

# Chapter 2

## Green Planning of Cities and Communities: Theories, Strategies and Tools of a Complex Framework



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**Abstract** If urban planning plays a fundamental role in the future of humanity, which is concentrating an increasing share of the population in cities, then green planning is the most effective response to the climate change emergency. This chapter analyses theories, strategies and tools that characterize the green planning of cities and communities useful for understanding and managing its complexity. The first section analyses the continuously evolving relationship between urban planning and sustainable development. The topic of sustainable development in green planning is seen as a comparison between two approaches, one more utopian and idealistic and one more pragmatic, both in the two fundamental declinations: the more anthropocentric and the more ecological. Subsequently, the more applicative aspects are dealt with: from the analysis of the sectoral planning tools, relations and synergies are highlighted with the aim of providing an integrated, inclusive model. The final part of the chapter proposes a planning strategy aimed at supporting a structured, integrated and effective green planning model for cities and communities.

### 2.1 Green Planning: Evolution of Ancient Paradigms in Urban Planning

Although the concept of “sustainable development” linked to climate change is relatively recent in urban planning, but more generally in architectural design, the research by architects, landscape planners and urbanists of such a relationship, sometimes codified, is not new. This has been between the shape of cities, or architecture, and the natural environment understood in all its meanings, from the choice of vegetation to environmental control through the use of natural resources (in particular solar energy and wind energy).

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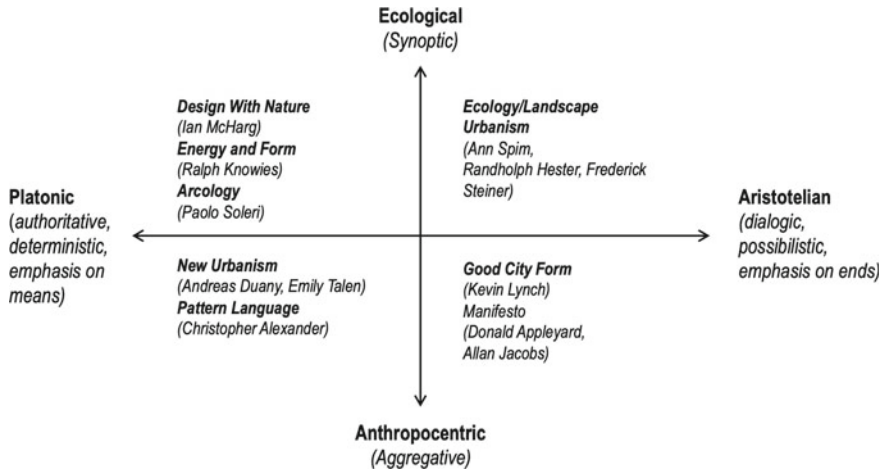
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**Fig. 2.1** Normative models of sustainability through design (Banerjee 2014)

theorized, before the theme of sustainable development linked to climate change, effectively supported by the scientific community, became the dominant theme of all environmental, economic and social choices on a universal scale.<sup>1</sup>

The definition of tools and methods for the green planning of the land coherent with the current instances cannot ignore the analysis of what has been done, or simply theorized.

Interesting in this regard is the work of Banerjee (2014), Professor in Urban and Regional Planning at the University of Southern California whose title is eloquent: “Urban design and sustainability: looking backward to move forward”. Objective of that paper is a critically review of the urban design theories and movements to reveal how their theoretical roots relate to sustainability.

Banerjee argues that “as is common practice, in the tradition of design, much of this legacy in defining, practicing and achieving sustainability goals is normative and speculative, and relatively few of this tenets have been applied in practice and are thus yet to be formally vetted through empirical studies through empirical studies or formal evaluation of the outcomes”.

The author frames the various contributions and theories within a four-quadrant matrix structured along two axes.

The first (horizontal) axis compares two approaches, the Platonic and the Aristotelian, while the second (vertical) axis compares two ways of conceiving planning: one anthropocentric and the other ecological (Fig. 2.1).

Regarding the first axis, it is useful to recall the differences between the Platonic approach and the Aristotelian approach. Although Aristotle was a disciple of Plato,

<sup>1</sup>The definition now widely shared of “sustainable development” is that contained in the Brundtland Report drawn up in 1987 by the World Commission on the Environment and Development.

the two philosophers have two different ideas about optimal dimensions and the governmental order of cities.

As far as Plato is concerned, the theoretical intent to plan an ideal polis takes on a philosophical dimension expressed in two dialogues, on the Republic and the Laws. He does not go as far as to define the completeness of architectural forms: the only aesthetic notation concerns the urban scheme for which Plato deems any solution of absolute regularity to be deplorable.

Aristotle dedicates an entire work to the administration of the polis, the “Politics” in which he analyses the political realities starting from the organization of the family, understood as the basic nucleus of society, to move on to the different types of constitution.

Central for Aristotle is the reference to nature: man is a “political animal” and as such is naturally led to join his own kind to form communities. The fact that man is born of “logos” fits well with his innate sociability. Unlike Plato, for Aristotle politics has a certain autonomy with respect to philosophy: the politician and the legislator can perform their task well thanks to their practical wisdom.

Aristoteles bases his reflections on the experience of real cities (city states), and emphasized the process by which the ideal form and size may be achieved (Banerjee 2014).

As for the second axis (from anthropocentric towards ecological), the first approach involves the synoptic thinking that involves the wider ecosystem, while the second focuses on human goals and on the consequences of the results of design actions: in other words, it puts the man at the centre of the interests of design choices.

The quadrants of the matrix define four major conceptual approaches possible to sustainable design:

- Ecological and Platonic;
- Anthropocentric and Platonic;
- Ecological and Aristotelian;
- Anthropocentric and Aristotelian.

The first quadrant (**Ecological and Platonic**) includes design approaches strongly related to nature. In this quadrant, we find the theories of Ian McHarg (Design With Nature), of Ralph Lewis Knowles (Energy and Form) and of Paolo Soleri (Arcology).

Ian L. McHarg (1920–2001), a Scottish landscape architect and writer on regional planning using natural systems, was the founder of the department of landscape architecture at the University of Pennsylvania in the USA. His book “Design with Nature” (McHarg Ian 1969) that continues to be one of the most widely celebrated books on landscape architecture and land-use planning pioneered the concept of ecological planning and set forth the basic concepts that were to develop later in geographic information systems (GIS).

Going against the Judeo-Christian traditions of the Bible which says that man must have dominion over the earth,<sup>2</sup> McHarg affirms that for man to survive, this

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<sup>2</sup>The position of the Catholic Church towards the environment has changed for many years. The last document concerning the environment is the encyclical of Pope Francesco “Laudato si” published

idea must be taken only as an allegory and not as literally true and states that the man is a “planetary disease”, who lived without due regard for nature.

Ralph Lewis Knowles (1928), American professor emeritus of Architecture and fellow of the American Solar Energy Society is a leading theorist of solar access design. He created the concept of the “solar envelope” and championed solar access planning. The concepts expressed by Knowles concerning access to sunlight, contained in his work “Energy and Form: An Ecological Approach to Urban Growth” (Knowles 1978) are still today contained in national and regional legislation and in municipal building codes.

