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## Integrating environmental issues with the practice of urban planning

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### ABSTRACT

Environmental protection of urban areas has become a common concern among academics, policy makers and urban planners. Therefore, environmental issues are often underlined and incorporated into many strategies for urban development. In the article a discussion about the development of the concept of sustainable development in the context of urban planning and international policies is presented, followed by a review of planning tools for integrating spatial and environmental planning.

**Keywords:** Sustainable development, Environmental planning, Spatial planning, Integrated urban planning, Planning tools

### 1. INTRODUCTION

In metropolitan areas human behaviours and biophysical processes continuously interact. A failure to understand the complexity of these interactions in the past led to many inadequate policy decisions and investments with negative long-term effects on the environment. Therefore, the assessment of future urban growth and the development of integrated models are crucial for more efficient land use planning, minimising urban pressure on the environment and reducing the use of resources and the emissions of pollutants [1]. A multi-disciplinary approach towards a holistic understanding of the mutual relation between

environmental quality and human well-being is advocated in much of the current research [2,3]. Environmental issues are underlined and implemented in urban planning within the concept of sustainable development which has become a widely accepted paradigm both in developed and developing countries. However, environmental protection is not its sole and most important component.

Sustainable development is a dynamic approach that can vary significantly according to local context and conditions. It is not aimed at achieving a particular state but rather at a constant promotion and improvement of the quality of life in a social, economic and political aspect. Although the definitions of sustainable development vary among policy makers, practitioners and academics, the following principles are commonly agreed upon: respecting natural resources due to their scarcity, balancing ecological, economic and social development and planning in a long-term perspective.

However, there is no agreement on how to put the definition of sustainable development into practice [4]. In the context of urban planning, it is commonly associated with several practices and trends in urban development which are believed to minimise the environmental impact of urban areas and improve the quality of life in the urban environment such as the compact city concept, brownfield redevelopment and urban infill (see for example [5-8]). They were developed and discussed along with the development of the international environmental strategies and agendas. Moreover, many researchers stress the fact that sustainable urban planning should be process-based and continuously evolving rather than focused on fixed goals. It also requires social education and involvement of all stakeholders [9].

The aim of this article is to review the current literature on integrating environmental planning with spatial planning and to compare various planning tools which were developed to serve this purpose. In it, planning tools are considered a set of methods, procedures and methodologies which assist the process of urban planning and policy making at different levels (local, regional, national or global). Based on an extensive literature study, further prospects of integrated planning will be shown.

## **2. ENVIRONMENTAL ISSUES IN THE CONTEXT OF THE DEVELOPMENT OF SUSTAINABLE DEVELOPMENT CONCEPT**

Environmental issues were first addressed worldwide in relation to urban development at the United Nations Conference on Human Environment in Stockholm in 1972 where it was agreed that there is a need for a common concern for the preservation and enhancement of the human environment. The conference was concluded with a declaration of 26 principles among which protecting natural environment and maintaining renewable resources was underlined as it was stated in the Declaration of the United Nations Conference on the Human Environment. Over a decade later, when it became clear that the challenges set up by UN Conference still remained to be addressed and solutions implemented in many countries, a World Commission on Environment and Development chaired by Gro Harlem Brundtland was established in 1983 and it was assigned to formulate 'a global agenda for change'. The commission issued a report entitled 'Report of the World Commission on Environment and Development: Our Common Futures' (known as the *Brundtland Report*) in which the term 'sustainable development' was coined and long-term environmental strategies were proposed. Since its

publication, the phrase 'sustainable development' has become widely used by politicians, governors and planners. Many of the latter believe that it can be achieved by replacing many current resource-consuming and environmentally straining practices with more environmentally sustainable ones [10].

The integration of different aspects of environmental quality in urban environment was underlined in the report entitled Green Paper on the Urban Environment issued by the Commission of European Communities in 1990. In the report it was noted that various components of environmental quality, such as air and water quality or noise level, should be integrated into the strategies for urban development in a holistic rather than sectoral approach. It was also one of the first documents which referred to urban form in European urban policies, advocating for more dense and mixed urban development which can be associated with the tradition of European cities.

Two years later environmental issues were again discussed globally at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro. Often referred to as the Rio de Janeiro Earth Summit, the conference, unprecedented both in its size and scope, was attended by 172 governments and resulted in several important documents and declarations, among them the Agenda 21. In this document, the concept of sustainable development is revisited in its social, economic and ecological dimension. Apart from many other environmental issues, it advocates for integrated land-use planning and management. The Agenda 21 document of the Rio del Janeiro conference repeats the recommendations of *Bruntland Report* and encourage local authorities to initiate the process of sustainable development [10].

