



**EXCEPT**  
INTEGRATED SUSTAINABILITY



# **SUSTAINABLE URBAN DISTRICTS 2015 GLOBAL REVIEW**

Strategies to accelerate  
sustainable urban development

*May, 2015*

creating the foundations for a sustainable society



## FOREWORD

**This project arose from the joint desire of WWF and Lafarge to contribute original research on the topic of sustainable construction.**

**Over the last 10 years, it has become increasingly apparent that sustainability gains can be derived from improving systems, in addition to improvements that can be made by individual actors or buildings. This means two things: that sustainable construction is best understood from the perspective of cities or districts; and the practices of a company or sector can be improved by understanding their role within the interactions of a whole supply chain.**

This thinking inspired the form of this report. We analysed the experiences and approaches of existing, more sustainable urban districts, and focussed on the interactions between the supply chain players – to draw lessons for the whole sector using a systems-based lens.

To shape this report, a group of experienced and credible stakeholders from across the construction sector were engaged. Initially, it was intended for these contributors to help guide the research and ensure that the findings and recommendations were relevant to their sector. However, each contributor has gone well beyond this remit, developing and implementing strategies to take forward these findings into their own industries and organisations. Thanks go to all those listed below for their valuable input, alongside our delivery partners Except Integrated Sustainability.

All eleven projects that participated in our research have shared their experiences and lessons in an open and insightful way. Their experiences have been invaluable for building the recommendations in this report. We hope that by grounding our research in these credible and diverse case studies, our findings will be practical, widely applicable and relevant to today's sustainable construction challenges.

Above all, we hope that this report will help inspire those within the construction sector to introduce more sustainable technologies and ways of working – and to support those now creating the next generation of sustainable district developments.

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## EXECUTIVE SUMMARY

### WHAT STRATEGIES FOR THE CONSTRUCTION SECTOR SPEED UP SUSTAINABLE URBAN DEVELOPMENT?

**To answer this question we examined eleven projects around the world with diverse ambitions and sustainability targets using a systemic and holistic perspective. We extracted the success and failure factors, and uncovered strategies that accelerate sustainable development both on a project level and for improvements across the building sector.**

Sustainability targets influence the practice of urban development as well as the roles of contributors and beneficiaries. The eleven studied projects demonstrate successful approaches that increased their sustainability performance. Implementing the lessons learned in these projects will significantly speed up sustainable development projects around the world. In addition, we've found strategies to achieve improved performance in the construction industry globally.

### HOW IS SUSTAINABLE URBAN DEVELOPMENT DIFFERENT?

**Sustainable urban development is significantly more ambitious than traditional development. It requires more and higher targets, requiring a mind shift beyond the design, construction and marketing of property, towards creating resilient, socially just, and environmentally responsible communities. This involves all stakeholders in the construction supply chain.**

#### HOLISTIC DESIGN AND 360 DEGREE SCOPE

Sustainable living means living in harmony with natural resources as well as living a just, healthy, and happy life; a broader scope than a usual construction trajectory. This requires dealing with a wide range of issues such as CO<sub>2</sub> emissions, energy use, renewable energy and material sourcing. It also deals with aspects such as conservation of ecosystems and species, contributions to local culture, and catering to the needs of healthy and happy living. New finance and business models are essential to create incentives for communities to function well and meet all targets simultaneously. Taking all sustainability aspects into account simultaneously is a big challenge.

#### HIGHER PERFORMANCE THROUGHOUT

Most building standards today do not require the market to deliver truly sustainable neighborhoods. Raising the ambition to sustainable development is often considered to lead to less competitive real-estate prices, but case studies show that this is not true. They do show that reaching higher performance targets, including financial targets, requires new strategies, commitment and perseverance.

### STRATEGIES FOR SUSTAINABLE DEVELOPMENT

#### MIND-SHIFT: BUILD TO BE RESILIENT

Sustainable development focuses on the full lifespan of urban districts, from conception to demolition or replacement and beyond. This changes the mind set, role, and involvement of contributors and beneficiaries. To activate this, resilient neighborhoods require new strategies for the following:

- › **Ambition setting:** Success indicators for sustainable urban development go beyond the specifications of buildings and the ability to sell property. Above all, sustainable urban development targets use-phase performance of the neighborhood and its ability to further improve over time. Using performance-based goals helps to steer towards actual improved functioning of a neighborhood throughout its lifetime.
- › **Involvement of occupants:** Urban development induces and enables lifestyle change of occupants. To achieve sustainability goals in the use-phase, the support and active participation of occupants is essential. Focusing on and involving end-users from vision to execution helps to achieve this.
- › **Team formation:** Selecting a skilled and motivated design & development team is a key success factor to meet both sustainability targets and local needs. Successful teams include all disciplines and skill-sets to deal with the full spectrum of sustainability from the start. In addition, they consist of involved and intrinsically motivated professionals.

- › **Business models:** Linking reward systems to the actual (not projected) financial performance of the neighborhood improves sustainability performance in the use-phase. Business models that involve full life-cycle incentives help to meet longer-term operational goals. The larger scope and demands require financing of up-front process costs. These can be covered by incentive structures throughout a project's life-cycle, and the project's value increase through improved performance and desirability.
- › **Work culture:** All involved parties from the design to the use (and end-of-life) phases contribute to the performance of neighborhoods. A cooperative setting that encourages guidance and learning is essential in this multi-disciplinary and user-centered approach. Also, exchanging and incorporating ideas from other parties and disciplines is critical to realize all the development goals simultaneously.

#### **SURPLUS VALUE**

A recurring pattern in successful sustainable projects is the pride and sense of purpose people have in their work. Adding social and other regional values proved beneficial for the studied projects in many ways. Apart from a motivated work force, advocacy for change and a drive to provide beneficial spillover effects make neighborhoods attractive and contributes to their image and marketing. People's increased involvement in projects leads to stronger commitment and active participation by third parties. Last but not least sustainable development generates increased political support due to its positive regional impacts, which help speed up projects.

#### **ROAD MAP FOR SECTOR CHANGE**

Besides the above mentioned strategies to increase performance of development projects, sector wide programs speed up sustainable development worldwide with the following strategies:

- › **Fostering value awareness:** There is a common belief that higher sustainability targets will lead to lower financial gains. There are many examples that prove that the opposite is true. Showcasing examples of successful business cases convinces key players that sustainable development leads to prosperous business. They also help communicate how suppliers and project developers can best benefit from sustainable development.
- › **Cross-sector innovation:** Cooperation between project developers, suppliers and financial institutions enables the sector to link neighborhood performance to finance, risk, and reward systems. By making suppliers responsible for the performance of their solutions in the use-phase, they are incentivized to realize long-term performance goals. This guarantees that operational goals will be met. New business models prove that this changing role of suppliers in the use-phase is possible and works.
- › **Performance monitoring:** As mentioned, the real measures of success are related to the actual sustainability performance of urban districts. To strengthen incentives towards neighborhoods that function well on all sustainability criteria, development and implementation of performance monitoring in the use-phase are of great importance.
- › **Responsible financing:** The financial sector can stimulate true sustainable urban development by accrediting design approaches and business models that connect reward systems to the actual performance of neighborhoods.
- › **Disseminate technologies and innovation:** Exchanging, connecting, and combining local and global knowledge proved important for all studied projects. There is no single construction method that performs best in all contexts and climates. Creating awareness about adapting technologies to local contexts helps to achieve better implementation. In many regions construction companies rely on known and traditional construction methods, because experience with innovative methods is absent and barriers to introduce them locally is high. Lowering these barriers to new technology implementation is a major challenge to speed up sustainable development in upcoming markets. Tools that help this are online learning platforms, easier to assemble construction techniques, and remote guidance systems (e.g. via mobile devices).

#### **SUBSTANTIATION OF CONCLUSIONS**

Part 1 of this report summarizes insights and strategies for project developers, suppliers, and sector organizations to speed up sustainable urban development.

Part 2 of this report documents -in detail- how the studied projects successfully apply the presented strategies. These projects serve as inspiration and proof that the suggested strategies lead to significantly improved performance levels.

## CONTENTS

This report shows how embedding sustainability goals changes urban development and offers strategies and insights for companies and sector organizations to accelerate sustainable development. The content presented is based on research of eleven notable sustainable urban districts from around the world. This allowed us to base our recommendations on real world experiences in urban development trajectories.



*Location of the 11 research projects.*

## PART 1 - STRATEGIC AGENDA

**Part 1 presents the main insights and conclusions gathered from the eleven projects, and present the uncovered strategies.**

**Chapter 1** explains the central research question, our view on sustainability, scope of research, and the method used.

**Chapter 2** addresses the difference between traditional urban development and sustainable urban development, and how practices change when sustainability becomes an ambition.

**Chapter 3** presents innovative strategies for higher performance levels. Urban development projects will significantly improve when parties adapt these strategies derived from the case studies.

**Chapter 4** suggests strategies for sector organizations and governments to accelerate change. Innovation and project speed will be improved with these strategies, if implemented sector wide in the construction sector and other sectors, such as in finance and governance.

**Chapter 5** lists the main conclusions from this research.

## PART 2 - RESEARCH

**Part 2 shows the lessons learned for each of the projects in practice, including its process and systems maps, their goals, and strategies.**

**Chapter 1** explains the method used to map the development processes in a visual model. This approach enables the reader to quickly read and extract important information from the process maps used in chapter 2.

**Chapter 2** gives an overview from origination to realization of the eleven sustainable urban districts. For each example the development steps, stakeholder involvement and key impact decisions on the district's goals are presented.

**Chapter 3** summarizes the key 'lessons learned' that helped improve the impact of stakeholders and suppliers on the sustainability performance of the districts.

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# › PART I - STRATEGIC AGENDA



## 1. INTRODUCTION

**Transitioning towards a sustainable society is a major challenge for our civilization. Climate change, biodiversity, and resource consumption are all greatly affected by human activities. By 2050, it is expected that 70% of people will live in cities. This will place immense stress on the urban environment, and how it can cope with its impact on the planet.**

The urban development and construction sectors have a clear role to play in how the urban environment deals with sustainability. The sector impacts aspects such as material use, resource management, and environmental performance, but also fundamentally defines how we shape our culture, and enables people to live healthy, just and happy lives, for very long time spans.

Because of this, the necessity to develop sustainably is emphasized around the world. Within the coming years, all stakeholders in the development of urban areas will face immense challenges to meet this urgent goal, and we need new strategies to achieve them; strategies that work, as room for error is diminishing rapidly.

With this research WWF and Lafarge provide these practical strategies and insights that help the sector to accelerate sustainable urban development.

### RESEARCH GOAL

**To answer the question: How can sustainable development of urban districts be accelerated and performance increased?**

To answer this question we examined eleven projects around the world with diverse ambitions and sustainability targets. We extracted their success and failure factors, and uncovered strategies that accelerate sustainable development both on a project level and for sector wide improvements.

We show how these new strategies and approaches enable new forms of sustainable urban development, demonstrate how exemplary performance can be reached, and how to make high performance sustainable projects economically viable.

› A panorama of Lyon Confluence, a sustainable district developed from the old industrial area between the Rhone and Saone rivers in Lyon, France.





## RESEARCH METHOD

- 1 Long-list of 34 new-built districts from around the world
- 2 Selection of 11 diverse and exemplary projects for detailed analysis
- 3 Interviews with key decision makers and desk study for each of the 11 districts
- 4 Mapping each project's development process, stakeholder involvement, key decisions, and events
- 5 Extraction of lessons learned and strategies
- 6 Selection and analysis of three projects for an in-depth 'deep dive' exploration, including site visits
- 7 Translate the lessons learned and challenges into strategies for individual projects
- 8 Formulate strategic opportunities on a sector level to accelerate innovation across multiple projects

## ABOUT THE MAPPING

We've used systems-mapping as a way to register, analyze and communicate the development pathways of the districts. This enabled us to engage with large quantities of information while at the same time creating at-a-glance insight using the maps. The maps for each project are included in part 2 of this report. They illustrate key decisions and processes, the stories behind the projects and help identify lessons learned.

## DISTRICT SELECTION

The selection of the eleven urban districts is based on the following criteria:

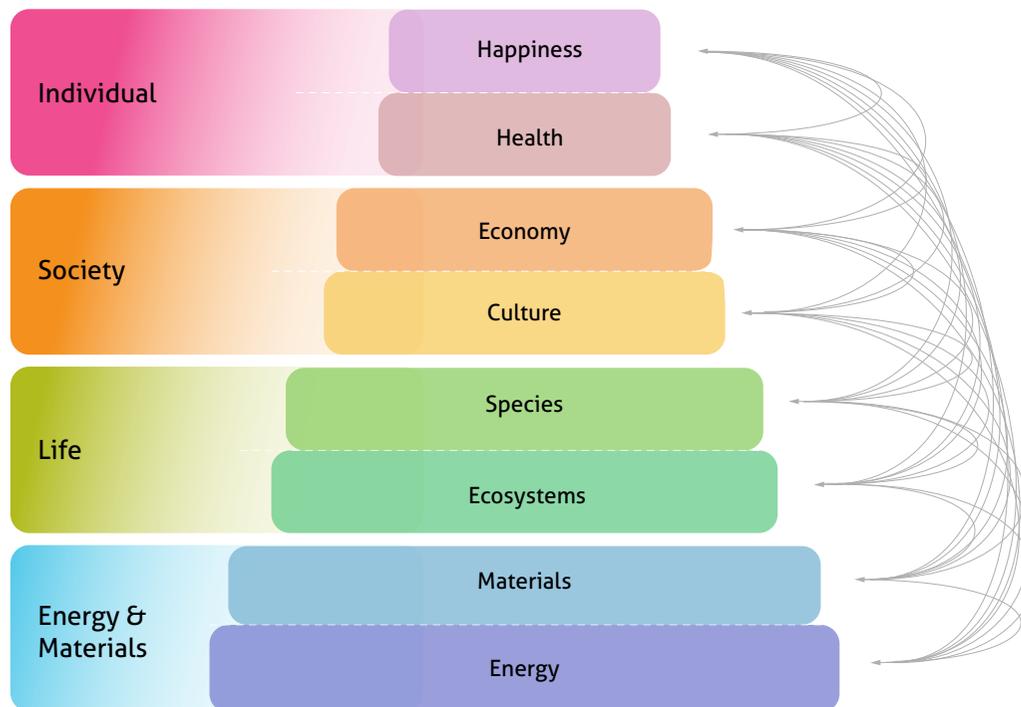
- 1 The districts set high and ambitious sustainability targets, also in comparison to other projects in their region.
- 2 A broad set of sustainability goals for the project are formulated.
- 3 The projects have gained notoriety for their pioneering approach toward sustainability.
- 4 Diversity in geographical location to represent a good mix of regions from around the world.
- 5 Diversity of large and small scale developments, as well as bottom up and top down initiatives.

Based on interviews with project managers of the eleven projects we picked three projects to study in more detail, visit, and use as a check for the found strategies. The three projects for this 'deep-dive' are:

- › Pedra Branca (SC, Brazil)
- › Lyon Confluence (France)
- › Eva-Lanxmeer (Culemborg, The Netherlands)



Above: The eleven sites included in this study.



Above: SiD's ELSIA diagram

### ELSIA UNIVERSAL PERFORMANCE FRAMEWORK

Neighborhoods can range in size from a couple of houses, to a large city with surrounding urbanized areas. Each district is created with its own set of dreams, values and goals in mind giving it its own unique culture and identity. The sustainability goals of districts are connected to, and part of, the essential goals of the community. To compare them, a coherent framework was used to map the goals that are communicated in the studied project.

Symbiosis in Development (SiD) is a systems-based approach for sustainable development and design. SiD's ELSIA tool provides a universal framework to organize goals and performance levels of the projects. The ELSIA categories used are:

- › Energy & Materials
- › Species & Ecosystems
- › Culture & Economy
- › Health & Happiness

In part 2 of this report the goals and the development process of the studied projects are described. The goals are mapped in accordance with the ELSIA framework. On a time line the key process steps are presented that enabled the realization of the goals.

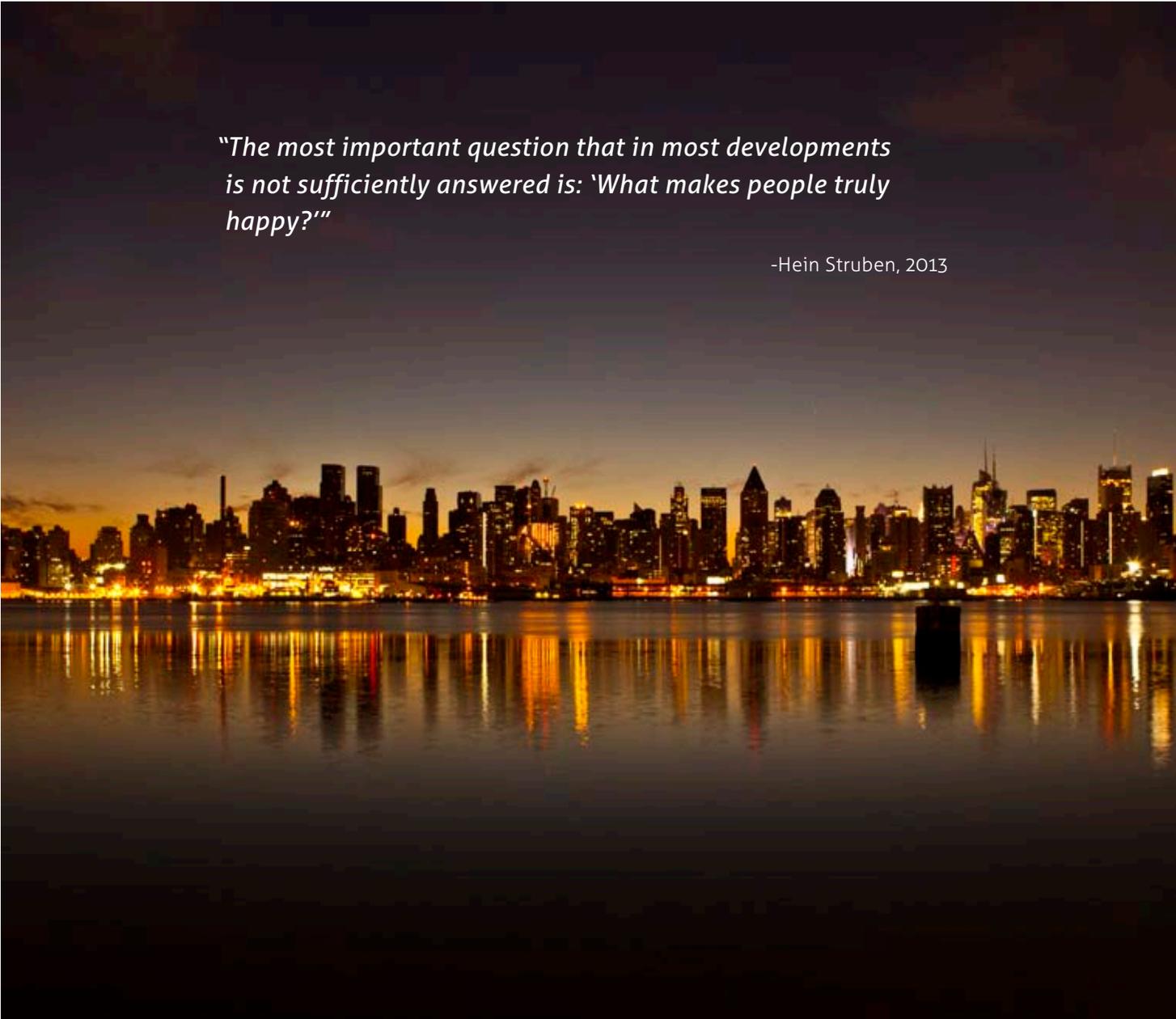
## 2. WHY SUSTAINABLE DEVELOPMENT IS DIFFERENT

**The case studies show what is currently happening in the area of sustainable urban development, and exactly how sustainable development differs from traditional approaches. While each urban district has its own unique approach, the stories of these districts show a number of strong characteristics that span across all of them. The most important of these are increased scope of performance and higher standards.**

Sustainable urban development is significantly more ambitious than traditional development. Its increased level of performance and scope stretch beyond the design, construction and marketing of property and includes the creation of resilient, socially just, and environmentally responsible communities.

Adding sustainability goals affects the challenges and performance levels of the eleven studied projects. As a result, all stakeholders in the supply chain change the way they work and interact in these projects, including project developers, municipalities, urban planners, architects, suppliers, and financiers.

The drive to create truly sustainable neighborhoods in their use-phase also impacts the business models and the roles of contributors over the course of the projects.

A nighttime photograph of a city skyline, likely New York City, with numerous skyscrapers illuminated and their lights reflecting on the water in the foreground. The sky is dark, and the water is calm, creating clear reflections of the buildings.

*“The most important question that in most developments is not sufficiently answered is: ‘What makes people truly happy?’”*

-Hein Struben, 2013

## HOLISTIC DESIGN AND 360 DEGREE SCOPE

**Urban districts with true sustainability ambitions consider not just resource use and the environment, but have a holistic approach that includes community wellbeing and economic resilience. This performance scope is much wider than common construction trajectories. This broad scope includes material aspects such as CO<sub>2</sub> emissions, energy use, renewable energy and material sourcing, as well as conservation of ecosystems and species, contributions to local culture, and catering to the needs of healthy and happy living. This increased scope has far reaching consequences and fundamentally changes the way urban development is performed.**

Taking such a broad scope of goals into account simultaneously is a big challenge. To tackle this challenge, the projects used different methods to create and track their goals, such as One Planet Living principles and LEED-ND certification for community development. These strategies turn out to drive every project towards becoming mixed-use and to focus on building resilient communities.

### 1. MIXED-USE NEIGHBORHOODS

All neighborhoods can be identified as mixed-use. Mixed-use neighborhoods offer opportunities for local employment, entrepreneurship, leisure, pleasant living and social involvement. The 'everything nearby' philosophy reduces the need for transportation, promotes local economic development, and adds the variety that makes a neighborhood attractive and lively.

The development teams of exemplary projects do not just design buildings and infrastructure. They engage and interact with future occupants, such as residents and entrepreneurs, to facilitate human scale solutions for a wide range of neighborhood functions.

In the Pedra Branca and Menlyn Main projects life-style change is an essential part of the urban development vision. Residents and entrepreneurs are attracted to these neighborhoods beyond their buildings and facilities, drawn in by the integrated vision of an attractive, desirable and local life-style that offers unique entrepreneurial, social and leisure opportunities. This results in neighborhoods that are found to be much more desirable and attractive, adding lasting commercial value. Last but not least, mixed-use neighborhoods also increase a community's resilience.

### 2. BUILDING RESILIENCE

From a traditional business perspective, a project is successful if the market value of the property is higher than the investment necessary to create it. Even though this requirement remains valid, there is a visible shift in urban development towards more inclusive value propositions, including social, cultural, and natural values. Doing so increases the diversity and resilience of a neighborhood and anchors the value of the project into society, which will also make it financially more sustainable in the long run. A win-win situation on all accounts.

To secure this, development of the district and the realization of its goals do not stop when the buildings are delivered, the residents continue to shape the development of the community together. This allows a neighborhood to adapt in time and continue to maintain and increase its value. This continued and long-term development can be steered and facilitated, and several strategies for this are presented in the projects. These strategies change the involvement of both the urban developers as well as the occupants significantly.

These strategies work best when projects include the (future) occupants during development, involving them in the early design process and catering to their desires and needs. The central question in this phase is: "What will make the occupants truly happy?"

### HIGHER PERFORMANCE THROUGHOUT

**Strong environmental and financial performance and usability can be mutually reinforcing. Building standards today do not require the market to deliver sustainable neighborhoods. However, a clear trend is visible around the world for higher levels of performance. Governments demand increasing energy, health and environmental performance and there is a growing demand among residents and companies for more sustainable living and working.**

Raising the ambition to truly sustainable development is generally considered to decrease real-estate profitability. The case studies show that this is not necessarily true. They do show that in order to reach higher sustainability performance while getting profitable results new strategies need to be applied. If these are successfully applied, both sustainable performance and financial performance increase.

### UNIVERSAL PATTERNS

The following increased standards can be seen in all projects, detailed to the right:

- 1 Long term financial performance
- 2 Sector-driven positive impact
- 3 Combining comfortable & affordable
- 4 Long-term performance focus





› Eva-Lanxmeer, the Netherlands

### 1. LONG TERM FINANCIAL PERFORMANCE

Developers that realize that higher sustainability targets are commercially attractive are driven to keep improving and go beyond earlier successes. New technologies with higher sustainability performance and lower cost of ownership keep emerging to support these strategies. Suppliers of these technologies work with developers to set new standards and have a competitive advantage. This effect stimulates and accelerates innovation among front-runners, for example in Lyon Confluence. Proving innovative techniques in front-runner projects paves the way towards broader application in the sector.

### 2. SECTOR-DRIVEN POSITIVE IMPACT

Many initiatives are launched to lower the impact of the construction sector on natural resources. The Climate Positive Initiative of the Clinton Foundation and Cradle to Cradle© initiatives are clear examples of how the sector is moving towards a positive impact, benefiting those that are following these new sector goals.

### 3. COMBINING COMFORTABLE AND AFFORDABLE

New materials, construction technologies, and technical installations improve the quality of houses in many ways, making comfortable living available to a larger part of the population. Although the quality of buildings are improving, the costs of utilities and other monthly expenses are generally going up. This pressures the sector to lower the cost of ownership and provide affordable living now and in the future.

### 4. LONG-TERM PERFORMANCE FOCUS

High standards for building materials, insulation and energy generation are crucial to enable low energy consumption and carbon footprints in the use phase. At the same time, it is clear that the sustainability performance is to a large extent determined by how the buildings are used, and the functioning of the district as whole.

Business models that focus on performance criteria in the use phase allow projects to distribute this responsibility and reach the desired performance. Maintaining high performance levels is particularly supported when investment decisions are based on total cost of ownership, as opposed to direct return on investment. These business models enable long-term involvement of developers and suppliers.

## 3. STRATEGIES FOR SUSTAINABLE DEVELOPMENT

**This chapter describes what new strategies are needed to realize the broader scope and higher standards of sustainable developments successfully.**

**The diagram on the next page shows an overview of strategies found at the investigated projects for each development phase. Paragraphs 3.1 to 3.6 describes these individual strategies in some detail.**

Sustainability in its full scope applies to the construction, the life-style & behavior of occupants and to the end-of-life phase. A full vision and design scope takes into account at least:

- › Energy consumption & Carbon emissions
- › Production of renewable energy
- › Material cycles & material sourcing
- › Local ecosystem enhancement
- › Social & (local) economic development
- › Healthy and happy life-styles
- › Optimal usage and continued development

This broad sustainability scope impacts the development process on the following aspects, outlined in the following paragraphs:

### 3.1 AMBITION SETTING: DESIGN FOR LIFE-STYLE CHANGE

### 3.2 INVOLVE OCCUPANTS: OWNERSHIP & CONTINUITY

### 3.3 TEAM FORMATION: MULTI-DISCIPLINARY

### 3.4 RESPONSIBLE BUSINESS MODELS: TRUE COMMITMENT

### 3.5 ENABLING ADAPTATION AND FLEXIBILITY

### 3.6 SURPLUS VALUES: SOMETHING TO BE PROUD OF

STRATEGIES USED		INITIATION	DESIGN	PRE-CONSTRUCTION	CONSTRUCTION	USE	END OF LIFE
<b>3.1 AMBITION SETTING</b>	① PERFORMANCE & END-USER CENTRED VISIONS	Focus on community performance levels	Share ambitions to enable co-creation		Guide the realization of new building standards	Involvement and/or management by community	Long-term vision includes end of life solutions
	② CERTIFICATION & LABELS	Communicate desired performance levels	Select desired certification standards		Monitoring and due diligence		
<b>3.2 INVOLVEMENT OF OCCUPANTS</b>	① EARLY INVOLVEMENT	Involve occupants as early as possible in goal setting and decision making					
	② COMMUNITY DEVELOPMENT				Facilitate lifestyle changes by community management		
<b>3.3 TEAM FORMATION</b>	① SELECTING PARTNERS	Strict selection criteria	Enlist the right project partners				
	② MULTI-DISCIPLINARY TEAMS	Co-creative design process		Stakeholder cooperation			
	③ EMBED IN LOCAL CONTEXT	Involve local parties & local expertise			Use local resources & ecosystem services		
<b>3.4 RESPONSIBLE BUSINESS MODELS</b>	① FINANCE UP-FRONT PROCESS COSTS	Pre-finance multi-disciplinary approach and involvement of all stakeholders			Return of investment through higher land and property prices and/or lower costs of ownership		Enable material mining and re-use
	② LIFE-CYCLE BUSINESS MODELS	Plan inclusion in maintenance and monitoring of performance levels			Services to monitor and manage facilities		Information or ownership model for re-use
	③ PERFORMANCE BASED CONTRACTS	Communicate responsibilities & accountability	Carrot and Stick solutions to warrant / secure performance levels		Monitoring	Evaluation and profit sharing	
<b>3.5 ENABLING ADAPTATION AND FLEXIBILITY</b>	① EMBED RESILIENCE	Make resilience an explicit goal, get experts	Ensure flexibility and diversity in all facets (program, form, scale, time)				Enable super-use
	② CONTINUOUS LEARNING	Plan for learning and improvement	Open communication and willingness to share knowledge		Performance monitoring and evaluation		
	③ GUIDANCE AND TRAINING	Identify gaps in knowledge and skill	Support project partners			Maintenance of technical installations	
<b>3.6 SURPLUS VALUE</b>	① ADVOCACY FOR CHANGE	Share vision with all stakeholders	Work with members, anticipate roadblocks	Share new solutions & initiate lobbying efforts for inadequate regulations			
	② SPILLOVER EFFECTS	Communicate ambitions to the greater region	Identify areas for expanded activity beyond project	Prepare communication materials, focus on advocacy and awareness of project		Focus on learning, formalize channels for spin-off services	

› Above; Strategies for sustainable development, divided into action points for the phases of the development process

### 3.1 AMBITION SETTING: DESIGN FOR LIFESTYLE CHANGE

Every project starts with an ambition. We see that this ambition is typically captured in a broad set of goals, both qualitative and quantitative, that reflect the scope of sustainability, and sets a baseline for the standards required. We see that for successful projects this goal-setting phase not only focusses on the construction phase (i.e. develop property that can be sold or let out in the most sustainable way), but also on performance in the use phase.

Goals for ambitious sustainable projects take into account continued development and growth of the area and the stakeholders that will live, work and enjoy life there. The studied projects all developed a user-centered vision with clear community performance goals. In turn, these challenging goals and visions help to attract the right suppliers and inspire and empower occupants to continue the development of the neighborhood.

The use of labels, such as LEED or local Green Building labelling, help to define goals clearly, and enable the projects to communicate and manage their ambition levels in an understandable, appealing, and concrete manner. Labels usually only support an ambition partially, the true goals and drivers of a project come from its community and context, not from a predefined standard alone.



*“Involvement of residents from the start proved a key success factor in Eva-Lanxmeer. It provided continuity in the process and ownership of the goals. Today, residents still feel responsible to maintain and to further develop their eco-village.”*

-Hein Struben, 2013



## 1 PERFORMANCE & USER-CENTERED VISION

A strong and credible vision attracts and helps selecting project partners with an intrinsic drive to realize the ambitions of the project. It generates support and enables adoption of the goals by the occupants. Beyond describing what the neighborhood will look like, a true vision describes how the neighborhood will operate and continue to serve the wishes and needs of its occupants.

