

Article

The Three Pitfalls of Sustainable City: A Conceptual Framework for Evaluating the Theory-Practice Gap

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Abstract: Over the last three decades the environmental, economic and social crisis and the challenges and possibilities offered by new technologies have become the drivers of plans and projects for sustainable cities. In the face of a wide experimentation, the aim of this paper is to answer the question: what progress is implemented by the goal of sustainable city? To this end, I hold it is important point at the watershed between the declared intended goals of the projects realized to date and the results on the ground. To analyze this discrepancy, I have identified a common theory-practice gap in the form of the three pitfalls of sustainable city, which bring about economic and ethical conflicts and risks creating socio-spatial utopias. The three pitfalls are: (1) the idea of the city as a business; (2) the oversimplification of urban complexity; (3) the quest for the ideal community. This conceptual framework has two purposes. First, it helps to systematize the existing literature on the sustainable city project, focusing on few selected issues. Second, it offers a project evaluation framework, useful both for the management of resources and for the planning of urban space. To pinpoint these pitfalls in projects for sustainable cities could allow us to adopt a holistic approach to the city project and practice.

Keywords: urban sustainability; eco-cities; eco-neighborhoods; holistic approach; green technologies; sustainable communities; critical theory; project evaluation framework

1. Introduction

According to The World Bank data [1], in 2016 over 54% of world population lives in urban areas. Urban population, which is expected to grow more in the future and the built-up area expansion have increased in parallel with energy consumption and CO₂ emissions (Figure 1). According to the data of the Global Report on Human Settlement prepared by UN-Habitat (2011), [2], cities occupy less than 2% of world's land surface but consume more than 75% of the world's energy and are responsible for up to 70% of greenhouse gases.

The leading role of the city in combating climate change has been enhanced since the 1990s: the preservation of the environment and natural resources and the establishment of CO₂ emissions limits are becoming main targets for the international political agenda. The consolidation of strategies and actions for urban sustainability came through the renewal of city project practice departing from the development models that have characterized the urban growth in the age of architecture, urban space and culture commodification.

The research on sustainable urban models goes hand in hand with the design and construction of eco-neighborhood projects in Europe and eco-cities in Emerging Countries, especially in China, where we are witnessing the foundation of new cities for more than 500,000 inhabitants.

Despite these projects are pilot experiments conducted in order to test new technologies and measures to be transferred to the current practice, these have remained exemplary but isolated cases.

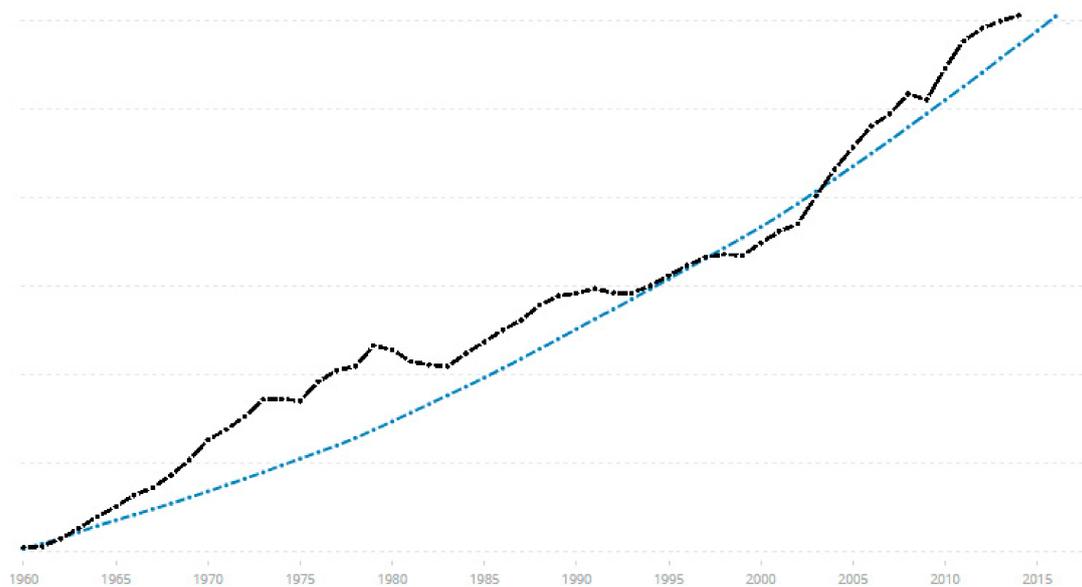


Figure 1. Urban Population (blue) and CO₂ Emissions (black) (1960–2015) (Data source: [1]).

In contemporary cities, the fossil energy-consumption continues to grow and inequalities and integration problems are more and more marked. The 2030 Agenda for Sustainable Development and their 17 Sustainable Development Goals (SDGs) adopted in 2015 to end poverty, protect the planet and ensure prosperity, in fact, highlight current challenges and goals to tackle these future problems. For this reason, it's important to evaluate the experiences conducted so far and ask ourselves what kind of progress has been promoted by new sustainable urban models.

In this regard, this paper analyses the urban models emerging from the international projects realized to date. The great differences between policies and approaches by countries make it difficult to compare different eco-city projects and define if one is more sustainable than another, which is also not relevant for this paper. Rather, the aim of this paper is to demonstrate the existence of recurrent “mistakes” that limit the success of the projects and prevent the implementation of good practices of sustainability in everyday practice of city construction. Despite the experimentation in urban sustainability has led to ambitious and noteworthy reference projects, through the analysis of relevant literature, this paper illustrates the gap between theory and practice responsible for the achievement of only partial results respect to the multiple issues that frame the project of a sustainable city.

In order to more analytically unravel this gap, I propose to frame it in the terms of three recurrent “pitfalls of sustainable city project”. The review of the literature allows me to point at the procedural and decisional mechanism, which risk of bringing about economic and ethical conflicts, in relation to the following three pitfalls: (A) the idea of the city as a business; (B) the oversimplification of urban complexity; (C) the quest for the ideal community. I should specify that this distinction is largely analytical: the three pitfalls are in fact not necessarily alternative but can appear at the same time or in different combinations, as I will hereby show.

My analysis of the three pitfalls is further explored with respect to the three currently prevailing approaches to urban project: (1) technocentric, (2) top-down and (3) exceptional (Section 3). The resulting conceptual framework enables, on one hand to systematize the existing literature on the sustainable city project and on the other to highlight issues that can be taken as criteria for a qualitative analysis of projects. The taxonomy of the three pitfalls analysis may in fact prove useful in project evaluation and therefore in the management of resources and in the planning of urban space. Such an evaluation framework may be developed further, by associating qualitative criteria to measurable indicators and by creating a catalogue of guidelines for urban project and planning.

The paper is organized in three parts (Sections 2–4). First (Section 2), I offer a brief overview of the recent research literature focusing on the methodological approaches adopted for a comparative assessment of sustainable city project. Then (Section 3), I present the “three pitfalls” and the overall conceptual framework. The identification of three pitfalls and the description of related problems, made through the systematic literature review. In the following section (Section 4) I analysis selected projects to apply the conceptual framework and to highlight the three pitfalls of sustainable city project.