A theorist who partly puts into practice the concepts of “design with nature” is Paolo Soleri (1919–2013) architect, writer, sculptor, urban planner and Italian artist. Just graduated, and in 1947, he moved to the USA where he met and attended Frank Lloyd Wright.

In 1956, he moved to Arizona where he founded Arcosanti (1970), a prototype city for 5000 people, based on the concepts of “arcology” (architecture and ecology) (Soleri 1969). His model of city is based on the restraint of energy and environmental resources aimed at protecting the environment, thus setting out an ethical path for the future of man.

The second quadrant (**Anthropocentric and Platonic**) includes design approaches related to the “New Urbanism” (Andrés Duany and Emily Talen) and to the “Pattern Language” (Christopher Alexander).

The New Urbanism is an urban movement which promotes pedestrian areas that contain the mix of urban uses.

Developed in the USA since 1980, it continues to reform many aspects of real estate development and urban design.

The proposed model, described in the Charter of New Urbanism, holds that the traditional city, with its mix of functions, density and integration of different transport systems, constitutes a much more efficient way of developing a lively community rich in cultural interactions.

New Urbanism strategies are aimed at reducing road congestion, overbuilding and the conversion of urban areas: it also includes strategies aimed at historical preservation, road safety, green building and the development of brownfield sites.

LEED® (Leadership in Energy and Environmental Design) environmental certification protocols draw many of their concepts into the Charter of the New Urbanism (CNU) (see Table 2.1).

Duany worked as a guest professor in many institutions and received two honorary doctorates. His conception of the new urban model is contained in the book “Suburban Nation: The Rise of Sprawl and the Decline of the American Dream” (Duany et al. 2000).

Another important exponent of the New Urbanism Movement is Emily Talen, professor of urbanism at the University of Chicago. Her research is devoted to urban

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in 2015. The encyclical, in addition to expressing great concern for the environmental emergency (considers the environment the common home), states the need to stimulate an ecological education and spirituality for the development of new beliefs, new attitudes and lifestyles.

**Table 2.1** Principles enunciated in the chart of new urbanism (The region: metropolis, city and town) (<https://www.cnu.org/who-we-are/charter-new-urbanism>)

#	Description
1	Metropolitan regions are finite places with geographic boundaries derived from topography, watersheds, coastlines, farmlands, regional parks and river basins. The metropolis is made of multiple centres that are cities, towns and villages, each with its own identifiable centre and edges
2	The metropolitan region is a fundamental economic unit of the contemporary world. Governmental cooperation, public policy, physical planning and economic strategies must reflect this new reality
3	The metropolis has a necessary and fragile relationship to its agrarian hinterland and natural landscapes. The relationship is environmental, economic and cultural. Farmland and nature are as important to the metropolis as the garden is to the house
4	Development patterns should not blur or eradicate the edges of the metropolis. Infill development within existing urban areas conserves environmental resources, economic investment and social fabric, while reclaiming marginal and abandoned areas. Metropolitan regions should develop strategies to encourage such infill development over peripheral expansion
5	Where appropriate, new development contiguous to urban boundaries should be organized as neighbourhoods and districts, and be integrated with the existing urban pattern. Non-contiguous development should be organized as towns and villages with their own urban edges, and planned for a jobs/housing balance, not as bedroom suburbs
6	The development and redevelopment of towns and cities should respect historical patterns, precedents and boundaries
7	Cities and towns should bring into proximity a broad spectrum of public and private uses to support a regional economy that benefits people of all incomes. Affordable housing should be distributed throughout the region to match job opportunities and to avoid concentrations of poverty
8	The physical organization of the region should be supported by a framework of transportation alternatives. Transit, pedestrian and bicycle systems should maximize access and mobility throughout the region while reducing dependence upon the automobile
9	Revenues and resources can be shared more cooperatively among the municipalities and centres within regions to avoid destructive competition for tax base and to promote rational coordination of transportation, recreation, public services, housing and community institutions

design and the relationship between the built environment and social equity. She is also the editor of several volumes, among these “New Urbanism and American Planning: The Conflict of Cultures” (Talen 2005).

This quadrant also includes the important contribution of Christopher Alexander (1936), British–American architect and design theorist, currently professor emeritus at the University of California, Berkeley. Alexander is perhaps best known for his book “A Pattern Language” (Alexander et al. 1977). Arguing that users are more sensitive to their needs than any architect could be, he produced and validated a “pattern language” to empower anyone to design and build at any scale. Alexander’s work has also influenced the development of “agile software development” intended

as approach to software development under which requirements and solutions evolve through the collaborative effort of self-organizing and cross-functional teams and their customer(s)/end user(s).

The third quadrant (**Ecological and Aristotelian**) includes more fundamentalist design approaches related to the Ecology or Landscape Urbanism inspired by traditional landscape architecture (Anne Spirn, Randolph Hester and Frederick Steiner).

Anne Whiston Spirn is an American landscape architect, photographer and author: her work promotes community-oriented spaces that are functional, sustainable, meaningful and artful but also resilient (Spirn 2011). She makes reference to the writings of Leon Battista Alberti in the fifteenth century and more recently to such pioneers as George Perkins Marsh, Frederick law Olmsted and Lewis Mumford (Banerjee 2014).

Randolph T. Hester is a professor in the Department of Landscape Architecture and Environmental Planning at the University of California at Berkeley. Hester is also a sociologist, practicing landscape architect and co-director of Community Development by Design, a neighbourhood planning organization focused on community participation and input (Hester 2009).

Frederick R. Steiner is an American ecologist who currently serves as the Dean and Paley Professor for the University of Pennsylvania School of Design. Fellow of the American Society of Landscape Architects and the American Academy in Rome, Steiner is an expert in ecological planning, historic preservation, environmental design, green building and regional planning, all of which are discussed in "The Living Landscape". His important contribution to landscape architecture is the book "An Ecological Approach to Landscape Planning" (Steiner 2000).

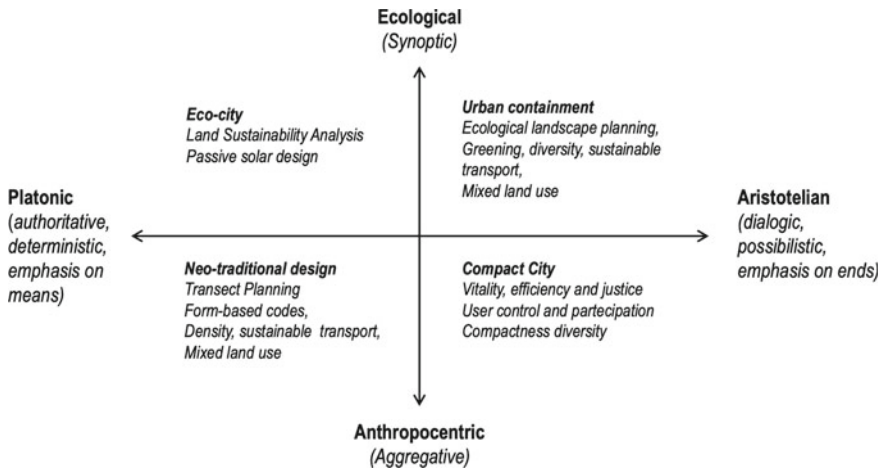
The last quadrant (**Anthropocentric and Aristotelian**) mainly includes a design approach related to the "Good City Form" (Kevin Lynch), a design strictly related to the anthropocentric perspective. The contributions of Donald Appleyard and Alan Jacobs can reasonably be included in this quadrant (Appleyard and Jacobs 1987).

