Green Stormwater Infrastructure, Complete Streets, and Interagency Collaboration in San Francisco

By

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ABSTRACT

In many US cities, the implementation of green stormwater infrastructure (GSI) in the right-of-way remains problematic. On one hand, many cities' policies are espousing the Complete Streets model, an approach whereby streets should serve multiple users and purposes and combine different design elements, including GSI facilities; on the other hand, the collaboration between city agencies that would be required to implement Complete Streets project conflicts with the compartmentalized structure of city governments. This thesis analyzes the San Francisco experience with GSI, investigating citywide policies and actual street improvements that the city was able to deliver over the years. This investigation shows that although the city embraced the Complete Streets model and adopted policies that in theory encourage collaborative projects, it also did not create an implementation mechanism to support collaboration, which currently remains at the discretion of city agencies. The thesis also shows that, from a San Francisco agency standpoint, collaboration in a street project can be perceived as a hamper, rather than as an opportunity. In particular, in the case of GSI, this resulted in one agency choosing to work independently in order to implement its projects, which as a result didn't always score well in terms of completeness. This led to a paradoxical situation, by which as GSI-based street improvements were implemented over the years, agency acceptance toward GSI increased whereas agency collaboration decreased. Ascribing issues with collaboration to the compartmentalized structure of the city government, the thesis concludes with recommendations both for the San Francisco agencies wishing to engage in collaborative projects, and for the agency in charge of GSI as it moves toward a new batch of GSI projects in the right-of-way.

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CONTENTS

Abstract .......................................................................................................................................................... 2

1 THE RISE OF THE COMPLETE STREET CONCEPT ............................................................................. 6
  1.1 From transportation to street life: movements fostering integrative street design and current emphasis on Complete Streets .......................................................... 6
  1.2 Adding ecology and keeping the rest: the Green Streets movement ........................................... 10
  1.3 Complete Streets and Green Streets: the challenge of implementation .............................. 11
  1.4 Complete Streets and Green Streets: possible synergies ...................................................... 15
  1.5 Roadmap ........................................................................................................................................... 16

2 COMPLETE STREETS, GSI AND CITY AGENCY ARENA SAN FRANCISCO ................................ 17
  2.1 Introducing the arena of city agencies concerned with the right-of-way .............................. 17
  2.2 First policies and improvements on San Francisco streets .................................................. 21
  2.3 Tying it all together: the Better Streets Policy and Plan ...................................................... 24
  2.4 GSI in San Francisco’s right-of-way and potential synergies with the Complete Streets Concept ........................................................................................................................................... 30

3 FOCUSING ON STREETSCAPE PROJECTS WITH GSI .............................................................. 34
  3.1 Streetscape with GSI before and after the Better Streets Plan ............................................. 34
  3.2 Measuring the degree to which GSI projects fit within the Complete Streets framework ........................................................................................................................... 37
  3.3 Method .............................................................................................................................................. 37
    3.3.1 Sample ........................................................................................................................................ 37
    3.3.2 Assessed variables ................................................................................................................. 39
    3.3.3 Data Collection ..................................................................................................................... 43

4 ANALYSIS ........................................................................................................................................... 43
  4.1 Projects histories ........................................................................................................................ 44
    4.1.1 Leland ...................................................................................................................................... 44
    4.1.2 Newcomb .............................................................................................................................. 46
    4.1.3 Cesar Chavez ......................................................................................................................... 48
    4.1.4 Wiggle ...................................................................................................................................... 48
    4.1.5 Holloway .............................................................................................................................. 51
    4.1.6 Sunset .................................................................................................................................... 53
  4.2 Comparative findings: from few, slow, collaborative and complete early projects, to more numerous, faster, less collaborative and less complete recent projects ........................................................................................................................... 56
  4.3 Considering agencies’ standpoint: barriers and incentives to collaboration and completeness ........................................................................................................................................... 62
### ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSP</td>
<td>San Francisco Better Streets Plan</td>
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<td>CEQA</td>
<td>California Environmental Quality Act</td>
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<td>DMA</td>
<td>drainage management area</td>
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<td>DPW</td>
<td>San Francisco Department of Public Works</td>
</tr>
<tr>
<td>EIPs</td>
<td>Early Implementation Projects: a program of GSI streetscapes by PUC</td>
</tr>
<tr>
<td>GSI</td>
<td>green stormwater infrastructure</td>
</tr>
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<td>ISD</td>
<td>integrated street design</td>
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<td>PLN</td>
<td>San Francisco Planning Department</td>
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<td>MTA</td>
<td>San Francisco Municipal Transportation Agency</td>
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<td>PUC</td>
<td>San Francisco Public Utilities Commission</td>
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<td>San Francisco Sewer System Improvement Program</td>
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<td>UWA</td>
<td>San Francisco Urban Watershed Assessment</td>
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1 THE RISE OF THE COMPLETE STREET CONCEPT

Streets should work as multipurpose spaces: they can be efficient and safe conduits for drivers, transit users, pedestrians and bicyclists; they can serve as inviting public spaces that bolster socialization and culture; they can provide attractive locations that sustain the local economy; finally, streets can contain features that provide environmental services.

Listed above are the goals of the Complete Streets movement, which has since the 2000 been espoused by jurisdictions across the US, promoting some cities to transform their street space to attain them.

This chapter outlines how different movements over time addressed the goal of an integrative street design, leading to today’s definition of Complete Streets. In doing so it also identifies the moment in which green stormwater infrastructure (GSI) was incorporated into the Complete Streets framework.

Furthermore, the chapter introduces the main challenges and tradeoffs related to the implementation of Complete Streets and it highlights the dilemmas city agencies are presented with in order to deliver their street improvements. In doing so it notes how these difficulties also apply in the case of projects that incorporate GSI.

The chapter concludes with a roadmap that illustrates how these concepts will be addressed through the analysis of a specific city: San Francisco, California.

1.1 FROM TRANSPORTATION TO STREET LIFE: MOVEMENTS FOSTERING INTEGRATIVE STREET DESIGN AND CURRENT EMPHASIS ON COMPLETE STREETS

The rise of the integrative street design approach has been a slow process, which was strongly tied to cultural and socioeconomic shifts, and which led to the re-formulation of street standards and policies as a response to the changed conditions.

This process mirrors the more general evolution of transportation planning beyond the original engineering framework where it was born. While the early transportation planning considered one problem at a time through the tools of one discipline, newer trends try to devise solutions that address multiple issues by employing more comprehensive strategies where several disciplines come together (Hebbert, 2005).

Transportation planning has become increasingly complex as it is seen less in isolation and
more as part of a family of multiple, mutually dependent goals. Transportation planners explore new
directions that reduce the sole emphasis on providing more vehicular capacity, and look at broader
solutions to creating mobility options (Bain, Gray, & Rodgers, 2012).

The idea that streets are conduits for people and not just for vehicles was promoted in
the US since the 1960s as a counter-reaction to car dominance. Arguably one of the first people to
introduce this idea was Jane Jacobs, whose recommendations to improve cities highlight streets
should reflect human scale, and that they should be safe for pedestrian use (Jacobs, 1961). The
first policy to actually include the idea of integrative street design, however, came from the United
Kingdom. In the 1964 “Traffic in Towns” report Buchanan introduced the theoretical construct of
environmental areas, i.e. urban rooms with no through-traffic that cities should be divided into, and
contended that within certain capacities of the environmental area it would be possible to have
mixed street use (MoT, 1964).

The diffusion and actual implementation of the “integrative street design” approach was
then fueled over time by many different movements. All of these movements shared the same goal,
namely to physically modify the arrangement of the right-of-way in order to reduce the negative
effects of motor vehicles, thereby improving livability and road safety. However, these movements
differed in terms of the solutions proposed. Following Karndacharuk, Wilson, & Dunn, the spectrum
of these movements can be divided in two main categories based on whether or not they pursued
a physical separation of pedestrians from vehicles (Karndacharuk, Wilson, & Dunn, 2014). The first
category of movements is well encapsulated by the idea of a “shared street”, and it comprises all
movements promoting a full integration between road users, one that would not require any physical
separation to organize flows in the right-of-way. The second category of movements is summed up
in the concept of “calmed street”, and it includes movements that on one hand advocate for traffic
calming measures as a way to reduce inbalances between street users, and on the other hand still
hold on to the idea of physical segregation between pedestrians and vehicles.

The first category, shared streets, can be traced to the woonerf, a street type implemented
in The Netherlands since the late 1960s. It consisted of a shared, level surface with special paving
across the entire road width (no curb), and with special signage at its gateways. Originally tested in the
1970s on residential streets only, the woonerf was then extended to commercial streets within urban
settings. Throughout the 1970s and 1980s the shared street concept gained international popularity
and was implemented in thousands of streets across countries like Germany, England, Sweden,
Israel, Switzerland, Japan, France, New Zealand and Australia (Ben-Joseph, 1995; Karndacharuk et
al., 2014). More recently, the EU embraced the shared street concept through both national and EU
policies (Great Britain Department for Transport, 2011; Shared Space, 2005).

Despite its relative success, the implementation of the shared street concept could in some
cases entail very high costs. While in a street within a new developments the shared street approach
could potentially increase profitability, as reducing the street section in favor of private parcel would result in higher density or larger yards (Ben-Joseph, 1995), in the case of the improvements on existing streets, the cost of reconstructing the entire street's cross section was often deemed excessively high and, when possible, to avoid. In the UK context, for instance, Pharoah contended that due to their high costs, early “shared space” projects, though sometimes impressive in and of themselves, never offered more than a very limited and therefore localized solution (Pharoah, 1993).

The other category, calmed streets, was less radical and for this reason more widely embraced, particularly by transportation planning policies. Following Ewing & Brown’s definition, calmed streets are streets where a number of physical measures, such as changes in street alignment and installation of barriers, are installed to reduce traffic speeds and/or cut-through volumes, thereby pursuing public purposes such as safety and livability (Ewing & Brown, 2009). Traffic calming measures have been institutionalized and mainstreamed by incorporating them within manuals and standards (Ewing & Institute of Transportation Engineers, 1999; Lovell, 2005), and have been framed as both a means to address specific local needs and as a way to pursue overall transportation goals.

Because of its wide adoption, the calmed street approach has also been widely explored and innovated over time, thereby extending its original definition toward areas that were not within the traditional scope of transportation planning. Arguably, the broadening of the calmed street approach has also mirrored the more general shift of transportation planning toward an approach that, as argued by Hebbert, pays more attention to today’s health and environmental agenda, is more holistic, is more intertwined with urban design, and more sensitive to the idea of streets as places (Hebbert, 2005).

Several were the US movements that contributed the enhancement of the calmed street concept by embracing the place function of streets. These include the “Livable Street”, “Living Street”, “Context Sensitive Design”, “Complete Street”, and “Road Diet” (Karndacharuk et al., 2014). An analysis of two of the most popular of these movements, the “Complete Street” and the “Livable Street” movement, clearly highlights how the calmed streets approach gradually enlarged its original scope, thereby going beyond transportation.

The term “Complete Street” refers to a street that is designed to be safe for drivers, bicyclists, transit users, and pedestrians of all ages and abilities (Laplante & McCann, 2008). Under this approach, basic accommodations for all users and disabled travelers are necessities rather than optional items (Institute of Transportation Engineers, 2010).

Retrospectively, the first concrete effort to institutionalize this idea in the US context was made by the Oregon State Legislature, which, with the 1971 “bike bill”, stated that any newly built or rebuilt road would need to accommodate bike and pedestrian movement (McCann & Rynne, 2005). More than three decades later, the US complete street movement was formally established through the creation, in 2005, of the National Complete Streets Coalition, which over the years has promoted
the adoption of Complete Streets legislation, standards, and policies both at the local and the state
level (attempts to introduce federal legislation on Complete Streets were also made in 2009 but
that proposal did not pass). More recently, there has been an effort to assess completeness based
on flexible audits that take into account how the community significance of a transportation mode
varies as a function of its context (Kingsbury, Lowry, & Dixon, 2011). Accordingly, even the term
Complete Streets appears to have naturally grown in meaning, from completeness of travel modes,
to completeness of people’s interests, not only in terms of movement. In other words, the most
recent version of the calmed street approach is more sensitive to the social dimension of streets and
pays more attention to street life.

As the name suggests, a “Livable Street” refers to a street environment that
facilitate social interaction. The stress on human interaction was clamorously brought about by
Appleyard and Lintell who, in their study on three residential streets in San Francisco, showed how
human relationships were much more numerous in streets with lower traffic volumes, thereby
suggesting the inverse proportionality between liveability and traffic, holding other variables
constant (Appleyard & Lintell, 1970).

Adding another layer of complexity to the discourse about streets and human interaction,
Bosselmann, Macdonald, & Kronemeyer showed how street design mattered as much as traffic in
their study on highly trafficked boulevards with landscaped side medians. They demonstrated how
residents on boulevards rated their living conditions as better than residents on conventionally-
designed medium-traffic streets, indicating how a certain design played an important role in
mitigating the impact of traffic (Bosselmann, Macdonald, & Kronemeyer, 1999). The implications
of this work, which is that traffic and livability are not necessarily at odds, continue to enlarge the
original category of calmed streets. Calmed streets are thus not only streets in which the impact
of vehicular traffic is reduced through speed control measures, but also high-quality environments
whose spatial quality and design can contribute, regardless of actual traffic reduction, to strengthen
the sense of place and facilitate social interactions.

The boundaries between these movements have blurred over time. A good example is the
1997 Creating Livable Streets report, produced by the Portland metropolitan area government to
envision the future of arterial streets in the region. Defining regional street livability in very holistic
terms, this document pays attention to both transportation, social interaction, identity, landscape,
and safety (Metro Regional Services, 1997).