### KEY INGREDIENTS

- › **Formulate community performance goals in time**  
Make a distinction between short-term (construction) goals, goals that will be realized in the use phase, as well as goals for the end-of-life or transformation phase.
- › **Share ambitions to enable co-creation**  
Visions supported and adopted by all stakeholders, at the very least the occupants, stand the test of time better.
- › **Involve, guide and train**  
New technologies, monitoring and lifestyle support programs help reach high sustainability levels. Guiding maintenance and construction workers as well as users to share the vision helps both technical innovation and 'soft' strategies such as behaviour change.

### Example

All goals, qualitative as well as quantitative, and all solutions applied in Eva-Lanxmeer, are co-created with and approved by its (future) residents. By creating workgroups that consist of experts and dedicated residents, all choices are chosen to match the dreams and needs of its residents.

## 2 STANDARDS & CERTIFICATIONS

Performance standards, certification & labels such as LEED and BREEAM offer universally applicable guidelines. There are many different types, from product to project level, both private and publicly issued, and some are mandatory, others voluntary. These systems help manage the ambition level of projects and gain public recognition, although if poorly chosen can hurt the performance of a project and drive up costs.

### KEY INGREDIENTS

- › **Establish desired performance levels**  
Each design process needs creativity to find the best solutions based on the local circumstances and context. Labels can support and augment the development of (specific) goals, but should not drive them.
- › **Select the right standard**  
Standards are not a guarantee for performance. Some standards are costly to implement, some don't support holistic performance, while others only serve niche areas. Choose a system that supports the message about the ambitions of the project and helps to select the right suppliers. Care should be taken that labels do not lower the potential performance of a project.
- › **Monitoring and due diligence.**  
The frameworks of labeling systems help to manage, monitor and communicate operational performance in the neighborhood and in the supply chain.

### Example

In Masdar certified materials are used to ensure the application of building materials with very high recycling percentages. The standards push what had been done in other projects around the world before.

### 3.2 INVOLVEMENT OF OCCUPANTS

**To be able to form successful goals and ambitions for a project all stakeholders need to work together and make the project their own. Higher sustainability targets can be met if the occupants understand how design choices affect the performance and user experience of the buildings and neighborhood. Especially for the long term continuity of the ambition ownership of the district goals among these stakeholders is vital, which means involving them from the start. The researched projects show that this is true for private residents, companies and shops alike, as well as the construction and development team.**

To find out the true needs of stakeholders, interactive methods for community involvement work best, such as joint idea sessions and workshops. These allow stakeholders to actively participate in the goal setting and development of the neighborhood. This requires careful management, because a stakeholder group can have members with opposing views and interests. The highest ambitions are reached when each stakeholder learns and understands the objectives of the project as a whole, and shares its larger ambition.

The stakeholders should not be guided to make the design decisions themselves necessarily, but to determine the performance criteria and operational wishes that can be used by a skilled design team to develop the plan. Feedback on this plan is then used to jointly work towards a design that achieves the ambition and has a strong and unified design.

› Stakeholder participation for the Sustainable Schiebroek-Zuid project in Rotterdam.



For occupants, weaving their dreams and ideas into the neighborhood design and community programs enables the implementation of functions and lifestyle options that maximize value for them. This often results in design choices that are not necessarily the cheapest, but that reflect the values that truly matter to the occupants.

***“Sustainability is inherently not competitive but cooperative.”***

– Silvia Lenzi (Pedra Branca)



## 1 EARLY INVOLVEMENT IN DESIGN PHASE

Neighborhoods that support the needs of their occupants benefit from increased demand and sustained higher property value, for example in Menlyn Maine, Eva-Lanxmeer, Dockside Green, and Pedra Branca.

### KEY INGREDIENTS

#### › A vision based on true needs

The best way to build high value property is to understand the needs and desires of stakeholders and accommodate them. To trigger and extract these, multiple interactive work sessions with future occupants are organized where experienced facilitators guide them through a vision process.

#### › Involvement of future occupants

Early involvement of future occupants is essential to incorporate their needs and desires. Most projects do this top-down, involving occupants in a predetermined process by the developer. A bottom-up approach reverses this, where the central project team consist of its future residents that need to agree with all design choices (Eva-Lanxmeer). This increases ownership and involvement of occupants. A risk involved with the bottom-up approach is the "design-by-committee" syndrome: when stakeholders become too detail oriented about the actual design the overall quality suffers. A combination between top-down and bottom-up works best.

### Example

In Menlyn Maine, office buildings and neighborhood programs were designed together with the companies that wanted to settle there. This resulted in a food program on the rooftop of an office building to facilitate attractive and healthy lunches.

## 2 CONTINUED COMMUNITY DEVELOPMENT

The use-phase of a project has the most influence on the development of the local economy, the community and the realization of most sustainability goals, and this is where the most value is created. Because of this, community involvement after construction is complete helps to retain performance and continue to increase value over time.

### KEY INGREDIENTS

#### › Lifestyle change, social and economic development

Project developers set up programs together with local stakeholders and residents to support the continued social, economic and ecological development of the neighborhood. Programs initiated by the project developer can be transferred to professional and (self-organizing) community organizations over time.

#### › Continued value creation

The ongoing development of a neighborhood benefits from professional organizations that ensure proper maintenance and support of ongoing development of the area.

### Example

The developing company Pedra Branca S/A set up professional organizations to run and maintain facilities (e.g. tap water) and develops the neighborhood (e.g. lifestyle programs). Only after these organizations are up and running are they transferred to local residents. By setting up these organizations, Pedra Branca learned how future systems, buildings and neighborhood programs can be organized for future projects.

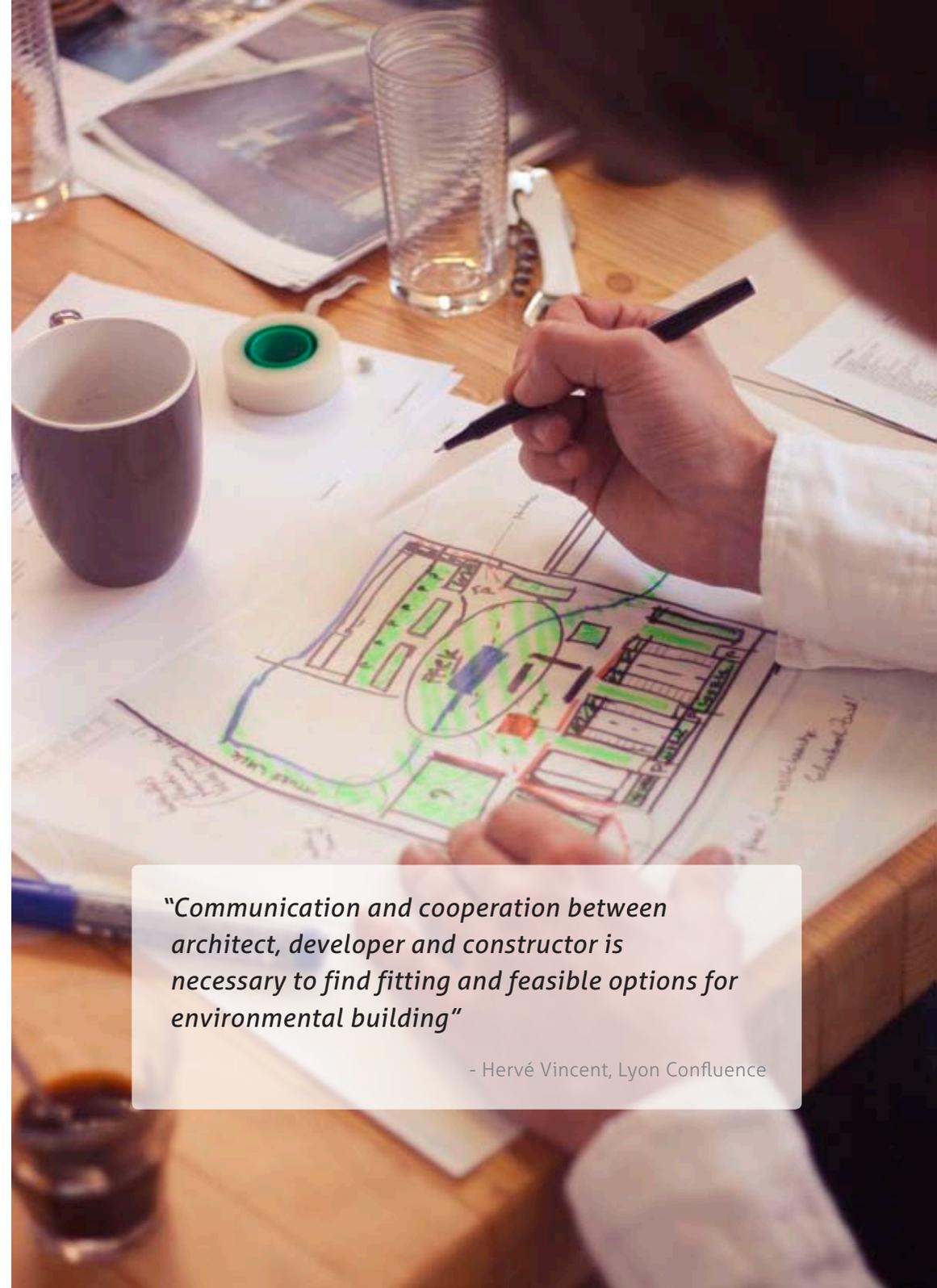
### 3.3 DESIGN REQUIREMENTS

**The broad scope in ambition significantly affects the demands for the development and design team. Traditionally, a construction processes requires a handful of disciplines, such as architecture, construction, engineering, property development, etc. The broader goals demand more disciplines, and a tighter cooperation throughout all phases.**

New knowledge required for sustainable development includes material sourcing and recycling, renewable energy, water purification, local food production, ecology, and autonomous social and economical infrastructure. This knowledge is typically in the possession of other types of disciplines than are traditionally part of a development process. The success of projects depends on the performance of these new multi-disciplinary teams. It's a challenge to manage these disciplines to work together smoothly across the development process.

Finding the right project team is fundamental. Investing time and money in selecting capable, motivated and committed partners that cooperate well pays off in later project phases in terms of reduced process and failure costs, and increased performance.

This team needs both members that have the knowledge and experience concerning these new areas, and members that have a proper understanding of the local social, economic, and environmental context.



*"Communication and cooperation between architect, developer and constructor is necessary to find fitting and feasible options for environmental building"*

- Hervé Vincent, Lyon Confluence

## 1 SELECTING PARTNERS

Careful selection of project partners ensures quality knowledge levels and experience, willingness to learn, motivation and a sense of ownership of the project goals. These qualities generate advantages in all project phases.

### KEY INGREDIENTS

#### › Strict selection of project partners

A selection process with strict selection criteria, non-negotiable terms for cooperation & joint responsibility, and taking the time to get to know all project partners will ensure that the most capable and motivated project partners are chosen. Parties should be chosen as a team, not one by one as individuals. For example, an architect may be brilliant but not have the right cooperative skills in a synergetic team.

#### › Alignment of ambitions

A key social asset in projects is to align and couple the intrinsic motivation of project partners. This stimulates excellence of work and the willingness to shoulder the risks involved in delivering performance.

#### › Cooperative attitude and involvement

Essential characteristics of project partners to successfully and creatively overcome the projects sustainability challenges are the willingness to share knowledge, work in teams, and commit to the project goals.

### Example

The tender process in Lyon Confluence was arranged so that only multi-disciplinary developer teams could apply. This enabled the project owner to compensate for the typically dominant position of the architect in the development process.

## 2 MULTIDISCIPLINARY TEAMS

A mix of experts is required to work synergistically across different facets of the urban context. A multi-disciplinary design process leads to more integrated design solutions and improves insight, costing, and ability to identify and solve problems early on.

### KEY INGREDIENTS

#### › Mix a broad set of disciplines

Key insights come from unexpected areas. Beside the required extra disciplines for sustainable development such as ecologists and energy experts, other disciplines such as urban sociologists and journalists add great value to a project.

#### › Collaborative design process

A collaborative design process allows each expert in the team to add their valued knowledge. The workload of experts differs in each stage of the development, but all disciplines remain necessary in each phase to ensure the realization of goals and continued development.

#### › Stakeholder cooperation

Stakeholder cooperation in the design phase improves the quality and unity of the work. This leads to an increased sense of project ownership, better project planning, and more integrated design solutions that are better able to address all sustainability goals.

### Example

In Eva Lanxmeer a bottom up process was organized from the start to include experts and residents in all design choices even in the initiation phase. In Pedra Branca multi-disciplinary design workshops were organized top-down to enable cross-disciplinary design process and involvement of local stakeholders.

## 3 EMBED IN LOCAL CONTEXT

There is no one-size-fits-all solution: truly sustainable projects maximize their interaction with their context. This allows projects to connect to the local needs of occupants, improves the quality of life and overall attraction of urban districts. In addition, the local context provides opportunities to lower supply chain impact, for example through local sourcing, re-use of materials, closing material cycles, and using ecosystem services.

### KEY INGREDIENTS

#### › Local expertise

Successful implementation of new urban concepts requires involvement of local expertise as they are intimately familiar with the local social, economic, and environmental circumstances. Non-local architects with knowledge of advanced concepts can be selected to develop the urban plan. However, local experts have to guide the design team to adapt the designs for local cultural and climatic conditions.

#### › Local resources

Selecting the right materials and construction techniques requires a proper understanding of the local construction sector and local suppliers. The availability of local expertise and capacity to innovate determines which material and construction innovations are feasible.

### Example

In Hammarby Sjöstad, using integrating waste management with district heating together with expertise from local infrastructure companies enabled a comprehensive and integrated eco-infrastructure that saved energy and costs.

### 3.4 NEW BUSINESS MODELS

**To ensure that performance of a sustainable urban district is realized and not just stated on paper, or degrading over time, long-term incentives can be built in. Business models that support the ambitions of the project and incentivize each stakeholder to deliver to the best of their abilities is a successful strategy. This performance-oriented development is triggered by embedding financial incentives for all parties to secure the goals in the use phase.**

Some of the studied projects apply carrot and stick incentives to reward or impose penalties to stakeholders for the design phase, which works well. These incentives ensure involvement of the parties well beyond the design phase. The incentive stimulates parties to correct design mistakes and it stimulates the designers to guide the construction and use phase to ensure that new technologies will be installed and used in accordance to the design specifications.

To do this, the start-up phase requires investigation into possible business models. This requires more resources in the early design phase. These process and development costs need to be earned back and the business model of the developer needs to be aligned with the long-term benefits in order to make this work.

Life-cycle business models incorporate the long-term benefits to make sure that the incentives of the occupants (shops, residents, companies), the developer and the investors are aligned. Feedback mechanisms such

as result-based reward systems, ensure that realizing the long-term goals is beneficial for all.

In many projects, performance-based contracts are used to enable profit sharing or to impose penalties based on the realization of goals. Linking the total cost of ownership or the costs of living to the benefits of the suppliers and the project developer, ensures that the required operational performance levels will be met.

*“Especially during the real estate depression the low cost of ownership proved to be one of the project’s key success factors. It showed us that ‘sustainable buildings’ are in fact affordable.”*

- Jurgens van Huyssteen, Menlyn Main



## 1 FINANCE UP-FRONT PROCESS COSTS

More resources are needed at the start of sustainable projects to enable the stakeholder involvement, new business models, up-front collaboration and local context design. These costs are returned through higher property values, lower cost of ownership and a high market demand.

### KEY INGREDIENTS

#### › Pre-finance multi-disciplinary teams and occupant involvement process costs

In the studied projects, investors who pre-financed up-front process costs for locally adaptive design and stakeholder involvement benefited from higher quality projects and increased property value.

#### › Benchmark added project value

It is hard to pinpoint the benefits of a multi-stakeholder approach. This doesn't make it less important. In Eva-Lanxmeer, Menlyn Main, Dockside Green and other projects, the added value (ie. higher market value and lower cost of ownership) significantly outweighed the extra process costs.

#### › Incorporate flexibility and end-of-life value

Enabling re-use and material mining increases end of life property value and immediate value of buildings.

### Example

Through Stockholm's leasehold land system, tax income is generated that is re-invested in the city. This enabled the city to make the comprehensive designs of Hammarby Sjöstad. In Eva-Lanxmeer, the market value of the property exceeded the initial taxation of the project. The added value is used to repay the initial process costs that were financed by the local government.

## 2 LIFE-CYCLE BUSINESS MODELS

Developers can generate more income by becoming more actively involved in the use-phase of a project and aligning their business models to match this role. This aligns their incentives to realize (long-term) performance goals, as the performance in the use phase affects their business case. In addition, by realizing the innovative and high performance new buildings enables them to gain a competitive advantage through experience.

### KEY INGREDIENTS

#### › Organize inclusion in the use phase

In the first phases of the development, all members of the development team address their role to support continued performance development in the use phase.

#### › Facilitate continued business-model development

Continued development guided by professionals increases value and lowers costs.

#### › Manage and monitor performance levels

Maintenance, monitoring, and optimizing performance levels have a high return on investment.

#### › Information and ownership models for re-use

Embedding end-of-life solutions in the design enables retrieval and re-use of materials, saving costs.

### Example

Pedra Branca aligned their incentives with the interests of local shop keepers. The lease price for shops is related to their turnover. If the area fails to attract customers both parties will suffer a lower income. Pedra Branca also set up professional support organizations for maintenance and continued development. The organizations are transferred to residents only after they are up and running.

## 3 PERFORMANCE-BASED CONTRACTS

Performance-based reward systems directly stimulate all parties to perform their role as best as possible for the whole. Reward systems in the reviewed projects included bonus and fine structures that are linked to the realization of the desired goals.

### KEY INGREDIENTS

#### › Team formation using responsibility & accountability

Shared financial incentives for the realization of the aspired performance levels help to attract capable and reliable project partners and stimulate realistic goal setting.

#### › Carrot & stick solutions increase performance

Financial reward (or fine) systems create a shared incentive to meet the aspired goals. Linking the financial rewards of project partners to the actual performance in the use phase ensures that all parties actively pursue the realization of the predefined goals throughout the project.

#### › Monitoring and evaluation.

Implementing monitoring and evaluation systems early on in the process enables performance-based contracts, and quantifies increased value during and after construction.

### Example

Dockside Green's development is based on a "triple bottom line" tendering process, and a financial penalty of 1 million dollars which was agreed to by all parties if their performance targets were not met. This system favored progressive developer teams that pushed ambitious social and environmental benefits for the site.

### 3.5 ENABLING ADAPTATION AND FLEXIBILITY

Integrating sustainability in urban development means working with a new and diverse set of concepts, knowledge, techniques, and stakeholders, which also change over time. This process requires parties to think and work differently. Key strategies to achieve results in this environment are to share knowledge, plan time to learn, and strengthen communication between all stakeholders throughout the construction and use phases. Also, the realities of neighborhoods change over time. In order for an urban district to continue to be sustainable, it needs to be flexible enough to adapt itself to changing conditions. Embedding adaptive strategies help to establish neighborhoods that do not just perform now, but also in the future.

The key word for future-proof developments is resilience. Resilience is the capacity for a community to withstand sudden or gradual changes on a variety of levels, and still continue to flourish in a healthy way. Flexibility is an essential component of resilience, and so are fairness, transparency, connectivity, and autonomy, among others. These aspects need to be balanced both in a physical sense as well as in economic, social, and environmental ways. This is a continuous process of understanding, learning, adapting, implementing and monitoring.

Learning is a fundamental process for project partners to develop the necessary knowledge and skills to successfully design, implement and maintain urban innovations.



> Dockside Green, Canada

*"Communication, education, and explanation on issues of sustainability was important throughout the development process"*

- Karine Lapray, Lyon Confluence

## 1 EMBED RESILIENCE IN ALL FACETS

As the context for neighborhoods change over time, so do the needs and desires of its occupants. A resilient district transforms itself to match the needs of its occupants and continues to build value. This is achieved with the right mix of flexibility, self-organization, diversity, and transparent decision making structures.

### KEY INGREDIENTS

#### › **Transparent local autonomy**

If the neighborhood can make its own decisions and is responsible for its own basic resources such as water, energy and waste, it can adapt faster to changing conditions and adapt the neighborhood to local needs.

#### › **Flexibility and diversity**

Flexibility is important to be able to change the program of buildings and urban spaces to suit new uses, as well as future re-purposing of the site. This is best realized through a high level of diversity (in scale, program, occupants, etc) rather than modularity, allowing for a richer and more vibrant urban environment.

#### › **Circular resource networks**

By closing energy and material cycles in the neighborhood, increased options are available in the future to reconnect these cycles in different ways to balance energy and resource use, making it more resilient.

### Example

The Eva-Lanxmeer project offers a wide variety of housing typologies, technologies and program. This diversity makes it exciting and inspiring to live in as well as visit, increasing its value. As demographics in society shift, many options are available for a variety of occupant types, including elderly, children, students, and families.

## 2 CONTINUOUS LEARNING

The learning process is crucial to improve the quality of designs and to implement innovative solutions. Organizing for learning supports problem solving and induces a reflective mind-set. This reduces failure costs in each phase, while improving stakeholder motivation, quality of the project and final project performance.

### KEY INGREDIENTS

#### › **Plan for learning and knowledge sharing**

Investing resources at the start of the project to organize learning and knowledge sharing helps to prevent set-backs in later project phases, and creates opportunity to make improvements.

#### › **Performance monitoring and evaluation**

Monitoring the progress in the realization of the district goals helps to identify and solve bottlenecks as early as possible throughout the project.

### Example

The CONCERTO program in Lyon Confluence shows the importance of supporting the design process with environmental and energy expertise. Initially, architects questioned if sustainable goals could be aligned with other design ambitions. Contemporary building designs now accommodate highly innovative sustainable technologies. In the following development phases design teams were required to have sustainability experts at the core of a multi-stakeholder design process.

## 3 GUIDANCE AND TRAINING

Providing support to help implement innovative concepts and technologies reduces the cost of failure, and helps to ensure that new technologies are implemented and used correctly. For suppliers this is important to protect the image of new technologies. In addition, it relieves building owners of risks with those techniques.

### KEY INGREDIENTS

#### › **Identify gaps in knowledge and skill**

Investing time at the start of each phase to assess the capabilities of project partners helps to determine the need for support. Not addressing a lack of knowledge and experience often leads to mistakes, project delays and high failure costs.

#### › **Interaction between designers, suppliers, installation and maintenance companies**

Involving suppliers, maintenance companies, and construction and installation workers to ensure that new technologies are properly installed and used is vital in guaranteeing continued sustainability performance of the district.

### Example

The structural involvement of international sustainability experts to support local project partners proved to be a key success factor to increase local awareness and knowledge on sustainability in almost all studied projects. This allowed for more efficient management of the project and more effective contribution of local design partners.



### 3.6 VALUE THROUGH LEADERSHIP

The attachment and pride that people have about their projects is prominently visible in all studied urban districts. This is a valuable surplus asset that sustainable projects generate. Contextual factors such as climate, local industries, and especially cultural norms and values determine the totality of the performance of a project. These surplus values are gained by creating positive effects on neighboring areas and legislation to help future projects. The pride and honor that people take in their work drives them to look beyond their own project. In turn, the projects receive support from local authorities and gain a positive image that help sell or let out the property.

Focusing on this "surplus value" and communicating it at all stages of the project offers several important benefits. Firstly, spreading this information helps gain regional, national, and even international notoriety. Broad public support often creates new market demand and competition for companies that address sustainability in their work.

Secondly, actively working to advocate for new sustainability solutions drives innovation at a broader level. Specifically, working with governments results in new public-private partnerships that demonstrate more sustainable ways of building and managing public assets.

#### 1 ADVOCACY FOR CHANGE

**Advocacy is an effective instrument in communicating and pushing forward sustainability goals. This earns financial and ownership benefits through government and community support, (tax) exemptions, improved image, reciprocal knowledge and the opportunity to self-manage infrastructure and public programs.**

##### KEY INGREDIENTS

- › **Reach out to government early-on**  
Communicating sustainability ambitions earns critical support in the early phases of the project, and prompt governments to think differently about design and management of public infrastructure and social programs.
- › **Form external partnerships and anticipate roadblocks**  
Close collaboration with government opens the door to opportunities for the project such as private-public partnerships or pilot programs. Working with government also helps understand regulatory roadblocks, and strategies for avoidance early-on.
- › **Share solutions & lobby for innovative regulations**  
Advocating change has powerful systemic effects. Technical or policy successes demonstrated in a project can be scaled up and broadly replicated.

##### Example

Codding Enterprises (Sonoma Mountain) adopted a philosophy called 'developer advocacy' whereby progressive laws and regulations are lobbied for not only the immediate project, but at a regional or even national scope. The idea has led to many important policy changes and exemptions, which benefits future developments.

#### 2 SPILL-OVER EFFECTS

**Innovative projects are a "beacon" for regional transformation. Actively involving neighboring areas catalyzes social and political change, and can boost the regional economy. Regional spin-off effects boost the image and market demand for the entire region and the development project in particular.**

##### KEY INGREDIENTS

- › **Communicate ambitions to your neighbours**  
Communicating the sustainability and lifestyle ambitions of the project helps capture public interest and drives local market demand.
- › **Involve regional parties, identify areas for expansion**  
Many of the successes of a project can be replicated and adapted to neighboring communities. Expanding initiatives outward by involving regional parties in the process are a means of creating long-term and meaningful impact for people in the region.
- › **Channel learning into new services**  
Skills and knowledge generated in the project provides new business opportunities and boosts the local economy by developing new services and trades.

##### Example

In Pedra Branca the new district provides an opportunity for neighboring residents to generate business. Waste management programs provide jobs for people living in nearby favelas. Setting up programs to improve the situation in those favelas benefit the image of the entire region and improves living conditions in both Pedra Branca and the favelas.

## 4. SECTOR-WIDE APPROACH

**The impact of sustainability on urban development and the strategies identified in chapters 3 affect the design and construction sector in many ways. The innovative strategies and the new ways of working require fundamental changes of the design and construction sector. This chapter describes approaches that enable large scale implementation of the strategies for sustainable development sector-wide.**

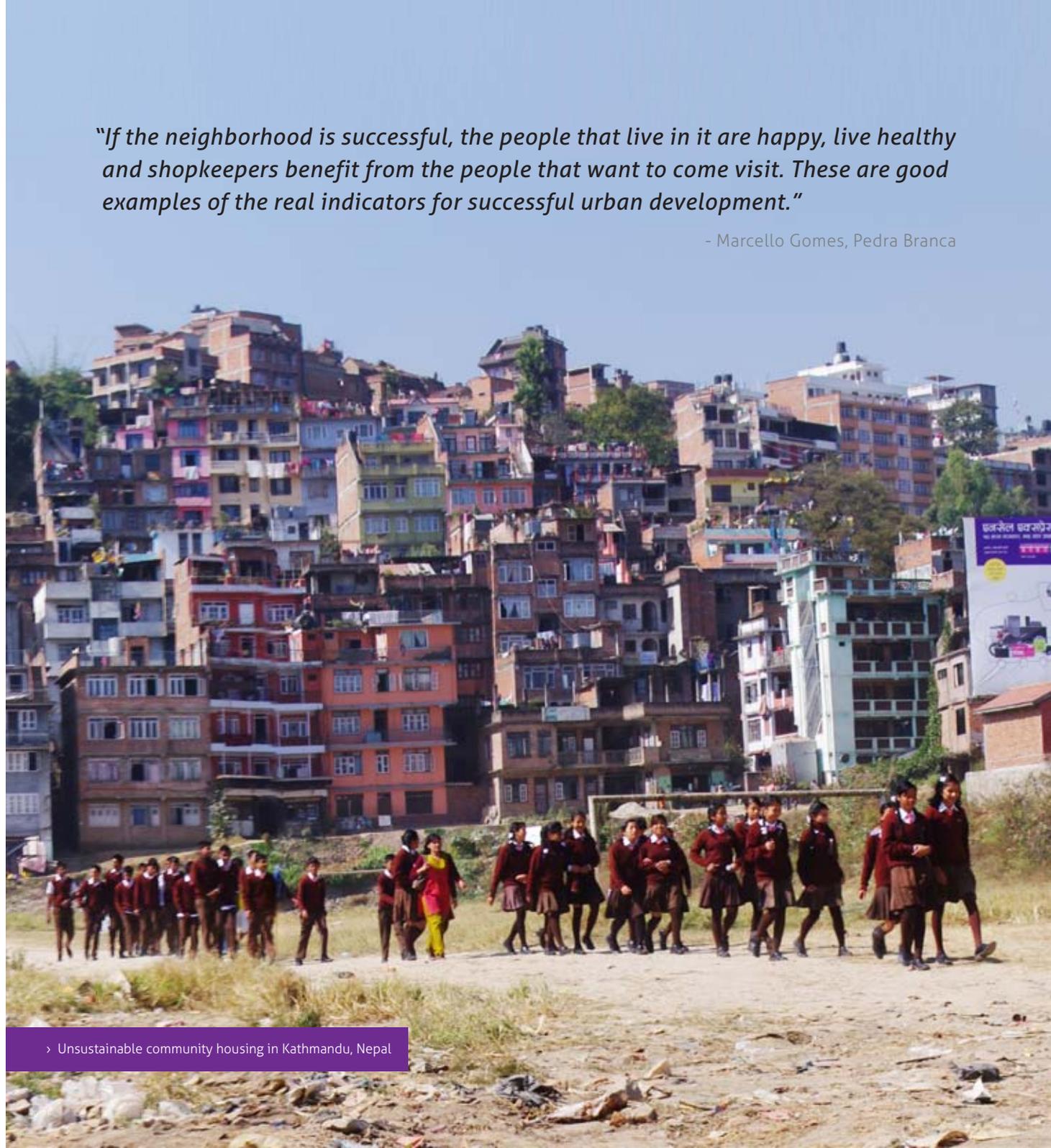
Applying the strategies for sustainable urban development on a larger scale requires the sector to:

- 1 Understand that good neighborhoods boost value
- 2 Initiate cross-sector innovation
- 3 Speed up application of innovative technologies
- 4 Efficiently and effectively share knowledge and experience
- 5 Measure its success by monitoring the actual performance of the urban neighborhoods and their communities
- 6 Incorporate all values in the business case and financing conditions for urban development.

The following paragraphs explain these in more detail.

*"If the neighborhood is successful, the people that live in it are happy, live healthy and shopkeepers benefit from the people that want to come visit. These are good examples of the real indicators for successful urban development."*

- Marcello Gomes, Pedra Branca



› Unsustainable community housing in Kathmandu, Nepal

## 1 GOOD NEIGHBORHOODS BOOST VALUE

**The construction sector creates buildings, public spaces and roads, but the most important impact of urban development is the wellbeing and appreciation of the people that visit or live in the neighborhood. Occupants' appreciation reflects upon the image of the region and affects the property prices and the success of commercial activities in the district as a whole. Their lifestyle and behavior affects the actual sustainability performance of the neighborhood: the core values one hopes to achieve. Creating awareness about this across the sector, supported by clear use cases that demonstrate increased financial benefits, is one of the most potent means to improve the sector as a whole.**

### EFFECT ON DESIGN PRINCIPLES

The core values of wellbeing and happiness are the real indicators for successful urban development and are directly related to how the neighborhood functions. A well performing district enables people to live desirable life-styles that allow for social contact, development of economic opportunities, fair costs of living, comfort, and safety. It creates ownership among the stakeholders and allows them to take responsibility of the neighborhood, which in turn enables continued development.

