

**Using Scenarios for Regional Strategic Transportation Planning:
Framework, Methodology and Application to Mendoza, Argentina**

by

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B.Sc. in Civil Engineering
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Submitted to the Department of Civil and Environmental Engineering in Partial Fulfillment
of the Requirements for the Degree of

MASTER OF SCIENCE IN TRANSPORTATION

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ABSTRACT

Uncertainty about the future is a key variable in any strategic planning activity. Developing *scenarios* is a way to address such uncertainty in an explicit and structured manner. This thesis intends to show how scenario-based planning can be used in regional strategic transportation planning. The inherent complexity of strategic planning efforts for regional transportation systems is characterized and studied in three "contexts". The first context deals with the strategic planning process itself. The second one addresses the relationship between transportation and economic development/competitive advantage. The third context involves the relationship between public and private organizations in transportation planning. The thesis shows that scenarios integrate and address the major concerns identified in the study of these contexts.

The concept of scenario is clarified and its role as a tool for making robust decisions and broadening decision-makers' perspective is emphasized. A few examples of earlier scenario exercises undertaken in different environments and for different purposes are presented. The scenario methodology and its underlying theory are studied.

The province of Mendoza, Argentina is introduced as a developing region interested in using transportation to support its socioeconomic development. The main characteristics of the province and the most relevant issues affecting this region and its transportation system are presented. The thesis builds on the previous discussion to raise some lessons for the strategic planning process in Mendoza. Finally, a step-by-step methodology is followed to illustrate the scenario-building process for the Mendozan transportation system.

Thesis Advisor: Dr. Joseph M. Sussman
Title: JR East Professor
Professor of Civil and Environmental Engineering

DEDICATION

To God, beginning and end of everything, and who has filled me with blessings.

To *México*, in the hope that one day I may be able to participate actively in its development and the improvement of the well-being of our population.

To my parents, who have given me everything and to my brother, whose friendship I treasure.

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These five personalities have set an example as persons and professionals that will endure in my memory and will encourage my own development.

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Many thanks to Mr. Richard Karash, who proposed the scenario methodology to our research group and guided a helpful "strategic conversation" on the Mendozan case, whose insights are reflected in the scenarios here presented.

My thankfulness and recognition to my classmates and friends at MIT, IDB and beyond. Learning with you made learning all the more valuable and more fun.

Un abrazo muy fuerte al Club del Desayuno por su amistad y apoyo incondicional (que aunque a larga distancia, siguió tan efectivo como siempre).

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PREFACE

The research for this thesis was done within the framework of an MIT research project called ReS/SITE: Regional Strategies for the Sustainable Intermodal Transportation Enterprise. This project aspires to developing a new framework for regional strategic transportation planning. It has identified various shortcomings in that process through analysis of current planning efforts, and has worked to establish a new process to overcome those weaknesses. It builds broadly in the concepts of *scenarios* and *regional architectures* as fundamental to this new generation of regional strategic transportation plans.

1. INTRODUCTION

An inherent and major variable in any planning effort is uncertainty about the future. Developing *scenarios* is a way to address such uncertainty in an explicit and structured manner. As it will be seen later in this work, it is important to acknowledge that the final objective of this approach is not to provide a more accurate forecast of future events, but to broaden our perceptions about the future, which in turn will generate sounder decision-making.

The last 15 years have seen the growth of the literature on scenarios. Scenario-based planning has been used in a variety of industries and by different kinds of organizations. The conclusion in this work is that scenarios are a powerful tool to be used in strategic planning processes, and can readily be applied in a regional strategic transportation planning context.

1.1 MOTIVATION FOR THE THESIS

The overall purpose of the present thesis is to help to improve strategic regional transportation planning. Thus, it has been deemed essential to relate the methodology of scenarios to the main characteristics and shortcomings of these planning activities. Previous research at MIT has highlighted several fundamental areas that have not been properly addressed by most transportation plans. Among them (Muñoz¹, 1997):

¹ Muñoz-Loustaunau, Abel Strategic Transportation Planning for Mendoza: Frameworks, Concepts and Scenarios, CIT/MIT Joint Program, 1997

1. The inherent complexity of the context in which transportation activities take place: the interaction of economic, social, political and environmental subsystems in shaping the transportation system.
2. The relevance of economic growth considerations, and the increasing economic competition among countries, regions and cities.
3. The need for a new public/private relationship for infrastructure development and operation.
4. The need for human resource development schemes to prepare professionals able to meet traditional and challenging new transportation demands in a changing environment.
5. The growing importance of intermodalism.
6. The rapid pace of technological changes affecting transportation and related areas, like information technology.
7. The need to balance between the requirements of passengers and freight movements.
8. The critical need to link transportation objectives to the specific strategic issues that a region may face.

Additionally, several authors have pointed out the existence of flaws common to many current strategic planning activities beyond the field of transportation. An essential concept that seems to be missing in most transportation planning efforts: in today's dynamic environment, the relevance of strategy shifts from the *strategic plan* to the *strategic planning process* itself. Detailed plans are not flexible. The strategy generation process can be the way to provide flexibility in planning, where flexibility is used here as the ability to cope with uncertainty and respond to change.

1.2 THESIS OBJECTIVES

The following are the objectives for this work:

- To show how scenario building fits in the overall framework of modern transportation strategic planning.
- To study the usefulness of scenarios to improve decision-making in general and for transportation systems in particular, and present the methodology in some detail.
- To show how scenarios can help the planning process in public/private partnerships by becoming a tool for brainstorming, creating consensus and facilitating this joint participation.
- To illustrate the use of the scenario-building technique through its application to a specific regional transportation system.
- To show how scenarios can help overcome the shortcomings in current regional strategic transportation planning.

1.3 THESIS STRUCTURE

Based on the motivation and objectives for this work, the thesis has been structured in three major pieces. A brief description of these parts and the chapters that form them follows:

I. The framework for scenarios

A significant effort has been made to present some of the most important characteristics of the environment in which the development of scenarios for transportation systems is likely to take place. Figure 1.1 portrays the three “contexts” that define this environment.

Chapter 2 deals with the topic of strategic planning from the perspectives of planning and strategy. . It reviews the works of different authors who clarify the structure of this process, provide a classification of planning schools and highlight some of the common flaws that exist in current strategic planning practices.

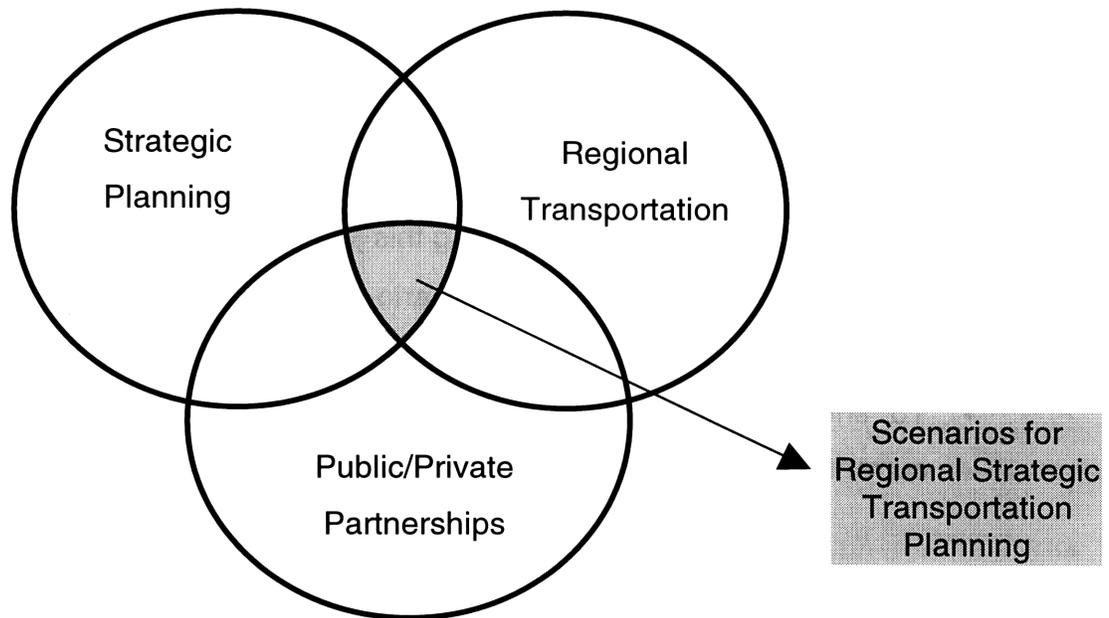


Figure 1.1
The Framework for Scenarios

Chapter 3 presents two major elements of the regional transportation context. First, the relationship between transportation and economic development is visited. Then the increasing competition that regions and nations face in the global economy is also addressed. The chapter also reviews the concepts of competitive strategy put forward by Prof. Michael Porter.

In chapter 4 a particular organizational context is chosen to study the use of scenarios: public/private partnerships. The chapter provides the background and some reasons that explain the rising of these mixed associations and their

relevance in regional development. Finally, we focus on the activities of these partnerships in the infrastructure and transportation fields.

II. The Methodology.

After defining the environment, we introduce the concept and methodology of scenarios. Chapter 5 shows how scenarios constitute a tool that can integrate the contexts of strategic planning, regional transportation and public/private partnerships. The chapter also shows how scenarios can help to improve strategic planning for transportation by solving some of the problems and limitations previously identified in the above three contexts (strategic planning, regional transportation and the public/private partnerships).

Chapter 6 goes deeper into the methodology and presents the underlying theory and structure of scenarios and the principles and practice of scenario-based planning. Several methodologies for building scenarios are also reviewed and one is chosen for the application part of the thesis.

III. The Application.

In Chapter 7 the province of Mendoza in Argentina is introduced as a region that can benefit from the development of scenarios for its transportation system. In Chapter 8 an application of the scenario technique is undertaken. A step-by-step methodology is followed to illustrate the scenario-building process for Mendoza.

Finally, Chapter 9 closes the thesis with the conclusions and suggestions for further research.

1.4 A NOTE FOR THE READER

The breadth covered by the framework part of this work is intended to provide the reader with an appropriate background for the study of scenarios for transportation. A reader that is already knowledgeable of these topics and is mainly interested in the use of scenarios might prefer to go directly to the Methodology and Application parts of the thesis.

2. THE STRATEGIC PLANNING CONTEXT

2.1 ABOUT “PLANNING”, “STRATEGY” AND “STRATEGIC PLANNING”

A review of current business literature will yield a long list of books, articles and papers whose titles include the words “planning”, “strategy” and of course “strategic planning”. The practice of strategic planning is regarded as a symbol of good management in both private and public organizations.

The idea of a structured approach to deal with the present and future environment of an organization in order to achieve its goals is an appealing one. Different thinkers have proposed different ways to accomplish this task and accordingly we can find several schools of planning.

The popularization of the strategic planning literature has been accompanied with the usage of different meanings for the terms “planning” and “strategy” which may be the cause of some confusion. Prof. Henry Mintzberg² (1994) presents some of these definitions and moves gradually toward a richer notion of “planning” and “strategy”. In the following two sections, we review his work on this matter and highlight the basic elements of these concepts.

2.1.1 FOUR BASIC ELEMENTS OF PLANNING

Figure 2.1 depicts four basic elements in Mintzberg’s analysis. The simplest notion of planning is to think about the future, and in a more proactive view, planning implies taking action to obtain the desired results. We perceive also a decision-making element of planning: essentially it is necessary to choose

² Mintzberg, Henry, The Rise and Fall of Strategic Planning. The Free Press ed., 1994

among different alternatives. Here it is important to remember that organizations³ perform different activities in order to deliver their output – products or services— from a set of input resources. For instance, we can think of a company with three different departments: production, financing, and marketing. Different activities involve different types of decisions that must be confronted simultaneously by organizations. While decisions move at a different pace, making coordination harder, organizations do usually integrate all relevant decisions at a certain point in time. The development or approval of any plan brings together different decisions to be confronted simultaneously (Mintzberg⁴, 1994).

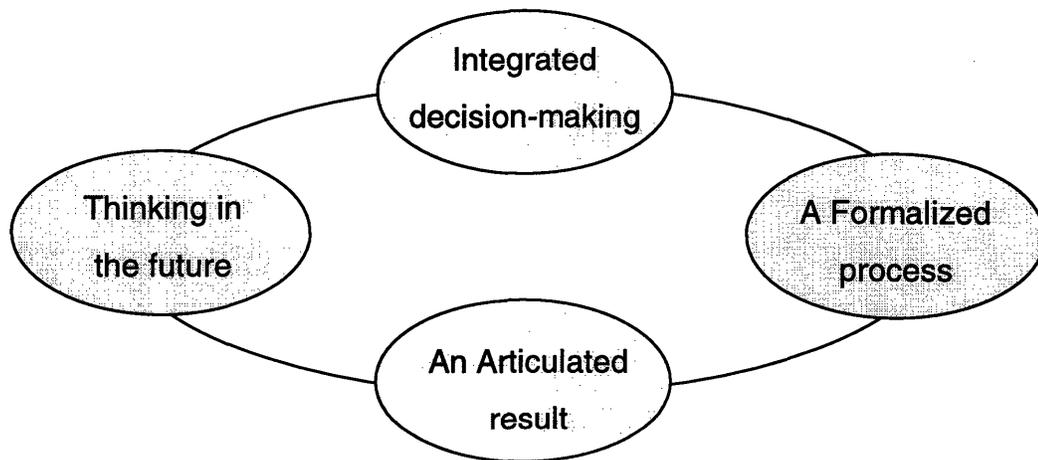


Figure 2.1
Four Basic Elements of Planning

The identification of this need for integration provides the starting point to build a more comprehensive planning concept. To develop an *integral system of decisions*, the planning effort must address the relationships existing among this

³ Unless otherwise specified, “organization(s)” will be used regardless of their public or private sector character.

set of resolutions. When planning starts to deal with the relations and interdependence of an organization's decisions, it has entered the domain of strategy⁵. The awareness of such a systemic nature is central to the study and practice of decision-making, planning and strategy in today's organizations. We will discuss this topic further when reviewing Prof. James Quinn's *hierarchy of strategic subsystems* in section 2.5.5 and Prof. Michael Porter's *strategic fit* in section 3.3.4.

The third and fourth elements of Figure 2.1 are related to the organizational context of planning. According to Mintzberg, formalization is a key component. The planning process must be formalized within the organization to

*"...decompose,... articulate, and especially... rationalize the processes by which decisions are made and integrated in organizations."*⁶

The outcome of planning must be articulated as an integrated system of decisions. That is, planning should result in a clear statement of the system of decisions in the organization: what are the most relevant decisions? Is there a relationship between the different decisions? How will decision X be affected by other resolutions?

2.1.2 SOME PERSPECTIVES ON STRATEGY

Hax and Majluf⁷ (1991) state that most works on strategy undertaken during the last few decades have emphasized only a single perspective on this complex concept. These two authors provide a comprehensive review of the "various

⁴ Ibid. 2

⁵ Ibid. 2

⁶ Ibid. 2, p13

⁷ Hax, Arnoldo C., and Nicholas S. Majluf. The Strategy Concept and Process: A Pragmatic Approach. Prentice Hall, 1991

dimensions of strategy” some of which are also discussed by Mintzberg⁸ as follows:

Strategy as position or strategy as perspective

Some authors have shaped a meaning for strategy, namely to find the position in which the organization can make better use of their advantages and avoid its weaknesses. Others have emphasized the way in which the activities are performed, i.e., the perspective of the organization. These two views differ in the focus of their analysis: the external context of the organizations (position), or the internal one (perspective).

Strategy as a plan vs. strategy as a pattern

Strategy can be seen as a tool that leads the organization’s activity, or conversely as a result of a behavior pattern over time. In the first view, strategy plays a proactive role, guiding the organization’s actions in an intentional and controlled way. In the second one, the actions define the shape of the realized strategy. If a corporation conducts itself in a certain manner, we think of such behavior as its strategy.

The discussion of these two perspectives identifies the existence of different *forms* of strategy. Figure 2.2 taken from Mintzberg⁹ is helpful to explain this. Generally, after a deliberation process, some of the intended strategy is dropped out (unrealized strategy), while the rest –*deliberated strategy*— proceeds to form part of the *realized strategy*. The other element of the realized strategy, which is generally not explicitly recognized in current planning literature is the *emergent strategy* i.e., a set of strategic actions that are taken in response to unexpected events. The importance of Figure 2.2 is that it highlights the fact that in the real world strategies are a mix of previously deliberated decisions and emergent

⁸ Ibid. 2

⁹ Ibid. 2, p.24

determinations. While deliberated strategies are formulated in advance, emergent strategies are formed to respond accordingly to pressing needs.

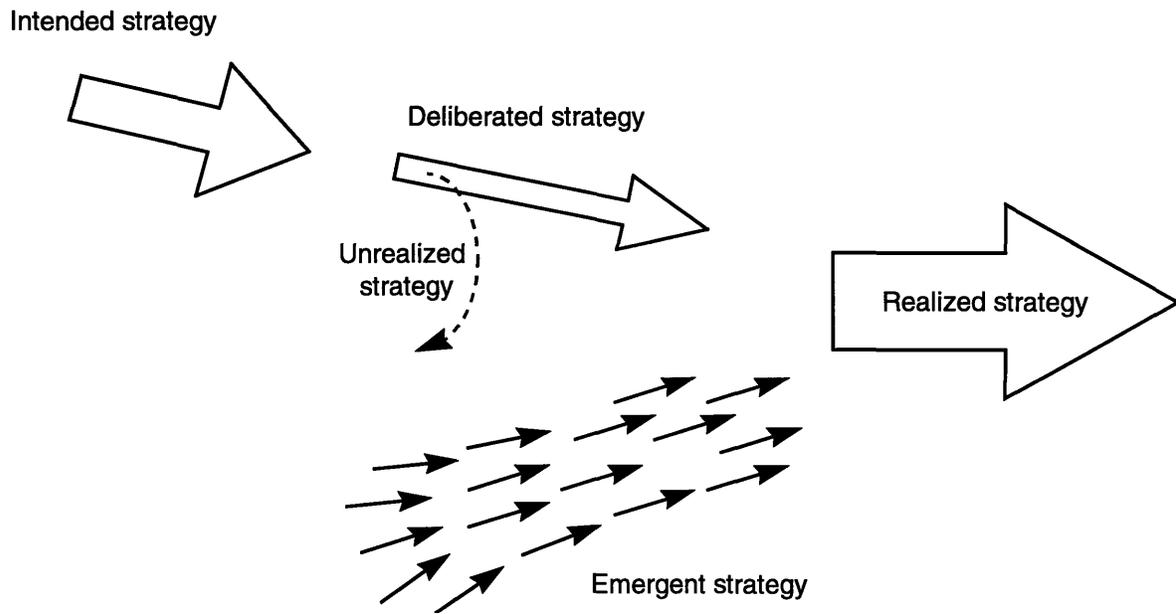


Figure 2.2
Different Forms of Strategy
(Mintzberg⁹, 1994)

2.1.3 AND... A DEFINITION OF STRATEGIC PLANNING

It seems appropriate to suggest that the concept of strategic planning should integrate some of the elements and perspectives of planning and strategy discussed above. Hence, *strategic planning can be thought as a formalized process to think about the future and whose result must be articulated as the integrated system of **high-order decisions** that will lead an organization's activities.* This broad definition will be sufficient for the purposes of this work. The following points are worthwhile to be noted:

1. The above definition assumes the leading and control roles of strategy and planning.
2. If we accept Mintzberg's different forms of strategy –and this thesis does so— strategic planning has to face the existence of emergent strategies, which are the result of unexpected events. Therefore it is not possible to formulate and deliberate them in advance; they must be generated after such events have occurred.
3. It is important to note that regardless of their emergent or deliberated character, strategies are a form of decisions. A strategy is a high-order determination on how to better address the elements present in the external and internal environment of an organization. Therefore, strategy-making is basically decision-making.

The question that arises at this point is: how can strategic planning help organizations cope with uncertainty, and provide a framework for integrating current strategies with some others that may or may not be formed in the future? And how can this be done in the context of regional transportation systems? Before answering these questions, it is necessary to examine the nature and structure of strategic planning in general and strategic planning for regional transportation systems in particular. The rest of chapter 2 and chapter 3 will be devoted to this task.

2.1.4 STRATEGIC MANAGEMENT AND STRATEGIC PLANNING

The business literature often portrays strategic planning as a subsystem of a larger structure: the strategic management system of any organization. Morrison and Wilson¹⁰ (1996) have proposed a simplified model of strategic management

¹⁰ Morrison, James L., and Ian Wilson. The Strategic Management Response to the Challenge of Global Change. Taken from http://sunsite.unc.edu/horizon/welcome/Scenario_wksp.html; also published in: *Future Vision, Ideas, Insights, and Strategies*. Howard Didsbury ed. Bethesda, MD: The World Future Society, 1996

that is presented in Figure 2.3. The blocks in Figure 2.3 represent the six basic elements of strategic management identified by these authors: environmental analysis, organizational assessment, strategic direction, strategic plans, implementation and performance evaluation. In this model, the strategic planning subsystem in this model encompasses the first four blocs.

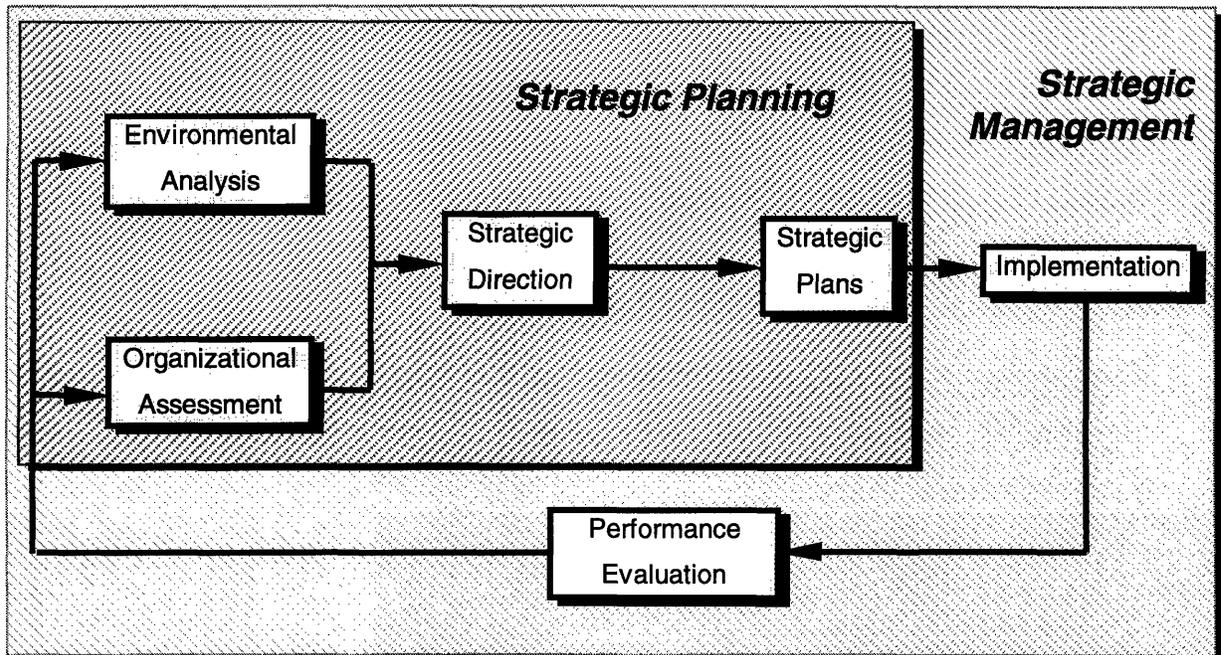


Figure 2.3
Strategic Planning and Strategic Management
 (adapted from Morrison and Wilson¹¹, 1996)

2.2 INSIDE THE STRATEGIC PLANNING PROCESS

2.2.1 THE STRUCTURE OF STRATEGIC PLANNING

Another important contribution of Prof. Mintzberg is a clarification of the structure of current strategic planning activities by noting the differences between the two

¹¹ Ibid. 10

major constituents of this process –strategic thinking and strategic formalization— (Mintzberg¹², 1994):

a) Strategic thinking

This is the part of the process where individuals and organizations actually *make strategy*, and can occur in the form of strategy formulation, or strategy formation, depending if they can be considered deliberated or emergent strategies. There are two phases in strategic thinking: the analysis of the external environment and internal conditions of the organization (first two blocs in Figure 2.3), and the strategy formulation/formation (represented by the third bloc in Figure 2.3).

b) Strategic Formalization

Also referred as “strategic programming”, in this stage the developed strategy is transformed into a set of procedures that can be implemented in a human/institutional system. This stage is represented by the fourth box of Figure 2.3. Three major steps are required to perform strategic formalization:

1. Codification. A strategy is formulated/formed as a rich mental picture, but then must be clarified and articulated in concrete terms that can be expressed to the people in the organization.
2. Elaboration. The strategy must be elaborated, i.e., analyze the consequences within the organization and design the plans and programs that are required for its deployment.
3. Conversion. Implementation of a major new strategy will affect the daily activities of any organization. The objectives of each unit in the organization’s structure will need to be reconsidered, as will be the allocation of resources and the usefulness of internal policies and procedures.

¹² Ibid. 2

The previous structure of strategic planning implies that strategies are not the result of planning, but exactly the opposite –its origin. While Mintzberg’s model depicts the implementation of strategies outside the domain of strategic thinking, implementation concerns must be addressed as part of this process. Strategy-makers should preview the environment to be faced during implementation. This exercise can show a strategy that would be particularly difficult to implement and actually reshape the decisions on which strategy to pursue.

This thesis is mostly interested in the strategic thinking stage of the process, and therefore will emphasize the strategy making process of strategic planning.

2.2.2 THE PRESENCE OF UNCERTAINTY

Because the nature of strategic planning involves thinking about the future, uncertainty is always an issue. We can not know with certainty how the future will look, but in order to perform strategic planning we must assume the future conditions of the environment in which organizations or investments will perform. And the results of planning depend heavily on the accuracy of such assumptions.

A traditional approach to deal with this concern has been the design and use of forecasting techniques and models. In spite of the complexity reached by the state-of-the-art forecasting tools, our capacity to predict future events is severely limited. Peter F. Drucker¹³ (1974) has stated that:

“Strategic planning is necessary precisely because we cannot forecast”

¹³ Drucker, Peter F. Management: Tasks, Responsibilities, Practices. Harper & Row, 1974, p124

The limitations of forecasting are reflected in the three basic alternatives of forecasts commonly used in project evaluation: low, medium, and high figures. The medium values are generally labeled “realistic” estimates, and depending on if high or low numbers are desirable or not, these figures are attributed an “optimistic” and “pessimistic ” character. The main problem with these approaches is that they do not explicitly address the level of uncertainty faced by organizations.

In an article in the Harvard Business Review, Courtney et al¹⁴ (1997) propose the existence of the following different levels of uncertainty:

- Level 1: The future is clear enough for traditional forecasting techniques to predict the future with sufficient precision.
- Level 2: There are few feasible futures that can unfold from the present and they can be clearly defined as discrete alternatives. A typical example of this case takes place when the occurrence or not of a specific event will affect the development of future events.
- Level 3: There is an entire range of feasible futures instead of a discrete set of outcomes.
- Level 4: The future is so unpredictable that not even the range of feasible outcomes can be identified.

The above classification recognizes that while we can not predict the future, it is true that some parts of it can be foreseen. There are stable trends as demographics, and characteristics of the social or institutional context that we know will not change dramatically even in the long term. Of course, as we move further into long-term forecasts, the uncertainty is stronger and becomes the

¹⁴ Courtney, Hugh, Jane Kirkland and Patrick Viguerie. Strategy Under Uncertainty. *Harvard Business Review*. November-December 1997, p67-79

driving force of the future state of things. Figure 2.4 taken from Mahaffie¹⁵ (1995) gives an idea on the reliability of forecasts for different trends and changes.

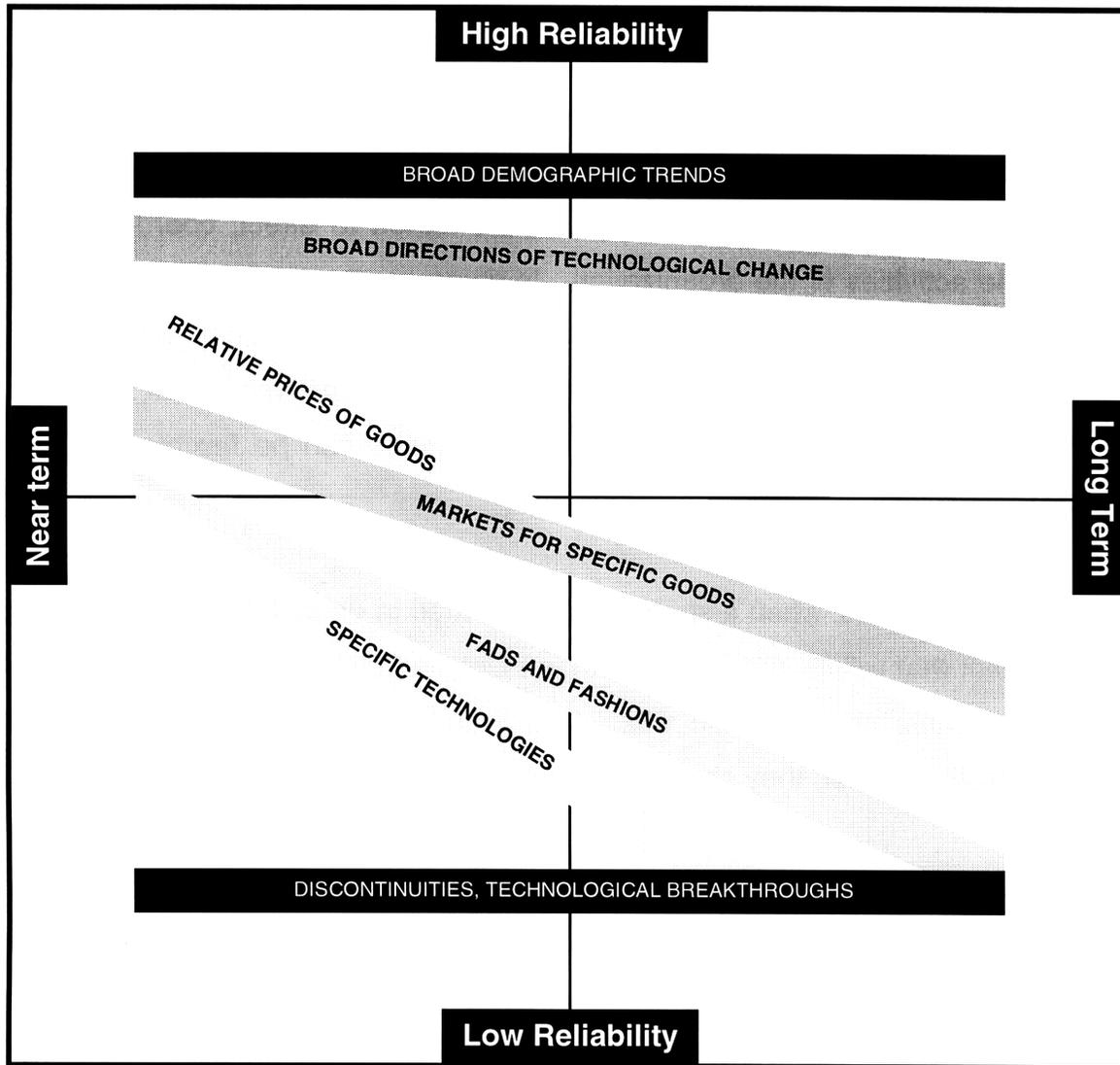


Figure 2.4
Relative Reliability of Forecast for Different Trends
(Mahaffie¹⁵, 1995)

¹⁵ Mahaffie, John B. *Why Forecasts Fail*. *American Demographics*, Vol. 17, No. 3, p.36

2.2.3 THE ISSUE OF FLEXIBILITY IN STRATEGIC PLANNING

Because organizations must recognize the presence of uncertainty in the future, flexibility in strategic planning is highly regarded. It is common to read and hear about the importance of making “flexible plans”, which can keep leading the activities of an organization after a change in its environment has occurred. Nevertheless Mintzberg argues that the concept of a “flexible plan” is essentially a contradiction (Mintzberg¹⁶, 1994): plans are aimed to direct, coordinate and control the activities of the organization. In doing so, they draw a path that has to be followed within established boundaries, and therefore, they actually limit the flexibility to act. The more detailed the plans are, the more inflexible they become. As a result, only broad and general plans can be flexible (Quinn¹⁷, 1980a).

In a parallel to plans, when a strategy is formulated in detail it becomes a strong commitment that will be difficult to change. Detailed strategies are too inflexible –an undesirable characteristic when facing an uncertain future. If we want flexible strategies then they should be general enough to allow change.

The problem is of course that organizations face a multitude of specific needs in specific contexts, which requires specific solutions. Because a broad strategy is not likely to perform adequately in these cases a tradeoff between flexibility for the future and efficacy in the present arises. Not surprisingly the tradeoff has been usually been resolved in favor of efficacy in the current operation.

The perception of an increasing dynamism in today’s environment has motivated the search for alternative ways to deal with this concern. If we pursue the idea

¹⁶ Ibid. 2

¹⁷ Quinn, James B. Strategies for Change: Logical Incrementalism. Richard D. Irwin ed., 1980

of broadness and generality of plans, we know that at some point detailed plans will be required to address some issues in a specific way. The usefulness of these approaches will greatly depend on the organization ability to switch to “specific mode” in a timely manner when new information has arisen. While we still need to review some additional concepts to perceive more clearly the issue of flexibility—specifically Prof. Quinn’s discussion on specific and general goals in planning—we can start using some of the ideas we have reviewed so far.

First of all, let us clarify the meaning of the term “flexibility” in the context of planning: flexibility is used here as the ability to cope with uncertainty by responding promptly to change. Now, in Figure 2.2 we see that in the strategy context the response to a change in the environment takes the form of generation of emergent strategies. Mintzberg’s forms of strategies reminds us that regardless of broad and specific plans, the real source of flexibility is the capacity of the organization to react in the presence of changing circumstances. *The ability to generate emergent strategies is a reflection of the flexibility built into organizations.* The search for a flexible strategy therefore requires us to deal explicitly with these emergent strategies: the way they are formed and how can this process be improved.

A critical observation: the provision of flexibility takes place in the strategic planning process, not in the plans! In today’s dynamic environment, the emphasis in strategy shifts from the *strategic plan* to the *strategic planning process* itself. And the stage of strategy generation—or strategic thinking—seems to be the appropriate period in which flexibility should be built into the planning process.

A related finding: this provision of flexibility occurs *through the human resources* of the organization. While the concept of “strategic planning process” is helpful, it is only a conceptual construct. The foundation of this process is the people

that participate on it. The resulting argument is that the efforts oriented to improve the strategic planning process should deal with the development of the organization's human resources.

2.3 A CRITIQUE OF CURRENT STRATEGIC PLANNING PRACTICES

Several authors have pointed out the existence of flaws common to many current strategic planning practices. These flaws have been identified both in the strategy and in the planning literature. It is argued that strategic planning, as it is conducted in most organizations, has lost its role of strategy formulation, becoming more a strategy implementation device, or an activity oriented to improve operational effectiveness. In what follows, we review some of these critiques.

2.3.1 FROM THE PLANNING SIDE

In his book "The Rise and Fall of Strategic Planning", Prof. Henry Mintzberg¹⁸ highlights the most common problems occurring in current strategic planning activities. For the interested reader, Appendix A presents what Mintzberg has called the "fundamental fallacies of strategic planning", which according to him help to explain the presence of the following faults:

- Strategic planning in most organizations has an excessive emphasis on implementation and scheduling of procedures, without accounting for what is supposed to be the object of the process: the generation of the strategies. Prof. Mintzberg goes farther by asserting that because of its normative function, formalization-oriented planning can become a force that inhibits strategic thinking.

¹⁸ Ibid. 2

- Some models of strategic planning propose the detachment of top executives from daily activities in order to concentrate in the formulation of the organization's strategies, and restrict the participation of the remaining personnel to the implementation tasks. These approaches assume that the information required by the "strategic thinkers" can be conveniently provided with formal means of communication. But these usually carry only a fraction of the knowledge generated in an organization. In fact, many significant pieces of information useful for strategy-making do not flow through the formal channels. As a result, people isolated in an "ivory tower" will miss essential data, and therefore are likely to generate inappropriate strategies.
- Detachment between strategy formulation and daily operations also raises the issue of commitment. There is a weak incentive to support a strategy developed by someone else, and on the other hand, strategy-makers' interest in their output may be lowered by the fact that they will not be responsible for the application of their ideas. The importance of this issue is stressed by Drucker¹⁹ (1974) in the context of plans:

"The distinction that marks a plan capable of producing results is the commitment of key people to work on specific tasks. The test of a plan is whether management actually commits resources to action which will bring results in the future."

- The rigidity of the most organizations' strategic planning structures assumes that a creative innovation-based process like strategy-making can be performed by a system as efficiently as is done by individuals. The formalization of strategic planning eases implementation of strategy, but a formal operational system can not substitute for the intuitive/creative process by which strategy is generated in the human mind. The fundamental problem

¹⁹ Ibid. 13, 128

is in the very nature of planning –an analytical process that breaks down a problem in its parts— while the basic tool of strategic thinking is precisely the opposite skill: synthesis. Breaking down elements into their pieces allows formal planning to manage larger amounts of information, and study in detail the characteristic of each subsystem. But the final and central activity is to integrate those pieces into a comprehensive whole, a system of strategies.

2.3.2 FROM THE STRATEGY SIDE

In an update on his corporate framework of competitive strategy, Prof. Michael Porter²⁰ (1996) points out that organizations have usually failed to generate their own strategies because of the following basic pitfalls:

- Strategy has been confounded with “operational effectiveness”, and therefore management and control tools have supplanted organizations’ strategy. Porter points out that while both operational effectiveness and strategy are necessary for success, the ways they improve performance are essentially different. Operational effectiveness means performing a set of similar activities *better* than rivals do. Strategy is *chosen* to perform *different* activities from the competition’s, or performing similar activities in *different ways* than competitors do.
- Because of the limitation of resources and the incompatibility of certain activities, the strategic planning process involves choosing between tradeoffs. Current thinking regards the presence of tradeoffs as a negative characteristic that should be avoided. But to arrive to a sustainable strategy, organizations must decide among these tradeoffs instead of avoiding them.

²⁰ Porter Michael E. What is Strategy? *Harvard Business Review*, November-December 1996, p 61-78

They actually enable the existence of diverse strategies. Porter²¹ goes farther by asserting that:

“Strategy is making tradeoffs in competing. The essence of strategy is choosing what not to do. Without tradeoffs, there would be no need for choice and thus no need for strategy.”

2.4 THREE CORE SCHOOLS OF STRATEGIC PLANNING

Van der Heijden²² (1996) maps all the approaches to planning that have been proposed so far on to three core “paradigms” in planning:

- The rationalist (or formal) school
- The evolutionist school
- The processualist school

The following sections present a brief summary of his work on this matter. While at some level it characterizes the first two schools with a “black or white” principle, it highlights their basic assumptions and proposals.

2.4.1 THE RATIONALIST SCHOOL

The rationalist school is represented by Prof. Porter’s work and approaches strategy-making with the idea that there is a right answer for the organizations’ needs. Therefore, the objective for the whole strategic effort is clear and simple to state: to discover this solution and apply it. According to this school, the major steps required to achieve this are (Van der Heijden²³, 1996 and Quinn²⁴, 1989)

²¹Ibid. 20, p70

²² Van der Heijden, Kees. Scenarios: The Art of Strategic Conversation. John Wiley & Sons, 1996

²³ Ibid. 22

1. Defining the organization's mission: the reason for its existence
 - Defining utility for the organization
 - Defining strategic objectives
2. SWOT (Strengths, Weaknesses, Opportunities and Threats) Analysis
 - Evaluating the organization's internal situation (strengths and weaknesses)
 - Evaluating the organization's external environment (opportunities, threats, competition)
 - Identifying strategic options
3. Selecting the options that maximize the organization's utility
4. Proposing plans of actions to achieve this maximum utility
5. Implementing the plans
6. Monitoring and control performance

2.4.2 THE EVOLUTIONARY SCHOOL

The evolutionary school rose as a result of growing concerns that the rationalist model did not consider important issues in a proper manner. It points out the limitations of a precognitive approach for strategic planning in complex organizations and dynamic environments. Different authors have studied real-world strategic planning practices and concluded that the formal strategy process of the rationalist model does not describe reality. The evolutionist approach assumes that the complexity of today's environment hinders the ability to control, predict and even fully analyze the subsystems involved in the organization's performance. Therefore, the belief that organizations can improve their odds by thinking and developing a suitable strategy is mere illusion. In a dynamic environment, survival of organizations can be explained only by their ability to react and adapt. Therefore managers should not devote

²⁴ Quinn, James B. Strategic Change: "Logical Incrementalism" *Sloan Management Review*, (SMR Classic Reprint) Summer of 1989, p45-60

long hours to identify the solution that maximizes the organizations' utility under current needs or with a set of assumptions that are deemed likely to occur. Van der Heijden suggests that the evolutionist view considers this ability to adapt as something random which can not be developed or controlled by the organizations.

2.4.3 THE PROCESSUALIST SCHOOL

The processualist school states that an organization's success results from the creativity, abstraction capacity and "brain power" of their people. And there is no way to codify these characteristics into a formal planning structure. The focus is made in the internal process by which the ideas are generated and how to improve the ability of the organizations to engage in it. An essential element of the processualist model is the idea of continual learning by linking action, perception and thinking. Organizations should develop their skills of perception, reflection, and action to become "learning organizations." In this context, a reassessment of the role of planning itself has occurred. Arie de Geus²⁵, former head of planning of Shell has concisely expressed this new role:

"... we think of planning as learning and of corporate planning as institutional learning."

But how do organizations learn? Let us first address briefly the issue of individual learning. Every human being has a mental model of his/her own, formed by a set of assumptions, generalizations and biases. They shape our perception on how the world works and therefore influence our actions. Senge²⁶ (1990) raises the following concern:

²⁵ De Geus, A.P. Planning as Learning. Harvard Business Review, March-April 1988, p70.

²⁶ Senge, Peter M. The Fifth Discipline: the Arts and Practice of the Learning Organizations, Doubleday/Currency, 1990, p176.

*“The problem with mental models lie not whether they are right or wrong....
The problem with mental models arise when the models are tacit –when
they exist below the level of awareness.”*

Because we are sometimes unaware of our mental models, they remain unexamined. And because our models are not examined, they remain unchanged. In a changing world, it is then only a matter of time before our unchanged mental models deviate from reality.

A prerequisite for distinctive organizational behavior –and learning— is the alignment of the mental models of the different people that form part of it. For organizational learning to happen, people must share their ideas, develop theories and act accordingly in a joint effort. The alignment of the individuals’ mental models generates the consensus necessary for the common action. The engagement in a “strategic conversation” process is required for organizational learning. Such a process provides adequate space for joint understanding of the environment, consensus and an alignment of ideas.

2.5 LOGICAL INCREMENTALISM

One of the authors that can be classified into the evolutionist school is Prof. James B. Quinn. He introduced the concept of “logical incrementalism” in the late 1970’s with the publication of three articles in the Sloan Management Review, which provided the base for a later book, “Strategies for Change: Logical Incrementalism”²⁷.

The following sections review his work as a useful and valid model that explains strategic planning in complex systems. Appendix B also presents a few additional ideas about this view.

²⁷ Ibid. 17

The driving force behind Quinn's research was his findings on how managers create strategy in the context of real day-to-day performance. He stated that instead of using the rationalist model for generating the organizations' objectives and strategy, managers follow an integrative approach that moves incrementally and that:

"The processes used to arrived at the total strategy are typically fragmented, evolutionary, and largely intuitive."²⁸

Everything starts with rough objectives that are continuously clarified, reshaped and narrowed, as additional information becomes available or consensus in the organization is achieved.

The theory of logical incrementalism states that although extensive formal planning is possible and desirable in some cases, its efficacy when dealing with complex long-term issues is substantially diminished. The basic error is in specifying certain parameters too early in the process. We can use always use new information to refine the results of the planning effort and make incremental improvements. Additionally, the long-term impacts of strategic decisions can not be fully appreciated at the beginning of the process. Organizations need to advance further in the planning before becoming fully aware of the aware of the implications at stake.

2.5.1 THE STRATEGY-MAKING PROCESS

To make strategy, different organizations combine the analytical tools of the rationalist school with some other elements defined by their internal informal relations. The appropriate mix of formal and informal elements will vary in

²⁸ Ibid. 24, p.45

different organizations, and is a mix of four factors that will determine how the strategic planning is carried out, i.e., the level of incrementalism in the process (Quinn²⁹, 1980):

1. Organizational culture

The culture prevailing in the organization is the first determinant of the strategic planning process. A dynamic, entrepreneurial oriented institution will undertake its planning activities differently than a more rigid and bureaucratic one.

2. Nature of the environment and opposition

The environment in which an organization is immersed plays a significant role in determining the type of process. When faced with a complex and changing environment and/or strong competition, errors and miscalculations can be extremely costly, and therefore the process tends to move step by step. Before committing definitely to a certain position, that posture is likely to be tested in a flexible way against the environment, adjusting it incrementally according to the obtained results.

3. Organizational form and management style

Organizations whose structure incorporates groups with different viewpoints, interests and certain level of operating independence will also tend to plan incrementally. The simple reason is that since imposing centralized solutions does not work here, consensus must be obtained through negotiation. Key elements that relate to this point are the influence that top-level management has in the decision making, and the opposition/indifference thresholds for each negotiating party.

²⁹ Ibid. 17

4. Time horizon and degree of control over events

The shorter the time horizon, the more rationalist the planning process tends to be. Interestingly, the key factor is not the time horizon by itself, but the degree of control that organizations have over events, i.e., how much is the final outcome determined by the actions and influence of the organization? Quinn found that even for long term horizons, planning was still quite formal as long as the company had reasonable control over the outcome. Furthermore, in the same organization and for the same long-term period the type of planning will tend to differ for activities with dissimilar degrees of control.

2.5.2 STRATEGIC GOALS: SPECIFIC VS. GENERAL

One of the principles of incrementalism that differs most from the formal school of planning is related to the issue of goal definition. In contrast with the accepted rationalist belief that goals should be specific, measurable and widely publicized, the managers studied laid out a small number of goals, broadly stated and rarely quantitatively measured. According to Quinn³⁰ (1977), the main reasons for this are

- Specific goals generate centralization in the organization and discourage desirable participation of subordinates.
- Specific goals easily become the focus for extended opposition that otherwise would develop in a fragmented way. Especially when dealing with controversial issues, or performing in a highly politicized environment, the use of broad objectives can help to keep the process

³⁰ Quinn, James B. Strategic Goals: Process and Politics. Sloan Management Review, Fall of 1997, p21-37

moving forward, avoiding resistance to concentrate on such narrowly defined points.

- After a specific goal has been announced it tends to be very difficult to change the direction of the organization. The goal is rapidly identified with the senior manager and the personnel endorsing it. In fact, accepting change in the goal appears as the acknowledgment of a mistake, and the image and decision-making ability of the managers may be affected. In an institutional perspective, a continual change of goals is regarded as a sign of unstable direction and lack of proper guidance. Because of all these, general goals are a good source of flexibility in the presence of uncertainty and limited information.
- Broad goals promote cohesion and identity by emphasizing widely supported ideas and omitting at that time the specific discrepancies that may exist among different views. More specific objectives can easily lose support from certain stakeholders, creating conflicts in the first stages of the strategic planning process. Clearly such details must be addressed at some point, but the incremental theory argues consensus has developed on a set of general objectives this is easier to do.

The use of specific goals has not been banished from logic incrementalism; rather they are reserved for certain particular conditions, in which their specificity is more appropriate. Selected specific goals can be announced at a proper time to create the momentum and energy necessary to produce a desired change. Proposing new specific goals is also a major statement of change from the past by focusing on different issues and actions. This role is especially important after an organization has suffered a crisis or major adversity. In addition to the above, we must also note that at a certain point the use of more specific

objectives and plans will be necessary to continue the strategic planning process.

2.5.3 LOGICAL INCREMENTALISM IN GOAL SETTING

The goal setting process requires active participation from many individuals to establish an organization's goals. At the same time, people in charge of the strategy formation need to keep control over the process. Although logical incrementalism involves a large participatory effort, Quinn acknowledges that the degree of cooperation can not feasibly reach a total consensus. Managers generally provide the main lines of the goals and then promote staff intervention and discussion to enrich the process and generate involvement at all levels. In short, strategic goals do not arise from an analytical action as suggested in the formal planning literature; rather they result from a process that moves step by step and evolves continuously.

2.5.4 INCREMENTALISM AND STRATEGY IMPLEMENTATION

Logical incrementalism provides also an alternative approach to implementing strategic goals. According to Quinn³¹ (1980b), the broad steps for doing so are

- Identify and address the main points of potential opposition and support. Of great consequence is also to distinguish "indifference zones", which are likely to face only moderate opposition and are potential compromise points. The underlying principles are to search for win-win situations, get the main players to support the objectives, and avoid alienating people as long as possible.

³¹ Quinn, James B. Managing Strategic Change. Sloan Management Review, Summer of 1980, p3-20

- Increase the personnel's comfort levels with new ideas. Most people perceive little known concepts as risky. Exposing managers to these concepts in a previously planned step-by-step approach can ease natural rejection and tension due to implementation of novel ideas, before actual implementation takes place.
- Improve the organization's ability to cope with uncertainty. At the beginning of the incremental planning process, the specifics of the task to be undertaken are not well defined. Therefore, actions such as the provision of flexibility, building reserve resources, and improving the organization's reaction time are central to the implementation. These actions include technology and environment scanning, developing a pool of human resources in specific areas, or maintaining independent sources of essential supplies.