Another trend is the Context-Sensitive Design movement, and the slightly broader Context-
Sensitive Solutions approach, which looks beyond the right-of-way to include an understanding of the
communities and environments that streets and roads pass through. These approaches recognize
that streets are part of physical, social, and economic environments, and that these issues need to
be part of mobility solutions.
1.2 ADDING ECOLOGY AND KEEPING THE REST: THE GREEN STREETS MOVEMENT

Since the 2000s, in response to the increased attention to environmental issues, street design has begun to incorporate ecological design elements. Based on these premises, the Green Street movement proposes that the right-of-way incorporate facilities to promote stormwater infiltration and filtering or by preventing polluting runoff from flowing into nearby streams. These facilities, which can be tested or not, are referred to as green stormwater infrastructure (GSI).

While GSI can be installed on both private and public land, and city policies related to GSI use both realms, the Green Streets movement focuses specifically on incorporating GSI into the right-of-way.

Arguably the first city to pick up on Green Streets was again Portland, Oregon, where Metro proposed the concept of Green Streets through a design handbook. Focusing on regional streets, this documents massive upgrades by planting filtration strips located along streets that would then replace minimum, integrate with the conventional drainage system. According to the report, as streets progressively incorporate green stormwater infrastructure as a visible component of street design, the face of the Portland metropolitan area will change. After Portland, a number of other US cities adopted the Streets approach, such as New York (NYC Department of Environmental Protection, 2010), Philadelphia Water Department, 2011), San Francisco (San Francisco Water Power Sewer, 2013) and Seattle Public Utilities, 2013).

It should be noted that, despite the narrow definition of Green Streets as those street that incorporate green stormwater infrastructure, the discussion regarding green infrastructure is much older, ambiguous and broader.

The Green Streets movement gets credit for further expanding the number of issues addressed through street design: streets can do even more than addressing the needs of all street users (as advocated by the Complete Streets movement, and can also manage stormwater.

The most recent and progressive street policies tend to wrap up all previous movements, from transportation to street life and ecology, and try to stress design solutions that considered their interactions.

Some cities even reformulated the Complete Streets concept originally born within the transportation community, stressing the idea that street design should not only address the needs of all users, but that in doing so should also address issues beyond street users such as the aforementioned water management. For example, to the City of Philadelphia, Complete Streets refers to a type of street design that considers the interaction of many different users, elements of street design, and surrounding land uses” (City of Philadelphia...
As such, GSI features are treated as one of the elements that should interactively build a complete street. Other US cities, for instance Boston, developed guidelines that include stormwater management under this broader definition of a complete street (City of Boston, 2013).

Following the more recent and broader reformulations of the Complete Streets concept, this thesis will from now on refer to the concept as a holistic street design approach based on all the street users and combined multiple design elements to deliver a diverse set of improvements, from transportation to aesthetics to the environment. Conceptually this broader definition also includes Green Streets. In other words, incorporating GSI in the right-of-way can, along with other measures, yield Complete Streets.

Finally, it should be noted that the notion of Complete Streets allows for flexibility in terms of spatial outcomes. As such, the look of a complete street would depend on the specific way in which street uses are balanced and on the specific array of design elements employed to pursue street “completeness” (McCann & Rynne, 2010).

1.3 COMPLETE STREETS AND GREEN STREETS: THE CHALLENGE OF IMPLEMENTATION

Implementing the Complete Streets concept represents a challenging task. Because of its multidisciplinary nature, achieving Complete Streets involves several parties on different scales, from state regulators to local politicians, to city agencies and the like.

In the report Taking Action on Complete Streets, McCann and Seskin recommend five kinds of activities that should take place in order for communities to successfully transition toward a Complete Streets approach: first, changing the way decisions are made; second, updating design guidance; third, implementation planning; fourth, offering training and education; and fifth, measuring performance (McCann & Seskin, 2013).

At the city scale, changing the way in which decisions are made is particularly relevant. While Complete Streets supporters consider the street space as a whole, within a city government the varying dimensions related to a street correspond to different public agencies. One department controls street maintenance and another one manages traffic; one agency is in charge of providing public spaces, whereas another body might be responsible for the utilities located under the street surface.

All of these entities make decisions with respect to streets, and do so based on their own perspectives. In fact agencies approach the specific aspects that they are responsible for through the lenses of very different disciplines, such as from transportation, civil engineering, landscape
architecture, and urban design.

The subdivisions in city agencies, can therefore represent a barrier to pursuing the comprehensive spatial outcomes advocate by the Complete Streets movement. Furthermore, implementation is often derailed by the silo mentality built within and between agencies, and might be particularly problematic in larger jurisdictions in which interdepartmental division should therefore be addressed more aggressively (McCann & Seskin, 2013).

Beyond the fragmented system of city agencies, which is characteristic of most large cities and represents a structural barrier to Complete Streets implementation, when it comes to making decisions about streets there are more specific aspects at play. Modifying the balance of different street uses as advocated by the complete street movement result in each change in the right-of-way causing an impact on the other dimensions of the street space, and these impacts in turn ensnare other agencies in the game. For instance, extending the sidewalk has the inevitable consequence of reducing space for cars, and it might also entail less evident (but equally, if not more serious) impacts, such as utility relocation and traffic rerouting. Whether more or less evident, these impacts all correspond to different agencies.

The impact brought about by a complete street project would vary from case to case. This is because the Complete Streets notion allows for flexibility in terms of spatial outcome, and because each site presents specific opportunities and constraints. In many cases minimal disruption might yield to significant improvements (Smart Growth America & National Complete Streets Coalition, 2013) whereas in other cases it might be necessary to introduce greater modifications to the right-of-way in order to pursue completeness.

Regardless of the extent of disruption, given the multiple impacts of a complete street project and the aforementioned fragmentation of responsibilities among city agencies, when it comes to decide to pursue a Complete Streets approach there should be some kind of collaboration among city agencies.

Without collaboration, each agency would work independently to deliver its own set of improvements trying to minimize conflicts with other agencies. In a non-collaborative scenario, even if improvements from different agencies accumulated over time, the overall outcome would not necessarily be street complete, as the rebalancing of street uses could not be pursued without communication between agencies.

From the perspective of a city agency, however, engaging in a collaborative project poses a number of dilemmas. When confronted with the possibility of joining a collaborative project, an agency is compelled to consider the tradeoffs of such a choice.

In examining possible pros of collaborating in a complete street project an agency takes several aspects into account. It might want to know if collaboration can lead to savings, for instance through sharing expensive permitting costs. An agency might also be interested in collaborating
if a hostile local community requested additional improvements. Two agencies, each of which planned to deliver an improvement within the next year might be forced to collaborate because of a moratorium that prohibits demolishing streets more than once a year. Or perhaps an agency might be eager to collaborate in a project as that would give it access to massive state funding.

From an agency standpoint collaboration in a complete project could also have many cons: an agency interested in beautification might prefer to not participate in a project that includes some controversial traffic diversions, as it anticipates major protests and stalling; likewise, an agency aiming to install street furnishing in response to a community campaign, and that was faced with the choice between installing it now on one street, or in three years on another street within a major repaving program, might decide to go for the non-collaborative option in order to accelerate project delivery; finally, an agency might not be interested in collaborating because that site does not represent a priority according to its agenda, or because it does not have the budget at the moment the opportunity arises.

Given the multitude of options they are presented with, agencies make choices based on their respective goals, opportunities and constraints. Depending on the case, there would be win-win situations, in which case agencies would likely engage in a collaborative projects, and win-lose situations, in which case agencies would rather work independently.

As a result of the choices made by city agencies, projects might end up being very collaborative, moderately collaborative or not at all collaborative. Furthermore, depending on which agencies are involved, some disciplines might be represented whereas others might not.

Indeed, the design output would also be affected by the way in which agencies collaborate. The outcome would be a function of both the number of agencies collaborating in the process as well as the specific mix of agencies involved. Mixes of agencies and disciplines would correspond to different sets of design elements and combinations thereof. ure 1 shows how a particular set of disciplines, each of which would be represented by a specific agency, could combine with one another. In doing so it also shows the different combinations of design elements that could be selected in each case.

Referring back to McCann and Seskin’s five areas of intervention, the second aspect, updating design guidance, is also a crucial one. While the authors argue that design guidance shouldn’t necessarily be nailed down to design specifications, developing citywide design guidelines that reflect the Complete Streets model has several purposes: it shows how the application of a Complete Streets policy would look like in a specific location; moreover, having design guidelines can reduce uncertainty and controversy over the way in which design elements are combined; finally, setting an ideal spatial outcome would also make agencies realize the necessity of collaborating with one another in order to achieve it. In this respect, while final design depends on the way in which processes unfold, also setting a desired spatial outcome can exert some influence over the type or
When considering the incorporation of green stormwater infrastructure (GSI) in the right-of-way, all of the issues identified in the discussion about Complete Streets apply. In the Complete Streets framework, water management represents one of the disciplines that are represented in a street project. Accordingly, responsibility over this issue are usually under a separate city agency. Relatively, GSI facilities represent the array of design elements that meet the water management goal and that could possibly be combined with design elements serving other agencies’ goals.

As such, when it comes to implementation, literature on Green Streets and GSI in the right-of-way provides recommendations that resemble very much the ones of Complete Streets, thereby confirming that this has absorbed the notion of Green Streets. As such, literature about the implementation of GSI in the right-of-way stresses the importance of streamlining the implementation process by simplifying procedures, setting clear standards, and promoting collaboration among different agencies (Water Environment Federation, 2014). An example of concrete application of these recommendations is Portland’s Green Street Cross-Bureau Team, which was created in 2007 to orchestrate the interests of different agencies specifically on street improvements through GSI (City of Portland, 2007).
There is a difference however, between installing a combination of different design elements to achieve a complete outcome, and doing so including also GSI facilities: this difference consist in the more recent introduction of GSI in the design toolset. This characteristic can further complicate implementation as city staff and expertise might be well equipped to combine traditional design elements, but might have no expertise in GSI, in which case it might be resistant to its introduction.

Despite this difference, the same dilemmas presented in the discussion about Complete Streets implementation apply in the case of street projects that include GSI. As such, agencies interested in delivering green stormwater infrastructure will examine the pros and cons of doing it within a collaborative Complete Street project and of doing it independently.

As in the case of Complete Streets, the incorporation of GSI in the right-of-way also needs to deal with the structural constraint of the subdivision in city agencies. In this respect, literature highlights how Green Streets projects are often anchored to capital improvement plans managed by single agencies, and how this might run counter to the kind of interdepartmental collaboration needed for integrative Green Streets projects (Newell et al., 2013).

### 1.4 COMPLETE STREETS AND GREEN STREETS: POSSIBLE SYNERGIES

Recent trends have been attempting combining Complete Streets projects with GSI projects in the right-of-way. This combination is based on conceptual overlap (in particular the definition of Complete Streets tend to incorporate GSI facilities), and on similar challenges in implementation. For example, the city of Lancaster, PA broadened the approach to street reconstruction to integrate GSI, traffic calming and pedestrian and cycling amenities into each pavement reconstruction project. In doing so, this city developed techniques for funding the various elements of those projects, as well as for conducting the analyses that are necessary during planning. City staff pointed out that having a broader project scope enabled the city to assemble a greater amount of resources than it a traditional street reconstruction project (Graybill & McCormick, 2016).

Awareness about the potential convergence of Complete Streets and Green Streets policies has been growing also the state level. Under the slogan “Complete Streets are Green Streets”, the state of Vermont supported a number of street projects were traffic and water management were combined with community development. In doing so state agencies responsible for these issues are committed to work with each other and local communities in order to target programs and grants (Fitzko, Brown, & Amore, 2015). Similarly, California has been considering the adoption of performances measures for “Complete Green Streets”, which if adopted would set the standards for urban arterials throughout the state (Macdonald, Sanders, & Anderson, 2009).

The aforementioned convergence would seem reasonable also from the perspective of
those city agencies that are interested in complying with the increasing regulatory requirements for water quality. Taking advantage of the momentum that the Complete Streets movement has gained across the United States, cities’ water departments could try to fit GSI into Complete Streets projects as a way to scale up their stormwater programs.

Despite this potential, however, implementing GSI within a Complete Streets framework remains problematic. Barriers include all the matters with the implementation of Complete Streets and GSI projects in general (as explained in the previous section), as well as issues related to combining the twos. The rest of this thesis addresses these questions in the case a large American city, San Francisco, CA.

1.5 ROADMAP

This thesis addresses the way in which San Francisco dealt with the adoption of the Complete Streets concept, with the implementation of street improvement projects that incorporated GSI in the right-of-way, and with the combination of the twos.

The next chapter (chapter two) describes how a large US city, San Francisco, incorporated the Complete Streets model within its citywide policies, and it identifies the 2010 Better Streets Plan as the first document that brings all dimensions together. Furthermore, the chapter introduces the arena of city agencies that in San Francisco have responsibilities over streets and stresses how as of now collaboration is fundamentally of matter of choice. Additionally it highlights how the efforts made by PUC to plan and fund GSI, and it points out the potential for the integration of GSI within Complete Streets project.

The third chapter considers the street improvement projects that in San Francisco installed GSI in the right-of-way and challenges the relationship between these attempts and the Complete Streets concept advocated for in the BSP. In particular, the chapter poses questions about first, the degree of collaboration pursued to implement these projects, second, the level of completeness achieved, and third the reasons why collaboration and completeness were achieved or not. In doing so, it illustrates a method that compares street improvements that installed GSI before and after the BSP.

The fourth chapter analyzes of six projects that added GSI to the right-of-way by looking at both process and project quality. It then presents a number of findings regarding collaboration and completeness both within the sample and in the larger population of projects delivering GSI in the right-of-way. Additionally, the chapter discusses the reasons inducing a San Francisco agency to collaborate or not with other agencies, as well as the impact this has on project completeness.
The fifth chapter summarizes the results of the analysis stressing the ties between obstacles to collaboration and completeness and the compartmentalized structure of city governments. In doing so it highlights the importance of considering the agency perspective. Finally, the chapter offers suggestions about how to maximize the number of complete projects in general, and of complete street projects that add GSI in particular. In doing so, the chapter outlines short-term measures that could be taken within the existing system of city agencies, as well as long-term measures that would require changes in the structure of the system.