### STIMULATE DIVERSE AND FUNCTIONAL NEIGHBORHOODS

Diversity is key. Many of the studied projects focus on mixed-use development. They build for a mixed group of residents, with different income levels, social backgrounds, etc. In addition, functions are mixed (live, work, leisure, shopping, etc.) to lower transportation needs, make them more interesting and offer more op-

portunities for residents and businesses over time. This forces the involved parties to think about the relations between different people, buildings, shops, meeting places, streets, and traffic. Stimulating higher diversity in planning across a region, nation and internationally improves performance of the sector.

### IMPACT ON THE SECTOR

Embedding core values in urban development requires the sector to prioritize long-term performance goals over short-term construction objectives. As more parties play a role in the design phase, the role of urban developers and architects changes significantly, which should be reflected in educational programs and sector training.

### CHANGING ROLE OF INVESTORS

The role of investors shifts from creating marketable property to "Responsible urban financing": committing to the creation of resilient and flourishing districts. This boosts both financial return, and resilient investments in the long term. A trend is visible for banks and investors towards 'Socially Responsible Investment'. Stakeholders in the finance sector want to show that they invest in sustainable projects, and this can be done by including performance targets related to sustainability in their investment criteria and valuing structural cost savings.

In addition, the value of a project is influenced by incentives that enforce or stimulate the realization of its performance goals. Banks and investors benefit greatly when they utilize 'Life-Cycle Business Models' and 'Performance Contracts' as described on page 27, as they lower risk in projects and strengthen projects in realizing their upfront formulated performance goals.

### RAISING AWARENESS OF THE IMPACT AND ADVANTAGES

In general, the awareness of these core values in the industry is still low. The strategies discussed in chapter 3 show that awareness affects the entire development approach. It changes the way we measure success, it requires more disciplines to be involved early on, and it changes the roles and manner in which professionals interact.

Change can best be stimulated by providing examples that prove that sustainable design approaches outperform traditional urban development approaches.

### KEY RECOMMENDATIONS

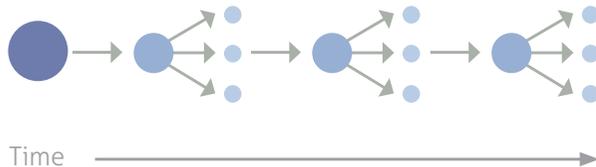
- › Share and create examples that prove that a focus on core values is beneficial in the short-term and the long-term.
- › Innovate development processes for early involvement of stakeholders and neighboring communities to incorporate the demands and wishes of (future) occupants. Ask residents, shopkeepers and businesses what they want, before designing buildings.
- › Focus attention and support parties to deal with a broad scope of sustainability goals. Steer away from a single-focus development. Challenge the sector to develop mixed-use and functional districts.

## 2 CROSS-SECTOR INNOVATION

**Urban development is not just about managing the expectations of what the district will look like, it's as much about managing the expectations of how it will function. The issues that need to be addressed for this range from cost of living, minimization of energy use, production of renewable energy, social development, development of local economy, impact on the environment, to even the impact on the life-style of occupants. As a consequence, the skills needed in projects accumulate. Encouraging all project partners to collaborate requires a mind-set for cooperation, exchange of ideas and willingness to work together in cross-sector innovation projects. This requires the breaking down of walls across the sector and partnerships to create new forms of collaboration.**

### BREAKING DOWN WALLS TO ENABLE OPEN COOPERATION

The broad sustainability scope and high ambition levels for urban development require a network-approach, or collaborative structure. This approach steers away from the linear structure in which the majority of design and construction processes are organized, in

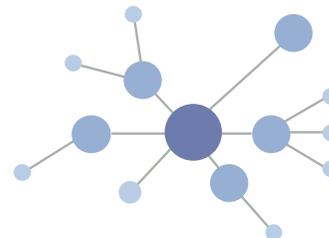


In a traditional development process processes are executed sequentially.

which each party has a clear, more or less independent, confined task. The projects discussed in part 2 of this report rely on a collaborative approach, with input from a broad team with many different experts in the design and creation process.

### CHANGING ROLES AND DYNAMIC COOPERATION

A network-approach significantly changes the dynamic of teams and the roles of their members, e.g. the role of the architect and the need for more cooperation in the researched projects. The development manager plays a central role to facilitate cooperation and information exchange between all required stakeholders. This can be supported by good knowledge management tools, standardized cooperation contracts, collaborative Building Information Management (BIM) software, and regular face to face update sessions. Aiding the sector by providing these tools and proper training greatly helps the sector. For example, the usage of BIM wildly varies across the world, even among western countries. Countries that lag behind in BIM implementation can leapfrog into a better position by choosing a proven



In a collaborative structure multiple parties come together at the start of the project, and move through the process as a whole, single network.

standard from abroad and roll it out sector wide.

### TEAM CREATION AND WORK METHODS

Parties working together have to be willing to share ideas and learn from each other. Functional solutions are best created through team-effort and consequently visualized and materialized by architects. This way of working requires a culture change towards more cross-sector cooperation and a cross-sector innovation mentality. We consider this to be one of the biggest challenges for the sector.

### KEY RECOMMENDATIONS

- › Stimulate cooperation of disciplines, with specific attention to change an open cooperative culture.
- › Foster the creation of cooperative work environments in which all parties take part in the decision making processes.
- › Stimulate the use of cooperative tools across the sector to create unified standards.
- › Partnerships for long-term cooperation make it easier for parties to work in an open and cooperative manner.

### 3 DISSEMINATE TECHNOLOGIES AND INNOVATION

**The construction sector avoids failure costs and is reluctant to offer clients sustainable innovations that they have little experience with. The construction sector is also traditionally organized in a linear process where construction techniques, materials and installations are combined in a one-off process from start to finish. Consequently, each construction process has its own challenges and its own risks of failure, and sustainable innovation doesn't drive risk directly. This skewed perception is widely recognized as an essential barrier for innovation.**

#### GUIDANCE, SUPPORT AND GUARANTEES

The supply chain can lower the barrier for innovation by taking financial responsibility for the final performance of projects. The failure rates for innovative technologies are reduced if the construction workers are better trained and guided in their work. This can be aided by new tools and mobile devices that allow suppliers to guide the construction and train remotely.



#### LESS COMPLEX CONSTRUCTION METHODS

The studied projects show that in many cases traditional construction methods are used when the skills for more innovative construction methods are locally unavailable. Innovative construction methods are simply too complex: they require specific knowledge, equipment or experience. Innovation in the sector is accelerated if suppliers offer easier to assemble building techniques. Design for Disassembly is an approach used in other industries to improve this. It has also proven to lower assembly cost. In addition, application in the construction sector will enable better re-use of materials.

#### CROSS-SECTOR INNOVATION

The sector is scattered into many different industries (eg. glass, steel, concrete, wood, plaster, energy and ventilation installations, domotica, insulation, etc.). Cross-sector innovation speeds up the implementation of highly sustainable techniques if more integrated solutions are offered with high performance levels for energy-use, indoor air quality, natural light and/ or shading etc.

#### CROSS-SUPPLY CHAIN INNOVATION EXAMPLE

In the Netherlands a new form of social housing renovation is made possible by changing the way housing corporations assign projects to construction companies. The construction companies are challenged to offer solutions that improve the business case for housing companies, lower the cost of living for residents, while improving comfort and health standards. These performance targets changed the role of construction companies completely. In their new role they

build coalitions with different types of suppliers that together co-create designs that deliver unprecedented performance. New renovation concepts now allow for a complete home makeover in 5 to 7 days. These result in houses that look new, are energy neutral, and lower the cost of living for residents from the day they move in. This supports the performance scope of newbuild projects, as trends in consumer preference are changing faster and faster.

#### KEY RECOMMENDATIONS

- › Stimulate cross-sector innovation to enable easier to apply techniques with high performance levels.
- › Create solutions that can be adapted to different circumstances, climates and environments.
- › Use new media techniques for remote guidance to allow the use of innovative techniques on construction sites.
- › Design for re-use and disassembly to make the assembly of buildings and structures easier.
- › There is not one construction method or material that should be used in all projects. What works if suppliers of different materials and techniques work together to create an array of integrated construction and design techniques.

## 4 SHARING KNOWLEDGE AND EXPERIENCES

**Knowledge and experience are crucial for innovation. Knowledge sharing within projects is essential to allow all disciplines to work together and design integrated solutions. Across the sector, sharing knowledge with third parties contributes to spin-off in the region and/or in other projects abroad.**

### GOAL-ORIENTED PROJECTS GET HIGH INNOVATION LEVELS

Fostering the use of performance and goal oriented design greatly enhances the performance of the sector as a whole. Asking suppliers the right questions enables true innovation and valuable cooperation. Narrow questions result in limited options, whereas open questions can lead to innovative solutions. For example, if a developer asks his suppliers to build a LEED Silver building, he will get a design for just that. If he asks for the best possible option to realize property with a competitive commercial business case and high sustainability performance, the final proposition may very well have a higher LEED standard and include finance structures to allow for higher initial investments, and retain its value longer. In Masdar and Menlyn Main,

the suppliers were asked to deliver solutions that outperform the (local) market in sustainability and enable good business cases. Suppliers and developers shared knowledge and invested in the learning process to develop products with better sustainability qualifications and lower the construction cost.

We learned that in sharp contrast to limiting the range of solutions through adding detailed specifications, better results are achieved if developers share their ambition and challenge suppliers to come up with the best possible solutions to meet that ambition.

### MIXING INTERNATIONAL AND LOCAL KNOWLEDGE

A much used strategy is to create a project team with local and international / non-local professionals. This allows for a broader range of knowledge and knowledge exchange and enables the team to really understand the local context. In addition, it stimulates the development of local expertise. To allow learning, work methods are chosen that encourage close cooperation and sharing of knowledge.

### BENEFITS OF KNOWLEDGE SHARING

Innovative projects often serve as demonstration projects. They are truly valuable if they share their experiences and document work methods, lessons learned and the barriers they encountered. The studied projects that did share their knowledge benefited in turn from extra attention, that actually enabled them to learn as well.

Greenwich and Dockside Green contributed to new legislation. Eva-Lanxmeer provided documentation that was used in other projects in the region. These projects benefited from the positive image and the increased support.

*“At the speed of today’s developments our diplomas have increasingly shorter lifespans.”*

– Dr. Luciano Rodrigues Marcelino (Unisul)

### KEY RECOMMENDATIONS

- › Enable learning in any work process by: asking the right questions, allowing time for learning, and by choosing work methods that support learning and open cooperation.
- › Documenting project experiences will help other projects. It will also create visibility and generate extra response for additional learning opportunities.
- › Showing how surplus value has been realized will benefit other projects, but also generate and result in support.

## 5 PERFORMANCE MONITORING

**Monitoring systems can be applied on many levels, i.e. dealing with the origination and impact of a single material, installation performance, energy systems in a building, or monitoring community development and happiness levels of the people that live and work in a district. Stimulating standards for monitoring reduces the threshold for monitoring implementation for projects across the sector.**

### MONITOR HOW THE DISTRICT FUNCTIONS

The monitor system is closely related to the vision and central goal of the project, namely to create a functional neighborhood. This goal requires monitoring systems that use the right indicators that reflect how successful the district is for all its stakeholders. Through evolving monitoring systems and broadening their scope from

the performance of a single object to a much more effective system level, the sector will gain support in the realization of their urban visions and community development.

### PROVIDE FEEDBACK TO STAKEHOLDERS

Behavioral changes take time and require active involvement of stakeholders. Monitoring systems prove to be highly effective in raising awareness and affecting the decision making process of occupants in their everyday activities. Communicating and sharing community performance levels over time will keep stakeholders involved, ensure that important aspects of the vision are remembered and it will encourage them to actively pursue continued development.

### CONSOLIDATE LABELS AND CERTIFICATIONS STANDARDS

There is an abundance of labels and certification standards, most of which contain many advantages and useful elements. However, consolidating the labeling systems will benefit the sector, as simultaneously maintaining multiple labelling and certification standards is cumbersome for suppliers. Actively organizing cooperative, streamlined certification standards will relieve this issue while safeguarding the focus on specific, essential content for projects.

### KEY RECOMMENDATIONS

- › Foster the application of active monitoring of the performance of districts. This creates a better learning experience and a mind-set to steer towards functional neighborhoods.
- › Provide feedback to stakeholders about the performance of neighborhoods. This can be focussed on physical performance as well as lifestyle and social performance. Monitoring and providing feedback is essential to change behavior.
- › Support consolidation of certification standards and labels, while allowing the focus on essential and specific innovative elements within individual projects.



## 6 RESPONSIBLE FINANCING

**Align the incentives of all parties across the sector and supply chain using business models that steer towards long-term sustainable development. Business models that will benefit from positive long-term performance will automatically steer towards more (hands on) inclusion in the use phase and adopt measures to stimulate continued development. This can be done by:**

- › Coupling the income of the developer to i.e. the turn-over in the shops. In Pedra Branca the commercial success of shops is directly linked to the rent the project developer will receive. This way the incentive to create a functional neighborhood will be shared by all parties.
- › Direct involvement in community management. In many projects a company was set up to design and build the district and to develop the community. The continued involvement changes the mind-set. It focuses the attention of the developer to the use phase, and not just to the completion and sale of the building.
- › Make developers responsible for operational performance. If developers build via DBFMO (Design, Build, Finance, Maintain, Operate) contracts, their business cases benefit from an optimal total costs of ownership (TCO). This extends their financial horizon to include operational costs. The building benefits from an optimal TCO as well if the developer remains the owner. In addition, a positive reputation of the district affects the price of the property. The

developers indicated that apart from financial involvement, the experience of operating their own buildings enabled them to design better buildings for subsequent projects.

The sector can accelerate sustainable building by changing the business models and contracts to enforce long-term involvement.

### RESPONSIBLE FINANCING

Investors significantly influence the way we build. Financial contracts can involve guidelines to align the financial incentives with truly sustainable development, i.e. responsible financing. Through initiating programs to develop such guidelines, the sector can stimulate investors to abide by them and invest accordingly whilst gaining better return on investment.

*“Longer-term and close cooperation between architects, engineers and construction companies enabled us to lower the initial investment for a highly sustainable building by as much as 30%.”*

- Jurgens van Huyssteen  
(project developer Menlyn Main)

### FINANCE MULTIDISCIPLINARY DESIGN APPROACHES

Involving more disciplines and professionals in the design phase may require extra process costs. However, doing so also prevents failure costs and adds significant value, as is shown in the studied projects. In fact, in long-term development projects, the cooperation enabled design teams to lower the initial investment for sustainable buildings by over 30% (e.g. Menlyn Main).

There are different ways to finance the up-front process costs to involve all the required disciplines:

- 1 Pre-finance the design costs and allow payback via higher land and property prices (i.e. Eva-Lanxmeer). This approach requires one party, the developer or municipality, to finance the upfront costs. Per project this will require an extra, small, initial investment, which will avoid failure costs and add more value. Hence, this investment can be done via a revolving fund. Pre-financing in the studied examples was sometimes done by municipalities, but also by investors that understood how the desired performance indicators result in financial advantages.
- 2 Work with long-term performance contracts to include reward or penalty systems. This approach requires all parties that contribute to the design of a functional district to invest in the process and bear part of the risk. In turn, the involved parties can benefit from designs that meet the desired performance levels.

### INVEST IN RE-USE AND RECOVERY OF MATERIALS

In Masdar, the aluminium and concrete used for construction contained high percentages of recycled materials. Material suppliers are making progress to further increase these.

In contrast, only a few building designs today take measures to enable re-use and recovery of construction materials. When asked if any end-of-life measures were taken for material recovery in his specific building design, one architect made the noteworthy remark that he did not like to think about how his creations were taken apart or demolished.

From the developers (and architects) point of view, shortage of construction materials is generally not considered to be an urgent issue. Similarly, investing in material recovery is not considered to be profitable, as materials will be used in buildings for extensive periods of time.

A few projects (e.g. Karaikak Pondicherry and Sonoma Mountain Village) paid special attention to finding and re-using locally available waste materials. In general, however, design and construction methods seem to pay little attention to reclaiming, recovering and re-using materials. In other sectors (i.e. office furniture, footwear, automotive, etc) Design for Disassembly proves to be valuable. The main benefit within these sectors is the advantage of easy and cheap assembly. The sustainability benefit of material re-use is considered to be a nice secondary effect.

Material recovery and re-use is an important issue, given the expected amount of construction worldwide, and the amount of construction material that is still going to landfills. It should be dealt with by more parties than just material suppliers.

The challenge for the design and construction sector is to develop techniques that enable easy (dis)assembly that allow for high recovery rates, and keep costs low, with a focus to make the assembly of buildings easier and cheaper. This also accelerates the penetration of innovative construction methods in developing countries.



### KEY RECOMMENDATIONS

- › Change business models to align long-term performance incentives.
- › Support the use of long-term performance contracts and collect more examples of how it benefits projects over time.
- › Initiate programs to develop guidelines for responsible urban financing to align financial incentives with truly sustainable development.
- › Invest in business models that incorporate reclaiming and re-using materials (locally).

## 5. EPILOGUE

### FROM THE EXCEPT RESEARCH TEAM

**We are on our way to overcome the crossroads facing the pursuit of a sustainable planet. We have a long way to go, but the projects in this book show that the capacity and willingness to change our wasteful and destructive ways is there. And these projects are not the only examples of pioneering urban (re)development. All around the world innovation in sustainable development is accelerating and increasingly convinces even financial conservative parties of its benefits. This brings hope, perspective, and fuel to continue moving forward to start living within our boundaries, while increasing quality of life for all of us.**

For this research, our team traveled the globe to unearth details of the projects, and added Except's fifteen years experience in sustainable urban redevelopment. We want to create direction and energy for sector wide improvement, and contribute to the success of future sustainable neighborhoods and regions. We learned a tremendous amount, and are implementing the lessons learned in our practice. Together with visionary organizations such as WWF we move the frontier of urban development using innovations like vertical agriculture, organic urban planning and online tools for closed urban metabolisms. We hope to see innovations like that turn up in future research projects, as new standards for future neighborhoods.

We thank WWF and the steering group for giving such a valuable piece of research to the world, and for giving us the opportunity to contribute..



# › PART II - RESEARCH





## 1. INTRODUCTION

We face the challenge of establishing a sustainable society. To a large degree, this has to be done by transforming the places where we live, play, and work. Neighborhoods of all sizes, ranging from a simple group of houses to large cities with surrounding urbanized areas are undergoing rapid changes. Neighborhoods contain an impressive amount and diversity of structures, cultures, ecosystems, and dynamics. These all work together to form the homes of people where their dreams can grow and flourish.

In the progression towards a sustainable society, we analyzed 11 pioneering sustainable urban regions around the globe to find out what lessons we can learn from their successes and failures, and how we can apply these to new neighborhoods everywhere, and the construction sector as a whole.

This section of the report contains all the detailed information on each of the 11 projects and the methodology used to analyze them.



Above: The eleven sites included in this study.

## 2. PROJECT MAPPING METHODOLOGY

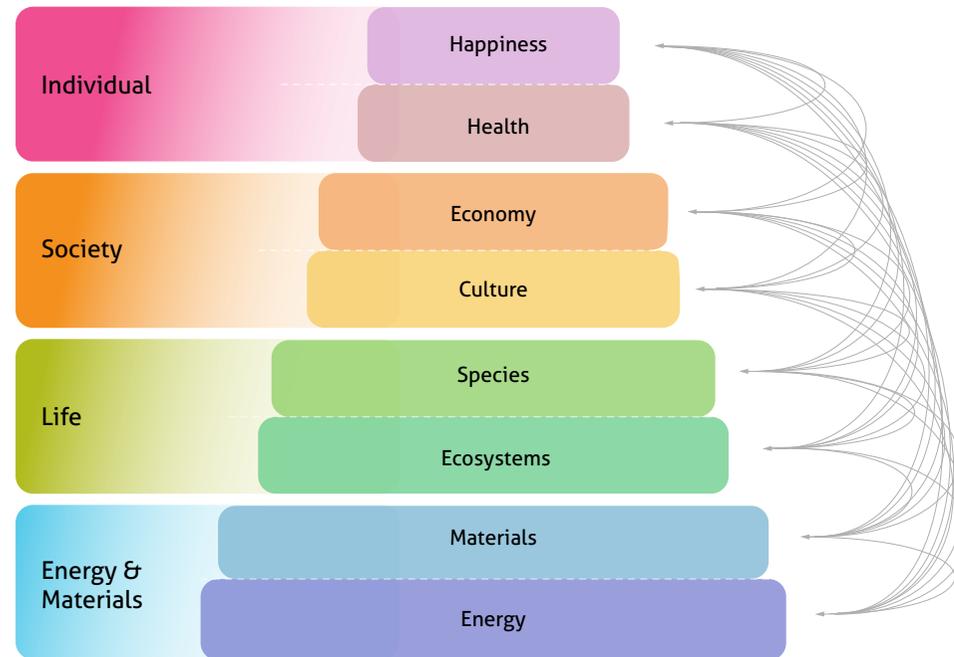
### 1.1 GOALS OF SUSTAINABLE URBAN DISTRICTS

Neighborhoods are communities of people, first and foremost. They are created with a set of values and goals in mind. Sustainable districts interact directly with the base values and goals of the community as a whole. We use these goals as the basis of evaluation of the stories of each of these districts.

Goals and ambitions among the projects are diverse, spanning cultures across 5 continents. In order to evaluate the goals and performance of the districts, we use parts of the Symbiosis in Development (SiD) framework. SiD allows a full-spectrum side-by-side comparison of all aspects of these neighborhoods, and enables evaluation on the level of both object, network and system to evaluate things like resilience, autonomy and transparency.

### 1.2 COMPARING THE SUSTAINABILITY GOALS

Framing and organizing the sustainability goals for each district is important to make them communicable and comparable. To do this we use the ELSIA framework of SiD. ELSIA is a coherent framework for working on integrated sustainability, and for formulating a holistic set of sustainability goals. This framework provides a neutral way to organize the complete set of goals and to analyze how these are affected by the decisions and actions of the stakeholders involved in the development of urban districts.



› Fig.1 - ELSIA model

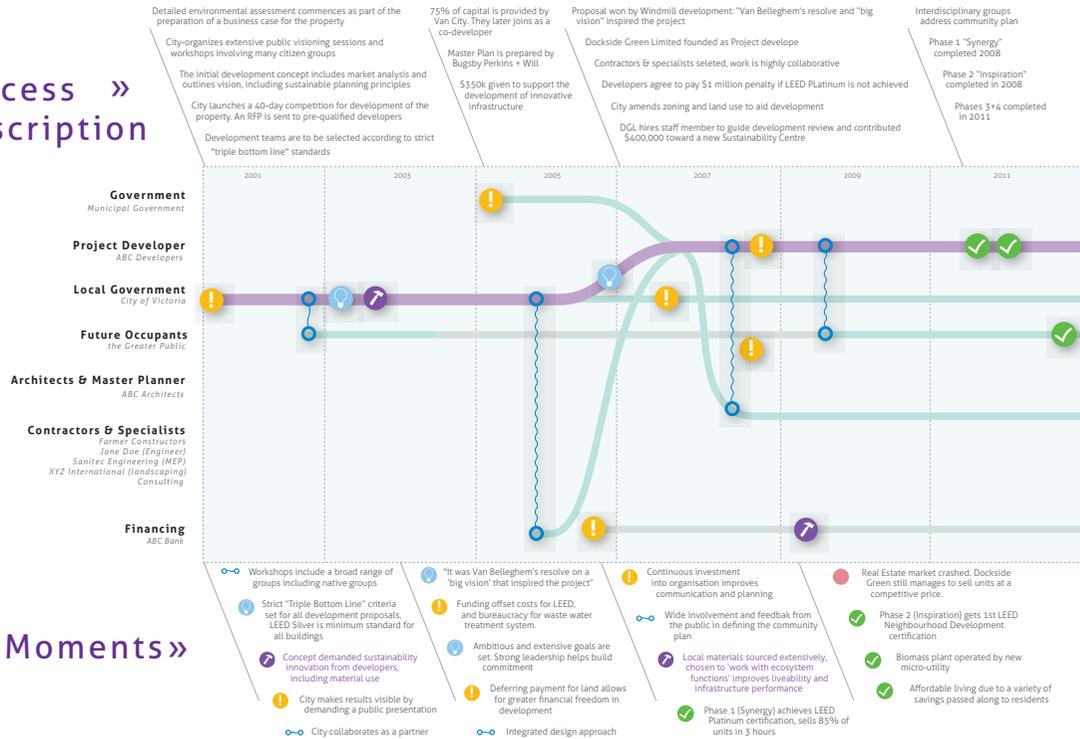
For each district considered in this report the ELSIA framework organizes the performance goals that the developers of that district formulated in the four basic categories:

- › Energy & Materials
- › Species & Ecosystems
- › Culture & Economy
- › Health & Happiness

### 1.3 MODELING SUPPLY CHAIN IMPACT

The decisions and actions of each stakeholder throughout the life cycle of a district will directly- and indirectly affect its sustainability performance. By making these relations visible it becomes apparent what actions contributed the most to the realization of its sustainability goals. A process map and an analysis map are produced that will help to understand where the key moments lie that affect the sustainability performance of the urban district.

## Process » Description



## Key Moments »

## Legend »



## 1.4 DISTRICT MODEL

For each district in this study we developed a graphical model of the development process. This model is divided into two main parts; a process description, and a collection of key moments. Taken together with the central time-line graphic, we are able to re-tell the "story" of each district.

The **Process Description** is intended to provide an objective overview of the district's development, and the roles played by key stakeholders. We found it important to provide an overview of the major activities in the development process because it allows a basic contextual understanding of how the district evolved.

Looking at this map at a glance, the reader is able to understand the following aspects of each district's development process:

- A time line of the project, including project phases
- Clearly identified stakeholder groups
- Each stakeholder's involvement over time
- (Annotated) points of interaction, achievements, cooperation, and decisions that shaped the process over time.

The **Key Moments** provides much deeper insight into the details of the development process. In this map, we use graphical tools to highlight key decisions, processes, and action moments that significantly shaped the development process of a district. We also pinpoint decisions and interactions that resulted in the achievement or advancement of its sustainability goals.

Unlike the process map, here the focus is on key information that connects specific activities to results. An icon library indicates key moments, and visualizes the dynamic nature of the evolving process. These icons can be found in the legend at the bottom of every map.

## 2.1 LYON CONFLUENCE, FRANCE

### LYON CONFLUENCE IN FIGURES

<b>Site area:</b>	50 hectares, 45% reclaimed
<b>Built Area:</b>	100 hectares
<b>New houses:</b>	3700, 25% social housing
<b>Commercial space:</b>	32 hectares
<b>Eco-renovation:</b>	4000 houses
<b>Website:</b>	<a href="http://www.lyon-confluence.fr">www.lyon-confluence.fr</a>

### THE STORY OF LYON CONFLUENCE

The Lyon Confluence development is situated at the confluence of the Rhône and the Saône rivers. It transforms a former industrial and logistic site to a new mixed used neighborhood, extending the city centre of Lyon and reconnecting it to its two rivers. The project was initiated in the late 1990s by the Greater Lyon Authority, and is managed by public development company SPL Lyon Confluence.

To determine the kind of urban community that was desired in the confluence area, consultation events with the professional public, local residents, and developers were organized by Greater Lyon. The results of the events were used by François Grether and Michel Desvigne to develop the master plan for Lyon Confluence. They proposed a two phased development (ZAC 1, ZAC 2) that focused on social- and cultural diversity, and architectural esthetic. Although sustainability as such was not explicitly highlighted in the design, particular detail was given to local ecology restoration, mixed-used functionality, and public transportation.

The inclusion of Lyon Confluence in the European

Union's CONCERTO program encouraged both Greater Lyon and SPL Lyon Confluence to set ambitious targets for energy efficiency in buildings and use of renewable energy technologies. In order to win tenders, architects, developers, and engineering companies were required to form teams and submit joined proposals.

The CONCERTO program proved to be a key success in stimulating involvement and interest from architects, developers, and other key stakeholders. This generated enough momentum to go beyond the achieved energy targets in CONCERTO and plan for development of zero and energy positive buildings in ZAC 2. Furthermore, an eco-refurbishment program was established to renovate existing houses in the Sainte-Blandine districts to achieve greater energy efficiency.

The introduction of the One Planet Living principles inspired a larger perspective on sustainability. A sustainability action plan was made detailing a broad set of sustainable design criteria for ZAC 2. Further exploration of innovative urban technologies and systems are planned in the context of Smart Community Lyon Confluence.

The development of the "Confluence" illustrates the importance of communication and education. Continued efforts, by particularly the SPL Lyon Confluence and TRIBU, were necessary to inform and mobilize stakeholders. This allowed the project to showcase innovation in terms of process design and sustainability performance.

Completion of ZAC 1 and ZAC 2 is expected in 2015, 2035 respectively.