Kevin Andrew Lynch (1918–1984) was an American urban planner and architect. He graduated in urban planning at the Massachusetts Institute of Technology in 1947, having also done an internship in Frank Lloyd Wright's Taliesin studio, and began his research and teaching work at MIT where he became an assistant in 1949, associate professor from 1955 and full professor since 1963.

Lynch concentrates his research activity on the study of people's perception of the urban landscape, therefore from an absolutely anthropocentric position. His scientific contributions range, in a vast conceptual field, from environmental psychology to the geography of perception (Lynch 1981).

Lynch, with his studies, has shown that people perceive the urban space they frequent or live in through common elements and mental patterns, creating their mind maps through the use of five categories: paths, margins, neighbourhoods, nodes and references.

The contribution of Banerjee, discussed in this paragraph, has allowed us to construct a theoretical path on the contributions that many authors have expressed, regarding the relationship between urban planning and the environment, even in



**Fig. 2.2** Form models of cities inserted in the matrix of Fig. 2.1: towards an integrative approach (graphic elaboration from Banerjee 2014)

periods in which the emergence of sustainability as we know today, it was not emerging.

Of particular interest is the redefinition, by Banerjee, of the two-dimensional matrix and of the four quadrants of Fig. 2.1 useful for their macro-classification according to the different approaches to urban planning. In his document, the author hopes for a supplementary framework by providing an overview that is shown for convenience in graphic form in Fig. 2.2.

## 2.2 Sustainability in Green Planning Between Utopias and Pragmatism

### 2.2.1 *Conferences of the Parties: Utopian but Essential Strategies for Sustainable Development*

The concept of “sustainable development”, the main attractor of all the environmental policies of recent decades and, therefore, also of green planning of cities, is quite ambiguous: Pankaja and Nagendra (2015) argue that “it is now enshrined on the masthead of Environment magazine, featured on 8,720,000 Web pages, and enmeshed in the aspirations of countless programs, places, and institutions”.

The most widely accepted definition is that proposed by the World Commission for the Environment and Development was established by the United Nations General Assembly in 1982, better known as the “Brundtland Commission”: “Humanity has

the capacity to make development sustainable—to ensure that it meets the needs of the present without compromising the capacity of future generations”.

The inspiring principles of the contribution, “Our common future”, published in 1987 date back to a few years before: in the Stockholm Conference on the human environment of 1972, where the conflicts between environment and development and in the “Strategy World Conservation” programme of the 1980 International Union for Nature Conservation, which advocated conservation as a means to help development and specifically for sustainable development and the use of species, ecosystems and resources.

As Brundtland argued that “*The environment does not exist as a sphere separate from human actions, ambitions, and needs and attempts to defend it in isolation from human concerns have given the very word “environment” a connotation of naivety in some political circles. The word “development” has also been narrowed by some into a very limited focus, along the lines of “what poor nations should do to become richer”, and thus again is automatically dismissed by many in the international arena as being a concern of specialists, of those involved in questions of “development assistance.” But the “environment” is where we live; and “development” is what we all do in attempting to improve our lot within that abode. The two are inseparable*” (Brundtland 2004).

The publication of the report marked the beginning of an important path: important international meetings then followed, starting with the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992 (the so-called Earth Summit), which published a declaration of principles, a detailed agenda 21 of the desired actions, international agreements on climate change and biodiversity, and a declaration of principles on forests.

Ten years later, in 2002, at the world summit on sustainable development in Johannesburg, South Africa, the commitment to sustainable development was reaffirmed. Since then, the leaders of the United Nations Framework Convention on Climate Change (UNFCCC) have written the history of the fight against climate change, between successes and failures, milestones and agreements of convenience.

Among the successive conferences of the parties (COP), it is useful to recall the most important ones.

The first real breakthrough takes place at COP 3 (1997), with the approval of the Kyoto Protocol, the first treaty in the world to reduce greenhouse gas (GHG) emissions. The commitments envisage a first phase of emission reduction for the 2008–2012 period compared to 1990 levels.

The COP 18 in Doha (Qatar) in 2012 managed to secure a second season for the Kyoto Protocol (expiring the same year), extending it until 2020; season from which, however, most of the industrialized nations have been lost by the wayside.

The twenty-first COP in Paris (2015) brought home the first major achievement, namely a shared global climate pact. The overriding objective is to keep the temperature rise “well below 2 °C”, with the recommendation to do more (for a scenario below 1.5 °C). One of the key provisions of the agreement is the creation of a review mechanism for the various countries’ commitments: the reviews will take place every five years, with a view to progressively increasing its ambition.



The 2016 Marrakech COP 22 closed with the approval of the Marrakech Alliance for global climate action. The assembly drafted the draft of a common plan for the implementation of the Paris Agreement, the first set of rules by which national reduction commitments will have to be relaunched: the goal is to create a shared system to judge the effectiveness of the climate policies and measure cuts in emissions.

Sustainable development as a concept, as an objective and as a movement and is now fundamental to the mission of countless international organizations, national institutions, businesses, cities and communities (Pankaja and Nagendra 2015).

### ***2.2.2 Sustainability in Urban Planning: A Continuous Commitment for Solving Contradictions***

The environmental topics covered by the Conferences of the Parties (COP) discussed in the previous paragraph are fundamental as they allow compatibly with the commitments of the Nations involved, the definition of strategies at a global level and the monitoring of the health of our planet over the years.

For the evaluation of the state of the environment at global level (e.g. the emissions of GHGs and the values of the average temperature of the planet), for the definition of the necessary objectives to be achieved through environmental indicators and for the monitoring of the results over the years, predictive complex models are necessarily used.

The achievement of the objectives of improving environmental conditions, however, takes place through concrete actions, promoted by national, regional environmental policies but also environmentally conscious local, such as sustainable or green planning of cities and communities.

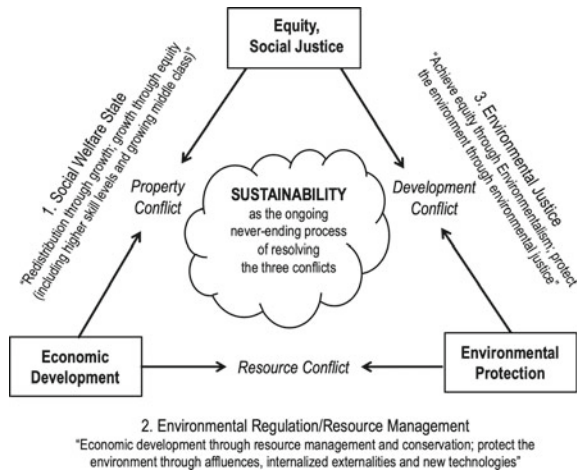
The definition of environmental strategies at the global level and the promotion of bottom-up planning actions are theoretically two sides of the same coin, in that they contribute to achieving a common goal which is sustainable development as a contribution to solving climate changes.