After the path of the organization has become clearer, the following steps should include:

- Generate "pockets of commitment" within the organization. The use of team projects to study a particular issue of the strategy is a good way to do this.
- Formalize those pockets of commitment to boost focus and consensus. A common approach is the use of specific committees. Quinn notes that through the choice of the committee's participants, its resources and timing, its results can be largely influenced. These committees can also aim to evaluate, balance, or neutralize opposition; to generate new options; or to broaden support and commitment for a specific alternative. Many organizations choose to empower someone particularly identified with a view to lead the effort and on whom its success will depend.

2.5.5 DIMENSIONS OF STRATEGY

Quinn³² (1980a) proposes that we should think of strategy as having four basic dimensions:

1. The three *essential elements* of strategy
 - Main objectives
 - Guiding policies
 - Major action sequences
2. A few *key concepts* and *thrusts* that provide focus, cohesion and balance.
3. The presence of *uncertainty*
4. The need for a *hierarchical subsystem* of strategies

Each strategy must address efficiently its particular objectives and context. In addition they must be linked as integral elements of a hierarchical system. The set of strategies must support each other, they must be properly aligned toward the major goals of the organization.

We note that the *hierarchical subsystem of strategies* is analogous to Mintzberg's *integral system of decisions*. As mentioned earlier in this chapter, the importance of this systemic view in strategic planning can not be overstated. Let us use a transportation example to clarify this fundamental principle. In the next chapter we will review Prof. Porter's model of competitive strategy and we will see that a regional competitive strategy and regional transportation strategic planning are linked and can be thought as elements of an overall development strategy for a particular region. We will also see that the competitive strategy can lead planning and deployment of the transportation system in a region. It is

³² Ibid. 17

clear that these systems –development strategy, competitive strategy, and transportation strategy— are hierarchically linked. Figure 2.5 depicts this hierarchy.

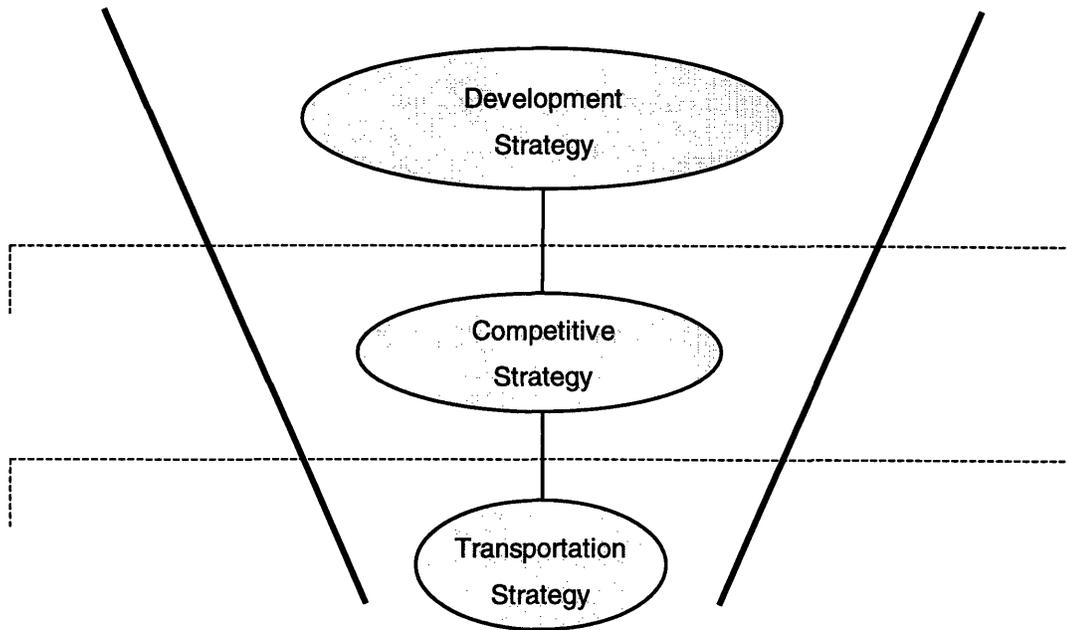


Figure 2.5
A hierarchy of regional strategies

In Figure 2.5, the development strategy occupies the top position in the hierarchy. It is followed by the competitive strategy –which can be seen as a tool to achieve the developmental goals— and then the transportation strategy –that analogously is a tool to achieve the competitiveness goals. The dashed lines represent the fact that there may be other components of the development and competitive strategy. In the same way, the strategic planning for the transportation system in the region is linked but in a higher level of hierarchy to the road access system of the main localities within the region.

2.5.6 SUMMARY

In chapter 2 we have reviewed the main principles and elements of strategic planning. We have also pointed out some of the approaches and flaws that are identified in the works of different authors in the field. After discussing some of the main issues involved in strategic planning for regional transportation systems, chapter 3 will highlight some implications and lessons that our discussion of generic strategic planning has in the context of regional transportation.

3. THE REGIONAL TRANSPORTATION CONTEXT

In the present chapter, some of the key changes and characteristics of current socioeconomic systems will be reviewed. These systems create the context of the strategic planning effort in transportation, which drives the definition of objectives for the transportation system. As a result, the increasing relevance of the features presented in the following sections is likely to reshape the provision of transportation systems around the world. We will address only two major components of this context: First, the relationship between transportation and economic development, and then the increasing competition faced by regions in the global economy. As part of this last issue, Prof. Michael Porter's framework for competitive strategy will be also studied.

3.1 THE REGIONAL SCALE

At the beginning of 1998, the United Nations listed 185 independent countries as Member States³³. We think of these nations as different population units that share essential elements as territory, language, economy, culture, institutions, beliefs, and so on. And within most nations there are smaller units –regions— that can be further differentiated by using additional characteristics.

The scope of this thesis is the regional unit. Some authors have highlighted the increasing relevance of regionalism in today's world. Omhae³⁴ (1995) states that we are witnessing the arising of "region-states", enabled by the globalization of trade, the rise of information technology and the dynamism of capital flows. While the concept or region evokes a strong geographical component, physical

³³ <http://www.un.org/Overview/unmember.html>

boundaries are becoming less important every day due to improvements in communication and transportation systems. Rodriguez et al³⁵, (1997) argue that the shared elements that determined our traditional understanding of “region” have lost relevance and a different characteristic has become the essence of a region: *common economic interests*. Under this view, the members of a region need not to be geographically linked or to share the same political/social institutions.

Regardless of the traditional or the economic-based understanding of a region, it is clear that the global economy has fostered competition among different regions of the world. In the words of Rodriguez³⁶:

“These regions recognize that global competition is at the heart of their economic success or their failure. The aim of a ‘competitive region’ is to offer its members access to low cost, quality goods; to provide low-cost resources; and to foster development and regional prosperity. “

3.2 TRANSPORTATION AND ECONOMIC DEVELOPMENT

3.2.1 THE MOTIVATION FOR INVESTING IN TRANSPORTATION INFRASTRUCTURE

Transportation is not an end to itself and “does not occur in a vacuum.” Transportation systems are closely woven to the daily activities of the society they serve. This relationship is dynamic by nature and works in both directions:

“Indeed, the transportation system will usually affect the way in which the socioeconomic system grows and changes. And changes in the

³⁴ Omhae, Kenichi. The End of The Nation State: The Rise of Regional Economies. The Free Press, 1995

³⁵ Rodriguez, Daniel A., Abel Muñoz-Loustaunau, Todd Pendleton, and Joseph M. Sussman. Regional ITS Architectures and the Competitive Region. Preprint CD-ROM, 77th Annual Meeting, Transportation Research Board, 1997

³⁶ Ibid. 35, p2.

socioeconomic system will in turn call forth changes in the transportation system."³⁷

The effort undertaken by different regions across the world to improve their transportation systems is motivated by the developmental effects attributed to transportation. It is known, intuitively and from past experience that investment in transportation infrastructure has an important relationship with the economic performance of a region. We also know that the economic effects of transportation investments can vary dramatically from one case to another. Due to the complexity of the problem, this intuitive relationship has not been established in a straightforward manner. One approach to study this issue is to review situations where the provision of infrastructure has yielded economic benefits, and to abstract conclusions on the common characteristics identified.

A general agreement exists in the extreme conditions: the effect of transportation infrastructure on the economy will be larger for areas where there are limited or no previous routes, and will be smaller for well connected regions. (Sheppard³⁸, 1989). These effects will also depend on the general condition of the economy in the area under study. In general, the effects of new infrastructure in a depressed economy will be mainly a redistribution of economic activity in the region, with small or none aggregate economic growth.

A study undertaken at MIT under the supervision of Prof. Joseph Sussman stresses the basic roles played by transportation in the economic activities (Pendleton³⁹ T., 1997):

³⁷ Manheim, Marvin L. Fundamentals of Transportation Systems Analysis. Vol. 1: Basic Concepts. Massachusetts Institute of Technology, 1979, p12.

³⁸ Sheppard, Eric. Transportation and Economic Development: The Geographical Literature. Minnesota Department of Transportation, Final Report, Appendix 1, 1989.

³⁹ Pendleton, Todd. Toward Greater Integration of Economic Considerations into Strategic Transportation Planning, Working Paper, MIT, 1997

1. Transportation *sustains* present economic activity.

The transportation system is a support and facilitating structure for the flow of goods and people generated by existing economic activity. The lack of adequate transport infrastructure will hinder the performance of some industries, and will completely exclude the presence of others. The key concern for the transportation system in this role is related to issues of capacity and maintenance of the infrastructure. Transportation facilities must be able to serve current flows without being incapacitated by congestion. Timely investments are needed to avoid deterioration of its infrastructure. In this role transportation generally seems to follow economic development, actually “catching up” with the preceding growth of traffic and economic activity in the region.

2. Transportation *retains* present economic activity

A natural trend generated by regional economic growth is the expansion of industrial activities in the area. Regional output increases and so does the need for inputs for the production process, resulting in higher transportation utilization. This is also true from the view of passenger transportation and the growing character of roadway traffic with the increase of per capita income is well known. A regional transportation system with inadequate capacity becomes a constraint to industry. Industries simultaneously facing this constraint and the incentive to expand due to the economic environment may move out from the region. To retain economic activity, it is obvious that a transportation system can not be planned exclusively to provide service for current traffic levels.. Although the concern is still the facility's capacity, the focus has shifted from traffic demand prior to economic expansion to increased traffic levels in the future. In this role, transportation investment happens before additional economic growth: it does not only precede economic growth, but it seems to function as a prerequisite for it:

“...infrastructure investment, more than most other types of investment, creates conditions for future growth well into the long run.”⁴⁰

3. Transportation *attracts* new economic activity

In the global economy, regions compete among themselves to attract resources to support its economic and social objectives. An important share of these resources come from “outside” companies that relocate or expand their operations to new locations. Of great relevance for these organizations is the choice of location and here the condition of the regional transportation system plays a third role. It must be remembered though, that provision of efficient and well-maintained transport infrastructure may not be enough to attract economic activities. Several other factors and regional characteristics play an important role on relocation/expansions decisions. According to some, while it is possible to think in a transportation system designed to increase the attractiveness of a region (recall our discussion about competitive advantage), measures of accessibility that would enable to rank the results achieved are still not satisfactory (Salvucci⁴¹, April 1998). Therefore, we can state only a broad purpose of transportation in this role: transport investments must provide an interconnected network that links the region with main markets and suppliers. Again, in this role transportation precedes economic growth in the region.

4. Transportation *physically link* regions to the global economy

We must recall from our discussion on competitive advantage that globalization has enabled regions to participate and take advantage of

⁴⁰ -----, Economic Returns from Transportation Investment. Eno Transportation Foundation, Inc., Forum Proceedings, July, 1996

⁴¹ Salvucci, Frederick. Senior Lecturer at MIT and former Transportation Secretary of the Commonwealth of Massachusetts. Personal Communication. April 1998.

opportunities all over the planet. In order to actually benefit from them, regions must be linked to the rest of the world's markets and suppliers. This fourth role of transportation is likely to occur before the increased economic activity derived from the new opportunities can take place.

The four roles discussed above provide a framework to conceptually evaluate the transportation system in a region. Figure 3.1 depicts the structure of such framework. Because transportation should be a tool to achieve higher objectives, its efficacy and "value" will depend on those objectives. If a region's primary concern is to avoid the loss of production and employment, this will translate into a higher relevance attributed to projects that improve the retaining ability of the transport system.

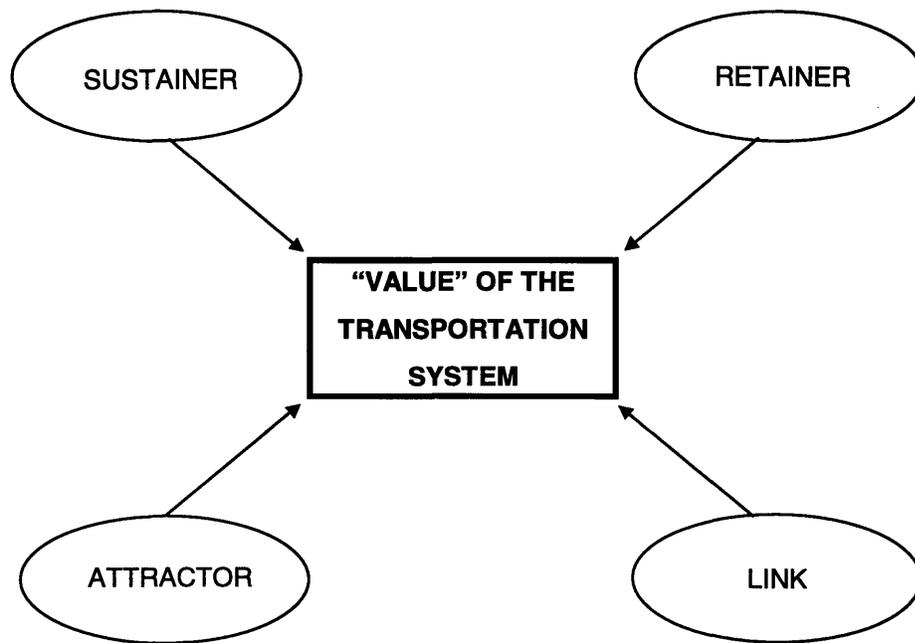


Figure 3.1
A Conceptual Framework for the Evaluation of
Regional Transportation Systems
(based on Pendleton⁴², 1997)

⁴² Ibid. 39

3.2.2 THE IMPACTS OF TRANSPORTATION INFRASTRUCTURE

Vickerman⁴³ (1991) states that there are three basic effects of transportation investments in the economy of a region:

- Type A effect –*corridor effect*— in which the infrastructure does not generate much impact in the region, and the traffic just passes by.
- Type B effect –*crossroads effect*— that improves the transportation link from/to the region.
- Type C effect, which improves regional productivity by reducing the transportation costs within the region.

Simon⁴⁴ (1996) states that there are four specific impacts of investments in transportation infrastructure:

1. Impacts during construction.

These result from the effect of the initial investment to deploy the infrastructure. The most evident direct effects take place in the hiring of labor services, and purchase of equipment. Indirect effects in the region can become equally important, as a consequence of interaction in the economy. If companies and workers involved in the project spend their share of the investment on goods and services produced in the region and the investment comes from external sources to it, additional employment and economic activity will be generated.

⁴³ Vickerman, R.W. (editor). Infrastructure and Regional Development. Pion Limited, London, 1991.

⁴⁴ Simon, O. The Economic Impact of Transport Infrastructure Provision: a Review of the Evidence. Proceedings of the Institute of Civil Engineers: Transport. Volume 117, Issue 4. November, 1996

2. Increase of production in the medium and long term.

If the new infrastructure increases transportation efficiency, a reduction of transportation costs will be generated. The effect of this reduction on the overall production costs will vary depending on each particular industry. Transportation has different incidence in the structure of costs for manufactured goods, bulk commodities and perishable products. For cases where transportation costs are an important part of the production cost, the impact will be higher. An important consideration is that the provision of improved infrastructure works in both directions: outside companies may be able to reach the local market with reduced prices. If regional productivity is dampened by factors others than transportation, new investments can intensify the competition faced by local companies. We can summarize this idea stating that the reduction of transportation costs that benefit basically local producers rather than outside companies will only happen when the lack of transportation infrastructure is a *binding constraint* of production.

3. Value of property in and around the area.

In general, an improved transportation network will increase the value of the property around the area. Industries prefer to locate in well-connected regions to reduce their operating costs. For companies in the service sector, this network also provides accessibility to the customers upon which they rely to survive. This is generally also true for agricultural land: better access to urban markets, to the rest of the country, or to the international economy, tends to increase profitability and raise the value of the land with it. In a recent study undertaken at MIT focusing on the metropolitan area of San Juan, Puerto Rico, Daniel Freire⁴⁵ (1998)

⁴⁵ Freire, Daniel. The Potential Economic Development Opportunities of Tren Urbano. Master in City Planning/Master of Science in Transportation Thesis. Department of Urban Studies and Planning, Massachusetts Institute of Technology, Cambridge, MA, 1998.

highlights that density is a major variable in the effect that transportation investments have in the economic development of urban and suburban areas. Sheppard⁴⁶ (1989) points out that industries heavily dependent on transportation services prefer to locate near the terminal or major nodes of the network (i.e. locations near a market, a supplier or a transshipment point). For these companies:

“...an improvement in the transportation network would tend to reinforce the attractiveness of terminal locations if that improvement tended to reduce the importance of per-mile relative to terminal costs, but would favor intermediate locations if the converse were true.”

4. Technological Progress and Innovation.

Improving the transport links to a previously isolated region facilitates the access of new technological products and services to these newly connected areas. The first step to get an isolated community into the computer age may well be to build the transport infrastructure that assures a fast, reliable, and cheap distribution of the computer products and services. Although additional investments are clearly required to generate such technological impacts, transportation infrastructure enables this progress.

3.2.3 MEASURING THE EVIDENCE: THE US INTERSTATE HIGHWAY SYSTEM

Several studies have been carried out at the national scale in the US, dealing with a macroeconomic approach to the Interstate Highway System. They have related the investments to deploy this system with the economic performance of industries. This has been done either by using a production function that defines the output produced by industries for a specific mix of inputs, or a cost function that indicates the change of the cost of production with the level of

⁴⁶ Ibid. 38

output. In general, these studies show that the Interstate Highway System has substantially improved productivity in the US. Nevertheless, there are important differences in the rates of return yielded by these public works. Some of the differences can be explained based on different methodologies, while some others then result from statistical problems when handling aggregate data, or simplifications in the models that do not reflect the structure of production and transportation infrastructure with sufficient accuracy (USDOT,⁴⁷ 1995).

As an example of these type of studies, the US Federal Highway Administration uses the following three approaches (Binder and Smith⁴⁸, 1996):

- Macroeconomic analysis, to study the magnitude of the impacts of infrastructure at a regional and national level.
- Microeconomic industry analysis, to study these impacts from the perspective of the industries. It uses logistics costs, level of service variables, and econometric analysis to identify how that infrastructure investment is transformed into private sector productivity
- Assessment of the highway system, to review the value of the infrastructure based on the service provided rather than on the amount of investment. It also studies the enhancement of the system's connectivity yielded by a particular road.

A recent investigation by Prof. Ishaq Nadiri⁴⁹ (1996) has overcome many of the statistical limitations of previous research that intended to address the relation between transportation and economic development. Prof. Nadiri's results

⁴⁷ ----- . Transportation Investments and Economic Performance. Transportation Statistics Annual Report, Chapter 7, USDOT, 1995

⁴⁸ Binder, Susan and Theresa Smith. The Linkage between Transportation Infrastructure Investment and Productivity: A U.S. Federal Research Perspective. In *Infrastructure and the Complexity of Economic Development*, David F. Batten & Charlie Karlsson eds., 1996.

⁴⁹ Nadiri, Ishaq, Highway Capital Infrastructure and Industry Productivity Growth. Executive Summary, Draft Final Report, New York University, 1996

confirm that for the past forty years, public investment in highways in the U.S. has yielded a significant positive economic return. An important additional result obtained by this study, shows that increase in non-local road system (NLS) capital stock (i.e., main or “interconnective” highways), yields a greater economic return than an increase in total highway capital stock. Table 3.1, summarizes the findings of this research (Nadiri,⁵⁰ 1996 and Eno Transportation Foundation⁵¹, 1996):

	1950-59	1960-69	1970-79	1980-89	1950-89
Total Highway Capital	35%	35%	16%	10%	28%
Non Local Highway Capital	48%	47%	24%	16%	34%
Private Capital	13%	14%	12%	11%	13%

The numbers in Table 3.1 seem to confirm our basic ideas on transportation and economic growth: the rates of return yielded in the earlier years of the system (1950s and 1960s) are notably higher than in recent decades. Still, the rate of return yielded by investment in total highway capital in the past decade remains competitive when compared to the private rate of return in the same period. The larger return of the prior years has been explained as a result of at least the following factors (Eno Transportation Foundation,⁵² 1996):

- A strong demand for transportation and a rapidly expanding economy in the United States.
- The fact that a large pool of industries benefited from the public investments in transportation.

⁵⁰ Ibid. 49

⁵¹ Ibid. 40

⁵² Ibid. 40

- A natural process in which after the first investments in transportation met the initial needs and the highway system matured, subsequent investments become basically alternatives for the existing roads, thus producing lower rates of return.

The following are among the conclusions that can be drawn from Prof. Nadiri's work (Nadiri,⁵³ 1996 and Eno Transportation Foundation⁵⁴, 1996):

- Transportation investments are able to produce a large positive effect on the economy. The fact that this does not always happen strongly suggests that these investments must be done compatibly with the particular economic context of each region and with other policies like zoning and taxes.
- The rates of economic return of highway investment vary significantly over time, according to the location of the roads, and apparently according to the sequence in which they are made. Provision of interconnected roads seems to have generated better results than local relatively unconnected roads.
- While the rate of productivity growth in the U.S. economy has benefited substantially from investment in highway infrastructure, the main factors were external to highway capital provision, mainly those related with national income and growth in population.

With the above conclusions we finish our study on transportation and economic investment. In the following section we will introduce the concept of competitive strategy and will discuss its relationship with regional strategic transportation planning.

⁵³ Ibid. 49

⁵⁴ Ibid. 40

3.3 COMPETITIVE STRATEGY: A FRAMEWORK FOR REGIONAL TRANSPORTATION

In chapter 2, Figure 2.4 depicted a hierarchy of regional strategies. In this hierarchy the strategy for social and economic development occupies the higher position followed by the competitive strategy. In what follows we will review Prof. Michael Porter's framework of competitive strategy, which this thesis argues can shape strategic planning for regional transportation.

The ever-increasing pace and technological breakthroughs of the past decades have defined a clear trend that is likely to become the basic structure for the world in the next century: worldwide economic integration and globalization. The advances in transportation and telecommunications have made it possible to increase and improve mobility and accessibility of people, freight, and information in ways not conceived a few generations ago. This new accessibility has promoted a new state of increasing economic interdependence in the world. Companies are not only trying to find new markets or suppliers outside their borders; they are also changing the location of their facilities, expanding and diversifying their operations in the face of growing competition among regions and countries to attract these resources. On the other hand, opportunities that were the privilege of a reduced pool of participants because of their proximity to a specific geographic area can be now seized by a larger number of parties.

In a first approach, there is a competitive challenge for regions at two different levels:

1. Competition among a particular region and other areas (regardless if they are inside or outside the national borders) to attract international investments and take advantage of the opportunities generated by the international context.
2. Competition among a region and other areas of a country for the distribution of national resources.

Both levels will be treated jointly; unless specifically stated, there will be no differentiation between them in the following pages. When referring to “other regions”, we can think of either other areas in the same country, or a territory located in a completely different part of the world.

3.3.1 STRATEGY AND THE “COMPETITIVE ADVANTAGE OF NATIONS”

In his book, “The Competitive Advantage of Nations” (1990), Porter⁵⁵ addresses the issue of competitiveness from the national perspective. While the book makes a deep analysis of different industries in several countries, this section will only review the central ideas and their relation with the topics of competitive strategy that will be studied later in this chapter.

The basic thrust in Porter’s framework is that each country has some individual industries that compete successfully on a world-wide basis because their native environment provides advantages that are valuable in the international markets. The main policy role would be to identify and develop those advantages and the factors that produce such ascendance. The main source of national competitive advantage is *innovation*, which is itself generated by (Porter⁵⁶, 1990):

- New technologies
- New or shifting buyer needs or priorities
- The emergence of a new segment of an industry
- The change in input costs or availability
- The change in governmental regulations

⁵⁵ Porter, Michael E. The Competitive Advantage of Nations. The Free Press, 1990

⁵⁶ Ibid. 55

Acquiring an advantage is not enough to compete successfully in today's world. Bench-marking and competitor analysis techniques have allowed the replication of many of the operations and tactics of the leading corporations. It is necessary to sustain the competitive advantage gained. Porter⁵⁷ states that the ability of a particular industry in any nation to maintain its preeminence against competition depends on three elements:

1. The source of the advantage, which can be
 - a) "Low order" sources, i.e., cheaper costs of labor and raw materials, or the existence of economies of scale. Low cost resources can be relatively easy to find in other regions and the existence of economies of scale is also readily available to competitors.
 - b) "High order" sources, for instance, the possession of proprietary processes, technology and the presence of differentiation from competition based on the uniqueness of the product/service provided. These sources are more difficult to imitate and are less available to rivals.

2. The number of distinct sources of advantage.

Industries should obviously try to multiply the number of sources of advantage they have. The more advantages they have, the more difficult will be for competitors to threaten their viability.

3. Constant improvement and upgrading

The most important element of a sustainable advantage is the constant effort to progress and enhance the product or service delivered to the consumer.

⁵⁷ Ibid. 55

Figure 3.2 presents the well-known “Porter’s Diamond” with the factors that determine the competitive advantage of a nation’s industries. These determinants are also listed below (Porter⁵⁸, 1990):

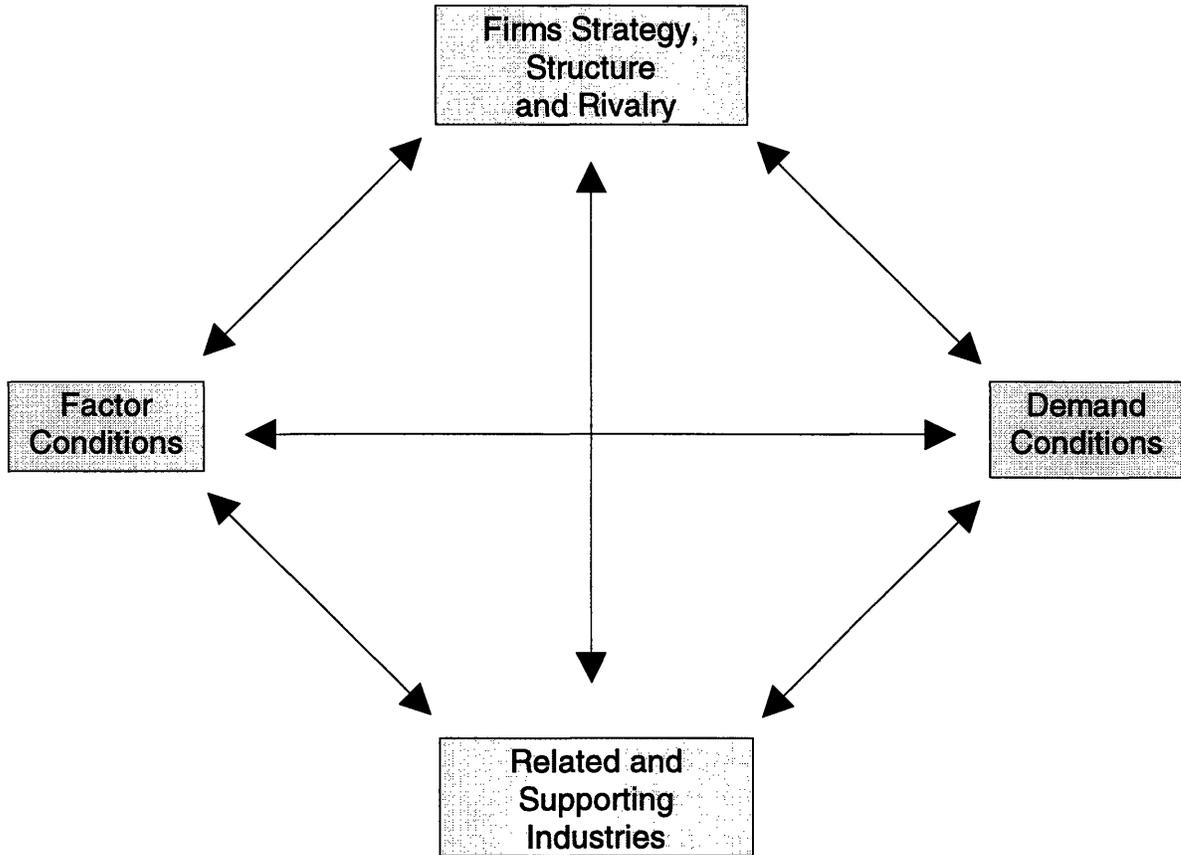


Figure 3.2
The Determinants of National Advantage
(Porter⁵⁹, 1990)

- Factor conditions: the availability of the production factors in a nation; skilled labor, infrastructure, capital.
- Demand conditions: the structure of demand for the product or service; segmentation of demand, and sophistication of buyers.

⁵⁸ Ibid. 55

⁵⁹ Ibid. 55, p72.

- Related and supporting industries: the presence of lack of efficient suppliers and related industries.
- The firms' strategy, structure and rivalry in the industry

As examples of how these elements shape the competitive advantage of a nation, Porter states that intense domestic rivalry provides a strong incentive for innovation and improvement in the industry. Similarly, the presence of highly sophisticated buyers in the domestic market provides the national industry with an advantage for competing overseas.

3.3.2 COMPETITIVE STRATEGY AND STRATEGIC PLANNING IN THE REGIONAL CONTEXT

“Developing a competitive strategy is developing a broad formula for how a business is going to compete, what its goals should be, and what policies will be needed to carry out those goals”⁶⁰

From this quotation it can be seen that the concept of competitive strategy is linked to –actually encompassed by– the process of strategic planning. Nevertheless, a competitive strategy emphasizes the relation of the organization to its environment, and furthermore, it narrows the scope of the environment by focusing on the particular industry or industries –the niche– in which an organization competes.⁶¹

Porter's framework starts with the goals of the organization and the means to achieve them. These goals define the way in which the organization will compete. As we saw in the previous chapter, the first step in the rationalistic approach to planning is a statement of the mission to be achieved by the organization. This work argues that both the ideas of competitive strategy and

⁶⁰ Porter, Michael E. Competitive Strategy: Techniques for Analyzing Industries and Competitors. The Free Press, 1980

⁶¹ Ibid. 60

strategic planning can be easily transferred from the corporate to the regional context.

A statement of the region's objectives, expectations and aspirations is needed to start. The SWOT analysis constitutes an essential element for competitive strategy and strategic planning for regions. The rising of economic and trade blocks across the world can be thought as an opportunity of development for a large number of regions worldwide. A recognized weakness, especially in developing nations, is the poor condition of the transport and communication infrastructure. And the increased state of competition can be a threat for certain regional economies.

After the definition of goals the following step to develop a regional competitive strategy is to identify the environment and distinguish the niches in which the region competes or would like to compete. Here, the aspirations of the region can give an idea about the new areas of competition that should be considered. It is also useful to identify different scales of competition (national and international) along with institutional, economical, environmental and technological issues that affect the region's competitive performance. It is possible to find niches of competition for a region in the following general clusters:

- Products and services that the region currently generates.

The simplest niche to identify is the one formed by different regions that compete to sell their products and services in the same market. The products and services that define a niche should include those that are similar and substitutes.

- The “attractiveness” of a region

A region also competes to attract resources to support its economic and social objectives. These resources include federal funding, private (national and international) investments and population. Improvement in the regional infrastructure, e.g. a renovated transportation system that provides easier access and greater mobility, will increase the attractiveness of such a region in the eyes of national and foreign companies interested in establishing a new factory or branch. In the face of growing international trade, a major concern for certain regions does not relate only to their ability to attract companies or population. A central issue in these areas is the ability to provide efficient freight transportation and therefore be chosen as a regular path to move goods and commodities from production areas to market centers.

- Current and future opportunities

As mentioned previously, more regions can take advantage of the opportunities that arise in a global market. Different geographic areas can take advantage of their specific characteristics and improve their capacity to compete in the international arena. As will be shown later in this thesis, an example of a future opportunity for several South American regions has been identified in Asia and the Pacific Rim: the possibility of a large increase in food demands from countries like China and India (Sussman et al,⁶² 1996). Nevertheless, major infrastructure investments currently under consideration are necessary to improve the accessibility of these markets for the agricultural and food-processing regions of South America.

⁶² Sussman, Joseph M., Xing Yang and Carl Martland. Toward the Development of a Strategic Transportation Plan for Mendoza, CIT/MIT Joint Program Report, 1996

3.3.3 COMPETITION ANALYSIS AT THE REGIONAL SCALE

According to Porter⁶³ (1980), the state of competition within an industry is given by the interaction of the five basic competitive forces:

1. Threat of new entrants into the industry
2. Threat of substitute products and services
3. Bargaining power of suppliers
4. Bargaining power of buyers
5. Rivalry among existing firms

To understand the state of competition in each of the niches of competition of a region it is necessary to make a deep analysis of these five forces in each industry of interest. Let us consider as an example the wine exports of a region into a neighboring country. The analysis can start with the following questions:

- How likely is e.g. that producers in other neighboring countries start to sell wine for the consumer nation? Is there any local production likely to increase their share of the market?
- Is it feasible that demand for wine in the market will decrease due to greater commercialization or improved marketing of other liquors or beers?
- Is the wine business in the consumer country a buyer's or a seller's market?
- Do rival companies often get into cut-throat price reduction to attack competition?

Depending on the conditions of each particular case, an effective competitive strategy must be able to perform the following (Porter⁶⁴, 1980):

⁶³ Ibid. 60

- a) To identify and locate the region in a certain position in the niche where its capabilities can provide the best defense against the current competition.
- b) To change the balance of competitive forces and by this mean improving the region's position in the niche.
- c) To anticipate changes in the competition, therefore allowing us to think how to take advantage of the future state of competition before the shift actually happens.

Porter⁶⁵ (1980) also discusses the three generic tactics used to deal with competition:

1. Overall cost leadership
2. Differentiation: achieving a general perception of uniqueness in the industry
3. Focus on a specific segment of the market

He acknowledges that each generic tactic implies certain requirements and risks. A common risk is simply not reaching a leadership position in these generic tactics and get stuck in the middle of the scale, which results in a poor competitive position.

While the best tactic for a region will clearly depend on the characteristics of the competition within the niche considered, overall cost leadership is an important advantage when speaking of regional competition. The understanding of how this leadership can be achieved is also relatively straightforward: it is generated by the combination of several identifiable factors like labor costs, tax levels, financial rates, and the availability of infrastructure, services and technology.

⁶⁴ Ibid. 60

⁶⁵ Ibid. 60

Developing a perception of differentiation in a region is a more complex and uncertain matter. What exactly gives a region dominance in the performance of certain activities? (electronics and computers in Silicon Valley; wines in Bordeaux, France; tourism in the south of Spain). Great effort and a long period of time are usually required to yield the desired results. As a first conjecture, we can think that constant and planned efforts along with advanced technology, limited-access know-how and/or unique characteristics of a region, may promote its differentiation. The above ideas suggest that logical incrementalism is a planning framework well suited for undertaking these efforts.

The third tactic is to focus on a specific portion of a market with particular needs. It can be used in any of the niches identified by a region, either by satisfying the special requirements of designated customers, or by generating the particular conditions that will attract a specific industry or resources.

Porter stresses the need for a complete and sophisticated study of the competitors and provides a complete framework for doing it. The basic components of this analysis should be (Porter⁶⁶, 1980)

- Competitors' future goals
- Competitors' assumption about themselves, the niche and the other regions competing
- Competitors' current strategy
- Competitors' capabilities

In what follows, a more elemental approach is sketched for the clusters of niches previously identified:

- Products and services currently generated by the region.
What are the characteristics of the markets? Who are the additional suppliers? What are the differences/similarities among products and services? What are the prices paid for the products? What routes and distribution chains are used?
- The attractiveness of the region
The first step here is to analyze all the sources of support available for the region. As different sources like international capital flows and federal funding have different behavior and criteria for resource allocation, these characteristics should also be studied. Then it is possible to make a comparison of the regions that are competing to attract financial resources, jobs or population. A set of strength and weaknesses in view of other regions will arise and will point the direction for the following steps to take.
- Current and future opportunities
Looking back to our previous example, if a region is interested in supplying food for the large populations of the Pacific Rim, the structure of the world food market should be analyzed. According to Business Week⁶⁷ (1996) there are signs that a new trend in this market has started. After years of stable or decreasing prices, a growing demand and the limitations to significantly increase supply is likely to rise prices continuously in the following years. Important economic and geopolitical implications are involved. One of the expected effects of this new trend is to

⁶⁶ Ibid. 60

⁶⁷ _____ . *The Economics of Food*. *Business Week*, May 20, 1996, p78-84.

“...transfer wealth from food consumers to food producers across the globe.”⁶⁸

The main competitors in this niche will likely be traditional supply countries: US, Canada, Argentina, Brazil, Europe, Australia and South Africa. A study of their characteristics, strengths and weaknesses is needed. Transportation costs would be a major variable in the competition for this market. Therefore some regions would need to make significant improvements in their freight transportation networks to perform adequately in this niche.

3.3.4 THE SYSTEMIC NATURE OF A COMPETITIVE STRATEGY: STRATEGIC FIT

In the previous chapter, we discussed the relevance that Porter’s attributes to the tradeoffs in strategy. The systemic structure that Mintzberg and Quinn identified is also recognized by Porter: the existence of tradeoffs provides the key to structure a sustainable competitive advantage. The way to achieve this is combining the strategic activities to generate fit among them.

Porter⁶⁹ (1996) identifies three types of fit:

- First order fit: *simple consistency*

The simplest fit is that the activities undertaken by an organization –a region in our case— be consistent with its objectives. Each function that is performed consistently with the regional objectives adds its share to the total competitive advantage. Inconsistent activities, on the other hand, will reduce the competitive advantage of the region.

⁶⁸ Ibid. 67, p79

⁶⁹ Ibid. 20

- Second-order fit: *reinforcing activities*

In this case activities are not only consistent with the final objectives; more importantly they support each other. When performing a function by itself reinforces the results that will be obtained by other task the overall effect is intensified. In a corporate environment, an example of this relationship is the double effect generated by advanced research of companies competing in the market of electronic equipment such as Sony. Technological research is used not only to produce more advanced systems than the rivals', it is also used as a powerful marketing tool. High-tech research is an independent activity that reinforces a completely different one. In a regional context, second order fit would imply, e.g., that the educational system of the region helps to attract external industries that find in this area a source of skilled professionals that are essential to their operations.

- Third-order fit: *optimization of efforts*

A deeper integration can optimize the results. A common way to achieve this optimization is by avoiding redundancy and wasted effort in the activities. It well may be that the most efficient solution to provide emergency medical service to a set of isolated mountainous communities is not to build a road to get to the nearest hospital in the area, but to establish a small telecommunication system linked to helicopter emergency teams. In the same way, an educational broadcast system can be use to provide high school instruction to these villages with a single teacher instead of several dozen.

Overall, a primary concern in all types of fit must be to focus on the entire system of activities:

“...the whole matters most than any individual part. Competitive advantage grows out of the entire system of activities... Strategic fit among many activities is fundamental not only to competitive advantage but also to the sustainability of that advantage. It is harder for a rival to match an array of interlocked activities than it is to imitate a particular sales-force approach, match a process technology, or replicate a set of product features.”⁷⁰

3.4 THE NEED FOR PUBLIC/PRIVATE COOPERATION

As can be perceived from the previous discussion, the development of a competitive strategy at a regional scale is not a simple task. Several facts suggest that a close collaboration between the public and private sector is needed to achieve best results:

- A regional study of competition niches and competitors will likely require large amounts of information and resources from public and private organizations.
- Some of the parameters that affect the competitiveness of a region will be primarily under private sector control, while some others will depend on governmental actions and policies.
- The definition of the regional objectives that is the first step in the process will be enriched if it involves the views of the public and private sectors. This will help to make these objectives a comprehensive list of regional expectations and aspirations.
- Finally, and most important: the need to align the regional strategic activities in a self-reinforcing way asks for close coordination between government and private organizations. The regional industry will know first-hand of the objectives that are to be pursued and therefore can adapt operations to better suit the regional strategies. And because it participated in its development, the objectives will not be disconnected from private sector resources and needs.

⁷⁰ Ibid. 20

The need for public/private cooperation is a major issue for the development of regions and their economic performance. A region can take advantage of the strengths of both sectors. In what follows and in a first approach, some ideas on the roles for the public and private sectors by each cluster of competition niches are presented:

- Products and services currently generated by the region.

The improvement in competitiveness in this area is mainly a private sector task. The role of the government is to provide a stable environment that encourages market competition, cares for the public interest and promotes growth in productivity. A combination of the public and private capabilities is likely to maximize and speed the benefits of a competitive strategy.

- The attractiveness of the region

Improving the attractiveness of a region requires a deep involvement of the public sector. Public institutions have the appropriate tools to lead and undertake a considerable portion of this effort, but again a joint participation with the private sector would tend to enhance the outcome of the process.

- Current and future opportunities

In this case, the predominance between the public and private sector roles is likely to vary from case to case. The private sector would seem more efficient in perceiving new opportunities or threats to the region's performance in the global economy. After this has occurred, the private concerns need to be transmitted to the public agencies, who must react to this new change in a timely manner. Depending on the nature of the threat or opportunity, the predominance of the government role in the regional response will vary.

3.5 LOOKING AT THE BIG PICTURE: COMPETITION, COOPERATION AND “COOPETITION”

We have presented in this chapter Porter’s framework of competitive advantage and competitive strategy as a tool to be used in the context of regional strategic transportation planning. This tool is generally well regarded by managers due to its usefulness and efficacy in improving the situation of an organization.

But there are also people who argue that if we take a step backward and look at a larger picture, the competitive model presents an undesirable side (Salvucci⁷¹, April 1998). It is based on a “zero sum game”, which implies that there will always be winners and losers: companies that become leaders are profitable and companies that fail and go bankrupt. What could look like a standard business reality takes a whole new perspective when competitive strategy is applied to the regional scale. The losers here are not companies with 100 employees; the losers are nations and states with millions of unemployed and unnourished. The stakes are high and no one wants to become a loser, so the result is a further incentive to improve the competitive status to stay afloat.

Brandenburger and Nalebuff⁷² (1996) have proposed a different approach for the business context, an approach that combines cooperation and competition:

“Business is cooperation when it comes to creating a pie and competition when it comes to dividing it up. In other words, business is War and Peace. But it’s not Tolstoy –endless cycles of war followed by peace followed by war. It’s simultaneously war and peace.”

“Coopetition” is the word that defines this approach. Knowing when to compete and when to cooperate is the secret.

⁷¹ Ibid. 41

3.6 IMPLICATIONS FROM THE STRATEGIC PLANNING AND THE REGIONAL TRANSPORTATION CONTEXTS

So far, this work has presented some of the most relevant aspects of the strategic planning and regional transportation contexts. This section summarizes the implications and lessons that can be drawn from the previous discussion.

3.6.1 FROM THE STRATEGIC PLANNING SIDE

Based on our discussion of generic strategic planning in Chapter 1, we can raise the following points:

- *Strategic Planning for Regional Transportation will tend to develop in an incremental way at least in some aspects.*

The complexity of the regional context and the close involvement of transportation with the socioeconomic system predispose the strategic planning process for regional transportation to a certain degree of incrementalism. Using Quinn's ideas on the strategy-making process, we can see that while the culture prevailing in the regional organizations will clearly vary from case to case, the remaining three determinants of the strategic process strongly suggest a substantial presence of incrementalism:

- ◇ The environment faced by a region is very complex and in constant evolution. National economy, politics, and the presence of globalization trends in trade and financial markets are influential elements surrounding the planning process.

⁷² Brandenburger, Adam M. and Barry J. Nalebuff. Coopetition. Currency Doubleday Ed. 1996, p4

- ◇ In the regional context the structure of the “organizational form” is a wide array of stakeholders from the public/private arenas. Most of them are independent from each other and have different –even conflicting— interests.
 - ◇ Due to the scope of regional activities, the time horizon is clearly long-range, and the complexity of the environment produces a medium-to-low degree of control over events.
- *The development of a regional transportation strategy for the future will require a choice between different alternatives identified for a region.*

Mintzberg and Porter reminded us that strategic planning is “fundamentally choosing” among several options. From the latter author, we must also remember that choosing between strategic decisions involves facing tradeoffs. The tradeoffs that regions are likely to face are complex in nature and will not be easy to reach consensus in them.

- *If a region wants “flexible strategic planning” , it must improve its capacity to deal with the future.*

Quinn’s work showed that the use of broad goals can provide room for flexibility while allowing the planning process to move ahead. We also acknowledged that at some point particular objectives and plans will need to be addressed. Mintzberg’s emergent strategies highlighted that after unexpected changes in the environment, the organizations’ reaction will depend on the flexibility of their strategic planning process.

- *The provision of such flexibility in the strategic planning process should be based on the development of the regions’ human resources.*

While there are undoubtedly institutional changes that can improve this versatility to deal with a changing environment, the key elements are the individuals within the regional organizations participating in the transportation

planning activities. Regional institutions must develop human resources that perform efficiently in a quickly evolving environment and able to adapt in order to face the new challenges to come. Managers of private and public regional organizations should become familiar with the new ideas that are being constantly generated and are likely to affect their activities. Technology scanning and environmental scanning practices can be of great help to this end.

- *Regions should acknowledge the two primary components of strategic planning –strategic thinking and strategic formalization-- and structure their own process accordingly.*

Mintzberg's division between strategic thinking and strategic formalization suggests that different skills are required for each of these activities. By recognizing the need to combine analysis with intuition and synthesis during the process, the value of the rationalist model of planning is also recognized. This model can generate an incentive for thinking about the future and provides the framework to implement the decisions taken. To avoid the excessive formalization of the process, regions should structure their strategic planning process based on the different characteristics and skills required for creating and formalizing strategy.

- *Regions should have both general and specific goals.*

Regional decision-makers can use a set of broad goals to start and advance the planning process with the initial consensus of diverse participants. They can also decide on the necessity and timing of announcing a few specific goals to generate a dynamic and intense response.

3.6.2 FROM THE REGIONAL TRANSPORTATION SIDE

The discussion on the relationship between transportation and economic development and the ideas of competitive strategy highlight the following issues:

- *To fully obtain the economic benefits of new transportation infrastructure, these investments should be properly integrated with the overall regional strategies.*

Provision of transportation infrastructure will not automatically trigger economic growth. From the existing evidence, although transportation infrastructure is a prerequisite for it, it seems unable to produce such growth exclusively by itself. The decision to deploy new infrastructure requires the consideration of the economic, social and institutional environment of the region. And all new projects should be responsive to the overall strategies and goals defined by the region.

As mentioned earlier, the structure of costs of the users of transportation is an important element of the economic analysis required to assess the effect of new investments in infrastructure. Therefore, as part of this coordination effort the major industries and producers of the regions, and their competitive counterparts should be studied from this viewpoint. As a corollary, regions should use its regulatory (or deregulatory) capabilities to encourage the elements of productivity not related to transportation as well.

- *Regions can use the different roles played by transportation in economic activities to assess their transportation system and evaluate future projects.*

Regions should aim for a balanced transportation system able to sustain existing economic activity, retain expected economic growth, attract economic external activities and link them with the main centers of the global economy. But “balanced” does not imply that the four roles should be equally important; rather it means that each role must be performed accordingly to the region’s needs. Based on higher-level objectives, each region should decide on the appropriate weight of these four roles in its transportation system.

- *Regions should aim to structure their transportation network in an interconnected way.*

Regions should try to provide the “interconnectivity” characteristic that was proven to generate the higher economic returns in the U.S. The provision of infrastructure to link new and existing sections of the system to the main network is an important part of the regional transportation effort. Regions should also be conscious of the larger economic benefits of the first provisions of infrastructure in an area. Except in the presence of congestion, investments should be oriented toward the generation of new solutions for transportation needs, rather than providing alternatives to existing routes.

- *Providing a market orientation and a competitive element in the regional transportation system is important.*

Transportation investments must meet the expectations of current and future demand in the region. The infrastructure must respond to the user’s needs and should benefit the largest possible number of users. This is not likely to occur in a transportation system lacking the incentives of competition. Regions should use their institutional capabilities to encourage competition in the transportation system and other related fields.

- *Developing a competitive strategy can enrich, refine –and even lead— the process of strategic planning for the transportation system in a region.*

As mentioned before, transportation is a tool that provides specific services to different users. This tool can be designed in a way to better serve the regional objectives previously defined. If a region undertakes a competitive strategy as the core of its development effort, the objectives of such strategy will lead the development and deployment of the transportation system and will shape its transportation strategic planning process.

With its narrowing approach to the environment of a region by refocusing on its different niches of competition, a competitive strategy can provide a foundation to take the strategic planning task to a more concrete stage. It can help to recognize needs and features related to particular industries and identify what the transportation system should provide to improve the competitiveness of the region in several fields.

Furthermore, Sussman et al ⁷³ (1996) noted that the strategic planning for the transportation system in a region should not be considered a static process, but a dynamic one. It requires a continuous effort of revision and improvement. Thus, the fact that the competitive analysis will be used as an input for a new cycle in the planning process is not beginning from scratch, but a refining operation.

3.7 SUMMARY

Chapter 3 has reviewed three elements of the regional transportation context: the growing relevance of regions, the relationship between transportation investments and economic development, and the increased state of competition present in the global economy. It has also raised some implications and lessons obtained from our discussion of the regional transportation and strategic planning contexts. Chapter 4 will close the framework part of the thesis by presenting the organizational context in which the development of scenarios for transportation planning will be studied.

