Spatial Planning in view of new challenges: Land take and some evidence from Greece

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Abstract: The growing interest in natural resources and ecosystem services has led to increasing attention to land as a natural resource. Land degradation has been included among the key environmental degradation problems all over the planet and land take is a key causal factor. Sustainable land management is required in order that land degradation be controlled. The role of spatial planning in sustainable land management has been accentuated, due to its close relationship with land use change and rapid urbanization. From the viewpoint of sustainable development, a turning point for land gaining significant importance on a global scale has been the Rio+20 Summit, 2012, in which the aim for a "land-degradation neutral world" was expressed, leading to efforts towards the minimization of land degradation. In the context of the EU environmental policy, land take and soil protection have been highlighted from the viewpoint of ecosystem services and the strategies for conservation of biodiversity. The case of Greece is interesting in this regard, since spatial planning is influenced by the EU context while at the same time patterns of territorial organization in the country are characterized by increasing land take. Based on the above, this paper examines the way land take becomes apparent as an environmental concern as well as a spatial planning task. It also focuses on the case of Greece and examines how spatial planning is capable of addressing relevant challenges and utilizing the EU policies' framework. It endeavours to highlight challenges emerging not only to addressing land-related issues but also to transforming the approach of spatial planning towards land resilience.

Keywords land degradation, land take, Greek spatial planning, ecosystem services

Introduction

Spatial planning is closely related to land management, since it is on a territorial basis that it endeavours to organize human activities, with land use plans being the most important planning instruments at the local level. Spatial planning addresses land-related issues in a normative way through land use regulation, or in a strategic way through the setting of policy objectives for territorial development. The relationship between spatial planning and the environment influences the content of spatial planning and, in particular, the way it addresses land-related issues. This relationship has led to increasing environmental concerns in the context of spatial planning including the recognition of land as a natural resource. Since the 1990s, the sustainable development agenda has posed significant challenges for spatial planning. Among these, land-related issues have a key role in promoting

environmental protection and socio-economic development. This is, for instance, the case with policy objectives set by the European Spatial Development Perspective document (EC, 1999) for the protection of environmentally sensitive areas as well as for soil protection. The sustainability agenda has highlighted various land-related challenges faced by spatial planning, as for example the problem of urban sprawl that led to the adoption of alternative policy options such as the compact city model as well as land recycling practices that seek to reduce land take. Recently, the importance of land in relation to spatial planning has been emphasized in the risk management framework, in particular in the context of climate-related risks, as for instance is the case with the risk of flooding that led to the adoption of measures aimed at reducing soil sealing such as green infrastructure.`

The growing interest in land as a natural resource in the context of the ecosystem services approach highlights the relationship between land and spatial planning and even more so the potentialities of spatial planning for tackling land degradation. The aim for a "land-degradation neutral world" was expressed in the UN Rio+20 Summit in 2012, involving two key policy directions: sustainable management of land in order that degradation be slowed down, and increasing the restoration rate of degraded land so that the two trends can converge for the minimization of land degradation (Barbut and Alexander, 2016). "Life on land" constitutes one out of 17 Sustainable Development Goals (SDGs) of the "Sustainable Development Agenda 2030" adopted by UN member states in 2015. This is the SDG 15 "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss" (UNDESA, 2019).

Awareness of land degradation is becoming evident at the European level, with land occupying a significant position in environmental issues addressed by the EU environmental policy. Since the mid-2000s, land and soil have been addressed not only by the EU statistical and monitoring systems but also by EU policy agendas, above all the sustainable development strategy, which provides useful tools for addressing land take. The EU has adopted the objective of promoting a "land degradation neutral world" in the context of sustainable development decided upon in the RIO+ Summit (Official Journal of the European Communities, 2013). The 7th Environment Action Programme places emphasis on natural capital and highlights the importance of land as a resource. It stresses that "the degradation, fragmentation and unsustainable use of land in the Union is jeopardising the provision of several key ecosystem services". Among others, it recommends that "Environmental considerations including water protection and biodiversity conservation should be integrated into planning decisions relating to land use, so that they are made more sustainable, with a view to making progress towards the objective of 'no net land take', by 2050" (Official Journal of the European Communities, 2013, p. 180). This is important especially for countries like Greece, in which land-related issues have started to be recognized.