Although the primary purpose is descriptive and not normative, in the conclusions I advance some recommendations on how not to fall into the three pitfalls and discuss future projects priorities and a critical agenda for sustainable cities.

2. Background

The vast body of literature on the projects analyzed in this paper can be subdivided into two general categories: single case studies and comparative research. This second category is often focused on the projects carried out in the same geographical, socio-economic and political context.

When different contexts are analyzed (e.g., Europe, Asia) the objective is frequently focused on the analysis of a particular issue of sustainable project, related to one of the pillars of sustainability, particularly in relation to environmental performances and economic impacts; only a few studies focus on a reflection on the idea of city and society carried by the most popular sustainable projects.

The overriding goal is usually to define the main features of the eco-projects based on an analysis of objectives, indicators and tools of sustainability with regard to specific technological performances. Even if a holistic approach is used, the focus is often the comparative analysis of sustainability assessment tools and indicators.

Despite a longstanding integrated vision of the city has been largely developed (e.g., [3,4]), the separation between different academic disciplines and professions still persists. Moreover, even today, we claim to solve urban problems through a partial interpretation of the city development processes. This “deficit in the take-up of theoretical background” [5] is the cause of emerging conflict between actors, policies and development scenarios.

It is very important to analyze eco-projects in relation to their wider urban context. Recent literature places special emphasis on this aspect (e.g., [6–13]). One possible cause for the segregation of a project is that the eco-cities are often designed according to a reductionist model as a predominantly experimental “technological-showcases” can’t interpret the city as a complex and unpredictable system [14]. In this respect, the analysis conducted by Rob Kitchin (2016) on the effects of smart city technologies is interesting. Kitchin highlights a poor critical reflection on the wider consequences of the use of Information and Communication Technologies (in terms of resilience, safety, security, etc.) and summarizes in a table “the promise and perils of smart cities” showing the plurality of shortcomings and risks that the use of strong technical solutions produces in the city project, in the absence of an integrated vision of economic, social, political and ethical effects [15].

The relationship between economic policies, place making and social development is the focus of analysis conducted by Simon Joss on 79 selected eco-cities [8]. As Joss suggested, the research “should inquire into how eco-cities are politically, economically, socially and culturally governed, what tensions and conflicts may arise between technological innovation, urban development and sustainable living and how these may be resolved within a framework of democratic governance.” Joss concluded that the future research should critically compare the intended aims with the results and provide a “critical assessment of underlying concepts and rationales and how these correspond to the reality of eco-city practice”.

With the same holistic approach Campbell (2016) analyses the contradictions of sustainable development, focusing on the misunderstandings derived from the different languages used by different disciplines involved in the sustainable urban planning and design [16,17]. Campbell uses a simple triangular model for better understanding the discrepant planning priorities and for guide

planning practice. The triangle, in fact, shows the conflicts and the potential complementary of interests at the same time (Figure 2).

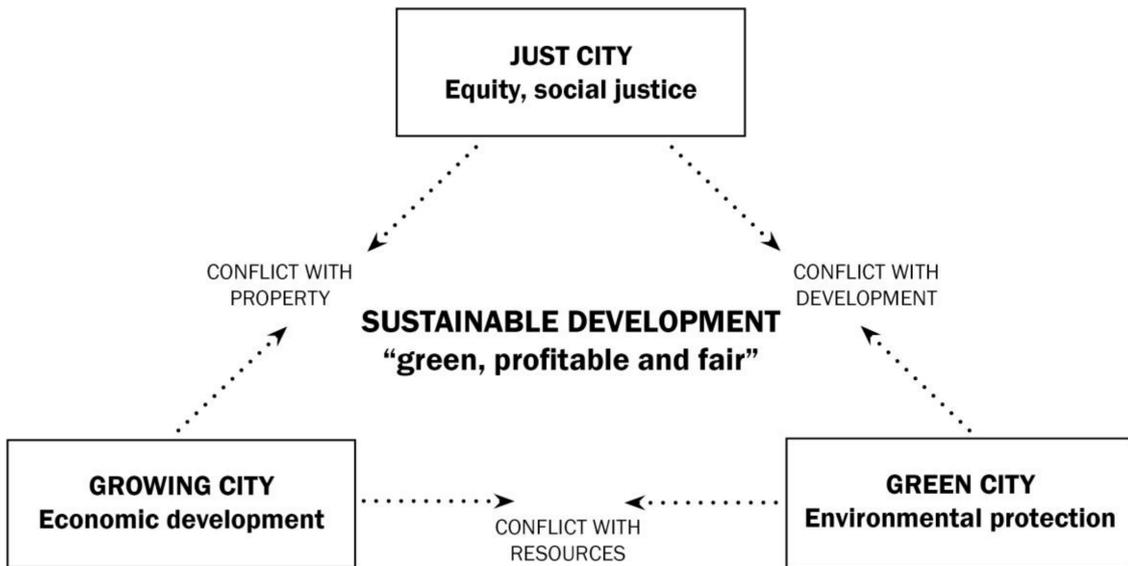


Figure 2. The Planner’s Triangle: the three priorities of planning and their associated conflicts, at the center is conceptually located the elusive ideal of sustainable development. Redrafted image from: [16,17].

3. The Three Pitfalls of Sustainable City Project: A Conceptual Framework

In my conceptual framework, I attempt employ but to, as it were, turn around this point of view. The three Points (corners) of the Triangle are not the three priorities for planning but the three principal pitfalls, which have their origins in a complex mixture of factors where the three pillars of sustainability (economic, environmental, social) are not distinguished (Figure 3).

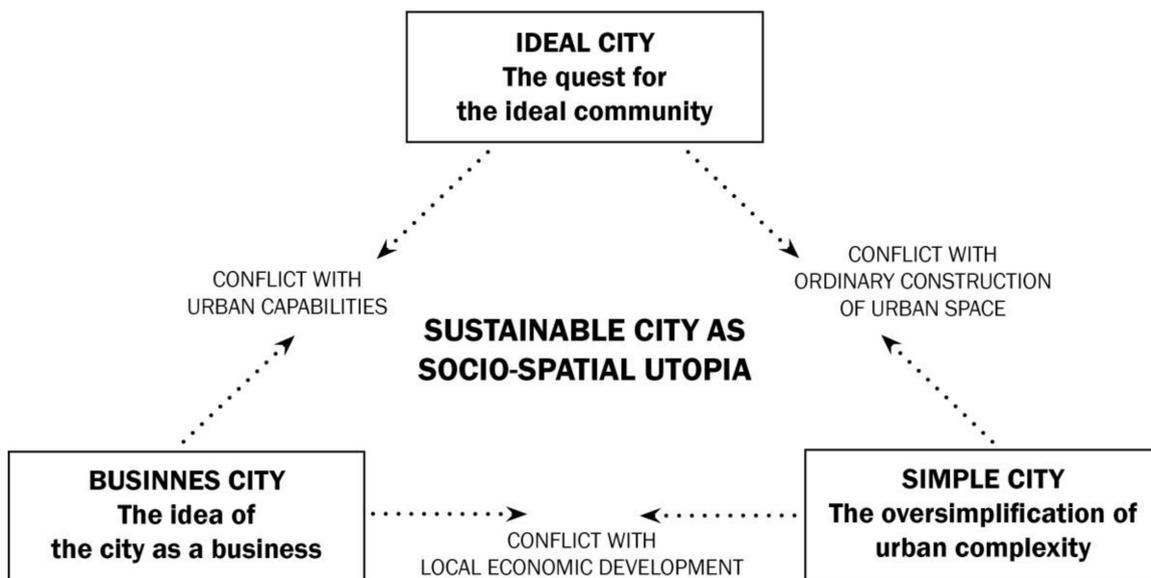


Figure 3. The three pitfalls of sustainable city project and their associated conflicts, in the middle point of the triangle is located the elusive ideal of sustainable city.