Realistically, the gap between top-down planning and bottom-up planning is large and difficult to fill and the conviction that in order to achieve a climate improvement objective it is sufficient to define the new improvement objectives in the COPs highlights an approach that is not constructive.

The real war on climate change is fought from the bottom up through bottom-up planning actions that must be implemented in concrete measures (e.g. the energy retrofit of existing buildings, the construction of new housing models or the use of renewable energy sources, the passage from the generation of centralized energy to distributed energy or the re-greening of urban areas).

The complexity in the implementation and management of bottom-up actions is in any case considerable and the technologies and the skills to act are not enough: it is necessary to face economic, organizational and social aspects, but it is above all necessary to affront and manage the inevitable clashes between different interests.

**Fig. 2.3** “Planner’s triangle” representing the three fundamental priorities of planning (green cities, growing cities, just cities), the three social conflicts and the three broad social and political institution to manage these conflicts (Campbell 2016)



A pragmatic and realistic theory, which also involves a new definition of “sustainable development” is that proposed by Scott D. Campbell Professor of Urban Planning at the University of Michigan (USA) (Campbell 1996).

According to this theory, urban planners work within the tension generated between three fundamental objectives: environmental protection, economic development and social equity, located at the three vertices of a triangle at the centre of which sustainable development is placed (Fig. 2.3).

The socially constructed view of nature proposed by Campbell puts into question the vision of these conflicts as a classic battle between “man against nature” or its current variation, “job against environment”. The triangular model proposed is used to ask whether sustainable development, the current object of interest for planning, is a useful model to drive planning strategies.

The three types of priorities are present in three perspectives:

- The *planner of economic development* sees the city as a place where production, consumption, distribution and innovation take place. The city competes with other cities for markets and new industries. Space is the economic space of motorways, market areas and commuter areas.
- The *environmental planner* sees the city as a resource consumer and a waste producer. The city is in competition with nature for scarce resources and land being thereby always a threat to nature. Space is the ecological space of greenways, river basins and ecological niches.
- The *equity planner* sees the city as a place of conflict over the distribution of resources, services and opportunities. The competition is within the same city, between different social groups. Space is the social space of community, neighbourhood organization, trade unions: the space of access and segregation.

Campbell argues that there are other important ways of viewing the city, including the architectural, psychological and circulatory (transport); and one could conceivably construct a rectangle, a pentagon or polygons more complex than that of a planner. The triangular shape itself is not proposed as the geometric structure underlying the planner's world. Rather, it is useful for its conceptual simplicity.

Finally Campbell considers the implications of this point of view for planning. An important and constructive aspect of this theory is that the triangle shows not only conflicts, but also the potential complementarity of interests.

The former is inevitable and require planners to act as mediators, but the latter is one in which planners can be particularly creative in building coalitions between previously separated interest groups, such as workers and environmentalists, or community groups and companies. To this end, planners must combine their procedural and substantive skills and thus become central actors in the battle for growth, environment and social justice.

Campbell's first work published in 1996 was updated by his most recent paper (Campbell 2016) in which the Author, after about twenty years, substantially confirms the concepts of the previous publication.

At the end of the paper, Campbell states that "*The tension between growth and conservation persists: Our profession works to both aggressively expand the boundaries of the metropolitan region and erect bulwarks to conserve the natural and historic landscapes. .... Finally, the sustainability narrative remains vibrant and vital within planning because it has evolved in the past two decades through its very engagement with social justice, grounded in the ongoing practice of planning and designing both a greener and more equitable built environment. It is this productive collision of the environmental and community activist movements and the ongoing efforts to recombine and reconcile these two traditions with their divergent histories, values, and communities that has fueled the thoughtful advancement of sustainability planning. The sustainability movement will continue to be powerful as long as it creates a commons where planners, their allies, and their adversaries can debate the hard questions, negotiate compromises in the distribution of natural and human wealth, and creatively explore alternative urban futures*".

### 2.3 Design Concepts for Sustainable and Green Cities

The topic of the green planning of the city and of the communities should interface with those concepts of design which are the sectorial design criteria that have a direct or indirect effect on the sustainability of the territory, and the form of the built environment. All these aspects are analysed by Yosef Rafiq Jabareen who in his paper (Jabareen 2006) identifies sustainable urban forms and their design concepts by proposing a sustainable urban form matrix to help planners assess how different urban forms take account of sustainability.

### **2.3.1 Compactness**

The compactness of the built environment, also referable to urban continuity and connectivity (and in these cases should be occurring adjacent to existing urban structures), is a design strategy that allows for more sustainable urban forms. The compactness of urban space can reduce the distances necessary for the transportation of energy, water, materials, products and people.

The intensification of the built form also includes not only the occupation of previously undeveloped urban land but also the redevelopment of existing buildings or the recovery of existing abandoned and degraded areas: in these cases the goal is to limit the occupation of new areas not yet urbanized.

### **2.3.2 Density**

The density expresses the relationship between people or housing units and the occupied area. The relationship between density and urban character is also based on the concept of vital thresholds: with certain densities (thresholds), the number of people within a given area becomes sufficient to generate the interactions necessary to make urban functions or activities viable.

The density and type of housing influence sustainability through differences in energy consumption; materials; and land for housing, transport and urban infrastructure. The high density and use of integrated territory not only preserves resources, but also provides compaction that encourages social interaction. From the energetic point of view, the urban intensity allows one to have buildings that, for the same volume, have a lower dispersing surface. In a high-density city, it is also possible to use network energy infrastructures (e.g. district heating or district cooling), producing and employing the necessary energy more efficiently.

Urban density, on the other hand, limits the use of renewable energy sources, in particular solar thermal and PV solar, and could be in conflict with passive solar design.

### **2.3.3 Mixed Land Uses**

Zoning, a tool used in urban planning consisting of dividing the territory into homogeneous areas from a functional point of view, has generated negative effects both at the environmental and at the social level. For this reason, urban planners have turned to a different approach: the mixed use of land.

A functional diversification takes place within the city, the neighbourhood or in any case the urban areas. With this approach within the same area, multiple functions

coexist: residential, commercial, industrial (small industry), artisan craft and institutional. This choice generates a more stimulating urban environment from the social point of view but also a more sustainable environment from an environmental point of view. The coexistence of more functions, necessary for the vital functioning of the city, avoids large displacements for citizens: many of the journeys can be made on foot or by bicycle, thus limiting the environmental impact due to mobility.

A point to be considered in the green design of cities is that of diversity both in the forms and in the aesthetic aspect of the buildings and in the size of the spaces. Aesthetic, functional and dimensional diversity are the characteristics that make old cities which have developed over time through an overlap of attractive styles: the same concept should be applied to current cities that often, unfortunately, are characterized by a strong formal standardization which makes them unattractive and unsustainable.

### ***2.3.4 Passive Solar Design***

Passive solar design defines a bioclimatic design approach through which the design of buildings is carried out via two strategies: reducing energy consumption (e.g. through the thermal insulation of the building envelope) and using renewable energy sources (e.g. through the design of doors and windows that exploit the direct gains due to solar radiation). Through passive solar design, the building behaves like a solar collector with a direct exploitation of energy. In design strategies, it must be considered that solar radiation in summer can generate an increase in energy consumption (increase in summer thermal loads): for this reason, it is necessary to provide all the measures which can reduce the effect of solar radiation (e.g. through the use of shielding systems).