In seeking to explore contemporary challenges spatial planning is faced with, this paper focuses on those which are land-related, and land take in particular. The second part following this introduction examines the issue of land take and briefly presents the relevant EU framework. In the third part, the paper refers to the case of Greece and seeks to identify options for addressing land take that derive from the EU policy context. Concluding remarks highlight the significance of land take as a parameter of land degradation as well as the relevant role of spatial planning.

Land degradation, land take and spatial planning

Land degradation has become one of the most worrying issues regarding the environment (Oliveira, Tobias and Hersperger, 2018). It is considered "one of the major forms of environmental degradation all over the world" having an adverse impact on ecosystems' capacities to provide goods and services (Smiraglia *et al.*, 2014). Land degradation has negative impacts on human and ecological systems (Stavi and Lal, 2014). Various causes such as climate variability, soil quality, and land management are involved in the complex process of land degradation (Smiraglia *et al.*, 2014). This process includes "soil degradation and the capacity of land areas to support water resources, biodiversity and primary productivity" (EUROSTAT, 2018). The fact that land is a finite resource (Sonderegger *et al*., 2017, p. 9) combined with the fact that fertile soils are not a renewable natural resource triggers this process. Land degradation, which usually appears in the form of land take, land fragmentation, and soil sealing, severely affects ecosystems and threatens ecosystem services (BIO by Deloitte, 2014). Land use and land cover changes are key drivers of land degradation. In this respect, the role of urbanization seems to be crucial, despite the fact that urban areas occupy a relatively low percentage of the earth's surface, as it "affects land change elsewhere through the transformation of urban-rural linkages" (Lambin *et al*., 2001, p. 265).

Land take describes both the process and the result of land use and land cover change, which is largely caused by the processes of urbanization. According to the European Environment Agency (EEA, 2019) land take "looks at the change in the amount of agricultural, forest and other semi-natural and natural land taken by urban and other artificial land development. It includes areas sealed by construction and urban infrastructure, as well as urban green areas, and sport and leisure facilities".

Following Boschetti (2016, pp. 51-55), land-related challenges faced by land management and spatial planning go beyond mere land management rules, regulations and techniques, and concern not only land take that is linked to the urbanization process but all land transformations, including also "undeveloped lands (agricultural, green, open lands)". For instance, as Rojo *et al*. (2014) note, despite the potentialities of peri-urban agrarian ecosystems in relation to ecosystem services, they have been rather neglected by spatial planning.

As regards the policies capable of addressing land degradation, it can be argued that the various sectoral policies that address land-related issues such as those for agriculture, forests, and transportation lack a holistic approach. Therefore, sustainable land management is needed so as to address land degradation in an integrated manner (Barbut and Alexander, 2016). Efforts to achieve land protection and restoration should focus on addressing land use and land cover change, which mainly concerns spatial planning (Oliveira, Tobias and Hersperger, 2018).

Despite the fact that such an approach has not been widely implemented or is yet at an initial stage, it is being promoted by various policy contexts. For EU member states in particular, several EU policy frameworks, strategic guidelines and statistical and monitoring systems promote actions and measures towards combating land degradation. Since 2006, the "Thematic Strategy for Soil Protection" (CEC, 2006) has stressed land-related issues and acknowledged the fact that "there is little public awareness of the importance of soil protection". In 2011, the "Roadmap to a Resource Efficient Europe" (EC, 2011) which is orientated towards a green economy in the context of the "Europe 2020" strategy, noted that "more than 1,000 km² are subject to 'land take' every year for housing, industry, roads or

recreational purposes. About half of this surface is actually 'sealed'." Land and soil constitute one out of seven issues addressed in the chapter "Natural Capital and Ecosystem Services" of this Roadmap and are included in the vision set for 2050 which among others provides that "All resources are sustainably managed, from raw materials to energy, water, air, land and soil." One out of the eighteen milestones adopted by this Roadmap refers to land and soil: "By 2020, EU policies take into account their direct and indirect impact on land use in the EU and globally, and the rate of land take is on track with an aim to achieve no net land take by 2050; soil erosion is reduced and the soil organic matter increased, with remedial work on contaminated sites well underway" (EC, 2011).

