

Strategic land-use planning instruments in tropical regions: state of the art and future research

Eduardo Oliveira (1, 2)

(1) ERC MIDLAND Project, Earth and Life Institute, University of Louvain, Louvain-la-Neuve, Belgium

(2) Economic Geography Working Group, University of Kiel, Kiel, Germany

Patrick Meyfroidt (1, 3)

(1) ERC MIDLAND Project, Earth and Life Institute, University of Louvain, Louvain-la-Neuve, Belgium

(3) F.R.S.-FNRS, 1000 Brussels, Belgium

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Abstract

Human-induced activities are threatening the socio-economic and ecological sustainability of land systems globally, including in tropical regions. Authorities in these regions prepare and implement land-use plans to select and organize land uses in a way that will meet the needs of local communities while safeguarding ecosystems services. To this end, land-use planning is used to assess, manage and monitor the physical, social and economic conditions of territories and thus assist agribusiness, smallholder farmers and other land users in their land-based activities. There is, however, a lack of systematic studies identifying strategic oriented land-use planning instruments and further detailing the extent of their effectiveness in supporting land governance. Here, we contribute to address this gap by reviewing academic and grey literature with a geographic scope on tropical regions. We conclude by sketching future research domains intended to expand the role of strategic planning approaches in land governance in the tropics.

Keywords: Communities, ecosystems, frontiers, governance, sustainability, Tropics

Introduction

Pressure on land and other natural resources due to human-induced activities and climate change is dramatically increasing in many tropical regions, raising serious concerns about social, economic and ecological sustainability (Meyfroidt et al., 2013; Lambin & Meyfroidt, 2011). The pace changes to the biosphere, including due to land-use changes such as agricultural expansion and urbanization, are overwhelming (Masterson et al., 2019). Land-use planning, in this context, emerges as a technical-political instrument representing the future uses of land. Its objectives are, among others, to organize a territory by arranging the representation of existing land cover and uses through diagrams, maps and written documents (FAO, 1999). Land-use planning has been used to assess the physical, socio-economic,

institutional and legal potentials and constraints with respect to a socially-defined sustainable use of land resources (Ramakrishna, 2003). Here, we specifically focus on agricultural activities and land-use planning in rural areas of the tropics. Other land uses as urbanization or infrastructure projects will be considered elsewhere. Land-use planning in rural areas is thought to support decision-makers and land users in selecting and putting into practice those land uses that will best meet the needs of rural populations (or local communities) while safeguarding natural resources and ecosystem services (FAO, 1993). A number of studies concur in considering land-use planning as important for the governance of tropical landscapes. Gasparri et al., (2015) highlight that absent or ineffective land-use planning often results in loss of land for food provision or livelihoods of smallholder farmers. In Northern Ghana, land-use planning is seen as a tool to address climate change risks (Asare-Kyei et al., 2015). The effectiveness of land-use planning in rural areas is measured by its contribution to meeting the needs of local communities whilst supporting ecological sustainability of natural resources (Kleemann et al., 2017). It is also with aims of supporting the sustainability of territories that the strategic approach to spatial planning emerged, primarily in the developed world, mainly in Western Europe and North America, particularly at the urban-regional level (Albrechts, 2017). Strategic spatial planning (SSP) was then conceived as a means of envisioning shared, realistic and desirable better futures for communities and their citizens (Hersperger et al., 2019). Strategic spatial plans objectives relate to shaping the minds of interest groups who have a stake in spatial development or land uses (Cremer-Schulte, 2014). This goes beyond land-use plans effort which focus on improving or optimizing the productivity of the land for the improvement of economic and social conditions (improving local-based livelihoods), and protect the environment and biodiversity (IFAD, 2014). Planning theory often considers strategic spatial plans and land-use plans as the outcomes of separated planning processes (Albrechts, 2017). To date only few studies have explored the relationship between SSP and land-use planning. Some of these studies highlight the differences between them, primary between their statutory meaning i.e. land-use plans are often legally binding while strategic spatial plans assume a more guidance role for spatial development and governance (Searle, 2017) or their complementarity (Mäntysalo et al., 2015). Yet while both SSP and land-use planning are familiar concepts, their combination as strategic land-use planning (SLUP) is recent (Henríquez-Dole et al., 2018).

