Challenges in the Implementation of the 2030 Agenda at the Local Scale. The Case Study of the Municipal Masterplan of Cagliari

Maddalena Floris and Francesca Leccis(✉)

Università degli Studi di Cagliari, via Marengo 2, 09123 Cagliari, Italy
maddalenafloris@gmail.com, francescaleccis@unica.it

Abstract. The 2030 Agenda for Sustainable Development urges policy shift from a sectoral approach to a holistic one, which considers the interconnections among the economic, social and environmental dimensions of sustainable development and calls for integrated solutions. The Agenda identifies 17 Sustainable Development Goals, which are scaled at the national and regional level through the National Strategy for Sustainable Development and the Regional Strategy for Sustainable Development. This paper suggests a new methodological approach to advance the Sustainable Development Goals at the local level, by illustrating the procedure developed for the definition of the Preliminary environmental report of the Strategic environmental assessment of the Preliminary municipal masterplan of Cagliari, which localize the Sardinian Regional Strategy of Sustainable Development. The proposed methodology adopts the structure of the logical framework in order to provide a complete hierarchical relation among the objectives and the actions of the Preliminary municipal masterplan. The logical framework is articulated into four phases: the definition of the sustainability-oriented objectives, the analysis of policy consistency and coherence, the definition of the specific objectives and the definition of the actions. This contribution is centered on this last step and on the subsequent monitoring phase. In particular, impacts of the actions on the achievement of the sustainability-oriented objectives are assessed. In case they are found to be potentially negative, alternatives are provided. The monitoring system is constituted by a series of indicators that allow for the numerical measurement of a phenomenon in order to promptly identify negative impacts and take the appropriate corrective measures. The assessment of the actions is a key element in the definition of urban and regional plans, that allows for the development of special processes coherent with the Regional Strategy for Sustainable Development and able to contribute to the achievement of the Sustainable Development Goals. The proposed methodology is easily exportable in other Italian regional contexts and constitutes a fundamental reference framework for the integration of the Regional Strategy for Sustainable Development into the Strategic Environmental Assessment processes of territorial plans.

Keywords: 2030 agenda · Strategic environmental assessment · Monitoring

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1 A New Paradigm for Development

The 2030 Agenda embodies a new paradigm for global development, based on the synergistic relation between sustainability and development [17]. This paradigm calls for a new model of international development, which combines economic progress, social justice and the preservation of natural resources, with the aim of building an equitable, inclusive and environmentally sustainable world [17].

This new concept of sustainable development relies on 17 Sustainable Development Goals (SDGs) (Fig. 1), further structured in 169 targets [18]. Progress in their implementation has to be monitored through the 231 indicators identified by the UN [17].



Fig. 1. The seventeen sustainable development goals [2].

One of the most innovative defining features of the 2030 Agenda is its universality, which, not only means that principles are universal and, as such, applicable to all countries and all people, but also that all the countries at all levels have to devote an effort, both individually and collectively, towards global sustainability [16]. For this reason, nations and administrative regions are called to develop National Sustainable Development Strategies (NSDS) and Regional Strategies for Sustainable Development (RSSD), respectively, while Local Governments are appointed to implement the Strategies at local level [12].

The Italian government approved the translation of the global agenda to the national level on 22nd December 2017 [11][1]. The Italian National Strategic Objectives are the result of a process of tailoring of the Agenda targets and they are monitored through a set of national indicators defined by the Italian National Institute of Statistics (ISTAT)

[1] CIPE: Delibera n. 108 del 22.12.2017. CIPE Resolution N. 108 of 22nd December 2017. Available at: https://ricerca-delibere.programmazioneeconomica.gov.it/108-22-dicembre-2017/, last access 11.04.2022.