Urban passive solar design implies particular morphological choices: if solar energy is the reference energy source, the layout of the city must be organized so that the buildings have access to direct sunlight (right to the sun). The orientation of buildings and urban density are elements that must be considered.

The passive design of cities must also favour green areas and natural ventilation: the aim is to guarantee a comfortable urban ecosystem both in winter and in summer, limiting the phenomenon of “heat islands”. Passive solar design can be considered in contradiction with the compact concept design: a more compact urban fabric, in fact, limits the use of solar energy.

A design that stimulates a relationship with the climate can no longer neglect the fact that the climatic conditions can sometimes be the cause of disasters. A green design must carefully consider resilience, understood as the ability of the city to react effectively with respect to potentially devastating natural “stresses” (e.g. earthquakes or floods).

### **2.3.5 Sustainable Mobility**

Mobility is probably the main problem for environmental debates related to urban form: the evolution of cities and urban forms will depend to a large extent upon the implementation of new technologies that are rapidly evolving (e.g. electric mobility and in near future self-driving vehicles linked to the development of 5G technology) and to the changes in the paradigms that are already underway in some cities. For those who live in the city, the behavioural model, which includes for the possession of a vehicle, will have to change to the benefit of a model that envisages intensive use of public transport, cycle paths and use of supplementary on-demand private services (car-sharing, bike-sharing). Electric mobility will make the use of renewable energy sources (in particular solar PV) possible, thus eliminating emissions.

The policies for sustainable urban development, also considering the evolution taking place in the world of work which favours working from home, should, therefore, include measures to reduce the need for movement and provide favourable conditions for forms of transportation that are energy efficient and respectful of the environment. Land use planning plays a key role in achieving these goals.

### **2.3.6 Greening**

The greening of the city, or green urbanism, is an important design concept for the attainment of a sustainable urban form. The advantages that can be obtained are considerable: it contributes to the maintenance of biodiversity, to the improvement of the urban physical environment by reducing pollution, moderating the extremes of the urban climate and contributing to sustainable urban drainage systems. The greening of the city also has positive psychological effects on citizens, making the environment more pleasant. The improvement of the urban image generates economic advantages since the city becomes more attractive. Greening also has health benefits and an educational function as a symbol or representation of nature.

According to Beatley (2000), a city exemplifies green urbanism if it strives to live within its ecological limits, is designed to function in a similar way to nature, strives to achieve a circular rather than linear metabolism, aims at local and regional self-sufficiency, facilitates more sustainable lifestyles and emphasizes a high quality of community life and neighbourliness.

## **2.4 Green Planning: Synergies Between Planning Tools Towards a Common Goal**

To combat climate change, it is necessary to define, plan and implement strategies which are consistent with the international objectives that are often incorporated

by the states and made operational, sometimes mandatory, in national and possibly regional legislation.

The green planning of cities and communities must be developed in a coherent way through sectoral legislative tools.

A complete frame of reference is shown in the diagram in Fig. 2.4 which illustrates the relationships between green planning tools, urban planning tools and regional, national and international guidelines.

From the diagram, it is possible to observe the complexity of the matter. In fact, there are many planning tools and since they are promulgated by various administrative entities or by different public and private bodies, there are often overlaps or inconsistencies. This is what emerges from a research work done by Dall'O' et al. (2013) in which some planning tools approved in a small town near Milan (Italy) are analysed and compared.

From the diagram, one can also observe how there may be synergies between the various planning tools which could and should be exploited.

The proposed diagram has the advantage of “systemising” for the first time a complex and articulated framework: the proposed green planning model is the result of choices made at a local level (city or neighbourhood) but consistent with a strategic vision of sustainable planning developed at different levels (i.e. think globally but act locally).

At the highest level of environmental strategies are the international agreements on climate change defined at the Conferences of the Parties (COP) by the participating nations. On the same level are the Sustainable Development Goals (SDGs) developed by the United Nations. Internationally, there may also be actions at the continental level, for example, the European Union Directives.

At a lower level, one observes legislation or guidelines adopted at national and/or regional level on energy and environmental issues.

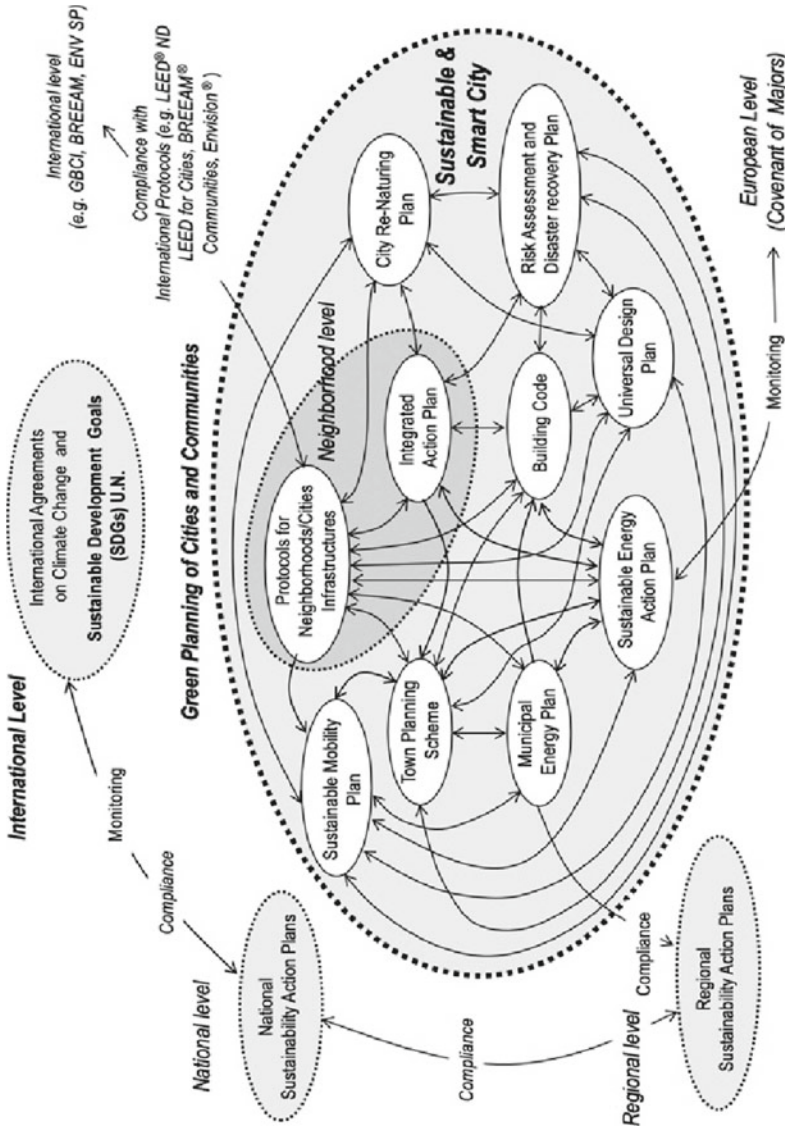
These legislative frameworks are important and must be considered in the green planning, for two reasons: they declare the commitments taken at a higher level than nationally and/or regionally and, more significantly, they are often mandatory.