This paper is a contribution to the broader effort of understanding SLUP as land governance instrument in tropical and subtropical regions, from humid forest to sub-humid (or savannah) and semi-arid landscapes (Pena-Claros et al., 2009; Young, 1989). Theoretically, we build on the literature referring to the relationship between SSP and land-use planning as ‘dualistic’ i.e. strategic and land-use planning are not mutually exclusive but potentially reinforcing each other (Mäntysalo et al. 2015; Mazza, 2010). Therefore, this review contributes to address the following research question: *can a strategic approach to land-use planning or SLUP contribute to improve land governance in tropical regions?* Three interlinked operational objectives structure the paper: (i) to identify the instruments used within strategic approaches to land-use planning in tropical regions; (ii) to critically assess how these instruments have been used in the tropics, and (iii) to understand better how they can contribute to improve land governance. Land governance, as defined in this study, involves

planning, policies, processes and institutions by which land, property and other natural resources are managed and the way that conflicting interests in land are settled (Osabuohien, 2015). Findings of this review should inform further discussions on the broader role of spatial planning, both strategic and land-use planning, in frontier situations, also land-use change hotspots where land and natural resources are abundant but labour and capital are scarce (Meyfroidt et al., 2014).

The next section details the methodology, followed by a section analysis the results of the systematic literature review through a content analysis of the selected sample of published records. The subsequent section critically discusses the instruments identified. The last section concludes with prospects for expanding research with respect to the overall roles of SLUP in supporting land governance in tropical regions.

Methodology

We searched for literature published between 1950 and 2019 in both academic and grey literature, in the English language. We followed the ‘Guidelines and Standards for Evidence Synthesis in Environmental Management’ (CEE, 2018). We conducted this review in six steps between January and April 2020.

First step—formulating the research question and objectives: We formulated the research question as follows: *can a strategic approach to land-use planning or SLUP contribute to improve land governance in tropical regions?* Three research objectives were framed: (i) identifying the instruments used within strategic approaches to land-use planning in tropical regions; (ii) assessing critically how these instruments have been used in the tropics, and (iii) reflecting on how the instruments can contribute to improve land governance.

Second step—elaborating the search protocol: We delineated the scoping supporting the literature search including the spatial planning dimension, the geographical scope and the land qualifiers (Table 1). We elaborated and run in the search databases of Google Scholar, ScienceDirect, and Scopus various search query strings until we found reasonable results and a final query (Appendix). We also run the final search string in the online citation databases Web of Science; however, the large number of publications retrieved precluded the practical utilization of this database (~117,000).

Table 1. Literature search-terms scoping

Spatial planning dimension	Geographical scope	Land qualifier
Land-use planning	Tropical landscape	Land deal
Strategic spatial planning		Land governance
Strategic land-use planning	Tropical region	Land grabbing
		Land registration
		Land rights
		Land systems
		Land tenure
		Land zoning

Final search query string: (“land-use planning” OR “strategic spatial planning” OR “strategic land-use planning”) AND (“tropical landscape” OR “tropical region”) AND (“land deal” OR “land governance” OR “land grabbing” OR “land registration” OR “land rights” OR “land system” OR “land tenure” OR “land zoning”).

Source: Authors’ own elaboration.

Third step—searching for literature: We conducted a systematic search for literature using a repeatable search strategy tailored to the research question and objectives. A published record was included in the results if it matched the following criteria: (i) the record dealt with strategic and land-use planning conceptually or empirically; (ii) it was published in an English-language peer-reviewed academic journal, as a conference proceeding, as a working paper, or as an academic book or book chapter in an edited volume. After running this search string and deleting duplicate records, we obtained 622 results. We were able to download 100% of the retrieved results as PDF files. The majority of the retrieved publications were published in or after the year 2000 (93%), but mostly in 2018 (124 publications) and 2017 (77 publications). Of the 622 retrieved publications, 34% were conceptual; 61% were empirical, containing at least one case study within tropical regions, and 5% were reports.

Fourth step—Critical appraisal and abstract screening: We screened the abstract (or introduction if abstract was not available) of the preliminary sample of 622 publications to assess their meaningfulness regarding the research question, thereby excluding 34 records without a clear focus on land-use planning or SSP in dominantly rural tropical landscapes, or that only marginally referred to the geographical scope and land qualifiers.