[11]. The Sardinian regional government, in turn, approved the RSSD[2] on 8th October 2021 [15]. The Sardinian RSSD gears the National Strategic Objectives to the Sardinian context through the definition of the Strategic Regional Objectives (SROs). A series of actions have been identified to pursue the SROs and a system of indicators has been defined to monitor progresses in SRO achievement [15]. The implementation of the 2030 Agenda at the local level is here illustrated through the case study of the Municipality of Cagliari, the capital city of Sardinia (Fig. 2), which localized the Sardinian Regional Strategy of Sustainable Development in the Preliminary municipal masterplan (MMP) of the city.



Fig. 2. The city of Cagliari in the Italian and Sardinian context.

This paper is structured into 3 sections: (i) a new paradigm for sustainability, (ii) methodology and case study, which is in turn organized into 2 subsections, and (iii) discussion and conclusion.

[2] RAS (Regione Autonoma della Sardegna): Deliberazione N. 39/56 del 08.10.2021. Strategia Regionale per lo Sviluppo Sostenibile. Indirizzi per l'attuazione. [Regional resolution N. 39/59 of 8th March 2021. RSSD. Guidelines for the implementation] Available at: https://delibere.regione.sardegna.it/protected/57125/0/def/ref/DBR57095/, last access 11.04.2022.

2 Methodology and Case Study

The applied methodology makes reference to the process of the Strategic Environmental Assessment (SEA), recognized as an efficient approach for the enhancement of the plan, because it allows for the balancing of socio-economic objectives and environmental concerns [8]. In particular, the methodology adopts the logical framework (LF) matrix, which enables the integration of the objectives and actions of the RSSD into the perspective plan, reflecting the SEA leading concepts of sustainability and endoprocedimentality and identification of alternatives [9]. The LF outlines a hierarchy of objective and actions [10], whose logic linkages are made explicit [19]. The matrix is constituted by four columns and *n* lines (Table 1). As illustrated in Table 1, columns represent: Sustainability-oriented objectives, Objectives deriving from the external analysis of the plans and programs in force, Specific objectives and Actions. Actions are separate into two sub-columns: those favorable for the achievement of the corresponding SpO and those potentially unfavorable for the achievement of the related SpO. Matrix completion develops from the left to the right, but far from being a linear sequence of steps, it is an iterative process, which might require to go back and forward to review and revise drafted elements in the light of the new ones [4].

Table 1. The structure of the logical framework.

Sustainability-oriented objectives	External consistency – related objectives	Specific objectives	Actions	
			favorable	Potentially unfavorable
SO.1	EC.1	SpO.1	A.1	A.8
			A.2	A.9
		SpO.2	A.3	A.10
			A.4	A.11
	EC.2	SpO.3	A.5	A.12
			A.6	A.13
		SpO.4	A.7	A.14
			…	…
…	…	…	…	…

Once every cell of the matrix is filled in, a set of indicators is defined to monitor and assess the advancement in the achievement of the objectives.

The next two sections illustrate the process of impact assessment of the actions and the definition of a set of indicators, respectively.

2.1 The Plan Actions and the Dualism with the Sustainability-Oriented Objectives

Endoprocedimentality mainly expresses through the internal coherence among the different level of the LF. However, internal coherence is not sufficient to guarantee the sustainability of the plan [21]. On the contrary, internal coherence needs to be flanked by a comprehensive analysis of the relation between the sustainability-oriented objectives and the MMP actions, since some actions defined for the achievement of a sustainability-oriented objective might entail potentially unfavorable impacts on other sustainability-oriented objectives.

Consequently, it is necessary to carefully analyze each action with regard to all the sustainability-oriented objectives, in order to identify potentially unfavorable impacts on sustainability-oriented objectives and, in this event, to seek non-conflicting alternatives.

Table 2 shows an example of the analyses of an action of the MMP of Cagliari with regard to some sustainability-oriented objectives, while Table 3 illustrates the negative impacts of the identified potentially unfavorable action with regard to some sustainability-oriented objectives and provides non-conflicting alternatives.

Table 2 shows the dualism of the MMP actions with regard to both the sustainability-oriented objectives and the environmental components.