#### ENERGY & MATERIALS

- › Low residential energy use: 50 kWh / m<sup>2</sup> / year
- › Renewable energy: 80% for heating
- › Zero Energy by 2030
- › 50% reduction in potable water consumption by 2030
- › Reduce non-recycled, non-recovered and non-composted waste to 30%

#### ECOSYSTEMS & BIODIVERSITY

- › Preserve and nurture biodiversity
- › Ground decontamination
- › Ecological restoration of river banks
- › Wildlife friendly buildings

#### CULTURE & ECONOMY

- › Attractive neighborhood for all ages and incomes
- › Mixed use neighborhood: living, working, commerce, leisure, and education
- › Eco-Friendly Transport Plan: Promoting cycling and walking, and alternative modes of transport

#### HEALTH & HAPPINESS

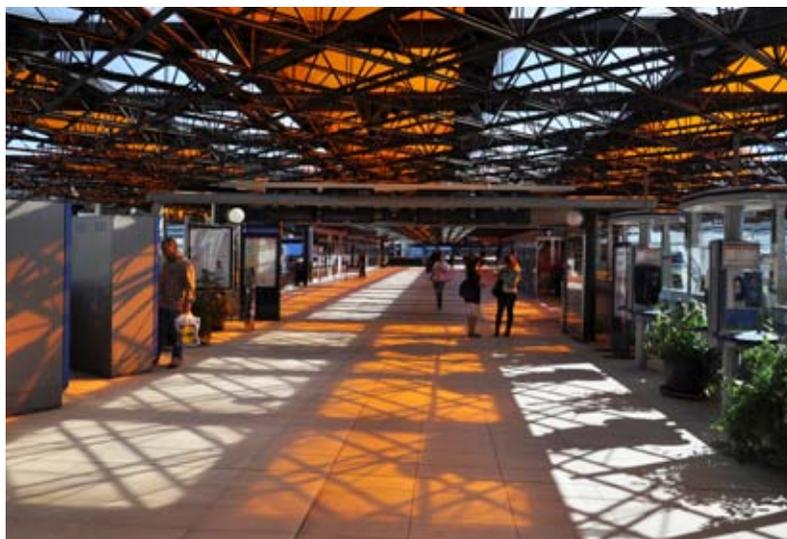
- › Natural light: Homes must receive at least two hours sun light
- › Public green
- › Community gardening
- › Green citizen initiative and education



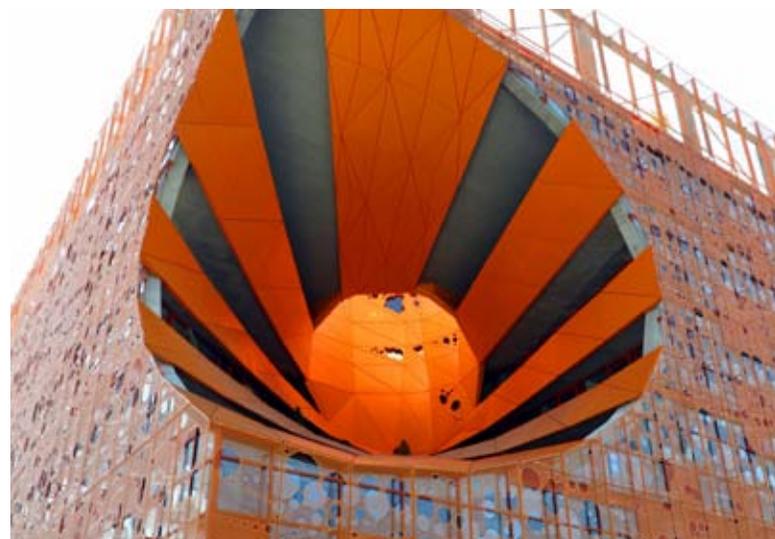
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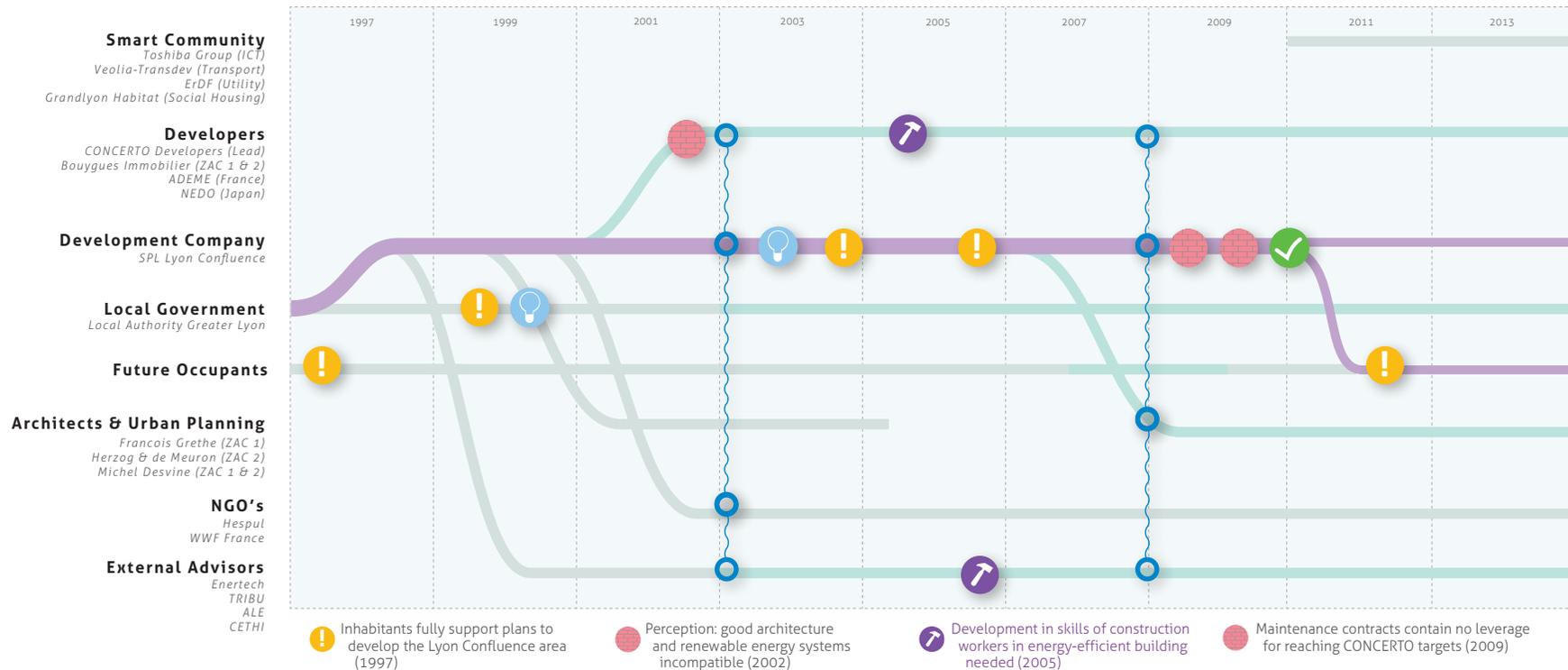
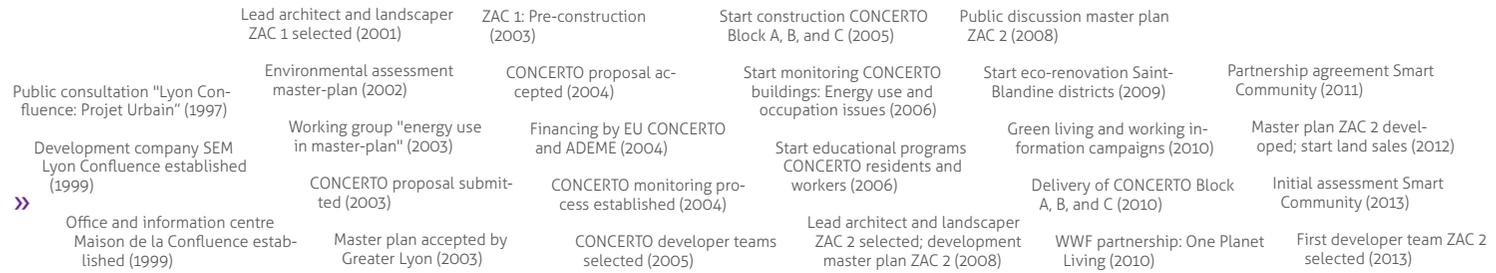


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## Process Description »



## Key Moments »

- ! Inhabitants fully support plans to develop the Lyon Confluence area (1997)
- ! Political will and commitment for project Lyon Confluence (1999)
- ! Public drive to create high quality neighborhood: social and functional mix, public transport, ecological restoration, and exemplary design (1999)
- ! Perception: good architecture and renewable energy systems incompatible (2002)
- ! Working group "energy-use" to inform and educate designers (2002)
- ! CONCERTO inspires ambitious (renewable) energy use targets (2003)
- ! CONCERTO objectives enforced through contractual commitments with developers (2004)
- ! Development in skills of construction workers in energy-efficient building needed (2005)
- ! On-site "green" construction trainings lay foundation for future work (2006)
- ! Maintenance companies involved in monitoring and problem solving (2006)
- ! All key stakeholders involved at the start of developing masterplan ZAC 2 (2008)
- ! Maintenance contracts contain no leverage for reaching CONCERTO targets (2009)
- ! Lack of on-site communication hinders problem solving during construction and delivery (2009)
- ! Occupants very receptive to "lifestyle" training during their first year (2012)
- ! ZAC 2: One Planet Living, Neutral and positive energy building (2010)

### KEY LESSONS FROM LYON CONFLUENCE

- › Building in different phases allowed stakeholders to apply their learning, increasing project ambitions and improving project approach.
- › Sharing responsibility by involving key stakeholders in project monitoring and evaluation, created a shared understanding and a problem solving mind-set.
- › Embedding sustainability in the project required involving key stakeholders at the start of the design phase. Good process management and intensive cooperation is essential for a multi-stakeholder process to properly utilize the different skills of professionals.
- › Investing time to review and reach stakeholder consensus on environmental design ambitions early in the design phase promotes good progression in later project phases.
- › Integrating performance targets into CONCERTO contractual agreements with designers and developers ensured commitment towards realizing the original environmental goals. Ownership can be facilitated by finding creative “carrot-and-stick” type of solutions that both engage and oblige stakeholders to deliver to the desired performance level.
- › The developer has a key role in ensuring that the conceptual image of the project meets the desired performance criteria. The idea in the start-up phase is to not make a “picture”, but

to make a reflection of what the neighborhood should be.

- › Architects play an important role in connecting design and technology. To enable good cooperation, architects needs to be open-minded and willing to involve engineers in the design stage.
- › Investing time and finances to educate and train stakeholders in sustainable design and construction proved to be effective, increasing professional performance and establishing a knowledge base for future work.
- › With every new project phase and transfer of responsibility between stakeholders, there is risk of miscommunication, mismatch in knowledge and skills, and lack of follow up on established goals. In order to reduce these risks it will be necessary to plan ahead for these moments, while also stimulating stakeholder motivation, communication, and interaction.
- › Detailed process, design, and even “how-to-built” specifications helped stakeholders understand their responsibilities and supported a better translation of the urban design into reality. Monitoring project process and implementation by financial, administrative, and technical committees facilitated a more steady process and allowed problems to be identified and solved early on.

### LESSONS FOR MATERIAL SUPPLIERS

- › New building materials and traditional materials used in sustainable construction require a high skill level to be properly used and implemented. Education and training was necessary to enable contractors to implement new technologies.
- › Integrating sustainability targets into building design includes a more careful consideration of materials and their use. Because material selection frequently happens at this stage, there is an opportunity for suppliers to inform and assist designers in their choices.
- › Late involvement of subcontractors in the design process may lead to a low sense of commitment to the project goals. Subcontractors may have lower motivation to apply more ambitious approaches or are not fully capable of realizing the project's ambitions.

## SUCCESS FACTORS AND PRECONDITIONS FROM LYON CONFLUENCE

### SUCCESS FACTORS

- 1 The efforts and ability of SPL Lyon Confluence and TRIBU to communicate and educate key stakeholders on sustainable design and building encouraged stakeholder learning and involvement. At each step of the process efforts were undertaken to support stakeholders in their professional activities. This enabled the SPL Lyon Confluence to increase sustainability performance, and explore and implement innovations such as constructing zero energy and energy positive buildings.
- 2 Funding provided opportunity for SPL Lyon Confluence to reach their ambitions; upfront financing ensured cooperation on designs during the competition, meetings and workshops were organized to support key stakeholders in their professional activities, and finances were used to explore urban innovations (e.g. Smart Community Lyon Confluence).
- 3 The lead developers in CONCERTO were made partner in the project to create co-responsibility towards realizing the programs targets. In addition, architects and developers were required to accept the design and energy specifications, further securing CONCERTO's ambitions.
- 4 The continued involvement of SPL Lyon Confluence and members of the Consortium Steering Group ensured that political, financial, administrative, and technical requirements and targets were managed.
- 5 The knowledge partners (e.g. TRIBU, ENERTECH, ALE) participating in CONCERTO were effectively involved

to anticipate and deal with barriers during the design, construction, and delivery of the each of the following project phases of Lyon Confluence.

- 6 Barriers encountered during the CONCERTO project proved to be essential collective learning moments. The project was a statement of success for the participants, laying the foundation for higher sustainability ambitions in Lyon Confluence.
- 7 The experiences from CONCERTO showed the importance of integrating environmental and energy expertise in the design process. This insight was applied in the design phase of ZAC 2, establishing sustainability at the core of a multi-stakeholder design process.
- 8 The high profile and pursuit of architectural quality in Lyon Confluence ensured that developers were keen to buy land and pursue further eco-innovation.
- 9 The design process for Lyon Confluence was set-up to establish a multi-disciplinary approach to developing the urban plan and individual building designs. An important reason for doing so was the relative dominance of the architect in the French design process. By involving developers and construction companies into the initial design stages, the teams were stimulated to coordinate and think about the outcome and users of the project i.e. "First functionality, than design".
- 10 The SPL Lyon Confluence implemented measures to promote social and cultural mixing within the buildings of Lyon Confluence, and between the old Perrache area and Lyon Confluence; social and private

apartments were combined in the buildings, and children from the schools in both areas were required to move between neighborhoods.

- 11 With the establishment of "SPL" Lyon Confluence its focus shifted more towards attending the needs of the local public and working towards creating a healthy livable environment. In addition, developers in ZAC 2 are required to provide additional services after finishing construction activities. This public focus was seen as necessary to encourage social interaction, involvement of residents, and the continued progression of the area.

### PRECONDITIONS

- 1 Strong political and citizen support for developing the confluence area and extending the city center.
- 2 A centrally strong coordinating function of SPL Lyon Confluence throughout the development process.
- 3 The willingness of stakeholders to explore and learn beyond what they are accustomed to.
- 4 Good working relation between French and Japanese national development companies (ADEME and NEDO).

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## 2.2 PEDRA BRANCA, PALHOÇA, BRAZIL

### PEDRA BRANCA IN FIGURES

<b>Total site area:</b>	300 hectares
<b>Built Area:</b>	180 hectares
<b>Commercial space:</b>	30%, 30.000 jobs
<b>Residential space:</b>	70%
<b>Projected population:</b>	40.000
<b>Number of students:</b>	10.000
<b>Website:</b>	cidadepedrabranca.com.br

### THE STORY OF PEDRA BRANCA

In 1997 Pedra Branca was a family cattle ranch. As the city started to grow around the land, the landowner (an established real estate developer) started working on plans to develop the land and founded Pedra Branca Ltda in 2000. Out of respect for the land Pedra Branca wanted to create value with respect for nature and the site's heritage. The development process accelerated as Unisul University settled on the site and founded the Pedra Branca campus in a partnership with Pedra Branca.

From the start the idea was to create a mixed neighborhood with commerce, businesses, parks and residential areas. From 2000 to 2005 parts of the land were sold and developed with predominantly single-family houses, a business centre and a shopping mall.

In 2005, at a conference in the USA, the president of Pedra Branca learned about the 'New Urbanism' principles. This changed the course of the development dramatically. From then on the New Urbanism principles were adopted in an integrated approach for urban development. DPZ (Max Rumis and Marcela Rumis) were invited to help

develop Pedra Branca as a sustainable city. Jaime Lerner (former Major of Curitiba, SC Brazil) was also invited to host inspiring workshops to change the way local parties worked. In a long-term partnership a setting was created for architects to share and exchange ideas. For each section that is developed sessions are organized to invite future occupants to exchange ideas and learn about their wishes and demands.

From 2009 on ARUP was welcomed in the development team. In the same year in Seoul, South Korea the Pedra Branca project was announced by the Clinton Foundation as one of the eighteen founding projects of the Climate Positive Development Initiative.

In 2009 a new partnership with ESPB (Espírito Santo Property Brasil) was established to create Pedra Branca S/A. This enabled the further development of the new neighborhood center (in 2010), where people will live, work, study and enjoy entertainment all in the same place, the primordial concept behind Sustainable Urbanism. The Block-by-Block approach for the development of new apartments in the next 20 years aims to facilitate 40.000 residents, 30.000 workers, 10.000 students.

Silvia Lenzi (architect and consultant for Pedra Branca), eng. Dilnei Bittencourt (Pedra Branca S/A), Valdir Tomazzi and the Unisul University have been involved from the start, and are still involved in the development of Pedra Branca today. Their long-term involvement provides continuity in the development process.

#### ENERGY & MATERIALS

- › Buildings designed and constructed with low environmental impact, low energy consumption, and low generation of greenhouse effect gases (best solar and dominating wind orientation)
- › Intense use of natural light and ventilation, solar heating, the use of rain water
- › Low car use: walking, biking, everything nearby – car sharing
- › Encourage material reuse and recycling - ZERO Waste
- › Climate positive development

#### ECOSYSTEMS & BIODIVERSITY

- › Respect for the natural landscape, surface and underground water and wildlife
- › Encourage contact with nature; inviting parks
- › Balance between green areas and constructed areas
- › Richness of parks with native flora
- › Proximity between wildlife and urban life

#### CULTURE & ECONOMY

- › Mix-use: schools, university, shops, businesses, residential
- › Housing diversity aims at coexistence of people from different classes, ages, cultures and races
- › Balance density and diversity (better energy performance, water, electricity, phone, public transport and land occupation).
- › Social program (encouragement of participation, / active citizenship, social awareness (keep streets clean, etc.), and cultural manifestations.

#### HEALTH & HAPPINESS

- › High quality internal environments
- › Everything you need nearby (familiarity)
- › Bicycle & pedestrian friendly (wide tree-lined sidewalks to provide shade)
- › Internet & telephone interaction / communication with representatives of the city / state
- › Accessibility in public areas (mobility for all)
- › Potable tap water
- › Consume local produce



## Process Description »

Initiation in 1997 as the city grew around the farm land and Unisul University wanted to settle on the site.

In 2000 Pedra Branca Ltda was Founded to develop the land.

2003: Opening of Business Center; 2004: Unisul inaugurates its shopping mall and Technopark.

In 2005 New Urbanism is adopted as an integrated urban development approach.

DPZ and Jaime Lerner get involved to incorporate New Urbanism through urban planning and stakeholder involvement.

In May 2009 Pedra Branca is announced as one of the 18 founding projects for the Climate Positive Development Initiatives.

Partnership between Pedra Branca Ltda. and ESPB to create Pedra Branca S/A.

In 2010 sustainable urbanism plan designed for a new neighborhood center (40.000 residents, 30.000 workers, 10.000 students).

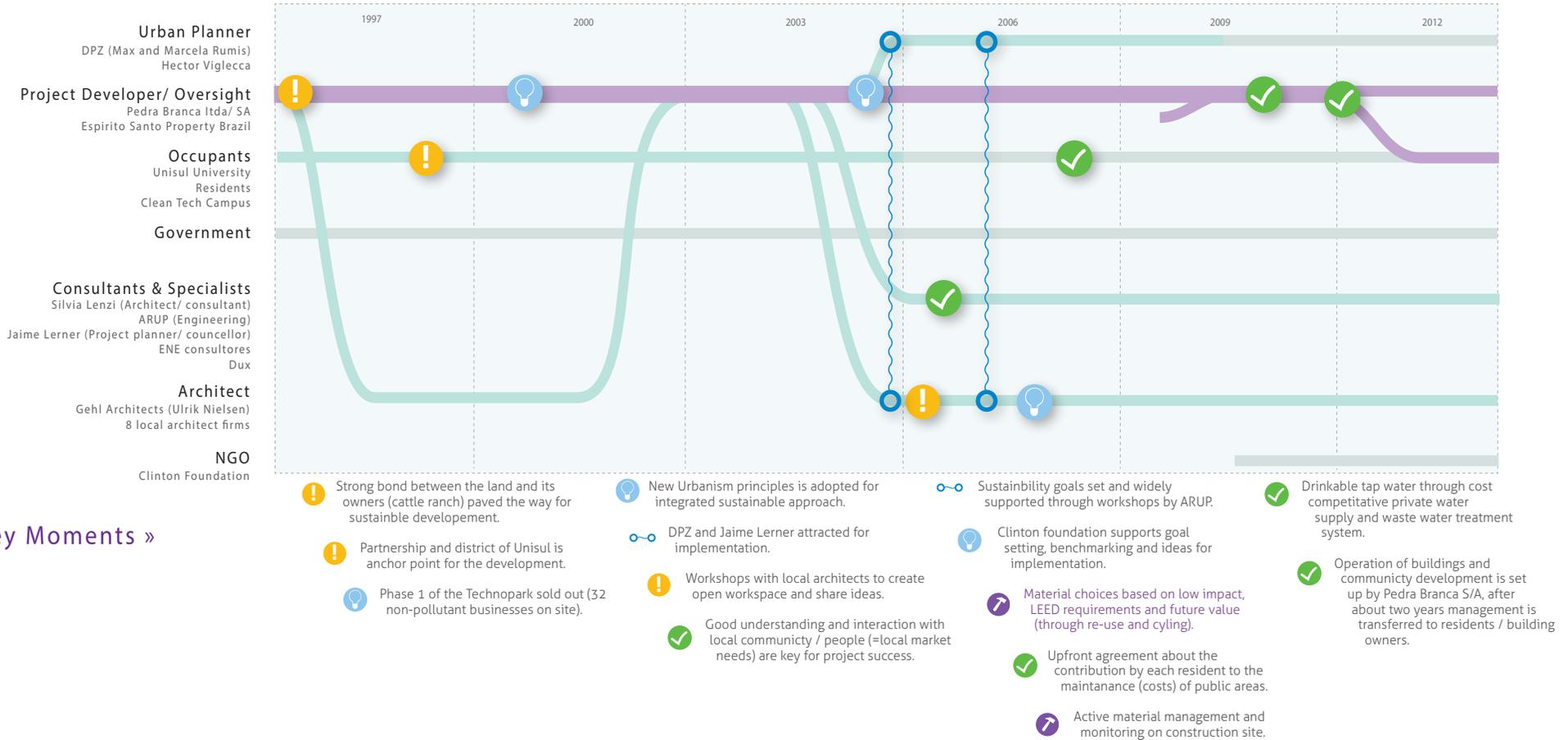
In 2010 the first Block 'Patio da Pedra' is developed.

Second Block 'Patio das Flores' is developed in 2011; and the third block 'Office Green' (LEED Silver standard) in 2012.

In 2013 retail on ground floors and 'Passeio Pedra Branca (30 shops) are opened.

Development is ongoing and will continue beyond 2025.

Roadmap for Climate Positive Impact to be developed.



### KEY LESSONS FROM PEDRA BRANCA

- › Early involvement of residents enables a transfer of tasks for maintenance and community building. Residents now arrange developments for the neighborhood. The transfer of tasks to residents is done after all services and organisations are set up and running professionally by Pedra Branca SA.
- › Up-front rules about residential contributions for maintenance and community development lead to full support of these rules.
- › 'Everything nearby' is a design philosophy that affects the lifestyle of residents. It diminishes the need for transportation and makes neighborhoods, pleasant and interesting. It enables people to bike and walk to every day destinations such as shops.
- › Long-term commitment in the project and strong external leadership enables competitors (eg. architects) to work together openly and exchange ideas.
- › Involvement and participation of the project developer in the use phase generates valuable knowledge and experience that helps improve future designs and projects. Linking the rent for shops to their sales creates the incentive to make Pedra Branca attractive and successful.
- › Not selling property, but inviting people into a new lifestyle attracted a lot of attention and helped to create awareness and support for the vision and goals of Pedra Branca.

### LESSONS FOR MATERIAL SUPPLIERS

- › The size of a project matters to challenge suppliers to develop and deliver higher standards. In this sense, bigger projects can speed up innovation.
- › Communication about material innovation is essential. There are many prejudices that say that sustainable materials and sustainable building are more expensive. Sustainable building in reality cost less over their lifetime. An example of this is LED lights (eg. for street lights), the investment is higher, but the pay-back over the lifetime of the product is attractive.
- › In upcoming markets the infrastructure for e.g. LEED certification is not widely developed. This is both a problem and an opportunity for international companies that want to strengthen their market position in those regions.
- › Introducing new efficient construction techniques into upcoming markets such as Brasil is difficult. Construction workers need to be trained. Local companies tend to stick to traditional building techniques that are familiar.

## SUCCESS FACTORS AND PRECONDITIONS FROM PEDRA BRANCA

### SUCCESS FACTORS

- 1 The original land owner's respect for the land. This steered the project towards sustainable development. Even though some were sceptical, now the Pedra Branca vision is acknowledged. Persistence paid off.
- 2 Continued involvement over time of local professionals in the core development team has enabled learning and it added good knowledge and understanding of local needs and desires.
- 3 The 'New Urbanism Principles' formed an sound philosophy that made sense to the developers and enabled meaningful urban development.
- 4 International expertise on urban development was combined with local architects to exchange professional expertise on sustainable urban development and local knowledge about the region.
- 5 Through a long-term partnership a setting was created for 8 local architects to work together. Architects no longer needed to compete with their ideas. They work together to realize a shared mission.
- 6 DPZ organized many workshops to invite local parties to contribute and help with the development. The open process, high involvement of the municipality and future occupants provided valuable input. In addition, it created support for the development.
- 7 Clear up-front rules on (financial) participation of residents to maintain the neighborhood provided a solid foundation for continued maintenance and development of the neighborhoods.
- 8 Pedra Branca S/A is responsible for the urban / building design, manages the construction and manages the first years of operating the buildings. The active role in all phases of the project enabled them to improve execution of all project phases. Organizing the operation and management of the buildings and public spaces generated valuable information to improve the design process in the next projects.
- 9 After a period of about two years the operational management of the building and community development is organized by Pedra Branca S/A. Over time, the management tasks are then slowly transferred to the occupants / building owners. The experience of Pedra Branca in the initial organization ensures a proper management structure. The long-term involvement of building owners provides an autonomous continuation of everything that has been built and organized. It also results in a high level of involvement.
- 10 International agents like the Clinton Foundation, and involvement of ARUP and Gehl Architects brought specific knowledge and examples that initiated planning for shared spaces, waste management systems and the construction of a private tap water and waste water treatment and management system.
- 11 The use of standards like LEED enabled good selection of suppliers and clear communication about project goals.

### PRECONDITIONS

- 1 The district of Unisul University served as an anchor point for the development. Today the University still serves as a valuable knowledge partner. The connection between the programs at Unisul and Pedra Branca a beneficial for both the region and the University.
- 2 Strategic partnership with ESPB provided a sound financial basis for the development.
- 3 High involvement and support from the municipality.

**CREDITS**

- › Marcelo Gomes (Pedra Branca, Executive Director)
- › Valério Gomes (Pedra Branca, President)
- › Vânio Pacheco de Abreu (Pedra Branca Team - Infrastructure)
- › Ramiro Nilson (Pedra Branca Team - Infrastructure)
- › Dilnei Silva Bittencourt (Pedra Branca Team - Consultant)
- › Richard Schmidt (Pedra Branca Team – Engineer)
- › Giane Formigoni (Pedra Branca Team – Engineer)
- › Nilto Bogo (resident of Pedra Branca neighborhood)
- › Valdir José Tomazzi (Valdir José Tomazzi Eireli - Me)
- › Nelson Teixeira Netto (Arquitetura Urbanismo)
- › Mariana Schwartz (Architect)
- › Juliana Castro (Architect)
- › Silvia Lenzi (Architect / Project Advisor)
- › Luciano Rodrigues Marcelino (Unisul)
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- › Geraldo Campos (Unisul)
- › Henrique da Cunha Sant'Ana (Resiliens)
- › Mary Yamakawa (Consultores)
- › Maíra Pires (Consultores)
- › Mary Yamakawa (LEED Consultant)
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- › Olavo Kucker (DUX)
- › José Renato Dellagnelo (INAITEC)
- › Giovani Bonetti (Marchetti Bonetti)
- › Camilo Martins (Mayor of Palhoça)
- › Photos: Pedra Branca S/A



## 2.3 EVA-LANXMEER, HOLLAND

### EVA-LANXMEER IN FIGURES

<b>Total site area:</b>	24 hectares
<b>Built Area:</b>	100 hectares
<b>New houses:</b>	200
<b>Income mix:</b>	30% social, 20% mid class, 50% free sector
<b>Ecological offices:</b>	40.000 m <sup>2</sup> BVO
<b>Schools:</b>	30.000 m <sup>2</sup>
<b>Urban farms:</b>	48.000 m <sup>2</sup> (Caetshage)
<b>Website:</b>	www.eva-lanxmeer.nl

### THE STORY OF EVA-LANXMEER

Eva-Lanxmeer is developed as an experiment and demonstration for integrated sustainable urban development. Marleen Kapteins (a professional environmental consultant) initiated the process. Her dream was to realize a neighborhood founded on a broad and integrated set of sustainability goals.

Kapteins started developing her vision in 1994 and presented it throughout the Netherlands. Through many talks, meetings and conferences she gathered a group of capable and persistent people that wanted to commit their time to initiate Eva-Lanxmeer.

From the start the future residents organized themselves in the EVA foundation. The process to organize early involvement of future residents, and the many disciplines embedded in the broad set of goals, was pre-financed by the municipality of Culemborg and repaid later in the process by the residents through increased land price.

The next step was involving project professionals with all required disciplines to enable the development of a plan that met all the sustainability goals. As the process map shows, all actors were involved in the development of the concept for Eva-Lanxmeer. A natural selection of eager and committed professionals and individuals ensured continuity of people in the process.

The central project team initiated specific workgroups (eg. to develop energy concepts, the landscaping, etc.) with professional contractors to develop concepts that met the central vision. Concepts and plans were only adopted if the residents agreed to them. This ensured a high level of awareness and a high level of quality from the end-user perspective.

The qualities in the urban plan, architecture, the building principles and landscaping, resulted in an attractive neighborhood with high market value property compared to the construction costs. Eva-Lanxmeer is a good example of how early involvement of residents and all required specialists results in high value property and sustainable housing and lifestyle changes.

#### ENERGY & MATERIAL

- › Low carbon / Low energy buildings
- › Eco-buildings,
- › Closing material cycles (for building and usage phase)
- › Prevent droughts and flooding (infiltration, controlled water drainage)
- › Separation of waste water flows and local wastewater treatment in natural landscape
- › Renewable energy (Solar and wind)

#### ECOSYSTEMS & BIODIVERSITY

- › Strengthen and re-cultivation of historical ecosystems, waterways and archeological structures
- › Quality landscape
- › Connecting architecture and nature through a color concept
- › Functional green spaces: meeting areas and permaculture
- › Maintenance and arrangement of public areas by residents (leading philosophy: the entire neighborhood as your own back-yard).

