

**THE DESIGN OF EFFECTIVE POLICIES FOR THE PROMOTION OF
SUSTAINABLE CONSTRUCTION MATERIALS**

By

Harn Wei Kua

B.S. Physics (2nd Upper Honors)
National University of Singapore (1996)

M.S. Theoretical Physics
National University of Singapore (1999)

S.M. Civil and Environmental Engineering
Massachusetts Institute of Technology (2002)

S.M. Technology and Policy
Massachusetts Institute of Technology (2002)

Submitted to the Department of Architecture
In partial fulfillment of the requirements for the degree of
Doctor of Philosophy in Architecture: Building Technology

at the
Massachusetts Institute of Technology
September 2006

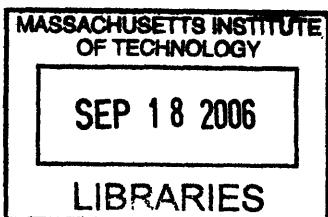
© 2006 Massachusetts Institute of Technology
All rights reserved

Signature of Arthur.....
Department of Architecture
May 25, 2006

Certified by
John Fernandez
Associate Professor of Architecture and Building Technology, Department of Architecture
Thesis Supervisor

Certified by
Nicholas Ashford
Professor of Technology and Policy, Center for Technology, Policy and Industrial Development
Thesis Supervisor

Accepted by
Yung Ho Chang
Head, Department of Architecture
Chair, Department Committee on Graduate Students



ARCHIVES

Thesis Committee:

John Fernandez, Associate Professor of Architecture and Building Technology
Department of Architecture

Nicholas Ashford, Professor of Technology and Policy
Center for Technology, Policy and Industrial Development

John Ochsendorf, Assistant Professor of Structure and Building Technology
Department of Architecture

THE DESIGN OF EFFECTIVE POLICIES FOR THE PROMOTION OF SUSTAINABLE CONSTRUCTION MATERIALS

by
Harn Wei Kua

Submitted to the Department of Architecture
On May 25, 2006 in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy
In Architecture: Building Technology

ABSTRACT

This research explores the associated effects of policy tools employed to promote sustainable building materials. By comparing the original motivations and intended effects of these policies and their actual outcome, and subsequently understanding the reasons behind any disparities between them, we suggest ways by which future policy planning can be improved.

This research is based on seven detailed case studies. They cover the applications of virgin material taxes in Denmark and Sweden, forest management and biodiversity legislations in United States' Northwest and its coupling economic adjustment initiative, legislations/public outreach/demonstration projects on the use of substitute fuels for cement manufacturing in United States and the United Kingdom, and economic incentives to promote afforestation/reforestation in Chile. Each of these cases is attended by negative, unanticipated outcomes. By analyzing these outcomes, we observe that a negative and unanticipated policy outcome occurs when a sustainability indicator/issue is either completely ignored by policymakers, or the policymakers fail to identify intrinsic but inconspicuous links between seemingly disparate indicators. These unexpected outcomes can be reduced, or avoided, if policymakers conceptualize policies more broadly, for which purpose we propose the concept of integrated policymaking.

This concept promotes the idea of co-addressing, or even co-optimizing, a wide range of eleven to sixteen sustainability indicators covering all the three domains of sustainability – economy, environment and employment. Furthermore, in doing so, policymakers must promote interactions among the different levels of governmental agencies (i.e. horizontal and vertical integration) and between the governmental and non-governmental stakeholder groups (i.e. time horizon integration and integration across stakeholder groups). We emphasize the significance of five different but interrelated types of feedback loops in supporting these different types and goals of integration.

Finally, we applied this concept to the seven cases and proposed a series of innovative integrated policy strategies to address the negative, unanticipated outcomes observed.

Thesis Supervisor: John Fernandez
Title: Associate Professor of Architecture and Building Technology
Thesis Supervisor: Nicholas Ashford
Title: Professor of Technology and Policy

ACKNOWLEDGMENT

No one makes it alone; especially over almost 6 years in MIT.

Professor John Fernandez has opened my eyes to the inherent beauty of materials – on how aesthetics and function can and should be mixed. His unique background paves the way for my developing of a better appreciation for the role of materials in sustainability. This is a significant cultural change for someone who used to view concrete and steel as but lifeless entities. His flexibility and open-mindedness exemplify the character traits we desire for effective sustainability endeavors.

Professor Nicholas Ashford, being one of the most foremost thinkers on sustainability of our times, has helped me appreciate the meaning of sustainability. He impresses all of us in drawing links amongst seemingly disparate issues, which are usually neglected by the commonplace approach. He has shown me the way to better scholarship and the need to avoid labeling ourselves, consciously or unconsciously, with our very own proficiency. He has a very profound impact on my work and attitude.

I would like to express my heartfelt gratitude to both Professor Fernandez and Professor Ashford for their excellence in their guidance and mentorship –something which can be very challenging for multidisciplinary and inter-disciplinary works.

Professor John Ochsendorf is someone beaming with enthusiasm and passion when it comes to his work on ancient structure preservation and sustainable development. In many ways, his passion is contagious. He sets an excellent example for younger and seasoned faculties alike, about how students can learn not just the materials/skills you impart but also – perhaps even most importantly – the attitude you bring into the class. The methodical and systematic approach he brings into our discussions helps to improve the quality of this work very significantly.

I would also like to thank Professor Leon Glicksman, Professor Leslie Norford, Professor Marilyne Andersen, Kathleen Ross and Nancy Dalrymple for their tremendous support and encouragement.

Without my fellow colleagues from Building Technology Program (Wanda, Lisa, Christine, Rogelio, Ed, Sian, Rosie, Nick, Matt, JC, Lisa, Patrik, Brian, Philipe, Kyong and Matt), TPP (Ralphy and Solomon Jamin) and the Design & Computation Group (Anas, Alex and Yanni), my experience in MIT will never be as rewarding and enjoyable.

My ‘gang’ of countrymen/countrywomen – Melvyn, Yuan Ping, Tenzin, Lenny, ‘Tger’ Teo, Nai Jia, Sharon Ching, Kwong Meng, Charolette, Jay, Sy Bor, Donald, Lu Feng, Ruimin and Ruijie – have given me amazing encouragement and much-needed help along the way.

My utmost thanks to the National University of Singapore, Department of Building, who has been funding my research for the past few years. Professor Cheong Hin Fatt (Dean), Professor George Ofori (Head of Department), and Kwok Wai (Deputy Head of Department) have all given me great guidance on how my research work at MIT can be of relevance to Singapore.

Last but never the least, nothing that I can say now and forever will sufficiently express my gratitude and respect for my dearest family, who has stood by me all these while in a land so, so far away – a land I shall return to with renewed energy, anticipation, and a wish to contribute to my people with whatever I learn.

THE DESIGN OF EFFECTIVE POLICIES FOR THE PROMOTION OF SUSTAINABLE CONSTRUCTION MATERIALS

ABRIDGED TABLE OF CONTENTS

Abstract	5
Acknowledgements	7
Abridged Contents	9
Detailed Contents	11
Chapter 1: Policymaking and Construction Materials	
1.1 What is Sustainable Development Policymaking?	19
1.2 Sustainability Challenges in the Use of Construction Materials	31
1.3 Common Sustainable Development Policymaking Tools	42
1.4 Current Research on Policy Integration	54
1.5 Research Questions, Methodologies and Scope of Research	56
Chapter 2: The Nature and Typology of Policy Tools	58
2.1 General Principles of Policymaking for Sustainability	58
2.2 Economic Tools	59
2.3 Legislations and Regulations	65
2.4 R&D Programs	68
2.5 Voluntary Programs	70
2.6 Stakeholder Organizations	74
2.7 Education and Outreach Programs	79
2.8 Summary – Application of Policy Tools	83
Chapter 3: The Results of The Case Studies	84
3.1 Introduction – the 7 Case Studies	84
3.2 Case Study 1- Virgin Material Tax in Sweden and Denmark	85
3.3 Case Study 2- Forest Management and Biodiversity Regulations in the Northwest of U.S	91
3.4 Case Study 3- Policy Tools to Promote the Use of Substitute Fuels for Cement Production in the U.S and UK	95
3.5 Case Study 4- Regulation and Subsidies for Reforestation and Afforestation in Chile	100
3.6 Conclusions	102
Chapter 4: Designing More Effective Sustainable Development Policies	103
4.1 Reasons Behind Negative Unexpected Outcome and the Need for Broader Conceptualization of Policy Solutions	103
4.2 Interaction and Integration: Identifying the Significance of Stakeholder Participation	105
4.3 Characteristics of Policy Integration	107

4.4	The Relation Between the Extent & Characteristic of Policy Integration and Policy Effectiveness	108
4.5	Policy Solutions for Improving Virgin Material Taxes in Sweden and Denmark	111
4.6	Policy Solutions for Improving Forest Management Policies	154
4.7	Policy Solutions for the Use of Waste as Fuels for Cement Production in the United States	181
4.8	Policy Solutions for the Use of Waste as Fuels for Cement Production in the United Kingdom	199
4.9	Sustainability Policy for Balancing the Reforestation Policies of Chile	215
Chapter 5:	Governance for Sustainability	216
5.1	Challenges and Opportunities for integrating Government Bodies	216
5.2	The Use of the Ashford-Hall Plots	218
5.3	Ashford-Hall Plots of Our Proposed Policy Solutions	220
5.4	Task Force in Integrated Policymaking	231
5.5	Role of the Technocrat	233
5.6	Sustainability Thinking and the Structure of the Institution	235
5.7	The Different Types of Feedback	237
5.8	Type 5 Feedback Loop, Continuity Between Successive Term of Office and the Significance of a Sustainability Commission	239
Chapter 6:	Conclusions and Future Research	243
6.1	Why Do Negative, Unanticipated Outcomes Occur?	243
6.2	Novel Contributions of this Work	244
6.3	Future Research	250
6.4	Final Remark – The Culture of Sustainability	253
References		254
Annexes		265

DETAILED TABLE OF CONTENTS

Chapter 1: Policymaking and Construction Materials

1.1	What is Sustainable Development Policymaking?	19
1.1.1	Important Milestones	19
1.1.2	Challenges in Policymaking for Sustainable Development	21
1.1.3	Frameworks of Sustainability	22
1.1.3.1	Economy-based framework	
1.1.3.2	Ecology- or Environment-based Framework	
1.1.3.3	Social-based framework	
1.1.3.4	Holistic Framework	
1.1.4	Sustainability Framework for the Built Environment	25
1.1.4.1	The Golden Rules for Ecological Design	
1.1.4.2	Cradle-to-cradle	
1.1.4.3	Cardinal Rules for a Closed Loop Building Materials Strategy	
1.1.4.4	USGBC LEED-NC Approach	
1.1.5	Framework for Assessing Sustainable Technology and Policy	28
1.2	Sustainability Challenges in the Use of Construction Materials	31
1.2.1	Worldwide Consumption	31
1.2.1.1	Cement and Aggregate	
1.2.1.2	Steel	
1.2.1.3	Wood	
1.2.2	Consumption and Sustainability	38
1.2.2.1	Cement and Aggregate	
1.2.2.2	Steel	
1.2.2.3	Wood	
1.3	Common Sustainable Development Policymaking Tools	42
1.3.1	Material Flow Analysis	42
1.3.1.1	Strengths of MFA Methods	
1.3.1.2	Weaknesses of MFA Methods	
1.3.2	Self-Organizing Holarchic Open System and Adaptive Management	44
1.3.2.1	Strengths in Policymaking	
1.3.2.2	Weaknesses	
1.3.3	Participatory Methods	46
1.3.3.1	Attributes of Successful Participatory Methods	
1.3.3.2	‘Integrated Assessment’ and Participatory Methods	
1.3.3.3	Strengths and weaknesses of Participatory Methods	

1.3.4	Case Studies Methodology	53
1.4	Current Research on Policy Integration	54
1.5	Research Questions, Methodologies and Scope of Research	56
Chapter 2:	The Nature and Typology of Policy Tools	57
2.1	General Principles of Policymaking for Sustainability	58
2.2	Economic Tools	59
2.2.1	Incentive/Empowerment Tools	59
2.2.1.1	General Tools	
2.2.1.2	Selective, Non Self-financing Tools	
2.2.1.3	Selective, Self-financing Tools	
2.2.1.3.1	Investment Funds	
2.2.1.3.2	Guarantee Funds	
2.2.2	Disincentive Tools	63
2.2.2.1	Tax and Levy	
2.2.2.1.1	Material-related Tax	
2.2.2.1.2	Emission-related Tax	
2.2.2.2	Fines and User Fees	
2.3	Legislations and Regulations	65
2.3.1	Regulation for Federal or State Government Agencies	66
2.3.2	Regulation for Industry and Society	66
2.3.2.1	Bans	
2.3.2.2	Standards	
2.4	R&D Programs	68
2.5	Voluntary Programs	70
2.5.1	Environmental Management System (EMS)	70
2.5.2	Rating or Benchmarking Schemes	70
2.5.3	Self-imposed Performance Standards	72
2.5.3.1	Extended Producer Responsibility (EPR)	
2.5.3.2	Firm Product Labeling Scheme	
2.5.3.3	Technology Experimentation	
2.5.3.4	Performance Reporting Scheme	
2.6	Stakeholder Organizations	74
2.6.1	International and Regional Organizations	76
2.6.2	Local Organizations	76
2.6.2.1	Trade Associations and Professional Societies	
2.6.2.2	Trade Union	
2.6.2.3	Think Tanks	
2.6.2.4	Consumer Groups or Associations	
2.6.2.5	Chamber of Commerce	
2.7	Education and Outreach Programs	79

2.7.1	Product Labeling Schemes	79
2.7.2	Design Standards	81
2.7.3	Demonstration Projects	81
2.7.4	Outreach Programs	82
2.8	Summary – Application of Policy Tools	83
Chapter 3:	The Results of Case Studies	84
3.1	Introduction – the 7 Case Studies	84
3.2	Case Study 1- Virgin Material Tax in Sweden and Denmark	85
3.2.1	Gravel Tax of Sweden	85
	3.2.1.1 Goals and Objectives of the Gravel Tax	
	3.2.1.2 Comparisons Between Outcomes and Objectives	
3.2.2	Raw Materials Tax of Denmark	89
	3.2.2.1 Goals and Objectives of the Raw Materials Tax	
	3.2.2.2 Comparisons Between Outcomes and Objectives	
3.3	Case Study 2- Forest Management and Biodiversity Regulations in the Northwest of U.S	91
3.3.1	Goals and Objectives of the Regulations and Other Related Policy Tools	91
3.3.2	Comparisons between Outcomes and Objectives	93
3.4	Case Study 3- Policy Tools to Promote the Use of Substitute Fuels for Cement Production in the U.S and UK	95
3.4.1	Goals and Objectives of the Relevant Policy Tools in the U.S.	95
3.4.2	Comparisons Between Outcomes and Objectives	96
3.4.3	Goals and Objectives of the Relevant Policy Tools in the U.K.	98
3.4.4	Comparisons Between Outcomes and Objectives	98
3.5	Case Study 4- Regulation and Subsidies for Reforestation and Afforestation in Chile	100
3.5.1	Goals and Objectives of the Relevant Policy Tools	100
3.5.2	Comparisons Between Outcomes and Objectives	100
3.6	Conclusions	102
Chapter 4:	Designing More Effective Sustainable Development Policies	103
4.1	Reasons Behind Negative Unexpected Outcome and the Need for Broader Conceptualization of Policy Solutions	103
4.2	Interaction and Integration: Identifying the Significance of Stakeholder Participation	105
4.2.1	Neglected Issues in Stakeholder Participation	106
4.3	Characteristics of Policy Integration	107

4.4 The Relation Between the Extent & Characteristic of Policy Integration and Policy Effectiveness	108
4.5 Policy Solutions for Improving Virgin Material Taxes in Sweden and Denmark	111
4.5.1 Improving the Sweden Gravel Tax Policy	111
4.5.1.1 Five Goals of Desired Policy Transformation	111
4.5.1.2 Key Stakeholders and their Willingness, capacity/incentive and Opportunity to Change	112
4.5.1.3 Possible Barriers and Strategies to Overcome Them	117
4.5.1.3.1 Promoting Widespread Materials Flow & Energy Accounting and Cleaner Production in the Aggregate Industry	
4.5.1.3.2 Improving the C&D waste Recycling Industry	
4.5.1.3.3 Diversifying Aggregate and Mining Jobs	
4.5.1.3.4 Integrating or Coordinating “Sustainable Concrete Aggregate” Scheme and the European Community CEN Standards	
4.5.1.3.5 Building Materials Information Portal and Database	
4.5.1.4 Strategy to Engage the Stakeholders	120
4.5.1.5 Policy Monitoring and Intervention Mechanism	133
4.5.2 Improving the Danish Raw Materials Tax Policy	134
4.5.2.1 Five Goals of Desired Policy Transformation	134
4.5.2.2 Key Stakeholders and their Willingness, capacity/incentive and Opportunity to Change	134
4.5.2.3 Possible Barriers and Strategies to Overcome Them	140
4.5.2.3.1 Promoting Widespread Materials Flow & Energy Accounting and Cleaner Production in the Aggregate Industry	
4.5.2.3.2 Improving the C&D waste Recycling Industry	
4.5.2.3.3 Diversifying Aggregate and Mining Jobs	
4.5.2.3.4 Integrating or Coordinating “Sustainable Concrete Aggregate” Scheme and the European Community CEN Standards	
4.5.2.3.5 Building Materials Information Portal and Database	
4.5.2.4 Strategy to Engage the Stakeholders	142
4.5.2.5 Policy Monitoring and Intervention Mechanism	151
4.5.3 Determinant of Success of the Task Force	152
4.5.4 Evolution in Government’s Trustee Role and the Formulation of Sustainability Law	153
4.6 Policy Solutions for Improving Forest Management Policies	154
4.6.1 Eight Goals of Desired Policy Transformations	154
4.6.2 Key Stakeholders and their Willingness, Capacity/Incentive and Opportunity to Change	157
4.6.3 Possible Barriers and Strategies to Overcome Them	164

4.6.3.1	Improving the Federal Preferred Purchase Program for Recycled Wood	164
4.6.3.2	Implementation of “Forest Grant for Sustainability” (FGS) Initiative and introduction of the concept of “Forest Loan”	164
4.6.3.3	Encourage job diversification via the ICE Scheme	165
4.6.3.4	Promote of MFA, SFA and EFA of the recycling process of wood	166
4.6.3.5	Continue to improve the adaptability of sustainable forest certification programs and their enforcement internationally	166
4.6.3.6	Adopt more creative approaches in addressing owl conservation	167
4.6.3.7	Certifying the process of recycled wood production	168
4.6.3.8	Enhancing the public image of recycled wood product	169
4.6.4	Strategy to Engage the Stakeholders	169
4.6.5	The Challenges in Balancing between the Industry’s Influence and Government’s Trustee Role for the Public Good	179
4.7	Policy Solutions for the Use of Waste as Fuels for Cement Production in the United States	181
4.7.1	4 Goals of Desired Policy Transformation	181
4.7.2	Key Stakeholders and their Willingness, Capacity/Incentive and Opportunity to Change	184
4.7.3	Possible Barriers and Strategies to Overcome Them	190
4.7.3.1	Demonstration and public outreach project led by the scientific advisory board	190
4.7.3.2	“Green Fuel Innovation” Credit/Permit Scheme and the “Credit Banking” System	191
4.7.3.3	Corporate Responsibility in Reporting Emission Data and Facility Clean-Emission Index	192
4.7.3.4	Waste Production Tax	192
4.7.4	Engaging the Stakeholders	193
4.8	Policy Solutions for the Use of Waste as Fuels for Cement Production in the United Kingdom	194
4.8.1	Comparison between the UK and US Cases	199
4.8.2	Key Stakeholders	200
4.9	Sustainability Policy for Balancing the Reforestation Policies of Chile	201
4.9.1	Three Goals of Desired Policy Transformations	201
4.9.2	Key Stakeholders and their Willingness, Capacity/Incentives and Opportunity to Change	203
4.9.3	Possible Barriers and Strategies to Overcome Them	208
4.9.3.1	Industrial Co-investment Program	208
4.9.3.2	Promotion of Sustainability under DL701 Reform	208
4.9.3.3	Reform of Forest Certification	209

4.9.4	Strategies to Engage Stakeholders	209
4.10	Conclusions and Summary	214
Chapter 5:	Governance for Sustainability	216
5.1	Challenges and Opportunities for integrating Government Bodies	216
5.2	The Use of Ashford-Hall Plots	218
5.3	Ashford-Hall Plots of Our Proposed Policy Solutions	220
5.3.1	Case Study 1: Gravel Tax of Sweden	221
5.3.2	Case Study 2: Northwest Forest Plan and Economic Adjustment Initiative of the US	222
5.3.3	Case Study 3: Policy Tools to Promote the Use of Substitute Fuels for Cement Production in the US and UK	226
5.3.4	Case Study 4: Reforestation and Afforestation Policies of Chile	228
5.3.5	Conclusions from Case Studies	231
5.4	Task Forces in Integrated Policymaking	231
5.4.1	The Use of the Ashford-Hall Plot for Integrating Task Forces	231
5.4.2	Role of A Task Force	233
5.5	Role of the Technocrat	233
5.6	Sustainability Thinking and the Structure of the Institution	235
5.7	The Different Types of Feedback	237
5.8	Type 5 Feedback Loop, Continuity Between Successive Term of Office and the Significance of a Sustainability Commission	239
Chapter 6:	Conclusions and Future Research	243
6.1	Why Do Negative, Unanticipated Outcomes Occur?	243
6.2	Novel Contributions of this Work	244
6.2.1	Sustainability Indicators	244
6.2.2	Policymaking Tools	245
6.2.3	Four characteristics of Policy Integration	246
6.2.4	Five Types of Feedback Loops	247
6.2.5	Indicator-Integration Case Study Plots	247
6.2.6	Stakeholder Venn Diagrams	247
6.2.7	Sustainable Commission Utilization	247
6.2.8	Co-evolution and Co-development with the Concept of Sustainability	248
6.2.9	Specific Innovative Integrated Policy Strategies for Cases	249
6.2.9.1	Gravel Tax of Sweden and Raw Materials Tax of Denmark	249
6.2.9.2	Biodiversity and Forest Management Policies for the United States Northwest	249
6.2.9.3	Policy Tools to Promote the Use of Substitute Fuels for Cement Production in the U.S and UK	249

6.2.9.4	Regulation and Subsidies for the Reforestation and Afforestation in Chile	250
6.2.9.5	Creative Employment of Stakeholder Engagement Mechanisms	250
6.3	Future Research	250
6.3.1	Geographically focused yet sectorally diverse integration study	250
6.3.2	Comparative Studies involving Developing and Developed Countries	251
6.3.3	Relationship Between Culture and the Ability to Embrace Integrated Policymaking	251
6.3.4	Refinement of Stakeholder Education Tools	251
6.3.5	The Concept of ‘Policy Psychology’	252
6.4	Final Remark – The Culture of Sustainability	253
References for Chapter 1		254
References for Chapter 2		261
References for Chapter 3		263
References for Chapter 4		263
References for Chapter 5		264
Annexes		
I.	The Associated Effects Of Virgin Material Tax – The Case Of Swedish And Danish Taxes On Natural Aggregates	265
II.	Associated Effects Of Forest Management Regulations And The Northwest Forest Plan: Lessons On Policy-Making For A Sustainable Timber Industry In The United States	284
III.	Addressing Pollution Prevention And Waste Minimization In Substitute Fuel Use In Cement Plants In The United Kingdom And United States	300
IV.	Analysing The Neglected Fundamental Associated Effects Of Chile’s Forestry Policies	311
V.	Additional Case Surveys	324

CHAPTER 1: POLICYMAKING AND CONSTRUCTION MATERIALS

1.1 What is Sustainable Development Policymaking?

To understand effective policymaking for sustainable development, one needs to be familiar with the various ways by which the sustainability question is framed and addressed. Since it is essential to comprehend the link between these frameworks and the contexts within which they are conceived, key features of important milestones in our sustainability discourse should first be examined. By extracting key lessons from these milestones and comparing them to the implications of the various conceptual frameworks, we can then assess the potential effectiveness of these frameworks in helping us improve sustainable development policymaking. The first section of this chapter is organized to reflect this perspective.

1.1.1 Important Milestones

A careful examination of four of the key milestones in the development of the concept of sustainability provides a useful scope to the challenges and potential of policymaking for sustainable development. The following events played a unique role in underscoring important evolutions in our ongoing effort to co-optimize the ecological, social and economic domains that define humanity:

- Brundtland Report,
- Rio Declaration on Environment and Development,
- Agenda 21 (as well as the concomitant strategy of Local Agenda 21), and
- Johannesburg Rio+10 Summit in 2002.

The publication of *Our Common Future* by the Brundtland Commission in 1987 (Brundtland, 1987) signified an epiphany that our economic activities are both an influence and outcome of the state of the natural environment, of which we are a part. ‘Sustainable Development’ was for the first given a formal definition:

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (Brundtland, 1987)

The Commission addressed a few problem areas by proposing several general directions of solution; these areas cover population, human resources (including human rights among women and children), food security, ecosystem preservation, energy consumption/conservation, increase in industrial efficiency and productivity, and the negative effects of urban growth. Solutions would require redefining the role of the global economy as well as carefully planned institutional and legal changes to the existing systems. Albeit briefly, it also provided policymaking guidelines to address institutional gaps that might undermine the success of sustainable development planning. Although the social domains of humanity, such as culture preservation and employment, were not extensively discussed in this report, it brought our attention to the effects that the North (i.e. developed nations)-South (i.e. developing nations) relationship imposed on sustainable development at the global level. In essence, it cautioned against the usually unpredictable and potentially dilemmatic associated effects of globalization.

Finally, the Commission urged the UN General Assembly to transform the report into a UN Program on Sustainable Development, from which future follow-up conferences can be spurred at the regional levels.

The 1992 Rio Summit Declaration operated on the same definition of Sustainable Development adopted by the Brundtland Commission. In contrast with the Brundtland's Report, it included much more social aspects into its recommendation for sustainable development (United Nations, 1992). For example, its Principle 10 (it contained a total of 27 principles) advanced the notion that public participation is a crucial determinant of sustainability; its principles 20, 21 and 22 advocated the importance of participation by women, mobilization of youths and respect for indigenous communities/culture. Reaching these goals requires a government to have a reasonable level of empathy for the wide myriad of perspectives embedded in the sustainable development discourse. Developing this empathy is, in and of itself, a great challenge for which Rio did not provide a clear proposal.

Agenda 21 (United Nations, 1992), building on the Rio Declarations, called for a new form of universal partnership within and among nations to address the different intertwined issues that challenged sustainable development. In particular, for the very first time since the Brundtland Commission Declaration, "problem-shifting" by one country to another was cautioned against:

"States retained their sovereign right to develop their own resources pursuant to their own policies; nevertheless, their activities must not environmentally damage other States or areas beyond their jurisdiction. States would also be held responsible for environmental damage to others from sources within their jurisdiction or control." (United Nations, 1992)

Shortly after Agenda 21 was proposed, the concept that sustainable development should begin at the microscopic level by addressing unique local conditions followed up. It is hoped that a agglomeration of local success stories will yield a more sustainable picture at a larger scale. This strategy is known as the Local Agenda 21. Implementations of Local Agenda 21 in the Nordic countries highlighted a neglected flaw in such an approach – as a result of communities being overly focused on local problems and solutions, many countries lack coordination and coherence in their sustainability efforts. This had created a number of challenges in designing nationwide policies, which are essential to meet policy targets laid down in international and supranational agreements (Norland et al., 2003). Strategically speaking, overly emphasizing the significance of local actions may even perpetuate a degree of policy narrow-mindedness that causes the shifting of problems beyond national borders¹.

Finally, the Johannesburg Rio+10 2002 Summit, other than providing a progress report of the world's performance over the decade, highlighted the presence of policy dilemmas in achieving sustainability (Dalal-Clayton and Bass, 2002). Good *and* bad policy practices were commonly implemented side-by-side. In essence, this reflected the policymakers' inability and/or reluctance to address problems and design policies beyond the traditionally narrow scope. At a more fundamental level, this phenomenon reflected the level of uncertainties in decision-making for sustainability, accentuated by the traditionally fragmented format with which policies aimed at the different aspects of sustainable development are made.

¹ An example of such problem-shifting is the use of virgin material taxes in Sweden and Denmark – our first case study.

In summary, these milestones in our understanding of sustainable development have revealed the following challenges, which are relevant to policymaking for a more sustainable future:

- Although sustainable development is *not* just about promoting environment-centric economic development, such a narrow perspective remains very widespread in many societies. A recent discussion by Shellenberger and Nordhaus (Shellenberger and Nordhaus, 2005) expressed concern over this misconception.
- Environment-centric decision-making is caused by a sense of narrow-mindedness, signified by an unwillingness and/or inability to view problems beyond traditional boundaries. The over-emphasis on local action may perpetuate such narrow-mindedness indirectly. As such, Local Agenda 21 needs constant adjustment and re-invention to eradicate this inherent flaw.
- As much as Local Agenda 21 has its undesirable potentials, it represents a change in institutional role. This is actually congruent to Spangenberg's suggestion that institutional sustainability – a form of social capital – should be viewed as the 4th dimension of sustainability (Spangenberg and Bonniot, 1998).
- The current somehow North-centric discourse of sustainable development should be corrected. More specifically, problem-shifting to the South, due to globalization, remains as one of the most glaring and most challenging obstacles to the global effort toward sustainability. A deep appreciation for the unique development-related issues faced by the South needs to be fostered in the North (Nagpal, 1995).

1.1.2 Challenges in Policymaking for Sustainable Development

The problems we gleaned from these important milestones are related to different forms of narrow-mindedness in policymaking, which prevent us from thinking beyond the following:

- *Geophysical boundaries*

It is easier to implement policies that focus on the local context (i.e. issues that concerned the local community or pertaining to the local geography) and ignore the possible negative effects that such 'local policies' might have on communities and/or ecosystems beyond the local geophysical boundaries. This gives rise to problem-shifting.

- Traditional policy objectives corresponding to specific sustainability indicators and domains (i.e. economic, ecological and social aspects)

When policies are designed and implemented to tackle only a few sustainable indicators, there is a tendency for policymakers to overlook any possible effects that these policy actions may have on the other indicators that are not explicitly considered.

- "Tried and true" operational perspectives – i.e. the usual way of doing things

The traditional methods of policymaking may not consider the two points mentioned above – that is, they neither prevent problem-shifting nor encourage policymakers to consider a wider range of indicators and explore the links amongst them.

Such narrow-mindedness implies an inability or unwillingness on the part of decision makers to strive to understand the perspectives of other stakeholders, especially in cases when these other perspectives differ substantially from one's own. One may describe this as a lack of *empathy*. In fact, to some extent, it is this lack of empathy that gives rise to misunderstanding and/or disparities in understanding how sustainability can be achieved. Costanza and Daly (1991) spoke of cultivating one kind of such empathy, by “getting people to think cross-disciplinary”. They observed that a more systematic approach that integrates cross-disciplinary and cross-perspective thinking into the policymaking process is still lacking. Such “cross-disciplinary” thinking can also be seen as connecting stakeholders to one another's experience and creating the *opportunity, capacity* and *willingness* (Ashford, 1994) to fuse such experiences with their decision-making heuristics.

Is there any relation between the ways with which we conceptualize linkages between the different sustainability domains in general, and indicators in particular, and the occurrence of unexpected outcome of sustainable development policies? Will developing empathy across these different sustainable development frames help to eradicate such negative phenomena? The next subsection presents a brief review of key sustainable development frameworks created from a rich array of perspectives. Appreciating the strengths and weaknesses of each framework will enable us to eventually identify useful sustainability indicators with which the effectiveness of policy tools is evaluated.

1.1.3 Frameworks of Sustainability

The different frameworks for sustainable development vary according to the degree to which each of the sustainability domains – economy, environment and social/employment – are taken into account. Many of them used one or a few of the domains as the focal point to invoke questions on other sustainability indicators and domains. One can roughly classify them into four main types of framework.

1.1.3.1 Economy-based Framework

A number of scholars addressed the meaning of sustainability from the economic perspective. Solow objected to the notion that sustainability is about preserving what we think our future generations would need (Solow, 1991), for it assumes that we are able to predict accurately the needs of our future. He suggested that whenever a resource is depleted, it would be substituted by another resource. Since technology advancement enables such substitutions, any exploitation of today's non-renewable resources should be paid for with a ‘rental’ toward technology investment in exploring substitute resources.

1.1.3.2 Ecology- or Environment-Based Framework

Daly however has an opposite view (Daly, 1991). Daly's “steady state economy” entails a vision of an economy that functions within its ecological limits. Arguing that the biophysical limits to growth are contributed by three interrelated conditions – finitude, entropy and complex

ecological interdependence – Daly suggested that putting a check on our current rate of resources exploitation is necessary and essential. While not as optimistic as Solow on the power of technologies, Daly opened up the problem space much more than the former; He proposed that three types of limits should be set within the frame of “steady state economy” – limits on human populations, artifacts and the degree of inequality in the distribution of artifacts among people (i.e. distributional equity).

Many scholars subscribe to insight that there are “hard” ecological limits. Holdren, Daily and Ehrlich (Holdren, Daily and Ehrlich, 1995) sets out the tenets of “biogeophysical” sustainability, in which they retained traces of both Daly’s and Solow’s theses. Their understanding of the meaning of sustainability is much more wide-based than the former two scholars. In the spirit of considering the interactions among the diverse properties that define the biogeophysical entity, Holdren et al. realistically highlighted the fundamental challenges to policymaking for sustainability:

“..the list of what is not known and what needs to be known in order to address ‘sustainability’ with comprehensiveness and rigor is a very long one...”
(Holdren, Daily and Ehrlich, 1995)

This leads to the following question: how will uncertainties and misconceptions affect the fostering of policy empathy? This is the main topic of interest in some of the more recent efforts to bring together different stakeholders under different settings/formats to tackle specific sustainability questions. Such a worldwide effort – known as Integrated Assessment – is reviewed in the subsection 1.3.3.

The Ceres Principles (2005) exemplifies a growing effort to incorporate a code of environmental conduct for environmental, investor and advocacy groups working together to co-develop the economic and environment domains. Ceres has a few pillar programs: company programs, industry programs, investor programs and Sustainability Reporting program. The last of which has evolved into the famous Global Reporting Initiative (GRI, 2005).

1.1.3.3 Socially-Based Framework

The NGO model (Court, 1990) and work by Goldberg et al. (Goldberg et al., 1988) added more specificity to the definition of social sustainability. In the book *Beyond the Brundtland*, a coalition of Southern and Northern NGOs came to the agreement that social equity should imply access to decision-making resources, empowerment and eventual emancipation of decision-making capacities. Besides, these should be carried out in a corporate culture that is error-friendly. Not surprisingly, these were extensively addressed under Agenda 21 and Local Agenda 21. Goldberg et al. considered self-reliance and peace as critical elements of social sustainability.

Other socially inspired models of sustainable development are developed to address industry-specific concerns. They usually pertain to promoting a better appreciation for the delicate balance between environment and industry-specific social indicators. McDonough proposed the Hannover Principles (McDonough, 1999) to assist designers, planners and policymakers arrive at design solutions that promote co-existence between human and the environment. One of its theses is to eliminate the notion of waste in the utilizing of materials – a concept that corresponds to the central spirit of industrial ecology. The Earth Charter Principles stand out advocating for balancing ecological integrity with the respect for community, social justice, democracy, nonviolence and peace (Earth Charter, 2004). The Natural Step System

Conditions, created and popularized by Swedish scientist Karl-Henrik Robert, defined basic principles for maintaining ecological processes and recognizing the significance of business and social needs through a highly dynamic process, using feedback loops (Natural Step, 2003)

1.1.3.4 *Holistic Framework*

There are also a number of models that go further to break down all the three domains into their respective detailed elements and explore practical measures to link up all or a few of these elements at a time. One of the most complete of such models is called the Conservation Economy by Ecotrust (2003). Ecotrust defines Conservation Economy according to 57 patterns – which are actually indicators each defined by a relationship with all other indicators. The complete pattern map is shown in fig.1.1. Worth noting is that not all 57 patterns are applicable under all socio-economic situations; in fact, as we will mention in chapter 4, section 4.3, aiming to achieve so many indicators may expose the inherent weaknesses in current government or organizational structure in meeting the challenges that sustainability policymaking poses.

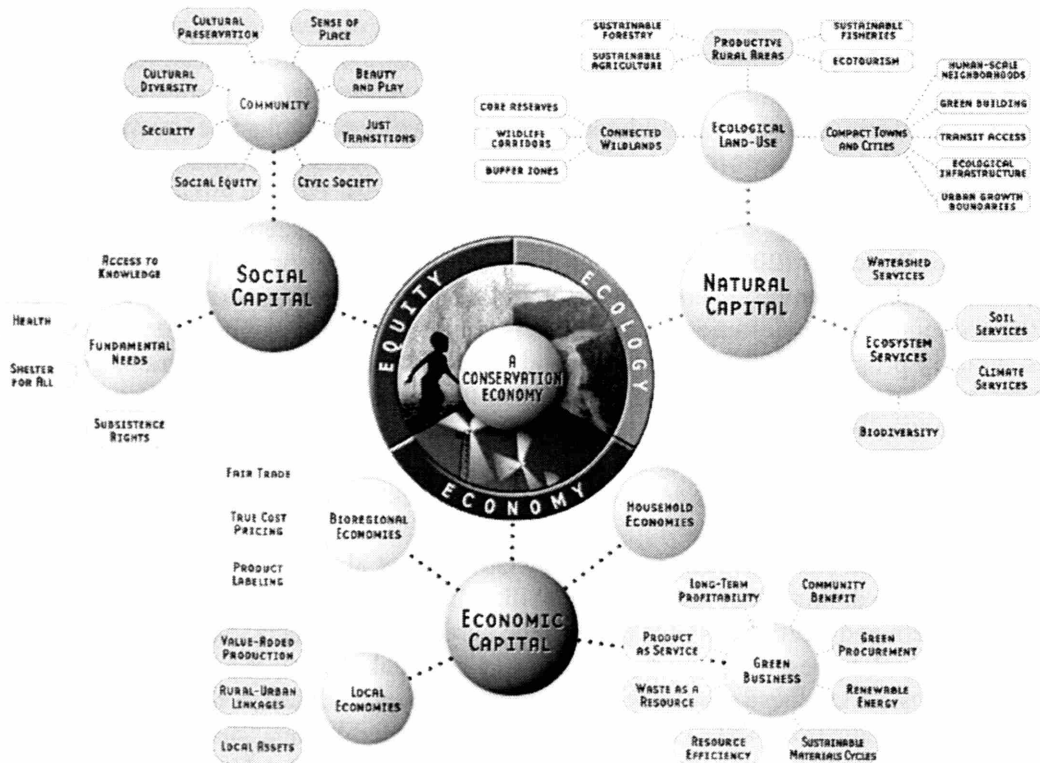


Fig.1.1. The Conservation Economy proposed by the Ecotrust (Ecotrust, 2003).

The Bellagio Principles (1997) are distinct from most models of sustainability thinking in that instead of detailing the indicators and relationship amongst them, it prescribes guiding principles to assess and select practical indicators. It proposes that indicators should:

- Reflect a holistic approach that consider both the positive and negative effects of human actions on the environment;
- Consider all 3 domains of sustainable development;
- Ensure the incorporation of adequate scopes – of space, time and boundaries – in tackling known challenges in the three domains;
- Have a practical focus, be measurable and comparable with certain references, address a limited number of key issues;
- Allow for openness in the assessment of data and sharing of information with stakeholders;
- Assist in the design of a program that facilitates effective communication and broad participation;
- Be subjected to ongoing assessment, adjustment and even correction, and
- Constitutes an institutional system that clearly assigns responsibility and provides ongoing support for decision-making, data collection and access, and local development

Faced with the challenges of ever-increasing number of sustainability indicators, Bellagio Principles play an important role in ensuring that only key issues are addressed. However, one needs to skillfully select a core set of indicators that not only reflect the pertinent issues at hand but also has the ability to be expanded and extrapolated to related but more detailed areas of concern. One example is the extension of ‘stakeholder communication’ into the realm of ‘global trade’ by considering the role of international trade agreements and treaties. A good example of such a sustainable development is Ashford’s ‘sustainable tripod’ (1994), fig. 1.2, concept, in which he extended the content of social sustainability within the scope of work and globalization. He suggested that employment is an important social element; as such, social sustainability should aim to ensure that livelihoods are available and secure, equitable reward for labor is present, maintenance of a decent standard of living (which is relative to the culture in question) is permitted and all works are conducted in a safe environment that allows for personal enrichment and satisfaction. In this representation, he interpreted sustainability in the light of several often-neglected policy-related issues, such as technology innovation and the omnipresent force of globalization. In essence, his framework provided a very insightful and practical entrance into key policy areas that reside in the interfaces of the three sustainability domains.

1.1.4 Sustainability Framework for the Built Environment

A few of the abovementioned frameworks have been applied to the built environment by building scientists and architects. In this subsection, we shall examine a few other concepts specially devoted, and relevant, to the building industry.

1.1.4.1 The Golden Rules for Ecological Design

Stefan Bringezu of the Wuppertal Institute suggested five “golden rules of ecological design (Bringezu 2002). These five golden rules are:

- 1) *Potential impacts for the built environment to the environment should be considered on a life cycle basis.* This advocates adopting a more holistic view on assessing the sustainability of the design as well as avoiding the shift of problems between different stakeholders and processes.

- 2) *Intensity of use of processes, products, and services should be maximized.* The fact that most buildings products are not used much of the time implies that many of our resources can be better utilized. As noted by Kibert (2006), notwithstanding this fact, economic, environmental and social costs have to be paid for the maintenance of these building spaces. On a brighter note, this also implies that if multi-functionality and more flexible models of use can be applied to the existing stocks of buildings, we may be able to reduce the demand for additional construction. Besides resulting in lower materials demand, this will also reduce the overall costs for the buildings' users;
- 3) *Intensity of resource use (material, energy, and land) should be minimized.* This rule is related to the factor 4 to 10 targets for material requirements including energy carriers. Achieving these targets require us to severely modify our ways of using goods and services. As observed by Kibert (2006), to be successful in such modifications requires us to "invest more intellectual power into the search for alternative options to provide the services and functions demanded by the users."
- 4) *Hazardous materials should be eliminated.* When these hazardous materials satisfy other environmental criteria (and not sustainability concerns), such as reducing landfilling demand, there will be vested interest to keep them in circulation within the economy. Two great examples to illustrate the level of difficulty in removing these hazardous materials both physically and politically are asbestos and Chromated Copper Arsenate treated wood.
- 5) *Resource input should be shifted toward renewables.* This rule is a restatement of one of the pillar concepts in ecological economics – that non-renewable raw materials will clearly diminish over time as finite amounts of them are consumed. As such, prices will aptly reflect these shortages in due course. Bringezu further emphasizes what many industrial ecologists and sustainability scholars advocate – the need to switch the renewables resources well before the price signals show. This is also in line, albeit indirectly, with Porter's hypothesis (Porter, 1991) that states that first movers of cleaner technologies will reap major benefits by getting on to the learning curve earlier than the rest of the competitors.

1.1.4.2 Cradle-to-cradle

Other than the abovementioned Hannover Principles, William McDonough's major contributions include the concept of cradle-to-cradle design, which he proposed with Braungart (McDonough, Braungart, 2002). McDonough and Braungart suggested the solution to sustainable design is to follow nature's model of *eco-effectiveness*. This entails separating the materials we use in human activity into *biological* substances (which can be recycled in nature and be used by other organisms as nutrients) and *technical* substances (which can, with proper design, be 100% recollected and recycled or even upcycled (producing, in second use, products of greater value than their original use, with zero waste)) (Kibert, 2002).

In this light, one can also define biological and technical nutrients. The former is a material or product that is designed to return to the biological cycle. They state that packaging, for example, can be designed as biological nutrients whereby at the end of its use it can be, as

they put it, thrown on the ground or compost heap. A technical nutrient is a material or product that is designed to go back into the technical cycle, into the industrial metabolism from which it comes (Kibert, 2002). They also define a class of materials they refer to as the unmarketables – materials that are neither technical nor biological nutrients. As noted by Kibert (2002), one of the problems with this concept is that biological nutrients may be fundamentally difficult to differentiate from technical ones, even those products that originate from a biological base such as biopolymers. Furthermore, we feel that the biodegrading processes of real biological nutrients require closer examinations in order to determine if the processes themselves are fast enough and whether more non-renewable resources are needed to accelerate the biodegradation.

1.1.4.3 Cardinal Rules for a Closed Loop Building Materials Strategy

Kibert (2005) opined that a truly green building product should ideally be comprised of materials that are also green. Currently, this is not the case. Products such as low-emissivity windows, and energy recovery ventilators, to name but a few, have significant materials components that could hardly be considered to be green or that may even hamper the reuse and recycling of the product. One way of defining a ‘green’ product is to assess its ability to ‘close the loop’ – that is, whether it is able to be recycled as ‘food’ in nature after its service lifespan. According to Kibert, a closed loop building product and materials strategy must address several levels of materials use in its implementation; this includes but is not restricted to the building, the building products, and the materials used in building products and in construction. Ideally the building materials system should follow the Cardinal Rules for an Ideal Closed Loop Building Materials Strategy (Kibert 2005):

- Buildings must be deconstructable;
- Products must be disassemblable;
- Materials must be recyclable;
- Products/materials must be harmless in production and in use;
- Materials dissipated from recycling must be harmless as well.

Although the realization of closed loop buildings products still need a lot of work, this guideline acts as an effective touchstone for making decisions about product and service development for the built environment. It also provides a guide for making policies that will support loop-closing industrial practices.

1.1.4.4 USGBC LEED-NC Approach

The U.S. Green Building Council (USGBC) has developed a suite of building assessment systems know as Leadership in Energy and Environmental Design (LEED). LEED has increasingly received much attention from the design, building, contracting, regulating and even consumer circles. It has evolved into different categories of development, the most prominent of which is LEED for New Construction or LEED-NC.

The latest version of LEED gives points for the Materials and Resource (MR) category as indicated below (Kibert 2006):

MR Prerequisite 1	Storage and Collection of Recyclables
MR Credit 1.1	Building Reuse: Reuse 75% of Existing Walls, Floors & Roof

MR Credit 1.2	Building Reuse: Reuse 90% of Existing Walls, Floors & Roofs
MR Credit 1.3	Building Reuse: Maintain 50% of Interior Non-Structural Elements
MR Credit 2.1	Construction Waste Management: Divert 50% from Disposal
MR Credit 2.2	Construction Waste Management: Divert 75% from Disposal
MR Credit 3.1	Materials Reuse: 5%
MR Credit 3.2	Materials Reuse: 10%
MR Credit 4.1	Recycled Content: 10% (post-consumer + ½ post-industrial)
MR Credit 4.2	Recycled Content: 20% (post-consumer + ½ post-industrial)
MR Credit 5.1	Regional Materials: 10% Extracted, Processed, Manufactured Regionally
MR Credit 5.1	Regional Materials: 20% Extracted, Processed, Manufactured Regionally
MR Credit 6	Rapidly Renewable Materials
MR Credit 7	Certified Wood

One point is available for each credit for a maximum of 13 points for the MR Category. Besides the MR category, LEED also encompasses the sustainable sites, water efficiency, energy and atmosphere, indoor environment quality and innovation and supervision. A maximum of 69 points (accumulated from all the categories) is possible. Building are rated as platinum (52-69 points), gold (39-51 points), silver (33-38 points), or certified (26-32 points).

LEED is without doubt a great start toward a design concept that coherently integrates the different components of design for sustainability. Currently, important measures such as deconstructability of buildings, decoupling of building systems, disassemblable products, and Extended Producer Responsibility are still not addressed under LEED. The main reason is that many of such concepts are still in the experimental stages and that marketable prototypes are still not available.

1.1.5 Framework for Assessing Sustainable Technology and Policy

Corresponding to his sustainable development framework, Ashford (1994) proposed a systematic approach for formulating sustainable technology policies. This method was based on prior observations of successful policy applications. This approach can also be employed to evaluate the structure of current policies and help identify potential areas of weakness in policy design and execution.

In a nutshell, the framework proposes the following sequence of steps in policy formulation and assessment²:

- 1) Description of the problems to solve, their historical context, issues and stakeholders involved;
- 2) Description of any prior attempts to resolve or improve the problems, and analysis of the reasons for failure. Such analysis should be carried out in terms of the economic markets, law and political process, private sector management specifics, and technical system inadequacies;
- 3) Description of prior tools and techniques used to inform the decision-making process;

² Ashford originally proposed this framework for policy formulation. As it appears, we find it useful as a policy assessment guide too.

- 4) Clarification of the goals and targets of a desired transformation of the status quo;
- 5) Identification of the tools, models and technique that could affect the *willingness*, *opportunity* and *capacity* of stakeholders to change, so as to rectify the existing problems;
- 6) Formulation of specific strategies that will affect the stakeholders' *willingness*, *opportunity* and *capacity* to bring about desired changes;
- 7) Identification of barriers and strategies for surmounting and circumventing them, which includes evaluating the likelihood or ease of implementation as well as political coalition-building

Given that construction materials represent a sizable percentage of our annual material demand, addressing related sustainability problems is important. In the next section, we describe the negative impacts that our demand on construction materials has on global sustainability.

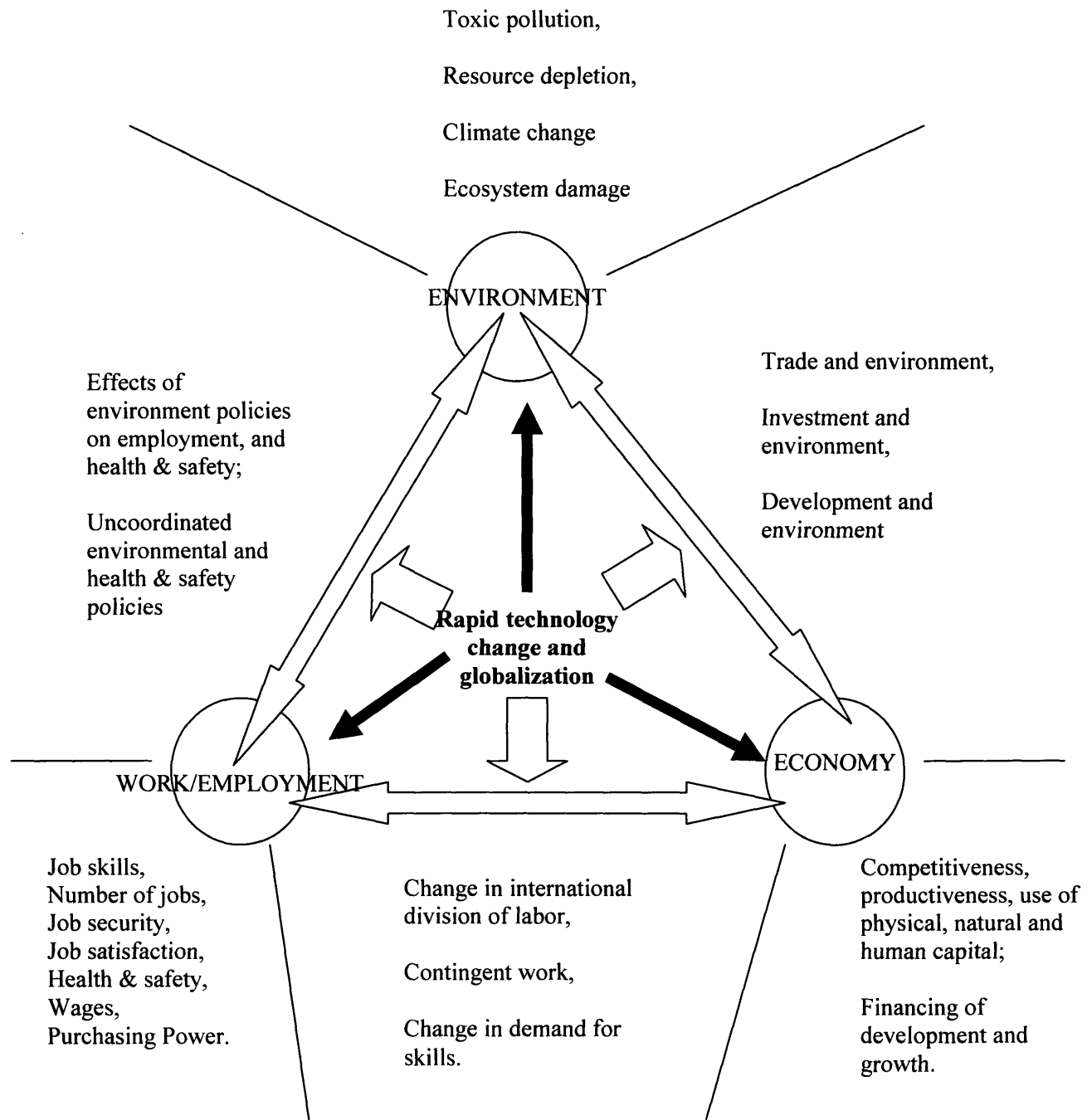


Fig.1.2. Ashford's 'Sustainability Tripod' (Ashford, 1994). Various policy-related concerns and sustainability-shaping forces should be addressed at both the vertices and sides of the triangle.

1.2 Sustainability Challenges in the Use of Construction Materials

1.2.1 Worldwide Consumption

Worldwide, the construction industry is by far one of the biggest consumers of extracted materials. In the U.S., in a typical year, on the order of 2.5 billion metric tons of materials are used to produce the built environment, compared to 70 million tons for machinery and equipment (producer durables) and 20-30 million of consumer durables. Although it represents about 8% to 9% of GDP³, resource extraction for construction exceeds 95% of the U.S. domestic total. The complexity involved in the construction industry implies that it also impacts the economic development of many other sectors of the economy. As observed by Horvath (2004), a US\$1,000 demand of ready-mixed concrete can generate as much as US\$1,166 of demand in the various related sectors including trucking, railroads, chemicals and stone mining. Construction industry is also responsible for inordinate quantities of waste materials, on the order of 150 million metric tons of construction and demolition waste, compared to a municipal solid waste stream of about 300 million metric tons in the U.S. (Kibert, 2006). Worldwide, buildings are estimated to be responsible for two-fifths of the world's material and energy flows, one-sixth of its fresh water usage and one quarter of its wood harvest (Augenbrog et al., 1998). The three most standardized construction materials and material systems are concrete, wood and steel. Our interest in concrete includes its two main constituents – cement and aggregates.

1.2.1.1 Cement and Aggregates

The most widely used cement for construction is hydraulic cement. Hydraulic cements are primarily used as the binding agents in concrete and most mortars. Hydraulic cements can be sub-divided into various types of Portland cement and/or masonry cement. Masonry cements include true masonry cements, Portland-lime cements, and plastic cements. Other hydraulic cements, such as aluminous cement, are included within the world hydraulic cement production data from the U.S Geological Survey, from which we obtain our data for this research.

In 2003, the world produced a total of around 1.95 Giga-tons of hydraulic cement. China remains the world's leader in cement production, accounting for about 42% of total production. India and the United States are the second and third largest producers respectively. Although the U.S produced around 4.8% of the world's cement in 2003, it consumed about 5.8% of the world's total production; this implies that it is a net importer of this important building material. China is the single biggest producer of the world's cement supply. Between 2000 and 2004, its production share increases steadily from around 36% (i.e.597 million metric tons) to just over 43% (933.7 million metric tons).

Coarse aggregates, such as gravels and crushed stone, provide compression strength to concrete by increasing the surface energy of the material system; that is, by binding to neighboring cement particles, they drastically increase the amount of energy needed to propagate a crack in the concrete mixture. For most countries, aggregates are the most required building

³ The U.S. construction industry's contribution to the GDP in 2000 was larger than the GDP of 212 countries of the world (out of 231 total). Of the 8-9% contribution, shipment of construction materials alone accounts for an average of 0.3% of the US GDP (this includes \$7.2 billion of cement, \$20.2 billion of ready-mixed concrete and \$6.1 billion of asphalt paving mixtures and blocks).

materials. Fig. 1.3 shows the comparison between U.S.'s consumptions of aggregates, cement, wood and steel. The ratio of aggregates to cement volume used for construction in the rural regions of developing countries could be expected to be higher than that in the urban regions of developed nations, as cement is a relatively more expensive commodity. As we shall elaborate later, aggregate mining presents a set of sustainability challenges that are distinct from those of cement production.

1.2.1.2 Steel

Steel is arguably the most recycled building material used today. Most of the structural steel utilized in the construction industry is manufactured from the electric arc furnace (EAF) process, which recycles nearly 100% scrap steel. It produces structural beams, steel plates, and reinforcement bars for which the major required characteristic is strength. In the U.S alone, almost 69 million tons of steel were recycled or exported for recycling in 2003. This high rate of recycling is sustained by the lower cost involved in recycling steel compared to mining virgin ore and moving it through the process of making new steel.

Usually, around 20% of a developed country's total iron and steel production is channeled into the construction industry. Fig. 1.4 shows the apparent consumptions⁴ of the U.S of cement and construction steel compared to the world's total productions of these two materials; fig. 1.5 compares more closely the level of consumption of these materials for the U.S only. These graphs show that U.S consumption for steel fluctuates a lot more than cement in the past 50 years; the demand for cement shows a steadier increasing trend. Nonetheless, the fact that the world's productions of these two building materials are on the rise is a cause for concern over the resultant sustainability impact.

China is by far the most prolific producer of steel in the world, followed by Japan and the U.S. In 2004, China accounted for 272.5 million metric tons of steel, while Japan and U.S produced 112.7 million metric tons and 99.7 million metric tons respectively (U.S Geological Survey, 2004).

⁴ Apparent consumption is equal to domestic production plus import minus export.

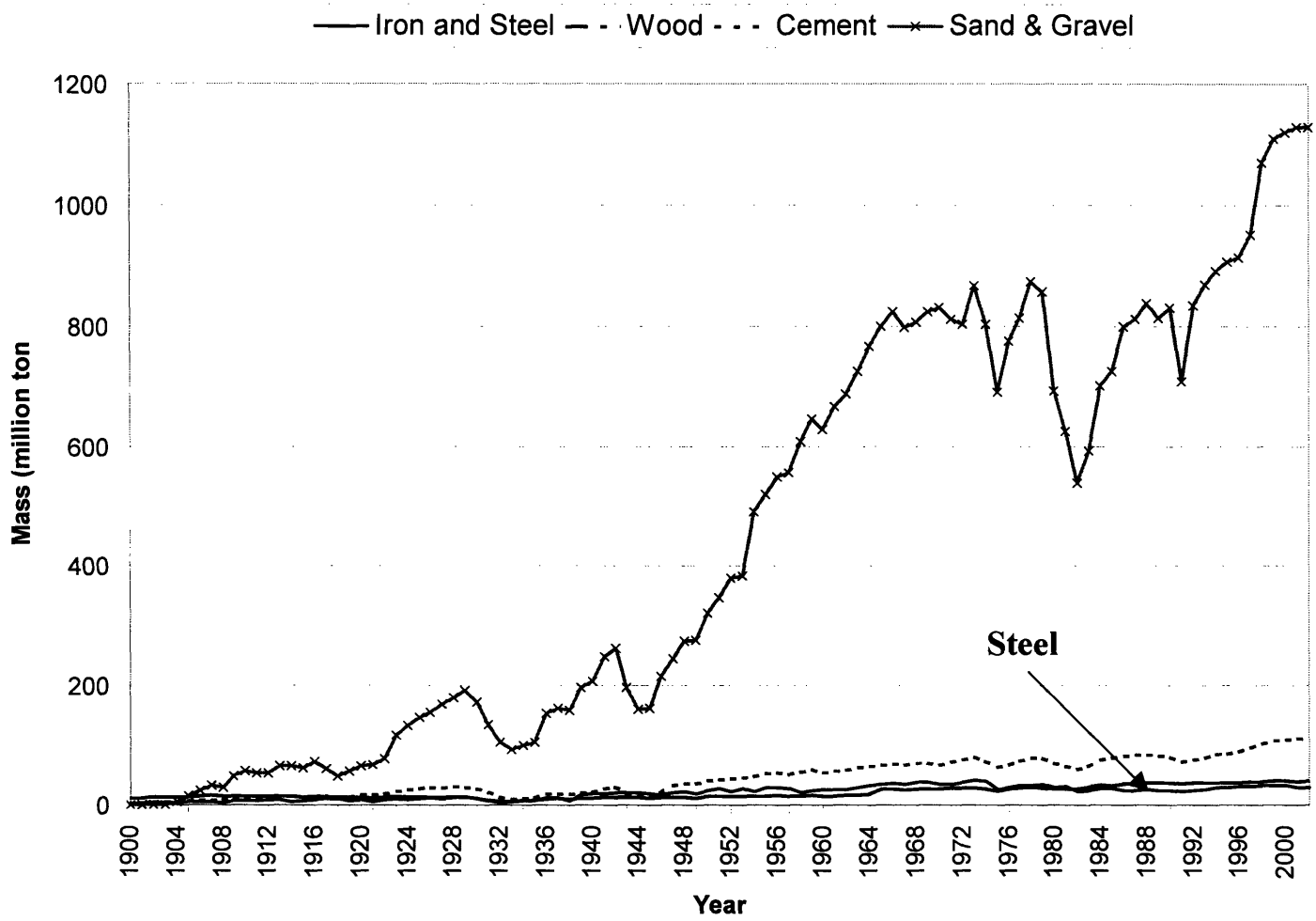


Fig.1.3 U.S consumptions of main construction materials, Sand and gravel are used as aggregates for making concrete (source: U.S Geological Survey, 2004)

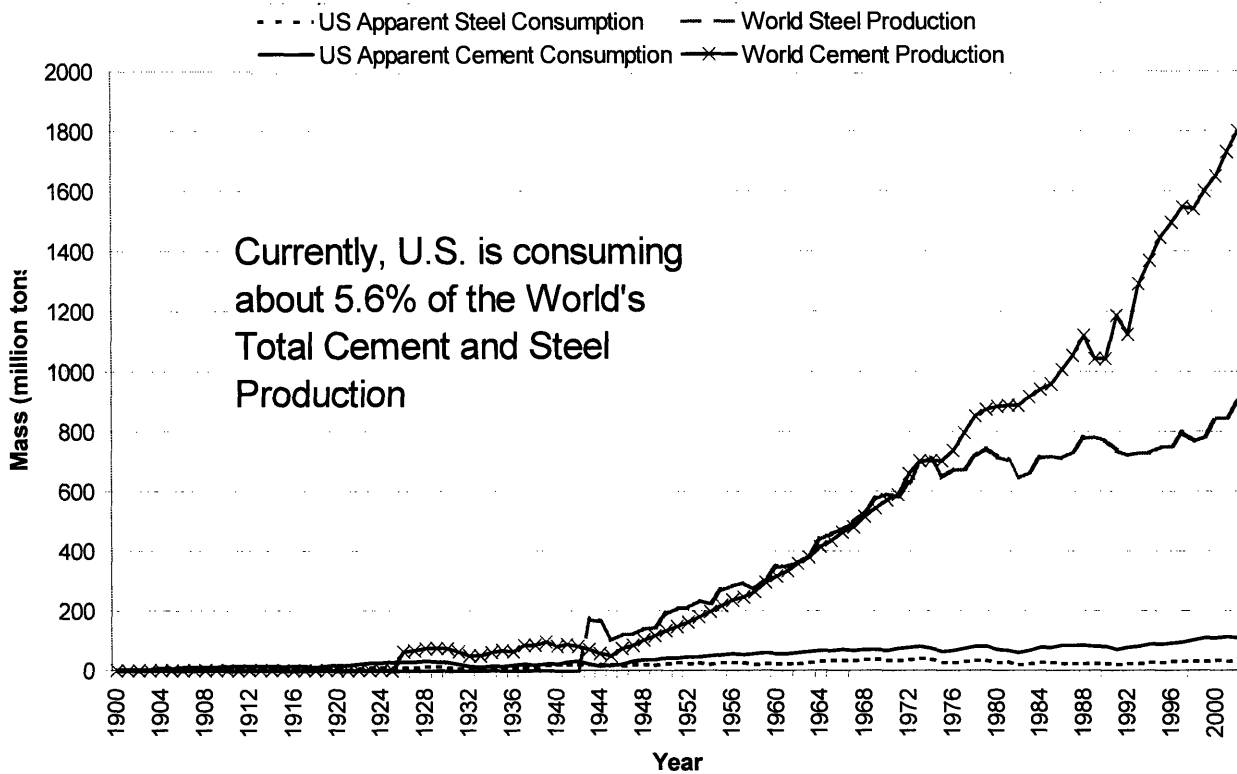


Fig.1.4. U.S. apparent consumptions of cement and steel, compared to the world's total productions (source: U.S Geological Survey, 2004)

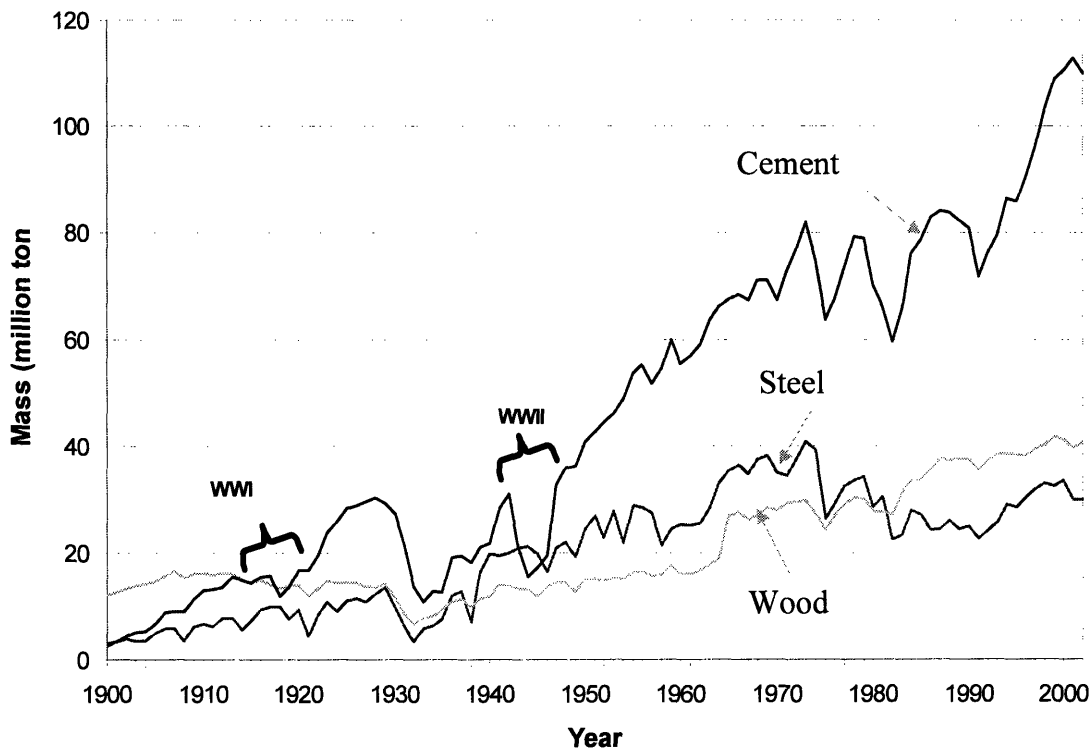


Fig.1.5. U.S. consumption of cement, steel and wood for construction (source: U.S. Geological Survey, 2004)

1.2.1.3 Wood

Wood that used for construction purposes – either as structural members or formworks – are mostly engineered wood products made from softwood trees. We are concerned with the global productions of the key engineered wood products such as chip and particle, compressed particle boards, hard boards, MDF (medium density fiber) boards, and plywood. As shown in fig.1.6, Canada is the world's largest producer of chip and particle (FAO, 2006). China overtook Sweden, Chile and Australia in 2003 to become to second largest producer. United States is the leading producer in compressed particle boards, as shown by earlier FAO data from 1990-1994, with the second-place China producing nearly half its annual amount (fig.1.7). In 2003, the U.S overtook China to become the world's largest hardboard producer (fig.1.8). Beginning in 2001, China's production outstripped the rest of the world and in 2004, it produced as much as nearly 4 times the amount of MDF produced in the second-place U.S (fig.1.9). China also overtook the U.S in 2002 to become the largest producer of plywood (fig.1.10).

Summarizing the fig.1.6 to 1.10, one can see that the U.S and China clearly dominate the production of engineered wood globally; as such, these two countries play very important roles in the sustainable development of the global wood industry.

Engineered wood is linked with many other industries, such as the paper and biomass fuel sectors. This means that fully and fairly evaluating the sustainability impacts of the construction wood industry *must* take these interconnections into consideration. Another challenge related to such interconnections among these different sectors is that policies that target at changing the flow characteristics in one or a few aspects of this industry network is very likely to result in associated effects elsewhere in the network. It is worth noting that such a complex network is generally true for the timber industry globally, and not restricted to the U.S.

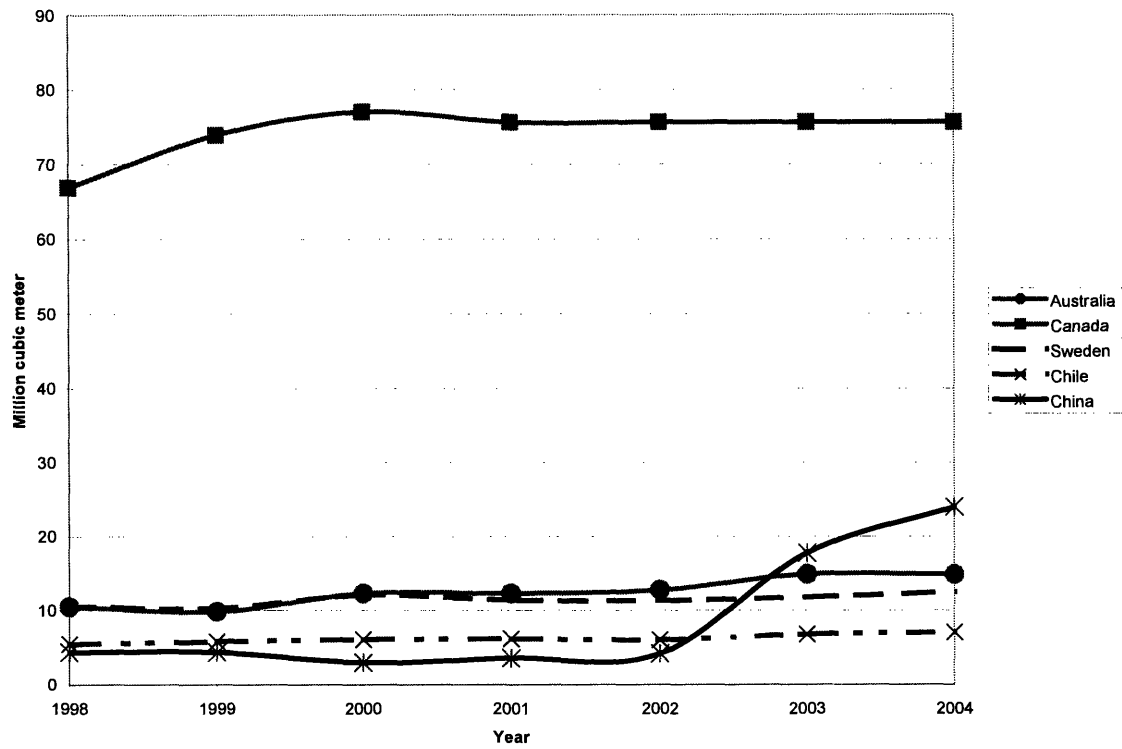


Fig.1.6. Production of chips and particles by the 6 largest producing countries in the world (FAO, 2006).

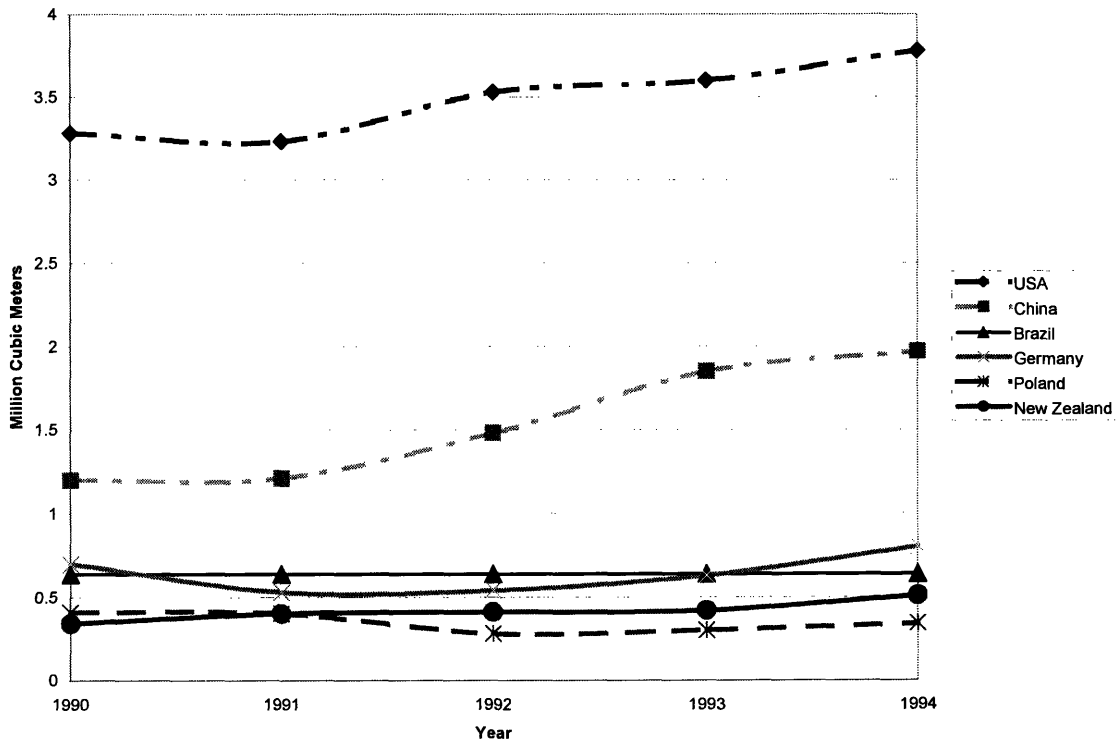


Fig.1.7. Production of compressed particle boards by the 5 largest producing countries in the world (FAO, 2006.)

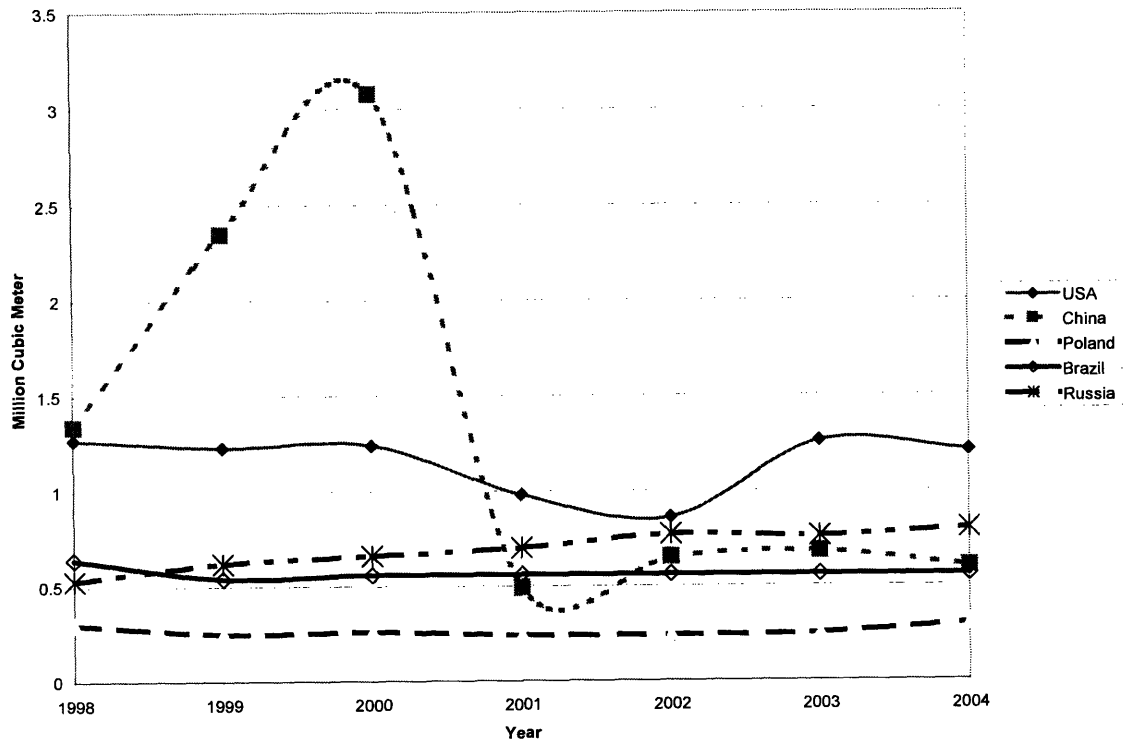


Fig.1.8. Production of hard boards by the 5 largest producing countries in the world (FAO, 2006).

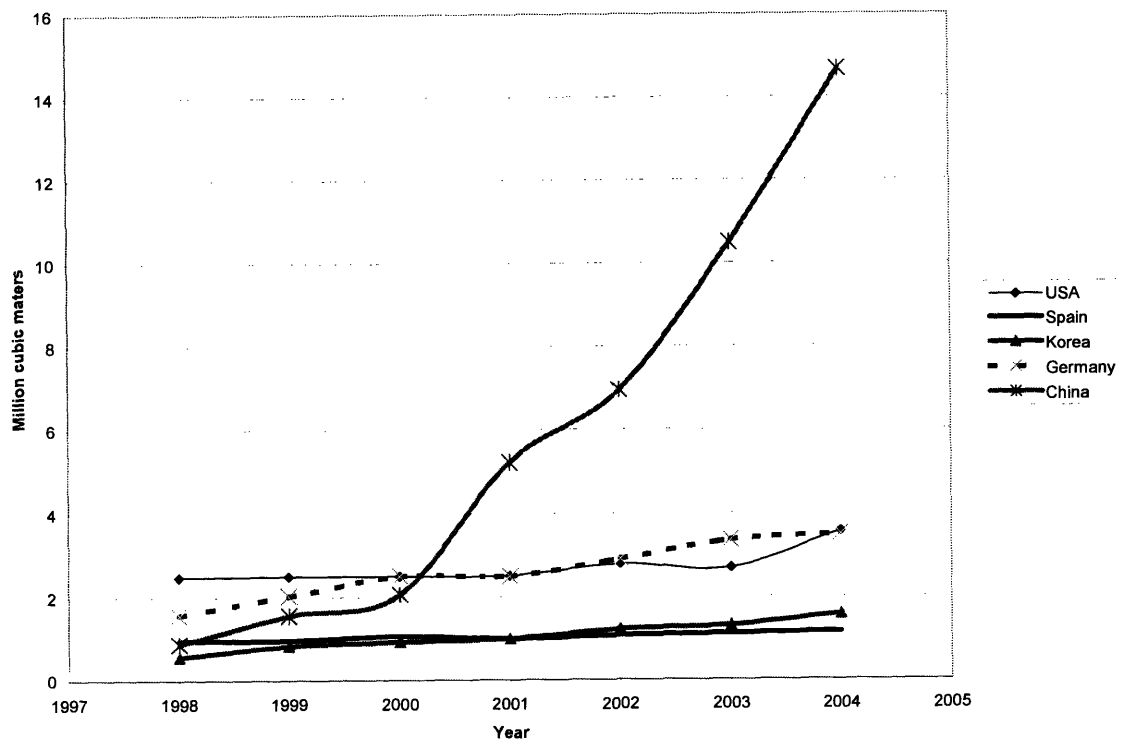


Fig.1.9. Production of MDF by the 5 largest producing countries in the world (FAO, 2006).

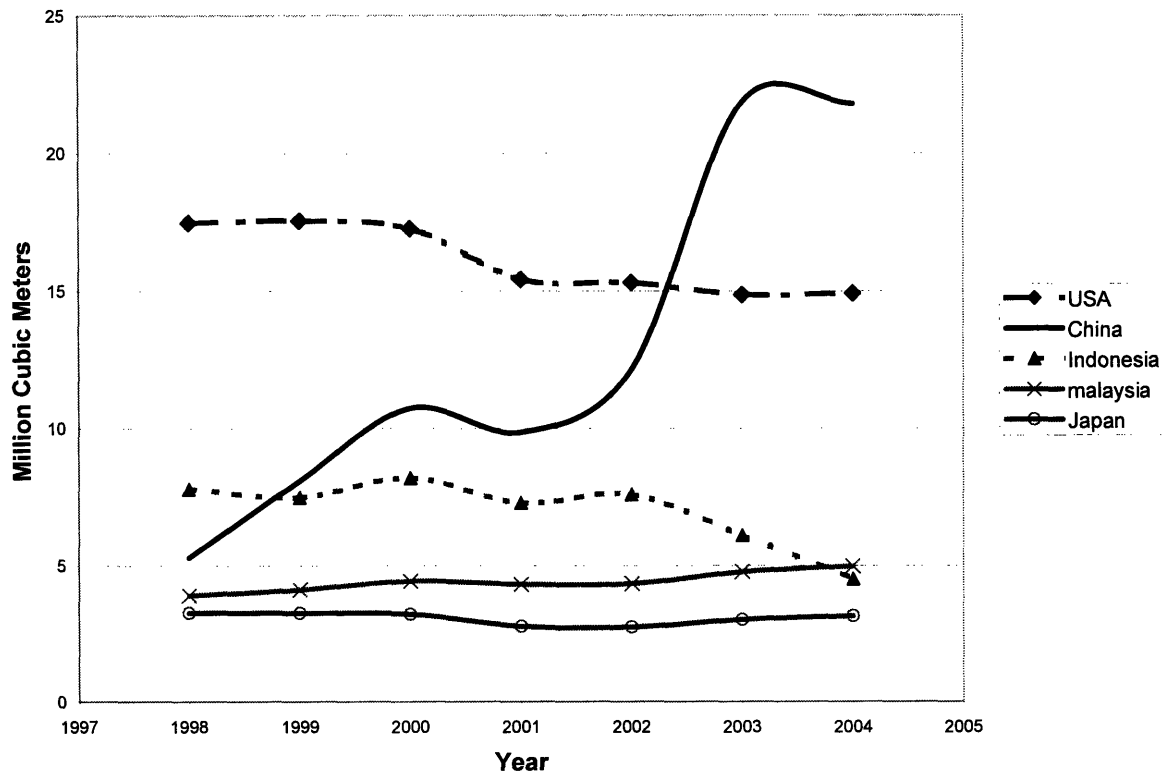


Fig.1.10. Production of plywood by the 5 largest producing countries in the world (FAO, 2006).

1.2.2 Consumption and Sustainability

Due to its size and contribution to the economy, construction is one of the largest users of energy, material resources and water. It is also a formidable polluter. The use of common building materials also has associated health hazards, of which indoor air issues are part. For example, better indoor environments may bring substantial annual health cost savings, estimated at \$6–\$14 billion from reduced respiratory disease, \$1–\$4 billion from reduced allergies and asthma, \$10–\$30 billion from reduced sick building syndrome symptoms, as well as \$20–\$160 billion from worker productivity gains unrelated to health (Horvath, 1998; Fisk, 2000).

In many developing and developed countries, the construction and construction materials industries are an important backbone of the economy, both for job creation and national asset accumulation. The nature of the industry and the fact that it concerns one of the most basic societal needs bestows upon it a level of complexity not commonly present in other modern day industries. One of its uniqueness is the highly fragmented cross-section of stakeholders that sustain the various operations of the industry. In this sense, assessing the sustainability and the impact of our consumption of construction materials must be carried out over a reasonably wide range of indicators and factors, beyond just pollution and environmental degradation. In this

subsection, we shall succinctly discuss the key sustainability concerns particular to each of the three types of construction materials in focus.

Even if the major construction material resources are plentiful, there is still glaring sustainability concern regarding the amount and nature of the energy used to tap and process these resources. In cases where construction material shortages are indeed a concern, transporting these materials to construction sites from large distances will not only make them more expensive but also invariably increase their environmental burdens as well. Our first case study examines this important issue within the contexts of the virgin material taxes in Sweden and Denmark.

1.2.2.1 Cement and Aggregate

On a per unit basis, cement is the most energy- and pollution-intensive component of concrete. The 1.45 billion tons of global cement production are accountable for about 2% of the global primary energy or close to 5% of the total global industrial energy consumption, about 5% of the global anthropogenic CO₂ emissions (Worrell et al., 2001), and significant emissions of SO₂, NO_x, particulate matter, and other pollutants (US EPA, 1999; van Oss and Padovani, 2003). Air pollution and energy consumption is the main sustainability (environmental) concern in cement production. Usually, wet kilns tend to require significantly more energy to produce every ton of cement than dry kilns, since extra energy is required to evaporate away the water in the mixture. As an estimate, wet kilns require 6GJ to produce 1 ton of cement, whereas single-staged dry kilns need only 4.5GJ. Using multi-staged kilns will further increase the efficiency to around 3.6GJ/ton (OEE, 2001). Putting things in perspective, in order to produce the 1992 quota of 80 million metric tons of cement, the U.S. used up around 0.5 quadrillion kJ, which is about 0.6% of U.S. total energy consumption for that year. Considering that cement accounts for only 0.06% of U.S. gross national product for that year, energy efficiency is indeed a significant issue.

CO₂, CO, sulfur and nitrogen oxides and traces of furans and dioxins are the main emissions from cement kilns. The levels of these emissions are dependent on the fuel used; the compositions of the ingredients for the clinker production as well as the level of exhaust filtering. For example, in general, production fueled by natural gas tends to produce higher total NO_x emissions than coal-fired kilns (van Oss and Padovani, 2003). Health concerns regarding cement kiln dusts (CKD) are related to its dispersal into the air and the leachate from CKD piles. The level of heavy metals in the CKD itself and leachate from the CKD piles is a traditional spark for argument against the use of industrial wastes as alternate fuels for cement production too (our third case study in Annex III provides an in-depth examination of this issue).

In China recently, unprecedented bold political moves have spurred innovation in the cement industry to replace old wet kilns by the more energy efficient dry, rotary kilns (Batelle, 2003). It is reasoned that reduced energy consumption will translate into more profit and less air emissions. While this may be true, the fact that many of the cement factories in the rural regions (which traditionally account for more than half of China's annual total production) employ farmers as laborers in these factories means that closures of these kilns will cause substantial loss of jobs. Our interviews with experts familiar with the Chinese industry reveal that in general, local governments do not put forth any special assistance programs to ensure retrenched workers are re-employed either in the new, improved plants or elsewhere within the same industry.

The biggest environmental concern of aggregate mining, as highlighted by our first case study (Annex I) is the preservation of the lining of underground aquifers. Since certain types of aggregates are also found to be highly localized geographically, substitution of "problematic"

materials (such as natural gravel and sand) by other similar materials (such as crushed stone) may end up increasing transportation needs. This in turn increases fuel use as well as operation costs of mining companies.

1.2.2.2 Steel

The steel and iron industry is also an energy intensive endeavor. In 2002, the average total energy consumption of steel production (EIA, 2006) was 16.4 BTU per ton of steel, or 17.3 million kJ per ton (or, 17GJ per ton). Hence, reduction of energy consumption, and thus greenhouse gases emissions, are the primary sustainability concerns. However, since most of the steel used for construction comes from recycling old steel using EAF, some energy reduction in the mining process has already been realized. Nonetheless, especially in the European Union, emission trading schemes are extensively implemented on the steel industry with the aim to accelerate the meeting of the Kyoto standards.

As in the case of cement, a dilemma exists in this effort. Although EU member states are subjected to the EU-wide emission-trading scheme, steel plants in many countries find themselves “double regulated” as they have to comply with their respective country’s emission control policies. For example, plants in the United Kingdom have to pay the Climate Change Levy (CCL). The CCL has also triggered off doubts regarding whether the employment of IPPC (Integrated Pollution Prevention and Control) directives is appropriate and does not stifle innovations in pollution prevention. Fortunately, countries like the Netherlands employed innovative measures by which steel companies can opt out of any national carbon levies in exchange for negotiations with the national government to agree upon a schedule of progressive emission reduction.

In summary, the sustainability concern in the steel industry is to strike a delicate balance between energy (and thus emission) reduction and sustaining the competitiveness of the industry in the international market.

1.2.2.3 Wood

The fact that the forest is a crucial component of the ecosystem and a cultural identity and livelihood for many civilizations means that any narrow perception of it as a mere source of structural timber is likely to trigger multi-party disputes. Even though CO₂ emissions from combusting wood fuel is not a major concern, given that the trees extract CO₂ from the air and soil for growth, emissions of fine particulates have long received attention from both the workers’ and users’ health perspectives.

The preservation of biodiversity and indigenous tribes’ land rights are increasingly emphasized in the assessment of sustainable forestry. However, judging from the ongoing disputes surrounding the application of forest certification programs, such as the Forest Stewardship Council (FSC) standards, to forests around the world, we are only beginning to fully appreciate the level of complexity involved in co-addressing the economic, ecological, social and employment aspects for this industry. To a great extent, this complexity is accentuated by globalization and international trade, which could easily result in the shifting of problems related to forest exploitation abroad. To make the issue even more challenging, the definition of “problem-shifting” is highly relative. If a country that, according to certain sustainable forestry standards, “absorbs the problems” from its trading partners (who buy timber from them) do not

acknowledge that a problem exists in the first place, requiring them to “correct” their actions to conform to these standards is almost impossible. Such denial of “problem-shifting” is most likely a result of one prioritizing economic benefits higher than nature and culture preservations.

Our second (Annex II) and fourth (Annex IV) case studies examine these dilemmas for the U.S. and Chile respectively.

We are still in the process of fully understanding the full sustainability impacts of building materials and the industries and sectors surrounding their development and use. More complete and comprehensive data on the material and energy flows of the different types of materials, including the more common ones such as adhesives and sealants, is needed for such a full evaluation. A better understanding regarding the resource consumption associated with the supply chain of the construction industry is also required. Application of lifecycle assessment may be an effective way of fully assessing the impact of innovative materials such as carbon fiber composites, including workers’ and occupants’ exposure and hazards. Such studies should include evaluating the best ways of recycling these materials in an environmentally, economically and technologically feasible way. Of course, addressing the nature of the building materials is just one part of the equation; sustainability-conscious design of building plays a vital role in ensuring that the sustainability potential of any material can be fully realized. Some relevant strategies to achieve this objective include adaptive reuse or modified use of buildings, design for disassembly, and design for future. The underlying principles of these methodologies were described in section 1.1.

1.3 Common Sustainable Development Policymaking Tools

In this section, we review 5 different kinds of decision supporting tools for policymaking. These are not policy tools per se, but they provide data, information and analyses necessary for effective policymaking.

1.3.1 Material Flow Analyses

Material Flow Analysis (MFA) is a family of modeling concepts and techniques focused upon a given geographical area and directed toward the systematic physical measurement of the magnitude and location of specific flows of environmentally significant materials in the societal metabolism (Daniels, 2002). MFA can technically be sub-divided into four common types, each differentiable by the boundaries and the nature of the flows involved in the accounting.

The Total Material Requirement and Domestic Output (TMRO) method accounts for the total annual mass flows of a comprehensive range of environmental inputs and outputs of the entire system of national or regional economies. By calculating the Total Material Requirement⁵ (TMR) and Total Domestic Output⁶ (TDO) of the focused economy, it can be considered as a form of macro-MFA. Bulk Internal Flow-MFA (BIF-MFA) is another form of macro-MFA that creates a material-balancing model that considers both material inputs and outputs, as well as the accumulation of stocks, in the focused economy. In essence, the BIF-MFA lies between the TMRO approach and the Physical Input-Output Table (PIOT) modeling method that captures the material flow balance between interdependent industries (as such, PIOT is considered a type of meso-MFA). Lifecycle Assessment (LCA) at the company or even product-level can be considered as a typical form of micro-MFA. Finally, Substance Flow Analysis (SFA) is a type of partial macro-MFA that accounts for the flows and stocks of one particular kind of substance (usually toxins or pollutants) throughout the economy (Daniels, 2002). The features and utility of these different types of MFA is summarized in table 1.1, adopted from Daniels and Moore (2002)

1.3.1.1 Strengths of MFA Methods

By knowing the nature of the material flows in and out of an economy of interest, policymakers and scientists are able to calculate and thus assess the various material-related traits of the economy in question. This includes the TMR and TDO of the economy. This in turn allows one to extract useful information such as the material demand, lifespan of goods and waste generation rates of consumers. Less directly, MFA gives us the essential ability to identify potentially and currently 'problematic' flows and thus select the main flows to act upon. With stock accumulation and average material retention time information, changes in material turnover can also be picked up easily. Such information is helpful for tackling problems in sustainable consumption and identifying potential areas for material recycling; one example is the effort to reduce landfilling of construction and demolition (C&D) wastes.

⁵ TMR is defined as the total amount of natural resources in the commodities produced by the economy, including all hidden flows, which is the total mass of materials mobilized in the production of commodities but do not themselves become part of the commodities.

⁶ TDO is the sum of the Domestic Processed Output (total mass of materials extracted within and imported into the economy that have been used and then flow back into the environment) and Domestic Hidden Flow (the total mass of hidden flows within the focused economy only)

Feature	TMRO	BIF-MFA	PIOT	SFA	LCA
Input into economy					
• Selected specific substances	+	+	++	+++	++
• Materials/bulk materials	+++	++	++	+	+
• Energy	+	+	+	?	++
Outputs to environment	++	++	++	++	++
Recycling of materials and energy	+	++	++	++	?
Stock exchange	+	+++	++	++	?
Economic elements					
• Specific goods and services	+	+	++	++	+++
• Production process	?	?	+	+	+
• Key socio-institutional entity (defined boundary for induced flows)	National, regional economy	National, regional, local, activity fields	Commodity, industry, national economy	National and global	Specific good or service (often unique to a firm)

Table 1.1. The key features of the various forms of MFA described in section 1.3.1 (adopted from Daniels and Moore, 2002). ‘+++’ means that this item is a defining feature of the approach, ‘++’ means that this feature is typically included in the technique and ‘+’ means that this feature is only included occasionally in the mode of analysis – in a partial or conditional way. ‘?’ means that this feature is rarely present in the approach

Another strength of MFA methods is that the methods can be employed to handle large systems, such as all the economic sectors of a country as long as material flow data is available. Besides, the different MFA methods highlighted in table 1.1 can complement each other to address different aspects of material flows. For example, since LCA is strong in its detailed account of environmental impact of a service or good, a series of SFA may be conducted for a group of substances to identify problematic flows before applying LCA on each of them to assess the possible pros and cons of material substitutes along these flows (Bouman et al., 2000).

In short, as a methodology, MFA in its wide variance covers a gamut of scopes and scales. Henceforth, cross-applications of these various forms of MFA can yield various level of useful material-related information.

1.3.1.2 Weaknesses of MFA Models

The main weakness of MFA models is that traditional application of the various modeling methods does not attempt to link material flows to sustainability indicators of the three sustainability domains. It is also not usually used to evaluate policy measures used to change material flows. Also, in order for MFA to be useful for identifying flows, good and reliable data

must be available and utilized. Unfortunately, such data may not be easily accessible. Even when data is available, they may vary over a wide range, in which case margins of error must be clearly stated in any results calculated from the flow accounting. Besides, accounting for the environmental impacts (i.e. output into the environment) is easier for fast throughput materials but may become less accurate the longer a material remains useful in the economy (Matthews et al., 2000). Also, when the overall quantity and use of a certain material is stable over a period of time, material flow data, such as environmental output data, may be easily available; however, for material flows that undergo rapid changes over time, the data may not be accurate enough for meaningful analyses. The common solution for such situations is to extend the data time series backward and forward over time; but this may not be feasible in all situations.

Partial Equilibrium Analysis (PEA) represents an economic equilibrium modeling approach that is used to test policies related to material flows. However, the weaknesses of this approach include the assumption that all relevant markets in the economy are clear. Also, PEA does not provide insights into the effects of material policies on the social indicators that are not directly related to the economic indicators addressed by the policy tools under study. Furthermore, the market equilibrium condition, which is expressed as the marginal costs equal to the marginal benefits for profit maximizing companies, may not be universally true. In fact, scholars like Spiegelman (2003) and Ehrenfeld (2004) expressed their concern over the application of this sweeping assumption to policy evaluations.

In the next section, we shall review and discuss on a relatively new perspective that the condition of “quasi-steady state” describes the human socio-ecological system more aptly than the condition of “equilibrium”.

1.3.2 Self-Organizing Holarchic Open (SOHO) System and Adaptive Management

Inspired in part by Prigogine’s theory on dissipative, quasi-steady thermodynamic systems (Nicolis and Prigogine, 1977), Kay (2000) interpreted the socio-ecological system as a nested constellation of self-organizing structures organized about a particular set of input and output. Complexity of this system is derived primarily from the overlapping and nested hierarchies of relationships among myriad of these self-organizing structures; this is termed ‘holarchy’. Therefore a SOHO is characterized by quasi-stable states (which may not all manifest at the same time) that operate within certain limits defined by feedback mechanisms (positive and negative). When positive feedback is operating, the SOHO will self-correct toward a stable condition; in contrast, negative feedback tends to amplify any deviation from stability and may eventually lead to disintegration of the system.

Holling (2001) also suggested that this ability of self-correction is a property of adaptive cycles, which he suggested is one of the bases of ecosystem and socio-ecological systems. In a nutshell, an adaptive cycle is the cycle that developmental changes in the physical and functional characteristics of a system go through. These changes occur in 4 distinct stages – exploitation, conservation, release and reorganization. An example of such a cycle is the re-growth of a forest burnt down by a bush fire. These stages differ in durations and intensity of activity; for example, the conservation stage tends to be a longer period of slow accumulation of resources (just like a company learning a new technique of production of goods), while the re-organization stage tends to be more intensive but shorter in duration (akin to Schumpeter’s ‘creative destruction’ (1950)).

1.3.2.1 Strengths in Policy Applications

Holling (2001) also introduced the idea that different adaptive cycles can be assigned different ‘speeds’⁷; to bring about changes in a particular adaptive cycle, it is necessary to connect it with a faster or slower adaptive cycle *at the right stage*. For example, in order for a successful technology innovation to influence policy planning, the adaptive cycle of the innovation (considered a faster cycle) must connect to that of the current technology culture (considered a slower cycle) at the conservation stage and just before the release stage. Policymakers therefore need to identify where the problems concerned are in their respective adaptive cycles, and then plan their actions to initiate connections between the appropriate cycles accordingly. This is one of the most practical insights of the concept.