With reference to the dualism of the MMP actions with regard to the sustainability-oriented objectives, it can be noticed that the action *A_01*, reported in the first column, "To locate new residential, commercial and productive activities in areas with less exposure to natural and man-made risks, excluding highly sensitive areas", can be potentially unfavorable for the achievement of the objectives *SO_06* and *SO_12*, while the same action substantially contributes to the achievement of the objectives *SO_03, SO_08, SO_14* and *SO_15*.

Concerning the dualism of the MMP actions with regard to the environmental components, it can be seen that, even within the same component, the same action *A_01*, has a dual attitude. For example, with respect to the component *Soil*, it can be potentially unfavorable for the achievement of the objective *SO_06*, while it substantially contributes to the achievement of the objective *SO_08*.

Similarly, as for the component *Landscape and historical and cultural heritage*, it can be potentially unfavorable for the achievement of the objective *SO_12*, while it substantially contributes to the achievement of the objective *SO_14*.

In total, notwithstanding the logical linkages between the sustainability-oriented objectives and the actions of the MMP of Cagliari explicated in the LF, as a result of this analysis, 33 actions are found to be in potential conflict with 13 sustainability-oriented objectives. In particular, conflicting relations are identified in the following environmental components: Air, Water, Soil, Flora, fauna and biodiversity, Landscape and historical and cultural heritage, Settlement system and demographic change, Transport and mobility and Noise.

Table 3 shows that the reason why the MMP action *A_01* is considered potentially unfavorable for the achievement of the sustainability-oriented objectives *SO_06* and *SO_12* is that it might cause a loss of natural and semi-natural areas and it might undermine the current condition of landscape components with relevant environmental value, respectively. The assessment of the potential environmental impacts that the realization

Table 2. Excerpt from the assessment table of Cagliari MMP action *A_01* with regard to the sustainability-oriented objectives.

Action	Assessment	Sustainability-oriented objectives	Environmental component
A_01 To locate new residential, commercial and productive activities in areas with less exposure to natural and man-made risks, excluding highly sensitive areas	Potentially unfavorable	SO_06 To ensure biodiversity conservation, protection of agricultural and semi-natural areas and restoration and valorization of ecosystems services	Soil
		SO_12 To ensure protection, valorization and sustainable fruition of coastal areas, marine-coastal wetlands, urban areas, agricultural landscapes and hills of the city of Cagliari	Landscape and cultural heritage
	Favorable	SO_03 To reduce exposure to flood risk and to decrease floodings in the whole municipal area through the adoption of preventive measures like the collection, reuse and recycling of rainwater	Water
		SO_08 To reduce exposure to the risks of landslides and flooding and to ensure adequate safety levels in areas with high hydrogeological risk	Soil
		SO_14 To reuse, enhance and regenerate the built environment and the public space	Landscape and historical and cultural heritage

(*continued*)

Table 2. (*continued*)

Action	Assessment	Sustainability-oriented objectives	Environmental component
		SO_15 To protect and enhance the built environment and urban green areas and to limit soil consumption	Settlement system and demographic change

Table 3. Excerpt from the assessment and alternative provision table of Cagliari MMP action A_01.

MMP potentially unfavorable action	Sustainability-oriented objectives	Assessment	Alternatives
A_01 To locate new residential, commercial and productive activities in areas with less exposure to natural and man-made risks, excluding highly sensitive areas	SO_06 To ensure biodiversity conservation, protection of agricultural and semi-natural areas and restoration and valorization of ecosystems services SO_12 To ensure protection, valorization and sustainable fruition of coastal areas, marine-coastal wetlands, urban areas, agricultural landscapes and hills of the city of Cagliari	The realization of new volumetry might entail potentially negative impacts on the achievement of the sustainability-oriented objectives reported in the second column, because it might cause a loss of natural and semi-natural areas and might undermine the current condition of landscape components with relevant environmental value	Intervention of restoration and redevelopment of the built environment The need of extra volumetry should be meet by regenerating the existing public and private housing stock. In case the building of new volumetry is necessary, location must be studied carefully and adequate impact mitigation and compensation must be identified in order to limit negative effects on the landscape and on the environment

of an action might entail is essential for the definition of the alternatives [1]. In the example here illustrated, the analysis of the MMP action *A_01* leads to alternatives oriented to the restoration and regeneration of the built environment, in place of the realization of new volumetry.