⁷³ Ibid. 62

4. A DIFFERENT ORGANIZATIONAL CONTEXT: PUBLIC/PRIVATE PARTERNSHIPS

4.1 CHOOSING THE ORGANIZATIONAL CONTEXT.

As mentioned at the beginning of the thesis, one of its objectives is to show how scenario building fits in the overall framework of modern transportation strategic planning. Having reviewed some of the issues involved in strategic planning and regional transportation, the previous chapters have noted the basic characteristics of the environment in which scenarios will be used. This chapter will define additional features of this environment by choosing a particular organizational context for the use of scenarios.

The organizational context chosen is what has been called “public/private partnership”. These particular organizations are formed with participants from the public and private arenas in order to achieve certain goals. While their structure, operation, time-span and scope of involvement varies largely, the beneficial character of this organizational arrangement is generally accepted. Explaining the rise of the public/private partnerships Colman⁷⁴ (1989) asserts that:

“It is not only logical but inevitable that in a democratic system governmentally and a capitalist, free enterprise system economically, the general goals and interest of public and private sectors be compatible and mutually supportive most of the time.”

Despite the theoretical legitimacy of this view, experience has shown that traditionally the scope for public and private sector involvement in the provision of services needed by society has been separated. Both ideological and

historical reasons have shaped this division. Too often the private and public sectors look at one another as a major obstacle for achieving their objectives: two forces with conflicting positions and goals. However, in the face of current globalization trends and limited government resources around the world, practical considerations have started to reshape perspectives on this matter.

The following sections provide some background and introduce the main reasons for the rise of these partnerships. The particularities of private participation in infrastructure and transportation and the need for efficient public participation are also reviewed. Finally, we make the argument for the use of public/private partnerships in regional transportation strategic planning and present the case of ITS deployment as a relevant example of these mixed associations.

4.2 THE CHANGE IN GOVERNMENT SIZE

According to the World Bank⁷⁵ (1997), most countries maintained a small public sector until well into this century; three significant historical events marked the turning point by encouraging government participation in new areas:

- The Soviet Revolution in 1917, with its state-directed central planning model.
- The Great Depression of the 1930s, which encouraged a more active government participation in economic activities.
- The disintegration of the European empires, caused by World War II.

⁷⁴ Colman, William G. *State and Local Government and Public-Private Partnerships: A Policy Issues Handbook*. Greenwood Press, 1989, p174.

⁷⁵ The World Bank. *World Development Report 1997: The State in a Changing World*. Oxford University Press, 1997

As a result, from 1960 to 1995 the size⁷⁶ of the governments in the industrial countries doubled.⁷⁷ During this period, an increasing awareness of the problems caused by such large state influence in a nation's activities also developed. In the last fifteen years or so, many countries have started or expanded efforts to reduce the size of their governments. The underlying concern is to increase the efficiency of the economic processes taking place in society. Depending on the policies that increased government participation and influence in the past, the downsizing of the public sector has taken two basic forms (RPCP⁷⁸, 1988):

a) Deregulation

In cases where instead of taking direct control of industries the government preferred to regulate them tightly, the decrease of governmental influence has taken place by eliminating and/or relaxing many of these controls. It must be highlighted though, that while undoubtedly many private-sector claims of excessive regulation may be valid, in some other occasions they could respond to the natural search for profit of corporations. Let us simply remember that not all regulation is bad; on the contrary, many public regulations are beneficial for economic and social well-being.

b) Privatization

In the second approach, reduction of public control is exemplified by selling public assets or contracting out public services to the private sector. The sale of previously state-owned assets is based on a redefinition of the role of public sector. By refocusing on the core functions of the government, the control of non-essential activities can be

⁷⁶ Measured by central governments' spending as a percentage of GDP.

⁷⁷ Ibid. 75

⁷⁸ -----, Privatization: Toward More Effective Government, Report of the President's Commission on Privatization (RPCP), U.S. Government, 1988

transferred to private companies. In cases where the nature of the activity requires some public sector involvement, contracting out services to the private sector allows government to keep some control of the industry. The basic objective in contracting out activities is to gain in efficiency by using private sector resources, while keeping government's ability to balance corporate profits and public interest. Figure 4.1 adapted from Guislain⁷⁹ (1997) shows the range of actions that can be included in the term "privatization":

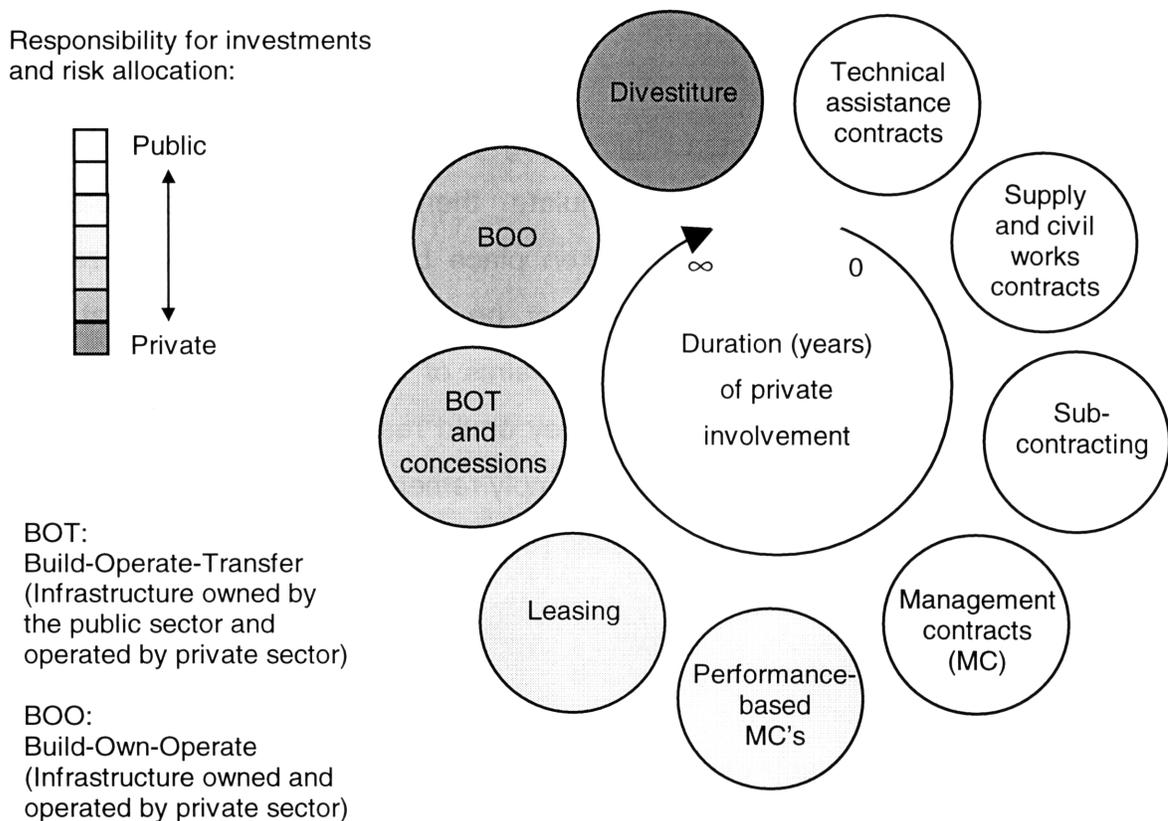


Figure 4.1
Privatization Techniques
(adapted from Guislain⁸⁰, 1997)

⁷⁹ Guislain, Pierre. The Privatization Challenge: A Strategic, Legal and Institutional Analysis of International Experience. The World Bank, 1997, p12

⁸⁰ Ibid. 79

The main benefits that can be yielded by reducing public control in the economic activities are (World Bank⁸¹, 1997):

- To unlock public resources previously devoted to assure state control or ownership and divert them to high-priority activities like basic education, health services, or poverty reduction programs.
- To establish the foundation for enhanced and cheaper services, by allowing competition and encouraging productivity improvements.
- To open the door for stronger private sector development, by reducing obstacles and costs for companies.

4.3 PRIVATE SECTOR PERFORMANCE

Why is the private sector generally regarded as more efficient than the public sector? As a first explanation, it can be argued that the profit incentive is a powerful stimulus for firms and individuals. Private-sector organizations are not subject to some of the constraints faced by governmental agencies, e.g., provision of universal service, close public scrutiny, and accountability to constituencies with diverging or opposite goals. Additionally, private companies have the following advantages over government-run services (Serageldin⁸², 1994):

- Management flexibility and ability to remunerate according to performance and need.
- Freedom from bureaucratic obstacles in daily operation.

⁸¹ Ibid. 75

⁸² Serageldin, I., Richard Barrett and Joan Martin-Brown, editors. The Business of Sustainable Cities: Public-Private Partnerships for Creative Technical and Institutional Solutions. ESD Proceedings Series No. 7. The World Bank, 1994.

- Better ability to retain professional and skilled staff, especially In many developing countries.

An element that helps to explain private sector performance is the management of human resources (HRM). A thorough study sponsored by the US Government during the Reagan Administration identified three central differences in HRM between successful private organizations and government agencies (RPCMI⁸³, 1987):

1. Responsiveness to Change

The cited study states that successful organizations in the private sector are willing to change their structure and operational procedures as required by a change in the environment. The evidence also suggests that the opposite happens in the public sphere: it is difficult to reshape the structure and operation of governmental organizations in a changing environment. The driving force of public officers is too often to maintain the status quo instead of improving effectiveness and efficiency. Additionally, decisions in the public sector are more sensible to the concerns of different constituencies, which also tends to slow the reaction time.

2. Human Resource Planning

In some of the private organizations studied, a fundamental thrust in their business strategy is the quality of their personnel. Significant resources and effort are devoted to attract and retain human talent. On the other hand, and with few exceptions in the world, governments do much less to attract and retain qualified and motivated individuals.

3. Management development and organizational culture

Some of the most recognized companies in the world have programs to develop their present and future managers. These mechanisms not only support managers in the task of leading, but also create strong corporate cultures that facilitate the achievement of objectives.

4.4 PUBLIC VS PRIVATE: FINDING THE RIGHT BALANCE

Despite the advantages of private organizations and the global trend of government-downsizing, it is important to recognize –and this thesis does so— that provision of services by the private sector and adoption of free market practices are not a flawless solution. There have been repeated examples throughout the world in which the predominance of private interests over public concerns has resulted in abuse and harm to society. A strong, capable public sector is needed now perhaps more than ever:

“Many have felt that the logical end point of all these [government downsizing] reforms was a minimalist state. Such state would do no harm, but neither could it do much good....Without an effective state, sustainable development, both economic and social, is impossible.”⁸⁴

There is still a significant role to be played by the public sector. The challenge is then to adapt public capabilities to the new times. The World Bank⁸⁵ (1997) has pointed out the tasks that should be at the core of every government:

- *Establishing a foundation of law*
- *Maintaining a nondistortionary policy environment, including macroeconomic stability*

⁸³ Report of the President’s Council on Management Improvement (RPCMI). Improving the Management of Human Resources in the Federal Government through a Private-Public Partnership. U.S. Government, 1987

⁸⁴ Ibid. 75, p iii

⁸⁵ Ibid. 75, p4

- *Investing in basic social services and infrastructure*
- *Protecting the vulnerable*
- *Protecting the environment*

One of the fields in which private participation has gained acceptance across the world is the provision of infrastructure. But it has also been recognized that despite having a large impact on quality of life, some collective good as basic infrastructure are particularly undersupplied by market forces (World Bank⁸⁶, 1997). As a result of this, the need to strengthen the public sector in this becomes more important. Four additional reasons for making public participation in infrastructure more effective are (World Bank⁸⁷, 1994):

“First, given current government dominance, the public sector will continue to have primary responsibility for infrastructure services in most countries and most sectors in the foreseeable future...Second, even with dynamic private sector involvement, some sectors --such as road networks and major public works— will remain predominantly in the public domain. Third, only an effective public sector will facilitate private sector involvement...Fourth, many developing governments will decide (for strategic, regulatory, or political reasons) to retain much of the responsibility for building and operating infrastructure in the public sector, as many high-income countries have done.”

Following the five core functions of government listed before will require the public sector to make an effective use of its regulatory capabilities. But effective regulation –and government— amidst a dynamic and complex environment like today’s can not be done from the isolation of a governmental ivory tower. As a result, we are seeing increasing participation from those being regulated and governed. One of the ways in which this participation has flourished is in the form of public/private partnerships. As it will be seen later in this chapter, a large number of these joint efforts have been oriented to the *implementation of decisions already taken* by the public sector. Participation of the private sector

⁸⁶ Ibid. 75

⁸⁷ The World Bank. World Development Report 1994: Infrastructure for Development. Oxford University Press, 1994, p37

as an entitled party in the planning process has not been that extensive. As the thesis begins to address this strategic planning role for the private sector, we will also start to narrow our focus to treat the particularities of the transportation field. But before this discussion, the following section will introduce the main roles that public/private partnerships have played in the field of infrastructure.

4.5 PUBLIC/PRIVATE PARTNERSHIPS IN INFRASTRUCTURE

An increasing number of public/private partnerships have been created to deal with infrastructure needs across the globe. The underlying assumption in these organizations is that joint participation from the public and private sectors can generate a better outcome than a separate engagement by public or private organizations. According to the World Bank⁸⁸ (1994), regardless of their public or private orientation, successful providers of infrastructure have:

- Clear and coherent objectives that are focused on the delivery of services.
- Autonomous management who with the rest of the personnel are accountable for the results.
- Financial independence

At this point it is important to differentiate at this point the basic different forms of private participation in infrastructure:

- a) Contractors
- b) Providers of services
- c) Users of services
- d) Participants in planning efforts

⁸⁸ Ibid. 87

Zimmerman⁸⁹, 1984 identifies these roles in the context of metropolitan areas:

- Private development of public infrastructure projects and public participation in the provision of incentives.
- Private provision of public services and goods, as in the operation and maintenance of tolled highways.
- Joint formation of policy, as in the public/private efforts oriented to renovate a number of central business districts in the US.

In a research project undertaken at MIT, Sitabkhan⁹⁰ (1997) found that a large number of partnerships have been project-specific. In the same way, most of the literature on public/private partnerships refers to this project-oriented role. In this context, Payson and Steckler⁹¹ (1996) characterize the participants of a public/private partnership as follows:

“The government or governments involved may be federal, state, or local, while the specific agencies involved are often departments of transportation or independent authorities. The private parties may include firms specializing in public-private infrastructure, construction companies, equipment manufacturers, operations specialists, real estate developers, and various advisors.”

The same authors point out several reasons for the growing use of public/private partnerships in infrastructure (Payson and Steckler⁹², 1996):

⁸⁹ Zimmerman, Karita A. Negotiated Investment Strategies: A New Approach to Public-Private Partnership. Master in City Planning Thesis, Department of Urban Studies and Planning, Massachusetts Institute of Technology, 1984

⁹⁰ Sitabkhan, Murtaza. New Roles for the Private Sector in Strategic Transportation Planning, Working Paper, MIT, Cambridge, MA, 1997

⁹¹ Payson, William H. and Steven A. Steckler. Developing Public-Private Partnerships in Infrastructure. In *Privatizing Transportation Systems*, Simon Hakim, Paul Seidenstat and Gary W. Bowman, eds. London, 1996, p33

⁹² Ibid. 91

- An increasing shortfall of public moneys and a simultaneous increase of infrastructure needs.
- Larger public acceptance of user fees instead of taxes to finance infrastructure.
- Successful experiences in previous partnerships
- A public sector that has become more experienced in the implementation of the partnerships.

For the reader interested in knowing the approaches to public/private infrastructure followed outside the U.S., we suggest the works of Tatsumi⁹³ (1998) and Saito⁹⁴ (1998) undertaken at MIT and take a look at the way in which Japan has address these associations.

4.5.1 INFRASTRUCTURE FINANCING AND DELIVERY

A large number of joint public/private efforts in infrastructure have focused on financing and delivery mechanisms. Under this approach to infrastructure development and beside its traditional role of builder, the private sector is viewed as a source of financial resources. Table 4.1 taken from the World Bank⁹⁵ (1994) presents the results of a survey on infrastructure projects that have been financed worldwide with private-sector participation since the early 1980s:

Private-sector participation in financing and development of infrastructure can occur in different ways. A whole new terminology has been coined to

⁹³ Tatsumi, Yasuo Strategic Regional Transportation Planning in the Osaka/Kobe/Kyoto Metropolitan Area in Japan. Master of Science in Civil Engineering Thesis, Department of Civil and Environmental Engineering, Massachusetts Institute of Technology, Cambridge, MA, 1998

⁹⁴ Saito, Makoto. Public Private Partnerships in Providing Rail Infrastructure: The Japanese Case. Master in City Planning Thesis, Department of Urban Studies and Planning, Massachusetts Institute of Technology, Cambridge, MA, 1998

⁹⁵ *Ibid.* 87, p95; originally published by *Public Works Financing* (October of 1993)

characterize these mechanisms (Miller and Evje⁹⁶, 1997): BOT (build-operate-transfer), BOO (build-own-operate), TKY (turnkey), DBOT (design-build-operate-transfer), and so on. We will not describe each of these financial approaches. As an example of the kind of financing arrangements involved, the main elements of a BOT project are presented as follows (Augenblick and Custer⁹⁷, 1990):

Country Group:		World	High Income	Middle Income	Low Income
Number of Projects Funded	Funded	148	64	77	7
	In the Pipeline	358	107	179	72
Total Value (US \$ billions)	Funded	63.1	34.3	25.7	3.1
	In the Pipeline	235.4	112.0	77.1	46.3
Distribution of Private Projects by Sector	Power	13%	8%	16%	29%
	Transport	60%	48%	69%	57%
	Water and Environment	16%	25%	10%	0%
	Telecom	2%	2%	3%	0%
	Others	10%	17%	3%	14%

- Private sponsors, usually a joint venture of construction contractors, equipment/systems suppliers often with local partners. Participating companies will *build* the project, *operate* it for a specific period of time and then *transfer* it to the public sector.
- Private equity investment (typically 10-30% of the total project cost).

⁹⁶ Miller, John B., and Roger H. Evje. Life Cycle Discounted Project Cash Flows: The Common Denominator in Procurement Strategy. MIT Working Paper, 1997

⁹⁷ Augenblick Mark, and B. Scott Custer, Jr. The Build, Operate and Transfer ("BOT") Approach to Infrastructure Projects in Development Countries. Working Paper (WPS498), The World Bank, 1990

- Private debt financing (typically 70-90% of the total project cost) raised through commercial or development banks.
- In some cases (e.g., projects in developing countries), there is also need for substantial governmental support in the form of performance guarantees for the public agencies involved, or guarantees against foreign exchange risk.

The way in which private participation in financing and delivery of infrastructure is beneficial to the public agencies involved can be seen in Figure 4.2 taken from the work of Prof. John B. Miller and Roger Evje at MIT⁹⁸ (1997). Figure 4.2 gives an idea of the difference in cumulative discounted cash flows for the public sector between a traditional approach (“design-build”) and a BOT arrangement. It can be seen that the use of BOT frees a significant amount of resources that would be used in the construction phase of the infrastructure.

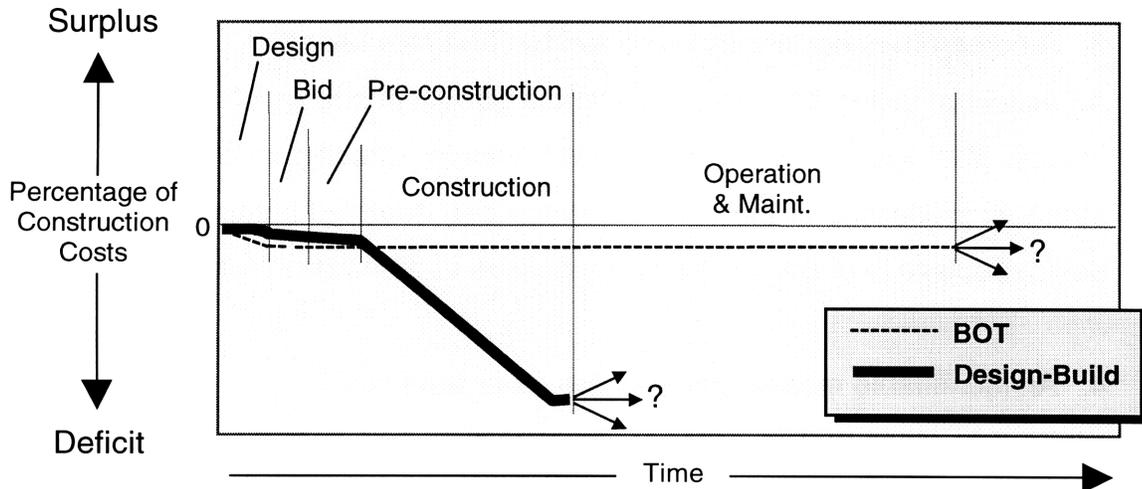


Figure 4.2
Design-Build vs. BOT: Cumulative Discounted Project Cash Flows
 (Taken from Miller and Evje⁹⁹, 1997)

⁹⁸ Ibid. 96

⁹⁹ Ibid. 96

4.5.2 ELEMENTS FOR THE SUCCESS OF THE PARTNERSHIP

From studying past experiences of public/private associations, Brooks¹⁰⁰ (1984) has identified a set of elements that ease the success of the process:

1. A sense of crisis or a fundamental opportunity

The partnership tends to be smoother and more productive, when both sectors face a crisis or have the certainty that they must act to avoid one.

2. An effort to search for win/win situations

An integrative negotiation style that aims for results that satisfy all participants is an important prerequisite for success. Although it is clear that at sometimes negotiations will face conflicting interests, a sincere effort to find solutions that are acceptable to both parties should be made.

3. A comprehensive strategy directed by “first-rate talent”

An essential factor is to put very talented people in charge of the process. Ideally, the leaders should be both people directly involved in the strategic processes of their organizations and qualified administration. A basic requisite is of course, that they believe in the ends of the effort.

4. An identifiable measure of success other than profit

While it is clear that in order to be attractive and useful to the private sector, the partnership must address market concerns and profitability, this should not be the only measure of success. Brooks¹⁰¹ (1984) stresses this important concern as follows:

¹⁰⁰ Brooks, Harvey. *Seeking Equity and Efficiency: Public and Private Roles, In Public-Private Partnership: New Opportunities for Meeting Social Needs*, Ballinger Publishing Company, 1984

¹⁰¹ Ibid. 100

“The public and private sector have to be involved jointly in meeting needs. It is the function of the public sector to identify the needs and of the entrepreneur in the private sector to invent a market or a customer delivery. Experience suggests that private partners in this cooperation cannot be solely profit maximizers’ they must have a strongly developed social conscience in combination with an eye for profitable business.”

5. Maintaining control over the agenda and the number of players

The more participants in the process, the more complex the discussion will become. The important issue is to bring into the discussion the quantity and quality of participants that will enrich the process without making it too complex to be managed.

4.5.3 PUBLIC/PRIVATE PARTNERSHIPS IN TRANSPORTATION

The large impact of transportation-related decisions in the socioeconomic and political life of societies has caused transportation to be treated differently from other economic activities and encouraged government intervention (Coyle¹⁰² et al, 1982). But private-sector participation is also significant as infrastructure builder, user of transportation, and provider of transport and related services.

The conventional approach to develop transportation infrastructure has made a clear distinction between the scope of activities for the public and private sectors. Lockwood¹⁰³ (1997) characterizes these different roles:

¹⁰² Coyle, John J., Edward J. Bardi and Joseph L. Cavinato. Transportation. West Publishing Co., 1982.

¹⁰³ Lockwood, Stephen. Public-Private Partnerships are the Answer: What is the Question? In *Transportation Finance for the 21st Century*. Conference Proceedings, Transportation Research Board and National Research Council. 1997, p112

"[In conventional public/private partnerships] the public agency defines the product, manages the process, makes the key decisions and takes (on behalf of the public at large) all the risks related to cost, delay, quality, and customer satisfaction. The private-sector role --in the form of design and construction entities— has been limited to arms-length vendor status, supplying competitive low-bid services confined to sequential design/bid/build processes under public-agency specifications/oversight."

Such a narrow role for the private sector does not take advantage of the entire set of private resources and capabilities. In the first instance, there are financial resources and technical/managerial expertise that can enhance the provision of transportation infrastructure and services. The recognition of this fact has encouraged the formation of public/private partnerships aimed to improve the delivery, operation and maintenance of transportation projects in different countries.

According to Salvucci¹⁰⁴ (April, 1998), the immense majority of the public/private partnerships in transportation are associations between public agencies and contractors. The users of the transportation infrastructure and services have not been successfully integrated into these partnerships.

Additionally, previous international experience suggests that not all areas of transportation are suitable to attract the interest of private organizations. The World Bank¹⁰⁵ (1994) has rated the feasibility of private sector delivery for different infrastructure types. Figure 4.3, adapted from this work, compares the marketability of different transportation infrastructure and the long distance telecommunication services.

¹⁰⁴ Ibid. 41

¹⁰⁵ Ibid. 87, p115

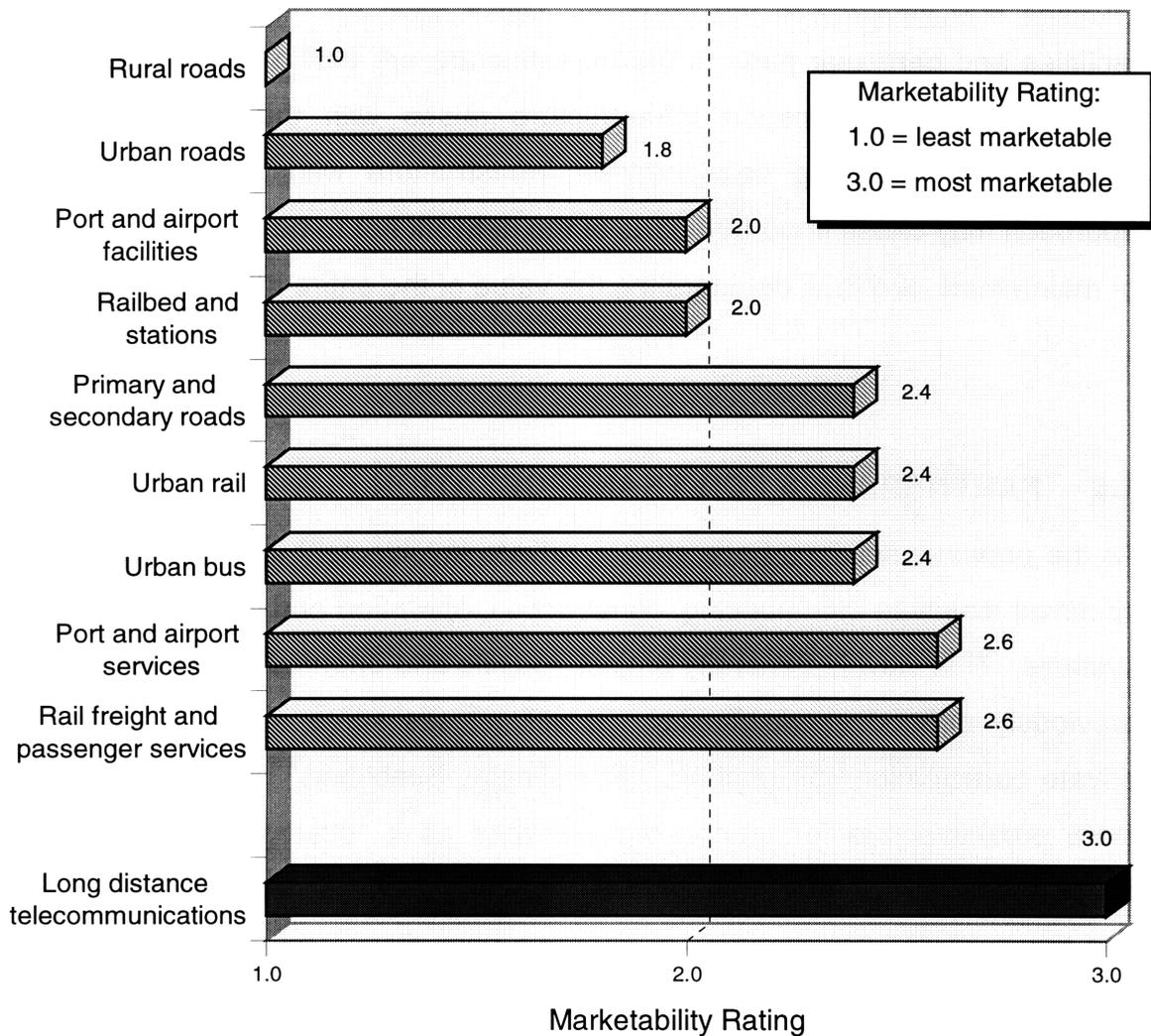


Figure 4.3
Feasibility of Private Sector Participation in Transportation
 (adapted from World Bank¹⁰⁵, 1994)

It can be seen in Figure 4.3 that while there are transportation activities that have significant opportunities for the private sector, some sector have inherent characteristics that limit private provision of these services and development of its infrastructure. The underlying issue is that because of its profit-maximizing

nature, private interest focuses on the most lucrative activities. The implications for transportation infrastructure is that private sector aims for the most profitable facilities and sections of the network. But it must be recognized that those facilities and particular parts of the infrastructure are part of an entire network, and the value of transport infrastructure raises with this interconnectivity. Building and operating transportation infrastructure with a profit-maximizing approach may cause important parts of the network not to be properly developed or maintained, and thus deteriorating the value of the entire system.

4.6 PARTNERSHIPS FOR TRANSPORTATION PLANNING

As the previous sections have shown, private involvement in transportation has occurred mainly in the financing, construction, operation and maintenance of the systems. This view is generally project-specific and oriented to the delivery of a previously defined service/facility. It still misses some of the potential that private participation can unchain. Specifically, Sitabkhan¹⁰⁶ (1997) proposes a more proactive role for private organizations as a “strategic partner” for the public sector during the transportation planning process. It should be noticed that the public/private planning partnership here discussed is not for particular projects, but rather planning involving the entire transportation system.

It is clear that in order to be effective, planning decisions taken by public officials have to consider the needs of the private companies. Zimmerman¹⁰⁷ (1984) states that the typical way in which private concerns has been raised is through “behind-the-scene lobbying” and technical studies supporting private sector views. In these approaches private sector input takes place as an external agent to the planning process, which has the following disadvantages:

¹⁰⁶ Ibid. 90

¹⁰⁷ Ibid. 89

1. The private sector lacks any decision-making role and its relegated to a second-class rank in the process.
2. It is harder for the private rationale to have direct exposure and permeate the minds of the planners and public decision-makers.
3. The process does not generate a proper environment for dialogue and common learning. It also complicates the private organizations' access to first-hand information on the government's objectives and strategies.

A joint planning effort in the form of a public/private partnership instead:

1. Puts the private sector right in the center of the decision-making and recognizes the legitimacy of its participation. This results in sounder and more comprehensive decisions that should aim to balance the needs of the industry and corporations, with those of the citizens.
2. Exposes the private-sector views to planners and public decision-makers since the beginning of the process.
3. Provides an environment that encourages the interchange of ideas and can generate learning in the individuals and organizations taking part in the effort. Such learning can occur at different levels:

a) Best Practices

Private companies confront some of the same organizational and technical problems faced by public agencies. Acknowledging that in many cases corporations have solved these problems satisfactorily, the public sector can learn from these best practices

b) Alignment of private and public strategies

A significant benefit can result from the interaction between organizations' strategies with the overall regional strategy. Just as the public sector can learn from corporate practices, private companies can benefit by adjusting their strategies to be consistent with the objectives and strategies of the public sector

c) Institutional Learning

Finally, the public/private partnership –as an institution— can learn too. Whether the learning occurs in how to better address certain technical issues or how to manage and control the planning process itself, it can only enhance the final outcome. This learning element will gain relevance in our later study of the scenario methodology, as we will see that one of the roles assigned to scenarios is to support institutional learning.

4.6.1 STRATEGIC PLANNING IN THE PRIVATE AND PUBLIC SECTOR

There are several differences in the way strategic planning is undertaken by private and public organizations. Among the most relevant are

- Private companies usually have more tangible ways to measure performance and success/failure than the public sector: profitability, market share, and so on.
- Private companies serve the interests of a relatively small number of main parties. More importantly, these interests are most of the time aligned, while the public agencies must try to balance opposing and conflicting interests of different constituencies.
- Public agencies are often affected by political pressures that can cause them to operate in a sub-optimal manner.

- Public organizations are usually slower to regroup and reassign resources in the face of unexpected events or new projects.

4.6.2 PRACTICAL OBSTACLES TO A PUBLIC/PRIVATE PARTNERSHIP FOR TRANSPORTATION PLANNING

While public/private participation as partners in the transportation planning process can generate such benefits, there are also several elements that hinder the formation and performance of these organizations. This section will mention some of them.

A first obstacle is found in the difference of incentives and perspectives that managers of public and private organizations have. The profit incentive can mobilize large amounts of private resources in relatively short time, but will also require governmental assurance that the public interest is not being left aside. On the other hand, public officers must be provided with incentives and tools that help them to challenge the bureaucratic status quo, and enables them to improve their organizations' reaction time for the planning process.

So far we have been using the terms public and private sector as if they were single units. But this is far from the truth. Within each sector there is a set of individual elements that have different agendas and perspectives. The public sector side of a partnership can encompass the three different levels of government: federal, state and local; additionally each of these layers can be represented by various agencies. As mentioned earlier, private participation in transportation takes place as user, provider of services and constructor of infrastructure. Some participants will probably have diverging or conflicting objectives (e.g., Environmental Protection Agency and Department of Transportation). In any case, such an inclusive composition will tend to add complications into the planning process.

Participation in the planning process under this arrangement demands intensive amounts of time and effort. The foreseen tangible benefits of the partnership may not be enough to counterbalance the size of the task. Formation of the partnerships can be affected by private-sector lack of interest. Companies that realize that they have little or no influence on the outcome will not be attracted to participate. Participation of private organizations in the decision-making must be assured in some way. At the same time, the need to care for society's well being calls for a structure that maintains the process under public-sector guide.

4.6.3 A TECHNOLOGICALLY-DRIVEN PARTNERSHIP: ITS

Interestingly, an entire generation of public/private partnerships in transportation has been the result of technological change. The rising of the Intelligent Transportation Systems (ITS) is a promising solution for a number of transportation problems. The need to address its implications in a comprehensive way has triggered a large cooperative effort between different levels of government and private organizations in the US, Europe and Japan.

ITS has created the need for public and private cooperation in two basic arenas:

1. The linkage between vehicle and infrastructure
2. The development of the electronic equipment and technological systems that are at the core of ITS.
3. The deployment of ITS, which is likely to have significant effects in the coordination and provision of transportation services and infrastructure.

Federal, state and local governments are interacting with private stakeholders from very different fields: software, electronic & telecommunications, rail and truck carriers, academic institutions, shippers associations, the automotive industry, transit advocates, environmental groups and so on. The general

objective of these partnerships is to study and plan the different issues involved in ITS development and deployment.

A result from these efforts has been already obtained. In 1996, extensive study and work by public/private groups, the U.S. Department of Transportation (DOT) proposed a system architecture for ITS in the United States¹⁰⁸. Basically, the architecture is a tool to coordinate and integrate the deployment of different ITS technologies and services.¹⁰⁹ Following this first step, several system architectures have been developed to deploy ITS technology in several cities in the country (Rodriguez¹¹⁰, 1996).

4.7 SUMMARY

This chapter has presented the background and some of the most important elements of public/private partnerships. These organizations define a complex organizational context in which regional strategic transportation planning can take place.

This chapter closes the framework part of the thesis. Chapter 5 will build on this framework to show how scenario building fits in the context of strategic planning, regional transportation, and public/private partnerships.

¹⁰⁸ <http://www.its.dot.gov/architecture/>

¹⁰⁹ <http://www.its.dot.gov/architecture/overview.html/>

¹¹⁰ Rodriguez, Daniel. Developing a System Architecture for Intelligent Transportation Systems with Application to San Juan, Puerto Rico, Master of Science in Transportation Thesis, Department of Civil and Environmental Engineering. Massachusetts Institute of Technology, 1996.

5. SCENARIOS AS THE INTEGRATIVE TOOL

The previous three chapters have provided a framework in which scenarios will be used for strategic planning of regional transportation. It is possible now to study how the scenario-building technique fits into this framework. This chapter starts by presenting the concept of scenarios, their main characteristics and the roles they have been assigned in the planning literature. Then, we will study how the use of scenarios relates to the major issues identified in the context of strategic planning, regional transportation and the public/private partnerships. Finally, three relevant scenario-planning efforts undertaken outside the corporate environment will be briefly described.

5.1 SCENARIOS

Just as has occurred with the words “planning” and “strategy”, the term “scenario” has been used in many ways in the planning literature. A common meaning attributed to scenario is that of “alternative”, and for instance, the financial feasibility of many projects is said to be evaluated in the face of “optimistic, realistic and pessimistic scenarios”. But the notion of a scenario as a mere point in the future is very limited. Van der Heijden¹¹¹ (1996) asserts that

“The scenario is a story, a narrative that links historical and present events with hypothetical events taking place in the future.”

A scenario can be thought of as a story describing how the future may unfold from the present. Scenarios plot different forms in which the future may develop

¹¹¹ Ibid. 22, p213

in a structured way.¹¹² The term “structured” implies that it is not enough to propose the future stage of the system: a cause-effect explanation on how this actually might happen must be also provided. As an illustration, Figure 5.1 presents a set of events creating a scenario of growth of exports in an agricultural region.

In Figure 5.1 the starting point is the current state. From there, a set of trends and events that can be already perceived initiate the unfolding of the scenario. It must be noted that some of these trends and events are external while some others are internal to the region. The region has little if any control over the external part of the scenario, but has a definitive influence in the internal events of the scenario. Increased demand for agricultural products in Asia/Pacific (due to the population growth in these countries), the generalized reduction in cultivable areas and a lack of a technology that boosts crops productivity cause the prices of food to rise in the international market. Additionally, the continuous urbanization trend across the world generates a larger demand for processed food. In the part of the scenario directly involved with the internal context of the region, constant increases in trade and macroeconomic and political stability enables an influential event: the establishment of a major transportation link between the region and Asia/Pacific. Availability of this link, and improving the regional transportation network (i.e., movement of products from production centers to the primary link to Asia/Pacific) generate a reduction in transport costs between these areas. This reduction and the higher prices of food encourage more agricultural production in the region. The large demand for processed food (an external element) and the additional production of food in the region (an internal element) cause the establishment of food processing industries. At the end, the region sees an increase in its exports of agricultural products and processed food.

¹¹² Schwartz, Peter. The Art of the Long View: Planning for the Future in an Uncertain World, Doubleday ed., 1996

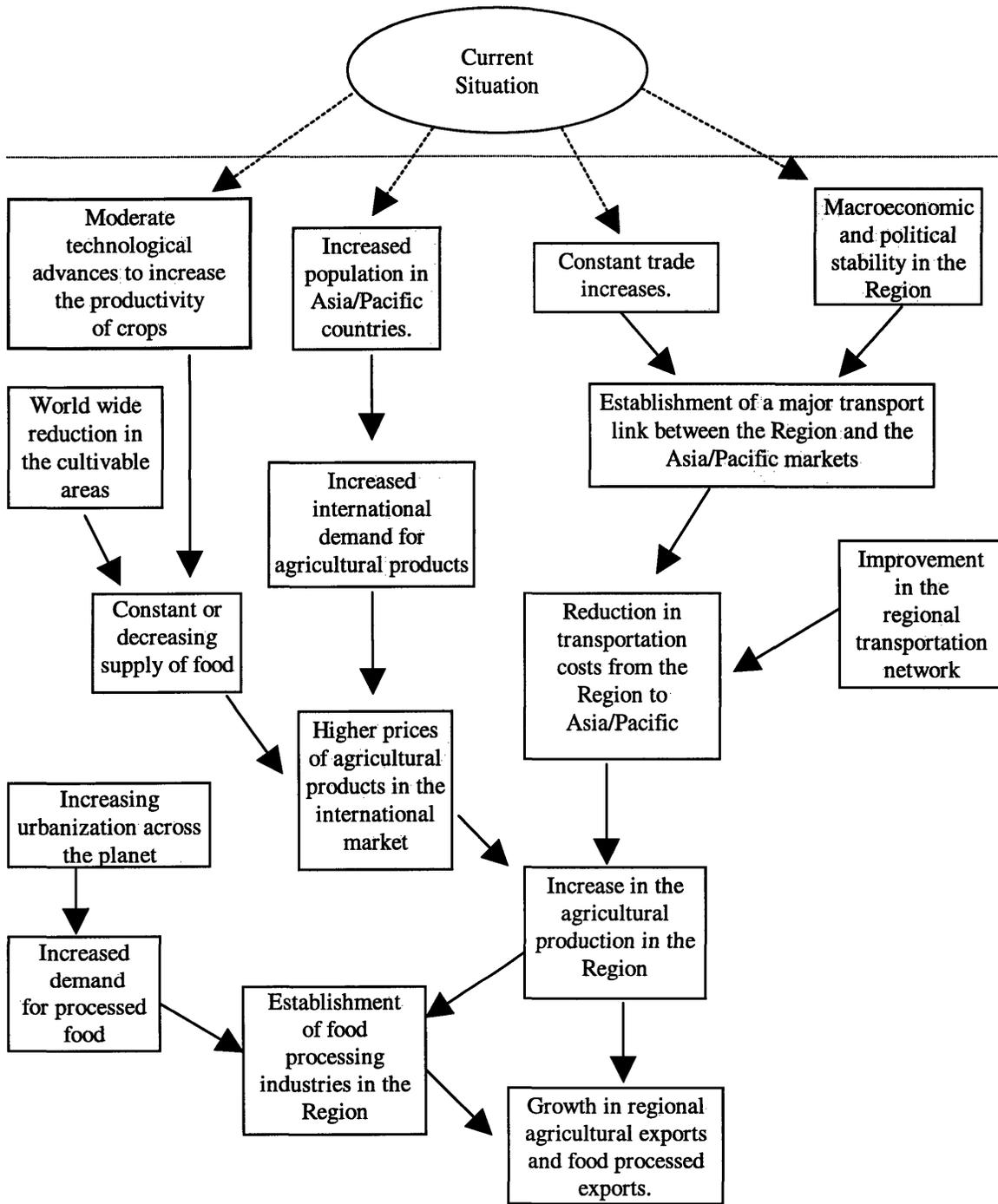


Figure 5.1
A Tentative Scenario for an Agricultural Region

5.1.1 THE ROLES OF SCENARIOS

From the study of the scenario planning literature, three major roles assigned to scenarios can be identified:

1. Scenarios as a forecasting tool.

Using probabilities for the events and trends under study, these works range from simple risk assessments for decision-making to complex developments in decision theory. A central activity in this role is to assign probabilities of occurrence to the alternative scenarios constructed.

2. Scenarios as a tool to generate robust decisions.

In this “strategic-thinking “ role, there are no probabilities assigned to the scenarios. Scenarios are used to test the performance of specific investment decisions, corporate strategies, or even public sector policies for various scenarios. Therefore:

“The end resultis not an accurate picture of tomorrow, but better decisions about the future.”¹¹³

By thinking about how these decisions would perform under different but equally likely scenarios¹¹⁴, it is possible to identify their vulnerability and strengthen them accordingly. The role of scenarios is to broaden the strategy and decision-makers’ perspective about the future, so that they can make sounder decisions. The final outcome of scenario-based planning are robust decisions, i.e., decisions that will perform adequately across a range of envisioned scenarios.

¹¹³ Ibid. 112, p9

¹¹⁴ The issue of assigning probabilities to scenarios based on their likelihood of occurrence will be discussed in section 6.4

The strengthening of existing strategies and decisions is not the only function of scenarios under this approach. The identification, study and deliberation of feasible futures by decision-makers provide the best environment to *formulate* new strategies. In fact, Peter Wack¹¹⁵ (1985b), one of the seminal figures in scenario developing, asserts that:

“If the scenario process does not bring out strategic options previously unconsidered by managers, then it has been sterile”

3. Scenarios as a tool for organizational learning.

A good amount of recent literature strongly emphasizes this third role for scenarios. It is based in the reassessment of the learning role of planning proposed by the processualist school (refer to section 2.4.3). In this approach, scenarios become a tool by which organizations learn to deal with the complexity of its environment and improve its reactions in the face of sudden changes.

While there are some exceptions, the above approaches seem to follow an historic evolution in the literature, with the forecasting focus appearing earlier and the decision and learning roles becoming more visible in recent years. In its forecasting role, scenarios are primarily a quantitative tool that can be programmed for a computer and most likely will yield a numerical result. Then it is up to the decision-makers to use that figure to make a resolution. This approach shares many of the limitations of other forecasting techniques.

The present thesis will focus on the use of scenarios as a strategic-thinking tool for sounder decision-making in regional transportation. Also, the learning role of scenarios will be also addressed at some extent. We will not address the forecasting approach to scenarios.

¹¹⁵ Wack, Pierre., Scenarios: shooting the rapids. *Harvard Business Review*, Volume 85, number 6, November-December 1985, p.139-150

5.1.2 BUILDING SCENARIOS: AN OVERVIEW

In Chapter 8 we will follow a step-by-step methodology to build scenarios for the transportation system of a specific region (Mendoza, Argentina). This section gives a brief overview of the major elements involved in scenario building.

Van der Heijden¹¹⁶ (1996) distinguishes three basic components in any scenario exercise:

1. The characterization of internal issues or strategies about which an organization is seeing for insight.
2. A set of scenarios describing alternate and possible futures of the organization's environment that will affect these issues.
3. A component where scenarios interact with the internal issues. This is the area in which scenarios can prove most productive: as a testbed for organizations' strategies and concerns.

Mercer¹¹⁷ (1995) envisions the same components in three progressive groups of activities:

1. Environmental Analysis

This is the stage in which the information that will be used to build scenarios is gathered and studied. Mercer warns of the need to undertake a high quality data collection and analysis:

*"Scenarios can only be as good as the information they are based upon."*¹¹⁸

¹¹⁶ Ibid. 22

¹¹⁷ Mercer, David. Scenarios Made Easy. *Long Range Planning*, Volume 28, issue 4, August 1995, p 81-86.

¹¹⁸ Ibid. 117

Mercer also recommends these activities to be performed by a team rather than an individual. A team-based approach widens the coverage of the scanning and enriches the analysis due to the interaction among the team members.

2. Scenario planning

Here is where the specific techniques of scenario planning are used. This stage involves at least the following steps:

- a) Identify, in the results of the environmental analysis, which factors drive the development of the future –the drivers in the scenarios.
- b) Integrate the drivers into a meaningful and viable framework. Here, it is necessary to discover the patterns that relate the drivers. A structure is then created by grouping the drivers into clusters according to their relationships. The links among drivers should be also identified.
- c) Generate initial “mini-scenarios”. The resulting framework allows to produce different alternative ways in which the future may unfold as a result from the interactions between the drivers. Mercer states that the number of this “mini-scenarios” should be between seven and nine.
- d) Reduce to 2-3 larger scenarios that encompass the most critical issues and concerns. The reason for doing this is a practical one, as the use of more scenarios is harder to manage by decision-makers.
- e) Write the scenarios in a format suitable for the audience for which they are intended. As mentioned in the beginning of this

chapter, scenarios are usually written as stories that describe the unfolding of the future.

- f) Finally, identify the important implications for the organization resulting from the scenarios.

3. Corporate strategy

This stage involves all the subsequent events that use the results of the scenario building to improve an organization's strategies and activities.

5.2 SCENARIOS AND THE STRATEGIC PLANNING CONTEXT

5.2.1 SCENARIOS AND THE THREE SCHOOLS OF PLANNING

Across the literature dealing with the strategic thinking and learning aspects of scenarios, there are continuous references to the issues of strategic planning already discussed in the Chapter 2 of this work. Several authors have recognized that scenarios can play a broad and relevant role in modern strategic planning by becoming a source of strategic thinking within organizations. Table 5.1 summarizes the functions that scenarios can play in each of the planning schools introduced in Chapter 2. In Table 5.1 the general function of “generating strategic thinking in the organization” is listed in all schools. It should be noticed that, depending on the approach of each school –rationalist, evolutionist or processualist— certain benefits of scenarios become more relevant in explaining how they promote strategic thinking.

For the rationalist school the fact that makes scenarios a strategic-thinking tool is that choosing is at the core of scenario-based planning. Different strategies can be tested across all scenarios to prove their soundness and the tradeoffs arising from the presence of alternatives are highlighted.

The evolutionist can benefit from scenarios by means of their focus on strategy-making and their ability to generate consensus. Scenarios are also a major tool for studying the complexity and dynamism of the environment. Finally, the processualist school can use scenarios as a tool to make managers' mental models explicit as well as to reshape them to better match reality.

Table 5.1 Scenarios and the Three Schools of Planning		
School	Role of Scenarios	Function of Scenarios
Rationalist	Strategic-thinking	<ul style="list-style-type: none"> • To generate strategic thinking in the organizations. • To test decisions and strategies, making them robust across all envisioned scenarios. • To highlight the choices and tradeoffs faced by decision-makers. • To broaden decision-makers perspective, resulting in better decisions.
Evolutionist	Strategic-thinking	<ul style="list-style-type: none"> • To generate strategic thinking in the organizations. • To focus on the strategy-making process. • To generate consensus among decision-makers. • To analyze the complexity of the organizational environment.
Processualist	Learning	<ul style="list-style-type: none"> • To generate strategic thinking in the organizations. • To make decision-makers' mental model explicit. • To help changing the decision-makers mental models. • To generate learning by "rehearsing" current decisions in the future.