One of the applications of the adaptive cycle to actual policymaking is the Adaptive Environmental Assessment and Management (AEAM) method used to evaluate current environmental impact assessment. AEAM considers stakeholder involvement as a practical way to encourage connections between adaptive cycles and co-create policy solutions. Stakeholder involvement would also contribute different viewpoints reflecting the true nature of inherent uncertainties of the problems (Noble, 2000). This will enable policy solution options to be adaptive, and thus resilient, to surprise outcome.

1.3.2.2 Weaknesses

The application of the SOHO and adaptive cycle concepts to policymaking is still in the rudimentary stage. Recent development has spurred active research into multi-agent modeling of decision-making process. Many of these efforts, in the design of their algorithms, either have to resort to simplistic assumptions about human behavior or draw generalizing conclusions regarding the casual effects of external stimuli. An example is the mistake of bundling of human decision-making heuristics in Jager’s modeling of “consumats” in the face of dilemma of the commons (Jager, 2000).

Holling suggested that policies could only be successful when the “stars are aligned”, at which time connections between appropriate adaptive cycles can be realized; however, this is a passive strategy at best. Many adaptive cycles have notoriously slow speed of change. An excellent example is the social norm of a community group. So, instead of viewing a successful policy as one that “strikes at the right moment”, why not think of it as one that creates favorable conditions so that the inherent speed of the cycle can actually be adjusted, hence accelerating or enhancing connections? At the heart of adaptive planning is the knowledge that our system is highly dynamic, and that the very policies implemented to change aspects of this system might end up modifying the system itself. This reminds one of the Heisenberg’s Uncertainty Principle. Holling seems to have assumed constancy in the speeds of these individual cycles.

Connections between adaptive cycles representing different sustainability domains and indicators were not explicitly mentioned either. These are the fundamental challenges in sustainability policymaking. Can a technology innovation cycle be connected to, and thus change, the cyclic, seasonal variation in employment in the construction industry? How about a connection between this seasonal variation and the social image of construction jobs? Knowing

⁷ By ‘speed’, Holling refers to the time taken for the cycle to occur. For example, the needles of a coniferous tree can be considered as an adaptive cycle that has a much shorter cycle period than the development of the tree itself, another adaptive cycle.

the true limits of such connections is very important to the effective implementation of this concept.

The AEAM advocates adaptive planning with uncertainties in mind. Theoretically, communicating of uncertainties among stakeholders should be encouraged. However, in reality, different stakeholders have different level of tolerance for uncertainties. In the recent Air and Waste Management Association (A&WMA) Annual Exhibition and Convention, held in Minneapolis, Minnesota, one of the plenary sessions was aptly named “Compliance and Enforcement: Are We On the Same Page?” It was highlighted in this session that while the Office of Air Quality Planning and Standards (OAQPS) approve of the use of the AP-42⁸ emissions factor, the Office of Enforcement and Compliance Assurance (OECA) concluded from the legal standpoint that AP-42 is insufficient to demonstrate compliance. This disparity stemmed from the fact that the OAQPS is composed of mainly scientists and engineers who favor reasonable assurance, while the OECA comprises mainly attorneys who prefer absolute assurance. AEAM so far has neither satisfactorily addressed this issue nor suggested an innovative approach to enhance multi-party appreciation for the level and nature of uncertainties inherent in sustainability planning.

In the next sub-section, we shall critique the ongoing effort in grouping stakeholders, in a myriad of format, to enrich and inform the policymaking process.

1.3.3 Participatory Methods

1.3.3.1 Attributes of Successful Participatory Methods

By the word ‘participation’, or ‘involvement’ and ‘engagement’, we mean a process by which individuals and groups gather in order to communicate, interact, exchange information, provide input around a particular set of issues, problems, or decisions, and participate in actual decision-making. In that capacity, each shares in the decision-making to a certain degree (Ashford & Rest, 2001). The justification for broad stakeholder participation, especially the public, is well described (Fiorino, 1989; Folk, 1991; Laird, 1993; National Research Council, 1996). In general, stakeholder participation perform three core functions (Ashford & Rest, 2001):

- Helps ensure that the government is responsive and accountable to its citizens,
- Creates a venue and mechanism for individuals and groups to influence decisions that will ultimately affect them, and
- Through the above two functions provides stability to the democratic system and creates a sense of belonging to the society.

The main advantage of actively seeking inputs from non-governmental groups and especially members of the ‘unspecialized’ public is that this facilitates the contribution of essential community-based knowledge, information and insight that are often lacking or insufficient in expert-driven risk processes. This is especially so as the public is increasingly aware of the fact that interpretation of science is value-laden, in terms of how scientists make assumptions, frames problems, and report findings (NRC 2006). Above all, the underlying goals and assumptions of science and technocratic processes may even be at odds with what the public considers as what is

⁸ An AP-42 emissions factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. Such factors facilitate estimation of emissions from various sources of air pollution.

more directly important to their life and livelihood. An excellent example is our third case study in which the public reacted very strongly against the UK government's decision to allow certain firms to experiment with waste fuels after a few non-governmental laboratories produced alternate scientific evidence indicating that cement kilns that combust these fuels produced more harmful emissions. They then became more critical over the way the British Environmental Agency (EA) run its public dialogue and feedback sessions. This degree of distrust and doubt in a way prompted the Board of Directors of Rugby Cement to take a closer look at the details of the process with which the EA approved of Rugby Cement's use of waste fuels, in their effort to salvage the public image of the company. On a more positive note, Yosie and Herbst (1998) noted that increased transparency of government decision-making, diffusion of information technology, decentralized decision-making in large institutions and the general popularity of stakeholder engagement processes paved the way for more interactive and participatory forms of institutional decision-making.

What is successful stakeholder participation? Many scholars have debated on this issue from two general angles – a normative, theory-based perspective and an evaluative perspective based on the process and/or outcome of the participatory process. Regarding the first perspective, Webler (1993), building on Habermas' Theory of Communicative Action (Habermas, 1984, 1987), suggested that successful participation should

- Encourage multi-way communication;
- Is consensual and non-hierarchical;
- Requires respect for individual autonomy;
- Relies on citizens' reasonableness; and
- Promotes critical self-reflection.

English et al. (1993) further suggested that the ideal outcome of stakeholder involvement is a normative consensus. Their proposed ethical criteria that help in the designing and later evaluating of stakeholder involvement processes include representativeness, impartiality, accountability, confidentiality, transparency and recognition of promises. Laird (1993) believed that the learning process is central to participation in policy discourse; he also proposed an integrative form for effective participation – the participatory analysis. Along the same line, Fiorino (1990) suggested that discussion play a central role in successful participation and that participation theory suggests other criteria for evaluating whether a mechanism is a democratic process (which he believed to be a quality that underlies successful participation). These criteria are:

- Direct involvement of 'amateurs' in the decision-making process;
- A shared collective decision-making process that is fair, and
- Equality of participation

To this list, Syme and Sadler (1994) included the normative criterion of interactive justice, which they suggested include the extent to which participants believe they have an adequate degree of knowledge about and control over the issue at hand. This claim is supported by Hadden (1990) who stressed the importance of mechanisms that enhance control and equity among participants as a yardstick for successful participatory processes.

Researchers who prefer a more evaluative set of criteria for participatory mechanisms generally work on two aspects of these mechanisms – the outcome and process. Process studies primarily focus on means rather than ends, and that the criteria used to assess the success of the

participatory mechanisms examine a variety of their procedural aspects (Ashford, 2001). Lach et al. (1996) considered process indicators such as accessibility to the decision-making process and diversity of views represented as two of the most important aspects for stakeholder engagement. Syme and Sadler (1994) suggested independence of the facilitator as one of the keys criteria for ensuring procedural justice in participation. More generally, Yosie and Herbst (1998) opined that important process indicators are those that add value to a decision-making process.

There were also works that evaluate success according to the outcomes of the participation process. Lach and Hixson (1996) proposed such outcome indicators as project/decision acceptability, mutual learning and respect, project efficiency, and cost avoidance. Conflict resolution was proposed as another important criterion (Shepherd and Bowler, 1997), since the need to achieve consensus (Elder, 1982; Fiorino, 1990) and participants' satisfaction with the mechanism outcome (Mazmanian and Nienaber, 1979).

Nonetheless, works by Lynn and Busenberg (1995), Schweitzer et al. (1996), and Chess and Purcell (1999) suggested that a better approach is to evaluate both process and outcome goals when assessing the success of the mechanisms. In particular, Schweitzer et al. opined that given the tremendous diversity of stakeholder groups and the issues they address, the use of one approach – that is, either assessing the outcome or process – will result in the oversimplification of the criteria. In their study of the factors that contribute to successful stakeholder participation, Peelle et al. (1996) grouped those factors into five categories:

- Process factors;
- Organizational context;
- Strategic considerations;
- Contextual factors, which includes the social, economic, historical and political context of the situation, and
- Unique factors.

By applying these factors to their case studies and categorizing them into different level of necessity, the authors concluded that the following factors are essential for success in most cases (Ashford & Rest, 2001):

- Agency⁹ clarity on goals,
- Agency clarity on roles of stakeholders,
- Agency's responsiveness to stakeholders' views and contributions,
- General openness of the agency,
- High priority given to trust-building actions,
- Development of such trust between agency and public,
- Existence of adequate resources to support the participatory programs,
- Commitment by top management and leadership to the participation process,
- Managers and leaders going beyond legal minimums,
- Two-way communication and education, and
- Presence and creation of interactive and iterative public participation.

Ashford and Rest (2001) also summarized attributes of successful participation as: access to information, availability of resources, openness in discourse, mutual trust, trustworthiness,

⁹ 'Agency' is defined as the government institutions by the authors

respect for diversity, accountability (of government to stakeholders and individual participants to their constituencies), and appropriate balance of power/autonomy.

1.3.3.2 Integrated Assessment and Participatory Methods

The phrase “Integrated Assessment” (IA) is often mistaken as a generic terminology that describes a way of assessing a policy. Within the sustainability community, IA is a group who efforts are focused on complex issues and unstructured problems (Dowlatabadi and Morgan, 1993; Schneider, 1997). In the late 1990s, scholars in IA started to see the benefits of gathering input of contextual and practical knowledge, experiences and preferences through participatory processes (van der Sluis, 2000; Cohen, 1997; van Asselt Marjolein, 2002). van Asselt Marjolein provided a good summary of the various formats of participatory methods undertaken by the IA community. They are: public hearing/meetings, focus groups, scientist-layperson workshops, policy exercises, citizens’ juries, citizen advisory committees, citizen surveys, consensus conference, negotiation and scenario analyses. Each of them is concisely described below:

i. Public Hearing and Meetings

Public hearings and meetings are a very common form of stakeholder engagement vehicle. They are often required by law. Besides being easy to convene, they are usually opened to anyone who is willing to hear and be heard, and provide an opportunity for stakeholders to directly communicate with policymakers regarding policy decisions.

ii. Focus Group

It is a planned discussion among a selected group of stakeholders designed to obtain feedback and specialized information about a certain problem in a non-threatening environment. The mutli-national collaboration in Europe – Urban Lifestyles, Sustainability and Integrated Environmental Assessment (ULYSSES) – makes use of this methodology (van Asselt and Rotman, 2001).

iii. Scientists-Layperson Workshops

The Mackenzie Basin Impact Study (MBIS), a case study of Northwest Canada, is an example of how such a meeting of scientists and other stakeholders enhance one another’s understanding of an environmental problem at hand (Cohen, 1997). Recommendations of policy solution are discussed. Above all, the group would review and rank proposals for further cross-sectoral research to be undertaken by the scientists.

iv. Policy Exercises

Parson (1997) noticed that current assessment methods under the IA umbrella are either representational or deliberative in nature. Mathematical models that form a causal chain from the determinants of emissions to the valuation of their impacts are an example of the former. Expert panels formed to address stakeholders’ concern about climate change issues belong to the latter type. Parson (1986) and Brewer (1986) suggested that a policy exercise, in the form of a game that requires participants to address hypothetical scenarios of sustainability challenges according to a set of pre-determined rules, could benefit from

being both deliberative and representational. The scenarios should be realistic enough to reflect the real world problems yet dissimilar enough to provoke innovative viewpoints.

v. *Citizens' Juries*

A citizens' jury is a group of randomly chosen people who will go through a deliberative process based on information from several perspectives and ultimately make public their conclusions on certain policy (Cosby, 1995). This method of public participation had been applied in the U.S. and Germany to provide input for election candidate ratings as well as state level agricultural, health care, water and welfare policies (Smith and Wales, 1999). The selection process helps enhance representativeness and impartiality; however, a majority rule concept to voting may result in displacing minority interests and views on an issue (Ashford, 2001). This concept of involving lay citizens into the juries serves to attain a more balanced profile of values and knowledge-based judgment.

vi. *Citizen Advisory Committees*

Such committees are usually convened by carefully selecting representatives from the non-governmental stakeholder groups based on certain criteria. These committees are tasked with the duties of examining specific issues, provide ongoing consultation to a government agency or non-government organization and make policy recommendations based on their observations (Lynn, 1987; Lynn and Karetz, 1996; Vari, 1996). Such arrangements allows for meetings and in-depth study of concerned issues over time, thus resulting in an accumulation of a common base of knowledge. It also has the advantage of accurately matching the level and nature of expertise of its members to the tasks required of them. Membership to these committees not only creates a sense of belonging and a degree of accountability, it also facilitates communication between the agencies or organizations that engage them and the experts in the committees.

vii. *Surveys*

They are a very common way of soliciting views, opinions, knowledge and perceptions on particular issues from the general public. If designed correctly, surveys are a very useful method of obtaining information from even the silent majority of the community. Successful surveys rely on thoughtful sampling methods, accurate statistical analyses of collected data, the use of simple language, minimal time burden on respondents, skilful posing of questions in order to capture the average response to the questions, and creating a non-coercive environment within which the surveys are conducted. Readers are referred to English et al. (1993) for a more detailed description.

viii. *Mediation and Negotiation*

These are alternative dispute resolution arrangements by which consensus is reached over a period of time of facilitates dialogue, deliberation and compromise. Federal agencies often use such methods as negotiated rulemaking in regulatory process (Ashford, 2001). Advantages of these methods include allowing participants to meet over time, giving them access to information and thus providing them with the opportunity to learn about the different perspectives on a certain issue (Susskind and Ozawa, 1985; Susskind and

McMahon, 1985). It also provides government agencies performing the mediation sufficient time to improve upon their mediation approach when there is a need to do so.

ix. Consensus Conference

This is usually a multi-day public enquiry session in which lay people are given a chance to direct their questions to a panel of experts, assess the experts' response and then negotiate among themselves. At the end of the session, they are to reach a consensus and write a report directed at the government expressing their views and any recommendations.

x. Scenario Analyses

In this methodology, the different perspectives of stakeholders are pooled together to solve sustainability related problems contained in hypothetical sequences of events (Rotman et al., 2000). The scenarios used are not predictions of the future, but act as a catalyst to concretize concepts of problem solving should they really occur in the future. This methodology is extensively employed in VISIONS – the “Integrated Visions for a Sustainable Europe” run by the DGXII of the European Commission between 1998 and 2001. A scenario adopted was the ‘Knowledge is King’ world, in which Information and Communication technology revolutionizes Europe, leading to the decline of traditional industries. Participants were required to flash out likely consequences and propose policy fixes. Scenario Analysis can be considered a form of mega-tool, in that it could be employed in the other methods as well.

1.3.3.3 Strengths and Weaknesses of Participatory Methods

Engaging stakeholders on different platforms is a key strength in the IA approach. Many of these methods also incorporate the communications of uncertainties to the lay people, through discussions with experts in the field concerned.

However, we notice that current focus groups and scientist-layperson stakeholder workshops tend to emphasize too much on providing scientists with feedback to improve on their IA models, either for simulating multi-agent decision-making or for building scenarios to test their computer algorithms. Besides, policymakers are usually not involved in the meetings at all. In fact, Parson (1997) suggested that having policymakers in the policy games would discourage thinking out-of-the-box. When the sense of ownership to the deliberative process is not instilled in policymakers, the perceived realism and thus confidence in any recommendations by other stakeholders is highly suspected.

Methods such as citizens' juries and consensus conference are not designed to involve numerous participants at once. Furthermore, the lengthy process, and thus high cost, is a serious shortcoming. Finally, many applications of scenario analysis missed the opportunities to further involved layperson stakeholders beyond merely discussion of policies pertaining to hypothetical scenarios. Is there a way to engage them on a long-term basis, garnering their support and anchoring on their enthusiasm to initiate grass-root activities that strengthen the society foundation in dealing with any sustainability challenges in the future? Ashford (1999) also addressed this issue by proposing that public participation could be used beyond just information exchange, building consensus and providing stakeholders' recommendations. It should also help empower communities in actual decision-making.

Most public hearings occur too late in the decision-making process. The most outspoken critics or those who are most comfortable with public speaking frequently dominate discussions. The fact that criticism and defense of positions occur openly invites posturing. Coupled to the fact that such meetings usually last only a few sessions, public hearings and meetings typically do not have a long-term effect in enhancing stakeholder participations. While citizen advisory committees allow for long term deliberation of the problems at hand, limited inclusiveness, representativeness, high demand for commitment on the part of committee members and the practicality of advices offer by the committees may limit the usefulness of this participatory mechanism. Surveys may enhance participation by allowing more people to express their views, they do not allow for long-term dialogues and learning. As mentioned earlier, the way questions are asked and responses to the questions interpreted by policymakers will determine whether the views are accurately reflected and represented. Although mediation is an established method of seeking consensus between opposing sides, it usually involves organized interests. However, this also implies that unorganized parties may be neglected. Bias in the mediation process may occur in favor of the existing political power distribution.

1.3.3.4 Defining the Role of Government in Stakeholder Participation

Ashford's study of public participation in contaminated communities (Ashford & Rest, 2001) revealed that government participation is an essential element in successful stakeholder involvement. In fact, the outcome of the interaction is highly dependent on *how* each is involved. Government can play the role of either a trustee for the affected community or a facilitator of consensus within the affected community; the community posture may either be utilitarian (i.e. each concerning with one's rights and benefits) or communitarian (i.e. stakeholders agree and commit to promoting the 'greater good'). However, just because a government adopt a trustee role does not mean that decisions are made independent of stakeholders' input; rather, the government will make the final decisions after substantial and meaningful stakeholder input.

Both kinds of roles can affect the process and outcomes of stakeholder participation efforts. That is, the role of the government and the tenor of the stakeholder participation co-determinative of success in tackling multi-dimensional challenged typified by sustainable development. To be more precise, when a government presents itself as a mediator of opposing interests, the environment engendered will very likely result in a utilitarian outcome, unless the dominant party in the dispute represents a communitarian perspective. Conversely, if the government behaves as a guardian of the 'greater good' or for the disadvantaged, then the policy outcome is very likely to address imbalances of power and advance the overall welfare of the society.

A summary of these various roles and postures is provided in table 1.2.

Which role should the government play in order to optimize sustainable policymaking? It depends on many factors, namely the level of civic-mindedness of the stakeholders involved, the nature of the problem concerned, the history of the relationship between government and non-government stakeholders. But one fact cuts across the two roles – the government being a stakeholder itself *must* interact with other stakeholders in order to make effective policies. As we shall see in Chapter 4, this interaction is even more crucial in sustainable development.

STAKEHOLDER POSTURE

GOVERNMENT’S ROLE	UTILITARIAN (Competing interests)	COMMUNITARIAN (Promoting the ‘greater good’)
As a TRUSTEE for the affected stakeholders	Decision made by government in a trusteeship role on behalf of all the participating stakeholders AFTER seeking their views and opinions	Decision made by government in a trusteeship role on behalf of the stakeholders (with the possible result of benefiting even the larger non-participating public as well)
As a FACILITATOR of utilitarian or majoritarian consensus, or alternative dispute resolution among the stakeholders	Stakeholder involvement processes reaching a consensus or compromise among the participating stakeholders	Idealized stakeholder involvement processes reaching normative consensus, possibly expanded to benefit the larger non-participating public as well.

Table 1.2. Types and outcomes of interactions between the different roles of the government and posture of participating stakeholders (adopted from (Ashford & Rest, 2001)).

Public discourse in sustainability issues usually involve much more uncertainties and estimations of the future impacts; besides, they might also concern impact in areas that may not be directly relevant or of interests to some stakeholders, unlike problems that originate from single issues such as water pollution. These further demand the government to be flexible in their role while interacting with other stakeholders. Above all, given the mandate granted to it by the public, the government should never hesitate to step in and take communitarian decisions that truly reflect the requisites and attributes of sustainable development. These points will be utilized in our proposed policy transformations to tackle the problems that surfaced in our seven – but categorized into four – case studies in Chapter 4.

1.3.4 Case Studies Methodology

Case studies emphasize detailed contextual analysis of a limited number of events or conditions and their relationships. Different concept of examining case studies have been developed and applied in a vast array of fields. There are two main camps in the treatment of case study as a research methodology. “Holistic” type case study, as advocated by Stake (1995), is mostly a quantitative exploration of a single case in a particular discipline. “Embedded” types tend to be more explanatory and descriptive, focusing on unstructured qualitative treatment of an inter- or a trans-disciplinary question (Scholz and Tietje, 2001). The Transdisciplinary Case Study Research Group at ETH Zurich employed the “embedded” methodology extensively, and has since completed cases on the sustainability of urban transportation, traditional industry, rural landscape changes, organizational development and agriculture.

Case studies are sometimes criticized for lacking statistical rigor. However, the main contribution of case studies is to stimulate problem solving of issues similar to the cases

concerned. This, however, does not mean that case study methodology lacks generality and generalizability, especially when a case serves as a counter-example to some prior claim or hypothesis. In this particular case, this counter-example will help motivate further efforts to identify other counter-examples, and ultimately the formulation of a set of conditions under which the hypothesis or claim in question is invalid. The key to a successful case study lies in a systematic, purposeful approach to the following stages:

- Definition of the key research questions
- Determination of case selection criteria
- Selection of the cases and determine data gathering and analysis techniques
- Preparation to collect the data
- Collection of data in the field and from literature review
- Evaluation and analysis of the data
- Comparisons between the lessons gleaned from the various cases to extract generalizable messages

1.4 Current Research on Policy Integration

Current research on policy integration can be generally divided into theoretical/ conceptual and application-based approaches. Even though many of these studies are based on the integration of only a few indicators that are related to only one or two of the three sustainability domains, all acknowledge the fact that sustainability solutions must have an integrated approach to be effective.

Conceptually, a wide variety of terms related to policy integration are used in the literature. The main ones are policy coherence, policy consistency, inter-governmental management, cross-cutting policy-making, holistic government, joined-up government, collaboration, and policy coordination (Meijers, Stead, 2004). Usually, policy coherence and policy consistency are discussed within the framework of policy coordination. Challis et al. (1998) broadly described policy coordination as ‘a pursuit of coherence, consistency, comprehensiveness and of harmonious compatible outcomes’. The concept of inter-governmental management (Agranoff, 1986; 1996) is similar to inter-organizational coordination, but puts more emphasis on the achievement of goals via cooperation and co-ordination between different levels of governments. The idea of holistic government is similar to cross-cutting policy-making and joined-up government. These concepts are mentioned, and applied, in various forms by scholars such as Ling (2002), and international organizations such as OECD (1996; 2002). In an analysis of what activities constitute the agenda of a joined-up government in Great Britain, Ling (2002) identified four ways of achieving more integrated policy in practice:

- Defining new types of organizations (e.g. culture and values, information and training)
- Defining new accountabilities and incentives (e.g. shared outcome targets and performance measures)
- Defining new ways of delivering services (e.g. joint consultation and involvement)
- Defining new ways of working across organizations (e.g. shared leadership, pooled budgets, merged structures and joint teams)

In general, all these concepts stress the significance of coordinating activities across organizational boundaries without removing the boundaries themselves. These boundaries are inter-departmental, central-local, and sectoral.

Policy collaboration is studied by a few scholars. For example, Huxham (1996) described it as a very positive form of an organization working in association with other organizations for some form of mutual benefit. Gray (1989) defined it as the ‘process through which parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible’. Some scholars, such as Mulford and Rogers (1982), see coordination as more or less the same as integrated policy-making, whereas others view these strategies as essentially different (OECD, 1996; 2002). The OECD observes that policy integration is quite distinct and more sophisticated than policy coordination. Policy integration requires more inter-sectoral interaction than policy coordination. Whilst co-ordination aims at adjusting sectoral policies in order to make them mutually enforcing and consistent, policy integration results in one joint policy for the sectors involved or one policy with different coordinated elements involving many sectors in joint policymaking. Most of the time, policy coordination involves policies of similar sectoral objectives, whereas integrated policy-making includes a range of different (and seemingly disparate) objectives.

Meijers and Stead (2004) also highlighted what they called ‘facilitators’ and ‘inhibitors’ of policy integration and coordination, which built upon the set proposed by Challis et al. (1988) and Halpert (1982). These determinants of successful integration point to the need for both horizontal and vertical integration, which is an opinion shared by many other sustainable development policy researchers. In particular, Briassoulis (2004) defined the ‘object of policy integration’ as the cross-relationships among the objects, goals, actors, procedures and instruments of two or more policies. She also proposed four clusters of dimensions of policy integration – substantive, analytical, procedural and practical. Under each of these dimensions, she further elaborated a series of components. In order to apply these ideas to actual policymaking, she suggested a detailed list of criteria for each of the abovementioned cross-relationships. However, what is missing and inadequate is the evaluation of how each of these criteria is linked to the others. For example, although Briassoulis suggested the ‘use of communication instruments for policy integration’ (as a criterion for relating policy instruments), she did not shed light on how this will affect the ‘use of one policy as an instrument to achieve the goal of another policy’ (another criterion suggested for relating policy instrument). One expects the effectiveness of communications amongst stakeholders as a very important factor for effecting successful policy integration.

Many current applications and studies of policy integration focus on the environmental aspects of policymaking. For example, environmental policy integration (EPI) was given its political status by Article 6 of the 1999 Amsterdam Treaty, which states that “environmental protection requirements must be integrated into the definition and implementation of the European Community policies and activities referred to in Article 3, in particular with a view to promoting sustainable development” (Lenschow, 2002). This led to various policy developments that are aimed at providing the necessary procedures to materialize the injunction of EPI. However, narrowly focusing on EPI overshadows the other domains of sustainable development – employment and economy. Other primarily environmental efforts include those by Coffey and Dom (2004) and Feindt (2004). There are also other studies that focus on the cultural aspects (e.g. Ball, 2004), employment aspects (e.g. Sprenger, 2004) and economy aspects (e.g. Luken, Hesp, 2004). It is important to note that policy integration strategies and concepts should always be applied to actual sustainability problems by co-addressing the three domains of sustainability. This will allow us to gain useful experience with which to apply these concepts over a larger

scale. Besides, what works within the environmental, economic or employment alone (or even between two of these domains) may not be as effective when all three domains are considered within a common and integrated framework.

There is relatively little emphasis on how to achieve integration of policies across diverse terms of election or appointment for government officials. That is, the question of how to ensure that sustainability policies' objectives remain coherent, coordinated and integrated after a government renews itself is seldom touched on in the literature. This is a form of temporal integration, which was mentioned by Briassoulis (2004). Realistic instruments that enhance stakeholder engagement in order to improve policy integration also require more studies, especially those related to all three domains of sustainability. Finally, the questions of how the choice of sustainability indicators can affect our decision of which stakeholders to engage, and how that in turn affects the design of integrated policy, require more in-depth analyses and creative answers.

1.5 Research Questions, Methodology and Scope of Research

In subsections 1.1.1 and 1.1.2, we mentioned the concern over policy ineffectiveness stemming from narrow-mindedness in the policymaking process. As the Johannesburg Rio+10 2002 Summit alluded to, such narrow-mindedness may lead to negative surprises in policy outcome. In order to widen the scope of enquiry and yet deepen the exploration for the real causes of these surprises, our research questions are:

“What are the associated effects – expected and unexpected, positive and negative – of some policy tools employed to promote sustainability in the construction material industry?”

“What lessons can be gleaned from these effects to contribute to better and more effective sustainable development policymaking?”

Considering the nature of the problems, we adopt a combination of ‘holistic’ and ‘embedded’ case study methods. The choice of cases are based on the following criteria:

- They must pertain to the construction wood, concrete aggregate, cement or construction steel industries;
- The presence of policies employed to address sustainability issues;
- The period of time since initial implementation of these policies must be long enough for policy effects to be assessed;
- As far as possible, there must be comparisons between the application of similar policy tools in different countries but under similar conditions.

Data collection is accomplished in two ways:

- Extensive literature review;
- Field and phone interviews to verify data and/or establish new facts not mentioned in the literature.

How do we carry out our policy analysis? First, we identify very clearly the aims and objectives of the policy tools and policies in these cases. Next, we study the outcome from as wide an angle as possible. We then compare the original aims with the actual outcome to identify and explain any surprises (positive and negative), uncertainty, unexpected outcomes and expected results. Finally, we learn from our comparisons and understand how sustainable development policies can be better designed. In our treatment of each case, we employ Ashford's policy assessment framework outlined in subsection 1.1.4. With the help of Ashford's 'sustainability tripod', illustrated in fig.1.1, we identify the following sustainability indicators with and by which the cases are evaluated:

- Energy use (including the fuel mixes involved);
- Air pollution
- Water pollution
- Toxic waste production
- Biodiversity
- Lifecycle cost
- Environmentally derived costs
- Socially derived costs
- Market share and economic competitiveness
- Number of jobs
- Purchasing power and wages
- Workers' safety and health
- Levels and diversity of skills
- Opportunity for upgrading, and
- Innovation of industry

Finally we compare the effectiveness of the set of case studies and associated policies to determine general principles that may be applied to the next generation of sustainable development policy initiatives.

CHAPTER 2: THE NATURE AND TYPOLOGY OF POLICY TOOLS

2.1 General Principles of Policymaking for Sustainability

In general, formulation of environmental policies requires the setting of policy goals, followed by selecting appropriate policy instrument to achieve these goals. Scholars such as Turner et al (1996) suggested that the design and execution of any policy should be guided by six core principles, although real-world situations almost always requires one to trade one off for another, depending on the nature of the concerned issues. These are:

- Economy efficiency principle, which suggests as little interference as possible to private resource allocation decisions in competitive markets and provide continuous incentive for increasing market competitiveness;
- Environmental effectiveness principle, which requires policies to be linked to solving predominant environmental problems, such as pollution prevention and resource preservation;
- Fairness principle, which forbids the policies from imposing disproportionate cost burden on the least well-off in the society;
- Administration cost-effectiveness principle, which demands the policies to involve low or reasonable administrative and compliance costs;
- Institutional concordance principle, which requires the policies to be compatible with existing national regulations as well as international agreements, and
- Revenue raising principle, which requires any taxes and fees to raise appropriate amounts of finance to at least offset expenditures and/or be channeled to uses so that the other principles can be adhered to.

The first three of which actually correspond to the three domains/pillars of sustainable development. The fourth and fifth principles are relevant to the institutional dimension of sustainability suggested by Spangenberg et al. (2002). Regarding trade-off in policymaking, an international group of scientists, government officials, lawyers, and labor and grass-roots environmental activists met January 23-25 at Wingspread in Racine, Wisconsin to define and discuss the so-called Precautionary Principle (Rachel's Environment and Health Weekly, 1998). The outcome was the Wingspread Statement on Precautionary Principle, which states in essence that:

"We believe there is compelling evidence that damage to humans and the worldwide environment is of such magnitude and seriousness that new principles for conducting human activities are necessary... it is necessary to implement the Precautionary Principle: When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. In this context the proponent of an activity, rather than the public, should bear the burden of proof ... The process of applying the Precautionary Principle must be open, informed and democratic and

must include potentially affected parties. It must also involve an examination of the full range of alternatives, including no action.”

In sustainable development, policy tools are designed to bring about behavioral changes in the appropriate stakeholders. Theoretically, such behavioral changes would bring about the desired changes toward greater sustainability. Hence, these tools can be described generally as either having a *direct* or *indirect* control effect. Legislations and regulations best exemplify the direct control mechanism. Indirect control mechanisms mainly appeal to the market response or individual conscience to adopt the desired changes. Such indirect control can be a negative, positive or co-operative incentive. Examples of negative incentives include taxes, fees, and a liability to lawsuits. Positive incentives may take the form of subsidies, research and development (R&D) funding, tax credit and government-led ‘buy-green’ type campaigns. Information sharing symposia and government-backed demonstration projects are two kinds of co-operative incentive.

In this chapter, we classify policy tools that are relevant to sustainable building materials into 6 categories. Some of them belong to the *direct* control type while others belong to the *indirect* control types. Depending on the nature of the problems they are designed to address, the actual tools may be a hybrid of the *direct* and *indirect* control mechanisms. These 6 main categories are:

- Economic tools;
- Legislations and regulations;
- R&D programs;
- Voluntary programs;
- Stakeholder organizations
- Education and outreach programs

In our description of these tools, we venture beyond merely reviewing their current or past applications to sustainable development problems; as far as possible, we also discuss on the challenges and opportunities of each type of tool.

2.2 Economic Tools

Fig.2.1 illustrates the detailed typology of economic instrument commonly in use to address issues in sustainability. These tools can generally be divided into two types – “incentive/empowerment” and “disincentive”. “Incentive/empowerment” tools are those that provide an encouragement and/or capacity to act in accordance to the concerned policies. That is, funding mechanisms to empower communities and finance sustainable development projects are considered as both an incentive and an enabling tool. “Disincentive” refers to those tools that aim to divert stakeholders from practices that contradict the intended policy goals.

2.2.1 Incentive/Empowerment Tools

These tools can in turn be divided into three categories: selective (non self-financing), selective (self-financing) and general. “Selective” incentives refer to benefits that are given to those who satisfy special criteria, such as a proven commitment to sustainable development projects and a capacity to create new and more sustainable technologies. On the contrary, “general” incentives do not require such special conditions. “Non self-financing” incentives refer

to gifts, allocation and/or entitlement to qualified applicants, while “self-financing” ones involve the financing agencies receiving some forms of economic benefits in return. Each of these categories is succinctly discussed below.

2.2.1.1 General Tools

These tools are usually applied to the general consumers as an encouragement for them to modify their consumption behavior in order to help achieve certain policy goals. *Deposit refund* is a system in which a deposit is made on purchase of a product and refunded when the product or the product’s packaging is returned. *Purchase rebates* are non-selective subsidies that grants consumers discount for the purchase of certain selected items; an example is the rebate for purchase of EnergyStar appliances.

2.2.1.2 Selective, Non Self-financing Tools

Tradable permits is favored by many economists as a policy tool that has the theoretical potential of co-optimizing pollution reduction and cost-efficiency, provided a competitive permit market is put in place (Eyckmans, Coenen, 2004). A relevant example for the building material industry is tradable emission permit system currently in place in Europe, which is applied to both the steel and cement industries. The basic idea is for the government to determine the permitted total emission of a certain gas and distribution the emission quota among the various industries. These emission quota are called permits. Profit-maximizing companies would compare between investment in pollution prevention technologies and the purchase of additional permits from the permit market. Theoretically, this arrangement ensures that the total pollution abatement cost for the industry and society is minimized. A potential pitfall of this system is that the high, and often uncertain, upfront cost of pollution prevention innovations may readily prompt companies to resort to purchase of additional permits. Furthermore, the likelihood of large companies from the most energy-consuming industries to buy more permits implies a possibility for emissions, and thus the negative environmental and societal effects of pollution, to be concentrated on certain “hotspots”.

Project grants and *awards/prizes* share similar nature in that applicants usually have to go through a competitive process. The subtle difference is that the providers of research or development grants usually expect something in return; in this sense, grants may also be considered as a form of selective self-financing tool. *Subsidies* are preferential credits or other less tangible treatment for the introduction of technique or technologies that are congruent to the target policy directions. Subsidies can take on many formats. One example is the provision of relatively cheap and functional real estate space within specially designed and centralized R&D parks for promising firms; In addition, these firms may also be given special networking and marketing support. Our case study on the forest management and biodiversity policies in the U.S. highlighted how subsidies given to Canadian lumber imports created a trade dispute between Canada and the U.S. (refer to Annex II).

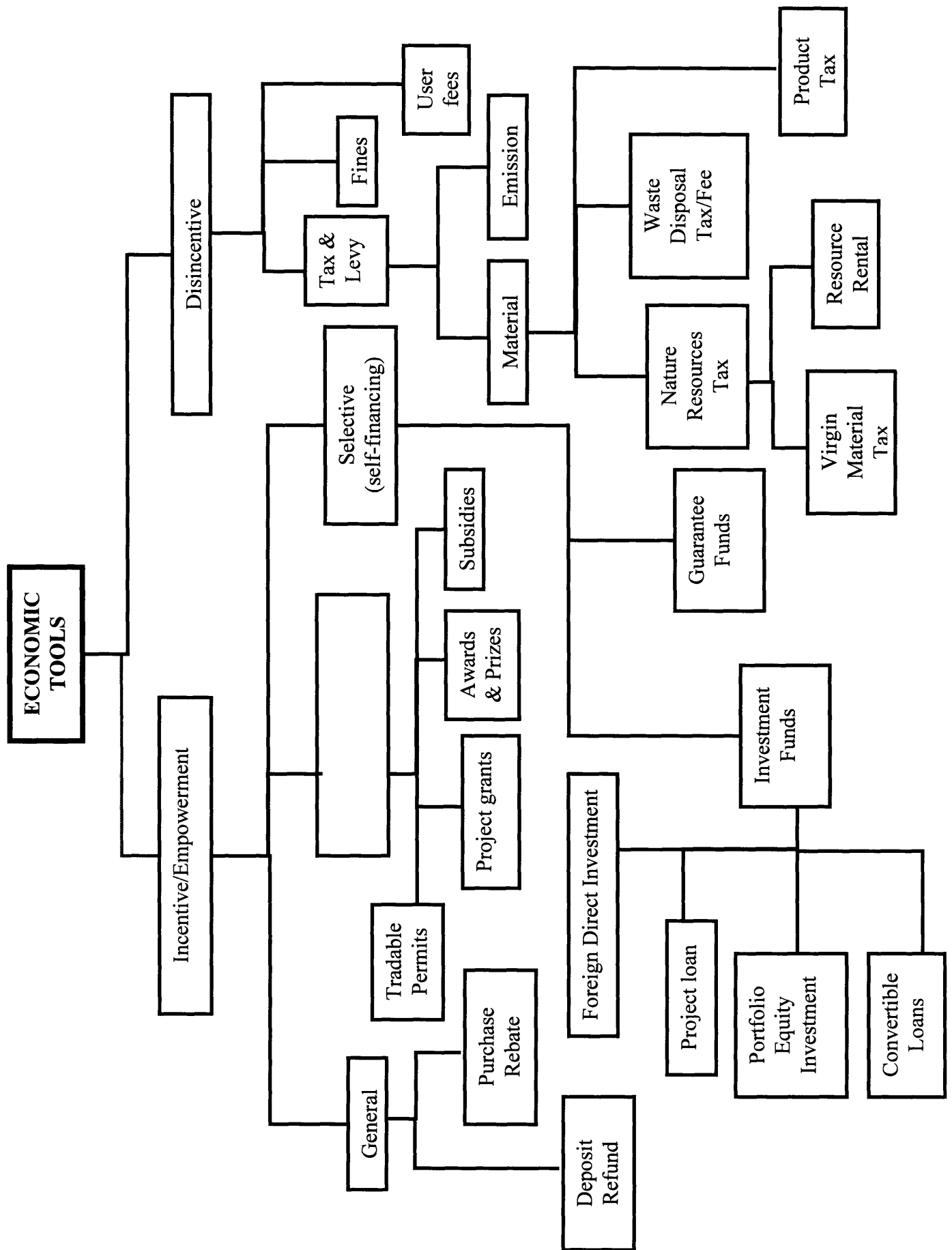


Fig.2.1. The typology of economic tools relevant to promoting sustainable development.

2.2.1.3 Selective, Self-financing Tools

We divide this into two main categories: investment funds and guarantee funds. Each is concisely described below.

2.2.1.3.1 Investment Funds

Foreign Direct Investment (FDI), *Portfolio Equity Investment (PEI)* and *bank loans* are the three main forms of investment. They differ in terms of the level of risk-sharing among the public and private stakeholders involved, and the effects they have on a recipient's financial or economic state (Ashford and Caldart, 2004).

FDI is the direct transfer of financial resources, technology, managerial skills and market access to the recipient industry or economy (Ashford and Caldart, 2004; Chesky, 1998; Economist, 2003). Advantages of such an arrangement include the ability to direct resources to their most effective use and risk-sharing between the firms and the foreign investors. In this sense, *FDI* is considered a safer source of capital than bank loans. However, the price firms must pay for such a safer option is that over long term, since foreign investors expect higher payoff in the face of the risks that they have to share with the firms, the cost on the firms will tend to be higher as well. A successful *FDI* hinges on the accurate knowledge of the investors on the industry and the firms, and demands huge investment of time and effort by the investors in forming a strategically effectual partnership (Economist, 2003).

PEI refers to an investment in a private (unlisted) company or a startup, with the benefit of an acquisition of equity (ownership) participation in the concerned company. When the investment is in infant companies, it is referred to as venture capital investment and is generally understood to be higher risk than investment in listed companies. What is the main challenge in ensuring that *PEI* is available to promote development of sustainable building materials? The process of allocation of investors' funds to invest in equity – globally and in developing countries – is one that involves a wide range of different stakeholders and actors (Griffith-Jones and Leape, 2002). Institutional investors – such as pension funds and insurance companies – as well as retail investors (wealthy individuals) and charities, are major actors in global equity investment. In the case of pension funds, the ultimate responsibility for allocating funds falls on their fund trustees. However, particularly in the US and the UK, trustees rely on the advice of investment consultants, who advise on how they should allocate their assets (typically including the percentage to be allocated to emerging markets). One of the main reasons behind pension fund trustees increasingly relying on consultants is to avoid facing legal responsibility for possible losses, for which they may have to respond with their personal assets (Griffith-Jones and Leape, 2002). Once the broad allocative decisions are taken, one or several fund managers are chosen (again with advice from the consultants). These fund managers may have global, regional or country mandates, and most specialize in bonds and/or equities. In the case of investment in developing countries, these may be a small part of a global fund, which may take the form of specialized funds for all emerging markets. Hence, availability of *PEI* strongly depends on whether the financial benefits of sustainable building material technologies are well understood by this wide range of actors.

Bank loans can be widely divided into two types – *interest loan* and *convertible loan*. Bank loan can be considered as the riskiest type of capital flow. Far too often, it is based on speculations on interest rate differentials and exchange rates (Hausmann and Fernandez-Arias,

2000). The financing institutions usually take the risks involved in the investment and it is the first type of capital to be withdrawn in times of trouble (Hausmann and Fernandez-Arias, 2000). Convertible loan fund is different from conventional interest loans in that the lender of the fund has the option, under certain conditions, to convert part of the loan into equity in the borrower's company share. An advantage of convertible loans over PEI and venture capital in particular is that usually the borrower adopts a more "hands-off" management and thus do not exert any direct influence in the use of the funds. The creation of this type of funds is also favored in situations where there is a lack of private equity at various stages of the targeted firms' development, which is a common feature in many European countries.

As a whole, investment fund has limited risk sharing among the funded companies, private financing institutions (such as the banks) and the government. When highly uncertain technology investment is involved, either due to the nature of the technologies itself or the environment in which investment is made, a preferred form of financing is the *guarantee fund*.

2.2.1.3.2 Guarantee Funds

These funds guarantee loans to companies either directly or indirectly. Loans are directed to companies only under special conditions; for example, companies who are pre-financing contracts with foreign partnering companies are eligible for such loans. In the indirect case, the banks that grant certain kind of credits to qualified companies are given certain degree of guarantee that their loan will be reimbursed by the government in the event that the borrowers fail to return the loan. In this sense, it mechanism represents a lower risk as well as a higher acceptance for longer return on investment on the part of private financial institutions than normal loans and investment funds. It also increases the probability of new companies with promising innovations or technology adoptions to obtain loans from private institutions. Since the government only has to pay the guaranteed amount when the loan is not reimbursed to the bank or private funding bodies, this type of fund also allows the government to spread its financial resources to more projects than is possible with traditional subsidies.

2.2.2 Disincentive Tools

2.2.2.1 Tax and Levy

The idea of environmental taxes and levies originated with Pigou (1920), who opined that the market mechanism fails if "external costs" are not reflected in market prices. An appropriate tax will help to internalize externalities. Scholars such as Baumol and Oates (1971) showed that taxes and levies are an efficient tool to pursue environmental goals, even if the externalities cannot be quantified. An adjacent concept of levying tax is to use the subsequent revenue to reduce other existing taxes by an equivalent amount (Kohlhaas, 2000). This approach aims to ensure that the business sector and private households, taken as a whole, will not face a higher overall tax burden. Ideally, this method also enables policymakers to reduce the negative impact caused by current tax systems that are considered harmful to the economy.

Although in principle, market-based economic instruments offer efficiency gains over direct regulation measures, the magnitude of the efficiency advantage is conditioned by the real world context and application. Especially in sustainable development, the social gains they offer are currently limited by a policy process driven by multiple conflicting objectives determined on a wide range of uncertain variables.

Tax and levy may be categorized into *material-related* and *emission-related* tax and levy. Each is discussed as follows.

2.2.2.1.1 Material-related Tax

There are three main types of material-related tax:

- Natural Resources Tax

Virgin material tax is a type of Nature Resource Tax. It is generally meant to compel payment by extractors and consumers for the use of natural resources. The main goals are to regulate the consumption of and reliance on these natural resources, encourage higher material use efficiency and trigger large-scale material substitution within the economy. It is also used to internalize the external costs incurred by mining a precious natural resource and spur innovation in technology associated with material applications. Different types of virgin material tax are currently applied to different industries. In the wood industry, for example, a severance tax is collected for the felling of trees.

Resource rental takes the form of competitive bidding and area-based taxes (e.g. for purchasing rights to logging in forests). Rentals are also collected through abstraction charges for water.

- Waste Disposal Tax

Meant to control the nature and amount of wastes, *waste disposal tax* is usually applied alongside other policies and taxes meant to encourage reuse and recycling too. For example, landfill tax and landfill ban imposed on unprocessed wood construction and demolition (C&D) wastes in several states in the U.S. have motivated an increase in wood recycling. In Annex I, we examine how the combination of waste and virgin material taxes in Sweden and Denmark might have masked the real associated effects of the virgin material tax, which is the increase in import of these natural resources.

- Product Tax

Product tax are collected for the consumption of products that are proven or believed to have a negative environmental impact in their manufacturing, use and disposal process. Energy, packaging and lubricant oils are a few examples to which product taxes apply.

2.2.2.1.2 Emission-related Tax

The most famous example of such a levy is the Climate Change Levy (CCL) collected from energy intensive industries, including cement and steel plants, in Europe. Such levies are typically charged according to the total number of kWh use of electricity and fuels. For example, the UK charges 0.43p/kWh and 0.15p/kWh for electricity and gas/coal fuel use respectively. Usually, emission tax and levy have a built-in structure that allows firms to negotiate for levy rebates. Cement and steel firms in the UK with installations that are regulated under the Integrated Pollution Prevention and Control (IPPC) Directive are eligible for rebate negotiation.

2.2.2.2 Fines and User Fees

Fines are penalties imposed on violators of legislations whose actions pose actual or potential harms to the community, ecosystem and/or the economy. *User charges or fees* are collected as a source of revenue to sustain the environmental services for the users or finance related works in other industries. An example is the entrance fees collected for natural parks.

2.3 Legislations and Regulations

Regulations are favored as a tool that internalizes externalities and thus “gets the prices right”. Taxes and levies are supported by the promulgation of legislations. In his response to the argument that regulations tend to impair firms’ competitiveness, Porter (1991) opined that:

“The conflict between environmental protection and economic competitiveness is a false dichotomy. It stems from a narrow view of the sources of prosperity and a static view of competition. Strict regulations do not inevitably hinder competitiveness advantage against foreign rivals; indeed they often enhance it” (Porter, 1991)

In essence, Porter believed that regulation, if properly designed, can cause the regulated firm to undertake innovations that reduce pollutions and other negative impact while saving on materials and energy costs. In fact, if a firm is to move by complying in a clever way, other firms will later be forced to follow suit in a more expensive way. Thus, the first-mover firm will enjoy the “learning curve” advantages of being first and early. Porter extrapolated this concept and argued that first-mover firms will also benefit by being subjected to a national regulatory system that is slightly ahead of those in other countries; for this reason, he believed the U.S. should be ahead of other countries in its environmental regulations. This is known as the *Porter Hypothesis*.

However, Porter left out a few important points regarding how such regulations should be planned and implemented, and how different firms will respond to stringent regulations to reap the potential benefits. Furthermore, Porter was in fact talking about incremental innovation in environmental technologies. Ashford et al. (1983; 1985) proposed the *Strong Form of Porter Hypothesis* that states that stringent regulation could bring about dramatic innovations, which are often achieved by new firms or entrants displacing the dominant technologies. Put in another way, the success of a strict regulation is contingent on the inherent innovativeness of the regulated firms and any new entrants.

Ashford et al. (1979) earlier on also observed that regulations were more likely to succeed in spurring innovations whenever environmental, health and safety regulations were present as an element in the planning process than when they were absent. Since sustainable development policymaking essentially involves a myriad of related issues, “by increasing the problem space” within which policymakers search for solutions, regulations that add new dimensions to old problems should be favored. Nevertheless, one still requires sufficient social concern and pro-activeness, and political will to support the design of such a regulation.

Fig.2.2 shows the typology of legislation and regulation. Generally, they can be categorized into those that apply to only federal/state/ government agencies and those that apply to the entire industry and/or society. Each can be sub-divided into several categories. We provide a comprehensive dissection below.

2.3.1 Regulation for Federal or State Government Agencies

The best example of such a regulation is the Clinton Presidential Executive Order 12873, also informally known as the “Buy Recycled” executive order. The purpose of order was to more effectively utilize the vast purchasing power of the government to procure products that are environmentally preferable. Recycled paper, recycled wood and paper products are some of the main items focused under this executive order. However, unless a progressive plan is in place to further require “green-purchasing” to be practiced in the industry¹⁰, such federal programs are likely to lack any long term positive effects.

2.3.2 Regulation for Industry and Society

Most of the implemented regulations belong to this category. *Emission trading, bans and standards* are three main types of such regulation.

2.3.2.1 Bans

There are two main types of *bans* that could contribute to sustainability. The first type is a ban on the *disposal or landfilling of specific kinds of waste*. As mentioned in the sub-section on waste disposal tax/fee, a ban on certain types of waste may be resorted to when the landfilling tax is insufficient to create the desired effects. The decision by the Department of Environment Protection of Massachusetts to enforce a ban on the disposal all unprocessed C&D wood waste and crushed concrete is a good example. Banning of *specific types of material* is essential to ensure the health and safety of construction workers and occupants. France banned the use of asbestos (unless in uses where less hazardous substitutes are currently absent) from January 1, 1997; this ban included asbestos-cement. Similarly, after a long political tussle, the U.S. banned the use of wood products impregnated with Copper Chromate Arsenate (CCA) preservative in all new residential buildings effective from January 1, 2004.

2.3.2.2 Standards

We consider existing standards to fall into two general categories: *performance standards* and *design/specification standards*.

A performance standard is one that specifies a particular outcome but does not specify how that outcome should be achieved. On the other hand, a design or specification standard, specifies a particular technology, such as a catalytic converter, that must be utilized. As mentioned by Ashford and Caldart (2007), in either case, the standard can be based on:

- A desired level of protection for human health or environmental quality;
- Some level of presumed technological feasibility;
- Some level of presumed economic feasibility; or
- Some balancing of social costs and social benefits.

¹⁰ Indirectly, the LEED – Leadership in Energy and Environmental Design – Green Building Rating System is a way to encourage the building industry toward the procurement of recycled content building materials. However, at this stage, LEED is still a voluntary program.

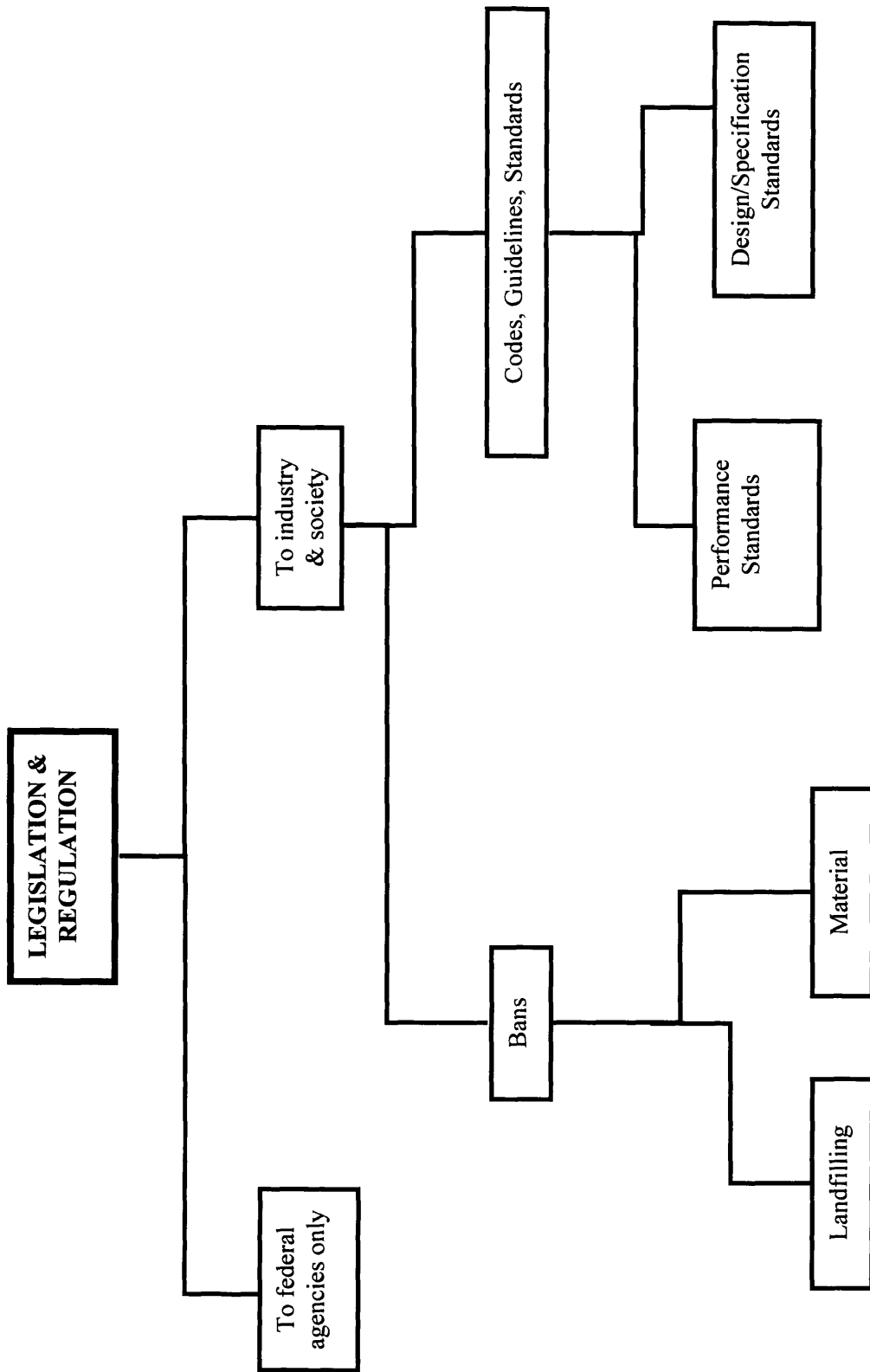


Fig.2.2. Typology of sustainable development legislation and regulation.

However, it is common for a standard to be based on a combination of these three. For instance, many standards based on technological feasibility are also based on some concept of economic feasibility. Other requirements that could be considered 'standards' include

- Information-based obligations, such as the disclosure of (and retention of, or provision of access to) exposure, toxicity, labeling of chemical content, and production data, and
- Requirements to conduct testing or screening of chemical products.

A *design/specification standard* can be viewed as a technology prescribing in nature while a *performance standard* is more technology-forcing in nature. The difference between them is that while the former directly or indirectly expresses a preference for specific types of technology, the latter does not. That is, the former does not encourage technology innovation. The key to using standards to spur innovation is by purposefully setting the standards a little higher than that achievable by current technologies; this can then encourage, or even provide incentives for, the industry to innovate a next level of technologies that can actually meet the new requirements.

In some cases, due to unforeseen outcome of policies, standards that are initially intended to be performance-based (technology-forcing) may turn out to be design/specification-based (technology-prescribing). An example is the application of UK's CCL concession with the IPPC Directive. Under this regulation, only plants that operate technologies that are regulated under the IPPC Directive are eligible for rebate negotiation (as mentioned in sub-section 2.2.2.1.2); however this will disqualify any firms that are willing to try out new and cleaner technologies that are currently not regulated under IPPC from such negotiation. This puts such firms in a disadvantaged position, especially if they stand to benefit more from such a negotiated rebate even after the technology switch. This encourages firms to stay within their comfort zone and only select technologies that are regulated under IPPC Directive.

A good example of performance standard related to sustainable building design and construction is the ASTM E-2129: Standard Practice for Collection of data for Sustainability Assessment of Building Products. It compiles a set of ASTM or other established standards that apply to a wide range of sustainability concerns. For instance, it refers to the Occupational Safety and Health Act (OSHAct) as a code for choosing materials that can ensure the safety and health of workers. However, what it fails to offer as a cross-cutting, multi-faceted standard is to offer suggestions on how to resolve any contradictions and conflicts between the prescriptions or directions from these different codes.

2.4 R&D Programs

Treating R&D activities as a policy tool goes beyond merely financing the daily operational expense. It is an increasingly common trend to build a R&D program around a strong infrastructure foundation. Namely, R&D activities are usually concentrated in locations and links between academic and industrial activities are emphasized. A good example is the R&D park concept in which institutes of different nature are concentrated in a special locality. Besides enhancing networking, if designed properly, R&D parks may also strengthen the marketing potential by increasing visibility of projects (Joerg and Larrue, 2004). Silicon Valley has long enjoyed tremendous popularity due to such high visibility. However, the long-term visibility and reputation of a R&D park also depends on the quality of the projects delivered. Nonetheless, not focusing exclusively on the results of R&D projects alone, but also treating the development of

the supporting and networking infrastructure as an integral part of these projects could reap more spillover benefits.

In section 2.3, in our discussion of the Porter Hypothesis, we pointed out that Porter referred to incremental innovations. Ashford et al., on the other hand, proposed that incumbent firms are unlikely to spearhead any innovative breakthroughs of a disruptive nature (Christensen, 1999) and thus policies should stimulate “spin-outs”¹¹ from these firms. In general, R&D policies to spur disruptive innovations are different from those that only encourage incremental innovation or pure technology adoption or diffusion. The research agenda must not restrict the imagination of innovators and a minimum degree of risk sharing between private and public funding agencies must be achieved. The supporting infrastructure and available resources must also provide an appropriate safety net for innovators who do not succeed. Finally, the experience of such ventures should be well documented and utilized as education materials for future projects.

A R&D program may be supported either by the *government* or *private industrial funders*. In the latter case, usually the government sets the limits for the agenda via regulations and legislations. An example of a *government-backed R&D program* in the wood industry is the Agenda2020 (2005). Initiated in 1994, Agenda2020 is an industry-led partnership with the government and academia that aims to accelerate the U.S forest products industry through innovation in processes, materials and markets. The technology roadmap and portfolio is organized around seven core platforms:

- Advancing the forest biorefinery;
- Advancing nanotechnology for the forest products industry;
- Developing breakthrough manufacturing techniques and technologies;
- Developing next generation fiber recovery and utilization;
- Positively impacting the environment;
- Advancing the wood products revolution, and
- Nurturing a technologically advanced workforce.

However, a closed examination of the Agenda2020 project funding for 2003 revealed that less than 1% of the total expenditure was spent on workforce training related research (the US\$390, 000 project funding was provided by the National Science Foundation). The actual R&D agenda is heavily slanted toward environmental and economic development of the industry. The social aspects of sustainability, including employment related factors, are neglected. This underscores the common inability of large-scale government R&D programs to really address sustainability at its core. Henceforth, a closer tie with other government- or private-backed R&D, or even non-R&D, programs should be fostered. In the case of the wood industry, the EPA-supported job creation program – known as the Jobs-Through-Recycling Program (JTRP) – could be co-opted into Agenda2020. This may be accomplished either by making job creation an objective for wood fiber recycling R&D projects or set up a sister-fund to help innovators apply their knowledge to the agenda of the JTRP.

The Cement Sustainability Institute (CSI) of the World Business Community for Sustainable Development (WBCSD) is a good example of *private agencies*’ involvement in the building industry. It is a consortium of a number of leading cement companies who collaborate to address issues related to global sustainability. One of these issues is the industry’s emission of

¹¹ “Spin-out” companies are conceptually different from “spin-offs” in the way that in case they fail, they are allowed to return to the mother firm. This provides a safety net for bold innovative ventures.

carbon dioxide, the main greenhouse gas contributing to man-made global warming (WBCSD, 2005). In 2001, the CSI companies agreed on a methodology for calculating and reporting CO₂ emissions: the Cement CO₂ Protocol (WBCSD and WRI, 2006). While accounting for the specific needs of the cement industry, the protocol was closely aligned with the overarching greenhouse gas protocol developed under a joint initiative of the WBCSD and the World Resources Institute (WRI). Other than producing the Protocol, CSI also commissioned a study on the different sustainability concerns in and of the worldwide cement industry. This led to the so-called Agenda for Action objectives (WBCSD, 2002) and an earlier industry-wide sustainability policy analysis and proposal (Battelle, 2002).

2.5 Voluntary Programs

As shown in fig.2.3, there are 4 common types of voluntary scheme. Each of them may be funded and sustained by either the government or private sponsors. Each of them is described below:

2.5.1 Environmental Management System (EMS)

The success of ISO 9000 – the quality management system (QMS) – as well as growing worldwide concern for the environment accelerates the introduction of the ISO 14000. While the ISO 9000 is required by law in the construction industry in many countries (e.g. Singapore), adoption of ISO 14000 is purely on a voluntary basis. Ofori et al. (2001) found that although contractors in Singapore are confident that it is a right decision to make ISO 9000 mandatory, many will only adopt ISO 14000 if the cost saving is substantial and customers are concerned over the environmental performance of the building. This is especially so since the certification of another ISO systems may imply higher investment of costs and time on their part.

This study underscores one important point: companies cannot depend merely on goodwill to adopt voluntary EMS. Besides the need to sense clear market signals, the process of certification must be streamlined to reduce paperwork (Tan, 1997; Tan et al., 1998). To some extent, this was achieved in 1999, when Kienta Engineering Construction Pte Ltd became the first construction enterprise to have an integrated system combining certification of QMS and EMS. Since 2000, there has been active promotion of such *Integrated Management System (IMS)*, focusing on a wider range of sustainability related factors, including quality control, environment protection and occupational health and safety (Ofori et al., 2001; Dhaliwal, 1998).

2.5.2 Rating or Benchmarking Schemes

The primary objective of a *rating or benchmarking scheme* is to standardize a scheme to assess the sustainability performance of a material or system of products. Such schemes typically evaluate the entire lifecycle of the products concerned. The difference between a *rating* and *benchmarking* scheme is that the former operates on an absolute set of standards (but which may differ in detailed content to suit different regions, countries or functionality), whereas the latter relies on a relative set of standards usually set by the best practice in the current industry.

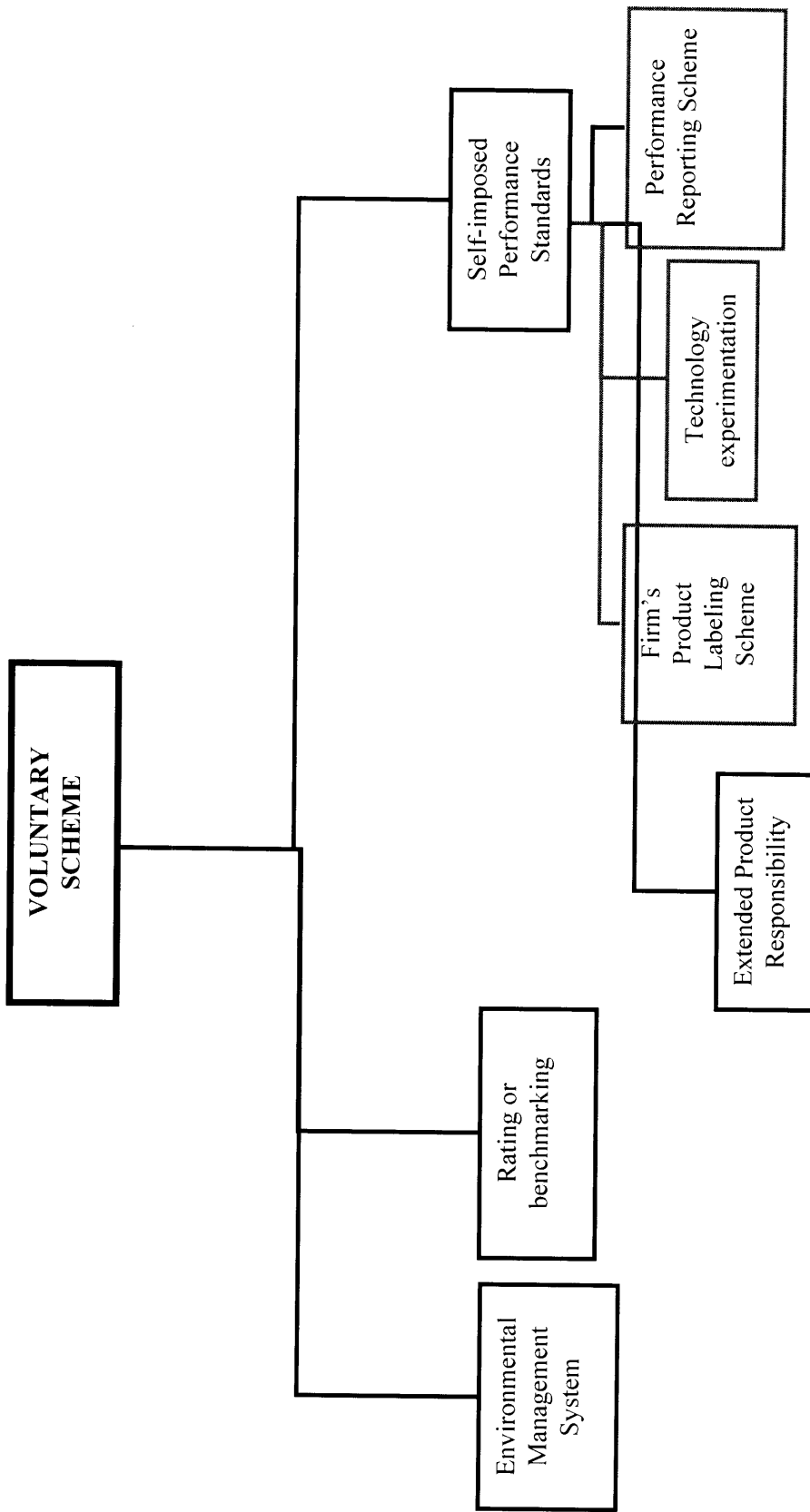


Fig.2.3. Typology of voluntary scheme.

As mentioned in the last sub-section, LEED (Leadership in Energy and Economic Design), developed by the U.S Green Building Council, is a purely voluntary program. LEED provides a complete framework for assessing building performance and meeting sustainability goals. After a successful first phase, USGBC extended LEED into other building types, and now there are specific standards for the following:

- New commercial construction and major renovation projects (LEED-NC);
- Existing building operations (LEED-EB),
- Commercial interiors projects (LEED-CI),
- Core and shell projects (LEED-CS),
- Homes (LEED-H), and
- Neighborhood Development (LEED-ND)

Building owners and developers who choose to conform to the LEED rating system do so primarily to reduce operating costs, improve working and occupancy conditions and enhance the 'green' image of their properties (which may in the future enhance market value and enhance asset value). However, this is provided that owners and developers are willing to pay additional costs for consultancy and accreditation of their buildings, which may be 10%-30% higher than usual.

For the industry to be more efficient, it must have better information to help them gauge the potential in building energy savings. The Energy and Sustainability Unit (ESU) of the School of Design and Environment, National University of Singapore, initiated a series of energy auditing and benchmarking projects in 2002 to address this issue. These projects were meant to first derive an Energy Efficiency Index (EEI) for every building with a sizeable air-conditioning load. When this has been established, the ESU and the Building and Construction Authority (BCA) of Singapore can then set performance benchmarks for the buildings by type. With all these in place, building owners will know how their buildings fare compared to the performance benchmark. Any performance below the benchmark would imply that improvement could be made to the building to attain the required energy efficiency level.

2.5.3 Self-Imposed Performance Standards

Self-imposed performance standards are slightly different from rating and benchmarking systems in that firms link and distinguish themselves with certain product qualities or their unique management styles. We identify four ways by which firms achieve that: *extended product responsibility, firm product labeling scheme, technology experimentation* and *performance reporting scheme*.

2.5.3.1 Extended Producer Responsibility (EPR)

EPR is a special arrangement in which producers of goods are responsible for the post-consumer treatment of the concerned goods. EPR was identified as a principle and strategy for waste minimization by OECD at the 1995 Waste Minimization Workshop held in Washington D.C. In this context, the principle of EPR was stated as:

"Producers of products should bear a significant degree of responsibility (physical and/or financial) not only for the environmental impacts of their products downstream from the

treatment and/or disposal of the product, but also for their upstream activities inherent in the selection of materials and in the design of products.” (Environmental Canada, 2002)

With the point of incidence at the post-consumer phase of the product’s life cycle, a distinct signal is sent to the producers to alter the design of their products in order to reduce their environmental impact. Producers accept responsibility when they design their products to minimize environmental impacts over the product’s life cycle; for those impacts that cannot be eliminated by design, the EPR arrangement implies that they accept physical and/or economic responsibility (full or partial) for those impacts. However, the cost associated with the treatment and disposal can be passed on to consumers, thus internalizing the externalities.

Firms that venture into EPR distinguish themselves as environmentally conscious by providing this additional service at a cost for the consumers. This to some extent also increases the market share in the competitive building materials industry. Besides, with the popularity of the voluntary LEED benchmarking and rating system, which award points for the use of recycled content materials, more firms are paying attention to EPR or its hybrid format (Fishbein, 2000). However, even if firms manage to reduce their costs on raw materials by switching to recycled materials, the profit margin must be substantial enough for more firms to convert in the future. Interface Inc., who provides old carpet take-back service for its customers, is one of the EPR pioneers in the building industry (Interface, 2004).

2.5.3.2 Firm Product Labeling Scheme

By linking corporate name to a product of a distinct environmental or sustainability quality, but without offering EPR related services, companies are able to set themselves apart from their competitors. Home Depot is known for its commitment to sell only wood products that are made from lumber certified by the Forest Stewardship Council (FSC). EnergyStar scheme is also a form of labeling scheme but it differs from the former in that it is not associated exclusively to a firm who is committed to marketing and selling them; besides, it is actually a federal supported generic labeling program in which purchase is encouraged by rebates.

Since firms do not offer additional environmental (or sustainability) with their distinct products, the real value of product labeling scheme depends entirely on the effectiveness and rigor of the labeling scheme. In some cases, firms may even make the mistake of supporting, and thus perpetuating, a flawed labeling practice by catalyzing the formation of the supply chain (Harman, 2005). Therefore, it is the onus of participating firms to assess the authenticity of the claims regarding the value and intrinsic advantage of the concerned product types.

2.5.3.3 Technology Experimentation

The main reason why firms would volunteer to experiment with new technologies is to reap the first-mover advantage by being the first to master new technologies, or even to innovate technologies that conform to an impending regulation. At the bottomline, however, firms must be able to justify such experimentation with possible tangible (e.g. profits) and intangible (e.g. enhanced public image) benefits.

Our third case study (Annex III) describes how cement companies in the U.S. and UK are switching to using waste as fuel for their cement kilns. Specifically, in 2004, the Environment

Agency of Wales confirmed that the cement manufacturer Lafarge Cement UK Ltd. is allowed to carry out a trial burning of Meat and Bone Meal (MBM) as a fuel at its works in Aberthaw, Vale of Glamorgan (Land Regeneration Network, 2004). In the granted nine-month trial, in which MBM is used to provide up to 30% of the heat required for the cement-making process, Lafarge still continued to use coal and petroleum coke as their traditional fuels. During the trials, Lafarge was required to carry out a rigorous program of emissions testing, and independent monitoring was also carried out. Once the trial is complete¹², the results will be analyzed and considered to determine whether it has been a success. The monitoring results will also be placed on the Public Register. The reason why governments are generally willing to partner up with firms and run trials of this nature is that cement production is highly energy intensive and using of waste as fuels also contribute toward reducing the need for landfilling.

Annex III describes in detail the unexpected, negative associated effects of such voluntary efforts.

2.5.3.4 Performance Reporting Scheme

Corporate Social Responsibility (CSR) is a relatively new research topic that explores how firms can incorporate various social aspects into their business (Burke and Logsdon, 1996). These aspects include improving workplace conditions, contributing to the well-being of local communities (e.g. public education) and garnering public feedback on certain decisions (Scott, 2005). *Reporting schemes* are corporate voluntary efforts to report the status of their involvement in these areas periodically, usually in their annual reports. Recently, another form of reporting was introduced. The Corporate Responsibility Index (CRI) was launched by Business in the Community (BITC), a U.K. consortium of 700 companies devoted to improving their positive impact on society. The index, which is the first of its kind, benchmarks the CSR performance of companies. The index rates a company on its CSR strategies and how well it has integrated those strategies into its overall business operations. The index also rates company management practices that impact the community, environment, marketplace, and workplace (Baue, 2003).

In order to further increase the value and economic impact of this index, BITC planned to develop the index into a tool for companies to compare their performance to best practice, as well as a tool for investor analysis. Toward this end, BITC is developing links with the National Association of Pension Funds and the Association of British Insurers as well as investment fund managers and financial analysts to encourage the use of the index for benchmarking.

The significance of voluntary schemes highlights the pivotal role played by stakeholders in the overall effort in sustainable development. The means by which the different stakeholders organize themselves determine the significance of their role in the industry. We shall describe *stakeholder organization* as a distinct policy tool in the next section.

2.6 Stakeholder Organizations

Stakeholder organizations can best be categorized according to their geographical and functional contexts. *International*, *regional* and *local* groups play vital roles in the putting sustainability into practice at different levels and scales.

¹² The trial is expected to complete at the end of September 2005. The first analysis results are expected by the end of 2005.

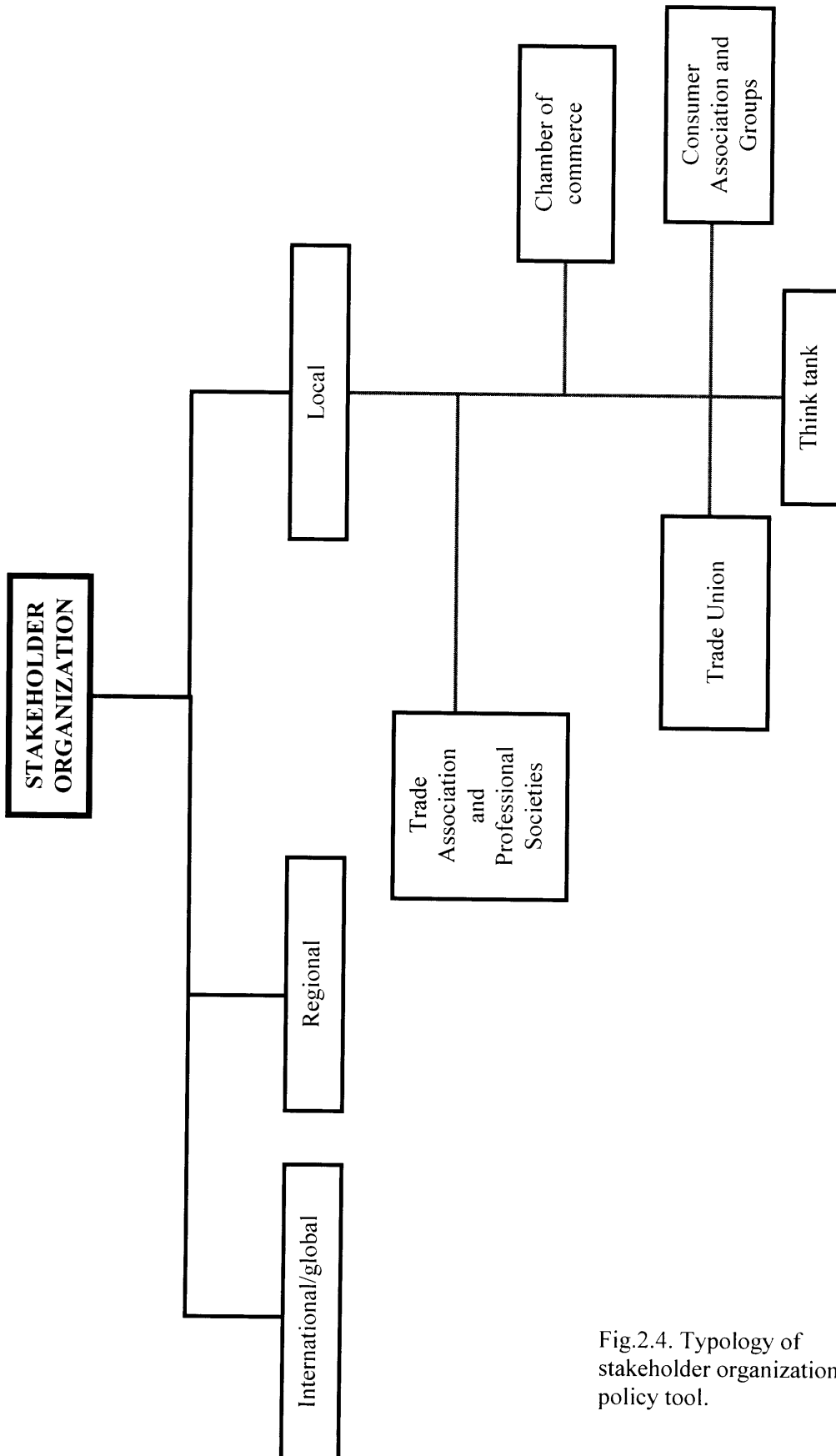


Fig.2.4. Typology of stakeholder organization as a policy tool.

2.6.1 International and Regional Organizations

Usually, *international organizations* aim to pool together resources and expertise from around the world so that experience dealing with common problems faced by the industry can be shared among member firms or countries. Politically, such organizations also provide the critical mass to represent the industry in international political activities. The International Iron & Steel Institute (IISI) serves as an international association and think tank that addresses any issues that impact the global iron and steel industry. It also undertook the Global CO₂ Breakthrough Program in 2003, in which it established a Coordination Committee and agreed a protocol for information exchange and evaluation methodology for regional programmes in Europe, Japan, South Korea, Canada and the U.S. (IISI, 2003).

Regional organizations have similar political potential as international organizations, but due to similar geophysical and socio-political conditions, and perhaps mutual understanding, such groups are more able to address specific sustainability issues unique to that region. Similar to international organizations, these regional organizations are committed to information sharing and the formation of think tank groups, which are also instrumental in addressing problem shifting or cross boundary environmental impacts. The ASEAN (Alliance of South East Asian Nations) Center for Energy is such an example. The Center is positioned to be a catalyst for the economic growth and development of the ASEAN region by initiating, coordinating and facilitating regional as well as joint and collective activities on energy (ACE, 2000). To realize this vision, it strives to accelerate the integration of energy strategies within ASEAN by providing relevant information on state-of-the-art technology and expertise to ensure that over the long term, necessary energy development policies and programs are in harmony with the economic growth and the environmental sustainability of the region. ACE's focus includes promoting energy efficiency in buildings; in 2003, it organized the ASEAN Energy Award for Energy Efficient Buildings.

2.6.2 Local Organizations

Local organizations refer to the various ways in which stakeholders within a country, state, city or village are organized to perform specific functions in and for the industry. Fig.2.4 illustrates seven forms that such an organization can take. Each is briefly introduced as follows.

2.6.2.1 Trade Associations and Professional Societies

A *trade association* acts as a representative for the industry's interests, for which it speaks in the national policymaking. It is usually constituted with different sub-divisions, each charged with looking after a segment of the industry stakeholders. It may also incorporate a R&D wing, which may be associated to an effort of a larger scale in-charged by either a regional or international industry organization. Since it has a wide range of resources, it is in a useful position to disseminate professional knowledge among its members, especially across the different stakeholder groups. Some of these sub-divisions can be developed into *professional societies* that are composed of and represent professionals, or laypersons who are interested, in specific professions.

In the U.S. an example of a successful trade association in the building industry is the National Association of Home Builders (NAHB). One of its key goals is to provide and expand the opportunities for all consumers to have safe, decent and affordable housing (NAHB, 2005). Some trade associations perform more specialized role in the industry by providing specific

services for its customers. An example is the building societies in the UK. These societies are financial mutual institutions that provide a range of services to assist in housing ownership. These services include current accounts, credit cards, cash machines, travel money, unsecured loans, various types of insurance and estate agency services. Building societies are unlike banks, in that they do not have shareholders requiring dividends. This implies that most can be run at a lower cost and hence able to offer better rates of interest (BSA, 2005). To coordinate and represent the different building societies in important issues such as building society legislation, the regulation of the sector, developments in the savings market, financial inclusion and the promotion of building societies' mutual status, a trade association – the Building Societies Association – was established.

2.6.2.2 Trade Union

A *trade or labor union* is an organization formed by workers in the concerned industry. It may acquire the status of a legal entity (called a "collective bargaining agent" in the USA) with a mandate to negotiate with employers to maintain and improve wages and working conditions for the workers it represents. In such cases, unions have certain legal rights, most importantly the right to negotiate collectively with employers over wages, working hours and other terms and conditions of employment — meaning that such things are not set unilaterally by management, but must be agreed upon by both parties.

How do trade or labor unions impact sustainable development? Besides keeping wages, workers' health and safety issues, and working conditions in check, some scholars argue that unions' stance on sustainability policies depends very much on the perceived risk that their members face in losing their jobs (Fredericksson and Gaston, 1999). However, it is also possible for unions to support these policies if there is a low risk of job loss for their own members but high risk of non-unionized workers of losing their jobs. Migration of skilled labor toward the cities has given rise to its unique set of sustainability challenges around the world. In fact, Faini (1998) suggested that trade unions' wage-setting policies can have a great effect on the overall state of the local economy and the regional (within the country) convergence. Specifically, he suggested that if unions in the unskilled (or less skilled) and skilled (or more skilled) regions of a country were to coordinate their wage-setting policies – increasing the wage in the former while repressing that in the latter, with the aim of discouraging labor migration into the skilled (or more skilled) regions – the overall economy will be held back. Henceforth, it is the onus of the government to pre-empt and guard against any kind of policy coordination that may give rise to such unexpected associated effects.

2.6.2.3 Think Tanks

A *think tank* is a multi-disciplinary research institute or organization providing advice and ideas on problems of policy. Think tanks in different countries play different roles with regards to policymaking. In the U.S, they participate actively in forming both foreign and domestic policies. Typically, these issues will be debated within and among think tanks and the result of these debates will influence government policy makers (Wikipedia, 2005). They generally receive funding from private donors, and this may give them more freedom to propose and debate controversial ideas than people within the government, provided the funding agencies' do not have politically charged agenda. Think tanks in the Great Britain operate on a similar structure as the American counterparts. In Germany, they play a more detached role of providing research support for policymakers instead of explicitly proposing policies themselves.

Two of the most famous sustainability think tanks in the U.S are the Union of Concerned Scientists (UCS) and the World Resources Institute (WRI). Formed by a group of MIT faculties and students in 1969, the UCS is now an independent nonprofit alliance of more than 100,000 concerned citizens and scientists. UCS augments scientific analysis and aspires to promote innovative thinking and committed citizen advocacy to build a more sustainable environment (UCS, 2005). The main programs that UCS runs to achieve this aim are in the areas of clean vehicles, clean energy, global environment well being, global security and the link between food and the environment. In the same spirit, the WRI was formed in 1982, under the leadership of James Gustav Speth. Its main objectives include addressing challenges in global climate change, explore ways to harness markets and enterprise to expand economic opportunity and protect the environment. It also aims to provide public access to information regarding natural resources and the environment, and study how the relationship between human and the ecosystem could be changed to materialize a sustainable future (WRI, 2005).

2.6.2.4 Consumer Groups or Associations

We distinguish *consumer groups and associations* from trade associations who also cater to consumers in the industry. These groups or associations provide very specialized services to consumers, usually related to the protection of their rights, the safety of products, and ensuring that consumers are not been taken advantage of by firms. Some also disseminate information regarding their rights, product information and even as a mediator for dispute resolution. Hence, consumer groups and associations play a vital role in rallying and sending consumers' signals to the market.

In order to strengthen consumer protection for buyers of new homes and improving the quality of residential construction, the Homeowner Protection Office (HPO) of the British Columbia, Canada, was formed under the Homeowner Protection Act in October 1 1998 (HPO, 2005). Besides administering a builder registry, managing a Reconstruction Fund, providing consumers information, assisting in dispute resolution and licensing qualified builders, HPO also funds an in-house R&D program. Under its auspice, R&D programs in building science, educational and training methods in residential construction, building envelope materials innovation, green building & energy, and facilities maintenance support the mandates of the Homeowner Protection Act (HPO, 1999).

2.6.2.5 Chamber of Commerce

Chambers of Commerce (CoC) are business advocacy groups that are usually not associated with government. They cannot be considered as think tanks since they usually do not directly participate in policy analysis and proposal. Companies operating within a geographical context can become a member of its CoC in two possible ways: compulsory or non-compulsory membership. Compulsory membership occurs in most countries of EU (France, Germany, Italy, Spain) and some Asian countries. U.S, Canada and UK are examples of countries whose CoCs do not require compulsory membership. CoCs' main tasks are promotion of foreign trade, training and general services to companies (which is especially valuable to multinational corporates). They also have a consultive function. This means that federal or state governments must consult CoCs whenever a new law related industry or commerce is proposed (Wikipedia, 2005). In other words, a strong CoC is in the position to support any new economic policies that aim to extend the environmental and social aspects of sustainability without shortchanging the commercial potential or investment attractiveness of a concerned region.

With their extensive reach within the local and international business community, CoCs are in good positions to organize workshops and seminars on themes regarding corporate social responsibility and the contribution of the business community to sustainable development. For example, the Cache Chamber of Commerce (2004) organized tele-conferences on “Green Business and Agriculture” and “Renewable Energy” to its members. Another great example is that the International Chamber of Commerce (ICC) and WBCSD collaborated on the project Business Action for Water (BAW) in December 2004. During the last decades, business efforts to manage water wisely have evolved, yielding invaluable lessons in the efficient use of freshwater resources, improvement of water quality and ecosystems, and in providing safe drinking water and sanitation to people throughout the world. It is hoped that BAW can be developed into an effective vehicle by which businesses can share their growing expertise in water management best practices and in building multi-stakeholder consensus around the various challenges in sustainable water use (ICC and WBCSD, 2004).

In many ways, the different forms of stakeholder organizations described briefly above have the capacity to reach out to their own members and provide them with the essential information pertaining to their fields of interest. This speaks for the potential of such organizations as a tool for promoting sustainability in the concerned industry. However, the specific ways in the general public and stakeholder organizations’ members are educated on these issues should be considered as a tool of and in itself. In the following section, we shall describe how *education and outreach programs* can be effective in connecting policymakers to even the unspecialized public citizens on issues pertaining to sustainable development.

2.7 Education and Outreach Programs

Fig.2.5 illustrates the different types of *education and outreach* tools. While *demonstration projects* and *outreach programs* can either be supported by the government or private agencies, *product labeling schemes* and *design standards* are usually results of government directives or legislations. Each is described below.

2.7.1 Product-Labeling Schemes

As mentioned before, *product-labeling schemes*, such as the EnergyStar, is an effective way to encourage consumers to purchase earmarked products that are identified by the government as embodying certain desirable qualities with respect to sustainable development. However, such encouragement usually does not originate from an enlightened notion of the impact of consumerism but from the benefits that are attached to or associated with these earmarked items. Tools like purchase rebates, hopefully strengthened by government’s lead-by-example green purchasing programs, will have a positive effect in enhancing the purchase of these products.

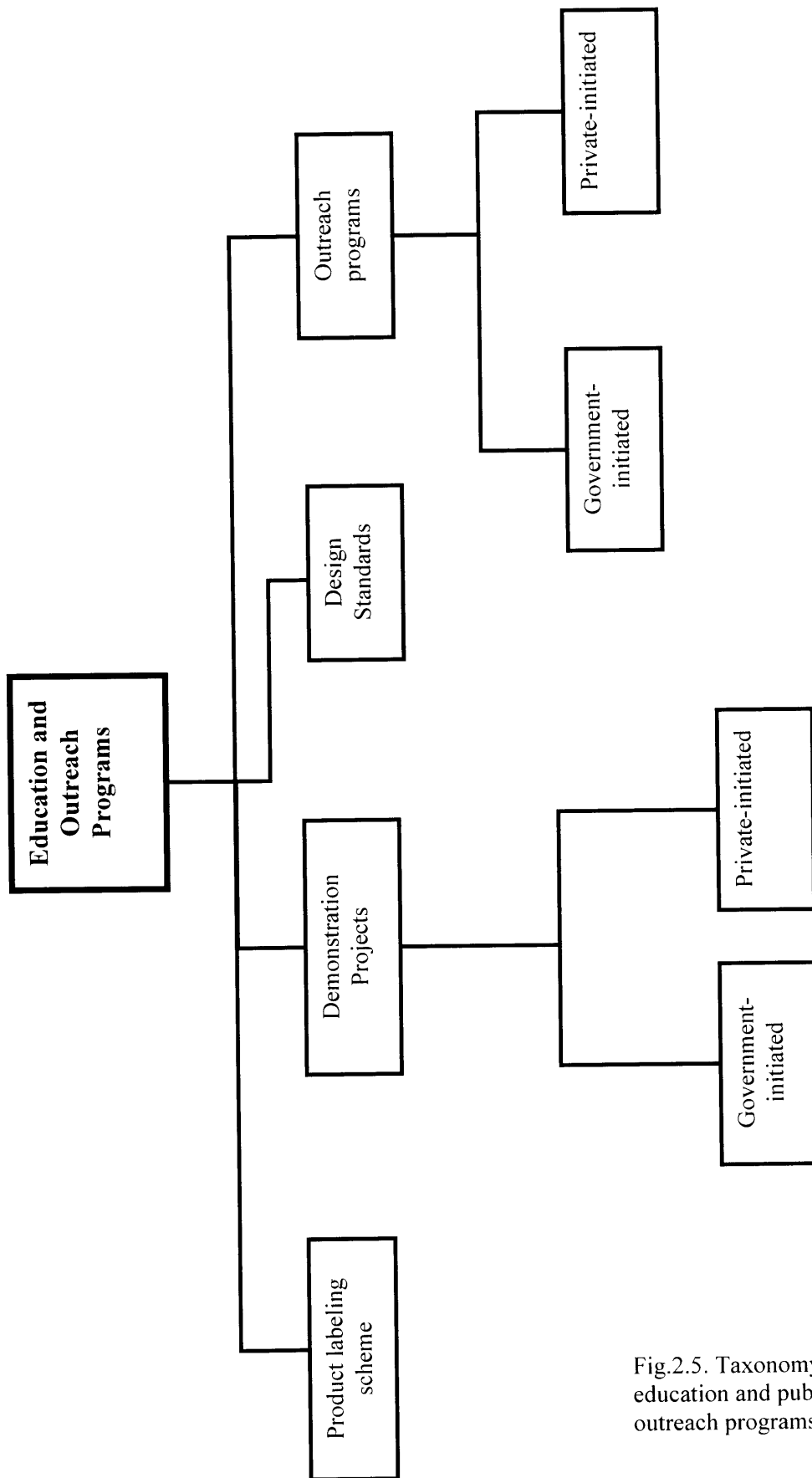


Fig.2.5. Taxonomy of education and public outreach programs

There are many ways in which these schemes can be implemented. EnergyStar is considered a “unilateral” scheme in which the U.S. federal government initiated and supported the program, and garnered support from the business community to sell earmarked products. Such a format may have limited potential to educate the public on sustainable products and consumption. In contrast, some product labeling schemes utilize the “snow-balling effect” and engage the business community to assist in encouraging consumers, including their business partners, to adopt earmarked products. This is implemented by introducing stakeholder network as the focus, and not products; it is through this network that earmarked products are promoted. An excellent example is Japan’s Green Purchase Network (GPN). The GPN involves the world’s second largest steel producer – Nippon Steel – and one of the largest national construction companies – Obayashi Corp. – as its partners. These two companies, especially in the latter’s case, help to “spread the word” by requiring its suppliers and partners adopt products that are recognized as sustainable under GPN. This in turn motivates companies to get certified and their relevant products labeled according to GPN’s standards.

2.7.2 Design Standards

We mentioned that ASTM E-2129: Standard Practice for Collection of data for Sustainability Assessment of Building Products (2004), is categorized as a regulatory tool. However, it can also be considered and used as an educational tool for design and construction professionals. The same can be said for the different types of buildings codes adopted at the state-level. Such educational tools belong to the category that is more catered to specialized personnel, rather than for the unspecialized members of the public.

2.7.3 Demonstration Projects

A demonstration project is usually an integral part of a R&D program, meant to try out certain novel concepts so that their feasibility and viability over a larger scale could be more accurately assessed. It is also useful in providing vital information and feedback on the original concepts so that they can be improved and further tested in future demonstration. Furthermore, a demonstration project provides the visibility required to test public’s reaction and acceptance, which along with other relevant information, can be used to fine-tune the policies from which the projects originated.

The state government of Texas subsidized the construction and operation of the Eco-industrial Park in Brownsville, as a demonstration of the concept of industrial ecology and industrial symbiosis. Most importantly, researchers and government policymakers planned to use it to collect important data regarding the generation and reuse of industrial wastes, as well as the right composition of firms among whom the flow of wastes can be optimized, resulting in minimum costs and minimum wastage from each firm.

An example of private firm initiating a demonstration project is the case of Lafarge UK’s technology experimentation, described in the section of voluntary schemes. However, not all voluntary technology experimentations are demonstration projects. To “demonstrate” means to conduct the technology experiment in the public and taking on the onus to report the relevant results of such experimentations to all concerned stakeholders. Because the public expressed apprehension over the emissions from the burning of wastes as fuel, and that the UK Environment Agency has the social responsibility to provide them the required information, this experimentation by Lafarge was converted into a demonstration project rather than an in-house

test. The indirect advantage of this conversion is that other cement firms who were also contemplating switching to alternate fuels could judge the public reaction from this demonstration. In the event that the results of the demonstration project turn out to be acceptable, UK Lafarge will reap the first-mover benefit and may even be labeled as the pioneer of this technology.

2.7.4 *Outreach Programs*

There are a few reasons why firms, government or private agencies decide to reach out to the public. They are:

- To inform the public about themselves;
- To teach the public about certain things;
- To collect feedback about themselves;
- To involve the public in the policymaking or project improvement process¹³;
- To garner public support for impending or existing policies or measures;
- To promote membership in the agencies or firms;
- To request for donations or other forms of financial support for a cause with which the public is expected to be able to recognize.

The American Forest & Paper Association (AF&PA) is the trade association for the U.S. forestry industry. On October 14, 1994, its members agreed to adhere to a set of forestry principles that call for a land stewardship ethic that integrates the reforestation, nurturing, and harvesting of trees for useful products with the conservation of soil, air and water resources, wildlife and fish habitat, and forest aesthetics. These principles later developed into the Sustainable Forestry Initiative (SFI) program, which competes against the Forest Stewardship Council (FSC) certification program. In its effort to promote SFI, AF&PA committed to a series of industrial outreach projects that introduce firms and forest owners progressively to the various constituents of SFI. For example, it introduces new waste minimization technique to these members, adhering to the standards spelled out under SFI (AF&PA, 2002). Another private-initiated public outreach project is the community panel formed by Lafarge North America on the Earth Day of 2003, which engaged the public in a forum to discuss the current environmental challenges and, most importantly, how the cement industry in general, and Lafarge in particular, can help to address them.

An example of a government-led outreach program is the EPA's Landfill Methane Outreach Program (LMOP) (EPA, 2005). This is a voluntary assistance and partnership program that promotes the use of landfill gas as a renewable, green energy source. By preventing emissions of methane (a powerful greenhouse gas) through the development of landfill gas energy projects, LMOP helps businesses, states, energy providers, and communities protect the environment.

¹³ In Chapter 1, public (or stakeholder) participation is considered as a type of decision support tool – it provides the information necessary for policymaking. In this chapter, it is also considered a type of policymaking tool that is capable of changing stakeholders' behavior in order to achieve the concerned policies' objectives. That is, the very participation of the stakeholders has the possibility of changing their behavior.

2.8 Summary – Applications of Policy Tools

Policy tools are meant to bring about the necessary changes required to achieve the policy goals. At the most fundamental level, these changes are behavioral changes. We identified a total of 46 types of policy tools that can be classified into the 6 main categories.

In actual application, these tools are seldom implemented alone. There may even be hybrid versions of the ones described in this chapter. For example, R&D programs may be initiated by the government but funded by private agencies after a certain period of times. Purchase rebates (a kind of economic “general” incentive) may be applied to specific products that meet sustainability criteria (i.e. product labeling scheme). Public outreach activities may be an activity organized by either the trade association or even the trade union (both of which are stakeholder organizations).

The greatest concern regarding such combination of policy tools stem from the fact that not all these combined tools are applied to achieve just one pre-determined set of policy goals at one time. Say, policy tool “A” is combined with tool “B” and “C” to achieve the goals of policy “D”; however, at the same time, policy tool “B” and “C” each has the aim to achieve goals of policy “E” and “F” respectively. Such a situation may result in the outcome of policy “D” to be unanticipated and/or undesirable.