Another important document was the European Spatial Development Perspective issued by the European Commission in 1999 which was aimed at delivering framework for integrated and multi-sectoral framework for spatial development. The importance to recognise all sectors of development activities, such as the environmental protection, economic growth or transport system, was underlined. This was followed by the European Landscape Convention of the Council of Europe from 2000 in which the protection of landscape in underlined in the first place as a component of sustainable development and in which environmental issues are also present.

In 2002, ten years after the conference in Rio de Janeiro, another United Nation Earth Summit was held in Johannesburg – the World Summit on Sustainable Development. It resulted in many international agreements but most importantly, the Johannesburg Declaration on Sustainable Development was signed. It is based on previous documents – the *Bruntland Report* and Agenda 21. In terms of urban planning, more specific strategies were developed in the Leipzig Charter on Sustainable European Cities by European Commission which specifically refers to sustainable urban development. It promotes, among many others, traditional, polycentric urban structure, high quality public space and efficient infrastructure.

In European environmental legislation two strategies were introduced - Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA) to promote sustainable development and to integrate environmental targets into project-related and strategic decision-making. According to the Organisation for Economic Co-operation and Development (OECD), their main objective is to take environmental implications into account at the level of planning. The first one is implemented at a higher level, to government plans, programmes and policies. The latter was established to introduce an obligation to assess environmental impact of particular investments such as water, energy or transportation

infrastructure. The development and evolution of the concept of sustainable development was presented in Fig. 1.

1972	United Nations Conference on Human Environment in Stockholm, Sweden
1987	Report <i>Our Common Future</i> (known as <i>Brundtland Report</i> ) by the World Commission on Environment and Development
1990	Green Paper on the Urban Environment by the Commission of the European Communities
1992	Earth Summit in Rio de Janeiro (United Nations Conference on Environment and Development) followed by the document Agenda 21
1999	European Spatial Development Perspective (ESDP) by European Commission
2000	European Landscape Convention of the Council of Europe
2001	European Union Strategic Environmental Assessment Directive 2001/42/EC
2002	United Nations Conference on Environment and Development in Johannesburg, South Africa
2007	Leipzig Charter on European Sustainable Cities by European Commission
2011	European Union Environmental Impact Assessment Directive 2011/92/EU

**Fig. 1.** Timeline presenting the development of international and European agenda and legislation for sustainable development and urban planning

### 3. URBAN AND ENVIRONMENTAL PLANNING – APPROACHES TOWARDS INTEGRATION

Traditionally, environmental planning was focused on issues such as establishing green areas within the city, improving air quality and health of the inhabitants; however, the *Brundtland Report* put urban sustainability into a much wider perspective. Although local environmental quality should still be present in urban policies, the main focus should be on the city as a part of a wider natural ecosystem and its 'ecological footprint' on the environment [10]. As long as environmental and urban planning remain separate fields of practice and research, sustainability objectives may not be fully met. Nowadays, there is an increasing number of strategies aimed at integrating environmental and urban planning. According to many academics and practitioners, a standard, sectoral approach should be replaced by more holistic systems in which many areas of research are integrated [11-13]. The term integration had become widespread and integrated assessment of various environmental impacts should be incorporated into the process of decision-making at different stages of urban planning.

Initially, environmental planning emerged as an independent discipline, separate from urban and regional planning but it was soon realised that achieving sustainability requires integration of environmental and development planning [14]. Nowadays, geographical, ecological, planning and social sciences are perceived as a one complex, trans-disciplinary framework [15]. On the other hand, the implementation of environmental norms may inhibit urban growth and for this reason environmental aspects are not always incorporated into spatial planning [16]. Therefore, a more relaxed approach towards environmental regulations is sometimes argued. According to Glasbergen, a form of flexible regulation to achieve environmental quality can be a more successful tool in the process of participatory planning [17]. According to Driessen et al., this can be exemplified by the allowance of higher noise levels in Dutch cities which was compensated for example by more green spaces. Yet, such practices had to be abandoned lately due to new European legislation [18].

Environmental planning should be also discussed in the context of participatory planning which is becoming a prevalent trend in many countries. Collaborative and horizontal modes of decision-making have replaced the top-down, centralised approach [19]. Similarly, in environmental planning and management, the participatory approach has become a widely accepted standard of practice. In the 1990s environmental planning could still be described as centralised due to the fact that state governments were mainly responsible for formulating environmental objectives and legislation. In the following two decades many efforts have been put into integrating urban and environmental planning and into developing collaboration at different levels. Driessen et al. refer to those changes as 'shifts in urban environmental governance' [18]. Nowadays, public participation in environmental planning and decision-making is advocated by many planners, policy makers and academics [18,20-22].