5.2.2 WHERE DO SCENARIOS FIT IN THE STRATEGIC PLANNING PROCESS?

Several frameworks that integrate scenarios with the activities of strategic planning and management have been proposed. Based on the forecasting role assigned to scenarios, Godet¹¹⁹ (1990) perceives them as a tool for studying the organization's environment and reducing uncertainty before decision-making is actually undertaken. Wack¹²⁰ (1985b) on the other hand, sees the generation of strategic options as the core benefit of scenarios and points out that this occurs when scenarios are combined with the strategic vision and option planning activities of an organization. Figure 5.2 uses again the strategic management model proposed by Morrison and Wilson¹²¹ (1996) to show the areas of influence of scenarios in strategic planning.

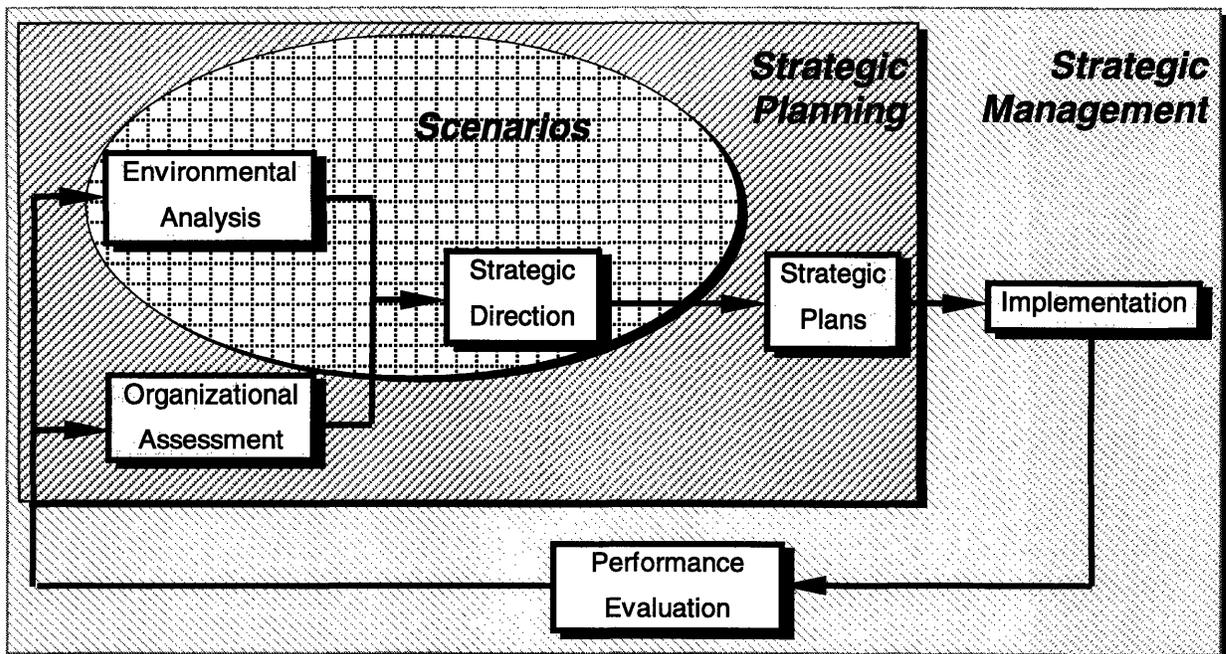


Figure 5.2
Integration of Scenarios and the Strategic Planning/Management Systems
(adapted from Morrison and Wilson¹²², 1996)

¹¹⁹ Godet, Michel., Integration of Scenarios and Strategic Management: Using Relevant, Consistent and Likely Scenarios. *Futures*, Volume 22, number 7, September 1990, p738

¹²⁰ Ibid. 115

¹²¹ Ibid. 10

¹²² Ibid. 10

In Chapter 2 we characterized strategic planning as encompassing the first four blocks: environmental analysis, organizational assessment, strategic direction and strategic plans. This thesis argues that scenarios interact directly with two of them: the analysis of the external environment and the generation of strategic direction.

5.2.3 PERCEPTION AND MENTAL MODELS: A COMMON ELEMENT IN THE DECISION-MAKING AND LEARNING ROLES OF SCENARIOS

In the second of two classic articles on scenarios published in the Harvard Business Review, Wack¹²³ (1985b) asserts that the key problem with the use of scenarios is that the “interface” with decision-makers is often ignored or neglected. Scenarios in this case merely lay out a set of alternative futures to be used as an input to decision-making; this is the case e.g., of the model by Godet¹²⁴ (1990) briefly mentioned above. Objecting to this view, Wack¹²⁵ (1985b) makes the following statement:

“Scenarios deal with two worlds: the world of facts and the world of perceptions. They explore for facts but they aim at perceptions inside the heads of decision-makers. Their purpose is to gather and transform information of strategic significance into fresh perceptions.”

The notion behind this view is that the way in which decision-makers perceive the world –their mental model of the world— will greatly influence their determinations. Based on the requirement for cause-effect links between envisioned events, scenarios are useful in challenging perceptions and mental models. Managers can discover that the views they have regarding the future of certain issues are not consistent with the trends and forces driving the future.

¹²³ Ibid. 115

¹²⁴ Ibid. 119

¹²⁵ Ibid. 115

The implications of this approach are central to decision-making and the need to cope with uncertainty in planning. In their decision-making role, scenarios are used to broaden the decision-makers perspective, which will generate sounder decision. In the learning role, scenarios are an appropriate tool to make the decision-makers' mental models explicit. In both approaches there is a continuous effort to expand the manager's perspective and make their mental model more consistent with reality. It can be seen that in any of these roles, scenarios have a direct role in the decision-making process.

One of the most impressive examples of how scenarios can reshape perceptions is the well-known scenario exercise carried out by Royal Dutch/Shell in the 1970's. Pierre Wack¹²⁶ (1985) who was the head of the Business Environment Division of Shell's Planning Department at the time, provides an interesting first-hand narration of the exercise, which is summarized below:

The planners of this multinational oil company were looking for events that could significantly affect the business environment of Shell. A fundamental element of the business was of course the price of oil, and therefore they investigated how a price increase might occur. They actually identified determined events and plausible trends that provided a cause-effect relation suggesting that oil producer countries would eventually charge higher prices. But the perspective of Shell's management had been shaped by decades of uniform growing consumption and stable oil prices. Challenging the conventional wisdom of the time, they presented their managers a set of scenarios in which oil prices increased sharply. One of the most useful tools for reshaping the managers' perspective was a set of scenarios whose foundation was the conventional assumption that things would remain the same. These "challenge scenarios"

¹²⁶ Wack, Pierre. Scenarios: uncharted waters ahead. *Harvard Business Review*, Volume 85, number 5, September-October 1985, p.73-89

highlighted the events that were necessary for the oil price to remain constant, and it was clear that all of them were highly implausible. Then, Shell planners described the dramatic impacts of an oil crisis on the operation of the company and in the economies of the oil consumer countries. In response to the recognition of this possibility Shell's managers perceived the possibility of the crisis, and as a result the company performed much better than the other oil companies when the oil OPEC crises occurred.

In a meeting held with Mr. Richard Karash, a Boston consultant working in the areas of strategic planning and learning organizations, he acknowledged that the success of Shell was not because they predicted the oil shock and acted consequently. On the contrary, Shell was basically in the same position as the rest of the industry when the crisis developed. What Shell did was to ask their managers to explain how their strategies could perform adequately even in the presence of high oil prices. The critical difference was that Shell decision-makers were mentally prepared for such event, and therefore they adapted to the new environment more rapidly.

5.3 SCENARIOS AND THE REGIONAL TRANSPORT CONTEXT

In Chapter 3 we mentioned the dynamic relationship between transportation and the socioeconomic system. Two elements of this relation were studied in more detail. The first one emphasized how transportation can affect the economic development of a region; the second one showed how increased economic competition among regions can shape their transportation systems. Overall, the discussion highlighted the relevance of economic issues in transportation and the need to integrate these considerations in the transportation planning process.

It must be asked then how effective is scenario-based planning in including the economic and other concerns that affect regional transport? Wack¹²⁷ (1985b) answers this question as follows:

"I have found that scenarios can effectively organize a variety of seemingly unrelated economic, technological, competitive, political, and societal information and translate it into a framework for judgment in a way that no model could do."

Scenarios explicitly integrate these external elements in one of the steps in the scenario development process: the identification and study of the driving forces that will lead the unfolding of the future. According to Schwartz¹²⁸ (1996) driving forces for a scenario are usually found in each of the following arenas:

- *Society*
- *Technology*
- *Economics*
- *Politics*
- *Environment*

Of particular interest to our previous discussion of competitiveness, Becker and van Doorn¹²⁹ (1987) see, as one of the strong points of scenarios, its ability to assist organizations to perform the kind of competition analysis suggested by Porter and presented in section 3.3.3. Scenarios can provide useful insights on how competitors may react in the face of future events. Scenario planning involves the identification of:

1. The forces that are driving the markets for current products of services,
2. Trends that can affect the attractiveness of a region, and
3. Future niches and opportunities.

¹²⁷ Ibid. 115

¹²⁸ Ibid. 113

¹²⁹ Becker, Henk A., and Joseph W.M. van Doorn. Scenarios in an Organizational Perspective. *Futures*, Volume 19, number 6, December 1987, p 669-667

In order for scenarios to capture the context of regional transportation —or any context in which scenario planning will be used— an extensive research effort is needed. While several general topics may be used as input in any scenario, research will also require information specific to the field of application. The information needs of scenario planning are significant, and include “hard data” (statistics and the like) as much as “soft data” (expert insights, management opinions).

5.4 SCENARIOS AND THE ORGANIZATIONAL CONTEXT

5.4.1 PUBLIC/PRIVATE PARTNERSHIPS’ CHARACTERISTICS AFFECTING THE PLANNING PROCESS

Chapter 4 provided a picture of the planning role for public/private partnerships that this thesis argues would improve regional strategic transportation planning. These mixed associations are a special kind of organizations and their specific characteristics will affect the planning process. The determinants of the strategic process proposed by Quinn and reviewed in section 2.5.1 can shed some light for such organizations:

1. Organizational culture

It must be emphasized that a public/private partnership is not an “organization” in the sense of being as a corporation or a public agency. In the words of O.P. Agarwal¹³⁰, it is more an “*arrangement of organizations*”. Nevertheless, the tangible boundaries, established hierarchy, accountability, and shared vision of the partnership can help to create a culture of its own. The culture in the partnership will be the first

¹³⁰ Agarwal, O.P. MIT Graduate Student. Personal Communication. March, 1998

determinant of the planning activities. The existence of a collaborative or confrontational attitude between public and private stakeholders will make a big difference in the outcome of the effort. A relevant issue in these associations will likely be how to create a bond between all participants and the public/private organization at large. Each member of the partnership will be clearly identified with an independent organization. Every partner should see its participation as a way to serve its own interest and the interests of the region-at-large at the same time.

A related issue is that of continuity. Efforts to build an effective public/private planning culture should aim to establish the partnership on a permanent basis.

2. Nature of the environment and opposition.

The complexity of the regional environment for transportation will be one of the most significant parameters in the strategic planning process. There is a broad range of issues that need to be considered in any transportation solution, and different political constituencies can originate sharp opposition, which will hinder the planning process. Decision-making in the partnership will face simultaneously the complex environment and latent and overt opposition from different groups.

3. Organizational form and management style

Most participants will have operating independence. The presence of shippers, carriers, infrastructure developers, public agencies, environmental advocates and so on, will generate diverging and conflicting interests.

It is under this panorama that major decisions on the management style of the partnership are to be taken. Chapter 4 argued that unless private

organizations can effectively influence the process with decision-making functions, there is a risk of lack of interest by the private sector. On the other hand, it was also pointed out that the profit-maximizing behavior needs to be supervised and harnessed by the state in order to assure the public interest. These two ideas suggest private sector decision-making entitlement under public sector supervision and direction. The question that remains to be answered is how to integrate these seemingly opposite requirements in the structure of the partnership. How can we find the right balance?

4. Time horizon and degree of control over events.

In general, the time horizon for this kind of exercises will not be short. While some significant events and trends driving the environment will be out of the region's control, some others can certainly be influenced and managed.

According to Quinn's theory, the above issues strongly suggest that the planning process in a public/private partnership will follow an incremental approach. One implication from this incremental character is the need to build consensus to advance the planning process. Tenaglia and Noonan¹³¹ (1992) have reported the ability of scenarios to build management consensus in the corporate context. But with a broad range of independent organizations and political contention involved in the regional transportation planning it will be harder to generate consensus in the partnership. Most stakeholders clearly would like to influence the outcome of the process in a way that is favorable for them. Can scenarios help to build consensus under these circumstances? Based on evidence from past experiences, the author of this work believes it can be done. Section 5.5.2 later on this chapter, presents a case in which scenarios helped to generate

common understanding in a broad and highly politicized atmosphere with public and private participants from opposite constituencies.

5.4.2 SCENARIO DEVELOPMENT STAFF: INTERNAL OR EXTERNAL TO THE PARTNERSHIP?

Following the growing use of scenarios and the recognition of their ability to generate strategic thinking in organizations, several works have studied some organizational issues involved in scenario planning. If an organization desires to undertake scenario planning it can develop an “internal unit” to guide this activity, such as the one in Royal Dutch/Shell, or instead contract an “external unit” of consultants and scenario experts. The important thing to notice is that regardless of the internal/external characteristic of the staff that will lead the scenario building, active participation from the members of the organization in the exercise is essential.

Becker and van Doorn¹³² (1987) describe the conditions that support the presence of an internal or external scenario-guiding staff. Table 5.2 summarizes their work on this matter.

A public/private partnership for regional strategic transportation planning combines characteristics that can support an internal or external staff: a partnership will congregate different organizations that can benefit individually from the work carried out by an internal scenario unit. On the other hand it is unclear whether the flow of scenario projects will be continuous enough to justify the internal staff. For a public/private association starting with the use of scenarios, the use of external guidance in the form of specialized consultants

¹³¹ Tenaglia Mason, and Patrick Noonan. Scenario-based Strategic Planning: A Process for Building Top Management Consensus. Planning Review, Volume 20, number 2, March-April 1992, p13-19

¹³² Ibid. 129

seems to be the most rational approach. After a first or few other exercises, the organization can decide to establish an internal unit for future scenario activities.

Table 5.2 Internal or External Scenario-Guiding Staff (based on Becker and van Doorn¹³³, 1987)	
Characteristics that support an Internal Staff	Characteristics that support an External Staff
<ul style="list-style-type: none"> • Large organizations that can afford the presence of an internal unit by itself, or a number of smaller organizations having enough in common as to be served by the work of this unit. • A continuous flow of similar projects • A need or preference to keep the work in secret. 	<ul style="list-style-type: none"> • Small organization • Discontinuous flow of projects or of very different nature • Aim for broad public participation in the process.

5.4.3 COMMON PROBLEMS IN SCENARIO PLANNING

The use of scenarios in any organization is not free from obstacles and flaws. Among them Schriefer¹³⁴ (1995) notes:

- Lack of focus

In order to be useful, scenarios must be relevant to the decision issues and strategic concerns of the decision-makers in the organization. To reshape managers' perspective, scenarios must start precisely from their concerns and perception of the world. Scenarios should be used without losing sight from the decision context and the audience for whom they are developed.

¹³³ Ibid. 129

¹³⁴ Schriefer, Audrey. Getting the Most Out of Scenarios: Advice from the Experts. *Planning Review*, Volume 23, number 5, September-October 1995, p33-35

- Lack of involvement by decision-makers'
Decision-makers need to be involved in and committed to the scenario process. Without this active participation the use of scenarios becomes futile.
- Scenarios are challenging and difficult to use
Scenarios challenge decision-makers' and planners' perspectives and are time- and effort-intensive at the same time. It is important that the process be carried out carefully to avoid excessive complexity and burden that will discourage the interest of managers and staff.

Ralston, as cited by Schriefer¹³⁵ (1995), suggests the following tactics to overcome the above problems:

1. Develop an organizational culture receptive to scenarios.
This is a central issue. To promote a receptive culture, scenarios should be tailored to the specific needs of the organization, made simple and relevant to the strategic concerns of managers. As already mentioned, participation of decision-makers is essential.

Based on her experience in a comprehensive scenario planning activity undertaken by British Airways, Moyer¹³⁶ (1996) provides additional insight on how such receptive culture can be promoted:

“The positioning of the Scenario Planning exercise as an ‘experiment’ and the consultative style engaged people’s interest

¹³⁵ Ibid. 134

¹³⁶ Moyer, Kathy. Scenario Planning at British Airways –A Case Study. *Long Range Planning*, Volume 29, Issue 2, April 1996, p172-181

without them feeling that a new structure was being imposed on them. This mean people tended to be predisposed to being involved in the exercise.”

2. Look for opportunities to use scenario planning

Because scenarios are easier to apply to certain issues, organizations using the methodology for the first times should try to apply scenarios to these topics. In general investment decisions, contingency planning and explicit challenges to planning assumptions are more friendly applications of scenarios.

3. Create a strong communication program to transmit the messages of the scenarios to the entire organization.

Once the scenarios have been developed, they should be presented to the members of the organization that did not participate in their construction. Realizing the insights and strategic implications of each scenario require them to be communicated properly and in a way that catches the attention of the audience. For instance, Ralston suggests playing each scenario in ten-minute video segments.

4. Link the scenario development with the rest of the strategic management process.

Building scenarios should not be isolated from the rest of the strategic planning and management activities. As put forward by Schriefer¹³⁷ :

“Scenarios are not the answer to everything. They must fit within a corporate vision and cannot stand alone. They need to be supported by a good planning and thinking infrastructure in the company.”

¹³⁷ *ibid.* 134

5.5 EXAMPLES OF SCENARIO-BUILDING OUTSIDE THE CORPORATE ENVIRONMENT

Within the scenario literature, many of the cases where the methodology has been applied belong to private sector organizations. This section will present three examples in which scenario planning has been used *outside* the corporate domain. These examples describe scenario activities in different countries and with different focus, in which the issues under study were clearly relevant for both public and private stakeholders.

5.5.1 THE CANADIAN GOVERNMENT PREPARES FOR THE FUTURE: THE GOVERNANCE SCENARIOS

A scenario effort directly involved with the needs and objectives of the public sector was undertaken in Canada in 1995. The following narration of this exercise is based on information provided by the Canadian government's Task Force on the Future of the Public Service (TFFPS)¹³⁸:

In August of 1995 the Canadian government created the Task Force on the Future of the Public Service which was commissioned to explore the future of the federal public service for a ten-year planning period. The Task Force was composed of 26 members primary from the public and academic fields and with minor participation from the private sector. Scenario planning was chosen as a tool to test policies and decision in different futures, instead of trying to predict a particular future.

The Task Force needed to be prepared before building the scenarios. This learning effort lasted four months and was structured in the following way:

¹³⁸ Public Service Commission of Canada. Task Force on the Future of the Public Service: The Governance Scenarios. http://www.psc-cfp.gc.ca/library/scenar/scenar_f/sarapr30.htm

- An initial workshop to identify key strategic issues involving the future of the public sector, predetermined elements, critical certainties and uncertainties, and needs for further information research.
- The use of selected readings for certain topics.
- Several intensive roundtable discussions with worldwide recognized experts.
- Input from strategic conversations with federal deputy ministers.
- A final session in which the Task Force participated developed the scenarios.
- Several follow-up half day workshops with senior public servants were held to refine the scenarios to improve their usefulness.

Resulting from the process were three “governance scenarios” (labeled “Evolution”, “Market”, and “Renaissance”) describing three different futures in which Canadian public sector might need to operate and govern the country. A “Crisis Wild Card” was added later as another way in which Canada might evolve. Following the refining of the scenarios, the Task Force has promoted their use as:

“a powerful set of tools for encouraging and facilitating strategic discussion and dialogue about the future of the public service, about governance in Canada, and even about public policy issues.”¹³⁹

Table 5.3 based on the on-line document prepared by Task Force, depicts the main characteristics of the scenarios resulting from this effort:

¹³⁹ Ibid. 138

Table 5.3 The Governance Scenarios (based on the Task Force for the Future of Public Service of Canada¹⁴⁰)	
Scenario	Main Characteristics of the Scenario
Scenario 1 "Evolution"	<ul style="list-style-type: none"> • More attention to the parts that to the entire system: different regions and groups increasingly pursue their own interest; institutions function as independent entities instead that elements of an integrated system • Step by step improvements in the public service; continuity on the performance of bureaucratic procedures and institutional leadership • Government manages problems pragmatically and carefully • A focus on the short to medium term
Scenario 2 "Market"	<ul style="list-style-type: none"> • A borderless world centered around regional economies; growing income disparity, favoring entrepreneurs and risk-takers • Market mechanisms are used to address social and regional issues; private sector concerns help to set federal agenda • Society continuously adapts to the needs of competition in the global economy; wealth creation becomes a priority • The role of government is refocused to support and facilitate international competitiveness
Scenario 3 "Renaissance"	<ul style="list-style-type: none"> • Challenges are addressed through a more inclusive and systematic approach • The responsibility for governance is redistributed among society, private and public sectors; increased citizen participation in decision-making; the role of the federal government is to provide strategic, long term and leadership • Partnerships and alliances are the foundation of business relations; the distribution of wealth is more equitable • A learning society harnesses technology and uses it to compete effectively in the global information technology
"The Crisis Wild Card"	<ul style="list-style-type: none"> • Generalized falling incomes; people expect the government to lead and act; the public sector's speed of reaction becomes critical • While sovereignty and international status of Canada are at risk, the focus in on political direction/survival

5.5.2 SOUTH AFRICA LEARNS FROM THE FUTURE TO DECIDE IN THE PRESENT: THE MOUNT FLEUR SCENARIOS

Just as the experience of Shell in the seventies showed the power of scenarios to reshape decision-makers' perspective, the so called "Mont Fleur scenarios" highlight how this tool can benefit strategic conversations and build consensus amidst a group of individuals with conflictive positions. The facilitator for the

¹⁴⁰ Ibid. 138

Mont Fleur scenarios, Adam Kahane, as cited by van der Heijden¹⁴¹ (1996) provides the basis for the following description:

The project was undertaken between 1991-1992 --a period of great uncertainty and charged with conflict in South Africa due to the political transition being negotiated at the time. The scenario effort brought together a group of 22 prominent members of the South African society representing different constituencies: left-wing activists, officials of the African National Congress, senior corporate executives and academics.

The group was divided in subgroups that were asked to generate stories of what could occur to South Africa. With such organizational setting, a major concern was the distortion of the scenario-building process encouraged by the participants' personal or political interests. Kahane avoided this risk by:

1. Making the participants to focus on "what might happen" instead of what they would like to happen"
2. Requiring the strict adherence to the cause-effect relationship between events envisioned as part of a scenario.

This second point proved of fundamental importance as several of the scenarios created were clearly based on the interests of particular groups. Each scenario was then presented in a plenary session and only two questions were allowed to challenge a scenario:

- "Why does that happen?"
- "What happens next?"

¹⁴¹ Ibid. 22, p 199-202

Unless the presenter of the scenario could answer these questions in a satisfactory way, the story was regarded as inconsistent and therefore unworthy of further consideration. This search for internal consistency in the scenarios allowed the process to remain free from distortions. The remaining scenarios were narrowed down and finally four stories believed to be most relevant for the South African context were chosen. Each of these four scenarios (“Ostrich”, “Lame Duck”, “Icarus” and “Flamingoes”) represented a plausible future and highlighted some of the threats facing the country. Table 5.4 presents the main events that define each scenario. All the parties involved in the discussion gained a new level of awareness regarding the impact of the decisions that were about to be taken.

5.5.3 LESSONS FROM MONT FLEUR

In a later document, Kahane¹⁴² highlights what the results of the Mont Fleur scenarios were and were not:

- The scenarios did not solve the crisis. It helped to establish a common language and mutual understanding among the involved parties. Some areas of understanding were important in the actual negotiations that in this case occurred simultaneously to the scenario exercise.
- The scenarios did not generate agreement on the solution to the problem. It generated consensus on how the country “worked” on the nature of the crisis and on some of its feasible outcomes.

¹⁴² <http://www.gbn.org/scenarios/fleur/fleurIntro.html>. Kahane, Adam Learning from Mont Fleur: Scenarios as a Tool for Discovering Common Ground.

Table 5.4
The Mont Fleur Scenarios
(based on Davis-Floyd¹⁴³)

Scenario	Summary and Main Events of the Scenario
Scenario 1 "Ostrich"	<p><i>"The Ostrich depicts a government that does not want to face realities. An ostrich supposedly hides its head in the sand when danger threatens. The ostrich does not want to see and cannot fly away..."</i></p> <ul style="list-style-type: none"> • Increased international tolerance enables the white government to harden its position, which leads to a break down in the constitutional negotiations • A "moderate alliance" government is formed and faces the opposition of the liberation movements; the State represses mass resistance • Economy remains lagging due to an unstable business climate and escalating violence, leading to stagnation economic hardship • Eventually, negotiations reopen, but under worse conditions than before
Scenario 2 "Lame Duck"	<p><i>"The Lame Duck envisages a formal, protracted transition for most of the coming decade, like a bird with a broken wing that cannot get off the ground, and thus has an extremely uncertain future."</i></p> <ul style="list-style-type: none"> • An agreement is negotiated, but fears from the different stakeholders impose clauses and conditions that slow and hinder the transition. • The long transition based on an enforced coalition incapacitates government • Indecisive government policies fail to address the social and economic problems of South Africa; uncertainty grows, investments hold back
Scenario 3 "Icarus"	<p><i>"The third scenario is one of macro-economic populism of a popularly elected government which tries to achieve too much, too quickly, like the youthful Icarus flying too close to the sun."</i></p> <ul style="list-style-type: none"> • Government tries to solve the inherited problems through massive spending • After a couple of years of impressive economic results and improved living standards, the government runs into a large budgetary deficit; the country falls into a deep economic social and political crisis • Either the government changes abruptly its policies or it is removed from office; in any case the noble intentions of the program are abandoned
Scenario 4 "Flamingoes"	<p><i>"Flamingoes characteristically take off slowly, fly high, and fly together. In this scenario, a decisive settlement, followed by good government creates conditions in which and initially slow but sustainable economic and social take-off becomes possible"</i></p> <ul style="list-style-type: none"> • Sound social and macro-economic policies are adopted; government becomes more efficient and succeeds in curtailing corruption • Adequate social investments reduce violence and give hope to the population; gradual and generalized income increase • Substantial agreement on general objectives; balance between social reconstruction and sustained economic growth

¹⁴³ Davis-Floyd, Robbie. *Storying Corporate Futures: The Shell Scenarios*. The International Journal of Futures Studies. Volume 1, 1995-1997 (excerpted form "The Mont Fleur Scenarios" *The Weekly Mail/The Guardian Weekly*, South Africa, 1992.1)
<http://www.systems.org/HTML/fsj-v01/rd-f/shell-3.htm>

Kahane¹⁴⁴ also lists a set of conditions for the success of these kinds of scenario efforts. From them we can draw the lessons that Mont Fleur can bring for the development and use of scenarios in *public/private partnerships*:

1. In order to be effective, the development of scenarios must be a credible process. The people guiding and structuring the activity must be broadly respected as advocates of the planning process and not of any particular position or outcome.
2. Developing the scenarios is an informal and reflective process whose power comes from its status as an insight-building and imaginative exercise. It should be treated *separately* from any formal negotiations and/or joint decision-making to be made. As mentioned earlier in the chapter, the influence of scenarios includes the generation of strategies and decision-making. But Kahane warns us about the need to insulate each of these processes carefully.
3. Because developing the scenarios will build common ground among the different organizations involved, it is important that the process be as inclusive as possible. Participants must represent all the important perspectives at hand.
4. Individual participants must be respected in their organizations and able to influence their own groups and constituencies. They should also approach the process with open mind and be able to listen to and work with others.

¹⁴⁴ Ibid. 142

5.5.4 STUDYING THE FUTURE OF TRANSPORTATION IN THE US

The last application of scenarios presented in this chapter was undertaken in the US and is directly related to the transportation field. The following description is based on a report from the Research And Technology Coordinating Committee (RTCC) of the Federal Highway Administration (RTCC¹⁴⁵, 1997):

The issue to be studied was the future of the US highway transportation system. The RTCC developed a list of key factors that could serve as descriptors of the future highway system:

- Future travel demand
- The future role of the government; new trends in finance and taxation
- Information and communication technologies
- Environmental and energy-related issues
- Vehicle and fuel technology
- Delivery of social services
- Other (economic globalization, social attitudes and values)

In order to identify the driving forces of the scenarios, the most important and most uncertain of these element were chosen. The criteria for doing so required that the driving forces should:

- Be essential to the development of the future highway system and at the same time be independent of it.
- Having a considerable uncertainty and the potential for a major shift over the next 25 years.

¹⁴⁵ Research and Technology Coordinating Committee (FHWA) The Future Highway Transportation System and Society: Suggested Research on Impacts and Interactions. Transportation Research Board, Washington, DC, 1997

Based on these parameters, four issues were identified as the driving forces of these scenarios: highway-related technology, finance, energy and the environment. Each of these driving forces was considered to have two possible end states, which are depicted in Figure 5.3. The combination of these outcomes defines the different futures that can occur.

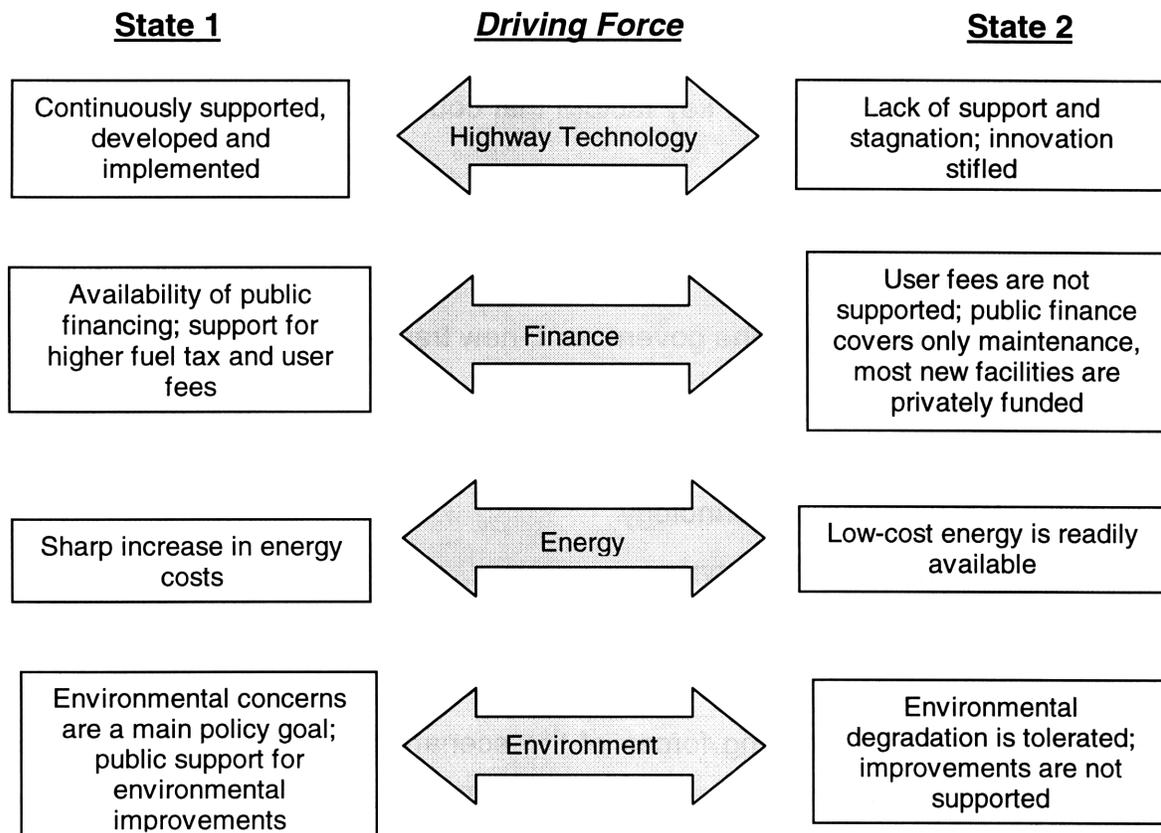


Figure 5.3
Possible outcomes of the Driving Forces
(based on RTCC¹⁴⁶, 1997)

The RTCC examined the 16 possible combinations resulting from four driving forces each with two alternative outcomes. Table 5.5 shows the scenarios that were chosen as representing the widest range of feasible futures with the minimum overlap:

Table 5.5
Four Scenarios for the Transportation System in the US
(based on RTCC¹⁴⁷, 1997)

Scenario	End-State of Driving Forces	Characteristics of the Scenario
Scenario 1 "Scarcity and Downward Spiral"	<ul style="list-style-type: none"> • Highway technology stagnates • Lack of political will to apply user fees • Sharp reduction of low-cost energy supplies • Environmental improvements are not supported 	<ul style="list-style-type: none"> • Rationing of petroleum and gasoline supplies; sharp reduction in single-occupancy vehicle travel; increased demand for lighter, more energy-efficient vehicles ; • Personal mobility is not a high priority goal; reduction of non-work travel • Reduction in transportation funding • Increased use of telecommunications and information technologies • Concerns of economic well-being make environmental protection a low priority goal
Scenario 2 "Significant Downturn for the Nation"	<ul style="list-style-type: none"> • Highway technology stagnates • Lack of political will to apply user fees • Low-cost energy is available • Environmental improvements are not supported 	<ul style="list-style-type: none"> • Growing income disparity, continuing suburbanization and deterioration of central cities; transit almost entirely privatized • Widespread use of communications and information technology • Limited funds for transportation and deterioration of the nation's infrastructure, especially in areas of cold weather • The location of cities and regions would become critical to their economic success • Increasing security problems for freight shipments and individuals
Scenario 3 "The Present Reflected into the Future"	<ul style="list-style-type: none"> • Highway technology is widely used • Lack of political will to apply user fees • Low-cost energy is available • Environmental improvements are supported 	<ul style="list-style-type: none"> • Widespread support for innovations in highway and transportation systems technology • Increased use of public/private partnerships for transportation projects; increased willingness of the private sector to invest heavily in ITS • Metropolitan areas with economic potential are benefited • Growing conflict in certain locations to choose between rehabilitating old infrastructure or add road capacity
Scenario 3 "Improvements in Many Areas"	<ul style="list-style-type: none"> • Highway technology is widely used • Political support to apply user fees • Low-cost energy is available • Environmental improvements are supported 	<ul style="list-style-type: none"> • Clear signs of a global warming threat triggers research and efforts to reduce the effects of petroleum-based transportation • Technological breakthroughs lead to clean, renewable and low -cost energy • The externalities of transportation are routinely accounted for in pricing travel behavior • The gas tax stops being the major source of revenue for highway agencies

¹⁴⁶ Ibid. 145

¹⁴⁷ Ibid. 145

5.6 SUMMARY

Chapter 5 has presented the way in which scenarios integrate some of the major concerns identified earlier in the framework part of the thesis:

- Scenarios have an important role to play in each of the three schools of planning (rationalist, evolutionist and processualist). Scenarios puts planning activities back into the track of strategic thinking by highlighting the need to choose among different alternatives, generate consensus among decision-makers, or generate organizational learning by reshaping managers' mental models.
- Scenario building allows us to capture the complexity of the context of the system under study and the key issues of its performance. For instance, with scenarios we can include into our decision-making process both the characteristics of the world economy and the specifics of a regional transportation system.
- Scenario building is a tool that has been used by public and private organizations and even mixed associations. Scenarios can provide a common ground for the public and private sector to start a common approach to policy formation and regional transportation planning.

In the following chapter, we will study in more depth the theory and principles underlying scenario-building.

6. THE SCENARIO-BUILDING METHODOLOGY

Chapter 5 presented the main ideas behind scenario planning and how scenarios can help to solve some of the limitations and concerns previously identified in the contexts of strategic planning, regional transportation and public/private partnerships. Chapter 6 will go deeper in the theory and practical principles underlying the development of scenarios. First, we will present an overview of the theory behind scenarios. Then, three different approaches to building scenarios will be introduced. One of them will be chosen and will be studied further before we apply this methodology in the Province of Mendoza, Argentina. Finally, the issue of assigning probabilities or not to scenarios, a fundamental area of debate in the scenario community, will be addressed.

6.1 ELEMENTS AND DEGREES OF UNCERTAINTY IN SCENARIOS

Figure 6.1, which repeats for the reader's convenience the scenario structure depicted in the previous chapter will be used to illustrate some of the concepts used in scenarios. Amara and Lipinski¹⁴⁸ (1983) identify two primary elements that affect the development of the future, and characterize their differences:

- a) *Events* have discrete values, and are usually reduced to two possible states. An example of an event in the scenario sketched in Figure 6.1 is the provision of a major infrastructure link between the agricultural region and the Asia/Pacific area, the two states being the existence or lack of such link.
- b) *Trends* have a continuous range of feasible values. These can be easily identified in Figure 6.1 as the growth rates of population and

¹⁴⁸ Amara, Roy and Andrew Lipinski. Business Planning for an Uncertain Future: Scenarios and Strategies, Pergamon Press, 1983

consequently of the demand for agricultural products, or the economic indicators of trade, Gross National Product (GNP) and the like.

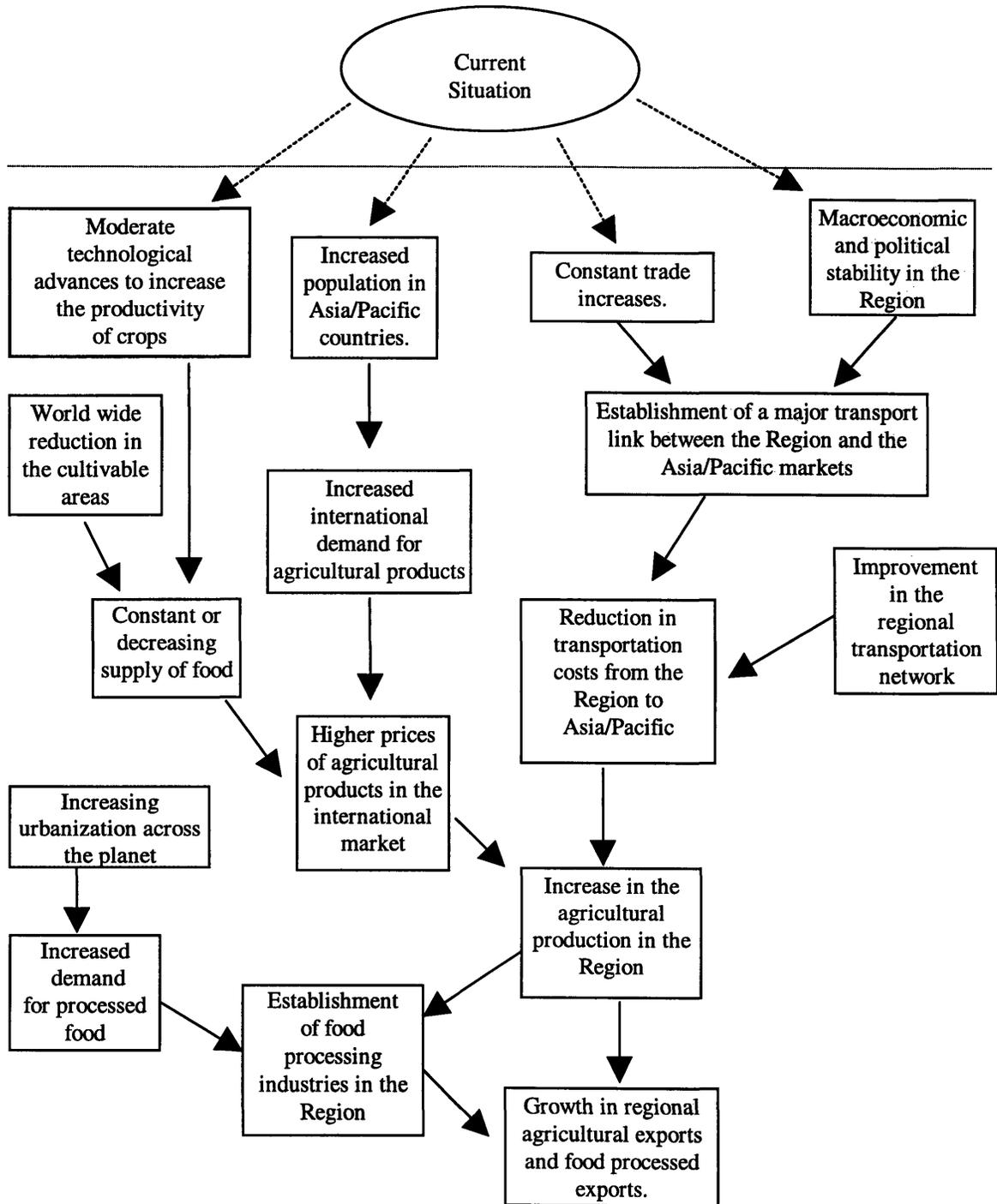


Figure 6.1
Different Events and Trends in a Scenario Structure

In section 2.2.2 we saw that different trends and events in the future have different levels of uncertainty. Based on Schwartz¹⁴⁹ (1996) and Van der Heijden¹⁵⁰, (1996) we can classify the trends and events that form a scenario according to their degree of uncertainty as follows:

1. Predetermined Elements

A basic premise behind scenario planning –and planning in general– is that while we can not forecast the entire outcome of a system, there are at least some events that can be predicted and trends whose result can be forecast. Schwartz calls these the “predetermined elements” of a scenario, and points out that they can be found in:

- Slow-changing trends, such as demographic growth
- Constrained situations, which in the example of Figure 6.1 can be illustrated as the inevitable pressure to increase food prices, due to an increase in population, the reduction of cultivable lands, and the inability to generate a breakthrough in food production technology.
- Elements “in the pipeline”, e.g., the number of teenagers or senior citizens that will live in the industrialized nations by the year 2005.

2. Risks

There are also trends and events whose outcome is not known, but can be assessed thanks to historical precedents that allow a sound estimation of probabilities for the possible outcomes. A classic example of this kind of uncertainty occurs in the decision to drill an oil well. Most of the time there is not enough information to be sure that a specific site contains sufficient oil as to be a profitable enterprise. But based on previous

¹⁴⁹ *ibid.* 112

¹⁵⁰ *ibid.* 22

similar experiences the oil industry has developed the knowledge required to assign probabilities to this problem and act consequently.

3. Structural or Critical Uncertainties.

These are events or trends that are identified as central factors that will affect the development of the future. Because they are often unique, we usually do not have a reliable way to estimate their likelihood. Looking at Figure 6.1 again, the growth of population and the reduction of farming land are slow changing trends which can be thought as “predetermined”. But for the other factor needed for higher food prices –a lack of breakthrough in agricultural technology — we can not know with certainty whether or not will occur. We know that is feasible, but we do not know that will actually happen, and if it does, what form will it take. In this scenario, technology is a critical uncertainty that must be considered. It is simply not possible to confidently assign probabilities to such critical uncertainties.

4. Unknowables

These are events that we can not even imagine will appear in the future. We know that these elements occur from time to time in society, but we can not prepare for them.

6.2 CRITICAL UNCERTAINTIES: SEARCHING FOR A STRUCTURE

Figure 6.2 taken from Van der Heijden¹⁵¹ (1996) presents an interesting view on how scenarios can effectively address the critical uncertainties. At the top of the “iceberg structure” in Figure 6.2 there are the events that we can see happening in the environment, --the first step in analyzing critical uncertainties. After

¹⁵¹ Ibid. 22, p98.

several events have occurred in time, we begin to distinguish a pattern or discover a trend. The mental process does not stop there. The immediate step is to try to find the cause of the pattern. We identify several factors that play a role in causing the occurrences and we assume that there is a structure linking the factors in a way that determines the direction and magnitude of the events.

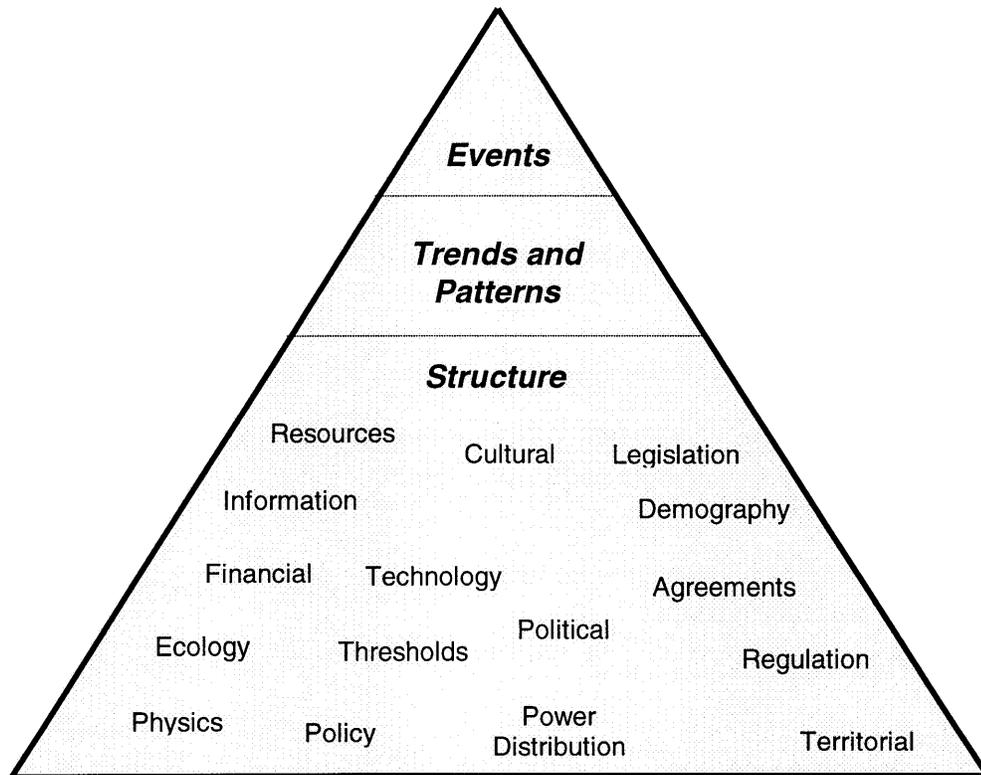


Figure 6.2
The Iceberg Structure of Critical Uncertainties
(Taken from Van der Heijden¹⁵², 1996)

Building scenarios requires us to find the structure behind a number of critical events. To understand the structure of an event, we must generate a cause-effect relationship among the different factors involved. This “causal” structure is in fact a model that can be used to project *–not predict–* possible future conditions in the form of a scenario. It is necessary to remember here that

¹⁵² Ibid. 22

because of our mental models, different people will generate different structures of cause-effect, generating in turn different scenarios. A way to address this problem is through the formation of interdisciplinary “scenario teams”. The team will have a broader perspective than any one individual and can provide also the necessary filter to refine the ideas of each participant.

“Scenario planners start from the premise that there is much more to be said than just reporting events. They assume structure underneath events, driving these in one direction or another. The assumption is that events do not just happen at random, but they are related to each other through a structure where causes drive effects and one event leads to another.”¹⁵³

6.3 THREE APPROACHES TO SCENARIO-BUILDING

Huss and Honton¹⁵⁴ (1987) provide a comprehensive description of three different approaches for building scenarios:

1. Intuitive Logics

This methodology is also known as the “SRI approach” to scenarios after the Stanford Research Institute, which together with Royal Dutch/Shell developed this fashion of scenario-building. The underlying assumptions of the intuitive logics method are

- In order to improve decision-making, organizations must understand the complex relations between different external factors that will influence the outcome of decisions.
- These factors are of economic, political, technological, social and environmental nature. Many of them are “soft data” as politics, environmental concerns, and social attitudes that can

¹⁵³ Ibid. 22, p 98

only be characterized with qualitative attributes. These variables are not suitable for use in quantitative forecasting models.

The main steps of this approach are (Huss and Honton¹⁵⁵ 1987)

- a) The demarcation of the scope of the task, by defining the organization's decisions and strategic concerns that will be analyzed.
- b) The identification of the most important "decision factors" that will determine the success or failure of the strategies/decisions.
- c) The identification of the key forces in the environment of the organization that are behind the decision factors, i.e., the elements that "drive" the decision factors.
- d) A thorough analysis on the key environmental forces, including past trends, uncertainties and interrelationships among these forces.
- e) The definition of the logics behind each scenario. The major assumptions of how each scenario may develop.
- f) The actual development of the scenarios. This stage integrates the scenario logics and the key environmental forces identified earlier. Here is where a sound cause-effect relationship between events must be established.
- g) The determination of the implications for the performance of the organization's strategies/decisions in the face of each of the scenarios.

¹⁵⁴ Huss, William R., and Edward J. Honton. Scenario Planning –What Style Should You Use? *Long Range Planning*. Volume 20, number 4, August 1987, UK.

2. Trend-Impact Analysis

The second methodology presented by Huss and Honton is based on an independent forecast of an already selected set of key dependent variables. This forecast is adjusted later on depending on the occurrence of impacting events. The main steps involved in this approach are (Huss and Honton¹⁵⁶, 1987)

- a) Selection of the topic of study and identification of the key scenario drivers. The drivers are then classified into alternative states. If the drivers of a set of scenarios are the level of competition in certain industry and the condition of the international economy, the driver-states can be chosen as strong or weak competition and stagnated or growing international economy. Each of these driver-states are placed in a matrix as shown in Figure 6.3 and the scenarios result from the combination of these driver-states.