We conducted 4 case studies on the building materials industry and the results are contained in Annexes I-IV. The next chapter discusses these results and, more importantly, reveals the various associated effects caused by the combination of policy tools applied in each case.

CHAPTER 3: THE RESULTS OF CASE STUDIES

3.1 Introduction – the 7 Case Studies¹⁴

Reiterating our primary research objective, the two research questions are:

- “*What are the associated effects – expected and unexpected, positive and negative – of some policy tools employed to promote sustainability in the construction material industry?*”, and
- “*What lessons can be gleaned from these effects to contribute to better and more effective sustainable development policymaking?*”

The 7 case studies we conducted are:

1. *The Associated Effects Of Virgin Material Tax – The Case Of Swedish And Danish Taxes On Natural Aggregates;*

The Gravel Tax of Sweden and Raw Materials Tax of Denmark provide an excellent insight into the effectiveness of virgin material taxes in addressing resources management and improving overall sustainability of the industry. The comparison between these two similar taxes, each complemented by a waste tax, highlights the importance of coordination and coherence among the different policy tools. This is presented in Annex I.

2. *Associated Effects Of Forest Management Regulations And The Northwest Forest Plan: Lessons On Policymaking For A Sustainable Timber Industry In The United States;*

The successes and failures of the Northwest Forest Plan and Northwest Economic Adjustment Initiative offered much insight into balancing between the different elements in sustainable development policymaking. This case was chosen based on the criteria that it is one of the few examples around that aspired to address all the important sustainability qualities pertinent to the wood product/timber industry. This is presented in Annex II.

3. *Addressing Pollution Prevention And Waste Minimization In Substitute Fuel Use In Cement Plants In The United Kingdom And United States;*

A detailed comparison between the use of substitute fuels in the UK and U.S. revealed a rich array of policy tools utilized to address waste minimization, pollution control, public health assurance, cost reduction and technology forcing. The crux of the ongoing dispute between opponents and proponents of substitute fuel use also underscore the technological challenges faced by modern pollution control and prevention. Above all,

¹⁴ We have a total seven cases but they are categorized into 4 case studies

this case demonstrated the nature of political argument and how scientific argument could be steered by political agenda. This is presented in Annex III.

4. *Analyzing The Neglected Fundamental Associated Effects Of Chile's Forestry Policies*

This case underlined the dilemma that many of the world's developing nations are currently facing in trying to balance the various aspects of sustainable development – employment, economic competitiveness and profitability, and natural resource preservation. This case analyzed the causes behind the ironic outcome of the reforestation and afforestation subsidies and legislation in Chile. It also showed how an antagonistic stance (i.e. mutually excluding stance) against a political opponent with a powerful business and industry backing might not be the best way to resolve differences in sustainability ideals. On the contrary, a mutually benefiting and inclusive method had shown some progress. We offered some suggestions to further utilize this concept in creating stronger and longer lasting win-win situations. This is presented in Annex IV.

The cases are analyzed in sections 3.2 – 3.5. For each case, we first state the original policy objectives and goals, before examining the outcome. Next, we compare between the objectives/goals and these outcomes. Finally, in sections 3.6 and 3.7, we reflect on the general and specific policymaking lessons gleaned from the cases respectively.

3.2 Case Study 1- Virgin Material Tax in Sweden and Denmark

3.2.1 Gravel Tax of Sweden

3.2.1.1 Goals and Objectives of the Gravel Tax

The goals of the Swedish Gravel Tax are clearly stated in the “Law Concerning a Tax on Natural Materials (1995: 1667) (EPA, 2001). One of these goals is to ensure that not more than 30% of the aggregate required nationwide comes from natural gravel, with its substitutes making up the rest of the 70%. The consumption of natural gravel should not be more than 12 million tons in the year 2010. As an integral element of the Swedish Environmental Objectives – Interim Targets and Action Strategies (Bill 2000.2001: 130), approved in 2001, it is expected to contribute toward reducing the nationwide landfill waste by 50% of the 1994 level by 2005 (Arm, 2003). For a detailed account of the application of the tax with respect to other associated policies, the readers are referred to Annex I.

With regards to reducing lifecycle costs, environmentally/socially derived costs, and market dependence on domestic extraction of gravel, the Gravel Tax was expected to have some indirect effects. However, the Gravel Tax did not set specific targets with regards to reducing industrial energy consumption, air pollution, water pollution, and toxic waste production. The Tax also did not address possible impact or repercussion on the number of jobs in the industry, purchasing power/wage of the workers, health and safety of workers and the flexibility of skills and opportunity for upgrading for the workers.

3.2.1.2 Comparisons between the Outcomes and Objectives

In fig.3.1, we qualitatively assess the discrepancies between the goals of policy tools and the actual outcome. For a full account of the policy outcome, readers are referred to Annex I. The

first row of the table contains the sustainability indicators that we used to assess the policy tools, as mentioned in Chapter 1. For each indicator, we compare between the policy original goal (i.e. “aim”) and the outcome (i.e. “Actual”). “X” means that the original policies did not have any explicit goals on the concerned sustainability indicator. When the policy outcome (marked under the columns “Actual”) spotted a positive impact, we mark it with a “+”, otherwise a “-” is used. Whenever the policy outcome is unknown or inconclusive, we mark it with a “?”. “++” means that the positive outcome is very distinct and the converse is represented by “--”. The explanations of our assessment are presented as follow; the numeration corresponds to the superscripts that appeared in the table in fig.3.1:

1. As was mentioned earlier, energy conservation, pollution reduction and toxic wastes removal are not explicitly linked to the reasons for the Gravel Tax.
2. If energy usage is linked to fuel use, substitution of gravel mining with increased crushed stone operation implies that fuel use might not have decreased by the tax. However, if energy and fuel involved in export and import are also accounted for, the increase in reliance on gravel import during certain periods after the implementation of tax might actually imply an overall increase in energy and/or fuel use. Therefore we assess this policy to be “?”.
3. The increase in stone crushing, as a substitution for gravel mining, might not cause any substantial change in emissions and toxic waste production. So far, no comprehensive environment impact assessment was carried out and documented in this aspect.
4. As mentioned before, the main aim of the Gravel Tax is to conserve local natural resources and, with all other relevant policy tools, encourage recycling of wastes. In a way, this relates to a desire to reduce lifecycle cost by reducing environmentally derived costs.
5. As shown by the data on import of gravels and material substitutions in Annex I, import has increased and C&D wastes are not substantial enough to cater to increasing demand of aggregates. Primarily, the increase in import is likely to increase the overall lifecycle costs, even if the increase in stone crushing does not result in any increase in cost as compared to gravel mining. Import and export are also important stages in a product lifecycle).
6. As described in the original policy intent and trade data, the Swedish government planned to reduce reliance on export on aggregates, including crushed stone and other aggregate substitutes. That was why, unlike the Danish Raw Materials Tax, the Gravel Tax is imposed on export as well.
7. Notwithstanding the fact that the decrease in export is expected, the success of reducing market share by the tax is compromised by the increase in import.
8. There was a concern of the impact of the tax on the remaining companies (some of which are owned by foreign investors) dealing with aggregate trade in Sweden. The

	ENVIRONMENT							
	Energy usage		Air pollution		Water pollution		Toxic wastes	
	Aim	Actual	Aim	Actual	Aim	Actual	Aim	Actual
Swedish Gravel Tax	X ¹	? ²	X ¹	? ³	X ¹	? ³	X ¹	? ³

	ECONOMY					
	Lifecycle costs		Environmentally & socially derived costs		Market share	
	Aim	Actual	Aim	Actual	Aim	Actual
Swedish Gravel Tax	+, i.e. to reduce costs ⁴	- ⁵	Same as life-cycle costs ⁴	- ⁵	-, i.e. aim to de-emphasize aggregate trading ⁶	- ⁷

Fig.3.1 Assessment of the effects of the Gravel Tax of Sweden.

	EQUITY/EMPLOYMENT							
	Number of jobs		Purchasing Power		Health & safety		Flexibility of skills & upgrading opportunity	
	Aim	Actual	Aim	Actual	Aim	Actual	Aim	Actual
Swedish Gravel Tax	X ⁸	X ⁹	X ¹⁰	? ¹¹	X ¹²	? ¹³	X ¹⁴	? ¹³

original intent of the Gravel Tax is not to drastically decrease the number of employment in the industry.

9. As shown in fig.3.2, although the employment situation in the non-metal mining industry is increasing steadily, one cannot for sure link this to the introduction of the Gravel Tax. The most one can claim is that the tax is insufficient to negatively impact the number of jobs available in the industry. This is probably caused by the presence of substitution materials.
10. The effect of the tax on the wage and social security contributions to workers who continued to be employed in the industry was not explicitly discussed in the literature.

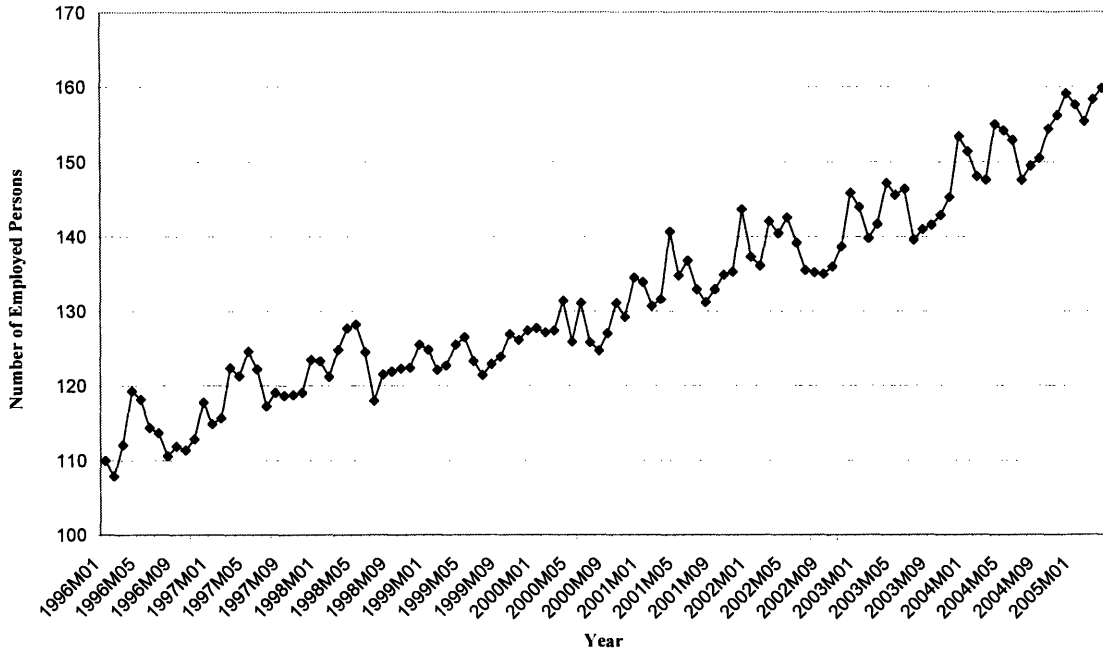


Fig.3.2 Annual employed persons in the non-metal mining industry of Sweden (number in Feb 1994 is taken as 100 units) (Eurostat, 2005).

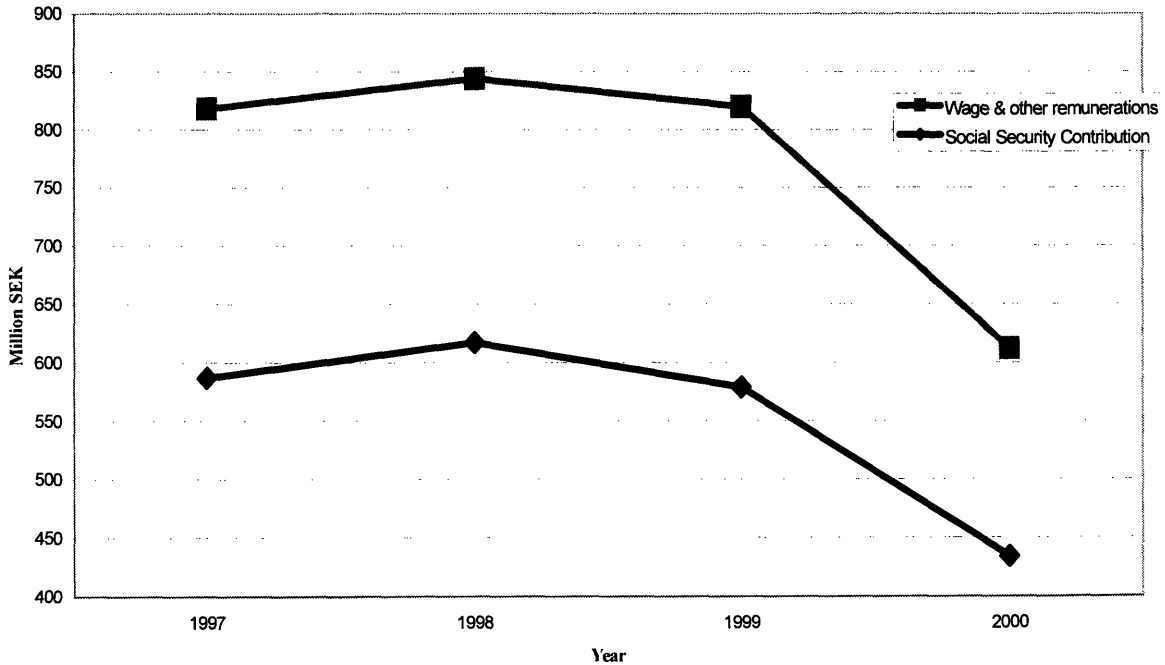


Fig.3.3 Annual wage, other remunerations and social security contribution of employees in the non-metal mining industry in Sweden (Eurostat, 2005).

11. As shown in the fig.3.3, although the wage and social security contribution continue to decrease, this global trend cannot be linked exclusively to the tax.
12. The tax is not linked to any objectives to improve health aspects or avoid certain risks in the industry
13. The effects are unknown. However, the ‘mining, quarrying and manufacturing’ industry is traditionally high-risk.
14. From the Eurostat 1996 data, mining, quarrying and manufacturing industry received average score in terms of educational programs for workers. The tax was not expected to impact the nature of work (especially since material substitution was present) and quality/quantity of educational programs.

3.2.2 Raw Materials Tax of Denmark

3.2.2.1 Goals and Objectives of the Raw Materials Tax

The main goal of the Raw Materials Tax is to enforce the vision of the Raw Materials Act and help ensure that exploitation of raw material deposits is based on the principles of sustainable development. The supply of raw materials to the society shall be ensured in the long term, and the raw materials are to be used according to their quality. Furthermore, waste shall be used to the greatest possible extent as a substitution for natural materials (EPA, 2000). To achieve this latter goal, the Waste Tax was implemented in 1987; The Action Plan for Waste and Recycling (1993-1997) also had the general objectives to increase recycling as well as to reduce the requirement for landfilling. Under this Action Plan, one of the main targets include achieving 54% recycling, 21% landfilling and 25% incineration. It was reported that most of these targets were met in the late 1990s, including the C&D waste category (Green Alliance, 2002).

With regards to energy consumption, air pollution, water pollution and toxic wastes production, the Tax did not have any explicit targets. In the social/employment domain, it did not lay down any specific goals either. It aimed to reduce both lifecycle and environmentally/socially derived costs, while increase its market share (or to protect its competitiveness in international natural materials trade).

3.2.2.2 Comparisons between the Outcomes and Objectives

The comparison between the actual outcome and policy goals are presented below. The numeration corresponds to the superscripts in the table in fig.3.4:

1. Energy conservation, pollution reduction and toxic wastes removal are not the main reasons for the implementation of the Raw Materials Tax.
2. If energy usage is linked to fuel use, substitution of gravel mining with increased crushed stone operation implies that fuel use might not have decreased; Besides, increase in reliance on gravel import during certain periods after the implementation of tax may actually imply an increase in energy use. So, we assess it as a “?”.

	ENVIRONMENT							
	Energy usage		Air pollution		Water pollution		Toxic wastes	
	Aim	Actual	Aim	Actual	Aim	Actual	Aim	Actual
Danish RMT	X ¹	? ²	X ¹	? ³	X ¹	? ³	X ¹	? ³

	ECONOMY					
	Lifecycle costs		Environmentally & socially derived costs		Market share	
	Aim	Actual	Aim	Actual	Aim	Actual
Danish RMT	+, i.e. to reduce costs ⁴	- ⁵	Same as life-cycle costs ⁴	- ⁵	+, i.e. aim to reduce the effect on local/locally based companies ⁶	- ⁷

Fig.3.4. Assessment of the effects of the Raw Materials Tax of Denmark.

	EQUITY/EMPLOYMENT							
	Number of jobs		Purchasing Power		Health & safety		Flexibility of skills & upgrading opportunity	
	Aim	Actual	Aim	Actual	Aim	Actual	Aim	Actual
Danish RMT	X ⁸	? ⁹	X ¹⁰	? ¹¹	X ¹²	? ¹³	X ¹⁴	? ¹³

- The increase in stone crushing, as a substitution for gravel mining, might not have caused any substantial change in emissions and toxicity. So far, no comprehensive environment impact assessment was carried out and documented in this aspect.
- The main aim of the Raw Materials Tax (RMT) is to conserve local natural resources and, with all other relevant policy tools, encourage recycling of wastes. In a way, this relates to a desire to reduce lifecycle cost by reducing environmentally derived costs.
- As evidenced by the data on import of gravels and material substitutions, import has increased and C&D wastes are not substantial enough to cater to increasing demand of aggregates. Primarily, the increase in import is likely to increase the overall lifecycle costs, even if the increase in stone-crushing does not result in any increase in cost as

compared to gravel-mining (NB: Import and export are also important stages in a product lifecycle).

6. As described in the original policy intent and trade data, Denmark did not impose this tax on exports. A comparison also reveals that there are more exclusion clauses for the types of raw materials than the Swedish case. One reason might be that the Danish tax actually covers a wider range of materials.
7. The decrease in export is more gradual than the Swedish case (Annex I); however, the increase in import (of key raw materials and their substitutes) during the various periods is an associated effect. So, overall, the success of increasing market share by the tax is compromised by the increase in import.
8. The original intent of the Tax did not explicitly address the changes to the number of employment in the industry.
9. As shown in fig.3.5, the employment fluctuates markedly between 1995 and 2003. However, this trend cannot be attributed exclusively to the Tax. Nonetheless, one may conclude that even the introduction of the Tax is insufficient to reduce the number of jobs in the industry absolutely, especially since substitute minerals do exist.
10. The intended effect of the tax on the wages of workers who continued to be employed in the industry was not explicitly discussed in the literature.
11. The increasing wage (fig.3.6) is more of a reflection of the global trend of the industry rather than an exclusive effect of the tax.
12. The Tax is not linked to any objectives to improve health aspects or avoid certain risks in the industry.
13. The effects are unknown. However, the mining, quarrying and manufacturing industry is traditionally a high-risk one.
14. The Tax is not aimed to address any educational or upgrading aspects of the industry.

3.3 Case Study 2- Forest Management and Biodiversity Regulations in the Northwest of U.S

3.3.1 Goals and Objectives of the Regulations and other Related Policy Tools

As an integral part of the Climate Change Action Plan (CCAP), the Northwest Forest Plan (NWFP) was proposed and executed to achieve the dual goals of mandating forest management in the Pacific Northwest federal forests and protect the endangered Spotted Owls. In order to buffer the economic ill-effects of reducing timber harvest in these forests, the Northwest Economic Adjustment Initiative (NWEAI) was proposed. Plans under the NWEAI include job training, job training and shifting the overall focus of job creation from the wood/forest industry to environmental management and civil engineering industries. However, these two policies did not have explicit goals to address any issues in energy consumption, air and water pollution, and

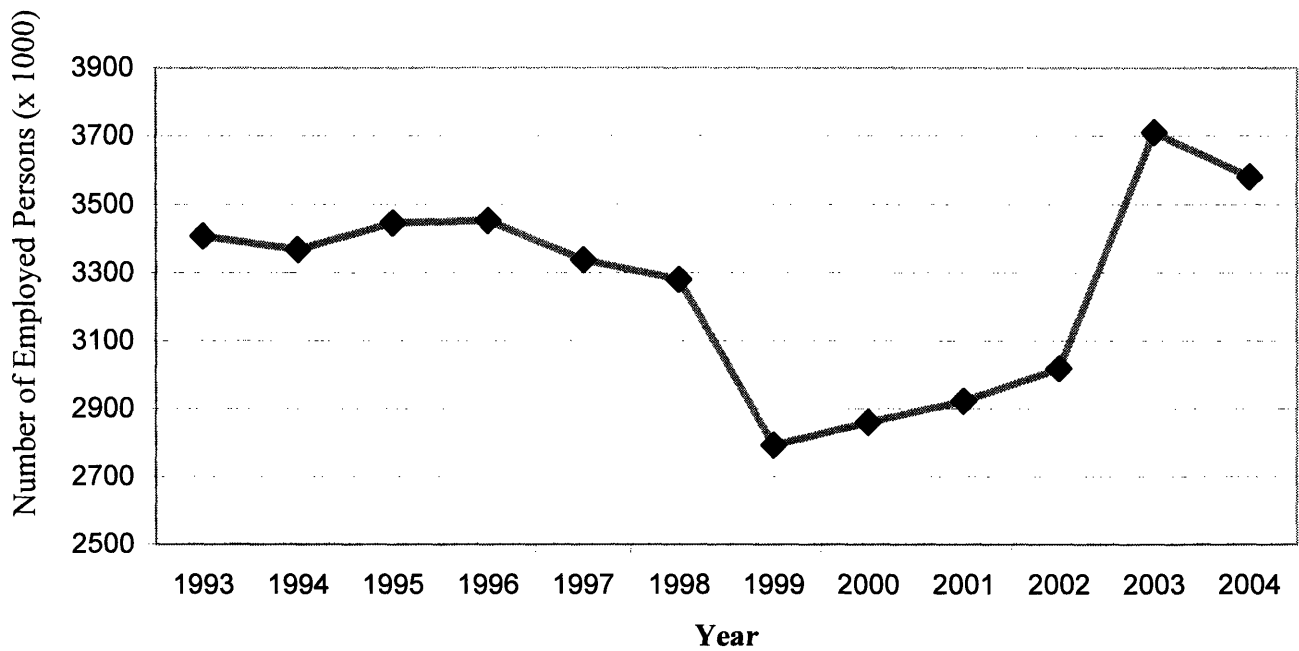


Fig.3.5. The total number of employed persons in the mining and quarrying industry in Denmark (Eurostat, 2005).

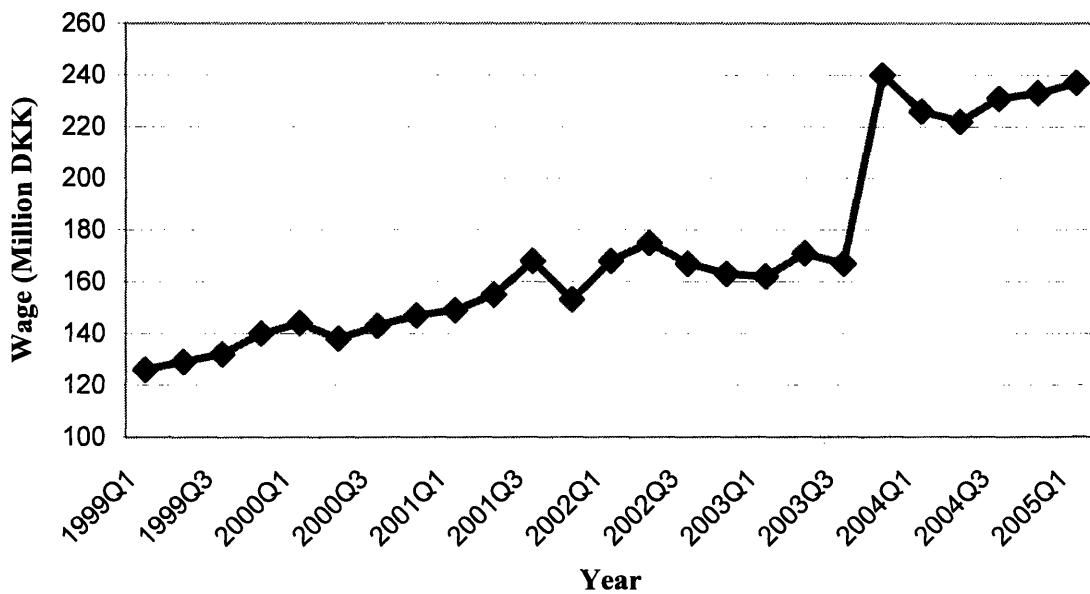


Fig.3.6. Aggregate wage of the mining and quarrying industry of Denmark (Eurostat, 2005).

workers' health and safety. Readers are referred to Annex II for a more detailed account of these two important policies.

3.3.2 *Comparisons between the Outcomes and Objectives*

The comparison between the actual outcome and policy goals of the NWFP and NWEAI are presented below. The numeration corresponds to the superscripts in the table in fig.3.7:

1. Energy conservation and pollution reductions were not the main reasons for the implementation of the NWFP (some other aspects of the CCAP addressed these issues directly).
2. If energy usage is linked to fuel use, then the shift of wood production to the South as well as increase in import actually imply a negative effect on the overall energy usage.
3. No related data was found so far regarding whether the shift of production to the South had resulted in a higher concentration of air and/or water pollution in these areas due to the wood processing industry.
4. The NWFP was primarily motivated by the need to protect the Spotted Owls from extinction. Other species were also considered.
5. One of the biggest unexpected outcomes of the policy is that biodiversity has increased so much that the survival of the Spotted Owls are under further pressure, due to competition for habitat from more aggressive species of owls (hence, the actual result is a "+" and "--").
6. One of the objectives of the NWFP was to improve forest management. Judging from the original requirement of the Supreme Court, against which the Bureau of Land Management and Forest Service were penalized in 1992, was to reduce the environmental impact of all forestry activities.
7. The reduced incentive to improve forest management in the Northwest and the accompanying overexploitation in the South presented new and unforeseen challenges to forest management. However, no data is available to show if the expenses incurred to address these new problems were higher or equal to that anticipated when the NWFP was planned (i.e. "-" or "?")
8. The NWEAI was solely implemented to ameliorate any negative economic and social impacts of the NWFP; As explained in Annex II, these plans fell short in many ways.
9. The "-" sign here showed that the negative impact of the NWFP were not successfully buffered by the NWEAI. However, the "+" meant that at least a number of the funded projects that were of civil engineering nature did took off under the auspice of the NWEAI. So, the results were mixed.
10. The reduction in federal forest harvest in the Northwest was accompanied with an increase in harvesting from the South. Albeit a weak attempt, the US government also tried to promote wood recycling as an alternative to harvesting new wood.

	ENVIRONMENT							
	Energy usage		Air pollution		Water pollution		Biodiversity	
	Aim	Actual	Aim	Actual	Aim	Actual	Aim	Actual
NWFP & NWEAI	X ¹	- ²	X ¹	? ³	X ¹	? ³	++ ⁴	+ & - ⁵

	ECONOMY					
	Lifecycle costs		Environmentally & socially derived costs		Market share	
	Aim	Actual	Aim	Actual	Aim	Actual
NWFP & NWEAI	+, i.e. to reduce costs ⁶	? ⁷	+ ⁸ , it is more of increasing derived benefits than decreasing derived costs with the NWEAI	+ & - ⁹	+, i.e. NWFP aims to at least maintain its domestic market share ¹⁰	- ¹¹

Fig.3.7. Assessment of the effects of the NWFP and NWEAI.

	EQUITY/EMPLOYMENT							
	Number of jobs		Purchasing Power		Health & safety		Flexibility of skills & upgrading opportunity	
	Aim	Actual	Aim	Actual	Aim	Actual	Aim	Actual
NWFP & NWEAI	+ ¹²	? ¹³	+ ¹⁴	? ¹⁵	X ¹⁶	? ¹⁷	+ ¹⁸	? ¹⁹

11. Although data showed that it took around 3 years for domestic production to stabilize to the pre-NWPF levels to cater to domestic demand, the increasing demand also caused an increase in import. This set off the ongoing lumber dispute between the US and Canada.

12. NWEAI aimed to at least maintain the total number of jobs (beyond the timber industry too) by absorbing the displaced workers of NWFP.
13. Although data showed an overall increase in the employment in manufactured wood products and timber harvest, this cannot be attributed exclusively to the NWFP and NWEAI (especially since NWEAI aspired to match displaced workers with jobs in other sectors). Such increase in employment may just be a reflection of the overall increase in domestic demand for wood.
14. NWEAI aimed to at least maintain the purchasing power of displaced workers who are matched to new jobs. However, it was expected that these new workers might have to accept a pay cut in the new jobs.
15. Although data showed an overall increase in the annual payroll across all jobs in the timber industry, this cannot be attributed exclusively to the NWFP and NWEAI.
16. Neither the NWFP nor NWEAI were designed to address specific occupational health and safety concerns.
17. Occupational Safety and Health Administration data indicated that the average nonfatal accident rate in the timber industry is around 6% - this is equal to the rate in construction industry. This figure is more or less the same between 1993 and 2000. Neither the NWFP nor NWEAI were expected to have any direct effects.
18. NWEAI focused on a different type of upgrading – that to convert workers from the timber industry to the environment management/civil engineering industry.
19. One of the concerns over the NWEAI was that many of the jobs created, and filled, were temporary. Therefore, whether workers who were trained in the new skills applied these skills in their future long-term jobs was not confirmed (i.e. “?”).

3.4 Case Study 3- Policy Tools to Promote the Use of Substitute Fuels for Cement Production in the U.S and UK

3.4.1 Goals and Objectives of the Relevant Policy Tools in the U.S

As described in Annex III, the Clean Air Act, Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), National Emission Standards for Hazardous Air Pollutants (NESHAP) and Comparable Fuel Exclusion (CFE) are applied concurrently to ensure that while cement kilns reduce their reliance on fossil fuels, the air quality in the vicinity of the plants is not compromised. Legislation such as the CFE was implemented to accelerate the fuel approval procedure. In fact, the call for public feedback on the CFE and the disclosure of the lifecycle assessment results of plants using recycled liquid fuel as kiln fuel (Chem Systems, 1999) exemplify several versions of public participation and feedback mechanism in the U.S. As shown in fig.3.8, this set of legislations in the U.S. aimed to address a wide range of indicators. Although it is expected to impact the market share of cement produced in the U.S, number of jobs in the industry and purchasing power of the employed are neither explicitly stated nor alluded to.

	ENVIRONMENT							
	Energy usage		Air pollution		Water pollution		Toxic waste	
	Aim	Actual	Aim	Actual	Aim	Actual	Aim	Actual
U.S Clean Air Act, RCRA, CERCLA, NESHAP, CFE	+ ¹	+ ²	+ ¹	? ³	+ ⁴	? ³	+ ⁵	? ⁶

	ECONOMY					
	Lifecycle costs		Environmentally & socially derived costs		Market share	
	Aim	Actual	Aim	Actual	Aim	Actual
U.S Clean Air Act, RCRA, CERCLA, NESHAP, CFE	+, i.e. to reduce costs ⁷	+ ⁸	+ ⁹	? ¹⁰	X ¹¹	? ¹²

Fig.3.8. Assessment of the effects of the legislation and regulations that support use of substitute fuels for manufacturing cement in the U.S.

	EQUITY/EMPLOYMENT							
	Number of jobs		Purchasing Power		Health & safety		Flexibility of skills & upgrading opportunity & innovation of industry	
	Aim	Actual	Aim	Actual	Aim	Actual	Aim	Actual
U.S Clean Air Act, RCRA, CERCLA,	X ¹³	? ¹⁴	X ¹³	? ¹⁴	+ ¹⁵	? ¹⁶	+ ¹⁷	? ¹⁸

3.4.2 Comparisons between the Outcomes and Objectives

The comparisons are explained below. As usual, the numeration corresponds to the subscripts used in fig.3.8.

1. The primary aims of the various regulations to control the use of alternate fuels were to reduce fossil fuel usage and thus reduce related air pollutions.

2. On the local (plant) level, an uptake of wastes did result in a reduced reliance on fossil fuel.
3. While some levels of air emissions from fossil fuels might have been avoided, opposing evidence also indicated that under certain operational conditions, some air pollutants might actually be more serious for some alternate fuels. Concerns were also expressed regarding the disposal of combustion residues and their effects on groundwater.
4. An important aim of reducing waste disposal to landfills was to reduce the chance of leakage and thus contamination of groundwater. This is especially true for the case of hazardous liquid wastes such as used solvents.
5. Removal of toxic wastes under the high temperature in cement kilns was believed to be effective – technically and economically – in reducing accidents related to the disposal of toxic wastes.
6. The residues in cement kiln dusts, such as the presence of heavy metals, created substantial disputes regarding the safety of approving some of these fuels.
7. Waste reduction by recycling of wastes is thought to be an effective means of reducing lifecycle cost of cement production.
8. Cement kilns actually benefited from the recycling as they were often paid to accept these wastes as fuels.
9. The bottom line of the main legislations is to safeguard the interest and safety of the environment and human community. Waste reduction by recycling of wastes is generally an effective way of reducing operational costs for cement kilns. This is also a projected environmentally derived cost-saving for the industry.
10. Judging from opposing evidence, the harm caused by some of these uses under sub-optimal operational conditions may actually have ended up imposing unnecessarily high socially-derived costs. However, since these occurrences are contingent on the level of monitoring and maintenance of kiln conditions, the overall effect can also be judged to be unknown, i.e. “?”
11. The regulations are not expected to improve the quality and thus marketability of the cement produced with alternate wastes.
12. The dispute arising from the controversy of heavy metal trace might have affected the marketability of cement kiln dusts as ingredients for soil stabilization (no information regarding this associated effects have been documented so far).
13. The policies were not expected to affect substantially the number of jobs and purchasing power/wage of workers in the cement and waste-handling industry.
14. The number of jobs and wages were not expected to be affected by these policies.

15. The regulations ensured that the handling of wastes, especially toxic wastes, was carried out in a safe manner. The regulations ensured that emissions from alternate fuels do not pose new threats to the public.
16. As described before, opposing evidence indicated that public health might be jeopardized by irresponsible use or negligence in the controlling of combustion conditions. However, no evidence had been presented regarding the effect on workers' health and safety.
17. None of the regulations specified special requirement of improving skill upgrading and education of workers handling these alternate fuels. However, the BDAT and MCAT were crafted to allow for technological innovation in pollution prevention, hence "+".
18. The policies were not expected to affect the skill levels of workers involved. However, there was a concern that the MCAT standards of the Clean Air Act might not do enough to spur pollution prevention innovation among companies and in the industry.

3.4.3 Goals and Objectives of the Relevant Policy Tools in the UK

In the UK, the Integrated Pollution Prevention and Control (IPPC) Directive, Best Available Technique Standard (BAT; proposed under IPPC), Substitute Fuels Protocol and Waste Incineration Directive (WID) play the same role as the abovementioned policies in the U.S. The main difference between these policies and those in the U.S. is that IPPC applies to the EU, and so certain provisions unique to the UK industry were enforced to make sure their objectives conform to the IPPC; besides, UK also makes adjustments in its national policies so that its building materials industry and national economy are not negatively impact. An example is the assurance that steel and cement firms are not "double charged" with two emission trading systems (one under EU and the other imposed by UK). The BAT also emphasized on "technique" improvement, instead of just technology adoption or innovation, to meet the minimum emission control standard achievable by a certain top percentile of currently available technologies.

However, just like the U.S.'s case, these policies were not explicitly implemented to address issues in market share of the produced cement, number of jobs and purchasing power/wage of the workers.

3.4.4 Comparisons between the Outcomes and Objectives

The comparison between the policy objectives and actual outcomes is presented in fig.3.9. During the similarity between the policies in the U.S and UK, the explanations associated with superscripts "1" through "16" in fig.3.9 is the same as those in fig.3.8. The only differences between the two countries' policies with respect to promoting employment conditions are:

17. None of the regulations specified special requirement of improving skill upgrading and education of workers handling these alternate fuels. However, the BAT standards, unlike the U.S MCAT and BDAT focused on spurring improvement in the 'technique' involved in pollution prevention. 'Technique' is a much more general term and an emphasis on technique-improvement might help uncover more cost-effective way to realizing improvement in the control of emissions from alternate fuels.

18. The policies were not expected to affect the skill levels of workers involved. Although BAT has a theoretical advantage over the U.S system, the real effect on the innovativeness of the industry in pollution prevention has not been quantified.

	ENVIRONMENT							
	Energy usage		Air pollution		Water pollution		Toxic waste	
	Aim	Actual	Aim	Actual	Aim	Actual	Aim	Actual
UK IPPC, BAT standard, WID, SFP	+ ¹	+ ²	+ ¹	? ³	+ ⁴	? ³	+ ⁵	? ⁶

	ECONOMY					
	Lifecycle costs		Environmentally & socially derived costs		Market share	
	Aim	Actual	Aim	Actual	Aim	Actual
UK IPPC, BAT standard, WID, SFP	+, i.e. to reduce costs ⁷	+ ⁸	+ ⁹	? ¹⁰	X ¹¹	? ¹²

Fig.3.9 Assessment of the effects of the legislation and regulations that support use of substitute fuels for manufacturing cement in the UK.

	EQUITY/EMPLOYMENT							
	Number of jobs		Purchasing Power		Health & safety		Flexibility of skills & upgrading opportunity & Innovation of industry	
	Aim	Actual	Aim	Actual	Aim	Actual	Aim	Actual
UK IPPC, BAT standard,	X ¹³	? ¹⁴	X ¹³	? ¹⁴	+ ¹⁵	? ¹⁶	+ ¹⁷	? ¹⁸

3.5 Case Study 4- Regulation and Subsidies for Reforestation and Afforestation in Chile

3.5.1 Goals and Objectives of Relevant Policy Tools

Between 1540 and the mid-1900s, the large numbers of immigrants from Europe who settled in southern Chile brought on the clearance of considerable areas of forests to make way for agriculture, livestock grazing and construction. By 1955, about one-third of Chile's original forests were destroyed. In 1974, the Forest Development Law (DL701) was promulgated for two purposes: 1) to privatize the forest industry and increase the international competitiveness of the local forest product industry, 2) provide subsidies to encourage nationwide reforestation and afforestation (Silva, 1997; Neira, 2002).

Examination of the policy background reveals that its original intent did not include any improvement in energy consumption, prevention of air or water pollution or toxic waste production, reduction of lifecycle, enhancing health and safety of workers, and improving the skill or innovation opportunity of the industry.

3.5.2 Comparisons between the Outcomes and Objectives

A summary of the comparison is presented in fig. 3.10, in which the numeration corresponds to the superscripts in the table. The discussions are presented below:

1. The DL701 was not intended to address energy conservation, air and water pollution.
2. The direct influence of the DL701 on these aspects of sustainable development was not known for sure, if any.
3. The DL701 was initiated to address Chile's worsening deforestation. Instead of increasing biodiversity, the incentives were knowingly channeled to the cultivation of commercial plantations that gradually replaced most of the previously preserved native forests. This showed that DL701 prioritized economy competitiveness over biodiversity.
4. The outcome of native forests being replaced by commercial plantations was anticipated.
5. DL701 aimed to increase the economic value of the environmental effort by concentrating on commercial plantations. In that sense, it aimed to increase the environmentally derived benefits of its new forests.
6. With respect to biodiversity, the environmentally and socially derived costs actually decreased with the success of DL701 – precious natural heritage was displaced by commercialism. However, in terms of the economic benefits of the country and people as a result of successful marketing of inherently more economically desirable trees, one might interpret that the environmentally derived benefits actually was increased.
7. As described in Annex IV, Chile has developed into one of the most important timber products exporters. It also owned its global market share to the groundwork laid down during the periods when DL701 incentivized large scale reforestation with commercial plantations.

	ENVIRONMENT							
	Energy usage		Air pollution		Water pollution		Biodiversity	
	Aim	Actual	Aim	Actual	Aim	Actual	Aim	Actual
Chile's DL701	X ¹	? ²	X ¹	? ²	X ¹	? ²	- ³	- ⁴

	ECONOMY					
	Lifecycle costs		Environmentally & socially derived costs		Market share	
	Aim	Actual	Aim	Actual	Aim	Actual
Chile's DL701	X ¹	? ²	+ ⁵	- or + ⁶	+ ⁵	+ ⁷

Fig.3.10 Assessment of the effects of the DL701 and reforestation subsidies and incentives of Chile.

	EQUITY/EMPLOYMENT							
	Number of jobs		Purchasing Power		Health & safety		Flexibility of skills & upgrading opportunity & Innovation of industry	
	Aim	Actual	Aim	Actual	Aim	Actual	Aim	Actual
Chile DL701	+ ⁸	+ ⁹	+ ⁸	? ⁹	X ¹⁰	- ¹¹	X ¹⁰	? ¹²

8. With the development of a competitive forestry industry, DL701 directly aimed to increase the total number of jobs and wages of workers.
9. Although there was an increase in the general wage level, subsequent industry development in the 1990s saw many countries moving to outsourcing of logging works to independent, non-unionized contractors. This was reported to have lead to poorer working conditions, less than fair wages and compromised safety in an inherently risky industry.
10. DL701 was not aimed at improving any aspects of the occupational health, skill education and industry innovation.

11. As mentioned in point 9, the trend of contracting becoming the dominant work arrangement in the industry had eroded the occupational health standards. Contracted workers being more willing to accept less favorable working conditions and even tolerant unfair treatment by forest owners caused this.
12. Contracted workers, usually on temporary basis, may lack the essential qualifications to perform the jobs. In a way, widespread reception of such a work arrangement will result in long-term incentive not to hire trained and thus more expensive workers. This in turn discourages workers from receiving education and a vicious cycle is hence set up.

3.6 Conclusions

Annexes I-IV describe in details the nature of the problems in the four cases, which include their historical context, development, issues and the stakeholders involved. This corresponds to point 1 of Ashford's policymaking framework. Where applicable, the annexes also describe the nature, success or failure of any prior attempts to rectify any negative unexpected outcome— as in the cases of preserving Chilean native forests and the resolution of stakeholder disputes on the safety of using alternate fuels for cement production. This corresponds to points 2 and 3 of Ashford's policymaking framework. This chapter builds upon those descriptions by further analyzing the nature of the policy outcomes, and discussing the ways in which the original policy aims differ from the actual outcome.

The next chapter focuses on the clarification of goals of a desired transformation and formulation of strategies to achieve these goals, which includes identifying and addressing possible barriers to improvement. These correspond to points 4, 5, 6 and 7 of Ashford's framework.

CHAPTER 4: **DESIGNING MORE EFFECTIVE SUSTAINABLE DEVELOPMENT POLICIES**

This chapter extracts key policymaking lessons, which help us define the targets of desired transformation of the status quo for each of the cases. Since the annexes already described the concern of the stakeholders involved, we concentrate on discussing the ways by which their *willingness, opportunity* and *capacity* to change can be affected. After identifying possible barriers to these changes, we formulate specific strategies to surmount and circumvent them.

4.1 **Reasons Behind Negative Unanticipated Outcome and the Need for Broader Conceptualization of Policy Solutions**

Figs. 3.1 to 3.10 clearly show that a negative unexpected outcome occurs to a sustainability indicator/issue when

- 1) It is completely ignored by policymakers, and/or
- 2) Policymakers fail to identify intrinsic but inconspicuous links between seemingly disparate indicators.

In other words, these unexpected outcomes can be avoided if policymakers *conceptualize policies more broadly*. This means considering a wider range of sustainability problems together from the outset and formulating policy strategies to address these problems concurrently. As far as possible, one should also aim to co-optimize these diverse sustainability indicators with the policy solutions.

Why are so many policies today still focused on one or a few sustainability problems, as exemplified by the cases reviewed? A common assumption is that an effective policy is one that concentrates its resources on addressing one or a few issues at a time. To what extent is this assumption correct? A deeper analysis of the policy outcomes will refute this assumption. Fig.4.1 summarizes our analysis. The qualities for comparison are described as follow:

1. *Policy Reach* concerns the number of sustainability indicators that a policy is originally designed to address or influence. As a numerical guide and not for any computation purpose, a *policy reach score* can be given to each of the tools in the cases to indicate this quality. Hence, if a case considers only 5 of the 11 indicator groups, it is labeled as “5/11”, as in the case of the DL701 policy of Chile.
2. *Policy Exclusion* is the complementary concept of policy reach – it means the number of indicator groups that are *not* considered by the policy. Chile’s DL701 scores 5/11 for policy reach, and thus scores 6/11 for *policy exclusion*.
3. *Anticipated outcomes* are observed for each policy tool in several of the 11 indicator groups. If the actual outcome turns out to be as anticipated, we indicate this as an *Anticipated Outcome*. For example, US policies to promote the use of alternate fuels for cement production are expected to have a positive impact in 8 indicator groups but only 2 of the groups have results that match expectation, the *anticipated outcome* score is just 2.

4. *Unanticipated outcome* refers to the special and noteworthy situation in which the outcome of a policy turns out to be exactly opposite to what is expected or intended. That is, if a policy tool is intended to increase the number of jobs but the outcome is a loss of more jobs, we have a *negative unanticipated outcome*. A positive unanticipated outcome explains the situation when the outcome is expected to be worse off than the status quo (as a result of the policy action) but the actual outcome turns out to be better off. As table 4.1 shows, the unanticipated outcome we have identified for all cases are all negative in nature.
5. *Uncertainties* concern the fact that the effects of a policy in certain areas or indicator groups are unknown until after a certain period of time has elapsed. Further policy modifications are then devised to react to these newly discovered effects later on. The 4 cases reviewed featured a few important outcome *uncertainties*.

Policy Tools		Policy Reach	Policy Exclusion	Anticipated Outcome	Unanticipated outcome		Uncertainties
					-	+	
Case Study 1	Swedish Gravel Tax	3/11	8/11	1	2	0	7
	Danish Raw Materials Tax	3/11 <<50%	8/11	0	3	0	8
Case Study 2	NWFP + NWEAI	7/11 >50%	4/11	1	3	0	7
Case Study 3	U.S Policies	8/11 >>50%	3/11	2	1	0	8
	UK Policies	8/11 >>50%	3/11	2	1	0	8
Case Study 4	Chile's DL701	5/11 <50%	6/11	3 or 4	0 or 1	0	6

Table.4.1. Assessment and comparison of the policy outcomes of the case studies. The legends are described in section 4.1.

One can draw three conclusions from table.4.1:

1. *A longer policy reach does not automatically imply a higher occurrence of unanticipated outcomes. The way the policy is planned and executed is the key to controlling the outcome and minimizing the occurrence of negative unexpected outcomes.*

This characteristic is displayed by the case on the use of substitute fuels in the UK and U.S. The only possible negative unexpected outcome in this case concerns the likely health hazards of emissions from these fuels, which as explained in Annex III, can be controlled by stepping up on both emission control and monitoring by both the plants and

regulators. This would seem to indicate that, technically speaking, all sustainable development policies should be *designed to have as long a reach* as possible, addressing a wide range of sustainability indicators and indicator groups. However, while this is being planned, policymakers should ensure that the *main* sustainability issues specific to the cases (e.g. reduction of aggregate consumptions in the first case study) are also addressed.

2. *The success of a policy should not be judged merely from the occurrence of anticipated outcomes. Higher occurrence of anticipated results does not imply a lower occurrence of negative unanticipated outcomes.*

This characteristic is especially true for narrowly scoped and focused policies with very short policy reach. The DL701 of Chile is an excellent example. It was more focused than the US substitute fuel policies (i.e. it has a shorter policy reach) and recorded more anticipated outcome; however, it resulted in around the same number of unanticipated outcome too.

3. *A narrower policy, i.e. one with a shorter reach, may serve to focus policymaking resources. However, it does not guarantee a higher occurrence of positive anticipated outcome.*

Out of the four cases, the virgin material taxes in Sweden and Denmark have the shortest policy reach; yet the occurrence of anticipated outcome is not higher than all the other cases.

In summary, a more focused policy is not necessarily a more successful one. And a broadly designed policy does not necessarily incur a higher risk of negative unanticipated outcomes. One can also conclude from table 4.1 that the policies in all the four cases can be further improved by considering the neglected indicators and relationships between seemingly disparate indicators in policy design.

4.2 Integration and Integration: The Significance of Stakeholder Participation

Getting policymakers to think more widely extends beyond having them think about the environmental, economic and social/employment aspects of the policy problems, solutions and ramifications of a solution. It also entails preventing and addressing cross-boundary problems; examples of a “boundary” include the geographical boundary of a country, sector boundary of the commercial timber industry, and the operational boundary of a sustainability indicator. As evidenced in the case on virgin material tax in Sweden and Denmark, the conventional concept of “doing sustainability at home” can result in “problem-shifting” by increasing imports. Policy-making achieves integration when it not only considers a wide range of sustainable indicators in all the three sustainability domains, but also explores profoundly the often-inconspicuous correlation among these indicators. Furthermore, integration may serve more policy targets by establishing new correlations among indicators; for example, policies that encourage forest owners to invest in eco-tourism as a condition to allowing them to harvest a certain additional volume of timber in a previously protected forest will correlate nature conservation and profit generation. In other words, extending “policy reach” epitomizes the spirit of integration in desirable policymaking.

However, we warn against policymakers considering multiple policymaking elements without interacting with the concerned stakeholders, who are either affected by or have an effect on the policies of interest. Stakeholder participation mechanisms that are treated simply as a mean for policymakers to defend their decisions made unilaterally are both discouraging and misleading. Policy-making that encourages interactions among a myriad of stakeholders within a pre-determined conceptual framework, in which the roles of the government (federal and state) is clearly defined and adhered to, is said to embrace the spirit of integration. Another manifestation of integration is that the different phases of policy-making must be related to one another. For example, if a policy gives rise to negative unanticipated outcome, policymakers need to communicate these observations to those who are charged with designing these policies, and improve on the original approaches.

Integration and interaction are intimately related. Interaction should be an important vehicle for achieving integration. Then again, effective interaction depends on a commitment to integration. As described in section 1.3.3.1 of Chapter 1, many Integrated Assessment projects do not include key players, such as local government officials, in their dialogue sessions. Such “interactive” strategy that does not aim to “integrate” across the range of stakeholders’ interests is very unlikely to result in effective sustainable development policies.

In short, to effectively “integrate” the various components, a policymaking process must provide opportunity for “interaction” among the stakeholders concerned with these elements. Yet, to effectively design a scheme for “interaction”, policymakers need to understand the benefits of, and aspire to achieve, “integration”.

The interdependence of interaction and integration is illustrated in fig.4.1. Does “integrating” stakeholders into the policymaking process imply that they must be co-designers of national or international policies, and how much should they be involved? Different political systems are shaped by different limits on policymaking; the conditions for stakeholder inclusion may be different for policy problems of different nature. First of all, these limits should be re-examined and even challenged. However, if stakeholders cannot be involved as co-designers of policies, they should be motivated to form local task forces that support the overall policy agenda at the municipal or national level. An example is the Neighborhood Watch program that was started in the late 1970s in Singapore, in which local volunteers, with the help of local police officers, organized a series of activities to acquaint neighbors with one another, and promote neighborhood cooperation and vigilance in the fight against crime.

4.2.1 Neglected Issues in Stakeholder Participation

A common problem with existing stakeholder participation mechanisms and policies is that the commitment of participants – the force that drives them to participate in the first place – is not fully utilized and creatively channeled. In many activities under the Integrated Assessment, stakeholders are engaged only within the planned programs. More can and should be done. Interested and highly motivated individuals should be inspired and supported to form local voluntary groups, which work along *with* the bigger policy goals of the nation or region. Nonetheless, this decentralized or sparsely diverse system of stakeholder engagement is still a version of integration.

There is also another non-obvious and often-neglected element of integration. Usually stakeholder feedback mechanisms bring together concerned individuals who have a

preconception of the problems to be addressed, their collective stance, individual agenda and concerns etc. However, all these are based on information that may be intentionally or unintentionally biased and/or distorted by fellow stakeholders within the group. Hence, it is essential for individual stakeholders who are interested in being part of the policymaking process – either as a co-designer or feedback provider – to have access to accurate and verified background information on the problems concerned. In fact, a better policymaking process should provide an environment for these individuals to comfortably access such information free from any unwanted influence and distraction from other stakeholders, yet at the same time learn from others. As such, proper design of methods of engaging these stakeholders is of utmost importance. As mentioned before, well-designed methods encourage more transparency in the government’s decision-making, which in turn provides the impetus to promote more widespread stakeholders engagement programs.

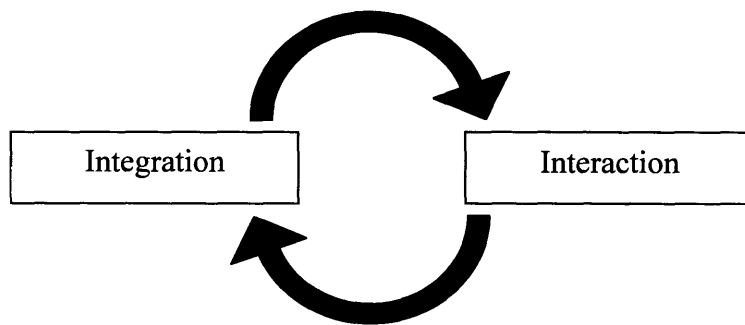


Fig.4.1. The interdependence of interaction and integration for design of effective sustainable development policies.

Put another way, stakeholders should be “trained” individually first, so that later they can perform better as an integral part of a group.

4.3 Characteristics of Policy Integration

We can identify 4 characteristics of policy integration that can be used as a yardstick to assess and benchmark any policy. This qualitative categorization can also be used to compare amongst different policies. These characteristics are:

- Characteristic 1:** Policy concerned *must* contain indicators in *all 3 domains (i.e. economy, environment and equity)*
- Characteristic 2:** Policy concerned ideally co-optimizes or simply co-addresses the indicators under characteristic 1
- Characteristic 3:** Policy concerned encourages interaction and collaboration amongst key non-governmental stakeholders
- Characteristic 4:** Policy concerned encourages collaboration amongst a wide but relevant range of governmental agencies and institutions

In short, a policy that demonstrated a greater number of these characteristics is considered as being more integrated than one with fewer characteristic. However, even if a policy achieves all 4 characteristics of integration, it can still be further improved by increasing the number of indicators explicitly addressed and integrated in the policy.

4.4 The Relation Between the Extent & Characteristic of Policy Integration and Policy Effectiveness

This section supports the proposition that the extent and characteristic of policy integration affect its effectiveness – as measured by the number of policy goals (positive anticipated outcome) achieved, number of unanticipated associated negative outcomes and number of uncertain outcomes.

Four additional cases were surveyed; they are:

- xi. Santa Monica Sustainable City Plan (SCP);
- xii. EPA's Environment Performance Track;
- xiii. Jobs For Youth – Boston;
- xiv. SO₂ Cap-and-Trade Scheme.

The details of these cases are presented in Annex V.

In fig.4.2, circles in the graph represent all the cases. The x-axis stands for the *number of sustainability indicators explicitly addressed* in the policy, whereas the y-axis is the *number of sustainability indicators integrated into the policy*. In addition, the levels of policy integration of these cases are graphically presented in fig.4.3. A few key conclusions can be arrived at from these plots:

- The number of indicators integrated into the policy is a more significant predictor of anticipated positive outcomes than number of indicators explicitly addressed, as indicated by the fact that cases with more integration show higher number of achieved policy goals;
- Policies integrating more indicators also show lower number of negative unanticipated outcomes;
- The relationship between number of indicators integrated and number of uncertain outcomes is not a strong one, because a majority of the cases surveyed and studied does not consider all the 11 key indicators but instead narrowly focuses on a few selected ones;
- Even though a policy considers a very wide range of indicators – as in the case of the Santa Monica SCP – the number of such indicators integrated into a policy may actually be very low. This is especially the case when existing government structure does not allow or encourage policymaking units to overlap in their policy design, implementation and monitoring;
- Fig.4.3 revealed that on average, policies that have higher number of indicators integrated into them embody *more* characteristics of integration. In other words, policymakers who are convinced that a wide range of indicators must be integrated will realize that they can

only do so by achieving more characteristic of integration (e.g. getting non-governmental stakeholders involved, which reflect the integration-interaction relation described in section 4.2). That said, the reverse is not true: policies that achieve all 4 characteristics of integration may do so only for a minimum of 3 indicators – one for each domain – that are easy to achieve;

Even the most popular successful environmental policies, such as the SO₂ cap-and-trade included in our study, does not look into all the 11 key sustainability indicators. Henceforth, using policy integration as a working concept, we propose policy solutions for each of our seven main case studies that aim to achieve high number of indicator-integration over all the 11 indicators. This will be addressed from sections 4.5 to 4.9.

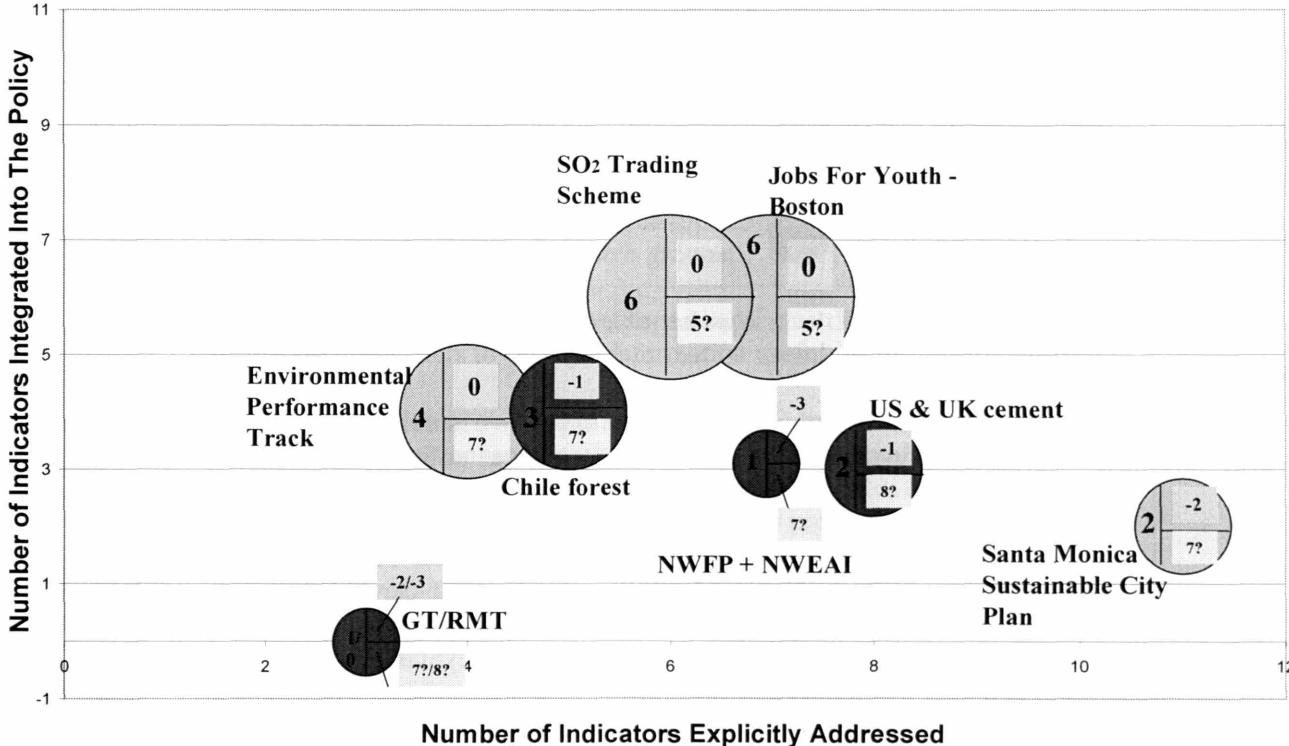
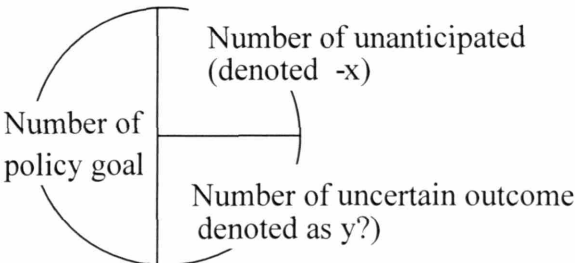


Fig.4.2. Relationship between the number of indicators addressed, number of indicators integrated into the concerned policy and policy effectiveness as measured by the number of anticipated positive outcome. The size of the circles correspond to the number of positive anticipated outcomes – the more the positive outcome, the bigger the circle. The numbers in the different segments of the circles are interpreted as follows:



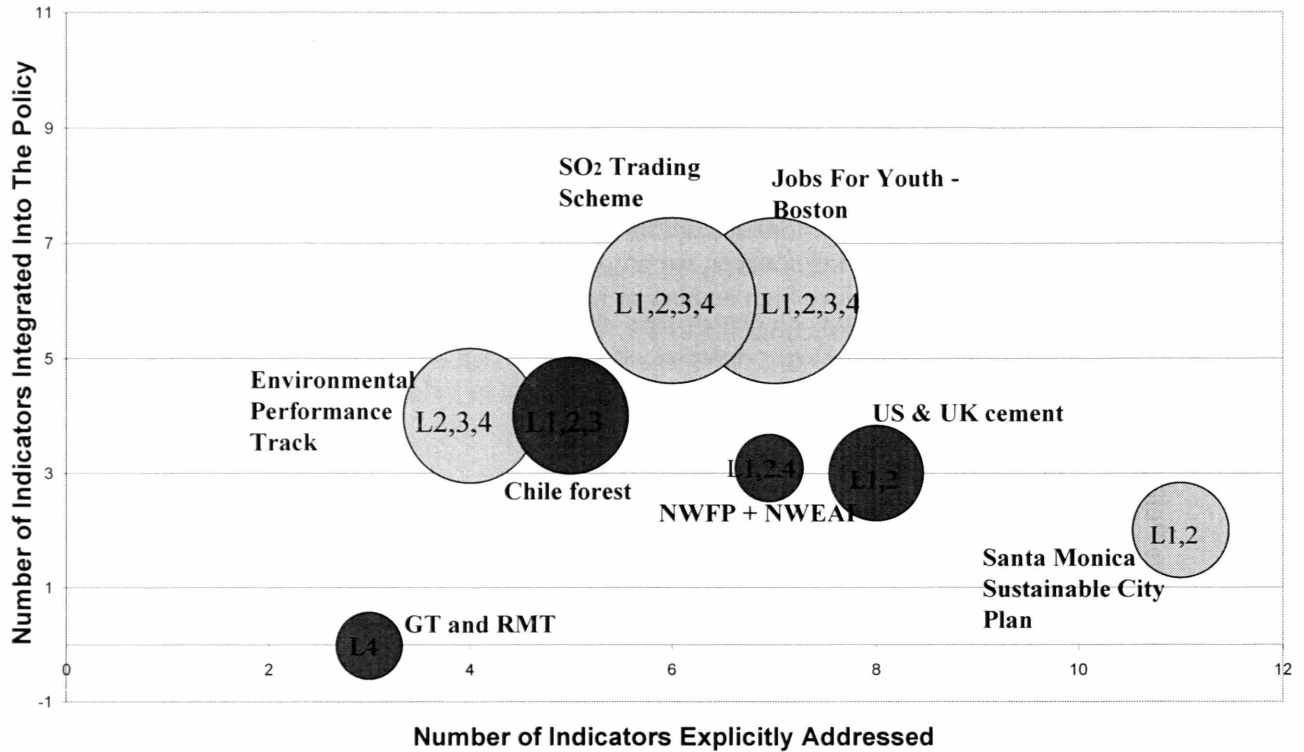


Fig.4.3. Relationship between the number of positive anticipated policy outcome and the characteristic of policy integration in each concerned policy case.

As described in Annex V, the Santa Monica Sustainable City Plan (SCP) has 62 specific sustainable indicators, all of which can be easily classified into our 11 key indicators. Although they list ‘volunteer’ and ‘community involvement’ as indicators, we treat them as a policy tool as we believe they play a more primary role in successful policymaking, rather than just a result – transient or eventual – of sustainability policymaking. Even with so many indicators considered, the SCP has only two characteristics, and only two indicators are properly integrated. This shows that knowing what entails sustainable development does not imply an ability to integrate all these indicators in a way to achieve sustainability goals. Furthermore, our interviews and survey of the meeting minutes of the task force revealed that although many governmental agencies are involved in the SCP, collaborations between them and amongst non-governmental stakeholders are largely absent. In fact, having such a diverse and disparate government structure may make an attempt to score in so many indicators even more difficult, which in turn results in frustration. This is because the task force will very likely find itself caught in dilemmas in which the different agencies involved are either concerned only of their own jurisdiction or are unaware of any opposing views of other stakeholders. This leads to frustration on the part of the task force – a sentiment that will lead to a misconception that sustainable development is either impossible or extremely difficult to achieve.

Viewed in another way, the practice of sustainable development can be treated as a yardstick for the degree of overlap and flexibility in a government structure; it is also an indication of the strength of the relationship between the government and the non-governmental stakeholders.

4.5 Policy Solutions for Improving Virgin Material Taxes in Sweden and Denmark

4.5.1 Improving the Swedish Gravel Tax Policy

4.5.1.1 Five Goals of Desired Policy Transformation

A better Gravel Tax should consider the following goals of transforming the existing policies, which are currently neglected:

- 1) Accounting for any increases in energy and fuel usage as a result of any substitution of natural gravels by alternate aggregates. A likely candidate tool for performing such a large-scale accounting is national-, state- or municipal-level material flow analysis of the aggregate and related mining industry. More emphasis could be paid to promoting this research direction through the following policy instruments:
 - a. Diversion or addition of more funding in the form of project grants or/and awards & prizes to encourage current research groups;
 - b. Initiation of more research collaboration among industrial, academic and government researchers to generate information useful for future policy-making.
- 2) Minimizing air emissions, water pollutions and toxic & non-toxic wastes treatment of mining activities in check, we ensure that the increased activities in tapping substitute aggregates and salvaging construction and demolition (C&D) wastes do not result in increased environmental deterioration. We should do so by promoting adoption and innovation of pollution prevention technologies; a possible strategy is to give firms that violate pollution standards lighter punishment in exchange for verified investment to pollution prevention technologies research, development and demonstration.
- 3) Promoting R&D in order to further reduce the reliance on imported aggregates for civil engineering works. This should target at the collection, processing and evaluation of the use of C&D wastes for new constructions. This includes formulating and formalizing performance standards for the reuse of these salvaged materials, to complement increased in research collaboration among the industry, academic and government stakeholders;
- 4) Diversifying of jobs in the mining industry is a strategy worth exploring. Mining jobs are traditionally hazardous. Besides, skill-upgrading opportunities in the industry are usually low. Aggregate and mining workers should be trained to work in another related field during the periods with low demands for construction materials. As shown in fig.2.5, outreach program within the mining industry should be initiated to convey the advantages of cross-training; the safety mechanism that ensures that this does not deprive incumbent and existing workers in the second field of jobs and advancement respectively should also be communicated effectively. One possible measure is to pair the mining industry with another industry that has a high potential for growth and in need of more employment. The recycling industry is a good example.

- 5) Preventing problem shifting should become an integral part of international sustainable development. We identified geographical problem shifting to exporting countries as the greatest negative effect of this tax– the increase of imported aggregate into Sweden. We should encourage Sweden’s trading partners to be concerned of the environmental and health/safety impacts of the mining activities in their respective countries. An aggregate-certification program, which may be called the “Sustainable Concrete Aggregates” scheme, would be implemented in which exporting companies are required to comply to mutually agree upon sustainability guidelines in their production process. New import taxes should be collected from Swedish firms, part of the revenue of which is used to finance this scheme.

4.5.1.2 Key Stakeholders and their Willingness, capacity/incentive and Opportunity to Change

The key stakeholders in the Swedish case are described as follow:

- 1) *Government agencies.* The Ministry of Sustainable Development and Coordination Unit for Sustainable Development are the two main national government agencies charged with the mission to promote sustainable development. The Swedish Environment Protection Agency and Swedish National Road Administration are the main agencies that have helped in shaping the Gravel Tax.
- 2) *Construction and demolition wastes recycling industry.* This includes companies and trade associations (e.g. the Swedish Association of Waste Management - RVF) that deal with these wastes.
- 3) *Svenska Bergmaterialindustrin (SBMI), the Swedish Aggregates Producers Association.* SBMI is the aggregate industries’ national trade association.
- 4) *Swedish aggregate companies.* These are companies who are charged the Gravel Tax, or will be charged the proposed import tax.
- 5) *Employees of the aggregate mining and processing industries.* They may be employed by companies who are trading companies themselves. However, there are also companies who specialized only in mining and processing.
- 6) *Labor unions.* Around 80% of the workforce in Sweden is unionized.
- 7) *Research and academic institutions.* Relevant parties include groups whose research interests are in materials and energy flow accounting, and development of better wastes recycling technique.
- 8) *Building materials suppliers, contractors, developers and owners.* They are the end consumers of building materials and are in the position to create the demand for change.
- 9) *Swedish green building associations and promoters of green building concepts.* As yet, Sweden does not have a nationwide green building rating system that is similar to the LEED system in the United States. However, organizations and initiatives such as the Scandinavian Green Roof Institute and the Joint UK-Sweden Initiative on Sustainable Construction play key roles in promoting sustainable architecture and construction.

- 10) *UEPG – European Aggregate Association*. This is an international trade association that represents all aggregate companies within the EU.
- 11) *Companies and firms that sell aggregates to Sweden*. Due to high costs of transporting aggregates over long distances, the majority of Sweden's trading partners are from the neighboring Scandinavian countries.

These stakeholders' status quo, and their willingness, capacity/incentive and opportunity to change are discussed in brief in Table.4.2.

Table 4.2. Detailed descriptions of key stakeholders.

No.	The stakeholders	Status quo	Willingness To change	Capacity/Incentive to change	Opportunity to change
1.	Government agencies	<p>Judging from the National Sustainable Development Strategy (Swedish Ministry of Environment, 2004), sustainability targets are set only within the country context.</p> <p>This document highlights the need to implement impact analyses for activities that tap natural resources.</p>	<p>The success of the Ministry of Finance and SBMI to oppose the proposal to raise the tax to US\$1.40 in 2003 underlines the presence of opposing views on this tax. This is a challenge for future changes.</p> <p>Therefore, to avoid another round of antagonistic exchange, the Ministry of Finance and SBMI must be convinced of benefits of the desired transformations described earlier.</p>	<p>The National Sustainable Development Strategy, Ecocycles Bill 2003/4 and landfill bans already contain clear mission statements that can be used to initiate more extensive impact & materials flow analyses and reuse of wastes.</p> <p>Existing collaborations between government agencies and research groups can be tapped on to promote these initiatives.</p>	<p>The newly formed Coordination Unit for Sustainable Development is an effective vehicle to bring about the desired changes. We see its formation as a new opportunity for improvement.</p> <p>However, its current work scope is focused on coordination between the Ministers and Ministries. The first step should be re-defining its fundamental role to reach out to other stakeholders instead.</p>
2.	Wastes recycling industry	<p>While the combined effects of the taxes see a steady increase in the amount of C&D wastes collected, SBMI told us that the quality and quantity of reusable salvaged asphalt and concrete is inconsistent.</p>	<p>These stakeholders should welcome any increased interest in the recycling industry. However, any increase in their financial burdens, results from any required R&D and certification should be minimized or appropriately offset.</p>	<p>A barrier is the absence of a national certification system for the quality of salvaged wastes for use in building constructions. This explains why current uses of these wastes are restricted to roads and light-load constructions.</p>	<p>The Svenska Renhållningsverksföreningen (RVF) – Association for Waste Management – is currently promoting the use of slag and incinerator ashes as substitutes for natural gravels in road construction. This work is supported by the National Road Administration. We view this as a good opportunity to promote widespread reuse of C&D wastes and their by-products in buildings (RVF, 2003).</p>
3.	Ministry of Industry, Employment and Communications; SBMI; labor	<p>From our conversation with SBMI, we know it is also studying the trends in domestic aggregate substitutions. It has links with</p>	<p>SBMI and the labor unions will lead oppositions of any policies that increase the financial burdens on Swedish aggregate companies, which may affect</p>	<p>Given SBMI's track record of successfully opposing the increase in tax rate in 2003, and the commitment of the labor union in decision-making, they play a central role in supporting</p>	<p>We see a possibility for these stakeholders to support any policy changes that ultimately promote an improvement in job stability and health/safety for aggregate and</p>

	<p>unions: employees of aggregate and mining industries; trading companies</p>	<p>the labor unions for aggregate and mining workers. Around 80% of Sweden's workforce is unionized. There is no fixed minimum wage by legislation. Hence, labor unions play a crucial role in helping to set minimum wages by collective bargaining.</p>	<p>the employees' wages as a result. They are likely to oppose an introduction of import tax to the existing Gravel Tax.</p>	<p>any future changes. To garner their support for promoting clean productions of substitute materials, policymakers must emphasize these policies as a strategy to improve other aspects of workers' welfare.</p>	<p>mining workers. In short, we deem the inherently dangerous nature of mining job to be an opportunity for policy transformations.</p>
4.	<p>Research and academic institutions</p>	<p>There are many research groups who are currently engaged in studying the materials and energy flow patterns of Sweden. An example is the Flow Research Group at Wuppertal Institute in Germany.</p>	<p>These groups should welcome additional support for the study of flow patterns of substitute materials and carry out impact analyses of new mining activities</p>	<p>Although existing flows accounting techniques suffice in identifying changes in flows, improvement is needed in integrating uncertainties into the accounting as well as translation of data into policy options.</p>	<p>The governments should provide more opportunities for understanding how research results can be utilized in policy designs. Specifically, government should create, maintain and make accessible physical accounting databases with the aid of academic researchers. They can use the information and deduce how policies such as an increase in waste tax can affect the overall materials flow pattern in the industry, assuming that each of the sectors in the industry aims to optimize its profits. Increased funding in these areas of research is also desirable.</p>
5.	<p>Building consumers and green building associations & promoters</p>	<p>Currently there is still no sustainable building rating scheme in Sweden, although Sweden is always represented in the Green Building Challenge. Green design is a voluntary pursuit. Consumers have not yet become a strong</p>	<p>Low costs and high performance are the main requisites to persuade consumers to embrace recycled-content materials.</p>	<p>Traditionally, contractors, developers and owners depend on material suppliers to provide the information on sustainable building materials products. Studies have shown that suppliers may underestimate consumers' demand for sustainable building materials. Thus, providing</p>	<p>Consumers should see the need to invest in recycled aggregates. One of the best ways to accomplish this is to first establish a sustainable building or development labeling and rating scheme. The demand for recycled aggregates can then included as one of the criteria. The</p>

		<p>motivating force to persuade more investment into the reuse of salvaged materials, and responsible tapping of natural resources.</p>		<p>both sides with this information empowers them with the capacity to change.</p>	<p>LEED rating system can be used as a model.</p> <p>An innovative mean of sharing information on sustainable building products are also needed</p>
6.	UEPG – European Aggregate Association	<p>The voice of aggregate industries in EU, the UEPG is working closely with EC for Standardization (CEN/TC 154) to develop a European standard for aggregates.</p>	<p>If the demand for impact analyses of aggregate mining is worked into the standards, UEPG is likely to support our proposed change.</p>	<p>UEPG works closely with SBMI to ensure that the Swedish national standards, such as the EN12620, conform to the CEN standards. If it is willing, UEPG, with the support of SBMI, has the capacity to support our proposed change.</p>	<p>Using the CEN mandates as a common ground for discussion, policymakers in Sweden can introduce our 5th policy goal to the UEPG. Once they vowed their support for this change, the proposal can be brought up to EU for further consideration.</p>
7.	Sweden's trading partners in aggregates	<p>Neighboring Scandinavian countries are the main importers. The present Gravel Tax does not apply to imports.</p>	<p>Our 5th proposed change will cause additional costs to be incurred by these trading partners.</p> <p>Unless these costs are reduced by mutually agreed measures, strong oppositions are expected from them.</p>	<p>As long as the exporting countries are convinced that the 5th proposal is not intended to be a trade barrier and can help enhance their domestic well being, their governments have the capacity to promote the new requirements domestically.</p>	<p>Sweden can help provide the opportunity for the trading partners to change by:</p> <p>Committing financially to the 5th proposal, by channeling a certain percentage of its import tax revenue to lower their cost burden</p> <p>Collaborating with their research units in the impact analyses efforts.</p>
8.	Ministry of Industry, Employment and Communication; Ministry of Finance	<p>Their main concerns are on the predicted effect of an additional import tax on the local firms.</p>	<p>Measures that offset any cost increase for the firms will persuade the two Ministries to support the 5th proposal.</p>	<p>Since our first 4 proposals concern various indicators relevant to the missions of the two Ministries, it is in their capacity to support the 5th proposal.</p>	<p>Again, the Coordination Unit plays the key role in linking up the Ministries – as it is doing now – and provides the opportunity for mutual understanding and support that is essential for the successful implementation of all the 5 goals of transformation.</p>

4.5.1.3 Possible Barriers and Strategies to Overcome Them

4.5.1.3.1 Promoting Widespread Materials Flow & Energy Accounting and Cleaner Production in the Aggregate Industry

It is important for the Swedish Coordination Unit of Sustainable Development to step out of its present mode of operation. It needs to reach out to the eleven different key stakeholders described above. The formation of a task force¹⁵ comprising members from the different stakeholder groups will serve to facilitate the Unit's work.

Once this alliance is formed, possible barriers faced by the different stakeholder groups could be concurrently addressed and assisted by the respective members of the task force. A possible obstacle to successful materials flow accounting of the aggregate industry, which will provide important data for the impact analyses of these activities, is the uncertainty in, and poor availability of flow data. This can be effectively overcome if aggregate companies and SBMI are engaged in the early stage of policymaking in which the government comes to a consensus with them on the need for materials accounting. Pollution control is enforced with existing regulations. In fact, current violators of pollution standards can be given concessions on their fines if they vow to invest in a systematic program of materials accounting. As a possible strategy, the government should consider diverting an amount of tax revenue to assisting companies to implement their own materials accounting programs across the industry. It should also reward investment and innovation in cleaner production technologies.

Finally, a well-known barrier in materials flow research concerns the inability of most researchers to convert flow data and simulation results into policy options. This should be fundamentally addressed by holding dialogues and seminars involving *only* policymakers and flow researchers. Above all, we believe this will allow flow researchers to consider more realistic scenarios and relevant boundary conditions in their future scientific works. From the perspective of the policymakers, more accurate knowledge of the capabilities of flow analyses will provide them with the opportunity to consider more policy design options, as well as assess implemented and future policies.

4.5.1.3.2 Improving the C&D Wastes Recycling Industry

The government should anchor its strategy on the ongoing effort by the RVF to promote using incinerator ashes as road aggregates. Collaborations should be initiated to link up research units and the RVF to advance our existing knowledge on the performance of buildings (not just roads) utilizing salvaged wastes and their by-products as aggregates. In a future when firms are required to get their aggregate substitutes certified, as one learns from the experience of forest product certification, they will incur additional costs. This will be a barrier to the industry's acceptance of any standardization and certification scheme for aggregate substitutes. A possible

¹⁵ There is an important difference between the 'task force' we refer to here and the more conventional meaning of the word as used in Local Agenda21 and even that associated with citizen's advisory boards/committees (Vari (1996); Lynn and Karetz (1996)). Our version of the unit is comprised of a cross-agency and multi-stakeholder group leadership-management team whose work is integrated across all issues and levels of governance. Readers are referred to Chapters 4 and 5 of this work for the four characteristics of integration and four types of required integration for governance for sustainability. The conventional task forces usually are comprised of only local stakeholders and/or non-governmental advisors.

solution is for the government to provide different levels of financial assistance for firms of different capacities. For example, smaller firms will qualify for government subsidy with a higher ceiling.

4.5.1.3.3 *Diversifying Aggregate and Mining Jobs*

The rationale behind this goal is to reduce any pressure on the industry to safeguard jobs and shortchange the full potential of the recycling industry. However, main barriers to encouraging people to learn other job skills, especially when they still have their original jobs in the mining and aggregate industry, is the unwillingness to sacrifice their spare time. While working in another related field may not decrease the inherent risks of the mining industry to which its workers are exposed, this strategy does provide additional job security and hence satisfaction for workers. Based on this point, the labor unions, SBMI and RVF should communicate with one another in the design of new policies to ensure that:

- Incentives are provided to motivate workers to learn new skills. Educational funds should be made available to interested workers. We need to set up an agency at the local level to consolidate and coordinate all applications for such funding. Administrative officers at the local level must receive proper training (and preferably be certified) in fund applications and management;
- Trained workers are matched to jobs that are compatible with their skills;
- If extra labor is needed in the recycling industry, the RVF and labor unions from both the mining and recycling industries should work out a quota to ensure that an influx of freshly trained, multi-skilled workers do not deprive incumbent and potential recycling workers of their jobs.

4.5.1.3.4 *Integrating or Coordinating “Sustainable Concrete Aggregate” Scheme and the European Community CEN Standards*

The existing CEN Standards for aggregate – the CEN/TC 154 series – contain technical guidelines for optimizing functional performance and safety in the use of aggregates for building and road construction (CEN, 2005). A likely barrier to garnering support and endorsement from UEPG is that our proposed “Sustainable Concrete Aggregate” (the 5th proposal) Scheme’s criteria may introduce more difficulty and uncertainty in the implementation of the CEN Standards. This was exactly the experience with the Forest Stewardship Council (FSC) forest certification program in its formative years. If the FSC program is anything to go by, we may need to start an entirely new product-certification scheme, which is coordinated with the CEN/TC 154. Above all, Sweden must impose the same certification guidelines on domestic firms, so as to prove that these moves are not a disguised trade barrier.

To avoid the mistakes made by FSC in the certification of wood products, the “Sustainable Concrete Aggregate” Scheme should be flexible and offer a variety of schemes to cater to firms of different capacities. For example, the bigger and more endowed firms that deal with greater volumes of aggregates should be required to do a more complete impact analysis, which may be supplemented by the materials flow analyses of that country concerned, provided such data is available. Nonetheless, in all cases, the cost of impact analyses incurred by the firms that export aggregates to Sweden should be minimized or even offset by the import tax collected

from the importing companies. In fact, if the importing countries' governments support this cause, they should also co-sponsor the "Sustainable Concrete Aggregate" Scheme.

To lessen the industry's resistance to the introduction of an import tax component to the existing Gravel Tax, the government should seek input from SBMI and labor union on measures to eradicate adverse effects on the industry. As mentioned above, in sub-section 4.3.1.3.3, diversification of jobs in the industry – our 4th policy goal – has great potential. How about the impact on Swedish aggregate firms? The primary aim of the original Gravel Tax is to regulate the use of *natural gravel*; therefore, the Swedish government should collect the new import tax for natural gravels but provide more subsidies for the firms' investment in recycled materials. This in turn depends on the success of our 3rd policy goal. It is worth noting that the pace of introduction of the new import tax must be in synchrony with the development of the recycling industry (which depends, among other factors, the introduction of the performance standards for C&D wastes and their by-products).

We need to create a sizable domestic demand for both recycled aggregates and certified imported or domestic aggregates. As mentioned in table.4.2 above, the willingness of consumers to opt for these materials depends primarily on the upfront costs and familiarity of building contractors with these materials. The Swedish government should seek the help of non-governmental groups such as the Scandinavian Green Roof Initiative, Joint UK-Sweden Initiative on Sustainable Construction and Green Building Challenge to work on a green building design guideline and rating system. The use of recycled materials and certified aggregates should be incorporated as one of the criteria. Note that committing to the existing LEED certification system in the United States is voluntary; on the other hand, the Building Construction Authority (BCA) of Singapore has made energy-efficient building design mandatory for all local developments. In fact, scholars in Singapore are studying the possibility of making sustainable building design mandatory in 10 years' time. That is, the United States and Singapore each presents an opposite end of the policy spectrum; Sweden needs to consider an appropriate combination of policy tools (which may evolve with time) to optimize its local uptake of sustainable design and construction ideals.

Another barrier to domestic acceptance of these substitute materials is related to the knowledge of these materials. The problem is actually two-fold:

- There is relatively little knowledge and thus confidence in the reuse of recycled concrete as aggregates;
- Contractors and suppliers could have an inaccurate knowledge of how receptive consumers actually are toward green, or sustainable, building products.

The first problem can partially be resolved by the success in meeting our 1st policy goal. However solving the first and second problems totally require us to establish an effective *building materials information portal and database*.

4.5.1.3.5 *Building Materials Information Portal And Database*

This information system should be established and managed by the Ministry of Industry, Employment and Communications and the Swedish Construction Federation. Given that this

databank contains information for other types of building materials as well means that both these agencies have a vested interest in its creation.

Given that the construction industry is so fragmented, standardization of product quality will not be easy. However, registered contractors and building materials companies should be co-opted as default members of this portal and they will receive regular information (e.g. mailers, newsletter etc.) regarding advances in building materials R&D, and even related government policies. Regular consumer surveys should also be conducted by the two agencies and the results of which are to be included in the database and shared with the industry. If the sustainable design and construction rating system is also created, it should refer consumers to this portal and database for a preferred set of building materials.

4.5.1.4 Strategy to Engage the Stakeholders

Table.4.2 and section 4.3.1.3 both outline the nature of the stakeholder network that policymakers need to set up in order to achieve the five target policy transformations. In table.4.3, we detail the ways by which the different stakeholders relevant to each goal transformation can be engaged, using the list of different methods presented in section 1.3.3. In table.4.3, the types of stakeholder participation tools utilized are highlighted in italic.

Table. 4.3. Methods for engaging stakeholders in achieving target transformations.

No.	Target Policy Transformations	Stakeholders involved	Comments on tools and methods of engagement
1.	To build a general consensus within the government on the significance of these 5 policy transformations	Coordination Unit and all relevant ministries and agencies	<p>Coordination Unit should first propose the overall plan – comprising our 5 proposals – to the Prime Minister’s Office and Ministry for Sustainable Development for feedback.</p> <p>Subsequently, the Coordination Unit should form an alliance with the Ministry of Environment and the various agencies through a series of internal meetings. The result of these meetings should be the formation of a cross-ministerial and cross-agency task force (hereafter termed the “task force”). The task force should also co-opt relevant non-governmental stakeholders, especially the key stakeholders’ representatives or leaders. Since the Coordination Unit is the leader of the task force, it has a final say in the composition of the task force and representatives of the stakeholders.</p> <p>From here onward, the following points 2 to 6 (each corresponds to a policy proposal) should be executed concurrently.</p> <p>Within each point, we outline the execution of the respective stakeholder engagement plan in chronological order. Any sub-goals are also described in details.</p>

<p>2.</p>	<p>Promoting materials flow and impact analyses. Strengthening pollution control.</p>	<p>Coordination Unit, Ministry of Environment, various government agencies, the research and development community, SBMI and members of the public.</p>	<p>We propose the following actions to engage the stakeholders, in chronological order:</p> <ol style="list-style-type: none"> 1) The task force must conduct <i>focus group sessions or seminars</i> to bring together relevant government agencies and the research community. The academic community must be involved at this stage too. The objective is to fully familiarize with the real potential of existing technique, and to identify goals for their improvement. Note that <i>scenario analyses</i> should be used to help researchers identify weaknesses of current techniques. 2) Next, the SBMI should be involved in <i>special focus group meetings</i> with the task force to discuss likely impact of this policy goal on the industry. At this stage, it is essential for the task force to accurately communicate to SBMI the <i>essence of all the 5 policy goals</i>. This in turn will motivate SBMI to think widely in their assessment of our new policy initiatives. 3) The task force should sponsor <i>surveys and public meetings</i> at the township level to gather feedback regarding any concerns with local mining activities. 4) Concurrently with step 3, the task force may need to send its representatives to assist SBMI in the latter's meeting with industrial representatives in <i>focus group meetings</i>. <p>These steps are summarized in fig. 4.4 below.</p>
-----------	---	---	--

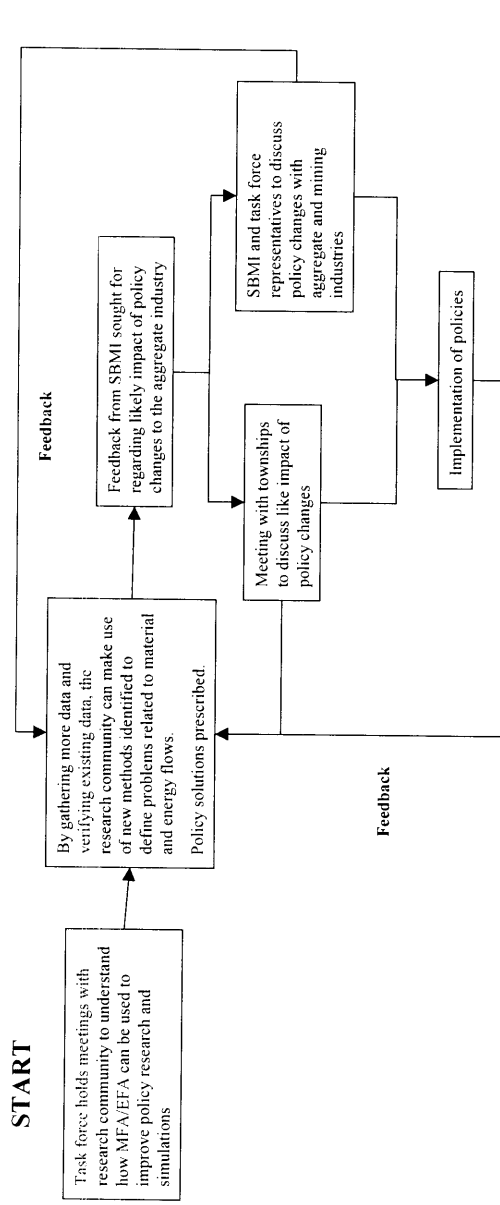


Fig.4.4. Steps to promote material flow analysis as a form of impact assessment in Sweden.

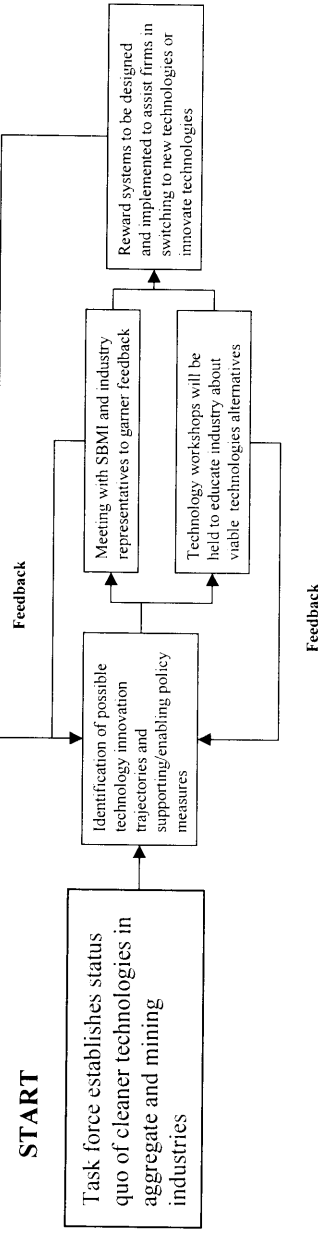


Fig.4.5. Steps to promote cleaner production and technology.

3.	Promoting cleaner production technologies	Coordination Unit, Ministry of Environment, various government agencies, the research and development community, SBMI and members of the public.	<p>As this involves the industry investing in new technologies, the task force should play a slightly different role here. We recommend the follow steps, in chronological order:</p> <ol style="list-style-type: none"> 1) It should form its own <i>expert team</i> or advisory board to evaluate the current technology capacity and potential of the industry. 2) Next, the SBMI and industrial representatives should be invited for an informal meeting with technology experts from within and without the task force advisory board. <p>The meetings can be divided into different stages -- the first stages should focus on the task force explaining rationale behind the policy targets and its advisory board describing applicable new pollution control technologies.</p> <p>Subsequent sessions should allow industrial representatives to give their feedback on any difficulties faced with these new technologies. That is, these sessions should be held in the form of <i>technology workshops</i>.</p> <ol style="list-style-type: none"> 3) Finally, the task force and the relevant government agencies should design an innovation reward program to encourage firms to invest in R&D of new pollution control technologies. These technologies will reap dividends beyond the aggregate industry as well. <p>Any such decision should be shared among the stakeholders during the <i>technology workshops</i>. Examples of such workshops are those employed by PATH (Partnership for Advancing Technology in Housing).</p> <p>These steps are summarized in fig.4.5 in the previous page.</p>
4.	Improving the C&D wastes recycling and reuse industry	Coordination Unit, Ministry of Environment, research community, recycling industry and RVF	<ol style="list-style-type: none"> 1) <i>Focus group meetings</i> with research community should first be held to identify the status quo of recycling technologies in Sweden. Government should also follow up on the ongoing effort by RVF. Non-proprietary results of this project should be shared with the research community to further advance the prospects of reusing C&D wastes in construction.

			<p>2) Once ample knowledge is gleaned, the task force should consult the RVF and recycling industry representatives about the aim to implement a performance standard for C&D wastes and their by-products intended as substitute aggregates. A research endowment benefiting R&D in this area should be formed and endorsed by the government.</p> <p>3) Once a consensus is reached, the task force then leads in formally proposing these standards to the Ministry of Sustainable Development and the Prime Minister's Office for approval.</p> <p>Steps from 1 to 3 are outlined in fig.4.6.</p>
--	--	--	---

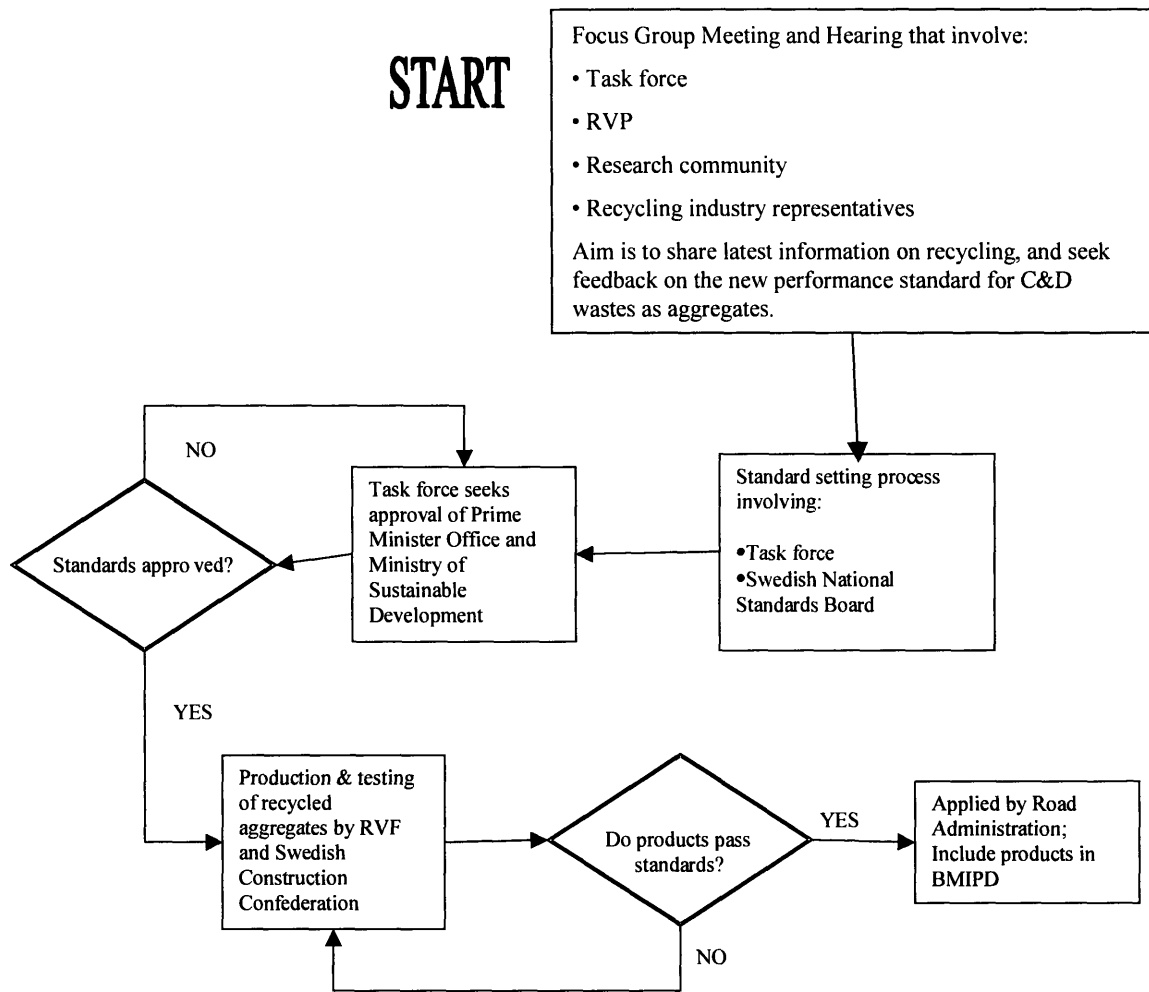


Fig.4.6. Proposed action flow chart for improving Sweden's C&D wastes recycling and reuse industry. The double-headed arrows imply that information is fed back to the preceding stage to fine-tune decision-making.