2 COMPLETE STREETS, GSI AND CITY AGENCY ARENA
SAN FRANCISCO

This chapter outlines how San Francisco, a city that takes pride on its urban environment, has embraced the Complete Streets idea through both policies and street improvement projects.

The chapter starts with an introduction to the different city agencies with jurisdiction on the right-of-way, and tells the story of how the city policies with respect to streets evolved over time. In doing so it highlights the Better Streets Plan as a milestone in the city’s acceptance of the Complete Street concept. Throughout this account, the chapter refers to how concrete street improvement projects were related to policies.

The chapter also identifies the moment in which GSI was promoted to components of the right-of-way. In doing so, it also presents the effort made by the San Francisco Public Utilities Commission to introduce GSI in the right-of-way, as well as the concrete street improvement projects planned.

The chapter concludes by claiming that in San Francisco GSI could beneficially be integrated into the Complete Streets framework as a means to scale GSI programs in a sustainable fashion.

2.1 INTRODUCING THE ARENA OF CITY AGENCIES CONCERNED WITH THE RIGHT-OF-WAY

In order to grasp the challenges related to implementing street projects, it is important to understand the perspective of the different agencies with responsibilities over the right-of-way.
Introducing city agencies it is crucial to recognize their respective goals, scope and power.

In San Francisco streets are regulated by a multitude of city agencies, each of which focuses on a different matter that in turn corresponds to a specific area of the right-of-way. As shown in figure 2 this division in city agencies is particularly crucial when trying to achieve a Complete Street project where multiple agencies are responsible for a specific component.

Four agencies appear to be particularly important: the Department of Public Works (DPW), the Municipal Transportation Agency (MTA), the Public Utilities Commission (PUC) and the Planning Department (PLN).

The Department of Public Works (DPW) is the owner of the right-of-way, and it is arguably the agency with most tasks. These tasks can be grouped in three subsets: the first one is to maintain and clean, and it ranges from street resurfacing to sweeping; the second one is to improve and to green, and it includes increasing sidewalk accessibility, placing street furniture, planting new trees (the aforementioned Great Streets Program falls within this category); the
third one is to design and build the right-of-way, and it consists in developing design engineering¹ for all city-led projects in the right-of-way, as well as estimating costs, bidding, and awarding contracts.

In terms of the first task —maintenance— DPW, as the owner of the right-of-way, tends to have a conservative approach with respect to street design. In particular, DPW is not inclined to experiment with street design when this cannot be easily maintained or cleaned.

In terms of the second task —improving— DPW regularly plans for and delivers streetscape improvements under the Great Streets Program and the like. Using landscape architecture as a framework, DPW delivers streetscape projects combining aesthetic and functional improvements through projects that, even in their more basic versions, try to pursue design unity.

The second agency interested in the right-of-way is the Municipal Transportation Agency (MTA). This agency is in charge of planning, designing, building and operating the city’s transportation network. While MTA looks at both the roadway and the pedestrian environment, the bulk of the improvements delivered by this agencies are, because of its focus, functional. These could go from buffering a bike lane, to adding a bulb-out to accommodate a bus stop, to redesign an intersections in order to increase safety. In other words, MTA operates primarily within the realm of traffic engineering.

MTA is also the entity that, whenever a change of the right-of-way is proposed, and when such change entails an alteration in terms of transportation, has to authorize the modification. This function applies any change, whether they come from MTA itself or from another agency, and go modification as small as removing one parking spot, to radical changes like removing one lane.

A third agency dealing with the right-of-way is the Public Utilities Commission (PUC). This agency provides drinking water and wastewater services throughout the city, and it also operates half of the city’s street lights². Informed by the utilitarian philosophy, this agency is committed to provide its customers with efficient and reliable service.

This agency started to be concerned with streetscape improvement projects as a way to install GSI facilities in the right-of-way and thereby reducing the burden on the city’s combined sewer system. Until a decade ago, participation of this agency in streetscapes was limited to assessing conflict between aboveground streetscape and underground utilities, just like SMTA does for traffic. Given its only recent involvement in above-ground projects, the number of streetscape projects delivered by PUC is limited.

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¹ In San Francisco design engineering refers to the process of taking a conceptual design (the first 25% of design) and developing a detailed design proposal (remaining 75% of design), which will guide construction. While conceptual design can be undertaken by any city agency, except few cases design engineering is always conducted by DPW

² Additionally the Public Utilities Commission provides wholesale water to three other counties and it delivers hydroelectric and solar power to all city agencies
When it comes to priorities, PUC’s focus is on the performance of the GSI facility installed in the right-of-way. As a matter of fact, GSI facilities are considered part of the improved sewer system, and are therefore part of PUC’s asset. As such, this agency is also responsible for maintenance, as a well-maintained facility will likely have higher performances. Since the budget to build GSI comes directly from water bills, PUC’s concern is to maximize GSI performance in order to employ users’ money efficiently.

The fourth agency interested in streets is the Planning Department (PLN). While, the main task of this agency is to update the General Plans and to enforce the planning code, this agency is also involved in certain street improvements, for which the agency curates the conceptual design (first 25% of design) and community outreach. Moreover, this agency occasionally collaborate with other agencies to secure funds for a specific project, for instance by co-writing grants. Often, the involvement of PLN in a street or other public realm improvement project, stems from an established relationship with the local community, or alternatively, from a need that the agency identifies.

Another way in which PLN can get involved in street improvements is when the agency has to program development impact fees. In this case PLN works with other agencies to identify improvements paid for through impact fees, including public realm and street improvement projects.

In terms of the approach to street improvements, this agency brings to the table the urban design perspective, thereby focusing on public space and community needs. In this respect, the expertise offered by PLN resembles DPW’s landscape architecture group. However, while DPW has to keep a conservative approach due to its concern with maintenance and safety, PLN is freer to advance innovative proposals for the design of the right-of-way.

While all of all these agencies deliver street improvement projects, and while there might be some overlaps in terms of terms of scope, these agencies tend to look at the right-of-way with different perspectives: in particular, DPW operates within the landscape architecture realm, thereby looking at projects holistically, but it is also conservative due its concern with maintenance; MTA focuses on improvements that increase efficiency in terms of movement across the road network; PUC is also concerned with network efficiency, but its network includes power, the grey infrastructure and green infrastructure; finally, like DPW, PLN looks at streets through the lenses of urban design and landscape architecture; moreover, although its involvement is limited to certain projects, this agency has more freedom to introduce innovative solutions for the design of the right-of-way.

In San Francisco, a street project always has a leading agency. This is the agency that is responsible for the bulk of the project and usually the one that initiates it. As such, leading agencies bear most of the project costs, including environmental review, surveying, estimating costs, bidding and other soft costs. Moreover, while when an agency works on a projects on its own it becomes automatically the leader, when more agencies are involved they also need to clarify which of them will lead the project. In few words, being the leading agency entails one hand a great deal of burden
and on the other hand a certain degree of control over the project. The distinction between leading and non-leading agencies is particularly important when considering the way in which agencies make choices to collaborate or not. For instance, an agency planning a major improvement on a street would arguably have the budget to lead the project, whereas an agency only interested in a minor improvement would prefer to participate without leading the entire project.

The way in which the city of San Francisco has embraced both the Complete Streets and the Green Streets Concept has to do with the action of these four agencies, as well as with their role in developing street policies and delivering concrete projects.

2.2 FIRST POLICIES AND IMPROVEMENTS ON SAN FRANCISCO STREETS

San Francisco is one of the US cities that has safeguarded its streets and urban environment since the seventies (fig. 3). As early as 1971 San Francisco had an Urban Design Plan, the first in a US city, that insured architectural quality of both buildings and public spaces (Hu, 2012). In 1985 the city adopted the Downtown Plan, and ten years later the Downtown Streetscape Plan, which included street design specifications stressing visual aesthetics and sensuous comfort considered from the pedestrian perspective. These plans, however, focused only on the downtown area and more importantly, few street improvements were actually delivered (Livable City, 2015).

The quality of street realm has long been central also in the city’s transportation policy. In 1973, the city adopted the progressive Transit First Policy, which promoted the use of public right-of-way by pedestrians, bicyclists and transit users. However, although some of the subsequent strategic planning decisions were in line with the idea of promoting transit, in terms of physical improvement of city’s streets the impact of the Transit First Policy was not substantial (Bialick, 2013a).

Actual city-led street improvements projects started to gain ground in the nineties and consisted mainly of road diets, i.e. reconfigurations of the roadway that reduced the space for

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3 For example the decision, throughout the eighties and the nineties, to on one hand sustain downtown job growth, and on the other hand to restrict new parking in order to encourage transit usage (SPUR, 1999). As a result, during those years pedestrians literally gained ground within the city’s right-of-way, regardless of whether or not physical improvements of the right-of-way would be delivered.
cars to allocate more space to other users, such as bicyclists and pedestrians. Road diet projects were implemented under the leadership of the former Department of Parking and Traffic (now Metropolitan Transportation Agency). In terms of number, as of 2010 about forty road-diet projects had been delivered (Roth, 2010). A milestone road diet was, for instance, the 1999 road diet on Valencia Street, which reduced the number of lanes from four to two in order to accommodate bike lanes and more space for pedestrians.

While road diets introduced radical changes in the apportionment of the right-of-way, these project were very much transportation driven, and didn’t necessarily deliver improvement in the aesthetics of the pedestrian realm.

A few years later, streetscape improvement projects, more focused on combining pedestrian experience, safety and aesthetics, started to gradually gain ground. In particular, large batches of streetscape improvement projects started to proliferate with the creation, in 2005, of the Great Streets Program, which has been running until now and is led by the San Francisco Department of Public Works (DPW). At the time of writing, streetscape projects under the Great Streets Program have reshaped the right-of-way of twenty-three San Francisco streets.

Streetscape projects under the Great Streets Program focused mainly on pedestrian realm, but at the same were addressed multiple issues at once, and where therefore more in line with contemporary reformulation of the Complete Street concept. For example a baseline project under this program would remodel the pedestrian realm to integrate aesthetic improvements, such as repaving and tree planting, with minor transportation improvements such as limited curb-side
extension that accommodated more space for bus stops.

Streetscape projects under the Great Streets Program were not road diets, and as such they did not introduce radical changes in the roadway. Nevertheless, in some instances streetscape improvements ended up incorporating a previously planned road diet, thereby delivering both types of improvements, road diet and streetscape, within a bigger project.

In any case, a baseline Great Streets project was already broad in scope, and therefore it required some level of collaboration among city agencies in order to consider the different interests at stake. An exemplary project delivered through the Great Street Program was the ambitious streetscape project on Divisadero Street, whose planning started in 2007. Here different city agencies collaborated together on a comprehensive project that moved from transportation and economic development issues, and that delivered improvements in terms of traffic and transit on the one hand, and aesthetics and comfort on the other. Like in Divisadero Street, most projects under the great street program, even if less ambitious, tried to address multiple issues at once and instigate collaboration among agencies, especially DPW and MTA, with respect to the pedestrian realm.

Another project under the Great Streets Program was the streetscape project built on Valencia Street from 2008 and 2010 on the same stretch where ten years earlier the city had reconfigured the roadway through a road diet. This project delivered additional traffic improvements and at the same time it ameliorated pedestrian environment in terms of aesthetics and comfort. A comparison of the road diet and the streetscape project helps to clarify the difference between these two approaches: the early one introduces a radical reconfiguration of the right-of-way but was very transportation focused; the second one combined improvement in terms of comfort and aesthetics with minor transportation upgrades, thereby pursuing a more complete outcome. Indeed, the latter built on the success of the former (Sallaberry, 2014), and the street would be very different had only the streetscape been implemented.

Concurrently with the start of the Great Streets Program, San Francisco also began to experiment with GSI facility in the right-of-way. In particular, between 2006 and 2008 the city started planning three streetscapes based on the Complete Streets model and including GSI. The first project to include GSI was Leland Avenue, whose planning started in 2005, followed by the projects on Newcomb Avenue and Cesar Chavez Street. Although water management was a responsibility of the Public Utilities Commission, these projects were not part of a PUC program, though this agency was involved.

The process by which GSI was incorporated differed from project to project, as Leland and Cesar Chavez were based on adding GSI into ongoing street improvement projects, whereas Newcomb had GSI as the main driver. Moreover, sources for Leland and Chavez included funding from (but not limited to) the Great Street Program, whereas Newcomb didn’t. Despite their differences, however, all three projects aimed at delivering a Complete Street and incorporating GSI in the right-of-way.
In sum, in terms of built improvement projects of the right-of-way, San Francisco's first attempts included road diet projects and streetscape projects. Three of the latter, Leland, Newcomb and Cesar Chavez, also included GSI. All these streetscape improvements represented willful attempts to implement the Complete Streets concept in San Francisco, thereby responding to movements that had been advocating for it, from the Complete Streets movement, to the Shared Streets, Livable Streets, Context-Sensitive and Green Street Movement.

2.3 TYING IT ALL TOGETHER: THE BETTER STREETS POLICY AND PLAN

At the same time of the delivery of the first batch of projects under the Great Streets Program, San Francisco took also crucial steps toward a city-wide adoption of the Complete Streets concept, which culminated with the adoption of the Better Streets Policy (2006) and the Better Streets Plan (2010).

Orchestrating the different interests associated with the right-of-way, and tying together
existing city policies, the Better Streets Policy established the varied roles that San Francisco's streets should play, from accommodating all transportation modes to providing attractive space for public life and well-being, from organizing the city's development pattern, to supplying corridors for urban wildlife.

While linking all of these aspects, the Better Streets Policy also included sustainable water management as one of roles San Francisco streets should play. In linking for the first time the city's street policy to water management, the Better Streets Policy endorsed those projects that had experimented with GSI, opening the way for the incorporation of GSI across the city.