	Strong Competition	Weak Competition
Stagnated International Economy	<i>Scenario 1</i>	<i>Scenario 2</i>
Growing International Economy	<i>Scenario 3</i>	<i>Scenario 4</i>

Figure 6.3
Driver-States Matrix and Resulting Scenarios

¹⁵⁵ Ibid. 154

¹⁵⁶ Ibid. 154

- b) Creation of a “scenario space”, i.e. selecting a subset of the scenarios resulting from the driver-state matrix. Following the example of Figure 6.3, the organization may choose scenarios 1, 2 and 3 as the more relevant ones to be refined. It must be noticed that in other cases, the driver-state matrix can easily have more than four scenarios.
- c) Identification of relevant trends and collection of time-series data. Once the organization has determined the scenario space, a comprehensive list of impacting trends is created and historical data on them is collected.
- d) Extrapolation of these trends into the future by means of standard time-series techniques.
- e) Identifying a list of impacting events, based on literature review, or consulting experts in the related areas.
- f) Estimation of time-dependent probabilities of occurrence for each of the impacting events.
- g) Modification of the extrapolation previously done, based on the trend-impact analysis and the event-probability estimations.
- h) Writing of the narratives constituting the scenarios.

3. Cross-Impact Analysis

The idea behind this analysis is that events should not be forecast in isolation from the occurrence of other impacting events. Huss and Honton identify two major branches of this approach: the INTERAX and BASICS methodologies. A brief description of these approaches follows (Huss and Honton¹⁵⁷, 1987):

¹⁵⁷ Ibid. 154

A. INTERAX (Interactive Cross-Impact Simulation).

Developed at the University of Southern California, ITERAX is based on a computerized simulation model and its approach follows eight steps:

- a) Definition of the issue and time period to be analyzed.
- b) Identification of key indicators whose values can be measured or estimated in time.
- c) Projection of the key indicators by developing models that use econometric and forecasting techniques.
- d) Identification of impacting events through interviews and discussions with experts, and using the ITERAX Delphi database.
- e) Development of probability distributions for the impacting events.
- f) Estimation the impact of the events on the key indicator variables.
- g) Completion of the cross-impact analysis.
- h) Run the model. Using a Monte Carlo simulation, each run will generate a single scenario.

B. BASICS (Battelle Scenario Inputs to Corporate Strategies)

The main differences between BASICS and INTERAX is that the former one does not use Monte Carlo simulation and does not perform independent forecasts of the key indicators. BASICS is also based on a computer model and its steps are

- a) Definition of the topic, scope and time period
- b) Identification of areas of influence (political, technological, economic, regulatory)

- c) Definition of “descriptors”, i.e. key factors, trends, attributes or variables that describe the topic. Descriptors are then classified in “states”, and a matrix of descriptor-states (similar to the driver-state matrix presented in Figure 6.3 is formed).
- d) Completion of the cross-impact matrix and running of the computer program.
- e) Selection of scenarios for further study, based on the results of the last step.
- f) Inclusion of low-probability but high-impact events as part of a sensitivity analysis.
- g) Forecast and study the implications of each scenario.

6.3.1 CHOOSING AN APPROACH FOR THE APPLICATION PART OF THE THESIS

The scenarios to which we have been referring in past chapters of this thesis are related to the intuitive logics methodology. The following are the main reasons for choosing this approach:

- The exchange of ideas when building the scenarios and the discussion of their implications generate a proper environment for performing strategic thinking in the organizations.
- The identification of the forces driving the future and the sound cause-effect requirement between events are useful tools to reshape decision-makers' perspectives. In this way, the intuitive logics scenarios provide a direct link into the strategic direction block of the planning process (see Figure 5.2).
- It does not intend to play any forecasting role, which would limit the ability of scenarios to uncover the entire range of possibilities posed by the future.

- The intense intellectual interaction between participants can become the common ground to initiate or advance planning efforts involving public and private stakeholders.

Chapter 8 applies the framework based on this approach to develop scenarios for the transportation system in the Province of Mendoza in Argentina. The next section will expand the study of the *intuitive logics* approach to scenario building.

6.3.2 A SCENARIO-BUILDING FRAMEWORK –INTUITIVE LOGICS

Figure 6.4, taken from Van der Heijden¹⁵⁸ (1996), sketches the framework for scenario building.

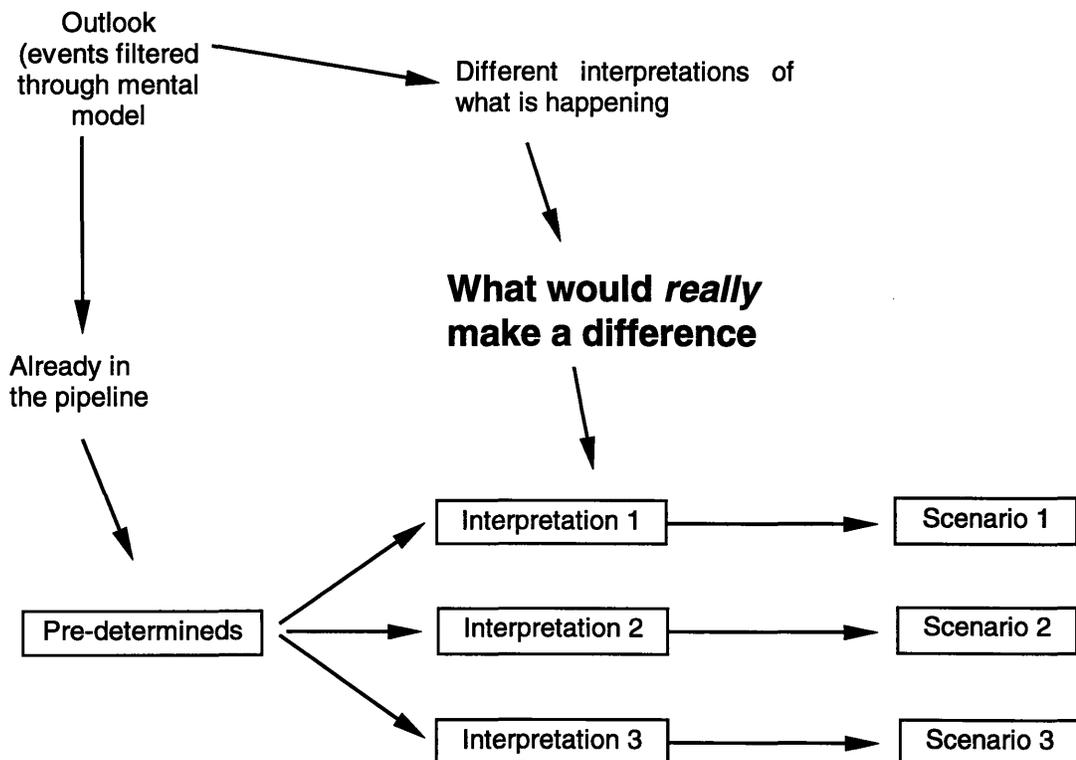


Figure 6.4
A framework for Scenario Building
 (Taken from van der Heijden¹⁵⁹, 1996)

¹⁵⁸ Ibid. 22, p 95

6.3.3 GENERAL PRINCIPLES IN SCENARIO BUILDING

Van der Heijden¹⁶⁰ (1996) provides us with a set of general rules that must be followed when building scenarios:

- A carefully selected team must perform the task of building scenarios. Because the broadness of the scope covered in a scenario, the team should be integrated with individuals from different backgrounds that will provide multidisciplinary perception and knowledge. An essential requirement for the members of the team is to approach the process with an open mind; they should be able to suspend their disbelief in the different scenarios that will be discussed.
- In order to analyze current trends and events, the process generally demand large amounts of information. The scenario team must have a previously set schedule for the duration of the different stages of the process¹⁶¹: data collection, analysis and structuring, refining and presentation of scenarios.
- The number of scenarios should be between two and four. The use of more than four scenarios is regarded as impractical.
- The outcome of a scenario must develop rationally from a sequence of events related by a cause-effect structure.
- The arguments on which a cause-effect relationship between two events is explained must be sound and defensible.
- Each of the scenarios must reflect central concerns and essential issues for the organization sponsoring the effort. At the same time, the scenario-exercise must result in an original viewpoint or a broadening perspective of the decisions under consideration. There is a challenge to be faced in

¹⁵⁹ Ibid. 158

¹⁶⁰ Ibid. 22

¹⁶¹ We will lay out these steps in our application of the scenario methodology in Chapter 8.

finding a proper balance between elements of novelty and relevance to the organization.

- A central activity should be to provide a picture of the implications that each scenario would generate for the organization.

6.3.4 THREE WAYS TO BUILD INTUITIVE LOGICS SCENARIOS

The intuitive logics scenarios described earlier can be also developed in different ways. Van der Heijden¹⁶² (1996) describes three methods for building these scenarios:

1. Inductive Method

In the inductive method, the set of scenarios emerges naturally from the data available. Scenarios can be generated inductively at two levels: events and logic, and the approach is very similar in both cases. At the event level, the study of the data and the insights gained are used to create a list of “illustrative events” along with their timing and actors involved. These events are recorded on cards, showing clearly if they are predetermined or uncertain elements. All scenarios will include all the predetermined elements, and uncertain elements will be included only in one scenario.

The list of events will be the source to create the scenarios and they need to be ordered by time of occurrence. Some of the cards will be evidently linked, while for some others the connection will not seem as clear. At this point different scenarios can be started to accommodate all events. At the end of the exercise, all cards must fit naturally in one of the scenarios under creation. Because of the requirement of internal

¹⁶² Ibid. 22

consistency, new events may be generated to provide connectivity among events and ensure a logical structure.

At the logic level, instead of events, the process generates units of logical relationship. This is done through a mini-story (known as “snippets”) that links events in a consistent way. The snippets are then grouped following the team intuition on their closeness. Each group of snippets is then ordered in time. In the same manner as in the event level, new snippets will be generated to assure the overall logic of the scenarios.

After the scenarios have been finished and refined to a degree that is satisfactory for the team, they are named and the overall logic underlying them is inferred.

2. Deductive Method

The deductive method searches for structure in the data and uses this structure as a framework to identify the scenarios to be developed. At the event level, the method starts by grouping data according to their importance. The knowledge and insights gained during the analysis of the environment are summarized on cards. The insights are then grouped in an iterative way in clusters that are mutually independent and internally consistent. The remainder of the process can be done at three levels: events, trends or structure. At the event approach, a small number of key events that will determine the unfolding of the future must be chosen. The occurrence or not of these events will define the different scenarios. When instead of events, key trends are the ones that will determine the outlook of the future, the dominance of a trend over other ones will define the different scenarios.

At the structural level, the challenge is to identify two or three driving forces that will distinguish each scenario. To generate the larger benefits from this approach, the driving forces should be chosen because not only for their influence in the future, but also because they are the most uncertain. Opposite end-states of the chosen driving forces can then be expressed in a matrix like the one showed Figure 6.3, which will define the set of scenarios.

3. Incremental Method

Van der Heijden recommends the incremental method in cases where scenario planning is not fully integrated in the strategic thinking process of an organization. This approach generates interest in the scenario methodology at the same time that helps organizations to preview the unfolding of the future. The incremental method uses a “challenge scenario” as the ones used by Shell earlier on (see 5.2.3). This challenge scenario is based on the official future and the task of the team is to find the weak points of this view: areas where the official perception does not match reality as reflected by the predetermined and the uncertain elements. After these flaws have been highlighted, it is simple to develop alternative scenarios that challenge the official future in a sound and convincing manner. An important consideration is that these alternative scenarios should be defined not as a result of using different variables, but different perceptions on the driving forces in the system. If the official future is not internally consistent, the first alternative scenario will adjust this flaw and follow its own representation of the future.

The actual choice of the most appropriate method depends on the characteristics of each scenario exercise. Table 6.1 summarizes some of the main advantages and disadvantages of each method.

**Table 6.1
Comparison of the Three Methods
(based on van der Heijden¹⁶³, 1996)**

Method	Advantages	Disadvantages
Inductive	<ul style="list-style-type: none"> • Capable of producing powerful scenarios emerging naturally from the data. • Recommended for diverse organizations aiming to “explore” the future. 	<ul style="list-style-type: none"> • Easy to end up with a set of “good/bad” scenarios, which will erode the usefulness of scenarios in providing strategic direction to the organization. • The process takes longer time. • Requires larger tolerance for ambiguity in the participants.
Deductive	<ul style="list-style-type: none"> • Step-by-step approach • Less time-intensive than the inductive method. • Recommended for groups lacking diversity of thinking. 	<ul style="list-style-type: none"> • Sometimes is not possible to find a small number of key elements (events, trends or driving forces) that will determine the future
Incremental	<ul style="list-style-type: none"> • Recommended for organizations with little or no experience in scenarios. 	<ul style="list-style-type: none"> • More limited than the other two methods.

For the application of the scenario methodology in Chapter 8, the deductive method will be chosen as the approach to build scenarios for the transportation system in Mendoza Argentina.

6.4 ASSIGNING PROBABILITIES TO SCENARIOS

As suggested by our discussion in section 5.1.1, the decision to assign probabilities of occurrence to the developed scenarios is closely related to the roles assigned to them. The fact that the use of scenarios to develop robust decisions considers all scenarios equally likely may rise a doubt in the credibility of the methodology. After a set of scenarios has been built, it would seem natural that some may look more likely to occur than others. As recognition of

¹⁶³ Ibid. 22

this fact, it would also seem logical to weight their different likelihood—even judgmentally— by assigning probabilities of occurrence to each scenario.

Despite the apparently simplicity of this idea, many scenario-planners—some of them seminal figures as Wack— strongly oppose the assignment of probabilities to the created scenarios. Global Business Network, an organization that brings together leading thinkers and practitioners of scenario planning has posted in the Internet (GBN¹⁶⁴, 1996) an interesting discussion among its members on whether scenarios should be assigned or not a probability of occurrence. Some of the main ideas raised in this discussion follow (authors in parenthesis):

- Assigning probabilities to scenarios naturally invites managers and decision-makers to focus on the one that seems to be the most probable at the time and forget about the other scenarios (Lee Schipper). In general, people focus strongly on quantitative figures and ignore the more important concepts and underlying structures (Adam Kahane).
- Any specific scenario has a minuscule probability to occur as it has been built (Adam Kahane). The future will most likely be a combination of the different scenarios developed. Therefore, scenario-builders should not try to pinpoint the exact future, but rather to show the range of futures that may come to pass.
- Scenarios are not about estimating probabilities or employing sophisticated decision-analysis techniques. These approaches do not guarantee robust decision-making, as they do not reveal --much less allow to consider— hidden factors and events that can affect the performance of the decisions. Scenarios are about improving perception. (Kees van der Heijden). Scenarios help to understand the range of possibilities of a system and to

¹⁶⁴ Global Business Network. Probabilities: Help or Hindrance in Scenario Planning. June 1996. <http://www.gbn.org/Scenarios/Probabilities/>

prepare individuals and organizations to face successfully different futures (Steve Rosell).

The comments of Pierre Wack on this matter are straightforward:

"It looks very attractive to use probabilities in scenarios, both from the perspective of the client –which scenario will really occur?-- and from the perspective of the scenario writer, who can communicate more of the information he already has. But I have a strong feeling that it will be poisonous and will contaminate the logic of scenarios.

These are strong words: let me explain. First, I do not know of any successful case of scenarios using probabilities, not one, and I think there are good reasons for this. Probabilities are more of a nuisance than a help in the non-trivial process of communicating scenarios to management. By focusing on the outcome instead of developing and understanding of the forces leading to an outcome, they will have a superficial and mechanical impact, and will not change management mind-sets in depth." ¹⁶⁵

The discussion on the usefulness of assigning probabilities to scenarios is an ongoing and recurring matter in which a complete consensus has not still been achieved. Several of the most influential scenario-planners believe probabilities are more a problem than an aid. Therefore, in the application of scenarios to the Province of Mendoza in Argentina to be undertaken in the following chapter, we will not assigned a probability of occurrence and therefore in effect will consider all scenarios equally likely. As a result, we should aim to make the decisions robust for *all scenarios*, and not only for those that would seem more likely to occur.

6.5 SUMMARY

In this chapter we have introduced some of the theory behind scenario planning and three different methodologies to build scenarios have been reviewed.

¹⁶⁵ *ibid.* 164, Final Comments

Within the chosen methodology, three alternative ways to create scenarios were also studied. Finally, the issue of assigning probabilities to scenarios was addressed. This chapter closes the methodology part of the thesis. In the next chapter a specific application of scenario planning for the transportation system of Mendoza, Argentina is undertaken.

7. THE PROVINCE OF MENDOZA, ARGENTINA

The present chapter will introduce the province of Mendoza, Argentina and will describe the characteristics and issues relevant to this particular region and its transportation system. This background information will provide the basis for building the scenarios in the next chapter.

7.1 THE PROVINCE OF MENDOZA, ARGENTINA

Located in the southern cone of the American continent, Argentina has an area close to 2.8 millions of square kilometers and a population of around 35 million (World Bank¹⁶⁶, 1997). Starting in the 1940's Argentina, once considered among the most prosperous nations in the world, suffered slow economic growth and its economy continuously eroded until in 1989 the state became financially insolvent¹⁶⁷. A sustained effort of structural reform in the last years has improved the overall economic situation of the country.

As can be seen in Figure 7.1, the province of Mendoza is located in the most western portion of Argentina and is bordered by Chile, close to the Andes Mountains. Mendoza has an area close to 150,000 km² and over 1.4 million inhabitants, with roughly half of them living in the metropolitan area of the same name^{168, 169}.

¹⁶⁶ Ibid. 75

¹⁶⁷ The World Bank Group. <http://www.worldbank.org/html/extdr/offrep/lac/argentin.htm>

¹⁶⁸ Espinosa Edgardo et al. Mendoza en el Corredor Bioceanico Central. Relevamiento y Estado de Situacion. CIT/MIT Joint Program, 1996

¹⁶⁹ Unless specifically stated, Mendoza will refer to the province of Mendoza.



Figure 7.1
South America, Argentina and Mendoza
 (adapted from Yang¹⁷⁰, 1997)

7.1.1 ECONOMIC ACTIVITY

Despite its arid climate, agricultural activities and manufacturing of products from agricultural and cattle origin have traditionally played an important role in the Mendozaan economy. A moderately diversified agriculture yields different vegetables and fruits, and a significant portion of this harvest is processed in the

¹⁷⁰ Yang, Xing. Designing a Transportation Network for Mendoza, Argentina: A Strategic Approach. Master of Science in Transportation Thesis, Department of Civil and Environmental Engineering, Massachusetts Institute of Technology, Cambridge, MA 1997, p 9

province (Espinosa¹⁷¹ et al, 1996). The province is increasingly active in exporting its products. Table 7.1 based on Yang¹⁷² (1996) shows the performance of the major exports of Mendoza in the last years:

Products	1988	1989	1990	1991	1992	1993	1994	1995	1996
Agricultural and Primary Products	25.7	37.8	60.9	76.3	56.0	65.3	77.9	116.3	123.5
Manufactures of Agricultural and Cattle Origin	62.2	110.4	134.8	111.1	104.6	96.4	109.5	193.0	213.0
Manufactures of Industrial Origin	40.1	49.3	73.0	70.3	54.2	90.6	158.6	182.0	203.0
Fuels and Energy	24.4	54.8	157.2	113.8	136.2	131.9	172.1	215.0	245.0
Total	152.4	252.3	425.9	371.5	351.0	384.2	518.1	706.3	784.5

While traditionally the role of Mendoza in the Argentinean economy has been hindered due to the long distance to the city of Buenos Aires, this situation may be coming to an end (Sussman et al¹⁷⁴, 1996). The creation in 1991 and later development of the Mercosur Trade Alliance (Mercosur), currently formed by Argentina, Brazil, Chile, Uruguay, Paraguay, and Bolivia, has significantly increased the trade flows among these countries. As a result of this, there are clear opportunities for rapid growth in the national and regional economies of these countries. The importance of Mercosur for Mendoza has been highlighted by Sussman et al¹⁷⁵, (1996):

“Any planning for the province of Mendoza must be conditioned by Argentina’s expanded focus on international trade, and in particular, its role in the Mercosur trade alliance...”

¹⁷¹ Ibid. 168

¹⁷² Ibid. 170, p12

¹⁷³ Ibid. 172

¹⁷⁴ Ibid. 62

¹⁷⁵ Ibid. 62

In recognition of the above, the following section presents additional information on this multinational trade association.

7.2 THE MERCOSUR TRADE ALLIANCE

After several years of diplomatic contacts and negotiations, in 1991 Argentina, Brazil, Uruguay and Paraguay signed the Treaty of Asuncion¹⁷⁶. This agreement aimed to the creation of a free trade zone and customs union including all signing members: the “Mercado Común del Sur” (Southern Common Market), or Mercosur for short. Bolivia and Chile joined as “associated members” in 1996 (Balazs, 1997)¹⁷⁷. Unless otherwise specified, when alluding to Mercosur in this work we will not differentiate between “full members” (Argentina, Brazil, Uruguay and Paraguay) and associated ones (Bolivia and Chile), and will be therefore referring to all six countries.

The participation of Chile has particular importance for Mendoza, as it could benefit not only from access to the Chilean market, but also to the Chilean ports in the Pacific (Rasquin and Sussman¹⁷⁸, 1996). These ports can become a gateway for the export of Mendozan products to Asia and the Pacific Rim.

Table 7.2 based on the statistical data published by the Inter-American Development Bank presents some basic data for each of the Mercosur members.

¹⁷⁶ Red Academica Uruguaya. <http://www.intr.net/mercosur/primerp.htm>

¹⁷⁷ Balazs, Caroline A. *An Analysis of MERCOSUR: South America's Common Market*, 1997. <http://www.aimi.org/Mercosur/index.htm>

¹⁷⁸ Rasquin, Oscar and Joseph M. Sussman. *Strategic Planning for Multimodal Freight Transportation in the Northern Oasis of Mendoza*. Phase I Summary Report. CIT/MIT Joint Program, 1996201

Table 7.2
Mercosur Countries: Basic Data as of April, 1997
(source: IDB¹⁷⁹, 1997)

	Argentina	Bolivia	Brazil	Chile	Paraguay	Uruguay	Total Mercosur
Population (millions)	34.6	7.6	163.9	14.5	5.0	3.2	228.8
Land Area (thousands of km ²)	2,777	1,099	8,456	756	407	177	13,672
1996 GDP (in millions of 1990 US\$)	211,642	6,956	493,038	49,745	7,392	9,959 ^a	778,732
GDP 1987-1996 (Avg. Annual Growth Rate)	2.5	3.7	1.9	7.1	3.7	3.3	----
1996 GDP per capita (1990 US\$)	6,105	916	3,007	3,440	1,471	3,127 ^a	----
GDP per capita 1987-1996 (Avg. Annual Growth Rate)	1.2	1.4	0.2	5.4	0.9	2.7	----
1996 Exports of Goods (millions of US\$)	23,818	1,107	47,747	15,353	2,680	2,440	93,145
1996 Imports of Goods (millions of US\$)	22,123	1,405	53,286	16,500	4,059	3,143	100,516

^a Data corresponds to 1995

Since its creation, Mercosur has boosted intra-regional trade.¹⁸⁰ Figure 7.2 shows the growth in trade among member nations from 1991 to 1996. During these years, trade between the full members has increased by 217%, which results in an impressive average annual growth rate of 28%. If this trend continues, the region's internal trade would double every three years, posing an enormous challenge for the transportation system currently serving Mercosur.

¹⁷⁹ Inter-American Development Bank, Basic Socio-Economic Data, 04/21/97. Washington, DC.

¹⁸⁰ Ibid. 178

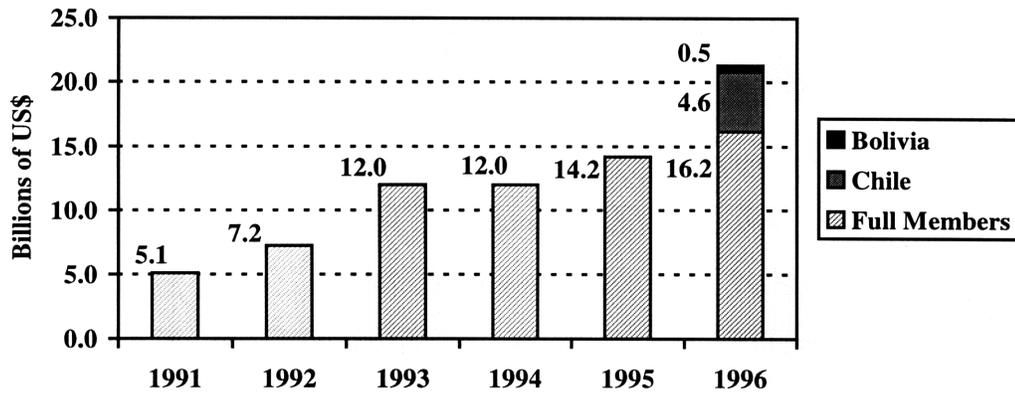


Figure 7.2
Trade Among Mercosur Members
 (source: Mercosul Estatísticas¹⁸¹)

But Mercosur has not only supported trade within its borders. In the six-year period between its formation and 1996, trade with other countries has increased 89%¹⁸². As shown in Table 7.3, Mercosur growth rates compares favorably with that of the developed regions in the world:

Mercosur	United States	Japan	European Union
3.8%	2%	1.7%	1.5%

Figure 7.3 taken from Balazs¹⁸⁴ (1997) shows that a large amount of Mercosur exports are directed towards overseas markets, with the European Union and the U.S. the major trade partners:

¹⁸¹ TRIX MediaNet. Mercosul Estatísticas. (Document in Portuguese)
http://www.trix.net/index.cgi?mercoul_estatisticas_.par

¹⁸² Mercopress News Agency. Mercosur News. December, 11, 1997.
<http://www.falkland-malvinas.com/archive/sni211197.html>

¹⁸³ Mercopress News Agency. Mercosur News. October 2nd, 1997.
<http://www.falkland-malvinas.com/archive/sni4021097.html>

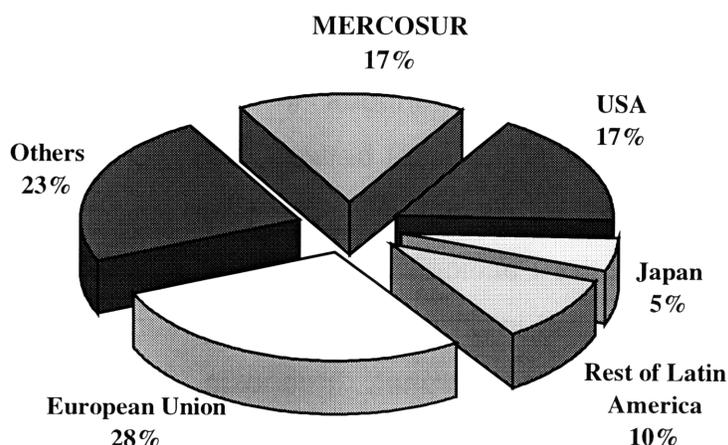


Figure 7.3
Destination of Mercosur Exports
 (taken from Balazs¹⁸⁵, 1997)

After having established itself as a key player in the Latin American trade, Mercosur may have started to expand its influence. Two approaches followed by Mercosur seem to reinforce this view:

1. Formal discussions to accept new members have been going on for sometime.¹⁸⁶ Some of these countries like Peru, Ecuador, Colombia and Venezuela (members with Bolivia of the so-called “Andean Group”) can be considered part of Mercosur’s natural area of influence. But Mexico and Canada –two NAFTA members— have also applied for their incorporation and President Menem of Argentina has expressed its belief that they will become members as early as the first half of 1998.¹⁸⁷

¹⁸⁴ Ibid. 177

¹⁸⁵ Ibid. 177

¹⁸⁶ Mercopress News Agency. Mercosur News. October 25, 1997.
<http://www.falkland-malvinas.com/archive/sni4251097.html>

¹⁸⁷ Mercopress News Agency. Mercosur News. February 15, 1998.
<http://www.falkland-malvinas.com/archives/sni8150298.html>

2. Mercosur has made an effort to reach out beyond its borders and strengthen overseas trade. The link with the European Union has a predominant position in this effort. Continuous interactions have speeded formal negotiations for a common market between the two blocks by 2000.¹⁸⁸ The traditionally more distant relationship with South Asia has started to change too.¹⁸⁹ The rise of the Pacific-Rim as a major player in the world economy has encouraged shared interest to establish closer links between Mercosur and the ASEAN nations (Brunei, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam).¹⁹⁰

7.3 TRANSPORTATION ISSUES IN MENDOZA AND MERCOSUR

7.3.1 OVERVIEW

The formation of Mercosur and the more recent inclusion of Chile have positioned Mendoza in a strategic location because of the increasing freight flows directed to the Chilean ports in the Pacific Ocean. The Andes Mountains are a natural barrier that hinders the movement of commodities between Chile and Argentina. Several border passes through the Andes do exist, but because of their high altitude, the bad weather causes them to close during winter (Koehne¹⁹¹, 1996). Therefore, the construction of a major infrastructure link between Mendoza and Chile has been proposed continuously.

An additional consideration is the deployment of an international transportation corridor in South America. The so-called "Bioceanic Corridor" is envisioned as a

¹⁸⁸ Mercopress News Agency. Mercosur News. December 11, 1997
<http://www.falkland-malvinas.com/archive/sni3111297.html>

¹⁸⁹ M.G.G. Pillai. Latin Tigers Show Claws. The World Paper Online. March 1997.
<http://www.worldpaper.com/March9/pillai.html>

¹⁹⁰ Ibid. 189

¹⁹¹ Koehne, Timothy. On Projects, Transportation Projects and the Mendoza (Argentina) – Los Andes (Chile) Transportation Corridor. Master of Science in Transportation Thesis, Department of Civil and Environmental Engineering, Massachusetts Institute of Technology, Cambridge, MA 1996

transportation corridor connecting the main centers of population, production and transshipment points in South America, including ports along the Atlantic and Pacific (refer to Figure 7.4). The deployment of such infrastructure is highly dependent of numerous economic, political and social factors. If completed, such transportation infrastructure would become a first-order international multimodal and intermodal corridor linking Mercosur, the Pacific Rim and NAFTA (Sussman et al¹⁹², 1996).

Mendoza is interested in strategic planning for its regional freight transportation system that helps it to obtain and sustain competitive advantages in a changing international economy. Yang¹⁹³ (1996) summarizes the main goals of this region:

“[to] balance the objectives of promoting economic growth, improving environmental quality, and facilitating the mobility and accessibility for people and freight.”

It has been suggested that the Bioceanic Corridor can be used as a tool for economic development in Mendoza (Sussman et al,¹⁹⁴ 1996). The following section provides additional information on this international transportation infrastructure.

7.3.2 THE BIOCEANIC CORRIDOR

The construction of a Bioceanic transportation corridor in South America –hardly a new idea— has taken on momentum in the last years as a result of three major reasons (Espinosa et al¹⁹⁵, 1996):

¹⁹² Ibid. 62

¹⁹³ Ibid. 170

¹⁹⁴ Ibid. 62

1. A rapidly expanding trade between regions in the Atlantic Coast of South America and the Pacific Rim nations that demands more efficiency in the transportation system.
2. Potentially major flows generated by this trade would justify the large investments needed to manage the increasing traffic.
3. The presence of a base for a future Bioceanic infrastructure in the existent linkages between:
 - a) the ports of Chile, Argentina, and the southern ports of Peru and Brazil.
 - b) the rail networks of Southern Peru, Northern Peru, the Northeast of Argentina, Bolivia, Paraguay and Brazil.

The deployment of the Bioceanic Corridor would imply (Espinosa et al¹⁹⁶, 1996):

- Offering transport services through multiple modes complementing each other and interconnected in a truly intermodal network.
- Achieving economies of scale and density by means of large shipments scheduled with adequate frequency.
- Providing support services to transportation and trade activities along the corridor and within its hinterland.
- Providing links to other international transportation corridors.
- Supporting of the institutional structures required to manage, operate and maintain the Corridor in an efficient manner.

¹⁹⁵ Ibid. 168

¹⁹⁶ Ibid. 168

7.3.3 THE ALTERNATIVES FOR THE BIOCEANIC CORRIDOR

As shown in Figure 7.4, there are three main different routes that could serve the purpose of a Bioceanic Corridor. The decision on which location will be chosen as the major transportation corridor in South America has not been taken yet. A brief description of the characteristics of these alternatives follows (Espinosa et al¹⁹⁷, 1996):

1. The North Bioceanic Corridor.

The corridor uses two routes to link the northern ports of Chile and the southern ports of Brazil. The first route (called Arica-Santos) starts in Arica, Chile and crosses Bolivia to end in the port of Santos in Brazil. The highway link has paved surface with exception of 900 km between Santa Cruz y Puerto Suarez where the road is only consolidated. Additionally, in this section the road uses a number of rail bridges adapted for highway operation. As a result, traffic must be interrupted when trains need to cross. The railroad infrastructure consists in a narrow-gage line (1m) across the three countries, but the link between Cochabamba and Santa Cruz is missing.

The second path (Antofagasta-Santos) starts in Antofagasta, Chile and goes east to Salta in Argentina to connect later in Santa Cruz (Bolivia) with the first route. The road infrastructure between Antofagasta and Salta combines paved and gravel surface. This route has a complete narrow-gage rail line between both oceans. It currently carries approximately 90,000 metric tons per year and its capacity has been estimated in 2 million metric tons per year.

¹⁹⁷ Ibid. 168

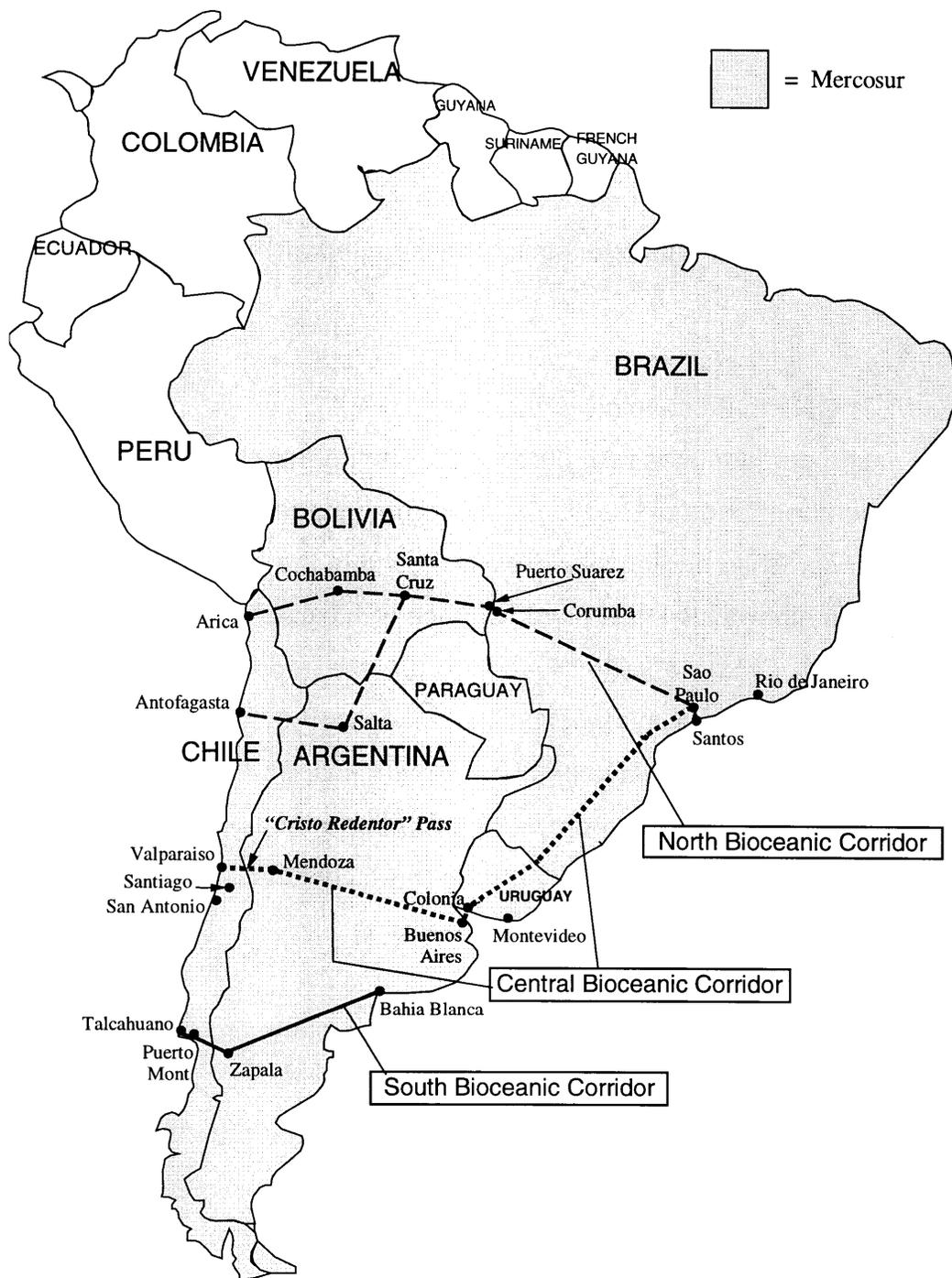


Figure 7.4
The Alternatives for the Bioceanic Corridor
 (adapted from Yang¹⁹⁸, 1996)

¹⁹⁸ Ibid. 170

2. Central Bioceanic Corridor

This corridor links the ports of the central zone of Chile and the Atlantic coast ports of Buenos Aires in Argentina and Sao Paulo in Brazil. The road infrastructure of this corridor is the only one completely paved and is in better condition as it uses the national routes of Argentina. The railroad connection in this corridor is not complete and several sections of the network use different gages. The rail link between Mendoza and Buenos Aires –a wide-gage line (1.676 m)— is estimated to have a capacity up to 10 million metric tons per year.

Yang¹⁹⁹ (1996) makes a case for the viability of the Central Bioceanic Corridor:

“The Mendoza Route 7 and the Cristo Redentor Pass is currently the only major route over the Andes. The economic logic for the Cristo Redentor Pass in the Central Corridor is compelling. Mendoza is opposite to the two most important ports of Chile – Valparaiso and San Antonio. Mendoza is the most important dry port in Argentina. Due west of Mendoza is the most attractive region for development in Chile, with 65% of the country’s ...population and the bulk of the economic activity.”

Despite of the above, several major infrastructure improvements will be needed to make the this corridor functional, among them (Rasquin and Sussman²⁰⁰, 1996):

- Upgrade and expand the highway and railroad infrastructure between Buenos Aires and Mendoza.

¹⁹⁹ Ibid. 170, p. 20
²⁰⁰ Ibid. 178

- Improve the international and interregional linkages, especially the connection between Argentina and Chile through the Andes. This later connection is notably hindered by the lack of a rail link between the two countries.
- Build bypass routes to divert traffic around the city of Mendoza.
- Develop better modal coordination.

3. The South Bioceanic Corridor

This corridor links the Chilean ports of Talcahuano and Puerto Mont with Bahia Blanca in Argentina. The main existing infrastructure consists in a wide-gage rail line. The border passes used by this corridor are lower than in the North and Central alternatives. The winter conditions are not as severe and the passes are open almost the entire year. An important disadvantage to this corridor is that it does not link major productions/consumption centers in South America.

7.4 THE TRANSPORTATION SYSTEM IN MENDOZA

The highway and railroad infrastructure is the backbone of the Mendozaan transportation system (Rasquin and Sussman,²⁰¹ 1996). Figure 7.5 depicts the primary transport infrastructure in Mendoza.

Based on Espinosa et al²⁰² (1996), a brief description of the major elements of the transportation infrastructure in Mendoza follows:

²⁰¹ Ibid. 178

²⁰² Ibid. 168

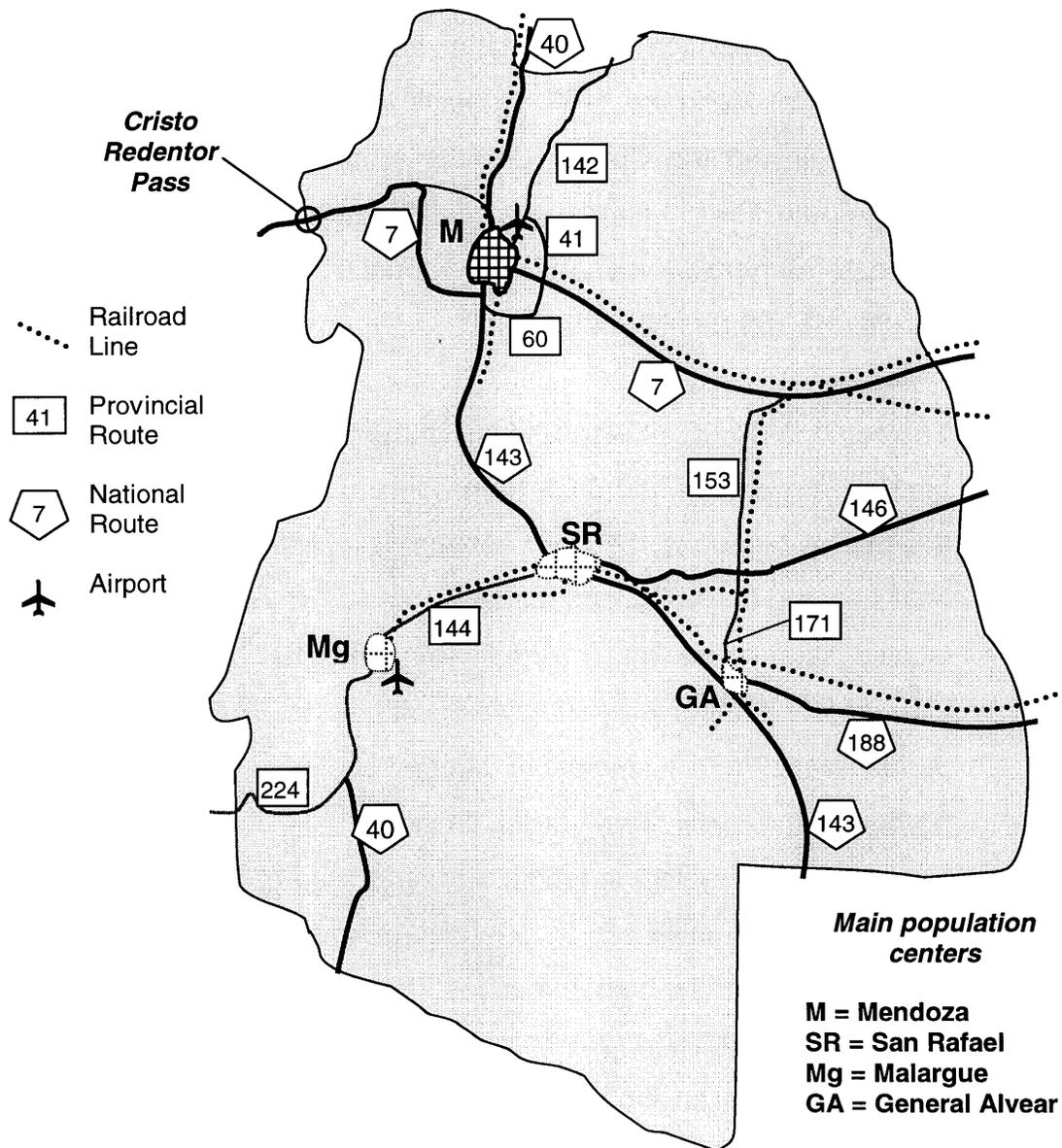


Figure 7.5
Primary Transportation Infrastructure in Mendoza
 (based on Espinosa et al²⁰³, and the Argentinean Transport Ministry²⁰⁴)

²⁰³ Ibid. 168

²⁰⁴ Secretaria de Transporte. Infraestructura Ferroviaria. <http://www.mecon.ar/transporte/ffcc-c.jpg>

a) Highway

The National Route 7 (NR7) is the main link between the cities of Mendoza and Buenos Aires in the East. The section of Route 7 crossing the province is a four-lane road. Approximately 93 km west of the city of Mendoza, NR7 connects with the Provincial Route 153 (PR153) linking the Central Corridor to the South of the province. Going south, PR153 meets with NR146 and then becomes PR171 to arrive to General Alvear. Two National Routes are linked to this locality: NR188 and NR143.

The National Routes NR40 and NR143 provide the main link to cross the western part of Mendoza from north to south. Immediately after the city of Mendoza, NR40 constitutes the access to the portion of NR7 heading to the Chilean border for all flows. At this point, the road is also a four-lane link. After getting on NR7 again, the Central Corridor encounters increasingly difficult terrain. The width of the road varies from 6.70 to 12 meters in different sections until it arrives at the border with Chile. The border crossing uses the Cristo Redentor Tunnel of 3100 meters in length and is located at 3185 meters above sea level. The tunnel can be operated in one direction (with height of 5.10 meters), or in both directions (and a height of 4.20 meters). There is no ventilation system in the tunnel and all freight considered dangerous uses an old rail tunnel that has been readapted for this purpose.

b) Rail

The Argentinean rail network consists of more than 40,000 kilometers of lines and it is operated through several private companies. Table 7.4 shows the composition of the rail lines located in Mendoza:

Narrow Gage (1 meter)	Medium Gage (1.435 meters)	Wide Gage (1.676 meters)	Percentage of the National Network
303	0	1,353	3.91%

* Includes deactivated branches

The concessionaire serving Mendoza is the “Buenos Aires al Pacifico” (BAP) railroad. The “Buenos Aires-Mendoza-San Juan” (BAMSJ) rail corridor is linked to the Argentinean ports of Buenos Aires and Rosario in its western end and to the City of Mendoza in the east. Then the rail line goes north into the Province of San Juan until it reaches the provincial capital of the same name. The BAMSJ line connects with the Mesopotamic railroad –also owned by BAP— serving the north of Argentina and a critical link for the Bioceanic Corridor, as it is the natural link with Brazil, Paraguay and Uruguay.

The BAMSJ line has, in general, favorable alignment and gradients. There is double rail in 621 kilometers out of the 1,063 kilometers between Mendoza and Buenos Aires. The BAP railroad currently transports approximately 2.1 million metric tons per year, and its potential capacity is estimated at 10 million metric tons per year. The referred document mentions that despite the above, the private operator has said that investments in the order of US\$ 150,000 per kilometer are required to upgrade the BAMSJ line.

²⁰⁵ Secretaria de Transporte. Longitud de via por provincias.
<http://www.mecon.ar/transporte/ii-c27.htm>

A multimodal freight terminal has been already built in Palmira, east of the city of Mendoza. This facility is likely to play a significant role in the freight transportation system in the province, as it is conveniently located for land flows linking the city of Mendoza with other regions.

c) Air

The “El Plumerillo” Airport is located on the north access to the city of Mendoza (NR40). It is connected to the NR7, the bus station and with nearby rail lines. While the airport’s infrastructure and equipment enable it to receive large freight carriers as the B-747 year-round, the air terminal is not prepared to manage freight operations.

7.5 THE PASS THROUGH THE ANDES

A critical issue involving the Mendozan transportation system and the Bioceanic Corridor –in any of its three alternative routes— is the border pass between Chile and Argentina that occurs in the Andes Mountains. The Cristo Redentor Pass in Mendoza is the major route over the Andes, but is not the only feasible alternative.²⁰⁶ A comprehensive study aimed at analyzing how to improve the international connection between Chile and Argentina was contracted out by the Transportation Ministries of both countries. Figure 7.6 shows the five major border passes between Chile and Argentina identified by the contractor. Based on this work, a description of each of these passes follows below (CJPII²⁰⁷):

²⁰⁶ Gimenez, Roque. Problemática del Transporte en el Contexto Regional: Tunel de Baja Altura. *Workshop on Transportation and Communications*. CIT/MIT Joint Program, Mendoza, Argentina, 1995. (Document in Spanish)

²⁰⁷ Consorcio Juan Pablo II. Estudio Prefactibilidad Mejoramiento Conexión Internacional Zona Central (Chile) y la Región Cuyo (Argentina): Informe Diagnóstico y Propuesta. Informe Etapa II. Volumen I.. (Document in Spanish)



Figure 7.6
Main Border Passes Through the Andes
 (adapted from Yang²⁰⁸, 1996)

1. San Francisco Pass

This road links the city of Copiapo in Chile with the cities of Tinogasta and Aimogasta in Argentina. The geometry of the road is complicated due to the mountainous terrain. On the Chilean side, the road starts at 370 meters of altitude in Copiapo and travels 284 km to reach the pass at 4,726 meters above sea level. Several of its sections have

²⁰⁸ Ibid. 170

steep gradients of up to 4%. On the Argentinean side, Aimogasta has an altitude of 820 meters and is 359 kilometers from the pass. While in general the slopes are milder on the Argentinean side, the road reaches here its maximum gradient (5%) in a 6 km section. Due to the severe climate, the pass is open only from December to March (i.e., the summer months in the Southern Hemisphere). Despite an increase in the use of the pass in the previous years, in 1994 only 580 vehicles—all of them automobiles—crossed the Andes through San Francisco, i.e. less than two vehicles per day.

2. Agua Negra Pass

The major cities linked by this road are Coquimbo in the Pacific coast of Chile and San Jose del Jachal in Argentina. Coquimbo is located at 10 meters of altitude and 232 kilometers from the pass (4,760 meters above sea level). San Jose del Jachal is located at 1,160 meters of altitude and 154 km from the pass. On both sides, a fair amount of the journey must be done in sections with grades above 3%, reaching 5% in the Argentinean side. The geometry of the road is extremely difficult and drops of rocks and snow are not uncommon. The pass is closed practically during the entire winter. From 1992 to 1994 the traffic through Aguas Negras quadruplicated, reaching 2,209 automobiles in 1994, i.e., a daily average of 6 cars.