No.	Target Policy Transformations	Stakeholders involved	Comments on tools and methods of engagement
5.	Job diversification	Coordination Unit, Ministry of Industry, Employment and Communication, SBMI, RVF, labor unions, aggregate industry and recycling industry	<p>1) The Ministry of Industry, Employment and Communication should work closely with the task force in its analysis of the current situation and prospect of employment in both aggregate and recycling industries. Most importantly, predictions should be made regarding employment opportunities in a future when more C&D wastes and their by-products are reused in construction.</p> <p>2) Next, the task force should identify jobs for which current aggregate and mining workers can be cross-trained. Special <i>focus group meetings</i> in which creative brainstorming sessions are conducted will serve this purpose.</p> <p>3) The Ministry of Finance should also be involved in the starting of an education fund to assist workers who are committed to re-training or cross training for new jobs.</p> <p>4) The next stage comprises the training of “managers” and instructors. The former are charged with the administrative works that include processing applications for education fund and job allocation/matching, while the latter are charged with the job training.</p> <p>These steps are shown in fig.4.7.</p>

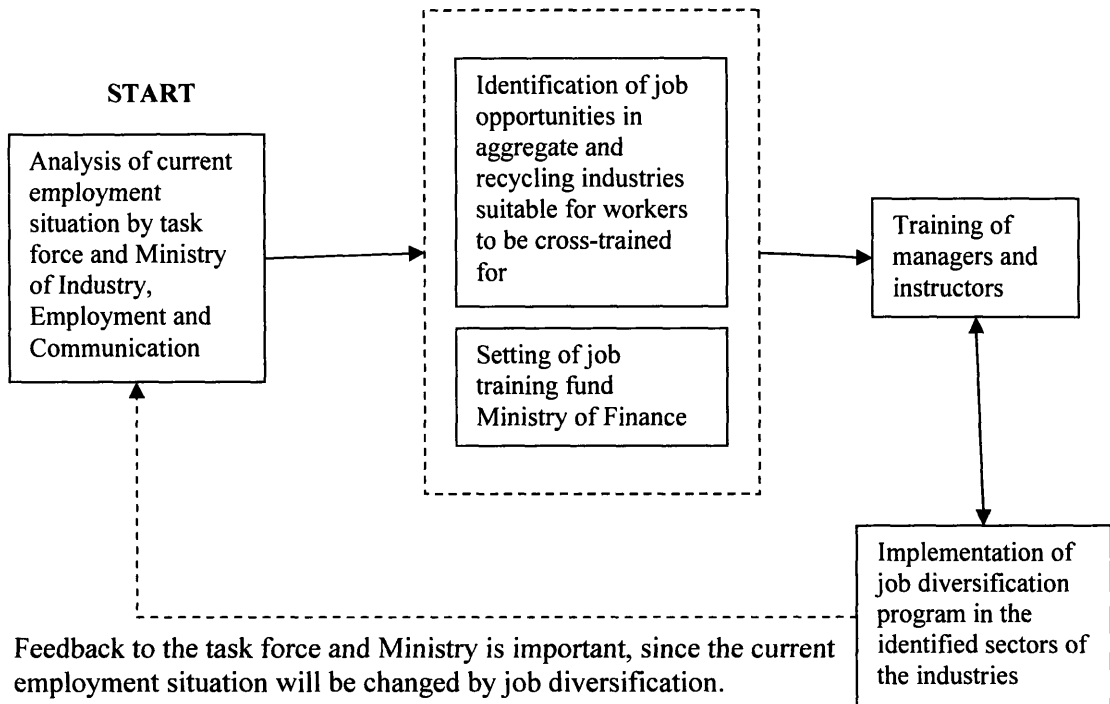


Fig.4.7. Proposed action flow chart for diversifying jobs in the mining and recycling industries. The double-headed arrows imply that information is fed back to the preceding stage to fine-tune decision-making.

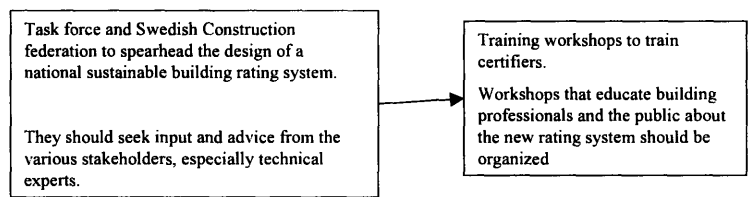


Fig.4.8. Creating a national sustainable building design and construction rating system.

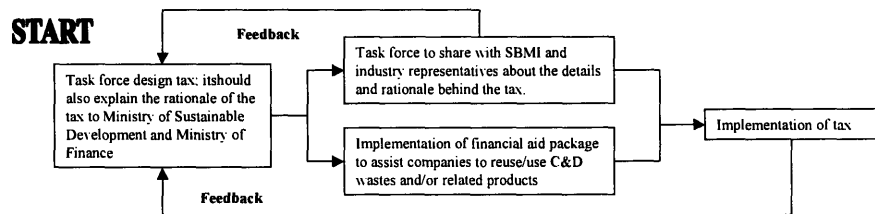


Fig.4.9. Imposing import tax on Swedish companies that import natural gravels.

6.	<p>Implementation of the “Sustainable Concrete Aggregate” Scheme as a vehicle to promote responsible natural resource management in trading countries.</p>	<p>SUB-GOAL: 1</p> <p>Creation of a national sustainable design and construction rating system.</p>	<p>Coordination Unit, Ministry of Environment, Swedish Construction Federation, Green Building Challenge, Scandinavian Green Roof Initiative & other similar groups, and stakeholders related to other aspects sustainable construction</p>	<p>1) Since this rating system involves a much wider range of stakeholders, we suggest the Swedish Construction Federation to play a more active role, alongside the task force. <i>Focus group meetings</i> with these stakeholders, including those involved in the aggregate and recycling industries, should be engaged.</p> <p>2) <i>Training workshops</i> should be conducted to train and certify evaluators.</p> <p>3) <i>Workshops</i> should also be made available to inform and educate interested public or building professionals about the rating systems.</p> <p>These steps are summarized in fig.4.8</p>
<p>SUB-GOAL: 2</p> <p>Imposing import tax on Swedish firms.</p>	<p>Coordination Unit, SBMI, aggregate industry representatives, Ministry of Finance</p>	<p>1) It is advisable that the task force begins working on this sub-goal <i>after</i> some groundwork to promote job diversification and clean technologies (point 3) are completed.</p> <p>2) The task force should hold internal meetings with the Ministry of Sustainable Development and Ministry of Finance to discuss the rationale behind, and analyze the possible impacts of, the new import tax.</p> <p>3) The subsequent round of meetings should now include SBMI and industry representatives. Emphasis is placed on discussing how the government intends to use the tax revenue (i.e. to support “Sustainable Concrete Aggregate” Scheme) and availability of assistance package to help firms invest in reuse of C&D wastes and their by-products.</p> <p>These steps are summarized in fig.4.9</p>		

<p>Implementation of the "Sustainable Concrete Aggregate" Scheme as a vehicle to promote responsible natural resource management in trading countries</p>	<p>SUB-GOAL: 3 Starting a new certification scheme for local and imported aggregates</p>	<p>Coordination Unit, UIEPG, research community, SBMI, aggregate industry representatives, importing countries' government agencies and importing firms</p>	<p>The task force needs to work locally and internationally on meeting this goal:</p> <ol style="list-style-type: none"> 1) Locally, the task force should tap on the expertise engaged to introduce the performance standards for the reuse of C&D wastes (point 4). At the same time, local UIEPG representatives (including members of the SBMI) familiar with the CEN/TC 154 standards should be invited to comment on the plan for the new certification scheme. <p>In order not to commit the same error as the FSC system for forest products, the task force should conduct <i>surveys</i> and organize <i>stakeholder feedback meetings</i> to understand how firms of different capacities are likely to be impacted by this scheme. These stakeholders should be informed of the financial assistance of the type described in section 4.3.1.3.4.</p> 2) Internationally, the task force needs to first explore with UIEPG options to integrate the new criteria into the existing EC CEN. This will involve the relevant EC officials in high-level <i>negotiation</i>. Should the task force elect to implement the new standards independent of CEN, less participation from EC is expected, although the professional advice from UIEPG is desired. <p>Finally, after the availability of the import tax revenue for offsetting the cost of compliance by trading partners is confirmed, the task force may plan to sign a bilateral or multilateral agreement with trading partners.</p> <p>These steps are illustrated in fig.4.10.</p>
---	---	---	--

		<p>SUB-GOAL: 4 Creating the Building Materials Information Portal and Database (BMIPD)</p>	<p>Coordination Unit, Swedish Construction federation, Ministry of Industry, Employment and Communication and building consumers</p>	<p>1) As in the case of the rating system, the task force should enlist the help of the Swedish Construction Federation to spearhead this initiative.</p> <p>2) Next, <i>consumer surveys</i> should be conducted so that the task force understands the level and nature of acceptance of sustainable building products.</p> <p>3) <i>Membership</i> to the BMIPD is then established. Contractor members are given periodic updates on development in products and technologies.</p> <p>4) To coincide with special occasions, such as the annual Earth Day, the BMIPD should organize a "<i>Building Our Future</i>" Day during which the public is treated to a series of <i>outreach events</i> aimed at educating them on sustainable building products. This will also be an ideal occasion to conduct <i>consumer surveys</i>.</p> <p>5) Concurrently with point 4 above, the profile of the BMIPD can be given a boost by formally incorporating it into existing, established sustainable construction schemes and projects. The Joint UK-Sweden Initiative for Sustainable Construction is a good example.</p> <p>These steps are shown in fig.4.11.</p>
--	--	--	--	---

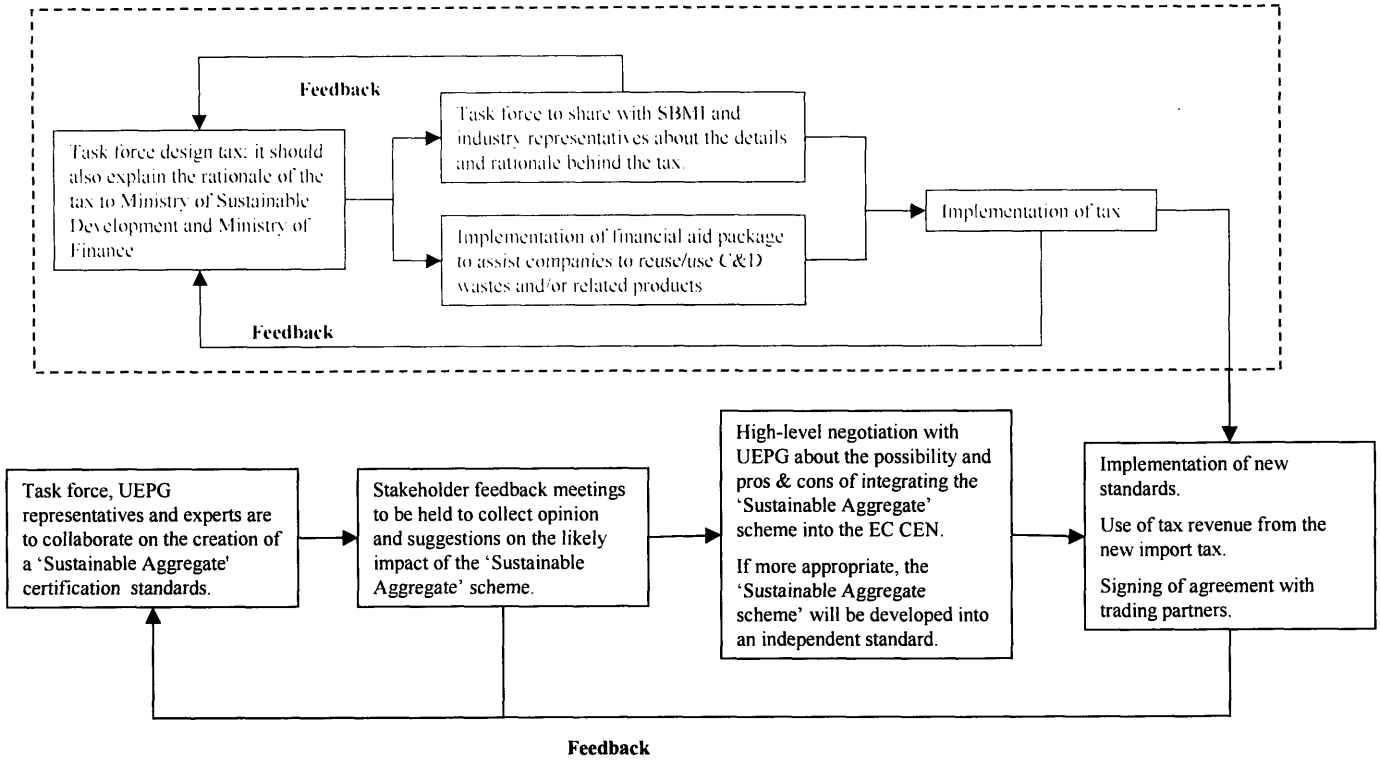


Fig.4.10. Creation of the certification scheme for local and imported aggregates. The dotted area represents the steps we outlined to implement the new import tax for natural gravels.

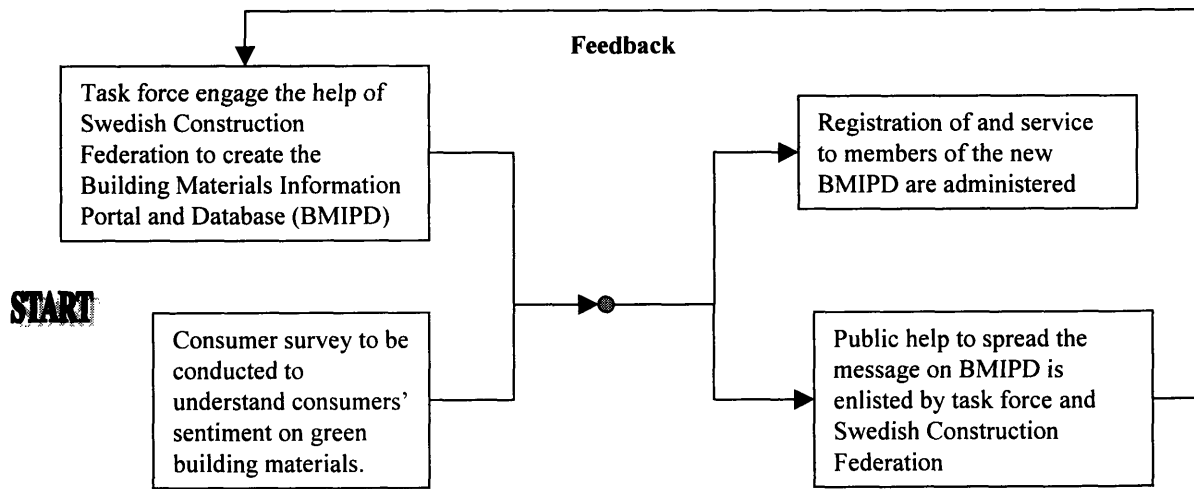


Fig.4.11. The creation of a new BMIPD.

Finally, we summarize the stakeholder involvement in all the 5 policy transformations in fig.4.12. The figure provides a clear overview of the stakeholders who will play multiple roles in these transformations.

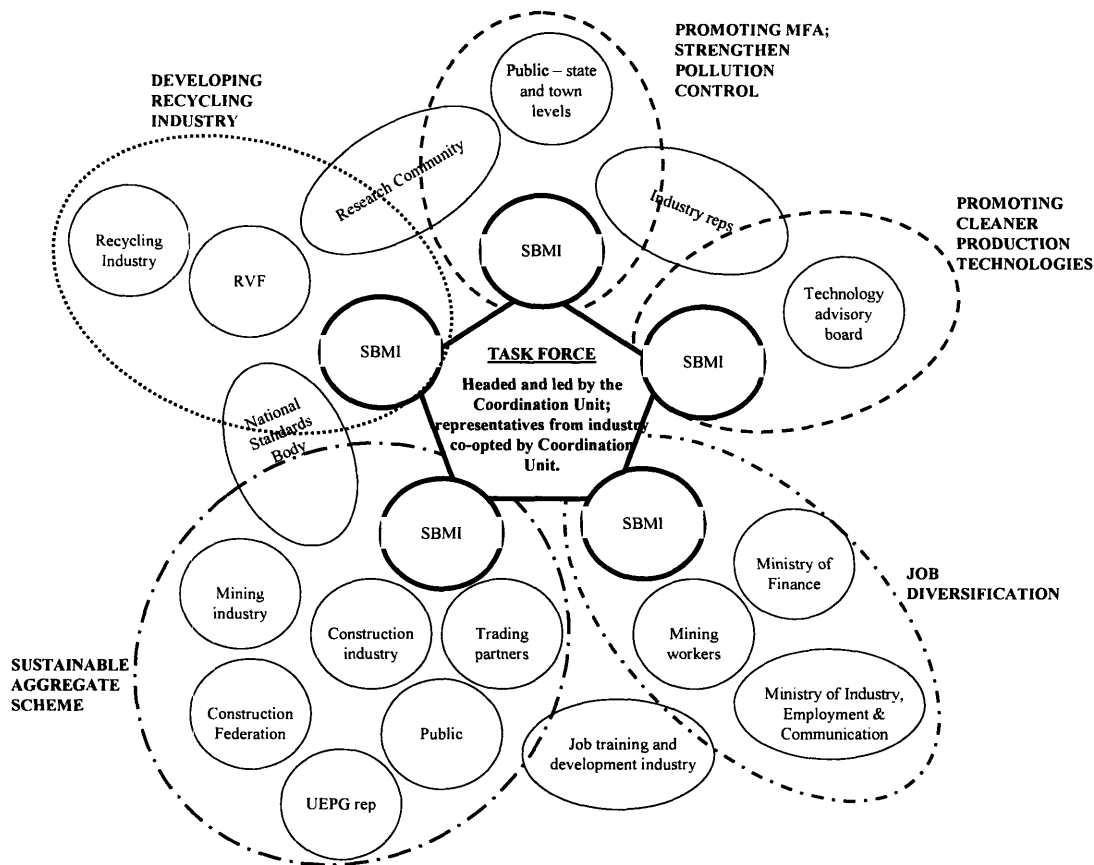


Fig.4.12. The stakeholder Venn diagram that describes the involvement of the diverse stakeholders in effecting the 5 proposed policy transformations. The SBMI should be involved in all 5 transformations, since it represents the mining industry in policy discourse (and thus plays an important role in future feedback). The relationships among the stakeholders within each policy ‘blob’ are underlined in table 4.3.

4.5.1.5 Policy Monitoring and Intervention Mechanism

The main advantage of having a task force to spearhead the entire transformation strategy is that individual stakeholder member has a vested interest to act as a “bridge” between the other task force members and the community he/she serves. In fact, we suggest that task force members should be selected according to specific criteria, one of which is their deep involvement with their respective communities and ability to organize a communication network from which feedback on policy design attributes and outcome can be sought for. This requires the task force to render individual member support in the event that he/she needs to organize focus group meetings or conduct consumer surveys to gather such feedback. Above all, the task force members must be competent enough to gather feedback on the different policy transformations in which their respective groups are involved.

In section 4.2.1, we mentioned two neglected aspects of stakeholder (especially the general public) engagement. By keeping in touch with the community, task force members should also help mobilize and facilitate local volunteer actions, thus helping to channel creative energies into furthering the task force's mission deeper into the community. Above all, as mentioned, it helps build stronger stewardship toward the cause of the policies. An example is the organization of local groups to volunteer at an exhibition that features the Building Materials Information Portal and Database on Earth Day.

Realistically, there is no absolute guarantee that our policy transformations will not result in unforeseen conflicts with their original intents or give rise to unexpected outcome. However, an effective task force, composed by the right group of members, will function as an effective buffer against these unforeseen outcomes. Playing the leadership role in steering the task force, the Coordination Unit must evaluate every feedback provided by the stakeholder groups through the stakeholder task force members, and deduce whether the outcome of a certain policy transformation has the potential to compromise the success of another policy transformation. This is especially vital if two or more transformations affect a particular stakeholder group (e.g. examining how the current aggregate & mining industry is affected by the diversification of mining jobs and introduction of the new certification scheme). By always aligning its overall goals with Sweden's national sustainable development targets and international commitment, the Coordination Unit ensure that there are no conflicts between policy outcome and the bigger goals of Sweden.

In the event that such conflicts are detected within certain stakeholder groups, the Coordination Unit must mobilize its members (with the concerned groups' representatives in the task force acting as the "bridges") to design and execute rectifying policies. These new policies are monitored in order to ensure that no new conflicts ensued.

4.5.2 Improving the Danish Raw Materials Tax Policy

4.5.2.1 Five Goals of Desired Policy Transformation

Due to the similarity of the nature and outcome of the Swedish and Danish taxes, the five goals identified for the Swedish Gravel Tax are also appropriate for the Danish Raw Materials Tax. In fact, Sweden and Denmark may even spearhead the "Sustainable Concrete Aggregates" scheme as partners; in case either party is the key importer of raw materials into the other party, and that these materials are covered by either tax, both parties can set an example by implementing environmental impact analyses and additional import tax collection to offset the cost of doing such analyses.

4.5.2.2 Key Stakeholders and their Willingness, Capacity/Incentive and Opportunity to Change

The key stakeholders in the Danish case are:

- 1) *Government agencies:* unlike the Swedish case, Denmark does not have a separate agency whose sole purpose is to implement or coordinate sustainable development strategies nationally. The Ministry of Environment, Danish National Agency of Environment Protection Agency, and National Environment Research Institute are the main agencies in-charge of leading sustainability discourse and policy planning. Other important actors include the Danish Energy Agency and the National Agency for Enterprise and Construction; the latter represents the building industry in matters such as

construction policy, public-private cooperation, prices of building materials, and building regulations.

- 2) *Construction and demolition wastes recycling industry*: besides the companies that deal with these wastes, the Danish Waste Technology Group, Danish Waste Management Association (DAKOFA), the International Solid Waste Association, and the Waste Center Denmark are the key actors that must be engaged in policy improvement.
- 3) *Mining industry and related government agencies*: the Ministry of Transport, Geotechnical Institute, Geological Survey of Denmark and Greenland, and the mining companies are the key stakeholders. Support from the Confederation of Danish Industries will be helpful in implementing any changes that will impact both the construction and mining industries.
- 4) *Trade related stakeholders*: firms that are engaged in the trading of raw materials, the Danish Export Association, Danish Trade Council, Danish Trade Group and the Ministry of Economic and Business Affairs will have an impact on the success of realizing our goals.
- 5) *Labor unions*. As in the case of Sweden, 80% of the workforce in Denmark is unionized. More than 50% of unionized workers belong to unions that are affiliated to the Danish Trade Union Congress (also known as the Confederation of Danish Labor, or, LO). The Ministry of Employment is another key decision-maker in employment related issues.
- 6) *Research and academic institutions*. Key stakeholders include the Ministry of Science, Technology and Innovation, Danish Standards Association, National Environment Research Institute, Geotechnical Institute, and universities are the main actors who will generate the important knowledge essential for our policy transformations.
- 7) *Building materials suppliers, contractors, developers and owners*. They are the end consumers of building materials and are in the position to create the demand for change.
- 8) *Promoters of green building concepts*. Unlike Sweden and the LEED rating system in the United States, the government centrally implements Denmark's key green building policies. The famous energy-labeling scheme for buildings is actually mandatory, and Danish Energy Agency is the party in-charged of designing, implementing and monitoring the scheme.
- 9) *UEPG – European Aggregate Association*. This is an international trade association that represents all aggregate companies within the EU.
- 10) *Companies and firms that sell aggregates to Denmark*. Due to high costs of transporting aggregates over long distances, the majority of Denmark's trading partners are from the neighboring Scandinavian countries.

The status quo, willingness, capacity/incentive and opportunity to change of these stakeholders are discussed in brief in table 4.4.

Table 4.4. Detailed descriptions of key stakeholders in Denmark.

No.	The stakeholders	Status quo	Willingness To change	Capacity/Incentive to change	Opportunity to change
1.	Government agencies	<p>Judging from the National Strategy for Sustainable Development (The Danish Government, 2002), sustainability targets are set only within the country context.</p> <p>Denmark emphasizes on resource efficiency, as well as helping targeted countries in their sustainable development efforts. However, there is not effort to identify and rectify any 'problem shifting' as a result of domestic sustainability efforts.</p>	<p>There are many uses that are exempted from the current Raw Materials Tax. E.g. sea floor materials that originate from capital dredging projects are not charged the Tax.</p> <p>Therefore, we should expect some forms of resistance to proposals to either increase the Tax on materials that are being taxed now, or implement the Tax on more materials.</p>	<p>The National Strategy for Sustainable Development, Raw Materials Act and comparatively high Waste Tax contain clear mission statements that can be used to initiate more extensive impact & materials flow analyses and reuse of wastes.</p> <p>Existing collaborations between government agencies and research groups can be tapped on to promote these initiatives. However, the renowned success of Denmark's Local Agenda21 program at the grassroots levels may ironically induce communities to look more inward and address sustainability targets that are easier to achieve than those at the national or regional levels that demand more skilful integration and coordination.</p>	<p>One of the key components in the National Strategy for Sustainable Development is the <i>knowledge-based environment policy</i>. The Danish government already emphasized the need for public-private collaboration to generate more and better information on the environmental impact of the different industries (also known as the Cardiff Process).</p> <p>This will generate the information needed for our proposed policy transformations.</p>
2.	Wastes recycling industry	<p>As in the Swedish case, the quality and quantity of reusable salvaged asphalt and concrete is inconsistent.</p>	<p>These stakeholders should welcome any increased interest in the recycling industry. However, any increase in their financial burdens, results from any required R&D and certification should be minimized or appropriately offset. Currently, companies that trade in recycled materials also trade in virgin materials. Weaning them off virgin materials may be a</p>	<p>A barrier is the absence of a national certification system for the quality of salvaged wastes for use in building constructions. This explains why current uses of these wastes are restricted to roads and light-load constructions.</p>	<p>Like Sweden, Denmark has increased its waste recycling considerably over the last 20 years. New measures are still being implemented (The Danish Government, 2004).</p> <p>Denmark is still in the process of revising its standards for asphalt and concrete recycling and reuse. Statutory Orders will soon cover these for recycling of residues and soil for building and construction purposes.</p>

	<p>3. Ministry of Employment, Ministry of Economy and Business, labor unions & Confederation of Trade Unions, employees of aggregate and mining industries; trading companies</p>	<p>Around 80% of Danish workforce is unionized.</p> <p>In the National Action Plan for Employment (Ministry of Employment, 2004), the Danish government put forth long term proposals to address various aspects of sustainable employment. In particular, it emphasizes the significance of the new flexijob schemes, reduction in regional imbalances in employment, and lifelong learning.</p>	<p>The labor unions will oppose to any policies that increase the financial burdens on Danish companies that utilize raw materials affected by any changes to the Tax policy.</p> <p>Without convincing counter-measures, they will oppose an increase in import tax.</p>	<p>The Confederation of Trade Unions published its Draft Strategy for Sustainable Development (CTU, 2004) in 2004. It highlighted the need to further promote the ability of workers to adjust to any seasonal variations in their jobs, and the importance of education and re-training of workers. Policy transformations that also support these goals will gain the unions' support.</p>	<p>We see a possibility for these stakeholders to support any policy changes that ultimately promote an improvement in job stability and health/safety for aggregate and mining workers. In short, we deem the inherently dangerous nature of mining job to be an opportunity for policy transformations.</p>
	<p>4. Research and academic institutions</p>	<p>Amongst others, the Danish Environmental Protection Agency is very experienced in using MFA and SFA to identify sources of toxic substance release into the waste stream and the environment (Hansen, Lassen, 2002).</p>	<p>These groups should welcome additional support for the study of flow patterns of substitute materials and carry out impact analyses of new mining activities</p>	<p>Although existing flows accounting techniques suffice in identifying changes in flows, improvement is needed in integrating uncertainties into the accounting as well as translation of data into policy options.</p>	<p>The governments should provide more opportunities for understanding how research results can be utilized in policy designs. For example, government agencies could use the flow diagrams to deduce how policies such as an increase in waste tax can affect the overall materials flow pattern in the industry, assuming that each of the sectors in the industry aims to optimize its profits.</p> <p>Increased funding in these areas of research is also desirable.</p>
	<p>5. Building consumers, Contractors' Association and Energy Agency.</p>	<p>Currently there is no sustainable building-rating scheme in Denmark, although there is a mandatory energy-</p>	<p>Low costs and high performance are the main requisites to persuade consumers to embrace recycled-content materials.</p>	<p>Traditionally, contractors, developers and owners depend on material suppliers to provide the information on sustainable building materials products. Studies have shown that</p>	<p>Consumers should see the need to invest in recycled aggregates. One of the best ways to accomplish this is to first establish a sustainable building or development labeling and rating scheme.</p>

	<p>labeling scheme created by the Danish Energy Agency. Green design is largely a voluntary pursuit.</p> <p>Consumers may not yet become a strong motivating force to persuade more investment into the reuse of salvaged materials, and responsible tapping of natural resources.</p>	<p>The Energy Agency's experience with the current level of success of the energy labeling scheme will determine the government's willingness to expand this scheme into a more holistic sustainable building scheme.</p>	<p>suppliers may underestimate consumers' demand for sustainable building materials. Thus, providing both sides with this information empowers them with the capacity to change.</p>	<p>The demand for recycled aggregates can then included as one of the criteria. The LEED rating system can be used as a model.</p> <p>An innovative mean of sharing information on sustainable building products are also needed</p> <p>The National Strategy for Sustainable Development already contains clear mandate on resource management and efficiency. This is an opportunity to integrate such goals into a systematic scheme that applies to building design and construction.</p>
6.	<p>UEPG – European Aggregate Association</p>	<p>If the demand for impact analyses of aggregate mining is worked into the standards, UEPG is likely to support our proposed change.</p>	<p>UEPG works closely with the Association of Danish Stone and Gravel Industries (ADSGI) to ensure that the industry conform to the CEN standards. If it is willing, UEPG, with the support of, has the capacity to support our proposed change.</p>	<p>Collaboration with the ADSGI and Danish Standards Association may allow policymakers in Denmark to introduce our 5th policy goal - the Sustainable Concrete Aggregate Scheme – to the UEPG. Once they vowed their support for this change, the proposal can be brought up to EU for further consideration.</p>
7.	<p>Denmark's trading partners in aggregates, Danish Export Association and Confederation of Danish Industries</p>	<p>Our 5th proposed policy transformation will cause additional costs to be incurred by these trading partners.</p> <p>Unless these costs are reduced by mutually agreed measures, strong oppositions are expected from them.</p>	<p>As long as the exporting countries are convinced that the 5th proposal is not intended to be a trade barrier and can help enhance their domestic well being, their governments have the capacity to promote the new requirements domestically.</p>	<p>Denmark can help provide the opportunity for the trading partners to change by:</p> <p>Committing financially to the 5th proposal, by channeling a certain percentage of its import tax revenue to lower their cost burden</p> <p>Collaborating with their research units in the impact analyses efforts.</p>

8.	<p>Ministry of Employment, Ministry of Economic and Business, and Ministry of Finance</p>	<p>Their main concerns are on the effect of an additional import tax on the local firms.</p>	<p>Measures that offset any cost increase for the firms will persuade these key Ministries to support the 5th proposal.</p>	<p>Since our first 4 proposals concern sustainable development indicators relevant to various aspect of the National Strategy, and they also complement the 5th proposal, it is in their capacity to support the 5th proposal too.</p>	<p>Coupled to the current model whereby the Ministry of Environment coordinates all sustainable development efforts, our proposals provide the opportunity to reinforce collaboration among the different agencies to further promote sustainable development.</p>
----	---	--	--	--	--

4.5.2.3 Possible Barriers To Successful Policy Transformations, and Strategies to Overcome Them

4.5.2.3.1 Promoting Widespread Materials Flow & Energy Accounting and Cleaner Production in the Aggregate Industry

The current model in which the Ministry of Environment coordinates all agencies in the overall sustainable development is similar to the Swedish model as represented by the Coordination Unit. However, coordination should occur at the more ‘grass root’ level and not be restricted to the inter-Ministerial leadership level. Therefore, we also recommend the formation of alliance with stakeholder volunteers who are charged with forming “bridges” between the Ministry of Environment and the stakeholder groups they represent. Once this alliance is formed, the recommendation for Sweden (section 4.5.1.3.1) can also be applied to Denmark.

4.5.2.3.2 Improving the C&D Wastes Recycling Industry

The government should ensure that the current business models by recycling companies, by which virgin and recycled products are traded together, do not shortchange the potential of the industry to create a stronger market for recycled content products. This also applies to C&D wastes such as asphalt and concrete. If these business models become a barrier, the Ministry of Economy and Business and, in particular, the private-public collaboration of Danish Waste Technology Group should engage the Confederation of Danish Industries to revise these business models. Other similar “flaws” in the C&D waste markets should concurrently be identified and rectified.

Collaborations should be initiated to link up research units and the Danish Waste Technology Group to advance our existing knowledge on the performance of buildings (not just roads) utilizing salvaged wastes and their by-products as aggregates. In a future when firms are required to get their aggregate substitutes certified, as one learns from the experience of forest product certification, they will incur additional costs. This will be a barrier to the industry’s acceptance of any standardization and certification scheme for aggregate substitutes. A possible solution is for the government to provide different levels of financial assistance for firms of different capacities. For example, smaller firms will qualify for government subsidy with a higher ceiling.

4.5.2.3.3 Diversifying Aggregate and Mining Jobs

The same observation and recommendations for Sweden is relevant in the Danish case too (refer to section 4.5.1.3.4). The labor unions, Confederation of Trade Unions, and Ministry of Employment should play the key role in incentivizing workers to be trained in other job skills and that trained workers are properly matched to compatible positions. A possible “entry point” is the Flexi-job Scheme (Ministry of Employment, 2004). As in the Swedish case, it is important to ensure that a quota for incumbent recycling workers must be kept in order to prevent a situation in which an influx of freshly trained, multi-skilled workers deprive the former of jobs.

4.5.2.3.4 Integrating or Coordinating “Sustainable Concrete Aggregate” Scheme and the European Community CEN Standards

As mentioned in section 4.5.1.3.4, the “Sustainable Concrete Aggregate” Scheme may need to start off as an entirely new product-certification scheme that is independent of but congruent with the CEN Standards. If Sweden and Denmark can collaborate on and pioneer this new scheme within EU (for a start), without foreshadowing the CEN Standards, it may eventually be incorporated into the CEN as it becomes effective and popular. Being a member of the UEPG, the Danish Association of Stone and Gravel Industries will play an active role in to ensure that the two schemes do not compete with but complement each other. The situation between the FSC and SFI (Sustainable Forestry Initiative) exemplifies the kind of competition that can exist between two certification schemes.

The essential difference between the Raw Materials Tax and the Gravel Tax is that the former is collected for a wider range of mineral materials, and not just natural gravels. In order to successfully implement the “Sustainable Concrete Aggregate” in Denmark and its trading partners, there is a need to conduct separate environmental impact analysis for each type of raw material. The amount of subsidies for the impact analysis of the production and transportation of these materials should then be individually set for these materials.

To overcome the lack of strong market signal for companies to utilize recycled materials, it is important to “encourage the use of recycled materials to ‘green’ companies’ image”. One way to go about doing this is to promote corporate voluntary reporting (a kind of policy tool/instrument), and emphasizes the significance of using recycled products in such reports. Government agencies, especially the Environmental Protection Agency and Ministry of Environment should spearhead such efforts with government-initiated Preferred Purchase Programs followed by annual reporting on their websites and related literature.

Finally to overcome the barrier caused by relatively little knowledge and thus confidence in the reuse of recycled concrete as aggregates and the inaccurate knowledge that contractors and suppliers might have on the receptiveness of consumers toward green, or sustainable, building products, our suggestion of a *building materials information portal and database* is also relevant for Denmark.

4.5.2.3.5 Building Materials Information Portal And Database

Presently, Waste Center Denmark (2005) provides a very good online resource on waste related information. However, there is relatively insufficient focus on C&D wastes, particularly regarding ways by which these wastes can be reused and recycled in the building and housing industries. Besides, information regarding retailers and wholesalers, and standards of recycled content products, can be provided for readers as well.

Our earlier suggestion to co-opt registered contractors and firms as default members of this portal applies to the present case as well. Above all, this enhanced Waste Center Denmark should be intimately linked to the “Sustainable Concrete Aggregate” Scheme and the proposed sustainable building design guideline such that the Center provides coherent information on the two schemes and explain accurately how they complement each other in the nation’s overall effort to promote sustainable use of precious raw materials. The Waste Technology Group and Danish Construction Association should also be involved as the co-designers of this extensive database and outreach tool.

4.5.2.4 Strategy to Engage the Stakeholders

Table.4.4 and section 4.5.2.3 both outline the nature of the stakeholder network that policymakers need to set up in order to achieve the five target policy transformations. In table.4.5, we detail the ways by which the different stakeholders relevant to each goal transformation can be engaged, using the list of different methods presented in section 1.3.3. In table.4.5, the types of stakeholder participation tools utilized are highlighted in italic.

Table. 4.5. Methods for engaging stakeholders in achieving target transformations.

No.	Target Policy Transformations	Stakeholders involved	Comments on tools and methods of engagement
1.	To build a general consensus within the government on the significance of these 5 policy transformations	Ministry of Environment and all relevant Ministries and agencies	<p>The Ministry of Environment should play the same role as that prescribed for Sweden's Coordination Unit. It should first propose the overall plan – comprising our 5 proposals – to the Prime Minister's Office for feedback.</p> <p>Subsequently, it should form an alliance with the various Ministries and agencies through a series of internal meetings. The result of these meetings should be the formation of a cross-ministerial and cross-agency task force (hereafter termed the "task force").</p> <p>The task force should also co-opt relevant non-governmental stakeholders, especially the key stakeholders' representatives or leaders. Since the Ministry of Environment is the leader of the task force, it has a final say in the composition of the task force and representatives of the stakeholders.</p> <p>From here onward, the following points 2 to 6 (each corresponds to a policy proposal) should be executed concurrently.</p> <p>Within each point, we outline the execution of the respective stakeholder engagement plan in chronological order. Any sub-goals are also described in details.</p>

<p>2.</p>	<p>Promoting materials flow and impact analyses. Strengthening pollution control.</p>	<p>Ministry of Environment, various government agencies, the research and development community, Environmental Protection Agency, Environmental Research Institute and members of the public.</p>	<p>We propose the following actions to engage the stakeholders, in chronological order:</p> <ol style="list-style-type: none"> 1) The task force must conduct <i>focus group sessions or seminars</i> to bring together relevant government agencies and the research community. The academic community must be involved at this stage too. The objective is to fully familiarize with the real potential of existing technique, and to identify goals for their improvement. Note that <i>scenario analyses</i> should be used to help researchers identify weaknesses of current techniques. 2) Next, the Association of Stone and Gravel Industries should be involved in <i>special focus group meetings</i> with the task force to discuss likely impact of this policy goal on the industry. At this stage, it is essential for the task force to accurately communicate to the Association the <i>essence of all the 5 policy goals</i>. This in turn will motivate the Association to think widely in their assessment of our new policy initiatives. 3) The task force should sponsor <i>surveys</i> and <i>public meetings</i> at the township level to gather feedback regarding any concerns with local mining activities. 4) Concurrently with step 3, the task force may need to send its representatives to assist the Association in the latter's meeting with industrial representatives in <i>focus group meetings</i>. These steps can be described similarly with fig.4.8.
-----------	---	---	--

3.	Promoting cleaner production technologies	<p>Ministry of Environment, Ministry of Science, Technology & Innovation, the research and development community, Association of Stone and Gravel Industries and members of the public.</p>	<p>As this involves the industry investing in new technologies, the task force should play a slightly different role here. We recommend the follow steps, in chronological order:</p> <ol style="list-style-type: none"> 1) It should form its own <i>expert team</i> or advisory board to evaluate the current technology capacity and potential of the industry. 2) Next, the Association of Stone and Gravel Industries and industrial representatives should be invited for an informal meeting with technology experts from within and without the task force advisory board. <p>The meetings can be divided into different stages – the first stages should focus on the task force explaining rationale behind the policy targets and its advisory board describing applicable new pollution control technologies.</p> <p>Subsequent sessions should allow industrial representatives to give their feedback on any difficulties faced with these new technologies. That is, these sessions should be held in the form of <i>technology workshops</i>.</p> <p>Finally, the task force and the relevant government agencies should design an innovation reward program to encourage firms to invest in R&D of new pollution control technologies. These technologies will reap dividends beyond the aggregate industry as well.</p> <p>Any such decision should be shared among the stakeholders during the <i>technology workshops</i>.</p> <p>Fig. 4.9 similarly describes the above steps.</p>
----	---	---	---

4.	Improving the C&D wastes recycling and reuse industry	Ministry of Environment, Waste technology Group, research community, recycling industry and Waste Management Association, Waste Center Denmark	<p>1) <i>Focus group meetings</i> with research community should first be held to identify the status quo of recycling technologies and businesses in Denmark, including the mentioned business models. Non-proprietary results of this project should be shared with the research community to further advance the prospects of reusing C&D wastes in construction.</p> <p>2) Once ample knowledge is gleaned, the task force should consult the Danish Standards Association and recycling industry representatives about the aim to implement a performance standard for C&D wastes and their by-products intended as substitute aggregates.</p> <p>3) A research endowment benefiting R&D in this area should be formed and endorsed by the government.</p> <p>Once a consensus is reached, the task force then leads in formally proposing these standards to the Prime Minister's Office for approval.</p> <p>4) Finally, the Ministry of Environment should initiate a government-wide movement to establish a Preferred Purchase Program and support recycled content products, including recycled aggregates. Companies should be encouraged to follow suit and even report their commitment in annual reports. The best way to start this off is to encourage construction firms that are already reporting their annual sustainability contribution to embrace the proposed "Sustainable Concrete Aggregate" Scheme (refer to point (6)).</p> <p>The stages described above are linked in the same way as those illustrated in fig.4.10 for the Swedish case.</p>
----	---	--	--

5.	Job diversification	<p>Ministry of Environment, Ministry of Employment, labor unions, Confederation of Trade Unions, Association of Stone and Gravel Industries, Waste Management Association, aggregate companies and recycling companies.</p>	<p>1) The Ministry of Employment should work closely with the task force in its analysis of the current situation and prospect of employment in both aggregate and recycling industries. Most importantly, predictions should be made regarding employment opportunities in a future when more C&D wastes and their by-products are reused in construction.</p> <p>2) Next, the task force should identify jobs for which current aggregate and mining workers can be cross-trained. Special <i>focus group meetings</i> in which creative brainstorming sessions are conducted will serve this purpose.</p>
			<p>3) The Ministry of Finance should also be involved in the starting of an education fund to assist workers who are committed to re-training or cross training for new jobs.</p> <p>4) The next stage comprises the training of “managers” and instructors. The former are charged with the administrative works that include processing applications for education fund and job allocation/matching, while the latter are charged with the job training.</p> <p>The stages described above can be linked to one another in the same way as illustrated in fig. 4.11 for the Swedish case.</p>

<p>6.</p>	<p>Implementation of the "Sustainable Concrete Aggregate" Scheme as a vehicle to promote responsible natural resource management in trading countries.</p>	<p>SUB-GOAL 1</p> <p>Creation of a national sustainable design and construction rating system.</p>	<p>Ministry of Environment, Energy Agency, Green Building Challenge, Contractors' Association, Construction Association, Standards Association, contractors and building owners.</p>	<p>1) Since this rating system involves a much wider range of stakeholders, we suggest the Construction Association to play a more active role. <i>Focus group meetings</i> with these stakeholders, including those involved in the aggregate and recycling industries, should be engaged.</p> <p>2) <i>Training workshops</i> should be conducted to train and certify evaluators.</p> <p>3) <i>Workshops</i> should also be made available to inform and educate interested public or building professionals about the rating systems.</p> <p>These steps are similar to fig.4.8 for the Swedish case.</p>
		<p>SUB-GOAL 2</p> <p>Increasing import tax on Danish firms.</p>	<p>Ministry of Environment, Association of Stone & Gravel Industries, aggregate industry representatives, Ministry of Finance</p>	<p>1) It is advisable that the task force begins working on this sub-goal <i>after</i> some groundwork to promote job diversification and clean technologies (point 3) are completed. This is to provide the task force with essential information regarding</p> <p>2) The Task Force should hold internal meetings with the Ministry of Finance to discuss the rationale behind, and analyze the possible impacts of, the new import tax.</p> <p>3) The subsequent round of meetings should now include the Association and industry representatives. Emphasis is placed on discussing how the government intends to use the tax revenue (i.e. to support "Sustainable Concrete Aggregate" Scheme) and availability of assistance package to help firms invest in reuse of C&D wastes and their by-products.</p> <p>These steps are similar to fig.4.9 of the Swedish case.</p>

	<p>Implementation of the "Sustainable Concrete Aggregate" Program as a vehicle to promote responsible natural resource management in trading countries.</p>	<p>SUB-GOAL: 3 Starting a new certification scheme for local and imported aggregates</p>	<p>Ministry of Environment, UEPG, research community, Association of Stone and Gravel industries, aggregate industry representatives, importing countries' government agencies and importing firms</p>	<p>The task force needs to work locally and internationally on meeting this goal:</p> <p>1) Locally, the task force should tap on the expertise engaged to introduce the performance standards for the reuse of C&D wastes (point 4). At the same time, local UEPG representatives (including members of the Association) familiar with the CEN/TC 154 standards should be invited to comment on the plan for the new certification scheme.</p> <p>In order not to commit the same error as the FSC system for forest products, the task force should conduct <i>surveys</i> and organize <i>stakeholder feedback meetings</i> to understand how firms of different capacities are likely to be impacted by this scheme. These stakeholders should be informed of the financial assistance of the type described in section 4.3.1.3.4.</p> <p>2) Internationally, the task force needs to first explore with UEPG options to integrate the new criteria into the existing EC CEN. This will involve the relevant EC officials in high-level <i>negotiation</i>. Should the task force elect to implement the new standards independent of CEN, less participation from EC is expected, although the professional advice from UEPG is desired. Agreements are signed with trading partners.</p> <p>These steps are similar to those shown in fig. 4.10</p>
--	---	---	--	---

	<p>(Cont'd) Implementation of the "Sustainable Concrete Aggregate" Program as a vehicle to promote responsible natural resource management in trading countries.</p>	<p>SUB-GOAL: 4 Creating the Building Materials Information Portal and Database (BMIPD)</p>	<p>Ministry of Environment, Waste Center Denmark, Waste Technology Group, Construction Association, and building consumers</p>	<ol style="list-style-type: none"> 1) As in the case of the rating system, the task force should enlist the help of the Danish Construction Association to spearhead this initiative. 2) Next, <i>consumer surveys</i> should be conducted so that the task force understands the level and nature of acceptance of sustainable building products. 3) <i>Membership</i> to the BMIPD is then established. Contractor members are given periodic updates on development in products and technologies. 4) To coincide with special occasions, such as the annual Earth Day, the BMIPD should organize a "Building Our Future" Day during which the public is treated to a series of <i>outreach events</i> aimed at educating them on sustainable building products. This will also be an ideal occasion to conduct <i>consumer surveys</i>. 5) Concurrently with point 4 above, the profile of the BMIPD can be given a boost by formally incorporating it into existing, established sustainable construction schemes and projects. <p>These steps are similar to those illustrated in fig.4.11.</p>
--	--	---	--	---

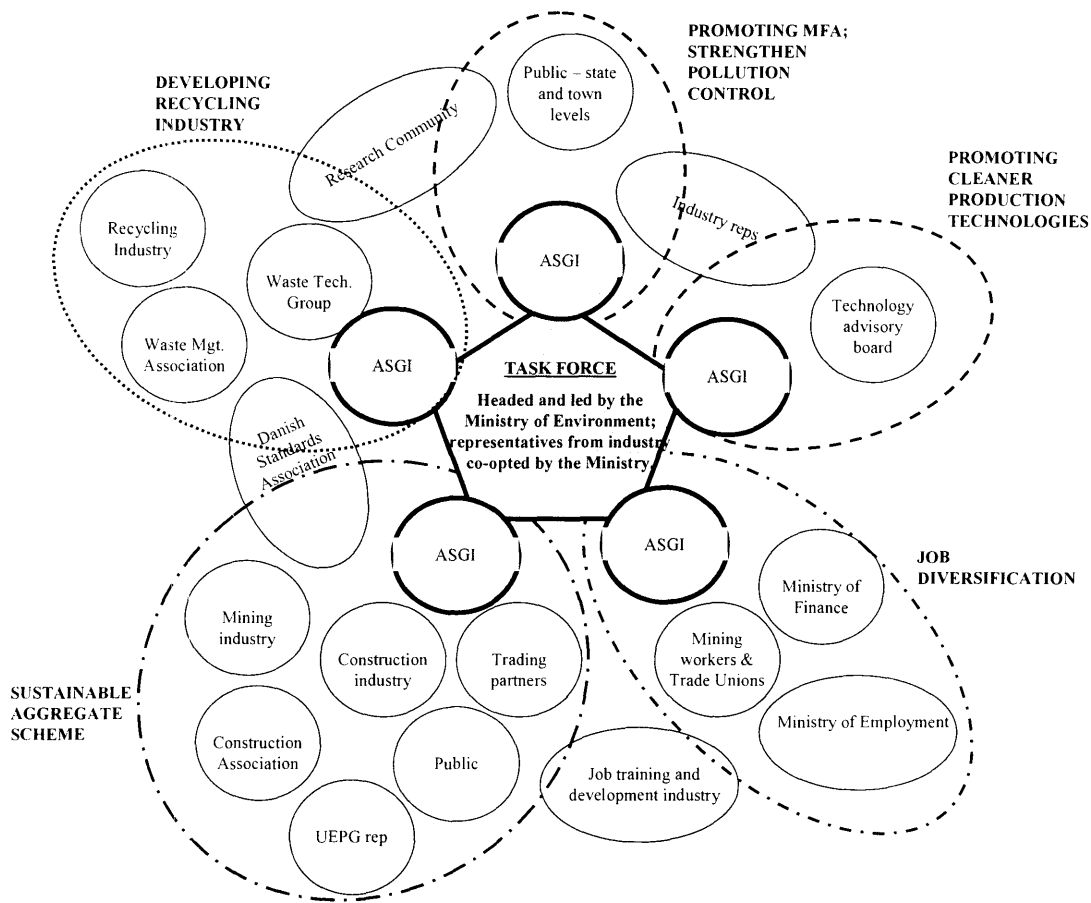


Fig.4.13. The stakeholder Venn diagram that describes the involvement of the diverse stakeholders in effecting the 5 proposed policy transformations. The ASGI (Association of Stone and Gravel Industries), as in SBMI in the Swedish case, should be involved in all 5 transformations, since it represents the mining industry in policy discourse (and thus plays an important role in future feedback). The relationships among the stakeholders within each policy ‘blob’ are underlined in table 4.5.

As in the Swedish case, we summarize the stakeholder involvement in all the 5 policy transformations in fig.4.13. The figure also provides a clear overview of the multiple roles played by some key stakeholders.

4.5.2.5 *Policy Monitoring and Intervention Mechanism*

The concept behind the coordination among the Danish agencies is similar to the Swedish case. As mentioned before, the main goal of such coordination is to garner the cross-agency support and foster stakeholder understanding of the different measures aimed at achieving the 5 policy transformations.

Denmark has a very strong tradition in Local Agenda21, which started from its adoption of the Aarhus Convention. Getting concerned citizens to be involved in grassroot activities that

support the different initiatives outlined and described in the preceding sections is an effective strategy. In fact, in the same spirit as our suggestions in section 4.5.1.5, the task force should focus on mobilizing grassroots efforts to spur the uptake of our 5 proposals by the recycling, construction and mining industries, since citizens are actively involved in sustainability discourse at the local level. The only challenge for the Ministry of Environment is to ensure that the ensuing activities and policies at the local levels are appropriately coordinated. In fact, not only is this coordination a policy monitoring process, this is one of the key steps in helping local policymakers to learn from one another's experience.

If local actions are found to conflict with national sustainability goals and/or our 5 policy transformation goals, the task force must mobilize its members (with the concerned groups' representatives acting as the "bridges") to design and execute rectifying policies. These new policies are monitored in order to ensure that no new conflicts ensue.

4.5.3 Determinant of Success of the Task Force

How does one decide if the task force in both cases is successful or otherwise? Using the National Sustainable Strategy as the master plan and reference, a successful task force is one that is able to gather the necessary resources to achieve the stated sustainability goals. With the government representative - Coordination Unit in Sweden and the Ministry of Environment in Denmark – acting as the leader, the task force is essentially an extensive co-option of, and collaboration among, stakeholder representatives who meet specific criteria to play the roles of "bridges".

However, there is a concern that in such a cross-agency organization, the inherent imbalance of force in the group will corrupt the process of collaborative policy making. This corruption may exist in the form of policies or views biased toward the most powerful – politically and/or economically – stakeholders or stakeholder groups. Under this situation, a "normative consensus" (English et al., 1993; Fiorino, 1989, 1990), in which participants in the collective decision-making process willingly take on "moral action" and sacrifice personal interest for the "common good" is not likely to happen. As Ashford (2001) pointed out in their case studies on the stakeholder participation in contaminated communities, the government can either act as a *facilitator* of dispute resolution or a *trustee* for the public good in multiple stakeholder decision-making. To overcome the adverse influence of power imbalance within the task force, and in its interaction with the various stakeholders, it is important for the government to play the *trustee* role to safeguard the public interest and the accomplishment of sustainable development ideals.

Having the government acting as a trustee for public good does not imply undermining the potential of stakeholder participation. This is because stakeholder participation, and being actively involved in the discourse as well as the selection of representatives (through the setting of selection criteria that are adhered to while appointing representatives), allows the government to obtain useful information about the problems and concerns on which its eventual decisions are based. Besides, such information will help build capacity and thus empower the stakeholders. This may take the form of grassroots voluntary action, which was identified as an important strategy to, for example, promote the Building Material Information Portal and Database. Then again, by playing the trusteeship role, the government has to ensure that all such actions do not contradict the goals of the National Sustainable Development Strategy.

4.5.4 Evolution in Government's Trustee Role and the Formulation of Sustainability Law

As much as it is difficult to unambiguously define the government's role as either a trustee or facilitator in real world situations, one may expect the role of government to change, either consciously or unconsciously, during the course of policy-making. This is especially the case when lobbyists manage to influence the political stance of key government officials, so that policies are made to favor their positions. Are there safety mechanisms in place to keep this in check?

Currently, many parts of the National Sustainable Development Strategy is a not mandatory, except for legislations on, for example, air pollution. In order to ensure the effectiveness of the National Sustainable Development Strategy and that its potential is not compromised by a change in the government's role in the future, we should consider ways to develop aspects of the 5 policy transformations into regulations. That is, the transformation should progressively contribute toward a *Sustainability Law*.

In fact, a few of the suggested policy transformations must be made mandatory in order to be effective; these include the "Sustainable Concrete Aggregate" Scheme and its new standards on sustainability that import aggregates must meet and the performance standards of building materials containing recycled asphalt and/or concrete. Laws on mandatory recyclability and recycled content of concrete for specific purposes can then follow after the latter standards are accepted and promulgated.

However, the development of the other policy transformations into legislations may be more difficult and less direct. The use of material and substance flow analyses as methodologies to assess sustainability impacts will be challenged by existing methodologies such as environmental impact and cost-benefit analysis. In order for the former to be accepted as a mandatory requirement for the industry, one has to prove its superiority in assessing the impact on all the three aspects/domains of sustainable development. This in turn relies on the accuracy and authenticity of the flow data of the mining industries. Similarly, the long term effects of job diversification must be closely observed and studied, before any moves are made to demand workers to go through compulsory trade cross-training programs in their jobs or companies to offer cross-training opportunities as a form of employee welfare entitlement.

In summary, each of the 5 policy transformations we proposed should be either

- The first step toward introducing changes to the mining and recycling industries that will eventually, after intensive debate and meticulous deliberations, lead to it being written into a Sustainability Law, or
- The stage on which existing legislation is promulgated and subsequently fine-tuned, so as to achieve the concerned sustainability targets stated in the National Sustainable Development Strategies. For example, although air pollution regulations and landfill bans presently support the uptake of clean production technologies, further monitoring is needed to ensure that these regulations do not contradict the policy intentions of the other 4 policy transformations. If these are observed, this legislation will need to be revised and/or reinterpreted by the judicial arm of the government.

4.6 Policy Solutions for Improving Forest Management Policies

4.6.1 8 Goals of Desired Policy Transformations

The current forest management policies, led by Bush Healthy Forest Plan, can be further improved by the following policy transformations:

- 1) *Improve the Federal Preferred Purchase Program for recycled wood products.* The last program was shadowed by the emphasis on recycled paper. We propose including recycled wood products, such as furniture, into the list. It is worth noting that many of the new federal buildings, such as the Ronald Reagan Building, is LEED certified; and the use of recycled wood siding and certified wood are two of criteria it met.
- 2) *Implement a “Forest Grant for Sustainability” (FGS) Initiative and introduction of the concept of “Forest Loan”.* This is essentially a conditional “stepwise” opening of the Northwest protected forests that is allowed for by the Healthy Forest Plan. The idea is to encourage firms to explore ways to benefit from non-timber utilization of the forests, and using the existing forest stocks as a supplement to these efforts. The message to send across the industry is that trees should be cut down only when there is absolutely a justified need to do so. For example, if a firm applies to use 20 hectares of the protected forests, the federal and state government should consider granting it up to a cap of 10 hectares. This is called the “forest grant cap”. Such “forest grants” are issued by the government in quantum of 1 hectare (i.e. 1 “forest grant” represents 1 hectare of the protected forests). In order for the firm to earn 1 more “forest grant”, it must show how it can generate from non-timber methods a revenue equivalent to timbering 1 hectare of forest. The more non-timber revenue it can generate, the more “forest grants” it can end (up to a cap).

As the forest industry matures with this initiative, the government can reduce the “forest grant” quantum size (say, from 1 hectare to ½ hectares) while still requiring companies to pledge to non-timber revenue equivalent to 1 hectare for each grant (which is now only ½ hectare); the government can also reduce the “forest grant cap”, or even implement both these measures.

How can one work this Initiative into the current Healthy Forests Plan? Given that the industry’s pressure to open up the protected forests is overpowering, introducing the FGS to the industry at this point may not be effective. One possible strategy is to treat the forests opened up to a firm (quantified in terms of volume of timber harvested) as a type of *forest loan*, which must be returned later within the FGS Initiative. This *forest debt* can be cleared by firms pledging a *higher* non-timber revenue in order to qualify for one unit of “forest grant”. For example, a firm that harvests 200 thousand board feet of wood per year may be required to pledge a non-timber revenue equivalent to 3 hectare of timber in order to qualify for 1 “forest grant”, whereas another firm that harvests only half the amount would need to pledge to an equivalence of 1.5 hectare.

One way in which a firm can pay up such a loan is to invest in eco-tourism, by developing a certain area of the forest together with a park developer and the forest landowner. In this setup, in order for the development to meet the sustainability requirement and standards set by the government, the government should retain a trustee role; by that we mean that although the government does not have an equity in the property, all development must pass sustainability mandates laid down by the federal and state governments.

To help the current timber industry deal with more short-term challenges, we suggest that the current Healthy Forests Plan to be implemented for not more than 2 years (so that any further modifications to the ecosystem can more easily be monitored and controlled), within which special modifications are made to the current severance or income tax on the harvested timber. After two years, the FGS Initiative should be introduced into the Healthy Forests Plan.

- 3) *Encourage job diversification via the ICE Scheme.* As in the case of the aggregate virgin materials tax in Sweden and Denmark, to reduce the negative impact on employment that any change in forest industrial policies may bring about, skill-upgrading is essential to encourage workers to hold concurrent positions in related fields. An example of such a field is the recycled wood industry. However, unlike the seasonal nature of the demand for building stocks, harvested wood has wide range of uses other than for producing building materials. This implies that workers who hold two jobs cannot easily switch from one position to the other. To reduce such conflict in timing, which if left unsolved will result in workers losing confidence in the entire policy system. Our proposal is to implement the “Industries Co-Employment” (ICE) Scheme.

The objective of the ICE Scheme is to encourage firms to collaborate and discuss ways by which their operation and/or marketing can actually be integrated. Such integration allows more flexible deployment of workers between positions. Over long term, this arrangement may even allow for a gradual shift of precious human resources toward the recycling industry as it becomes more and more developed (as a result of the policy measures to be described in point 4). Employers in the ICE Scheme have the incentive of “co-paying” the employees.

A likely test bed for the ICE Scheme may be a mini mill and a recycled wood manufacturing firm. In this arrangement, the wastes of the mini mill are channeled to the latter’s plant as resources. Extrapolating this notion, the concept of Industrial Ecology may actually be used as a basis for job diversification – i.e. instead of linking industries with energy or material cascades, we link them with human resources and economic arrangements in order to yield multiple win situations.

On a similar note, the government and related agencies can also encourage the formation of consortia between researchers and industry, and different sectors in an industry, that result in entrepreneur startups to create and thus diversify jobs.

Finally, as was mentioned in the Swedish and Danish case, we must strike a balance between creating cross-employment opportunities for timber workers and retaining of jobs for incumbent workers in the industries in which these timber workers find alternate employment. Designing a job quota system may be a good starting measure.

- 4) *Promote of MFA and EFA of the recycling process of wood.* This proposed transformation is similar to our suggestion for the Swedish and Danish case. The objective is to ensure that the current process of wood recycling do not result in the uncontrolled flow of toxic additives into the waste stream, energy wastage and increase in pollutions (to the air, water and land). We suggest increased funding of research collaboration among the academic, government and industrial bodies to provide more accurate data regarding these flows and their effects on the environment.

- 5) *Continue to improve the adaptability of sustainable forest certification programs and their enforcement internationally.* The main objective is to avoid “problem shifting” to importing countries.

- 6) *Adopt more creative approaches in addressing owl conservation.* The failure of the Northwest Forest Plan to protect the Spotted Owls population is due to the lack of timely monitoring of the population. In fact, scientists are still discovering new facts about how the survival of these birds is affected by their environment. However, the Achilles’ tendon of the existing policies on owl protection lies in the failure of community efforts to confluence with the economic priority of the forest/timber industry. For example, initiatives such as the Audubon’s IBA (Important Bird Area) Program and U.S. National Wildlife Refuges emphasize too much, and at times even exclusively, on the ideology of conserving nature’s beauty in its campaign. We proposed a series of overlapping measures that can help ensure such an environmental mission positively contribute to economic gain.

The Audubon Society has many successes in its nationwide Backyard Bird Count (including the annual Christmas Bird Count) program, in which help from the general public is enlisted to keep an eye on the population of native and exotic birds. With nocturnal birds such as the Spotted Owls and their preys, this will be more challenging but not impossible. In the late 1990s, the Singapore Zoo unveiled an innovative concept in tourism, which became an instant hit – the Night Safari. Basically, this arrangement allows visitors to take a peek at the nocturnal dimensions of wild animal at close range. A similar concept could be applied to the Backyard Bird Count.

One possibility is what we called the “*Community Scientist Program*”. Special pavilions may be built in designated areas in the protected forests to provide a safe environment for volunteers to spot owls (these may even be part of a tourist attraction, when the forests are been developed into a recreation spot). Most civilians do not have the experience with, and thus should be intrigued by, the use of night vision binoculars; they could be given crash courses in the use of these equipments and co-opted as “Friends of the Owls”. By turning up and completing bird-watching assignments, they can earn points that will qualify them for some benefits, which may include free admission to national parks such as the Yosemite. More adventurous volunteers may even signed up more courses that will trained them into volunteer research assistants of scientists studying these owls. They get to go on occasional field trips with the scientists. The basic idea is to bring science to the community, who will in return enrich the science!

The media should also be engaged in certain ways. Together with community groups (such as the Audubon Society) and the independent public education bodies, media has the ability to create a more proactive image of the endangered species, which may “sell” better in the market. The Spotted Owls are always been projected as a victim of circumstances. But the general public does not understand it enough to value it. It is worth trying to portray the Spotted Owl as an asset, by a degree of characterization, in the form of a caricature and/or a mascot in appropriate national parks, i.e. Spotty the Owl. Spotty may deliver speeches or be an ambassador to interact with children during public talks at the parks. The idea is to draw commercial interest to the iconic owl and their state of survival. Once the industry sees an economic potential in supporting the conservation effort, the FGS and ICE Schemes can fall into place much more easily.

- 7) *Certifying the process of recycled wood production.* While LEED lifted the profile of certified and recycled wood products considerably, the *process* of recycled wood

manufacturing is not emphasized. This is largely due to our incomplete knowledge of the impact of the process on sustainability. Policy transformation 4 should provide us with the essential knowledge and information to establish a certification process for the process of recycling. Under this system, current recycled wood products should be categorized according to their sustainability performance and then improved upon. These products should then be advertised using the Federal Preferred Purchasing Program as the vehicle.

- 8) *Enhancing the public image of recycled wood products.* Besides depending on the Federal Preferred Purchasing Program, a building materials information portal and database (BMIPD) should also be established and publicized to the citizens at large and registered trade organizations and professionals.

4.6.2 Key Stakeholders and their Willingness, Capacity/Incentive and Opportunity to Change

- 1) *Government agencies.* Due to the range of the Northwest Forest Plan and the Northwest Economic Adjustment Initiative, we identified the following government agencies each of which has a specific role in our policy transformations:
 - a. Department of Agriculture
 - i. Forest Service
 - Forest Products Laboratory
 - ii. Natural Resources Conservation Service
 - iii. National Rural Development Partnership
 - iv. Rural Business-Cooperative Service
 - b. Department of Commerce,
 - i. International Trade Administration,
 - ii. National Technical Information Service,
 - c. Department of Labor
 - i. Bureau of Labor Statistics
 - ii. Employment and Training Administration
 - iii. Office of Small Business Programs
 - iv. Occupational Safety and Health Administration
 - v. Employment Standards Administration
 - d. Department of the Interior
 - i. National Park Service
 - ii. Bureau of Land Management (BLM)
 - iii. US Fish and Wildlife Service
 - Endangered Species Program
 - Fire Management
 - Fisheries and Habitat Conservation
 - National Conservation Training Center
 - National Wildlife Refuge System
 - Division of Bird Habitat Conservation
 - e. Department of Housing and Urban Development
 - f. Environmental Protection Agency (EPA)
 - g. National Park Foundation

- 2) *Timber and forest industries.* These include the timber companies, the American Forest & Paper Association (AF&PA), and the American Wood Council. Since the Southeastern Lumber Manufacturer Association represents independent lumber manufacturers in the southeast – which took over the majority of the timber market under the NWFP – it should be included as well.
- 3) *Support groups for independent forest landowners.* The main stakeholders are the Forest Landowner Tax Council and the Forest Landowner Association. Together they aim to provide a voice for forest landowners on national and regional issues, the Association follows every piece of legislation appearing before Congress that affects forest landowners and their property.
- 4) *Recycled wood and wood products industries.* Concerned stakeholders include the APA Engineered Wood Association, Wood Component Manufacturers Association and Wood Product Manufacturers Association, and American Institute of Timber Construction
- 5) *Labor unions.*
- 6) *Research and academic institutions.* These actors include those whose major research interest lies in timber products and those who are interested in recycled wood products. The key stakeholders are universities, Society of Wood Science and Technology, and the Forest Products Laboratory.
- 7) *Building materials suppliers, contractors, developers and owners.* They are the end consumers of building materials and are in the position to create the demand for change.
- 8) *Green building communities.* The LEED rating system plays an instrumental role in creating a growing demand for and popularity of certified wood for building construction.
- 9) *Independent educational and outreach bodies.* TPM Resource Solutions, Forest Product Society, and Certified Forest Products Council.
- 10) *Mass media*
- 11) *Standard setting and verification agencies.* American National Standards Institute,
- 12) *International groups or organization.* International Wood Products Association aims to promote and enhance trade in the imported hardwood and softwood products industry. It is supportive on the issue of sustainable forestry and products certification.
- 13) *Community conservation groups.* A good example is the Audubon Society.

These stakeholders' status quo, and their willingness, capacity/incentive and opportunity to change are succinctly discussed in Table.4.6.

Table 4.6. Detailed descriptions of key stakeholders in the United States case study.

No.	The stakeholders	Status quo	Willingness To change	Capacity/Incentive to change	Opportunity to change
1.	Government agencies, standard setting agencies	The failure of the Northwest Forest Plan and Northwest Economic Adjustment Initiative to bring about the increase in job replacement and owl population increase at the sacrifice of national timber production, the Bush Administration is compelled to implement the Healthy Forest Plan.	<p>The switch in government position is very much driven by the industry's interest as well as the pressure from the ongoing trade dispute resulting from competition from subsidized Canadian lumber.</p> <p>Any policy goals to improve overall sustainable development must address the economic and social (especially employment) aspects of the current situation.</p>	<p>The ICE Scheme and FGS Initiative actually have the potential of increasing employment opportunities in the United States, while creating additional revenue for the timber and forestry industry.</p> <p>Clinton's Administration used the Federal Preferred Purchase Program (under Executive Order 13101) and the Spotted Owl conservation as the flagship concepts to support the Forest Plan. The Bush Administration can use its Healthy Forest Plan, with major modifications as outlined in our FGS Initiative proposal, as the flagship to re-emphasize the Executive Order 13101 and support the rest of our proposals.</p>	<p>The current decreasing trend in the quality of timber industry jobs provides a good opportunity to implement a policy that addresses job creation, job security and forest fire prevention (the theme of the Healthy Forest Plan).</p> <p>The job situation also provides an opportunity to introduce our ICE Scheme to re-invent the industry.</p> <p>Furthermore, we view the relative failure of Forest Plan as a call for a more coordinated and cross-departmental political leadership to tackle the many concerns around the Healthy Forest Plan.</p>
2.	Timber and Forestry Industry	The Healthy Forests Plan provides a great potential for the industry to pick up its dwindling employment. The timber-starved industry has a high possibility of over-logging the opened forests.	<p>The industry feels stifled by the Forest Plan and expects to see quick results in a new policy.</p> <p>If the Healthy Forests Plan can be implemented as currently planned for the next 2 years, the industry may be more willing to support and try out the FGS Initiative from the 3rd year onward.</p>	<p>The capacity of a very traditional timber industry to embrace innovative policy measures is still not known.</p> <p>However, since the trade dispute with Canadian timber importers is likely to linger on, initiatives that provide alternatives to timber revenue will provide an incentive for firms to participate in our proposed policy transformations.</p>	<p>With the escalating number of visitors each year in the National Parks, tourism is a rich ground of opportunity for expansion and integration involving the traditional timber industry.</p> <p>In fact, the inclusion of timber workers may even create more opportunities for tourism industry. These can be considered under the FGS and ICE schemes.</p>

3.	<p>Forest landowners and organizations</p>	<p>Some forest landowners, in their effort to offset their property tax commitment, were known to knowingly allow premature harvesting and/or over-harvesting in their forests.</p> <p>Southeastern landowners face tax burdens due to the increased need to ensure forest health amidst increased harvesting under the Forest Plan.</p>	<p>Landowners may not be comfortable with the arrangement that the government is the “guardian” of the their forests, as described earlier under the FGS Scheme.</p> <p>The government should assure landowners that the approval process could be streamlined for those with good track records in developing their forests in a sustainable way.</p>	<p>It is reasonable to expect landowners to be concerned about how a mixed-use arrangement for their properties – as exemplified by the FGS and ICE schemes – will affect their tax commitment.</p> <p>Therefore, as long as tax incentives are provided to lessen their burden, and expertise provided to advise them on developing their forests in alternate ways, they should have the capacity to support our proposals.</p>	<p>As in the case of the timber industry, the booming tourism industry provides ample business opportunity for landowners to co-invest in various alternatives in land use.</p>
4.	<p>Recycled wood and wood products industry</p>	<p>With the introduction of the LEED rating system and forest certification schemes, wood products originated from recycled wood and sustainable forests are getting more emphasis.</p> <p>Since wood wastes are also products of paper making, the impact of paper-making to the sustainability of forests</p>	<p>An increase in investment and political emphasis on the industry will be welcomed by the industry.</p> <p>However, if policies succeed in encouraging more usage of recycled fibers in the paper-making industry, competition for this material may arise.</p>	<p>Our proposal to channel more resources into recycling industry – in terms of research funding, and human resources – should be an incentive for the industry to support our transformations.</p>	<p>More meticulous MFA/EFA of the current flow patterns of recycled wood will review opportunities to improve the industry’s overall sustainability.</p> <p>In order to translate these into opportunities for the industry to support our proposals, research efforts must address identified problem areas. For example, if some energy consuming steps of recycled wood processing are identified, the government must provide incentive in the search for and adoption of new technologies.</p>

		must be studied together.			Using the existing Agenda2121 as the tool to provide such research proposals with additional funding is a good start.
5.	Research and academic institutions	The Forest Products Laboratory, and Society of Wood Science & Technology have done many works in the application and processing of recycled wood products. More recent focus areas include the combining recycled wood fibers and plastic to form a composite.	These groups should welcome additional support for the study of flow patterns of recycled wood and carry out impact analyses of recycling activities and even the use of wood-plastic composites.	As in the case of aggregate recycling, current efforts in MFA, SFA and EFA by the academic community still have not been integrated into policy design and implementation. This makes it more difficult for the work done so far to support our cause. With increased incentives in policy related MFA/SFA/EFA research, there should be more work in these areas in the future. As a result, we expect the research community to be more able to contribute to our proposed transformations.	The points mentioned for the recycling industry apply here too. Basically, more detailed MFA/SFA/EFA can reveal previously neglected areas of sustainable use of recycled wood. This may also be the case for harvested wood. Thus, new opportunities for innovation may be revealed by these efforts, which will be effectively boosted by an increase in funding and channeling of talented human resources.
6.	Building consumers, green building associations & promoters, contractors and suppliers	As mentioned before, the LEED can be considered a big step in the direction of garnering demand-side support for certified forest and recycled wood products.	LEED is still a voluntary effort. The willingness of consumers to purchase these products will depend on their comparative costs. Currently, there are no substantial price differences between these and those made from virgin wood. We expect an effective and highly publicized Federal Preferred Purchasing program to be able to boost public image of these products. On the supply side, contractors must receive the demand signal from consumers in order to invest in these materials. In the current	Traditionally, contractors, developers and owners depend on material suppliers to provide the information on sustainable building materials products. Studies have shown that suppliers may underestimate consumers' demand for sustainable building materials. Thus, providing both sides with this information empowers them with the capacity to change.	LEED opens the way for our proposals. More outreach is needed to create more opportunity for consumers to get accustomed to the new recycled wood certification process – our 7 th proposal – and thus their true benefits. This outreach can take the form of publicized Federal Preferred Purchase Program. A more established information portal for building material – of the same nature as that prescribed for Sweden and Denmark – will also work for U.S.

		market, the Home Depot is the most prominent local retailer.		
7.	<p>International organizations on wood products and trade</p> <p>The International Wood Products Association plays an active role in endorsing various environmental policies concerning the harvesting and trading of wood.</p> <p>Their impartiality toward any of the forest certification system is required for it to further its role and enhance its leadership position.</p>	<p>We expect the IWPA to support the cause of our proposals - especially the promotion of wood recycling and further adoption of the forest certification programs.</p> <p>However, <i>process certification</i> of recycling of wood may negate some of the current claims of manufacturers and thus result in internal disputes.</p> <p>So, it is important to time the new categorization of products according to this new standard carefully. IWPA will be willing to help.</p>	<p>So far, the IWPA does not directly participate in the setting of any certification standards. With its experience in the different difficulties faced by countries or regions of different background in adopting standards set in one particular country, it has the capacity to contribute to a more flexible yet just standard.</p> <p>We believe including IWPA in the <i>process certification</i> is useful.</p>	<p>Opportunities are created by the success of the emphasis placed on recycled wood and forest protection – our 1st, 4th and 5th proposals.</p> <p>The current widespread flaw of “problem-shifting” in policy tools and neglecting of this trend in international sustainable development provide organizations such as the IWPA with a legitimate reason to address the global effect of wood trading, leveraging on the implementation of the new <i>process certification</i>.</p>
8.	<p>Independent educational bodies</p> <p>They are currently involved in different aspects of the industry. TPM Resources commit to providing consultancy services on the issues such as employee counseling, and workers’ safety practices.</p> <p>Others provide information on certification programs around the world.</p>	<p>Our proposals contain a few concepts that even these educational bodies may hesitate to support. Therefore, they should first be trained and educated in these concepts (such as job diversification) by the concerned government agencies.</p>	<p>Given their present capacities to address the various issues in the industry – most of which are employee-driven – they are expected to be able to help deal with these aspects of the policy transformation.</p> <p>An incentive may be for the government to recognize them openly as the genuinely independent educational bodies that are knowledgeable in the new policies.</p>	<p>Our proposals, especially the 3rd, 5th and 7th ones, provide an opportunity for these bodies to play new roles and provide new services to the industry. Their initial successes will play a big role in attracting more such organizations to follow suit.</p> <p>Finally, appropriate bodies can be invited to develop the Building Material Information Portal and Database (BMIPD) with the government.</p>
9.	<p>Community conservation groups</p> <p>Currently these groups, and notably the</p>	<p>Many individuals who support Audubon’s activities and mission</p>	<p>We see a great incentive for these organizations to participate in</p>	<p>We consider our 3rd proposal – job diversification – to be a good opportunity to engage in dialogue and obtain feedback.</p>

		<p>Audubon Society. adopt a very pro-environmental and pro-conservation policy stance.</p> <p>In order for them to more effectively promote their viewpoints, they must change their position to one that address all 3 domains of sustainable development.</p>	<p>may belong to advocacy groups.</p> <p>They may have a ingrained perception of how a successful conservation projects should be executed.</p> <p>To get them aboard, the essential "traditional" elements such as community activities should be included. In addition, they should be introduced to the possibility of co-developing the 3 domains concurrently. One example is to engage these members in dialogues to discuss the impact of bringing the timber industry into partnership with the eco-tourism industry.</p>	<p>stakeholder focus group meetings.</p> <p>Usually these groups have members who have the capacity or contacts in conducting studies regarding the ecosystem in question; thus they can in return boost our capacity to implement our plans</p>	<p>These organizations may provide us with the idea of the types of jobs that need to be created to ensure the long term profitability of national reserves and/or owl conservation.</p> <p>The re-projection of the endangered species – our 6th proposal – also provide the opportunities for them to participate in a meaningful and fun ways of teaching and garnering more support from the general public on owl conservation.</p> <p>Of course, volunteers can also participate in outreach activities for the BMIPD.</p>
10.	Labor Union	<p>The labor union supports the Healthy Forests Plan; in fact, several unions filed four lawsuits challenging the different aspects of the Northwest Forest Plan.</p>	<p>Our proposal to go with the Healthy Forests Plan for the first two years will serve to settle some disputes backed by the unions. However, in order for them to support the "forest loan" concept and the FGS and ICE scheme, they must be convinced that the different reasons behind the failure of Clinton's NWEAL are examined and rectified in these new programs.</p>	<p>The key determinant of gaining union support is the ability of the proposals to convince them that more jobs will be created for the affected timber workers and that the transition inherent in the job diversification process is smoothed out.</p> <p>Unions in the recycling, tourism or any industry involved in the job diversification must provide the essential information regarding possible effect on their employee members.</p> <p>As long as more jobs are created in those industries with which the timber industry integrates under the ICE Scheme, the unions will have the incentive and capacity to support our proposals.</p>	<p>The concept of job creation through diversification provides the unions with the opportunity consider the structural modification underlined in the ICE Scheme (in which a <i>co-employed</i> worker will be under two unions).</p> <p>The failure of the NWEAL also provides the opportunities to compare and contrast our ICE Scheme against the former initiative.</p>

4.6.3 Possible Barriers To Successful Policy Transformations, and Strategies to Overcome Them

4.6.3.1 Improving the Federal Preferred Purchase Program for Recycled Wood

In the present Administration, the Healthy Forests Plan may become a barrier to the widespread promotion of recycled wood by the federal government under the Preferred Purchase Program. This may explain why federal policymakers prefer to gravitate toward the adoption of LEED rating system for its new buildings, which essentially contains criteria that pertain to recycled wood products.

Since the new Administration in 2008 may have a different appreciation for the sustainability issues facing and imposed by the timber industry, we propose a concerted effort to spend the next 2 years designing a more effective Preferred Purchase Program based on a new theme – the certification of recycled wood according to its *process* – our 7th proposal. Besides giving us the required time to construct the certification system, doing so will not conflict with the essence of the Healthy Forests Plan – a conflict that we are unlikely to emerge with our plan accepted by the industry.

Of course, in order to cut down on any delay in launching the new certification scheme in the industry, as a result of industry resistance, the standards should be completed within, say, 1 ½ years and allows 3-4 months for public comments and further fine-tuning and resubmission for public comments. Besides, since the new standards may challenge existing perception of the sustainability of recycled paper – an item prominently endorsed by the federal government – we need to leave enough time for the government and paper industry to react to this change in assessment and demand.

4.6.3.2 Implementation of “Forest Grant for Sustainability” (FGS) Initiative and introduction of the concept of “Forest Loan”

As we have mentioned earlier, the first stage of the FGS Initiative can be introduced in when the new Administration took over office in 2008. Will allowing the industry to harvest the originally protected forests breed more challenges and even barriers to the successful implementation of our proposals? Yes, unless we hold the firms who invest in the logging to be responsible for the sustainable management of the harvested forests. There are two means of achieving this:

- Mandatory severance tax (which are the virgin material tax paid out for logging the trees) that are adjusted to reflect the notion that timber firms are incurring loans from the forests, or
- Conversion of a percentage of severance tax into a “debt” (“debt” because what they are using now is considered as a form of loan from the forests) with a low interest rate. For states that do not collect severance tax, income tax from timber sale can be allowed for conversion too.

The severance tax rate and “debt” rate must be adjusted accordingly so that the more entrepreneurial of firms will find it an incentive to convert some of their tax commitment into “debts”. However, the more risk-averse firms would prefer to pay the severance or income taxes

upfront, since the investment opportunities open to firms who pledge non-timber revenues in exchange for “forest grants” carry with them certain amount of risks.

In short, the concept of “forest loan” is introduced to the industry in a less threatening manner.

To facilitate the switch to a new business model that involves an integration of the traditional timber enterprise with a non-timber venture, the government must provide both financial and technical assistance (in the form of expert advice on business planning). One of the latter types of assistance may be the pairing of firms or industries – so-called industry matchmaking. For example, a recreation park developer who registers under this FGS Initiative can be paired with a timber firm to explore the opportunities of developing a certain area of the protected forests into an eco-tourism attraction. In fact, independent educational and outreach bodies, such as the TPM Resources, can be enlisted to advise timber firms to pay back their loans by investing in mergers, acquisitions or just partnership.

4.6.3.3 Encourage job diversification via the ICE Scheme

Opposition to the ICE Scheme can come from three areas: timber industry, the industry that will co-employ the timber workers, and the timber workers themselves (and their unions).

The timber industry will be afraid of losing valuable skilled timber workers to a second industry, especially in a time when the industry is starved of timber and workers are in need to cater to the projected increased outflow of timber. This fear will undermine the long-term success of the ICE Scheme. The only solution is to ensure that the forest landowners, timber firms, loggers and other related tradesmen, and related stakeholders in the alternate industry understand the real effects of the increased tax and the “forest debt” options. Workers, through the help of their unions, must understand both the risks and opportunities associated to their being co-employment in alternate industries. With incentives such as an ICE Development Fund, interested workers will be given sponsorships to defray a big portion of their education/training fee (as in the case of the re-training program put forth by the Ministry of Manpower of Singapore). If the message regarding the projected future is made very clear to the timber industry, landowners and timber companies are very likely to explore collaboration opportunities with other firms.

Industries that are expected to accept timber workers trained in new skills will resist changes if the influx of new labor threatens to displace jobs and increase unemployment amongst their incumbent labor force. To overcome this likely barrier, the government should study closely the employment situations in the industries concerned. Above all, the government should use this as a motivation to *create* new jobs to cater to new needs and provide new services. For example, there is an Annual Great Lakes IronJack and IronJill Lumberjack Decathlon, in which participant pitch their skills against one another in an array of skill contests. This concept can be further developed into a regular attraction in parks reserved for investment by timber firms who are interested to pay off their “forest debts” in exchange for “forest grants”. For example, as a tourist attraction, timber workers can find jobs as performers in the art of lumberjacking or even offer classes in saw carving and sculpture. The reserved parks may even hold an Annual Lumberjack Olympics that showcase the skills of lumberjacks and wood craftsmen from all over the world (very much similar to the annual World’s Strongest Man Competition). Alternatively, timber workers can also work as forest guides or even curators on the history of a significant piece of forestland. Learning from the failure of the NWEAI, in which case jobs created in the affected Northeast communities require technical skills very different from those acquired by timber

workers, jobs created by and within these reserved parks should offer a smoother transition from one job to another.

If the government identifies specific areas in other closely related industries as areas of potential growth with a demand for more labor, the ICE Scheme can train timber workers and match them to these jobs. An example of such an industry is the wood recycling industry. One way of avoiding a situation faced by the NWEAI, in which the training received by the trainees did not match what was required of them in the new jobs, we emphasize training on the job as far as possible. In the event that these newly-trained timber workers threaten to take jobs away from workers who are primarily trained in the skills required by the industry in question – which is unlikely, given that employers usually prefer more experienced workers – the ICE Scheme must have a mechanism to set quota for these newly-trained timber workers via specific and stringent performance criteria.

4.6.3.4 Promote of MFA, SFA and EFA of the recycling process of wood

As in the case of the aggregate industries in Sweden and Denmark, the uncertainty in, and poor availability of flow data, can crippled any good intention to further promote the MFA, SFA and EFA of the recycled industry. Nonetheless, we believe this can be effectively overcome if companies engaged in wood recycling and the use of recycled wood products are involved in the early stage of policymaking in which the government comes to a consensus with them on the need for materials and energy accounting. Besides, there is a stronger incentive for them to account for the amount of waste wood they use under the FGS Initiative, in which these companies, being a part of the wood supply chain, are required to pledge to non-timber revenue too; a way for them to fulfill this requirement is to invest in recycling technologies. If the new standards (out 7th proposal) on recycling wood are imposed too, these firms would have to account for the energy consumption of their practice too.

In short, overcoming this barrier requires the wholistic approach of executing the various proposals in synchrony with one another.

Beyond this realm, the enforcement of pollution control can also be combined with the promotion of MFA. For example, current violators of pollution standards can be given concessions on their fines if they vow to invest in a systematic program of materials accounting in their recycling efforts. As a possible strategy, the government should consider diverting an amount of tax revenue to assisting companies to implement their own materials accounting programs across the industry. It should also reward investment and innovation in cleaner production technologies through subsidies on established technologies proven to benefit the environment.

4.6.3.5 Continue to improve the adaptability of sustainable forest certification programs and their enforcement internationally

The last few years witnessed major development of the forest certification programs all around the world. Most notably, the Forest Stewardship Council (FSC) has made several significant modifications to its original sustainable forestry guidelines to accommodate widely differing conditions in the regions or countries to which the guidelines are applied. For example, the FSC decided to streamline some of the monitoring processes demanded by the original FSC standards for small and low intensity managed forest (SLIMF, now a new set of standard).

However, rivalries among these standards also resulted in the birth of competing standards, such as the Sustainable Forest Initiative (SFI), which is currently favored by the forestry/timber industry. FSC and SFI are on the opposite end on the sustainability goals stringency spectrum, in that the former contains more and more specific criteria for meeting sustainability standards. In fact, accredited certifiers under each of these certification schemes may also have their own schemes. For example, the Scientific Certification System (SCS) Forest Certification Program recommends both FSC and their re-instated SCS Independent System to their clients; the latter of which is aimed to offer their clients an alternative to potentially polarizing schemes¹⁶.

Having a non-partisan information processing and dissipation system that firms can rely on for advice on certification schemes plays a pivotal role in motivating healthy competitions between the different schemes. The Certified Forest Products Council (CFPC) plays that role in the United States (Forest Certification Resource Center, 2005). However, all the 5 systems suggested by CFPC are voluntary. This situation is similar to the current situation of the LEED rating system for sustainable building design. This thus reminds us of a similar remark made earlier – that the government should explore the possibility of making sustainability standards mandatory. However, the case of forestry is much more complicated than with sustainable building design; unless the government can settle the major challenges that many firms faced while trying to abide by FSC (which later led to the inception of the SFI and much later on, the SCS Independent Scheme), formulating a legislature is impossible.

The solution to this challenge is to have an independent government body to perform the following functions:

- Set minimum standards that firms must satisfy in all three domains: economy, environment and social equity; however, firms are allowed to use any of the 5 certification schemes in the market as long as the minimum targets are met;
- Set new guidelines that allows firms to use *different* certification for different domains and even different indicators within the domains.

Besides spurring healthy competition among, and improvements within, the various certification schemes, these policy measures will prevent certification schemes (which come in a package form) from being designed too stringently so as to justify more costly consultation and processing by any of the candidate schemes.

In short, by passing a legislature that requires forest certification, yet keeping the legal choice of schemes flexible and even unbundled, we can ensure that firms do not suffer as a result of profiteering and that more innovation can occur as a result of this ensuing healthy competition.

4.6.3.6 Adopt more creative approaches in addressing owl conservation

Any initial resistance on the part of the academic community to embrace the “Community Scientist Program” could be addressed and even eradicated by referral to the well-documented success of the Audubon Society’s program. The government should engage the academic community, Audubon Society and other conservation societies in multilateral meetings with business representatives, since the key to success of this proposal is the involvement of the

¹⁶ Personal communication with Dr Robert Hrubec of SCS, and Mr. Daniel Simonds of SGS Systems and Services Certification, Inc.

industry in the “Community Scientist Program” and “Spotty the Owl”. To be more specific, under the FGS Initiative, firms should be given the option to invest in these plans, which can be included as visitor attractions in reserved parks. For example, a tourist from Germany may be offered a special “Spotty the Owl” tour package in one of the reserved parks, in which he/she gets to try out the adventure of spotting owls in specially designed pavilions. Besides, he will earn discounts at local restaurants if he is able to devote 1 full hour of his time helping with owl observation. Similar perks can be provided to encourage more active participations for visitors of different age groups.

In short, “Spotty the Owl” can be marketed into a mascot, much like the role designed for Mickey Mouse by Walt Disney, which embodies both educational/public outreach mandates and economic values. We believe this will effectively remove identified barriers that the industry & business communities, Audubon Society and the academic community may pose to the realization of this proposal. With such a correlation, the FGS and ICE Schemes are effectively integrated into this proposal.

4.6.3.7 Certifying the process of recycled wood production

Through its Chain-of-Custody certification program, FSC hopes to ensure that companies that process, transform or trade wood can individually ascertain that the wood involved is FSC certified. SCS Independent also has a similar component that examines the way the sustainability attributes are passed from one stakeholder to another along the supply chain. However, all these certification schemes focus on validating the practice of forestry at the source – the forests themselves. They do not address the sustainability of the entire lifecycle of the wood products insofar as material and energy are concerned. So, the common conception that standards like FSC plays the main role in sustainable wood is not correct. This creates a case for having a certification that concentrates on the production of recycled wood products.

The biggest barrier to implementing this proposal is the lack of rigorous data on energy and materials/substance flow in the recycling industry. Recall that we mentioned that the timber industry is allowed to have their investment in the recycling industry count toward their non-timber revenue pledge. Specifically, investing seed money into MFA, SFA and EFA researches qualifies for such a pledge.

Since EFA and MFA information essentially involves mapping out the entire industry network of energy and material exchange paths respectively, any policy change aiming at improving the sustainability of the current flow will modify this flow pattern, which in turn requires the firms to change their operations. These are big challenges, especially as each firm or sector is required to make different types of change. Basically, different types of approach must be planned to cater to each scenario. For example, the technologies used by older firms may require upgrading, in order to conserve more energy. Or, the treatment of black liquor by paper mills may not meet current standards.

What these firms need is individualized consultancy service that helps them resolve individual gridlocks in their operation. The government could either form a new outreach unit for this purpose or co-opt outreach agencies, such as TPM Resource Solutions and Forest Product Society, to perform such a consultant role. The incentive for firms to improve their performance is having their products upgraded according to the new certification standards.

4.6.3.8 *Enhancing the public image of recycled wood product.*

Recycled content wood products are already widely in use. To further increase the usefulness of the proposed BMIPD, the implication of the new classification should be emphasized in it. One of the best ways of highlighting these classified products is to qualify their use in the LEED system; that is, products that are classified as of a better “grade” will receive more points under the LEED system.

4.6.4 *Strategy to Engage the Stakeholders*

In table.4.7, we detail the ways by which the different stakeholders relevant to each of the 8 goal transformations described can be engaged, via the list of different methods presented in section 1.3.3. As in the previous cases, the types of stakeholder participation tools utilized are highlighted in italic in table 4.7.

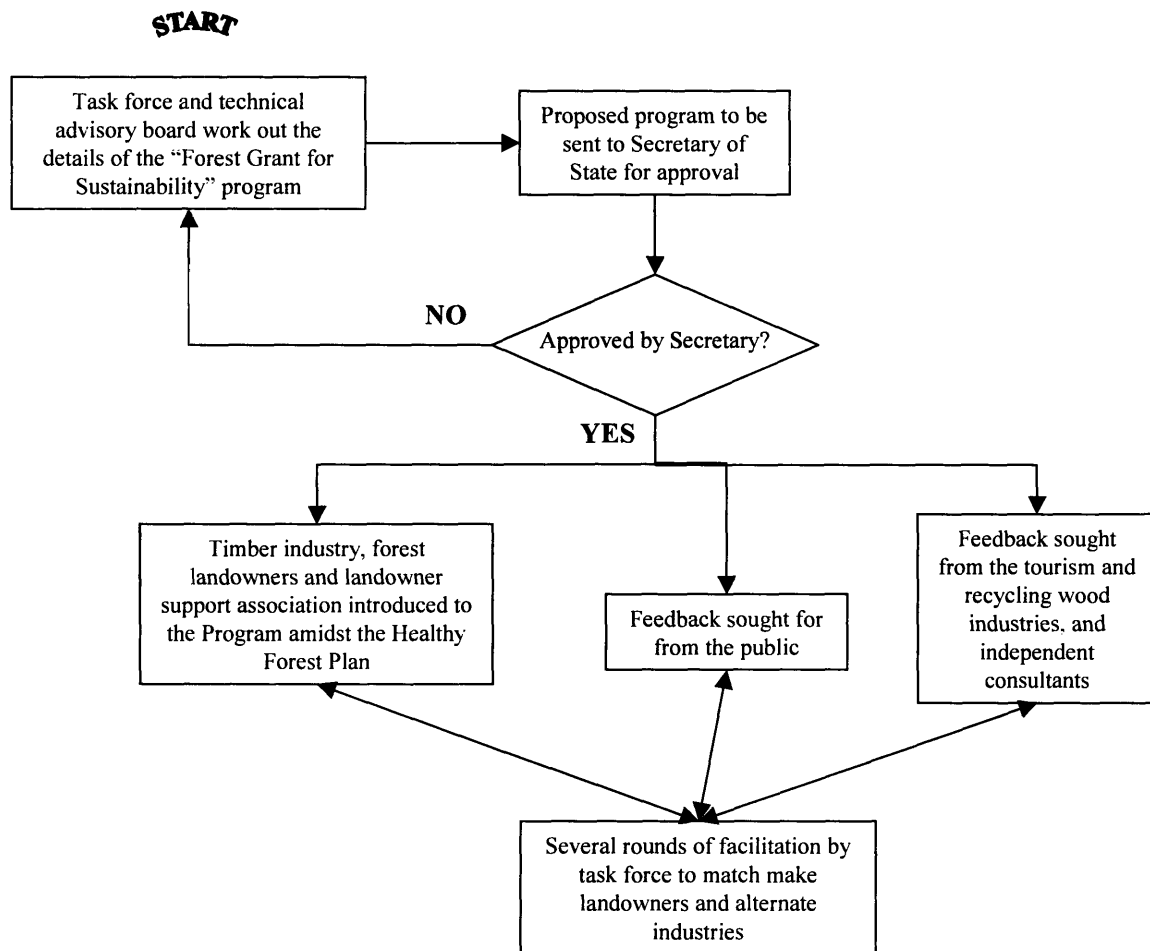


Fig.4.14. Implementation of “Forest Grant for Sustainability” (FGS) Initiative and introduction of the concept of “Forest Loan”. The double-headed arrows signify feedback mechanisms.

Table 4.7. Summary of stakeholder interaction and engagement strategies.

No.	Target Policy Transformations	Stakeholders involved	Comments on tools and methods of engagement
1.	Improving the Federal Preferred Purchase Program for Recycled Wood	EPA, DOE, Department of Commerce, Department of Labor, Department of the Interior, Department of Housing and Urban Development, National Park Foundation	<p>We propose that the EPA play the leadership role and act as the key government representative in:</p> <ol style="list-style-type: none"> 1) Coordinating the different government agencies in their effort to promote purchasing of recycled wood products within their agencies. 2) Forming an alliance with these agencies through a series of internal meetings. This will compose the central committee of the task force, which will be made up of key 'bridging' individuals drawn from the different stakeholder groups. <p>Although technically speaking establishing the task force can proceed without reaching a consensus amongst these key government agencies on improving the Federal Preferred Purchase Program for recycled wood, we stress the importance of using this as a 'litmus test' for deciding the composition of the central committee as well as testing the resolve of the committee, or the different agencies, in addressing the issue of sustainability as a whole.</p> <p>The success of this Program is very important as it can be widely portrayed as how the government can in fact work together as an united front in sustainability issue; this will give them greater credentials as leaders in spearheading the following policy proposals.</p>

2.	Implementation of "Forest Grant for Sustainability" (FGS) Initiative and introduction of the concept of "Forest Loan"	Task force, timber companies, forest landowners, support groups for landowners, recycled wood industry, labor unions, community-based conservation groups	<p>These steps should be executed in this order:</p> <ol style="list-style-type: none"> 1) The task force shall propose and work out the technical details of the "forest grants" and "forest debts" to its technical advisory board. The size of the "forest grants" and the acceptable non-timber revenue pledge must be worked out within this group. 2) After that, the plans would be presented to the Secretary of State for approval. 3) The timber industry, landowners and their support groups should then be introduced to these ideas from the outset of the Healthy Forest Plan by the task force. Feedback is sought for. 4) Concurrently as point 3., the public opinion is sought for in two ways: <ol style="list-style-type: none"> a. Publication in <i>federal register</i>; b. <i>Community meetings</i> in townships or cities in which timber plays a big economic role.
			<ol style="list-style-type: none"> 5) Task force should then facilitate or match make the meetings between timber companies and firms in those industries in which the former may invest in to commit to their non-timber revenue pledges. Such <i>focus group meetings</i> may involve the tourism or recycling industries. Task force should provide <i>expert advice</i> on the accounting for the revenue that such joint venture will accrue. Independent education groups such as the TPM Resources Solutions should also be involved. Several rounds of facilitation may be required before a strategic partnership between the industries are established and reinforced. <p>A summary of these steps is presented in fig. 4. 14.</p>

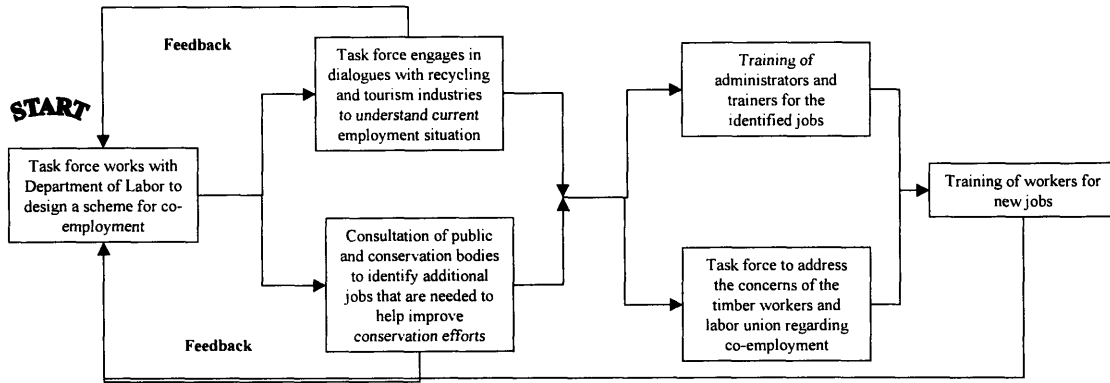


Fig.4.15. Diversification of jobs via the Industry Co-Employment (ICE) Scheme. Feedback is needed to ensure that information gathered at the dialogue sessions helps to finetune the planning of the co-employment scheme.