It should be noted that in tying together all of these different components within a comprehensive vision this policy reflected the current tendency to expand the Complete Streets concept in order to address issues beyond transportation.

The Better Street Policy also established that, since the different roles played by streets corresponded to different city agencies, in order to deliver Complete Streets all San Francisco agencies should “coordinate their various determinations regarding the planning, design, and use of public rights-of-way” (City and County of San Francisco, 2010b).

In furtherance of the Better Streets Policy, the city adopted in 2010 the Better Streets Plan, which provided a comprehensive array of design guidelines for the pedestrian realm aimed at achieving Complete Streets.

The plan categorized all the city's streets through into fifteen street types, specified which improvements were recommended for each type and offered a visual representation of how multiple improvements could come together in each case. Improvements, which are divided into standard and case-by-case improvements, go from traffic calming (e.g. marked crosswalks), to aesthetics (e.g. special pavement) and pedestrian comfort (e.g. furnishing). Moreover, as shown in Figure 4, some of the standard improvements, including tree planting, stormwater management and curbside extension apply to almost all street types, thereby setting heightened design requirements for streets improvement in general.

Although the Better Streets Plan did not focus on roadway and vehicle travel characteristics, as the plan was mainly concerned with pedestrian environment, its design guidelines did regard the roadway, as the definition of pedestrian realm advanced in the plan explicitly included components of the roadway where vehicular traffic has to compromise with other users, such as in intersection, parking lanes, and alleys.

In setting an ideal spatial outcome to pursue when undergoing street improvement, and in

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4 The Better Streets Policy stresses the need to integrate some of the greatest, though sectorial, city policies including the Urban Design Element of the City's General Plan and the Transit-First Policy.
Figure 5 Shift in interagency collaboration if the Better Streets Plan was implemented to the greatest extent possible, providing a visualization of how to do so, the BSP meets McCann and Seskin’s suggested action to provide design guidance in support of the implementation of Complete Streets.

Moreover, the process that led to the adoption of the Better Streets Plan was very synergistic and it included the involvement of eight city agencies under the guidance of the Planning Department. Collaboration also included a massive community outreach effort, the result of which are also included in the plan document. Agency collaboration in drawing this plan was also based on the fact that the same agency members who had worked on streetscape projects were the ones collaborating on the Better Streets Plan. These people were eagerly supporting Complete Streets as the desirable outcome, and agency collaboration as the necessary means to achieve that outcome.

Lessons from the streetscape improvement projects delivered before 2010 played a crucial role in the shaping the Better Streets Plan. In this respect those first streetscape improvement projects served as both a showcase for the Complete Streets concept and an experiment from which guidelines could be distilled. For instance, the streetscape on Leland Avenue, which had been built in those same years, and which was one of the Complete Street projects that had also installed GSI, was included in the Better Streets Plan as a model for how the plan’s design guidelines could be
Figure 6 Number of streetscape improvement projects per year. Department of Public Works.
applied.

However, in terms of “changing the way decisions are made”, to keep using McCann and Seskin’s categories, the BSP was not particularly assertive. The plan indicated that decisions with respect to street projects should be made collaboratively, but did not establish an implementation mechanism for agencies to collaborate on Complete Streets projects. For example, the plan that streetscape projects be “combined whenever possible to provide “completeness” in streetscape design” (City and County of San Francisco, 2010, p. iii). Further, it recommended that the city should “look for opportunities to combine and create synergies among capital street improvement projects, for instance by matching curb ramp funds with curb extension projects, merging traffic calming, greening, and stormwater projects” (p.248). Nevertheless it did not specify the incentives agencies would receive in exchange for combining their capital improvement programs.

If, as suggested by the plan, such combination should be pursued whenever possible, then the hope would be to increase the number of collaborative projects delivered over the years. Figure 5 visualizes the shift that would occur if the BSP were implemented to greatest extent possible. To be sure, in such scenario not all projects would be synergistic, since depending on the improvement there might be no opportunities to combine it with other projects. Instead, an ideal scenario would be one in which all rational opportunities for collaboration are seized. Accordingly, most projects would belong to more than one programs, with different intensities of synergy depending upon the specific situation.

However, since the BSP is not legally binding, and since city agencies in San Francisco are hierarchically at the same level, currently collaboration is still at the discretion of city agencies. Given the discretionary nature of this decision, the objective of maximizing synergies is even more challenging, as it would entail inducing agencies to choose to collaborate as many time as possible.

A more effective approach was offered by another document, the Recommendations from the Office of the Controller on the Better Streets Plan, which were developed concurrently with the plan to suggest possible tools for its implementation though were ultimately not followed (City and County of San Francisco, 2010a). This document proposed to innovate the process that led to street improvement projects by creating two interagency groups working specifically on streets. These would work respectively on funding Complete Streets projects (Advanced Planning for Streetscape Capital group), and assuring the completeness of planned street improvements (Streetscape Design Review Team). The rationale behind this proposal was twofold: on the one hand, it tried to overcome the fragmentation of responsibilities between agencies by creating interagency teams focusing on streets; on the other hand, it aimed at specializing the teams’ focus in order to have experts in both budget planning and street design. Unfortunately, the groups recommended by the Office of the Controller were never officially formed, though the devising of these entities represented an attempt to foster the implementation of the Better Street Plan.
Although the BSP didn’t establish a specific mechanism for city agencies to collaborate on Complete Streets projects, because of its visionary impetus, its citywide nature, and most importantly the collaborative fashion in which it was developed, the Better Streets Plan represented an important passage in the acceptance of the Complete Streets model.

After the adoption of the Better Streets Plan, the city kept delivering street improvements addressing transportation, streetscape, water management and combinations thereof. The Great Street Program lead by the DPW continued to deliver a large number of streetscape improvement projects. From 2010 to 2015 there has been a net increase in the number of streetscape projects planned by DPW every year as shown in Figure 6. At the time of writing, the Department of Public Works has thirty-three ongoing or planned streetscapes projects.

In terms of quality, streetscape projects led by DPW planned after the Better Street Plans confirmed the trend toward more complete and more collaborative projects. As an example, the streetscape project on Potrero Avenue (planning started in 2012), where a number of agencies led by DPW developed a streetscape proposal that upgraded the pedestrian realm functionally and aesthetically, increased safety on existing bike lanes, and maximized transit reliability.

SFMTA also continued to lead street improvements, from bike lanes, to traffic calming and other traffic-related enhancements. In 2010, MTA also created the Livable Streets subdivision, a new entity encompassing traffic calming, bicycle and pedestrian programs. Named after Appleyard’s seminal book, the creation of this subdivision represented an effort, within MTA, to consider streets beyond movement.

Relatedly, MTA also started to work on some streetscape projects. Streetscape projects led by MTA moved from transportation but seized the opportunity offered by street redesign to also deliver other types of improvements, from trees to sidewalk repaving, lightings etc. MTA-led streetscapes projects often involved other agencies, which focused on the non-transportation piece of the improvement. As example, the proposed streetscape on Masonic Avenue led by MTA in collaboration with the Planning Department, started as a road diet that remodeled the street to accommodate a new bike lane, and it ended up adding new public space and massive greening.

In conclusion, after the adoption of the Better Streets Plan, the city kept delivering street improvements projects. In particular DPW-led projects experienced a net increase. Moreover, MTA created an internal subdivision to address street management beyond movement, and it also started to engage in a few streetscape projects.
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Figure 7 GSI technology per street type

2.4 GSI IN SAN FRANCISCO'S RIGHT-OF-WAY AND POTENTIAL SYNERGIES WITH THE COMPLETE STREETS CONCEPT

While San Francisco had already started to experiment with GSI since before the BSP, having included sustainable water management as one of the roles of the streets, San Francisco continued to fuel these efforts. In terms of how to combine GSI with other streets elements, the greatest contribution came from the BSP, which dedicated a specific section to GSI. As shown in Fig 7 the plan included a chapter that indicates which GSI facility is most suitable to each street type, and where in the right-of-way GSI can best be placed. The plan also provided a description of different GSI solutions, including bio-retention facilities, permeable pavement, swales, vegetated
gutters and infiltration trenches.

In terms of project planning, however, the greatest effort was the one of PUC, which planned a number of GSI street projects as part of its Sewer System Improvement Program (SSIP). The SSIP was approved in 2012 this agency approved SSIP to address issues in terms of aging infrastructure (San Francisco’s sewer system is the oldest on the West Coast) and combined sewer overflows (occasional overflows result in non-treated water being discharged into the ocean).

As part of its SSIP, PUC chose to integrate grey and green stormwater infrastructure (GSI) to upgrade the city’s collection system.

The GSI part of the program entailed planning eight street projects, one for each of the eight San Francisco watersheds, which are referred to as Early Implementation Projects (EIPs). EIPs have the goal of gaining local experience with designing, building and managing GSI as well as assessing performances of different technologies in specific sites across San Francisco. Once the all EIPs are complete, PUC plans to scale up to have a citywide program to deliver GSI street improvements.

For the first phase of the SSIP, the budget allocated to these GSI street projects was 64 million dollars, accounting for 15% of the investment in the water collection system, and 2% of the entire SSIP. In the second phase and third phase of the program, PUC plans to increase the investment by 147% as GSI street projects will be implemented city wide.

For PUC, planning these GSI street projects was motivated by a number of reason. The first motivation was that installing GSI represented a way for the city of San Francisco to gain the National Pollutant Discharge Elimination System (NPDES) permit. Under the NPDES permit, which is usually granted by state authorities, communities are required to implement nine minimum controls to mitigate combined sewer overflow, one of which is GSI. The second reason was that implementing GSI could reasonably reduce energy usage (for example in terms of combined sewer discharge structures), as well as capital costs and operations and maintenance costs for managing wet weather flows and pollutant loadings.

While implementing its eight EIP projects, PUC is also working for to create a framework that could guide implementation of GSI citywide. To do that, this agency conducted a comprehensive suitability analysis, the Urban Watershed Assessment (UWA) to prioritize street segments were GSI would be most effective. In particular, the UWA started by selecting those segment where at least 60% of the drainage management area (DMA) was feasible to aby GSI and then identifying the GSI technologies or combinations thereof that maximized infiltration in each specific site. Further, the assessment prioritized segments where GSI projects could be most beneficial to local communities as well as those where synergies with other agencies could be pursued. The output of this analysis was a list of the 50 potential segments where GSI would be most suitable, feasible, and combinable with other improvements in the spirit of the Complete Streets movement.
Figure 8: Number of projects in the right-of-way per street stretch
Given its acceptance for the Complete Streets concept and its commitment to deliver GSI in the right-of-way, San Francisco represents an excellent stage for implementing GSI within a Complete Streets framework.

The city adopted a citywide vision, the BSP, which adopted the Complete Streets model and encouraged interagency collaboration as the main means for implementation. Moreover, the Complete Streets idea seems to have gained some momentum across those agencies that drew the BSP. As mentioned above, the number of streetscape projects also grew accordingly, with thirty-three planned or ongoing street projects led by DPW, several others street improvements led by MTA, and multiple projects where these agencies already collaborate with each other.

Given that PUC is currently implementing eight GSI street projects and that it identified fifty ideal sites for future projects, the framework for scaling up the program is already in place. More importantly, through the SSIP, PUC set aside an important budget in support of GSI for the following thirty years.

Moreover, implementing Complete Streets projects by consolidating different agencies’ programs as advocated by the BSP, if pursued, could be a means to deliver improvements throughout the city in a cost effective way. Figure 8 shows the extent to which projects from different city agencies overlap spatially, showing clearly how in the course of eight years (2012-2020), most streets are interested by multiple projects.

In this scenario, PUC could scale its program by seizing the high number of opportunities to fit GSI within Complete Street projects where it would not play the role of the leading agency. In this scheme, PUC could entirely avoid certain costs while share others, thereby making the scaling up of its GSI program financially more sustainable. This approach could also be a means to anticipate the increasingly stringent regulatory requirements to mitigate combined sewer overflow.

Indeed interagency collaboration in a Complete Street Project can also make implementation problematic and for this reason agencies might choose to conduct projects independently. As illustrated in section 1.3, from an agency standpoint collaboration might result in delays, rivalry and also higher expenses. Other reasons for an agency not to collaborate could include different prioritization criteria or lack of budget. Moreover, as GSI is a still relatively new technology, agencies that are not familiar with it might not be well prepared to incorporate it into an interagency project.

As such, in the case of San Francisco the aforementioned opportunities of conjugating GSI and Complete Streets might conflict with the way in which agencies choose to implement their projects. Accordingly, a crucial question remains: are San Francisco agencies choosing to collaborate with one another in Complete Street projects that include GSI? And further, what are the barriers
to integrating GSI implementation into the Complete Streets framework? These are the questions addressed in the next chapters.

3 FOCUSING ON STREETSCAPE PROJECTS WITH GSI

This chapter considers the relationship between BSP, agency collaboration, and project completeness of streetscape projects containing GSI, an element that was steadily advocated for in BSP. The chapter starts by summarizing the array of GSI streetscapes delivered over the years and by acknowledging an increase in number of projects. The chapter then proposes to go beyond increase in projects and poses questions regarding agency collaboration and project completeness as well as a method to measures them and their mutual relationship.

3.1 STREETSCAPE WITH GSI BEFORE AND AFTER THE BETTER STREETS PLAN

Before 2010, the city had only built three streetscape projects that included GSI. Such projects had piloted the process of agency acceptance toward GSI, which had culminated in the Better Streets Policy acknowledging sustainable water management as one of the roles of streets. Accordingly, the BSP had provided the design guidelines to base the incorporation of GSI facility in the right of way. Subsequently, PUC had started to plan its batch of eight early implementation projects (EIPs) mentioned in the previous chapter.

In the five years prior to BSP, the planned GSI streetscapes per year was 0.6, whereas after it was 1.6, almost three times more (fig 9). Specifically for GSI, this net increase can be partially attributed to the impact of BSP. While other design tactics like curb extension had been part of the city’s design palette for a long time, GSI was introduced for the first time through the BSP.
The increase in streetscape improvements with GSI also mirrors an increase in streetscape improvement projects without GSI. Fig 10 shows how both categories experienced a net increase in the five years following the BSP.