3. Cristo Redentor Pass

This pass connects the provinces of San Felipe de Aconcagua in Chile and Mendoza in Argentina. It is considered to start in the Chilean city of Los Andes (altitude: 833 meters) and after 65 kilometers it crosses the border at 3,185 meters of altitude. From there, it travels another 196 kilometers to reach the city of Mendoza (altitude: 769 meters). The road presents steep slopes (7% and 8%)

and close curves 30 kilometers before and after the border. The pass is closed during winter an average of 47 days/year for cars and 60 days/year for trucks and buses. The Cristo Redentor Pass absorbs 90% of the land traffic of all border points between Chile and Argentina with a daily average of 809 cars. Table 7.5 classifies the traffic using the pass in 1994 by type of vehicle:

Type of Vehicle	Annual Transits	Percentage of Total
Cars	164,953	55.9%
Buses	37,608	12.7%
Trucks	92,772	31.4%
Total	295,333	100.0%

The large share of TransAndean traffic managed by Cristo Redentor can also become a cause for concern. According to Koehne²¹⁰ (1996) the pass capacity has been estimated in 5,000 vehicles per day. But the same author suggest the need to review this figure based on claims that during the peak demand (approximately 3,000 vehicles/day) congestion is already occurring. The strong growth rates in trade of Mercosur showed earlier suggest that this problem could become critical for the development of the Central Bioceanic Corridor, and it could even affect the development of Mercosur itself.

4. Pehuenche Pass

This link connects the province of Maule in Chile with the southern portion of Mendoza in Argentina. The cities directly linked are Talca (Chile) and Malargue (Argentina). From Talca (altitude: 332 meters)

²⁰⁹ Ibid. 207

²¹⁰ Ibid. 191

the road travels 166 km to reach the pass at 2,553 meters above the sea, and then descends into Argentina and arrives to Malargue (altitude 352 meters) after 150 kilometers. The alignment of the route is difficult and presents steep slopes (5% to 7%) 40 km before and after the borderline. The pass is closed from April to the beginning of November. The pass is used lightly and almost exclusively by automobiles. In 1994 1,246 vehicles crossed through Pehuenche, i.e. an average of 3.4 cars per day.

5. Pino Hachado Pass

The last of the passes studied was Pino Hachado, which links the provinces of Malleco (Chile) and Neuquen (Argentina). The Chilean section is considered to start in Victoria at approximately 300 meters above sea level. The road arrives to the border pass (1,884 meters of altitude) after 194 km and then descends into Argentina and reaches Zapala at approximately 1,080 meters of altitude, after travelling 122 kilometers. The route takes place over a hilly terrain and the alignment is considered not as difficult as in the other four passes. In 1994 17,457 vehicles used Pino Hachado, being 65.6% automobiles 34.4% buses. The daily average transit was 47.8 vehicles.

The figures and facts presented above highlight the importance of the Cristo Redentor Pass for the Central Bioceanic Corridor. The characteristics of Cristo Redentor and its location relative to major production centers, markets and transportation links in Chile and Argentina seem to confirm its predominance. But it is also true that the inability of the pass to serve an increasing trade due to congestion will strengthen the competitive position of the alternatives. A major investment in any of the alternative passes can also cause a significant shift in the flows crossing the Andes. The improvement of these international transport

links is likely to play a major role in the choice that the route the Bioceanic Corridor and the bulk of Mercosur's freight flows will follow.

Mendoza has recognized the need to study the ways in which the Cristo Redentor Pass can be improved.²¹¹ In the following section we review one of the proposals under discussion for a major investment aimed to improve the Cristo Redentor Pass.

7.5.1 THE JUNCAL-HORCONES LOW-ALTITUDE TUNNEL

One of the options proposed to enhance the international link between Mendoza and Chile –and thus the Central Bioceanic Corridor— is the construction of a tunnel through the Andes. Koehne²¹² (1996) has performed an economical analysis of different technological alternatives for the operation of the tunnel. The following discussion is based on the study of technical feasibility (CJPIIb²¹³) completed by request of the Chilean and Argentinean Transport Ministries.

Eight different sites and alignments were studied and the choice between a tunnel for highway or railroad was also analyzed. Figure 7.7 depicts the location and overall alignment of the proposed tunnel. This facility would be part of the present link between Los Andes (Chile) and Mendoza. The tunnel built between the localities of Juncal (Chile) and Los Horcones (Argentina) would save the steepest part of the current alignment. The length of the tunnel would be on the order of 27 km., being the altitudes of the two ends 2,274 meters in Juncal and 2,720 meters in Horcones. The construction of the tunnel would provide a link available all year round. Several options for the mode to be used in the tunnel have been proposed: a highway-only tunnel, a railroad-only tunnel, and a rail shuttle that would transport cars and trucks in flat cars.

²¹¹ Ibid. 206

²¹² Ibid. 191

²¹³ Consorcio Juan Pablo II. Estudio Prefactibilidad Mejoramiento Conexión Internacional Zona Central (Chile) y la Región Cuyo (Argentina): Estudio de Factibilidad Técnica, Túnel a Baja Altura Juan Pablo II. Informe Etapa III. (Document in Spanish)

While the exact additional capacity provided by the tunnel depends on the different transportation systems proposed, it has been estimated that the capacity is around 10,000 vehicles/day.²¹⁴ There are also different estimates of cost and time for construction. Koehne's analysis suggests a cost range from US\$ 1.0 billion to US\$ 4.2 billions and a completion period from 11 to 19 years.²¹⁵ The choice of transport system to be used in the tunnel will also have major repercussions for the feeder system: a rail tunnel would require and encourage a more fully developed rail network in Mendoza.

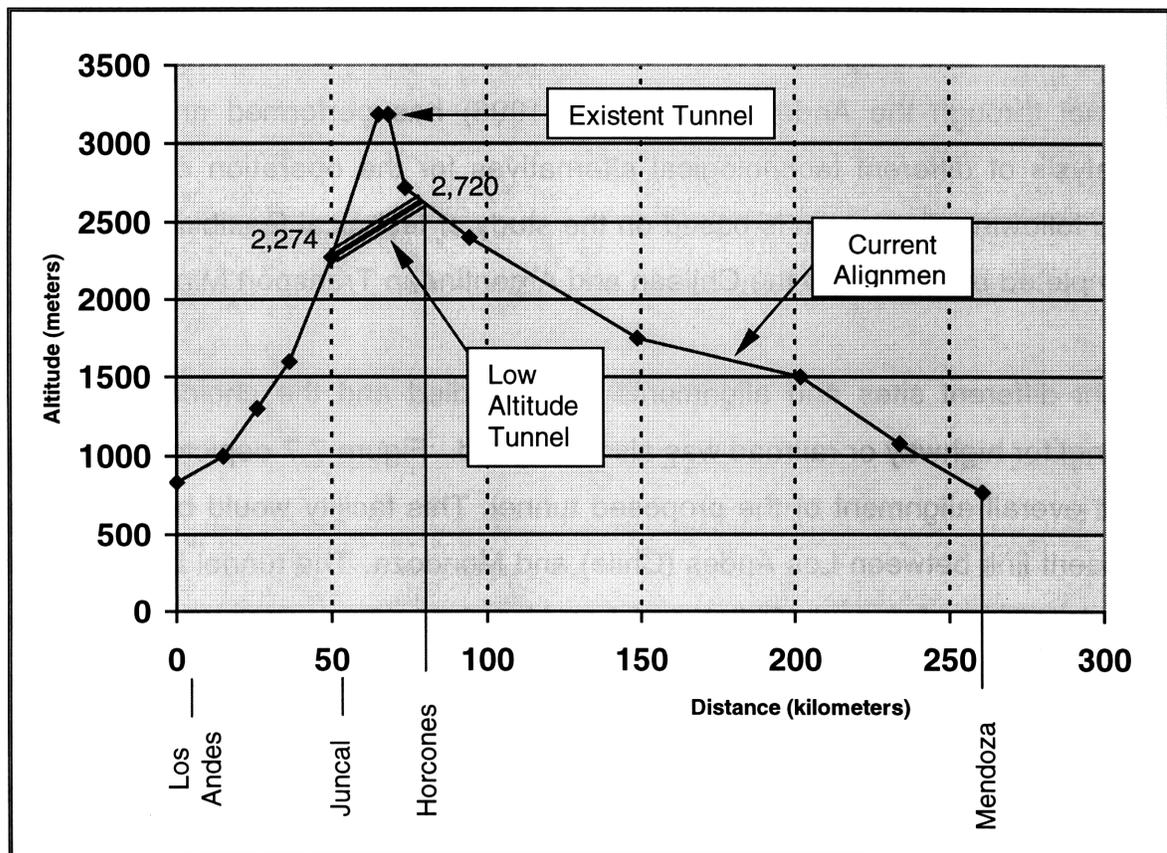


Figure 7.7
Cristo Redentor Pass: Current Alignment and Proposed Tunnel
 (based on Espinosa et al²¹⁶, 1996)

²¹⁴ Ibid. 191

²¹⁵ Ibid. 191

One of the key variables involved in the analysis of the tunnel is the growth in the demand for transportation through the Andes. Koehne²¹⁷ (1996) shows that for different levels of demand, there are different “optimal solutions” for the timing of the construction and operation of the tunnel. Furthermore

“...there is a serious gap between the maximum traffic volume that can be handled by the current route and the minimum traffic volume needed to justify the tunnel.”²¹⁸

The basic problem is of course that it is not possible to forecast this demand in a confident manner. This issue will be at the core of the scenario analysis to be undertaken in the next chapter.

7.6 SUMMARY

In this chapter we have introduced the province of Mendoza as a developing region that is interested in using regional strategic transportation planning as a tool for its economic development. The Mercosur Trade Alliance and its relevance for the Argentinean and Mendozaan economy have been also presented. The transportation system in Mendoza has been presented and some important issues affecting its performance have been reviewed. Among them, we have presented the Bioceanic Corridor, the Cristo Redentor Pass and the Low-Altitude Tunnel between Juncal and Horcones. The following chapter will use this background to build the scenarios for the transportation system in the province. During this process, several additional elements impacting the Mendozaan transport system will be identified and studied.

²¹⁶ Ibid. 168

²¹⁷ Ibid. 191

²¹⁸ Sussman, Joseph M., Carl Martland, Abel Muñoz-Loustaunau and Xing Yang. Strategic Planning for Multimodal Freight Transportation in the Northern Oasis of Mendoza. Summary Report. Year 3. Unpublished.

8. BUILDING SCENARIOS FOR REGIONAL STRATEGIC TRANSPORTATION PLANNING IN MENDOZA

The last chapter described the characteristics and issues relevant to Mendoza and its transportation system was presented. The present chapter will apply a specific scenario-building methodology for the transportation system of the province of Mendoza in Argentina. We will use some of the findings of our previous work on the scenario methodology (Chapter 5 and Chapter 6), and a step-by-step approach to build and use scenarios within the context of Mendoza will be followed.²¹⁹

In his book “The Art of the Long View”, Dr. Peter Schwartz²²⁰ (1996) explains step by step the process of building scenarios. We use this framework and follow his guidance here to show the process of scenario developing by making a specific application to the Mendozan context. When the use of Schwartz’s framework in Mendoza triggers the need for further studying certain issues – a common occurrence in scenario building— this will be also undertaken.

8.1 STEP1: “IDENTIFY THE FOCAL ISSUE OR DECISION”

According to Schwartz, it is better to start a scenario “from the inside out” with a decision or central issue faced by the province, and then move toward the external context. What are the decisions about the transportation system that the Mendozan decision-makers –public officers and private manager— will have to evaluate in the short term? Which of the decisions that must be taken will

²¹⁹ An early version of the scenarios received the valuable contribution of Mr. Richard Karash, a private consultant in the Boston Area whose work includes leading private corporations in developing their own scenarios.

²²⁰ Ibid. 112

have a strong influence in the life of the province? Which of them will have a long-term effect on Mendoza? How do these decisions relate to higher-level goals of the province?

At this stage of the scenario building, it is useful to discuss some of the ideas on strategic planning, economic development and competitive advantage that were presented earlier in the thesis. In section 3.2.1, we recognized that transport systems are closely related to society's needs and functions, and that transportation can be thought of as a tool to support a region's economic activity. Regional strategic transportation planning should be responsive to the specific socioeconomic needs and objectives of the region under consideration. Quinn's hierarchical subsystem of strategies (see section 2.5.5) also reminded us the critical importance of a systematic approach to strategic planning. A transportation strategy for Mendoza should be based on the overall objectives and strategies of the region. Therefore, before addressing the transportation decisions faced by the province, the following sections introduce some thoughts on regional strategies in Mendoza and its competitive niches.

8.1.1 MENDOZAN STRATEGIES

In October of 1994, the province of Mendoza and MIT signed an agreement for a collaborative program of science and technology, whose ultimate purpose was to support the socioeconomic development of the province.²²¹ For this thesis, the concerns and issues studied in this joint effort are considered a good reflection of some of the objectives pursued by the province. The following assessment of the Mendoza strategies –depicted in a systematic view in Figure 8.1— is based on the above reference as well as on information provided in different

²²¹ Massachusetts Institute of Technology and the Province of Mendoza, Argentina. Collaborative Program of Science and Technology. Progress Report, October 1995

documents generated by this program (all of which are listed in the bibliography as publications of the "CIT/MIT Joint Program").

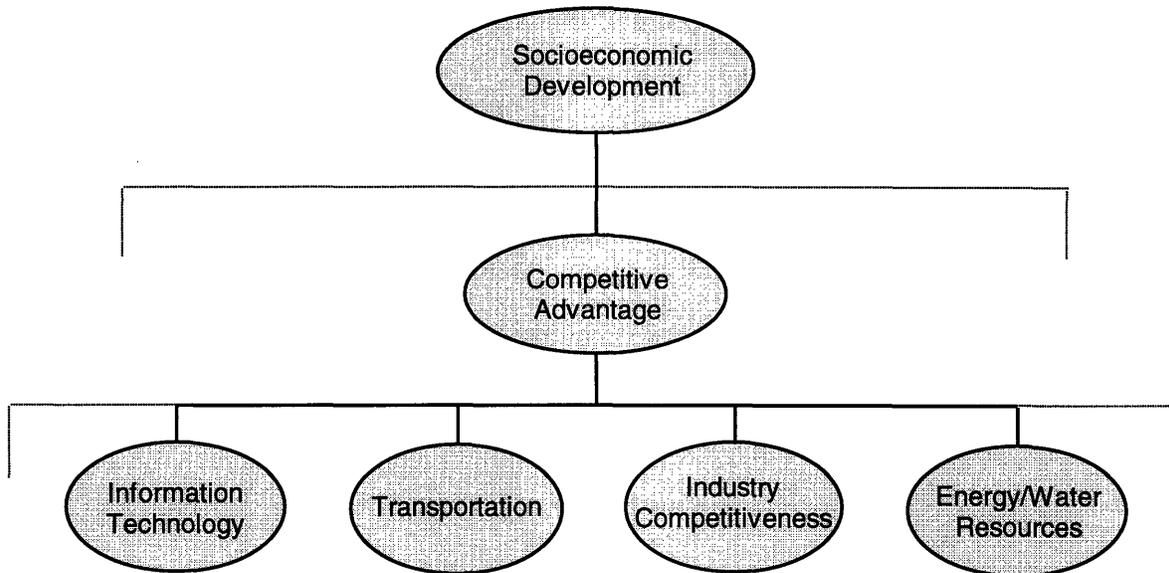


Figure 8.1
Some Elements of Mendoza's Regional Strategies
(based on MIT/Mendoza²²², 1995)

Figure 8.1 shows some of the elements of the Mendoza's regional system of strategies. The dotted lines indicate that there may well be other elements in each of these strategic levels. The generation of sustainable economic development that improves the living conditions of the population is shown as the highest level objective. The ideas of competitive strategy are considered a tool that will help to achieve the development of the province. In a third level, four strategic subsystems supporting the competitive approach of Mendoza are depicted. A short description of each of them follows: ²²³

²²² Ibid. 221
²²³ Ibid. 221

1. Information Technology Strategy

This aims to help Mendoza companies to increase their efficiency and potential through the use of information-technology applications and a technology transfer effort.

2. Transportation Strategy

Because of the favored location of Mendoza with respect to Mercosur flows, the development of a multimodal freight transportation system is at the core of the transportation strategy.

3. Industry Competitiveness

This aims to improve the efficiency and competitiveness of the Mendoza firms, this strategy focuses on manufacturing industries

4. Energy/Water Resources Strategy

This will assess the alternatives for a sustainable development of the water and electricity sector in Mendoza.

Another fundamental concept from our previous discussion is the need for *fit* among the elements of the overall regional strategy (section 3.3.4). At the simplest level, the activities undertaken in each of the above fields should not conflict with the objectives of other field. Another requirement is that these activities should support each other, reinforcing the overall effect.

At this stage we seem to find a major problem, as there are signs that the above strategies have not been developed with a systemic approach. Salvucci²²⁴ (April, 1998) has pointed out the existence of conflicts between some of the

²²⁴ Ibid. 41

Mendozan strategies –conflicts that could blockage the socioeconomic development of the province:

- One element of the Energy/Water Resource strategy is the construction of a dam for generation of electricity in the province. The dam could significantly alter irrigation patterns and thus the agricultural yields of Mendoza. The location of the dam also conflicts with the transportation strategy, as sections of the Bioceanic Corridor would be flooded.
- The industrialization strategy, focused on manufacturing firms seems also to pose a risk for the agricultural land of Mendoza. Part of the land has already become more saline and polluted, among other reasons due to the overexploitation of subsurface water.²²⁵ Additionally, a tradeoff arises because some of the best agricultural land is also becoming the most appreciated by real estate developers. While the provincial government has already identified the need for land-use regulation and has promoted a land-use regularization program²²⁶, the outcome is still unclear.

8.1.2 COMPETITIVE NICHES FOR MENDOZA

In our earlier review of Porter's work on competitive strategy, we identified three major niches of regional competition that are now briefly reviewed in the light of the Mendozan situation:

1. Products and services that Mendoza currently generates.

Mendoza competes with other regions to sell its products and services in the same markets. Table 7.1 pointed out the main Mendozan exports:

²²⁵ Ibid. 221, Attachment C: Energy/Water Resource Project Planning

²²⁶ Ibid. 168

- Agricultural and primary products
- Manufactures of agricultural and cattle origin
- Manufactures of industrial origin
- Fuels and energy

2. The attractiveness of the province

Mendoza also competes to attract resources to support its socioeconomic objectives. In the context of Mercosur and the Bioceanic Corridor, a major element in the attractiveness of Mendoza is related its desire to be chosen as the main pass to cross the Andes to get to Chile and its Pacific ports.

3. Current and future opportunities

As mentioned earlier in this thesis, a perceived trend in the world food market (to be discussed later in detail) and the relevance of agricultural/cattle related exports in its economy suggest a future opportunity for Mendoza (and other regions). The Bioceanic Corridor would improve the accessibility of these regions to Mendoza, Argentina and the rest of Mercosur.

8.1.3 THE FOCAL ISSUE FOR TRANSPORTATION STRATEGY FOR MENDOZA

Figure 8.1 suggests that a transportation strategy for Mendoza should be aimed at supporting the province's competitiveness. An essential concern expressed by Mendoza has to do with Mercosur and the international trade flows that pass through the province. Mendoza is both interested in attracting more of these commodities movement and concerned that the growth of trade in the region will surpass its infrastructure capacity. Therefore, investments aimed to build and maintain infrastructure are likely to be a major element in the transportation strategy. An additional concern is that the infrastructure investment should

benefit Mendoza, generating a crossroads effect and supporting an improvement of regional productivity (refer to section 3.2.2).

In section 3.2.1, we presented Pendleton's four basic economic roles of transportation (sustainer, retainer, and attractor of economic activity; link to the global economy). Figure 8.2 uses these roles to suggest how investment in transportation is linked to the competition niches of Mendoza:

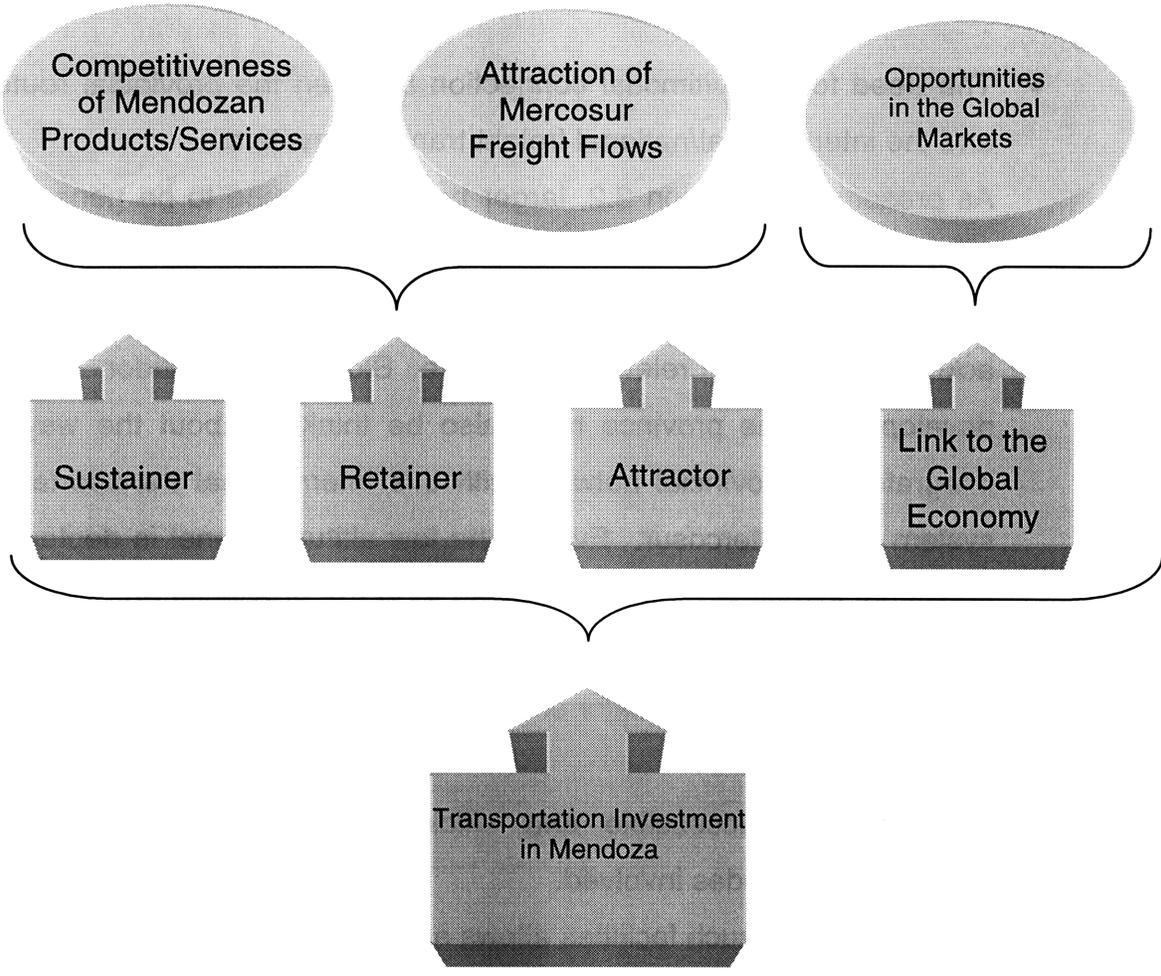


Figure 8.2
Transportation Investment and the Competition Niches of Mendoza
(based on Pendleton²²⁷, 1996)

²²⁷ Ibid. 39

The last chapter introduced the importance of the Central Bioceanic Corridor for Mendoza. It was stated there that a major variable in the choice of route for the Bioceanic Corridor will likely be the condition of the international link between Chile and Argentina. The investment needed to improve the pass between Mendoza and Chile arises as a central issue of decision for Mendoza.

Previous work at MIT has identified six other major concerns for the transportation system in the province (Martland et al²²⁸, 1997):

- The need for a multimodal connection between the provincial routes and the international/national freight transport system.

As presented in section 3.2, larger benefits seemed to be generated when transportation investments provide “interconnectivity”, i.e., provide a link with the main network. At the same time that Mendoza acknowledges the relevance of the Bioceanic Corridor for its development, the province must also be thinking about the way to integrate the provincial network with this international transportation system and to Mercosur. Even if the low altitude tunnel is deployed, additional investments will be needed to in the provincial and national routes crossing Mendoza. The Buenos-Aires Mendoza highway and the BAMSJ rail line are major elements of the link to the main network.

- The need for accessible and efficient freight terminals for the transportation modes involved.

The provision of such facilities allows and expedites changes of mode, which in turn enables more efficient distribution and flow of goods as the shippers can chose to use different modes for different parts of the movement. The province is already building a multimodal freight

²²⁸ Martland Carl et al. Strategic Planning for Multimodal Freight Transportation in the Northern Oasis of Mendoza. Phase II Summary Report. CIT/MIT Joint Program, 1997

station in the town of Palmira, 45 km east of the city of Mendoza²²⁹. This facility will link the railroad to the National Route #7.²³⁰ The improvements needed in the terminal of the “El Plumerillo” airport in order to be able to operate a freight service are also part of this concern.

- The state of the provincial highway network.
Attempts to use transportation investment to support Mendoza’s economic development are likely to encourage increasing utilization of the regional highway network. Proper maintenance of this infrastructure is essential to assure it will support the development effect generated by other transportation investments in the province.
- The need to upgrade the railroad serving Mendoza
As mentioned in section 7.4, the “Buenos Aires al Pacifico” (BAP) railroad is the concessionaire serving Mendoza. BAP owns the “Buenos Aires–Mendoza–San Juan” (BAMSJ) line and the Mesopotamic railroad. While both lines can play a major role in the Bioceanic Corridor significant investments are required to upgrade the BAMSJ line before it can reach its potential capacity of 10 million metric tons per year. The fact that the Mesopotamic and the BAMSJ line have different rail gages suggests also that further investments to facilitate the connection between the two lines might be necessary.
- Land use planning that supports and takes advantage of efficient freight movements.
Currently, flows using the Bioceanic Corridor interfere with the local traffic in the provincial capital. Failure to provide a proper bypass

²²⁹ Ibid. 62

²³⁰ Ibid. 168

route can generate problems both to the city and the Corridor. A well-planned land use program can support the creation of facilities and services (food, fueling and other truck-related activities) that benefits from these flows. Land use policy can also be used to control road accesses and avoid suburban sprawl to encourage a better use of the transportation infrastructure.

- The state of the urban transportation infrastructure and facilities in the city of Mendoza.

Proper attention must be paid to the condition of local streets, parking regulations, delivery/unloading activities, and the interaction between freight and passenger movements.

We argue that these six concerns and the one about the international link can be characterized as a set of transportation-related strategies. It is likely that in the face of limited resources, Mendozaan decision-makers will need to choose among them. Figure 8.3 depicts the focal decision for the scenarios: **Which of these seven strategies should be given priority in face of limited resources?**

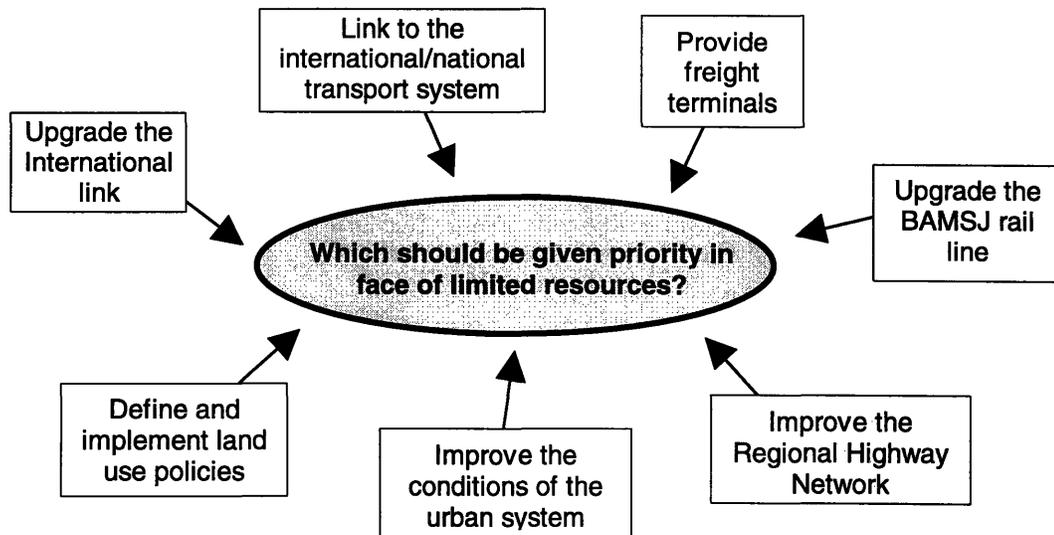


Figure 8.3
The Focal Issue for the Mendozaan Scenarios

An alternative approach that could be pursued during this process is **how to get more resources that allow us to do more?** The study of each of the strategies can identify new sources of moneys and/or political support that enable to accomplish more.

8.1.4 CHOOSING A TIME FRAME FOR THE SCENARIOS.

Van der Heijden²³¹ (1996) suggest that the determination of how far the scenarios will look into the future –the horizon year— should be based on the nature of the concerns or areas of interest:

“The horizon year needs to be selected on the basis of the future impacts of today’s decisions and strategies. Major capital investments require consideration of a period up to 20 years.”

The Mendoza objectives and the impact of the decisions faced by the province are both of a long-term nature. Based on this fact, a rough 20-year horizon is considered adequate for the purposes of this thesis. Therefore, the scenario exercise will cover from 1998 through the year 2020.

8.2 STEP 2: IDENTIFY KEY DECISION FACTORS OF SUCCESS

The second step in Schwartz’s methodology is to identify the key factors that will determine the success or failure of the decision to be made. At this point, we are focusing on the provincial environment: How do we define the success or failure of the decision from the viewpoint of the province? What would the Mendoza public officers like to know when choosing among the existing alternatives? Three key decision factors for the scenarios can be found in:

²³¹ Ibid. 22, pp. 158.

- a) The demand for transportation through the Andes
- b) The regional economic development and competitive advantage resulting from the transportation investment.
- c) The competition posed by other regions/modes providing transportation services.

8.2.1 THE DEMAND FOR TRANSPORTATION

Whatever investment option is chosen, it must be clearly appropriate for the level of demand to be served. Neither a chronically congested small road nor a huge infrastructure facility working at very low traffic levels are likely to be considered a success. The future demand for transportation services across the Andes is likely result from the growth rate of traffic moving through the Central Bioceanic Corridor. The growth rates of transits through the Cristo Redentor Pass during the last years are presented in Figure 8.4.

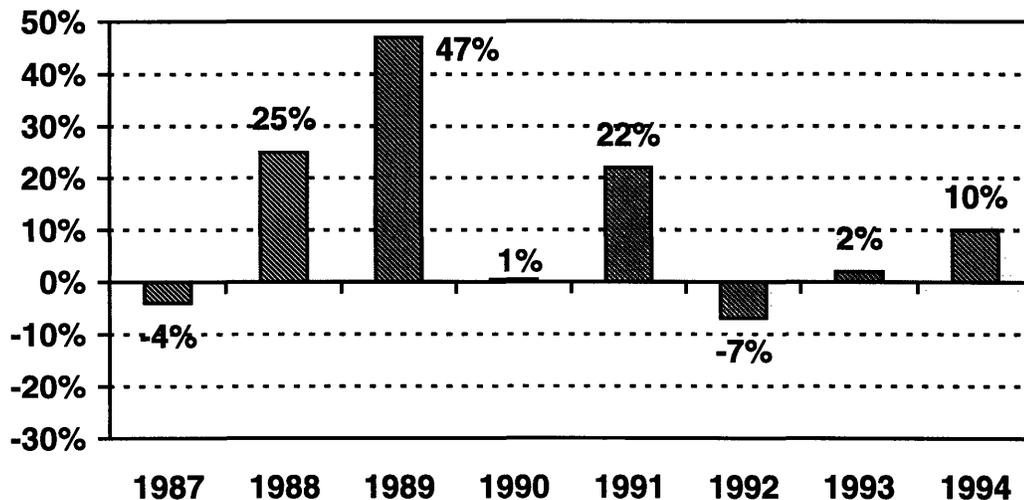


Figure 8.4
Growth Rates of Transits through Cristo Redentor
 (based on Koehne²³², 1996)

²³² Ibid. 191

Table 8.1 Traffic at the Cristo Redentor Pass: Annual Growth Rates (based on Koehne ²³³ , 1996)			
Projection	1994 – 2010	2010 – 2015	2015 – 2020
A: Low growth no tunnel	3%	3%	3%
B: Low growth with tunnel	3%	5%	5%
C: High growth no tunnel	9%	9%	9%
D: High growth with tunnel	9%	12%	10%

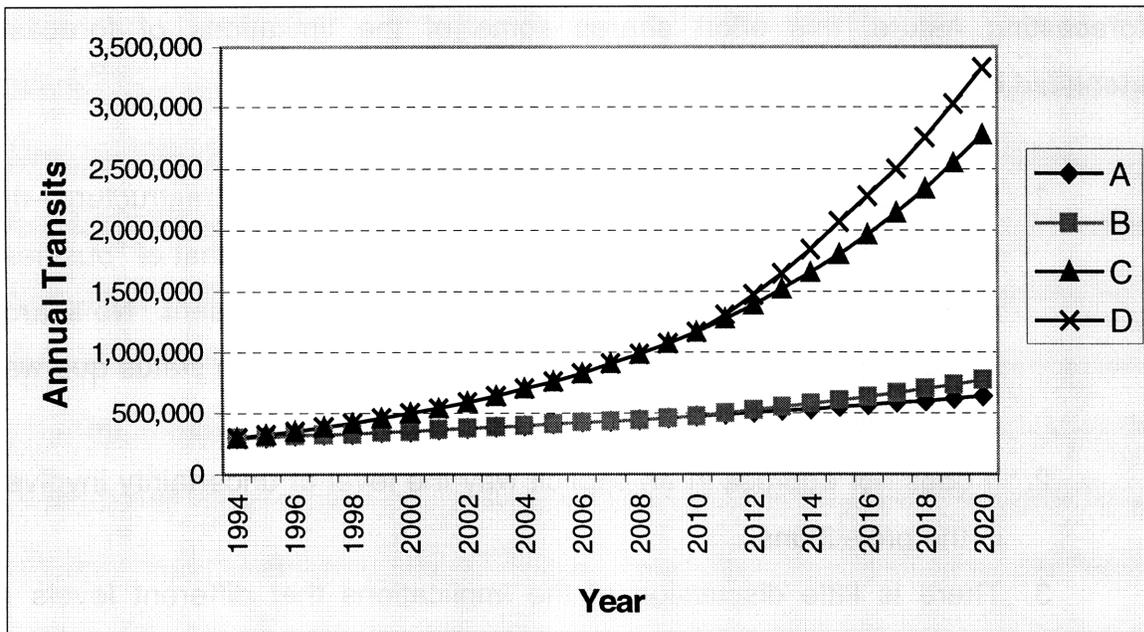


Figure 8.5
Cristo Redentor Pass: Four Traffic Growth Rates
(based on Koehne²³⁴, 1996)

The minimum traffic that is believed necessary to make the low altitude tunnel financially sustainable is in the order of 3,650,000 transits/year (10,000

²³³ Ibid. 191, pp110, 111

²³⁴ Ibid. 191, pp110, 111

vehicles/day).²³⁵ Therefore, all four projections in Table 8.1 seem to fall short of supporting an investment in the tunnel.

The projections obtained by the contractor were the result of a comprehensive effort in data collection and the use of transportation theory and mathematical models. Both passenger and freight movements were included. The freight part of the study considered the trade trends between Mercosur and overseas countries that crosses the Andes Mountains. Nevertheless, because of its forecasting nature, this effort shares some of the limitations of forecasts identified by some authors earlier in the thesis:

1. Despite considering the construction of a new major infrastructure –the tunnel— the underlying structure of the projections is that of “business as usual”. The future looks as an extension of the present. No search for events or trends that could dramatically change the status quo was performed.
2. It does not address in an explicit way the level of uncertainty involved in the projections.
3. There is little discussion of the implications that different levels of demand poses for the Mendoza decision-makers.
4. A broader approach to the issue of financing the tunnel is missing. While the tunnel may not be viable if financed based on user fees, some other sources of financial support may be explored. The tunnel can generate public benefits broadly distributed over Mendoza, Argentina and Mercosur. This, and our earlier recognition that investment in infrastructure is at the core of governmental activities,

²³⁵ Consorcio Juan Pablo II. Estudio Prefactibilidad Mejoramiento Conexion Internacional Zona Central (Chile) y la Region Cuyo (Argentina): Evaluacion Economica Financiera Etapa V. (Document in Spanish)

suggests that the federal government in Argentina (and the rest of Mercosur countries) could provide some financial resources.

8.2.2 THE ECONOMIC DEVELOPMENT AND COMPETITIVE ADVANTAGE RESULTING FROM THE INVESTMENT

A factor of a different nature is the economic development and competitive advantage enabled/supported by the new transportation investment in the province. Long-term economic benefits can be generated thanks to reduction in the transportation costs and an improvement in the accessibility/mobility in the province. It is of little interest for the province that the infrastructure capacity matches the transportation demand if the Mendozaan firms and population do not share the benefits created by these flows.

In section 3.2.2 we pointed out Vickerman's three basic effects of transportation investment –corridor effect, crossroads effect, and regional productivity improvement. Figure 8.6, based on Yang²³⁶ (1996), focuses this concern in the Mendozaan context. The first arrow in Figure 8.6 depicts a case where transportation infrastructure works as a bridge that crosses the province, simply passing through the region having little or no interaction with local economic activities. This effect could occur for instance, if the provincial highway network is not properly integrated with the Central Bioceanic Corridor. The crossroads effect improves transportation from/to the region, by means of reduced transportation cost of supplies and outputs. Finally the last effect helps to improve the productivity of the region.

²³⁶ Ibid. 170, pp. 33

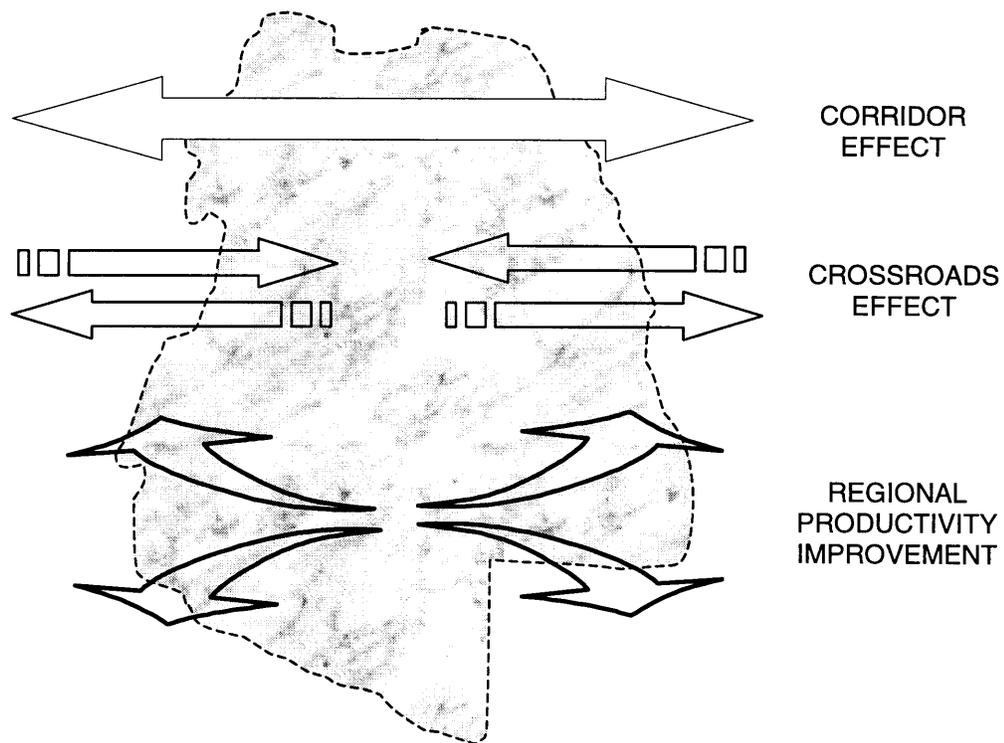


Figure 8.6
Feasible Outcomes of Transportation Investment in Mendoza
 (based on Yang, 1996; Vickerman, 1991)

The way Figure 8.2 depicted the relation between transportation investment and the competition niches of Mendoza suggests that different niches are better served by certain transportation investments. It can follow that investments in different kinds of infrastructure (highway vs. railroad, the international link vs. provincial routes, etc.) will tend to support different niches. And each of the strategies defined in step 1 involves the improvement of the international link, which is likely to play a role as link to the global economy and attractor of economic activity, more than as sustainer or retainer.

The following are among the lessons that can be raised for Mendoza from our discussion in section 3.2:

1. Unless congestion or lack of competition are a problem, transportation investments should aim to provide new solutions rather than alternatives to existing links. According to Koehne's opinion presented earlier, the capacity of the Cristo Redentor Pass should be studied and estimated again. The critical impact of congestion in the Pass as an obstacle to trade and arguably the development of Mendoza would require this task to be undertaken as carefully and timely as possible.
2. The economic effects of new transportation infrastructure in a depressed economy will be mainly a redistribution of economic activity in the region, with small or none aggregate economic growth. Additional inputs will be required to trigger the benefits that are enabled by transportation.

In the following section, we study the world food market, which could provide the incentives required for non-transportation investments and activities that are necessary to complement the effects of the transportation effort.

8.2.3 TRANSPORTATION COMPETITION FOR MENDOZA AND THE BIOCEANIC CORRIDOR

The third key decision factor identified for the scenarios is the competition posed by other regions/modes providing transportation services that could attract some of the flows that otherwise would travel through Mendoza. Because of the relevance of the Central Bioceanic Corridor for Mendoza's transportation system, competition faced by this international corridor should be studied. Two major areas of transportation competition for the Bioceanic Corridor are

- a) Transportation within Mercosur. Being relevant for Mendoza the flows from/to the province, and the Transandean traffic going between Chile and the rest of Mercosur.
- b) Overseas trade of Mercosur that could use the Bioceanic Corridor and Mendoza to access a major port as departure/arrival point for this traffic.

We can identify these to areas of competition with two potential sources of transport competition for Mendoza and the Central Bioceanic Corridor:

1. Southern & northern alternatives of the Bioceanic Corridor; additional border passes between Chile and Argentina.

This source corresponds to Mercosur's internal flows. As presented earlier, the Central route of the Bioceanic Corridor is by far the most used and has inherent advantages over the north and south alternatives. The most important advantage is perhaps that it is the shortest link between the economic centers of Brazil, Uruguay, Argentina and Chile and connects them with major ports in the Atlantic –Buenos Aires, Sao Paolo— and the Pacific –Valparaiso, San Antonio (Koehne, 1996²³⁷; Yang²³⁸, 1996). While the Central Corridor needs infrastructure improvements in order to function as an international transportation link, the other two alternatives seem to require even larger investments. This seems to suggest that the preeminence of the current route would continue in the future.

Figure 8.7 taken from the study of demand for the low-altitude tunnel depicts the share of demand for the different border passes. The estimation considers that the tunnel would become operational in

²³⁷ Ibid. 191

²³⁸ Ibid. 170

2010. According to Figure 8.7, before 2010 the percentage of crossings using Cristo Redentor is approximately constant. The new tunnel would then take a large amount of this traffic, but the percentage of trips using other passes does not change significantly.

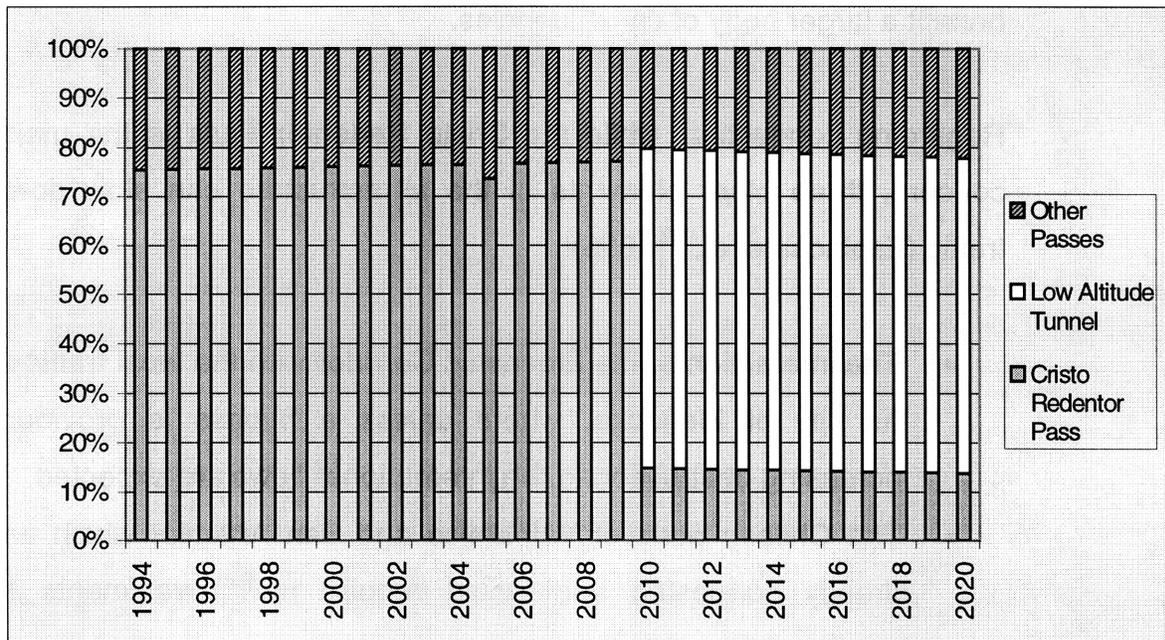


Figure 8.7
Share of Border Crossings between Chile and Argentina
(based on CJPII b²³⁹)

In a first approach, it could then be argued that only congestion in the Central Bioceanic Corridor, or a major investment in the passes serving the north and south routes could alter the existing balance.

None of these alternative routes for the Corridor seem to present a traffic level that can justify the large investments required to become a relevant competitor of Cristo Redentor. Despite this fact, Chile has announced that will invest US\$ 160 millions during 1998 to improve

²³⁹ Ibid. 213

thirteen border crossings –including Cristo Redentor.²⁴⁰ According to the Chilean Minister of Public Works the main purpose of these investments is “to advance integration with Mercosur”²⁴¹ One of the explanation for such lack of focus in the border investments is the natural political pressure to spread infrastructure investments to benefit a larger body of constituencies.

Regarding congestion, while the Cristo Redentor Pass is the major concern, three other elements of the infrastructure can slow down traffic (Espinosa et al,²⁴² 1996):

- The interaction of the Bioceanic Corridor with the local traffic in the city of Mendoza, where unless a bypass is provided, increasing obstruction to the international flows are expected.
- The Chilean ports of Valparaiso and San Antonio, which are already congested and would require new investments to handle additional traffic.
- The Chilean side of the Bioceanic Corridor close to the border, where the road takes place in very difficult terrain, with small curvature radios and steep grades exceeding 8%.

2. The Panama Canal

From a broader perspective, the Mendozaan transportation system will be affected by competition to the international transport services provided by the Bioceanic Corridor. A central player in international freight transport is the Panama Canal, and therefore this section tries to characterize its role in the scenarios.

²⁴⁰ Mercopress News Agency. Mercosur News. March 9, 1998.
<http://www.falkland-malvinas.com/news/sni9.html>

²⁴¹ Ibid. 240

²⁴² Ibid. 168

80 kilometers (50 miles) long and finished in 1914, the Panama Canal connects the Pacific and Atlantic Oceans, allowing huge savings in distance and time for ships travelling across the globe.²⁴³ Table 8.2 gives an idea of the distance savings for three maritime routes.