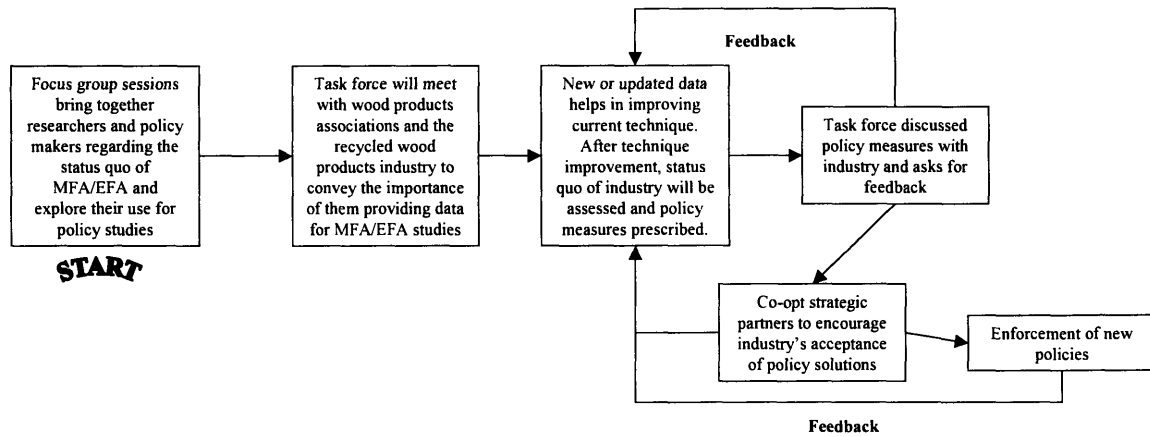


Fig.4.16. Promotion of material flow analysis and energy flow analysis as tools for sustainable development policymaking.

3.	Encourage job diversification with the ICE Scheme	Task force, Department of Labor, public, tourism industry, conservation groups, recycling industry	<p>1) The task force needs to work out a scheme with the Department of Labor that allows for firms to co-employ workers and workers to be trained.</p> <p>2) Next, the task force has to discuss with both the recycling and tourism industries to decide the nature and number of new jobs that can be created without affecting the employability of existing employees in these industries.</p> <p>At the same time, feedback from the public should be sought for by the task force and conservation groups to identify new jobs that can be created and thus improve the national parks.</p> <p>3) Training of instructors and administrators for these identified jobs should follow.</p> <p>4) Concurrently as point 3, the labor union and trade associations and independent outreach groups should be approached for opinion and suggestions based on the types of job vacancies for timber workers identified.</p> <p>5) Conducting of <i>seminars</i> to attract, and subsequently train, timber workers to register for training classes.</p> <p>A summary of these steps is presented in fig.4.15</p>
----	---	--	---

<p>4. Promote materials flow and impact analyses.</p>	<p>Task force, academic and industry research</p>	<p>1) The task force must conduct <i>focus group sessions or seminars</i> to bring together relevant government agencies and the research community. The academic community must be involved at this stage too. The objective is to fully familiarize with the real potential of existing technique, and to identify goals for their improvement. Note that <i>scenario analyses</i> should be used to help researchers identify weaknesses of current techniques.</p> <p>2) Next, the various wood product associations and the industry representatives should be involved in <i>special focus group meetings</i> with the task force to discuss likely impact of this policy goal on the industry and the need for them to provide accurate data for research. At this stage, it is essential for the task force to accurately communicate to them the essence of all the 8 policy goals. This in turn will motivate them to think widely in their assessment of our new policy initiatives.</p> <p>3) After the academic units obtain and confirm data on the material and energy flows in wood recycling, task force needs to hold <i>seminars and brainstorming sessions</i> to discuss on ways to improve present technique based on the information and flow simulation results.</p> <p>4) Based on the new technique, status quo of industry flows is assessed and policy measures are designed to rectify the identified problems.</p> <p>5) Task force and research representatives then meet with industry stakeholders to present and gather feedback on policy measures</p> <p>6) To 'ease' the industry into the policy changes, the government can co-opt those recycled wood companies who are willing to be pioneers of change as strategic partners. Federal agencies would be required to purchase all designated recycled products from these partners. One of the criteria of these partners is to implement the operation modifications according to the policy recommendations coming out from the MFA/EFA research.</p> <p>7) Proposed to congress the use of MFA/EFA as a legitimate impact analysis tool. Enforce new policies.</p> <p>The summary of these steps is shown in fig.4.16</p>
---	---	---

5.	<p>Improve the adaptability of sustainable forest certification programs through unbundling, setting of sustainability standards, stimulating of competitions and new legislature.</p>	<p>Task force, current certification agencies, certifiers, Certified Forest Products Councils (CFPC), industry, trade associations, community conservation groups, public, educational agencies (including agencies such as the TPM Resources Solutions)</p>	<p>1) Existing certifications require “bundling” of services – that is, organizations seeking certification are either certified or otherwise. The task force leads the charge for unbundling certification. It should begin an independent industry- and nation-wide effort to seek opinion on the definition of “sustainability”.</p> <p>2) The task force then decides on the eventual definition of “sustainability” based on these feedbacks. Together with its technical consultants, including the CFPC, the task force should re-examine the contents of all current certifications.</p> <p>3) Engage certification companies in discussions about unbundling and improving their systems.</p> <p>4) Once the task force and technical advisory board determine the minimum acceptable performance in sustainability, they will propose the plan to Congress, to be adopted as a new legislature to demand industry to meet minimum standards in forest management and productions.</p> <p>These steps are summarized in fig.4.17.</p>
----	--	--	--

6.	<p>Certifying the process of recycled wood production</p>	<p>Task force, certifiers, Certified Forest Products Councils (CFPC), recycled wood products industry, trade associations, education agencies (including agencies such as the TPM Resources Solutions)</p>	<p>1) With the data and information from the MFA and SFA researches conducted for our 4th proposal above, the current products should be classified according to a certification system – a system created and administered under the EPA directly.</p> <p>2) The task force would meet with the CFPC, industry, trade associations and educational agencies and explain the rationale behind the need for certification.</p> <p>3) With the support of stakeholder “bridges” and education and consultant agencies, the task force will formally and openly endorse products that are certified as having satisfied these performance standards. These products will receive an attention under the new Federal Preferred Purchase Program that is comparable to the rating they obtain on this certification system.</p> <p>These steps are summarized in fig.4.18</p>
----	---	--	---

7.	Enhancing the public image of recycled wood products	Task force, LEED certifiers, Certified Forest Products Councils (CFPC), recycled wood products industry, trade associations, educational agencies (including agencies such as the TPM Resources Solutions)	<p>1/ The combination of a certification process for the recycling of wood and improvement of MF/VEFA research – is an effective form of enhancing image of graded recycled wood products.</p> <p>2/ To ensure higher effectiveness, the task force will negotiate with the Green Building Council to include certified recycled wood into the LEED criteria.</p> <p>3/ Further expand the availability of certified wood products in the market by co-opting more retailers and wholesalers into the Federal Preferred Purchase list.</p>
8.	Adopting more creative approaches in addressing owl conservation	Task force, public, conservation groups, timber industry, landowners, tourism industry	<p>1) Task force should consult independent marketing and entertainment consultants to create a new image for the Spotted Owls and other endangered species.</p> <p>2) At the same time as 1, task force should engage academic (i.e. conservation and ecological) communities in planning “Community Scientist” program. Experience from corporations like Walt Disney may be useful too.</p> <p>3) At the same time as point 5 of the implementation of FGS Initiative and “forest grant” concepts, the “Community Scientist” and “Spotty The Owl” concepts should be revealed to the business community for consideration as a candidate for investment to satisfy the non-timber revenue obligation.</p> <p>4) Task force should, through its industry stakeholder “bridges”, play and maintain its active role in helping the timber industry integrate into the industries in which they have chosen to invest. At this point, specially designated agencies such as the TPM Resources Solutions can provide extra help. The government should also establish more affiliated consultants to provide such services.</p> <p>These steps are summarized in fig.4.19.</p>

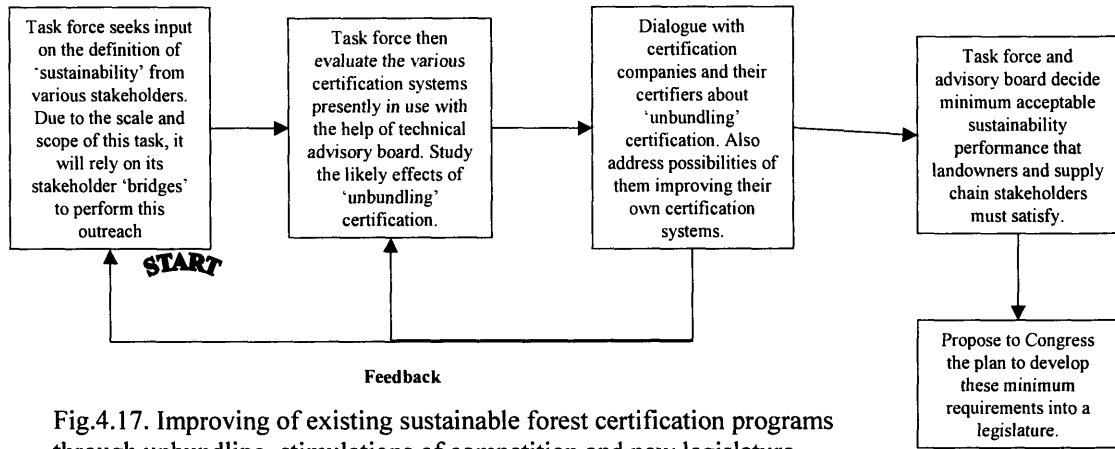


Fig.4.17. Improving of existing sustainable forest certification programs through unbundling, stimulations of competition and new legislature.

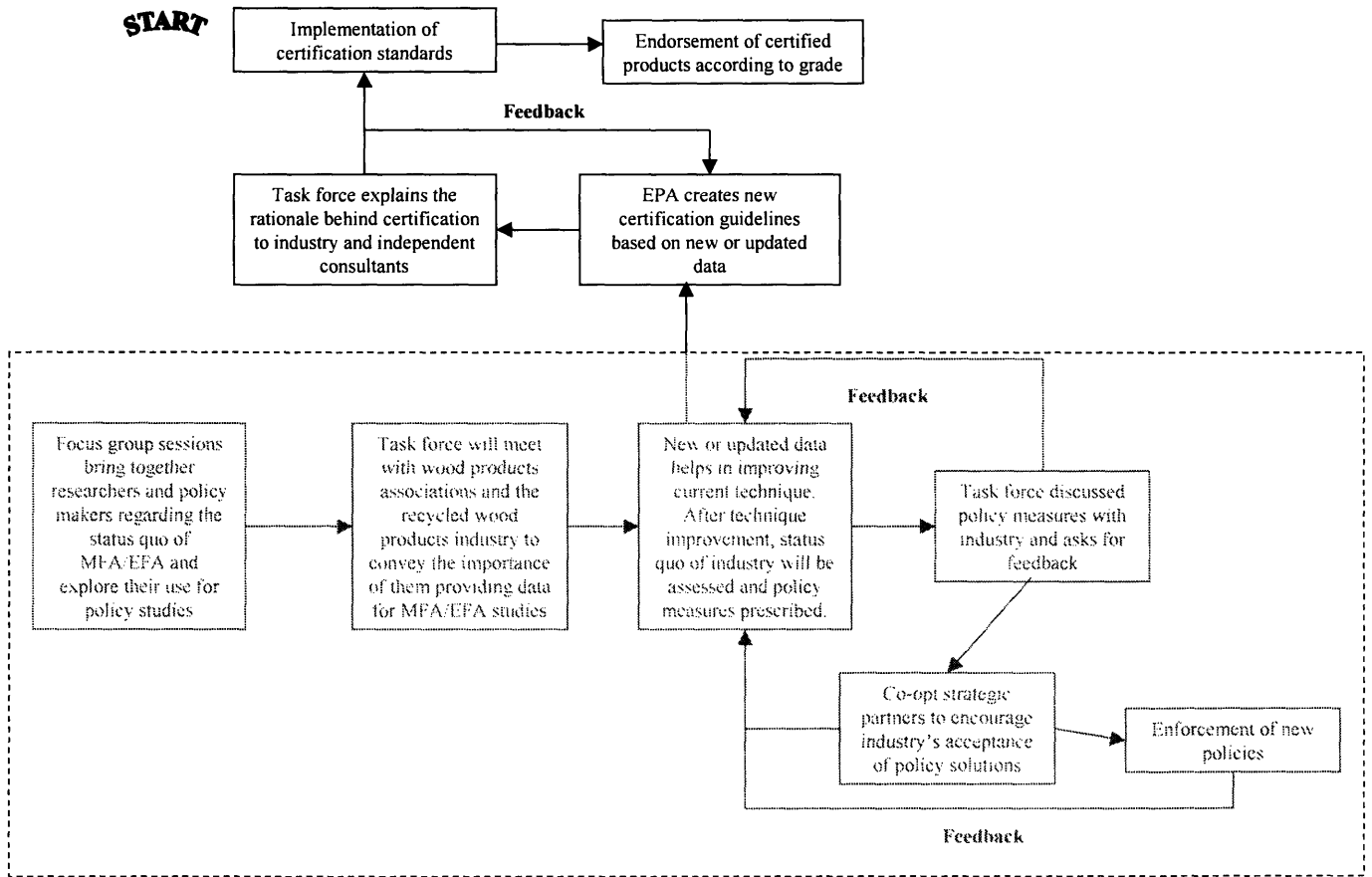


Fig.4.18. The certification of recycling process and recycled products is linked to the promotion of MFA and EAF (i.e. our 4th proposal).

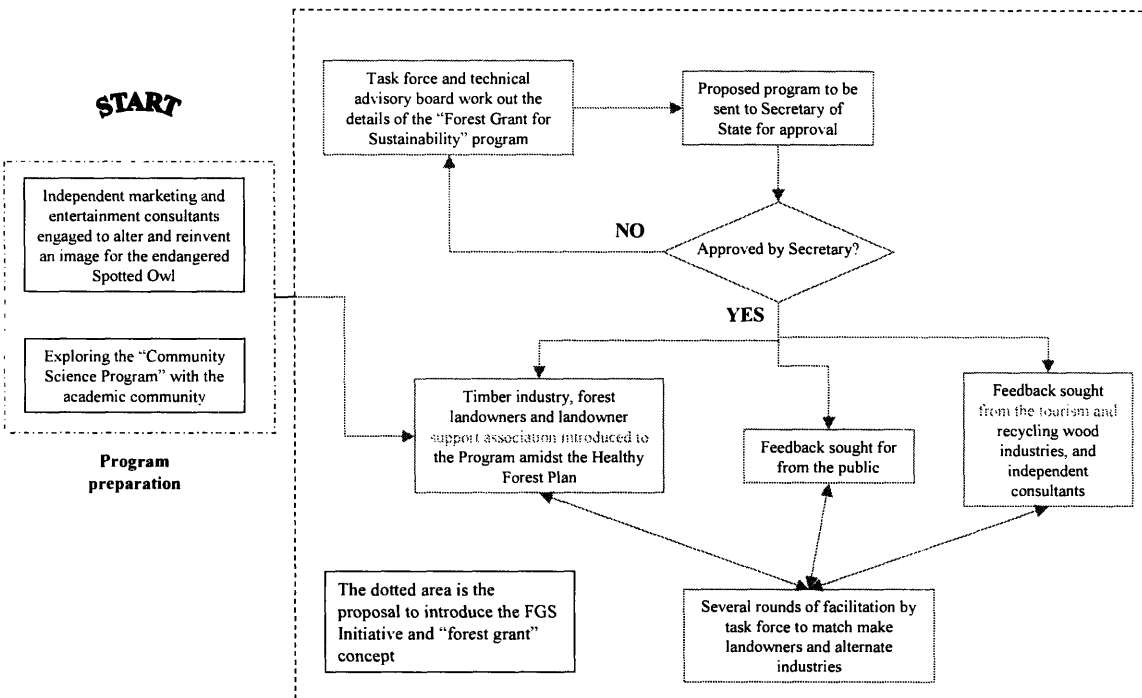


Fig.4.19. Adopting a more creative and market-driven (yet mutually beneficial) strategy to owl preservation. Its link with the introduction of FGS Initiative and “forest grant” concept is also shown.

As one may realize from table 4.6 above, the 8 different policy transformations involve substantial overlapping of key stakeholder groups. This may in fact be a strength of these policy transformation proposals, as these stakeholder groups may be better poised to see the ‘big picture’ and thus understand the rationale as well as relation among the 8 proposals.

4.6.5 *The Challenges in Balancing between the Industry’s Influence and Government’s Trustee Role for the Public Good*

In response to the aftermath of Clinton’s Northwest Forest Plan (NFP) and Northwest Economic Adjustment Initiative (NWEAI), the Bush’s Administration put forth the Healthy Forest Plan. This move to an extent is driven by the industry’s disappointment with the NFP and NWEAI. Given this situation, it will be a big challenge for us to introduce the “forest loan” concept. This is even more so considering that the current forest- and timber-related tax needs to be increased to draw attention to the “forest loan” itself, so that companies will commit to pledging non-timber revenue to repay the “forest debts” as well as to earn “forest credits”. Taken as a whole, aspects of our 8-policy package bear resemblance to Clinton’s NWEAI, which will bring back old, bad memory for some policymakers and industry stakeholders.

The current situation will develop into one in which industry interest may override the government’s leadership role in forest management and wildlife preservation matters.

In the light of these challenges, we believe one of the key strategies to marry the government’s need to assume the trustee role for the public good and the industry’s dominant

concern for the bottom line is to strategically plan the order of execution of our 8 proposals. These proposals require the government to play its trustee role in order to be successful.

As much as it is important to have technological demonstration projects before introducing large-scale innovation to the industry, we should introduce the timber industry to the benefits that an innovative marriage between their conventional business approach and other non-timber endeavors will bring. Smaller companies are expected to be more receptive to such propositions, provided sufficient and effectual supports are made available to them. To motivate these smaller enterprises to take the first step out of their comfort zone, the government, with the help of the task force, must concentrate their efforts on coming out with a viable business plan surrounding eco-tourism and the recycling industry. That is, our 8th proposal – reinventing and marketing a new image for the victimized Spotted Owl and exploring the “Community Science Program” – should be the first step to take. Furthermore, these innovative programs involve a very wide range of stakeholder groups and thus may serve to ‘warm them up’ for greater commitment in the future in the other proposals.

Once these enterprises participate in these programs, they must be very widely publicized as a model for enterprise community involvement – an example of corporate social responsibility; also, any economic success must be acknowledged and widely publicized in order to draw attention to the profit potentials of such collaborations. Once the government has shown the industry ‘a way out’, the increase in timber-related taxes and the “forest loan” concept will be better received when they are introduced subsequently. The rest of the policy proposals can be implemented as follow-up measures.

4.7 Policy Solutions for the Use of Waste as Fuels for Cement Production in the United States

4.7.1 4 Goals of Desired Policy Transformations

We believe the following policy transformations would rectify the problems described in our third case study:

- 1) *Demonstration and public outreach project led by the scientific advisory board.* The most salient point in this case study is that many scientific studies have revealed that the composition of emissions from cement plants that utilize waste as fuels are highly dependent on the dynamics and stoichiometry of chemical components found in the waste and the clinkers, as well as the conditions under which such reactions occur. These conditions and components can vary over a wide range even for a particular cement plant. In other words, science is not very exact. This leaves an ideological loophole for different stakeholders to knowingly select the facts that support their preferred agenda. Then again, stakeholders who are not exposed to both sides of the story are in danger of either being misguided by what they know or misled by those who are biased.

In the same spirit as the policy proposals for the previous two cases, a *cross-agency task force* should be in-charged of engaging a scientific advisory board to study the *degree of variability of emission data with the chemical composition of the waste and clinker, as well as changes in the combustion conditions in actual cement kilns*. This is different from the conventional tests carried out by both the US's EPA and UK's EA, in which the objectives were to absolutely determine if a certain waste fuel is harmful or otherwise. In other words, the advisory board should lead a large scale and thorough study to find out the different combinations of chemical parameters and combustion conditions under which even the most harmless waste fuels will be harmful.

As a follow-up, the board should make the results of the study available to all interested stakeholders, including members of the public. This may take the form of proactively inviting these stakeholders (including the public, at appropriate times) to visit the plants and laboratories at which these tests are carried out, and holding specialized seminars to disseminate the information generated through such studies.

The board should also explore into methods of improving the energy efficiency of cement kilns. A good start is to conduct walk-about to correct any errors in energy managements. For this purpose, professional energy service companies can be co-opted into the board to perform this job. Cement plants that have successfully implemented these energy conservation measures should also be invited to become demonstration projects/firms. In other words, firms that perform well should be openly commended.

- 2) *"Green Fuel Innovation" Credit/Permit Scheme and the "Credit Banking" System.* The concept of EPA's Comparable Fuel Exclusion is adopted, with the objective to select and approve fuels that can outperform current fossil fuels with reduced pollution. Benchmark fuels can be adopted from the list approved under the Comparable Fuel Exclusion rule. While current emission standards are based only on the former, comparisons are to be made between their rates of pollutant emission *and* the absolute amounts of these pollutants. Innovations in

techniques (and not just in technologies) are emphasized; credits are to be given according to the types and levels of such innovation. The fuel permitting flow chart is again show in fig.4.20.

This fuel-permitting process may be introduced in the form of Supplementary Environmental Project (SEP) as a condition for firms to have their penalties for pollution violations reduced by the federal and state governments. Firms that are not violators of these regulations may also apply to embark on this fuel-permitting process as an innovation waiver, in exchange for more time to adopt a certain pollution reduction guideline as required by the government.

An idea of using these “green fuel innovation” credits is to channel them into company accounts with the appropriate regulating bodies, as a kind of rotating fund reserved for future research and development projects. This will require EPA or the appropriate agency to set up such a “credit banking” system for this special purpose. In order for this credit system to benefit more firms and encourage the newer firms to adopt the fuel-permitting process, firms with extra credits are allowed to sell them away. The government should have a degree of control over the pricing of these extra credits, as free market mechanisms may invariably force the smaller firms – those that may be the sources of disruptive innovations – out of the competitions for these credits.

- 3) *Corporate Responsibility in Reporting Emission Data and Facility Clean-Emission Index.* One of the more common tools that reflect corporate responsibility toward sustainable development is the voluntary reporting scheme. A good example is the reporting protocol created by the Global Reporting Initiative (GRI) that was adopted by many companies around the world. The accessibility of information to the public, regarding the emission performance of plants using substitute fuels, is just as important. In order to encourage more firms to voluntarily report environmental performance, we suggest that regulating bodies provide additional “green fuel innovation” credits for firms that are permitted to use substitute fuels to openly provide data on their improvement. A more frequent reporting scheme is preferred.

As we have elaborated in Annex III, real time reporting on companies’ and regulating bodies websites are the most direct public outreach and reporting methods. This policy will supplement the “green fuel innovation” scheme and encourage firms to be more vigilant with their emission records. Above all, it also requires firms to ensure that their facilities operate under those conditions – as determined and demonstrated by the selected science advisory board – under which emissions are most likely to be reduced. In fact, by constantly reporting emission data, participating firms serve as ongoing demonstration projects that help to enrich the database set up by the science advisory board, which can be utilized to provide valuable information for new firms that are trying to reduce pollutions and/or try out the “green fuel innovation” scheme.

- 4) *“Green Fuel Innovation” Credit Multiplier Scheme and Waste Production Tax – reinforcing energy efficiency and waste reduction in the industrial network.* Imagine this future scenario: cement plants and certain chemical factories manage to, after many years of trials under the auspice of a successful “green fuel innovation” scheme, establish a profitable partnership with one another. This creates an efficient materials exchange network linking up these plants – the ideal of industrial ecology or industrial symbiosis. There are however inherent dangers in this alliance. As discussed at length by scholars such as O’Rourke, Connelly, Koshland (O’Rourke et al., 1996) Ashford and Cote (Ashford, Cote, 1997), this arrangement may “stiffen the industrial structure and impede process innovation”; that is, the “green fuel innovation” scheme may be degraded into an innovation impedance as a result of its success.

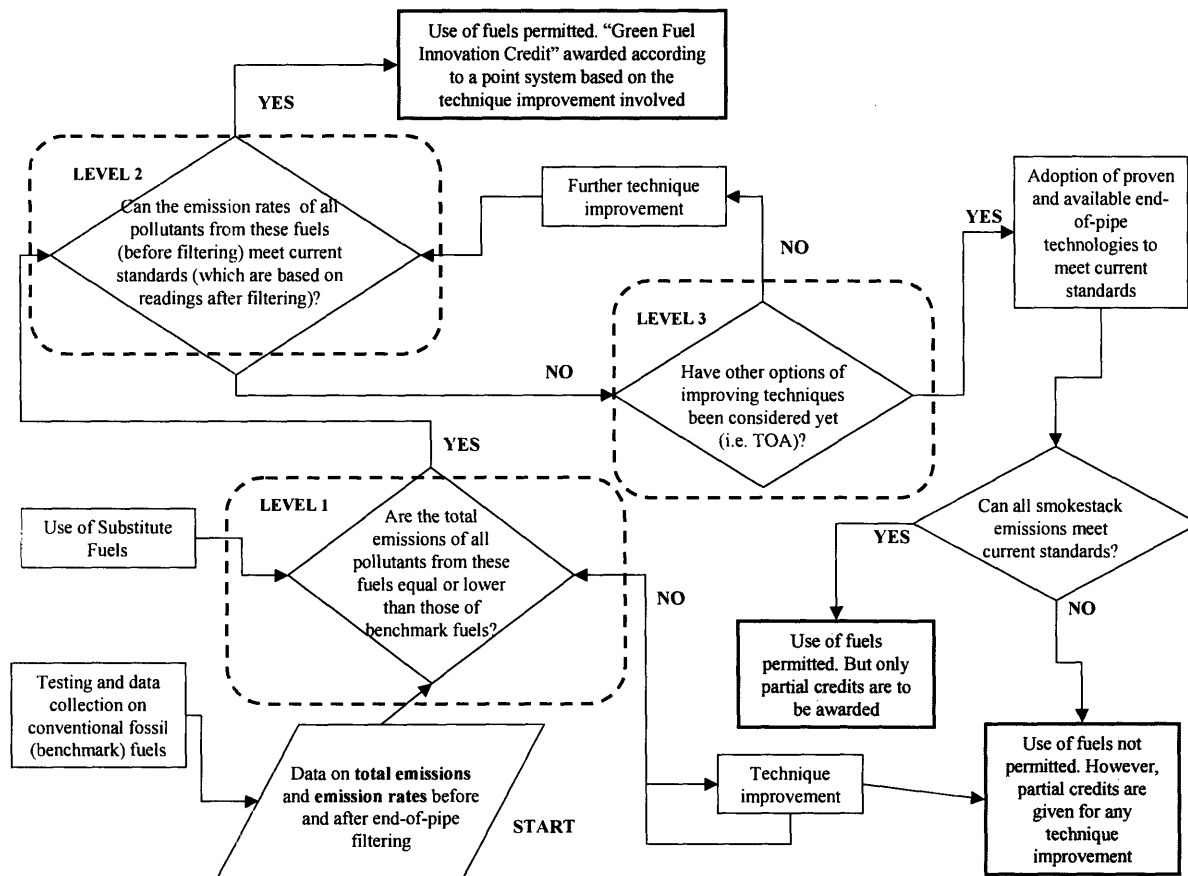


Fig.4.20. The “green fuel innovation” credit fuel-permitting process.

Besides, firms may settle themselves into a comfort zone in which there exists an economic incentive *not to reduce waste production in the first place!*

The government thus needs to send the right message to these firms from the outset. Waste production and disposal should be discouraged, with the emphasis that the reuse of waste for cement production should only be treated as the final resort, even if these cement kilns adhere to the guidelines of the “green fuel innovation” scheme. On the part of the cement kilns, government should step up on any effort to motivate and/or mandate energy efficiency and reuse of salvaged building materials.

Before waste reduction can materialize over a large scale, the government should provide sufficient incentives for waste producing firms to undertake innovative practices to reduce the toxicity in their wastes, especially in view of their subsequent use as fuels. If these firms can prove that they have carried out the necessary innovations, they will be awarded “green fuel innovation” credit as well, just like the cement producers. However, if both parties – the waste-producing firms and waste-utilizing cement plants – can prove that the cleaner use of the industrial wastes are a result of an innovative collaborations between them, both parties will earn *extra credits* under the Credit Multiplier Scheme. In other words, we hope to encourage firms to enter a sustainability-driven partnership that mutually improves each of

their operation and services. Note that the flow chart in fig.4.20 depicts that partial credits could be awarded to cement firms for their attempts to improve waste-fuel operation related technique even if the fuels are not approved eventually. Under the Credit Multiplier Scheme, waste-producing companies that contribute to these efforts will also be given equal credits as the cement firms concerned.

However, once the production rate of the waste, which is been approved under the fuel-permitting process to be used in the cement kilns, *exceeds certain pre-determined limits*, waste-producing firms will be subjected to a *Waste Production Tax*. In fact, beyond this crucial pre-determined waste limits, firms will not receive as many credits, if at all, under the “green fuel innovation” scheme and the Credit Multiplier Scheme.

With these 4 strategies in mind, the roles of the scientific advisory board of the government can be summarized as having the following components:

- Study the variability of the combustion conditions under which waste fuels are subjected and organize demonstration projects for outreach purposes;
- Conduct energy efficiency studies and consultancy for cement firms;
- Serve as referees for the “green fuel innovation” permitting procedures.
- Assist interested firms in the assessment of their fuels of choice.
- Suggest ways for waste producing industries to reduce their wastes;
- Study the possible repercussions of a reduction in the waste stream that flows from the waste-producing industries to the cement plants; this include identifying the alternate paths of waste flows and determining/estimating how these alternate flows can be affected by the “green fuel innovation” scheme. The effects that the Waste Production Tax has on the way resources and wastes are re-used within the firms must also be examined.

4.7.2 Key Stakeholders and their Willingness, Capacity/Incentive and Opportunity to Change

We identified the key stakeholders as follow:

- 1) *Government agencies*. Presently only the EPA is involved in this matter. In order for the 4 proposed policy transformations to be successful, participation by the following agencies are essential:
 - a. Economic Development Administration,
 - b. Department of Labor (especially the Occupational Safety and Health Administration),
 - c. Department of Energy
 - i. Energy Efficiency and Renewable Energy Office
 - ii. Energy Information Agency
 - iii. Office of Environment, Safety and Health
 - iv. Agency for Toxic Substances and Disease Registry
 - v. Office of Solid Wastes
 - d. Department of Health and Human Services
 - i. Office of Environment, Safety and Health
 - ii. Agency for Toxic Substances and Disease Registry
 - iii. National Institutes of Health
 - e. Chemical Safety and hazard Investigation Board

- 2) *Cement producers and trade associations.* The following organizations are the key stakeholders who will play crucial roles in our policies reform:
 - a. The Portland Cement Association represents cement companies in the United States and Canada. It conducts market development, engineering, research, education, and public affairs programs.
 - b. The Cement Kiln Recycling Coalition (CKRC) is a trade association which represents U.S. cement companies currently using waste-derived fuels, as well as those companies involved in the collection, processing, management, and marketing of such fuels for use in cement kilns.

- 3) *Waste producers and respective trade associations.* Firms that produce wastes that cement companies can use for their operation fall into this category. In particular, these stakeholders play the most crucial role:
 - a. Tire Industry Association (TIA) is an international association representing all segments of the tire industry, including those that manufacture, repair, recycle, sell, service or use new or re-treaded tires, and also those suppliers or individuals who furnish equipment, material or services to the industry. Tires are among the most common waste fuel for cement kilns.
 - b. The Society of the Plastics Industry is a trade association representing the entire plastics industry supply chain, including processors, machinery and equipment manufacturers and raw material suppliers in the United States.
 - c. The Waste Policy Center is an environmental consulting and communications organization, primarily dealing with solid waste issues.
 - d. Air and Waste Management Association (A&WMA) is a professional organization that provides training, information, and networking opportunities to thousands of environmental professionals in a number of different countries.
 - e. National Solid Wastes Management Association is a trade association representing for-profit companies in North America that provide solid, hazardous and medical waste collection, recycling and disposal services, and companies that provide professional and consulting services to the waste services industry.
 - f. Solid Wastes Association of North America (SWANA) plays similar role as the A&WMA but its focus is primarily on the technical and educational aspects of solid wastes
 - g. Chemical Industry Institute of Toxicology's mission is to promote the use of the best possible science for human health risk assessments and to enhance public health through the conduct of cutting-edge, interdisciplinary research that elucidates the mechanisms of action of chemicals on biological systems. Scientists in this institute can be engaged to perform assessment that supplement those performed by "conventional" governmental agencies, such as the EPA.
 - h. American Chemical Society can provide the professional base from which advice can be sought regarding the validity of the chemical tests conducted on the residues and emissions of cement plants that utilize waste fuels.
 - i. Chemical Manufacturers Association

- 4) *Members of the public.* It is very important to allow the public to access balanced and checked information regarding the emissions from plants that utilized waste fuels. Doing so will substantially reduce the negative effect caused by biased information, especially those originating from advocacy groups.

5) *NGOs and advocates.* Organizations such as the National Citizens Cement Kiln Coalition play an instrumental role in shaping public opinion on cement related issues. The disputes arisen from the use of wastes as fuel have resulted in the following groups forming such a coalition:

- Amber Terrace Intermediate School PTA, DeSoto
- The American Lung Association/Texas
- Beltline Elementary PTA, DeSoto
- The Chemical Connection
- Cedar Hill Early Childhood PTA
- Citizen Action/Texas
- Citizens Aware and United for a Safe Environment
- Citizens for a Safe Environment
- Clean Water Action/Texas
- Cockrell Hill Elementary School PTA, DeSoto
- DeSoto Early Childhood PTA
- DeSoto ISD Council of Parents and Teachers
- Duncanville City Council
- Fairmeadows Elementary PTA, Duncanville
- Gabe P. Allen Elementary PTA, Dallas
- Groups Allied to Stop Pollution
- Lone Star Chapter of the Sierra Club
- Moates Elementary School PTA, DeSoto
- Mothers Organized to Stop Environmental Sins
- NAACP/Dallas
- Northside Elementary PTA, DeSoto
- Physicians for Social Responsibility
- Protect All Children's Environment
- Texas Air Control Board's Task Force on Cement Plant Incineration
- Texas Air Control Board
- Texas PTA, District 10 Council
- Texas State PTA
- Waterford Oaks Elementary School PTA, Cedar Hill
- City of Blanco City Council
- City of Dallas Environmental Health Advisory Commission
- City of DeSoto City Council
- City of Duncanville City Council
- City of New Braunfels City Council
- City of San Marcos City Council

However, not every one these organizations opposes to the use of wastes as fuels; but all of them supports tighter regulations on the approval of wastes. Above all, they support any policy changes that promote more transparent approval, accounting and monitoring procedures undertaken by the governments.

The willingness, capacity, incentive and opportunities for these key stakeholders to change are described in table 4.8.

Table 4.8. The willingness, capacity, incentive and opportunity for the different stakeholder groups to adopt out proposed policy transformations

No.	The stakeholders	Status quo	Willingness To change	Capacity/Incentive to change	Opportunity to change
1.	Government agencies, standard setting agencies	This issue currently involves and concerns only the EPA. However, if the sustainability of the use of alternate fuels is to be accurately assessed, more agencies must be included into the policy transformation.	As reflected in our case study, the current position of the EPA is primarily driven by the economics of using the waste as a energy source for one of the most energy intensive industries in the country. EPA for one may be unwilling to support our policy proposals if these proposals impede the reduction in the use of already accumulated wastes. However, if existing wastes are assessed using our 1 st proposal, while using a combination of the 1 st , 2 nd and 4 th policies to incentivize waste reduction, EPA's stance may change.	Our policy proposals involve co-addressing different aspects of the cement processing that are relevant to the concerns of the individual aforementioned government agencies. If cement firms, with a hope to use wastes as fuels in order to save costs and increase revenue, adopt our proposals, they will pay more attention to often neglected qualities such as occupational safety. We may require cement firms to keep better contact with the relevant agencies in order to have their performance verified for credits. This facilitates the operation of each agencies and will serve as a kind of incentive for the latter to support our strategies.	By requiring firms to address the various sustainability areas under one scheme, we create a unique opportunity for the different agencies to collaborate closely on common projects. In other words, this provides the opportunity for them to work together.
2.	Cement producers and trade associations	As long as their current technologies and monitoring technique allow them, cement companies will continue to support the use of wastes as fuel. In a way, this lightens their pressure to improve energy efficiency and may even justify them not to do so in the near	Cement kilns will be willing to embrace our proposals if government provides more assistance and endorsement to energy efficient, to complement the Waste Production Tax that is to be imposed on their sources of wastes/fuels.	The credit systems must provide sufficient incentives for firms to convert to waste fuel assessment. Besides, to ensure they have the capacity to do so, government must put in place a team of experts that can provide the essential advice and guidance for them to embark on the fuel-permitting process.	The 4 strategies we propose provide a unique opportunity for cement firms to work with experts who are knowledgeable in the various aspects of sustainability throughout the fuel-permitting process. Furthermore, the credit systems provide the essential incentives and opportunities for these firms to justify their commitment to collaborating with external agencies.

3.	Waste producers and their respective trade associations	future. Currently, companies that produce wastes that cement firms can use may need to pay the latter to take their wastes. That is, in these cases, paying cement firms make more economic sense than disposing of them (provided such disposal is legal).	Different industries have different concerns, due to different restrictions placed on them by environmental and health regulations. In restricting the waste stream flow between them and the cement industry, the scientific advisory board must examine how the other alternate flows would be increased. By providing technical assistance regarding these alternate flows and any waste reduction strategies, the government can help increase the willingness of companies to adopt the proposed policy changes.	If the scientific board can provide the necessary assistance for waste reduction and, as a second choice, waste diversion (i.e. diversion away from the cement industry (provided that the wastes are found to be harmful), landfill and other potentially dangerous locations/functions), these companies should become more capable of adopting our proposals. The credit multiplier scheme provides additional incentive for them to collaborate with cement plants to make the transferring and utilizing of their wastes more sustainable.	As in the case for cement producers, the strategies we propose provide a unique opportunity for these firms to work with experts who are knowledgeable in the various aspects of sustainability throughout the fuel-permitting process (under the credit multiplier scheme, that is).
4.	NGOs, advocacy groups and members of the public	As described earlier, most of these groups form coalition that opposes on specific aspects of the government approval of waste fuel use. Many of these groups rely on biased information that choose to emphasize preferred aspects of the emission analysis results.	It is important to invite those scientific agencies that these groups depended upon to produce the emission analysis data on which the former based their claims to participate in the demonstration projects. This will help increase the willingness of these groups to consider our proposals.	Note that every one of the advocacy groups is concerned with a specific set of sustainability related issues. For example, the elementary schools will be concerned over the effects of the emissions on the health of their school kids. On the other hand, city councils will also be concerned for the health of the workers in those cement plants that utilize waste fuels. Our proposed fuel-permitting scheme encourages cement plants and waste-producing companies to improve on the <i>technique</i> of using these fuels. These techniques will be related to various sustainability indicators, which	We found from our detailed case studies that many of the advocacy groups and independent scientific agencies that conducted tests for the former expressed discontent over the fact that government decisions are not transparent enough. Although policies such as the Comparable Fuels Protocol were opened for public comments before, our 4 strategies allow these groups to participate more extensively in the decision-making process.

4.7.3 Possible Barriers To Successful Policy Transformations, and Strategies to Overcome Them

4.7.3.1 Demonstration and public outreach project led by the scientific advisory board

As we have mentioned before, there are 5 distinct roles and functions of the scientific advisory board. The initiation of studies into the variability of the emission data specific to the different waste types is required in this policy proposal. Technically, gathering a team of experts to conduct such tests is not a major challenge. The results will be very educational, as long as the ranges within which cement kilns' operation conditions can differ are carefully considered in the experiment. However, the greatest barrier may be that the government itself may not accept the recommendations from these studies.

An existing example will illustrate this clearly.

From our own interviews with fuel combustion experts¹⁷ in the government agencies and trade associations, we know that the quality of the emissions is highly dependent on the properties and purity of the waste fuels, raw materials for clinker production. In particular, variability caused by the waste fuels at either the preheater or calciner regions are mostly related to the different degrees to which the existing alkali, sulfur, chloride balances¹⁸ are upset. Nonetheless, the NO_x produced, regardless of its concentration, has been shown to be removed effectively by Selective Non-Catalytic Reduction (SNCR) filters. In Switzerland, the city of Zurich financed the sewage sludge fuel project undertaken by Holcim, in which an activated lignite coal filter is used to remove pollutants, including hydrocarbons, sulfur dioxide, and ammonia; in addition, they use a SNCR system to remove the NO_x in the emission, before burning the filter media in a part of the kiln where sulfur can be incorporated into the clinker. The SO₂ so produced will then be removed by using scrubbers. This has been proven to very effectively reduce the amount of NO_x in the emissions. However, while power plants in the U.S are subjected to the BACT of 0.11lb/mmBTU of NO_x, which compels the employment of SNCR technology, cement plants are allowed to emit up to 10 times as much, which basically negates the use of such technologies (Linero, 2000). In summary, the current regulations in the U.S do not require cement firms to employ this technology. Extrapolating this phenomenon, some of the technological pathways recommended by the demonstration project led by the science advisory board may end up being mere exhibits.

What are the reasons behind this double standard? Having a SNCR system not only implies additional costs on the part of the cement plants, the installed SO₂ scrubbers may also require more frequent replacement. In short, there is no incentive for firms to install such technologies. Unless cement companies stand to benefit from installing these technologies, which is required in their bid to use waste fuels, lobbyists are likely to put pressure on the government and avoid a stricter BACT.

A possible solution is to formally introduce the "green fuel innovation" scheme to the industry before commissioning the demonstration and outreach projects. In this introduction, the value of the credits earned by qualified cement plants and the waste-producing firms (through the

¹⁷ Al Linero, Division of Air Resources Management, Department of Environmental Protection, State of Florida.

¹⁸ These are points raised by Al Linero.

credit multiplier scheme) must be emphasized and clearly valued. Credits can be used for a variety of purposes:

- *Direct project financing.* Credits can be directly converted into seed funds to assist the concerned firms in their undertaking of sustainable development related projects in the future. These projects must be approved by the government agency that is in-charge of the “Credit Bank”. Trading is accepted for this purpose of the credits; that is, if another company is to buy over the credits earned by a cement company, as the rightful owner of these credits the former is qualified to use them as project financing instruments, as long as their projects meet pre-determined criteria;
- *Recycling fund to finance future fuel-permitting process.* As a specific case of direct project financing, companies can appeal to convert some of their credits into discounts on the fuel-permitting related costs for future attempts. In other words, the government will pay for part of their future costs;
- *Qualification points for governmental preferred purchase programs.* Government preferred purchase programs should include a category on “sustainable cement”. Exclusive membership is reserved for companies that earned a certain quota of credits. However, trading should not be accepted for this purpose. That is, if the cement company that earns these credits chooses to sell them away to another company that does not have any credits, although the former can still qualify for exclusive membership, the latter cannot.

Finally, the composition of the science advisory board must reflect the range of concerns and diversity of the stakeholders involved in this issue. As explained earlier, coalitions of advocacy groups may employ their own scientific experts to conduct independent testing of fuels. As far as possible, these scientific experts and/or bodies should be invited to contribute to the design of the demonstration and outreach projects. At the very least, they should be invited to critique the results of the tests in the event that they cannot, or elect not to, be involved in the actual projects.

4.7.3.2 “Green Fuel Innovation” Credit/Permit Scheme and the “Credit Banking” System

We foresee that the greatest barrier is in the implementation of the absolute emission standards (as opposed to the rate-based emission standards). The following questions have to be addressed and communicated to the relevant stakeholders:

- What should we use as the basic standard time scale for the absolute emission standards – one day or one week?
- Why are rate-based emission standards preferred, other than for the purpose of easier implementation and monitoring?
- If the “green fuel innovation” scheme introduces a successful absolute emission standard, how will this affect the power generation industry?
- What are the additional costs on cement and power plants, imposed by this new standard and concept of monitoring?

It is thus a crucial role of the science advisory board to thoroughly discuss on these issues before planning for the specifics of the new fuel-permitting process. In our opinion, the aforementioned fourth issue is the most critical and must be addressed. And, as explained in the last subsection, clarifying and increasing the economic benefits of the credit (and credit multiplier) system will encourage firms to embrace these new standards. To make the benefits even more attractive will require the government to provide subsidies to reduce the cost of compliance. In other words, given that traditional power plants are not subjected to the same fuel-permitting system and thus credit benefits, we can logically justify employing the absolute emission standards to cement plants only.

Afterall, this fuel-permitting process represents a new step in the sustainability direction. In the learning process, firms may perceive the requirements to be challenging, perhaps even overbearing. In fact, similar concerns led to the creation of alternate forest products certification systems in competition against FSC (refer the section 4.4 of this chapter). However, the “green fuel innovation” schemes are different in that, unlike the forest certification programs that either put their stamps on a product or otherwise, they provide partial credits to firms even if the waste fuels eventually fail the approval process. In other words, companies will be commended for the efforts they made and the commitment they show. We can also prevent lobbyists from using the fuel-permitting process as an excuse to oppose further sustainability efforts (and future sustainable development industrial policies that affect the cement industry) by allowing cement firms unlimited trials of fuels; that is, if a certain waste fuel fails the evaluation, the firm is free to try other waste fuels, one after another. Of course, in the process of these unlimited trials, all existing environmental regulations must be adhered to.

4.7.3.3 Corporate Responsibility in Reporting Emission Data and Facility Clean-Emission Index

This policy proposal will very likely be rejected in the wake of the ongoing dispute surrounding the double standards for power plants and cement kilns, as the latter will fear that disclosing too much will attract even more attention to the repercussion of the double standards. Even if we are to propose that the government begins implementing this scheme in selected cement firms that are more advanced in their sustainable development involvement, getting the industry as a whole to adopt this will be difficult.

Hence, we recommend that this policy transformation be implemented only *after* the aforementioned two strategies are successful. In fact, between these successes and implementing this strategy, the government must address the double standard issue. Hopefully, the successes of the demonstration projects and “green fuel innovation” schemes will encourage the cement industry to embrace relatively ‘new’ technologies such as the SNCR filtering and thus bringing their emission standards closer to the existing BACT for power plants.

4.7.3.4 Waste Production Tax

The ability to account for the relevant waste fuels will be the greatest challenge for this strategy. Note that this special tax is imposed only on those wastes that are approved and been traded between the cement and relevant waste-producing industries. Unapproved wastes (i.e. wastes that fail the fuel-permitting process) and wastes that are unsuitable as fuels for the cement kilns are not targeted. This differentiation will allow efforts and attention to be focused on these wastes, and thus facilitate the accounting process. In other words, the tax will be collected only on the amount traded to the cement industry as fuels.

However, to avoid the waste-producing industry from diverting the waste fuels away from the cement industry in avoidance of this tax, the tax rates must be assigned such that it is more expensive to dispose these wastes than to use it as fuels. This implies that the tax rates will be specific to the types of waste fuel in question. Is it technically possible for firms to want to use waste fuels and yet avoid the Waste Tax? No. Even presently, before firms can use wastes as fuel, approval must be sought for from the government (in the form of the Comparable Fuel Protocol, that is). Hence, the government can technically halt any use of waste unless firms are willing to adopt the “green fuel innovation” scheme.

4.7.4 Engaging the Stakeholders

In table.4.8, we detail the ways by which the different stakeholders relevant to each of the aforementioned 4 goal transformations can be engaged, via the list of different methods presented in section 1.3.3. As in the previous cases, the types of stakeholder participation tools utilized are highlighted in italic in table 4.8.

NO.	TARGET POLICY TRANSFORMATIONS	STAKEHOLDERS INVOLVED	COMMENTS ON TOOLS AND METHODS OF ENGAGEMENT
1.	Demonstration and public outreach project led by the scientific advisory board	Government agencies, academic and industrial research bodies, NGOs and advocacy groups (in particular, the research agencies engaged or referred by them), and technology consultants (especially in the field of energy efficiency and waste minimization)	<p>The following should be carried out in this sequence:</p> <ol style="list-style-type: none"> 1) As per the previous cases, we recommend a task force to be set up to lead all actions to realize the proposed policy transformations. Representatives should lead the task force from the EPA and DOE, with representatives from all the other agencies (those listed in section 4.5.2) as the associates. 2) Scientists who satisfy certain criteria determined by the task force are then invited into the science advisory board. This board should then be organized into 5 distinct yet overlapping sub-groups to perform each of the 5 functions described in section 4.5.3. 3) A special <i>focus group meeting</i> should be held with the coalition of NGOs and advocacies, and explain the rationale behind the demonstration and also the "green fuel innovation" scheme to them. At the same time, invitation should be sent to those scientific agencies whose scientific studies were quoted by the coalitions to participate in the demonstration projects in various capacities.

			<p>4) Next, a scheme of study is then drawn up describing the stages of the work to be done at the demonstration cement plants. This plan will include two components/stages:</p> <ul style="list-style-type: none"> • Nature of experiments; • Details of the demonstration itself – types of fuels to be used, types of technologies to feature, demonstration formats (dates and hours of tour etc.), invitation of industry stakeholders to view demonstration and the nature of any education follow-up on these visits. <p>5) Finally, qualified cement plants are specially invited to be the demonstration sites; incentives include heavily subsidized technology installations and free publicity on firms' commitment to sustainable development. Formal invitation for application may also be announced at a special <i>meeting/conference</i> involving the cement companies and trade associations.</p>
--	--	--	--

<p>2. “Green Fuel Innovation” Credit/Permit Scheme, Multiplier Scheme and the “Credit Banking” System</p>	<p>Task force, cement industry (including the trade association) and waste-producing industry and their respective trade associations</p>	<p>1) The task force will work out a coherent system for absolute emission standards with the help of the science advisory board.</p> <p>2) Next, the task force would form a special committee to look into the setting up of an industry wide “credit banking” system to keep track of earning and utilizing of earned credits by the qualified cement companies. The outlined legitimate uses of these credits are finalized.</p> <p>Concurrently, the task force would design the “green fuel innovation” scheme after the absolute emission standard is confirmed, and a thorough revision of the present Comparable Fuel Protocol (CFP) as well as the feedback received for the CFP is completed.</p> <p>3) As a form of industry outreach, the task force and its science advisory board should then organize special <i>meetings/conferences</i> to clearly explain the policy to the both the cement and waste-producing industries. In fact, firms that qualified, and are selected, for demonstration would be invited to pioneer this “green fuel innovation” scheme as an extension to the demonstration projects. In such meetings, the benefits of the credit must be emphasized to prospective participants.</p> <p>One reason to invite firms to participate before making it mandatory is to enable the government to learn about and from the effects of this scheme. Note that even though we propose that the government ultimately passes a regulation requiring all firms to adopt the “green fuel innovation” scheme, we feel that it is still essential to create a demand-pull component to motivate <i>more</i> firms to use waste fuels.</p> <p>4) Once firms agree to try out this fuel-permitting system, the science advisory board will assign specially trained members to provide consultancy services to them. These consultants should have an in-depth knowledge in the following realms:</p> <ul style="list-style-type: none"> • Energy efficiency in cement production. • Fuel evaluation according to the standards stipulated by the “green fuel innovation” scheme. • Sustainable development concepts and an ability to relate technique improvement to sustainability improvement in the use of the waste fuels of the plants, and
---	---	---

3.	Corporate Responsibility in Reporting Emission Data and Facility Clean-Emission Index (FCEI)	Task force, science advisory board, cement trade association and industry, cement companies who already have a corporate social responsibility program or are committed to public reporting schemes, power generation industry	<p>1) Foremost, the task force should focus on using the “green fuel innovation” scheme and demonstration projects to encourage firms to adopt or innovate pollution prevention technologies. The main advantage of doing so within the framework of the “green fuel innovation” scheme is that innovation is linked to sustainable development.</p> <p>2) After this, the task force should formally propose to the federal government and EPA the master plan to bring the cement industry “into the mainstream” and propose that they be subjected to the same BACT for power plants.</p> <p>3) Using “green fuel innovation” credit, or those of similar nature, as the incentive, the task force should offer qualified cement plants the opportunity to report FCEI real-time and online.</p> <p>4) The task force should concurrently assess the opportunity (including, perhaps, conducting a cost-benefit analysis if required by the relevant regulations) to make this requirement mandatory in the future.</p>
----	--	--	--

4.	Waste Production Tax	Task force, cement industry (including the trade association) and waste-producing industry and their respective trade associations	<p>1) Whenever a certain waste fuel is approved under the “green fuel innovation” scheme, the task force and the consultants who are employed by the cement and waste-producing companies involved should take note of the waste generated and traded over time.</p> <p>2) As early in the process as possible, these companies should be made aware of the rationale behind and implication of the Waste Tax. Also, companies should also be referred to the particular branch of the science advisory board that deals with waste minimization, as a follow-up to any successful waste fuel approval.</p> <p>3) In order to prevent waste-producing firms to resort to unlawful use of waste fuels, with the motive to avoid Waste Tax upon successful approval, the task force should propose to the federal and state governments more severe penalties for violators.</p>
----	----------------------	--	--

A pictorial summary of the stakeholder engagement strategies described in table 4.8 is presented in fig.4.21.

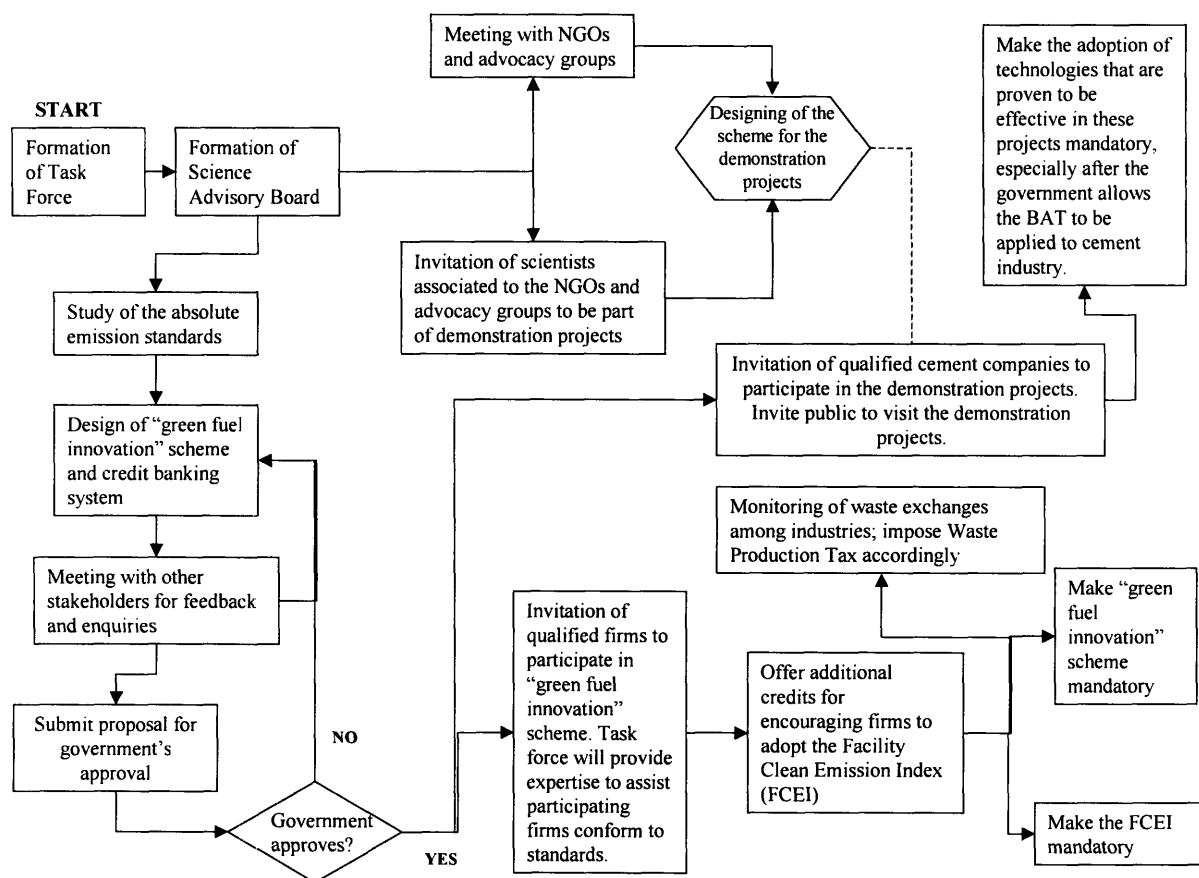


Fig.4.21. Flow chart that shows the relationship between the actions and stages of stakeholder engagement of our 4 policy transformation proposals.

4.8 Policy Solutions for the Use of Waste as Fuels for Cement Production in the United Kingdom

4.8.1 Comparison between the UK and US cases

In general, the transformation goals, stakeholder groups, their willingness, capacity, incentive and opportunity to change, and the methods of engaging the stakeholders are similar to those suggested for the U.S. This is because, as reflected in Annex III, the nature of the problems faced by the two countries/regions is very similar. In the following subsection, we shall expound the identity of these stakeholders who will important role in the proposed policy changes.

4.8.2 Key Stakeholders

- 1) *Government agencies.* Environmental Agency, the House of Commons environment Select Committee, National Rivers Authority, Health & Safety Executive, Her Majesty's Inspectorate of Pollution, Health Protection agency, Ministerial Committee on Science Policy, Department for Trade and Industry and the Department for Environment, Food and Rural Affairs.
- 2) *Cement producers and trade associations.* The British Cement Association (BCA) is the trade and research organization that represents the interests of the UK's cement industry at national and European levels. It is composed of Buxton Lime Industries, Castle Cement, Cemex UK Cement and Lafarge Cement UK. Together, they produce over 90% of the cement sold in the UK – around 12 million tonnes in a typical year.
- 3) *Waste producers and respective trade associations.* The following are the key organizations that should be involved:
 - a) Chemical Industry Association (CIA). The CIA is the UK's leading trade association for the chemical and chemistry-using industries, representing members both nationally and internationally.
 - b) The British Plastics Federation (BPF) is the leading trade association of the UK Plastics Industry representing 80% of Industry turnover.
 - c) Environmental Services Association (ESA). It represents all the waste management and secondary resources industry in the UK.
 - d) The Chartered Institution of Wastes Management (CIWM), is the professional body which represents over 5,000 waste management professionals - predominantly in the UK but also overseas.
 - e) The Composting Association is the United Kingdom's membership organization promoting good practice in composting and the use of composted materials. The Association actively encourages a regulatory and economic framework for the long-term sustainability of the composting industry.
- 4) *Environmental groups and advocacy groups.* Recently, the opposition against the use of waste fuels by Blue Circle Cement, Lafarge UK and Rugby Cement had spurred the coalition of several environmental groups. They are:
 - a) Communities Against Toxics,
 - b) Friends of the Earth,
 - c) Global Alliance for Incinerator Alternatives
 - d) Greenpeace
 - e) Solid Waste and Energy Recovery Facility
 - f) National Association for Cleaner Kilns
 - g) The Air That We Breathe Group

As in the U.S case, before inviting members of these groups into the cement kiln facilities in which demonstration projects are conducted, it is essential to have a meeting or briefing with them. This meeting will serve to lay the ground rules of the visit (with the prospect of arrest and custody for any violation of civic order during the visits), emphasize the rationale behind the projects, and convey the overall goals behind the 4 proposed policy transformations.

4.9 Sustainability Policy for Balancing the Reforestation Policies of Chile

4.9.1 3 Goals of Desired Policy Transformations

The following were identified as the key transformations capable of addressing the unanticipated negative outcomes of the Chile afforestation and reforestation policies:

- 1) ***Industrial Co-investment Program.*** A viable way to control the extent of forest substitution is to engage the commercial plantation industry in the development of sectors within the native forest industry, especially those that involve non-timber resources. The Program introduces these big companies to investment plans dealing with sustainably harvested native forest wood and/or their products. For example, Sweetbriar Rose (*Rosa Eglanteria*) was the main export from Chile as a medicinal plant in 1996 (Tacon, 1997). It fetched a total income of nearly US\$29 million in 1996. If value-added foodstuffs could be produced from it, for example chocolate or even medicinal wine (traditionally popular in Asia), the total income may be increased. The role of the government in this Program is to play the matchmaking role, set rules on investment, and implement guidelines to ensure that net profits from native wood harvested from small owners' forests are distributed fairly amongst the industries involved in the partnership.

- 2) ***Promotion of Sustainability under the DL701 Reform.*** The strength of the Reform program is that in many ways, it does not threaten the leadership and dominance of the commercial plantation industry. Since it has gotten to a great head start, we propose to use the current platform as the launching pad for a more extensive sustainability program for the small owners. In essence, this program should motivate more autonomy on the part of these owners. The role of the government in this strategy is to set, and ensure that these small owners abide by, specific sustainability standards in their businesses. For example, to enhance their economic standing, the owners can be included in the aforementioned Industrial Co-investment Program. As for their social responsibility, the government should demand a minimum standard in their provision of working environment and require them to deal fairly with issues that involve the rights of native tribes. As we have mentioned in the Annex IV, recent additions to the Reform Bill also proposed to waive the need for small owners to conduct and present technical studies and management plans on their forests, provided that they accepted management plans designed by the Corporacion Nacional Forestal (CONAF)¹⁹. In fact, subsidies were suggested to cover 75% to 90% of authorized expenses. Eligibility for this aid program would be on the basis of competitive proposals instead of entitlement or simple application procedures; in short, we believe that these stakeholders should not be entitled the subsidies but to earn them.

Since this promotion effort hinges on the Industrial Co-investment Program, the sustainability standards should finally also be extended to the commercial plantation and all other industries in the new business partnership.

¹⁹ CONAF is the Corporacion Nacional Forestal – the main agency that promotes native forest management amongst small forest owners, and the conservation of Chile's natural heritage. It is represented at both the provincial and regional levels.

Annex IV also highlights the formats of a few leading forest certification systems, such as FSC and the ISO Forest Certification. Especially the FSC, many of the criteria concern aspects of sustainability other than environmental preservation and protection. In fact, having a viable and flexible forest certification helps in promoting this sustainability reform to the DL701.

- 3) ***Forest Certification Reform.*** First and foremost, the local law – LdB – should act as the foundation for policy action. However, the government needs to further improve the LdB by incorporating more social sustainability indicators to make it more complete. How should the government deal with the co-existence of FSC-Chile, CERTFOR and ISO? In order not to hamper innovation, the government should lay down the minimum sustainability standards to be achieved in each of the 3 aspects of sustainability. A forest owner may choose any certification schemes as long as all of the minimum criteria are met. Even though the timber industry has been privatized, the certification of timber sustainability standards should remain the responsibility of the government.

The government could also consider co-opting any one, or all, of the 3 schemes into a national program aimed at promoting sustainability in all forests in Chile. By publicly acknowledging these co-opted members, the government should aim to motivate the certification standards to reinvent themselves in order to meet the minimum standards set by the government. Such acknowledgment may take the form of spelling out in details what are the certification standards that can satisfy each and every relevant sustainability standards in the LdB.

Depending on the criteria set, this may require CERTFOR and ISO to extend their reach to involve both local and international NGOs in their certification process. FSC-Chile will also need to increase the involvement of local NGOs in the certification process. This program will also require the government to inspect certified forests to verify that the established minimum criteria are met.

What is the relationship between the sustainability standards set under the DL701 Reform and those under the improved version of LdB? The latter concerns mainly forest management sustainability, whereas the former has a much wider coverage and include the production of native forests merchandise, trading, eco-tourism and other related activities.

In summary, the government sets overall sustainability targets – in the social, economic and environment spheres. These targets help establish standards for small forest owners to meet under the DL701 Reform’s extension (our second recommendation above). In terms of forest management practices, the improved version of LdB is used as minimum targets, after its contents are coordinated with the overall sustainability goals. Forest owners could use existing forest certification systems to satisfy these goals. Since native forests have to meet these goals too, big companies involved in the Industry Co-investment Program are indirectly investing in promotion of certified forest management.

4.9.2 Key Stakeholders and their Willingness, Capacity/Incentives and Opportunity to Change

The key stakeholders include the following:

- 1) *Government agencies.* National Forest Institute, Corporacion Nacional Forestal, Ministry of Economy and the Ministry Secretary General of the Presidency, Minister of Agriculture, and National Tourism Service (SERNATUR)
- 2) *Private tourism sector.* Tourism Corporation (wholesale travel agents that promotes external tourism)
- 3) *Industries.* Industries related to the commercial plantation, native forest and products. Food, medicine and handicraft industries should also be introduced to the Industry Co-investment Program.
- 4) *Certification agencies.* Forest Stewardship Council, ISO, CertforChile, and the Ley de Bases Chile.
- 5) *International and national forest preservation NGOs.* Comite Nacional Pro Defensa de la Fauna y Flora, AFI (Ancient Forest International), Defensores del Bosque Chileno, Renace (Red Nacional de Accion Ecologica), Geo Austral, and Chilean Foundation Lahuen.
- 6) *Research communities.* Academic and industrial research units that examine topics relevant to native forests fall into this category.

The willingness, capacity, incentive and opportunities for these key stakeholders to change are described in table 4.10.

Table 4.10. The willingness, capacity, incentive and opportunity for the different stakeholder groups to adopt out proposed policy transformations.

No.	The stakeholders	Status quo	Willingness To change	Capacity/Incentive to change	Opportunity to change
1.	Government agencies, standard setting agencies	As described in Annex IV, the Chilean government is split on the Native Forest Recovery and Development Bill. It is thus essential for the two parties to be united on common strategies. Inviting representatives from both parties will be a good start for the policy transformations proposed.	Neither the agencies that back commercial plantation industries nor native forest preservation should feel threatened by the proposals. It is crucial to portray the proposed changes as separate from the Native Forest Recovery and Development Bill. The Industrial Co-investment Program has the capacity to engage both sides on common objectives.	The Industrial Co-Investment Program provides both camps with incentives to invest in the native forests. Judging from the tussle around the Native Forest Recovery and Development Bill, we know that both camps have the backing of large groups of stakeholders. So, if the Industrial Co-investment Program can develop into a common ground for these opposing sides, the capacity to support the other 2 transformations is largely enhanced.	By treating the sustainability standards (2 nd proposal) as the pre-requisite for the small owners to qualify for the Industrial Co-Investment Program, the latter program provides the opportunity for agencies that support these owners to support the 2 nd and thus the 3 rd proposals.
2.	Private tourism sector	Chile has an existent eco-tourism industry. Most of the tour packages offered are for activities in ancient forests.	Resistance from this group is likely to result from having to divide the generated revenue with the plantation industry under the Industrial Co-Investment Program. However, if co-investment projects are built into the tourism packages to enhance their attractiveness, our proposals will gain the support from this group.	Since the eco-tourism is a growing sector of Chilean economy, it has the capacity to support the Industrial Co-Investment Program, provided the latter does not result in unwelcome competition. This will also depend on whether the Industrial Co-Investment Program boosts revenue by increasing the total number visits to the forests and parks, instead of merely from sales of souvenirs and food produced from the native forests (and if the cut given to the tour operator and ancient forest owners are not attractive enough).	The way to provide the tourism sector with the opportunity to support our 3 proposals is to provide them with the quantifiable incentives through the Industrial Co-Investment Program.
3.	Commercial plantation, native	These industries are largely operating in their	These seemingly disparate and/or conflicting industries	The incentive for the industries to participate in our proposals will be the	Having the government play the middleman to match-make

<p>forest, food, handicraft and natural medicine industries and their trade associations</p>	<p>own turfs.</p> <p>Commercial plantation and native forest industries may view each other as antagonistic and even mutually exclusive, except in some special cases when some small owners sell their plots to the commercial forests companies.</p>	<p>will be willing to support policies that synergistically build a new business model that allows the participating industries to benefit from the increased revenue generated from their business partnership.</p>	<p>prospects of more market shares and supported venture into new niche areas.</p> <p>Note that industries are free to choose to operate within their old business models while investing part of their capital in the Industrial Co-investment Program; any revenue generated from the latter will be additional benefits to them. The more risk-averse companies will welcome this flexibility.</p> <p>These plans aim to capitalize on the expertise and thus capacity of each of the participating industries.</p>	<p>industries within the Industrial Co-investment Program will guarantee a degree of impartiality stemming from a more global perspectives. This will encourage these industries to think outside their box and give them the opportunity to potentially benefit by stepping out of the business comfort zone.</p>
<p>4. Forest management certification agencies</p>	<p>Chile provides a market for a range of different types of certification programs.</p> <p>However, currently there is not one system to coordinate on how each can be more optimally utilized by the Chilean forest industries.</p>	<p>Requiring each certification system to change its own criteria is both difficult and unnecessary. In fact, this is not a requirement under our 3 proposals.</p> <p>The key of our 3rd proposal is to clarify to these organizations the <i>minimum</i> standards (using the improved version of the LdB as a platform) that all certified forests in Chile must satisfy.</p>	<p>Even if each system ultimately finds it necessary to fine-tune its original criteria to suit the new requirement, as in the case of FSC in which modifications were made to suit the unique conditions in each region, these changes are unlikely to be radical. This is because many of these systems already stress the need to co-develop all three aspects of sustainable development in forest management.</p> <p>The main incentives for them to support the proposals will be to get formal recognitions by the government in any official press materials. In exchange for this recognition, the systems need to ensure that their current standards already conform to the minimum standards of sustainability defined by the government (i.e. 2nd proposal), and publicly endorse these standards in</p>	<p>We believe the formal endorsement offered by the government will be a powerful tool that gives these firms the opportunity to penetrate the market further. This is especially the case if the small owners are required to abide by the minimum sustainable development standards.</p>

5.	International forest preservation organizations	These organizations are currently linked to international ecological research and eco-tourism.	As long as the protected native, ancient forests are not opened up for harvest or production as a result of our proposals, this group should be willing to support our plans. That said, one way of ensuring that negative unanticipated outcomes are minimized is to keep track of the effects that our plans have on the existing forests. That is, a successful sustainable forest management system does not give us the green light to open up more ancient forests for harvesting.	their respective publicity materials: If the Industrial Co-investment Program manages to increase the visitor count for the ancient forests (provided they are open for eco-tourism), there will be an incentive for this group to support our proposals. However, we must take precautions in ensuring that native forests merchandise in these tourists attraction are produced from legal harvesting and carried out under the new sustainability standards.	Crosscutting programs like our 3 proposals will formally introduce this group to other organizations that have different concerns yet have the resource to support forest preservation (as in the case of investing in protected forests currently used for tourism). In fact, this is the very definition of sustainable development – co-developing and co-optimizing the triple bottom lines. This may even result in more creative approaches to species protections that are both economically and socially attractive and beneficial.
6.	Research communities	Currently, research communities are involved with the various industries highlighted above.	Most, if not all, of these research groups are funded by the respective industries to perform assessment linked to their specific interest. Academic institutions interested in sustainable forestry and heritage preservation would be willing to support our plans. Research units funded by the industries should be united on common grounds identified under the Industrial Co-investment Program; they can be employed to study the likely effects of co-investment projects on	As mentioned under the 'willingness' column, these research units already have relevant data and information regarding the commercial plantations and native forests; hence, they have the capacity to support our need to establish a large-scale study program to assess the impact of the Industrial Co-investment Program. The additional funding allocated to these important research topics will serve as a good incentive. Recognition of research impact, in the form of sustainability related awards, will also provide the encouragement for more quality work in this area.	Their affiliation to the trade associations and industries provide us with the channel to convey the message carried in our 3 proposals to this group. As long as we make a strong case that the key industries support, the chances of involving these researchers are very high. Our 3 proposals also provide the unique opportunity for the sustainable development research community to study the impact of sustainability policies on the development of a precious national resource.

			companies' revenue and the resultant effects on the native forests' health. The government should play a greater role in such employment.		
--	--	--	--	--	--

4.9.3 Possible Barriers and Strategies to Overcome Them

4.9.3.1 Industrial Co-investment Program

Persuading the commercial plantation and timber companies to think beyond their current business models is a considerable challenge. Besides, the food, handicraft, native forest and eco-tourism industries may not accept any proposals that involve them sharing the revenue with the already powerful timber industries.

The government should begin by engaging the help of a core group of researchers who understand the status quo of the industries very well, including their economic perspectives, competition they face globally and any untapped potentials. Thereafter, by identifying specific roles and concerns of each industry in the collaboration, the government can experiment with different collaboration formats to derive the optimum arrangement for the industries involved. For example, since the commercial plantation companies have a history in dealing with small native forests, they can play the role of main sponsors for any native forest by-product industries under the Industrial Co-investment Program. These sponsorships may take several forms, including the provision of technical assistance in production, provided such expertise exists in the companies. The government needs to step up to the plate and provides what is absent but essential for this to happen. The production process should involve the existing labor in the local communities as far as possible. The small native forest owners need to be organized accordingly so that any increase in labor in their forests does not adversely affect the traditional or conventional activities in their forests.

When the joint investment involves eco-tourism, the private tourism sector should be invited to draw up plans with the relevant researchers to design projects that can draw more visitors to the Chilean forests. This may take the form of building mini resorts or camps in the forests and sponsorship plans may then be submitted to the commercial plantation companies and the government for joint consideration. Where handicrafts and food made from native forests resources are considered as part of the designed tour-attraction package, representative of these industries will be brought into the discussion as well.

In summary, the most viable way to resolve any potential conflicts of interest is to stress the point that the current profitability of the industries can be effectively increased when all the various industries' resources are pooled together. And since it is the *additional* revenue generated from this partnership that will be divided among them, each industry stands to benefit from the Program.

To effectively address the uncertainties associated with all kinds of novel policy approaches, as well as allow the government agencies to learn about the outcomes – anticipated and unanticipated – of this Program, it is advisable for the government to implement a 'demonstration partnership' involving volunteers companies.

4.9.3.2 Promotion of Sustainability under DL701 Reform

The main barrier to the promotion of sustainability under the relatively successful DL701 Reform will be the associated costs. Recall that the DL701 is meant to promote the rights of small forest owners; this was the main reason why the shift of subsidies to them had made such an impact on them.

A possible strategy may be for the government to help build up the economic capacity of these owners by extensively involving them in the Industrial Co-investment Program. Note that although the term “co-investment” applies more to the better endowed commercial plantation industry, the richer forest owners should also be encouraged to co-invest in relevant cross-cutting projects under the Program, such as those involving the eco-tourism. Once the economic benefits are prominent to the small owners, the government can then progressively introduce a second level of the sustainability criteria –demanding certification of forest management practices using one of the qualified and recognized (according to the minimum standards set by the government under the 3rd proposal) certification standards. Finally, the government should require these forest owners to satisfy specific social sustainability standards not covered by the provincial and national legislation and the chosen forest management standards.

Should the commercial plantation be subjected to similar criteria too? Of course. The original DL701 Reform did have an impact on this industry, although the powerful companies were not affected by the reduction in subsidies promised to them under the original DL701. We believe the approach to circumvent any resistance from this group against the introduction of sustainability standards is similar to that for the small owners – provide the economic benefits of the Industrial Co-investment Program first and then introduce the mandatory forest management certification and any additional social sustainability requirements progressively.

4.9.3.3 Forest Certification Reform

In the early 1990s, FSC faced huge challenges in implementing its certification systems to many developing countries; Chile was one of them. As mentioned in Annex IV, CERTFOR, ISO, and FSC have their strengths and shortcomings. These will become the main barrier to our proposed Reform. However, a bigger barrier, which may also be a potential pitfall for the Reform, may be for the government to either adjust their standards (i.e. the LdB) downward or not press for bolder changes in order to make it easier for existing forest certification standards to attain the forest sustainability criteria. This in turn implies that the sustainability requirements for small forest owners, and ultimately also for the commercial plantations, may not be stringent enough to be really effective.

Henceforth, it is very important for the government to select a core group of policymakers to shoulder the responsibility of setting the new sustainability standards who are not affiliated to any of the forest certification systems. Still, as we shall explain in the next section, this core group should meet with representatives of these certification organizations to learn about and from their experience with certifying local forests, as well as discuss the sustainability standards with them. What are the potential problems that these certification organizations may face with the new standards? Currently, not all of them have a range of coverage that addresses all 3 sustainability domains (although FSC may be the most complete in that sense). If an organization wants to improve itself so that it meets more of the sustainability standards, it must train a group of experts who are capable of performing the evaluation according to their criteria. The government should consider providing some assistance in this aspect; this may take the form of conducting training workshops for these certifiers, which are subsidized by the government.

4.9.4 Strategies to Engage the Stakeholders

In table.4.11, we detail the ways by which the different stakeholders relevant to each of the 3 goal transformations described can be engaged, via the list of different methods presented in

section 1.3.3. As in the previous cases, the types of stakeholder participation tools utilized are highlighted in *italic* in table 4.11

NO.	TARGET POLICY TRANSFORMATIONS	STAKEHOLDERS INVOLVED	COMMENTS ON TOOLS AND METHODS OF ENGAGEMENT
1.	Industrial Co-investment Program	Government agencies, academic and industrial research bodies, private tourism sectors, industries and international & national forest preservation NGOs.	<p>1) As per our suggestions for the last few cases, a task force should be set up comprising of leadership figures who were not biased on the past dispute surrounding the Native Forest Recovery and Development Bill. These leaders should also not be affiliated to and display any prior favoritism for any specific forest certification standards currently in the market.</p> <p>Selection of government representatives for the task force strives to create a balance between agencies that reside on either side of the dispute.</p> <p>2) Formation of Scientific Advisory Board. With its help, relevant researchers are grouped to carry out a status quo update and feasibility study to accurately assess the possibility to 'merge' the various industries.</p> <p>3) After this study, a draft plan is then drawn up regarding details of the co-investment concept, any technical/financial assistance packages for small forest owners, nature of the demonstration projects and proposed projects for collaboration.</p> <p>4) Meet with concerned industries in series of <i>focus group forum and conferences</i> to explain the benefits of the Program.</p> <p>5) Submit to Parliament for approval.</p> <p>6) Once approved, volunteers are requested and selected for the demonstration projects. Implement trials with volunteers. Share information of the outcome with the industries involved through <i>subsequent meetings and newsletter</i>.</p>

2.	Promotion of Sustainability under DL701 Reform	Government agencies and all industries relevant to the Industrial Co-investment Program, forest certification organizations	<p>1) Any economic success stories of the Industrial Co-investment Program must be emphasized and communicated to participating companies and industries. This requires the task force to put in place an effective communication channel to achieve that.</p> <p>2) With the help of a scientific advisory board, the government should re-evaluate the status quo of the DL701 Reform and explore the best way of introducing other sustainability indicators into the Reform.</p> <p>3) Proposal to be submitted to the Parliament for approval.</p> <p>4) Once approved, they should target introduction of these sustainability criteria to the small forest owners, most of whom are already familiar with the DL701 Reform.</p> <p>5) Receive feedback on the implementation of these criteria through <i>focus group feedback sessions and surveys</i>.</p> <p>6) Consolidate and assimilate the lessons from this phase: fine-tune the criteria and introduce an appropriate form to the commercial plantation and other relevant industries.</p>
----	--	---	--

3.	Forest Certification Reform	Government agencies, forest certifiers, forest certification organizations, native forests industry, commercial plantation industry, eco-tourism industry.	<p>1) The government, with the help of scientific advisory board, assesses the current LdB and proposes improvement.</p> <p>2) The certification organizations will be gathered in a <i>focus group meeting and feedback session</i> to discuss the improved LdB and the co-option program (i.e. the benefits of qualifying for this program). Standards subject to public feedback and review.</p> <p>3) Once Parliament approved of new standards, a coaching and assistance system will be set up, by which certifiers are trained by official responsible for the improvement of the LdB.</p> <p>4) The task force should also put forth a limited subsidy package to subsidize such training sessions.</p> <p>5) The forest industries are then subjected to the new legislatures. Feedback is sought for regarding outcome of the policy through regular <i>industry representatives dialogue sessions and feedback meetings</i>.</p>
----	-----------------------------	--	---

A summary of these steps is presented in fig.4.22.

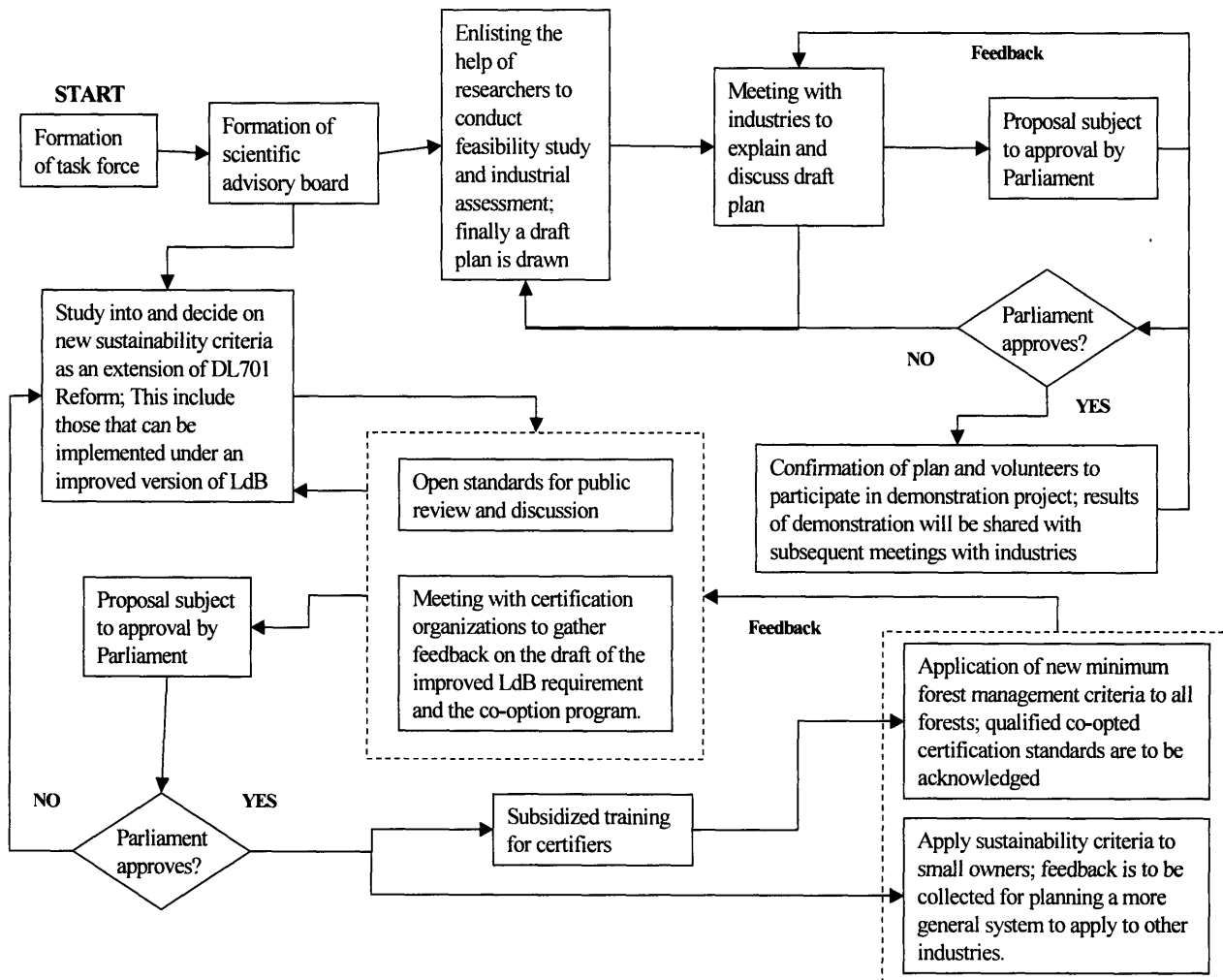


Fig.4.22. A summary flow chart showing the different stages of policymaking and ways of engaging the various stakeholders in our 3 policy transformations proposal.

4.10 Conclusions and Summary

This is an important section in which we brought forth these poignant points:

- A policy should have as long a policy reach as possible; Achieving so requires proper policy integration;
- Policy integration is intimately linked to stakeholder involvement and interaction;

- Extrapolating this, one can identify 4 distinct characteristics of policy integration;
- Case studies and surveys showed that policies that embody more integration characteristics and integrate more indicators tend to be more effective in accomplishing their original targets;
- The flaws of each of the seven cases studied (presented as four cases) can be addressed by specific integrated policy transformations.

In our policy proposals, we also highlighted the usefulness of

- *Indicator-integration case study plots* (fig.4.2 and 4.3),
- *Stakeholder Venn diagrams* (fig.12 and 13), and
- *Policy-stakeholder engagement flow diagrams* as tools to aid policymakers in designing, implementing, monitoring, correcting and evaluating integrated policies that effectually address sustainable development.

Although all of our proposed policy solutions pivot on the use of task forces, it must be emphasized that these task forces *do not* replace the government (federal, state, regional and local) in its responsibility to promote sustainability. Task forces, with their leadership represented by key members from governmental and non-governmental groups, are a mean of putting sustainability policymaking into practice. Their effectiveness and efficiency depends highly on the extent to which the government, who forms the backbone of these task forces, achieve four types of integration – *horizontal, vertical, integration over different time horizons, and stakeholders' interaction*. We have discussed the significance of stakeholder interaction to policy integration in section 4.2; Chapter 5 aims to extend the discussion and explain how stakeholder interaction, which includes non-governmental groups as well, should be analyzed and fostered within the framework of governance for sustainability. Section 4.3 highlights four characteristics of policy integration; in Chapter 5, we shall discuss how the structure of the government leads to the presence or absence of these characteristics and how the government structure should be changed in order for policies to embody all these four characteristics. In other words, it aims to link the four types of governance integration with the four characteristics of integration.

CHAPTER 5: GOVERNANCE FOR SUSTAINABILITY

Chapter 4 presents a series of integrated policy strategies that we believe will address the negative and unanticipated outcomes of the material related policies in the cases studied. The present chapter aims to provide readers with the following:

- A reiteration of the concepts and significance of integrated policymaking and stakeholder interaction,
- A distillation of the foundation of governance upon which integrated policymaking is realized, and
- A more general and generalizable analysis of the challenges underlying integrated policymaking.

5.1 Challenges and Opportunities for Integrating Government Bodies

The policy strategies described in chapter 4 embody the 4 characteristics of policy integration (section 4.3). The present section relates these 4 characteristics more directly to the role of the different levels of government– local, state, regional and national. Interpreting the four characteristics of integration in such a context allows us to identify the following four types of integration essential to government agencies:

- Horizontal integration* in which government agencies address as many of the 11 to 13 sustainability indicators as possible in their policymaking and hence overcome the fragmentation/balkanization of issues across and within themselves. For example, as shown in fig.4.12, the Ministry of Finance of Sweden is required to participate in policymaking that impacts both job diversification and the Sustainable Concrete Aggregate Scheme; besides, the fact that its representative is a key member of the steering committee of the task force proposed implies that there is a responsibility to ensure that financial policies support and not compromise the sustainability goals underlined the different policy strategies.
- Vertical integration* in which the efforts of the relevant local, state, regional and national level government agencies are coordinated in order to complement and even reinforce one another. One example is the ‘Sustainable Concrete Aggregate’ Scheme, in section 4.5.1.3.4, that emphasizes on the collaboration between the Swedish government and its international trading partners. Another example is our emphasis that the federal and state governments should coordinate the mechanisms and formats in which firms co-invest in eco-tourism under the “Forest Grant for Sustainability” Initiative (section 4.6.3.2).
- Integration over different time horizons* in which governmental and non-governmental stakeholders are systematically and progressively engaged in the different stages of integrated policymaking, supported by different types of feedback loops. However, what has not been addressed to similar level of details so far is the challenge of ensuring continuity in policymaking and commitment to policy goals between different terms of office. This will be described briefly under the so-called type 5 feedback loop in section 5.5.

- iv. *Integration of inputs from a wide array of governmental and non-governmental organizations – via effective stakeholder interaction.* This is to ensure that the ensued policies are aligned to the concerns and demand of as wide a range of relevant stakeholders as possible. As mentioned before, this form of integration requires government agencies to seek and utilize inputs and participation from relevant non-government stakeholders.

A multi-dimensional way of representing these 4 forms of desired integration in government agencies is shown in fig.5.1 (for brevity, it is called the Ashford-Hall plot hereafter), which is adapted from Ashford and Hall (Ashford, Hall, 2006).

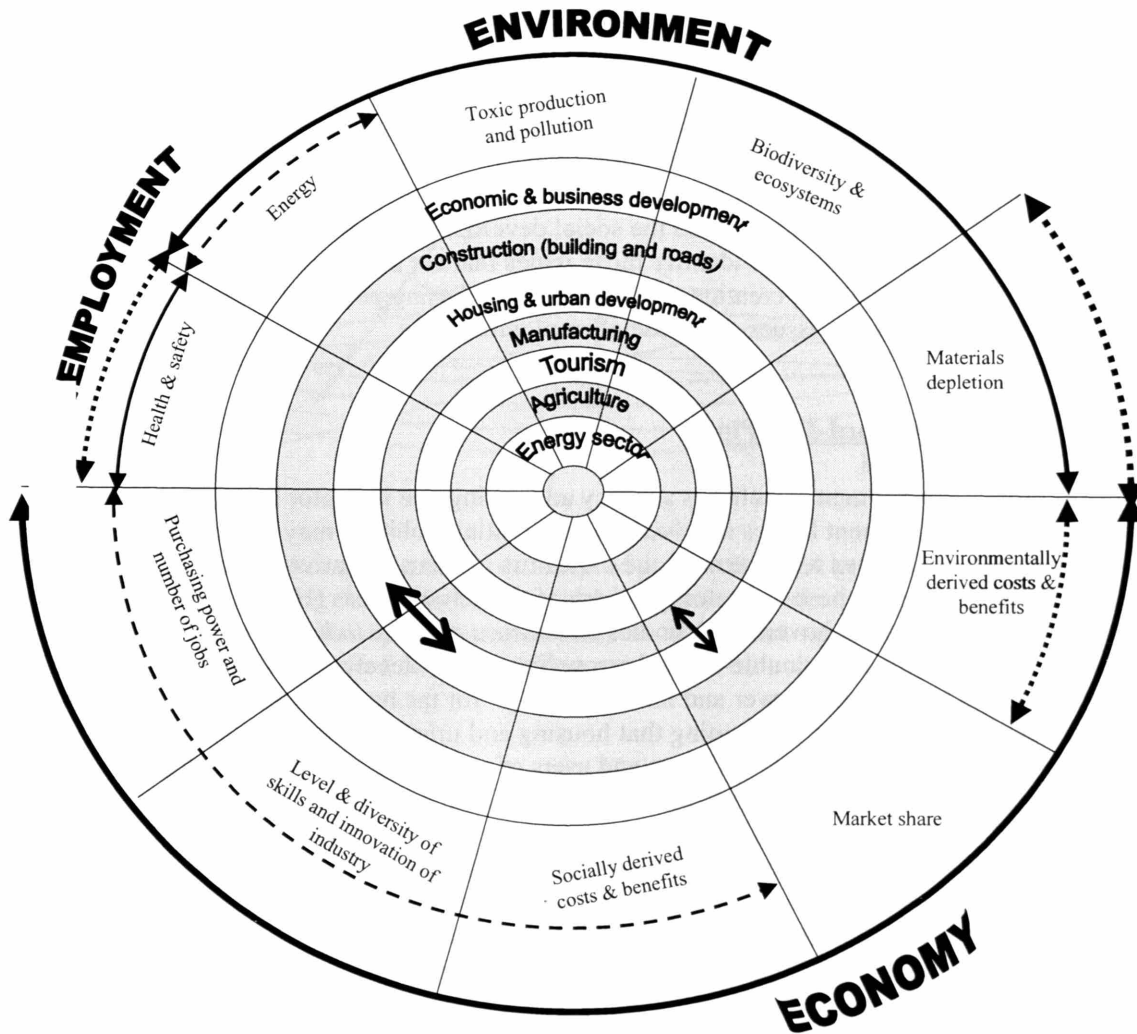


Fig.5.1. Ashford-Hall plot for visualization of the challenges and opportunities in achieving the four types of integration with respect to government agencies (adapted from Ashford & Hall (2006)).

In fig.5.1, the concentric rings represent activities of industrial/commercial sectors and also areas in which the government plays in its roles by providing either the respective goods or services. Each of these activity areas is often the responsibility of a government body (i.e. a

department, Ministry or agency), and can be further broken down into more detailed activities. For example, 'agriculture' includes sub-categories such as food crops and energy crops. The alternating gray tones of the rings are only for the purpose of visually differentiating one from the other. The position or size of the rings does not signify any special implication regarding their respective significance in policymaking.

The rings are segmented by wedges; these wedges are the sustainability indicators used throughout this work as an indication of areas of sustainable development challenges as well as measure of sustainability progress. Government agencies and oversight usually are organized according to these wedges, for example under a department of energy. However, some indicators may be more appropriate for some cases than the others; for example, biodiversity is used as an indicator for the cases on Chile's reforestation policies and the U.S. Northwest Forest Plan. On the outermost edges of the diagram are the three sustainability domains – social/employment, economy and environment. They each indicate, by means a thick double-headed arrows, the indicators that belong to each of them. Following these thick arrows one will find dotted or dashed double-headed arrows; these indicate the indicators that are relevant to other domains as well. For example, purchasing power and number of jobs concern both the economic development of a country/region/state and the social development of the individuals involved. Also, these dotted or dashed arrows identify those issues that are traditionally not confined to a particular domain. For example, creation of jobs or the purchasing power of workers are usually considered both an economic issues and a social/employment one.

5.2 The Use of Ashford-Hall Plots

If federal government establishes a policy addressing one indicator that influences the actions of all the government bodies involved, then potential problems may occur; when the other indicators are not considered together with the indicators in focus, negative and unanticipated results will likely occur in these indicators for each of the activity areas (Hall, 2006). Horizontal integration is needed so that government bodies co-address *as many indicators as possible*; as example is shown by the bold double-headed arrow linking the 'level and diversity of skills and innovation' to the 'purchasing power and number of jobs' for the housing and urban development role of the government in fig.5.1, meaning that housing and urban development should also encourages innovative activities of residents and users of space, and even supports the development of multiple skills by workers.

The bold double-headed arrow that links the 'market share' of the agriculture and housing& urban development is an example of another form of horizontal integration. Such integration requires government bodies to integrate their efforts in all activity areas. Achieving this type of horizontal integration usually requires innovation policy and business solutions; for example, increasing the market share and competitiveness of the urban development firms in a country, region or state may require the government to encourage more skillful and creative use of offsite manufacturing technique in prefabrication of building components.

Fig.5.2 illustrates the concept of vertical integration among the different levels of government – national/federal, state, and regional/local. There are two ways in which such vertical integration may occur. As shown as the 'A' arrows in fig.5.2, the different levels of government may be integrated based on the same activity areas and indicators. An example in the US is the coordination between federal and state-level EPA offices. However, vertical integration of a second type is also crucial, since the effects of federal policies usually trickle down to different state- and local-level industries or activities (as shown as 'B' arrows in fg.5.2).

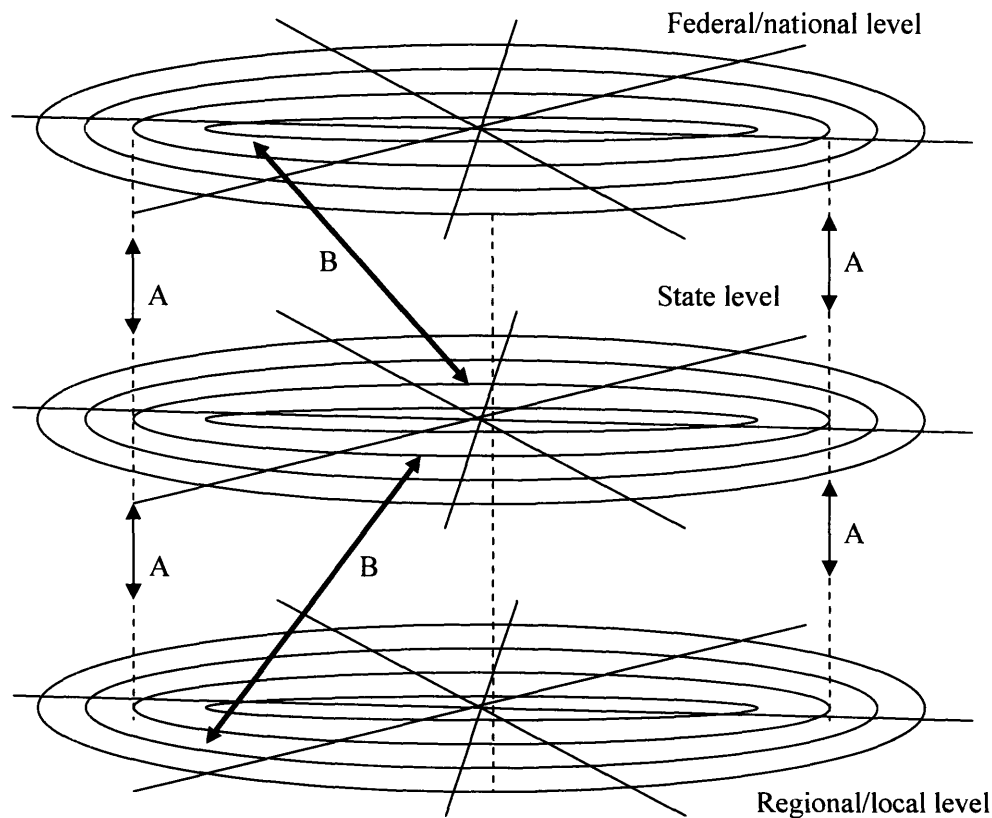


Fig.5.2. Vertical integration among the three levels of government and governance for integrated sustainability policymaking. ‘A’ represents vertical integration based on common activity areas and indicators. ‘B’ represents vertical integration across activity areas but not necessarily across indicators (adapted from Ashford and Hall, 2006).