Moreover this increase mirrors the diffusion of GSI in other US cities, like Portland, Philadelphia, and Seattle and is arguably related to the increased attention paid to water and other environment issues (City of Portland, 2007; Philadelphia Water Department, 2011; Seattle Public Utilities, 2013).
Figure 10 Streetscape Projects with and without GSI
3.2 MEASURING THE DEGREE TO WHICH GSI PROJECTS FIT WITHIN THE COMPLETE STREETS FRAMEWORK

Given that there was a net increase in the number of streetscape projects that included GSI, that this plan strongly advocates for the seizing of as many opportunities for agency collaboration as possible as a means to achieve Complete Streets, and that there is a large potential to include GSI into Complete Streets projects, the following question is due: to what degree do implemented GSI projects fit in the Complete Streets framework? This research addresses this inquiry by answering, in the case of streetscapes with GSI, the following sub questions:

- whether or not opportunities for collaboration were seized
- whether or not street completeness was reached
- what barriers had to be overcome
- what barriers remain today
- how barriers are related to the decision to collaborate or not
- what strategies could be adopted to address existing barriers

3.3 METHOD

3.3.1 SAMPLE

This research analyzed a total six streetscape improvement projects that included GSI. In doing it developed measures of process and project quality and looked for possible associations. The sample is composed by a first group of projects including the three only projects planned before 2010, the year in which the Better Streets Plan was adopted, and a second group including three of the eight projects planned after 2010.

While the first three projects had very different onsets, the second threes are all part of PUC's Early Implementation Projects (EIP), as all Green Streets projects after 2010 fall under at least the EIP program (sometimes also under other programs). The three projects are Leland Avenue, Newcomb Avenue and Cesar Chavez Street. The second threes are the Wiggle
Figure 11. The 6 GSI projects analyzed (underline) and the other GSI in San Francisco.
Neighborhood Green Corridor, Holloway Avenue and Sunset Boulevard. Fig 11 show the location of the analyzed street projects as well as the other street projects that installed GSI.

Each of the triplets analyzed includes one major residential thoroughfare, one neighborhood street with residential and commercial uses, and one neighborhood residential street. Having counterparts across triplets is meant make street types comparable in terms of potential for improvement.

In order to analyze what happened, or didn’t happen, in terms of collaboration and project completeness, this research employed a set of variables, which were measured in each of the six projects. Beyond measuring collaboration and completeness, this research addressed the reasons behind success or failure in terms of collaboration and completeness, by both contrasting the six analyzed projects, and gathering additional information about existing barriers to agency collaboration and project completeness. Following is a description of the variables employed and of the way in which variables were measured and additional information was gather.

3.3.2 ASSESSED VARIABLES

The variables assessed for each project include measures of both process and project quality. The variables are the following ones:

PROCESS QUALITY

- paying agencies (PAYING.AGENCIES): this variable identifies whether the project seized opportunities for consolidating programs of different agencies. To do that, it identifies the number of agencies had a significant financial involvement in either the planning or the construction of a project. In the case of construction, paying agencies are the ones that literally pay for engineering and building the project or part of it. In the case of involvement in the planning, the paying agency is the one that disburse money for conceptual design and or community outreach. Considering involvement in both planning and construction allows to account for the contribution of the Planning Department (PLN) which, although it doesn’t implement projects, is often involved in street improvement projects. Identifying

Figure 7 Overlapping works per street stretch
which and how many agencies were financially involved in the project is meant to highlight the number of entities exerting control over planning and design which, in case of multiple entities, could have resulted in delays or other problems. Minor involvements that didn't result in geometrical modification of the right-of-way (for instance signage) were purposely excluded, as contribution to project was small and so was control over project planning and design. Similarly, other types of soft involvement, such as compliance review, were purposely excluded from this variable, since they are deemed routine.

- onset (PLN.START): the date on which planning started. To identify project onset, this research referred to documents in which the streetscape improvement project had just been agreed upon. This date usually precedes community outreach by a few months. More general plans, such as neighborhood plans that are only mentioning the idea of a streetscape improvement, were not considered as the project onset.

- planning time (PLN.TIME): this variable measures the time between start of planning and start of construction. On the one hand, measuring planning time in this way prevents delays during constructions from affecting the measurement of planning quality; on the other hand, the entire interval between start of planning and start of construction is treated as planning time, even if the planning duration reported in official documents was shorter.

- agency agreement over GSI (AGENCY.AGREEMENT): this variable measures the degree to which city agencies agreed upon design and maintenance over green stormwater infrastructure. Expressed as an ordinal variable (low, medium, high), GSI AGREEMENT was measured qualitatively by reading reports and conducting interviews about the planning process. Details about controversies are included within the account of each project.

- community acceptance (COMMUNITY.ACCEPT): this ordinal variable (low, medium, high) measures the degree to which residents have opposed a streetscape project, and is based on both interviews and review of reports. As for the previous variable, details regarding controversies are included within the account of each project.

PROJECT QUALITY
Collaboration

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<tr>
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<td>• original scope</td>
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<tr>
<td>• final scope</td>
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Completeness

<table>
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<td>ordinal (score)</td>
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<tr>
<td>• design richness</td>
<td>ordinal (score)</td>
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GSI Specific

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<tr>
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Others

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<tr>
<td>• start of construction</td>
<td>numerical (date)</td>
</tr>
<tr>
<td>• start planning to start construction</td>
<td>numerical (days)</td>
</tr>
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<td>• context</td>
<td>categorical</td>
</tr>
<tr>
<td>• length</td>
<td>numerical (yards)</td>
</tr>
<tr>
<td>• community acceptance</td>
<td>numerical (date)</td>
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</table>

Figure 12 Variables Assessed
• design richness (RICHNESS): this variable is meant to express the degree of completeness of a streetscape project. As such it literally counts the number of design features included in a project and it groups them under three main categories: aesthetics and pedestrian comfort, transportation and traffic calming, and green stormwater infrastructure. These three categories of aesthetics and pedestrian comfort, transportation and traffic calming, and green stormwater infrastructure, roughly correspond to city agencies. The first category corresponds to DPW and PLN, the second to MTA, and the third to PUC. Accordingly each project has a different degree of design completeness that is resulting from the number and combination of involved agencies. However, since each projects offers specific design opportunities, comparing projects in terms of design richness makes more sense when contrasting projects with similar street type and context, implemented before and after the BSP.

• design unity (UNITY): this variable is meant to measure the degree to which the design elements, regardless of their amount, are integrated with one another, thereby delivering a unified streetscape, as advocated by both the BSP and the Complete Streets movement. As an example, projects scoring well in design unity would have continuous sequences of trees, paving material or other design elements. As explained in the next chapters, this research postulates that this measure is associated with particular combination of involved agencies, not just with their amount.

OTHERS

• Street type (TYPE): this categorical variable indicates whether the street was a major thoroughfare or a neighborhood street

• context (CONTEXT): this categorical variable expresses the land use along the street
3.3.3 DATA COLLECTION

This research drew from different information sources, each of which was helpful to highlight specific issues.

In person interviews to 13 city staff members from DPW, PLN, MTA and PUC, were conducted during January 2016. Some of the city employees interviewed had worked directly on the six projects considered in this analysis. As such, their insights served to determine measures of the process quality, for example in terms of controversies over specific issues, agency reaction to GSI and community acceptance of streetscape projects. More generally, interviews served to trace the history of each project, from its onset to delivery.

Furthermore knowledge from interviewees, regardless of whether they had worked on sample projects, was useful to identify the motivations behind the involvement (or not) of a city agency in a street improvement project. While measuring the degree of involvement of city agencies within a project can be done by reading reports, interviews yielded information about why a project was not collaborative, which could have not been gathered otherwise.

The review of reports regarding the six streetscapes was conducted to ascertain project start dates and determine duration of the planning phase. Moreover, reports served to understand the ways in which agencies handled collaboration in terms of clarifying responsibilities, as well as the to identify project goals. Furthermore, reports were crucial to assess design quality, particularly in terms of richness. Finally, site inspections, which were conducted in January 2016, provided direct experience of project quality and were particularly useful to assess design unity and context.

4 ANALYSIS

This chapter considers in depth the planning process and the design outcome of the sample of projects identified in the previous chapter. Project histories are presented in chronological order highlighting information about project onset, planning duration, agencies involved and major issues encountered.

The second part of the chapter presents a comparative table where each project is evaluated based on the variables introduced in the previous chapter. Based on this comparison, the chapter presents some conclusions remaining barriers to collaboration and completeness in
4.1 PROJECTS HISTORIES

4.1.1 LELAND

Leland Avenue was the first city-led streetscape improvement project in San Francisco to incorporate GSI features. This avenue serves as the main commercial corridor of the Visitation Valley neighborhood. Accordingly, the main goal of this project was to deliver an attractive street environment in order to strengthen the district's identity and favor existing businesses. Additionally, the project aimed at improving pedestrian connections to transit and providing new vegetated facilities that would connect to the neighborhood's greenway. However, stormwater management was not an explicit goal of this project.

The official start of the planning process for this specific street segment was July 2005. The resources necessary to finance planning, design and construction of this project came from several resources, but the city agencies that channeled these resources were mainly PLN, DPW, and to a much smaller extent the SF Arts Commission. Given that construction started in August 2009, the planning phase lasted in total 1492 days.

It is worth going through the steps of this four-year-long process. Having gotten a grant from a private foundation, PLN was the leading agency for the planning phase, for which it hired a design

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5 On this date, PLN receive a first grant that came from the Haas Jr. Foundation to conduct the community process and develop a conceptual design. A neighborhood-wide planning process had already started under the Mayor’s Office for Workforce and Economic Development (MOWED), which in 2004 produced the “Bayshore/Leland Commercial District Revitalization” plan. However, because it mainly consisted of an economic analysis, it did not focus on street design, and it was done at the neighborhood scale, the MOEWD document should not be considered the start of the planning phase of the Leland streetscape improvement project.

6 The first resource was the grant from the Haas Jr. Foundation, followed by the bulk of the budget coming from the Transportation for Livable Communities (TLC) federal program and the Proposition K local transportation sales tax fund. Minor resources came from the SF Arts Commission, which added a public artwork at the street’s gateway.
firm to assist with the community process and produce a conceptual plan. This first plan proposed to improve the street’s cross section through traditional design features and also through GSI features even though stormwater management was not an explicit project goal. Proposed traditional design features included streetlights, new trees and plantings, corner bulb-outs at intersections, accessible curb ramps, crosswalk improvements, street and sidewalk paving, sidewalk furniture and a public art work, whereas proposed GSI features included permeable pavement in the parking lane and bio-retention planters within bulb-outs. According to this plan, workshop participants were the ones who encouraged the use of sustainable technologies for the street design.

In terms of urban design, the most relevant output was the proposal of a special public space treatment at two locations, the street’s gateway and the intersection with the greenway. Having defined the design concept, the project was then handed off to DPW for design engineering and construction.

Additional steps, however, had to be taken before design was completed and construction could start. Because of innovative character of the design solutions included in the preliminary design, PUC had to commission infiltration testing and hydraulic modeling to select the appropriate GSI features, determine their location within the site, and model their future performance. The knowledge gathered through this analysis was then transferred to the DPW design team, thereby informing its final spatial proposal.

Additionally, DPW had to go through an internal review cycle to authorize the use of permeable pavement in San Francisco, as this design solution, never adopted before in the public realm, posed questions in terms of accessibility, performance and maintenance. This internal legislative step yielded the issuance of DPW Director’s Order, which technically was approved after construction had started. Arguably, if the agencies had waited for this order to be issued, the planning and design process would have taken even longer. Indeed, the non-standard nature of this project, entailed some extra collaboration both inter- and intra-agency, which on one hand lengthened the overall process, and on the other hand yielded a better design.

An additional element adding to the project’s richness was the placement of a public artwork at one of the special intersections that had been identified in the preliminary phase. However, because submission and selection of design proposals by the appointed panel happened after construction had begun, this extra step did not delay the start of construction any further.

In terms of maintenance of the GSI component this project was problematic. In this project, PUC did not directly design the GSI facilities and these didn’t become part of its assets. As such, this agency also did not allocate any budget for maintenance or monitoring. In this respect, the degree of collaboration is therefore not particularly high. However, as suggested by Thong, while it seemed that city staff overlooked maintenance responsibilities, part of the problem is attributable to the fact that grants seem to focus only on design and construction expenses rather than on maintenance.
Because this was a new type of project, the city staff had to address new technical challenges including site suitability for GSI and GSI sizing. Purely by chance, Leland Avenue scored well in terms of site suitability to GSI. The soil testing commissioned by PUC ascertained that the groundwater was more than 8 feet below the ground level, and that infiltration rates ranged between 1 and 25 inch/hour (Thong, 2011). Moreover, the project site had almost no slope, neither was it a land fill. Retrospectively, all of these characteristics complied with the criteria employed in the 2012 Urban Watershed Assessment to identify good sites for GSI. In terms of GSI sizing, however, this project suffers from some design flaws. Bio-retention planters and permeable pavement together represents only 1.88% of the total drainage management area (DMA). This flaw was partially countered by existing pervious surface that was already on site, mainly private gardens and open space, covering about 30% of the DMA.

Although the Better Streets Plan was not adopted until after the completion of Leland Avenue, there is a strong relationship between the two, as the plan was developed while the project was being planned, designed and built. Retrospectively, we see how the street type under which Leland falls, namely........, is matched to same design solutions that adopted for this project.

4.1.2 NEWCOMB

The one-block streetscape improvement project on Newcomb Avenue was the second city-led effort to incorporate GSI in the right-of-way. Lying within the Bayview neighborhood, Newcomb Avenue is a residential street with single-family houses and a relatively low-income population. Unlike Leland, Newcomb Avenue was openly meant to be a Green Street project, whose main goal was to demonstrate the technical and institutional feasibility of Green Streets in San Francisco. Accordingly, GSI features had a more important role than in Leland. Beyond stormwater management, this project aimed to reduce traffic speed and change value of adjacent properties.