2.2 The Monitoring Indicators as a Tool to Assess the Plan Actions

The evaluation process does not finish when the plan is adopted, but continues during its implementation through the monitoring activity, thus reinforcing the concept of the

planning practice as an ongoing learning process [5, 20]. In this sense, the monitoring activity ensures the control of significant impacts on the environment deriving from the realization of the plan activities and allows to ascertain whether the objectives are met [6, 14], so that it is possible to promptly identify negative impacts and take the appropriate corrective measures [3].

The monitoring activity is based on a series of indicators, which are parameters or a group of parameters that synthetically express the *status quo* of a phenomenon through a number. Plan monitoring, sanctioned by the article 10 of the EU Directive 2001/42/CE, is still often considered as an appendix of the assessment process and neglected by the working practice. One of the most frequent obstacles to the monitoring activity is constituted by technical and financial constraints of the public institutions [6, 7]. For this reason, it is crucial to identify a series of indicators which are not only able to adequately represent the monitored phenomenon with great communicative efficiency, but also easy to populate thanks to availability and updatability of data.

Indeed, according to the Organization for Economic Co-operation and Development [13, p.7], the ideal indicator should meet the following criteria:

- "provide a representative picture of environmental conditions, pressures on the environment or society's responses;
- be simple, easy to interpret and able to show trends over time;
- be responsive to changes in the environment and related human activities;
- provide a basis for international comparisons;
- be either national in scope or applicable to regional environmental issues of national significance;
- have a threshold or reference value against which to compare it so that users are able to assess
- the significance of the values associated with it.
- be theoretically well founded in technical and scientific terms;
- be based on international standards and international consensus about its validity;
- lend itself to being linked to economic models, forecasting and information systems".

In addition, data collected to inform the indicators should be [13, p.7]:

- "readily available or made available at a reasonable cost/benefit ratio;
- adequately documented and of known quality;
- updated at regular intervals in accordance with reliable procedures".

The indicators selected for the monitoring activity of Cagliari MMP are efficient tools to keep a check on the plan impacts in relation to the specific objectives (SpO) of the MMP. For each SpO a number of indicators of result are extracted from (i) the database of the Italian National Institute of Statistics (ISTAT) following the document in progress elaborated by Poliedra "Analisi del sistema degli Indicatori della Strategia Nazionale per lo Sviluppo Sostenibile e contributo a proposte di aggiornamento e revision" ["Analysis of the indicators of the NSSD and contribution for update and revision proposals"], (ii) the database of the Italian Institute for Environmental Protection and Research (ISPRA) on the basis of the XIV report on the urban environment and other publications concerning

environmental issues, (iii) the list of indicators identified by the four Italian regions of Marche, Umbria, Liguria e Piemonte during a project promoted by CreiamoPA or, whether not included in any of the sources, new indicators are specifically defined to represent the efficiency and efficacy of the MMP in achieving the SpO.

The selected indicators are able to verify if the achievement of the SpO through the MMP actions is coherent with the territorial and environmental system or, vice versa, if the plan implementation includes interventions that impede the fulfilment of the SO previously defined. In this way, it is possible to promptly identify negative impacts and take the appropriate corrective measures.

Table 4 shows the set of indicators selected in the Preliminary environmental report of the Preliminary MMP of Cagliari with reference to the plan action *A_01*. The six columns of the table report: the name of the indicator, the unit of measurement, the numerical value on the baseline year, the baseline year and indications for benchmark setting.