#### CULTURE & ECONOMY

- › Urban Integration
- › Social mix of residents
- › Sustainable office and school buildings
- › High level of communication and involvement of neighboring areas
- › Documentation of the process to enable spin-off projects
- › Professional Urban Farming
- › Education centre (planned)

#### HEALTH & HAPPINESS

- › High involvement of residents to realize their dreams, influence lifestyle change and add intrinsic quality in the neighborhood
- › Living environment and houses support personal development through ateliers and work spaces
- › Living areas that stimulate cycling and public transport, and minimize or eliminate cars
- › Local healthy food
- › Healthy buildings / indoor climate



# Process Description »

Vision for integrated approach presented across the country.  
 Project initiated to demonstrate & experiment with integrated sustainable approach.  
 Central work group and first project plan created

local government pre-finances process cost to enable involvement of all disciplines from the start.  
 Thematic workgroups develop concepts for all goals and are responsible for gaining support of residents.  
 Future residents buy their land

Financial evaluation, & permits acquired  
 Guidelines and materials check-list for eco-building designs  
 Residents choose their architects. Architects choose materials

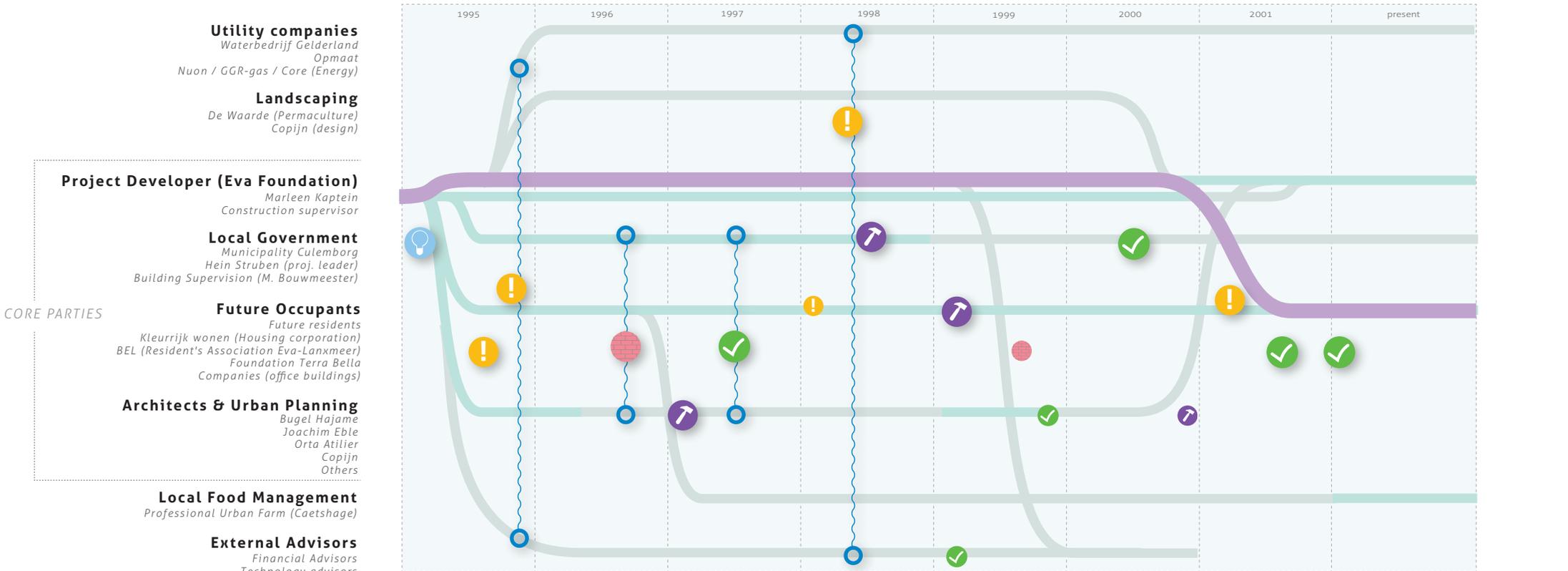
Final urban design and concept approved by future residents and central workgroup  
 Future residents buy their land  
 Guidance from municipality in the construction process

Phase 1 & 2 construction: project group with residents, supervised by central workgroup  
 Building supervisors assist construction companies in working with new materials

Phase 3 construction: "build it yourself" joint living, checked by central architect  
 Evaluation of living experience

Phase 4 construction: with housing corporation

Local initiatives by residents:  
 - professional urban farm provides local organic food  
 - Terra Bella (residents association) maintains public green areas  
 - local energy company established



CORE PARTIES

# Key Moments »

- Clear set of principles and goals envisioned, e.g. Eco-building (use of sustainable materials)
- Full participation of future residents.
- Interdisciplinary and strict selection to gain capable and ambitious project members (process costs pre-financed by municipality)
- Residents don't give full support to first urban plan (Joachim Eble involved to fine tune and gain residential support for the final urban plan)
- Coordination, guidelines and materials handbook for eco-building, enable architects to design to principles
- Full community support for urban plan
- Process leader manages learning processes & facilitates coordination. Workgroups for each sustainability theme provide innovative solutions
- High stakeholder involvement by making them responsible for adaptation & realization of ideas
- Superintendent guides construction & drives innovation in materials and techniques
- Attitude change after residents buy their land
- Designs checked to ensure eco-building and sustainability goals
- Goals achieved for: construction, low-energy, materials, bio-ecological building sustainable water & energy management, historical values & beautiful environment.
- Scorecard to challenge suppliers and develop innovative solutions
- Eco-building material check
- Consistent philosophy & good communication throughout the process
- High property values & goal achieved for sustainable mobility
- Residents coordinate further targeted development, e.g: local organic food has social & economical function, workgroup "Dry Feet" analyzed and resolved flooding in cellars, local energy company founded by residents to provide more sustainable energy

### KEY LESSONS FROM EVA-LANXMEER

- › The integrated and broad sustainability perspective resulted in an attractive and high quality neighbourhood with relatively high property value and sustainability performance.
- › Early involvement of residents resulted in local initiatives from residents (e.g. local energy company, urban farming, maintenance of public green, social program and life-style program for sustainable living).
- › Early and intensive involvement of residents resulted in strong social links and successful local economic program.
- › Taking enough time for concept development, project definition, planning and design paid off.
- › Involving true innovators (material and building experts) from early start all the way till usage phase enabled the realization of innovative concepts.
- › Once residents own the land their attitude will change. The initial attitude of (future) residents was open minded and flexible, after purchase of land the residents became more protective and demanding.
- › Making suppliers of new materials and technologies responsible for the final performance of the solutions, proved to work well in selecting solid partners and to overcome fear of working with new technologies.

### LESSONS FOR MATERIAL SUPPLIERS

- › Overall goals for sustainability are set by the initiators of the project. Within these choices many embedded goals for material use are included already.
- › Architects play a dominant role in selecting the final materials for buildings. They are the main audience for material suppliers to communicate advantages of new materials and technologies.
- › Risks and learning curves to apply new materials and technologies posed a significant barrier. Scorecards to demand performance and quality guarantees throughout the construction and usage phase, significantly contributed to the application of new materials.
- › No two project are the same. To ensure proper application of new materials and technologies extensive testing and support in many different situations is required.
- › Training construction and installation workers on a project level is necessary. Assisting them on the job to guide them through their learning curve is the best way to prevent "bad experiences" that will only result in higher reluctance to use new technologies.
- › High-level goals for material use are set and maintained by internal professionals with perseverance. These professionals are the "internal ambassadors" within the project that ensure the right level of support and knowledge throughout the design and construction process.

## SUCCESS FACTORS AND PRECONDITIONS FROM EVA-LANXMEER

### SUCCESS FACTORS

- 1 Clear and ambitious goals that were carried through the entire process. The main and central people remained present in all phases (from ideation until usage and maintenance phase).
- 2 Strong and exciting goals that all stakeholders wanted to commit and contribute to.
- 3 Involvement of all required disciplines from the early start. The project group was made up of people to span all necessary disciplines (energy, eco-building, food, water, nature/green spaces, residents, social and urban planning).
- 4 A thorough selection of capable people with profound knowledge, craftsmanship, determination, persistence, a strong desire to contribute to the sustainability goals and the ability to deliver results. Selecting the right suppliers was done via personal talks. Selecting the right suppliers and parties to involve also took into account their ability to adhere to the process and their ability to cooperate within the team.
- 5 Iterative process with residents from the start (as early as the ideation phase). This process allowed flexibility in selecting options with residential support, open communication, learning, trust, thinking from the perspective of maintenance and the involvement of all parties during the usage phase.
- 6 Specific workgroups for each sustainability theme were responsible for developing innovative concepts. Each workgroup had the responsibility to gain the support of the future residents for their final plans.

The central project group connected all aspects and secured that the integrated solution lived up to the vision.

- 7 The central workgroup appointed a superintendent for the building process (construction administrator). This enabled continuity and quality control directly tied in with the goals and philosophy of the project. The construction administrator also supported the builders working with new materials and techniques (e.g. working with low weight concrete and high insulation standards). This prevented elimination of innovative concepts in the construction process as a result of a lack of experience with the new materials or techniques.
- 8 Inclusion of all residential demands resulted in high quality neighbourhood with good property values. Once the building cost were clear, taxation of the property to be build showed that a good margin could be made.

### PRECONDITIONS

- 1 Pre-financing of the process costs by the municipality was key to enable the stakeholder involvement and the iterative development process. This resulted in high added value (high market value compared to foundation and construction costs). The costs of the process were paid back by residents through the land. This shows that local governments can play a significant role and enable participation of residents.
- 2 Political will, vision, commitment and active involvement ensured the support by the municipality throughout the process.
- 3 An open and flexible planning process is required. Allowing a learning process and the wish for early involvement of residents (to get their full support) resulted in the iterative process. To keep costs under control, a time plan was made, allowing for learning and iteration while meeting deadlines.
- 4 The process manager must be able to deal with distributed responsibility, learning processes, and facilitate participation while coordinating central planning and steering toward goal realization.
- 5 High level of communication throughout the process to inform and involve all crucial parties and get their full support.
- 6 A strong will to work with a result-oriented attitude with a consumer (not property) centred focus.



**CREDITS**

- › Hein Struben

**IMAGE CREDITS**

- › Eva Lanxmeer foundation
- › Tom Bosschaert

## 2.4 DOCKSIDE GREEN, CANADA

### DOCKSIDE GREEN IN FIGURES

<b>Total site area:</b>	61.000 m <sup>2</sup>
<b>Built area:</b>	26 buildings
<b>Functional mix:</b>	70% residential, 30% commercial
<b>Income mix:</b>	30% affordable housing
<b>Population:</b>	2.500 residents
<b>Schools:</b>	30.000 m <sup>2</sup>
<b>Website:</b>	www.docksidegreen.com

### THE STORY OF DOCKSIDE GREEN

The site for Dockside Green is located in a formerly industrial area in the Vancouver harbour. In an effort to develop a business plan for the property the city issued a detailed environmental assessment. The outcome of this assessment proved that a sustainable approach was feasible, and paved the way for an initial concept, drafted by the city. This concept presented a plan based on the concepts of the New Urbanism movement.

As a sustainability measure, the city mandated strict “triple-bottom-line” standards in the selection of the development team, requiring that developers consider social, economic, and environmental criteria everywhere. In the next phase the developers were challenged by the city to deliver innovative proposals with more sustainable selection criteria in return for lowered land prices.

Windmill Developments won the project as main developer, and Busby Perkins + Will (BPW) were chosen as master planners. Financing was provided by Van City, and they co-founded Dockside Green Limited, along with Windmill.

BPW prepared the master plan in 2005, adopting an integrated design approach, which included a wide range of specialists in ecological design and engineering. From the start a development and finance team coordinated roundtable meetings between all parties on how to best achieve the vision set by Windmill.

Dockside Green was planned over 12 distinct phases, and three neighbourhoods. The first neighbourhood, Dockside Wharf, has two residential projects (Synergy and Balance) and two commercial buildings (Prosperity). In the subsequent neighbourhoods, more residential, retail, and office development is planned. Other additions will include a boutique hotel, sustainability centre, plaza, and open-air amphitheatre.

The project was only slightly impacted by the real estate crash in North America. While other projects in Victoria shut down, Dockside remained profitable, selling almost all of the available units before completion. The main reason for this that the savings from eco-measures were passed onto the homeowner (eg. over \$500 per unit a year saved by on-site treatment of sewage).

From the beginning of the project all developers made an up-front commitment to sustainability, which forced them to incorporate unproven methods and technologies. The up-front funding was critical in allowing developers to take such risks.

Dockside Green profited from their sustainable neighbourhood development, was awarded certifications including LEED Platinum and LEED Neighbourhood Development (at that point the only one in the world).

#### ENERGY & MATERIAL

- › Low embodied carbon and low-energy use buildings
- › Eco-buildings with integrated rainwater management
- › Maximize closed material cycles (for construction and use)
- › Renewable energy generation on-site
- › Separation of waste water flows and local wastewater treatment in natural landscapes
- › Waste to energy plant and biogas production

#### ECOSYSTEMS & BIODIVERSITY

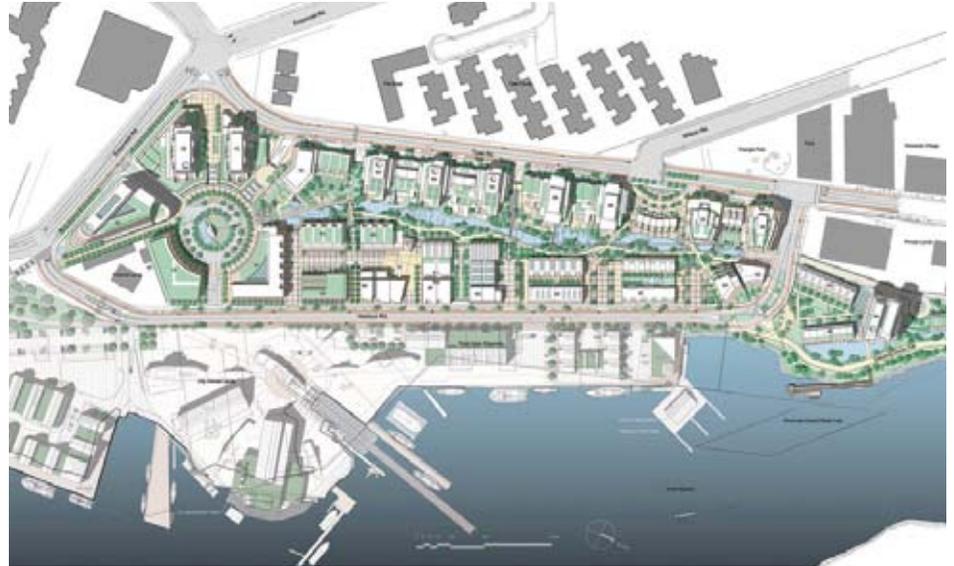
- › Creating a rich urban ecosystem with high biodiversity
- › Landscape remediation from industrial to wetland
- › Connecting buildings and nature through design and function
- › Community green spaces and recreational areas
- › Zero emission and zero waste to the environment

#### CULTURE & ECONOMY

- › Mixture of affordable housing, office, retail, entertainment, recreation, and commercial spaces
- › Sustainability center
- › Stimulate green jobs (ie. waste to energy plant)
- › Design for sustainable mobility within the development

#### HEALTH & HAPPINESS

- › Accessible, human-scale urban environment
- › Healthy buildings and abundant green space



## Process Description »

Detailed environmental assessment commences as part of the preparation of a business case for the property

City organizes extensive public visioning sessions and workshops involving many citizen groups

The initial development concept includes market analysis and outlines vision, including sustainable planning principles

City launches a 40-day competition for development of the property. An RFP is sent to pre-qualified developers

Development teams are to be selected according to strict "triple bottom line" standards

75% of capital is provided by Van City. They later joins as a co-developer

Master Plan is prepared by Bugsby Perkins + Will

\$350k given to support the development of innovative infrastructure

Proposal won by Windmill development: "Van Belleghem's resolve and "big vision" inspired the project

Dockside Green Limited founded as Project developer

Contractors & specialists selected, work is highly collaborative

Developers agree to pay \$1 million penalty if LEED Platinum is not achieved

City amends zoning and land use to aid development

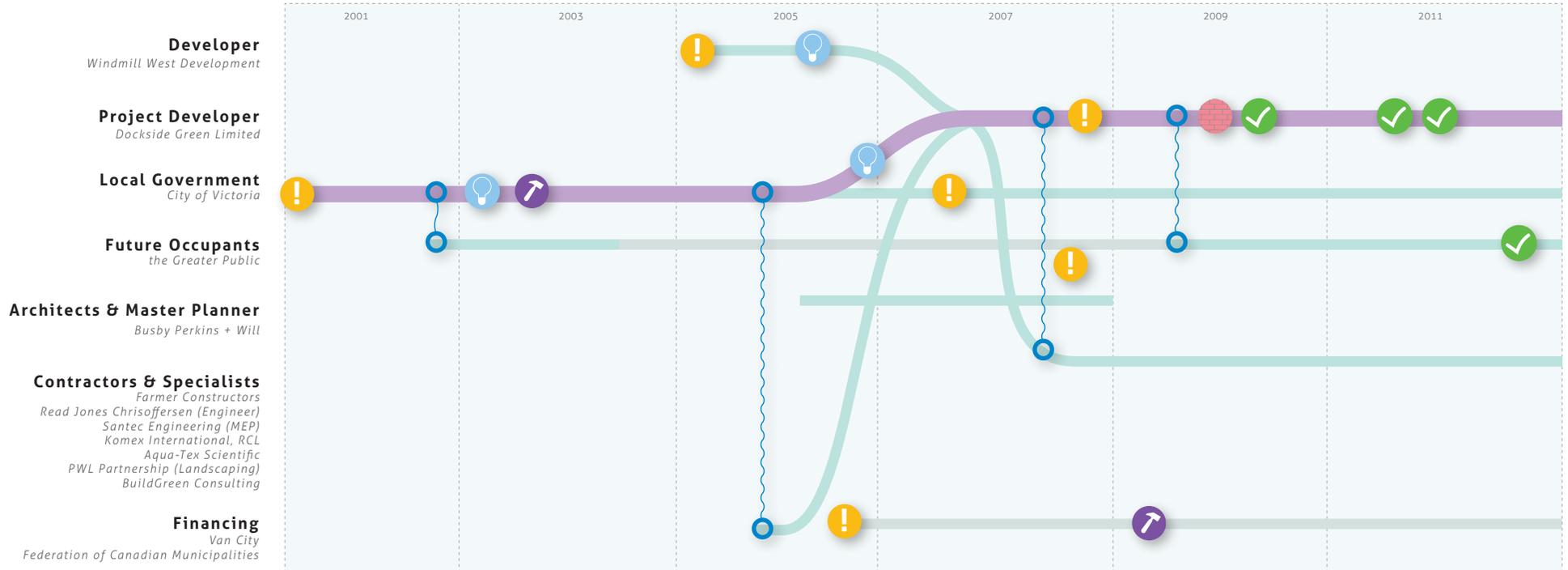
DGL hires staff member to guide development review and contributed \$400,000 toward a new Sustainability Centre

Interdisciplinary groups address community plan

Phase 1 "Synergy" completed 2008

Phase 2 "Inspiration" completed in 2008

Phases 3+4 completed in 2011



- Workshops include a broad range of groups including native groups
- "It was Van Belleghem's resolve on a 'big vision' that inspired the project"
- Continuous investment into organisation improves communication and planning
- Real Estate market crashed. Dockside Green still manages to sell units at a competitive price.
- Strict "Triple Bottom Line" criteria set for all development proposals, LEED Silver is minimum standard for all buildings
- Funding offset costs for LEED, and bureaucracy for waste water treatment system.
- Ambitious and extensive goals are set. Strong leadership helps build commitment
- Deferring payment for land allows for greater financial freedom in development
- Concept demanded sustainability innovation from developers, including material use
- City makes results visible by demanding a public presentation
- Van City collaborates as a partner in the new venture, providing ongoing support
- Integrated design approach and \$1 million penalty commitment among all parties created a united vision, responsibility, and accountability
- Wide involvement and feedback from the public in defining the community plan
- Local materials sourced extensively, chosen to 'work with ecosystem functions' improves liveability and infrastructure performance
- Phase 1 (Synergy) achieves LEED Platinum certification, sells 85% of units in 3 hours
- Phase 2 (Inspiration) gets 1st LEED Neighbourhood Development certification
- Biomass plant operated by new micro-utility
- Affordable living due to a variety of savings passed along to residents

## Key Moments »

### KEY LESSONS FROM DOCKSIDE GREEN

- › A visionary plan, strong commitment, and an integrated and collaborative approach helped to keep output high, while simultaneously embracing new and somewhat risky innovations.
- › Strict triple bottom line standards and pre-selection process laid the groundwork for serious, high-impact proposals, while effectively filtering out greenwashing.
- › The decision to force developers to make a public presentation helped make developers accountable for their plans. In the case of Windmill's winning proposal, the public gave a standing ovation, garnering public support and interest in the project.
- › Up-front funding (75% provided by Van City) and developer penalty commitments (\$1 million each) were effective financial instruments to ensure sustainability and innovation goals were achieved. Up-front investment helped tackle bureaucratic hurdles specifically.
- › Despite a significant real estate depression, units maintained high sales. This is largely attributed to actual savings passed on to the homeowner. Affordable housing units were also successfully sold, and were heralded as one of the project's big successes, that 'sustainable' can be affordable.

### LESSONS FOR MATERIAL SUPPLIERS

- › Strict material selection and sourcing criteria helped in attaining some of the highest LEED certificates in the world. Multiple performance criteria were generated from the integrated approach taken by developer teams, and included regionally-sourced and ecosystem-appropriate materials.
- › It is often the case that materials for construction can be sourced from waste. Successful examples of material reclamation were included on the site, including using sunken logs from a local reservoir. The project used recycled materials extensively.
- › Materials can serve many functions, and help achieve important sustainability criteria. Exterior surfaces and materials were often required to have a functional relationship with the ecosystem at Dockside. For example, integrated grey water management was achieved through porous surfaces integrated with buildings.

## SUCCESS FACTORS AND PRECONDITIONS FROM DOCKSIDE GREEN

### SUCCESS FACTORS

- 1 A clear vision from the outset, set by Windmill Developments in their project proposal. The vision and ambition were carried through effectively, and developer teams remained committed to their individual responsibilities.
- 2 A public presentation that outlined the ambitious goals for redevelopment. This initial public support fostered local interest and likely led to higher sales due to the demand.
- 3 Involvement of all required disciplines from the early phases of the masterplan development. The development team was made up of people that cover all disciplines (energy, eco-building, water, waste, and urban planning). Teams intensively brainstormed and workshopped different solutions to arrive at an optimal outcome.
- 4 Strict triple bottom line criteria set by the city was an effective instrument to filter through only “serious” parties that were committed to real sustainable impact.
- 5 Developers agreed to pay a \$1 million penalty if they did not achieve their goals. This created a performance-driven culture that embraced innovation.
- 6 A clear value proposition is made for the homeowner due to savings associated with eco-innovation. This propelled Dockside through a real estate crisis (almost all units sold before completion), and delivers a compelling argument for the marriage of affordability and sustainability.

### PRECONDITIONS

- 1 Largely private financing, with the majority available early in the process allowed developers to sign off quickly on bureaucratic and tasking processes (ie. LEED documentation).
- 2 Leadership on behalf of the local government to develop an ambitious redevelopment concept, containing culturally inclusive public vision exercises.
- 3 A multi-phased planning program helped speed the return on investment. High performing buildings and clear savings for tenants kept demand very high through subsequent phases
- 4 Wide involvement of the public during the development of the community plan further attracted local interest and demand. Dockside is favorably looked upon in Vancouver as an example of ‘new urbanism’.
- 5 High ambition for top sustainability performance led to the first ever LEED for Neighborhoods Platinum certification. The international media attention that resulted was an excellent showcase for innovation.
- 6 Investment in organizational capacity provided the human resources infrastructure for an integrated and collaborative approach. Investment in development and accounting staff were an important organisational element.

**CREDITS**

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- › Ken Pirie "Unsprawl Case Study: Dockside Green"  
[www.terrain.org/unsprawl/25/](http://www.terrain.org/unsprawl/25/)
- › Joe van Belleghem
- › "An Urban Developer Goes Green" [www.youtube.com/watch?feature=player\\_embedded&v=3jD7rATl39Y](http://www.youtube.com/watch?feature=player_embedded&v=3jD7rATl39Y)

**IMAGE CREDITS**

- › [www.green@work.com](http://www.green@work.com)
- › [www.perkinswill.com](http://www.perkinswill.com)
- › [www.pwlpartnership.com](http://www.pwlpartnership.com)



## 2.5 KARAIKAL PONDICHERRY, INDIA

### KARAIKAL PONDICHERRY IN FIGURES

<b>Total site area:</b>	69.000 m <sup>2</sup>
<b>Houses:</b>	909
<b>Website:</b>	karaikal.gov.in

### THE STORY OF KARAIKAL PONDICHERRY

The tsunami of December 26th, 2004 caused extensive damage to the South and East coasts of India. The immediate challenge in response to this disaster was to provide shelter to the affected population. The Swiss Red Cross (SRC) and Initiatives in Development Support (IIDS) made a first appraisal of the damage. This appraisal served as a basis for the local government's redevelopment plans.

The primary goals for reconstruction were:

- › Provision of a safe and sustainable habitat for 909 families, from 3 villages;
- › Build the capacity of village communities to derive long term economic benefits, manage community assets and apply knowledge on appropriate building practices.

The SRC coordinated the redevelopment effort amongst supporting parties. It was decided from early on that the site plan would be developed in consultation with the villagers. The SRC formed Village Reconstruction Committees (VRCs) which served to develop site plans and house designs, taking into account culture, lifestyle, comfort and safety requirements in an iterative process. This was an additional layer on top of the primary goals of structural safety, use of environmentally sound construction materials, and technologies (such as fly ash based bricks and rat trap

technique.) Together, the designs for the homes covered a comprehensive set of sustainability criteria.

Post-disaster constraints made self-reliance an absolute necessity going forward. Well over 100 artisans, professionals, and small businesses cooperated to fulfil the demands of the project. A strong focus was placed on investing in local knowledge and capacity building, including local youth placed with professionals in training trajectories. When construction commenced the project faced many barriers. Contractors often had insufficient financial capacity, and lacked skills for the type and scale of construction necessary. This led to intensive engagement with the contractors for training, planning and management support. There were also a number of cases where the difficult decision was made to reverse contracts, either in part or entirely. For future development projects Karaikal Pondicherry is working with the local building centre at Puvam to provide training to new entrepreneurs and artisans.

From June 2005 to September 2008, 9 local contractors completed 909 houses. Four contractors belong to Karaikal, while the others are from neighboring districts in Tamil Nadu. In addition to the homes themselves, the project addresses the health and hygiene needs of the villages. INTACH Puducherry set up a solid waste management system, which will be carried forward in the post reconstruction phase. Furthermore, the project established systems for long term management of the new assets, including a 'Maintenance Cell' which addressed necessary repairs and guides the process for house additions and expansions.

#### ENERGY & MATERIALS

- › Focus on local or on-site material sourcing, processing, and construction
- › Materials should work with nature and withstand regional ecological pressures

#### ECOSYSTEMS & BIODIVERSITY

- › Minimized ecosystem impact during reconstruction
- › Design sanitation and waste services that reduce ecosystem stress
- › Design Ecological buffer areas to protect community from recurring tsunamis

#### CULTURE & ECONOMY

- › Reconstruction of sustainable homes for 909 families
- › Invest to build capacity for communities, individuals, and local businesses to derive ongoing economic benefits

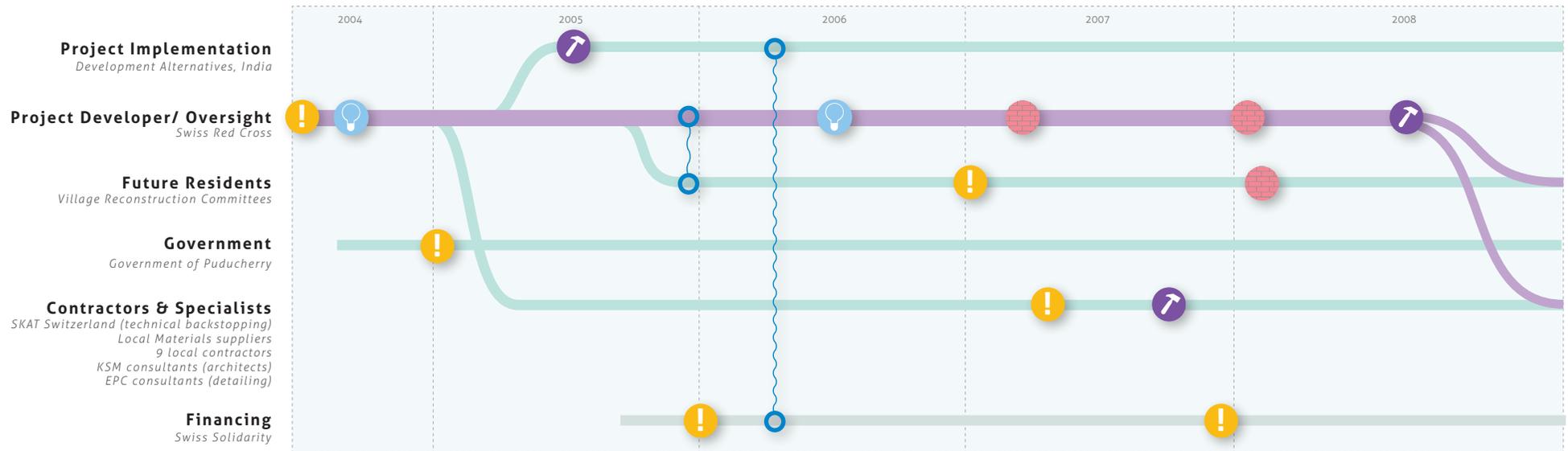
#### HEALTH & HAPPINESS

- › Safe homes to protect against future ecological disasters
- › Participation and co-development of community design and practices



<p>SRC conducted a rapid appraisal in the tsunami affected areas of South India, distributed relief resources</p> <p>SRC meets with Government regarding support for rehabilitation</p> <p>Government sets framework for permanent relocation and rehabilitation</p> <p>Skat and DA assess the feasibility of reconstruction initiatives. This formed the basis for the SRC proposal</p>	<p>SRC, DA, and Skat write a project plan. Approved by the government and Swiss Solidarity</p> <p>S.S. provided the majority of Capital following project plan approval</p> <p>Government stipulations and donor financing mechanisms are established to aid development</p> <p>Group-based workshops in design, quality, progress monitoring of houses and community</p> <p>VRC's formed focus groups, aiding design, construction technology and services, operation and maintenance, and negotiation with the government infrastructure</p>	<p>Houses allotted through draw, with preference to vulnerable individuals. A grievance redressal system and dedicated maintenance was setup</p> <p>Reconstruction heavily relied on local competency for immediate capacity needs and safe construction</p> <p>Demonstration house is subjected to assessment by village families and technical experts</p> <p>Focused on building future capacity to manage and develop the district in the long run.</p>	<p>Pilot phase of the first 100 houses began in February 2006</p> <p>240 houses completed by February 2008</p> <p>Hand-over to government and VRC's after construction phase</p> <p>Remaining houses completed June-October 2008</p>
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## Process Description »



## Key Moments »

- ! SRC steers and manages projects covering the entire gamut of relief, rehabilitation and development work
- ↗ Researching alternatives for construction technology and non-negotiable rules for technical performance engaged VRC's for sourcing and spurred entrepreneurialism
- ! VRC's are time intensive and iterative. Reconstruction projects should factor in requirements at the inception stage
- ↗ The speed and timing of reconstruction placed heavy pressure on local production system for fly ash blocks
- 💡 909 families in 3 villages are rehabilitated in safe habitat in a sustainable manner, enhanced capacity of village communities to derive long term economic benefits
- ! Financial instruments in place (ie. security deposit, conditions) ensured performance goals for sustainability were addressed properly
- 🧱 Planning process had to address the likely ecological impacts and increased load on essential services and infrastructure
- ↗ Drop in VRC commitment during construction because they didn't feel attached to the individual home
- ! Speedy development of rehabilitation/reconstruction policies and guidelines which incorporated experiences from earlier disasters
- 🔄 Demonstrating alternative technologies and building materials facilitated adoption by beneficiaries
- ! Reconstruction heavily relied on local competency to address the immediate capacity needs
- ↗ Goal Achieved: Embodied energy consumed by this development is 40% of conventional construction.
- 🔄 SRC organized a group-based strategy that reached out to the community through village reconstruction committees (VRC)
- 💡 Learning adapted goals: Health and hygiene was designed and implemented as a key goal
- ↗ Materials sourced locally, and from waste materials (ie. fly-ash bricks)
- ! The overall financial arrangement facilitated the achievement of the main goals

#### KEY LESSONS FROM PONDICHERRY

- › The project decided on a strategy to work via village community representative groups. These groups were comprised of traditional Panchayats, the representatives of women, disaster-affected groups, and minority groups. This enhanced community ownership towards the reconstruction process and their participation in supervision of quality of construction.
- › The project focused heavily on local job creation and skill development throughout the reconstruction process. Almost 70 masons working at local contractors have been trained and benefited from the opportunity offered by the reconstruction process.
- › SRC designed a strategy to strengthen the management capacities of local organisations. This strategy ensured their effective participation in the implementation, and also enabled them to exercise their new capacities in future development work within the villages.

#### LESSONS FOR MATERIAL SUPPLIERS

- › The project introduced appropriate alternatives for construction technology and manufacturing. Local manufacturers and artisans also comprised the entire workforce. This allowed for a number of benefits, including reduced embodied energy in materials, local economic and social support, and reduced risk through the supply chain.
- › Families were exposed to alternative construction systems and building materials, when in the design phase of the homes. The demonstration of these materials at the outset aided the selection process and feeling of ownership over the final product.
- › A strong emphasis was laid on environmentally friendly materials and construction technologies. Waste from a nearby industrial area was used for fly-ash brick production. This was a three-fold success: introducing fly ash blocks into the construction vocabulary of the region, demonstrating high quality walling materials using waste, and influencing the local government and local users to incorporate and promote the technology.