An example would be the influence of a federal carbon dioxide abatement program, implemented by the federal environment protection agency, which stresses on using forests as a carbon sink. This will most likely impact state policies and in turn boost the eco-tourism industries in those states that have a large forest stock. These industries can respond to this top-down political signal and offer more extensive or/and frequent tour packages that at the same time may serve to preserve biodiversity in designated tourist areas. *The significance of these concepts to sustainable development and sustainability policymaking is in underscoring the critical need to enhance connectivity among the different levels as well as the different activity areas and indicators of the different levels.* Policymakers have to know of such interconnections as well as using these as effective platforms to launch national policies that can be implemented coherently at the state and regional/local levels. For this reason, we recommend involving trade associations and civic societies in almost all of our proposed policy strategies.

5.3 Ashford-Hall Plots of Our Proposed Policy Solutions

A series of comparison between the existing policy tools in the case studies and our proposed solutions are presented in the form of Ashford-Hall plots in this section. The purpose is to highlight the extent of involvement and integration of the various governmental organizations in the two different scenarios in the cases. Since all of our proposals apply to the national and federal levels of the countries concerned, the plots we present pertain to that level only. Nonetheless, in order for our policy strategies to be fully effective, the associated agencies at the regional, state and municipal levels must also address the same sets of indicators as those prescribed for the federal/national level. In order to further ensure integration among these various levels – that is, vertical integration (fig.5.2) – one needs to make sure that the different types of feedback loops are utilized. These will be described in details in section 5.6.

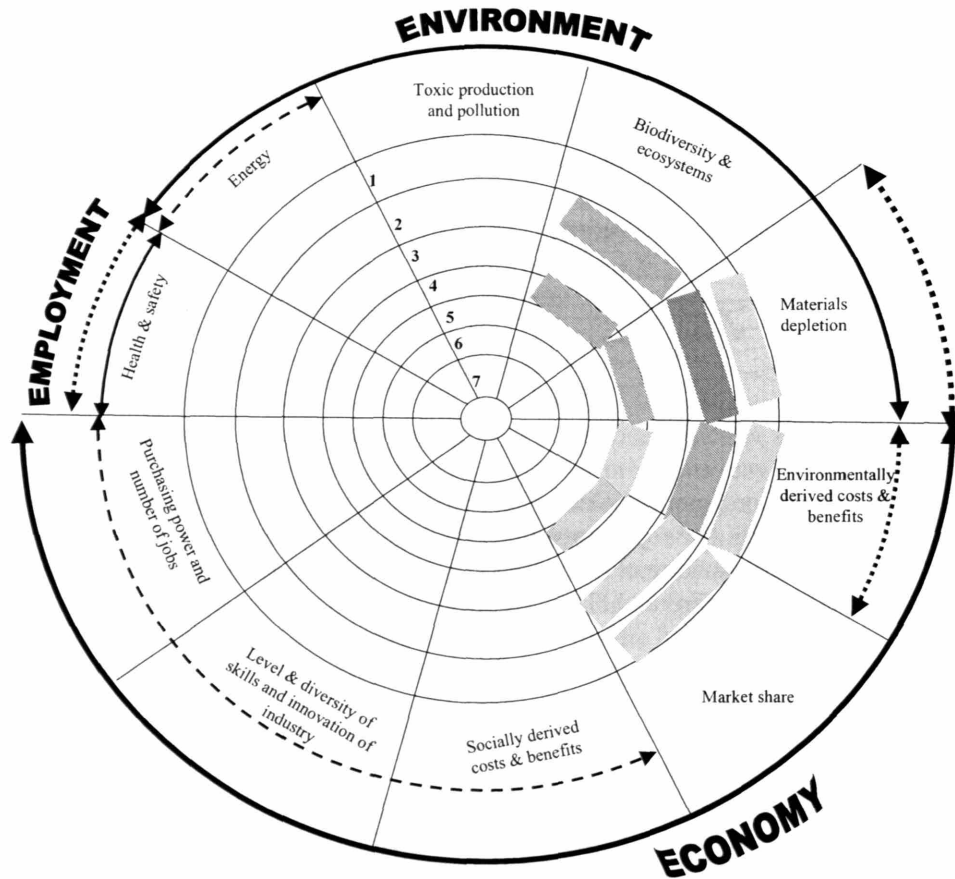


Fig.5.3. The shaded areas represent the indicators that are currently addressed by the various activity areas, sectors and government agencies through the Swedish Gravel Tax. The numerated rings represent: 1) economic & business development; 2) construction; 3) housing & urban development; 4) manufacturing; 5) tourism; 6) agriculture; and 6) energy sectors.

5.3.1 Case Study 1: Gravel Tax of Sweden

As shown in fig. 5.3, the Gravel Tax of Sweden is primarily the collaboration of the economic development sector (and the Ministry of Finance), construction sector (agencies include the Ministry of Sustainable Development and the Swedish National Road Administration) and the manufacturing/mining sector (main agencies including the Swedish EPA, which works closely with the Mining Inspectorate of the Ministry of Industry, Employment and Communication). It also shows that the primary concerns are ecosystem well-being (i.e. the geological aspects of ecosystem), preventing overexploiting the gravel lining of underground aquifers (material depletion), encouraging recycling (and so reducing environmentally derived costs) and decreasing the market share of domestically extracted natural gravels. These directly impact the economic

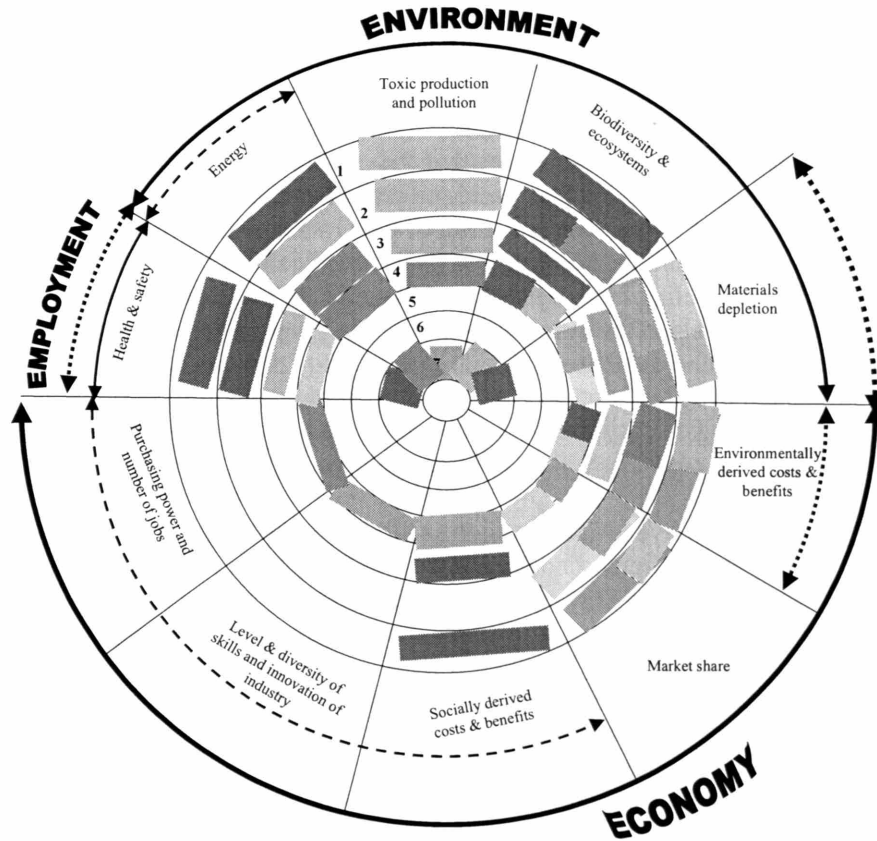


Fig.5.4. The hatched areas represent the indicators that are addressed by our proposed policies. Notice that in areas such as the ‘biodiversity & ecosystem’ under the ‘manufacturing’ sector there is a combination of hatched and shaded marking; this is to indicate that our policies address these indicators in addition to the existing Gravel Tax, and that our policies do not require abolishing the Gravel Tax. This is a sensible consideration for building political coalition. The numerated rings represent: 1) economic & business development; 2) construction; 3) housing & urban development; 4) manufacturing; 5) tourism; 6) agriculture; and 6) energy sectors.

development of the construction and manufacturing industries. The Danish Raw Materials Tax also shows very similar structure; therefore its plots are not shown here. Comparing fig.5.3 and fig.5.4, the latter of which depicts the combined effects of our five proposed policy elements that

constitute the integrated policy used to address the negative outcomes of the Gravel Tax and Raw Materials Tax, one can see that the range and depth of coverage of indicators in the various activity areas are substantially increased.

Our ‘Sustainable Concrete Aggregate’ scheme requires Swedish economic and business development agencies to consider the impact that their concrete aggregate import will bear on their trade partners. They now need to consider how the trade will affect the toxic production, material depletion, ecosystem and environmentally derived costs of their trade partners and themselves. These agencies also need to ensure that the scheme does not negatively impact their market competitiveness, which will in turn affect the domestic construction industry. Since the scheme must be integrated with the other policy elements, it should contain our proposed materials and energy accounting (our first policy proposal for this case study) as a methodology as well. This in turn implies that the scheme has relevance in health & safety and energy efficiency. In short, the ‘Sustainable Concrete Aggregate’ scheme has the potential to integrate many of the neglected indicators into international trade. The requirement for materials and energy accounting, and promotion of clean materials technologies in the procurement and use of substitute materials to natural gravels also means that the construction and housing sectors are now addressing additional indicators such as toxic and pollution reduction, energy efficiency, ecosystem, materials depletion, increasing recycling of C&D wastes (thus reducing environment derived costs due to disposal), and health & safety. Specifically relevant to the construction sector is the development of the recycling industry so that salvaged C&D wastes can be more competitive with natural gravels in the domestic market. The proposal to establish a building materials information portal and database is an outreach strategy that can be built into an urban development program and even the economic & business development efforts (through the ‘Sustainable Concrete Aggregate’ Scheme); this will serve the purpose of educating the public on sustainability and project the concerned trade in better light – a form of socially derived benefit.

In combination, all the five proposals address all the indicators in, and for, the manufacturing (mining) industry, including the increase of the level and diversity of jobs, as well as the purchasing power of workers. However, as they are, these strategies neither address, nor have the need to, address the tourism and agriculture sectors. Finally, energy agencies and sector are directly involved in the energy flow analyses of local material substitution activities. Since energy flows must be studied alongside the flows of materials, including fuels, the energy sector and agencies must address toxic & pollution reduction, ecosystem, material depletion, and health & safety - indicators that are not associated with them with the current Gravel Tax. Note that the existing Gravel Tax can be retained and implemented alongside our proposals, as shown by the shaded and checked areas in fig.5.4. However, our proposals do require the tax to be modified – tax should also be collected for all *imports* of gravels into Sweden (as is already the case with Denmark’s Raw Materials Tax).

In conclusion, by using the Ashford-Hall diagrams, we are able to clearly show that our policy solutions enable the relevant agencies to address more indicators and require more agencies/activity areas to integrate their efforts in the concerned indicators.

5.3.2 Case Study 2: Northwest Forest Plan and Economic Adjustment Initiative of the US

Fig.5.5 shows the situation under the now defunct Northwest Forest Plan (NWFP) and Economic Adjustment Initiative (NWEAI). The construction and housing & urban development sector/agencies did not explicitly address many of the important indicators. However, since the NWEAI did focus on creating new jobs in the environmental and civil engineering fields for local

communities, these sectors/agencies considered the balance between environmentally derived costs (from the owl protection program) and benefits (from new construction projects). They were concerned over how the shifts of logging activities from the northwest to the south and southeast would impact the prices of materials for local projects (i.e. the local market situations). The economic & business development agencies, which were involved in the design and implementation of the NWEAI, addressed both the biodiversity and environmentally derived costs. Since it also planned for a series of counseling services to help advise retrenched workers (in the agriculture (which includes the forestry industry) and manufacturing (which includes the wood processing industry) sectors), it contributed toward social benefits in a way. The increase in the import from trade partners like Canada was seen as a strategy to complement the reduction in production volumes from the Northwest. Later efforts to resolve the trade disputes between the wood industries from both sides showed an involvement with the market share issue arising from the policies. The agriculture and manufacturing sectors are the most directly involved in the NWFP's objective to preserve biodiversity. They are also affected by the NWEAI policies to create jobs in alternate industries. As described in Annex II, the reduction in local market share of the Northwest forests' timbers resulted in the unanticipated outcome of reduced incentive and/or capacity to keep up with costly forest management techniques, to which agencies such as the Department of Agriculture reacted with little success.

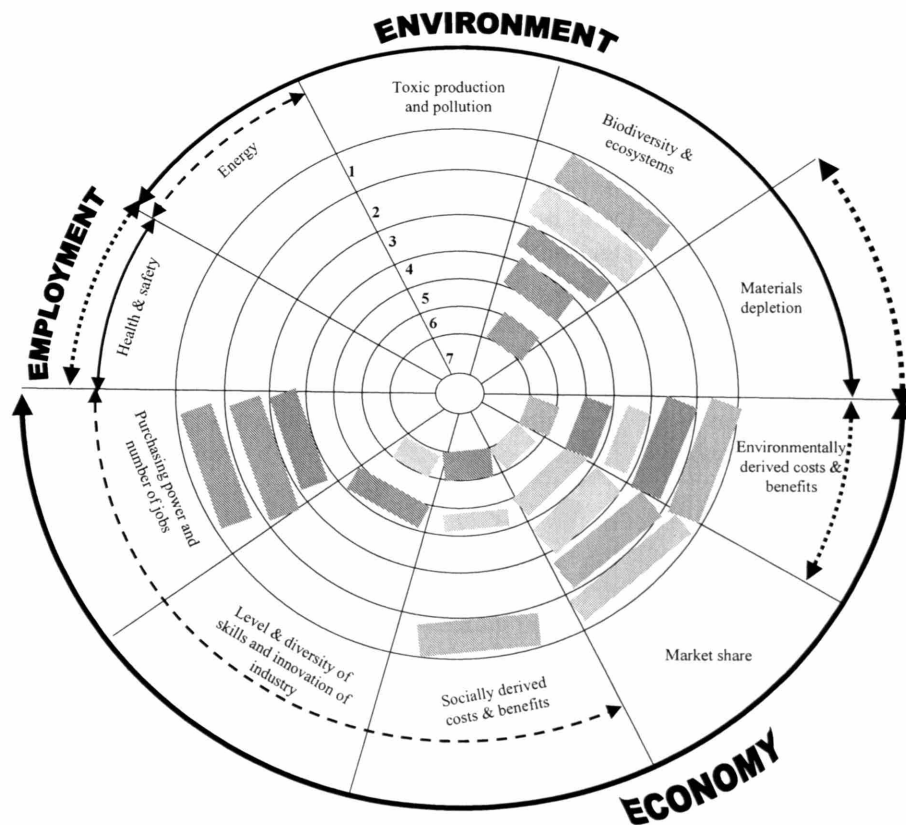


Fig.5.5. The shaded areas represent the indicators that were addressed by the various activity areas and government agencies through the NWFP and NWEAI. The numerated rings represent: 1) economic & business development; 2) construction; 3) housing & urban development; 4) manufacturing; 5) tourism; 6) agriculture; and 6) energy sectors.

The fact that the NWFP and NWEAI addressed more indicators than the Swedish Gravel Tax is already elaborated in chapters 3 and 4, and in fig.4.2 and fig.4.3. One needs to keep in mind that not all shaded areas have the same meaning; while one shaded area may mean that the policy considers that particular indicator from the *beginning or in the design stage of the policy*, another may mean that policymakers only consider that indicator in *response to some outcomes (especially negative and unanticipated ones)*. How does one know whether any of these shaded areas are desirable or not, or that the original policies that contributed to these shaded areas should be retained in our proposed strategies? As shown in fig.5.4, some areas are both shaded and checked. These indicate that our proposed policies *do not* require the existing policy (in this case, the Gravel Tax) to be abolished entirely. However, as shown in fig.5.6, our proposed policy elements ‘replace’ away some of the shaded areas in fig.5.5 with checked areas; this implies that our policies are expected to address the associated areas *better* than the NWFP and NWEAI, and that these latter policies should be omitted from these activity areas and indicators totally.

As shown in fig.5.6, the economic & development sector explicitly addresses toxic & pollution and energy efficiency through the promotion of MFA, EFA and SFA, biodiversity through more creative approaches of owl conservation (refer to section 4.6.3.6) and ‘Forest Grant for Sustainability’ (FGS) Initiative, market share through the improved federal preferred purchase program, and diversity of skills through the ‘Industry Co-employment’ (ICE) Scheme. However, some existing aspects of the NWFP and NWEAI can be retained to complement our proposed policies. The owl protection efforts so far should be maintained, if not strengthened. Some of the

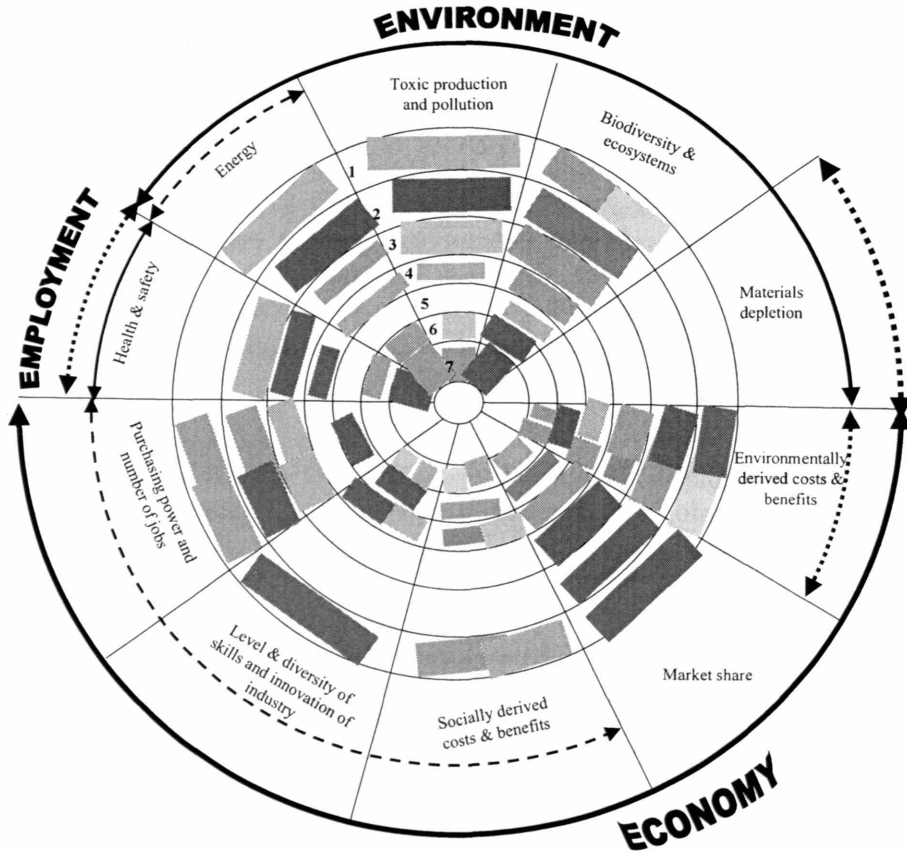


Fig.5.6. Hatched areas signify the indicators addressed by the different activity areas and agencies of our eight proposed policy elements. Areas where there are both checked and shaded patterns mean that certain components of the NWFP and NWEAI should be retained and integrated with

our strategies. The numerated rings represent: 1) economic & business development; 2) construction; 3) housing & urban development; 4) manufacturing; 5) tourism; 6) agriculture; and 6) energy sectors.

NWEAI staff members who are trained to be job counselors should be considered as counselors under our proposed ICE Scheme, thus contributing to environmentally & socially derived benefits, and job creation. Adopting MFA, SFA and EFA, and the promotion of the recycling wood industries, allow the construction, housing, urban development, and manufacturing (including recycling and recycled wood products) sectors to take measures to reduce pollution, toxic wastes, support energy efficiency industrial processes, and, as a result, enhance better health & safety for consumers and workers. The reason why we do not consider the existing NWFP effective in regulating the volume of logging in the Northwest forests is that existing problems with the sub-standard forest management there requires a fresh approach; besides, with the advent of Bush Administration's Healthy Forest Plan, the logging restrictions are essentially nullified. If local jobs can still be created to encourage timber workers to take construction jobs instead, these should be arranged under our proposed ICE Scheme. Hence, in this sense, the NWEAI can still be utilized to create more jobs in these sectors. The manufacturing and agriculture sectors share many of the features as the construction sector. Our strategy to integrate eco-tourism into the forestry industry is through the ICE Scheme and creative measures to protect the Spotted Owls. This is expected to have far-reaching effects since it directly enhances biodiversity, promotes the market share of non-timber enterprise, capitalizes the environment and social benefits from eco-tourism, diversifies skills as well as provides more jobs in the eco-tourism as a whole.

As in the case with our proposed policies for the Gravel Tax, the energy sector is more intimately linked to the other sectors through the promotion of MFA, SFA and EFA of the wood recycling process, and the certification of recycled wood products. This allows the energy sector and agencies to directly address not only energy efficiency, but also health & safety, toxic & pollution prevention, biodiversity and ecosystem preservation. The economic & business development agencies, primarily represented by the Economic Development Administration, would be involved in almost every indicator relevant to the construction, housing, urban development, manufacturing and eco-tourism industries; this is because our eight policy elements are deliberately designed to have a direct bearing on the economic performance of these industries.

In conclusion, our policy proposals cover much more indicators and require greater integration amongst the different agencies and activity areas. Furthermore, these proposals can also capitalize on any desirable outcome of the existing policies, thus building upon any foundation laid down by the NWFP and NWEAI that has the potential to further promote sustainability in the timber industry.

5.3.3 Case Study 3: Policy Tools to Promote the Use of Substitute Fuels for Cement Production in the US and UK

As shown in fig.5.7, the policies supporting and regulating the use of substitute fuels for cement manufacturing in both the United States and United Kingdom involve primarily the economic & business development, construction, housing& urban development and manufacturing sectors and agencies. Specifically, under these policies that are supported by the economic development agencies (such as the Economic Development Administration of the United States), the manufacturing sectors get to experiment with the use of these fuels in order to reduce reliance on fossil fuels and landfilling space (i.e. material depletion or space consumption concerns), while reaping financial benefits from being paid to collect the wastes from the waste disposers (i.e. environmental derived benefits). Economically, this also saves the cement manufacturers on expenditure on fossil fuels. The UK version of the Best Available Technology (BAT) standards encourages the employment of ‘innovations in technique’ in the clean technologies by the cement plants. Nonetheless, in both countries, there are legislations in place to ensure that pollution and toxicity are minimized or eradicated, thus safeguarding the health and safety of kiln workers. These regulations also protect construction workers (i.e. construction, housing& urban development sectors) from any toxic materials in the cement kiln dust (CKD). The energy sector – especially the fossil fuels lobby – has a stake in this policy direction, since it affects the market share of fossil fuels. As such, one expects data and information on the health & safety impacts from the toxicity & pollution of some substitute fuels, as reported by alternate studies, to be of interest to them. In fact, representatives from the energy sector were also involved in advocacy groups opposing the use of substitute fuels.

As shown in fig.5.8, our proposed policy solutions represent a more fundamental replacement of the current policies than those proposed for the last 2 cases. The fact that the ‘Green Fuel Innovation’ Scheme aims to improve the economic capacities of cement companies that are successful in abiding by more stringent emission regulations in their use of substitute fuels implies that now the economic & business development sector/agencies are directly involved in the policy. This Scheme also replaces the role of existing substitute fuels regulations in the way this sector addresses fossil fuel depletion, decreased reliance on landfilling and fossil fuels (i.e. energy), financial benefits from using wastes, innovation in application of cleaner technology, and the assurance that health & safety of public is not sidelined by economic considerations. The proposed Waste Production Tax – as an economic disincentive – serves to prevent any Jevon’s Effect in the waste exchange between cement kilns and other industries, which may happen if the promotion of sustainable cement in the market is successful (which also the cement manufacturing sector directly). On this note, such a public education program will contribute toward increasing the social benefits of an increased knowledge and awareness of how cement can be made more sustainable.

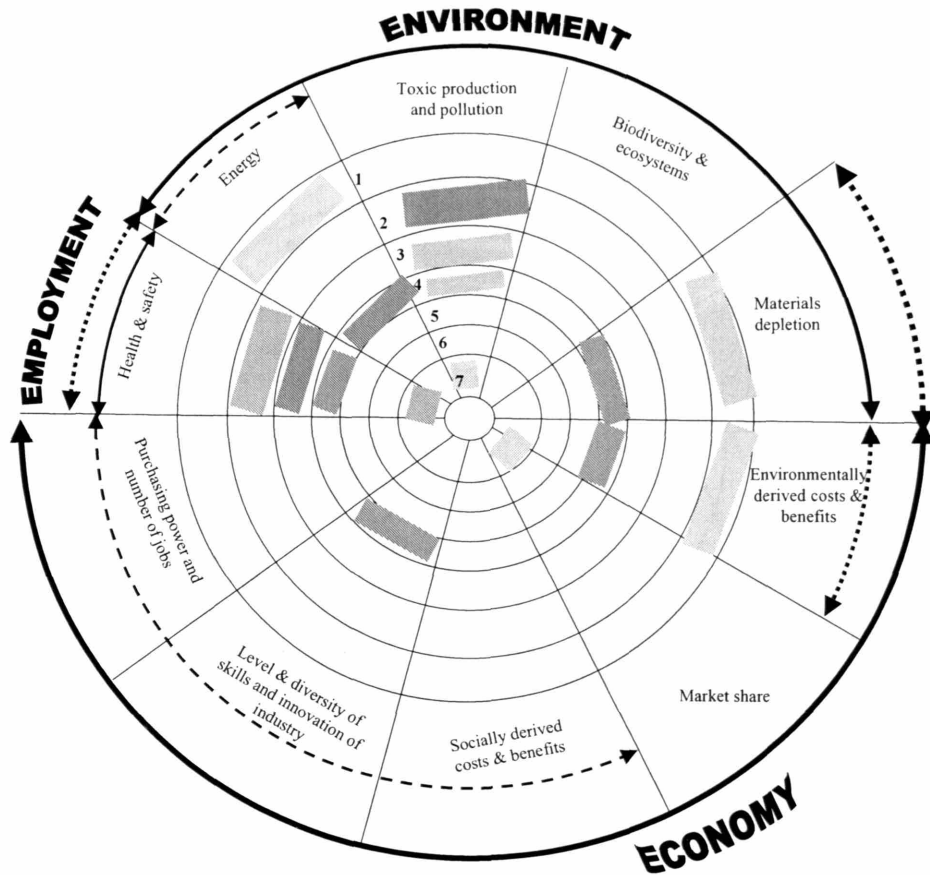


Fig.5.7. Shaded areas represent the indicators explicitly addressed by the current policies supporting and regulating the use of substitute fuels in the United States and United Kingdom. The numerated rings represent: 1) economic & business development; 2) construction; 3) housing & urban development; 4) manufacturing; 5) tourism; 6) agriculture; and 6) energy sectors.

The construction, housing and urban development sectors will be invited to the demonstration project (spearheaded by the scientific advisory board); this would clarify any queries on the safety of cement made with substitute fuels vis-à-vis the level of toxicity in the CKD and its possible impact, if any, on workers' health & safety. Of course, these concerns are relevant to the cement manufacturers as well. These manufacturers would benefit from the 'Green Fuel Innovation' Scheme by reducing reliance on fossil fuels and landfilling, while reaping the environmentally derived and innovation benefits in the form of the 'green fuels credit' earned under the Scheme (which can be further traded or converted into research & development funding). Besides, the Facility Clean Emission Index (FCEI) not only provides the opportunity for the manufacturers to earn additional 'green credits', through its transparency increases the public knowledge in the use of substitute fuels as well as public trust with the cement plants involved. Finally, the demonstration project plays a very pivotal role in reaching out to the advocacy groups who oppose to all uses of substitute fuels. This means that the demonstration

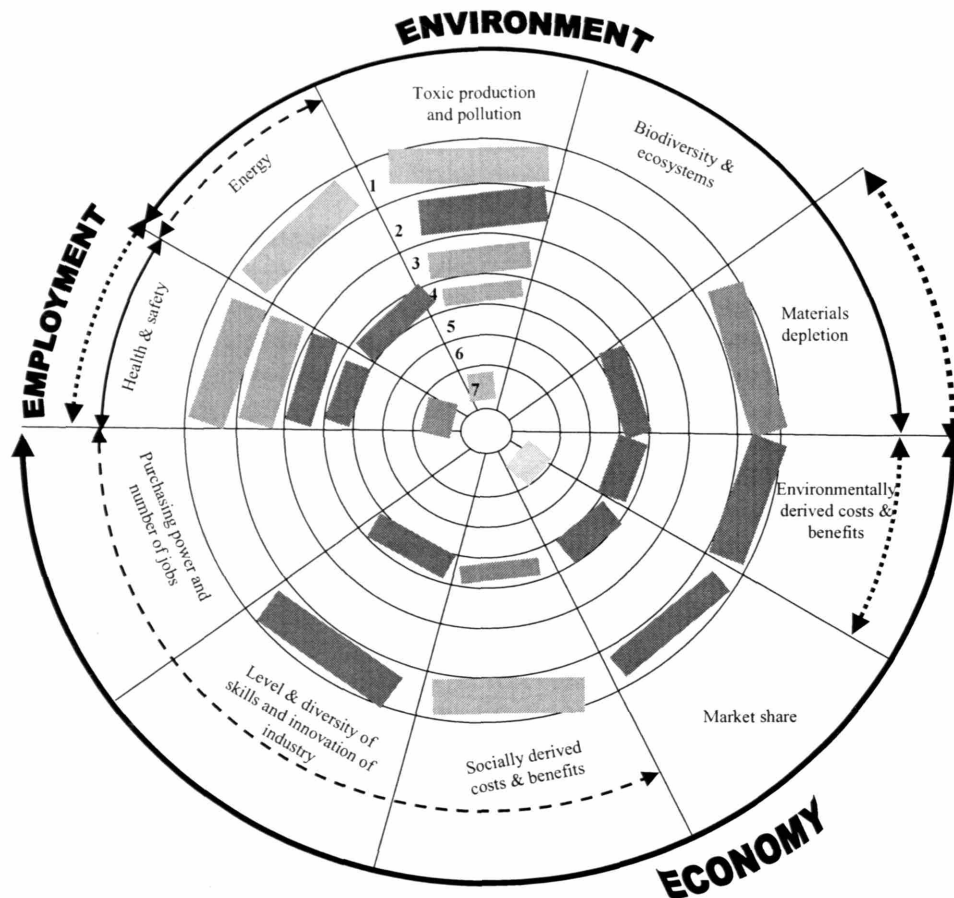


Fig.5.8. Hatched areas show how our proposed policy elements regulating and supporting the use of substitute fuels will involve the different sectors/agencies in the different indicators. The numerated rings represent: 1) economic & business development; 2) construction; 3) housing & urban development; 4) manufacturing; 5) tourism; 6) agriculture; and 6) energy sectors.

project will involve the energy sector in joint fact-finding regarding the levels of toxicity and pollution of such fuel uses, and any impacts on workers' and public's health & safety. However, none of our proposed policies need to explicitly address how the fossil fuel sector should position, or re-position, itself in the market in order to be more competitive (thus the shaded area from fig.5.7 remains in fig.5.8).

In conclusion, as illustrated by the Ashford-Hall plots, our proposals aim to replace and improve many of the existing policies that regulate the use of substitute fuels. Most distinctly, as implied by the greater integration required for implementing our proposals, the existing stakeholder engagement methods (surrounding these issues in both countries) need a great deal of improvement.

5.3.4 *Case Study 4: Reforestation and Afforestation Policies of Chile*

Fig.5.9 shows the extent of indicator coverage by the different sectors and agencies of the DL701 reforestation policies of Chile. The Ministry of Economy and the National System of Protected Wildlands (SNASPE), the latter of which is under the charge of the Corporacion Nacional Forestal (CONAF), address the issues of increasing the market share of Chilean timber and wood products internationally, and the job creation capacity and environmentally derived

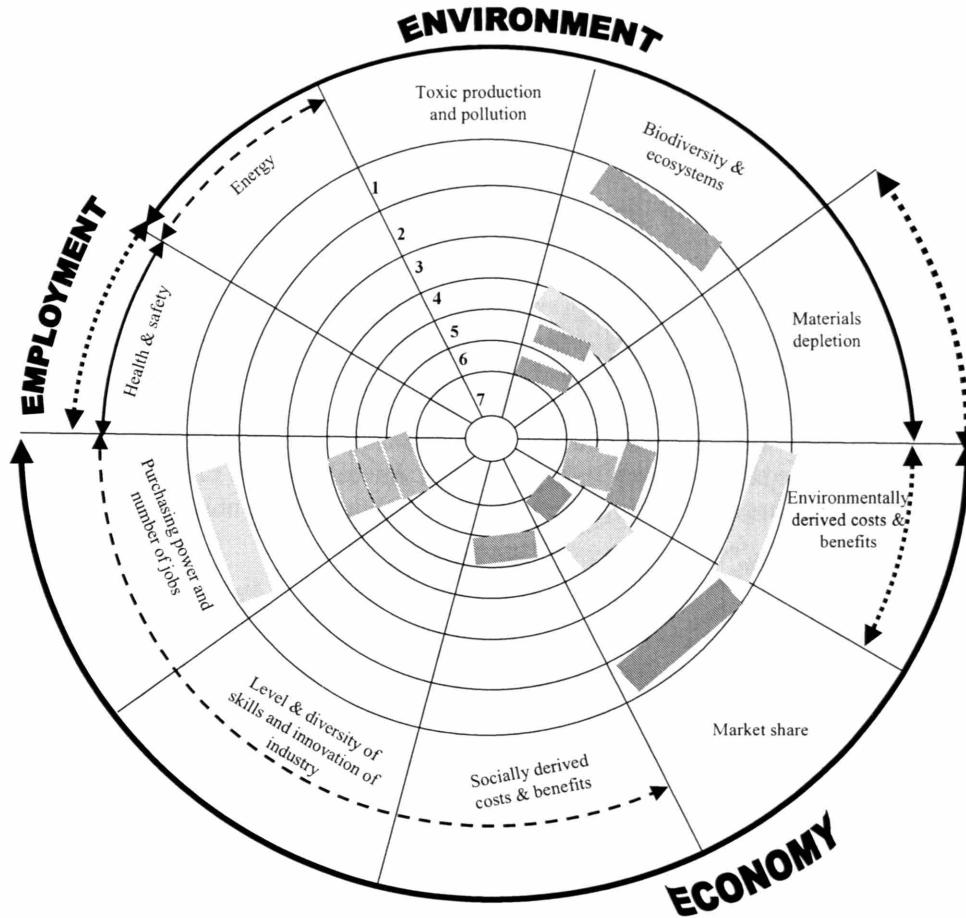


Fig.5.9. Shaded areas indicate the indicators addressed by the various agencies and sectors under the DL701. The numerated rings represent: 1) economic & business development; 2) construction; 3) housing & urban development; 4) manufacturing; 5) tourism; 6) agriculture; and 6) energy sectors.

benefits/costs²⁰ of the engineered wood products and forest sectors, while protecting chosen forested areas in order to maintain biodiversity. The non-timber agriculture/manufacturing and the eco-tourism sectors, together with the National Tourism Service (SERNATUR), helps ensure that existing policies complementing the DL701 promote biodiversity and other environmentally derived benefits to certain extent. These sectors also provide jobs and eco-tourism has the ability to generate socially derived benefits by educating the locals and international tourists on the flora and fauna of Chile.

²⁰ In the case of the DL701, environmentally derived benefits pertain to the rapid reforestation efforts with commercial plantations, whereas the costs pertain to the over-replacement of the Native forests with these plantations to the extent that biodiversity is compromised. Hence, environmentally derived cost is also closely related to biodiversity.

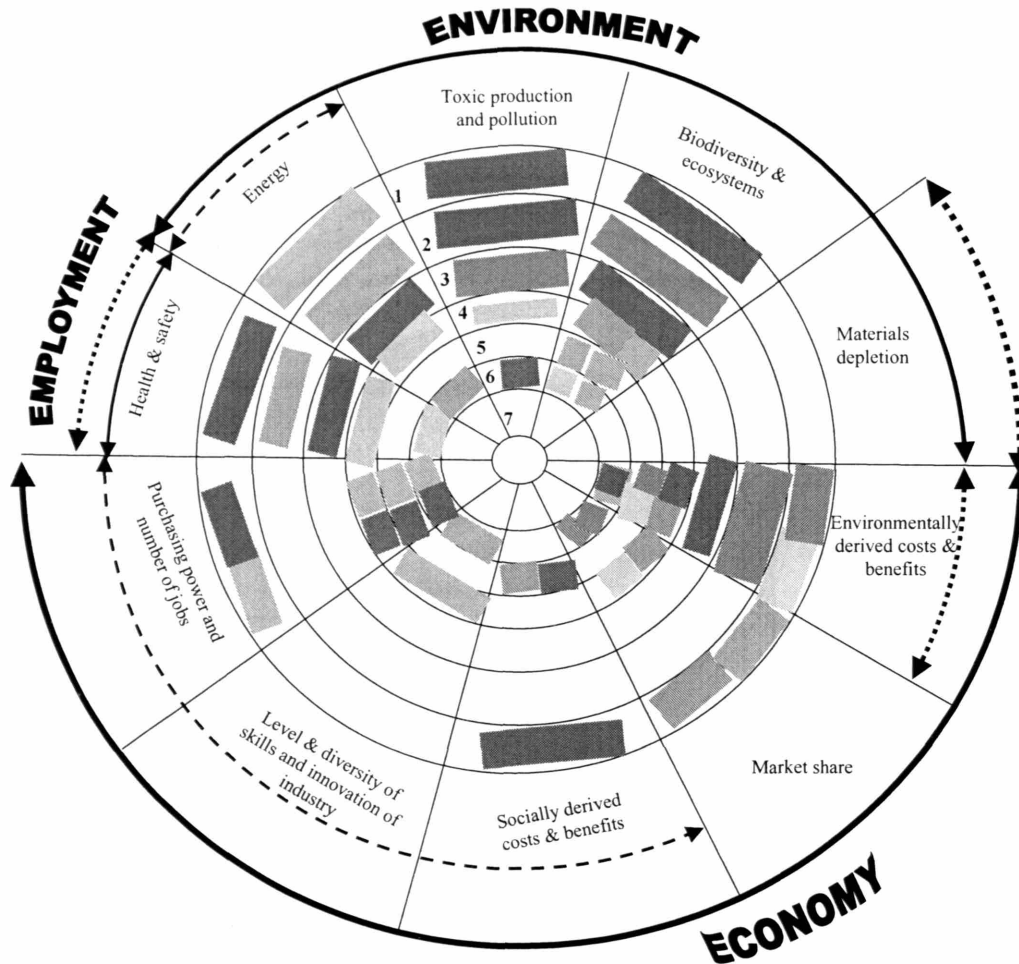


Fig.5.10. The hatched areas represent the indicators that the different sectors and/or agencies address under our proposed policy elements. Those areas that contain both checked and shade patterns are those in which our proposed policies can supplement current policies related to the DL701. The numerated rings represent: 1) economic & business development; 2) construction; 3) housing & urban development; 4) manufacturing; 5) tourism; 6) agriculture; and 6) energy sectors.

However, as we have elaborated in Annex IV, the DL701, and hence economic concerns, still dominate the development of the forest industry and to tackle these problems, our proposed policies address much more areas. As shown in fig.5.10, the main thrust of our action plan for Chile – the combination of an extended sustainability program under the relatively successful DL701 Reform and the forest certification reform program (which includes the co-option of current certification programs that pass the set of new sustainability requirements set by the government under a new Ley de Bases Chile (LdB) as well as the unbundling of key guidelines in these qualified programs) – addresses many indicators. The new sustainability requirements would hold the construction, housing, urban development, agriculture and business development sectors responsible for ensuring health & safety, increasing energy efficiency, reducing/preventing toxicity & pollution, and promoting biodiversity in their uses of both commercial and native forests. All uses should be based on sound decisions made not just on environmentally derived benefits of commercial plantations but also on recognizing the costs on biodiversity.

Our proposed Industry Co-investment Program (ICIP) encourages the key timber corporations to invest in key non-timber enterprises without threatening their current status under the DL701 and even the DL701 Reform. That is why we include the current policies the garner

the support of the wood products manufacturing, forest and eco-tourism industries in addressing biodiversity, environmentally derived benefits/costs, market share of timber domestically and internationally, and job creations (in all these industries). Under the ICIP, business development and eco-tourism, with the additional investment from the forest industry, will have more resources to contribute toward the social benefits in the form of visitors' knowledge of, and appreciation for, the natural beauty of Chile. We believe that the ICIP can contribute further – by directing more investment into non-timber product sectors, such as eco-tourism, more jobs can be created in these sectors. This would imply that, with more job options elsewhere, even non-unionized workers could now bargain for better pay and working conditions in the commercial plantations. Provided that these optional jobs are accessible to these workers (through a systematic job training program supported by the government), the ICIP indirectly helps to improve the level and quality of jobs in the wood products manufacturing and forest sectors.

In conclusion, our policy proposals can be built into the existing policy framework defined by the DL701 and DL701 Reform. Above all, these proposals substantially increase the policy reach and integration across a much wider range of indicators, agencies and activity areas.

5.3.5 *Conclusions from Case Studies*

In summary, figs.5.3 –5.10 allow us to compare the types of indicators addressed by the different agencies and sectors before and after our proposed policies are implemented. These comparisons also visually highlight the areas in which the 'old' and proposed policies can be implemented together. Above all, they show us the extent to which the different agencies and sectors are integrated with the various proposed policy elements.

5.4 **Task Forces in Integrated Policymaking**

5.4.1 *The Use of the Ashford-Hall Plot for Integrating Task Forces*

Throughout our policy proposals, the task forces play the critical roles in initiating all integrated policy actions and decisions. The advantages of assigning task forces to spearhead policy transformations are enhanced accountability and delegation of responsibilities. As described in chapter 4, every policy transformation forms part of the integrated policy, and a task force is put in charge of each integrated policy. *Ideally, an integrated policy should be comprised of a wide array of policies coherently linked to one another*; however, in most cases, it may either be impractical or ineffectual to have a mega-integrated policy that encompasses every policy within a country, region or state. This may even be the case within one industry, such as one that is as diverse and fragmented as construction; after all, it involves a wide variety of materials, services and interaction networks. For example, if we are interested to prescribe another integrated strategy to promote the sustainable use of wood in the construction industries in Sweden, a better approach will be to assign another task force to spearhead the initiative instead of adding more dimensions to our proposed 5-part integrated strategy that is aimed primarily at promoting Sustainable Concrete Aggregate use. In such a situation, one has to ensure that there is also integration among the different task forces and integrated policies, and that the strategies of one task force does not give rise to new problems that other task forces have to solve, or worsen the current problem the latter are trying to solve. Ashford-Hall plot offers a way of visualizing such an integration. In fig.5.11, each circle stands for an integrated policy/task force and we consider, as an illustration, two policies – one for sustainable concrete aggregate and one for sustainable wood. We intersect the two circles so that the activity areas and

government bodies of both *coincide with each other*. For ease of visualization, only the construction and agriculture industries are shown.

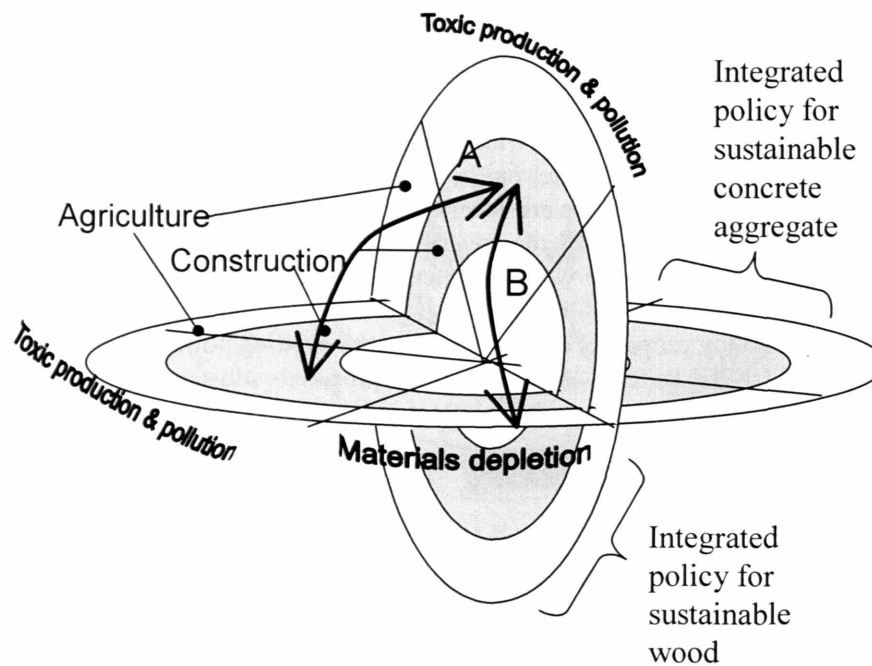


Fig.5.11. Integration of government bodies and issues of sustainability among different integrated policy strategies, in case it is impossible and/or impractical to fuse the two policies into one integrated policy. An example is shown for integrated policies addressing Sustainable Concrete Aggregates and wood separately.

Two indicators – toxic production & pollution, and materials depletion – are considered. In order to ensure a more holistic integration between these two integrated policies, the respective task forces should cooperate and coordinate amongst themselves to ensure that their respective policy strategies do not become a problem for the other. We envisage two possible types of coordination (or potential challenges) that can occur. Firstly, as shown by the double-headed arrow ‘A’, efforts must be made to ensure that strategies addressing, say, toxic production and pollution in the construction industry in concrete aggregate-related policy is coherent, and not conflict, with the efforts in wood-related policy for the same industry and sustainability indicator. Hence, this requires the government bodies in charged of construction to be vigilant of any potential conflicts between the two policies to the same industry.

Secondly, as shown by the double-headed arrows ‘B’, efforts must also be made to ensure that strategies addressing toxic production and pollution in the construction industry in aggregate-related policy do not contradict the objectives of strategies addressing, say, materials depletion in wood-related policy. Hence this requires the appropriate government bodies to enter into a dialogue and become part of the policy strategy. This coordination is very useful in preventing any negative, associated effects, such as the concrete aggregate-related policy causing consumers to turn to wood as a substitute materials for lightweight construction.

5.4.2 Role of a Task Force

There is an important difference between the task forces we need for policy integration here and the more conventional meaning of task force as used in Local Agenda21 and even that associated with citizen's advisory boards/committees (Vari (1996); Lynn and Karetz (1996)). Our version of the unit is comprised of a cross-agency and multi-stakeholder group leadership-management team whose work is integrated across all issues and levels of governance. The conventional task forces usually are comprised of only local stakeholders and/or non-governmental advisors.

It is worth noting that the proposed task forces do not release the government bodies of their need to embrace the integrated-policymaking mindset and culture. In fact, in order for a task force to be really effective, one requires the government leaders at the top – Presidents, Prime Ministers, Congresses or Parliaments – to adopt this thinking. A task force is a vehicle with, and by, which integrated policymaking is put into practice; it is not an entity separated from the governance structure. Put another way, these task forces are a manifestation of the integrated-policymaking ethos of the country, region or state.

Is there a preferred mode of operation for a task force to be more successful in its policy integration? There are many ways by which a task force can be engaged in policymaking. We believe a task force should go beyond merely doing feasibility studies or assessment of the status quo, and based their policy recommendations on their conclusions; it should have the power and capacity to initiate changes by actually putting their recommendation into actions. This is the reason why we think these task forces should form the leadership core at which the final decisions are made and proposed policies at their respective levels and in their concerned contexts are implemented. In short, the task force pays not just lip service to policy changes but is in the driver seat to implement actual changes with the help of stakeholder groups. In the Sustainable City Plan (SCP) of Santa Monica, the task force of the 1999-2000 period faced a challenge in persuading the City Parks and Recreation Department to incorporate specific recommendations from the SCP master plan into their development of certain properties. The feedback they got from the Parks and Recreation Department was that it lacked the essential resources, including manpower, to implement some of the changes required. When asked to provide human resources to support their recommendations, the SCP task force could not oblige. This is not surprising given that the task force is primarily a team of experts charged with the responsibility to offer advice on crosscutting sustainability issues.

5.5 Role of the Technocrats

As reflected in Chapters 2 and 4, stakeholder participation is an indispensable component of policymaking rather than a sustainability indicator. The various mechanisms of stakeholder engagement *indirectly but critically* define and even challenge the role of technocrats in the interaction process and the utilization of decision-making information obtained from such interactions.

In section 1.3.3.1, we pointed out that current focus groups and scientist-layperson workshops primarily treat the technocrats as the creators of knowledge, on which policies are based. Such a mindset is in danger of perpetuating the following pitfalls in sustainable development policymaking:

- Honoring traditional assumptions that simplify scientific modeling but do not aptly or fairly reflect the reality that policies must address,
- Resulting in scientific research and even policymaking that are detached from the real concerns of the public,
- Shortchanging the full potential of the non-specialized public in the stakeholder participatory process. This is especially the case when technocrats either deliberately or unintentionally, overwhelm them with scientific facts and data that are not properly explained within a broader context.

Besides, to a great extent, technocrats' power in influencing policies is dependent on the support from those holding political positions, who are also subjected to parallel influences by public opinion that either bypasses the technocrats or are not captured in the views of the technocrats. Therefore, it makes sense for technocrats to remain in closer contact with the grassroots level in formulating their contributions to the policy discourse.

The prerequisite to a successful interaction between technocrats and the other stakeholders is to *create a neutral environment in which each is willing, capable of and has the opportunity to learn from one another*, with the result of co-creating knowledge that supports the design and implementation of effective policies. On this note, the weaknesses of some of the existing stakeholder participation methods, which are highlighted in section 1.3.3.1, can be transformed into strengths to serve this purpose. We recommend the following steps to educate technocrats on their possible role in stakeholder interaction:

- Train selected scientists and professionals as potential *communicators* who represent their respective fields in future interactions with a non-specialized audience;
- During this training stage, efforts should be made to highlight the areas in which existing methods of enquiry are still not able to produce conclusive data about certain aspect of the policy. One example is the method of accounting for the number of owls in the Northwest forests immediately after the Northwest Forest Plan was implemented in 1995;
- These 'weaknesses' should be included on the agenda for discussion and brainstorming during the meetings. As described in our proposals to address the problems in the case study on U.S. forest management policies, incorporating a public participation program modeled after the Great Backyard Bird Count can well be the result of such a meaningful discussion – a good example of how a carefully crafted 'layperson' method may prove to have tremendous scientific value, and
- Encourage technocrats to work alongside what we call 'layperson experts'. Using the Great Backyard Bird Count as an example, the biologists who are working on keeping track of any changes to the owl habitat have to learn how to enlist the help of volunteers who may be well trained in bird-watching, wilderness first aid, or even night photography – special skills that even the biologists do not know but are valuable in helping to run the program. These 'layperson experts' may even be asked to teach such skills to the biologists and other participants in order to sharpen their skills in keeping track of the owls.

In summary, the purpose of stakeholder interactions should go beyond being teach-in sessions in which technocrats pass knowledge to non-specialized. They should be feedback sessions in which technocrats reflect upon what they do not but want to know, and utilize the knowledge and expertise of the others to fulfill this need. It is only through such information sharing and critique process that knowledge co-creation can be effectively realized.

5.6 Sustainability Thinking and the Structure of the Institution

We mentioned in Chapter 4, section 4.2, that as a development concept, sustainable development exposes the ‘weaknesses’ in existing government structure and the relationship between the government and other non-government stakeholders. Another way of viewing and conceiving this concept is that it is a way of helping the existing institution – government agencies, businesses, stakeholder organizations – to identify areas of inadequacy and pathways to grow and mature into a future state that are better poised in putting sustainability into practice.

The key to this growth is to allow both the concept of sustainable development and the institution to co-evolve. Intermediate sustainability goals must be set and revised to progressively spur the growth of the institution.

A common mistake made in setting such progressive and intermediate goals is to concentrate only on one or two of the domains of sustainable development in the first few years and hope to graduate into all three domains as the institution become more able and endowed. From the onset, *all* three domains should be included; for the start, with the purpose to ‘train’ or tune up the current institutions, a few key indicators in all three domains could be considered. As the institutions become more able, more indicators should be included. This notion can be illustrated as an upward spiraling helix in fig.5.12.

Setting of intermediate goals for sustainable development can be done in various ways but the most coherently articulated method is the backcasting method (Dreborg, 1996). Note that backcasting (shown in fig.5.12) is not about predicting the future or predicting the intermediate steps between the status quo and target future state; it is about setting logical intermediate targets linking the start and end points. The trajectories linking these intermediate points to one another is highly unpredictable but are guided by policy tools directed toward clearly-defined long-term targets. And these policy tools should aim to address all the three domains along the entire trajectory.

Who should initiate the initial sustainability concept and the revision of initial institutional structure? As mentioned in section 5.2, the political will of the leaders at the very top is instrumental to the adoption of the initial sustainability concept. Once this condition is present, a task force can keep up the momentum by organizing and even educating its key steering committee members about the essential changes that the stakeholder groups they represent must adopt in order to realize integrated policymaking in order to achieve well-defined goals for the future. Since the development of the structures of the groups will affect the success of the integrated policy concerned, it is in the interest of the task force to provide the necessary support – logistics, knowledge and even funding – to accelerate the evolution of these structures. This is a top-down approach.

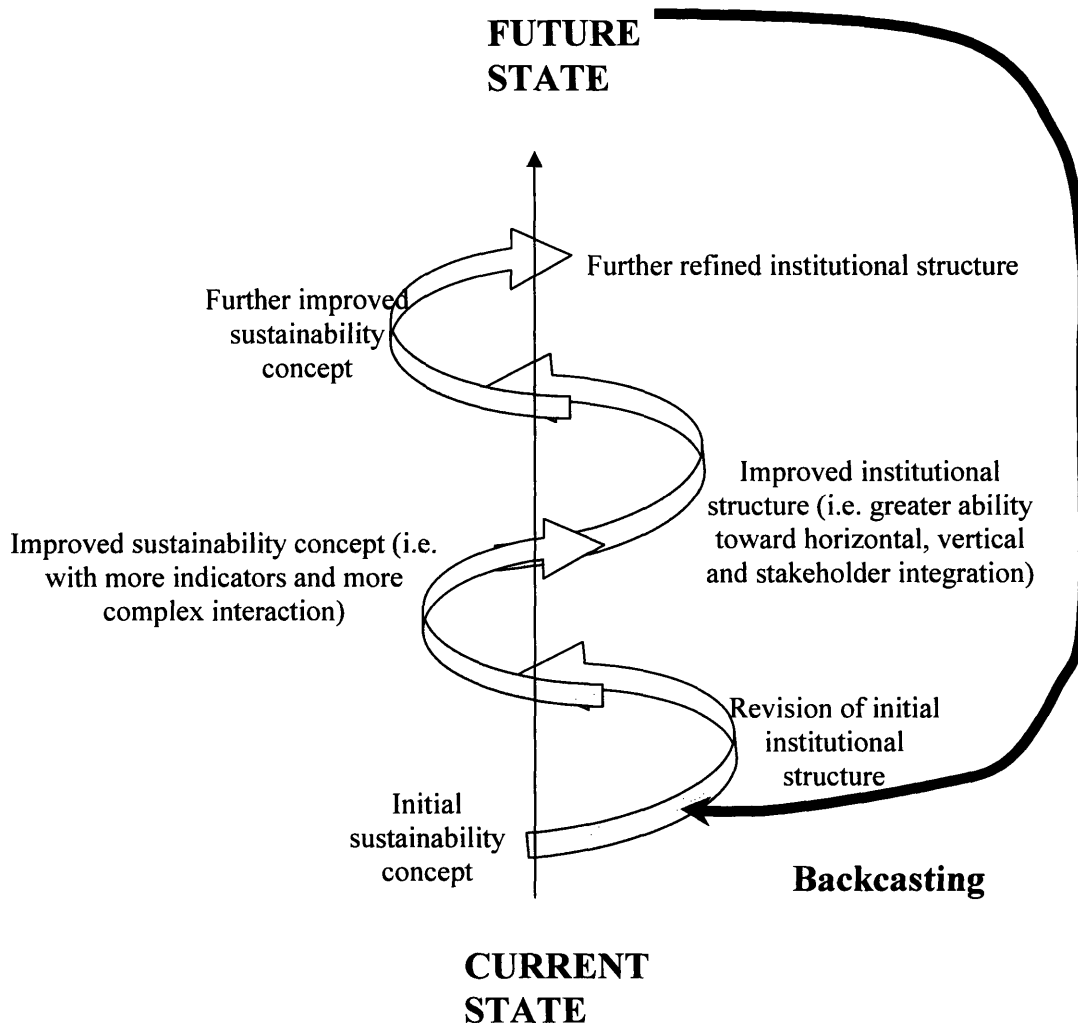


Fig.5.12. The co-evolution of the concept of sustainability and the institutional structure capable of realizing the sustainability ideals.

What happens if even the top leaders are neither long-term goal oriented nor concerned or aware of the concept of integrated policymaking for sustainability? Government and non-government stakeholders who are convinced of the benefits of integrated policymaking can form an ad hoc task force and strive to demonstrate this concept at a more local and smaller scale. This may begin with the task force constructing a limited vision for the future by addressing a few indicators (that span across all the three sustainability domains) in a local project. Once shown to be successful, the outcome should be highlighted to the local government and the task force should expand the future vision by including more indicators and stakeholders into its subsequent stage of policy strategies. Once convinced of the integrated approach, the local government should introduce the concept to the state government, who will finally share its experience with the federal government.

The success of this sharing of experience is contingent on the connectivity among the different levels of government. If this connectivity is not cultivated, the co-evolution will very likely fail. One example is the Jobs-For-Youth Boston program, which is widely acknowledged as a success story of a policy that co-addresses education, employment, skills upgrading and environmental remediation in several cities and towns in Massachusetts. However, this concept is not extended to all other regions and states that are faced with similar challenges. There is also a missed opportunity to further extend the coverage of such a policy to include other sustainability indicators, such as the training of qualified personnel to act as community outreach instructors to encourage more residents to convert to energy efficient appliances – a strategy that would have motivated the state government to design and implement a suite of policy tools to complement it. In short, such a bottom-up approach has the potential of evolving the overall governance structure of a country starting from the most fundamental level over a period of time.

In summary, sustainable development policies should be considered as a useful measure of the effectiveness of institutions and a catalyst for transformation of these institutions to better serve the efficacy of policy integration. A cautiously and intelligently designed and selected task force is a useful mechanism for making that possible.

5.7 The Different Types of Feedback

The seeking and management of feedback are critical to the success of stakeholder participation and policymaking. Current literature does not differentiate between the different types of feedback essential for sustainable development. In our policy proposals in Chapter 4, we can identify 5 distinct yet interdependent types of feedback:

- ***Type 1:***

When local government or task forces (as we have proposed for our cases) design policies, they should provide sufficient information to their superior – state or possibly federal governments – the details of their policy contents so that both can determine if the objectives of these policies are still coherent to the ‘bigger’ goals of the states and country;

- ***Type 2:***

Once type 1 loop is completed and results are of satisfaction, type 2 loop requires the policymakers of the different integrated policies to interact with one another, so that the objectives would not conflict with one another (as illustrated in fig.5.11). This assumes that not all sustainable development indicators can be captured and addressed in one and only one integrated policy;

- ***Type 3:***

Both type 1 and 2 loops are conducted before the policy implementation. After the beginning phase of a policy is implemented, type 3 loop comes into effect. Policymakers need to ensure that dialogue and meetings with grassroots level stakeholders remain open to collect feedback for the following purposes:

- To determine if the outcome of integrated policies contradict their original objectives. If this is the case, then the original policies must be revamped and re-designed.
- To determine if the outcome of an integrated policy conflicts with the objectives and/or outcome of other coupling integrated policies.

- **Type 4:**

What happens when there is no easy and feasible way to avoid some form of conflict, as identified from the type 3 feedback loops? The judgment call will have to come from the leadership of the task forces, state and federal government – directly or indirectly – to decide if the original sustainability goals should be revised in order to either mitigate or even eradicate these conflicts. The information needed for such decisions should be collected with the aim of deciding what is and what is not possible to change and avoid at the local levels. This may include scenario-brainstorming sessions with grassroots stakeholders in which some of the seemingly indispensable issues, such as driving into and within the city center, are challenged.

- **Type 5:**

The government agencies in the task force play the leadership role in the functioning of the unit. What happens when there is a change of office and the government agencies have to be replaced by new agencies? There is a possibility that original sustainability may be modified with different political ideals even when there are no observed conflicts from the type 2 and 3 feedback. These changes may or may not be beneficial to the community, state or country as a whole. Type 5 feedback is a mechanism by which information accumulated from the previous term of office is communicated to the new officer bearers by the remaining key members of the task force to open up a fair debate regarding the impact and/or necessity of any changes to the original goals in the absence of any conflicts between policy outcomes and objectives. This type of feedback loop will be further discussed in the next section.

Understanding the nature of the five types of feedback loops gives us a better idea of the kind of information we need in order to conduct these feedbacks. Note that type 5 feedback loop may not even be required as long as the conflicts between the objectives and outcomes of the integrated policies can be addressed without revising the original goals.

But how long will it take to collect information needed to decide whether there is a conflict between outcomes and objectives? It depends on the magnitude of the changes introduced by the policies as well as the nature of the policy. For example, with reference to the flow diagram in fig.4.22, which is reproduced in fig.5.12 for easy reference, the step in which the proposed new sustainability criteria as an extension of DL701 Reform is subjected to Parliament approval is the type 1 feedback loop, and it may take as long as 2 years worth of debate and verification. In the lower right corner, qualification of the certification standards and acknowledging their status officially by the government may take as short as 6 months; however, after applying the new, approved sustainability criteria to the small owners, the effect on their income and forest management practice can be ensured only after at least 1 year. That said, in order to generalize the information fed back from these small owners (i.e. type 2 and 3 feedback

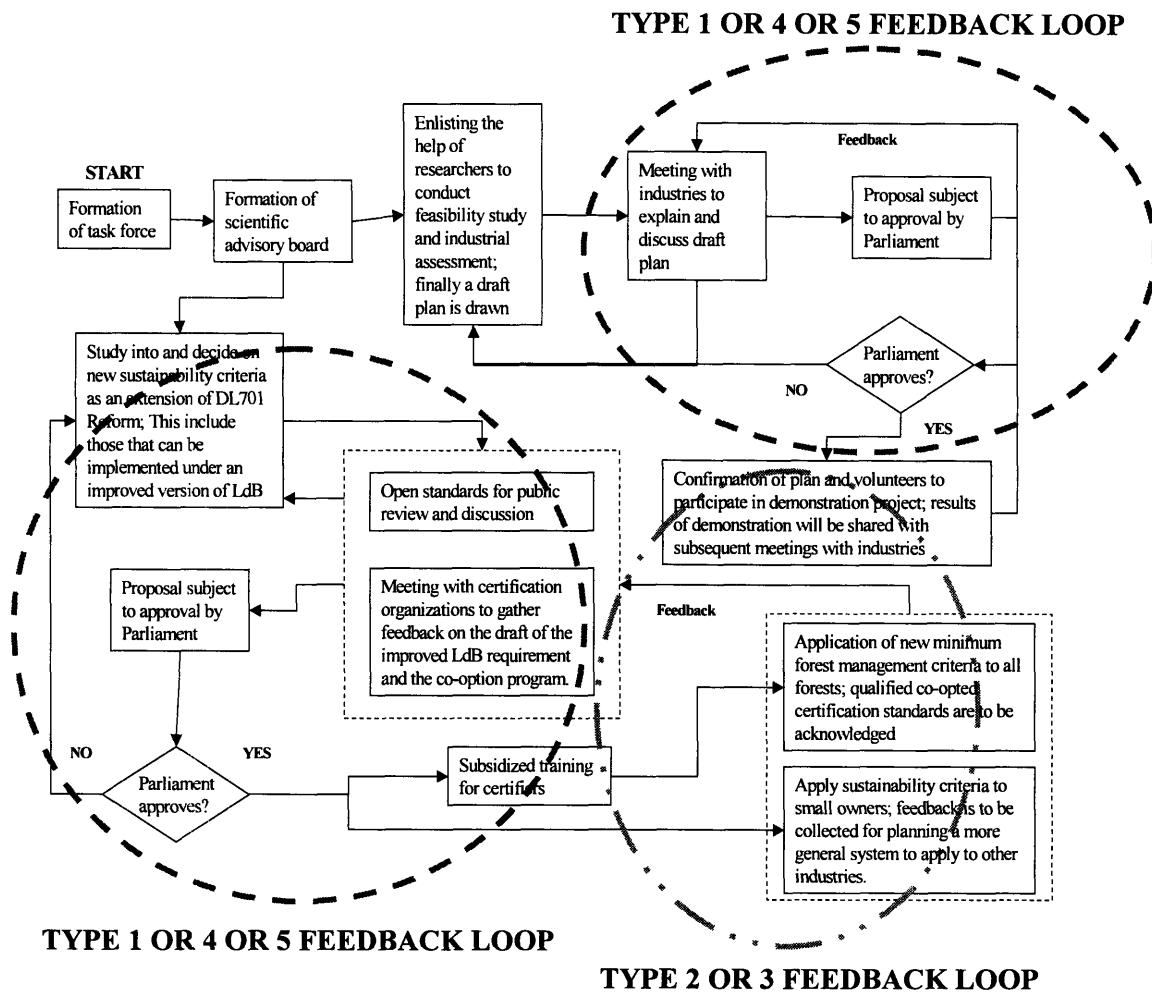


Fig.5.13. Different feedback loops in our proposed integrated policies for the Chile reforestation case.

loops) so that the criteria can be applied to the rest of the industry, an additional year may be required. Since one can view this as a two-staged process, one can make use of the efficiency of the type 2 and 3 feedback loops in the first stage as a signal to initiate the second stage.

5.8 Type 5 Feedback Loop, Integration Across Political Time Horizon, and the Significance of a Sustainability Commission

Basically, the type 5 feedback explores the issue of continuity in policymaking, and thus setting of sustainability targets, between successive terms of office of the government. This is the third kind of integration challenge – that between disparate time horizons – identified in section 5.1. The fact that the core, key steering committee of a task force comprises of representatives from different stakeholder groups – the format of which is employed in all our policy proposals for all the seven case studies – means some of the members are likely to remain in their position *as long as the task force is not dissolved after ever change in office*. Ensuring such organizational

continuity/integrity requires rules to be written that allows the passing of the key leadership responsibilities from the outgoing government agencies to an interim body and/or granting special but temporary administrative powers to elected non-governmental members within the committee.

Nonetheless, given the leadership position of the government in these task forces, there is a possibility for the new government to overrule any decisions made from the information obtained through the type 5 feedback loops to realize its own political objectives as they concern sustainable development. One good way of ensuring that this veto power is kept in check is to make certain practices of the task force mandatory by law – creating a form of *Sustainability Commission*.

The law, or *Sustainability Act*, establishing the Commission – at an appropriate level of government – should specify the following 12 elements:

- The composition of a Sustainability Commission (according to our recommendations) or any alternate body of leadership, management and governance; this includes the interim or ad hoc jurisdiction of key committee members. The Oregon Sustainability Act (Sustainable Oregon, 2002), presented during the 71st Oregon Legislative Assembly in 2001, contains no requirement for its Sustainability Board to include industry representatives as board members. We believe that having them in the Board, or the Commission, is crucial to the success of the integrated planning;
- The responsibilities, duties and authority of the Commission. The Oregon Sustainability Act clearly stated that the Sustainability Board is *not* allowed to propose or recommend any negative incentives or policies, and require rulemaking or other regulatory functions of a state agency, government body or other body. Granting our task forces the status of Sustainability Commissions circumvent these barriers, which we believe would seriously undermine the full potential of the Board to bring about profound and relevant policy transformations;
- The concept of policy integration. That is, the 4 characteristics of policy integration must be present to some pre-determined extent in the policies put forth by the body;
- The recommended set of sustainability indicators;
- The recommended set of stakeholder groups to be engaged in the policymaking process. This include the group of activity areas and government agencies relevant to the different industries concerned, as discussed using the Ashford-Hall plots;
- The presence and nature of the stakeholder participation mechanisms. For example, it is mandatory to have a new regulation undergo a period of public commentary under the informal rulemaking provision;
- Extrapolations of existing provisions by specifying the maximum period of time that the body or its representatives should respond to questions brought up at a public forum where feedback is sought for;

- Any special provisions for settling legal disputes originating from the integrated policies;
- The code of conduct of the body in all the 5 types of feedback described above;
- Any special regulatory concessions that may provide the essential incentives to encourage stakeholders accept the integrated policies. An example is the concessions given under the EPA's Environmental Performance Track, which includes an extension on the onsite storage of hazardous wastes regulated under RCRA for qualified applicants;
- Any guidelines for creating new standards or regulations that will help in realizing the objectives of integrated policies. An example is our proposal to create new sustainability standards as an extension of the DL701 Reform Bill for the Chile reforestation case study, and
- The criteria for modification of the original sustainability goals, in the absence of any known conflicts (type 4 feedback loop).

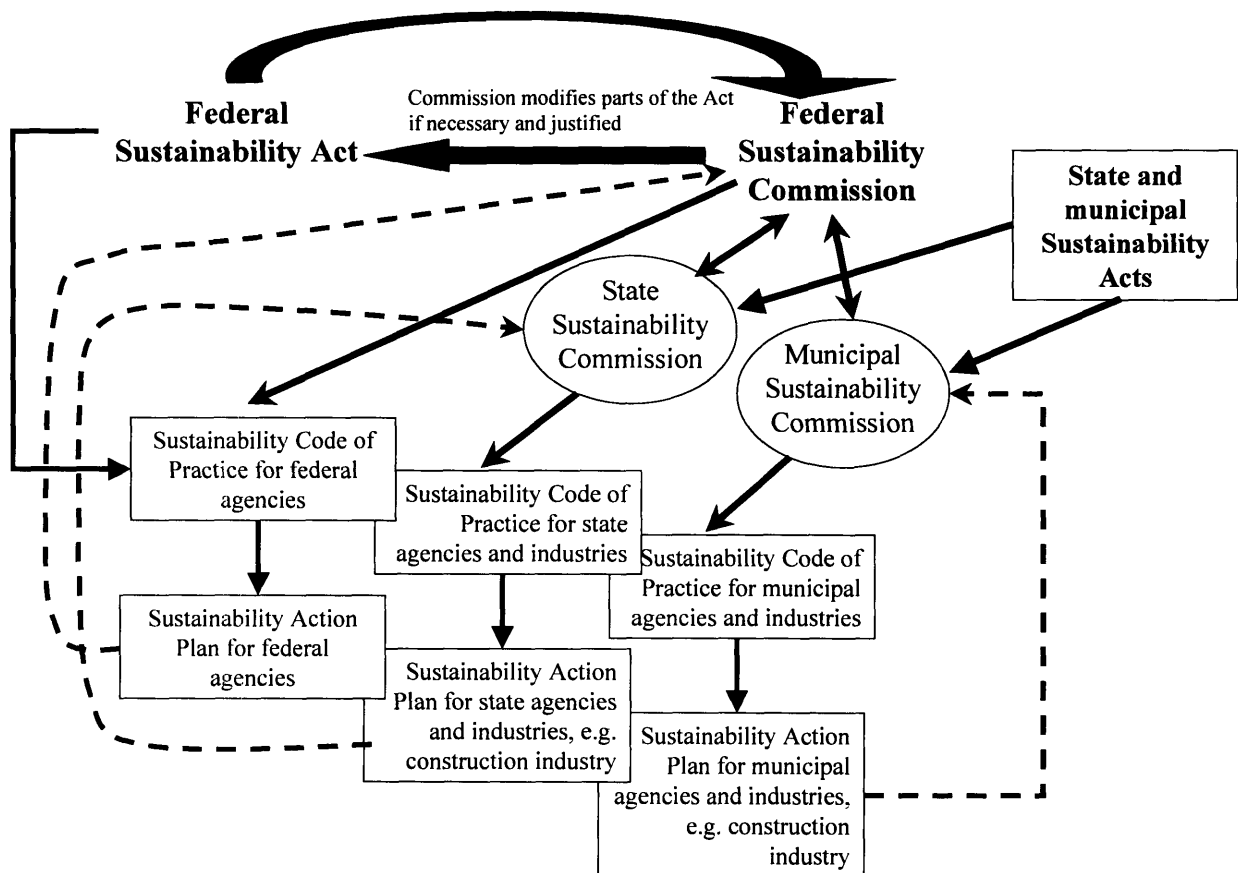


Fig.5.14. The relations among the federal Sustainability Act, the Sustainability Commissioners and Action Plans at the various levels of governance.

In that light, our proposed task forces in the different case studies should be conferred the *status of Sustainability Commission under the Sustainability Act*. Fig.5.14 maps out the relationship between the Sustainability Act and the Sustainability Commission, and shows how the federal, state and municipal level of Commissions are related and integrated for coordinated and more effective sustainability policymaking.

As shown in fig.5.14, the federal Sustainability Commission is in the position to further refine the sustainability goals outlined in the original Sustainability Act, subjected to approval from the Parliament or Congress. Furthermore, the federal Sustainability Commission could have the responsibility, under the Sustainability Act, to help establish and coordinate the duties (via the type 1 feedback loop) of the state and municipal level Sustainability Commissions. Alternatively, state governments can establish state or local Sustainability Commissions. Under the federal Sustainability Act, the latter Commissions will play the role of establishing the state and municipal level Sustainability Codes of Practice that will bind the local agencies and industries to local sustainability goals and standards. In order for these Codes to be effective and practical, the state and municipal level Sustainability Commissions must represent the interests and concerns of the wide range of stakeholders who will be affected by the ensuing policies.

The Codes are then translated into, and applied to, the formulations of Sustainability Action Plan that relate to every agency and industry (including, of course, the construction, housing, urban, materials manufacturing and agriculture/forest industries or sectors) at the concerned level. As shown in fig.5.14, the outcomes of the Action Plans must be fed back to the concerned Sustainability Commissions (via type 3 feedback loop) for monitoring and, if necessary, continual refinement of the policy strategies involved in the Action Plans.

In summary, the promulgation of the Sustainability Act helps ensure a high degree of consistency, coherence and continuity in the approach to integrative policymaking. It does, however, contravene the usual practice of wholesale replacement of agency leadership and decision-making power characteristic of multi-party democratic government.

CHAPTER 6 CONCLUSIONS AND FUTURE RESEARCH

5.1 Why Do Negative, Unanticipated Outcomes Occur?

We discovered that a negative and unanticipated policy outcome occurs for a sustainability indicator/issue when it is completely ignored by policymakers, and/or the policymakers fail to identify intrinsic but inconspicuous links between seemingly disparate indicators. These unexpected outcomes can be avoided if policymakers *conceptualize policies more broadly*. This means considering a wider range of sustainability problems together from the outset and formulating policy strategies to address these problems concurrently. As far as possible, one should also aim to co-address these diverse sustainability indicators with policy formulations.

This implies the need for policymakers and policy analysts to not only identify how the different sustainability indicators are linked to one another, but also how each has, through the existing policies framework, already impacting and is impacted by policies aimed at other sustainability indicators. A profound understanding as such will equip them with the essential background knowledge (albeit not the only necessary knowledge) to design an integrated policy approach to tackle as many sustainability indicators as possible at the same time. Put another way, policymakers would have to fully understand the intrinsic but inconspicuous links between seemingly disparate indicators in order for them in order to effectively conceptualize policies more broadly and in an integrated manner.

The seven cases taught us three important lessons regarding the current policymaking culture; they also provide a clear idea of how a more desirable way of designing and implementing policies might be fashioned. First, we found that a policy with a longer policy reach does not automatically imply a higher occurrence of unanticipated outcomes. The way the policy is planned and executed is the key to controlling the outcome and minimizing the occurrence of negative, unanticipated outcomes. Second, the success of a policy should not be judged merely from the occurrence of anticipated outcomes. Higher occurrence of anticipated results does not imply a lower occurrence of negative unanticipated outcomes. This important point may underlie the culture of designing policy strategies that focus solely on specific sustainability indicators or socio-geographical boundaries. This breeds complacency, especially when policymakers either do not or cannot see the link between the indicators being addressed in the policies concerned and those not addressed but show negative effects, or they wrongly believe that isolated and focused policies can help eradicate those other negatives effects. Focusing on only the anticipated results, and ignoring – either consciously or unconsciously – the negative effects on other indicators will only perpetuate a type of narrow-mindedness that will become a major barrier for integrated planning.

Third, a narrower policy, i.e. one with a shorter reach, does not guarantee a higher occurrence of positive anticipated outcome. It very much depends on how these policies are assessed and designed. Extrapolating this observation, supported by our comparative study of the seven cases, the best move for policymakers for sustainability is to extend their policy reach as much as possible, the degree of which will depend on the level of expertise and priorities of the specific communities in question.

How does one go about ensuring that the integrated policy, with its reach being as long as possible, is properly designed and implemented? We applied Ashford's framework for assessing

sustainable technology and policy throughout this study. Specifically, we started off with a description of the problems to solve, their historical context, issues and stakeholders involved. We started by describing any prior attempts to resolve or improve the problems at hand, and then analyze the reasons for their failure. Such analysis should be carried out in terms of the economic markets, law and political process, private sector management specifics and technical system inadequacies. The prior tools and techniques employed to address these problems should be fully analyzed as well. This is then followed by a description of a desired transformation – process and target state – for which policy strategies should aim. Doing so requires one to comprehensively clarify the goals of the desired transformations, identify the key stakeholders involved, and tools, models and technique that could affect the *willingness, opportunity, incentives* and *capacity* of these stakeholders to change. After these steps, the creative integrated policies will then assume the form of specific strategies that will affect the stakeholders’ *willingness, opportunity, incentives* and *capacity* to bring about desired changes and further sustain or evolve the very policies that cause these changes. In order for these strategies to be practical and useful, we need to identify barriers as well as strategies for surmounting and circumventing these barriers. This includes evaluating the likelihood or ease of implementation, political coalition building, cost effectiveness and, most importantly, the ability to integrated across the different sustainability indicators and stakeholders. All these are summarized in section 1.1.5.

Utilizing this assessment framework so described, and en route to discovering the abovementioned key lessons on policymaking, our work can be summarized as eleven unique and novel contributions to sustainability policymaking. 9 of these strategies pertain to policymaking in general, while one is related to the individual policy strategies for the four case studies. Some of these are related to the way policies are evaluated and policy solutions are represented and presented. Others underline important concepts of policymaking that we believe have potential for further development and research.

The following section and subsections will reiterate these contributions in much greater detail.

5.2 Novel Contributions of this Work

5.2.1 Sustainability Indicators

As described in section 1.3.3.2, our chosen sixteen indicators examine all three domains of sustainability and the interplay and interconnection amongst them. These indicators include energy consumption (including the fuel mix involved), air pollution, water pollution, toxic waste production, biodiversity, lifecycle cost, environmentally derived costs, socially derived costs, market share and economic competitiveness, number of jobs, purchasing power and wages, workers’ health and safety issues, culture, flexibility of skills, opportunity for upgrading, and innovation of the industries in question.

We found that these sixteen indicators can describe alternative indicator frameworks. However, some frameworks regard ‘stakeholder participation’ as a type of indicator as well. We prefer to consider it as a policy-enabling tool and integrated policymaking concept that must be present in order for sustainability policymaking to be successful. While a successful policy automatically embodies this feature and thus it can also be regarded as a form of indicator, treating it as a driving concept of policymaking serves to focus attention on developing a suite of innovative mechanisms to more effectively engage stakeholders.

In summary, our sixteen indicators provide a unified way of assessing a policy as it provides a clear link among the different indicators advocated by other framework currently in use by policymakers and researchers around the world.

5.2.2 Polymaking Tools

The second major contribution of this work is presenting a typology of policy tools that includes commonly used instrument such as virgin material tax and research and development funds. In summary, we systematically described the following suite of policy tools:

- Economic incentives and disincentives
- Legislation and Regulations
- Research and Development Programs
- Voluntary Programs
- Promoting Wider Stakeholder Participation
- Education and Outreach Programs

We reviewed a total of 46 different types of policy tools – all of which can be categorized into the above six types. As mentioned in the last section, stakeholder participation can be treated as a form of tool as well; in the list presented above, ‘voluntary programs’, ‘stakeholder organizations’ and ‘education and outreach programs’ are directly related to the methods by which they can be engaged. Nonetheless, two or all of these three types of tools are usually employed at the same. For example in a consensus conference, participants may be chosen based on their respective stakeholder organizations and the information exchange in the conference may be designed to share some important information or knowledge amongst the attendees. This trait was also observed in all of our cases, in which a wide range of tools is applied to meet the respective policy objectives.

Our classification provides a useful yet convenient toolbox, or checklist, for policymakers in their search for creative and effective ways of combining different kinds of tools to achieve integration in their planning and implementation.

5.2.3 Four Characteristics of Policy Integration

What do we mean by policy integration? What distinguishes an integrated policy from one that is not? We articulated four distinct characteristics of integration in chapter 4. They are:

- Characteristic 1:* Policy concerned *must* contain indicators in *all 3 domains (i.e. economy, environment and employment)*
- Characteristic 2:* Policy concerned should co-optimize, or at a minimum co-address, the indicators under characteristic 1
- Characteristic 3:* Policy concerned encourages interaction and collaboration amongst key non-governmental stakeholders
- Characteristic 4:* Policy concerned encourages collaboration amongst a wide but relevant range of governmental agencies and institutions

These may be treated as a checklist for policymakers designing integrated policies, after a list of sustainability indicators have been identified to suit the situation in question. However, on their own, these characteristics do not provide one with the goals and objectives of integration. Henceforth, we introduced a closely related idea – the four types of policy integration objectives and barriers.

5.2.4 *Five Types of Feedback Loops*

In our opinion, existing literature does not aptly categorize feedback loops or mechanisms into various relevant types. The author believes that by clearly articulating the distinction among the different types of feedback loops and mechanisms, each of which is relevant to different stages in the policymaking process, policymakers can better utilize the methods introduced in our work more effectively. To concisely reiterate these five types of feedback loops, they are:

- *Type 1:*

This is the type that represents the coordination between the local governments or task forces with the state and even federal governments. This is to ensure that the objectives of these policies are coherent with the ‘bigger’ goals of the states and country.

- *Type 2:*

Type 2 loop helps policymakers to ensure that the objectives of the integrated policy so designed do not contradict or conflict with other integrated policies. This assumes that not all sustainable development indicators can be captured and addressed in one and only one integrated policy.

- *Type 3:*

Policymakers need to initiate dialogue and meetings with grassroots level stakeholders in order to collect feedback for determining if the outcomes of integrated policies contradict their original objectives. They also need to ensure that an integrated policy does not conflict with the objectives and/or outcome of other coupling integrated policies.

- *Type 4:*

When there is no easy and feasible way to avoid some form of conflict, the leadership of the task forces, state and federal government would need to decide if the original sustainability goals should be revised in order to either mitigate or even eradicate these conflicts.

- *Type 5:*

This is a mechanism by which information accumulated from the previous term of office is communicated to the new officer bearers by the remaining key members of the task force to debate on any likely impact and/or necessity of any changes to the original goals.

Type 5 feedback loop is our proposal by which integration over different time horizons can be realized. In other words, we believe that in order to ensure the integration and continuity of policymaking over time, the remaining non-governmental key members of the task force or any other policymaking bodies should be given decision-making power even during the interim period between consecutive terms of office. This will help make sure that the latest team of office bearers does not change the original sustainability goals set by the earlier team unnecessarily and arbitrarily.

5.2.5 Indicator-Integration Case Study Plots

In order to visually map out the relationship between anticipated policy outcomes, number of indicators explicitly addressed and number of indicators integrated into the policy for each of the cases studied, we create the indicator-integration plot. The plot is also an excellent method of comparing. Using the size of the circles to indicate the number of anticipated outcome (fig.4.2 and fig.4.3), we establish from the cases we have studied so far that policies that have a higher number of indicators integrated into them embody more characteristics of integration and also tend to have more anticipated outcomes. We also show with these cases that the number of indicators integrated into a policy is a stronger predictor of success of policies than the number of indicators explicitly addressed; this further confirms the significance of policy integration.

5.2.6 Stakeholders Venn Diagram

Another tool we utilized is the stakeholder Venn diagram (fig.4.12 and fig.4.13). The Venn diagram is a very direct method of showing not only the different stakeholder groups involved in the different components of our integrated policy strategies, they can clearly articulate the overlaps of responsibility and involvement of these groups. In an effective way, Venn diagrams allow us to quickly gain an insight into the degree and extent of the third type of integration – integration across a wide range of relevant stakeholders. This in turn enables us to strategize an effective approach of facilitating stakeholder participation in all the components of the integrated policies.

5.2.7 Sustainability Commission Utilization

In all of our policy transformation strategies (which will be discussed in section 6.2.11), we employed the concept of a task force leading the transformation effort. Reiterating the rationale behind such a strategy, a task force is an excellent way of assigning specific responsibilities to the various stakeholder groups' representatives. Besides, having a task force enables us to create a more structural and organized approach to policy reforms, as described with the various policy flow diagrams for each of the case studies. Provided that each member knows and performs one's designated tasks efficiently, task force led initiatives should have a high rate of success. Under a Sustainability Act, these task forces should be conferred the status of a Sustainability Commission, in order for them to more optimally perform their duties.

Our proposed Sustainability Commission is however different from most of the current citizen or professional advisory boards in one main way – by virtue of its makeup and mandates, it actually has the power of undertaking policy design and implementation. This however does not release the governments (at all levels) from the need to embrace integrated perspectives. In fact, the Sustainability Commissions at the various levels, as we have stressed repeatedly, is the

result of such an integrated perspective, which is attributed to a presence of horizontal, vertical and time horizon integration within the government structure. Put another way, the Sustainability Commissions are a manifestation of the policymaking culture of a government, and they represent the brains and hands of integrated policymaking machinery of a country/state/region.

In 1998, the Singapore government set up an Interagency Committee on Energy Efficiency (IACEE); in April of 2001, the Ministry of the Environment and Water Resources re-structured the IACEE, expanded its scope and renamed it the National Energy Efficiency Committee. This was later, in April 2006, renamed as the National Climate Change Committee (NCCC). This committee is headed by the Senior Parliamentary Secretary of the Ministry of Environment and Water Resources, who is assisted by a very wide range of stakeholders organized into four sub-committees and four working groups. However, this differs distinctly from our use of Sustainability Commission in that the structure of the NCCC does not include any mechanism that collects feedback from the grassroot levels. Also, key members of our Sustainability Commissions are required to reach out to the stakeholder groups they represent for feedback on implemented policies as well as inputs on policy designs; these are largely absent in the Singapore's model. Above all, the NCCC does not consider sustainability policy but only focus on energy conservation policies.

In summary, our employment of Sustainability Commissions is unique in the sense that the structure is optimized so as to promote sustainability policymaking that embodies all the four characteristics of policy integration, which in turn results in the effective fulfillment of the four goals of integration. This structure also allows the five types of feedback loops to be established and sustained.

5.2.8 Co-evolution or Co-development with the Concept of Sustainability

We introduced the concept of using sustainability as a yardstick for evaluating the qualifications and capability of a country/state/region/organization to embrace sustainability. This concept of co-evolution or co-development captures the central belief that the nature of an organization should evolve with the original sustainability goals; these goals will progressively be modified and deliberately adjusted slightly higher than the original ones so as to progressively spur the organizations towards greater sustainability. Note that the word 'progressive' does not preclude the use of disruptive innovations to bring about quantum leaps in sustainability.

Along the same vein, we described two possible approaches to put this co-evolution into practice – the top-down and bottom-up approaches. Although both approaches hinge on the degree of connectivity among the different governmental and non-governmental stakeholders, the bottom-up approach, in our opinion, represents a tougher test of the government's acceptance of a more active role played by the other stakeholders in co-designing policies. Put it in another way, integrated policies not only help a country/state/region/organization attain desired sustainability, it should also constantly and consistently serve to spur it to set ever higher goals and subsequently attaining them. Doing so requires all policies to acquire no fewer than the four characteristics of integration and the country/state/region/organization to embody no fewer than the four types of integration.

Viewed in another way, the practice of sustainable development can be treated as a yardstick for the degree of overlap and flexibility in a government structure; it is also an indication of the strength of the relationship between the government and the non-governmental stakeholders.

5.2.9 Specific Innovative Integrated Policy Strategies for Cases

5.2.9.1 Gravel Tax of Sweden and Raw Materials Tax of Denmark

To tackle the challenges associated with the virgin material taxes in Sweden and Denmark, we propose a five-pronged approach in which the recycling industry should be developed, job in the aggregate and mining industry should be diversified, promoting cleaner technologies in mining and processing alternate aggregate, promoting material flow studies together with pollution control in the mining of alternate aggregates, and implementing the ‘Sustainable Concrete Aggregate’ scheme to address problem shifting to other regions and/or countries.

The ‘Sustainable Concrete Aggregate’ scheme is composed of four sub-goals, which include the creation of a national sustainable design and construction rating system, imposing and increasing tax on the import of aggregate into Sweden and Denmark respectively, starting a new certification scheme for the local and imported aggregates, and creating a public outreach program called the Building Material Information portal and Database.

5.2.9.2 Biodiversity and Forest Management Policies for the United States Northwest

The policy strategy to address the owl population and job displacement of the timber workers in the second case contains as many as eight policy components. Improving the Federal Preferred Purchase Program for recycled wood must be complemented by the ‘Forest Grant for Sustainability’ Initiative, the concept of ‘Forest Loan’ concept, job-diversification via the ICE Scheme, and the promotion of material and substance flow analyses of the recycling wood process. Furthermore, we should also improve the adaptability of the sustainable forest certification programs and their enforcement internationally. The recasting of the image of the endangered Northwest Spotted Owls should be seriously considered, as well as certifying the production process and improving the public image of recycled wood. The final element may take the form of the Building Material Information portal and Database.

5.2.9.3 Policy Tools to Promote the Use of Substitute Fuels for Cement Production in the U.S and UK

The problems existed for this case could be addressed by an integrated policy consisting of four main policy components. Firstly, a demonstration and public outreach project spearheaded by the scientific advisory committee and the task force steering committee to display the advantages and disadvantages of the use of alternate fuels should be initiated. An integration of the ‘green fuel innovation’ credit/permit scheme and the ‘credit banking’ system is believed to be a feasible and effectual program to incentivize the switch to the use of waste fuels as well as a thorough evaluation of their safety and emission profiles. Furthermore, promoting corporate social responsibility in reporting emission data and the facility clean emission index are a good strategy to engage the industry in responsible usage of waste fuels. Finally, ‘credit multiplier’ scheme and the waste production tax would be useful in preventing the Jevon’s paradox while encouraging more firms to establish waste materials exchange network and form sustainability-driven industrial partnership. A unique feature of our ‘credit multiplier’ scheme is that firms are credited according to the level of innovation involved in their collaborations and waste exchanges.

5.2.9.4 Regulation and Subsidies for Reforestation and Afforestation in Chile

Three goals of policy transformation form the main thrust of our proposed solution for Chile. The Industrial Co-investment Program aims at engaging big private commercial plantation firms in industries dealing with the products of native forests. In order to avoid further exploitation of the native forests, more sustainability guidelines should be introduced as an extension of the DL701 Reform policy, which has received much positive reaction from most of the political and industrial stakeholders. To further complement and even reinforce these two programs, we also propose a systematic reform of the local forest certification scheme, under which the different sustainability requirements are unbundled from all the relevant sustainable forest certification scheme, each of which is subjected to stringent assessment by the government for consideration as a sustainability partners under the extension of the DL701 policy.

6.2.9.5 Creative Employment of Stakeholder Engagement Mechanisms

All our policy recommendations for the four case studies are supported by a series of stakeholder engagement methods involving the Sustainability Commissions, directly or indirectly, at appropriate levels. A wide range of engagement methods are proposed – including focus group meeting, joint-participation in education outreach (in the case of the proposed Building Materials Information Portal and Database) and scientist-community meeting/joint fact-finding.

These mechanisms are designed so that they embody the key features that promote successful stakeholder participation, as discussed in chapter 1, section 1.3.3. To reiterate, these features are: 1) government playing facilitator or trustee role appropriately; 2) government being clear of the roles of the other stakeholders involved; 3) government being open to alternate views and there is political openness in the exchange between stakeholder groups; 4) activities in the project must emphasize trust-building and teamwork; 5) presence of adequate resources to support all activities in the project; 6) commitment to the sustainability discourse from the top leadership and management of the agencies and bodies (e.g. companies); and 7) presence of effective feedback system to promote communication and policy intervention if necessary. Specifically, our proposed policy solutions also ensure that the appropriate stakeholders are engaged at the right time, throughout the entire process of the policy design, implementation and monitoring. Finally, these policy solutions also aim to avoid the observed mistakes as well as strengthen the discussed weaknesses if traditional employment of common stakeholder mechanisms.

5.3 Future Research

5.3.1 Geographically focused yet sectorally diverse integration study

The organization and theme of the current work is such that only industries or sectors related to the building materials industry, such as the eco-tourism industry, are integrated into our policy proposals. The focus is also more toward a wider coverage of geo-political context, as shown by the wide range of case studies we selected for our analyses. As a follow-up effort, one could focus on more industries in the economy of one country – including transportation, energy generation, manufacturing, electronic, and agriculture – and explore the associated cross-sector and cross-industry effects of the policies aimed at addressing specific problems in each of these

industries. Using our 11 indicators as the guide, a similar approach to the one adopted here can be used to prescribe policy initiatives that overlap and integrate all these industries and sectors.

5.3.2 Comparative Studies involving Developing and Developed Countries

Our current work covers mostly the developed economy's experience with sustainable development policymaking. However, if a more focused study can be conducted on a number of countries according to the recommendations in the above subsection 5.5.1, then it will be very helpful to compare the complexity and difficulty in integrating policies across the major industries in developed and developing countries. Given that China is a rising world economy, as exemplified by its dominance over the supply of major engineered wood products, a prescription of integrated sustainable development policies at the provincial level will be very enlightening. India is another economy to which the concept of integrated policy should be applied and tested. The economies of African countries have traditionally been left out in major sustainability study; South Africa, Egypt, and even Kenya may be rich testing grounds for the feasibility of integrated policymaking. In fact, this led us to the following question that forms the heart of such comparative studies.

5.3.3 Relationship Between Culture and the Ability to Embrace Integrated Policymaking

Sustainability thinking can nourish the growth of an institution, which will in turn refine or re-define this original sustainability tenet as it matures, provided the institution receives the right education either from consultants or via technology/knowledge transfer from another economy. Are there certain preferred and common cultural traits that determine an economy's ability to adopt the sustainability thinking? Are some cultures in the world more open to the idea of collaborative stakeholder participation and decision-making – a central concept of integrated policymaking? Are some cultures more capable of maturing with the evolution brought about by the sustainability thinking described in section 5.3?

Although our hunch is that there is no clear cultural difference between acceptance of the various central tenets of sustainability policymaking, such studies may reveal interesting but overlooked aspects of decision-making, knowledge creation and policymaking.

5.3.4 Refinement of Stakeholder Education Tools

In Chapter 4, we mentioned that stakeholders should be trained in a conducive and friendly environment in the subjects in which they are expected to contribute their views before they are permitted to participate in the multilateral discourse. In section 5.1, we explain why it is essential for technocrats to be open-minded about being possibly educated by the non-specialized stakeholders in a way that enhance their contribution to the integrated policy strategies. A research direction of impact may be to design generalizable education tools to help stakeholders learn from one another. These tools could be viewed as preparation materials to get them ready for the actual interaction. Contents of the tool may include the following items:

- How to pick up and criticize new knowledge?
- How to behave in an argument?
- How to negotiate?
- The essentials of Sustainable Development

- What is the productive way of providing feedback?
- The art of listening and sharing one's views.

While it may be possible for selected stakeholders representing their respective groups to be grouped and educated in the abovementioned areas, current methods of gathering views and feedback from the public will need to change in order to educate them appropriately.

If so-called green businesses are given special status to reward their commitment to sustainable development, then why shouldn't the individuals who contribute in their capacities as feedback providers be similarly rewarded? A good starting point is actually to welcome all public participants to an official and openly endorsed club of stakeholders (say, a club of "Voice of the Community") at the appropriate administrative level. As club members, they are bestowed the respected identity as contributors to the sustainability discourse. Besides attending regular meetings, they will be invited to attend brief 30-minute teach-in that focus on the various skills mentioned above. In fact, special recognitions should be awarded to members according to their attendance and other forms of quantifiable contributions to the policymaking process. A research initiative that compares the quality of input from these club members, compared to the traditional approach's, will point the way to better stakeholder engagement strategies in the future.

5.3.5 *Study of Behavioral Changes in Policymaking*

Ashford (1994) first brought up the observation that in promoting changes in behavior, policymakers have to explore and analyze the *willingness*, *opportunity* and *capacity* to change. Understanding one's willingness requires a profound knowledge in one's intention, which is in turn affected by one's decision-making attributes and heuristics such as attitudes and values. Besides, what may be more important than the *absolute* opportunity and capacity to change is the degree and nature of *perceived opportunity* and *capacity* to change. In this sense, Ashford's perspective sets the stage for developing integrated policy studies through social psychology and behavioral science.