Table 1. Interlinks between sectors and resources (Land and Soil), and EU policy Initiatives

SECTOR / POLICY	LAND	SOILS
Energy	Reduce land take for biofuels	Prevent soil damage by SO_2 and NOx emissions
	Optimize energy infrastructure	Mitigate soil impacts of new infrastructure / Energy solutions
		Preserve peatlands
Food	Optimize land use to reconcile with other uses	Reverse soil loss
	Use taken fertile land for agriculture	Restore organic matter content in soils
	Reduce land take (e.g. via optimal animal protein intake)	Prevent soil damage by SO_2 and NOx emissions
		Avoid pollution from fertilizers and pesticides
Buildings	Avoid additional land take (e.g. for urban sprawl)	Avoid urban sprawl on fertile soil
	Remediate contaminated sites	Minimize soil sealing
Mobility	Minimize impacts of transport infrastructure on land fragmentation	Minimize impacts of transport infrastructure on land sealing
EU policy initiatives	Communication on land use (2014)	Guidelines on best practice to limit, mitigate or compensate soil sealing
	Communication on LULUCF in the EU climate change commitments (2011)[1]	

Direct relationship with spatial planning

Source: EC, 2011 (Annex: Resource efficiency – the interlinks between sectors and resources, and EU policy initiatives, p. 24) (own elaboration)

[1] An EU Regulation on the integration of land use, land use change and forestry (LULUCF) into the EU's 2030 climate and energy framework was adopted on May 2018. (See: Official Journal of the European Union, 2018).

Promoting strategic objectives and meeting commitments to land and soil protection is not always an easy task. Constraints derive from already established practices that implement EU policies, such as those for grey infrastructure. At the same time, synergies can be found between sectoral policies and land protection as seen in Table 1 above.

Several Community policies such as those on agriculture, regional development, transport and research address issues related to soil (CEC, 2006). In practice, soil protection is promoted by EU funding instruments such as those of cohesion policy. A case in point is the investment priority "Protecting and restoring biodiversity and soil and promoting ecosystem services, including through Natura 2000, and green infrastructure" which is promoted by the European Regional Development Fund within the thematic objective "(6) Preserving and protecting the environment and promoting resource efficiency" (EC, 2015).

Land as a natural resource is being addressed in the framework of the environmental policy of the EU. Despite the fact that a Europe-wide spatial planning policy does not exist, the EU framework significantly influences spatial planning of member states in terms of planning regulations and guidelines, which is above all the case with the 2001 Directive on Strategic Environmental Assessment (SEA). As Treville (2011, p. 6) argues, SEA "has the potential to be an effective tool for preserving land consumption". Moreover, land-related issues are addressed through the development of scientific tools and research including the monitoring, mapping and developing of statistics as well as through conceptual elaboration and empirical investigation (see, for example, EUROSTAT, 2018, JRC, 2015). This is the case with the indicators for monitoring the UN SDGs and, in particular, the SDG 15 "Life on land" that is based on three sub-themes: "ecosystem status", "land degradation", and "biodiversity". This is also the case regarding the CORINE Land Cover inventory for the monitoring of land cover all over Europe. Parallel frameworks such as the 2007 INSPIRE Directive on access and interoperability of spatial data, the 2007 Directive on the assessment and management of flood risks, and the 2011 Strategy for Biodiversity promote land-related issues. Thus, it can be assumed several tools for addressing land take can be utilized, as in the case of Greece that is presented below.

Land take and spatial planning in Greece

Land cover by artificial surfaces in Greece was 3.4% of total land surface in 2015 and 2.9% in 2009, which corresponds to an increase of 17.3% (4.4 and 4.1 for EU aggregate, respectively), while the capital region of Attiki shows the greater percentage of land cover by artificial surfaces (20.5 and 20.6 respectively for the same years) (Thoidou, 2017a, EUROSTAT, 2017). Among the various land cover categories, agricultural land has been mostly affected by land take in the period 2006-2012. The same is true for the EU28 average as well as for the average of the 39 countries for which the European Environment Agency provides land cover data (EEA39). However, the pattern of the relative contribution of land cover categories for uptake by urban and other artificial land development in Greece is quite different, as seen in Table 2 below.

As regards the contribution of the various types of human activities to the total annual land take in the country, the highest figure is for construction at 37.3% of the total, above the EU28 and the EEA39 averages. Land take by transport and infrastructures is also above the EU28 and the EEA39 averages, while land take by housing, services and recreation, as well as land take by industrial and commercial

sites are below the EU28 and the EEA39 averages. Land take by mines, quarries and dump sites is similar to the two averages, as seen in Table 3 below.