In the diagram, the operational scope of sustainable green planning on an urban scale or on a community scale is delimited by the central ellipse. In practice, there may be two areas: one urban and one suburban (neighbourhood scale or part of a neighbourhood scale).

Suburban planning is very important because it can affect interventions at a lower scale than those of the associated city which can be implemented, thanks to their lesser size and lower economic commitment, with greater ease.

Urban planning tools on an urban or suburban scale can be classified into three categories:

- mandatory planning tools as provided by national and/or regional legislation (e.g. town planning scheme, building code, mobility plan, etc.);
- those voluntary planning tools which are managed within national or international projects (e.g. Sustainable Energy (and Climate) Action Plan);



**Fig. 2.4** Relationships between green planning tools, urban planning tools and regional, national and international guidelines (updated and expanded from Dall'O' et al. 2013)



- those voluntary planning tools which are managed by private institutions (e.g. environmental certification protocols for buildings, neighbourhoods and cities).

A short description of the objectives of the green planning tools considered in Fig. 2.4 is reported in Table 2.2 that also shows the compatibility of the Sustainable Development Goals for each tool.

In the diagram of Fig. 2.4, the green city is also called the smart city. At first sight, this may appear to be an error but that is not so. Since the Smart Cities seem more fashionable, one naturally asks oneself: is there a difference between the two names? Everything depends on the meaning which is attributed to the term “smart”. A widely accepted meaning, proposed by Dall’O’ et al. (2017) is that the Smart City is a “smart” planned city, managed in an “intelligent”, environmentally sustainable and inclusive way. All these features are contained in the Green City, so it is possible to state, according to this vision, that the “green” concept is inclusive of the “smart” concept. Therefore, a green city is both sustainable and smart. In today’s urban configurations, smart technologies are becoming widespread, supported by ICT (Information and Communications Technology) systems: thanks to these infrastructures, the platforms offered by the world of Internet and related services can be used, from the IoT (Internet of Things) to the coming 5G essential to promote autonomous driving of vehicles.

Technological innovation does not conflict with green choices but, on the contrary, provides an indispensable support to manage the city, its functions and its services in a sustainable way. With reference to the diagram in Fig. 2.2, it can be stated that the green planning of cities and communities cannot be considered a single and independent action plan but an inclusive cluster plan that encompasses all the sector plans reported in Table 2.2 which also highlights the synergies with the SDGs.

This strategy is a good way to promote green planning that takes into account all the aspects related to improving the sustainability of the urban environment in its different components. These include not only the environmental and ecological but also the social, economic and safety aspects.

Actions to combat climate change, fundamental attractors of green policy policies, are transformed into an indispensable opportunity to promote new planning that can resolve the numerous conflicts discussed in Sect. 2.2.2.

Also interesting is the harmonized coexistence and the synergy stimulated between the three categories of planning tools:

- mandatory planning tools help to ensure consistency with international agreements;
- voluntary planning tools stimulate participation and involvement by citizens and all stakeholders;
- the environmental certification protocols such as LEED® or BREEAM®, as well as spreading a culture of sustainability among the stakeholders, also stimulate the real estate market since the certified buildings increase in value and the certified neighbourhoods become more attractive for investors.

**Table 2.2** Synergies between green planning tools and sustainable development goals

Green planning tool	Description	SDGs#
National Sustainability Action Plan	It defines the set of actions (laws, guidelines, technical reports, etc.) that Countries implement to combat climate change in line with international objectives and commitments	6, 7, 11, 13, 14, 15
Regional Sustainability Action Plan	It defines the set of actions (laws, guidelines, technical reports, etc.) that Regions implement to combat climate change in line with international objectives and commitments	6, 7, 11, 13, 14, 15
Town Planning Scheme	It is the fundamental tool for urban planning. Defines the rules for creating or modifying the urban layout (roads, public and private spaces, buildings, urban infrastructures, etc.)	6, 7, 11, 13, 15
Building Code	It is a tool that defines the functional, structural, energy and environmental requirements and performances for new buildings and buildings to be redeveloped. It also contains the rules for the provision of public and private outdoor spaces	6, 7, 11, 13, 15
Sustainable Mobility Plan	It is a green evolution of the classic transport plan. Defines the rules for sustainable urban mobility with less environmental impact	7, 10, 11, 13
Urban Energy Plan	It defines the set of actions and strategies that a city adopts for the optimal use of energy accelerating the transition to a model that, through energy efficiency, distributed generation and the use of renewable energy sources drastically reduces emissions of climate-altering and polluting gases	7, 11, 13

(continued)

**Table 2.2** (continued)

Green planning tool	Description	SDGs#
Integrated Action Plan	It defines strategies and rules to be applied for the redevelopment of neighbourhoods and small urban areas. It takes into account the peculiarities of the place where the interventions will be carried out, enhancing the environmental and socially sustainable choices	7, 11, 13
City Re-Naturing Plan	It defines strategies and rules to apply for a progressive greening of the city	3, 11, 13, 14, 15
Risk Assessment and Disaster Recovery Plan	Action plan aimed at making a city more resilient to external events that are dangerous for the city and its inhabitants (such as earthquakes or floods)	3, 11
Universal Design Plan	The tool defines rules and strategies to guarantee spaces and services of the city accessible to all the citizens	4, 5, 8, 10
Sustainable Energy (and Climate) Action Plan	It is the key document in which the Covenant signatory (of the Covenant of Mayors for Climate & Energy) outlines how it intends to reach its CO <sub>2</sub> reduction target by 2020. It defines the activities and measures set up to achieve the targets, together with timeframes and assigned responsibilities	3, 6, 7, 11, 13, 14, 15
Environmental Certification Protocol	Evaluation protocols for the environmental sustainability of buildings, neighbourhoods or entire cities, drawn up by non-profit associations or organizations, which assign a global score based on a score. The certification of the level obtained is made by an independent certification body	3, 6, 7, 11, 13, 14, 15

## 2.5 Defining a Green Planning Strategy

Progressing to a more operational step, it is important to organize a systematic path which permits the design, implementation and management of green planning: this path, schematized in Fig. 2.6, can be designated as the Green City Strategic Plan (CGSP). Green city planning is the primary responsibility of local governments at

various scales with the participation of all relevant local stakeholders and professional expertise as required.

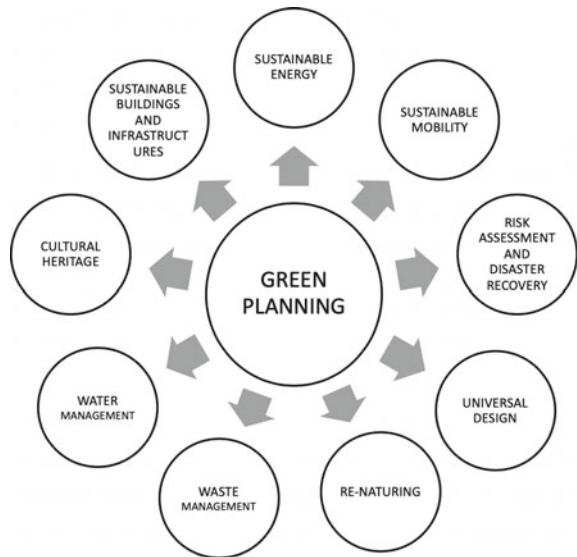
The Green City Strategic Plan will be the result of a process of consultation that has to be defined at the outset and carried out through well-defined steps.