This paper illustrates not a not purely theoretical as I then go into analyzing a selected set of heterogeneous projects as the source of empirical evidence. I have identified, in fact, the third pitfalls

through the literature on selected case studies, which highlight that the three goals of Campbell triangle have not been entirely achieved.

The comparison of the programs with which the projects have been promoted and publicized and the final results—gathered through a literature review—allows to convert the three goals into three pitfalls of sustainable city project. These pitfalls represent the key questions that need to be addressed in the future: (A) the idea of the city as a business; (B) the oversimplification of urban complexity; (C) the quest for the ideal community (Figure 3). I explain this conversion from a theoretical point of view (Sections 3.1–3.3) (Table 1) and I highlight the practical consequences through the case-study analysis (Section 4).

Table 1. Three Pitfalls: the conceptual framework and qualitative themes of analysis, compiled from: (A) [15,18–37]; (B) [9,14,38–46]; (C) [7,10,19,43,47–55].

	A. The Idea of the City as a Business <i>Actors and Funding</i>	B. The Oversimplification of Urban Complexity <i>Governance and City Vision</i>	C. The Quest for the Ideal Community <i>Society and Space Construction</i>
1. Technocentric			
1.1. Dominance of private	A.1.1. Green Capitalism. The eco-city project is an opportunity to market and advertise technological products by big private companies.	B.1.1. Technical solution—driven approach in decision-making replace local public authority with private governance.	C.1.1. The high cost of the innovative products excludes whole sections of population from the access of green tech and many sectors of the local welfare are privatized.
1.2. Data Control Systems	A.1.2. Governments and public organizations co-finance private initiatives and encourage the business produced by the market of big data.	B.1.2. Cities are considered as a rational machine, an ahistorical and aspatial space. In the absence of critical thinking about the city, important decisions go from politic to data.	C.1.2. In centralized digital control mechanisms based on big data, citizens are considered passive consumers from whom you want standardized behaviors.
2. Top-Down			
2.1. Centralized Planning	A.2.1. Cities become great attractors of global capital and the public actor's decisions are functional to the implementation of solutions developed by big investors.	B.2.1. The external capital has a strong influence of on urban-policy making and the centrally-controlled process; the managerialist orientation prevails.	C.2.1. Poor participation of the local institutions and communities in the decision-making processes. People cannot change decisions and plans already taken elsewhere.
2.2. Generalist Vision	A.2.2. An eco-city project is a showcase of the green products and the projects easily marketable around the world are promoted. These projects are opportunities to finance the private real estate development.	B.2.2. The complex environmental, economic and socio-cultural processes affecting urban development are ignored.	C.2.2. The basic needs of the broader public are disregarded in favor of a small section of the population.
3. Exceptional			
3.1. Special Procedures	A.3.1. Neoliberal policies are being promoted and private companies engage themselves in land-speculation-oriented local entrepreneurialism.	B.3.1. Derogations from the general urban planning rules that do not follow the normal channels are applied.	C.3.1. Eco-city projects are addressed to an ideal society aspiring to live in a green gated community. Inhabitants must pay higher costs to have access to services.
3.2. Quick Process	A.3.2. Extraordinary funds are allocated to finance eco-city projects and speed-up procedures. Tax benefits turn projects into entrepreneurial projects of spatial planning.	B.3.2. The design process is functional to achieve immediate objectives. The socio-economic impact analysis of public investment (stable jobs, affordable housing market, etc.) is not carried out.	C.3.2. International firms of architecture are engaged as guarantors of quality project. In many cases, the application of global models produces the standardization of urban forms, incompatible with the ways of life of local people.

To describe in detail the three pitfalls, I also develop a conceptual framework which break it down into the three project approaches that currently prevails: (1) technocentric, (2) top-down and (3) exceptional, namely not related to the ordinary (institutional) planning.

These approaches are characterized by (1.1) the dominance of private actors and (1.2) of the use of data-control systems to solve city problems; (2.1) the centralized planning and (2.2) the simplified and stereotyped interpretation of the contemporary city; (3.1) the adoption of special procedures and (3.2) hasty processes in order to obtain the fastest solutions. The resulting matrix define 18 critical issues summarized in Table 1 and explained in the paragraphs below.

In the Sections 3.1–3.3, I propose a short definition of each pitfall, supported by the description of the context in which they are generated and how they are manifested.

3.1. *The Idea of the City as Business: “The Sustainable City as a Big Economic Affair”*

The most of eco-city projects are dependent on technologies available on the global market and the city is considered as a big economic affair.

The construction of the eco-city project, in fact, may be very expensive due to the green technology requires high initial investment costs [18] and the first problem that must face is how to attract investment efficiently. According to the 2014 MIT-ICLEI Climate survey, in fact, the partnerships across the public-private play a crucial role in accelerating the development of solutions [38]. Therefore, a wide variety and combination of public-private partnerships are built [19,56]. In general, different investors and enterprises are invited by local authorities (central, provincial or municipal governments) to participate in construction and development of eco-city projects and in some cases, it is the same private company that is promoting initiative.

However, some major projects, closely linked to major public-sector initiatives, have fallen into the hands of private companies that have turned them into an important opportunity for profit. This has triggered a race for investments from large private companies which have become the largest supporters of these initiatives.

To promote the participation of private investors, these projects are often developed within special rules and favorable economic conditions promoted by local government. The increasing prominence of non-state actors has led to growing calls for privileged forms of governance, tax concessions and derogations from planning permission and building regulations.

The investment facilitations for private have encouraged new forms of real estate speculation. Big companies have supported the construction of new cities, ready to brand their alleged eco-products. In this way, often they legitimize the purchase of services by public authorities which would otherwise not be justified as general services [57].

The development of businesses related to the city project is favored through a top-down approach adopted by local government actors [58]. Centrally-controlled process and “managerialist” orientation, in fact, develops hand in hand with the increasing role of big companies and planning élites [47,59]. This condition leads to the creation of a new ‘green star system’ [60,61], particularly active in the context of public works.

In this context, exceptional projects provide an opportunity for the urban-entrepreneurialism growth and for the construction of a new “entrepreneurial city” [20,60,62–70], hired as the response to contemporary urban problems.

The close connection between eco-city projects and economic policies, whilst representing a driver for their development, could be one of the key risk factors of failure (e.g., goals set out in the initial programs, not achieved, especially in social terms). The most important goal—to build a model of sustainable city not only with regard to energy resources technology but also in terms of social and cultural development—risks taking the back seat.