Table 2. Relative contribution of land-cover categories to uptake by urban and other artificial land development % (land take/year 2006 – 2012)

Land-cover category / Country	Arable Land & Permanent Crops	Pastures & Mixed agricultural areas	Forests and transitional woodland	Natural grassland, heathland, sclerophylous vegetation	Open space with little or no vegetation	Wetlands	Water bodies	Total land take
Greece	33.5	30.8	7.3	27.3	0.3	0.0	0.7	100.0
EU 28	51.9	25.9	14.4	6.0	0.3	0.6	0.9	100.0
EEA39	46.2	26.7	16.3	7.2	2.1	0.6	0.9	100.0

Source: EEA 2017b (own elaboration)

Table 3. Annual land take by several types of human activity % (land take/year 2006-2012)

Types of human activity / Country	Land uptake by housing, services and recreation	Land uptake by industrial and commercial sites	Land uptake by transport and infrastructures	Land uptake by mines, quarries and dump sites	Land uptake by construction	Total
Greece	11.6	17.9	11.2	21.9	37.3	100.0
EU28	32.5	19.1	6.8	24.0	17.6	100.0
EEA39	18.7	22.1	6.4	21.0	31.9	100.0

Source EEA 2017a (own elaboration)

It seems that land take in Greece is caused by various activities that fall within the competence of different policies. It is essential to mention that soil is protected under environmental law as well as in the context of various sectoral policies albeit not without difficulties (Charalabidou, 2017). In their report on the best practices for limiting soil sealing or mitigating its effects, Prokop *et al*. (2011) noticed that detailed information about measures aiming to reduce land take and soil sealing was not available for Greece.

As already stressed, the role of spatial planning is crucial for addressing both, the causes and impacts of land take. Widespread unauthorized land development has led to the urbanization of large areas without prior planning as well as to the continuous expansion of out-of-plan areas dealt with by ad hoc legislation (EC, 2000, pp. 21-22, Thoidou, 2017a).

On a strategic level, in 2017 the Greek Government endorsed eight national priorities to promote the incorporation of the 2030 Agenda and into the national framework. As referred to in the "Voluntary National Review on the Implementation of the 2030 Agenda for Sustainable Development" (General Secretariat of the Government, 2014), the main national priority linked to the so-called environmental SDGs (11 "Sustainable cities and communities" and 15 "Life on land") is "the protection and sustainable management of natural capital as a base for social prosperity and transition to a low-carbon economy." In relation to SDG 11, and more particularly in the context of the provision made for "Inclusive, safe, resilient and sustainable cities", urbanization is considered a driving force for land use change. In the same context, the following sustainability challenges are stressed: "the extension of urban activities beyond designated urban zones, the building and housing construction in certain cases without prior adequate planning and building permits especially in coastal areas as well as the need to increase communal and green spaces in city centres." Among the priorities and measures selected, the following can be mentioned with regard to spatial planning: the already established "spatial planning framework system [..] setting the strategic guidelines for compact cities", the combat of "unauthorized construction and uncontrolled urban sprawl", and the "completion of the National Cadastre to cover the whole land territory of the country by 2020" (General Secretariat of the Government, 2014, pp. 62-63).

Quite recently, concerns regarding land-related issues have been expressed by the strategic plans at the metropolitan level. Worth noting is the emphasis placed by the new Strategic Spatial Plan for the metropolitan area of Athens–Attiki on the conservation of biodiversity, the protection of fertile agricultural land, combating urban sprawl and promoting the compact city model (Greek Government Gazette, 2014a). The contribution of this strategic plan is crucial not only for setting the overall context at the metropolitan level, but also for enforcing the implementation of new directions and measures by means of the detailed land use plans, which is not always easy to achieve through specialized instruments.

The European framework has seriously influenced the content and rationale of spatial planning in Greece, above all through the principles of sustainable development, which have been incorporated into the legislation and rhetoric of urban and regional planning. Moreover, the EU cohesion policy mainstreams environmental objectives into projects and programmes financed by Structural Funds (see among others Thoidou, 2017b). The implementation of the INSPIRE Directive has supported the prominence given to land-related concerns.