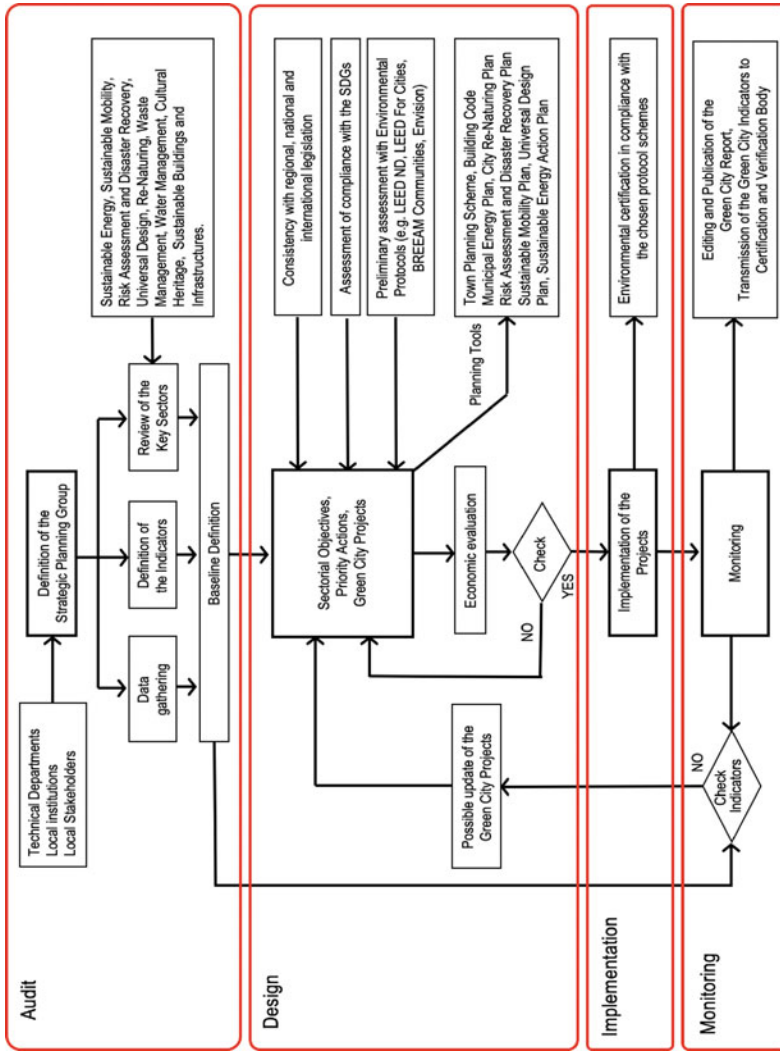
The key element of the CGSP is green growth, defined by (Global Green Growth Institute 2019): “Green growth provides strategies to sustain economic expansion while protecting the environment and ensuring socially inclusive development. In the urban setting, green growth is defined through negotiating amongst stakeholders a shared vision and mission for green city development, as well as specific green growth goals related to resilience to climate change and natural hazard impacts, energy and resource efficiency and related savings, greater and more equitable access to urban services and welfare, poverty reduction, and urban competitiveness Such goals have to be identified at the outset of the Green City Strategic Planning process as the most relevant ones for the local context”.

Consistently with what was discussed in Sect. 2.4, the GCSP can be conceived as a set of actions that must simultaneously satisfy sectoral needs: in Fig. 2.5, the key urban sectors relevant to Green City Strategic Plan are reported.

A typical flow chart of a Green City Strategic Plan is illustrated in Fig. 2.6. This defines four main phases: Audit Phase, Design Phase, Implementation Phase and Monitoring Phase.

**Fig. 2.5** Key urban sectors relevant to a Green City Strategic Plan





**Fig. 2.6** Flow chart for Green City Strategic Plan for cities and communities; the actions are divided into three macro-phases: audit, design, implementation and monitoring

### 2.5.1 *Audit Phase*

The audit phase deals with two aspects: the definition of the work group and, above all, the analysis of the current situation that constitutes the baseline, starting point and reference point on the basis of which to implement the actions (projects). For the development of a Green City Strategic Plan, it is important to create an operative team involving different individuals, characterized by clearly defined positions of leadership, thus able to take decisions. The top level of leadership of a GCSP requires a steering committee constituted by representatives from:

- Technical Departments (e.g. City Planning Department, Building Department, Environmental Department, Mobility Department, City Manager, Mobility Manager).
- Local Institutions (e.g. Provincial Government, Regional Government, National Energy Agencies, Environment Agencies, Public Universities, Public Research Institutes, Ministry of the Environment, Ministry of Energy, Minister of Infrastructure, Minister of Economy).
- Local Stakeholders (e.g. Non-government organizations, Civil society organizations, Private Universities/Academia, Research Institutions, Trade Associations, No-Profit Associations, Green Building Councils).

A Planning Secretariat should also be appointed, whose responsibility is to manage and coordinate day-to-day operations. The chair of the steering committee should be entrusted to a high profile person (e.g. the Mayor) preferably supported by a representative.

Once the steering committee is established, the audit phase should consider three aspects:

- Data gathering;
- Review of the key sectors;
- Definition of the urban sustainability indicators.

The collection of data within the Administration is also a useful opportunity to put order in the information substantially available, to define the state of the art of those actions and projects already started and those already completed and above all to start a dialogue and a permanent comparison between the different departments. This represents an important added value from a management point of view.

Particular attention must be paid to the definition of the urban sustainability indicators since they should be consistent with all the green planning tools: the goal is to define indicators that can be used for additional planning tools, avoiding duplication. An interesting contribution on this delicate topic is contained in the “Indicators for Sustainable Cities” report published by the European Commission (2018) which in its introduction describes a useful explanation of what the indicators are: “*Urban sustainability indicators are tools that allow city planners, city managers and policymakers to gauge the socio-economic and environmental impact of, for example, current urban designs, infrastructures, policies, waste disposal systems, pollution*

*and access to services by citizens. They allow for the diagnosis of problems and pressures, and thus the identification of areas that would profit from being addressed through good governance and science-based responses. They also allow cities to monitor the success and impact of sustainability interventions”.*

### **2.5.2 Design Phase**

The design phase defines the objectives and strategies, intended as projects, which must be adopted to achieve them. At this stage, it is important to:

- define realistically achievable goals;
- define objectives that are not in conflict with legislative instruments and with guidelines approved by higher-level administrations (e.g. regional or national);
- define strategies consistent with the sustainable development goals (SDGs) defined by the United Nations.