Table 4. Excerpt from the table of the monitoring indicators related to A_01.

Indicator	Unit of measurement	Value	Baseline year	Indications for benchmark setting
Redeveloped public and private areas	m^2	NA	-	Increase in the m^2 of redeveloped public and private areas
Soil consumption in urban areas	ha	2073	2020	Reduction in the ha of soil consumption in urban areas
Redeveloped volumetry	m^3	NA	-	Increase in the m^3 of redeveloped volumetry
People living in areas with high and very high risk of landslide	N of people	641	2018	Reduction in the number of People living in areas with high and very high risk of landslide

3 Discussion and Conclusion

The proposed paper explores and addresses the challenges in the implementation of the 2030 Agenda at the local scale. In particular, it analytically analyzes the dualism of the plan actions with regard to both the sustainability-oriented objectives and the environmental components and it reflects on the monitoring indicators as a tool to control significant impacts on the environment deriving from the realization of the plan activities and to ascertain whether the plan objectives are met.

Examples from the definition of the preliminary environmental report of the SEA of the Preliminary MMP of Cagliari are reported in order to better illustrate the developed methodology and the critical reasoning.

The developed methodological approach, described in Sect. 2, is based on the SEA process and adopts the LF to integrate the objectives and actions of the RSSD into the perspective plan. In particular, the RSSD is integrated in terms of sustainability-oriented objectives, specific objectives and actions of the perspective plan.

Subsection 2.1 shows that Cagliari MMP actions, although logically linked with the respective objectives, have unfavorable impacts on other objectives of the LF. The conducted analysis highlights that this dualism is detectable both in objectives related to different environmental components and in objectives related to the same environmental component. This means that the adoption of the LF itself is not guarantee of sustainability. On the contrary, once it is constructed, it is necessary to conduct a meticulous assessment of the plan actions with regard to every sustainability-oriented objective. When unfavorable impacts are detected, alternatives must be provided to overcome the conflicts.

Subsection 2.2 illustrates that environmental impacts determined by the plan actions need to be monitored through a set of adequate indicators, so that negative impacts are promptly identified and appropriate corrective measures are taken in time. It also demonstrates that monitoring indicators are not just the answer to the request of a European directive to keep a check on the plan impacts, but constitute a powerful tool to monitor the actual achievement of the plan specific objectives.

This study carries an important implication concerning the definition of new MMP. Indeed, traditional SEA used to take into account exclusively environmental issues, ensuring sustainable exploitation of natural resources and biodiversity protection and conservation. Differently, thanks to the above illustrated approach, the new model of SEA includes both social justice and economic progress in the process of definition of MMP. According to the proposed methodology, preservation of natural resources is flanked by prosperity and fulfillment of people lives, because human progress occurs in harmony with nature. In this way, this new generation of MMP allows for the building of equitable, inclusive and environmentally sustainable cities, as aimed by the 2030 Agenda and the related NSSD and RSSD.

Moreover, this study puts in evidence that current Sardinian regional guidelines for the SEA of MMP are out of date and need to be updated according to the new holistic approach suggested by the 2030 Agenda, which calls for the integration of the three pillars of sustainability. To this end, it is necessary to coordinate technical expertise and administrative capacity through effective and continuous cooperation among regional, provincial and local authorities.

The proposed methodology has been developed within the definition of the preliminary environmental report of the SEA of the Preliminary MMP of Cagliari, which localize the Sardinian RSSD, but it is easily exportable in other Italian regional contexts and constitutes a fundamental reference framework for the integration of the Regional Strategy for Sustainable Development into the Strategic Environmental Assessment processes of municipal plans. In addition, this approach can also be adopted for the definition

of territorial plans other than municipal plans. For example, it has already been applied for the definition of the plan of the Regional Park of Tepilora.

Further research might apply this methodology to the undertaking of SEA of different types of territorial plans such as local plans, metropolitan plans, regional plans, plans of regional and national parks, etc.

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