As Ludlow *et al.* (2013) note for the case of Greece, spatial data and methods have been taken into account by spatial plans in recent years while the utilization of digital platforms such as the one for electronic urban planning is expected to support the planning process. They argue that, despite the pressures to prioritize economic criteria due to the economic crisis, the pursuit of sustainable development remained important for spatial planning in Greece. The new "Special Inspectorate for Building and Energy" is considered a good practice since among others "it uses satellite photos of different periods to identify urban sprawl and land take, and penalizes illegal acts." Soil quality and appropriateness of ground conditions are examined by the geological studies carried out in the context of land use plans (Ludlow *et al*., 2013).

Evidence regarding the role of spatial planning in various environmental issues can be drawn from specific frameworks such as the National Strategy for Biodiversity (Greek Government Gazette, 2014b), as well as the report on the State of the Environment (EC, 2017).

In the document on the National Strategy for biodiversity, the growing urbanization and housing development, the development of industrial and tourist uses as well as land use change that affects natural systems, are all evaluated against the pressures placed on the species of flora and fauna of Greece. In this context it is concluded that urban sprawl and housing development together with uncontrolled urbanization which is triggered by the still allowed out-of-plan building and the accompanying infrastructural projects cause intense artificialization of land. Among others, from the viewpoint of spatial planning, delays and shortcomings in the revision of the spatial planning legislative context are considered to be among the key drivers of the loss of biodiversity, not to mention the non-application of existing legislative rules. This is, for instance, the case of the above-mentioned widespread unplanned land development. Consequently, several of the general targets set by the National Strategy for Biodiversity in Greece identify among others specific targets, which are directly related to spatial planning, as seen in Table 4 below.

Table 4. National Biodiversity Strategy in Greece: General and specific targets related to spatial planning

General Targets (selection)	Specific Targets (selection)
2. Conservation of national natural capital and ecosystem restoration	2.2 Restoration of important species and habitat types
3. Organization and operation of a National System of Protected Areas Protected Areas and enhancement of benefits from their management	3.3 Design, and possible integration, of ecological corridors of special designation status and their effective management
5. Enhancing the synergies among the main sectoral policies for the conservation of biodiversity	5.1 Effective integration of biodiversity conservation at all levels of spatial planning
6. Conservation of landscape diversity	6.1 Completion of integration of conservation landscape diversity policy into all sectoral policies. 6.2 Maintaining landscape diversity both inside and outside of protected areas. 6.3 Conservation of unique landscapes.
13. Appreciation of ecosystem services and the promotion of the value of Greek biodiversity	13.3 Promotion, establishment and maintenance of natural green infrastructure

Source: Ministry of Environment, Energy & Climate Change, 2014 (Table D1: Summary table of the general and specific targets of the National Biodiversity Strategy, pp. 92-97) (own elaboration)

Worth noting is that this strategy recommends the update and implementation of the National Action Plan against Desertification which was drafted in 2001 in the context of the relevant UN Convention.In the same direction, the report on the State of the Environment in Greece refers to shortcomings in sustainable land management as well as its coordination with sectoral policies. The

causes for biodiversity loss, it is noted, can be found in the way various policies such as those for agriculture, fisheries, forests, and tourism are applied, as well as in the prevailing consumption patterns (EC, 2017). In terms of funding, the above-mentioned investment priority on protecting and restoring biodiversity and soil is promoted by the Operational Programme on the Environment in the context of the EU cohesion policy 2014-2020 for Greece. However, it mostly addresses issues that concern protected areas, without making reference to spatial planning.

Concluding remarks

The increasing interest in land as a natural resource has accentuated the importance of land take as a process that causes land degradation and as a policy target that seeks to control this problem. This interest has also accentuated the role of spatial planning and has raised new challenges which highlight not only the need for detailed planning tools in the context of regulatory land use planning, but also for a renewed way of thinking in spatial planning that is a matter of both regulatory and strategic spatial planning.

It seems that the role of spatial planning in the conservation of biodiversity and more particularly in land and soil protection has started to be recognized in Greece, especially within the context of the implementation of EU policies. Even though the various strategies and reports do not proceed with detailed recommendations about new planning objectives, methods and practices, concerns for land degradation have started to appear in relevant rhetoric and practice. This might be a challenge and a driver for transformation of the rational of spatial planning itself towards a land-resilient approach

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