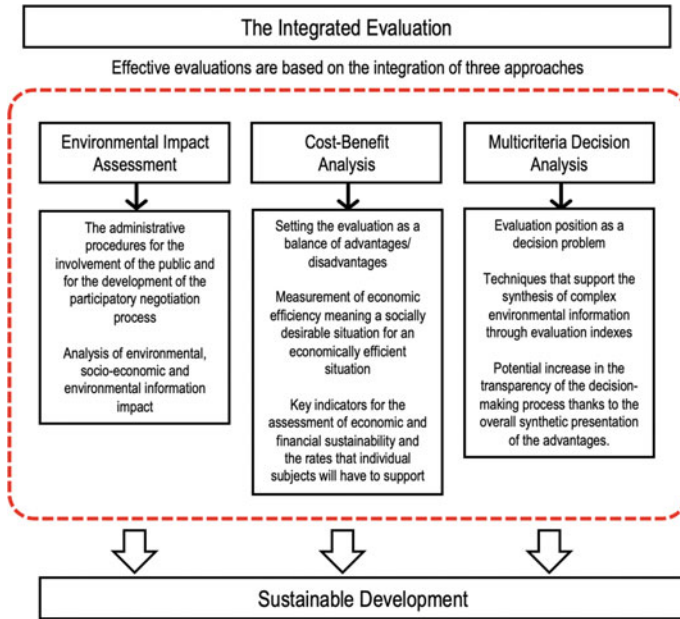
In choosing the actions to implement, the steering committee should ask itself the following questions:

- Is the proposed action strategic with respect to the needs identified in the audit phase?
- Is the implementation time compatible with the needs identified during the audit phase?
- Are there technical skills available within the Technical Departments capable of managing the action both from a technical and an economic point of view?
- Is it feasible from an economic point of view? In other words, are the financial resources available to cover the costs of implementation but also of management and maintenance?

If the objectives to be achieved can be clear, the paths to follow, and, therefore, the actions to be implemented in order to attain those objectives, are various. The resultant choice of what is best done, must be in the best interests of the community.

An evaluation of the design choices in green planning can be made using different approaches in accordance with the scheme proposed by Mondini (2018) (Fig. 2.7): Environmental Impact Assessment, Cost–Benefit Analysis and Multi-criteria Decision Analysis.

As regard the third approach, interesting is the contribution of Dall’O’ et al. (2013b) in which the authors apply a Multi-Criteria Methodology to Support Public Administration Decision Making Concerning Sustainable Energy Action Plans.



**Fig. 2.7** Main classic evaluation approaches employed in the pursuit of sustainable development (Mondini 2018)

### 2.5.3 Implementation Phase

In this phase, the projects are implemented: considering their complexity, the implementation may take a few years. The implementation of an environmental certification system compliant with a sustainability protocol (e.g. LEED® ND, LEED® for Cities, BREEAM® Community, Envision®) makes it possible to follow the implementation of the project with great care, ensuring consistency between the objectives defined in the design phase and their actual accomplishment.

### 2.5.4 Monitoring Phase

By having a monitoring phase, it is possible to verify whether the actions implemented were truly effective in achieving the objectives: this is assisted by a verification over time of the partially implemented actions.

The green planning strategy, although it may include the implementation of several sectoral projects, cannot be considered a macroproject, with a beginning and an end, but rather defines a continuous path of improvement that must be constantly verified through the monitoring of the achieved results.



This monitoring is performed by means of a comparison between the indicators periodically detected (e.g. every year) and the indicators obtained from the baseline that becomes the reference base. It is, thus, the presence of a monitoring phase which makes the difference between a project and a process.

Through a precise and detailed control, it is possible to identify the partial or global ineffectiveness of some actions, identify their causes and make corrections. All is done according to the typical Quality Systems approach which, using the Deming cycle (PDCA),<sup>3</sup> is a recursive processes.

The indicators built on the basis of the information collected during the monitoring phase can be used to update shared databases, for example, the international Application for Resilient Communities (ARC) platform developed and managed by the GBCI.<sup>4</sup>

To be successful, a Green Planning Strategy must be inclusive and shared. The involvement of citizens and stakeholders is fundamental to promote sustainable development, a process that offers endless opportunities for growth but at the same time generates economic and social conflicts. Campbell, it should be recalled, defines sustainability as “*the ongoing never ended process on resolving the three conflicts: development conflict, resource conflict and property conflict*” (Campbell 2016).

Conflict management can only take place on the basis of objective information: the indicators obtained during the assembly phase demonstrate whether certain choices have been effective or not and constitute an objective basis for comparisons and for the management of any conflicts.

It is, therefore, advisable that periodically the data obtained from the monitoring be made available to the community through a “Green Planning Report” to be disseminated through traditional means of communication and via the Internet. The steering committee, amongst its activities, should promote a public Web platform containing all information regarding the Green Planning Strategy.

## 2.6 Conclusions

An Italian plant physiologist, Stefano Mancuso, has published a book with a captivating title: “The Plant Revolution: How plants have already invented our future”, in which he analyses in depth how the plant world works and how the plant world is organized always to ensure the sustainability of our planet (Mancuso 2017).

Plants are energy self-sufficient using only solar energy, they do not impact the environment, rather they help us to remove the climate-changing gases which mankind produces, with waste by implementing circular economy strategies, they

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<sup>3</sup>PDCA, an acronym for Plan-Do-Check-Act, is a four-step iterative management method used for the control and continuous improvement of processes and products.

<sup>4</sup>Green Business Certification Inc. (GBCI) is the only certification and credentialing body within the green business and sustainability industry to exclusively administer project certifications and professional credentials of LEED®, EDGE®, GRESB®, Parksmart, PEER®, SITES®, TRUE and WELL®.

are also resilient, adapting, within certain limits, even to the climate changes. The plants also have a distributed intelligence and are organized “on the net”.

By imagining a strategy for sustainable development, one could start with this model or at least derive ideas from it. Mancuso’s reflections are interesting and should stimulate us to learn from nature ideas that could be useful for green planning in our cities.

Climate change asks us for important and decisive actions and the International Panel on Climate Change (IPCC), through objective monitoring of the environmental situation at a global level, conveys to us the concern that we are not far from the point of no return (or “tipping point”), i.e. from an environmental situation that no longer permits recovery. If the international community shares these concerns, the strategies which can be implemented are various.

If the problem is determined by growth, degrowth could be the solution. Some minority movements choose this path and call this strategy “happy degrowth”.

Humanity cannot share this strategy which would mean relinquishing many things. An aspect to consider, then, is the legitimate expectation of social improvement, and, therefore, of growth, of that part of the world’s population which currently lives below the poverty line.

A more realistic approach is to implement relatively quickly all possible strategies to reduce the environmental damage caused by anthropization without rules and regulations.

In the last few years, many things have been done: almost zero energy buildings are being built, cars are being manufactured which impact far less from an environmental standpoint, strategies are being implemented to promote the economic economy and protocols are spreading on a voluntary basis. International environmental certification for buildings, neighbourhoods and cities has allowed the real estate sector to reward economically those who invest in sustainability.

This is the road: to trace a path in which strategies take into account the enhancement of nature, a common good, but at the same time, use technological innovation and scientific knowledge to re-establish a sustainable relationship between mankind and the environment.

The purpose of this chapter, which shares a conscious growth strategy, is that of being a contribution to the topic of green planning for cities and communities.

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