The concept of "policy psychology" is a way of probing into the fundamental building blocks of knowledge and information, and exploring the relationship among the attitude, belief and decision-making heuristics of stakeholders who reside at both the receiving and originating ends of policies. By utilizing established concepts in social psychology – including representativeness, perspective taking, self-justification, the Theory of Reasoned Actions and Theory of Planned Behavior – one may be able to design tools to aid policymaking and policy communication. Since stakeholders are required to think across boundaries and beyond familiar contexts, a clear understanding of the role and significance of *empathy* – an ability to put oneself in another's shoes – will help to determine the types of information that is needed to enhance knowledge sharing.

Based on the Theory of Reasoned Actions and Theory of Planned Behavior – both of which have been extensively studied and empirically proven – behavior is directly linked to intention, which is determined by a host of other predictor attributes. It is useful for policy researchers to make use of these theories to examine those attributes that current sustainability policies address, and even identify opposing forces that act on these very attributes at the same time and prevent people from acting in a manner that supports sustainable development. This will help a great deal by pointing future efforts toward more focused policy strategies that engage stakeholders and consumers in specific ways so that there is a higher chance for behavioral and perspective changes necessary for realizing integrated policymaking.

5.4 Final Remark – The Culture of Sustainability

Even though sustainability, or sustainable development, is not a new concept, many policies that are intended to promote sustainability are still not designed and implemented as they should be. Although many know sustainable development as consisting of the three main domains of environment, economy and employment, few understand how to put the concept to practice. Policymakers are restricted to, and by, the traditional mindset and culture that encourage and perpetuate the balkanization of agencies and isolation of issues (addressing indicators). Attempts at combining these issues, or just balancing amongst them, fails to realize and thus appreciate the fact that many of these issues are intimately, although inconspicuously, linked to one another. The solution to this problem is for policymakers to design and implement policies in an integrated manner; this means that the policy should address as wide a range of indicators (in all three domains) at the same time as possible.

The author cautions against the complacency, and naivety, that policymakers may have regarding their role in promoting sustainability; doing policy without considering the input and feedback of stakeholders whom the policy impacts is both dangerous and myopic. Especially since sustainability concerns such a wide range of issues, a truly integrated policy is *only* possible if it engages the relevant stakeholders in the process of designing, implementing and monitoring the policies concerned. This involves linking up the governmental and non-governmental organizations and individuals in innovative and effective ways. It also eradicates any balkanization that plagues today policymaking.

Most importantly, a society must acknowledge and appreciate the fact that sustainability, as a concept of development, is dynamic. Therefore, it should be treated as such. Some policymakers and governments seem to commit the error of trying to achieve too much too soon. That is, they try to address a very wide range of indicators in a fragmented manner. A reason for this is that the required integrated sustainability policymaking structure – including an effective stakeholder participatory system – is either absent or not well established. When their efforts fall short of expectations, they may conclude that sustainability is impossible. The author believes that a new culture of sustainability policymaking will involve policymakers first modifying existing structure in order to address a few indicators (in all domains) in an integrated manner. Once successful, utilizing the lessons gleaned, they will improve the depth and breadth of their sustainability agenda and in turn modify the existing structure to coordinate with, and implement, this improved agenda. In short, sustainability should be viewed as a yardstick for the structure of policymaking. It is also a compass for constant renewal of our socio-political system. Most importantly, its dynamism implies that it should *co-evolve* with the society.

So, are we in need of a new culture in the way we lead our daily lives, in order to achieve sustainability? Yes, we do. But such changes may *not* be as threatening to men as men have feared the unknown for centuries. Every journey starts with a single step; with sufficient political will, the government and key non-government stakeholders should start thinking and acting differently as they do today – in the way proposed by this work. It is only then that the rest of the society will follow in their footsteps. With meticulous planning and consistent actions, our society may just embark upon a new culture – the culture of sustainability – strengthened by a heightened sense of appreciation for the beauty and fragility of the natural and socio-economic facets of our world.

REFERENCES FOR CHAPTER 1

- Agranoff, R., *Intergovernmental Management. Human Services Problem-Solving in Six Metropolitan Areas*. State University of New York Press, 1986
- Agranoff, R., Managing Intergovernmental Processes. In: Perry, J.L. (ed.) *Handbook of Public Administration. Second Edition*. Jossey-Bass, San Francisco, 1996
- Ashford N. A., An Innovation-Based Strategy for the Environment, *Worst Things First? The Debate Over Risk-Based National Environmental Priorities*, Eds. Finical A. M., and Golfing D., Resources for the Future, Washington, D.C., 275-314, 1994
- Ashford N. A., Rest K., *Public Participation in Contaminated Communities*, MIT Press, <http://web.mit.edu/ctpid/www/tl/PPCC3.pdf>, 2001
- Ashford N., Caldart C., *Chapter Eleven: Alternative Forms Of Government Intervention To Promote Pollution Reduction*, In: Ashford N., Caldart C., *Environmental Law, Policy, and Economics: Reclaiming the Environmental Agenda*, Cambridge, MIT Press, forthcoming 2007.
- Augenbroe G., Pearce A. r., Kibert C. J., *Sustainable Construction in the United States of America, A Perspective to the Year 2010*, CIB-W82 Rep., Georgia Inst. Technol., Atlanta, GA, 1998
- Battelle, World Business Council for Sustainable Development, *Toward a Sustainable Cement Industry, Policy Instruments' Promotion of Sustainable Development*, March 2002
- Bellagio Principles, <http://www.iisd.org/pdf/bellagio.pdf>, 1997
- Bouman M., Heijungs R., van der Voet E., van den Bergh J. C. J. M., Huppes G., *Material Flows and Economic Models: An Analytical Comparison of SFA, LCA and Partial Equilibrium Models*, *Ecological Economics* 32, 195-216, 2000
- Brewer, G.D.: 1986, 'Methods for synthesis: Policy exercises', in: W.C. Clark and R.E. Munn, eds., *Sustainable Development of the Biosphere*, Cambridge University Press, Cambridge, UK, pp. 455-473.
- Briassoulis H., *Policy Integration for Complex Policy Problems: What, Why and How?*, Proceedings of the 2004 Berlin Conference on the Human Dimensions of Global Environmental Change: Greening of Policies – Inter-linkages and Policy Integration, 2004
- Bringezu S., *Construction Ecology and Metabolism*, in *Construction Ecology: Nature as the Basis for Green Building*, Kibert C. J.. et al, London: Spon Press, 2002
- Brundtland Commission, World Commission on environment and Development, *Our Common Future*, New York: Oxford University Press, 1987
- Ceres Principles, <http://www.ceres.org/ceres/>, 2005
- Challis, L., Fuller, S., Henwood, M., Klein, R., Plowden, W., Webb, A., Whittingham, P., Wistow, G. *Joint approaches to social policy: rationality and practice*. Cambridge University Press, Cambridge, 1998

Coffey C., Dom A., *Environmental Policy Integration In Europe: Looking Back, Thinking Ahead*, Proceedings of the 2004 Berlin Conference on the Human Dimensions of Global Environmental Change: Greening of Policies – Inter-linkages and Policy Integration, 2004

Cohen S. J., *Scientist-stakeholder collaboration in Integrated Assessment of Climate Change: Lessons from a Case Study of Northwest Canada*, *Environmental Modeling and Assessment*, 2(4), 281-293, 1997

Costanza R. and Daly H., Goals, Agenda and Policy Recommendations for Ecological Economics, *Ecological Economics*. Ed. Costanza. New York: Columbia University Press, 1991

Court T. D. L., *Beyond the Brundtland*, Zed Books, New York, 1990

Crosby N., *Citizens' Juries: One Solution for Difficult Environmental Questions*, In: Renn O., Webler T., Wiedemann P., (eds.) *Fairness and Competence in Citizens Participation: Evaluating Models for Environmental Discourse.*, Kluwer Academic Publishers Dordrecht, The Netherlands, 157-174, 1995

Dalal-Clayton B., Bass S., *Sustainable Development Strategies: A Resource Book*, NSSD, 2002

Daly H., Chapter 9: The Steady-State Economy: Alternative to Growthmania, *Steady-State Economics*. Washington, D.C: Island Press, 180-194, 1991

Daniels P. L., Moore S., *Approaches for Quantifying the Metabolism of Physical Economies, Part I: Methodological Overview*, *Journal of Industrial Ecology*, Vol.5, No.4, 69-93, 2002

Daniels P. L., *Approaches for Quantifying the Metabolism of Physical Economies, Part I: Methodological Overview*, *Journal of Industrial Ecology*, Vol.6, No.1, 65-88, 2002

Dowlatabadi H., Morgan M. G., *Integrated Assessment of Climate Change*, *Science* 259, 1813-1814, 1993

Earth Charter, *Earth Charter Institute*, <http://www.earthcharter.org/>, 2004

Ecotrust, *Conservation Economy*, <http://www.conservationeconomy.net/>, 2003

Ehrenfeld J., *Putting a Spotlight on Metaphors and Analogies in Industrial Ecology*, *Journal of Industrial Ecology*, Vol.7, No.1, 1-4, 2003

Elder P., "Project approval, environmental assessment and public participation." *The Environmentalist* 2(1):55-71, 1982

Energy Information Administration, *Iron and Steel manufacturing Energy Intensities, 1998-2002*, http://www.eia.doe.gov/emeu/efficiency/iron_steel_9802/steel_9802_data.html, 2006

English M., Gibson A. K., Feldman D. L., and Tonn B. E. (1993). Stakeholder Involvement: Open Processes for Reaching Decisions About the Future Uses of Contaminated Sites. Knoxville, TN, University of Tennessee, Waste Management Research and Education Institute, December 1993.

- Feindt P. H., *Greening European Agricultural Policy – Multi-Level Strategies Between Trade, Budget, Agricultural And Environmental Policy*, Proceedings of the 2004 Berlin Conference on the Human Dimensions of Global Environmental Change: Greening of Policies – Inter-linkages and Policy Integration, 2004
- Fiorino D. J., "Environmental risk and democratic process: a critical review.", *Columbia Journal of Environmental Law* 14: 501-547, 1989
- Fiorino D. J., "Citizen participation and environmental risk: a survey of institutional mechanisms.", *Science, Technology, & Human Values* 15(2): 226-243, 1990
- Fisk W. J., *Health and Productivity Gains from Better Indoor Environments and their Relationship with Building Energy Efficiency*, *Annu. Rev. Energy Environ.*, 25: 537-66, 2000
- Folk E., *Public participation in the Superfund cleanup process*, *Ecology Law Quarterly* 18:173-221, 1991
- Food and Agriculture Organization, *Forestry Data FAOSTAT*, <http://faostat.fao.org/faostat/form?collection=Forestry.Primary&Domain=Forestry&servlet=1&hsbulk=&version=ext&language=EN>, 2006
- Global Reporting Initiative, <http://www.globalreporting.org/>, 2005
- Goldberg J., Johansson T., Reddy A., Williams R., *Energy for a Sustainable World*, Wiley eastern Ltd., New Delhi, 62-65, 1988
- Gray, B., *Collaborating Finding a Common Ground for Multiparty Problems*. Jossey-Bass Publishers, San Francisco, 1989
- Habermas J., *Theory of Communicative Action - Vol.1: Reason and the Rationalization of Society*. Boston, Beacon Press, 1984
- Habermas J., *Theory of Communicative Action - Vol.2: System and Lifeworld*. Boston, Beacon Press, 1987
- Hadden S. G., *Public Perception of Hazardous Waste*, LBJ School of Public Affairs, 1990
- Halpert, B.P., Antecedents. In: Rogers, D.L. and Whetten, D.A, *Inter-organizational coordination: theory, research, and implementation*. Iowa State University Press, Ames, 1982
- Holdren J. P., Daily G. C., Ehrlich P. R., The Meaning of Sustainability: Bio-Geophysical Aspects, *Defining and Measuring Sustainability: The Biogeophysical Foundations*. Eds. Munasinghe and Shearer. Washington, D.C: World Bank (for United Nations University), 1995
- Holling C. S., *Understanding the Complexity of Economic, Ecological, and Social Systems*, *Ecosystems*, 4: 390-405, 2001
- Huxham, C. (ed), *Creating Collaborative Advantage*. Sage, London, 1996
- Jager, W.**, *Modeling Consumer Behavior*, Universal Press, Veenendaal, Holland, 2000

Kay J. J., *On Complexity Theory, Exergy and Industrial Ecology: Some Implications for Construction Ecology*. In *Construction Ecology: Nature as the Basis for Green Building* edited by C. Kibert, J. Sendzimir, and G. Bradley Guy. London: Spoon Press, 2000

Kibert C. J., *Sustainable Construction: Green Building Design and Delivery*, New York: John Wiley & Sons, 2005

Kibert C. J., *Revisiting and Re-orienting Ecological Design as Applied to the Built Environment Materials*, draft paper for the Ecologies of Construction Symposium, Building Technology Program, MIT, March 2006

Lach D. and Hixson P., "Developing indicators to measure values and costs of public involvement activities." *Interact* (Spring), 1996

Laird F. L., Participatory analysis, democracy, and technological decision making, *Science, Technology, & Human Values* 18(3):341-361.

Lenschow, A., ed., *Environmental Policy Integration: Greening Sectoral Policies in Europe*, London: Earthscan, 2002

Ling T., Delivering joined-up government in the UK: Dimensions, issues and problems, *Public Administration* 80(4), 615-642, 2002

Luken R. A., Hesp P., *Developing and transition economy efforts to achieve policy integration for sustainable development*, Proceedings of the 2004 Berlin Conference on the Human Dimensions of Global Environmental Change: Greening of Policies – Inter-linkages and Policy Integration, 2004

Lynn F., "Citizen involvement in hazardous waste sites: two North Caroline success stories." *Environ Impact Assessment Review* 7:347-361, 1987

Lynn F. M. and Busenberg G. J., "Citizen advisory committees and environmental policy: What we know, what's left to discover." *Risk Analysis* 15(2):147-162, 1995

Matthews E., et al., *The Weight of Nations – Material Outflows from Industrial Economies*, Report for the World Resources Institute, Washington DC, 2000

Mazmanian D. A. and Nienaber J., *Can Organizations Change?* Washington, D.C., The Brookings Institution, 1979

McDonough, W., *Hannover Principles*, <http://report.tcc.virginia.edu/classes/tcc315/Resources/ALM/Environment/hannover.html>, 1999

McDonough, W., Braungart M., *Cradle To Cradle: Remaking the Way We Make Things*, New York: north Point Press, 2002

Meijers E., Stead D., *Policy Integration: What Does It Mean and How Can It Be Achieved? A Multi-disciplinary Review*, Proceedings of the 2004 Berlin Conference on the Human Dimensions of Global Environmental Change: Greening of Policies – Inter-linkages and Policy Integration, 2004

Mulford, C.L. and Rogers D.L., Definitions and Models. In: Rogers, D.L. and Whetten, D.A. (eds.) *Inter-organizational coordination: theory, research, and implementation*. Iowa State University Press, Ames, 1982

Nagpal T., *Voices from the Developing World: Progress Toward Sustainable Development*, Environment 3.8, 10-15, 30-35, 1995

NRC (National Research Council), Committee on Risk Characterization. (1996). *Understanding Risk: Informing Decisions in a Democratic Society*. Washington, DC, National Academy Press.

Nicolis G., Prigogine I., *Self-organization in non-equilibrium systems*, New York: Wiley, 1977

Noble B. F., *Strengthening EIA through Adaptive Management: A Systems Perspective*, Environmental Impact Assessment Review, 20, 97-111, 2000

Norland I., Bjornaes T., Coenen F., *Local Agenda21 in the Nordic Countries – National Strategies and Local Status*, Report no.1/03, Program for Research and Documentation for a Sustainable Society (ProSus), 2003

Office of Energy Efficiency, Natural Resources Canada, *Energy Consumption Benchmark Guide: Cement Clinker Production*, http://oee.nrcan.gc.ca/publications/industrial/BenchmCement_e.pdf, 2001

Organization for Economic Co-operation and Development, *Building Policy Coherence, Tools and Tensions*, Public Management Occasional Papers, No.12. OECD, Paris, 1996

Organization for Economic Co-operation and Development, *Governance for Sustainable development: Five OECD Case Studies*, 2002

Parson E. A., *Informing Global Environmental Policymaking: A Plea for New Methods of Assessment and Synthesis*. Environmental Modeling and Assessment, 2, 267-279, 1997

Parson, E.A.: 1996, 'A global climate-change Policy Exercise: Results of a test run, July 27-29, 1995. WP-96-90. International Institute for Applied Systems Analysis, Laxenburg, Austria.

Peelle E, Schweitzer M, et al., *Factors Favorable to Public Participation Success* (Report for US Department of Energy). Oak Ridge, Oak Ridge National Laboratory, 1996

Rotmans J., van Asselt M., Anastasi C., Greeuw S, Mellors J., Peters S., Rothman D., Rijkens N., *Visions for a Sustainable Europe*, Futures, 32, 809-831, 2000

Schumpeter J. A., *Capitalism, Socialism and Democracy*, New York: harper & Row, 1950

Shellenberger M., NordhausT., *The Death of Environmentalism, Global warming politics in a post-environmental world*, available online, 2005

<http://www.grist.org/news/maindish/2005/01/13/doe-reprint/>

Schneider S., *Integrated Assessment Modeling of Climate Change: Transparent Rational Tool for Policy Making or Opaque Screen Hiding Value-laden Assumptions?*, *Environmental Modeling and Assessment* 2 (4), 229-250, 1997

Scholz R., Tietje O., *Embedded Case Study Methods*, SAGE Publications 2001

Shepherd A and Bowler C, "Beyond the requirements: improving public participation in EIA." *Journal of Environmental Planning and Management* 40(6):725-738, 1997

Smith G., Wales C., *he Theory and Practice of Citizens' Juries*, *Policy and Politics*, 27(3), 295-308, 1999

Solow, R. M., Sustainability: An Economist's Perspective, *Economics of the Environment: Selected Readings*. Eds. Dorfman R. and Dorfman N. New York: WW Norton and Co., 1991, 179-187

Spangenberg J., Bonniot O., *Sustainability Indicators – A Compass on the Road Towards Sustainability*, Wuppertal Paper, No.81, February 1998

Spiegelman J., *Beyond the Food Web, Connections to a Deeper Industrial Ecology*, *Journal of Industrial Ecology*, Vol.7, No.1, 2003

Sprenger R-U, *Integration Of Environmental And Employment Policies: Assessment Of The Eu Experience To Date*, Proceedings of the 2004 Berlin Conference on the Human Dimensions of Global Environmental Change: Greening of Policies – Inter-linkages and Policy Integration, 2004

Stake, R., *The Art of Case Research*. Thousand Oaks, CA: Sage Publications, 1995

Susskind L and Ozawa C, "Mediating public disputes: obstacles and possibilities. " *J Social Issues* 41(2): 145-159, 1985

Susskind L and McMahon G, "The theory and practice of negotiate rulemaking. *Yale J on Regulation* 3:133-165, 1985

Syme G. J and Sadler B. S, "Evaluation of public involvement in water resources planning: a researcher-practitioner dialogue. " *Evaluation Review* 18(5):523-542, 1994

United Nations, *The Rio Declaration on environment and Development*, The Global Partnership for Environment & Development: A Guide to Agenda21 (Post-Rio edition), New York: United Nations, 3-9; 13-17, 1992

US EPA, *National Emission Standards for Hazardous Air Pollutants for Source Categories; Portland Cement Manufacturing Industry; Final Rule, 40 CFR Part 63, June 14, 1999*

van Asselt M. B. A., Rijkens-Klomp N., *A Look in the Mirror: Reflection on Participation in Integrated Assessment from a Methodological Perspective*, *Global Environmental Change*, 12, 167-184, 2002

van Asselt M. B. A, Rotmans, J., *From Project to Program: ULYSSES' Journey from Targets to Visions*. In: Kasemir B., Jager J., Jaeger C. (eds.), *Public Participation in Sustainability Science*. Cambridge University Press, Cambridge, 2001

van der Sluijs J., Kloprogge P., *the Inclusion of Stakeholder Perspectives in Integrated Assessment of Climate Change*. Presented at the Euro Conference "Implementation and Limits of Interdisciplinarity in European technology Assessment", Bad Neuenahr, 2000

van Oss H. G., Padovani A. C., *cement Manufacture and the Environment, Part II: Environmental Challenges and Opportunities*, Journal of Industrial Ecology, Vol.7, No.1, 93-126, 2003

Vari A., "Citizens' advisory committee as a model for public participation: a multiple-criteria evaluation." In: Fairness and Competence in Citizen Participation: Evaluating Models for Environmental Discourse. O Renn, T Webler and P Wiedemann (eds). Dordrecht, Kluwer Academic Publishers: 103-116, 1996

Webler T and Renn O., "A brief primer on participation: philosophy and practice." In: Fairness and Competence in Citizen Participation: Evaluating Models for Environmental Discourse. O Renn, T Webler and P Wiedemann (eds). Dordrecht, Kluwer Academic Publishers: 17-33, 1995

Worrell E., Price L., Martin N., Hendriks C., Ozawa M. L., *Carbon Dioxide Emissions from the Global Cement Industry*, Annu. Rev. Energy Environ., 26: 303-329, 2001

Yosie T. F. and Herbst T. D., *Using Stakeholders Processes in Environmental Decision making: An Evaluation of Lessons Learned, Key Issues, and Future Challenges*, Washington: Ruder Finn., 1998

REFERENCES FOR CHAPTER 2

- Ashford N. A., Caldart C., *Chapter 11: Financing Sustainable Development*, In: *Sustainability, Trade and Environment*, MIT Press, 2004.
- Ashford N. A., Ayers C., Stone R. F., *Using Regulation to Change the Market for Innovation*, *Harvard Environmental Law Review*, 9(2), 419-466, 1985
- Ashford N. A., Heaton G. R., *Regulation and Technological Innovation in the Chemical Industry*, *Law and Contemporary Problems*, Duke University School of Law, Vol.46, No.3, 109-157, 1983
- Ashford N. A., Heaton G. R., Priest W. C., *Environmental, Health and Safety Regulations and Technological Innovation*, In: *Technological Innovation for a Dynamic Economy*, Hill C. T., and Utterback J. M., (eds.), Pergamon Press, Inc., New York, 161-221
- Baumol W. J., Oates W. E., *The Use of Standards and Prices for Protection of the Environment*, *Swed. J. of Econ.*, 73(1), 42-54, 1971
- Chesky E., *International Investment*, In: *The Fletcher Journal of development Studies*, Vol. XIV: 5-24, 1998
- Christensen C., *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*, Harvard Business School Press, 1997
- Dhaliwal R., *Helping Hand for Nature*, *The Straits Times*, Special Feature, The ISO Way, December 16, p.1, 1998
- Economist, *The. A Strange Recovery*, August 7, 2003
- Environment Canada, *Extended Producer Responsibility*, <http://www.ec.gc.ca/epr/en/epr.cfm>, 2002
- Eyckmans J., Coenen G., *Efficiency versus Equity in Tradable Emission Permit Systems*, http://www.econ.kuleuven.ac.be/ew/academic/energmil/climneg/pdf/CLIMNEG_WP77.pdf, 2004
- Griffith-Jones S., Leape J., *Capital Flows to low-income countries*, mimeo Institute of Development Studies and London School of Economics, 2002
- Hausmann R., Fernandez-Arias E., *Foreign Direct Investment: Good Cholesterol?*, Inter-America Development Bank, Research Department Working Paper No. 417, 2000
- Joerg L., Larrue P., *Policy Instrument for Sustainable Innovation*, <http://www2.vrom.nl/docs/internationaal/RegionalResearch03.pdf>, 2004
- Kohlhaas M., *Ecological Tax Reform in Germany, from Theory to Policy*, <http://www.aicgs.org/Publications/PDF/eco-tax.pdf>, 2000
- Rachel's Environment and Health Weekly, #586 *Precautionary Principle*, Feb 19, 1998

Ofori G., Gang G., Briffett C., *Implementing Environmental Management Systems in Construction: Lessons from Quality Systems*, Building & Environment, 37, 1397-1407, 2002

Pigou A., *The Economics of Welfare*, Auflage, London, 1920

Porter M., *The Competitive Advantage of Nations*, New York: Free Press, 1990

Tan T.K., Ofori G., Briffett G., *ISO 14000: Its Relevance to the Construction Industry and its Potential as the Next Industry Milestone*, Construction Management & Economics, 17, 449-461, 1998

Tan T. K., *ISO 14000: A Practical Approach for the Local Construction Industry*, National University of Singapore, 1997

World Business Council for Sustainable Development, World Resource Institute, *The Greenhouse Gas Protocol*, <http://www.wbcsd.ch/web/publications/ghg-protocol-revised.pdf>, 2005

World Business Council for Sustainable Development, *The Cement Sustainability Initiative: Our Agenda for Action*, <http://www.wbcsd.ch/web/publications/cement-action-plan.pdf>, 2002

REFERENCES FOR CHAPTER 3

Arm M., *Mechanical Properties of Residues as Unbound Road Materials – Experimental Tests on MSWI Bottom Ash, Crushed Concrete and Blast Furnace Slag*, KTH Land and Water Resources Engineering, Stockholm, 2003

Chem Systems Ltd., *Substitute Liquid Fuels (SLF) Used in Cement Kilns – Life Cycle Analysis*, Environment Agency Technical Report P274, 1999

Eurostat,
http://epp.eurostat.cec.eu.int/portal/page?_pageid=1090,30070682,1090_33076576&_dad=portal&_schema=PORTAL, 2005

Green Alliance, *Creative policy packages for wastes: Sweden*, 2002

Green Alliance, *Creative policy packages for wastes: Denmark*, 2002

Neira E., Verscheure H., Revenga C., *Chile's Frontier Forests: Conserving A Global Treasure*, A Global Forest Watch Chile Report, 1992

Silva E., *The State and Capital in Chile: Business Elites, technocrats and Market Economics*, Boulder: Westview Press, 1996

REFERENCES FOR CHAPTER 4

Ashford, N. A., Cote, R. P., *An Overview of the Special Issue*, J. Cleaner Prod., Vol.5, No.s 1-2, 1997

CEN Management Center, 2005, available online
http://www.cenorm.be/newapproach/cen/stdlist.asp?dir_area=89/106/EEC&prod_fam=CEN/TC%20154

Confederation of Trade Unions, *Draft Strategy for Sustainable Development*, 2004

Hansen E., Lassen C., *Experience with the Use of Substance Flow Analysis in Denmark*, J. of Industrial Ecology, Vol.6, 3-4, 201-219, 2002

Ministry of Employment, *Denmark's Action Plan for Employment 2004*, 2004

RVF, *Swedish Waste Management Plan*, 2003

Swedish Ministry of Environment, *A Swedish Strategy for Sustainable Development - A summary of Government Communication*, 2004 available online
<http://www.sweden.gov.se/sb/d/2023/a/25275>

The Danish Government, *The National Strategy for Sustainable Development: A Shared Future – Balanced Development*, 2002

The Danish Government, *Waste Strategy 2005-2008*, 2004

Forest Certification Resource Center, 2005,
<http://www.certifiedwoodsearch.org/matrix/matrix.asp>

O'Rourke, D., Connelly, L., Koshland, C. P., *Industrial Ecology: A Critical Review*, Int. J. Environment and Pollution, Vol.6, Nos. 2/3, 89-112, 1996

Tacon A., Fernandez U., Ortega F., *El Mercado de Productos Forestales No Maderables (PFNM) y su papel en la Conservacion de la Ecoregion de los Bosques Vadivianos*, WWF, CODEFF, Red PFMN, Valdivia, Chile, 1997

REFERENCES FOR CHAPTER 5

Ashford N., Hall R., *Technology, Globalization and Sustainability: Co-optimizing Competitiveness, Environment and Employment*, 2006

Dreborg K. H., *Essence of Backcasting*, Futures, Volume 28, Issue 9, 813-828, 1996

Hall R., *Understanding and Applying the Concept of Sustainable Development to Transportation Planning and Decision-Making in the U.S.*, Doctoral Dissertation, Technology, Management and Policy Program, MIT, 2006

Sustainable Oregon, Oregon Sustainability Act, House Bill 3948, 2002,
http://www.sustainableoregon.net/sust_act/HB3948.cfm

ANNEX I

THE ASSOCIATED EFFECTS OF VIRGIN MATERIAL TAX – THE CASE OF SWEDISH AND DANISH TAXES ON NATURAL AGGREGATES

1. Introduction – A Brief Overview of Sweden’s and Denmark’s Building Industries

The construction industry accounts for 11% of total European GDP; about 3.5% is attributed to construction materials and building products. It has also been estimated that construction materials and building products account for some 18-20% of EU manufacturing output (Council of European Producers of Materials for Construction, 2002). In 1998 alone, Sweden and Denmark contributed about US\$6.1 billion and US\$4.2 billion to building materials sale in Europe respectively. The construction trades account for approximately 26 million jobs in the European Union. Direct employment in the construction materials and building products industry was 2.5 million in 1998 (Council of European Producers of Materials for Construction, 2002).

After long, slow growth that lasted almost through the 1990s and a cyclical downturn in 2003-2004, the Swedish construction industry is in relatively good health. During the crisis of the early 1990s, industry consolidation resulted in stronger companies acquiring many smaller producers. Today, a number of large groups, a shrinking number of middle-sized market players and a diminished number of small companies dominate the market (Swedish Institute, 2001). Only about 25% of building materials are direct imports. It is also an increasing trend for Swedish companies to be jointly owned by multinational partners.

Similarly, the Danish construction industry experienced a drastic slump throughout the 1970s and 1980s, which reduced industry production and employment considerably. However, in the 1990s the sector experienced a slight upturn. Still, during the late 1990s and 2000, the production value of the industry constituted nearly 5% of the total gross factor income, as compared to 12% in 1972 when the sector's activities reached a peak. Since then almost 43,000 jobs have been lost (Hjulsager, 2000). The relative decline in the first half of the 1990s led to the industry being more export-oriented. This usually took the form of employees of Danish firms becoming increasingly active in the German market.

Cement is one of the primary building materials in Sweden and Denmark, Figure 1. The cement production trends for both countries accurately reflect the state of the local industries between 1990 and 1999. It is thus interesting to appreciate the role played by the Swedish Gravel Tax and Danish Raw Material Tax in responding to the respective changes in demand for concrete within that decade. Specifically, it is important to understand how the Swedish Gravel Tax has helped to regulate the depletion of precious natural gravel and sand while the industry experienced a pickup after the long slump in the 1990s. The Danish Raw Material Tax's effectiveness in addressing the increased activity in its export-oriented building material industry in the early 1990s will also be discussed against the backdrop of supplementary policy tools.

2. The Gravel Tax (GT) of Sweden

Gravel is regarded as an invaluable resource in Sweden since it is an important material that lines the underground aquifers and thus essential for the national drinking water supply. In

fact, the Swedish Environmental Protection Agency (EPA) recognized that “there is a great shortage of natural sand and gravel in many parts of Sweden” (Swedish EPA, 1997). These parts are mostly on the south of Sweden. The Geological Survey of Sweden predicted in 1994 that at the then consumption rate of these natural gravel, 80 municipalities would have exhausted their natural gravel resource by 2024; 40 of them are on the southern part of the country (TemaNord, 1999).

In 1995, Swedish gravel extractors were given permission to extract crushed rock and natural gravel for just 0.25 SEK per ton (US\$0.035 per ton). The charge was paid according to when the firms got the permission, the volume for which it is allowed to extract and the maximum duration of the allowed period of extraction. Soon, it was noticed that there were many explorations that went on without permission, because the penalty and costs are low compared to what one could earn from illegal quarrying (Andersson, 2004).

In 1996, the Swedish government introduced a Law Concerning a Tax on National Materials (1995: 1667), which imposed a tax on the extraction and sale of gravel. The overall purpose of the tax is to increase competitiveness for alternative materials and consequently decrease extraction and disposal of natural gravels (Sweden EPA, 2001). One of the main goals of the tax is to ensure that not more than 30% of the aggregate required nationwide comes from natural gravel, with its substitutes making up the rest of the 70% (Sweden EPA, 2000). The consumption of natural gravel should not be more than 12 million SEK (US\$1.68 million) in the year 2010. Any company that exploits a site that requires a permit under the Nature Conservation Act, Water Act or Road Act must pay this tax (ECOTEC, 2001). However, activities within gravel pits and for aftercare at the sites are exempted from the tax. It is worth noting that the tax does not include imports; only domestic use and exports are taxable.

In general, this tax is imposed wherever extraction

- Demands permission according to environmental law and regulations;
- Occurs with support of permission from environmental regulations, and for purposes other than use by landowners’ household;
- Is conducted with support from the right to quarry on others’ grounds according to section 38 of the Law of Public Roads.

The initial rate of the tax was 5 SEK (US\$0.7) per ton of natural gravel. This rate was chosen as a balance between effects from means of control and risk for early closedown of already active quarries (Sweden EPA, 2000). This rate stayed the same until in 2003; the government raised it to 10 SEK (US\$1.40) per ton (Arm, 2003) in order to have higher environmental effect. In fact, a proposal was forwarded to further increase the GT over and above this increase. The Ministry of Finance rejected this proposal, a decision well supported by the local natural gravel industry¹.

3. Other Environmental and Material Policies in Sweden

There are many other policy components that also inflicted indirect effects on the outcome of the GT. In the past fifteen years, Sweden has taken considerable political steps to

¹ The Swedish gravel industry is represented by the Svenska Bergmaterialindustrin, SBMI, the Swedish Aggregates Producers Association; SBMI is the aggregate industries’ national trade association.

promote sustainable use of natural resources in the construction industry. One of the most important policy tools closely related to the GT is the Waste Tax.

i. Waste Tax (SFS 1999: 673)

A waste tax of 250 SEK (US\$35) per ton of waste disposed in landfills was introduced in 2000. Since then, the rate has gradually been increased; in 2002, the rate was 288 SEK (US\$40.32) and 2003 the rate was raised to 370 SEK (US\$51.80). Waste tax is repaid for reused materials. The aim is to gradually reduce the amount of waste reaching landfills nationwide.

The Waste Tax applies differently to different waste categories and landfill types (Arm, 2003). It covers waste sent to a landfill at which more than 50 tons a year are either stored for longer than three years or finally disposed of. Waste such as mine waste, steel slag and blast furnace slag are exempted. However, incinerator ash, reclaimed asphalt, C&D wastes are affected. Scrap boulders and excavated materials are exempted if they are disposed of at a landfill site that does not receive taxable waste as well, such as C&D wastes. That said, technically, it is possible for disposers to make special arrangement to dispose of scrap boulders and excavated materials at special landfills with a limited annual collection volume.

The Waste Tax is about 40 times higher than the GT. As one will see for the Danish case, this rate disparity is considered small. Nonetheless, there are many other policy components in Sweden that determine the context within which these two taxes operate. Each one of them is described as follow.

ii. The Ecocycles Bill (Bill 1992/1993: 180)

The Swedish Parliament adopted this Bill in 1993. It states that ‘It should be possible to use, reuse, recycle or finally take care of what is extracted from nature in a sustainable way, with less consumption of resources and without harming the natural environment’.

iii. Swedish Environmental Objectives (Bill 1997/1998: 145)

In 1999, the Swedish government adopted fifteen environmental quality objectives that described the state of the environment necessary to achieve sustainable development. The fifteenth objective, entitled ‘A good built environment’, states that ‘Buildings and amenities must be located and designed in accordance to sound environmental principles and in such a way that they promote sustainable management of land, water and other resources.’ More specifically, this objective requires natural gravel to be used for construction purposed only when there are no possible substitutes in specific applications. Moreover, waste and residue should be separated accordingly and recycled on a co-operative basis in urban and surrounding rural areas (Arm, 2003).

iv. Swedish Environmental Objectives – Interim Targets and Action Strategies (Bill 2000.2001: 130)

Approved in 2001, these were proposed to achieve the fifteen objectives adopted in 1999. Basically, interim targets were proposed for each objective, indicating the directions and time scale of the actions to be taken. One of the targets reads: ‘The quantity of landfill waste, excluding mining wastes, will be reduced by at least 50% by 2005 compared with

1994, at the same time that the total quantity of waste generated does not increase'. It was also stated that by 2010, the extraction of natural gravel will not exceed 12 million tons per year and the proportion of reused materials will represent at least 15% of the total aggregate used. In fact, in 2001 alone, the corresponding figures were 23.4 millions tons and 11% (Hartlen, 1996). The majority of this 11% was excavated rock and scrapped boulders.

v. **Landfill Ban (SFS 2001: 512 and 2001: 1063)**

To further reduce the amount of wastes diverted to landfills, the landfill ban was introduced for landfills involving sorted combustible waste in 2002; a ban the landfills involving organic waste was planned to come into effect in 2005. As a result, expansion of recycling capacity, especially waste incineration with energy recovery, is planned nationwide.

4. Outcome of the Swedish GT

As shown in fig.2, between 2000 and 2002, the average production rate of crushed bedrock exceeds sand and gravel by about 10 million tons. The Swedish building industry long recognizes that the amount of available C&D wastes tends to fluctuate too much annually to be a stable substitute for natural gravel². Of the four main types of possible alternate aggregates, mine waste and scrap boulders are the most substantial source. Mine waste is a residue that originates from remote areas where consumption of aggregates for road and building construction is generally lower. In fact, it is a usual practice to transport mine waste from, for example, Kiruna in Northern Sweden for use in the South. It should be an interesting study to conduct a lifecycle impact assessment of such long-distance transportation of mine wastes and compared it to the costs and benefits of using more bedrocks for construction in the South.

Regardless, with the construction industry being familiar with mine waste and scrap boulders, companies in Sweden seem to respond well to the combined effects of the various environmental policies by turning away from natural gravels. In fact, about 6 months after GT was introduced, county administrative boards that process extraction permits applications noticed a notable increase in rock quarry application, which implies a shift towards crushed rock products. As shown in fig.3, the annual revenue from the GT decreases steadily after a momentary increase between 1996 and 1998. A likely explanation for the increase within that period is a delay in tax payment by eligible parties. Also in 1996, 46% of the 70 million tons of various aggregates used for construction are sand and gravel; this figure decreases to 40% of 75 million tons in 1998.

However, it is worth noting that before the tax was implemented in 1996 (fig.4), there was already a steady decreasing trend in the extraction of natural gravels. Hence, the impact of the GT is unknown, The extraction of crushed rocks first exceeded that of natural gravel around 1997, and the sustainability impact of such a substitution should be studied in greater details.

What are the impacts of the GT on the price of natural gravel and sand? The Natural Gravel Commission estimated that the price difference in extraction and production of natural gravel and crushed bedrocks was between 7 SEK (US\$0.98) and 8 SEK (US\$1.12) (ECOTEC, 2001). Depending on the quality and location of mines, consumers have to pay between 40 SEK

² From private communication with Svenska Bergmaterialindustrin.

(US\$5.60) and 120 SEK (US\$16.80) per ton. Transportation cost for aggregates can be rather high – the cost of transporting low quality gravel 20-30 km may equal to the cost of the gravel itself (ECOTEC, 2001); the distance between gravel pits and consumers is thus crucial in determining the gravel prices. Overall, the GT actually increases the total gravel costs by 4%-12%, provided that this increase is passed to the consumers. There were some concerns about how the GT will impact local Swedish producers (Finansdepartementet, 2003). While it may be rare to transport large quantities of aggregates over long distances due to the high costs involved, Swedish exporters may find themselves paying two taxes – the GT for their export to Sweden and possible import tax in the importing trading partner (like Denmark).

However, as fig.5 shows, there was a dramatic increase in the import of key raw materials, including natural gravel, for 4 years beginning from 1998. There was also a momentary increase (albeit a very drastic one) in import of crushed stone. If the avoidance of extraction of natural materials is associated to preserving the natural environment and that the objective of the Gravel Tax is to achieve this goal, then the increasing domestic demand might have ‘shifted the associated problems’ of extraction abroad. To this end, the GT cannot be viewed as successfully promoting sustainable development, even though export of these materials dramatically decreased from 1996 onwards (fig.6). Interpreting domestic apparent demand as the sum of import and domestic production minus export, fig.7 shows that although there was momentary decrease in demand between 1999 and 2000, and again between 2001 and 2002, there is a likelihood of further increase beyond 2002. Even though the current data shows that the increase in import may be periodic instead of being steady and long term, from the policymaking perspective, it is still important to understand the forces behind such short term ‘problem-shifting’ and prevent it from becoming a long term yet periodic trend.

5. The Danish Raw Material Tax (RMT)

Between 1977 and 1990, a tax for raw materials already existed in Denmark. The tax rates were between 0.35 DKK (US\$0.06) per m³ (from 1977 to 1983)³ and 0.5 DKK (US\$0.09) per m³ (from 1983 to 1990) (Andersson, 2004; Lindgren, 2000). Since 1 January 1990, the new tax for Raw Materials has been put into effect and the tax rate has been fixed at 5.00 DKK (US\$0.90) per m³. This tax was levied on the following raw materials:

- Stones, gravel and sand
- Clay, limestone
- Peat, top soil, and
- Similar deposit

However, tax exemptions exist for the following purposes (Andersson, 2004):

- Raw materials extracted for coastal projects to protect the beaches against erosive action;
- Sea floor materials that originate from maintenance and capital dredging projects and are utilized as raw materials;
- Residual products and wastes that are extracted from already closed depots;
- Top soil and mould that are delivered without payment;
- Raw materials commercially extracted or imported by a business, whereby the total annual amount extracted is less than 200 m³;

³ 1 ton of gravel = 0.6 m³

- Recycled materials (if not commercially extracted again) and waste products.

Unlike the Swedish case, the Danish Tax is not levied on export but import. The purpose of this arrangement is to maintain Denmark's competitiveness against neighboring gravel-exporting countries that do not impose taxes on these materials.

Under this tax regulation, commercial extractors and importers of raw materials are to be registered. Registered businesses, which use raw materials in further processes, have to account for the amount of raw material used as the basis of their tax assessment. However, there are cases where extraction is not formally considered as 'raw material extraction' and hence liable for the tax. For example, when gravel is removed as a necessary measure to complete a road-building project.

The RMT has always been linked to the Waste Tax. In fact, both were introduced together in 1990. The two taxes are intended to jointly support and inspire reduction in resource depletion along the waste management hierarchy (Green Alliance, 2002). So, in order to fully understand the effect of the RMT, one needs to understand the role played by the Waste Tax as well. In the following section, the Waste Tax and a few other important and related policy tools are described briefly.

6. Other Environmental and Material Policies in Denmark

i. Waste Tax on Landfill and Incineration

In 1987, a waste tax was imposed on landfill and incineration. Initially, the tax was the same for landfill and incineration – 40 DKK (US\$7.20) per tons. Since then, it has been increasing almost every year and in 2000; in 1999, the structure of the tax was as follow:

- 375 DKK (US\$67.50) per ton for landfilling;
- 330 DDK (US\$59.40) per ton for incineration, and
- 280 DDK (US\$50.40) per ton for waste delivered to electricity production plants.

The incineration tax are complemented by tighter emission standards. Worth noting is that these rates are significantly higher than the raw material tax of 5 DDK (US\$0.90) per m³ or 3 DKK (US\$0.54) per ton (i.e. about 100 times less than the waste tax!).

Collectively, the two tax systems have resulted in the rate of recycling of C&D waste being about 90%. Regardless, it is expected that the relatively high waste tax is the main contributor to this increase in recycling rate. In other words, the high recycling rate may be sustained by the avoidance of the penalty for throwing away rather than preservation of natural resources.

Politically, like Sweden, Denmark has a rather sophisticated system that encourages material extraction and recycling. Even though the Waste Tax is identified to have the most direct effect on consumers' and producers' behavior, the following policy components play an important role in shaping the economic and social context within which the RMT and Waste Tax operate.

ii. The Raw Materials Act

The exploitation of raw materials on land and on the seabed is regulated in the Raw Materials Act of 30 June 1997. The Act does not apply to oil and gas.

The purpose of the Act is to ensure that exploitation of raw material deposits is based on the principles of sustainable development. The supply of raw materials to the society shall be ensured in the long term, and the raw materials are to be used according to their quality. Furthermore, waste shall be used to the greatest possible extent as a substitution for natural materials (MAGIS, 1989).

The administration aims to safeguard nature conservation and the environmental, cultural, and social aspects, as well as commercial interests of other sectors.

iii. The Planning Act and Exploitation of Raw Materials on Land

The exploitation of raw materials on land is regulated and monitored by the regional authorities, the 14 County Councils. Any extraction of raw materials on land for commercial purposes requires permission from the County Council. Normally permission can be granted for a period of up to 10 years.

The regional administration of raw materials on land is based on guidelines laid down in the region plans according to the Planning Act after an evaluation of the raw materials deposits and environmental aspects and other interests areas (MAGIS, 1989). Areas where exploitation is preferably meant to occur are designated in the regional plans. Regional plans are revised every four years.

iv. Exploitation of Raw Materials from the Seabed

The Ministry of Environment and Energy, the National Forest and Nature Agency is responsible for the administration of marine raw materials, sand, gravel and stone both in the Territorial Waters and on the Continental Shelf. Exploration and exploitation of raw materials on the seabed requires permission and may be carried out only in limited areas that have been subjected to an environmental assessment. Beneficial use of dredged materials is included in the regulation. Permissions can be granted for a period of up to 10 years.

Application for exploitation, which can be assumed to have a significant impact on the environment, is subjected to a special environmental impact assessment procedure in accordance with the European Economic Community Directive 85/337 as amended by Directive 97/11 during which the general public, public authorities and organizations have the opportunity to state their opinion (Ministerial Order nr. 126 of 4. March 1999).

Dredging vessels working in Danish Waters must have an authorization from the Ministry of Environment and Energy. The total tonnage is limited to 25.000 m³. Authorization may be granted on special conditions, for a limited period of time and for utilization for a specific task.

v. Action Plan for Waste and Recycling (1993-1997)

The general objectives of this action plan are to increase recycling as well as to reduce the requirement for landfilling. Some of the main overall targets include achieving 54%

recycling, 21% landfilling and 25% incineration. It was reported that most of these targets were met in the late 1990s, including the C&D waste category (Green Alliance, 2002).

vi. Waste 21 – National Waste Management Plan 1998-2004

This was the second phase of the national plan; the main objective was to shift focus away from incineration toward recycling. Specifically, the plan demanded greater quality of waste management, utilization of resources in waste, and better waste treatment, including removal of contaminants. The overall targets set were: 64% recycling, 12% landfilling and 24% incineration. C&D waste recycling rate was about 90% in 1999, thus meeting the specific target. This was mainly due to the implementation of the waste tax on landfill and incineration (Green Alliance, 2002).

vii. Possible Expansion of Incineration

Due to mainly the relatively poorer recycling and reuse rates of household waste stream, the Danish government may consider liberalizing the incineration market. Incineration is seen as an environmentally sound solution because of the heat recovery and power generation at all power plants in Denmark. In fact, Denmark's policies on incineration seem to be less stringent than many European countries such as Germany and Sweden (Green Alliance, 2002).

7. Outcomes of the Danish RMT

Fig.8 shows the relative abundance of C&D wastes (asphalt and concrete), crushed bedrock and natural gravel and sand in Denmark between 1995 and 1999 (Veltze, 2003; U.S Geological Survey, 2002). A similar trend exists as in the Swedish case – that crushed bedrock is a more substantial alternate material for replacing natural gravel and sand in construction than C&D wastes. It is also observed that within this period, there was an increasing trend in the extraction/production of natural gravel and sand. However there was a slight reduction in the rate of increase after 1998, with a corresponding increase in the amount of crushed bedrock produced. It is likely that some form of material substitution might have taken place between 1998 and 1999.

Interestingly, data that includes the year 2000 and beyond, as well as periods earlier than 1995 (fig.10), show that there were reductions in domestic extraction in these periods (Statistikbanken, 2005). This shows that the RMT, together with the other policy tools put in place, might have had a positive earlier impact, albeit a brief one. It would be interesting to see for how long the current decreasing trend can be maintained. Fig.10 also shows that the trend of extraction of natural gravel, sand and stone pretty much mirror that of the total raw materials; this either indicates that the use of the other materials might have stayed around the same between 1990 and 2003, or that any material substitution among these materials are able to stabilize the total demand.

Another interesting observation is that the rate of recycling of C&D waste in 2002 is as high as 90% (TemaNord, 2002). In fact, between 1994 and 2000, when the total extraction of raw materials increases, the proportion of recycled materials was about the same (TemaNord, 2002). This indicates that those years actually spotted increases in the total amount of recycled materials used. Between 2001 and 2003, when a decrease in total raw material extraction was observed (fig.10), the highest proportion of recycling was also recorded. This is either caused by an equal or increased in the absolute amounts of recycled materials within that period. In totality, one can conclude that total recycling rate in Denmark is indeed increasing. The Waste Tax, which as mentioned is about 100 times higher than the RMT, is believed to be the main cause of this high rate.

It is expected that the tax burdens be transferred to end consumers, resulting in an increase of price between 3% and 33% (ECOTEC, 2001). One reason of this is that these consumers are usually in the building and infrastructure business, which are believed to have demands that are highly inelastic.

However, for 3 years starting from 2001, there is an observed increase in import of gravels, shingles, flints and pebbles (fig.11). This is further supported by data showing increasing tax revenue in fig.9 (recall that the RMT is collected for import only). Also, although more recent data on Danish export of key raw materials show a decreasing trend (fig.12), earlier data (fig.13) showed that by not taxing export, the RMT might not produce sufficient motivation to reduce export. In fact, the export of raw materials continued to increase for 6 years after the implementation of the RMT in 1990. Fig.14 further illustrates that the domestic apparent consumption of key aggregates fluctuates between 1995 and 2000, but has been increasing since then.

8. Discussions

The trends of increasing imports in both countries imply that emphases to reduce domestic extractions of raw materials resulted in certain degrees of 'problem-shifting'. Full sustainability impact assessments should be conducted even for material options (i.e. utilizing crushed stones instead of extracting natural gravel). Even though both countries, with the help of these taxes, achieved increased recycling in concrete and asphalt, downcycling may restrict the uses of these materials. In summary, this case study shows clearly how successful virgin material taxes (from the perspective of meeting national goals) do not necessarily promise better sustainability. Regulation of domestic demand and reflections on the impacts of international trade policies should be integrated into a policymaking process that truly considers the multitude of dimensions in assessing the sustainability of any policy

9. Conclusions

Both countries should capitalize on the relative successes of their taxes in promoting recycling by further reducing the reliance on natural gravel. One way of achieving this goal is to further expand the base of available alternate aggregates – especially domestically available ones that do not have as high an adverse environmental impact as natural gravels – should also be an ongoing effort; this is because an over-reliance on crushed bedrock will increase the dependence on uneconomical long distance transportation and thus fuel, in the event that this additional transportation cost is insufficient to shift demand toward other options. In fact, such an expansion

may even shift aggregate companies in both countries away from natural gravel import and yet increase or maintain their market competitiveness. More research into measures that help reduce the cost of using substitutes, including processed C&D wastes, by smaller companies is also essential to further ensure long-term success of these taxes.

On the note of transportation and international trade, Sweden and Denmark are in the position to contribute to regional effort to promote a more holistic approach in sustainable extraction and utilization of precious natural materials. Our integrated policy proposals are described in details in Chapter 4, sections 4.3 and 4.4.

References

Andersson L., *Taxing Raw Materials – A Qualitative Study of the Swedish Tax on Natural Gravel and the Danish Tax on Raw Materials*, Lulea University of Technology, Department of Business Administration and Social Sciences, Division of Social Sciences, unpublished thesis, 2004

Arm M., *Mechanical Properties of Residues as Unbound Road Materials – Experimental Tests on MSWI Bottom Ash, Crushed Concrete and Blast Furnace Slag*, KTH Land and Water Resources Engineering, Stockholm, 2003

Council of European Producers of Materials for Construction, <http://www.cepmc.org/links.htm>, 2002

ECOTEC, *Chapter 11: Aggregates, Study on Environmental Taxes and Charges in the EU*, in association with CESAM, CLM, University of Gothenburg, UCD and IEEP (CR), 2001

Eurostat,
http://epp.eurostat.cec.eu.int/portal/page?_pageid=1090,30070682,1090_33076576&_dad=portal&_schema=PORTAL, 2005

Finansdepartementet, *Naturgrusskatten: Maluppfyllelse och konsekvenser*, Stockholm, 2003

Geological Survey of Sweden, *Grus, sand och krossberg: Production och tillgangar*, 2001

Green Alliance, *Creative policy packages for wastes: Sweden*, 2002

Green Alliance, *Creative policy packages for wastes: Denmark*, 2002

Hartlén J., *Waste management in Sweden*, Waste Management, Volume 16, Issues 5-6, 1996, Pages 385-388

Hjulsager K., *Denmark - Production and Communications - The Building and Construction Industry*, Royal Danish Ministry of Foreign Affairs, 2000

Lindgren G., *Taxation of raw materials and chemical compounds: an overview of theory and practice*, Stockholm: Naturvardsverket, 2000

MAGIS, *Extraction of sand and gravel on the Continental Shelf of Denmark, national policy on supply of sand and gravel*, 1989

Statistikbanken, *Rastofindvinding (1000m³) efter amter och rastoftype*,
www.statistikbanken.dk/statbank5a/SelectVarVal/saveselections.asp

Swedish Environmental Protection Agency, *Environmental Taxes in Sweden – Economic Instruments of Environmental Policy*, in *Natural Gravel Tax*, 104-105, 1997

Sweden Environmental Protection Agency 2000:5077, *Naturgrusskatten: utvardering av skatteeffekterna*, Stockholm: Naturvardsverket, 2000

Sweden Environmental Protection Agency 2001:5155, *Avgifter, skatter och bidrag med anknytning till miljovard*, Stockholm: Naturvardsverket, 2001

Swedish Institute, *Swedish Construction Industry and Infrastructure*, 2001

Sweden National Road Administration, *Facts about the Swedish National Road Administration, Roads and Traffic*. Publication 2000:23E, Borlange, Sweden

TemaNord, *The Use of Economic Instruments in Nordic Environmental Policy 1997-1998*, 142, 1999

TemaNord 2002:581, *The Use of Economic Instruments in Nordic Environmental Policy 1999-2001*, Copenhagen: Nordic Council of Ministers

United States Geological Service, *Europe and Central Eurasia: International Minerals Statistics and Information*, 2002

Veltze S. A., *Taxes on waste, a steering instrument – experience from Denmark*, ISWA Beacon Conference Seminar, Malmo, Sweden, 23-24 October, 2003

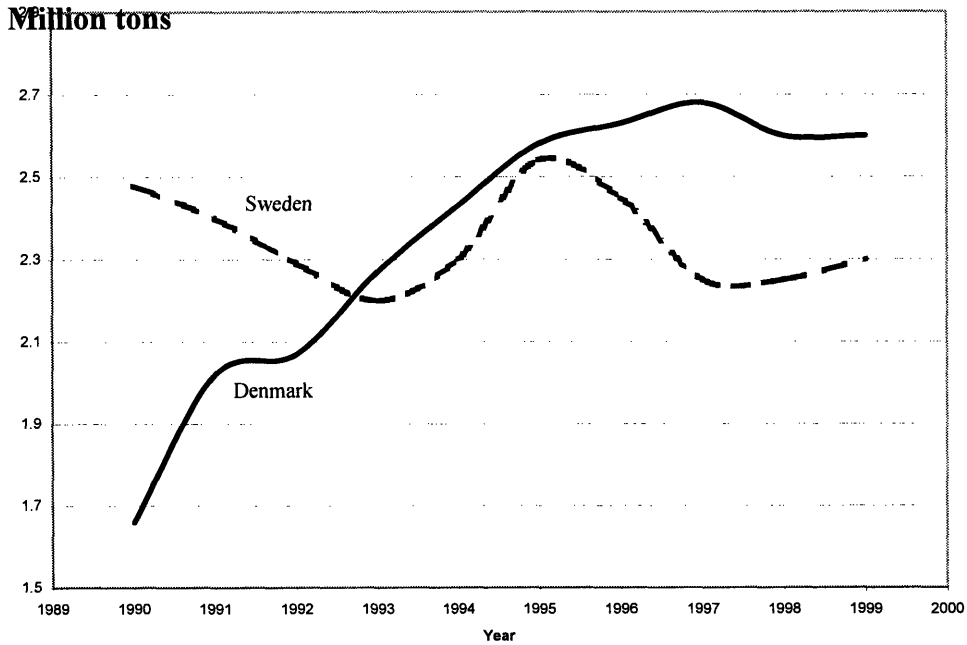


Fig.1. The annual cement production of Sweden and Denmark (U.S Geological Survey, 2002).

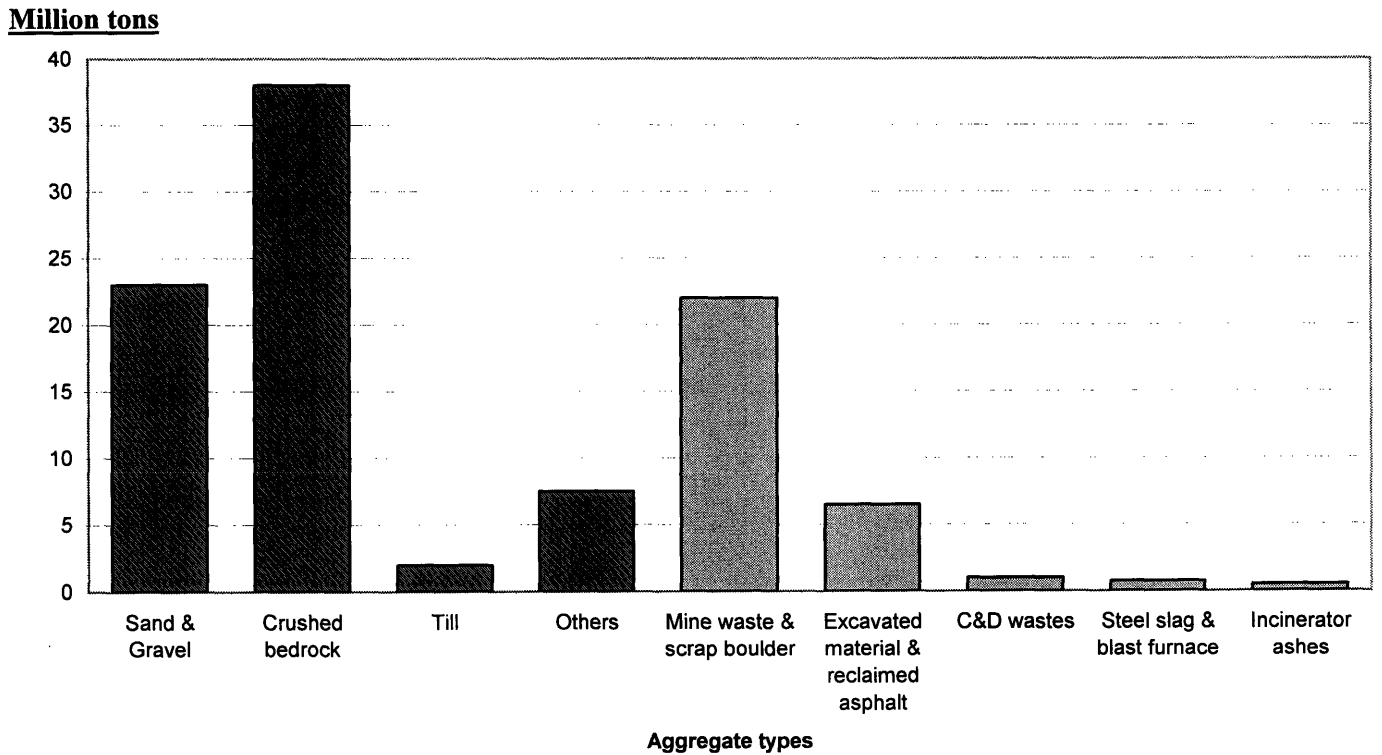


Fig.2. Average (over three years) production rates of aggregates in Sweden. Conventional aggregates are shown with the shaded bars, whereas alternative aggregates are shown with unshaded bars (SNRA, 2000; Geological Survey of Sweden, 2001; Green Alliance Sweden, 2002).

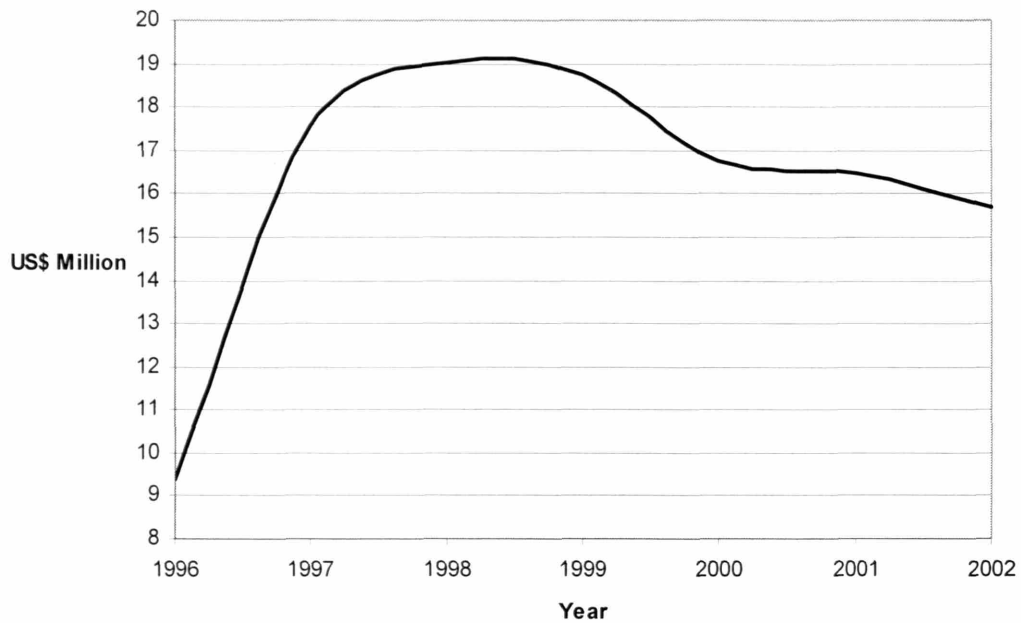


Fig.3. Annual revenue from the Swedish GT (Sweden EPA, 2000; ECOTEC, 2001).

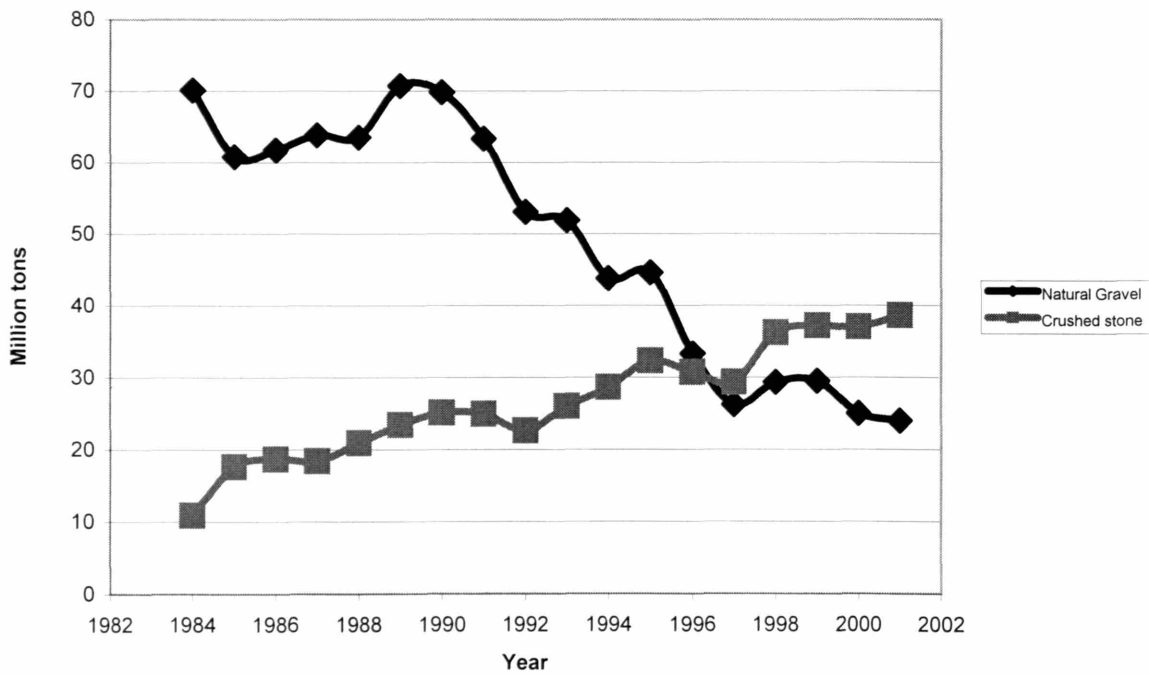


Fig.4. Annual productions of natural gravel and crushed stone in Sweden (Swedish EPA, 2001)

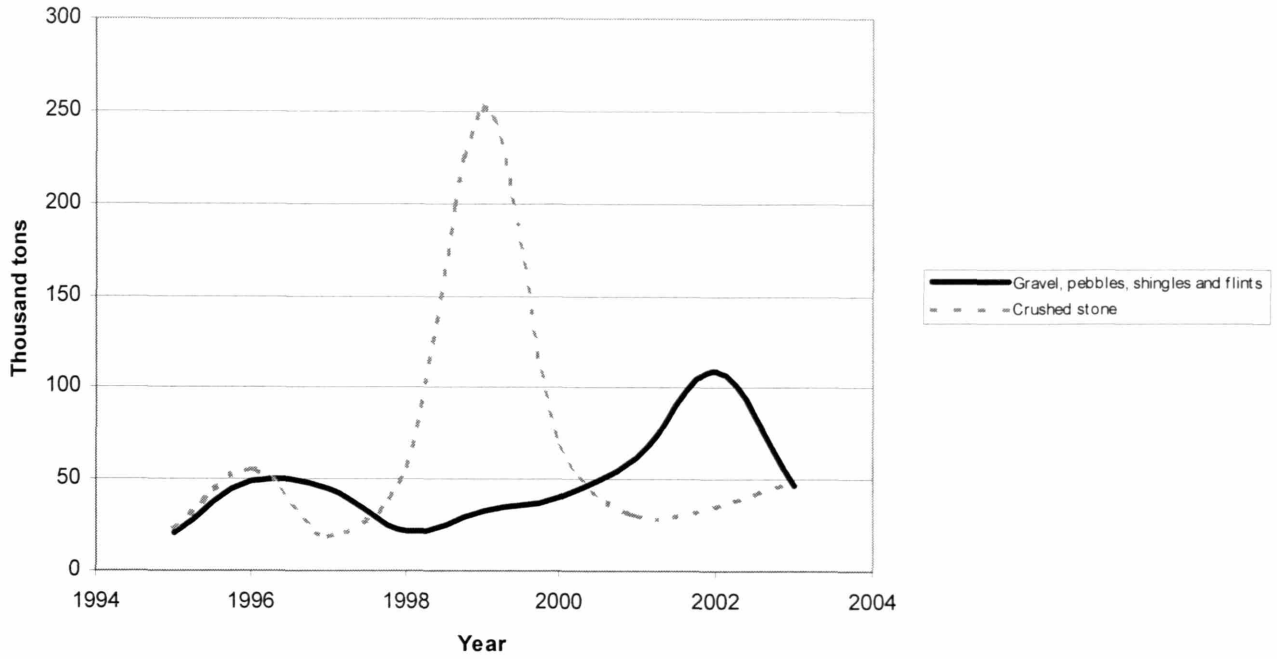


Fig.5. Annual import of gravels, crushed stone and other related construction materials by Sweden (Eurostat, 2005)

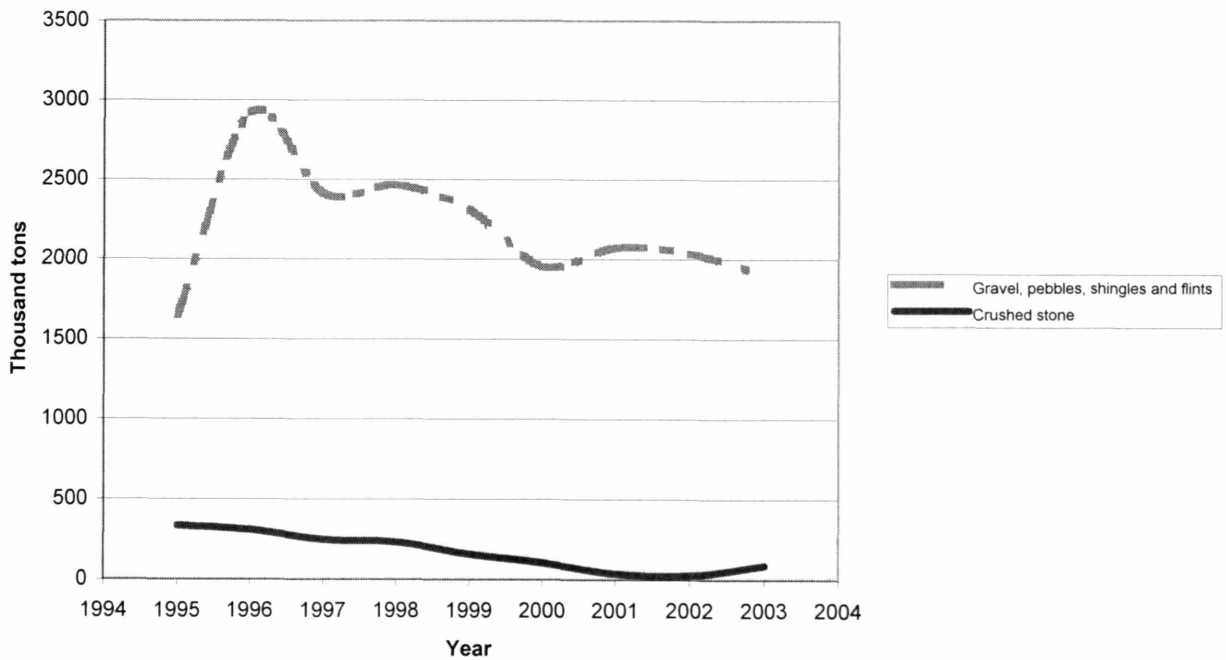


Fig.6. Annual exports of gravels, crushed stone and related construction materials of Sweden (Eurostat, 2005).

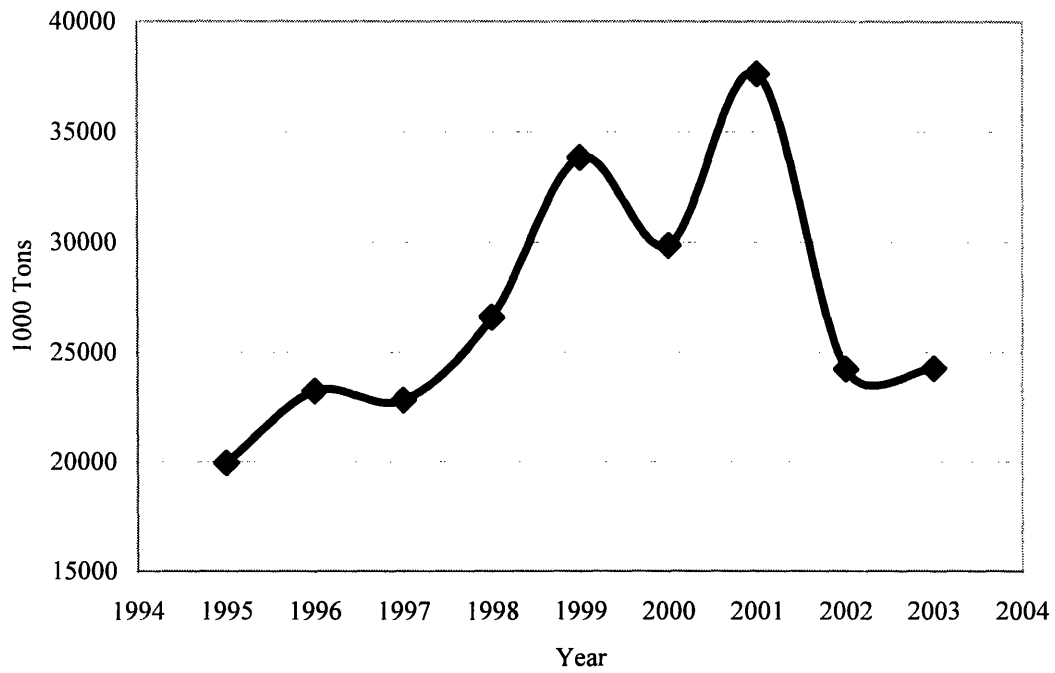


Fig.7. Domestic apparent consumption of gravels, crushed stone and other similar building materials used as aggregates (Eurostat, 2005)

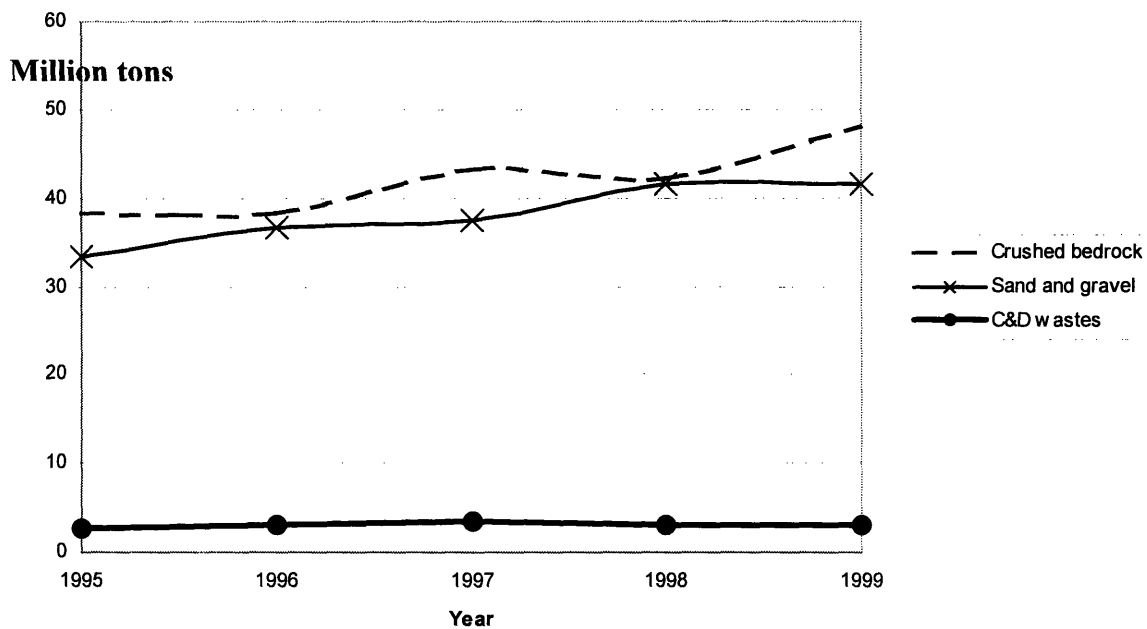


Fig.8. The variation in the annual production of crushed bedrock, sand and gravel, and C&D wastes in Denmark (Veltze, 2003; U.S. Geological Survey, 2002).

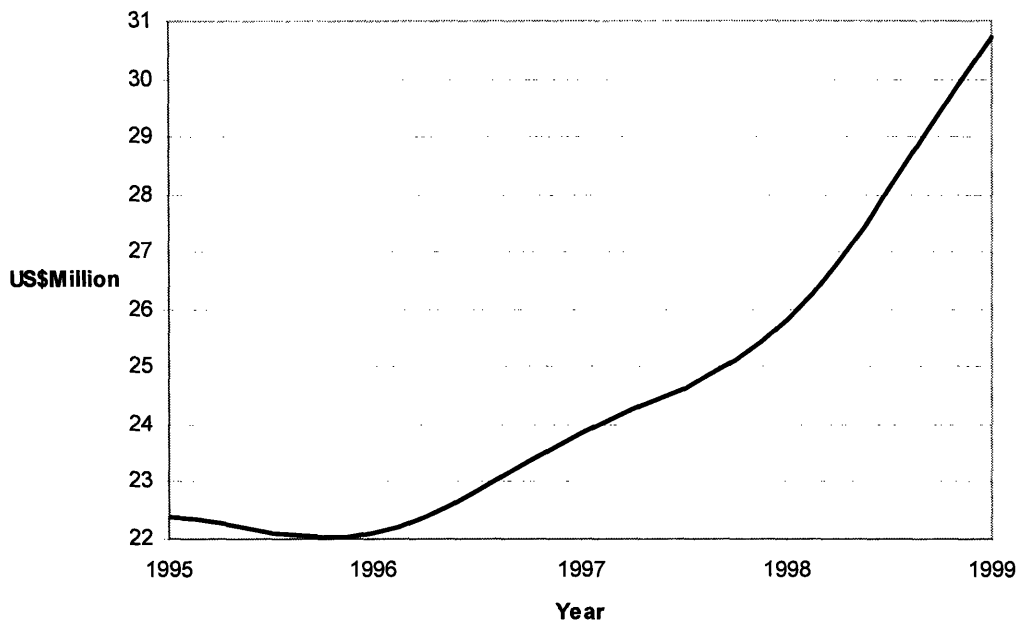


Fig.9. Annual revenue of the Danish RMT (ECOTEC, 2001).

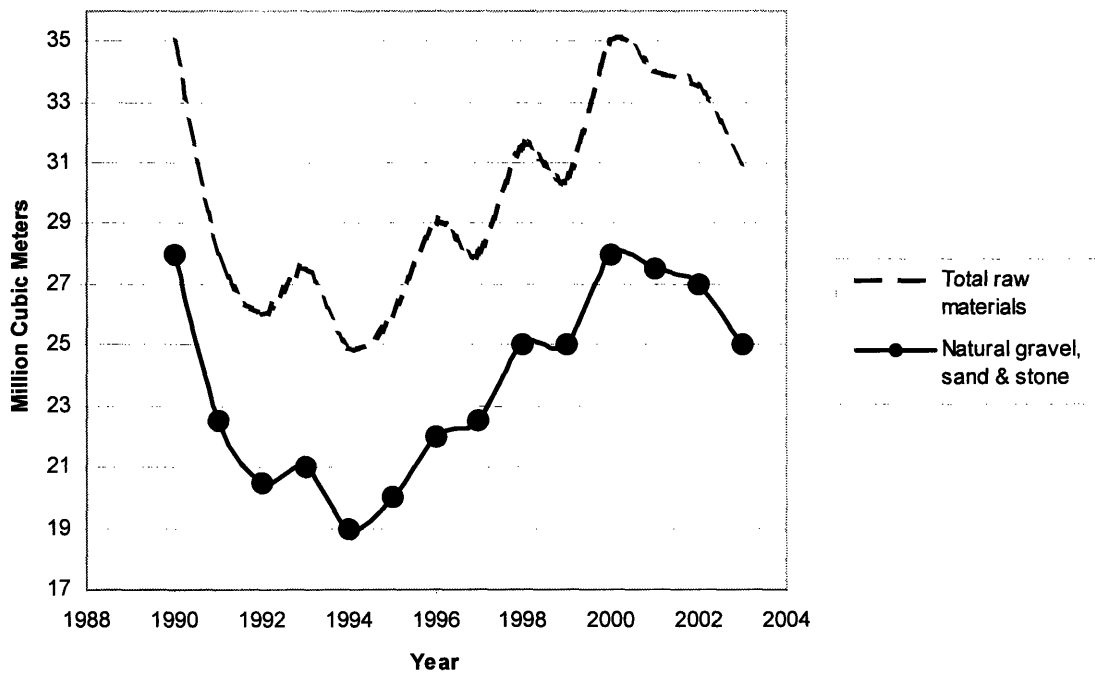


Fig.10. Comparison of the extraction of natural gravel, sand and stone with that of total raw materials in Denmark (estimated from Statistikbanken, 2005).

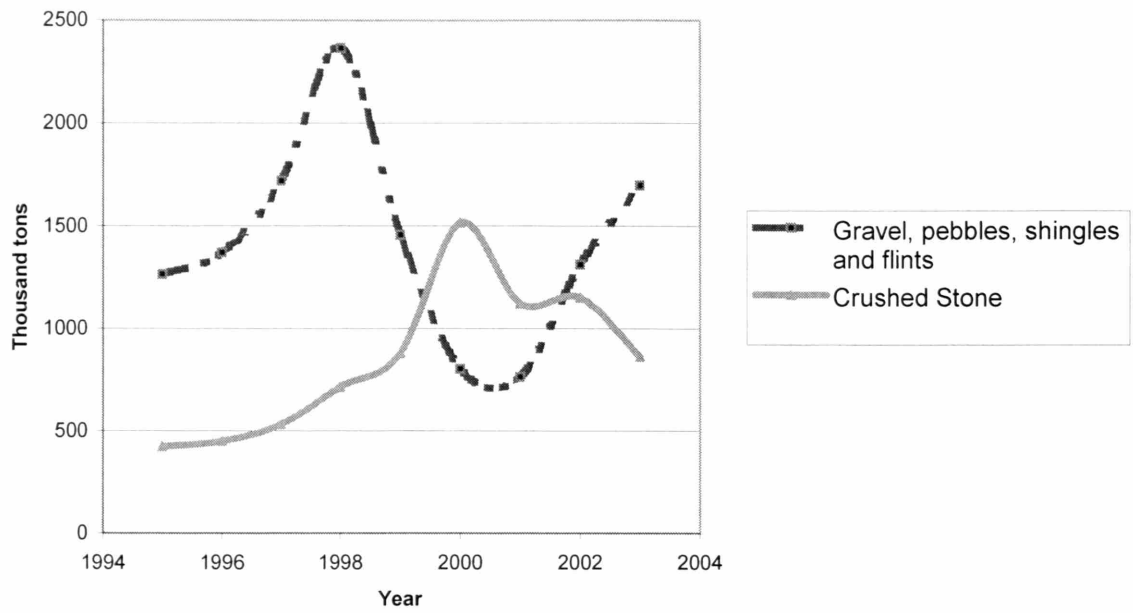


Fig.11. Annual import of key raw materials by Denmark (Eurostat, 2005)

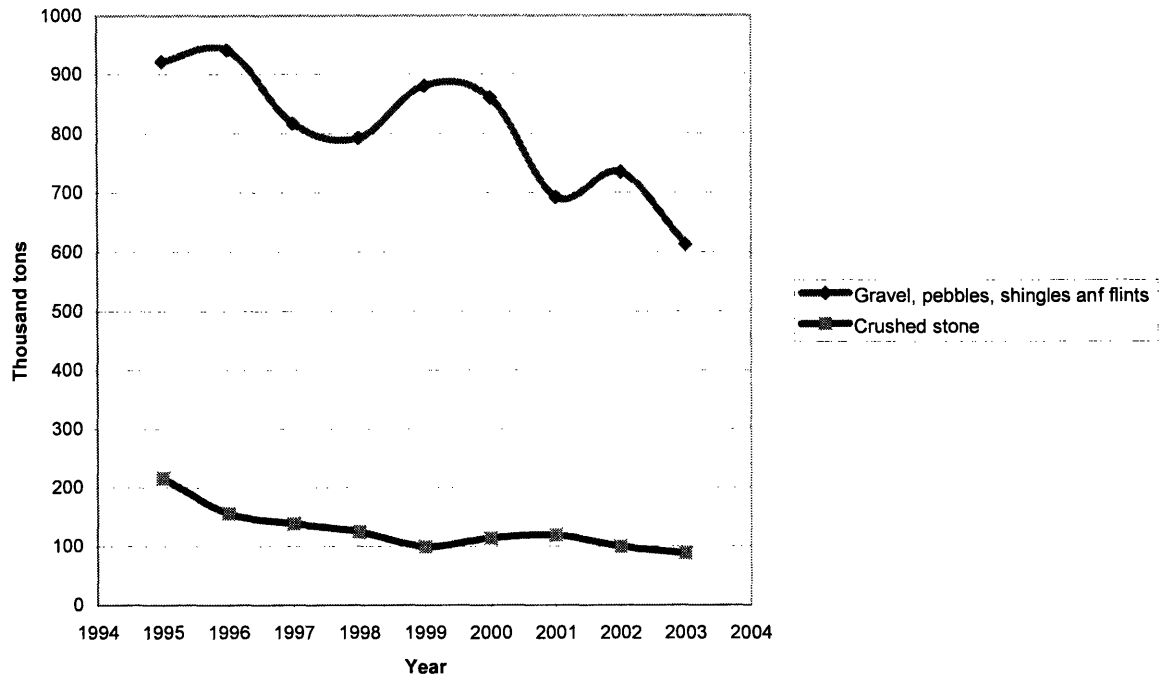


Fig.12. Annual export of some raw materials by Denmark (Eurostat, 2005)

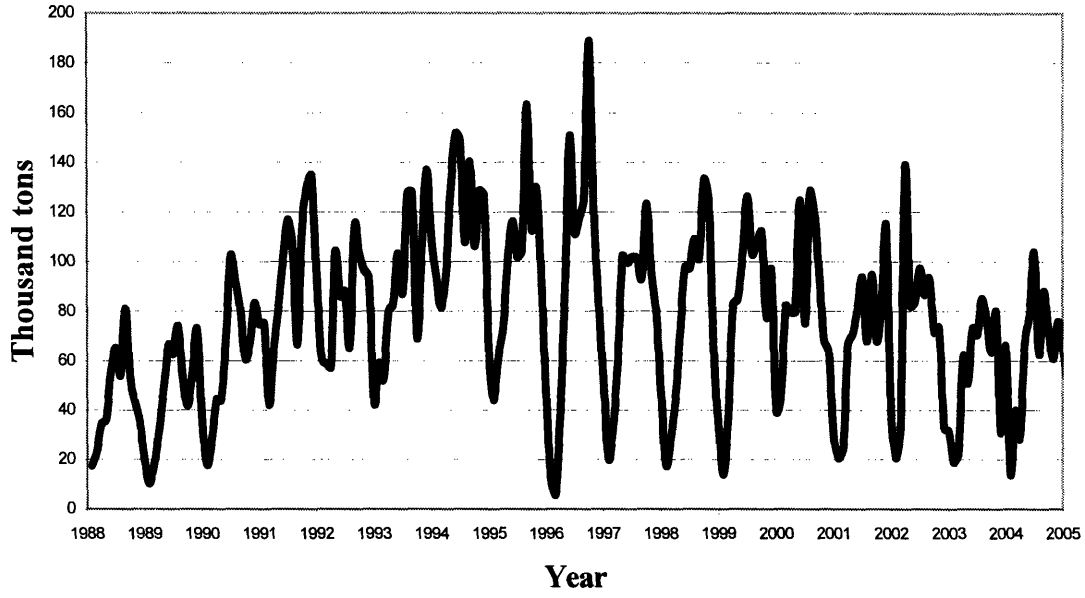


Fig.13. Monthly export of raw materials, including pebbles, gravel, crushed broken stone, slag tarred maca and dross, of Denmark (Statistics Denmark, 2005). Note that the types of materials accounted for in this data set is fewer than that in fig.12.

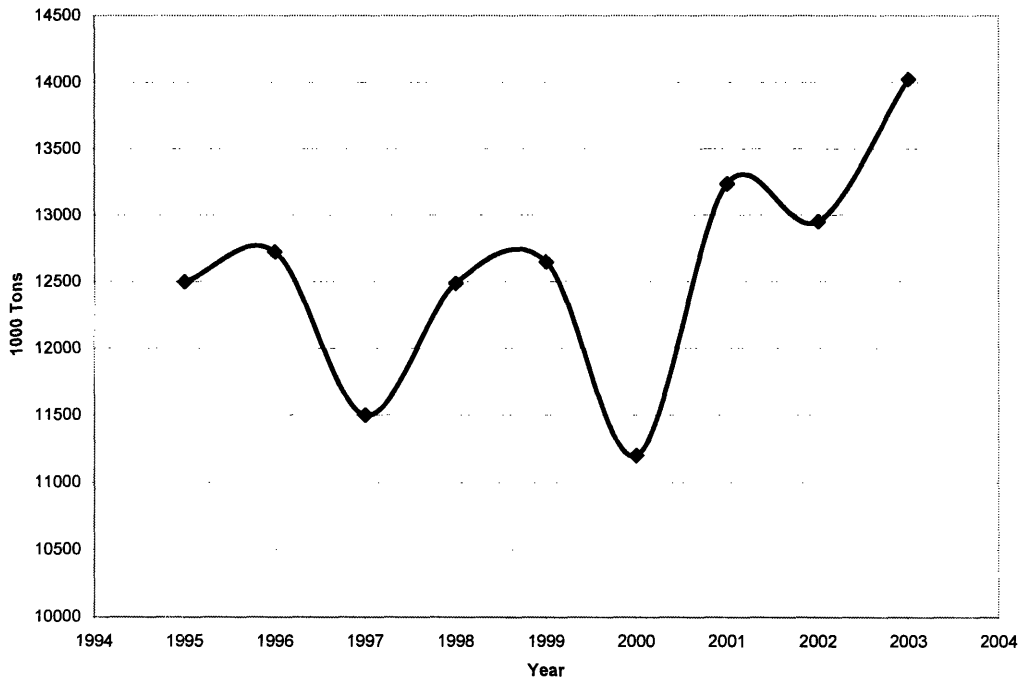


Fig. 14. Denmark's apparent domestic consumption of gravel, shingle, pebbles, crushed stones and similar materials used for construction purposes (Eurostat, 2005).

ANNEX II

ASSOCIATED EFFECTS OF FOREST MANAGEMENT REGULATIONS AND THE NORTHWEST FOREST PLAN: LESSONS ON POLICY-MAKING FOR A SUSTAINABLE TIMBER INDUSTRY IN THE UNITED STATES

1. Introduction

Environmental policy tools are strategies that are applied to complex situations for the purpose of improving the relationship between industry and the natural world. Project grants, law and regulations, and stakeholder organizations are three common types of policy tools applicable to natural resource industries. This paper analyzes the associated effects – expected and unexpected – of the applications of these tools to promote a sustainable U.S. timber industry. As a general guideline, as long as a policy produces an irony or negative impact on any of the three aspects of sustainability, the policy is unsuccessful. For the timber industry, biodiversity, community empowerment, cultural preservation, economic competitiveness, and employment are crucial sustainability indicators used in our study.

Specifically, we examine how the Northwest Forest Plan (NWFP) – an integral part of the Clinton Administration Climate Change Action Plan (CCAP) that focused on balancing forest management with economic growth – gave rise to associated effects that negatively impact these selected indicators.

Survey conducted by the U.S. Forest Service (USFS) revealed that annually about 20% of harvested wood goes into the production of building materials (APA, 2003). In 2000, about 278 million tons of wood was harvested and imported to support the construction and paper/pulp industries. About 37.3 million tons of this amount was collected as waste. The recycling rate for wood was about 45%, of which 17% was eventually channeled back to be manufactured into engineered wood. That is, around 7.6% of the discarded wood was recycled into building materials (McKeever, 2002). This implies that the majority of the timber required for building construction came from the forests; in fact, this value does not change much for most years. As such, forest management is very crucial to the well-being of the U.S. building industry.

In general, this policy analysis underlines some of the potential pitfall of policy initiatives targeted at changing an industry's culture; in particular, our conclusions and recommendations highlight specific areas in forest management and biodiversity strategies on which policy-makers should pay attention in future design, implementation and monitoring of sustainable policies.

2. The Pre-CCAP Period

2.1 *The Increased Demand on Federal Forests after World War II*

The ownership of forests in the United States differs substantially between the western and southern regions. The West is dominated by public ownership, with approximately two-thirds

of the timberland owned and managed by the USFS, the federal Bureau of Land Management (BLM) and the state departments of natural resources (Alig et al., 1990). In contrast, the South's timberland is dominated by private owners.

The Post World War II period saw an expansion in demand for timber for housing. People looked to the national forests and lands owned by the USFS and BLM in the West to meet this dramatically increased demand. This has resulted in massive efforts to improve the road access to these lands. Harvesting from private lands, including tribal and industry lands, also increased. In fact, sales from these lands increased from around 3 billion board feet in the late 1940s to around 13 billion board feet in the 1960s and beyond (Timber Institute, 2002). By 1960s, timber from federal forests alone was able to meet almost 20% of the total demand. This contribution from federal forests lessened the pressure on private forests, many of which were heavily impacted to meet the war effort. Besides an increase in demand for timber for construction, the period between 1940s and 1960s also spotted dramatic increase in park visitation.

With these increases in demand came the need to protect the forests from abuse and negligence. For this purpose, the Multiple-Use Sustained-Yield Act (MUSYA) and Wilderness Act were passed in 1960 and 1964 respectively. Later, in 1968, the Wild and Scenic Rivers and the National Trails System Act were also passed. Around this time, public concern for the harvesting practices on federal lands by USFS and the BLM began to surface. In particular, clearcutting in the Bitterroot National Forest in Montana and the Monongahela National Forest in West Virginia received the most attention (Timber Institute, 2002). Following the enactment of the Forest and Rangelands Renewable Resources Planning Act (RPA) in 1974, the USFS and BLM were required to assess the national long-term demand and supply situation for forest products, and design programs to address these projections. The 1976 National Forest Management Act (NFMA) provided further detailed guidelines for the management of national forest lands, which included measures to allow for public participation (Wear & Murray, 2004). The NFMA was the primary tool to address the widespread use of the clearcutting method.

2.2 *Protecting the Northwest Spotted Owls*

One of the most important legislations passed in the 1970s was the Endangered Species Act (ESA). It contained a statutory goal for protecting species in jeopardy. Together with the regulations mentioned in the last subsection, the ESA had a profound influence on the use and management of both federal and non-federal lands. On June 23, 1989, a certain species of owls found in the Pacific Northwest (PNW) forests – the Northwest Spotted Owl – was proposed as endangered under the ESA in the federal register (54 Federal Register 26666, 1989); the final listing came on June 26, 1990 (55 Federal Register 20821, 1990). The BLM and USFS, on behalf of the federal government, proposed changes to the forest management practice in 1986; ironically, their environment impact assessment (EIA) records, vis-à-vis the protection of the nature habitat of the owls within the federal forests, were challenged by the ESA as inadequate. As a result, in 1992, both USFS and the BLM were enjoined from selling timber in designated owl habitat until the mandatory EIA were satisfactorily completed (Gorte, 1994).

The federal government responded to this injunction with a series of administrative studies and option analyses. With new information and data, it contested the Court's decision to ban timber sale from federal forests. This process culminated with the 'Forest Summit', headed by President Bill Clinton. A new forest plan – the Northwest Forest Plan (NWFP) – was then proposed in 1993. After passing judicial tests and debates, it was implemented until August 2004

(Montgomery, 1994). The NWFP was an integral component of the CCAP under the Clinton Administration.

3. Clinton Administration CCAP

3.1 An Overview of the Clinton CCAP

The CCAP aims to address the twin challenge of responding to the threat of global warming and strengthening the economy. There are 9 components in the Plan, each addressing a particular environmental or economic concern. These concerns are (U.S Global Change Research Information Office, 2003):

- Emission reduction (and evaluation of its economic effects)
- Energy demand
- Transportation demand
- Energy Supply
- Methane and other gases
- Forestry
- Joint implementation of all the abovementioned actions
- Monitoring, evaluation and adjustment of policies
- Long-term strategies for reducing emissions of greenhouse gases

Under the forestry action plan, the main goal is to lower harvest in the old-growth forest in order to optimize its use as a carbon absorber. Old-growth forests have higher carbon densities than second growth forests. Enhanced protection of old-growth forests was expected to encourage the increase in recycling of wood fiber. Specifically, the action plan proposed the U.S. Department of Agriculture (USDA) to increase technical and economic assistance (under the Stewardship Incentive Program (New et al., 1997)) to private non-industrial landowners to motivate better forest management. The USDA and Environment Protection Agency (EPA) also led by example by expanding in-house voluntary programs to reduce their use of paper and step up paper recycling programs; more funding was also provided to support research into new recycling technologies.

3.2 The NWFP – what it entails

Under the direction of the President, the Forest Ecosystem Management Assessment Team (FEMAT) was formed to design and oversee the implementation of the NWFP. The team categorized the federal lands in the PNW into six key designations, each fulfilling different needs expected from the 24 million acres of forests in the three states of Washington, California and Oregon; these designations are: adaptive management areas, matrix lands, riparian reserves, late-successional reserves, congressionally withdrawn areas and administratively withdrawn areas⁴ (BLM, 1999). Each category of land is differentiated by different limit on harvest. For example, in riparian reserves, cutting of trees is limited to treatment of forest stands to maintain suitable habitat conditions for wildlife; harvesting of old-growth or late-successional trees are strictly prohibited in late-successional reserves.

⁴ Some information is also verified through private communication with the Oregon Bureau of Land Management

In totality, this categorization plan resulted in around 80% of the total forest acreage to be reserved for various recreational and conservation purposes. It hoped to balance efforts to protect endangered species such as the Northwest Spotted Owls (Yaffe, 1994) and Marbled Murrelet with the conditional opening of certain federal forests for continuous harvesting. The NWFP also had a special plan to offset the negative impact of the changes to the industry. This was the Northwest Economic Adjustment Initiative (NWEAI).

3.3 *An Overview of the NWEAI*

NWEAI, established in 1993, was a socio-economic program meant to offset negative impacts of the NWFP. It promised to support economic adjustment for communities affected by the reduced timber output by diversifying jobs in these areas. The original intent was to foster inter-agency partnership in order to create more job opportunities for displaced workers, while re-inventing community-scale government intervention by encouraging them to embrace adaptive management (Forest Community Research, 1999).

The main strategy was to re-train displaced workers and channeled them to ecosystem restoration projects planned to improve rural neighborhood (Donoghue et al., 1999). These projects were to be initiated, managed and monitored by community representatives, namely the Community Economic Revitalization Teams (CERTs). In other words, NWEAI could be seen as a large-scaled project to empower local governance.

4. **The Results of the NWFP**

The NWFP has a profound effect on the forest and ecosystem management in the U.S. In this section, we discuss the various direct and indirect results of the Plan. Specifically, we examine how the reduction in timber harvest from the PNW forests cause private forests nationwide and federal forests in the South to respond to domestic need by increasing productions. This has given rise to new problems in these forests. Besides, the increase reliance on import of softwood, especially from Canada, also resulted in complicated trade dispute between the two countries. The population of the Northwest Spotted Owls has been found to be shrinking for the past decade, due to unforeseen ecological factors. The innovative and ambitious NWEAI also produced mixed results. Each of these results is described below.