An important component of sustainable development is planning at the local level. The significance of local governance was underlined both in the *Bruntland Report* and in Agenda 21. Environmental issues require transparent and flexible decision making based on the common knowledge and values due to their complexity and dynamic nature. For this reason the participation of various stakeholders is sought and embedded into planning policies, both national and international [23]. It is believed that local knowledge can contribute to solving many environmental and health risks. Moreover, community participation in environmental decision making puts pressure on planners to confront the expertise of environmental scientists with the experiences of residents and with local conditions. Therefore, efforts are made to improve the process of public participation and to encourage as many stakeholders as possible. For example, Kingston et al. researched the possibility to use Internet-based technologies to support traditional means of public participation in order to widen participation in the UK planning system [24].

There is a wide variety of tools and methods to evaluate both the environmental impact of urban areas and the quality of life in urban environment (e.g. water and air quality, noise and odour levels and other) which can be incorporated into local and urban planning. For example, Vrščaj et al. present methods for soil quality evaluation to support land use decisions in urban planning [25]. With the use of dynamic olfactometry, the quality of urban air in terms of odours and industrial emissions can be successfully assessed [26]. Noise mapping method is used to determine environmental noise dispersion [27]. Pauilet et al. propose evaluating and modelling environmental impact of land use and land cover change with the use of aerial photographs based on a study in Merseyside, UK [28]. There are also examples of incorporating environmental evaluation into local participatory planning and

collective decision-making. For example, C. Easter, R. Voigt, J. Witherspoon and J. Cesca describe how odour nuisance evaluation in an area adjacent to a wastewater treatment facility in Fairfax County, VA, was used to develop an Odour Control Master Plan with the participation of local residents (the research was published in: *Odours and VOCs: Measurement, Regulation and Control Techniques*, Kassel, 2009). The discussion and collective decision-making was used to develop a set of recommendations for odour control improvements to be implemented in the facility.

#### **4. TOOLS FOR INTEGRATING ENVIRONMENTAL ISSUES WITH URBAN PLANNING POLICIES AND PRACTICES**

There are several tools and methodologies developed for incorporating environmental issues and environmental quality assessment into the practice of urban planning. According to Runhaar and Driessen, planning tools can be classified into two main categories: substance-oriented and process-oriented. The first type of tools is based on the knowledge of the state of the urban environment (e.g. indicators, geographic information system - GIS) or analytical tools such as EIA or health-impact assessment. They imply planning which is based on dialogue, achieving a common consensus and the search for new creative solutions [16]. The concept of process-oriented planning was developed by many other authors [9,29]. Based on the experiences from the above-mentioned planning approaches, some planners (e.g. in the Netherlands) try to develop new tools specifically aimed at the integration of spatial and environmental planning which combine both the content and process aspects. For example, a distinct type of 'hybrid' planning tools which are developed in the Netherlands in order to define area-specific environmental ambitions in spatial planning. Five Specific methods can be named: the 'Milieu maximalisatie methode' (MMM, or environmental maximization method), 'Milieu Op Z'n Plek' (the right place for the environment), 'LOGO' (local area typology and environmental quality), 'MIRUP' (environmental tool in spatial plans), and 'MILO' (environmental conditions in the living environment) [16].

The above-mentioned procedures, SEA and EIA are among the most commonly used for environmental evaluation which are also incorporated outside Europe. For example, an increasing number of countries in Latin America are including them in environmental policies and plans [30]. In China, apart from SEA and EIA, there is also another procedure called PEIA (Plan Environmental Impact Assessment) which is applied to comprehensive and special plans [31]. As SEA has more impact on urban policies, it is more often a subject of research among academics than EIA, e.g. [4,30-32]. It is a process of systematic decision support to ensure that environmental aspects are considered in policy making, plans and programmes [4]. SEA is particularly focused on plans for metropolitan areas [30]. However, some researchers believe that the framework and practice of SEA still requires improvement. According to Keysar and Steinemann, although SEA is widely regarded as a planning tool, it is often kept separate from the planning process. Therefore, it is criticised for having only a minor influence on decision-making and being used to justify decisions already made [33].

Based on an extensive literature review on planning and development approaches aimed at achieving urban sustainability, Yigitcanlar and Terimam propose an 8-step integrated planning and development process. Its phases are as follows: defining planning issues and goals, evaluating priority and redefining these goals, generating alternatives based on the

achievement of indented goals and objectives, assessing and re-evaluating the alternatives, the beginning of the implantation process, construction phase (administrative procedures and funding arrangements), completing and delivering the project and, finally, its monitoring and eliminating any occurring defects and deficiencies. Each component of the process includes a set of criteria and variables which are accompanied by particular evaluation techniques. It is argued that a thorough sustainability assessment at every stage of the process would increase public knowledge about all the planning and implementation stages and enable the communities to guide urban transformation [34].