The planning process of the Newcomb Avenue project started in 2006 (City and County of San Francisco, 2014). The site had already drawn the attention of PUC for a while due to its proximity to a water treatment plant, and there had been discussion with the residents about some kind of environmental remediation in the area. However, the proposal of a streetscape improvement on Newcomb was not advanced until 2006, when PLN intercepted two grants from
the city to finance planning and design. At a later stage PLN received another grant from the US EPA specifically to support the adoption of GSI. Subsequently, the San Francisco Redevelopment Agency (SFRA) allocated most of the resources to finance construction, to which PUC added resources to build GSI. Given that construction started in May 2011, the planning and design time was in total 1946 days.

The first phase of this five-year-long process, namely the planning phase, was led by PLN as this agency had gathered the most of the funding. As in Leland, the concept design resulting from the planning phase combined non-GSI and GSI features. The non-GSI piece included new trees, traditional planters, raised crosswalks, bulb-outs and a chicane, whereas the GSI features were permeable pavement in the parking lane, and bio-retention planters in the bulb-outs.

As usual, for the design phase the project was handed off to DPW, but now this agency was actually hired by PLN, as that is where the budget came from. The control over the budget gave PLN a great deal of power (Andres), which the agency willfully used to promote GSI and a more integrated street design.

Despite this greater deal of control, however, in order for the concept design to be accepted, PLN had to overcome a number of barriers. The first one was a controversy over street sweeping, which in San Francisco is the responsibility of DPW. Following a strict interpretation of its mandate, this agency contended that the street could not have one single square inch of non-sweepable surface, although this would have impeded the construction of several bulb-outs. A second obstacle was a contention with the Fire Department over the crosswalk space between two bulb-bouts, which was considered too narrow for a truck to pass. Trying to beat resistance PLN “bullied through” by reaching out to the Greening Director, appointed by the Mayor to push greening projects throughout the city. The Director broke the impasse by dictating that parties solve only the most critical issues and discuss the minor ones after construction. Hadn’t it been for this high-level intervention, the project would have not been built (Andres).

In terms of design integration and richness, this project did a very good job. The project addressed stormwater management and traffic calming while delivering aesthetic improvements. Green elements include both GSI features and traditional landscaping. The latter fills the gaps between GSI thereby providing a sense of continuity and an overall green feel.

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7 From SF City Administrator's Office: Community Challenge Grants
8 From its tax increment fund
4.1.3 CESAR CHAVEZ

The streetscape improvement project on Cesar Chavez Street was the third city-led project to include GSI and, because of its 16-block extension, also the longest. A major car-oriented thoroughfare running through residential neighborhoods, Cesar Chavez used to strongly separate the Mission District from the Bernal Heights area. The objective of this project was therefore to deliver a design that would unite rather than divide neighborhoods. In doing so, the project aimed to improve the street’s safety, beauty and efficiency and, by adding GSI, to it to the rank of Green Street.

Given that planning started in May 2008 and that construction started in February 2013, the planning and design phase lasted in total 1737 days.

In terms of design concept, the Cesar Chavez was different and similar to the other projects. Different because it included a radical road-diet proposal to remove 2 of the six lanes. Similar because it included a cocktail GSI and non-GSI features. Non-GSI design features were a widened landscaped median, corner bulb-outs at intersections and mid-blocks, normal planters in the bulb-outs, new trees both at sidewalks and at median, sidewalk resurfacing, sidewalk furniture, crosswalk improvements, pedestrian refuges, bike lanes, street lights, and a new plaza integrated with a raised crosswalk. The GSI feature a number of bio-retention planters located in the bulb-outs in different ways throughout the site.

Despite its big size, this project did a very good job at delivering an integrated and rich project. The project addressed stormwater management and traffic calming while delivering major aesthetic improvements. Green elements include both GSI features and traditional landscaping. As in Newcomb, green features fill the gaps between scattered GSI pieces, and provide a sense of continuity and green feel. Given the length of this streetscape, the task of achieving continuity was much harder, and the non-GSI green features employed to convey continuity were much more powerful. The most important one was indeed the median, a continuous strip landscaped with palm trees, that had no stormwater purpose but tied together the streetscape running through its entire length. Similarly, a number of normal planters with shrubs and trees played a crucial role in compounding the green feel at intersections, where having bio-retention planters in the bulb-outs would have not been enough to qualify urban form.

4.1.4 WIGGLE

Taking its name from the area in which it is located, the Wiggle Neighborhood Green
Corridor is a streetscape improvement project that involves a sequence of street segments that, due to their lack of slope, have become a popular route for bikers moving from east to west San Francisco. In terms of context, the prevailing land use along the Wiggle route is residential, though some retail is present at block corners. The goal of this project was twofold: on one hand to institutionalize the corridor by improving biking and walking conditions; on the other hand to install GSI features and upgrade segments to Green Streets.

The planning process of this streetscape improvement project begun in September 2011. Given that start of construction is currently planned for October 2016, the total duration of the planning phase should be 1857 days.

There were two agencies that, drawing from multiple resources, paid for the construction cost of the Wiggle project: MTA and PUC.

The onset of this project was when in 2011 the MTA hosted the ThinkBike Workshop to develop recommendations to improve bike movement in this and other sites in San Francisco. Immediately after the workshop MTA painted signals on the asphalt to mark the popular bike route, and announced it would have done a streetscape improvement project to make the route safer and more enjoyable.

Coincidentally, PUC had also an interest in the site, which it had identified as an ideal locations for one of its “early implementation projects” (EIP), the PUC-funded program to build GSI in the right-of-way. After some discussion, the two departments decided to join forces, thereby carrying one single project that would include both GSI and traffic calming features, and that would be both an EIP project and a “sustainable street” project. In an informal fashion, the two agencies decided that MTA would have led the project, thereby being in charge to prepare the CEQA application. A part from this technical aspect, however, it was assumed that the two agencies would have been on the same hierarchical level.

The community process and concept design was thus led jointly by PLN and MTA. In the concept design that came out of this phase, the transportation piece included a better-marked bike route, corner bulb-outs, raised crosswalks, and a traffic diverter. The GSI piece consisted of bio-retention planters in the bulb-outs and permeable pavement in the parking lane. This project also lay within the Green Connections network, and it’s not a case that MTA was on board, since the bike component was very strong.

The funding to pay for construction were channeled by MTA and PUC. MTA got the money from the city’s Bond (note they actually came from DPW but they were transferred to MTA, which can therefore be deemed as the channeling agency). PUC’s budget, instead, came from the agency’s multi-year SSIP, which set aside budget for this and seven other GSI-based streetscape improvements.

In the Wiggle project, the design engineering of the GSI piece, was carried out by a
consultant and not by DPW. The 100% GSI design was then incorporated within DPW’s design for the whole site.

During the design phase, a specific section was included to the Project Charter to clarify how the two agencies, both paying for construction, would split costs. Corner bulb-outs are probably the most emblematic example: the ones serving only traffic calming purposes would be paid by MTA, whereas the ones containing GSI would be on PUC. An even higher degree of specification was achieved to figure out responsibilities in highly integrated design elements that addressed multiple interests at once. For a relatively complex intersection, for instance, the project charter specified that, with respect of the sidewalk, bulb-outs incorporating GSI would be paid by PUC, including curb ramps, whereas concrete bulb-outs would be on MTA. Similarly, in the roadway, permeable pavement on parking lanes would be paid by PUC, and raised crosswalk would be on MTA.

Indeed, having two agencies made it possible to have a larger project. For instance, MTA would have arguably never paid for bio-retention planters. Similarly, due to budget constraints, a PUC-only project would have arguably included fewer bulb-outs, but because of the overlaps, the number of bulb-outs that could be delivered was higher.

However, having two agencies on board, also made it more likely that problems would occur, and with them delays. This is what happened with the traffic diverter proposed by MTA. Despite participatory meetings that had addressed the diverter and obtained buy-in from the community, installing a diverter entailed modifying signage in other areas, whose residents had not been consulted. As a result, as soon as they found out these changes, residents were furious. Because of this issue, the environmental review process had to be re-opened, thereby delaying the entire project, PUC component included. To be sure, delays were not caused by collaboration. Instead, what happened is delay of one agency affected schedule of another agency, which, had they had two separated projects, would have not been lagged behind.

The Wiggle case explains this phenomenon very clearly: this was a recent project (meaning GSI was not new to city agencies), where MTA and PUC paid each for a specific project piece, and where delays stemmed from the very fact that the project had several pieces, thereby multiplying the chances of complications. Not surprisingly, having more issues at stake yielded problems, which in the Wiggle case consisted in having to reopen environmental review due to protests against one specific traffic calming feature (the diverter), thereby delaying the entire project schedule by three

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9 All projects follow this 35-95% rule except the Wiggle Project that falls under the SBSIP (sample bay side system improvement program) because it is in the Channel Watershed. This program has a separate consultant, NWH-URS. For the Wiggle phase I (oak fell) and phase II, the green infrastructure was designed completely by the consultant. The 100% design was then incorporated within DPW’s design for the whole site.]
months. Similarly, PUC had its delay due to the discovery of an auxiliary water supply system, which also caused delay. Because agencies hit delays at different time, one delay compounded the other thereby ending in an even longer. Had the agencies not collaborated, delays would have not added up.

In terms of basic synchronization with other projects, MTA and PUC coordinated with DPW in order for street repaving to occur right after streetscape was complete.

Not being the first streetscape integrating GSI features, bulb-outs and the like, this project had no issues in terms of acceptance of design solutions. Because DPW, which is the agency more attached to standards and maintenance, had already dealt with similar projects in the past, there was no need for leading agencies to request high-level intervention and push for innovative design solution.

In terms of integrated street design, however, this project was medium. This is because the two leading agencies, MTA and PUC, whose mandate imposed them to focus only on traffic and stormwater respectively. While the collaboration allowed to share the costs thereby delivering more features, the features delivered still stuck to these two agencies’ missions. Specifically, because of the discrete improvements proposed, this project lacks a sense of continuity, which could have been achieved with a special treatment of the sidewalk or with sequences of vegetated facilities beyond GSI. If we compare this project with Leland, also a neighborhood street with residential and commercial use, the differences in terms of spatial outcome are evident.

4.1.5 HOLLOWAY

This streetscape improvement project involves eight blocks on Holloway Avenue, a neighborhood street, mainly residential that runs through the Ingleside area, in South San Francisco. This project was one of PUC’s early implementation projects (EIPs), and was therefore driven by stormwater management needs. Unlike Wiggle, which was a joint project between PUC and MTA, Holloway was a PUC led project. As such, its goals were to reduce stormwater volumes in order to prevent overflow and flooding, and to treat water in order to prevent polluted water from entering the nearby Lake Merced. Improving neighborhood aesthetics was also included in the goals but did not represent the driver of this project.

The planning process of the Holloway Avenue project started in December 2012. Given that construction started in February in 2016, the total duration of the planning phase was 1127
days. The budget for the Holloway streetscape improvement came entirely from PUC\textsuperscript{10}, which funded planning, design and construction and was therefore the leading agency.

The planning process of the Holloway Avenue project started in December 2012. As the leading agency, PUC was directly in charge of community outreach and design concept\textsuperscript{11}. Throughout planning, the team realized that this segment lay within the Green Connections Network, and as such it should have been treated accordingly to improve bike movements and augment green character. However, no other agencies were willing to join the project at the time planning occurred. While the project factsheet mentioned what the project would have brought to like a segment of the Green Connections plan, the Holloway streetscape improvement was led uniquely by PUC, which resulted in a design that focused primarily on GSI. Accordingly, community meetings concentrated primarily on selecting favorite GSI solutions. Some marginal collaboration occurred between PUC and MTA to implement red curbs near crosswalks. This traffic calming measure, however, did not modify street design, whose construction was still entirely born by PUC. MTA was consulted as usual to check design compliance of bulb-outs and other elements modifying traffic. Not participating in construction financing, however, MTA did not add features to the project.

Accordingly, the design concept that came out was very stormwater-focused, and included permeable pavement in parking lanes, corner bulb-outs with bio-retention planters, mid-block linear bio-retention planters, and the aforementioned red-painted curb. No additional transportation elements, such as raised cross-walks, bike lanes or diverters were added, neither were added street furniture or new trees.

In terms of synchronization with other projects, some internal coordination occurred within PUC, as the agency realized that Holloway had major sewer improvement scheduled in the near future. As in Cesar Chavez, these works were then pushed forward to right before the streetscape.

As usual, after concept design the project was handed off to DPW, which was "hired" by PUC to complete design engineering. During this phase, PUC was basically DPW's client, and had therefore a great deal of control over design outcome, which the agency used in at least one instance. Not coincidentally, the issue regarded integrated street design. In order to both augment the area's small tree cover, and to improve neighborhood aesthetics, DPW's landscape architects had proposed to plant new trees within PUC-paid bio-retention planters. PUC, however, didn’t want woody plants but only shrubs, both because trees' roots might affect GSI performance and because the maintenance plan did not include arborists. Since PUC was the client, trees were therefore not

\begin{flushleft}
\textbf{10} SSIP
\end{flushleft}

\begin{flushleft}
\textbf{11} For developing the design concept of this and many other projects, PUC hired AECOM Parsons.
\end{flushleft}
included and the design ended up being less integrative. Indeed this choice was perfectly in line with PUC’s mandate, which was maximize GSI performance in order to use money coming from water-fee payers efficiently.

Having one agency exerting its authority over another agency was not new. For example, in Newcomb, PLN had hired DPW, thereby being in the position to push to introduce innovative design solutions and broaden project scope. This attitude was consistent with PLN’s role, namely to push existing boundaries, spur innovative solutions and develop new visions. In the case of Holloway, however, the same power had been used to narrow project scope, neither could it have been otherwise given the structure of city agencies’ arena.