As the result, the contemporary cities become places where more opportunities for profit are concentrated [71] and the eco-city project represents an expression of green capitalism [21]: “a set of responses to environmental change and environmentalism that relies on harnessing capital investment, individual choices and entrepreneurial innovation to the green cause” [72]. As a result, the city is often considered as a big economic affair, as showing projects analyzed in Section 4.

3.2. *The Oversimplification of Urban Complexity: “The Sustainable City as a Simple, Rational and Predictable System”*

Sustainable development implies the integration of environmental protection and socio-economic growth. However, when technologies are considered the solution to the contemporary problems, a conflict arises with the reality of city’s complexity [39–41,72,73].

The focus on energy-efficient building technologies and transportation and the general concept of green as an antidote to contemporary urban problems [74], points at the danger of “greenwashing” cities [75,76] that often comes in forms through the technocentric vision of urban space.

Despite all the projects claim in their programs to adopt an integrated approach to the urban scale [22,23,77–79], in fact, the discourse and the practice is strongly techno-centered [24,25,80] and limited to energy systems, building efficiency and transportation. In this way, sustainability is conceived as a technological problem and unexpected ecosystem processes and feedbacks are reduced to a set of controllable information [42,81]. The Simon Joss (2011) indicates that over 75% of initiatives focuses on energy technologies [8].

Massive data is being used to spread knowledge about and standardize customs, behaviors and movements [25,82,83] and provide the most efficient solutions for contingent problems, in the absence of critical thinking about the city [48].

In relation to strong technological projects, the recent mapping of geographical distribution of Smart Cities in Europe found that the most common measures concern the “smart environment” (33%) and the “smart mobility” (21%), while the lowest number of actions (9%) concerns “smart people”; these actions generally affects large and medium-sized cities with more than 500,000 people [84]. According to Joss, “it is not uncommon in practice to see atomistic lists of eco-city indicators with a preponderance of environmental criteria alongside a far smaller number of vaguely defined socio-economic criteria” [85].

The risk of oversimplification of the relationships between territories and the communities which live there, the danger of progressive confusion between dynamics of access to information and knowledge, the trivialization of essential concepts such as innovation and community, is manifest [86]. From this perspective, the political and social dimension of problems takes second place, if not disappear altogether [26].

3.3. *The Quest for the Ideal Community: “The Sustainable City as the Ideal Living Space for the Ideal Society of the Future”*

The eco-city project, the “new political spaces for experimentation” [87], integrate social and economic considerations into urban development processes [88], often only in theory but not in practice. Although reducing inequality and promoting just, peaceful and inclusive societies through social protection policies are some of the most important goals of sustainable development, the cost of green technologies makes most of the eco-city projects accessible only to wealthy élites. According to Joss, in fact, “under the banner of green technology, inhabitants are forced to pay higher costs for their use of facilities in eco-cities” [19].

As the most popular case studies show, the project of sustainable city has been predominantly defined from the development of cost-intensive technologies and infrastructures using to solve sustainability problems and enhance the quality of life and, for this reason, it is not today readily accessible to different political, economic and social realities. Despite the global investments in clean energy quadrupled since 2000—the record of 260 billion dollars was reached in 2011 [89] and the global smart city market is valued at US\$1.565 trillion in 2020 [90]—citizens having access to these technologies are only a very small part of the World population.

The overabundance of products and technologies, accompanied by the scarcity of resources of the local governments, make the sustainable city “a dark object of desire which leads to frustration for public administrators” [91] and penalize the most disadvantaged citizens who cannot access or are unable to use new technologies [26,92–94]. The high construction, rental and purchase costs are

an important indicator of social groups that will most benefit from new developments. This aggravates social inequalities between inhabitants that have access to the eco-innovations and those who do not. According to Nguyen and Davison, “all these plans focus on promoting green technology within a framework of ecological modernization, they lack appropriate tools for achieving equitable modernization and enhancing social equity” [49].

Even now, many eco-neighborhoods and cities are not created to meet real housing needs but to produce new investment property. They are predominantly commercial ventures which use the city as a place for technological experimentation and the inhabitants as test subjects on which to test behavioral patterns defined by large amounts of data.

Just to give one example, the Manifesto of smart cities proposed by Siemens foresees that “in a few decades time, cities will have countless autonomous and intelligent information systems, which will have perfect knowledge of habits and energy consumption of citizens” [48]. This entails the adoption of top-down approach whereby the citizens are reduced to passive and unpaid data clerks [43,95], whose behavior is driven by technological devices. But are we really sure that citizens want to live in a high-tech city [96]?

The future inhabitants of eco-neighborhoods and cities are carefully selected but nevertheless rarely are the future residents involved in the planning process [97].

In emerging countries, workers do not live in new eco-cities which, designed for tens of thousands of inhabitants, often consists in completed but not yet occupied residential blocks [50]. In some cases, they become “ghost cities”, or “running at significantly under capacity, a place with drastically fewer people and businesses than there is an available space for” [98].

All this helps to see why the spread of best practices of urban sustainability are limited within the theoretical and spatial boundaries of a few exceptional cases. Many projects, although they became important references, remained isolated examples that have not been able to create profound effects on the ordinary practice of city construction. These “exceptional” projects, often linked to significant investments, can be considered as a “pearls in the sea of degrading urban environments” [51].

4. Experiments in Urban Sustainability: The Three Pitfall Analysis

The case studies analysis allows me to show how the three pitfalls occur in project practice. This study is not intended to provide a comprehensive picture of models adopted around the World. The selection of heterogeneous projects (by size, economic, political and cultural context, actors involved), in fact, provide a rich source of comparison. In particular, the choice of nine projects carried out in Europe and in several emerging countries (China, India, UAE) is useful for demonstrate the “universal” nature of the three pitfalls that may occur in any political, economic and socio-cultural context because they are the result of global processes.

The Table 2 summarizes the literature used as the source for this part; Tables 4–6 contain a collection of quotes from literature that provides the interpretations of three pitfalls by the selected authors.

Table 2. Case studies, the selected literature review.

Project	1	2	3	4	5	6	7	8	9
Pitfall 1	[28]	[97,99]	[100]	[101]	[102,103]	[104]	[38]	[7,105,106]	[99,107]
Pitfall 2	[108,109]	[97]	[110]	[111,112]	[27,113,114]	[115]	[116]	[117–119]	[120,121]
Pitfall 3	[108]	[122]	[110]	[14,53]	[53,123,124]	[9,104]	[11,125]	[96,125,126]	[54,127]

4.1. Eco-Neighborhoods and Cities in Europe and Emerging Countries

Europe plays a leading role in international climate and environmental politics [128–130]. European research in urban planning and design is greatly carried out through the sustainable neighborhood project. The neighborhood, in fact, regain a central role in reinventing city, because it provides the ideal size for local-level implementation of sustainable strategies, from an environmental, economic and social point of view [131–133].