There are also many other tools and methodologies aimed at integrating urban and spatial planning. Moreover, some new approaches and practices are often developed within the already existing tools. The most prevalent are listed in Table 1.

**Table 1.** Urban environmental and planning tools.

<b>Urban planning tool</b>	<b>Study subject, research area, materials and methods</b>	<b>Main conclusions</b>	<b>Ref.</b>
SEA (Strategic Environmental Assessment)	Analysis of the consideration of the sustainability principles of urban plans of SEA in Italian urban plans in 15 major cities (based on Gibson's framework [35])	The research showed that several sustainability issues are identified and considered in urban plans but ignored in actions and decisions; the provided framework can provide guidance for improving the outcomes of sustainability in decision-making and to implement the stated objectives into actual strategies.	[4]
SEA (Strategic Environmental Assessment)	The study focuses on methodology for Strategic Environmental Assessment in Latin America based on the Chilean experiences. The method is based on Land Sustainability Index (LSI) which was developed for the Metropolitan Region of Barcelona by Marull et.al.[36]	Although in Chile there is a Specific plan appraisal tool (SEIA), the application of SEA might help to improve the sustainability in Chilean planning and development. The proposed methodology provides a complementary assessment and a prospective approach towards future land use.	[30]
LSI (Land Sustainability Index) for SEA	In the paper, LSI is presented which is a transparent, modular hierarchical system of cartographic indices to support SEA of land uses in regional planning. It is based on three indicators: impacts of plans on biological, geological and hydric resilience (TVI), natural heritage (NHI), and ecological	LSI is a holistic index for SEA and a highly effective tool. As a quantitative and cartographic tool based on GIS, LSI facilitates delivering results to planners and policy makers.	[36]

	connectivity (ECI). It was used for the evaluation of municipal plans for Barcelona Municipal Region.		
PEIA (Plan Environmental Impact Assessment)	The study focuses on developing a framework for integrating PEIA with urban and rural planning in China. Ten stages of decision-making with ten corresponding stages of PEIA were proposed.	In China PEIA is still considered as an independent process and the conducted study was the first attempt to integrate it with the process of planning and decision-making. As soon as PEIA is recognised as a platform for participation and negotiation, sustainable development may be achieved.	[31]
EIA (Environmental Impact Assessment)	In the paper, public participation in EIA is examined in terms of public involvement and its institutionalisation as well as the shortcomings and strength and common approaches towards public participation. The study is supplemented by two case studies from the USA.	The study showed that a proactive approach towards public participation can benefit the process of planning. As it was concluded from the analysis of case studies, the collaborative and interactive planning can improve environmental decision making.	[37]
CBEP (Community- based environmental planning)	In the paper, the practice of community-based environmental planning is examined and reviewed. Based on international literature study, six key problems with the CBEP approach are identified and some possible solutions are suggested.	CBEP offers a possibility for the residents to respond to environmental issues. However, it operates in a very complex context and therefore its role may be limited. Moreover, environmental planning at the level of local communities should not replace state planning.	[21]
MCDM (Multicriteria decision making)	MCDM methodology (in preference ranking organisation method of enrichment evaluation PROMETHEE (developed by Brans and Mareschal, published in: "Multiple Criteria Decision Analysis – State of the Art Annotated Surveys, Berlin: Springer 2005) which is a set of tools to achieve collective decisions in planning and a framework for social environmental education, was presented based on a case study of river management in Central Vermont.	MCDM methodology helps to provide a structured analysis and to formulate explicit and substantive discussion and to express the stakeholders' preferences. The PROMETHEE method helps to accelerate the discussion process. Unlike the typical conflict resolution and consensus building methods, this is a fully analogical tool. Therefore, their effectiveness is difficult to compare.	[22]



## 5. CONCLUSIONS

There is a growing body of evidence that urban planning should include environmental quality evaluation and should be integrated with environmental planning. This is also present in many urban strategies and policies. Many tools were developed to support this process of integration which vary according to scale and function. The review revealed that a single, widely implemented set of tools for integrating environmental and urban planning does not exist and the methodological approaches vary at different scales (local, regional and governmental) and between different countries. Moreover, several examples of incorporation of environmental issues into urban planning can be found, especially at the level of local planning.

On the basis of this literature survey, the following conclusions can be made: (1) a multidisciplinary, intersectional framework is required to address environmental issues in urban planning more comprehensively; (2) tools for implementing environmental issues and standards with urban planning vary in terms of methodological approach and many of them require further research and development; (3) tools for integrating environmental issues with urban planning should be more process-based and participatory as collective decision-making is becoming a widely accepted standard of practice in urban planning and development; (4) sometimes a more relaxed approach towards environmental standards is advocated and justified in which local social and economic conditions are taken into consideration along with environmental issues.

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