## SUCCESS FACTORS AND PRECONDITIONS FROM KARAIKAL PONDICHERRY

### SUCCESS FACTORS

- 1 Speedy response to the initial tsunami by the Swiss Red Cross and the Initiatives in Development Support. The comprehensive appraisal was vital in early decision making by the government
- 2 The creation of quite strong (sometime non-negotiable) guidelines and policies by the government incorporated learning from previous reconstruction efforts. These guidelines put sustainability criteria in the forefront, and allocated clear leadership over the entire process.
- 3 The initial goal to invest in local resources, assets, and labour force was key in assisting local economic recovery, building public support, and exploiting local 'know-how'. Job creation and practical skill development will likely create a positive impact well after the construction of the district.
- 4 The decision to found Village Reconstruction Committees (VRCs) was instrumental in gaining broad public support, and ensured that the design and planning phases appropriately addressed social and cultural sensitivities.
- 5 Investment in local manufacturing capacity and regionally appropriate materials cut out the need for logistics operations tied to importing. Not only was this critical in reducing risks and costs, but helped boost the local economy and cut-out the embodied energy associated with the transport of materials.
- 6 Financial arrangements for the entire project were largely private and centralized, allowing for decisive

project management and the freedom to deal with up-front investment costs.

### PRECONDITIONS

- 1 Openness and learning to an adapting situation. Because post-disaster reconstruction efforts are plagued with unexpected variables, the capacity for the team to recognize and quickly address problems was key precondition for a successful process. For example, material sourcing, manufacturing, and sanitation capacity were all successfully addressed mid-process.
- 2 A clear leadership structure and excellent communication through the entire process is critical. The SRC effectively oversaw the entire process of relief, rehabilitation, and development work, and strictly monitored the performance of construction - often times cutting back on the scope of projects to ensure quality.
- 3 The support and participation of the community was a precursor to a successful process. VRC members took ownership of reconstruction, and assisted with a number of design and planning elements. The imparted local knowledge was a key instrument for a smooth process, but such organized participation also empowered citizens with ownership in the project.
- 4 Training was provided to local youth in building trades such as painting, plumbing, and electrical works. Working placement programs allowed 18 youth to work and learn directly with contractors.



**CREDITS**

- › Babette Pfander (Swiss Red Cross)
- › Amitabh Sharma (Swiss Red Cross)

**IMAGE CREDITS**

- › Swiss Red Cross
- › Skat
- › Development Alternatives

## 2.6 SONOMA MOUNTAIN VILLAGE, USA

### SONOMA MOUNTAIN VILLAGE IN FIGURES

<b>Total site area:</b>	81.000 m <sup>2</sup>
<b>Houses:</b>	1.500
<b>Projected population:</b>	5.000
<b>Commercial area:</b>	77.000 m <sup>2</sup>
<b>Website:</b>	sonomamountainvillage.com

### THE STORY OF SONOMA MOUNTAIN VILLAGE

Sonoma Mountain Village (SOMO) exists on a 175 acre property formerly owned by Hewlett-Packard and Agilent. Coddling Enterprises initialized the project with the intent of providing solar power to the neighboring community. Two phases of PV arrays were installed over two years. During this time, SOMO was approached by Bioregional North America in order to develop a "One Planet Action Plan" for the community. The concept envisions 1,900 homes and significant retail, commercial and office space. The plan also lays out environmental goals, including 100% heat, electricity, cooling, and lighting from on site renewable energy sources. Social goals were key for Coddling, and this was reflected in extensive public involvement through the development process.

Planning was quick to start, mostly thanks to funding provided privately by Coddling. Planning concepts developed quickly and resulted in a number of key developments:

- › A Standard Construction Specification guide, showing how tenants can improve and outfit their properties.
- › Legislative activism, appealing for exemption or modifications to state policies perceived as barriers to development.

- › Analysis and assessment, including both state sanctioned reports and private studies to maximize One Planet goals.

The City Council approved the Environmental Impact Report, General Plan Amendment, and certified the Development Agreement for Sonoma Mountain Village.

A substantial emphasis was placed on on-site manufacturing and retrofitting instead of new-build. Coddling construction manufactures high quality steel-frame construction on-site, powered by renewable energy, and a successful material recovery program contributed both structural and hardware components.

Despite being struck hard by the real-estate crisis in California, Coddling established a non-profit green business incubator (Sonoma Mountain Business Cluster) with goals to assist over 100 startups to create 2,000+ jobs. 358,000 square feet of buildings have undergone retrofit, and 342,000 square feet still to be renovated.

At this time, Sonoma Mountain Village functions primarily as a business park with some 700+ workers on site. Construction of the entire community is expected to finish in 2025.

#### ENERGY & MATERIALS

- › Renewable Energy on-site
- › Zero carbon operations in use-phase
- › Reduction or elimination of waste in construction
- › Maximum use of reclaimed, re-used materials
- › Maximum on-site material manufacturing with renewable energy

#### ECOSYSTEMS & BIODIVERSITY

- › Exceed storm water runoff standards
- › Intelligent use of grey water
- › Minimum 50% reduction in drinking water use in all retrofitted spaces relative to national Energy Policy Act of 19923 by reducing wasted water
- › Offsite conservation to mitigate development footprint
- › Integrate biodiversity into the urban areas

#### CULTURE & ECONOMY

- › Maximize sustainable transport
- › Maximize local food production and sales in community
- › Create a community oriented culture
- › Provide a One Planet Center on the Town Square
- › Establish non-profit green business incubator
- › Assist 100+ startups to create 2,000+ jobs
- › 25% affordable housing, exceeding municipal requirements
- › 4,400 new jobs

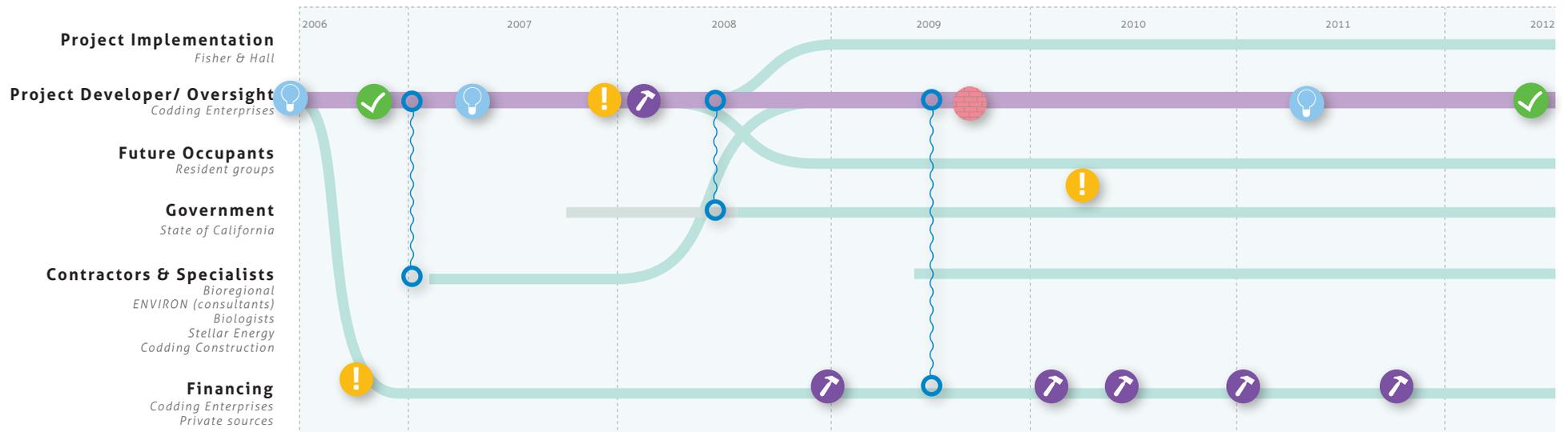
#### HEALTH & HAPPINESS

- › EcoTrails program, fitness infrastructure
- › Provide services and facilities on site that meet local needs
- › Integrate health infrastructure into the design
- › Create facilities for all age groups, including teenagers



## Process Description »

<p>Coding decides to install 1MW of solar power on former manufacturing facility</p> <p>1.14 MW array installed, &amp; generated 4.41GWh.</p> <p>Financing 100% private. 2/3 came from Coding Enterprises</p> <p>Coding works with BioRegional North America to develop the One Planet Action Plan for Sonoma</p> <p>A second MW on another building is planned for completion in early 2011</p> <p>Coding lobbys \$40,000 to help approve a transport sales tax bill</p>	<p>Action plan reviewed and endorsed by BioRegional's One Planet Steering Group in August 2007</p> <p>State mandates environmental impact review.</p> <p>First draft of the Standard Construction Specification guide has been completed – offers guide for how tenants can improve their properties</p> <p>Coding engages local authorities to permit narrower streets and alleys</p> <p>Majority of reclaimed materials re-used in retrofit of existing buildings.</p>	<p>ENVIRON undertakes initial analysis of embodied carbon for the project as part of a larger GHG inventory</p> <p>SOMO signs contract with Stellar Energy to provide an additional 1.00 MWe PV array</p> <p>Coding lobbys local government to permit use of rainwater and greywater in buildings</p> <p>Real estate depression in California, home building delayed until 2012-13</p> <p>Final EIR approved along with the Final Development Plan.</p>	<p>Master Plan approved. City re-zones to allow mixed-use development and Development Agreement</p> <p>Biologists perform assessment for species classified as threatened, endangered or concerned</p> <p>Business park operational, 700+ workers now on-site</p> <p>358,000 s.f. of buildings have undergone retrofit; 342,000.s.f.of existing buildings still to be renovated.</p>
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## Key Moments »

- Commitment to install 1 PV array to power the community
- Broad public support and collaboration on living plan
- Private Capital helps give sustainability a primary focus
- Material performance analysis evaluates sustainability broadly
- 1.14 MW PV Installed on November
- Standard metering plan for tenants encourages responsibility from public. Highly engaging community workshops address sustainability issues. (Schools invited to present)
- BioRegional expands Coding's focus on sustainability to include broader goals. Comprehensive sustainability goals set, incl. LEED Platinum standard
- Design out waste: recycling materials, prefab walls built onsite. (75% Construction waste reduction minimum, 90% min over time)
- Trained entire design and construction team on green building and LEED gives key learning to the team
- Real Estate bubble hits California hard. Delays building, slows progress on sustainability targets
- Extensive material inventory program is a key success: includes structural steel, insulation, piping, and hardware components
- Prefab Steel frame system used for retrofitting (uses 40% of standard construction)
- 30 tons of asphalt and concrete were reused in LEED-CI Platinum retrofit.
- Engage architects to better understand and optimize the package of low-energy materials
- Goal Achieved: 97% reduction in construction waste, currently manufacturing 20% of materials on site in a solar powered factory
- 25% affordable housing, exceeding municipal requirements

**KEY LESSONS FROM SONOMA MOUNTAIN**

- › Early involvement of residents was not only a successful strategy for continued engagement and community cohesion, but it also attracted tourism. SOMO has been established as a major green destination in Sonoma County, with 3-5 events each week at the existing Event Center that deal with environmental themes (last year alone, 200 events).
- › On-site production and assembly of modular components for construction significantly reduced the embodied carbon in materials, due to the already-installed PV. Coddling happens to own the largest biodiesel production plant in California, which has been able to provide fuel for construction vehicles, further lowering embodied carbon.
- › Developer-led advocacy and lobbying was effective in amending regulations to achieve the community's goals. Advocacy efforts were also instrumental in boosting the reputation of the project, and setting precedents for future developers.

**LESSONS FOR MATERIAL SUPPLIERS**

- › Resourcefulness in regard to material use was a central philosophy, from sourcing, through manufacturing, construction, and usage.
- › Prefabricated structural components allowed for rapid construction.
- › A strong re-use policy, and a focus on optimizing on-site manufacturing techniques led to an extremely high reduction of job site waste. This also allowed developers to save money in the construction process.

## SUCCESS FACTORS AND PRECONDITIONS FROM SONOMA MOUNTAIN VILLAGE

### SUCCESS FACTORS

- 1 Collaboration with BioRegional facilitated a broader approach to 'sustainable community development' and set a number of exciting goals that motivated the community and developers.
- 2 Open involvement of the community through workshops. Often creative approaches were taken to "rethink" problems and develop solutions. This was critical in maintaining support
- 3 Coddling adopted a type of "developer advocacy" to lobby to amend or earn exemption from planning legislation. This helps set precedents and build political support on a larger scale.
- 4 Strong focus and execution on on-site manufacturing, retrofitting, waste recovery allows resources to be used intelligently.
- 5 Sustainability Performance Analysis for building materials helps determine the most appropriate material for the construction application.
- 6 The first use inventory of reclaimed materials has been a huge success, with the majority of reclaimed materials already re-used in the retrofit of the existing buildings. For example, 30 tons of asphalt and concrete were reused as part of the LEED-CI Platinum retrofit.
- 7 Coddling continues to work with architects to design model homes that can be used in planning and permitting, and allow Coddling to better understand the package of low-energy materials that need to be used.

### PRECONDITIONS

- 1 Private financing and private development (using in-house expertise in development and construction) by Coddling was key to developing quickly.
- 2 An open and engaging community process to determine community planning and overcome sustainability problems. Encouraging a learning process and early involvement of residents resulted in high participation and support throughout the process.
- 3 The range and depth of Coddling's "developer advocacy" philosophy has had impressive results in paving the way for greater change in two ways:
  - › Lobbying and engaging both nationally and locally to amend laws that block sustainable development, and;
  - › Encourage them to reduce the impact of public operations (ie. shared services and infrastructure that individuals cannot influence)
- 4 The early creation of the Standard Construction Specification guide was key in achieving goals later in the construction phase. Designers and builders followed the guide, which required that reclaimed materials from on-site sources were to be used first, as well as easily recyclable materials. This program has been successful, such that the inventory has been largely used up in retrofitting the existing buildings.

**CREDITS**

- › Geoffrey Syphers (Coddling Enterprises)

**IMAGE CREDITS**

- › One Planet Communities



## 2.7 HAMMARBY SJÖSTAD, SWEDEN

### HAMMARBY SJÖSTAD IN FIGURES

<b>Site area:</b>	200 hectares
<b>Houses:</b>	11000 houses, 46% rentals
<b>Commercial space:</b>	20 hectares
<b>People:</b>	25.000
<b>Website:</b>	hammarbysjostad.se

### THE STORY OF HAMMARBY SJÖSTAD

The Hammarby Sjöstad development is situated on the south side of Hammarby Lake near the city centre of Stockholm. The project redeveloped a brown-field industrial location to a compact mixed use neighborhood that expands the inner city across the water. In 1996 the first plans to develop the area were made by the City of Stockholm.

The City Council of Stockholm occupies a strong central role in the development of Hammarby Sjöstad, being responsible for the financing, design, and implementation of the project. The original master plan was prepared by Stockholm's City Planning Bureau and included a phased development with 12 sub-districts. Detailed design codes for each of the sub-districts were developed using the "parallel sketching" process and formed the contractual basis for the developers.

Stockholm's bid for the 2004 Olympic Games was an important catalyst for the environmental program in Hammarby Sjöstad. The national and local environmental policy targets were augmented and included an ambitious "eco-cycle" model for local sustainable resource use. The Hammarby Model was jointly developed by Stockholm's public infrastructure companies (water, energy, and waste).

It provides an elegant solution for integrating the local municipal solid waste and wastewater management system to generate electricity, heat, and cooling for Hammarby Sjöstad. The City of Stockholm did not win the Olympic bid, but enough momentum for Hammarby Sjöstad was generated for the project to continue.

At the moment there are some 9.000 houses built. The construction costs of the houses were 5% higher due to the environmental program, but the market value of houses was 15-20% higher. The remaining houses and construction activities are scheduled for completion towards the end of 2017.

#### ENERGY & MATERIAL

- › Heating supply based on waste to energy or renewable energy
- › Green electricity from grid
- › Residents will produce 50% of own energy needs
- › 100 liters water consumption per person per day
- › 95% reuse of phosphorus in wastewater on agricultural land
- › 15% domestic waste reduction
- › Maximum 10% construction waste to landfill

#### ECOSYSTEMS & BIODIVERSITY

- › Sanitary redevelopment and reuse of old brown-field sites into beautiful parks and green public spaces
- › Development of green public spaces is compensated in the form of biotopes that benefit the biological diversity in the immediate area
- › Natural areas of particular value shall be protected from development

#### CULTURE & ECONOMY

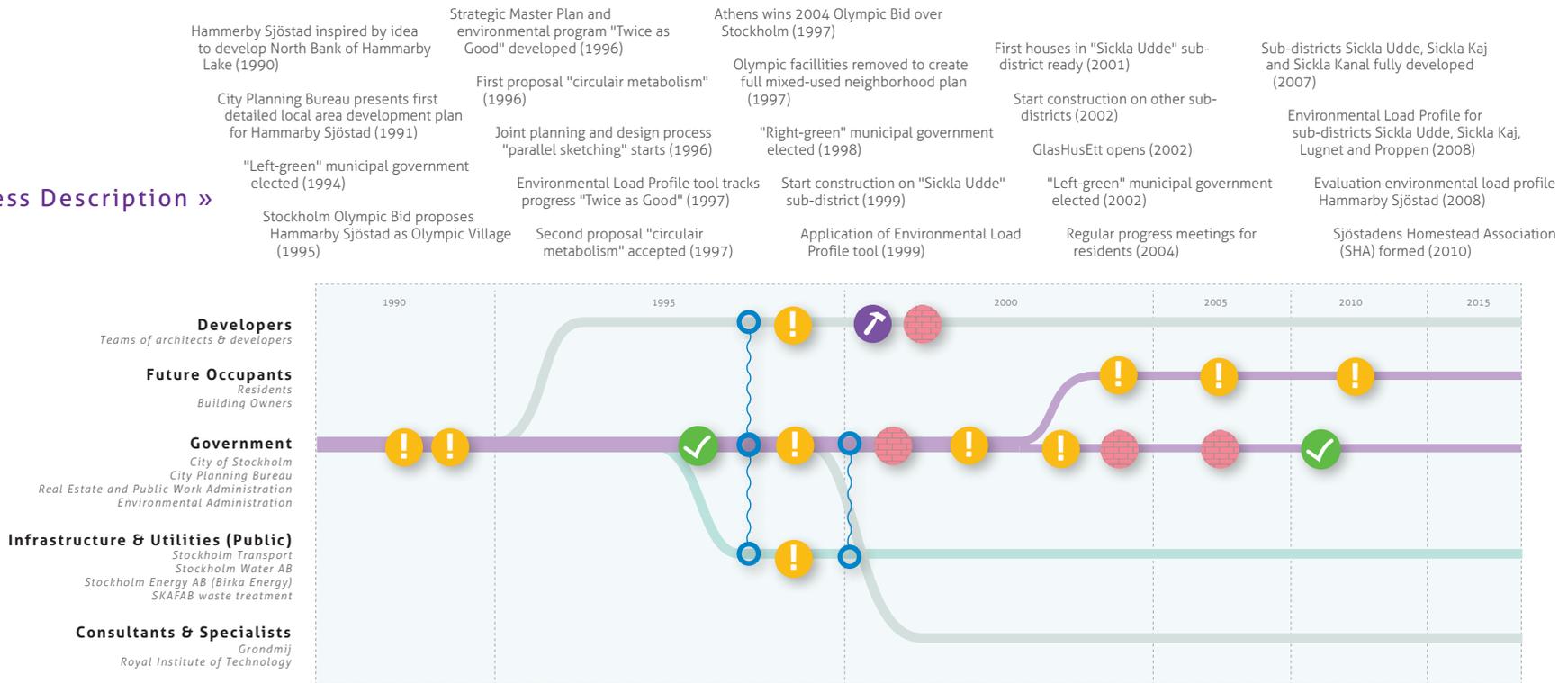
- › 80% of private and work transport by public transport, cycling, or on foot
- › Mixed use neighborhood: living, working, commerce, leisure, and education
- › Mix of rented flats and owned

#### HEALTH & HAPPINESS

- › Minimum of 15m<sup>2</sup> of courtyard space and a total of 25–30m<sup>2</sup> of courtyard space and park area within 300m of every apartment.
- › Minimum of 15 % of the courtyard space shall be sunlit for at least 4–5 hours at the spring and autumn equinoxes.
- › Glass House citizen information, education and encouragement



## Process Description »



## Key Moments »

- ❗ Strong coordinating and management role City (1991)
- ❗ Leasehold land system allows City to lead planning and design process (1991)
- ✅ Olympic bid inspires ambitious environmental targets (1996)
- 🔗 Key stakeholders participate "parallel sketching" process (1996)
- ❗ Stakeholder participation and confidence through familiarity "parallel sketching" process (1996)
- ❗ Infrastructure companies maintain momentum despite losing Olympic Bid (1997)
- 🔗 Infrastructure companies collaborate for "circular metabolism" (1997)
- ❗ High environmental ambitions maintained after Olympic bids (1997)
- ❗ Decreased political interest: Less public control on land sale and energy targets (1998)
- ❗ Minimum leverage with developers to secure environmental targets (1998)
- 🔧 Suppliers and contractors selected based on material and construction procurement policies (1998)
- ❗ Detailed design codes ensure high quality translation of masterplan (1999)
- ❗ Environmental targets not all reached in "Sickla Udde" but seen as important first step (2001)
- ❗ GlasHusEtt central to support residents in environmental lifestyle (2002)
- ❗ Politics: lowered social housing share and more parking spaces (2002)
- ❗ Survey: Residents attracted to aesthetics and less for the environmental aspects (2005)
- ❗ Energy targets adjusted from 100 kWh/m<sup>2</sup> to 60 kWh/m<sup>2</sup> due to cost (2005)
- ✅ Energy targets adjusted for new buildings from 100 kWh/m<sup>2</sup> to 60 kWh/m<sup>2</sup> (2009)
- ❗ GlasHusEtt residential point for government lobbying (2010)

### KEY LESSONS FROM HAMMARBY SJÖSTAD

- › Embedding sustainability requires a strong process that involves all stakeholders from the start of the design phase. A clear process and communication structure is necessary to effectively guide such a multi-stakeholder process from design phase through use phase. Regular communication allows for alignment and the capacity to innovate.
- › Including plenty of preparation time early in the initiation and design phase promotes good progression of the project in later development phases. Collective review of the development approach and plan, as well as anticipation of potential issues therein, creates awareness and cultivates a problem solving mind state.
- › Ensuring stakeholder ownership throughout the phases of urban development ensures that they give their best effort in realizing the ambitions of the urban development. Ownership can be facilitated by finding creative “carrot-and-stick” type of solutions that both engage and oblige stakeholders in their work.
- › Detailed process, design, and even “how-to-built” specifications help stakeholders understand their responsibilities and support a high quality translation of the urban design into reality. Strict monitoring at each step of the project is necessary to further guide stakeholders and to identify and solve problems early on.

### LESSONS FOR MATERIAL SUPPLIERS

- › New building materials and traditional materials used in environmental construction require enough skill to be properly used and implemented. Education and training might be necessary in order to instruct developers and contractors on their use.
- › Integrating sustainability targets into building design requires a more careful consideration of materials and their use. Because material selection frequently happens at this stage, there is an opportunity for suppliers to inform and assist designers in their choices.
- › Sub contracting can lead to underperformance of buildings despite well made execution plans by developers. Sub-contractors often have a high turnover in workers joining and leaving the project, resulting in a shortage of on-site material expertise. Also, because sub-contractors are sometimes less involved in the project than the main developer or contractor there is a risk that “ownership” is not carried through to reach the project's ambitions.

## SUCCESS FACTORS AND PRECONDITIONS FROM HAMMARBY SJÖSTAD

### SUCCESS FACTORS

- 1 The city of Stockholm uses a leasehold land system to generate tax income, which in turn is reinvested in development of the city. The system and generated budget made it possible for the city council to buy up land, lead the process and plan more effectively, and refine the “urban product”.
- 2 The city of Stockholm had a central coordinating function, integrating the role of process manager, master planner, and project developer. This ensured ownership throughout the development. The expertise and resources of the city council of Stockholm allowed it to execute this role capably.
- 3 The City Council, including council boards, developers, architects, and other stakeholders participated in a joint and integrated design and planning process. The “parallel sketching” process was adopted to evaluate and finally integrate the best design features produced by private sector architects and master planners. The familiarity of this process supported stakeholder participation and confidence. Detailed masterplans for each of the sub-districts were produced, which formed the basis for the contracts with developers.
- 4 Each of the detailed masterplans specified highly comprehensive design codes which were included in the contractual obligation of the selected developers. This ensured fast construction and a high quality translation from the original design ambitions to final urban materialization.

- 5 The infrastructure and utility providers in Stockholm are state owned. Together with the city Council they create a situation where a major part of the urban fabric is managed by the government thereby facilitating the implementation of environmentally conscious and integrated public infrastructure.
- 6 The GlashusEtt centre for environmental information and communication was established to function as the main point of community outreach. From its original function of providing residents with advice on environmental lifestyle, the centre is now being used as a tool for community consultation and lobbying towards the local government.

### PRECONDITIONS

- 1 Relative political agreement among political parties and active participation in the project by the local municipality.
- 2 Historic good relations and trust between Stockholm City and developers.
- 3 Shared project vision and goals for the project.
- 4 Participation of publically owned infrastructure companies.
- 5 Culture of using district heating systems based on local waste.

**CREDITS**

- › Stellan Fryxell  
Architect & partner, Tengbom Architects
- › Björn Cederquist  
Project Manager Social City, Stockholm City

**IMAGE CREDITS**

- › Björn Lofterud
- › Malena Karlsson



## 2.8 JINSHAN, CHINA

### JINSHAN IN FIGURES

<b>Total site area:</b>	83 hectares
<b>Built surface area:</b>	96 hectares
<b>New houses:</b>	5000
	70% low-medium income
<b>Commercial space:</b>	39,5 hectares
<b>Projected population:</b>	20.000
<b>Website:</b>	www.cmpd.cn

### THE STORY OF JINSHAN "THE HILLS"

The Jinshan development is located in the Panyu district of Guangzhou City, Southern China. The project establishes a new high density mixed use community in the middle of China's third biggest city. Jinshan is also known as "The Hills" and was initiated in 2005 by China Merchants Property Development (CMPD), one of the largest project developers in China.

CMPD set out to establish an innovative example of sustainable urban development in South China. They partnered with BioRegional, an entrepreneurial charity for urban sustainability, to adopt the One Planet Living program for Jinshan. As part of the program, a design process with key stakeholders was initiated to explore the One Planet Living principles and develop a sustainability action plan for Jinshan. In 2006 the action plan was used by architecture firm JEMER to prepare the first master plan of Jinshan.

The master plan proposed a 9 phased mixed used development with high rise residential apartments and villa's; a distinction from predominantly residential neighboring communities. Mixed use functionality is

fundamental approach of the One Planet Living program. The master design had a particular focus on keeping, restoring, and functionalizing the local ecology, and diverting common use of cars towards less impactful modes of transport.

Not all of the original sustainability ambitions in Jinshan were fully achieved. In particular the efforts to reduce personal car use and install renewables were not entirely successful. This reasons for this were a strong car culture, and the importance of governmental planning, regulations, and limited sustainability awareness.

Jinshan does succeed in setting a new standard for sustainable urban development in the region. It won the 2009 United Nations Habitat Business Award, as well as successfully being selected for several demonstration projects for energy efficiency and circular economy in the Guangdong province. More fundamentally, through Jinshan, key local stakeholders were involved in a collective learning and rethinking of the common approach to sustainable design, engineering, and integrated community development.

Currently the first four phases of Jinshan have been finished. Phases 5 to 7 and 9 are in the construction and respectively the design stage. Jinshan is expected to be completed in 2018.