The sustainable neighborhood becomes the metaphor of the ideal city of 21st century, a laboratory where the research for urban models evolves along with the construction of an ideal society, responsible and environmentally conscious. The first projects have been constructed mainly in northern Europe. Among the most popular examples, there are those of Ecolonia (Alphen Aan den Rijn, The Netherlands, 1989–1993), Vauban (Freiburg, Germany, 1997–2008), EVA-Lanxmeer (Culemborg, The Netherlands, 1994–2009), Solar City (Linz, Austria, 1998–2001) and BedZed (London, UK, 2000–2002).

There are many pilot projects related to exceptional events: Kronsberg (World Exposition “Humanity, Nature and Technology”, Hanover, Germany, 2000), Bo01 (European Housing Expo “City of Tomorrow”, Malmö, Sweden, 2001), Sociopolis (Biennial “Ideal City”, Valencia, Spain, 2003) and Valdespartera (International Expo “Water and Sustainable Development”, Zaragoza, Spain, 2008).

In the emerging countries, where changes in economic structure led to an acceleration of the dynamic process of urbanization [134], large new cities will be built in the next few years: Dongtan, Tianjin and Caofeidian in China, Skolkovo in Russia, Lavasa in India, Masdar in UAE.

Amongst all these countries, China, which the Global Carbon Project identifies as the biggest carbon polluter in the world, is the single largest developer of renewable power and heat over the past eight years and has the greatest number of employed in the renewable energy sector in the world [135]. The high level of air and water pollution, the environmental conditions, along with the need to invest in new green markets, have led the Chinese Government to promote sustainable development policies, especially about environmental protection and global climate governance [136,137].

In 1994, after the conclusion of the Earth Summit in Rio de Janeiro, the “China Agenda 21” was formulated and in 1997, during the 15th National Congress of the Communist Party of China, the strategy of sustainable development was written. In 1995, the State Environmental Planning Agency, now the Ministry of Environmental Protection (MEP), adopted the “Guidelines for the building of demonstration eco-communities (1996–2050)” and the “National Environmental Protection Model City” under the “Eco-Construction Programme”. In this context, Eco-cities have been presented as the key project for building a new sustainable urban model, because they “incorporate more sustainable principles, highlighting the importance of “saving land and resources” as well as “eco-friendliness”, while that of low-carbon cities is more concerned with “technological innovation” [27,138].

Policies Guiding Ecologically Sustainable Development are developed by Chinese government in order to build a “resource-conserving and environmentally-friendly society” (2005). The 11th Five Year Plan (2006–2010) has stated its intention of pursue the practice of “sound urbanization”, the research of a “new pattern for urban development which is resource conserving, environmentally friendly, economically efficient and socially harmonious.” For the first time in the history, the Five-Year Plan sets ambitious targets in reduction energy consumption and incorporates quantitative indicators for energy efficiency, resource conservation and environmental protection.

Today China is one of the country most active in implementing experiments on sustainable city development [139]. According to the Report of Chinese Society for Urban Studies (2011) [140], eco-city initiatives continued to grow substantially, from 82 in 2005 to 230 in 2011 and 90% of the more than 600 cities all over China have announced their intention to develop into an Eco-city [141].

4.2. The Case-Study Analysis

The principal project selection criteria are three:

- (1) Heterogeneity of projects; this allows to highlight the “universal” nature of the three pitfalls, which are the result of global processes affecting different economic, political and cultural context;
- (2) All projects have been approved for over 10 years and are completed or in an advanced implementation phase; this is a sufficiently long time to allow the monitoring of the results and discrepancies between the original goals and the final outcomes;
- (3) All of them are among the most relevant projects built in their country and for this reason many studies and a comprehensive literature are available.

Among the nine presented cases:

- (1) Bo01 and Hammarby are part of the more mature European projects, representative of Northern European eco-neighborhood model [142];
- (2) Valdespartera and Sociopolis are projects that address the challenges that the South-Western European cities face;
- (3) Dongtan, Caofeidian and Tianjin (SSTEC) are the most well-known sustainable projects in China, which can be allocated to three different approaches to the project;
- (4) Dongtan should have been the world's first eco-city and, after the failure of Dongtan, Caofeidian has been presented as the world's first fully realized eco-city; both are ambitious projects of. Tianjin eco-city, instead, is not designed to be a renewable energy and zero carbon emission city but aims to define a model in which technological solutions are practical, replicable and affordable;
- (5) Lavasa is the first sustainable city developed in India and Masdar is the World's first zero-carbon, zero-waste city in Abu Dhabi. These last two projects are representative of a more technological approach, getting close to theoretical model of smart city.

Due to the large body of literature, only the main characteristics of the projects, necessary to support my analysis, are summarized in Table 3: site characteristics (area, type of site, strategy), program (housing units, residents, new jobs) and actors (developers and designers).

Table 3. Case studies selected for documentary analysis and literature review.

PROJECT City, Country Timeline	SITE Area (A) Type of Site (T) Strategy (S)	PROGRAM Housing Units (H) Residents (R) Jobs (J)	ACTORS Developer/s (D) Project (P)
1. Bo01 Malmö, Sweden 2000–2011	(A) 18 ha (T) Brownfield (S) Urban regeneration	(H) 1450 (R) 3600 (J) -	(D) Public—Private European Commission, State of Sweden, City of Malmo, Sydskraft—regional power company and SBAB Bank. (P) KlasTham Lund Institute of Technology (Lund University) in collaboration with Department of Architecture City of Malmo
2. Hammarby Stockholm, Sweden 1994–2012	(A) 200 ha (including 50 ha of water) (T) Brownfield (S) Urban regeneration	(H) 11,000 (R) 25,000 (J) 10,000	(D) Public—Private The City of Stockholm, Stockholm Transport, the National Road Administration and private funding). (P) Stockholm City Planning Bureau, with Jan Inghe-Hagström as led architect
3. Sociopolis Valencia, Spain 2001–Unfinished	(A) 35 ha (T) Arable Land (S) Urban regeneration	(H) 3000 (R) 4200 (J) -	(D) Public—Private Generalitat Valenciana, Instituto Valenciano de Vivienda S.L. (IVVSA) (P) Guallart architects (masterplan)
4. Valdespartera Zaragoza, Spain 2001–2010	(A) 243 ha (T) Brownfield (S) Urban regeneration	(H) 9687 (R) 30,000 (J) 10,000	(D) Public—Private Ecociudad Valdespartera Zaragoza S.A., a mixed public company: City of Zaragoza (60%), Government of Aragón and (20%), comprising two banks: Ibercaja (10%) and CAI—Caja de Ahorros de la Inmaculada (10%). (P) Zaragoza City Council

Table 3. Cont.