From	To	Savings	
		In km	In miles
New York	San Francisco	12,668	7,872
U.S. East Coast	Japan	4,800	3,000
Ecuador (West Coast of South America)	Europe	8,000	5,000

Figure 8.8 shows the location of the Canal in the American Continent and its main structures. Figure 8.9 presents the waterway in profile. Ships crossing the Canal are raised or lowered 26 meters from the entrance to the end by means of three sets of locks (Miraflores, Pedro Miguel and Gatun)²⁴⁵. The locks are necessary because while the Atlantic and Pacific have practically the same average sea level, the Pacific has large tide variations (up to 18 feet). This would cause a current running northbound when the Pacific's tide was high and a current running southbound when low.²⁴⁶

²⁴³ Panama Canal Commission <http://www.pancanal.com/public/general/features/features.htm>

²⁴⁴ Panama Canal Commission. <http://www.pancanal.com/public/general/overview.htm>

²⁴⁵ *ibid.* 243

²⁴⁶ Panama Canal Commission. <http://www.pancanal.com/public/general/know.htm>

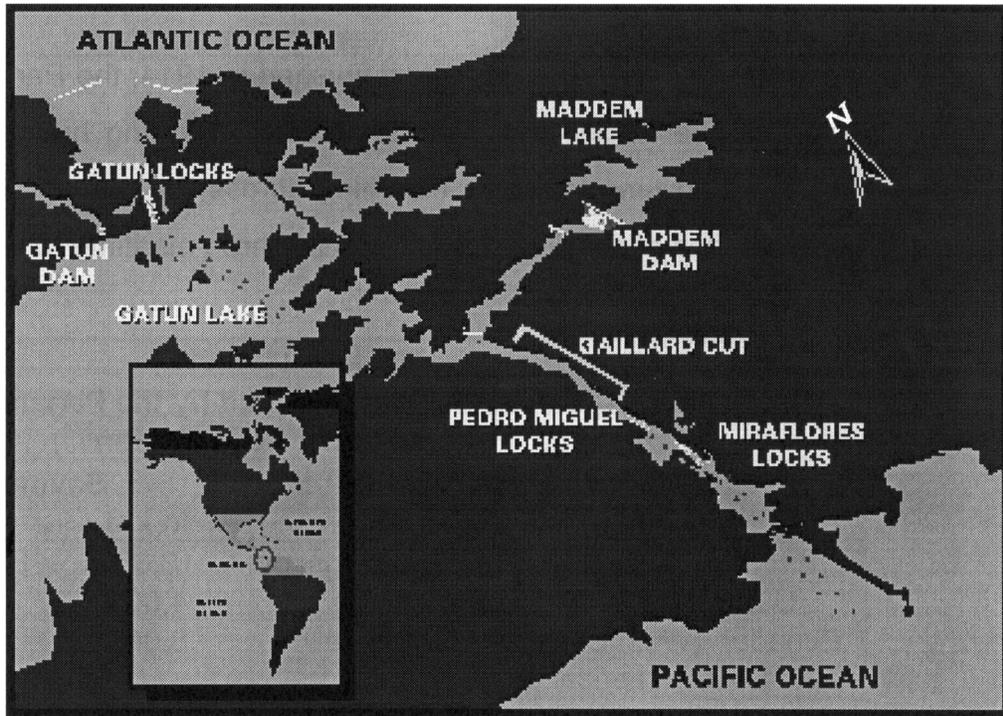


Figure 8.8
The Panama Canal
 (taken from Panama Canal Commission²⁴⁷)

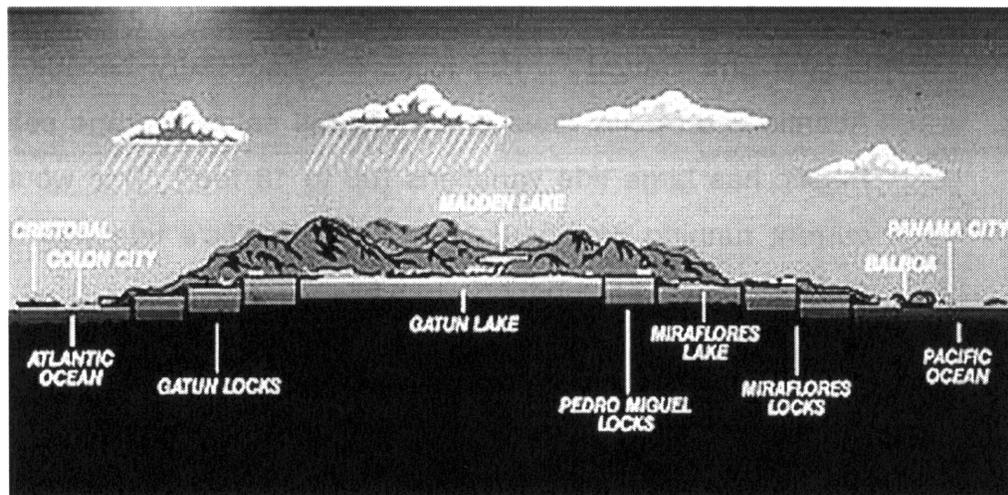


Figure 8.9
Profile of the Panama Canal
 (taken from Panama Canal Commission²⁴⁸)

²⁴⁷ Panama Canal Commission. <http://www.pancanal.com/public/pictures.htm>

²⁴⁸ Panama Canal Commission. <http://www.pancanal.com/public/profile.htm>

Figure 8.10 presents the cargo moved through the Canal in recent years. It can be seen that the largest part of the traffic growth seen by the Canal is due to increasing flows from the Atlantic to the Pacific.

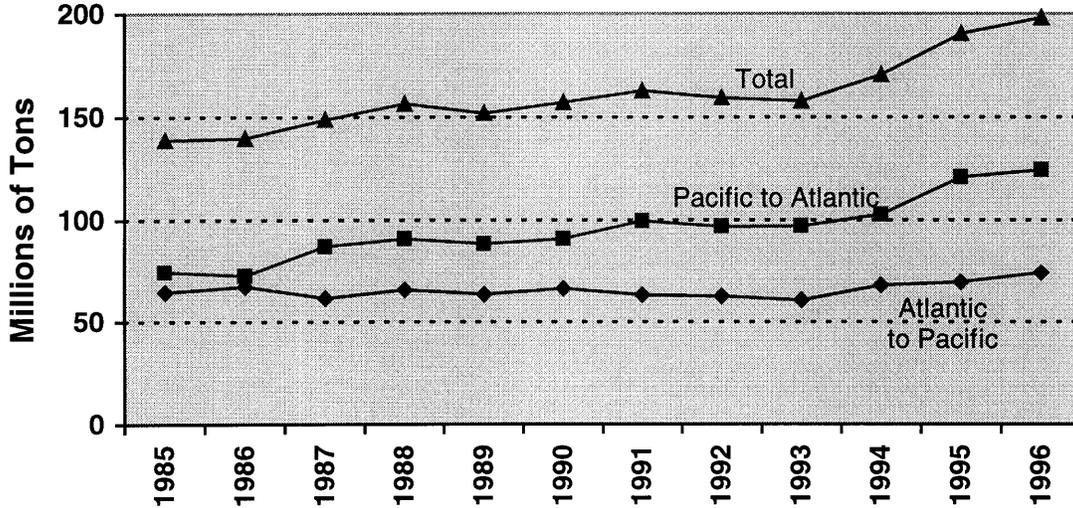


Figure 8.10
Commercial Traffic through the Panama Canal
 (source: Panama Canal Commission²⁴⁹)

Table 8.3 presents the principal commodities shipped through the Panama Canal. Of particular interest for our future discussion of the agricultural food market is the fact that in the last years, grain shipments have become the largest commodity group moved through the Canal reaching 23% of the total volume in 1995. Other agricultural products and processed food added another 6% of the total cargo moved in that year.

²⁴⁹ Panama Canal Commission <http://www.panacanal.com/public/operat/statisti/statisti.htm>

Commodity	1991	1992	1993	1994	1995
Grains	32.9	32.7	33.4	34.1	44.1
Petroleum and derivatives	24.0	25.2	25.5	26.9	27.5
Nitrates, phosphates and potash	14.7	13.8	13.1	15.4	15.9
Coal and coke	8.4	8.9	8.0	9.3	11.3
Ores and metals	11.4	9.6	10.6	10.1	10.8
Canned and refrigerated food	6.1	5.8	5.4	5.9	6.9
Other agricultural commodities	5.1	4.9	4.5	4.5	4.9
All other	60.1	58.4	57.2	64.3	68.9
Total	162.7	159.3	157.7	170.5	190.3

^a Data in millions of tons

Most traffic using the Canal moves between the East Coast of the U.S. and the Far East.²⁵¹ Table 8.4 shows some of the main routes using the Panama Canal from 1991 to 1995, including some routes that are relevant for the Bioceanic Corridor. Routes involving trade from/to South America are potential areas of competition between the Canal and the Bioceanic Corridor. New international trade or the attraction of some of the freight currently using the Canal –particularly flows between the east coast of South America and Asia— can provide the overseas traffic that Mendoza and the Bioceanic Corridor are looking to benefit from. It should be noticed, though, that the Canal is already a functioning critical artery of the world trade, while the Bioceanic Corridor it is not.

²⁵⁰ Panama Canal Commission. <http://www.pancanal.com/proposal/htraffic.htm>

²⁵¹ Panama Canal Commission. <http://www.pancanal.com/public/general/overview.htm>

Route	1991	1992	1993	1994	1995
EC U.S. - Asia	62.8	61.3	53.4	50.2	63.8
Round the World	7.9	8.0	20.2	27.1	20.9
EC U.S. - WC South America	11.2	10.4	11.0	14.9	16.9
Europe - WC U.S./Canada	15.0	15.0	10.9	11.7	13.4
Europe - WC South America	8.3	8.0	8.2	9.6	10.8
Europe - Asia	4.7	4.6	5.2	6.8	7.5
South America Intercoastal	3.2	3.9	3.8	4.1	6.0
EC South America - WC U.S./Canada	4.1	4.1	3.5	4.3	5.5
EC South America - WC Central America*	1.9	2.0	2.6	3.3	3.1
All other routes	43.6	42.0	38.9	38.5	42.4
Total	162.7	159.3	157.7	170.5	190.3

^a Data in millions of tons

^b EC = East Coast; WC = West Coast

* Does not include the Panamanian ports of Balboa and Cristobal

A significant element in this discussion arises is the Panama Canal's capacity and its ability to serve future demand. In 1995, the daily transit average exceeded 37, and traffic is expected to reach the Canal's operating capacity of about 39 transits/day by 1999 (the maximum sustainable capacity is 42 transits/day).²⁵³ The increase in transits is compromising the Canal's long-standing commitment to assure the transit through the Canal in an average of 24-hour Canal Waters Time (CWT).²⁵⁴ The average CWT in 1995 was 28.2 hours

²⁵² Ibid. 250

²⁵³ Panama Canal Commission. Panama Canal Spillway. January, 26, 1996. (reprint obtained in course 1.286's "Freight Transportation Management", Panama Capacity Study Case)

²⁵⁴ Canal Water Time (CWT) is the time a ship takes to cross from side to side once is ready for transit. While the actual transit of the Canal can be done in 8-10 hours, ships usually need to wait several hours for their turn to cross.

and increased to 32.6 hours in the first ten months of 1996.²⁵⁵ In response, the Panama Canal Commission's is speeding the expansion of the waterway's capacity. A 5-year capital investment program will provide US\$476 millions between 1996-2000 in addition to a previous US\$2.5 billion capacity expansion scheduled for completion in 2002 (Panama Canal Commission²⁵⁶; Martland,²⁵⁷ 1997).

The above investments are expected to increase the operating capacity to about 44 transits/day and the maximum sustainable capacity to 50.²⁵⁸ The Canal's demand projections suggest a 2% growth that would more than double tonnage and would roughly double transits by 2040 (Martland,²⁵⁹ 1997). A "back of the envelope" calculation results in the Canal's operating capacity being exceeded by 2004 and the maximum sustainable capacity by 2011. Proposals for longer term improvements to the Canal—including a third set of locks—are currently under discussion, but imply investments between US\$2 billion and US\$10 billion, and up to 20 years of planning and construction before becoming fully operational (Martland,²⁶⁰ 1997).

The trend of larger ships and containers are an additional element of this picture. Panamax vessels—the largest ships that can be handled by the waterway—make about 27% of the total transits through the Canal.²⁶¹ The pressure to reduce costs is encouraging the construction of larger post-Panamax vessels, which can not be served by the Canal. The increasing use of these ships would tend to reduce

²⁵⁵ Panama Canal Commission. <http://www.pancanal.com/proposal/capital.htm>

²⁵⁶ Ibid. 255

²⁵⁷ Martland, Carl. Panama Canal Capacity. Study Case for 1.286 Course: "Freight Transportation Management", MIT, September, 1997

²⁵⁸ Ibid. 253

²⁵⁹ Ibid. 257

²⁶⁰ Ibid. 257

²⁶¹ Ibid. 244

the costs of a multimodal movement involving maritime and land (more likely rail) transportation.

Martland²⁶² (1997) presents some of the discussions of a group of specialist and consultants gathered by the Panama Canal Commission on June of 1997. The arguments there expressed seem to suggest that while the Panama Canal faces some uncertainties in its operation, it will continue to be a major player in the world trade, and a formidable competitor for the Bioceanic Corridor.

The transfer of the Canal has also raised an additional concern –this one of political nature— on the waterway operation. Since its completion in 1914 and until 1979, the United States controlled and operated the Canal. In 1979 the Panama Canal Commission was created to operate the waterway during a 20-year transition, before Panama assumes complete control of the Canal on December 31, 1999²⁶³. Some have expressed fears that the Panamanian government could divert some of the Canal's resources to other ends, causing deterioration of the financial base and efficient operation of this international link.²⁶⁴ The security of the Canal after the U.S. troops leave is also a concern,²⁶⁵ since a significant part of the Panamanian security forces was destroyed in 1989 during the U.S. invasion.

Regarding these issues, the rationale followed in this work is that the likelihood of a permanent decay caused by a security problem or poor

²⁶² Ibid. 257

²⁶³ Panama Canal Commission. <http://www.pancanal.com/public/history/history1.htm>

²⁶⁴ Fabey, Michael. *Can Panama Handle it?* *Traffic World*. August 18, 1997

²⁶⁵ Rohter, Larry. *Handoff in Panama: Hong Kong was Just a Rehearsal*. *The New York Times*. July, 13, 1997

management is considered very low. The magnitude of the economic implications is likely to provide strong incentives for a careful operation by the Panamanian Government and if this is not the case, to force the major geopolitical powers to intervene before such decay occurs. Despite the last statement and because of the nature of the scenario approach, the feasibility of a future with a disrupted Panama Canal should not be discarded right from the start, as its occurrence would likely have a major effect on international trade.

A recent article on the Wall Street Journal²⁶⁶ provides an additional element supporting the consideration of a future with disrupted Canal operation. According to this report, water shortages due to uncontrolled development of the canal's watershed and climate change pose a major threat for the future operation of the Canal. The article states that already in 1998, the lowest rainfall levels in 84 years are drying up part of the lakes that are used to fill the locks of the Canal, and as a result, the Panama Canal Commission has limited the loads of some ships using the waterway. If water shortages like this become common in the future years, restriction on the weight of the ships is likely to divert some traffic to alternative routes and modes.

8.2.4 THE WORLD AGRICULTURAL MARKET: AN OPPORTUNITY FOR MENDOZA AND MERCOSUR?

As could be seen in Chapter 7 food production plays a significant role in Mendozan exports: over 40% of its 1996 exports were related to agricultural and cattle products (either manufactured or not). Argentina traditionally has been a net exporter of agricultural products and the four full members of Mercosur (Argentina, Brazil, Paraguay and Uruguay) hold a relevant share of the world's

²⁶⁶ The Wall Street Journal, April 22, 1998

cattle (26%), corn production (6.5%), soybean production (29%) and farming land (6%).²⁶⁷ The recognition of these facts encouraged the search for information on the world agricultural market that could affect the demand for transportation in Mercosur, especially across the Andes. This search revealed the existence of a heated debate on the world agricultural trends that, according to some authors, could be signaling the start of an era of huge demand, limited supply and hence, high prices. The occurrence of such event world change the transportation demand across the Andes and at the same time provide an incentive for non-transportation investments that could generate a developmental effect in Mendoza and the rest of Mercosur.

As presented in Figure 8.11, world trade of agricultural commodities –which represents roughly a 10% of world production²⁶⁸— has been growing strongly in the last decades:

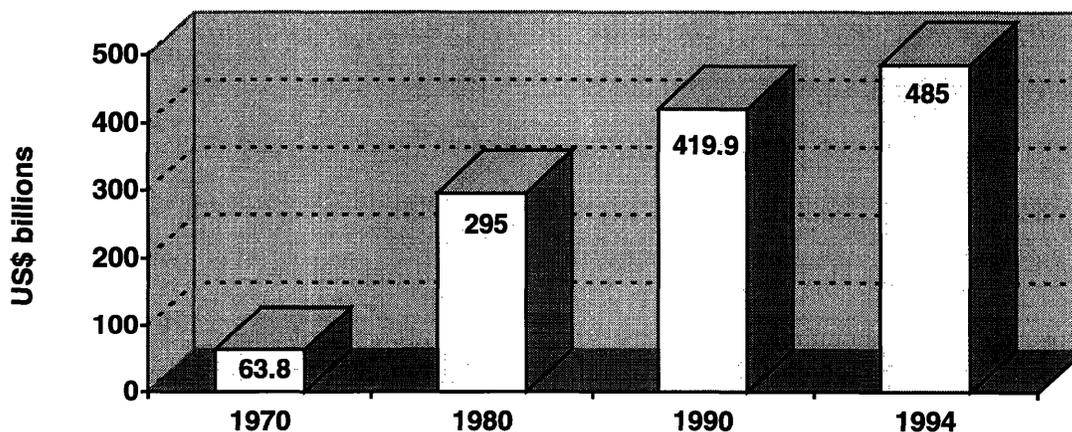


Figure 8.11
World Trade of Agricultural Commodities
 (based on FAO²⁶⁹, 1996a)

²⁶⁷ Ibid. 183

²⁶⁸ OECD. *The Future of Food: Long Term Prospects for the Agro-Food Sector*. 1998

²⁶⁹ Food and Agriculture Organization. *Food and International Trade*. Technical background document for the 1996 World Food Summit

There are two drivers for the global food demand: population and income level.²⁷⁰ Table 8.5 depicts population growth in the last decades and its projections into the future.

Year	World		Developed Countries		Developing Countries	
	Total	Annual Growth	Total	Annual Growth	Total	Annual Growth
1970	3,702	2.06%	1,008	0.82%	2,694	2.55%
1990	5,282	1.73%	1,148	0.60%	4,134	2.06%
2010	6,891	1.20%	1,206	0.15%	5,684	1.44%
2030	8,372	0.81%	1,212	-0.13%	7,159	0.98%
2050	9,367	0.45%	1,162	-0.23%	8,205	0.55%

It can be seen in Table 8.5 that a large share of this growth has and will continue to take place in developing countries, where population lives with lower levels of income. Per capita gross domestic product has increased steadily in the last 25 years, boosting the demand for meat and agricultural products²⁷². A further modest increase of per capita income in developing countries could nearly double their food needs in the following 30 years²⁷³.

Brown²⁷⁴ (1996) has pointed out that while population growth rate has slowed, the population base is still expanding. Because of this, the annual number of persons added to the world is larger now than ever before (e.g., in 1995, 90

<http://www.fao.org/wfs/final/e/volume3/t12-e.htm>

²⁷⁰ Macalla, Alex F., *Food Needs for the 21st Century*. Agricultural Outlook Forum, 1997
<gopher://usda.mannlib.cornell.edu:70/00/reports/waobr/aof/aof96/g-denis.asc>

²⁷¹ Ibid. 270

²⁷² Ibid. 67

²⁷³ Ibid. 270

²⁷⁴ Brown, Lester. *Tough Choices: Facing the Challenge of Food Scarcity*. W.W. Norton and Company, New York, 1996

million people were added, as compared to the 70 million added in 1970). Brown also highlights that close to 60% of the population growth is taking place in Asia, where a rise in income is expected.

	World	Developed Countries	Developing Countries
<i>Production</i>			
1969-71	1,117 (303)	635 (591)	482 (185)
1989-91	1,727 (327)	864 (690)	863 (214)
1993-95	1,729 (307)	802 (627)	927 (213)
Projected 2010	2,334 (327)	1,016 (723)	1,318 (230)
<i>Total use</i>			
1969-71	1,115 (302)	615 (573)	500 (191)
1990-92	1,758 (327)	786 (624)	972 (237)
Projected 2010	2,334 (327)	854 (608)	1,480 (258)
<i>Net trade</i>			
1969-71		22.5	-20.3
1992-94		89.1	-86.3
Projected 2010		162.0	-162.0

^a Data in millions of tons

^b Figures in parenthesis are kg per capita

Among all agricultural products, cereals are especially important in the world market: they provide 50% of the calories supplied and account for over 60% of harvested land.²⁷⁶ Table 8.6 shows data and projections for all cereals according to the United Nations' Food and Agriculture Organization (FAO). It can be seen from Table 8.6 that according to FAO, while some regional imbalances are expected –developing countries are expected to become net

²⁷⁵ Food and Agriculture Organization. Food, Agriculture and Food Security: Developments Since the World Food Conference and Prospects. Technical background paper, 1996
<http://www.fao.org/wfs/final/s/volume1/t1-s.htm>

²⁷⁶ Ibid. 268

importers—the food deficits (162 million tons) are manageable and can be matched with imports from developed countries. International trade of cereals is expected to increase continuously. China—the world largest cereal consumer—is estimated to require annual imports between 20 and 50 million tons per year during the early decades of the next century (Fan and Agcaoli-Sombilla, 1996 as cited in World Bank²⁷⁷, 1997b).

Contending with the above view, Brown²⁷⁸ (1995) has estimated that by 2030 China alone would need to import between 200 and 369 million tons of food. The rest of the developing world would also require continuously increasing amounts of imports to feed its population. Such disproportional demand, along with supply constraints would increase prices of agricultural products, generating an era of scarcity and high prices. The warning call made by Brown and others seem supported by current events in the world agricultural market. Prices of grain are now higher than they have been for a generation, demand has been rising constantly, and the decline in global grain stocks has got to the level to generate concern in the international community.²⁷⁹ As a result of these events, the issue of “food security” has regained relevance throughout the world in the last years, to the point that in 1996 FAO organized year of the World Food Security Summit, to discuss the different aspects of the problem.

The debate on the prospects for the future world food market is an on-going discussion. According to the World Bank²⁸⁰ (1996), the existence of two deeply divergent views (the “optimists” and the “pessimists”) can be explained by their different perception of four critical supply parameters:

²⁷⁷ The World Bank. At China's Table: Food Security Options. China 2020 Series. Washington, DC, 1997

²⁷⁸ Brown, L. Who will Feed China? Wake-Up Call for a Small Planet. W.W. Norton and Company, New York, 1995

²⁷⁹ Denis, G. 1996: A Crossroad for the World Grains Industry. 1996 Agricultural Outlook Forum. <gopher://usda.mannlib.cornell.edu/70/00/reports/waobr/aof/aof96/g-denis.asc>

²⁸⁰ The World Bank. Food Security for the World. Report prepared for the 1996 World Food Summit.

1. *The rate of increase in biological cereal yields to be expected over the next 15 to 30 years;*
2. *The amount of land to be added or lost from agricultural production;*
3. *The amount of land subject to intensification primarily through irrigation;*
4. *The impact of environmental degradation on food production capacity.*

Despite the differences regarding how challenging will be to satisfy increasing food demand, both sides of the debate seem to agree with the following statements:

- Trade of food will continue to increase in the future, as it is the only way in which countries can cover their deficits.
- Increasing population and the prospects of economic development in many developing countries will increase the demand for food continuously. Urbanization of these countries will reshape the structure of demand, increasing the need to process, transport and storage food.²⁸¹
- China plays a critical role in the international food market. Each year, the prospects of Chinese agriculture affect the performance of the world agricultural market. Because Chinese agriculture is done mainly with traditional methods and is heavily dependent on the weather conditions, yields can vary largely from year to year (Shang,²⁸² 1997). A consensus seems to exist on the fact that China will depend on imports in the future to cover the needs of its population (Nybery,²⁸³ 1996).
- The role of biotechnology in feeding future generations is still uncertain and is considered particularly important by some. We know that the technology has the potential to revolutionize food production, but it is not

²⁸¹ Ibid. 270

²⁸² Shang X., Present Situation and Trends of Chinese Agricultural Development. 1996 Agricultural Outlook Forum.

gopher://usda.mannlib.cornell.edu/70/00/reports/waobr/aof/aof96/x-shang.asc

²⁸³ Nyberg, A., China's Grain Marketing Infrastructure, 1996 Agricultural Outlook Forum gopher://usda.mannlib.cornell.edu/70/00/reports/waobr/aof/aof96/a-nyberg.asc

clear if this will actually happen. Public concerns and opposition from environmental groups to genetically altered products can hinder the development of biotechnology.

- An additional element of uncertainty is the presence of protectionist measures that backed by concerns of national food security close the borders to imports of food even in some of the most open economies such as in the European Union (Denis,²⁸⁴ 1996). Countries may be reluctant to rely on international markets for assuring their food supply, encouraging a policy based on subsidies to local producers and protectionism.

The future of the world food market is relevant to Argentina, which is among the traditional exporters of cereals and agricultural products. While the development of an industrial/service-based economy that involves activities with large value-added is generally regarded as desirable national goal, the World Bank has pointed out that:

“For many developing countries, improved agricultural productivity can be the engine of widely-shared growth. Indeed, growth in food and agricultural output has been the main basis of economic growth, higher per capita incomes, and better diets for most countries. Most of the developing countries that grew rapidly during the 1980s, and achieved the largest improvements in diets, experienced rapid agricultural growth in the preceding years.”²⁸⁵

According to the New York Times²⁸⁶, Argentinean entrepreneurs have already seen in the development of the food market enough opportunity as to begin investing in land, irrigation, biotechnology and new feeding systems for livestock. Figure 8.12 and Figure 8.13 show respectively the amount and value of the Argentinean exports of cereals for the last years.

²⁸⁴ Ibid. 279

²⁸⁵ Ibid. 280

²⁸⁶ The New York Times. [This Year in Argentina. Two Brothers Build an Empire.](#) April 14, 1998

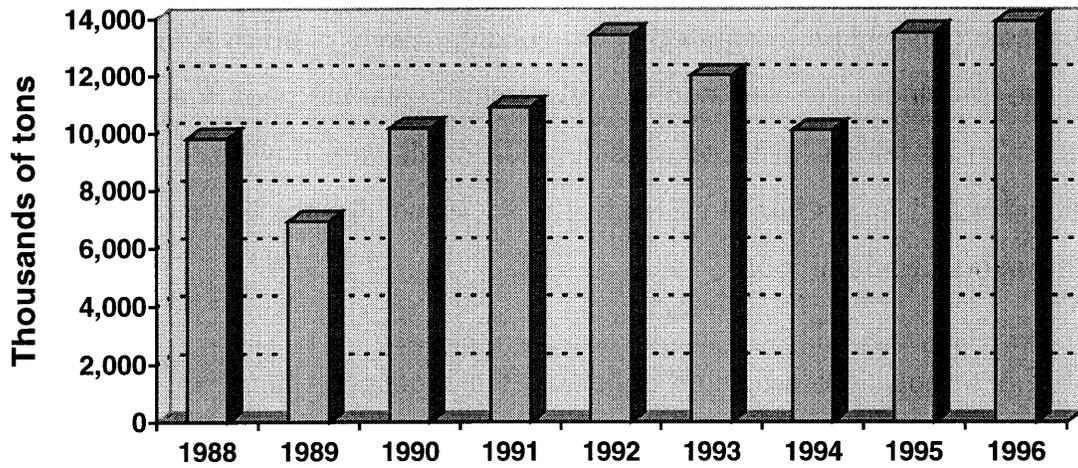


Figure 8.12
Argentinean Cereal Exports
 (source: Ministry of Economy and Public Works²⁸⁷)

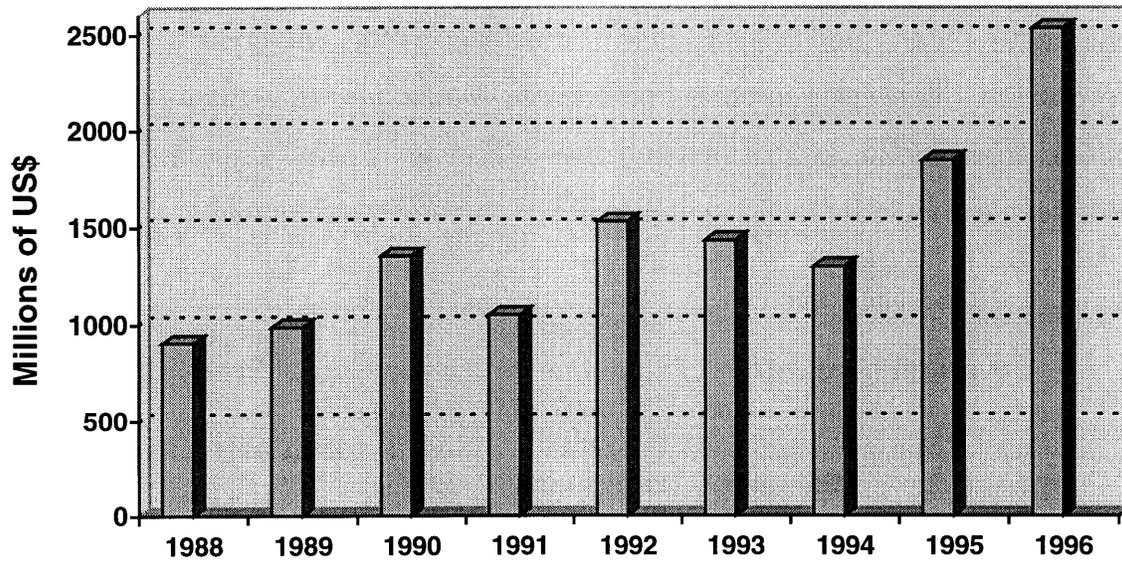


Figure 8.13
Value of Argentina's Exports of Cereals
 (source: Argentina's Ministry of Economy and Public Works²⁸⁸)

²⁸⁷ Ministry of Economy and Public Works.
<http://www.siap.sagyp.mecon.ar/comercio/cap12/12cua03.htm>

²⁸⁸ Ibid. 287

For Mendoza –as an agricultural region— the issues treated in the above discussion should be integrated in the considerations of an overall strategic plan for the province. In the context of strategic planning for the transportation system in Mendoza, a major consideration deals with how to link the strategic options listed in section 8.1.3 with the additional freight flows created by the international trade of food.

Table 8.7 shows the projected deficits in the production of cereal by developing countries according to geographic region. It can be seen that while Asia has been mentioned as a major target for exporters due to its increase in population and affluence, other regions will also require important imports of cereals. While Africa is actually expected to have the larger needs for food imports, a major concern is how will these already distressed economies be able to pay to feed their populations. Latin America –a closer market both geographically and culturally— can become a major destination for Mercosur’s agricultural production. Increasing imports from Mexico, Brazil and Venezuela have already offset Argentinean exports making the region an overall importer of food.²⁸⁹ Mendoza’s should be thinking how to serve some of these markets.

Table 8.7						
Developing countries: Projected Deficits in Cereal Production ^a						
(taken from FAO²⁹⁰, 1996b)						
	Total	Sub-Saharan Africa	Near East/ North Africa	South Asia	East Asia & Pacific	Latin America & Caribbean
1969/71	20.3	2.7	6.5	5.5	8.8	-3.2*
1992/94	86.3	11.2	35.8	3.1	20.1	15.3
Projected 2010	162.0	19.0	72.0	10.0	35.0	26.0

^a Data in million tons.

* Figure represents a surplus

²⁸⁹ Ibid. 278

²⁹⁰ Ibid. 275

One of the implications of the above is that the agricultural flows crossing Mendoza and Mercosur could be oriented westbound heading to the Chilean ports in the Pacific, eastbound to Brazil and the Atlantic coast of Argentina, or north to Peru, Bolivia and the rest of South America (Figure 8.14).



Figure 8.14
Feasible Flows of Agricultural Products from Mendoza and Argentina

8.3 STEP 3: DRIVING FORCES

Continuing with Schwartz's framework, after the key local factors have been identified, we must make a list of the forces in the macro-environment that will affect these key local factors. The objective is to distinguish the forces behind the key local factors identified in the last step. These driving forces are both internal and external to the province, and they can be predetermined elements or critical uncertainties. Schwartz states that this step is the most research-intensive of the process.

According to Van der Heijden,²⁹¹ (1996) the process starts by articulating a number of significant variables for the decision under consideration. A way to start the search for driving forces in Mendoza is to ask what are the main issues involved in the key factors already identified (demand for transportation across the Andes, economic development/competitive advantage gained in Mendoza, and competition in transportation services).

Table 8.8 presents a set of relevant issues highlighted by members of the MIT transportation group working in the Mendozan research project mentioned in section 8.1.1.

²⁹¹ Ibid. 22.

Table 8.8
Some Relevant Issues Involved in the Key Decision Factors

<ul style="list-style-type: none"> • Political and economic stability in Mercosur countries • Concerns regarding external economic shocks (e.g., Mexico 1995, South Asia 1997) • World political stability • Degree of cooperation between Mercosur • What's the constituency of the Central Bioceanic Corridor in Mendoza and Mercosur • How much does Mendoza really cares about its transportation system? Is transportation perceived as critical Mendoza's socioeconomic development • Perceived Increase in the global demand and trade of agricultural products • Agricultural nature of Mendoza and relevance of agricultural-origin products in Mendoza exports. • Feasibility of a disruption in the Panama Canal • World oil prices 	<ul style="list-style-type: none"> • International economic growth • Economic integration and free-trade trends. • Transportation and related technologies (fuels, new engine designs, fewer emissions) • Mercosur trade: intra-regional and overseas; international demand for Mercosur products: Europe, Asia/Pacific, NAFTA • Attitudes toward risk of investment in the region • Availability of international moneys to fund large transportation projects • Attitudes generated by global environmental concerns • Global climate change • Argentina's role as grain exporter nation • Expected traffic growth and capacity constraints in the Panama Canal • Mendoza's ability to benefit economically from traffic using its transport system
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After listing the above significant issues, it is necessary to group them in clusters of related topics as presented in Figure 8.15.

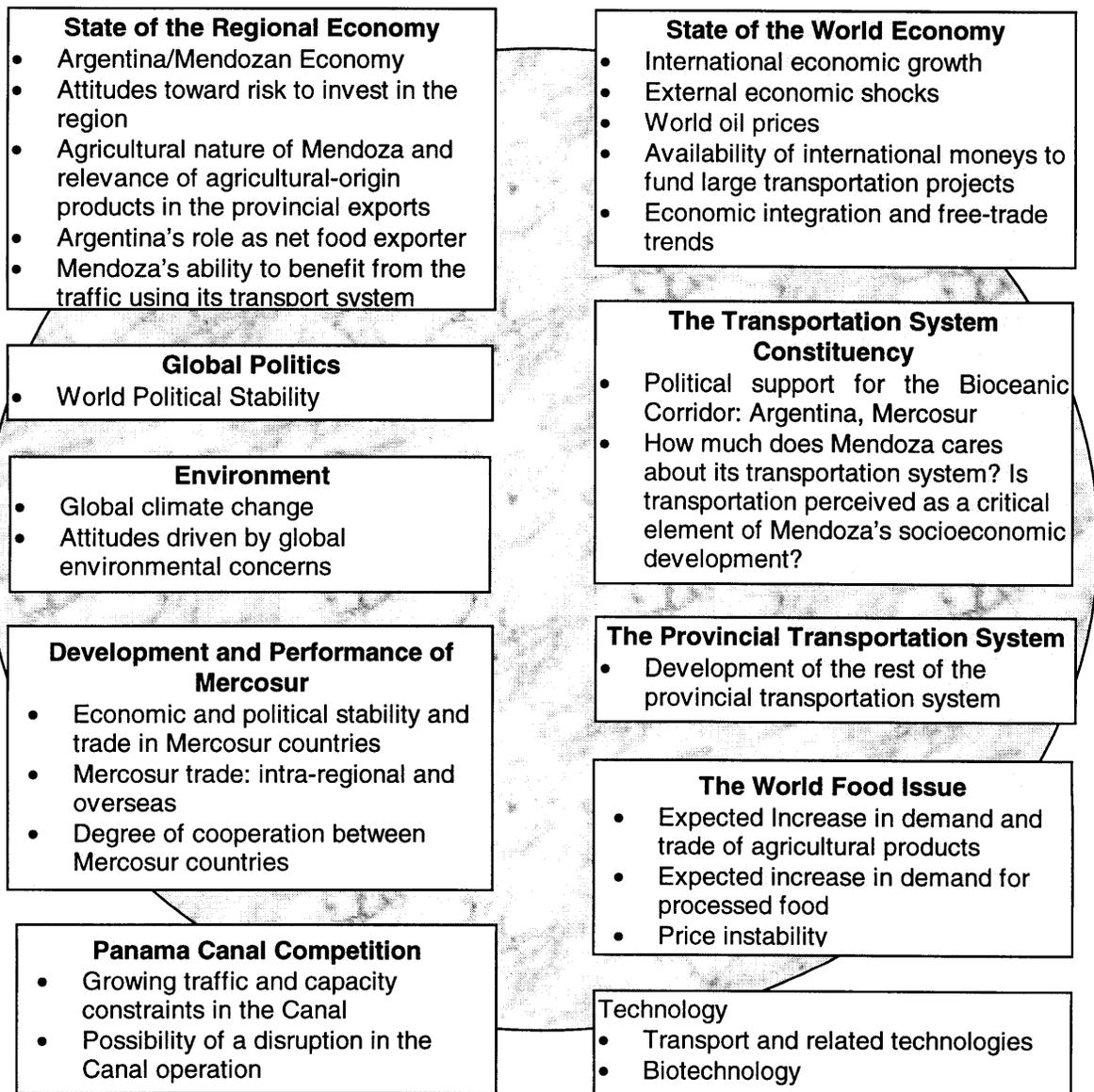


Figure 8.15
Clusters of Relevant Issues

8.3.1 THE INFLUENCE DIAGRAM

Van der Heijden,²⁹² (1996) recommends to use of an “influence diagram” as a way to identify and highlight the relationships between these variables and uncover the driving forces. It must be reminded that as mentioned in section 6.3.2, the construction of scenarios depends on the structure that is used to explain the relationships between events and trends. Different interpretations of this structure will result in different scenarios, and the interpretation is based on the perceptions and mental models of the scenario builders.

An influence diagram for the Mendoza case is depicted in Figure 8.16. The diagram reflects the relationship that the author believes connects the key decision factors and the relevant issues presented above. The diagram will be used to look for the driving forces of the scenarios and is not intended to include all elements and all relationships. It is easier to understand the relations represented in Figure 8.16 by starting with the key factor decisions of the scenarios –in boxes. An arrow starting, e.g., in element A and pointing to element B implies that element A affects element B.

The demand for transportation through the Andes is the first key decision factor and the diagram presents three major elements influencing it:

a) The condition of the infrastructure

The condition of the infrastructure is affected by a transportation constituency that encourages and lobbies for new investments. This constituency is itself influenced by the perception of how important is transportation for Mendoza and Mercosur.

²⁹² Ibid. 22

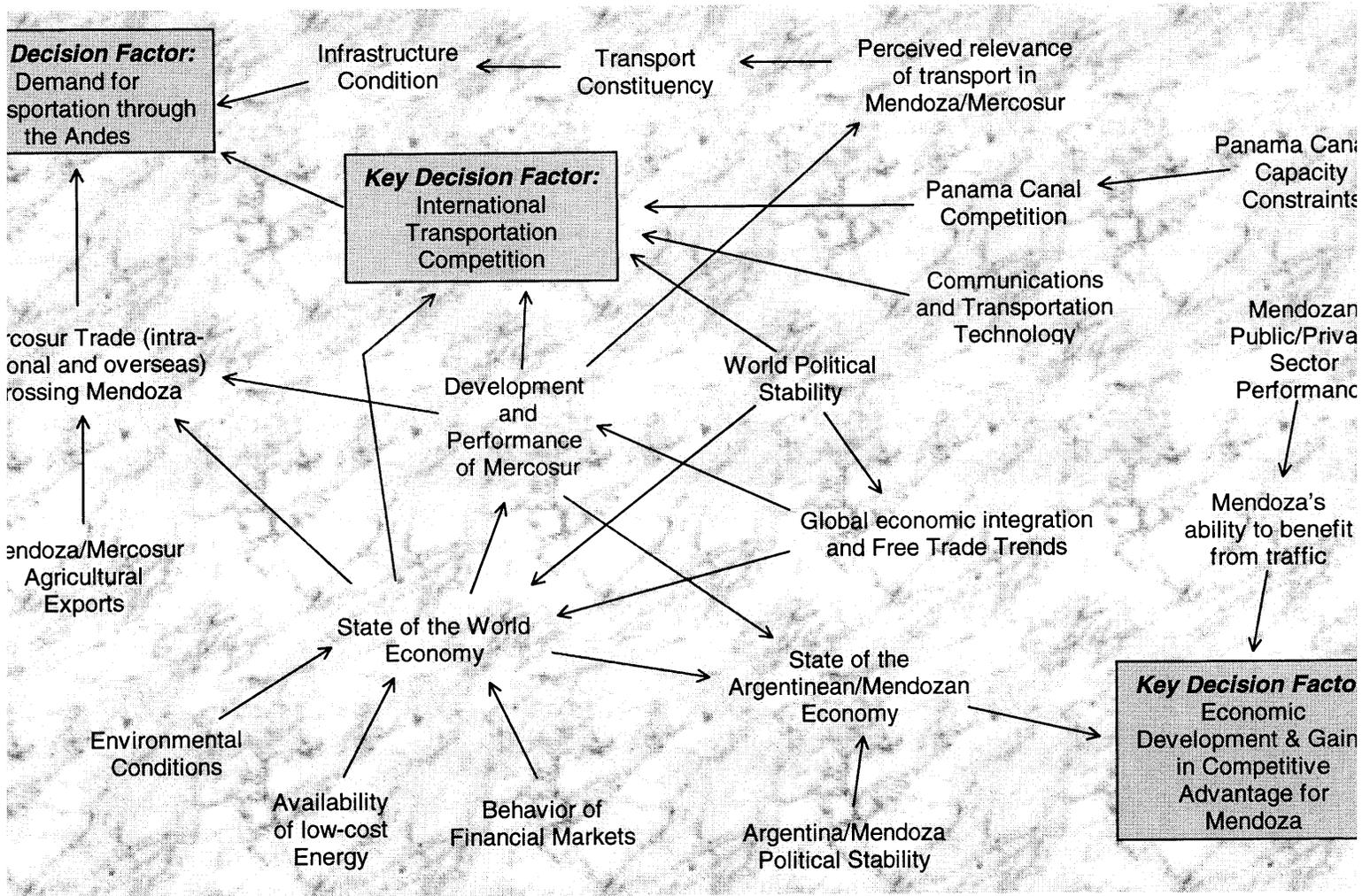


Figure 8.16
Influence Diagram for the Mendoza Scenarios

The development and performance of Mercosur will shape the perception of the role played by transportation. If Mercosur continues to develop and performs successfully, the flow of goods will increase and the relevance of transportation as a tool for economic well being is likely to grow. In the Mendoza case, we argue that the rise and prospects of Mercosur places transportation among the top priorities for the province. The potential benefits of strong Transandean trade are significant for Mendoza.

b) The international transport competition

This element is itself one of the key decision factors. The Panama Canal represents a large share of the international competition for the Trans-Andean flows. This can be better understood by looking at Figure 8.17:

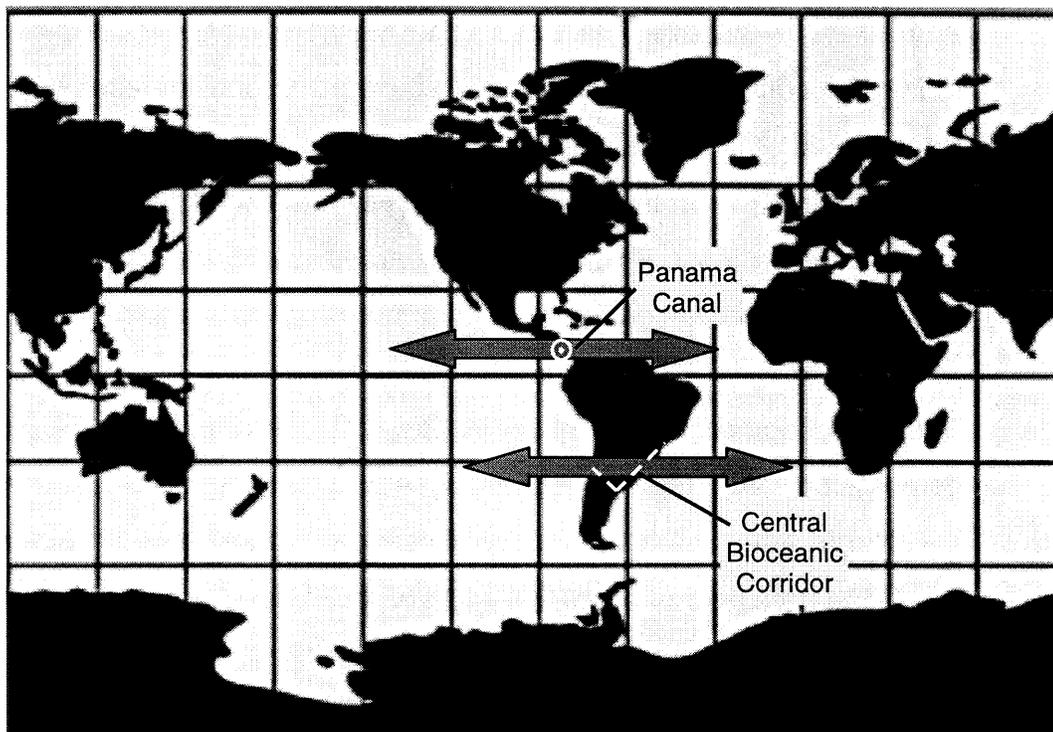


Figure 8.17
The Panama Canal and the Central Bioceanic Corridor²⁹³

²⁹³ based on http://www.lib.utexas.edu/Libs/PCL/Map_collection/globe.jpg

The capacity and operational issues of the Canal discussed earlier in this chapter will have a definite influence over the level of service –and of competition— that can be expected from this international waterway, and therefore is one of the elements to be considered in the scenarios.

Advances in communications, transportation and related technologies will also affect the competition in the market of international transport. Improved transportation has already enabled the expansion of global trade. Additional technological progress in these areas will continue to ease overseas movement of freight and people. New services and capabilities are likely to be developed by carriers and demanded by shippers.

A third influence over the level of transport competition is provided by political stability in the world. A stable and peaceful future that fosters trade could encourage different alternatives for routing and managing overseas traffic. On the other hand, a planet plagued with armed conflicts and a multiple insecure geographical areas would reduce the movement of goods and may also reduce the number of reliable transport options.

The development and performance of Mercosur will also affect competition. A prosperous Mercosur can encourage the deployment of the North and South Bioceanic Corridors. Inclusion of other South American nations could change –although perhaps not significantly— the traffic flows in the Southern Cone.

c) Mercosur's trade crossing Mendoza

Trade involving Mercosur and crossing Mendoza's is the more direct influence on the demand for transportation through the Andes. The state of the world economy influences overseas trade as it affects the demand

for Mercosur goods in foreign markets. Mercosur is itself the largest influence of intra-regional trade moving through Mendoza. Among all trade, the exports of agricultural products are presented as a specific influence. A further figure will address the world food issue with more detail.

Additionally to the economic performance of its member nations (not pictured in the diagram), Mercosur's performance is influenced by two elements: the state of the global economy and the trends in economic integration and free trade. The 1997 currency crisis in East Asia slowed down economic growth in Latin America²⁹⁴ and provides a good example of the effects that such economic events in distant regions can have on Mercosur.

The reader will note that Figure 8.16 depicts the economic integration and free trade trends not as a manifestation of the economic activity in the planet, but as an independent force in and of itself that affects the behavior of the world's economy. This consideration is based on the perceived strength of these trends of economic globalization. The world's political situation influences these trends, as a decomposition of the global status quo –e.g., an exacerbation of regional conflicts— could reverse the current trends and result in a world with a few closed trade blocks. It should also be noticed that there is no relation drawn between communication and transportation technologies and these economic trends. This of course does not mean that such relationship does not exist, but represents the notion that further technological advances in these areas will only speed economic globalization rather than define the direction of these trends.

²⁹⁴ Global Business News. Market Turmoil Hampers Latin American Growth. November, 1997

Economic integration and free trade have already been embraced by a large number of nations and seem to have a solid acceptance. Still, these trends could follow two courses.^{295, 296} The first one —*open regionalism*— implies a multilateral approach, encouraging trade among the different areas of the world. The second and opposite way —*closed regionalism*— means integration and free trade among members of different economic blocks and at the same time discrimination toward outsiders.

In the last chapter, we acknowledged the efforts of Mercosur to reach beyond its borders and strengthen overseas trade. Formal discussions with the European Union, Mexico, Canada are already underway. A major example of how economic integration trends could affect Mercosur can be found in the proposal to create the Free Trade Area of the Americas. This effort initiated in 1994 aims to create a free trade block stretching the entire American Continent by 2005.²⁹⁷ While the 1998 Summit of the Americas held in Santiago, Chile confirmed the intention of the American countries to create the largest trade block in the world, the project is not free from obstacles and uncertainties exist that could hinder and even prevent its completion.²⁹⁸

Beside world political stability, three other elements are depicted as influencing the state of the world economy:

²⁹⁵ Times Net Asia. [Japan External Trade Organization Chief-warms to liberalization.](http://web3.asia1.com.sg/timesnet/data/ab/docs/ab0992.html)
<http://web3.asia1.com.sg/timesnet/data/ab/docs/ab0992.html>

²⁹⁶ Talbott, Strobe. [East Meets West: The Asia-Pacific Region in an Age of Interdependence.](http://www.ozemail.com.au/~usaemb/archive/st971030.htm)
<http://www.ozemail.com.au/~usaemb/archive/st971030.htm>

²⁹⁷ Free Trade Area of the Americas. <http://www.ftaa-alca.org/englishversion/view.htm>

²⁹⁸ Traffic World. [Mother of All Blocks.](#) April 27, 1998.

a) Global environmental conditions

The perceived effects of environmental degradation can affect the future prospects of the world economy. According to the Boston Globe²⁹⁹, a recent study undertaken at the University of Massachusetts-Amherst concluded that 1997 has been the warmest of the last 600 years, followed by 1995 and 1990. The study:

“provides strong evidence that the extraordinary warming of recent years is a direct result of the burning of fossil fuels and other human activities that add carbon dioxide to the atmosphere.”³⁰⁰

The accumulation of evidence like this is likely to strengthen global environment concerns. But global climate change might affect the economy not only because of perceptions. The geographical patterns of food production in the world could be significantly altered due to global warming.

b) The availability of low-cost energy

The importance of low-cost energy in the world economy was exemplified during the decade of the 1970s when sharp increases in the price of oil pushed many countries into a decade of stagnation and inflation.³⁰¹ While in general the world economy is more energy efficient and its better prepared for such contingencies, higher-cost energy could have a major impact in the global economic performance.

²⁹⁹ The Boston Globe. '97 Warmest in Study of Last 600 Years. April 23, 1998
http://www.bostonglobe.com/dailyglobe/globehtml/113/97warmest_in_study_of_last_600_ye.htm

³⁰⁰ Ibid. 299

³⁰¹ Blanchard Olivier, Macroeconomics. Prentice-Hall Inc. New Jersey, 1997, p2.

c) The behavior of the international financial markets

Globalization of the economy has not only meant increased trade of merchandises and commodities, but also increased transactions of foreign assets and foreign currency, which in 1994 reached a volume of US\$ 1 *trillion per day*.³⁰² These gigantic flows of money provide short and medium term financial resources for many countries, but can also exacerbate economic problems. Sudden capital outflows and speculative attacks have played a major role in the currency crises and subsequent economic struggles suffered by Italy and Great Britain in 1992, Mexico in 1994 and East Asia in 1997.^{303, 304}

Two concerns of the author of this work may be considered a source of uncertainty for the future of the world economy:

- The increasing role that financial markets' perceptions –as compared to economic facts— have in the world economic performance
- The seemingly unchallenged ability of speculative attacks to trigger and profit from these capital crises, which is likely to provide an incentive powerful enough to guarantee the reoccurrence of this behavior.