As a result, in terms of design richness and integration, this project was poor. If we compare it with Newcomb, also a residential neighborhood street, this project does not include vegetated facilities other than green stormwater infrastructure, and it also does not include additional element to calm traffic or improve aesthetics. Regarding the aesthetics we saw how the only attempt was actually blocked, neither could it have been otherwise. Arguably, if the project had had aesthetic improvement as one of the drivers, extra funding would have been available for street furniture and tree planting.

In terms of traffic calming the project did not include any speed bumps, chicanes or raised intersections. These same elements were included in a traffic calming improvement on another very similar segment of Holloway Avenue, thereby showing that this site would be ideal for that type of improvements too (SFCTA......). The reason why additional features were not incorporated was therefore that at the time of the planning phase, no other agency was able to join the project and contribute to design completeness. The only agency who tried to introduce additional elements, DPW, tried to do it too late and its attempt was understandably blocked.

In terms of GSI acceptance, no claims were raised with regard to permeable pavements or bulb-outs, thereby showing how these solutions had by this time been embraced by city staff.

4.1.6 SUNSET

This 5-block streetscape improvement project is the first of four projects on Sunset Boulevard, a car-oriented residential thoroughfare running Golden Gate park to Lake Merced. Compared to other streets, Sunset Boulevard has a special cross section, with center lanes for through traffic and local access lanes separated from the center lanes by large landscaped medians. When entirely completed, the project will cover 16 blocks, thereby equaling Cesar Chavez in length.
As with Holloway Avenue, Sunset Boulevard was led and paid for by PUC, and belonged to that agency’s early implementation projects. Accordingly, the objectives of this project primarily related to stormwater capturing and detention. An additional goal was public education with respect to GSI (1).

The planning process of the Sunset Boulevard streetscape improvement started in March 2013, when PUC begun community outreach and concept design. As in Holloway, community meetings focused primarily on selecting GSI type. As usual, after completing outreach and conceptual design, the project was handed off to DPW, hired by PUC for design engineering. Construction was phased in 4 stretches. Given that construction of the first stretch started in October 2015, the planning and design time was in total 944 days, as long as Holloway and much shorter than the other projects.

The design consisted of several raingardens installed in the large medians. Exploiting existing topography, raingardens were strategically located and designed to maximize the capture and retention of stormwater. Treating raingarden as pedestrian amenities, the design incorporates an outdoor learning lab around a large raingarden, thereby encouraging people to enjoy and learn about GSI. Moreover, seating areas in some bus stops were replaced to better integrate raingarden with adjacent bus stops.

In terms of design richness and integration this project was poor. Like Holloway, Sunset Boulevard was entirely stormwater-driven. However, here the project seem to include an aesthetic piece, namely the raingardens placed within the landscaped medians, which was not present in Holloway. This aesthetic value, however, stemmed from pre-existing elements that were already there. A rain garden placed within medians with monumental trees would automatically increase amenity.

The Sunset Boulevard project also had a transportation piece, namely the re-design of bus stops adjacent to raingardens. However, transportation upgrades were delivered only where the street had to be ripped because of GSI, rather than everywhere it would have been needed. In comparison to the improvement on Cesar Chavez, also a major thoroughfare running through a residential area, this Sunset Boulevard project is indeed not as rich and as integrated. Arguably, if other agencies had been involved in planning and financing, the project would have been larger (perhaps extending to side lanes), richer (for instance including traffic calming and street furniture), and more integrated (for example re-designing a stretch of median to deliver a public space that incorporates GSI, traffic calming features and aesthetics).

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12 The site had been identified since 2012, when PUC had included a number of GSI-based streetscape projects within its Sewer System Improvement Program (SSIP) to upgrade the city’s aging infrastructure
Pedestrian advocates have notes that this project missed an opportunity to engage in a collaborative project which, beyond installing GSI, could have reduced pedestrian injuries (Bialick, 2013b).
4.2 COMPARATIVE FINDINGS: FROM FEW, SLOW, COLLABORATIVE AND COMPLETE EARLY PROJECTS, TO MORE NUMEROUS, FASTER, LESS COLLABORATIVE AND LESS COMPLETE RECENT PROJECTS

A comparison across these six projects, both in terms of planning process and in terms of spatial outcome, leads to some interesting results (fig 13).

The first result is that agency agreement over GSI tend to increase over the years. Projects whose planning started after adoption of the Better Streets Plan had a higher level of agreement towards GSI than early projects. This increase is evident in at least three aspects: first, early projects were financed through special sources, whereas more recent projects were part of a more institutionalized program; second, early projects had to overcome major issues related to the non-standard nature of design solutions, which more recent projects, as GSI became more common, did not have to experience; third, clarity with respect to maintenance of GSI increased from the first projects, where GSI was not even acknowledged, to the more recent projects, where maintenance was thoroughly considered, to the point that it informed design choices. These results are consistent with the trend shown in the previous chapter, which showed an increase from 2006 to 2015 in the number of planned streetscape containing GSI per year.

The second result is that the planning-and-design time is negatively associated with project date. In particular, the first three projects had a very long planning-and-design time: 4.7 years on average between beginning of the planning process and start of construction. By contrast, the average planning-and-design time in recent projects is one year shorter. This finding is not surprising and is attributable to the early-nature of the first three project and to the hurdles of introducing innovative design solutions in a fragmented arena of city agencies. The most emblematic example is perhaps Newcomb, a one-block project whose planning and design took almost three years longer in the sixteen-block project on Sunset Boulevard, and two years longer than in the eight-block project on Holloway.

The third results is that planning-and-design time is also associated with number of sponsoring agencies. In particular as soon as the number of paying agencies is greater than one, planning and design is longer. This finding introduces another variable, construction funding, which compounds the previously-outlined association between project date and planning-and-design time. In other words, beyond the historic trend towards shorter planning-and-design time, construction funding is also associated to planning-and-design time, to the point that even more recent projects, when there are multiple sponsoring agencies, take longer to plan and design. This is evident when comparing Holloway and Sunset on the one hand, and Wiggle on the other hand. While all three are recent projects, the planning-and-design time of the first twos, whose
construction was paid for by PUC only, was almost two years shorter than Wiggle, whose construction was jointly funded by PUC and MTA.

However, the longer planning-and-design time, was not “caused by” joint financing itself. Instead, having multiple agencies financing construction means having projects with multiple pieces that require more complex planning and potential sources of problems, thereby also resulting in delays. The Wiggle project explain this phenomenon very clearly: first, in terms of efforts, the strain to join forces and consolidate the MTA and the PUC pieces yielded some delays; second, in terms of problems, each piece of the project had its own delay.

Additionally, a twofold delay characterized projects that were both early and jointly-financed. Here the hurdles of advancing an innovative design proposal was compounded by the high number of pieces, thereby increasing the likelihood of delay. This is for instance the case of Cesar Chavez, where delays were caused by the project being both very innovative and very composite. Fig 14 represents planning-and-design time of both the six projects analyzed so far (three pre-EIP and three EIP) as well as remaining EIP projects. This scatterplot shows that on the one hand all pre-EIP projects (blue dots) have long planning-and-design times (as they are new and/or composite); on the other hand, all EIP projects (red dots) have a shorter planning-and-design time (as they are not nor very composite), the only exception being Wiggle, the only synergistic EIP project.

This leads to the fourth result (fig 15), perhaps the most significant one: on average first projects seized opportunities for collaboration more than recent projects did. In being more collaborative, early projects were also less standard. Each of them had stemmed from very different needs, in response to which agencies had chosen to collaborate. In Leland, for example, PLN and DPW chose to collaborate since the very beginning, and accordingly they co-wrote the grant to request funding. Similarly, in Cesar Chavez, the most collaborative and complete streetscape in San Francisco, the project had resulted from different agencies choosing to consolidate independent projects, most of which had already a budget to rely on. Despite these differences in the timing, the three early projects had in common the fact that agencies chose to collaborate.

By contrast, in the three recent projects analyzed, collaboration was on average lower. Being all “Early Implementation Projects” (EIPs) from PUC, the main goal was to demonstrate how GSI could be incorporated in the right of way, and not to deliver a Complete Street including also GSI. The lower degree of collaboration in the EIPs is particularly evident when considering also the five other projects. Fig.....shows clearly how the three early projects had multiple sponsoring agencies, thereby seizing existing opportunities for collaboration, whereas the more recent EIPs on average veered away from this collaborative path but also delivered a higher number of GSI streetscape in fewer years. While there are two exceptions -the Wiggle and the Mission and Valencia projects were both recent and collaborative- on average EIPs gravitate in the less collaborative area of the graph.

The fifth result of the project comparison is that planning-and-design time is not only
associated with number of agencies financing construction, but also with project richness and design integration. In other words, although collaborative projects took longer to plan and design, ultimately the spatial outcome was much better. Figure 16 compares counterparts with similar potential for improvement, from before and after 2010, showing how older projects score better both in terms of design richness and in terms of design unity. The most striking example is undoubtedly the couple Cesar Chavez-Sunset, with the latter scoring badly both in richness and unity. In the case of Wiggle, it is worth to mention that, while this recent project was collaborative it did not score high in terms of collaboration. This can be ascribed to the specific mix of agencies involved in the project, which in Wiggle were PUC and MTA. Since both agencies are mainly concerned with infrastructure, this project suffered in terms of design unity, as improvements were contained to specific intersections and the project didn’t include any trees or other elements to unify the design.
Figure 14 Planning time per project
STREETScape IMPROVEment PROJECTS AND SPONSORING AGENCIES

SPONSORED BY
DPW

SPONSORED BY
MTA

SPONSORED BY
PLN

SPONSORED BY
PUC

LEGEND

Leland analyzed streetscape projects

- streetscape projects with GSI

- streetscape projects without

Figure 15 Collaboration in GSI projects
<table>
<thead>
<tr>
<th>DESIGN ELEMENT</th>
<th>NEIGHBORHOOD STREET RESID</th>
<th>NEIGHBORHOOD STREET COMM+RESID</th>
<th>MA THC RES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newcomb Avenue Streetscape</td>
<td>PRE 2010</td>
<td>POST 2010</td>
<td></td>
</tr>
<tr>
<td>Holloway Avenue Green St</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leland Avenue Streetscape</td>
<td>PRE 2010</td>
<td>POST 2010</td>
<td></td>
</tr>
<tr>
<td>Wiggle Neighb. Green Corrid.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### AESTHETICS AND PEDESTRIAN COMFORT
- planters
- new trees
- street furniture
- street lights
- sidewalk paving
- curb ramps
- landscaped median
- plaza/focal point
- public art

### TRANSPORTATION AND TRAFFIC CALMING
- bulbouts
- chicane
- raised crosswalk
- raised intersection
- pedestrian refuge island
- improved bus stop
- new bike lanes
- speed stripes/bumps
- red-painted curb

### GREEN STORMWATER INFRASTRUCTURE
- bioret. planter in bulbouts
- bioret. Planter linear
- rain-gardens
- permeab. pav.- parking lane
- permeab. pav. - sidewalk

### TOTAL DESIGN RICHNESS
<table>
<thead>
<tr>
<th>MEDIUM</th>
<th>MEDIUM</th>
<th>HIGH</th>
<th>MEDIUM</th>
<th>HIG</th>
</tr>
</thead>
</table>
| material continuity
| green continuity
| distinctiveness
| presence of big planters
| sidewalk-roadway blend |

### TOTAL DESIGN UNITY
<table>
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<tr>
<th>MEDIUM</th>
<th>LOW</th>
<th>HIGH</th>
<th>LOW</th>
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Figure 16 Assessment of street 'completeness'
Following the identified correlation between project completeness and agencies’ financial involvement, the rest of this thesis uses the terms collaborative project and agency collaboration to signify those projects that pursue street completeness by consolidating financial contributions from different agencies.

In conclusion, the comparative analysis of these six cases showed how GSI streetscapes with a more collaborative process and a more complete design corresponded to longer planning times, whereas less collaborative and less complete projects had a significantly shorter planning. Moreover, the analysis showed that while in recent GSI streetscapes, agencies tended to follow this fast and less collaborative approach, they were also able to plan and deliver a higher number of projects than in the past.

4.3 CONSIDERING AGENCIES’ STANDPOINT: BARRIERS AND INCENTIVES TO COLLABORATION AND COMPLETENESS

Looking at planning process and outcome has highlighted what happened, and didn’t happen, in terms of collaboration and completeness. However, measuring process and project quality hasn’t necessarily helped to understand why collaboration didn’t occur. In order to address this question, it is essential to consider the agency perspective on collaboration. Assembling comparative findings and material gathered through in-person interviews, this section highlights the existing barriers preventing agencies from deciding to engage in a collaborative projects. Keeping the agency point of view and focusing on GSI, this section identifies the motivation that one specific agency, PUC, could actually have for taking part in a synergistic project.

4.3.1 WHY AN AGENCY MIGHT PREFER TO WORK INDEPENDENTLY

One of the greatest barriers to agency collaboration is that agencies’ budget cycles are not aligned. Accordingly, it is often the case that when an agency is presented an opportunity for collaboration, it might not be in the position to join a project because the budget for that period has already been allocated. If that is the case, assuming it is interested in joining, the agency would need to ask to wait until it will have a budget to allocate. However, since this would delay the project, it is often the case that agencies would proceed on their own.
Exceptionally, agencies might be able to quickly redirect budget from existing projects to finance other projects. As an example, PUC was able to use some of the budget of the Wiggle project to join another project where it added GSI facilities. Hadn’t PUC done so, it would have not been able to collaborate. As in most cities, however, in San Francisco agencies approach each other too late. For example, during construction of the Taraval train line, SFMTA approached PUC to ask them whether they would be willing to join the project to deliver a GSI piece. Although the agency was interested in collaborating, as the sandy site scored highly in terms of suitability to GSI, and although no expensive utility relocation would have been needed to deliver GSI, because unalignment of budget cycles, PUC was not able to join in.