PROJECT City, Country Timeline	SITE Area (A) Type of Site (T) Strategy (S)	PROGRAM Housing Units (H) Residents (R) Jobs (J)	ACTORS Developer/s (D) Project (P)
5. Dongtan Shanghai, China 2004–Unrealized	(A) 8600 ha (including 350 ha of buffer zone) (T) Agricultural Land (S) New urban area	(H) 3000 (phase 1) (R) 500,000 (J) 51,000	(D) Public—Private SIIC—Shanghai Industrial Investment Company, a Shanghai municipal government public-private pharmaceutical and real estate company listed on Hong Kong’s stock market. (D) transnational engineering and design firm (ARUP)
6. Caofeidian Tangshan, China 2007–Unfinish	(A) 7400 ha (T) Deserted sand-dune island (S) New urban area	(H) 800,000 (R) 800,000 (J) 350,000	(D) Public-Private Tangshan Municipal Government (initiator and owner of the eco city), Administrative Committee of Tangshan Caofeidian Industrial Zone (client) (P) SWECO in collaboration with Beijing Tsinghua Urban Planning and Design Institute (THUPDI)
7. Tianjin Tianjin, China 2008–Unfinish	(A) 3000 ha (T) Non-arable land (S) New urban Area	(H) 110,000 (R) 350,000 (J) 60,000	(D) Public Sino-Singapore Tianjin Eco-City Investment and Development Co., Ltd. A joint venture between Singapore Tianjin Eco-City Investment Holdings Pte. Ltd. (STEC) and Tianjin Eco-City Investment and Development Co., Ltd (TECID). (P) China Academy of Urban Planning and Design, Tianjin Institute of Urban Planning and Design, Singapore planning team led by the Urban Redevelopment Authority.
8. Masdar Abu Dhabi, UAE 2006–Unfinish	(A) 700 ha (T) Non-arable land (desert) (S) New urban area	(H) - (R) 40,000 (J) 60,000	(D) Private Clients: Mubadala, Abu Dhabi Future Energy Company (ADFEC), supported by the World Wildlife Fund (P) Foster and Partners
9. Lavasa Pune, India 2004–Unfinish	(A) 5000 ha (T) Greenfield (S) New urban area	(H) - (R) 240,000 (J) 80,000	(D) Public—Private Lavasa Corporation Limited (LCL); Ajit Gulabchand; HOK International Limited, USA; Hindustan Construction Company (HCC), Wispro, Cisco (P) HOK International Limited, USA

In the following sub-sections I analyzed the nine projects through three pitfalls categories. The brief description of each pitfall is accompanied by a detailed overview in the Tables 4–6 which contain a selection of quotes from the literature subdivided by project.

4.2.1. The Project Analysis through the First Pitfall

Many authors highlight that eco-neighborhoods and cities represent a remarkable window on the world of green global markets (Table 4). For example, in northern Europe the eco-neighborhood Bo01 plays a commercial role in Västra Hamnen.

The construction of sustainable city districts, in fact, seeks to market and export Swedish environmental technology and Bo01, particularly, is “a matter of branding” that will “attract taxpayers to Malmö” [28]. And in the same way the creation of cooperative-owned houses in Hammarby Sjöstad aims at obtaining quick profits [97].

In Spain Sociopolis and Valdespartera are part of the “narrative” of large events and have exploited the businesses generate around these [100].

In China, the Dongtan failure is attributed to the difficulty of generate a profit [102] because the eco-city should have been located in an ecologically sensitive region where the development of new job opportunities and economic activities are difficult [103].

The project of Caofeidian is very expensive and the project was suspended due to a lack of government support [104]. Tianjin, led by the joint ventures between Consortia in China and Singapore are profit-oriented [38]. The eco-city, in fact, is located in a focal point for the acceleration of growth in the Bohai Bay Economic Rim region and aims to attract clean-tech manufacturing activities.

In the official website Masdar is described as “a commercially-driven enterprise that operates to reach the broad boundaries of the renewable energy and sustainable technologies industry”. The urban sustainable development is interpreted only in economic terms [105]. Masdar exploit the green technologies market in order to develop a financial product to be marketed [7].

In India Lavasa is an example of “crony capitalism” [107] highlighted by cases of corruption which caused controversy [143].

Table 4. The first pitfall: selected quotes from literature.

Project	Selected Quotes	Source
1. Bo01	Key actors and participants in the process offer ambiguous explanations as to exactly why environmental issues became so central to Bo01 (. . .) According to the current director of city planning, the main object of the exhibition was to attract taxpayers to Malmö, the environment rather appearing as a series of afterthoughts, with questions of ‘energy and other green questions, such as ‘green space factors’, green roofs and storm-water management’ (interview). The director also claimed it was partly a matter of branding, partly an opportunity to demonstrate ideas for the city.	[28]
2. Hammarby	The key driver of the market-driven developers to construct cooperative-owned houses in Hammarby Sjöstad was to obtain quick profits (. . .) They were not willing to make large-scale capital investment in building low-energy homes and simply wanted continue engaging in ‘business as usual’ practices.	[97]
	As the political interest in Hammarby Sjöstad decreased, the forces promoting the implementation of the technique diminished.	[99]
3. Sociopolis	These neighborhoods have arisen without ties to large events, such as Sociopolis and Avenida Alfahuir [Alfahuir Avenue], but still form part of their “narrative”: embracing and leveraging businesses that were intended to generate an affluent, cosmopolitan and interconnected neighborhood attracted to global Valencia (Cucòi Giner 2013).	[100]
4. Valdespartera	Malgrado iniziali interessi e buone intenzioni, sembra che l’urbanismo contemporaneo a Saragozza sia stato determinato dall’industria immobiliare con accattivanti campagne di marketing, piuttosto che essere il risultato di una ridefinizione etica e consapevole di urbanismo in termini di sviluppo sostenibile.	[101]

Table 4. Cont.

Project	Selected Quotes	Source
5. Dongtang	The scale of Dongtan was perhaps too small to attract economic development and activities. (...) the cost of construction to achieve the target was very high, and SIIC does not seem to have felt confident that it could generate a profit.	[102]
	Among local government officials and planners is currently considered a failed project. This suspension is attributed to several political and economic reasons. (...) it is generally believed that Dongtan eco-city lost political priority both locally and nationally with his waning political influence.	[103]
	The project site selection and market-positioning of the project have been criticized (Qiu, 2011; Wu, 2012). (...) Dongtan was perceived as both harmful to the ecologically sensitive Yangtze estuary and incapable of supplying necessary job opportunities and economic activities for an economically self-sufficient eco-city.	[103]
6. Caofeidian	The “eco-city” was made possible through huge bank loans. Once it was half-built, these loans were halted and many projects suspended due to the rising cost of raw materials and a lack of government support.	[104]
7. Tianjin	The involvement of private capital can help relieve local government’s financial burden, but also introduces advanced technology and management experience to the construction. (...) it may lead to higher living costs for inhabitants when they use facilities provided by private players since most of them are profit-oriented.	[38]
8. Masdar	The Masdarian understanding of sustainability interprets urban development purely in economic terms. In the Masdar City project, the city is seen as a tool to produce profit, and the sustainable city is seen as a tool which can keep producing profit for the foreseeable future.	[105]
	Capital circulates through the networks of the green technology market; (...) and eventually flows into the emirate’s financial pool where it is again set in motion to diversify the local economy. This is why this “eco-city” was conceived, and it is this purpose which defines its nature.	[106]
9. Lavasa	[The objective] is to turn the whole development process, including the energy and infrastructure, into a single financial product that is replicable in other contexts.	[7]
	The best example of crony capitalism in this era of unholy alliances between corporations, politicians and bureaucrats.	[107]
	Critics of the project say the plan violates a host of statutes and laws (...). They cite the company’s 2004 annual returns, which show Union Agriculture Minister Sharad Pawar’s son-in-law, Bhalchandra Sadananad, and daughter, Sadanand Surpiya, jointly holding 7.49 lakh equity shares and 29 lakh redeemable preference shares. Gulabchand has donated £7.4 million to the University of Oxford for creating an Ajit Gulabchand chair.	[143]

4.2.2. The Project Analysis through the Second Pitfall

In general, the high use of technologies could led to the oversimplification of city complexity, in terms of the relationships between environmental protection, economic development and social cohesion (Table 5). Local surveys of the natural, social and economic conditions and feasibility studies are lacking and the final plans and actual implementation often deviated from the original master plan [144]. The investigation of nature and local culture were largely absent [52].