#### ENERGY & MATERIAL

- › 65% reduction building related energy demand
- › 50% reduction travel related CO2 emissions
- › Zero carbon by 2012
- › 50% reduction in water consumption
- › 70% diversion of waste from landfill
- 50% of food sourced from within 30km of site
- 75% local, healthy, natural, reclaimed and recycled materials

#### ECOSYSTEMS & BIODIVERSITY

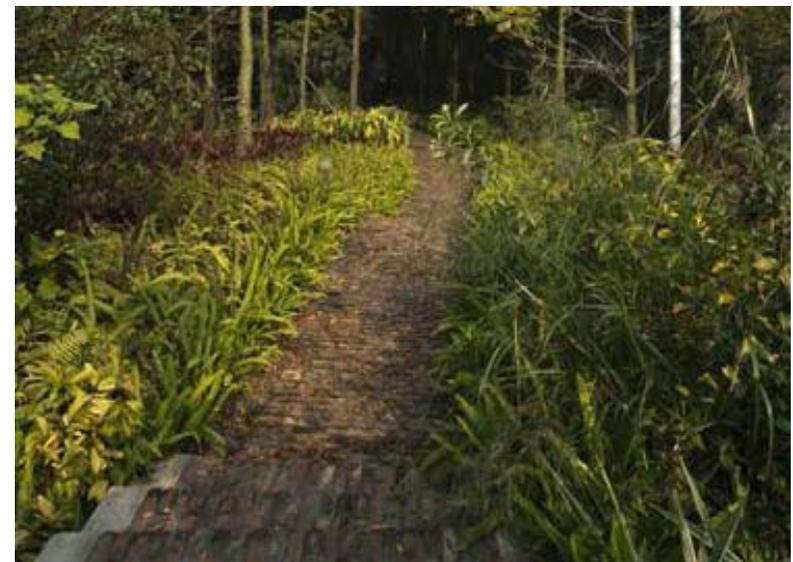
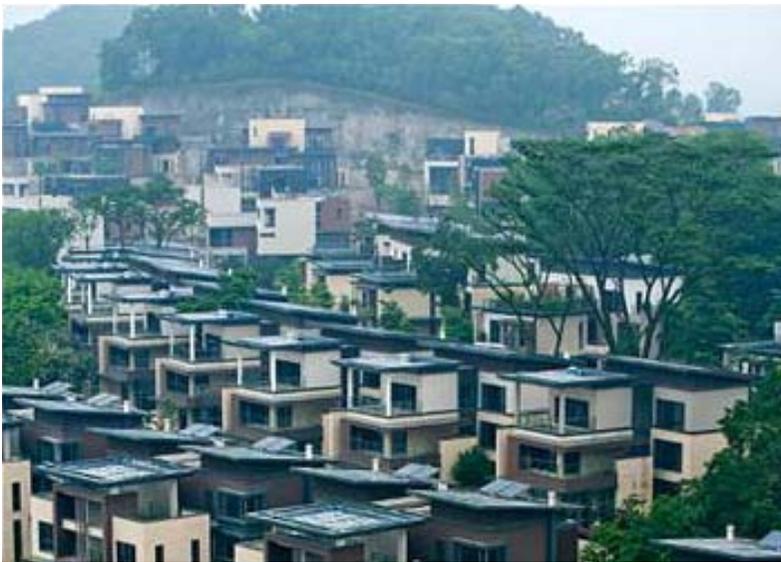
- › Preserve and nurture biodiversity
- › Conservation and improvement of existing biodiversity and ecological value
- › Wildlife friendly buildings

#### CULTURE & ECONOMY

- › Social programs for local food production and consumption
- › Lifestyle consumer education, organic waste recycling
- › Strong sense of identity rooted in local culture and heritage
- › Support residents and users to incorporate "green lifestyle"
- › Increase social equity locally and globally through investments
- › Mixed use development

#### HEALTH & HAPPINESS

- › Public green
- › Green citizen initiative and education
- › Providing a safe, comfortable, healthy and desirable environment



## Process Description »

Jason Hu (CMPD) inspired to adopt One Planet Living framework (2005)

CMPD's "green" development proposition accepted (2005)

Site research by BioRegional and DHV (2006)

Key stakeholder workshop to develop Outline Sustainability Action Plan (2006) LEED-ND guidelines adopted (2007)

CMPD and BioRegional sign cooperation agreement (2007)

First version of masterplan finished by JEMER (2007)

London College reviews masterplan (2007)

Government withdraws commercial space (2007) Tsinghua Architectural Institute verifies building designs (2008)

Phase 1: Start construction (2008)

CMPD starts monitoring construction activities (2008)

Local government visits BedZed, UK (2008)

Phase 1: First occupants move in (2009) CMPD starts organizing annual events for Jinshan residents (2009)

Sustainability Action Plan completed (2010)

Phase 2 & 3: First occupants move in and first commercial facilities open (2010)

Residential survey at Jinshan (2011)

CMPD stops efforts to lobby the local government (2012)

Government signs plan for the creative office park (2012)

Tsinghua Architectural Institute obtains project subsidies (2012)

Phase 4: First occupants move in (2012)

Jinshan masterplan completed (2012)

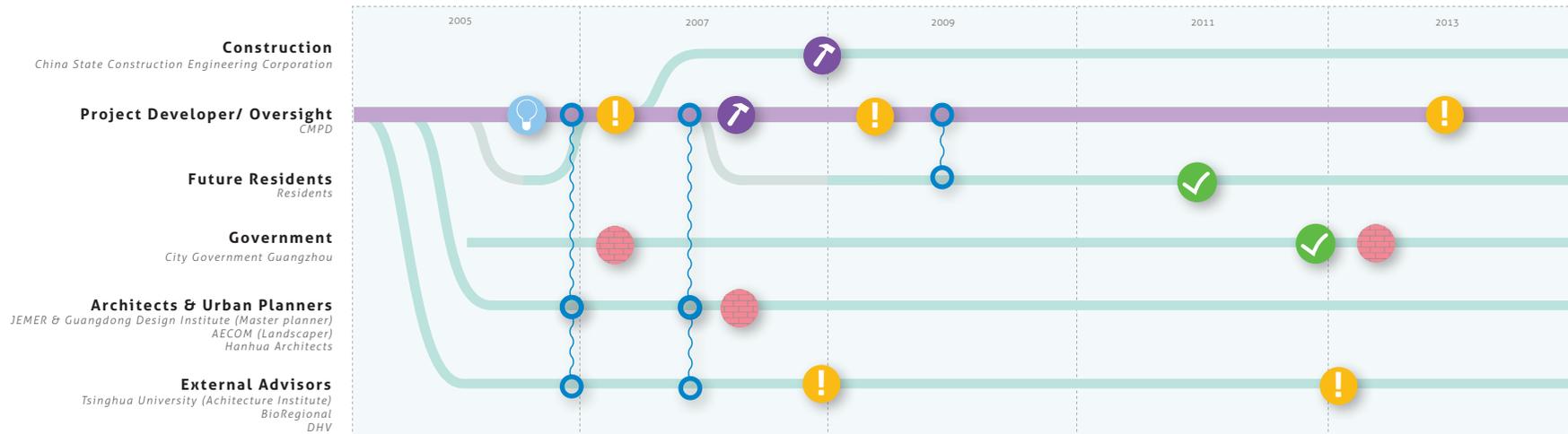
Training and education centre: Planning phase (2013)

Planning for "non-grid connected" PV systems (2013)

Phase 5, 6 & 7: Construction phase (2013)

Sustainability integrator BioRegional starts at CMPD (2013)

Phase 9: Planning phase (2013)



## Key Moments »

- Multi-disciplinary workshop to ensure integration of diverse sustainability goals and early involvement of key stakeholders (2006)
- One Planet Living goals for Jinshan collectively developed (2006)
- ! Lobbying on road development and public transport essential to reach One Planet Living goals (2006)
- ! Local government not willing to include light rail station in city plan (2006)
- ! CMPD establishes specifications for materials selection (2007)
- ! Suppliers not all intimately familiar with "sustainable" design, engineering, and construction (2007)
- BioRegional supports the process by providing sustainability expertise, trainings, and education (2007)
- ! Successful visit BedZed convinces local government to reinstate commercial space in Jinshan (2008)
- ! Monitoring of construction phase by CMPD's building supervisor to ensure delivery of right work (2008)
- ! Intensive stakeholder communication required to work effectively (2008)
- Annual "green lifestyle" educational efforts to reach One Planet Living goals (2009)
- ✓ Survey: "Residents enjoy living at Jinshan" (2011)
- ✓ Local agreement to slim down highway to four lanes, and install bus transit as alternative to light rail transport (2012)
- ! Regulations hinder grid connected renewable energy (2012)
- ! Training and education centre to further involve residents in achieving One Planet Living goals (2012)
- ! Knowledge integration by establishing sustainability department in CMPD (2013)

### KEY LESSONS FROM JINSHAN

- › When including a broad set of sustainability goals for a district, it will be important to involve all key stakeholders at the start of the design phase. A collective exploration and discussion on all the project ambitions and approach will stimulate a greater understanding for the project, and allows potential bottlenecks and their solutions to be identified early on in the process.
- › Monitoring is an essential activity to track and ensure best possible performance in each stage of development. Much of the sustainability goals are achieved in the construction and use phase, and often by stakeholders external to the organization in charge of the project. This creates performance risks as they may not prioritize the project ambitions due to lack of legal leverage, lack of ownership, or other economic reasons. Monitoring helps safeguard the original design criteria.
- › Future residents determine to a large extent the sustainability performance of a new district. Investing resources to stimulate greater understanding, involvement and ownership of residents is therefore essential. Achieving this is a social process requiring time and an understanding of residential needs. There is a difference between merely informing residents, and making them part of the development process. The degree of their awareness and sense of ownership determines the amount of responsibility residents can carry, which in turn influences their behaviour towards reaching and maintaining the sustainability goals.

### LESSONS FOR MATERIAL SUPPLIERS

- › The decision to select or to exclude certain construction materials is often made part of the design process. Material suppliers can support this selection process by participating earlier in the development process and by catering to the information needs of the stakeholders participating in the design process.
- › Project developers often make use of point-based methods or rating schemes for sustainable design and construction. Constructors can select their own materials as long as they achieve the desired performance standard. Material suppliers have an opportunity here to align their offer of materials and information on materials to these performance standards, facilitating the choice process for project developers.

## SUCCESS FACTORS AND PRECONDITIONS FROM JINSHAN

### SUCCESS FACTORS

- 1 A broad range of public and private stakeholders participated in a joint design workshop to develop the sustainability ambitions and solutions for Jinshan. Central to the workshop was the discussion and exploration of the 10 One Planet Living principles. This helped spread knowledge on sustainability, identify knowledge gaps, and created shared understanding of the project goals. The outcomes of the workshop were translated into a sustainability action plan and finally used as basis for the urban master plan.
- 2 Developing a new model of sustainable integrated urban development required going beyond the development and design approach familiar to the CMPD and local design partners. The readiness of CMPD to structurally involve BioRegional as sustainability expert proved to be a key enabling factor in the development of the project. Knowledge transfer through workshops and trainings were provided allowing a more efficient management by CMPD and more effective contribution of local design partners.
- 3 The One Planet Living goals for Jinshan were formulated at the level of the district as a whole, creating space to design different solutions for each of the sustainability goals. This allowed CMPD to work towards achieving key design objectives despite earlier implementation set-backs.
- 4 The Jinshan project and the One Planet Living program inspired CMPD to integrate new sustainability knowledge on integrated urban development. CMPD

appointed project managers for each of the ten One Planet Living principles, improving coordination on the different sustainability aspects of the project. The establishment of a company-wide sustainability department based on these managers is a further sign of the learning mindset the CMPD adopted in Jinshan.

### PRECONDITIONS

- 1 Strong drive for sustainability
- 2 The willingness of stakeholders to explore and learn beyond what they are accustomed to.
- 3 Sufficient project financing to pursue and implement sustainability solutions

**CREDITS**

- › Luting Jin  
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- › Sue Riddlestone  
Managing Director, BioRegional Development Group
- › Daisy Chen  
Programme Coordinator, BioRegional Development Group China

**IMAGE CREDITS**

- › China Merchants Property Development Co. Ltd

**[WWW.BIOREGIONAL.COM](http://WWW.BIOREGIONAL.COM)**

**[WWW.ONEPLANETLIVING.NET](http://WWW.ONEPLANETLIVING.NET)**

## 2.9 MENLYN MAINE, SOUTH AFRICA

### MENLYN MAINE IN FIGURES

<b>Total site area:</b>	165.000 m <sup>2</sup>
<b>Floor space:</b>	307.000 m <sup>2</sup>
<b>Residential area:</b>	85.000 m <sup>2</sup>
<b>Commercial area:</b>	40.000 m <sup>2</sup>
<b>Retail area:</b>	30.000 m <sup>2</sup>
<b>Community space:</b>	10.000 m <sup>2</sup> parklands
<b>Urban farms:</b>	800 m <sup>2</sup> on roof top
<b>Projected jobs:</b>	15.000
<b>Projected population:</b>	18.000
<b>Website:</b>	www.menlynmaine.co.za

### THE STORY OF MENLYN MAIN

In 1997 the current shareholders of Menlyn Maine identified a need for the rejuvenation of Menlyn as a commercial node with mixed functions for living, working and leisure. Boogertman (at that time the Architect) played a main role in this development. It was envisaged that it would be a green development. Shareholders and designers held sustainable design as the highest objective both for the entire district and for each individual project.

The land was acquired by several investors. From 2002 until 2005 the old middle class houses on the precinct were demolished to make way for the new high-density mixed used area. In phase 1 the roads and infrastructure (roads, energy, water, IT) were prepared.

In 2010 all land shares were consolidated to Menlyn Maine Investment Holding. To meet the local market needs while maintaining the mixed functionality, the initial urban plan was adapted many times from 2008 till 2013. In 2011 the Falcon building was delivered, and Nedbank moved into the

first 5 green start certified building. The Epsilon building followed in 2012 with 4 green stars.

A long-term relationship between Menlyn Maine and WBHO construction was initiated to allow a mutual investment in the learning process to enable high-level sustainable building. Together with highly qualified design teams (called 'the A-teams') Menlyn Maine managed to lower upfront additional investment for a sustainable building to 41%. These higher initial costs are earned back in lower operational costs of the buildings (lower total cost of ownership). Together with other social and comfort benefits this results in a solid business case for owners and users.

Construction of Retail, Hotels, Residential areas, entertainment centre and remaining offices continue until 2018. As part of the Clinton Climate Initiative a road map will be created to visualize how Menlyn Maine can become Carbon Negative.

Each project in Menlyn Main is individually financed by different means. Guidelines and regulations are formulated and maintained to ensure that all projects will be developed in accordance with the envisioned sustainable standards. In 2012 the Menlyn Maine Property Association was erected as the central organization that maintain the sustainability goals and maintains the precinct together will all building owners and tenants.

#### ENERGY & MATERIAL

- › Low carbon, low energy buildings and road map toward carbon negative impact
- › Green Star Buildings 4 stars or higher "by design" and "as build"
- › Local sourcing of material
- › Waste management and recycling programs
- › Water saving and grey water systems
- › Preparations are made for application of renewable energy (solar and wind) in the next 5 to 10 years.

#### ECOSYSTEMS & BIODIVERSITY

- › Green Roofs and 800 m<sup>2</sup> urban farm on roof top to provide locally grown fresh and healthy food
- › Green landscape, Trees sided roads
- › Functional green spaces: meeting areas in park and green roofs

#### CULTURE & ECONOMY

- › Mixed functions: offices, hotels, parks, residential, shops, leisure.
- › Connection of Menlyn Maine to surrounding areas, high accessibility
- › LEED ND certification for neighborhood development
- › Mix targets groups to address all sectors
- › Professional Urban Farm by local entrepreneur

#### HEALTH & HAPPINESS

- › Involvement of future building owners, tenants and residents as early as possible
- › Certification from Green Building Council planned for Green Star "in operation" to address behavior of building users
- › High quality, healthy, comfortable living with an cost-efficient proposition for residents, tenants and building owners that enhances their lives
- › Living areas that stimulate walking, cycling, and minimize the need for traveling over longer distances



## Process Description »

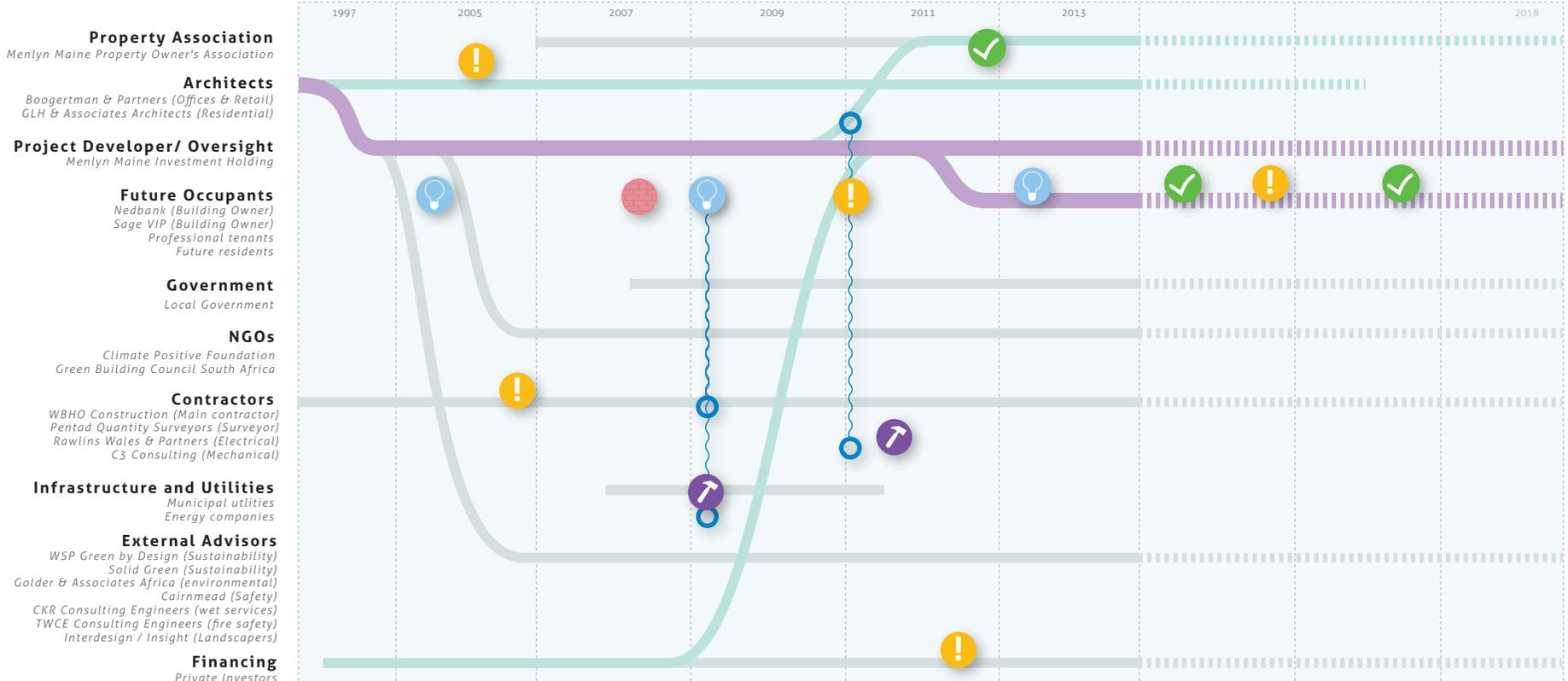
Current shareholders of Menlyn Maine envision the need for rejuvenation of Menlyn as a mix use commercial node  
 Land assembly by different investors / companies  
 Vision for green development to as a way to stand out, as this was not done before in South Africa

Acquisition of more investors & preparation of infrastructure  
 Nedbank (sponsor of Green Building Council) indicates desire to build Green Star in Menlyn  
 Adoption of New Urban Principles in development

Urban plan evolves bi-annually from 2008 till 2013 to meet local markets needs  
 Landshare 100% consolidated to Menlyn Maine Investment Holding  
 Development of Falcon and Epsilon Building

In 2011 and 2012 Nedbank and Sage VIP move into Falcon and Epsilon buildings  
 Participation of Clinton Foundation to become climate positive  
 Goal formulated for LEED NC (community goals) certification

Fix the Urban plan and development program  
 Foundation of Menlyn Maine Property Owner's Association operation and maintenance  
 Development of Pegasus Building  
 Continues development in 2014 - 2018 for Retail, Hotel, Residential area, Urban entertainment centre and offices.



## Key Moments »

- First outline of sustainability goals and guidelines by shareholders
- Involvement of Nedbank as launching customer speeds up sustainable development process
- Establishment of the Green Building Council in South Africa
- First urban plan (in 2007) according to European Model does not match local demand
- Higher sustainability goals: to become the first 'Green City' in South Africa
- Involvement of Green consultants impacts building design and material choices
- Long-term partnership to develop and build the site allows investment in learning and optimization of design and costs
- Contractor hires subcontractors and deals with sustainable sourcing of materials. Subcontractors must be able to demonstrate application of innovative technologies and/or guarantee performance levels
- Stronger conviction among investors about sustainable building - Attractive Total Cost of Ownership and there are more social advantage.
- First sustainable buildings in operation: 2 and 5 Green Star "by Design" and "As build", 50% lower energy consumption, 40% lower water consumption, waste management and monitoring
- Goal formulated for LEED NC certification (community goals) and becoming climate positive (through Clinton Initiative)
- renewable energy market is not competitive in South Africa
- Up front costs of building sustainable are about 45% higher compared to traditional building. First operational buildings show that these costs are earned back in the usage phase
- In 2014 road map will be made to become climate positive
- LEED ND Goal can be realized once the neighborhood is established.

### KEY LESSONS FROM MENLYN MAINE

- › Sustainable building concepts with high certification standards can have commercially attractive propositions for end-users.
- › Architects and contractors need to go through a learning phase together, to enable them to design cheaper buildings with high sustainability performance.
- › A hands-on approach to check out new materials and building concepts in practice will enable high performance standards and lower the risk in the development phase.
- › Performance warranties of sustainable materials (such as the endurance of paints) challenge suppliers to deliver sustainable products. Performance guarantees result in lower risk for the project developer, making it more attractive to apply innovative sustainable solutions.
- › Involvement of the Green Building Council and sustainability experts speed up the learning process of the design teams.
- › The advantages of sustainable development proved to be beneficial. It triggered the development team to raise its own goals for sustainability. In the process the motivation and the willingness to invest in high performance levels grew.
- › The slow-down in the real estate market also affected Menlyn Main which made it more difficult to operate the buildings to full economic capacity. However, Menlyn Maine managed to outperform the market due to its sustainable image.

### LESSONS FOR MATERIAL SUPPLIERS

- › Applying sustainability goals initially required perseverance and commitment. As projects evolve the desire to raise the level of sustainability seems to grow. This triggers new and more stringent demands on all materials used. As the bar is being raised, more and more materials and installations will be evaluated on different aspects of sustainability, for instance: locally sourced, ability to recycle, optimal composition (e.g. of cement), etc.
- › In big projects the main contractor is responsible for finding and selecting subcontractors. The main contractor will select and determine how and where the actual materials are being sourced.
- › Local presence in demonstration projects and having local dealers present with a solid track record is key to implementing in a developing market. The most convincing way to “sell” new concepts is to invite people to come and see the actual application with their own eyes.
- › A learning process is required to become sustainable with minimal extra up-front costs. New materials, installations, and proper design of sustainable buildings require experience and practice. The learning-curve is a crucial process that architects, project developers, and construction companies have to go through. Suppliers can cater to this need by providing high quality training.

## SUCCESS FACTORS AND PRECONDITIONS FROM MENLYN MAINE

### KEY SUCCESS FACTORS

- 1 Menlyn Maine Investment Holdings considers itself fortunate to have strong support from investors for the sustainability goals. This support only grew stronger as the project evolved and the multiple benefits became even more apparent.
- 2 In South Africa this development is one of the leading sustainability developments. Even worldwide the project's certification standards and participation in the Clinton Climate Initiative attract special attention. This also attracts experienced and highly qualified professionals that can and want to deliver projects that are on the forefront of the sustainable building market.
- 3 The ambitious goals set the project apart and attracts parties interested in high-level sustainable building. Increased focus and demand for sustainable buildings together with clever design and good management led to Menlyn Maine overcoming commercial challenges when delivered, and into the foreseeable future. Although the real estate market has slowed down, Menlyn Maine visibly outperforms the market.
- 4 Menlyn Maine organized strong teams and added specific knowledge from the Green Building Council in South Africa and other sustainability consultants. Using (mainly) proven technologies enabled high performance building at minimal risk.
- 5 Developing a good and long-term relationship for the entire development with the main contractor proved productive. Both companies pride themselves in their

achievements and want to outperform the market. Moreover, the mutual long-term commitment allowed both companies to invest time in their learning curve to optimise the way they design and build. This way they managed to significantly lower the up-front cost to build sustainably.

- 6 Guidelines and regulation, together with as-early-as-possible involvement of future residents, building owners and tenants ensures that the sustainability goals are adopted in the usage phase.
- 7 Different design team are formed for residential areas and retail / office areas.
- 8 Objectives are set relative to the current and future viability of certain technologies. At the moment, renewable energy is not commercially viable in South Africa because the energy prices are too low. However, the design of the buildings take future implementation of PV arrays into consideration. 40% of the roof space is reserved for solar and/or wind power. Menlyn also developed a strategy to actively monitor investment opportunities in solar and wind power to offset the energy use in the near future. These options are laid out in a road map delivered in 2014 to the Clinton Foundation.

### PRECONDITIONS

- 1 Investors for this project were convinced that sustainable buildings, despite higher initial costs, result in commercially viable and even more attractive business cases.

- 2 Flexible urban planning and adapting design to meet local market demands requires the willingness to enter into long approval processes from the local government each time the plan is adjusted.
- 3 There needs to be good relationships and trust among investors, project developers, architects and contractors. They need to allow each other time to learn and they need to work together to collectively build smart and deliver sustainable buildings at commercially competitive prices ranges.
- 4 Good project management also deals with getting the right parties and qualities in the project team. This requires an open attitude that recognizes the need to involve experts that may change the way companies would build normally.
- 5 All parties need to subscribe to maintaining the increased sustainability goals. They need to be adopted to all aspects of the building, from building materials such as concrete, wood, insulation, paints, waste management, all the way into the operational phase of the building.
- 6 Parties need to be able to not just copy design choices, but really adapt the plan to local conditions and demands.
- 7 The local market needs to develop a demand for sustainable buildings. There need to be enough local suppliers and buyers / tenants with a specific interest in sustainability.

**CREDITS**

- › Jurgens van Huyssteen (project developer, Menlyn Main)

**IMAGE CREDITS**

- › Menlyn Maine
- › [www.fgprop.co.za](http://www.fgprop.co.za)
- › [www.easterntimes.co.za](http://www.easterntimes.co.za)



## 2.10 GREENWICH PENINSULA, UK

### GREENWICH PENINSULA IN FIGURES

<b>Site area:</b>	121 hectares
<b>Built surface area:</b>	78 hectares
<b>New homes:</b>	13,000; ~ 32% affordable housing
<b>Commercial &amp; office space:</b>	38 hectares
<b>Projected population:</b>	30,000
<b>Website:</b>	www.gmv.gb.com

### THE STORY OF GREENWICH PENINSULA

The Greenwich Peninsula development is located on the river Thames in the London Borough of Greenwich. The project is one of the major regeneration projects in the United Kingdom, redeveloping what was once Europe's largest gasworks site into a dense mixed-use neighborhood. The plan for the area was initiated in 1997 by former Deputy Prime Minister John Prescott, who asked English Partnerships, the government's national regeneration agency, to carry out the project.

The Peninsula master plan is designed by a high profile and multi-disciplinary team lead by Richard Rogers Partnership. It includes two main areas: the Greenwich Millennium Village (GMV) to the south, and the Meridian Delta site to the north. The designs focus on creating a high quality modern mixed-use urban community. The project aims for a level four or higher of the Code for Sustainable Homes and a BREEAM rating of "very good" or "excellent" for non-residential units. As part of the Millennium Communities Program, the design for GMV emphasized sustainability in particular.

English Partnerships founded Greenwich Millennium

Village Ltd and Meridian Delta Ltd as private development partners for GMV and Meridian Delta site respectively. Their challenge was to establish a new and ambitious sustainability standard for urban development on an isolated brown-field site. This proved to be difficult for the first two phases of GMV in particular.

Most of the originally proposed sustainability goals were reconsidered due to high expected costs, resulting in lowered performance targets and use of traditional on-site construction over novel standardized off-site construction techniques. Despite these initial difficulties the project is now well on its way to achieve its sustainability targets, and in addition, successfully managed to push national policy to adopt ambitious sustainable design criteria for all new urban developments.

Greenwich Millennium Village and the Meridian Delta site are expected to be completed in 2015 and 2035 respectively.

#### ENERGY & MATERIAL

- › Codes for Sustainable Homes level 4 or better
- › Building for Life Standard; London Housing Design Standards
- › BREEAM "very good" or better
- › 80% reduction in primary energy consumption (GMV)
- › 50% reduction in embodied energy (GMV)
- › 50% reduction in construction waste (GMV)
- › 30% reduction in water use (GMV)

#### ECOSYSTEMS & BIODIVERSITY

- › Regeneration of local area
- › Protect and enhance local environment capital
- › Public gardens and connected greenways between neighborhoods

#### CULTURE & ECONOMY

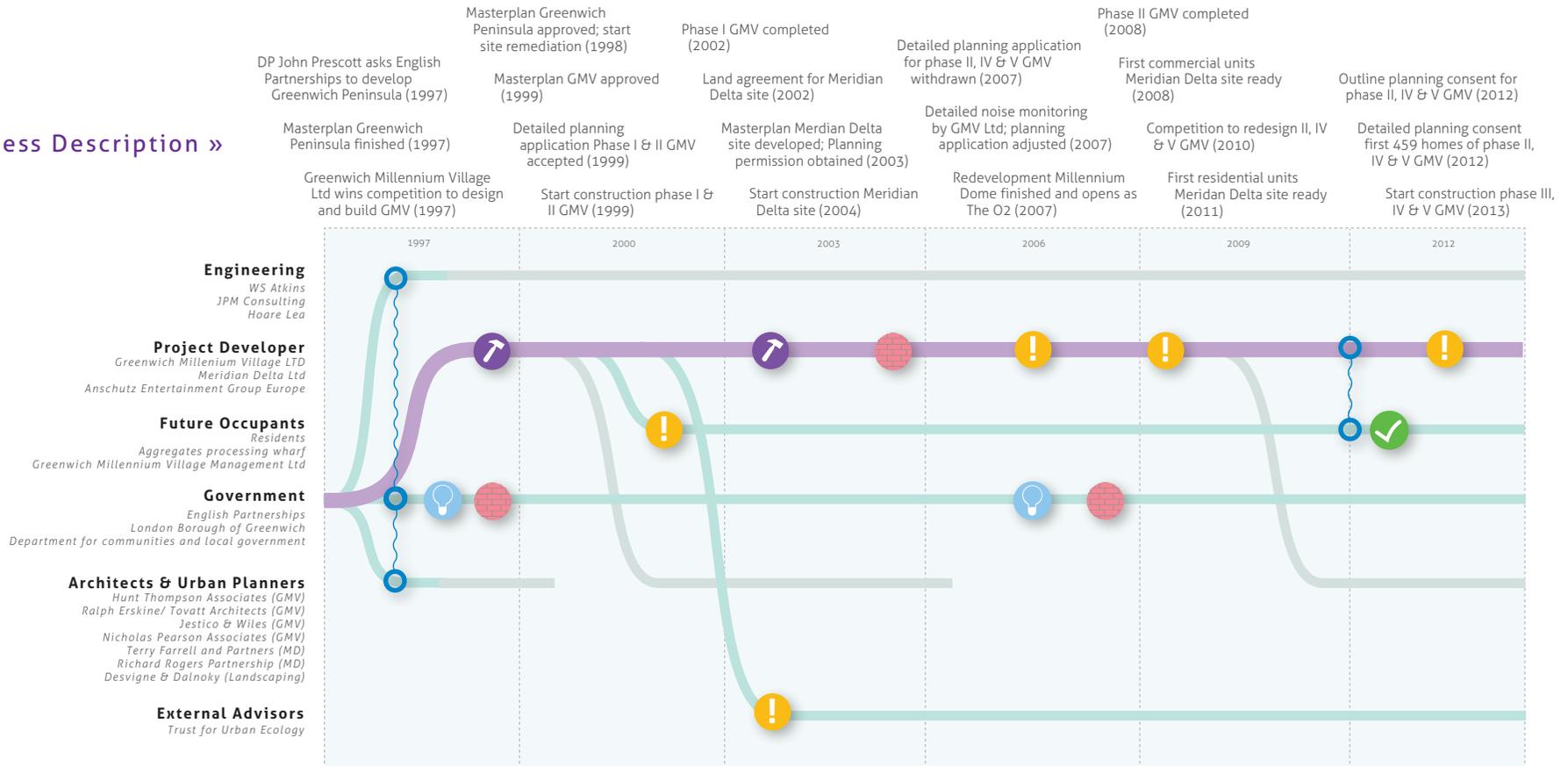
- › 30% reduction in construction costs (GMV)
- › 25% reduction in construction time (GMV)
- › Affordable housing
- › Mixed use community
- › Mixed income community

#### HEALTH & HAPPINESS

- › Public green
- › Greenways for cyclists and pedestrians



Process Description »



Key Moments »

- Sustainability criteria for GMV included in contractual agreement with developers (1997)
- GMV Management Limited established for the long-term management of community (2000)
- "Code for Sustainable Homes" level 4 included in contractual agreements (2006)
- Key stakeholder team worked together on development masterplan Greenwich Peninsula (1997)
- TRUE takes over management of Greenwich Ecology Park (2002)
- National policy inspired to adopt higher sustainability criteria (2006)
- Originally proposed sustainability performance targets adjusted or omitted due to expected costs (1998)
- Large service costs in GMV due to not properly functioning novel cladding and building facades (2002)
- Aggregates processing wharf legally opposed planning application GMV due to noise levels (2007)
- Novel standardized off-site construction not implemented due to expected costs (1998)
- Slow rates of development due to economic crisis (2004)
- Noise monitoring shows total redesign of planning application phase II, IV & V GMV is necessary (2008)
- Consultation events with residents GMV for input in design phase III, IV & V (2011)
- Local heat system GMV supports collective management and community organisation (2011)
- Financial investment by Knight Dragon in Meridian Delta Limited ensures continued development (2012)

### KEY LESSONS FROM GREENWICH PENINSULA

- › Involving key stakeholders in the design process helps ensure that sustainability goals are realistic and supported. This reduces the risk of them being diluted or omitted in subsequent phases due to financial reasons or lack of know-how.
- › Including “performance provisions” into contractual agreements with developers provided leverage for project initiators to adjust the level of sustainability performance for each new planning application. This creates opportunity to ensure that sustainability targets will reflect new advances and regulatory standards that come into effect.
- › The phased development of Greenwich Millennium Village created space for the developers to organize consultation events with the residents. This allowed them to collect valuable feedback on the design and implementation process. Planning for and capturing such “learning” is therefore essential for achieving the best results.
- › Using new design elements introduces a degree of uncertainty in the development process. Proper testing of such innovations and planning for their continued maintenance is therefore important for managing performance levels and extra service costs.