The last key decision factor in Figure 8.16 is the economic advantage and/or competitive advantage resulting from Mendoza's transportation strategy. On one side this factor is influenced by the ability of the province to benefit from the flows using its transportation system, which in turn depends on the performance of Mendoza's public and private sector. Another major influence comes from the

³⁰² Ibid. 301

³⁰³ Ibid. 301

³⁰⁴ International Monetary Fund. World Economic Outlook 1998
<http://www.imf.org/external/pubs/ft/weo/weo0598/index.htm>

state of the Argentinean and Mendozaan economies, since as discussed earlier, transportation investments in a stagnated economy will tend to relocate economic activity instead of creating new ones. Just as the world political situation influences the state of the global economy, the political conditions in Argentina and Mendoza will affect the economic performance of the region.

8.3.2 THE GRANULARITY OF THE ANALYSIS

Before attempting to identify a set of driving forces from Figure 8.16, it is necessary to comment on the level of detail of the analysis. Van der Heijden³⁰⁵ (1996) states that the “granularity” of the driving-force analysis poses a significant challenge, and that a safe middle ground must be found between specific structural relationships among variables –that are hard to generalize— and high level analysis that provide little evidence of causal relationships. His recommendation is to:

“...lean towards a fuzzy fit of a somewhat imprecise generalization, with enough validity to be useful in understanding underlying structure.”³⁰⁶

It is clear that the previous analysis of the influence diagram for the Mendozaan scenarios has been performed at a very general level. For the purposes of this thesis –illustrating the use of the scenario technique in a regional transportation context— it is considered appropriate.

A more detailed analysis of the influence diagram could start by disaggregating the elements of Figure 8.16 in different areas. As an example, of this approach, the influence diagram in Figure 8.18 focuses only on the demand for transportation through the Andes and looks exclusively at the influence of the global food market in Mercosur trade. Then, the relationships in the influence

³⁰⁵ Ibid. 22

³⁰⁶ Ibid. 22, pp195

diagram can be established through quantitative models representing a particular structure between events and trends.

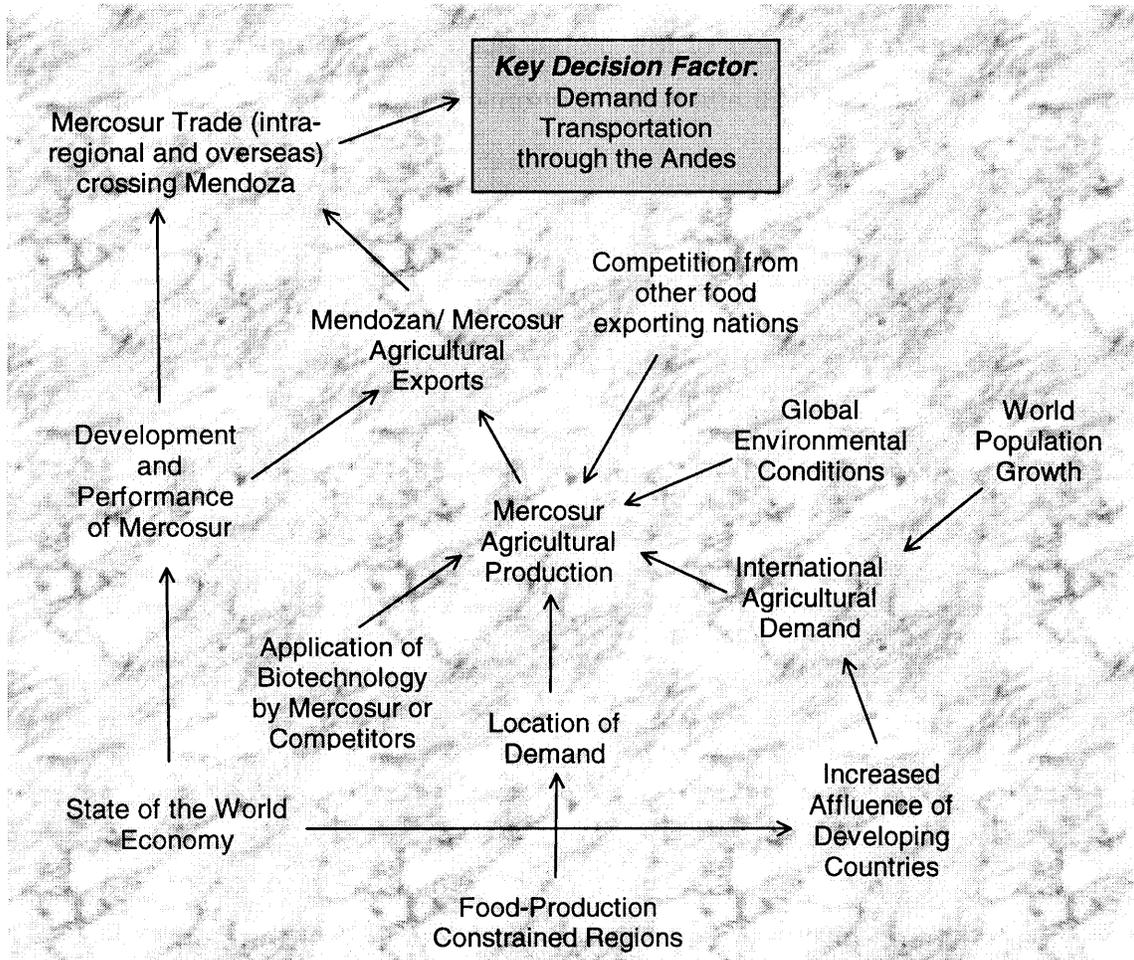


Figure 8.18
Influence Diagram: World Food Issue and Transportation Demand across the Andes

8.3.3 THE DRIVING FORCES OF THE MENDOZAN SCENARIOS

Several of the elements represented in Figure 8.16 and Figure 8.18 can be characterized as driving forces of the scenarios. There are a few which seem to have a leading influence on the behavior of some of the other variables and the overall outcome. These are the driving forces of the scenarios:

- World population growth
- Increased affluence in developing countries
- Mercosur's development and performance
- The behavior of the financial markets
- World political stability
- The international demand for agricultural products
- The development of biotechnology
- Global environmental conditions
- The availability of low-cost energy
- The advance in communications, transportation and related technologies
- Panama Canal competition
- Global economic integration and Free Trade Trends

8.4 STEP 4: RANK KEY DECISION FACTORS AND DRIVING FORCES BY IMPORTANCE AND UNCERTAINTY

We have to rank the key factors and driving forces: first, based on their relevance to the success of the focal decision identified at the beginning of the process; and second, based on their uncertainty. The final objective is to identify two or three driving forces that are the most relevant for the outcome of the project and are also the most uncertain.

Table 8.9 presents our ranking according to both criteria and is the base to find the major axes that will define the structure of the scenarios.

Table 8.9			
Ranking of Key Decision Factors and Driving Forces			
By importance		By uncertainty	
<i>Key Decision Factors</i>			
1	Economic development and competitive advantage gained by Mendoza	1	Economic development and competitive advantage gained by Mendoza
2	Demand for transportation through the Andes	2	Demand for transportation through the Andes
3	Competition for International Transport Services	3	Competition for International Transport Services
<i>Driving Forces</i>			
1	Mercosur's development and performance	1	Mercosur's development and performance
2	Global economic integration and free trade trends	2	Level of affluence in developing countries
3	Level of affluence in developing countries	3	Global economic integration and free trade trends
4	Panama Canal competition	4	World political stability
5	International demand of agricultural products	5	Development of biotechnology
6	Development of biotechnology	6	Communications, transportation and related technologies
7	Communications, transportation and related technologies	7	Panama Canal competition
8	Behavior of financial markets	8	International demand of agricultural products
9	World political stability	9	Behavior of financial markets
10	Availability of low-cost energy	10	Global environmental conditions
11	Global environmental conditions	11	Availability of low-cost energy
12	World population growth	12	World population growth

8.5 STEP 5: SELECT THE LOGIC OF THE SCENARIOS

Schwartz³⁰⁷ (1996) explains this fifth step as follows:

"The results of this ranking exercise are, in effect, the axes along which the eventual scenarios will differ. Determining these axes is among the most

³⁰⁷ Ibid. Schwartz, pp. 243

important steps in the entire scenario-generating process. The goal is to end up with just a few scenarios whose differences make a difference to decision makers.... ...Once the fundamental axes of crucial uncertainties have been identified, it is sometimes useful to present them as a spectrum (along one axis), or a matrix (with two axes), or a volume (with three axes) in which different scenarios can be identified... ...The logic of a given scenario will be characterized by its location in the matrix of most significant scenario drivers."

Based on the above ranking, the following will be selected as the crucial uncertainties that will define the scenarios for Mendoza:

- Mercosur's development and performance
- The trends of global economic integration and free trade
- Level of affluence in developing countries

Figure 8.19 depicts the "scenario space" for Mendoza. Each block in the figure represents a different combination of "values" of the critical uncertainties.

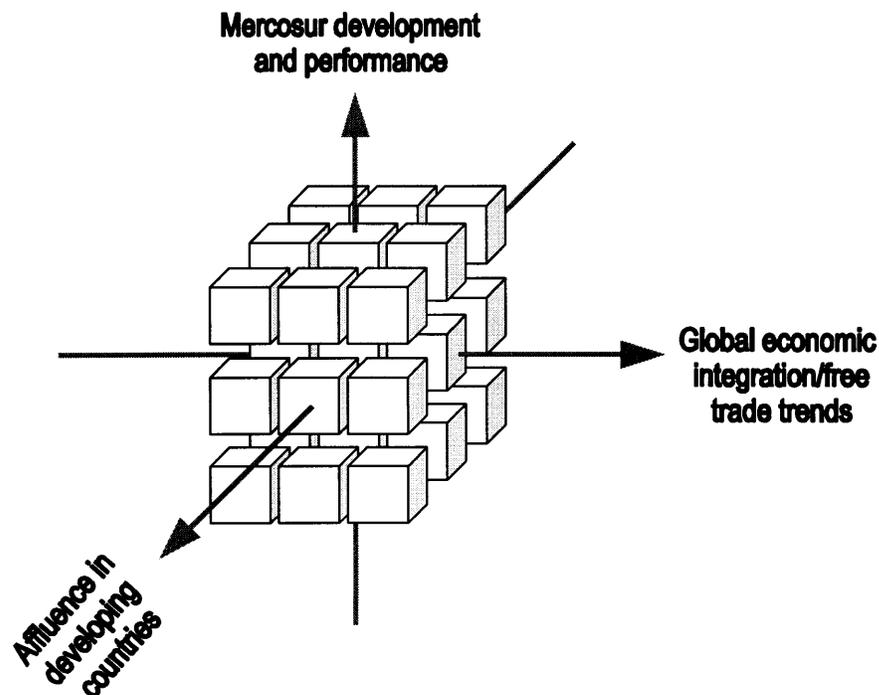


Figure 8.19
A Scenario Space for Mendoza

To define these values, each of the critical uncertainties will be characterized by different “states”; in our case these are qualitative descriptions of their feasible outcomes. Table 8.10 presents these states.

Table 8.10			
The States of the Critical Uncertainties			
Critical Uncertainties	States		
	1	2	3
Mercosur's development and performance	<i>Boom:</i> Mercosur booms and the member nations become the new “economic tigers” of the 21 st century	<i>Modest growth</i> Mercosur performance continues with a healthy but more modest growth	<i>Slow-down:</i> Mercosur slows down and eventually stagnates
The trends of global economic integration and free trade	<i>Open Regionalism:</i> Global integration and free trade amongst different areas of the world	<i>Closed Regionalism:</i> Regional integration and free trade only amongst members of closed economic blocks	
Affluence in developing countries	<i>Generalized Improvement:</i> Widely distributed income growth in developing countries	<i>Selective Improvement:</i> Income levels improve slightly but does not reach the majority of the population in developing countries	<i>Generalized deterioration:</i> Generalized fall in affluence in developing countries

The critical uncertainties and states presented above allow for 18 different combinations. These combinations are presented in Table 8.11 and each of them is a possible scenario that could be further developed. To be able to manage the rest of the process, we must choose only a reduced number of scenarios. For this purpose, we will use some of the recommendations expressed by some of the experts in the field and cited in our previous discussion on the scenario methodology:

- The number of scenarios should be between two and four.
- Each scenario should be relevant for the focal issues or decisions defined in the first step of the process.

- If using three scenarios, special care should be taken to avoid structuring them as a set of “good-regular-bad” futures, reducing therefore their usefulness.
- The use of a surprise-free scenario is a useful addition in the set.
- The chosen scenarios should represent the broad range of futures that may come to pass.

Combination	Critical Uncertainties		
	Mercosur	Globalization and free trade trends	Affluence in developing countries
1	Boom	Open global economy	Generalized improvement
2	Boom	Open global economy	Selective improvement
3	Boom	Open global economy	Generalized deterioration
4	Boom	Closed regionalism	Generalized improvement
5	Boom	Closed regionalism	Selective improvement
6	Boom	Closed regionalism	Generalized deterioration
7	Modest growth	Open global economy	Generalized improvement
8	Modest growth	Open global economy	Selective improvement
9	Modest growth	Open global economy	Generalized deterioration
10	Modest growth	Closed regionalism	Generalized improvement
11	Modest growth	Closed regionalism	Selective improvement
12	Modest growth	Closed regionalism	Generalized deterioration
13	Slow-down	Open global economy	Generalized improvement
14	Slow-down	Open global economy	Selective improvement
15	Slow-down	Open global economy	Generalized deterioration
16	Slow-down	Closed regionalism	Generalized improvement
17	Slow-down	Closed regionalism	Selective improvement
18	Slow-down	Closed regionalism	Generalized deterioration

From the 18 feasible scenarios, we have chosen four (combinations 1, 8, 11 and 18) as the most helpful for the Mendoza case. Table 8.12 lists these scenarios, which have been labeled to express the main difference they represent.

Scenario	Name	Critical Uncertainties		
		Mercosur	Globalization and free trade trends	Affluence in developing countries
1.	<i>"Extended Road"</i>	Modest growth	Open global economy	Selective improvement
2	<i>"Global Flight"</i>	Boom	Open global economy	Generalized improvement
3	<i>"Mercosur Trail"</i>	Modest growth	Closed regionalism	Selective improvement
4.	<i>"Pothole"</i>	Slow-down	Closed regionalism	Generalized deterioration

8.6 STEP 6: "FLESHING OUT THE SCENARIOS"

In this stage, we must return to the basic factors identified in steps two and three. We must consider each of the key decision factors and driving forces in each scenario. It is necessary to integrate each uncertainty in the scenarios. This is done based on the implications of these uncertainties and the likelihood of their presence in the environment defined by a specific scenario. Finally, we must provide the cause-effect relationship in the scenario by explaining in a "narrative form" how the present could develop into the future represented by that scenario.

In our case, Table 8.12 provides the general structure of the scenarios for Mendoza. The remaining driving forces and key decision factors previously identified were integrated to this structure. Those elements considered as predetermined appear in all scenarios. Uncertainties behave in different ways

as determined by the logic of the scenario and cause-effect relationship underlying its elements.

In what follows, the scenarios for 2020 are presented in a narrative form:

1. *“Extended Road”*

The world in 2020 is closer than ever to what could be considered a truly global economy –with the exception of most Africa. While the negotiations for the Free Trade Area of the Americas (FTAA) took 5 years longer than expected, the American Continent has been functioning as a single market since 2010. In view of the FTAA creation and in fear of losing ground on this huge market, the European Union strengthened its ties to Mercosur and used this relation as the gateway to the rest of the Americas. The relevance of Japan and China in the U.S. trade strengthen the links between the nations of the Asia-Pacific Economic Cooperation (APEC) and NAFTA, which eventually lead to closer commercial ties between APEC and the FTAA.

While increased multilateral trade has generated new and improved opportunities over the years, the benefits have not been uniformly distributed. An old problem –whose incidence is especially high in Latin America— persists, as the new wealth created does not reach a significant percentage of the population. Inequality creates occasional social unrest in developing countries, which affects their economy and drives away critical infrastructure investments needed for a sound and continuing socioeconomic development. Mercosur nations are not an exception: they are not able to repeat the high growth rates of the first years of the block. Despite this, the modest but continuous growth of Mercosur allows for increased intraregional and overseas flows.

The international demand for agricultural products –and their price— grows, but moderately. A predicted era of higher food prices does not occur due to the large

share of the population whose income remains constant and also to some applications of biotechnology. Argentina's agricultural surpluses are increasingly marketed to cover Latin American food deficits. Because of the moderate prices, geographical location and transportation costs are key elements of competitiveness in this trade. Therefore, US producers are better suited to serve the Mexican market, while Brazil and the rest of South America are major destinations of Argentinean food exports. The larger profits yield by processed food and specialty produce in more affluent markets (US and Canada) multiplies the presence of this industries.

The now indisputable effects of global warming are universally accepted. Environmental concerns encourage research and adoption of clean fuels, innovative propulsion systems and new engine designs. Clearer public perception of an environmental threat during the first decade of the 21st century resulted in an increase of energy costs, as it became politically acceptable to tax low-cost but polluting energy sources. In the medium and long term, as the new technologies become available, the overall results will likely be a modest increase in energy costs. The distribution of moneys generated by the tax on fossil fuels is a major debate in the international community. As the emissions generated in a country end up affecting all nations, the idea of a global fund has been around for some time, but a generalized agreement seems far from being achieved. Developed nations –users of cleaner technologies— continue to support proposals that charge emissions from all countries equally and distribute the funds also equally among all nations. Developing countries continue to argue that developed nations have created the largest part of the problem as they started to pollute earlier in order to foster their industrial development. Therefore, developing countries support a tax structure based on levels of development, and propose that a large part of the funds be invested to modernize their industries and transportation systems to reduce their emissions of pollutants to the environment. In the meanwhile, each country has used these

funds as it best suits their needs. Argentina and Mercosur have used part of the money to create a fund for the development and improvement of transportation infrastructure like the Low-Altitude tunnel across the Andes and the Bioceanic Corridor.

Even after major capital improvements performed at the turn of the century, the Panama Canal reached maximum sustainable volume in 2010. This has diverted traffic to other routes: some flows between Europe and Asia and between Europe and the West Coast of the U.S. use either one of the overland routes built in Nicaragua and in the south of Mexico. Some traffic between the two coasts of South America has shifted to land transportation, but a large part uses the North Bioceanic Corridor, as it matches the origin/destination patterns better (refer to Figure 7.4). The plans to build the third set of locks in the Panama Canal were overtaken by the fast development of these new transportation routes. Now that they have become reliable alternatives it is unclear if the third set of locks will be ever built.

Occasional instabilities in the world financial markets continue to shake the global economies every four to six years, but their real effect is not as menacing and countries have learned to live with them. With some periodical exceptions, multilateral trade has proved to be a fairly good way to encourage global political stability.

2. "Global Flight"

In this scenario, the world also lives in a global economy, but the speed of integration is higher than in Extended Road. The FTAA initiates its operation as originally scheduled in 2005. European fears of being left out the FTAA market and Latin American concerns over a US dominated block reinforce each other and speed the abolition of trade obstacles between the FTAA and the European Union. A fast growing Chinese economy becomes the engine of Asia and U.S.

interest in participating further in these markets encourages the establishment of trade links between APEC and FTAA.

Multilateral trade enables and sustains new economic activity across the globe. This global growth provides a proper economic environment, from which many developing countries are able to benefit. The international community is able to apply tighter controls on the international financial flows and thereby reduce the volatility of the capital markets. Developing countries can attract some of these flows and use them to develop a competitive industrial base and take advantage of their natural resources. A generalized growth in income follows, which triggers a further increase in trade.

Mercosur benefits from this economic environment. Investments in education, social services aiming the poor and critical infrastructure and productive projects support a rise in the quality of life enjoyed by the population. There is strong intraregional and overseas demand for Mercosur goods and commodities.

One of the products for which there is larger additional demand is food. Agricultural production faces constraints in several developed countries. Biotechnology has failed to provide significantly larger yields. Because of climate change, the prospects of Chinese agricultural —greatly dependent on rain patterns— create serious concerns. The balance in the international food markets has changed. Expected permanent shortages of food cause prices to rise considerably. Asia demands food and has the money to pay for it. Argentinean and Mercosur food exports do not only aim at Latin America.

The Panama Canal has been operating at capacity since 2005. The alternative transportation routes crossing the American Continent work close to capacity. The North Bioceanic Corridor —linking Brazil, Bolivia, the north of Argentina and the northern ports of Chile— takes a significant portion of the Intercoastal trade

of South America previously using the Canal. Nevertheless the large food exports from Argentina to Asia are better served by the Central Bioceanic Corridor that crosses Mendoza and connects Brazil, Buenos Aires (Argentina) and the Chilean ports of Valparaiso and San Antonio.

Global environmental concerns play a similar role in the Global Flight scenario as in Extended Road, and the same happens with the cost of energy and the world political stability.

3. *"Mercosur Trail"*

In this scenario, the world is formed by a few economic blocks that work as independent trade units. While there are flows of goods and capital among these blocks, the bulk of the exchange takes place within these regions. This scenario started to unfold when the US Senate denied for second time "fast track" powers to the new Administration that entered in 2000. This event was a definite strike to the multilateral discussions for the FTAA. Mercosur decided to go ahead on its own, and the rest of South America joined the block³⁰⁸. After attempting to diversify its links with other regions, the relevance of the US in their economies pulled Canada and Mexico back into NAFTA, which now embraces the Central America and Caribbean countries –including Cuba. Talks between Mercosur and the European Union broke off because of the great political pressure to keep agricultural subsidies in Europe. In view of this fragmentation, India, China and Japan decided to turn back their eyes to home and promote an Asian block.

Inequality in income growth and wealth distribution is the rule in developing countries. Attempts to reduce volatility of the international financial markets result in rigid regulations that discourage the movement of overseas investments

into developing countries. Mercosur's growth is constant, but modest. Also modest is the growth in food demand and prices of agricultural products. Relatively low prices and tariffs on food trade between blocks keep most flows contained within each economic block. Argentina is the food basket of the extended Mercosur. Some specialty products like wines and fruit conserves are still exported to NAFTA.

The effects of global warming are clear and acknowledged in all countries. Each block generates its own environmental standards to face the problem. Global approaches are initiated, but run into a standoff between developed and developing nations. Energy prices increase moderately, and the division of the world generates some changes in the world market of energy. Following a trend initiated at the turn of the century, Argentina has become the energy supplier of Mercosur based on its oil and natural gas production.³⁰⁸ A small tax on fossil fuels is charged and administered by each country, but it fails to reduce environmental degradation and the revenues generated are also limited.

The Panama Canal is able to satisfactorily serve current levels of demand. Frictions between some of the blocks create political tension and economic sanctions. The trade blocks seem destined to follow the path of the European Union and become a political union in order to be better suited to defend their economic interests.

4. "Pothole"

In this scenario the world is also formed by few independent and closed trade blocks. Large financial groups have developed a profitable business in this

³⁰⁸ The Economist. The Road from Santiago. April 11, 1998

³⁰⁹ Mercopress News Agency. Mercosur News.. August 22, 1997
<http://www.falkland-malvinas.com/archive/sni6220897.html>

future: speculative attack on foreign currencies. A set of major economic crises in the first years of the 21st century strike developing and developed nations, with the former being hardest hit. The financial run against the Mexican peso and the Brazilian real created by European investors in 2003 temporarily affected the stability of NAFTA and damaged Mercosur's performance in a more permanent way. The world economy slows down.

Mercosur's high growth is just a memory. After the crisis of 2003, economic output took 7 years to get back to the size it had before. Thereafter, the economy has lagged for 10 years and there is no clear way out in the near future. The income levels of Mercosur and the rest of the developed countries have deteriorated. Population in developed nations maintains a slow growing income, but inequality in wealth distribution is already a problem. Trade within Mercosur and the rest of the economic blocks exists but at a much lower levels than expected in the last years of the 20th century. The geographical location of regions and cities, and their access to major local markets becomes again a critical element of economic survival.³¹⁰ Demand for food increases slowly – following population growth. The constrained economic situation and the obstacles to trade among blocks encourage a revival of national food policies based on subsidies and protectionism to local producers. Argentina continues to produce more food than it consumes, but it is a low-profit export business.

While no clear evidence has been presented, claims that the speculative attacks on currencies are used to weaken adversary blocks gain acceptance, increasing political tensions between economic areas. The Panama Canal has excess capacity due to lower world trade. Global warming is evident, but the search for economic well-being overcomes environmental concerns. Keeping low-cost energy sources available is a primary goal, and taxing cheap fuels is not

³¹⁰ Ibid. 145

politically accepted. Transportation technologies therefore focus on increasing carrying capacity. The natural environment deteriorates further.

8.7 STEP 7: IMPLICATIONS

Once we have built the scenarios in some detail, it is necessary to consider their implications. In what follows, and as a first look, some implications that each scenario pose for the transportation system in Mendoza are presented:

1 "Extended Road"

- The international link with Chile would still be important. But the Argentinean food flows to cover the Latin American deficit, would make essential the link of Mendoza with Mercosur and the rest of South America: the Buenos Aires - Mendoza highway, the BAMSJ rail line and its connection to the Mesopotamic railroad.
- Proliferation of food processing industries would likely demand good connections between agricultural lands, processing centers and gateways to foreign markets. This suggests the importance of:
 - improving the provincial highway network
 - defining and implementing land use policies that encourage an orderly growth
 - providing the transportation system with efficient freight terminals

2 "Global Flight"

- The international link with Chile would become critical. But the success of an upgraded pass would not depend only on its own performance. The condition and operation of the Chilean part of the

link –the road and the ports of Valparaiso and San Antonio would also be essential.

- The new profitability found in agriculture would likely encourage additional farming in Argentina and Mendoza. The link between agricultural land and the main transportation network would also become important.
- The food flows heading to Asia and the rest of the Mercosur and overseas trade would require an improved connection to the east of Mendoza and the provision of efficient freight terminals.
- Definition and implementation of land use policies would be needed to deal with a possible rapid growth in provincial economic activity.

3 “Mercosur Trail”

- The link between Mendoza and Mercosur/South America becomes the critical issue. In this future, the border pass through the Andes may be more important to Chile than to Mendoza and Argentina.
- Mendoza’s agricultural output would continue to require improved access to the main transportation network and efficient freight terminals from where the products may be sent directly to national or foreign markets in the east or north.

4 “Pothole”

- In this future the connection to Buenos Aires –as the major Argentinean market— has increased importance.
- The provincial network has also primary relevance, as the economic success/survival of the rural areas and smaller cities in the province may depend on their connection to the City of Mendoza.

For all of the four scenarios, increased global environmental concerns are likely to put some pressure for the use of cleaner technologies and modes. It is left to further study if this factor could favor the use of rail over truck.

8.7.1 TESTING THE STRATEGIC CHOICES

An especially valuable contribution of the scenario methodology is that allows us to “test” the strategic choices against the different futures envisioned. Figure 8.20 depicts this process in a general context:

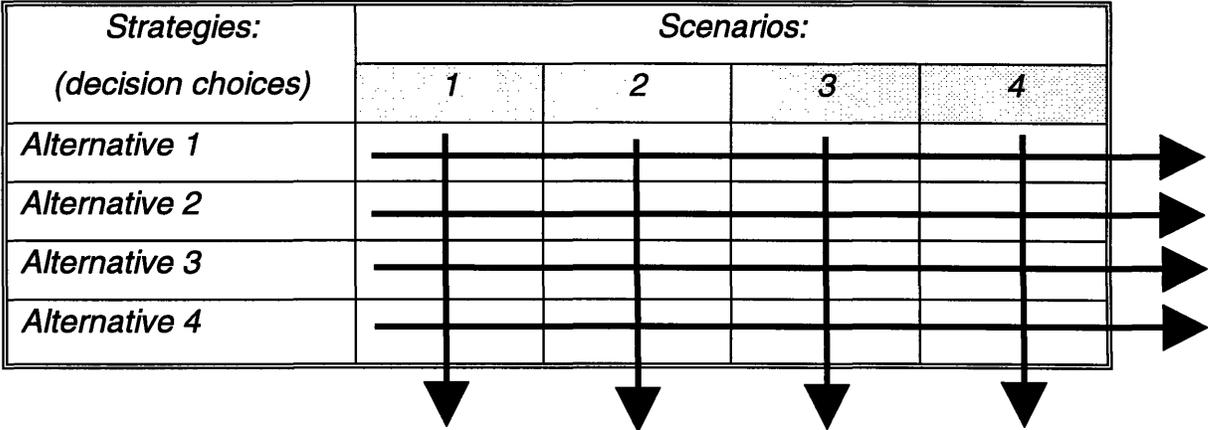


Figure 8.20
Scenarios as a Test Bed for Strategies

In Table 8.13, the author makes a specific assessment on the strategic options for the Mendoza case.

Table 8.13
Testing the Mendoza Transportation Strategies:
Perceived Impact and Performance by 2020

Strategies: (decision choices)	Perceived Impact* (I)	Performance of the Strategy					IxTP
		1 Extended Road	2 Global Flight	3 Mercosur Trail	4 Pothole	Total Perf. (TP)	
<i>Upgrade the international link</i>	5	3	5	2	1	11	55
<i>Link to the international & national transport systems</i>	5	5	5	5	5	20	100
<i>Improve the provincial highway network</i>	5	5	5	5	5	20	100
<i>Provide freight terminals</i>	4	4	5	5	3	17	68
<i>Upgrade the BAMSJ rail line</i>	4	4	5	4	2	15	60
<i>Define and implement land use policies</i>	3	5	5	4	2	16	48
<i>Improve the conditions of the urban system</i>	2	3	3	2	2	10	20

* Perceived impact of good performance in Mendoza's socioeconomic development according to the author

Scale:
1= Very low 4 = High
2= Low 5 = Very High
3 = Fair

Multiplying the respective figures of Total Performance and the Perceived Impact results in the last column of Table 8.13. This last column suggests a ranking of the strategic options based on their soundness across scenarios and their perceived impact on Mendoza's socioeconomic development:

Table 8.14
Ranking of Mendoza's Transportation Strategies

1. Improve the provincial highway network
2. Link this network to the international/national transport system
3. Deploy effective freight terminals
4. Upgrade the Buenos Aires – Mendoza – San Juan railroad line
5. Upgrade the international link
6. Define and implement land use regulations
7. Improve the conditions of the urban system

An important additional effort to be made during this stage aims to improve the robustness of each of the strategies available. The objective is to be able to create an option that performs adequately across all scenarios. In the case of Mendoza, some of the transportation strategies involve lumpy infrastructure investments –not a rare event in regional strategic transportation planning. Inherent in the nature of these investments, there is a loss of flexibility in decision-making –e.g., it is impossible to stage the construction of a tunnel to match increasing levels of demand.

Nevertheless, additional ways to provide flexibility should be pursued. In our case, the *order* in which the investments are made and the *interdependence* of their effects can provide this flexibility. Some of the transportation strategies that according to Table 8.13 perform consistently in all scenarios can be characterized as a prerequisite for the appropriate performance of others. This is the case of an upgraded international link between Chile and Argentina: in order for Mendoza to take full advantage of it, proper connections between the provincial highway system and the international/national transport system (Bioceanic Corridor) would be required *anyway*. As a matter of fact, undertaking the first three strategies in our rank provides a flexible approach in deploying the

infrastructure needs of the region. Despite the above, it should be acknowledged that pursuing some of these strategies first than others may have certain influence on future decisions. The choice between developing the highway or the railroad infrastructure in Mendoza is related to the type of tunnel (highway vs. rail) that could be built in the future

8.8 STEP 8: CHOOSE INDICATORS FOR EACH SCENARIO

The eight and last step in the process is to identify a set of signals that will provide a sound indication that different scenarios are unfolding in the course of the future. It is clear that any organization can take great advantage of identifying the start of the development of a certain scenario.

The indicators that Mendoza should be looking at are related to the driving forces previously identified. Among others the province could follow closely the events and trends affecting:

- The development and performance of Mercosur
- The behavior of the economic globalization and free trade trends, focusing on Mercosur efforts to reach out to other economic blocks.
- The issue of the financial markets and their role in possible future economic crises
- The development of the world food trade
- The operation of the Panama Canal

8.9 SUMMARY

In this chapter we applied Dr. Peter Schwartz's step-by-step methodology to build a set of scenarios for the transportation system in Mendoza. Several

issues relevant for the strategic planning of the Mendoza transport system were identified. Two of these issues were studied more closely: the behavior of the world agricultural market and the operation of the Panama Canal. We developed an influence diagram depicting the structure underlying the Mendoza scenarios as a way to search for the forces driving the future. Based on these forces, four scenarios were built. The implications of these scenarios were identified and used to test the strategic options previously identified for the Mendoza transport system. The testing exercise provided the basis to rank these transportation strategies according to their soundness across scenarios and their perceived impact on Mendoza's socioeconomic development.

It should be noticed here that the scenario exercise here undertaken has some limitations when compared to the applications of the methodology in a real organizational context:

- The scenarios should be the product of a team. Despite the valuable support from the MIT ReS/SITE research team, in the Mendoza case the scenarios can be considered the work of a single person.
- Scenarios should be built by people with a good understanding of the environment in which they are being developed. Unfortunately, the scenarios could not receive the feedback from our Argentinean colleagues previously working in the CIT/MIT project. Their closer involvement and richer perception of the Mendoza context would have certainly refined and improved the outcome of this work.
- Even in the intuitive logics methodology for building scenarios, quantitative data and models are used as a tool to better understand the relationships behind the scenarios. Larger amounts of disaggregate data on the economic, social and political situation of Mendoza, Argentina and Mercosur are required. It is necessary to detail the relationships between the elements

playing a role in the unfolding of the future. A quantitative analysis of the events and trends involved in the scenarios should be undertaken.

The next chapter finishes this work and presents a summary of the thesis along with its conclusions and suggestions for further research.

9. CONCLUSIONS

9.1 SUMMARY OF THE THESIS

The present thesis has discussed a broad range of issues that are relevant to modern transportation planning. The following points summarize some of the main ideas presented.

9.1.1 THE STRATEGIC PLANNING CONTEXT

- After studying Prof. Henry Mintzberg, we recognized that the outcome of strategic planning should be an integrated system of strategies, i.e., a clear statement of the hierarchy, relations and interdependence among the strategies leading an organization's activities. Prof. Michael Porter reminded us that pursuing a strategy implies a high-order decision, a choice between alternatives.
- Uncertainty about the future is a key variable in any strategic planning activity. Prof. Mintzberg's different forms of strategies highlighted that in the strategy context the response to a change in the environment takes the form of the generation of emergent strategies. The ability to generate emergent strategies is then a reflection of the flexibility built into organizations. And emergent strategies are the result of strategic thinking performed within the organizations. As a result, in today's dynamic environment, the planning process –not the plans— is the appropriate source of an organization's flexibility, which is understood as the ability to deal with uncertainty and react promptly to change. Because the foundation of the planning process is the people that participate on it, this provision of flexibility occurs through the human resources of the organization. The resulting argument is that the

efforts oriented to improve the strategic planning process should include the development of its human resources.

- We reviewed Van der Heijden's characterization of the different structures of strategic planning that have been proposed, and found that each one is useful in different ways. Prof. James Quinn's Logical Incrementalism is considered in this work as an extremely useful tool to understand strategic planning in real-world complex environments.

9.1.2 THE REGIONAL TRANSPORTATION CONTEXT

- Transportation is not an end to itself, but rather a tool to achieve higher-order objectives. Transportation systems are closely woven into the economic, political and social patterns of the area they serve. This relationship is complex, dynamic and works in both directions: transportation influences the social and economic systems, but is also affected by them.
- We have found evidence that the regional scale is an appropriate size to study and address the complex relationship between socioeconomic patterns and transportation.
- We saw how transportation investments have the potential to become a major player in the development of economic activities at a regional, national and international scale. After introducing Prof. Porter's theory on Competitive Strategy, it was suggested that these ideas can be used as a tool to lead strategic planning for regional transportation, and its concept of strategic fit as a valuable framework for regional development efforts.

9.1.3 THE PUBLIC/PRIVATE PARTNERSHIP CONTEXT

- The creation of public/private partnerships as an innovative approach for transportation infrastructure and planning was examined. While reviewing the history of public and private participation in providing infrastructure, it was pointed out that “public sector” and “private sector” are not synonyms of “bad” and “good”. We acknowledged that a right balance must be found. The dynamism of the private sector requires a capable and strong public sector perhaps more than ever. The World Bank highlighted as the critical issue the need to refocus governmental activities into a set of core functions –with investment in infrastructure one of them. When talking about public/private partnerships in transportation, a comment was made on the difficulty to integrate the parties that make use of the system: shippers, carriers and individual users. The benefits and complexity of a partnership for transportation planning were discussed and the Intelligent Transportation Systems (ITS) technology was presented as an example of joint public/private participation.

9.1.4 THE SCENARIO METHODOLOGY

- Scenarios can be characterized as a story describing in a structured way in which the future could develop from the present. The use of scenarios to generate robust strategies and as a tool for organizational learning was emphasized. It was shown how scenarios integrate and address several of the major concerns identified when studying strategic planning, regional transportation, and public/private partnerships. We reviewed the most common problems that arise when using the scenario methodology and described to some detail three examples of major scenario exercises. We used the work of Kees Van der Heijden and other authors to study the underlying theory and methodology of scenario planning.

9.1.5 THE APPLICATION OF THE SCENARIO METHODOLOGY

- The scenario methodology was used for regional strategic transportation planning for the province of Mendoza, Argentina. The main characteristics of the province and the most relevant issues affecting the region and its transportation system were introduced. Then, we followed Peter Schwartz's framework to build a set of scenarios for the province of Mendoza.

9.2 FINDINGS

9.2.1 SCENARIOS AND REGIONAL STRATEGIC TRANSPORTATION PLANNING

As mentioned in earlier chapters of this work, the scenario methodology is an approach that is responsive to the needs and characteristics of modern regional strategic transportation planning. This work argues that scenario-planning address several of the fundamental shortcomings of most transportation plans listed in section 1.1:

Additionally, we have found that scenario-planning is a tool for robust decision-making that works in two tracks:

- Allowing us to “test” decisions against different environments before they are actually taken
- broadening decision-makers' perspective, which results in improved determinations and ability to react quickly when the environment changes

Table 9.1	
Scenarios and the Identified Shortcomings in Transportation Planning	
Identified Shortcomings	Scenarios...
Lack of integration of: <ul style="list-style-type: none"> • The inherent complexity of the transportation context. • The relevance of economic development /competitive advantage considerations. • The rapid pace of technological changes affecting transportation. 	Allow us to effectively integrate a wide range of issues and topics that are relevant to transportation: societal, economical, political, technological and environmental.
<ul style="list-style-type: none"> • The need for a new public/private relationship. 	Have been used to achieve consensus in the midst of a politicized and adversarial environment. This suggests that scenarios can provide common ground for a public/private joint approach to planning and policy formation for regional transportation.
<ul style="list-style-type: none"> • Lack of human resources considerations 	Support human resource development as it broadens participants' perspectives and force decision-makers' to test their mental models against reality.
<ul style="list-style-type: none"> • Lack of an intermodal approach • Overemphasis of passengers needs as compared to freight movements. 	Can be tailored to the specific contexts of different regions and transportation systems.
<ul style="list-style-type: none"> • Need to link transportation to the broad regional strategic issues. 	Start with the identification of focal issues or decisions, thus allowing us to link transportation with higher-order regional strategies from the beginning of the process.

Therefore, instead of relying on the “point estimates” produced by forecasts, scenarios allow decision-makers to deal directly with the different levels of uncertainty of the key variables, and consider this uncertainties in the decision-making. ***Scenarios are a source of strategic thinking in the transportation planning process: they can initiate regional strategic transportation planning by analyzing the environment and generating robust strategies to be followed by a region.***

9.2.2 MENDOZA

The study of the Mendozan context, its transportation system and the application of Schwartz' scenario-framework highlighted several important issues:

- The existence of clear conflict between some of the strategies pursued by Mendoza indicates the lack of a systems approach to overall provincial objectives. As implied by our discussion on strategic planning, it is *essential* that this problem be addressed first. The conflicts between Energy/Water vs. Transportation, Energy/Water vs. Agriculture, and Industrialization vs. Agriculture imply important tradeoffs that Mendoza should resolve based on its higher order objectives. And it is in the main interest of the province that this be done *before* committing to long-term loans with international banks in order to finance a major infrastructure/facility.
- The importance that transportation will play in the socioeconomic development of Mendoza is closely linked to the rise and future performance of Mercosur. The scenarios actually suggest that –with the exception of increasing Argentinean food exports— the way in which the transportation system should be developed could depend on Mercosur more than on any other variable.
- The international market of agricultural and cattle products –a driver of the Argentinean food exports— has been identified as a major issue in Mendoza's strategic options.
- The results of the scenario exercise indicate that the Province should not focus first on large investments to upgrade the border pass with Chile, but rather aim to:

- Improve the provincial highway network
- Link this network to the international/national transportation system
- Deploy effective freight terminals

It is important to remark that despite the limitations of the scenario effort undertaken (recognized in the following section), these results are congruent with the findings of Yang³¹¹ (1996). Her analysis of the provincial highway network and specifically the Mendoza – Buenos Aires highway concluded that:

“The approximate magnitude of investment requirements for this highway is much lower than the investment requirements for the low altitude tunnel or the Rio de la Plata Crossing, but this major highway link has as much strategic importance to Mendoza as those large-scale projects. “

The same author found that the costs of improving the Mendoza – Buenos Aires highway earlier than the optimal time (as defined by the number of users), are significantly lower than the cost of doing it after and suffering congestion in the link.

9.3 REGIONAL ARCHITECTURES: THE LINK TO THE INSTITUTIONAL AND IMPLEMENTATION ASPECTS OF TRANSPORTATION

As mentioned at the beginning of this thesis, this work was done within the framework of the ReS/SITE research project: Regional Strategies for the Sustainable Intermodal Transportation Enterprise. Scenarios are only one of the two broad concepts used by ReS/SITE. The second concept is the one of a

³¹¹ Ibid. 170, pp158

Regional Architecture; its origins can be found in the “architectures” of computer systems.

In a parallel work to this thesis, Todd Pendleton defines Regional Architecture as:

“A framework that describes how various transportation institutions will interact in order to provide an integrated series of transportation services in a metropolitan-based region.”³¹²

While in Pendleton’s definition a Regional Architecture focuses on a “metropolitan-based region”, the transportation services and institutional interactions coordinated by this tool can be also identified in a broader scope like the Bioceanic Corridor. Section 7.3.2 pointed out that the deployment of this international link would imply:

“Supporting of the institutional structures required to manage, operate and maintain the Corridor in an efficient manner.”

While the scenarios would generate the strategic options and give direction for the strategic transportation planning effort, a Regional Architecture would coordinate the different local, national and international institutions (public agencies and private companies) to allow for the provision of transportation services in the Bioceanic Corridor.

³¹² Pendleton, Todd. Regional Architectures: Definition and Integration into the Strategic Planning Process with Application to the Greater Portland (ME) Region. Master of Science in Transportation Thesis, Department of Civil and Environmental Engineering, Massachusetts Institute of Technology, Cambridge, MA, 1998

9.4 SUGGESTIONS FOR FUTURE RESEARCH

9.4.1 ON THE SCENARIO METHODOLOGY

One major area in which further research is needed deals with the use of scenario planning in the context of a public/private partnership for regional transportation. How can scenarios be actually used by a group of public and private stakeholders to do strategic transportation planning in a specific region? How should the scenario planning exercise be structured? How to balance the claim for strong private sector influence and the concern for broad public gains?

9.4.2 ON THE MENDOZAN CASE

- The application of Schwartz's steps to Mendoza was made based in the perceptions of the author and with continuous advice from the ReS/SITE project team and other researchers at MIT. Despite such valuable contributions, and in order to become more useful for the province, the scenarios should be reviewed based on the limitations of the exercise identified in section 8.9.

9.5 A FINAL WORD

This thesis has studied the usefulness of scenario planning in the context of regional transportation. The scenario methodology has been presented and an application to a specific case has been made.

The author hopes that this work helps to advance the generation of a new regional strategic transportation planning and supports the development of the transportation system in Mendoza, Argentina.

APPENDIX A

MINTZBERG'S FUNDAMENTAL FALLACIES OF STRATEGIC PLANNING

Section 2.3.1 reviewed some of the critiques that have been made regarding current strategic planning practices. Mintzberg (1994) bases his critique in what he has called the “fundamental fallacies” inherent to the planning process:

- **The Fallacy of Predetermination**

An intrinsic characteristic of any strategic planning effort is that requires the assumption of future conditions of the organizational environment. The efficacy of planning therefore depends heavily on the accuracy of such predictions, and as mentioned earlier in this work, the accuracy of our long-term forecasting tools is eminently unsatisfactory. Therefore, Mintzberg asserts that the usefulness of strategic planning itself –that deals mostly in the long term range— is severely hindered.

Overall, the dependence of accurate forecasts is a real limitation, which is not possible to solve completely. And yet, discarding planning due to the presence of such a constraint is not an option. In short, it would go against the very human need for anticipation and foresight. Additionally, as it has been seen in previous chapters of this thesis, we know that at least some part of the future can be predicted with enough accuracy as to be useful.

- **The Fallacy of Detachment**

Strategic thinkers are needed because of their ability to look at the big picture and consider all major elements. But as presented in Chapter 2, strategy generated exclusively by people detached from the actual operation

can be risky. The strategic thinkers will not be able to perceive valuable information that is generated during the daily operation:

“Effective strategists are not people that abstract themselves from the daily detail but quite the opposite: they are the ones who immerse themselves in it, while being able to abstract the strategic messages from it.”³¹³

- The Fallacy of Formalization

This fallacy refers to the assumption that a creative innovation-driven process like strategic planning can be performed by a system as efficiently as is done by individuals. In a simplified approach, this assumption would imply that structuring a procedure that can be followed by managers as a check-list would generate the desired strategy. The evidence provided by Mintzberg conflicts totally with this idea: formal operational system can not substitute for the intuitive/creative process by which strategy is generated by individuals.

As a corollary, strategic planning processes with strong formalization emphasis will be inappropriately biased toward strategy implementation. The source of strategic thinking in an organization will rarely be these planning systems, but rather will tend to flow from less normative structures.

- The “Grand Fallacy of Planning”

Mintzberg states that the fundamental difficulty with strategic planning resides in the very nature of planning, which is in essence an analytical process that breaks down a problem in its parts, while the basic tool for strategic thinking is precisely the opposite: synthesis. Breaking down the elements into its pieces has allowed planning to manage large amounts of information, and study each subsystem in detail. Nevertheless, there is final

³¹³ Ibid. 2

and critical need to integrate those pieces back into a comprehensive whole, a real system of decisions.

“The obvious conclusion is that to be effective any organization has to couple analysis and intuition in its strategy making as well as other processes... analysis may not be synthesis, and so planning may not be strategy formation, but effective strategy formation, especially in large organizations, does depend importantly on analysis, both as an input to the process and as a means of dealing with its outputs.”³¹⁴

³¹⁴ Ibid. 2, p329

APPENDIX B

ADDITIONAL IDEAS OF LOGICAL INCREMENTALISM

Section 2.5 presented some of the main concepts of logical incrementalism as they were related with our discussion on the strategic planning process in Chapter 2. Appendix B introduces the a few additional ideas of this theory:

THE FUNCTIONS OF THE CORPORATE PLANNING STRUCTURES

The theory of logical incrementalism agrees with Mintzberg in that the corporate structures devoted to carrying out formal planning processes are seldom a source of strategy formation. Instead, Quinn³¹⁵ (1980) identifies several functions performed by these structures in the strategic planning context:

- To formalize and calibrate strategic decisions already taken.
- To provide a systematic mean for evaluating budgets.
- To support the implementation of already decided strategic changes.
- To provide an information network to managers.
- To force operating managers to periodically review their work in the long term context.

THE GENERATION OF STRATEGIC GOALS

In another parallelism with Mintzberg, the incremental view does not see strategic goals arising from analytical actions, as suggested in the formal planning literature; rather it considers them the result of a process that moves step by step and evolves continuously.

³¹⁵ Ibid. 17

The argument for incremental goal setting is strongly related to the use of broad objectives, which require a refining and reshaping process. According to Quinn³¹⁶ (1980), in a corporate environment, the strategic planning effort faces tensions and disagreements among different units of the company. The larger the company, the more numerous and complex the disagreements will be. In such an environment, the first step, that of generating a set of specific goals can also become an endlessly continuing and last action in the strategic effort. When facing the risk of not moving *at all* in the process, logical incrementalism offers the option of moving *step by step*. In such cases, establishing an array of broad objectives to generate initial consensus, and refining them as the process continues may actually be the best –sometimes the only— solution.

INCREMENTALISM AND CONTROL

While the incremental theory does not extensively address the issues of control, Quinn³¹⁷ (1980) highlights the importance to focus only on the central aspects of the strategy. The base of control is established in the beginning of the planning process, by using this small number of essential issues that will become the thrusts of the strategy and can be the source for future control measures.

The important thing to keep in mind is that keeping control in incremental planning it is necessary to maintain a cohesive vision of the process. Quinn states that controlling incrementalism requires a continuous integration of the different activities being performed, and to link these activities to the surrounding environment.

³¹⁶ Ibid. 17

³¹⁷ Ibid. 17

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