In the Bo01 is assent a thinking about the socio-economic stratification and differentiation of the population [108]. The residents of Hammarby have not been involved in the planning process [43] and the project is conceived as an “exhibition housing” [109]. Valdespartera also is not based on a real need related to the development of urban population and economic activities [111].

In the project of Sociopolis the reduction of the agricultural space ended up turning into a slogan to promote the initiative [123].

Despite the planning process is started with a detailed survey of the site project, Dongtan lack of understanding of the Chinese local context, especially concerning the socio-cultural and economic aspects and land-use issues [102,123,145,146]. In Caofeidian the modern have replaced the story of the place; and the historic activities disappeared [115]. The project of Tianjin ignores the citizens’ aspirations and lifestyles [116].

Masdar is “an Arabic autocratic collectivist community” [117] who imported a model of sustainability far from local standards [118]. Confronted with the energy efficiency of historical cities that has been achieved by passive and low-tech systems, the use of green technologies and the importation of non-local materials is questioned [119].

In Lavasa environmental laws were being violated [147]. For this reason, the National Alliance for People’s Movements criticized the project and in the 2010 the Ministry of Environment and Forests (MoEF) stalled the project for over a year [101]. To build the city, in fact, the natural habitat and forests was destroyed and the inhabitants of around 20 villages have suffered constant pressure and attacks from project officials, land mafia and company agents [120].

4.2.3. The Project Analysis through the Third Pitfall

Eco-city projects claim to achieve social goals but without active involvement of the population (Table 6) and to produce social cohesion by focusing on the formal aspects of urban space [14]. But in reality two things happen: (1) Urban spaces purely normative are designed, lacking public and cultural life, as in the case of Valdespartera [14,148]; (2) the high costs of housing and services is only accessible to rich people and create a homogeneous society, as in Bo01 [106], in Hammarby [122] and in Dongtan[144] where the participation processes have not been activated [124] and farmers and other people that originally had their livelihoods at the location have been transferred [53].

In Tianjin, the clear focus on social sustainability is lacking [11], the housing is designed to address to the needs of rich people aspiring to live in an eco-gated community. And similarly, Masdar is a “perfect fiction” [125] where wealthy people live passively [96].

The references to harmony and human-centered principles that characterize the project of Caofeidian, the people has never been a central role in the planning process [9] and today the eco-city is part of the Chinese ghost city. Even in Sociopolis, despite the investment for financing the architectural star system, most of houses are vacant [110].

In Lavasa exclusionary urban spaces are produced [127] and the richest people live isolated in a “green bubble”. While observing the Smart Cities Mission—the urban renewal and retrofitting program promoted by the Indian Government for the development of 100 cities citizen-friendly and sustainable—Carlo Olmo highlights the dangerous proximity with the model of gated communities, the phenomenon of the re-emergence of walls that is occurring all over the world, that in smart cities could find a “smart” development: walls that will be crossed using badges [86].

The scant attention in social impacts of sustainable eco-city projects, highlights that the international community shall pay particular attention to environmental issues and technological innovations useful to achieve these goals.

Table 5. The second Pitfall: selected quotes from literature.

Project	Selected Quotes	Source
	A functional planning ideology in the efforts made to plan for a general “user”, while socio-economical stratification and differentiation of the population were not.	[108]
1. Bo01	It was originally hoped that the project would be a shining example of low-energy living but because of its citizens' necessarily affluent lifestyles, this never really happened. Many of the houses feature generous expanses of glass to capture the sea views, for example, but these have translated into substantial heating bills for the owners. And combined with the openness and popularity of the district, these windows have brought home the meaning of “exhibition housing” all too acutely.	[109]
2. Hammarby	The City of Stockholm did not involve residents in the planning process and then tried to influence their attitudes. In fact, the residents were informed about how to live a more eco-friendly lifestyle just before moving into their houses, which decreased their sense of ownership over the energy-efficient houses.	[97]

Table 5. Cont.

Project	Selected Quotes	Source
3. Sociopolis	The defence of the initiative by its promoters has stuck on a boutade. Starting from an undeniable fact, the reduction of the agricultural space that surrounds València (20% in the previous decade) they did come to the ridiculous proposal that "the city can only preserve its countryside by turning it into urban land". In view of the inefficiency of the strategy of letting time pass by, in this case the most reasonable alternative would be a change of use, recovering its original one or adapting it to implement a zone of urban agricultural gardens, as it partially was in the initial project.	[110]
4. Valdespartera	Proyectos de expansión urbana que no responden a las perspectivas de crecimiento demográfico y económico real (que se va a agravar con la colmatación de barrios ya construidos como Valdespartera.	[111]
	Insufficient transport options from eco-city to the centre of Zaragoza. This encourages residents to use private cars instead of social transport. (. . .) water management and social infrastructure has lack of coherence.	[112]
5. Dongtang	The growth stage of the eco-city is vulnerable to complex problems, including radical power changes (. . .), disputes between developers (. . .), changing national policy on land acquisition.	[113]
	The Anglo-American vision of lower population density and the entrepreneurial real-estate oriented development driven by a prestigious international firm were deemed unsuited for the massive population and rapid pace of urbanization in China, and therefore incompatible with the Chinese path towards sustainability.	[27]
	Plagued by delays, cost overruns, overambitious aims and tight deadlines, Dongtan's potential to be an eco-city with 50000 projected occupants remains unrealized.	[114]
6. Caofeidian	The history of this site seems to be a history that people wish to get away from; the interest is to bring in the new and modern. This is also acknowledged by the SWECO actors, as a SWECO planner says: "The old activities do not continue in the eco city. They are sought after anymore. Shrimp farms and salt production will disappear. They might become a tourist trap if they are preserved when many industry is taken away".	[115]
7. Tianjin	Competitive eco-developments require consumers/citizens to engage with the greening of their city. However, very little is known about the extent to which consumer aspirations and lifestyles are sympathetic to eco-city development and to what degree eco-developments stimulate environmentally friendly behavior.	[116]
8. Masdar	Some of Masdar's most ambitious sustainability goals have faced declining state support [for] the clash between the values embedded in Masdar's "imported" model of sustainability, and the absence of corresponding standards among local society.	[118]
	Is planned on walled city principles, one can easily draw similarities between other historical cities (. . .) The urban form also creates shadows within the fortified city to enable the inhabitants to be able to walk comfortably in the scorching heat of the desert. (. . .) Although these 2 cities are similar in form, the technologies used to create these but forms are very different. This raises the question of whether Masdar could have employed such low-tech building systems to push the mantra of carbon footprint reduction to its limits. This raises the question of being carbon neutral versus net carbon neutral developments -and questions the validity of importing non-local materials such as glass and steel into the desert to construct a brand new city.	[119]
	Masdar is essentially an Arabic autocratic collectivist community.	[117]
9. Lavasa	Environmental laws were being violated, particularly in regards to the haphazard cutting of hills. The results of such carelessness are potentially grave; landslides, erosion, and subsequent pollution of water are likely consequences.	[121]
	The inhabitants of around 20 villages have faced eviction, land alienation, harassment by project officials, cheating by the land mafia and company agents, denial of community access to freshwater bodies, river, temples and common roads.	[120]

Table 6. The third pitfall: selected quotes from literature.