### LESSONS FOR MATERIAL SUPPLIERS

- › There are significant financial and performance risks involved when applying new building materials and techniques, such as the novel cladding and building facades used in GMV. Reducing these risks requires testing and local know-how on how to apply such innovations. Suppliers can influence the successful implementation of new construction techniques and new materials by providing better technical guidelines and parameters on their proper use.
- › The “Code for Sustainable Homes” design guide was central to the Greenwich Peninsula project. In the standard there is space for construction companies to select the materials they think appropriate to reach the desired performance level. Materials suppliers can facilitate this selection process by providing detailed and comparable information and by aligning their offer of materials to the required performance levels.

## SUCCESS FACTORS AND PRECONDITIONS FROM GREENWICH PENINSULA

### SUCCESS FACTORS

- 1 The demonstration and realization of the sustainability goals for phase I & II of GMV convinced legislators to change national policy towards more stringent sustainable design criteria (Level 4 of the “Code for Sustainable Homes”) for all new urban developments.
- 2 The experiences gained in phase I & II of GMV were incorporated into the designs of phase III, IV & V. The developer organized consultation events where residents were invited to give their insights and share their experiences. This promoted greater involvement of residents while improving the quality and implementation of the next phases.
- 3 The use of the “Code for Sustainable Homes” proved to work well. The standard is very well accepted by developers and construction companies, as it clearly lays out the requirements and methods of verification. This verification also provided English Partnerships the assurance that their targets were being met. Furthermore, the standard provided construction companies with a platform to distinguish themselves from competitors, while supporting effective business development and investment planning.
- 4 GMV Management Ltd was established to be responsible for the long-term management of GMV and to eventually be owned by the residents. Part of its first responsibilities was the management of the local environmental infrastructure. The community was made responsible for maintaining the local heat and boiler system which required residents to organize and coordinate tasks, fostering a sense of

community.

- 5 The so-called “section 106 agreements” permitted English Partnerships to include sustainability specifications in their contracts with developers. These “contractual provisions” are legally binding and linked to the granting of planning permission. This allowed English Partnerships to establish new sustainability targets for subsequent project phases that reflected the newly set performance standards for sustainable design and building.
- 6 English Partnerships allocated funds for social housing in Greenwich Peninsula. Design and sustainability criteria were established by English Partnerships, which developers of social housing were required to meet in order to win its funding. This provided leverage to ensure that sustainability targets were also achieved in the social housing segment.

### PRECONDITIONS

- 1 Political will for a new kind of sustainable urban development.
- 2 Section 106 agreements permitting local authorities and developers to make land use agreements.
- 3 Public financing for land regeneration, infrastructure, and social housing.

**CREDITS**

- › Daniel Bridge  
Principal Development Manager, Strategic Projects and Property, Housing & Land Directorate, Greater London Agency
- › William Stewart  
Principal Development Manager, Strategic Projects and Property, Housing & Land Directorate, Greater London Agency

**IMAGE CREDITS**

- › [www.gmv.gb.com](http://www.gmv.gb.com)



## 2.11 MASDAR CITY, UAE

### MASDAR CITY IN FIGURES

<b>Total planned area:</b>	600 hectares
<b>Residential area:</b>	6.000 m <sup>2</sup>
<b>Commercial:</b>	1.500 businesses
<b>Retail space:</b>	250 m <sup>2</sup>
<b>Community space:</b>	1.000 m <sup>2</sup>
<b>Projected population:</b>	45.000
<b>Projected commuters:</b>	50.000
<b>Website:</b>	www.masdar.ue

### THE STORY OF MASDAR CITY

Masdar means “the source” in Arabic and refers to Masdar the company, including Masdar City. The development of Masdar is initiated by the Abu Dhabi government to create economic diversification and knowledge-economy jobs. Masdar City is designed and operated to provide the highest quality of life with the lowest environmental footprint – all in a manner that is commercially viable. Masdar is designed to be the source of many things including knowledge, innovation and human capital development in the areas of renewable energy and clean technologies.

The development started in 2006 when the Abu Dhabi government and Mubadala (a 100% government owned company) created the subsidiary Masdar that consists of four business units (Masdar City, Masdar Capital, Clean Tech and the Masdar Institute of Technology and Science). The goal of the development is to create an internationally leading clean-tech hub for renewable energy and sustainable living.

Many international parties and partners were attracted to develop Masdar. And, many more will be involved as the development is planned to continue up to 2025. In turn, Masdar is now providing consultancy services to enable sustainable development in other regions.

The first six buildings of the Masdar Institute of Science and Technology campus are completed and fully operational. They include three residential buildings, classrooms, two laboratory buildings and a Knowledge Centre – a total of 35,000 m<sup>2</sup> of gross floor area. Students live in the on-campus housing within Masdar City. There are retail, services and food and beverage outlets and Masdar City hosts a monthly organic farmers market and street fair from April to October every year.

Construction of the second phase of Masdar Institute is ongoing was set to be completed by the middle of 2014; the 10,000 m<sup>2</sup> Courtyard Building, which will be the first commercial building in the city, is handed over by mid-2014, while the 23,100 m<sup>2</sup> Siemens Middle East Headquarters Building was completed by the end of 2013. These present three projects that tripled the size of the city, from 35,000 m<sup>2</sup> to approximately 110,000 m<sup>2</sup> by the end of 2014.

At full build-out by 2025, the city is expected to have 40,000 residents and 50,000 commuters.

#### ENERGY & MATERIAL

- › 30% less embodied energy in materials (550 kg CO<sub>2</sub> / m<sup>2</sup>)
- › >50% less energy use compared to BAU (i.e. passive design, high-efficiency appliances, shading to minimize air-conditioning needs).
- › Renewable energy production: 75% hot water, near 100% renewable electricity. Solar (130 MW), CSP (in exploration), wind farms, (20 MW), geothermal and there are plans for a hydrogen power plant.
- › 60% water reduction (80% recycling and reuse) low-flow showers, a water tariff, smart water meters, grey-water for crop irrigation and other purposes).
- › Recycled materials and waste reduction: attempt to go to zero-waste. Biological waste to create nutrient-rich soil and fertilizer, some may be incinerated as an additional power source.
- › Efficient logistics, minimal need for transport through mixed functions and low carbon transport (personal rapid transit).

#### ECOSYSTEMS & BIODIVERSITY

- › Preserve local wild life and local vegetation
- › Biodiversity protection area
- › Treated waste-water that is recycled for plant irrigation ensures water conservation

#### CULTURE & ECONOMY

- › Diversify Abu Dhabi's economy
- › Business innovation hub for renewable energy, sustainable innovation & education
- › Local procurement
- › Develop the UAE local market and impact other projects through the development of local regulations for sustainable building.

#### HEALTH & HAPPINESS

- › Maximize quality of live while minimizing environmental impact
- › Healthy buildings with air quality monitoring
- › High quality living and working environment
- › Less and clean-tech commuting



## Process Description »

Abu Dhabi government formulates ambition to create a leading clean-tech hub for renewable energy and sustainable technologies.

Masdar (full subsidiary of Mabadala) created by Abu Dhabi (UAE) Government and Mabadala.

First outlines for Masdar project plan developed with Foster & Partners and CH2M Hill.

In 2007 Abu Dhabi, United Arab Emirates announces Masdar as the world's first zero-carbon city.

International partnerships with many multinationals for sustainable development and to grow the new community.

Designs for the buildings of phase I  
Construction of phase 1 starts in 2008

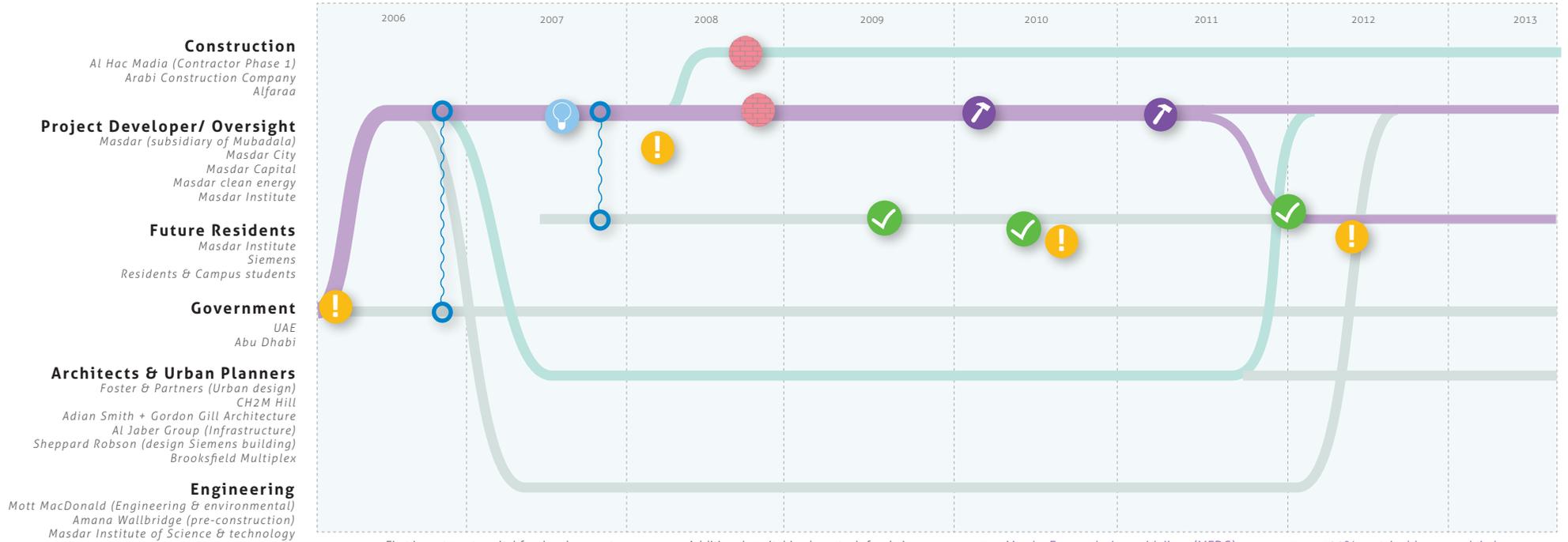
Planning of Masdar development is adjusted to be completed after 2020

Construction of phase 2 starts in 2010

First 6 buildings in operation in 2010 and first tenants move in

First buildings of phase 2 to be in operation in 2013

Development is projected to continue till 2020 - 2025.



## Key Moments »

- First investment capital for development of a new innovation hub with mixed-use.
- Initial goals are set to create innovation hub with mixed use, providing the highest quality of life with the lowest environmental footprint. Zero Carbon, Zero Waste, car free city and energy positive.
- Strategic goals and development coordinated with Abu Dhabi Executive Council.
- Attract and make inventory of needs of strategic partners and future occupants (companies, etc.).
- Additional capital in clean-tech fund via Consensus Business Group, Credit Suisse and Siemens Venture Capital.
- Dust from construction activities require measures to secure air quality.
- Due to the impact of the financial crisis phase 1 is delayed to be completed in 2015. The final completion is scheduled to occur between 2020 and 2025.
- IRENA chooses Masdar as the location for its headquarters.
- Masdar Energy design guidelines (MEDG) encompass supply chain impact and serve as a mandatory framework for designing energy-efficient buildings.
- Masdar Insitute moves in first operational building the first tenant.
- Strategic partnership with Siemens and Mitsubishi for long-term commitment.
- The Future Build tool assists architects, engineers and contractors in identifying and sourcing building products and materials with low environmental impact.
- 100% sustainably sourced timber  
- 90% recycled-content aluminium used for the inner façade  
- 30-40% lower carbon footprint concrete applied  
- Water-based paints that have no volatile organic compound, which - harm human health  
- Reinforcing bars made of 100% recycled steel.
- Siemens Building (LEED Platinum & Pearl 3 standard) wins several prestigious design awards

### KEY LESSONS FROM MASDAR CITY

- › Buildings can be made sustainable and economically viable.
- › Building sustainably can be done by understanding integrated holistic design and by working with very cross-disciplinary teams. It requires teams with a wide range of expertise. In Masdar 25+ disciplines were involved in the planning and design phase.
- › It is crucial to work with passion. Urban development is all about people. This is why lead designers need to put the people at the centre and bring them together. An open attitude towards learning from each other and from different experts is key.
- › Setting inspiring goals drives people to develop expertise and to go the extra mile.
- › Large projects have the potential to impact the entire region. These projects can be beneficial for (local) governments by contributing to new buildings standards. In addition, they can be beneficial for the local market by building local knowledge and expertise.
- › Expertise from around the world was necessary to create Masdar. The expertise and adaptation of international knowledge to local solutions enables Masdar to now export knowledge to regions with similar climate conditions.

### LESSONS FOR MATERIAL SUPPLIERS

- › The Masdar project proved that higher recycling rates for i.e. concrete and aluminium are possible.
- › Breakthroughs can be achieved by working across the value chain. In Masdar this was done by working together with Siemens, Mitsubishi, Honeywell, General Electric, etc. Developers can challenge suppliers to push the envelope and create win-win situations. Co-innovation requires an investment from both parties.
- › Don't build 'one size fits all' buildings. Australia's 18 climate zones and provided Masdar with experience in designing specific solutions for different zones, city and market.
- › The sector must re-examine traditional building techniques and use them to inspire modern buildings and capitalise on maximum efficiency. The goal is to find the sweet spot between good design, effective technologies, and good performance. For instance, in Masdar extra-thick walls funnel wind into rooms with towers known as Al Barajeel. These traditional design principles are valuable, simple, passive and hence efficient.

## SUCCESS FACTORS AND PRECONDITIONS FROM MASDAR CITY

### KEY SUCCESS FACTORS

- 1 Determination to realize economically viable sustainable development and the continuous drive to raise the bar. Reach for the limits to make buildings more sustainable and economically viable. The knowledge generated proves to be very valuable for all parties involved in this project and in all future projects.
- 2 Understanding integrated holistic design. This requires cross-disciplinary processes with a very broad range of disciplines. Doing this requires an open attitude to discuss and integrate solutions in the design. The project's scope document encompasses 25+ disciplines. The lead designer creates a team and organizes workshops to develop the right concept.
- 3 Close cooperation with suppliers to improve the sustainability performance of their production process and the quality of materials. For example, the city developed or brought to the local market a range of green materials, including low-carbon cement; high-recycled-content aluminum; sustainably sourced timber; water-based, low-VOC paints; and 100% recycled steel reinforcing bars. Working across the value chain, they challenged companies and created partnerships (with eg. Siemens, Honeywell, General Electric, Mitsubishi, Alcoa). Through cooperation win-win situations are created as the Masdar Projects are international showcases and result in a leading position for economically viable commercial development.
- 4 Educate and develop the local markets. Results in

growth of local suppliers and the local economy. It resulted in spin-off policies that affects all new build projects in the UAE.

- 5 Masdar Energy Design Guidelines proved to be a powerful instrument for suppliers to make sound material choices and provide information about sustainable material sourcing.
- 6 Passion and People. Promoting health and wellbeing attracts the aligned parties. Their experience adds to the project, and promotes the willingness to learn from each other.

### PRECONDITIONS

- 1 Long-term visions, commitment and a strong financial basis to create an international hub. When the project was announced in 2008 Abu Dhabi committed itself to investing \$15 billion in Masdar, making it the largest single government investment of its kind, encompassing 440 million sq. ft. of facilities when completed.

### TECHNICAL AND MATERIAL INNOVATIONS

Masdar is a special project in this book's line-up in the sense that it is built to develop a business hub for sustainable technology. This is why Masdar spends extra attention on the implementation of new technologies. Because the development and implementation of innovative technological achievements is of special interest, we've listed some (not all) of the noteworthy achievements of the project below:

- 1 The exterior wood used throughout the city is palmwood, a hardwood-substitute developed by Pacific Green using plantation coconut palms that no longer bear fruit.
- 2 Concrete– The ready-mix concrete used to build Masdar City contributes significantly to the carbon footprint; however, a variety of steps were taken to improve the sustainability of this concrete with regard to the sourcing of the materials and innovative design mixes and systems. All mix designs use granulated blast furnace slag (GGBS) as a 40% to 60% replacement for Portland cement. As GGBS is a by-product of the process to produce steel and is typically directed to landfills, using this material as raw material for another process reduces waste, improves the concrete's strength and durability, and reduces water and embodied carbon.
- 3 Aluminium– Masdar City worked with local and international suppliers and partners to develop recycled aluminium for use in the Masdar Institute buildings' façades. The façades use 90%-recycled aluminium for an embedded carbon number of 0.98 kg CO<sub>2</sub>e/kg, less than 10% of conventional aluminium. Extrusions for windows and door frames have been developed for the Masdar headquarters building with an 81% post-consumer and post-industrial recycled aluminium for an embedded carbon number of 5.96kg CO<sub>2</sub>/kg, nearly 50% less than conventional aluminium.
- 4 Steel– Steel reinforcing bars used in the first Masdar Institute buildings were made with recycled scrap sourced from electric arc furnace (EAF) steel mills

locally and Turkey. Worlds first to use 100% recycled steel.

- 5 Timber- A glued laminated timber roof was selected for the Masdar Institute Knowledge Centre as it is graceful and beautiful, but also because its FSC-certified timber has a lower embodied energy coefficient than other options.
- 6 Because of its need to understand the life cycle impact of its supply chain, Masdar City developed a rigorous product assessment process that has evolved into the region's first home-grown sustainable building products and materials listing portal. Called The Future Build, this portal makes it easy for architects, engineers and contractors to source locally available "green" materials for their projects in the UAE and region.
- 7 In terms of successes in the built environment, the Masdar Institute's residential buildings are designed to use 54% less potable water and 51% less electricity than business as usual (BAU), while 30% of buildings' power demand is met by rooftop PV and 75% of hot water is provided by rooftop thermal collectors.
- 8 With more than a dozen pilot projects underway, there are early successes to note, including the promising results from test drilling to use geothermal heat to power absorption chillers for air conditioning, integrated solar thermal air conditioning systems, and various day lighting systems – all of which could contribute to a further drop in demand for electricity.

#### CREDITS

- › Masdar spokesmen:
  - › Chris Wan
  - › Steve Severance
  - › Nick Brown
- › Masdar: [www.masdar.ua](http://www.masdar.ua) (image credits)



### 3. CASE STUDY OBSERVATIONS

The eleven case studies offer a wide range of lessons learned, and examples of decisions or approaches that helped optimize their sustainability performance. In this chapter the key observations from the case studies are described, and illustrated to show the relations between these strategic topics. These observations are used to identify the main trends that drive the sector and the strategic topics that need to be considered in order to innovate further towards sustainability.

#### 3.1 DESIGN FOR LIFESTYLE CHANGE

##### SET AND ENFORCE HIGH SUSTAINABILITY GOALS

A clear and appealing vision with ambitious sustainability goals helped developers to attract the project partners that shared their aspirations, were willing to learn, and work on the forefront of sustainable development. Ambitious project goals stimulated a high level of involvement, long-term commitment and (financial) support for the project. The projects show that high sustainability goals can be met commercially. In Menlyn Main, the sustainability goals even made the project more resilient to the financial crisis.

##### LABELS VERSUS CREATIVITY

Labels, such as LEED and GreenCalc, are important tools in urban development, and are often essential in selecting material suppliers. Where labels were used they offered many advantages, providing a way to set clear standards, enforce performance, and help communicate the sustainability ambitions of the districts. They may even push the market to new and higher standards. Material suppliers often communicate the desire to outperform existing labels and market demands. This pro-active attitude pushes the sector towards innovation. However, using labels may also lead to a “lazy” attitude. For example, project developers wanting to build ‘green’ can use labels to give the perception of building sustainably while labels are never a guarantee for this to be so. Creativity and thinking beyond labels is required in the design process.

##### EARLY INVOLVEMENT OF OCCUPANTS

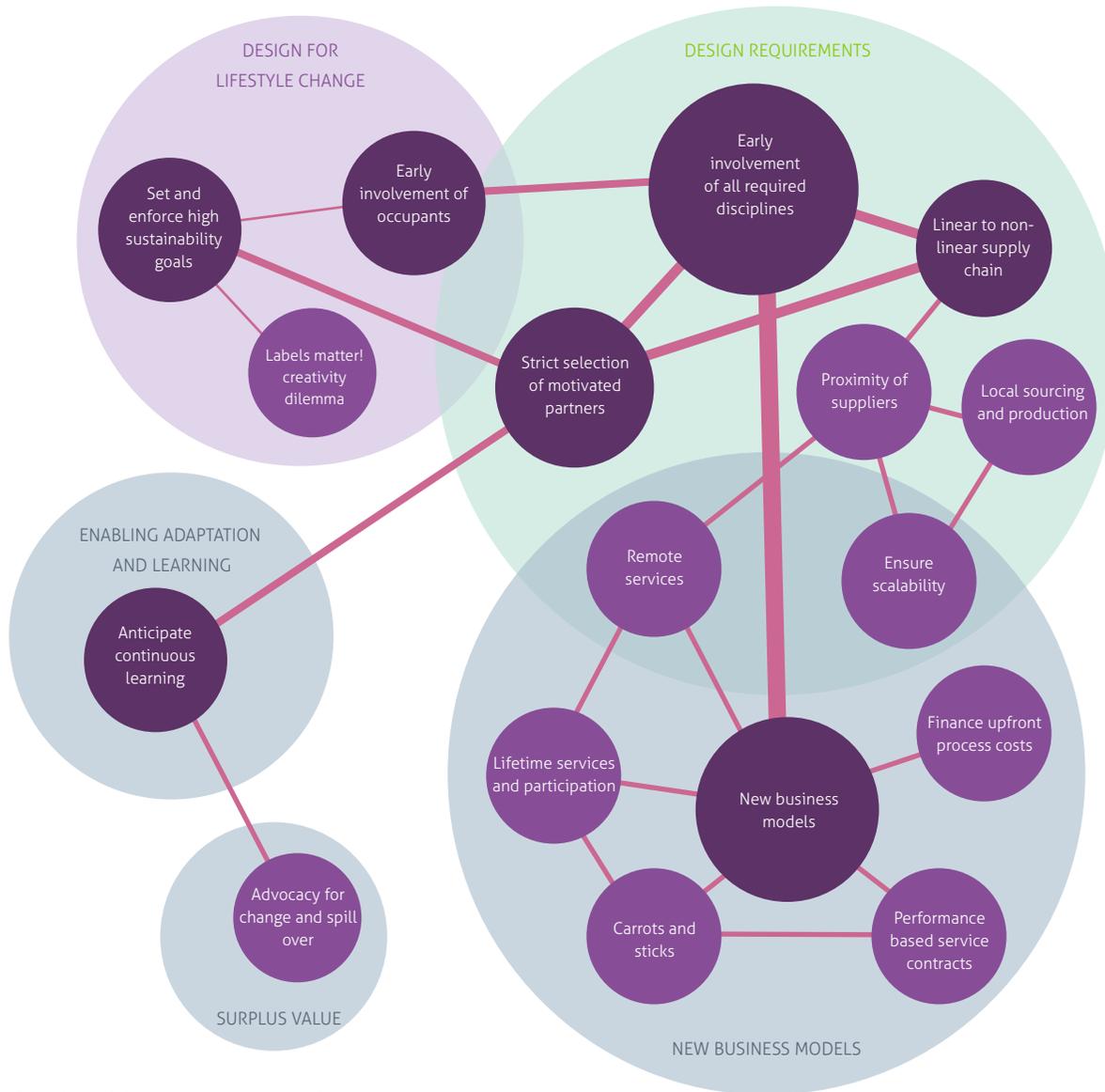
Hein Struben from Eva-Lanxmeer said: “In most development projects people forget to ask the most important question: “what makes people truly happy?” Answering this question requires involving future occupants in the process as early as possible and giving them sufficient decision-making power to influence the final designs. Early involvement led to higher property value, and to a high degree of “ownership” and involvement necessary for maintaining and improving the district during its use.

The local community can also be a valuable asset to developers. In Karaikal Pondicherry, local residents used their expertise to add value to programs such as material sourcing, home and neighborhood design, procuring workforce, and mediation over various socio-cultural barriers. In many cases involvement of the local community has brought the additional benefit of positive media attention. In both Dockside Green and Sonoma Mountain Village, community involvement created an environment of inspiration which has successfully generated media attention and even attracted tourism to the site.

#### 3.2 DESIGN REQUIREMENTS

##### STRICT SELECTION OF MOTIVATED PARTIES

There is a critical moment at the beginning of every



Overview of the main observations from the case studies

project where the selection of developers and other project partners takes place. This often takes place in the form of a government tender or request for proposal. The projects show repeatedly that adopting strict pre-conditions, terms, or non-negotiable criteria in the selection process will lead to better team performance and overall results. In order to optimally contribute to the project, project partners must be capable, have an intrinsic drive to realize the ambitions of the project, and be willing to carry the risk in delivering the required performance.

**EARLY INVOLVEMENT OF ALL REQUIRED DISCIPLINES**

To come up with a good mix of solutions there needs to be a high level of interaction between all disciplines. Cross-pollination between technologies and design options will result in a smarter mix of solutions to reach all sustainability goals.

More interaction in startup phase will lead to better results and more integrated planning. Most projects rely on a central party that involves disciplines at different stages in the process. In the examined examples we have seen that involving multiple disciplines early on in the process lead to more successful plans, better support and higher market value of the property. Architects and project developers benefit from involving more people and disciplines from the start.

**FROM LINEAR TO NON-LINEAR SUPPLY CHAIN**

In many ways the construction industry is still quite

traditional. In the automobile industry car parts are designed and innovated by involving many different parties in the supply chain. In the construction sector vertical and horizontal integration and co-production in the supply chain is still limited. Higher sustainability targets can be achieved if more cross-sector concepts and solutions are available and offered to the market.

#### **PROXIMITY OF SUPPLIERS**

Material suppliers and construction companies often have no real role in the initiation and design phase. Many project decisions are made prior to inviting construction companies and material suppliers. After developing the project goals and designs, materials suppliers and construction companies are approached to deliver the materials and techniques necessary to implement the designs, leaving little space for them to develop innovative concepts. The case studies provide several examples where project developers did not ask for specific solutions, but asked for an 'as high as possible' performance level such as e.g. energy positive buildings and high recycling rates for materials. This initiated an open design process that led to unexpected innovative solutions. The ability of suppliers to interact with architects, developers, and other project partners is crucial to successfully embed innovative concepts into urban plans and designs.

#### **LOCAL SOURCING AND PRODUCTION**

A major environmental impact in construction stems from the type of materials used and their embodied energy. Developers that intend to build sustainably will look to reduce embodied energy by sourcing locally as well as increasing the use of recycled, re-used, and even waste materials. Local or even on-site production of materials can help to significantly reduce the em-

bodied energy of construction materials. This demand for local and recycled materials challenges suppliers to find innovative ways to increase the supply of appropriate materials. In Karaikal Pondicherry, industrial waste was successfully repurposed into fly ash bricks used for construction. These materials were locally produced from locally sourced waste, eliminating the need for import. Similarly, Sonoma Mountain Village manufactured their own patented steel frames on-site in a factory powered by photovoltaic panels.

#### **SCALABILITY**

Achieving higher sustainability levels requires low cost solutions and availability of effective technologies. Economies of scale can contribute to achieving low cost "standardized" solutions. However, there are no one-size-fits-all solutions since climates and other contextual factors are different around the world. Local sourcing and production also imposes limits to the economy of scale that can be achieved due to the availability of local materials and expertise.

### **3.3 NEW BUSINESS MODELS**

#### **FINANCE UP-FRONT PROCESS COSTS**

New business models are required to finance the start-up phase for sustainable urban development to allow for a high participatory design process. Governments can stimulate such a design process by using public revolving funds, while the private sector is able to create new finance structures by itself. In Eva-Lanxmeer, Menlyn Main, and other examples it became evident that organizing an intensive start-up phase with high involvement of project partners led to higher added value of the project. The initial costs were earned back

through higher ground and property prices.

#### **LIFETIME SERVICES**

Suppliers should deliver solutions and services that will relief future owners of buildings from end-of life worries and costs. This requires long-term involvement of suppliers allowing them to manage costs and ensure the proper functioning of materials and installations throughout the life-cycle of a building. To organize this construction parties and material suppliers need to develop smart 'full lifetime service concepts'.

#### **NEW BUSINESS MODELS FOR MATERIAL SUPPLIERS**

Resource scarcity increases market opportunity and demand for alternative business models to optimize the use of materials in society. Large volumes of waste and materials from renovation and redevelopment cycles can be found locally. For material suppliers, there is significant opportunity in reclaiming these materials and repurposing or otherwise extracting value from them. Such innovations produce sustainability gains in many of the studied projects. Structuring businesses to collect and add value to end-of-life construction materials is an emerging trend with real economic and environmental benefits.

#### **PERFORMANCE BASED CONTRACTS**

Project developers require 'no worry' type of solutions to stimulate them to apply innovative materials and technologies. In order for suppliers of construction materials and building concepts to provide such performance guarantees good insight is needed into the functioning of innovations. A high level of co-production and co-innovation within the supply chain allows the necessary knowledge and experience to be developed to achieve this.

**CARROTS AND STICKS**

Incentives and penalties have proved to be effective instruments for developers and governments to stimulate commitment, performance, and innovation. In Docksider Green, the members of the development team agreed to pay a \$1 million penalty if they did not achieve their individual goals. This created a strong drive that encouraged cooperation and innovation.

**REMOTE SERVICES**

Construction companies need to be guided more effectively to apply new technologies right the first time. This can be done through apps, new media and other ICT solutions.

**3.4 ENABLING ADAPTATION AND LEARNING****ANTICIPATE CONTINUOUS LEARNING**

Urban innovation is an important driver of increasing the sustainability performance of urban districts. The successful application of such innovations requires a thorough understanding on how to work with them in the design, construction, and use phase. None of the parties have all the knowledge needed to create a sustainable district, emphasizing the importance of learning from and cooperating with each other. For example, building in phases and entering long-term partnerships enables project partners to optimize designs and to invest in the learning process.

Allowing external organizations to learn from project experiences is an important factor for other projects to reach a higher sustainability performance. In Eva-Lanxmeer the materials handbook and documentation

of the project enable re-use of knowledge and design principles in other developments in the municipality and the broader region

**3.5 SURPLUS VALUE****ADVOCACY FOR CHANGE AND SPILLOVER**

Political or bureaucratic barriers are often encountered during a project's development. Close cooperation with the government is important and quite typical, however, there will be instances where additional advocacy is needed to overcome barriers and secure the goals of the project. At Sonoma Mountain Village, Coddling Enterprises adopted a role of "developer advocacy" by contributing financially to lobbying efforts and applying for exemptions from planning guidelines. The advocacy efforts were successful in amending laws that blocked sustainable development and encouraged the government to reduce the impact of public operations. An additional systemic benefit of successful advocacy is setting a legal precedent for future developers to follow and generating public awareness of sustainable urban development.

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*“What’s the use of a fine house if you don’t  
have a tolerable planet to put it on?”*

Henry David Thoreau

**EXCEPT**  
INTEGRATED SUSTAINABILITY



**LAFARGE**



**British Glass**  
Manufacturers' Confederation

**worldsteel**  
ASSOCIATION