4.1 *The shift in the supply and demand of timber – the associated effect of increased import from Canadian forests*

Between 1993 and 1998, the federal timber harvest dropped by 70% - from 13 to 4 billion board feet annually (MacClerry, 2000). However, as shown in fig.1, the national production of softwood, which is used for building construction, rose from 33 to 34.5 billion board feet between 1993 and 1998 (FRL, 2000). This shows that the decrease in federal softwood production was more than made up for by the increase in production from the private and federal forests in the South (MacClerry, 2000).

Was this geographical shift in production of softwood sufficient to respond to the domestic need for timber? Fig.2 shows the annual housing starts between 1985 and 2001 (Howard, 2002). By comparing the softwood production between 1991 and 1993 (marked by the

first two dashed vertical lines in fig.1) with the housing starts within this period (marked by the first two dashed vertical lines in fig.2), one observes that although there was a net increase in housing demand, there was actually a net decrease in the softwood production. A similar trend was observed for the period between 1993 and 1995 in the two figures. However, the national softwood production between 1995 and 1998 reflects the steady increase in the housing starts within that period. Beyond 1998, the demand for wood for building leveled off – a trend reflected in the softwood production as well. Such a comparison shows that between 1993 and 1998, there was an increase dependence on timber import and recycled products. The increasing reliance on import is illustrated in fig.3⁵; from the projection by USFS and FERMAT, the dependence on import will only stabilize after 2015, provided that there is an increasing reliance on recycled wood and paper products. Considering that the new Bush's Healthy Forest Plan aims to open up protected forests under the NWFP for logging, it is highly possible that such stabilization may not happen in 2015. This new Plan will be discussed in section 5.4.

The U.S. is a net importer of softwood as well as softwood products. In 2002, Canadian softwood import accounted for around 20% of U.S. domestic demand. This import was about 64% of all softwood import, and the softwood comes from the three main timber-producing regions in Canada – Quebec, Ontario and British Columbia.

In fact, subsidized timber from Canada has been a long-standing controversy and source of disputes amongst American timber producers. As early as December 1986, the U.S. and Canada reached a Memorandum of Understanding on softwood lumber in which the 15% Canadian export tax was to be replaced by higher provincial stumpage fees (Gorte, 1994). In December 1991, the U.S. International Trade Commission (ITC) issued preliminary finding that the U.S. lumber industry had been injured by lumber imports from Canada, in response to widespread dissatisfaction expressed amongst local producers. By the end of 1992, a bi-national panel formed under the U.S.-Canada Free Trade Agreement asked to review the U.S. Department of Commerce (DOC) and ITC finding on the Canadian lumber subsidies and injury to U.S. lumber producers respectively (Gorte, 1994). After the panel's review, the injury case was not established. As a result, the U.S. Coalition for Fair Lumber Imports approached the U.S. Trade Representative to request for an Extraordinary Challenge Committee. In May 2002, the DOC imposed countervailing duties on Canadian imports, to which the latter responded with a North America Free Trade Agreement (NAFTA) challenge in 2004 (Department of Foreign Affairs and International Trade, 2005).

This dispute is fundamentally caused by an over-dependence on import. The Canadian forests that export softwood to the U.S. are also centers of disputes regarding poor forest management records.

4.2 *New, Unforeseen Problems in Forest Management in Canadian and United States forests*

The Forest Stewardship Council's (FSC) certification program is internationally recognized and widely adopted around the world. Its indicators span across the three aspects of sustainability; for example, it requires maintenance of old growth forests, public participation and consultation, preservation of tribal heritage and maintaining a sustainable growth rates. Individual country also needs to adapt the general FSC guidelines to conform to local situations and

⁵ The data of softwood consumption in fig.3 includes all form of softwood products and uses (i.e. both sawtimber and nonsawtimber)

conditions. The FSC Canadian National Boreal Standard is one of the Canadian forest certification standards⁶.

Recently, the Canadian Parks and Wilderness Society (CPAWS) and World Wildlife Fund (WWF) jointly conducted a survey of the forest management regulatory requirements in Quebec, Ontario and British Columbia (Henschel, Tessier, 2001). The report found that when the forestry requirements for these forests were compared to the FSC National Boreal Standard according to seventeen indicators, forests in Quebec, British Columbia and Ontario scores 43.1%, 56.9% and 60.8% respectively. This shows that with respect to the FSC standard, these forests still need to drastically improve on their forest management records.

Within the U.S., ironically, the NWFP gave rise to new challenges in managing the forests in both the PNW and Southern regions. Firstly, although the NWFP's Probable Timber Sale Quantity (PSQ) was estimated at 1.8 billion board feet (or, 224 million board feet annually) for the first eight years, the actual quantity was only 1.5 billion board feet. This was due to many reasons, which included new projections of cumulative watershed effects and riparian reserve designations. This had affected the timber industry considerably. In an effort to salvage losses resulting from this miscalculation, it was found that many harvesters actually turned to thinning rather than regeneration harvest to yield their timber volume. This further worsened the forest conditions in the PNW (U.S. Department of Agriculture, 2001). Besides, the management of late-successional reserves (LSR, which are specially established to protect and preserve old growth forest ecosystem) was not proactively pursued. The main reason was that forest owners were reluctant to spend funds allocated for maintaining LSR since such treatments would not contribute to the allowable sale quantity goals. Similar reasons also contributed to forest owners using thinning method as opposed to the recommended regeneration harvest in matrix lands.

Forests in the South were challenged with other forest management problems. Due to the shift in harvesting from the PNW federal forests to the South, in 1998 and for the first time in 50 years, Southern forests regeneration rate lagged behind harvest rate by 0.85 to 1.00 (MacClerry, 2000).

Different states in the U.S. have their own forest and timber tax policies. For example, not all states collect severance tax for trees fallen by loggers. The competition faced by states with severance tax from those who do not collect such tax is expected to have certain degree of influence over their forest management practice. Loggers and foresters may resort to premature logging in order to increase short-term profit. While a detailed discussion of the impact of the national and state forest tax systems is beyond the scope of this paper, one expects such measures to exacerbate the state of already poorly managed forests.

Henceforth, ironically, a policy action plan aimed at improving forest management ended up complicating the problems in both the PNW and South forests. The U.S. and other importers of Canadian timber should not be held responsible for the lag in forest management standards in Canadian forests; however, by depending too much on import, the NWFP could be viewed as adopting a 'not in my backyard' attitude in addressing universal health in the global forest ecosystem.

⁶ The CSA International is another certification standard in Canada; CSA is an independent non-profit organization accredited by the Standards Council of Canada. CSA is operated within Canada's National Standards System and according to nationally and internationally accepted standardization procedures and processes.

4.3 *How successful is the protection of the Northwest Spotted Owls*

The first large-scale monitoring of the population of the Spotted Owls was not undertaken until 1995. The report found that the population of the owl continued to drop despite the generous allocation of forest in the PNW for their protection. In the latest scientific review (Guynup, Ruggia, 2004), their populations had dropped by roughly half in Oregon's Warm Springs Reservation and parts of Washington. Along parts of the Oregon coast and Cascade Mountains, their population had dropped by almost a quarter. Their numbers remained stable in just a few areas.

The Barred Owls were commonly cited as the main reason for this continually shrinking population. The Barred Owl is a larger and more aggressive bird, and scientists found that many either preyed on the smaller Spotted Owls or took over the habitat from the weaker competitors. The conservation of old growth forests might have attracted this species into the PNW forests. Besides, West Nile virus and the pathogens from the Sudden Oak Death Syndrome may wreak havoc on the dwindling population in the near future.

This absence of clear success in owl protection has sparked new rounds of political debates. The timber industry argued that the availability of habitat is no longer the limiting factor for the Spotted Owls' survival; the conservationist camp reasoned that the intrusion of Barred Owls imply that more habitat needs to be set aside to further ensure that the Spotted Owls can get off the endangered species list eventually.

4.4 *Failures of NWEAI*

As it appeared, the job diversifying intention of NWEAI fell short of expectation. A sizeable portion of the funding provided under NWEAI was actually allocated for large-scale projects, upon recommendation by the CERTs. These were wastewater and portable water projects. Although these projects served to improve the distribution of services and quality of life in rural communities, and helped to attract new businesses into the rural area, collectively they did not provide sufficient immediate jobs to help the displaced workers (Donoghue et al., 1999). It was also observed that CERTs that had less experience in writing grant application usually found it more difficult in obtaining sufficient financial assistance to materialize their project plans. Ironically, this problem was especially glaring for those communities worst hit by the reduction in harvest. As a result, many projects could not get past the pilot-project phases, which directly compromise the ability to create more jobs in the long run.

Another problem in job-creation was that many of the large infrastructure projects that were expected to absorb the displaced workforce were more inclined toward technology and capital investment instead of labor investment. More smaller-scaled projects might help to alleviate the shortage; however, accomplishing this in turn required sufficient funding as well as experience and creativity in project development.

In some cases, it was observed that there was a disconnect between the content of workers' re-training and the availability of appropriate jobs. One of the reasons might be a lack of coordination between the different parties involved in re-training and job allocation. For that matter, case studies on the tribal communities in the three PNW states supported the conclusion that a closer knitted community leadership would have markedly improved the relevance of the re-training programs (Raettig, 1998).

Finally, the first large-scale evaluation of the outcome of the NWEAI was not conducted until 1996 (Forest Community Research, 1999). While the NWEAI was designed to be flexible and innovative at an administrative and policy level, it did not include a mechanism to allow for a comprehensive mid-course intervention of the program. An initiative-wide accounting system would have contributed to this, as would better accounting of socioeconomic indicators at the community level prior to the implementation of the NWEAI in full force (Raettig, 1998). Such an intervention program, we believe, would have identified the various unforeseen consequences and associated effects of the NWEAI at the community level.

4.5 Discussions and Recommendations

4.5.1 Developing A New Industry Culture Requires Considerable 'Lead-Time'

The new problems in forest management that emerged after implementing the NWFP were unanticipated. This is concluded from the disparity between the stated goals of the CCAP and NWFP and the observed outcome. While ecosystem management will create jobs to buffer the impact of NWFP, the willingness of CERTs and foresters to embrace these projects have been somehow overestimated. The inability of the timber industry to nimbly break away from the traditional model and mindset of doing business might have prevented forest owners to see short-term values in forests other than from harvesting. Although not all projects eventually proposed by the CERTs were developed after the injunction of the NWFP, they did not represent the cultural evolution that was needed to increase awareness and confidence in non-timber values of the forests.

The willingness, capacity and opportunity to change are the prerequisites to diversifying a locked-in industry (Ashford, 1994; Kua & Ashford, 2004). A period of 'lead-time', in which the different policy components of NWEAI are introduced in a step-by-step manner, might have been a better approach. A more systematic and gradual introduction of key policy changes would have allowed CERTs to build up in-house capacity to design projects that might have more positive and long-term impact on the communities.

4.5.2 Globalization and trade implications must be considered

The shift in domestic timber production and the increase reliance on Canadian imports are expected outcome of the NWFP. However, the undesirably lengthy and complicated dispute arising from competition between American and Canadian timber industries was undesirable, even if it is not totally unanticipated. One reason was that the NWEAI was expected to be much more successful than it eventually turned out to be. As mentioned in the last sub-section, a lack of sufficient 'lead-time' compromised the potential of creating non-timber alternative source of income.

In all trade issues, the demand for and supply of goods are mutually affecting. The mistake made on omitting the 'lead-time' might have been magnified by the ever-increasing demand for wood throughout the United States. An important element of the CCAP is the Executive Order 13101, which aimed to green the government through waste prevention, recycling and federal acquisition. Under the auspice of the Office of Environmental Executive, and supported by the Department of Energy (DOE), USDA and Environment Protection Agency (EPA), the Federal Green Purchasing Program was implemented throughout key agencies. The purpose was to make these agencies lead by example in promoting environmentally preferable

purchasing. With regards to wood consumption, much of the effort was put into paper recycling and procuring recycled paper products. Comparatively, little was done to promote the use of recycled wood products in construction; much less on reducing wood consumption⁷.

A study by the Forest Products Laboratory (Skog, 1998) suggested that consumption of roundwood products, including building materials, has grown more slowly than consumption of products because of improvements in production efficiency. The authors modeled the national roundwood consumption on the assumption that engineered wood and reconstituted products for structural applications are able to gradually substitute away products made from harvested wood. For example, the per capita consumption of roundwood for forest products was 2.3m³ in 1950, but declined to 1.7m³ in 1970 before rising back to the 1950's level in 1998 (fig.4). However, they found that the total roundwood consumption (including recycled roundwood fibers) would still grow by 0.6% per year to 750 million m³ by 2040; the current consumption is about 620 million m³ (fig.5).

In short, higher production efficiency and material substitutability do not imply less consumption. In the field of industrial ecology, this is also known as the 'rebound effect'. A detailed discourse of measures to promote sustainable consumption resulting in reducing overall wood consumption is beyond the scope of this paper.

4.5 Conclusions

The NWFP is an important element in the Clinton CCAP. It was implemented and enforced with the hope to improve forest management and protect the Northwest Spotted Owl in the PNW region. Ironically, the associated effects of the shift in forest harvesting from the PNW to the South were the emergence of new forest management problems and an over-dependence on Canadian imports. The congested federal forests in the PNW that are protected by the Plan attracted new species of owls and intense competition also resulted in the continual decline in the population of the endangered Spotted Owls.

One of the main lessons from this case study is that appropriate 'lead-time' is required to ensure the willingness, increase the capacity and provide the opportunity for the industry to change according to the goals of the NWEAI. We therefore recommend 'lead-time' to be given for the opening-up of protected forests to ensure that current recycling enterprises and successful NWEAI projects do not suffer amidst the pending timber influx. The absence of an effective approach to decelerate wood consumption will compromise any effort to focus on non-timber activities, even when there is increased recycling and production efficiency. Such an increasing demand also makes it harder to level the playing field for the local timber industry to compete with Canadian imports.

Finally, failure in aspects of the NWEAI and the monitoring of the Spotted Owl and Barred Owl populations could be attributed to an absence of effective policy monitoring and midcourse intervention mechanisms. These mechanisms call for more creative alliance between different stakeholder groups.

Our policy proposals are elaborated in section 4.6.

⁷ Private communication with officials and researchers from the Forest Products Laboratory, Forest Service, USDA

Reference

APA – The Engineered Wood Association, *Market Outlook, Structural Panels Engineered Wood*, http://www.cintrafor.org/CONFERENCE_TAB/ifpm%202003/Presentations/AdairCintra%2003.pdf

Alig R.J., Hohenstein W.G., Murray B.C., Haight R.G., *Changes in area of timberland in the United States, 1952-2040, by ownership, forest type, region, and state*, General Technical Report SE-64, Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station, 1990

Ashford N.A., *An innovation-based strategy for the environment, worst things first? The debate over risk-based national environmental priorities*, in *Resources for the Future*, Eds F. M. Finkel, D. Golding, Washington DC, pp 275-314, 1994

Bureau of Land Management, Oregon/Washington, *Background – The Northwest Forest Plan*, www.or.blm.gov/coosbay/fp-back.htm, 1999

Congressional Research Service (prepared by Ross W. Gorte), *Lumber prices – 1993. Report for Congress, 1994*, accessed May 29, 1998, www.cnire.org/nle/for-12.html

Department of Foreign Affairs and International Trade, *Softwood Lumber – Canada Steps Up Pressure On United States*, News Release, Jan 13, 2005

Donoghue E.M., Christensen H.H., Saranich R., *Chapter 8--The Northwest Economic Initiative: Lessons Learned and Questions Remaining*, in *Northwest Forest Plan: Outcomes and Lessons Learned From the Northwest Economic Adjustment Initiative*, United States Department of Agriculture, Forest Service, Pacific Northwest Research Station General Technical Report, PNW-GTR-484, November 1999

54 Federal Register 26666, United States of America, June 23, 1989

55 Federal Register 20821, United States of America, June 26, 1990

FEMAT, *Outlook for National Forest Products Markets*, in Chapter 6: Economic Environment of the Options, *Forest Ecosystem Management: An Economic, Environmental and Social Assessment*, July 1993

Forest Community Research, *Executive Summary: Northwest Economic Adjustment Initiative Assessment*, 1999

Forest Product Laboratory, U.S. Forest Service, Department of Agriculture, <http://www.fpl.fs.fed.us/documnts/FPLRN/fplrn272.pdf>, 2000

Gorte R.W., *Lumber Prices – 1993*, Environment and Natural Resources Policy Division, 94-122 ENR, February 1994

Guynup S., Ruggia N., *Owls Face Spotted Future*, National Geographic Channel, July 22, 2004

Henschel C., Tessier L., *Measuring Up – A National Evaluation, Comparison and Recommendations for Quebec's Public Forests*, Report to the Commission for the Scientific, Technical, Public and Independent Study of public forest management in Quebec, 2001

Howard J., Forest Product Laboratory, U.S. Forest Service, Department of Agriculture, *U.S. Timber Production, Trade, Consumption, and Price Statistics, 1965-2001*, Research Paper FPL-RP-595, 2002

Kua H. W., Ashford N. A., *Co-optimization through increasing willingness, opportunity and capacity: a generalizable concept of appropriate technology transfer*, Int. J. technology Transfer and Commercialization, Vol.3, No.3, 324-334, 2004

MacClerry D.W., *Ecological Sustainability, Consumption and NIMBYism*, U.S. Forest Service newsletter, Volume 9, Number 1, 2000

McKeever D., *Domestic Market Activity in Solid Wood Products in the United States, 1950-1998*, 2002, <http://www.fs.fed.us/pnw/pubs/gtr524.pdf>

Montgomery C.A., Brown G.M, Adams D.M., *The marginal cost of species preservation*, J. Environ. Econ. Manage., 26, 111-128, 1994

New B.D., Cabbage F.W., Moulton R.J., *The stewardship Incentive Program, 1992-1994: an accomplishment and program review*, U.S. Forest Service, SCFER Working Paper (83), 1-37, The Southeastern Center for Forest Economics Research, Research Triangle Park, North Carolina, 1997

Raettig T.L., Christensen H.H, Donoghue E., *The Northwest Economic Adjustment Initiative: An Assessment*, California Community Economic Revitalization Team, April 27, 1998

Skog K., Ince P., Haynes R.W., *Wood Fiber Supply and Demand in the United States*, North American Forestry Commission, Proceedings of the Forest Products Study Group Workshop, Forest Products Society Annual Meeting, June 23, Merida, Yucatan, Mexico, 1998

Timber Institute, *History of National Forest Conflicts*, www.ti.org/2chistory.html, 2002

U.S. Department of Agriculture, Pacific Southwest Region, *Northwest Forest Plan Review – Pacific Southwest Region Findings*, www.fs.fed.us/r5/nwfp/plans/r5-findings.shtml, 2001

U.S. Global Change Research Information Office, *The U.S. Climate Change Action Plan*, <http://gcrio.gcrio.org.USCCAP/toc.html>

Wear D.N, Murray B.C., *Federal timber restrictions, interregional spillovers and the impact on US softwood markets*, J. Environ. Econ. Manage., 47, 307-330, 2004

Yaffe S.L., *The wisdom of the Spotted Owl: policy lessons for a new century*, Island Press, Washington D.C., 1994

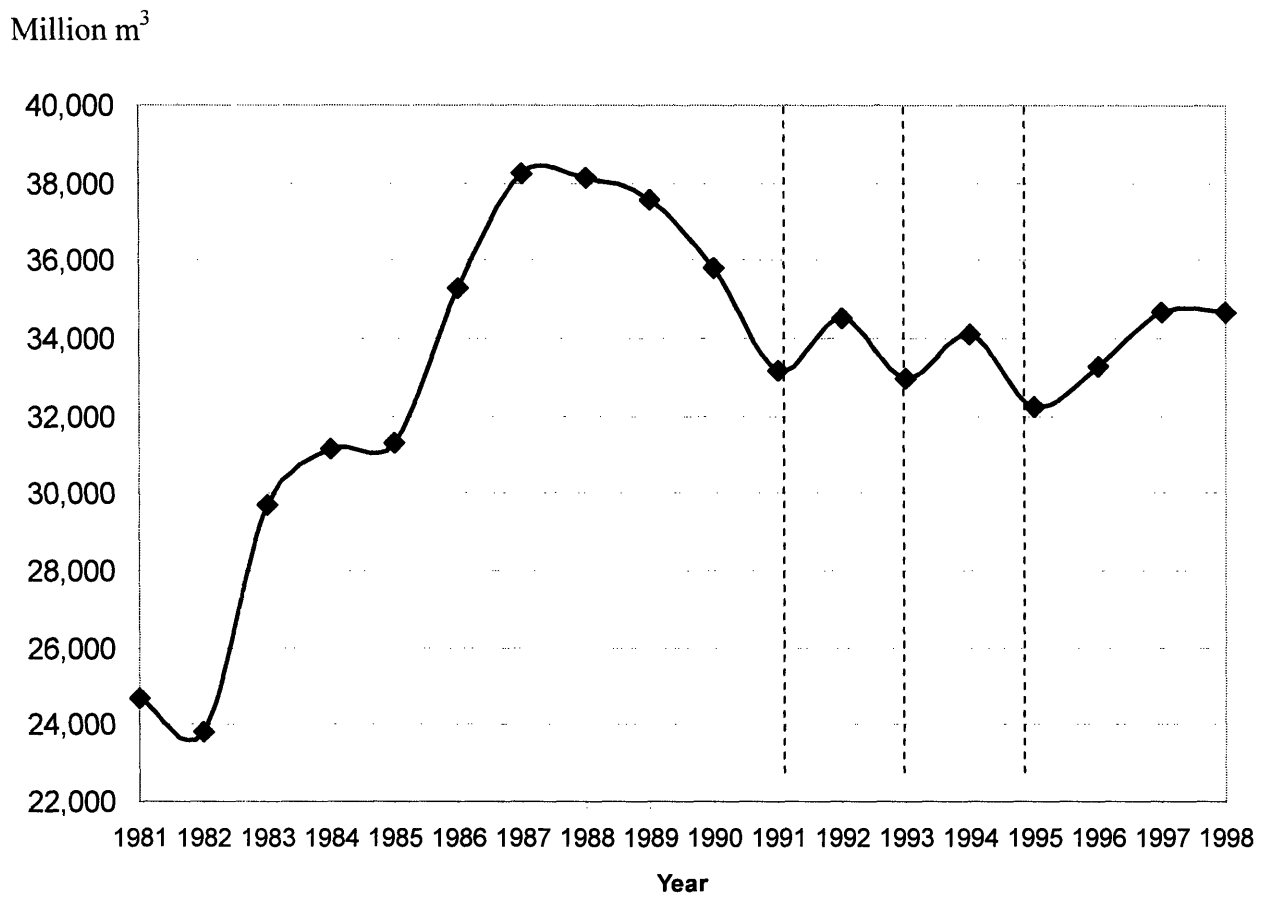


Fig.1. Production of softwood from all forests in the United States (FRL, 2000).

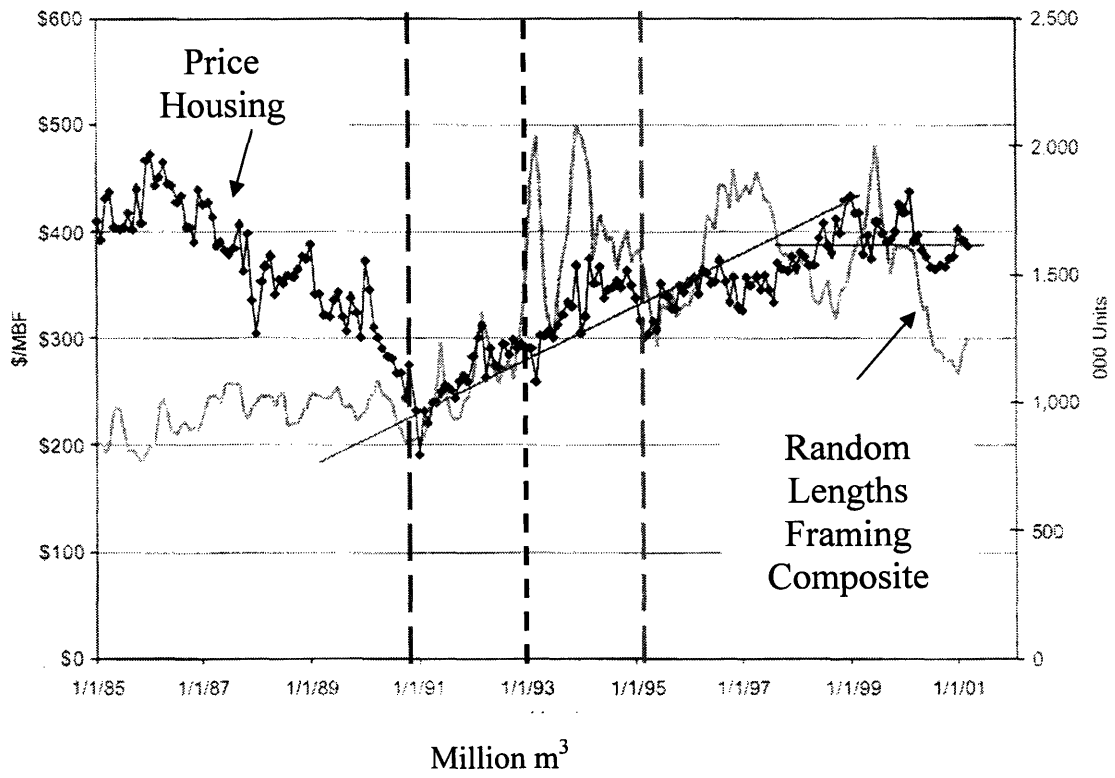


Fig.2. The number of annual housing starts and the price of framing composite of random lengths (Howard, 2002).

m³ per capita

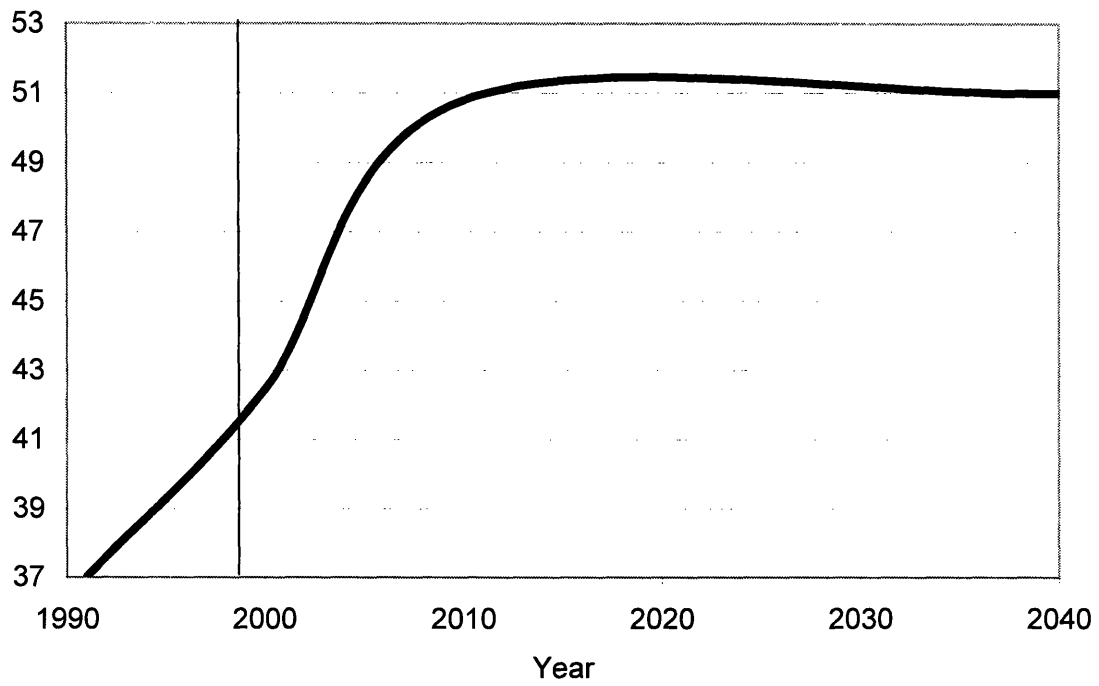


Fig.3. The actual and projected softwood import from Canada. Data between 1990 and 1993 were taken from ref. (FEMAT, 1993) while the rest was taken from ref. (Skog, 1998).

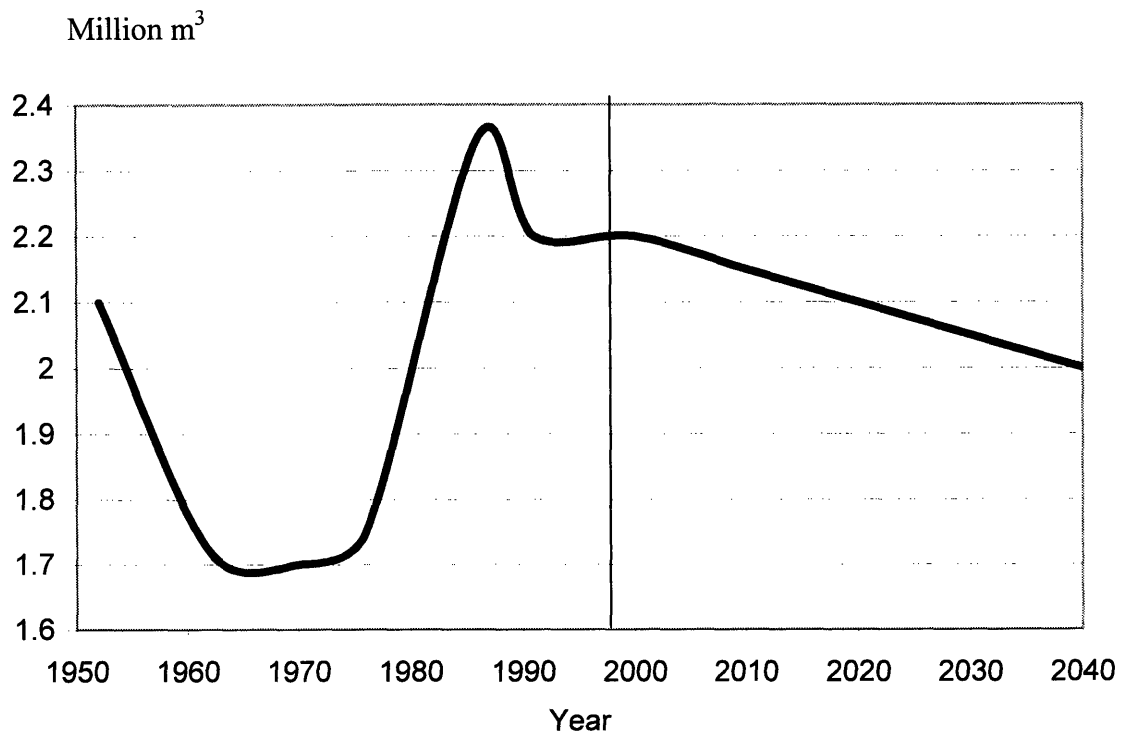


Fig.4. Per capita consumption of roundwood in the U.S. The projected decrease in consumption beyond 1998 is based on the assumption that reliance on solid wood manufactured from logs will decrease (Skog, 1998).

m³ per capita

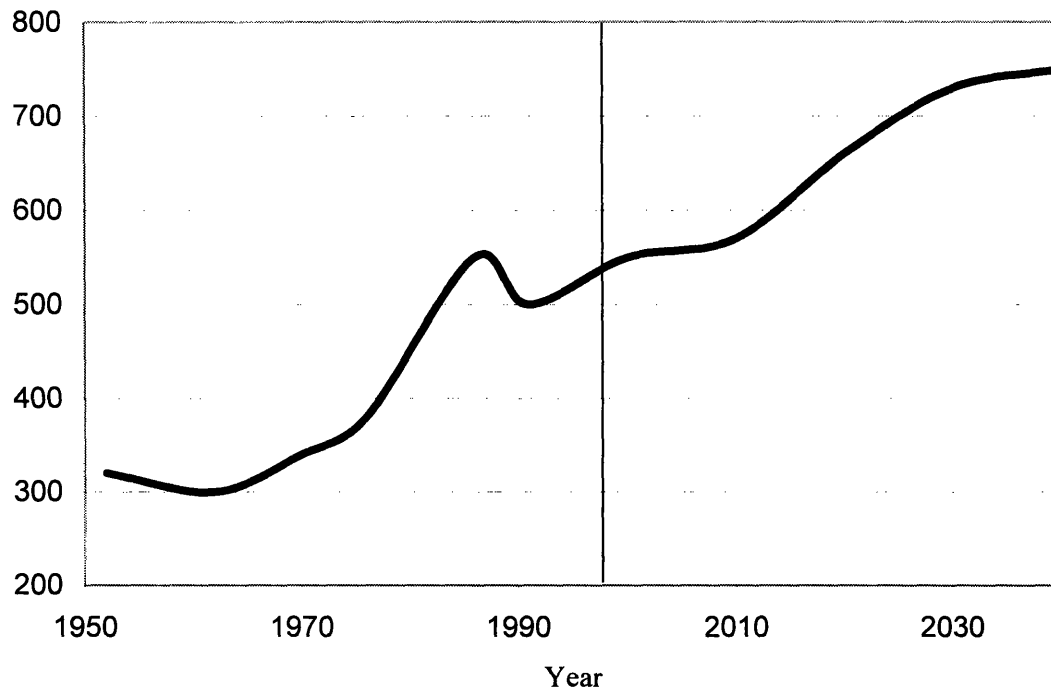


Fig.5. Annual total consumption of roundwood in the U.S (Skog, 1998). Values include recycled roundwood fibers.

ANNEX III

ADDRESSING POLLUTION PREVENTION AND WASTE MINIMIZATION IN SUBSTITUTE FUEL USE IN CEMENT PLANTS IN THE UNITED KINGDOM AND UNITED STATES

1. Introduction

1.1 *The Process and Demands of Cement Manufacturing*

Portland cement is produced by heating calcium (usually limestone), silica and alumina (typically clay or shale) and iron (steel mill scale or iron ore) in cement kilns to temperatures of up to 2,700 degrees Fahrenheit. Under this intense heat, the raw materials blend and form a pebble-like substance called "clinker." After the clinker is cooled it is ground-up with a small amount of gypsum to produce cement. Cement kilns are basically tilted, rotating cylinders lined with heat-resistant bricks. The raw feed material mixture ("meal") is fed into the higher, elevated or "cool" end of the kiln. As the kiln slowly rotates, the raw meal tumbles down toward the hot lower, or "flame" end, gradually altering physically and chemically in the intense heat to form clinker (Richardson, 1995).

Five thermal zones exist in cement kilns. The raw material initially passes through the drying and pre-heating zone, where the temperature of the raw material is raised to about 1,480 degrees Celsius. In the last three zones - the upper transition zone, the sintering zone and the lower transition or cooling zone (sometimes referred to collectively as the burning zone) – the raw material is heated to its maximum temperature of approximately 2,700 degrees Celsius and chemically alters under the withering heat to form clinker (Richardson, 1995).

Hence, cement kilns represent a very energy intensive sector. It typically requires energy inputs between 3200 and 5000 kJ/kg of clinker produced (Akgun, 2003). The auxiliary fuel (usually coal) requirements represent the main energy cost (around 50%; (BCA (1), 1997)). That explains why cement plants are keen on replacing portion of their fuel with industrial wastes (Lemieux, 2004). In fact, in many cases, cement companies are even paid to burn these industrial wastes (as a method of waste treatment) (BCA (2), 1997). From the perspective of a country, allowing cement plants to burn wastes, and thus recover their energies, is an effective strategy to utilize limited resources and reduce reliance on landfills.

1.2 *Concerns over Substitute Fuel Use*

Substitute fuels can come in gaseous, liquid or solid forms. These fuels are either fed directly into the burning zone in the kiln itself or into the pre-heating system for dissociating part of the carbonates from the meal before entering the kiln proper (Kaantee, 2004). Examples of liquid waste fuels include tar, chemical wastes, distillation residues, waste solvents, used oils, wax suspensions, petrochemical waste, asphalt slurry, paint waste and oil sludge. Solid waste fuels include petroleum coke, paper waste, rubber residues, pulp sludge, used tires, battery cases, plastic residues, wood wastes, domestic refuse, rice chaff, refuse derived fuels, nut shells, oil-

bearing soils, meat, bone meal and sewage sludge/pellets. Examples of gaseous wastes include landfill gas and pyrolysis gas (Kaantee, 2004).

There are three main requirements for the acceptance of such fuels for clinker production. Firstly, the use of these substitutes should not increase the costs of the operation; as described, using these fuels usually imply cost savings for the cement company. The second concern is that the cement quality and its compatibility with the environment must not be adversely affected. Trezza and Scian (Trezza, 2005) found that the addition of fuels extracted from wastes, within the percentages and under the conditions of the tests they carried out, did not significantly alter the clinker chemical and physical properties of the Portland cement clinker. However, more studies should be done with regards to other types of substitute fuels in the future. Lastly, the emissions released by the cement plants must not exceed the status quo due to conventional fuels (Maury, 1999). By far, this is the greatest concern.

What are the associated effects – intended and unintended, actual and perceived – of policies that encourage the use of substitute fuels in cement kilns? Do the results translate into a more sustainable cement/concrete industry? In this work, we examined the alleged effects of increased pollutant emissions. Through extensive review of scientific evidence and claims both opposing and in support of the use of these fuels, and conducting of interviews, we identified opportunities to improve current policies in order to ensure better sustainability in the use of such fuels. This means no negative impact on public health, waste minimization, cost reduction for cement plants, more active public consultation, and a more conducive policy environment for spurring innovation in pollution prevention technologies.

2. Why Regulate? How to Regulate?

Studies on the potential harm of emissions from cement plants normally focus on two classes of compounds: criterion pollutants and non-criterion pollutants (Schuhmacher, 2004; Levy et al., 1999; EPA, 1982; Pope et al., 1995; Schwartz et al., 2001; Samet et al., 2000; Cox, 1999; Castellsague et al., 1995). Criterion pollutants of interest are CO, NO_x, SO_x, particulate matter (PM) and hydrocarbons. Non-criterion pollutants include arsenic, cadmium, chromium, lead, zinc, dioxins, furans, polychlorinated biphenyls (PCB), benzene and other organic compounds. Levy et al. (1999) suggested that acute mortality rates increases by 0.6% and 0.04% for every 10µg/m³ in the concentration of PM₁₀ and SO₂ respectively. However, a chronic mortality rate of 4% for a 10µg/m³ increase in PM₁₀ concentration was proposed by Pope et al. (1995) and Schwartz et al. (2001). Samet et al. (2000) concluded from their study that increasing the amount of criteria pollutants in the air could enhance a number of morbidity outcome, such as chronic bronchitis and asthma attacks. Cox (1999) focused his study on NO₂ and SO₂, and arrived at similar results, whereas Castellsague et al. (1995) reported similar results for PM₁₀. CO, volatile organic compounds, Polycyclic Aromatic Hydrocarbons (PAH) and total hydrocarbons are products of incomplete combustion; for these reasons, debates on the engineering aspect of substitute fuel combustion focus on assessing the degree of complete combustion of these fuels in the kilns. This point will be expounded upon in section 6.

Emissions from industrial processes are regulated by legislations. In general, besides controlling the compositions of the fuel used in these processes, these legislations set criteria for technology adoption for pollution prevention and control. Since many of the existing cement plants are situated near residential areas, policy-makers increasingly see the need to incorporate public outreach and consultation mechanisms into their regulatory procedures. In short, a well conceived policy on regulating substitute fuel use should possess four components: strict

selection criteria for fuels, enforceable and systematic monitoring of emissions from plants, motivation for innovation in pollution prevention technology, and public consultation/outreach.

In the next two sections, we traced the evolutions and roles of the key policies in the UK and USA that regulate the use of new fuels. By analyzing the forces behind the key changes in these policies, one could understand the political will and even the perceived associated effects of these policies by the public.

3. Relevant Policy Tools in the UK

3.1 The Integrated Pollution Prevention and Control (IPPC) Directive and Best Available Technique (BAT)

The IPPC Directive was introduced by the EU IPPC Directive of 1996 (EU, 1996). It requires the appropriate authorities in a country to consider the complete environmental impact of a plant – including emissions to air, water and land, generation of waste, use of raw materials, energy efficiency, noise, prevention of accidents, risk management, health effects – for issuance of permits. The directive is based on the concept of BAT, in which the operator of a process is required to use the ‘best available technique’ to minimize emissions. According to Article 2(11) of the IPPC, ‘available techniques’ means those developed on a scale which allows implementation in the industry, taking into consideration the costs and advantages; It disregards whether these techniques are used or produced inside the UK, as long as they are reasonably accessible to the operator⁸. Annex IV of the Article 2 (EU, 1996) also underlined that ‘technological advances and changes in scientific knowledge and understanding’ (section 5) and ‘the length of time needed to introduce the best available technique’ (section 8) must be considered while defining and justifying the BAT selected. Therefore, in a way, this encourages the operator to be vigilant about state-of-the-art technologies and know-how in pollution prevention.

3.2 The Waste Incinerator Directive (WID) and Substitute Fuel Protocol (SFP)

The legislations that directly regulate the use of substitute fuels in the UK are the WID and SFP. The newest version of WID covers the incineration and co-incineration (e.g. in cement kilns or combustion units) of both hazardous and non-hazardous waste (as defined in Section 5.1 of Schedule 1 to the IPPC Directive). Generally, it requires the combustion of substitute fuels to comply with technical requirements, which aim to reduce air, water and land pollution. Although substitute fuels were in use in 1992, it was not until 1997 that the UK Environment Agency (EA) implemented a national policy to regulate their use; in 1999, the SFP was published, and it operated within the framework of the national policy. Since it was first issued, the SFP has been amended several times. In 1999, the monitoring requirements for certain fuels were clarified; in 2001, the arrangement to trial burn tires was revised.

Between 2002 and 2003, two significant events provided further impetus for policy improvements. In July 2003, the European Commission announced that it was referring the UK to the European Court of Justice (ECJ) for its failure to carry out an environmental impact

⁸ Article 2(12) defines ‘operator’ as any natural or legal person who operates or controls the installation or, where this is provided for in national legislation, to whom decisive economic power over the technical functioning of the installation has been delegated.

assessment before issuing the permit for Castle Cement in Lancashire to burn new fuels (BCA (2), 1997; BCA, 2004). This case is still in the early stage of written procedure (ECJ, 2005). In 2002, the EA was rebuked by the Rugby Borough Council for issuing a permit that allowed Rugby's Cement to switch to discarded tires as fuels even though the cement company, in the Council's opinion, did not provide convincing evidence that BAT for emission control⁹ had been adopted (ENDS, 2002).

In 2003, the EA further revised its approach to regulating substitute fuels in general. Five proposed changes were introduced to the SFP, which were issued for public consultation between 26 March and 18 June 2004 (Environment Agency, 2005). One of the proposed changes was to remove the minimum calorific value policy. Reacting to public concern that this removal will result in more hazardous wastes being treated as fuels for cement plants, the EA reasoned that rulemaking under the WID and ECJ were sufficient to impose strict emission limit values on these cement plants. One of the ECJ criteria actually requires operators to show that the amount of energy generated by the selected fuel when it is effectively been used must exceed the energy consumed in its use. In other words, this requires operators to conduct a lifecycle assessment of fuels. A cost-benefit analysis is also needed, which incidentally also underlies the IPPC's BAT standards.

4. Relevant Policy Tools in the USA

4.1 Resource Conservation and Recovery Act (RCRA)

RCRA is the legislation that gives the US Environment Protection Agency (EPA) the authority to control hazardous waste from the "cradle-to-grave"; that is, the generation, transportation, treatment, storage, and disposal of hazardous waste are regulated under this law. RCRA also set forth a framework for the management of non-hazardous wastes. The Hazardous and Solid Waste Amendments (HSWA) of 1984 – the so-called 'land ban' provisions – prohibits the land disposal of certain specified wastes unless EPA's standards specifying health-based treatment are met.

On August 20 1999, EPA issued a Federal Register Notice that Cement Kiln Dusts (CKD) is to be regulated under RCRA. As long as specific management standards are met, CKD will be treated as non-hazardous wastes under RCRA (40 CFR subsection 257; section 4005). One of the standards is that the landfills in which CKD is planned to be discarded must be aptly designed to control the releases of toxic metals to ground water. Under the Land Disposal Restrictions (LDRs) of RCRA subtitle C, the standards of treated hazardous wastes must meet or surplus benchmarks set by Best Demonstrated Available Technology (BDAT). It is only under special circumstances, such as when compliance is inappropriate or physically impossible, that matching with BDAT is not required.

4.2 Boiler and Industrial Furnace Regulations

In February 1991, the EPA promulgated a final rule under RCRA that expands controls on hazardous waste combustion by regulating the burning of hazardous waste in boilers and industrial furnaces (BIFs). The BIF rule sets levels of control for emissions of toxic organic

⁹ EA exempted Rugby Cement from the use of fabric filters (and approved their use of electrostatic precipitators), which are considered to be the BAT for new plants; Rugby Borough Council reasoned that since Rugby Cement was commissioned in 2000, it should be bounded by this new rule as well.

compounds, toxic metals, chlorine gas and particulate matter. Owners and operators of BIFs are subject to permitting and other standards applicable to hazardous waste treatment, storage and disposal facilities.

In a way, the HSWA provided a stimulus to burning hazardous wastes in BIFs, since many of these wastes are prohibited from land disposals. Nonetheless, EPA interpreted the LDRs as prohibiting combustion of certain inorganic metal bearing wastes, on the ground that combustion constitutes dilution (Richardson, 1995). However, combustion is still permissible under certain special conditions (EPA, 2001); one of which is when these inorganic metals are contained in organic, debris-like material (such as wood) and the waste has a heating value higher than 5,000 BTU at the point of generation.

4.3 *Clean Air Act (CAA) and the National Emission Standards for Hazardous Air Pollutants (NESHAP)*

The NESHAP of the CAA is the legislation that sets the emission standards for cement and aggregate kilns using substitute fuel. In April 2004, EPA proposed under NESHAP new standards (EPA, 2004) that will, when finalized, implement section 112(d) of the CAA by requiring hazardous waste combustors to meet hazardous air pollutant emission standards reflecting the application of the maximum achievable control technology (MACT). Conceptually, MACT is similar to BDAT. The subtle difference lies in the context in which both are used – MACT is used as an emission benchmark that signifies the optimum, state-of-the-art performance.

4.4 *Comparable Fuels Exclusion*

In 1998, EPA published the Revised Standards for HWC (EPA(1), 1998) that entailed the concept of fuel benchmarking. Under this rule, EPA excludes from the regulatory definition of solid waste hazardous waste-derived fuels that meet specification levels comparable to fossil fuels¹⁰ for concentrations of hazardous constituents and for physical properties that affect burning. In a way, this regulation has the objective of expediting the approval of new fuels. Before the Final Rule was promulgated, EPA opened the standards to public comments (EPA(2), 1998).

5. **Actual and Perceived Associated Effects of Substitute Fuels in the UK and USA**

5.1 *Evidence and Opinion Against the Use of Substitute Fuels*

A study conducted in 1995 (Ginns, 1996) on 300 children attending primary schools near a certain cement factory that utilized up to 50% recycled liquid fuel discovered that the subjects are 1.7 times more likely to have sore eyes, compared to children in schools not in the proximity of the cement plant. They were also 1.8 and 1.6 times more likely to suffer from sore throats and blocked nose respectively. In 1996, Acer Environmental (Acer, 1996) reported that emissions of pollutants from kilns burning wastes are often far greater than from those burning coal and coke alone; specifically, when compared to burning coal alone, burning of Cemfuel and coal will result in 40% rise in particulate level (an increase from 51 to 71 mg/m³). Furthermore, a 3% increase in

¹⁰ Only liquid fossil fuels are considered as benchmark fuels in the Comparable Fuel Exemption.

SO₂ (from 1310 to 1348 mg/m³) and 28% increase in CO (from 328 to 419 mg/m³) were also observed. However, a reduction of NO_x by 3% was noted.

Public perception could also be affected by tests carried out elsewhere; for example, a test in California (Schwartz, 1996) showed that when compared to coal burning, tire burning resulted in 53-100% increase in dioxins emissions and as much as 22 fold increase in PAH productions. A recent lifecycle assessment of substitute liquid fuels (Chem Systems, 1999), which was commissioned by the EA, also noted “incinerators are designed for very high retention of certain contaminants, such as sulfur or halogens. The retention in cement kilns, although high, may not be as good... suggestions are therefore made in the report for contaminant levels at which wastes should be excluded from substitute liquid fuels (SLF)”. According to the EPA’s estimate in its Report to Congress on CKD, children exposed to CKD derived from the burning of hazardous waste have a greater than 94% chance of developing serum lead levels above the 10µg/dl federal standard (EPA, 1994). Furthermore, the Portland Cement Association of the U.S found that cement plants that burn hazardous waste had over 80% more chromium and 25% more lead in their cement products than cement plants that did not burn hazardous waste (Delles, 1992).

Other than actual scientific evidence, the public’s suspicion could also be triggered off by perception of the regulating authorities and the long term uncertainty of burning industrial wastes. The two incidents described in section 3.2 were expected to affect the reputation of EA to some degree. Furthermore, the WID stated that cement kilns that draw less than 40% of their fuel’s heating value from SLF need not conform to emission standards meant for hazardous waste incinerators (EU, 1994). This seems to provide a legislation loophole for plants that plan to burn SLF as a minor yet long-term fuel option. In the US, the Comparable Fuel Exclusion Rule has drawn strong reactions from key stakeholder groups, including the public. For example, a few non-governmental groups showed concern over the fact that under this rule, burning of comparable fuels is not mandatory for cement and light-aggregate kilns (EPA(2), 1998). EPA’s rationale for this ruling was that these kilns are subjected to the BIF rule as well as the MACT standards of the CAA; as such comparable fuels should only be offered as another technology option for kilns. On the other hand, groups such as the Cement Kiln Recycling Coalition preferred the MACT standards under RCRA, and felt that an environmental impact assessment should be carried out for each type of new fuel. A possible resolution for these concerns is to bind cement kilns to the stricter requirement under either the Comparable Fuel Exclusion Rule or the MACT standards of CAA. EPA has not looked into this possibility.

In the NESHAP new standards (EPA, 2004), continuous monitoring via EPA’s continuous emission monitoring systems was required. It was also proposed that the CO destruction and removal efficiency standard of BIFs to be used to ensure that they are operating under good combustion conditions. However, EPA proposed that a one-time only compliance requirement for destruction and removal efficiency is needed, unless a kiln changes its design or operation in a manner that could adversely affect its ability to meet the destruction and removal efficiency standard. Furthermore, previous destruction and removal efficiency testing performed under RCRA could be used to document the one-time compliance. A more cautious approach would be to apply the concept of its proposed continuous monitoring to the testing of the destruction and removal efficiency standard.

5.2 *Defending the Safety of Substitute Fuels*

In justifying the proposed removal of waste exclusions for some substances (Environment Agency, 2005), the EA reasoned that since cement and lime kilns operate at very high temperatures and the solid material and products of combustion have a long residence time at this temperature, efficient combustion is ensured. Furthermore, from the lifecycle perspective, recycling of used SLF is not necessarily environmentally preferable to using it as a fuel (Chem Systems, 1999). Although dioxins were shown to be increased by burning tires (in the California case study mentioned in the last subsection), the lifecycle study also conclude that dioxin emissions from burning SLF was almost similar to when conventional fuels were used. Besides, a American study that address this issue also found that the amount of dioxin from tire burning can actually be controlled by controlling the temperature at the 'cold' end of the cement kiln¹¹; in fact, the lower the temperature, the lower the amount of dioxin. Furthermore, the lifecycle advantage of recycling SLF was found to be the weakest when the solvent had a high energy content. This thus justified the use of SLF under certain conditions.

Similarly, a number of risk assessments carried out in the US on liquid waste-derived fuel injected into kilns showed that they were a safe disposal option for many organic wastes (ERAtch, 1999). Furthermore, comparison of results taken from facilities injecting solid fuels either at the hot end or the mid-kilns all satisfied the compliance standards of emission of CAA (Coles, 1995). The data collected from these testing came from "worst case" operating conditions. That is, the BIFs regulations require compliance tests to be performed with maximum gas flow; maximum feed rates for metals; separate tests for maximum and minimum temperatures; minimum operating parameters for air pollution control devices; and maximum raw material feed rates. In essence, kilns are required to push operating conditions to the limit during compliance tests. Most kilns even spike additional metals into the waste-derived fuels to ensure reasonable operational flexibility. The result is that emissions during compliance tests are much higher than normal day-to-day operations (ERAtch, 1999). EPA even defended itself by pointing out that current US emission limits are also much higher under the NESHAP than the technology-based limits being considered in the EU.

6. **The Crux of the Debate on Substitute Fuel Combustion**

Many of the abovementioned evidence are true only under specific combustion conditions. For instance, even if cement kilns are run at higher temperatures than incinerators, there is no guarantee that the former will always provide longer residence times and adequate oxygen to give complete combustion. Ironically, an oxygen-deficient environment, which is favored for the production of cement, is what contributes to incomplete combustion as well. Technically, ensuring complete combustion of substitute fuels implies that kiln fans need to be operated at higher speeds to supply larger amount of air. However, this in turn implies higher electricity demand. Kaantee et al. (2004) roughly calculated that between 5 and 10% more air is required if meat-and-bone-meal and sewage sludge are mixed with primary fuels (petcoke). This energy, and thus economic, demand may become a barrier to improving the safety of using these fuels. Turbulence for good combustion needs to be ensured in the kilns. However, the larger the volume of solid mixture in the kiln, the more difficult it is to achieve turbulence, which is

¹¹ Opinion provided by experts in fuel combustion and Portland cement production.

essential for good combustion. As such, to achieve complete combustion, kiln operators are required to optimize the volume of raw materials being put in the kiln.

Since so many variables of the kiln and raw materials contribute toward the nature of the emissions, the crux of the debate should be on how to maximize fuel substitution while minimizing the negative impacts. Specifically, we need to consider:

- Enforcing more systematic and continuous monitoring, instead of relying on one-time approval. As mentioned in section 5.1, the new standard under NESHAP requires only a one-time compliance for CO destruction and removal efficiency. Furthermore, continuous hydrocarbon monitoring following the initial performance test is also not required. These points should be re-examined and rectified; after all, the passing of initial performance test does not necessarily imply satisfactory performance over long term, given the myriad of variables mentioned above.
- Providing economic incentives to motivate kiln operators to become more proactive in continuous monitoring of all the main pollutants, including contaminated CKD. Such incentive must be sufficient enough to encourage operators to take the necessary risks in choosing or even innovating new and cleaner technologies in meeting the MACT standards.

7. Summary

Examinations of opposing scientific claims reveal that substitute fuels need to be combusted under specific conditions to ensure safety. This is especially true for hazardous wastes. The crux of the dispute about replacing fossil with substitute fuels should be about how their use can minimize risks while maximizing waste reduction. Comparison between the BAT of the UK and BDAT/MACT of the US also revealed subtle conceptual difference, which we adopt together with that behind the Comparable Fuel Exclusion to propose a new fuel-permitting process. This process requires substitute fuels to perform at least equally as well as current fossil fuels in terms of total emissions and emission rates. This and other policy proposals are discussed at length in section 4.7

8. Reference

Acer Environmental Ltd., *Review of IPPC Authorization and Variations: Castle Cement Ltd., Ribblesdale Works*, May 1996

Akgun F., *Investigation of Energy Saving and NOx Reduction Possibilities in a Rotary Cement Kiln*, International Journal of Energy Research 27, 455-465, 2003

Ashford N., Caldart C., *Chapter 8: Regulation of Hazardous Wastes: RCRA, CERCLA and Hazardous Waste Facility Siting*, in *Technology and the Environment: Law, Policy and Economics*, 2002

Ashford N., *An Innovation-based Strategy for the Environment and the Workplace*, in *Worst Things First? The Debate over Risk-based National Environmental Priorities*, Finkel A. M. and Golding D. (eds.), Washington, D.C., Resources for the Future, 275-314, 1994

- Ashford N., Ayers C., Stone R., *Using Regulation to Change the Market for Innovation*, in *Harvard Environmental Law Review*, 9(2), 419-466, 1985
- Becker M., Ashford N., *Exploiting Opportunities for Pollution Prevention in EPA Enforcement Agreements*, *Environmental Science & Technology*, 29(5), 220A-226A, 1995
- British Cement Association (1), *The Environmental Impact of Cement Manufacture*, Environment Committee, Third Report, 1997
- British Cement Association (2), *Minutes of Evidence, Environment Committee*, 1997
- Castellsague J., Sunyer J., Saez M., Anto J. M., *Short Term Association Between Air Pollution and Emergency Room Visits for Asthma in Barcelona*, *Thorax* 50, 1051-1056, 1995
- Chem Systems Ltd., *Substitute Liquid Fuels (SLF) Used in Cement Kilns – Life Cycle Analysis*, Environment Agency Technical Report P274, 1999
- Coles C., *Refuse Derived Fuel as an Alternative Fuel for Cement Kilns*. In *Waste Combustion in Boilers and Industrial Furnaces: Proceedings of the International Specialty Conference*, SP-95, Air & Waste Management Association, Pittsburgh, PA, 86-102, 1995
- Cook A., Kemm J., *Health Impact Assessment of Proposal to Burn Tires in a Cement Plant*, *Environmental Impact Assessment Review*, 24, 207-216, 2004
- Cox L. A., *Internal Dose, Uncertainty Analysis and Complexity of Risk Models*, *Environ. Int.* 5, 841-852, 1999
- Delles J et al., *Trace Metals in Cement and Kiln Dust from North American Cement Plants*, Construction Technology Laboratories for Portland Cement Association, Skokie Illinois, 1992
- ENDS, *Agency on the rack in row over health impacts of tire burning*, Report 328, May 2002
- Environmental Agency, *Summary of Consultation and Decision Made on the Proposals to Revise the Substitute Fuels Protocol for Cement and Lime Kilns*, January 2005
- EPA, *Report to Congress on Cement Kiln Dust*, September 1994
- EPA(1), *Hazardous Waste Combustors; Revised Standards; Final Rule—Part 1: RCRA Comparable Fuel Exclusion; Permit Modifications for Hazardous Waste Combustion Units; Notification of Intent To Comply; Waste Minimization and Pollution Prevention Criteria for Compliance Extensions*, 40 CFR Parts 63, 261, and 270 [EPA F-98-RCSF-FFFFF; FRL-6110-3] RIN 2050-AE01, August 1998
- EPA(2), Office of Solid Waste and Emergency Response, *Response to Comments Document Hazardous Waste Combustors Revised Standards Final Rule Part I*, May 1998
- EPA, *Permitting and Compliance Policy: Barriers to U.S Environmental Technology Innovation*, 39 EPA 101/N-91/001, January 1991

EPA, Office of Solid Wastes and Emergency Response, Office of Enforcement and Compliance Assurance, *Land Disposal Restrictions: Summary of Requirements*, August 2001

EPA, *National Emission Standards for Hazardous Air Pollutants: Proposed Standards for Hazardous Air Pollutants for Hazardous Waste Combustors (Phase I Final Replacement Standards and Phase II)*, Proposed Rules, Federal Register: Volume 69, Number 76, Page 21197-21385, April 20, 2004

ERAtch Group LLC, *Alternate Inputs of Waste Materials and Cement Manufacturing*, www.eratech.com/papers/aiwmc.htm

European Court of Justice, *Commission v UK (Case: C-199/04)*, 2004

European Union, *Hazardous Waste Incineration Directive 94/67, Article 3, Article 6.2*, 1994

European Union, *Directive 99/61/EC of the European Parliament and of the Council of 24 September 1996 concerning Integrated Pollution Prevention and Control*, Official Journal of the European Communities L257, 0026-0040, 1996

Ginns S. E., Gatrell A. C., *Respiratory Health Effects of Industrial Air Pollution: A Study in East Lancashire, UK*, Journal of Epidemiology and Community Health, Vol. 50, 631-635, 1996

Kaantee U et al., *Cement Manufacturing Using Alternative Fuels and the Advantages of Process Modeling*, Fuel Processing Technology, 85, 293-301 (2004)

Lemieux P. et al., *Emissions Study of Co-firing Waste Carpet in a Rotary Kiln*, Journal of Environmental Management, 70, 27-33, 2004

Levy J. I., Hammitt J. K., Yanagisawa Y., Spengler J. D., *Development of a New Damage Function Model for Power Plants: Methodology and Applications*, Environ. Sci. Technol., 33, 4364-4372, 1999

Maury H. D., *The Production of Secondary Fuels from Domestic and Industrial Refuse and their Utilization in the Cement Industry*, Proceedings 5^o Congresso Brasileiro de Cimento, Associacao Brasileira di Cimento Portland, November 8-12, Sao Paulo, Brasil, 1999, 3-12

Pope C. A., Thun M. J., Namboodri M. M., Dockery D. W., Evans J. S., Speizer F. E., Health C. W., *Particulate Air Pollution as a Predictor of Mortality in a Prospective Study of U.S. Adults*, A. J. Respir. Crit. Care Med. 151, 669-674, 1995

Richardson M. A., *Hazardous Waste Combustion in Cement Kilns, An Introduction to Policy and Legal Issues Associated with Burning Hazardous Waste in Cement Kilns*, American Lung Association, April 1995

Schuhmacher M., Domingo J. L., Garreta J., *Pollutants Emitted y a Cement Plant: Health Risks for the Population Living in the Neighborhood*, Environmental Research, 95, 198-206, 2004

Schwartz S. et al., *Domestic Markets for California's Used and Waste Tires*, University of California, October 1996

Swift B., *How Environmental Laws Can Discourage Pollution Prevention, Case Studies of Barriers to Innovation*, Policy Report, August 2000, www.ndol.org

Trezza M. A., Scian A. N., *Waste Fuels: Their Effect on Portland Cement Clinker*, *Cement and Concrete Research*, 35, 438-444, 2005

ANNEX IV

ANALYSING THE NEGLECTED FUNDAMENTAL ASSOCIATED EFFECTS OF CHILE'S FORESTRY POLICIES

1. The Degradation of Chile's Native Forests

Chile contains the second largest remaining area of coastal temperate rainforests in the world. However, researchers believe that currently at least 56% of the original forest area has either been logged or converted to other land uses (Weigand et al., 1992). Between 1540 and the mid-1900s, the large numbers of immigrants from Europe who settled in southern Chile brought on the clearance of considerable areas of forests to make way for agriculture, livestock grazing and construction. By 1955, about one-third of Chile's original forests were destroyed. Moreover, logging based on high-grading – rapid mining of commercial species – left behind native forests degraded both economically and in terms of their biodiversity (Nunez, 1994; INFOR, 1995).

Beginning in the 1960s, a shift to an industry based on commercial plantations of Radiata Pine – an exotic species – accelerated Chile's reforestation significantly. This plantation boom sustained through the transition period between President Eduardo Frei, Sr. and President Salvador Allende (Silva, 1997). It was the promulgation of the 1974 Forest Development Law (DL701) that created the most impact on the local forestry industry.

2. How the DL701 encouraged afforestation and reforestation in Chile

Pinochet's government commitment to free-market economics manifested itself in the promulgation of the DL701. A national forest management strategy that reduced state involvement in the industry ensued. This strategy limited the government's role to controlling legislation affecting the forest sector, promotion of forest related activities developed by the private sector and management of protected areas under the National System of protected Wildlands (Neira, 2002). The two main changes made were: 1) the state's industrial capacity and forest lands were transferred to the private sector in a privatization process, and 2) implementation of forestry subsidy programs to encourage afforestation and reforestation. The subsidies included reimbursement for up to 90% of the cost of planting trees and a 50% deduction for tax purposes from the profits generated from cutting trees. However, these subsidies were used almost entirely to establish exotic commercial plantations. Only 4% of the subsidies went to small landowners with less than 50 hectares. That is, such incentives heavily favored the large corporations with larger shares of the market (Langman, 1998). Besides Radiata Pine, Monterrey Pine and Eucalyptus plantations were preferred, because these plants grow more than twice as fast as the native species (e.g. Araucana).

More importantly, these subsidies resulted in the creation of such a sizable critical mass of timber in Chile that it managed to attract foreign investment to exploit the resources. The rate of reforestation snowballed with the inflow of capital and increased 15 fold between 1974 and 1985.

3. Explicit Associated Effects of the DL701

3.1 Strengthening of the International Position of Chilean Timber Industry

Pinochet's free market policies toward the forestry and timber industries were responses to the worldwide boom in wood chip trade in the 1970s. Since then, Chile has maintained its international premier position as a wood chip exporter. In fact, Chile is currently the third largest exporter of wood chips in the world after U.S. and Australia. Wood chip production rose from 76 thousand cubic meters in 1986 (all from exotic commercial plantations) to 2.5 million cubic meters in 1995 (of which about 62% was sourced from native forests). Moving into the 1990s, wood chips were no longer the main export from Chilean forests. According to the National Forest Institute's report (INFOR, 2000), principal forest product exports are chemical wood pulp from plantations (39% of all forestry-related export), sawnwood (8.8%) and wood chips (3.8%). Fig. 1 shows the breakdown of the production volumes of the main building materials between 1997 and 1999. Total demand for particleboards also increased within this period. This shift away from wood chips could be understood from a number of other perspectives. Data from the 1988-1995 period indicated that the wood chip sector was responsible for only 0.01% of the total national employment and 0.5% of the total employment in the forestry sector. Furthermore, only about 17% of the earnings from wood chip trade went to workers' salary (Langman, 1998). In other words, wood chip business did not put a lot back into the local economy. Comparatively, value-added wood products fetched an average GDP that was 5.7 times more. Wood product sectors also employed 15 times more people than the wood chip sectors.

As much as 95% of Chilean wood chips go to Japan's pulp industry. In fact, it is expected that by 2010, Japan will replace up to a third of their current demand for Chilean native pulp with tree plantations. The U.S. is the largest importer of wood product from Chile (fig.2). The vast majority of the wood products exports to the U.S. come from trees harvested on Chile's exotic commercial plantations. The dominant wood products imported into the U.S. are mouldings, door and window components and frames, clear wood blocks and "cutstock" made of Radiata Pine (Aguilera, 2000). In fact, moulding containing Radiata Pine was installed in nearly 95% of the tract homes constructed in the last 20 years in Nevada, Arizona and southern California. Hence, international trade relations are constantly motivating Chile toward replacing more and more of its native forests with exotic commercial plantations.

3.2 The Destruction of Native Forests and Biodiversity

The increasing demand on and replacement of native forests with exotic commercial plantations are far from the concepts of sustainable development. The dramatic expansion of the commercial plantations gave rise to a number of significant negative ecological effects. As much as 10,000 to 20,000 hectares per year of native forests are cleared every year to make way for commercial plantations (CODEFF, 1992); this represented a diminution of biodiversity, especially affecting the communities of some of the endangered species of flora and fauna (Armesto et al., 1998; Wilcox, 1996).

Under DL701, the industry became highly oligopolistic. A few firms in the capital-intensive paper/pulp sector controlled most of the market. The power of these conglomerates was furthered boosted by foreign direct investment by large multinational corporations in the early 1990s (Gwynne, 1996). Several researchers found that many of these private firms put pressure on small forest owners to sell or abandon their claims under DL701, thus disrupting peasant communities, forcing abandonment of villages and migration to cities (Donoso, 1994). Since the

majority of the subsidies were excluded from small forest owners, DL701 neither promote nor safeguard the long-term interest of community forestry. Worse, the decline in the economic value of native forests and titling problems meant that small forest owners and peasants faced an increasingly difficult time managing native forests harvest in a sustainable manner; these also created loopholes that profiteers utilized by resorting to illegal logging and burning of native forests so as to clear the land for commercial plantations.

In summary, the forestry incentives in Chile negatively impact the social equity of the community forestry and biodiversity of the native forests, in favor of economic benefits from exports of raw wood and manufactured wood products (including building materials).

4. Policy Remedies to Promote Sustainability in the Forest Sector

Two pieces of legislation intended to promote better sustainability in the forest sector was then introduced in 1990 by the Concertacion. They were the Reform of DL701 Bill and the Native Forest Recovery and Development Bill. So far, only the former was passed in the Congress. We shall describe the key components of, and thus the differences between, these two proposed legislations. In the next section, we shall analyze the reasons behind the success and failure in the passing of the Reform of DL701 and Native Forest Recovery and Development Bill respectively from the policy mechanical perspective.

4.1 Reform of DL701

Large corporations benefited most from DL701's privatization schemes and subsidies allocations. Under the proposed Reform Bill, these large owners and companies were no longer eligible for subsidies and tax breaks. On the contrary, small owners were given more subsidies, which were necessary since many had no access to credit and so many were relegated to disadvantageous farming conditions. This Reform Bill also proposed to waive the need for small owners to conduct and present technical studies and management plans on their forests, provided that they accepted management plans designed by the Corporacion Nacional Forestal (CONAF)¹². In fact, subsidies were suggested to cover 75% to 90% of authorized expenses. Eligibility for this aid program would be on the basis of competitive proposals instead of entitlement or simple application procedures.

4.2 Native Forest Recovery and Development Bill (i.e. Native Forests Bill)

This proposed Bill was bolder than the Reform Bill. Its main notion was to battle against the lower market value of native forests (compared to commercial plantations) by providing economic incentives for native forest management. In essence, it is equivalent to removing subsidies from commercial plantations and re-direct them to native forests. The original proposed Bill even contained penalties for infractions – forest owners who wish to substitute native forests on their property would need to pay a heavy tax. The amount of tax would be dependent on the potential productive values of the substituted forests. Similar to the Reform Bill, native forest owners who wished to manage their forests would be eligible to apply for a one-time lump sum

¹² CONAF is the Corporacion Nacional Forestal – the main agency that promotes native forest management amongst small forest owners, and the conservation of Chile's natural heritage. It is represented at both the provincial and regional levels.

payment of US\$4,000 per hectare one year after initial outlays (Silva, 1997). Applications for this aid would be on a competitive basis as well.

5. Fundamental Associated Effects of the DL701

The subsidies dished out under DL701 dramatically empowered the large timber corporations in Chile. With the strengthening of alliance with foreign investors over the years, the vested interest in the prospects of the commercial plantations also increased. Although Silva (1997) suggested that international forces played a subsidiary role in shaping the policy reforms in Chilean forest industry, we feel that the motivation caused by international trade toward the protection of the interest of the business community cannot be ignored. One could expect that some government agencies also benefited from this improved economic competitiveness of the industry.

5.1 How the Reform of DL701 was affected by the Fundamental Associated Effects of DL701

In the 1990s, the success of DL701 resulted in increased stability of the raw wood and wood product markets and maturation of related technology. This in turn increased the access to private credit by companies dealing in commercial plantations. Put another way, the gaining of political backing of the timber industry as a result of DL701 actually caused other forces to act in its favor; as a consequence, the net economic ‘force’ acting in favor of commercial plantations became larger. In fact, given the ‘momentum’ of the industry created by these additional ‘forces’, removal of original ‘force’ – the subsidies – was not crucial to the future development of the industry anymore. This was proven by studies done by Lagos (1994), Drouilly (1995) and Vial (1996). They showed that this bill did not face any strong opposition by the timber industry, who was mildly disgruntled.

Since the Reform was primarily meant to benefit the small owners, and thus applied to mostly denuded and marginal lands apt for reforestation, the massive industry did not consider this bill stepping into its turf, so to speak. They also expected that wood from these small owners to be sold to them eventually; so, indirectly if marginally, they would also benefit from the bill.

In summary, the main reason behind the relative ease with which the Reform Bill was approved in the Deputies (Diez, 1996), and passed in the Senate (Neira, 2002), was that it did not really threaten to dissipate the ‘momentum’ of the industry and thus threaten the interest of the timber industry. In essence, the Reform Bill merely represented an application of the same tool to a formerly neglected group without threatening the industry. The lack of perceived antagonistic policy coercion made the proposal more acceptable to the industry. However, a shortcoming of such a mild approach was that the conservation of native forests was not addressed directly. Insufficient funding also restricted the potential of the original intention. The possibility of incentivizing cooperations between small and large forest owners, as well as between native and exotic commercial forests, was also left unexplored.

5.2 How the Native Forests Bill was affected by the Fundamental Associated Effects of DL701

Compared to the Reform Bill, the Native Forests Bill experienced a rockier political destiny. The political response to the original proposed bill exemplified how political mutual support and backing can ironically increase in the face of competing ‘forces’.

The evolution of this bill spanned across the presidential terms of Aylwin and Frei. A team made up of opposition think tanks, NGOs and academia, introduced the original bill, which had the strong political backing of the center-left Concertacion (coalition) and CONAF. It explored the policy of diverting the incentives meant for commercial plantations to add value and build an industry out of the native forests. It also challenged existing land use legislations and promoted conservation of native species. The bill was passed in the House of Deputies in 1994, with minor changes. However, the timber industry opposed to this bill. Strategically, it maneuvered to spilt the original policy making team; specifically, the then Head of CONAF was converted (Silva, 1997). Given its contribution to the economy, it gained the support from key political entities, including the Ministry of Economy and the Ministry Secretary General of the Presidency (the President Aylwin's chief political advisor), and undertook more widespread substitution of native forests (Silva, 1997). The remaining of the policy making team fought back; the Minister of Agriculture's unwavering support of the original bill ensured that the team's initiative was retained. President Aylwin also had the Head of CONAF replaced. The bill prevailed momentarily.

Undeterred by the defeat, the timber industry continued to garner more support and formed alliance with the wider business community, particularly the powerful manufacturers' associations, and, ironically, some environmental NGOs. Since the Senate was made up with a majority of conservatives who stood the side of the timber industry, the bill was blocked until Frei took over office (Vial, 1994; Silva, 1997). Frei administration undertook the re-writing of the bill, with the help of a new team of experts drawn from the different ministries (El Mercurio, 1995). The results were meant to mollify both sides; the rules for obtaining incentives for native forests management were made more stringent while a high price was put on the substitution of healthy standing native forests. Ironically, it was the party protecting the native forests who now strongly opposed the bill! Up till now, the bill is still not passed by the Senate.

The strong reactions from both sides stemmed from the threat the various forms of the original bill represented to their individual interest. The increase in political support of one party spurred the same reaction from the other. As more stakeholders got involved, and thus had a stake, in the alliance, the bill might be faced with a greater demand to appease more parties. The attrition of both sides could be attributed to the fact that during the time the original bill was proposed, the long-term economic values of native forests were not yet well established; in fact, the proponents of the bill hoped to use the economic incentive to lay the foundation for establishing the economic values of native forests. This problem was exacerbated by the tight fiscal policies and strict probity in government expenditure imposed by the Ministry of Finance to assure the stability of the macroeconomic conditions in the newly re-democratized Chile (Silva, 1996).

Similar to the Reform Bill, the Native Forest Bill neglected the possibility of incentivizing collaboration across the industry in general, and integration of the large industrial and grassroots development components of the sustainable development in particular. Both bills did not contemplate promoting multiple use of forests as an integrating concept for a highly diversified industry.

6. Assimilating the Lessons Through the Lens of Policy Mechanics

The development of the Chilean forestry legislation teaches us that fundamental associated effects should be addressed before the explicit associated effects. One should resist the

urge of addressing explicit associated effects because they are more visible and, at times, easier to solve. It is important to reduce the political resistance to change, and one way of achieving that is to reduce the political support and backing that will ironically increase in the face of ‘common enemies’. Achieving this reduction calls for a fundamental change in mindset regarding how business opportunities are created and collaboration are formed.

7. An Analysis of the Forest Certification Schemes in Chile

The failure of these forestry policies to address the various elements of sustainable development prompted sustainable forestry advocates to consider forest certification as a policy crusade. At its core, these standards aim to transform the way forests are managed and harvested by motivating a demand for sustainable wood products. The four schemes operating in Chile are Forest Stewardship Council (FSC) standards, ISO Forest Certification, CERTFOR standards and the Ley de Bases (LdB) regulations. In this section, we shall examine whether each of them

- Embodies the essential depth, breadth and capacity to address the different elements of sustainability;
- Addresses the fundamental associated effects due to the economic success of DL701 by engaging, or having the intention to engage, in the reduction of political mutual support and backing in the face of ‘common enemies’

7.1 The Contents of these Forest Certification Standards

FSC requires forest management and harvesting to meet 10 principles that covered all 3 aspects of sustainability – environment, economy and social equity. Evaluations are done according to 57 Indicators of Sustainable Forestry. To suit an adopting country’s unique situations, FSC certification allows the country to set national indicators, and the different regions within the country to set regional indicators. FSC has been improving the certification process since its inception, especially with regards to improving the lifecycle sustainability of wood products; this effort resulted in the recent development of the ‘chain-of-custody’ certification. Judging from the contents and intent of these standards, one concludes that FSC embodies the complexity to address the different aspects of sustainable forestry and timber industry.

The ISO, in many ways, is similar to the FSC. However, it (ISO 14001) lacks the specificity of FSC in the ecological principles/criteria. Furthermore, because ISO is supported primarily by the industry groups, ISO mainly focuses on guiding timber harvesting methods (i.e. ISO 14061), whereas FSC, judging from the weights it gives to the different principles, tends to consider environmental impacts as most important. Nonetheless, all 3 aspects of sustainability are considered by ISO. Although it has a breadth of coverage similar to FSC, it does not have the depth of FSC in some principles.

The CERTFOR is based on 9 principles, in which more emphasis is placed on social equity for forest owners and workers. It also adopts the chain-of-custody and group forest certification concepts present in FSC. While FSC stresses the use of precautionary principle in the definition and conservation of high value forests, CERTFOR appears more conservative and only requires an absence of ‘significant negative impacts on biodiversity’. CERTFOR also does not have special schemes for small forest owners. Relative to FSC, CERTFOR has comparable breadth but less depth in terms of specificity.

Unlike the rest, the Ley de Bases is an environmental regulation on preservation of biodiversity, pollution prevention, evaluation of environmental impacts, and sustainable use of natural resources. The regulation is not restricted to the timber industry. It also has provisions that require local government to be liable for environmental performance and responsible for disclosure of essential data from monitoring of target sites. Although it includes establishing standards for environmental education, the breadth and depth of coverage of other social equity related issues are not as explicit as the others.

7.2 Fundamental Associated Effects and 'Political Mass Reduction' in Forest Certification Schemes

One way by which a forest certification scheme can help address the fundamental associated effects of DL701 is to create new stakeholder relationships such that the political backing contributing to unsustainable development of the industry is reduced.

Will FSC certification introduce substantial changes to improve the current situation in Chile? Fig.3 summarizes the comparisons between the stakeholder involvements in the 4 schemes. FSC certification scheme involves international NGOs (including FSC itself) in information disclosure and standard setting. Local NGOs also participated in standard setting. Expert advisors are extensively sought for to provide assistance in monitoring of forests (to validate their adherence to FSC principles), information disclosure, standard setting and adjudication. Industry associations are engaged in standard setting only. FSC tries to involve as many private stakeholders in standard setting as possible. This can be seen as a way to adopt the general FSC principles to local conditions.

However, there is evidence that FSC has created different degrees of stakeholder segregation in many countries. In the U.S. for example, the companies who find FSC standards too stringent support an alternate certification scheme known as the Sustainable Forest Initiative (SFI)¹³. Criticism about the lack of rigor of SFI also resulted in the resurrection of the SCS (Scientific Certification Systems) Independent Forest Certification System, which is positioned between FSC and SFI along the certification spectrum. In Chile, the formation of CERTFOR and adoption of ISO are similar responses that indicate such a phenomenon. Besides, the non-profit nature of FSC may conflict with the for-profit nature of some of the certifying companies¹⁴ that it authorizes; this is especially evident if the FSC certification requires a higher cost on the part of forest owners, and so certifying companies are motivated to propose a more economical option other than FSC standards to their clients. Along the same line, wholesalers and retailers may not sense enough incentives to carry the FSC label on their products. Firstly, the consumers' demand for certified wood is not substantial (in the U.S. for example, only about 1% -2% of all wood products currently sold comes from certified forests (Harman, 2005)); secondly, businesses may find a less expensive source of wood that is uncertified but still legal. Similar problems are faced in Chile. Besides, only one principle under the FSC certification is relevant to addressing the widespread native forests substitution in Chile (all other principles can be applied to any type of forests). Judging from the current level of political interest in conservation, FSC on its own is insufficient to contribute to the 'political mass reduction' in the Chilean industry.

¹³ Information is gathered from interview with undisclosed industrial stakeholders.

¹⁴ Many FSC-authorized certifying bodies in the U.S. also have clients from South America, including Chile.

As shown in fig.3, unlike FSC scheme, CERTFOR is able to reach out to industry associations and involve them in the role of adjudication. LdB stands out from the others by committing local and central governments to forest management liability; LdB also requires governments to undertake monitoring, disclosure of information, standard setting and adjudication. However, the private sectors are not involved in any direct way. As we have analyzed, the 'political mass' of the timber industry is made up of a majority of private stakeholders; in order to maximize its potential in sustainable development in both commercial plantations and native forests, LdB needs to reach out to the private sector.

To summarize, the 4 schemes reviewed here do not have a balanced approach that will effectively address the challenge of excessive forest substitution, even though each embodies principles that cover the three aspects of sustainability. This stems from a lack of a mechanism that involves both the private and public sectors in a concerted sustainable forestry program that creates and highlights values of the native forests. The inability to generate substantial consumers' interest in purchasing certified wood products is linked to the conceptual/operational incongruence between the different stakeholders on which the successes of these schemes rely.

In Chapter 4, section 4.9, we suggest strategies to rectify this situation as well and propose methods to integrate such policy innovations with other elements that address more general biodiversity and forest management issues related to the DL701 and its Reform Bill.

8. Summary

The difference in the treatment between the Reform Bill and Native Forests Bill provided us the insight that the fundamental associated effects of the DL701 must be addressed in order to curb increasing exploitation and wastage of precious native forests. Tackling the explicit associated effects alone is not enough. We realize that unlike the Reform Bill, the Native Forests Bill ended up increasing the political mutual support and backing when the industry and concerned political office bearers unite in the face of its challenge on the original DL701. The current operation models of FSC, ISO, CERTFOR and LdB were also critiqued within the framework created by the current dispute over of the new bills. Integrated sustainable development policy, we believe, has the potential to tackle these problems.

References

Aguilera C., *Chilean Forestry Exports, 1988-1999*, 2000

Armesto J., *Biodiversidad, Etica y manejo Sustentable del Bosque Nativo en Chile*, in: La Tragedia del bosque Chileno. Ocho Libros Eds. Santiago, Chile, 103-108, 1998

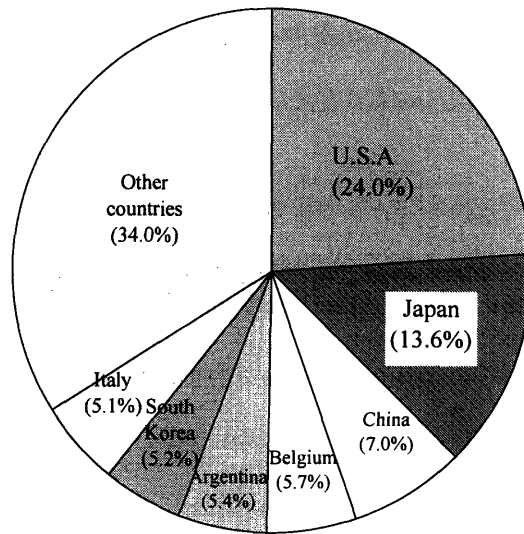
Comite Nacional Pro Defensa de la Fauna y Flora (CODEFF), *El futuro del bosque nativo Chileno: Un desafio de hoy*, CODEFF working paper, 1992

Cousins K., *Policy Choices and Private Governance – Forest Management Systems in Chile*, <http://www.bsos.umd.edu/gvpt/kcousins/Documents/Cousins%202002%20Sustainable%20Forestry%20in%20Chile.pdf>, 2002

Diez S., *Interview With the President of the Senate from Renovacion Nacional*, Chile Forestal, No. 238, 30-32, 1996

- Donoso C., *Opinion: Rechazo a proyecto de bosque nativo*, El Mercurio, 15 January 1996
- Drouilly M. E., *Corma y CONAF en la VII region: Avanzando unidos*, Chile Forestal, No. 222, 10-14, 1994
- El Mercurio, *The Revival Project for the Native Forests*, 20 November 1995
- Gwynne R., *Direct Foreign Investment and Non-traditional export Growth in Chile: The case of the Forestry Sector*, Bulletin of Latin American research, 15, 3: 341-357, 1996
- Harman D., *Certified Wood Catches on in Rainforests*, USA Today, April 22, 2005
- Instituto Forestal (INFOR), *Estadisticas Forestales, 1994*, Boletin Estadistico, No. 40, 1995
- Lagos E., *Avances del catastro de bosque nativo*, Chile Forestal, No. 8, 8-11, 1994
- Langman J., *Chipping Away a Global Treasure: Chile's Native Forest Crisis*, A Defensores del Bosque Chileno 1998 International Campaign Report, 1998
- Neira E., Verscheure H., Revenga C., *Chile's Frontier Forests: Conserving A Global Treasure*, A Global Forest Watch Chile Report, 1992
- Nunez J., *Regulacion Forestal En Chile: Desafios y Posiciones*, in Kerrigan G., et al., eds., *Políticas Economicas Para El Desarrollo Sustentable de Chile*, 147-203, Santiago: Editorial FACEA, 1994
- Silva E., *The State and Capital in Chile: Business Elites, technocrats and Market Economics*, Boulder: Westview Press, 1996
- Silva E., *People, Forests and Politics in Costa Rica and Chile – The Struggle for Grassroot Development-Friendly Initiatives*, Latin American Studies Association 20th International Congress, Guadalajara, Mexico, April 17-19, 1997
- Tacon A., Fernandez U., Ortega F., *El Mercado de Productos Forestales No Maderables (PFNM) y su papel en la Conservacion de la Ecoregion de los Bosques Vadivianos*, WWF, CODEFF, Red PFMN, Valdivia, Chile, 1997
- Vial J., *Economic Instrument for the Policies on Chilean Forests*, Workshop on Native Forests organized by the Ministry of Agriculture and the Universidad Austral, May, 1996
- Weigand J., Mitchell A., Morgan D., *Coastal Temperate Rainforests: Ecological Characteristics, Status and Distribution Worldwide. A Working Manuscript June, 1992*. Occasional Paper Series No.1 Ecotrust and Conservation International, Washington, D.C., USA, 1992
- Wilcox K., *Chile's Native Forests: A Conservation Legacy*. Ancient Forests International, Redway, California, USA, 1996

January-July 1999



January-July 2000

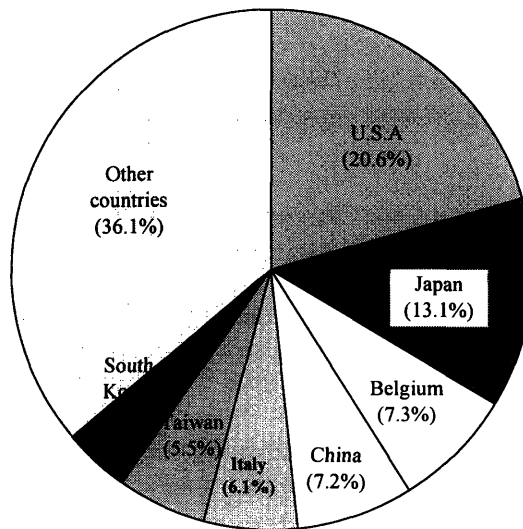
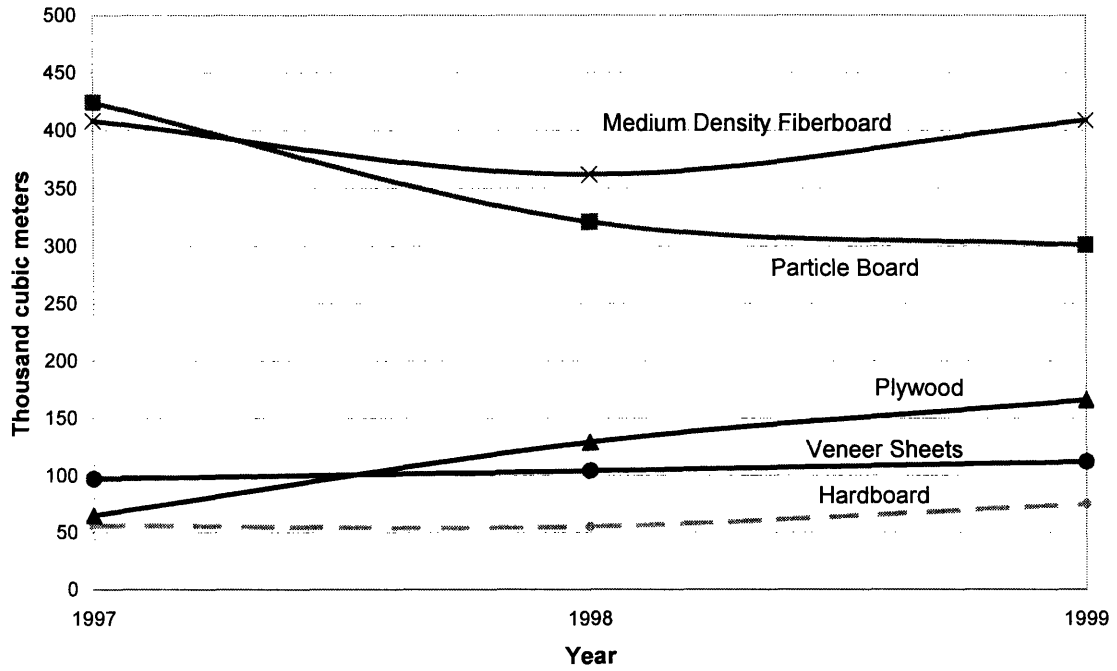


Fig.1. Export value of wood products by period according to country of destination (FOB US\$ million) (Neira, 2002).

Production of Major Wood Building Materials in Chile



Chile's Annual Production of Sawnwood for Building

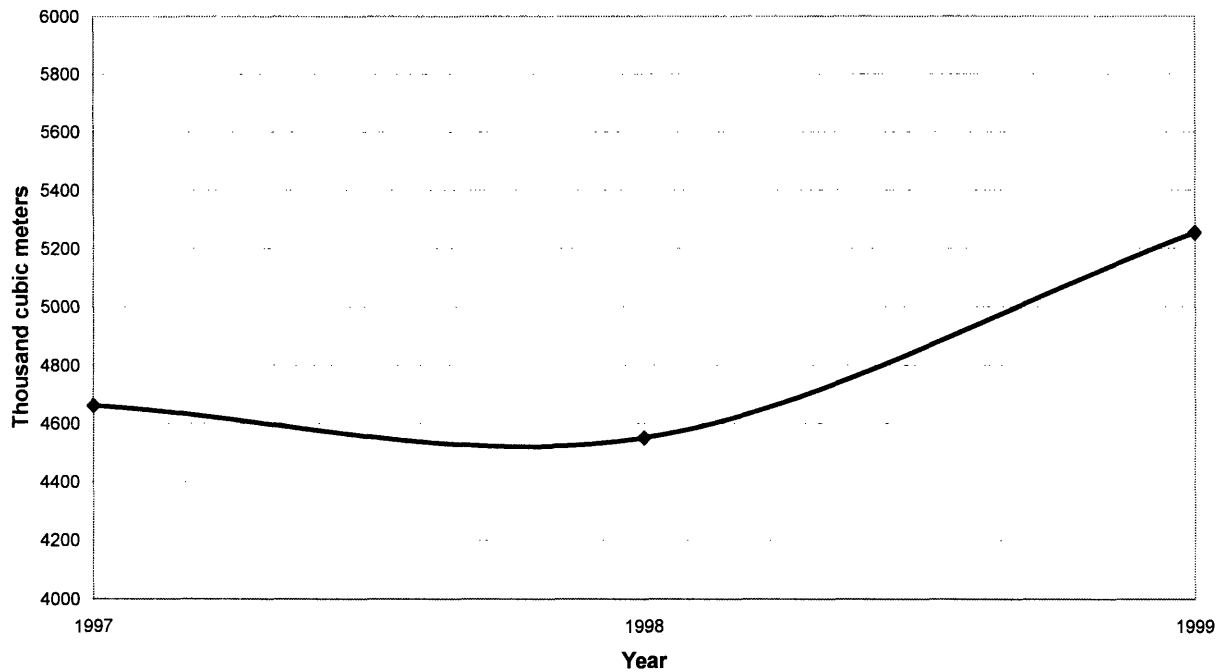


Fig.2. The annual production of major building materials from Chilean forests and plantation. Volumes of sawnwood are on average one or two orders of magnitude larger than the other products (Neira, 2002).

	Private Sector			Public Sector		
	International NGO	Local NGO	Industrial experts	Industry associations	Local government	Central government
Liability for compliance					LdB	LdB
Monitoring to ensure compliance			CERTFOR, FSC-Chile, ISO			
Disclosure of information	FSC-Chile		FSC-Chile		LdB	LdB
Standard setting	FSC-Chile, ISO	FSC- Chile	FSC-Chile	CERTFOR, FSC-Chile	LdB	LdB
Adjudication of qualification/disqualification			FSC-Chile, ISO	CERTFOR	LdB	LdB

Fig.3. A comparison of the way various stakeholders are involved in the 4 different forest certification or legislation schemes in Chile (adopted from Cousins, 2002).

ANNEX V

ADDITIONAL CASE SURVEYS

1. Sustainable City Plan, Santa Monica (<http://santa-monica.org/epd/scpr/index.htm>)

a. Objectives

To develop a complete sets of sustainable development policies for the City of Santa Monica

b. Sustainability Indicators

Involve as many as 63 indicators – each can be categorized into resource conservation, land use & open space & land use, housing, environmental & public health, transportation, community education & civic participation, economic development, or human dignity

c. Outcome

i. Only 2 out of the 62 showed conclusive and positive results, They are an increase in solid waste diversion from landfills and a reduction in GHG emission by waste sector;

ii. Policies

1. Main solid waste related policies are:

- a. Curbside recycling policy that makes full use of the many alleys in Santa Monica,
- b. Green purchasing, of which recycled content products are an integral part,

d. Number of sustainability indicators integrated:

i. 2 out of the 62 indicators are effectively integrated.

ii. In anticipation for the increase in waste collection volume, the City upgrade a good portion of the machineries and truck fleet to help ensure better efficiency. Waste diverted away from landfills also result in reduction in methane emission into the atmosphere, which led to overall reduction in GHG emission.

2. **Jobs for Youth, Boston (initiated by the EPA Brownsfield Fund)**

a. Objectives

- i. To empower the under- and unemployed by training them for environmental works, such as Brownsfield remediation;
- ii. To utilize the polluted and abandoned properties in the cities of Lyn, Somerville, Chelsea and Boston;
- iii. To provide educational opportunities for trainees.

b. Sustainability Indicators considered

- i. Toxic wastes removal and management
- ii. Reduce environmental costs
- iii. Increase number of jobs
- iv. Increase purchasing power
- v. Improve health and safety of workers
- vi. Upgrading of skills
- vii. Utilize Brownsfield for greater economic value

c. Outcome

- i. 6 out of the 7 indicators produce anticipated results (i.e. the economic values associated with Brownsfield remediation cannot be conclusively attributed to the program)
- ii. Project took on a life on its own, as more private sectors and institution committed to funding the program. A vocational training institution based in Boston – JFY NETWORKS, INC – later undertook it. The training program now is one of the most competitive of its kind in Massachusetts
- iii. Curricula of students evolved to keep up with most current demand, e.g. students are taught courses that will qualify them for OSHA certification, which allows them to be employed as entry-level industrial hygienists

d. Number of indicators integrated

All the 6 indicators that show positive results, enabled and supported by a tight network of stakeholders support.

3. EPA SO₂ Emission Trading Scheme

- a. Objectives:
 - i. Reduce SO₂ emissions in the context of acid rain reduction under Title IV of the CAA amendments of 1990
 - ii. Balanced market force and government regulations to achieve objectives using least cost methods.

- b. Sustainability Indicators considered
 - i. Air pollution
 - ii. Acid rain and water quality
 - iii. Reduce environmentally derived cost
 - iv. Reduce socially derived cost
 - v. Increase public health and safety
 - vi. Increase economic competitiveness of businesses in trading

- c. Outcome
 - i. Expected, positive outcomes were observed in all 6 indicators, however, it may not encourage the adoption of new pollution prevention technologies (which is not one of its main original objectives);
 - ii. Total abatement cost is significantly less than if a command-control regulatory option is in place. In fact, it was said that this saves about \$1 billion, or 30-50%, in implementing the policy.

- d. Policies strengths
 - i. Stiff penalty for exceeding emission rights - \$2k per ton, which is 10 times that of marginal abatement cost;
 - ii. Flexibility in adopting methods to achieve target emission quota, including the use of low sulfur coal;
 - iii. Auctioning of initial SO₂ allowance instead of free issuance, which generates revenue for other environmental purposes.

- e. Policies weakness
 - i. Flexibility allows for use of low sulfur instead of scrubbing technology. This may compromise innovation potential of companies

- f. Number of Indicators Integrated

- i. All 6 indicators are integrated – all of which are co-addressed by the way emission scheme is planned

4. Environmental Performance Track
(<http://www.epa.gov/performance-track/index.htm>)

- a. Objective
 - i. Creating partnership with firms in which firms agree to exceed regulatory requirement and adopt EMS in exchange for concession, such as reduced priority for inspection;
 - ii. Reduce regulation cost for the government
- b. Sustainability Indicators Considered
 - i. Various components of environmental indicators (divided into upstream, input, non-product output and downstream stages)
 - ii. Community interaction
 - iii. Environmentally derived costs – savings from regulatory concession, such as reduced priority in inspection and prolonged onsite storage of RCRA-regulated hazardous wastes
 - iv. Competitiveness
- c. Outcome
 - i. As many as 4, since this is the minimum requirement in the qualification process; but there may possibly be 8 in total if the submitted future plans by the applying companies are realized;
 - ii. More companies are signing up. Currently as many as 407 nationwide have already signed up and qualified;
 - iii. More partnerships initiated with various supporting agencies;
 - iv. Documented savings are available from EPA (not available as yet online, we include this document in Annex VI)
- d. Policy strengths
 - i. Relative ease of entry
 - ii. Fused into the current EMS, including ISO14000; so firms can apply what they may already know
 - iii. Benefits are communicated and can be easily quantified
 - iv. Partnership established (stakeholder participation – policy tool)
- e. Policy weaknesses

- i. Does not emphasizing all three domains of sustainable development.
 - ii. Technically it can be improved by demanding a more holistic criterion – that is requiring a minimum level of performance in all the 4 stages.
- f. Number of Indicators Integrated
 - i. All 4 or even 8 of the indicators, all of which are in the environment domain