Project	Selected Quotes	Source
1. Bo01	Bo01 was initially planned to be a heterogeneous and socially sustainable area, but at one point the city chose to consider the question of integration on the scale of the municipality, claiming that Malmö needed more wealthy taxpayers.	[108]
2. Hammarby	Critics of the scheme point to its exclusivity and failure to address Stockholm's problems of segregation. Residents are described as belonging to an 'economically homogenous' group, incomes are on average higher than in the Katarina-Sofia city district to which Hammarby Sjöstad belongs. Apartments for sale are similar in price to those in the inner city, with higher than average monthly management fees.	[122]
3. Sociopolis	No expense was spared in hiring the cream of the architectural star system (. . .). In 2013, with the development finished, barely 22 % was built (2,800 houses on its 35 hectares; 5 out of 18 planned towers) but most of them remaining vacant. Today the estate languishes awaiting better days, while no action is being taken to overcome this lethargy, and its increasing and unconcealed deterioration (Díaz 2016).	[110]
4. Valdespartera	Despite the professed concern to "consolidate [Valdespartera's] urbanity", this urbanity is understood as a type of social cohesion generated by the formal aspects of its space, rather than as a space produced by its public life.	[14]
	The public plazas are clear repetitions of a normative module, and while they tend to be neatly organized and relatively well maintained, they also lack an infusion of cultural life and vigor that can often be found in the neighborhood parks.	[53]
5. Dongtang	Displaced farmers were not likely to be able to afford housing at the eco-city site, even with 20% of dwelling units designated as affordable housing.	[123]
	The high design focus was bound to make the planners forget about the people that ultimately make up a city.	[53]
	Planners failed to adequately consult with the community and adopt a "locally guided process", a lapse common to nascent eco-cities.	[124]
6. Caofeidian	Almost completely absent in the plans, design models, and eco-city indicator framework is any notion of a central place and active role of people—citizens, residents, commuters, visitors—either now during the planning and development process or later upon completion of the city. All of this, despite the insistent references to harmony and human-centered principles.	[9]
	Was planned to accommodate one million inhabitants, yet only a few thousand live there today. It has joined the growing ranks of China's ghost cities.	[104]
7. Tianjin	While in the SSTECH master plan 20% of all residential units are designated as public housing, several of our interviewees indicated that the prices set for the 'public' housing would still only attract residents of above average wealth. (. . .) A lack of clear focus on social sustainability is also reflected at a broader metropolitan scale: while the urban development plan for the whole of the Tianjin metropolitan area from 2006 to 2020 calls for a 'deepening of the implementation of public participation and democratic decision-making mechanisms', there is little detail on how this is to be achieved within the SSTECH project.	[11]
	The majority of the housing is targeted at households with above average incomes (. . .) Some properties use fences or elevated driveways to create gated communities, advertised using images of luxury urban living, high-quality hospitals and schools where eco city residents receive priority for treatment and enrolment, and community-owned lakes, forests and parks for everyday recreation.	[125]
8. Masdar	Is like a perfect fiction totally detached from outside world. (. . .) conceiving the 'eco-city of the future' as a theme park is like solving social problems with gated communities.	[125]
	Urbanites become consumers of choices laid out for them by prior calculations (. . .) people learn their city passively. "User-friendly" in Masdar means choosing menu options rather than creating the menu.	[96]
	Developers have minimal plans to promote equity in the design of Masdar City. (. . .) only wealthy people will be able to reside permanently in Masdar, with the rest coming in as commuters to work. The lack of planning for affordable housing and other initiatives to promote equity suggest that Masdar is not as sustainable as its developers suggest.	[126]
9. Lavasa	Is attractive to the youth population in the middle and upper class income bracket. (. . .) the risk of producing exclusionary urban spaces. This would largely exclude indigenous and rural populations who were displaced from their land to build India's planned hill city.	[127]
	The company has sweeping rights over nearly all aspects of the life of the residents (. . .) It has the right to evict, to tax, to determine the use and design of land, to change the governing body and to change the rules while controlling the rights of people to object to these processes.	[54]

5. Conclusions

Despite the problematic issues that the three pitfalls conceptual framework allowed me to highlight, many projects should be regarded as unsuccessful but educational cases. I therefore very much agree with the idea that “the construction of eco-city thus not only involves active physical construction but also more subtle re-construction and de-construction of what it means to be an eco-city” [149]. Compared to the process-oriented and pragmatic approach of sustainable urban development, the eco-city approach is more visionary and for this reason a fertile terrain for creative thought, useful in developing the future scenarios for sustainable urban management [11,150].

In this context, the conceptual framework outlined in the previous sections allows me to verify “on the ground” the three pitfalls hypothesis. The qualitative project analysis may evolve in order to define an evaluation framework, by associating qualitative criteria to measurable indicators and by creating a catalogue of guidelines for urban project and planning.

The critical issues gathered from the analysis of three pitfalls permit to establish of some directions for the project of sustainable city:

- (1) In order not fall into the first pitfall, we need to go “from the idea of city as business to the idea of city as democratic space”, reaffirming the need to guarantee the right to housing, a fundamental human right, that should guide the programming of the financial resources, especially public. As Caprotti (2014) suggested, “the ‘entrepreneurial prototyping’ of cities should act as a crucial initiator of wider societal change” [50];
- (2) To manage resources more efficiently, the city project will face complex economic, social, cultural and institutional aspects [55,151]. The city is not a summary of predictable and controllable elements and processes and for this reason we must combat the tendency to oversimplification of complexity. The sustainable city project must be carried out through the transition “from the oversimplification of complexity to the enhancement of diversity.” In this context, the sustainable city project should introduce a democratic design process, capable of giving voice to the plurality of subjects and fostering dialogue between different cultures, contrasting the vision of a homogeneous society;
- (3) The transition “from socio-spatial utopias to mixed communities” avoids the third pitfall. We need innovative programs and policies with which to re-launch territories from a social and cultural point of view. Substantial investment is required to combat poverty and reduce social inequalities [152]. To that end, technologies must be accessible to everyone. The unequal distribution of new technologies, in fact, is an indicator of discrimination between rich and poor citizens. This assumes that we go beyond the concept of the extraordinary project, increasing investments to ensure broad urban quality.

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