Another barrier to agency collaboration is lateness in realizing the opportunity to work together. Particularly in large cities, there are hundreds of projects on the right of way occurring simultaneously. In order to cease opportunities, agencies need first to be aware of them. In the case of San Francisco, the city developed an online GIS platform that identifies overlaps between projects, though only projects whose construction has already been scheduled are included. This is because this platform is meant to highlight potential conflicts between construction sites. However, in order for collaboration to happen, agencies need to know about projects at the earliest stage of their planning, rather than when construction has already been scheduled. When construction of a project has already been scheduled, even if an agency wanted to join the project and had some budget to allocate, it would probably be too late to engage in a collaborative effort.

Fear of possible delays also represents an obstacle to collaboration. As highlighted in the previous section, delays in collaborative projects are basically inevitable. To have to interface with other parties takes longer time due to issues with communication and need to agree upon respective responsibilities, costs, and the like. Depending on the agency, the certainty of delay might represent a huge deterrent to engage in a collaborative project. For instance, an agency trying to catch up on deferred maintenance might perceive an opportunity for collaboration as an obstacle to meeting its objectives. In projects where the need of collaboration is evident, fear of delays might be countered by the fear of protests for having missed an opportunity. By contrast, fear of delays plays a significant role in those projects where collaboration would be preferred but not indispensable.

Fragmentation in terms of funding sources, consisting in each agency managing its own capital program to pay only for improvements that meet its mandate, also can represent an obstacle to collaboration. With the raison d’ être of an agency’s capital budgets being to finance certain types of improvement, any synergy with other improvements can often feel as a not required step. As it was in the case of the fear of possible delay, this barrier can be overcome for those projects where collaboration is a must, but not in those projects where collaboration is
desirable but not essential.

Finally, institutional culture still represents an obstacle to collaboration. Agencies are often still operating as separate silos, and staff might not have the training to manage complete projects. While efforts like the BSP made a huge effort to address this aspect, cultural shifts are by definition incremental process.

The obstacles discussed above, from budget cycles, to silos mentality, to funding sources, stem from the separation between city agencies. As such, the architecture of city agencies represents the major obstacle to having a collaborative planning process that delivers Complete Streets projects.

4.3.2 POTENTIAL ADVANTAGES OF COLLABORATION IN GSI STREETSCAPES

From an agency's standpoint, engaging in collaborative and Complete Streets projects might also be advantageous. This is particularly true in San Francisco, where joining a project might result in major savings compared to working independently.

Given the existing system of city agencies in San Francisco, when an agency works on its own on a project, it automatically becomes the leading agency. As such, it has to bear most of the costs associated to a project, from environmental review, to any utility relocation, surveying, estimating costs, bidding and other soft costs. Depending on the project these costs might be extraordinarily high. For instance, environmental review for streetscape projects like the ones analyzed in this research range from 50,000 to 500,000 USD. Similarly, utility relocation can easily cost millions of dollars. Streets are contentious sites, where even non-complete projects might entail utility relocation or generate problems that would easily boost project cost. Since an agency working by itself has to shoulder all of these costs, conducting projects in isolation doesn’t always represent the best alternative.

In the case PUC, a streetscape project including solely GSI hardly justifies the high costs, and for this reason some projects were often referred to as unsustainable. By contrast, when agencies work together the bulk of these costs are born by the leading agency, and rest of them can be shared between the two. As such, collaboration without leadership clearly represents an appealing option for an agency that is interested in saving money like PUC.
5 CONCLUSIONS AND SUGGESTIONS

5.1 CONCLUSIONS

By looking at San Francisco, this thesis has addressed the relationship between the incorporation of GSI in the right of way, and the Complete Streets movement.

As part of its stormwater management policy, San Francisco has been trying to carry out street improvement projects to incorporate green stormwater infrastructure (GSI) in the right of way of existing streets.

Concurrently, the city developed a citywide framework for streetscape projects, the Better Streets Plan (BSP), which openly embraces the Complete Streets concept, a holistic street design approach based on considering all the street users and combining multiple design elements to deliver a diverse set of improvements, from transportation, to aesthetics, to the environment.

Most importantly, the array of elements of a Complete Streets, as advocated by the BSP, also includes GSI. As such, the BSP contains a section in which specific GSI technologies are matched to street types, thereby providing a comprehensive set of design guidelines for the citywide incorporation of GSI in the right of way.

While the BSP assumed interagency collaboration as the means to implement Complete Streets, it also didn’t introduce an implementation mechanism to ensure that agencies seize opportunities for collaboration, which at the moment is a matter of choice.

In addition to being at the discretion of city agencies, collaborative projects are also hard to plan and deliver.

In a context where collaborative and Complete Street projects are optional and also particularly hard to deliver, an agency interested in installing GSI in the right of way is not incentivized to do so through a collaborative project. On the contrary, choosing to work independently might often the preferred path.

By looking at the process and outcome of six street improvements containing GSI, this thesis assessed whether opportunities for collaboration and completeness were seized. Comparing older and newer GSI streetscape improvements, this thesis found that older projects were on average more collaborative and more complete, though they took longer to be implemented, whereas more recent projects were on average less collaborative and less complete, and had a shorter average planning time. The analysis highlighted also that performances in terms of
completeness were associated with degree collaboration, as expected, but also with the specific mix of agencies involved.

Furthermore, this thesis showed that recent street improvement with GSI were less collaborative and less complete because one agency, the one in charge of GSI, started to conduct its own program of GSI streetscape projects, and because in these projects, opportunities for collaboration were most of the times not seized.

By considering the agency perspective, the thesis also investigated the specific barriers that prevent San Francisco agencies from engaging in collaborative projects in the right of way, and that in the case of the analyzed projects prevented recent GSI streetscapes from being collaborative and complete.

This investigation showed that most of the barriers to collaboration are strongly linked to the persistence of a compartmentalized structure within the city governments. As highlighted in the first chapter, these results are consistent with the literature, according to which collaboration clashes with the historical separation between city agencies, whose staff was until not long ago trained to treat street components as conflicting elements. These results are also consistent with that part of the literature that stresses how GSI projects are often anchored to capital improvement plans managed by single agencies, and this might run counter to the kind of interdepartmental collaboration needed for integrated street design projects (Newell et al., 2013).

5.2 SUGGESTIONS

San Francisco is at a pivotal stage, one in which there is a great deal of tension between holistic citywide street policy and fragmented project implementation. This is particularly evident when considering the relationship between the Complete Streets model advocated in the BSP and actually implemented GSI streetscapes, where adopting a non-collaborative approach was more convenient in order to deliver projects.

Following is a list of suggestions aimed in general at maximizing the number of city-led collaborative and Complete Streets projects, and in particular at incorporating GSI within these projects. Recommendations are divided in short- and long-term suggestions.

In the short term, the system of city agencies is likely to remain the same. In order to increase the number of collaborative projects within the existing system, there are a number of measures that could be taken. The first recommendation is to openly tackle the lack of collaboration by mandating a quota of collaborative and Complete Streets improvements. Such quota could be set in different ways: for instance, the city could require agencies to set a
percentage of their budget for complete and collaborative projects, or it could mandate a fixed number of complete and collaborative projects per year; alternatively, it could require to seize a percentage of the existing opportunities for collaboration. The latter option would take into account that the amount of opportunities varies over time.

Given the different degrees of completeness, mandated Complete Streets projects might be divided in different subsets corresponding to light, moderate and high completeness. Since not all complete projects must include GSI, this component would be mandated only for projects falling within the high end of the spectrum. This would also ensure that projects where PUC contributes the GSI, also have other agencies that PUC could share costs with.

The second recommendation is to tackle the lack of collaboration indirectly by regularly conducting prioritization studies to identify opportunities for collaboration at an early stage of planning, and use this knowledge to support the decision making of city agencies. This would entail the creation of an interagency online platform to host a database of projects at early planning stage from different agencies. Agencies would be required to compile the database as soon as they conceive projects. In entering projects in the database, agencies would need to specify information such as improvement type, location, and estimate of project disturbance. Groups of projects that overlap spatially or that are close to one another would then be highlighted as potential opportunities for collaboration.

This information could then be used to either consolidate overlapping early stage projects already in the database, or to add new “pieces” to an existing project. In the first case, project managers from different agencies would use information about improvement type to assess how compatible their projects are. In the second case, an agency that has not yet decided the site for a street improvement would opportunistically target the segments where projects have already been planned.

Within the San Francisco arena, this second option might be particularly valuable for agencies that don’t want to lead projects in order to save money. In the case of PUC, for example, this platform could be used to join projects by other agencies and add GSI. In particular PUC might select those projects that will cause a great deal of disturbance, such as the ones where roadway and sidewalk will be repaved, as these projects represent opportunities for installing a permeable pavement. In doing so, an agency like PUC might aim for a quota of low hanging fruits and another quota of more ambitious projects. By doing that, it would ensure that a quota of projects, the easier ones, are delivered in the short run.

In the long term, the city could address departmental division by establishing a new entity with responsibilities over streets, whose task would be to implement the BSP by leading citywide street improvement planning. The rationale behind this proposal is on the one hand to bring together different agencies’ interests, and on the other hand to have an enduring body to
operationalize the Complete Streets concept.

One of the tasks of this entity would institutionalize the already existing core of city staff that believes in the Complete Streets approach and that has already worked together on the BSP as well as on street improvement projects. As stressed by the literature, these bodies can help partners who were active in policy adoption remain engaged as the focus shifts to implementation (McCann & Seskin, 2013). It should be noted that establishing interagency entity was already recommended as a means to operationalize the BSP, though such body was never created (City and County of San Francisco, 2010a).

Once created, such entity could manage the aforementioned interagency platform aimed at combining early stage street projects from different agencies. In doing so, it would not only be responsible of managing the database but also of prioritizing projects.

In terms of funding, this new body could either have the power to draw from different agencies’ budgets, thereby mimicking the current process of assembling sources from different agencies, or it could rely on a newly created Complete Streets fund. More importantly, because it would have a broad scope and because it would be consistently seeking funding, this entity would be more likely to intercept funding than a normal agency.

Having an interagency team focusing on streets was the choice of cities like Boston, which created a Complete Streets Advisory Committee composed of representatives from both the community and the city agencies that have some impact on the streetscape, including the Water and Sewer Commission. In the case of San Francisco, this interagency entity would indeed include representative from PUC, thereby considering water management issues while planning and prioritizing street projects.

Such entity might choose to maximize the number of Complete Streets project that include GSI. To finance this endeavor, San Francisco could follow the example of Portland, which decided to earmark 1% of the construction cost of any city-led project that doesn’t install GSI, for a fund that the city can use to build streetscape projects with GSI (City of Portland, 2007).

In conclusion, this thesis suggested a number of approaches that San Francisco could adopt to maximize the number of collaborative and Complete Streets projects as advocated in the BSP, particularly the ones including GSI. In the short term the city should try to seize as many opportunities for collaboration as possible. This could be attained mandating a quota of collaborative projects, increasing knowledge about existing opportunities, or both. In terms of GSI, the city should seek opportunities for PUC to join other agencies’ projects without leading the project. In the long run, the city could change the agency arena by creating an interagency body with the task of implementing the BSP, and pursuing the Complete Streets model.
6 APPENDIX

6.1 LIST OF INTERVIEWEES

PUC
Mike Adamow
Rafael Garcia
Ken Kortkamp

PLN
Paul Chasan
Adam Varat
Andres Power

MTA
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6.1.1 QUESTIONS ABOUT SPECIFIC PROJECTS

- What was your role in this streetscape improvement project?

- How did the project start and what agency led the planning phase?

- Can you describe how coordination with other agencies (DPW and SFMTA) occurred in this specific project? Were there any standard mechanisms to guide collaboration?

- Financially, what was the contribution of each agency, and how did this affect the planning process?

- What are the major issues you had to deal with while collaborating with other agencies for this project? (e.g. different values, no time alignment, personal issues)

- Did these collaboration issues delay the planning phase or did they just make it harder?

- Do you think that if fewer agencies had been involved the process would have been more expeditious?

- Apart from issues with collaboration, were other external factors affecting the planning process? (e.g. opposition from residents, the person in charge retired and the project sat on a desk for months)

- Did these other issues slow down the planning process or did they just make it harder?

- How would have you solved any issues with agency collaboration in this project?

- Did issues with agency collaboration affect the project’s design quality?
• Similarly, did the project’s financial plan affect design quality?

• How many agencies did the contractor have to interface with?

6.1.2 MORE GENERAL QUESTIONS:

• How long have you worked at the ______for, and what was your role?

• What type of streetscape projects have you worked on?

• What is your personal experience with interagency collaboration and what are the main issues that you encountered?

• Do these collaboration issues delay the planning phase or do they just make it harder?

• What about design quality? Do issues with agency collaboration affect the project’s design quality?

• Let’s talk about the planning process again. Are there any standard mechanisms to guide collaboration during the planning phase that you used?

• Let’s talk about the agency that leads the planning process. For a city agency, what are the implications of leading the planning phase in terms of responsibility and costs?

• How does that affect the planning process?

• Do certain agency lead planning phase better than others?

• How would you solve any of the issues with agency collaboration?

• Let’s now talk about trends. Do you think collaboration has increased over time,
or perhaps has become simpler to pursue?

- Now let’s talk a little bit about policies. Are there any policies at the city level that facilitated the collaboration of different agencies?

- Let’s talk about one specific policy. In 2010 the city adopted the Better Streets Plans. Do you think that the Better Streets Plan, by introducing design standards that address multiple purposes, simplified the collaboration between agencies?

- Let’s talk about another policy. In 2010 the Office of the Controller produced a document named Recommendations for Improved Streetscape Project Planning, Design, Review and Approval, which proposed to introduce a Streetscape Design Review Team that would be the only entity that contractor would have to interface with? Are you familiar with it? Do you think it’s a good idea? What stage is this proposal at?
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73
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