Fifth and Sixth steps—Full article screening, content analysis and reporting: The final sample of 588 records was assessed for quality, which required a thorough reading of the full text. We then carried out a content analysis of this final sample before reporting the findings.

Results

In this section, we discuss the findings retrieved from the literature. Although we analysed the entire final sample of published records (588), for readability reasons and because of the length limitations of this paper, we do not refer to every record in the results section. We first report on a broader conceptual background intended to set the stage for an analysis of the instruments used within SLUP and succinctly describe their objectives (Table 2). We then critically assess how these instruments have been used in tropical regions and debate how a SLUP approach supports land governance.

Land-use planning, strategic spatial planning and land-use dynamics in tropical regions

Land-use planning aims to empower public and private actors to make strategic decisions about how to allocate land resources (Gerber et al., 2017). Land-use planning is also expected to contribute to resolve, mitigate, avoid or forestall land use conflicts (Boix & Zinck, 2008). Land-use planning processes can also contemplate environmental concerns (e.g. zoning protected areas; agro-ecological zoning i.e. land areas defined based on combinations of soil, land form and climatic characteristics, FAO, 1996). It can also take into account how

different land uses are connected. For example, in many European countries, land-use planning solidifies the extent of forest-designated lands, whether public or private, so that urban growth or agricultural expansion could only have a limited impact on forested landscapes (Mather, 2007). Other countries have developed a variety of land-use planning instruments for cropland protection; this include defining priority areas for agricultural activities or establish national targets to limit land-take (Oliveira et al., 2019). In tropical regions, land-use planning instruments for agriculture are fundamental for supporting local livelihoods (FAO, 2017; Lambin et al., 2013). However, in particular since the food and energy crisis of 2007–2008, large tracts of agricultural land in the tropics have been acquired by companies from developed countries seeking to ensure their food supplies or invest idle capital (Ingalls et al., 2018). Consequently, extensive agricultural investments have been threatening rural populations and smallholder farmers who are still the majority of farmers globally. For example, Samberg et al. (2016) estimated the contributions of smallholders in an analysis of 41 crops and 83 countries in smallholder dominant regions (Latin America, sub-Saharan Africa, and South and East Asia) that represent 35% of global cropland. Ricciardi et al. (2018) found that farms < 2 hectare produce 28–31% of total crop production and 30–34% of the food supply on 24% of gross agricultural land when using their measured farm size dataset. Ricciardi's et al. (2018) findings are in line with Samberg et al. (2016) and Herrero's global estimates (Herrero et al., 2017). Altogether, these perils have led to substantial changes in land-use dynamics, including the design of planning instruments and land policies combined with stock markets enabling agricultural companies' access to investment capital; national land policies facilitating extractive and forestry industry acquisition of land and subsurface rights (Rudel & Meyfroidt, 2014). These new influences of private actors and forms of market-based governance reinforce, in theory, the role of land-use planning in promoting social, economic and ecologically sustainable land uses (Meyfroidt et al., 2013). However, a key question remains as to whether land-use planning remains relevant in today's global agri-food system and the extent it can assume a strategic role in land governance in tropical regions marked by acute land-use changes.

In theory, the participatory character of land-use plans, and the general aims of contributing to collective wellbeing and protection of socio-ecological systems for current and future generations, should ensure that land-use planning can support sustainably- and strategically oriented land-use governance in tropical regions and beyond (Oliveira & Hersperger 2018). Integrating all these aspects in land-use planning, therefore, requires a 'spatial' dimension that asserts a strategic, outward looking and integrating perspectives on future land uses and envision possible socio-economic development trajectories (Lloyd & Peel, 2005). These definitions, thus, highlight the conceptual and practical cross-fertilization of land-use planning and strategic spatial planning (SSP) (Mäntysalo et al., 2015). From the 1960s onwards, SSP started to put more emphasis on issues related to urban development projects along with environmental concerns, and agricultural land uses. However, a focus on urban areas and soil sealing due to urbanization predominates in the literature (cf. Tobias et al., 2018 for a state of the art on soil sealing and unsealing; Healey et al. 1999 for a comparative evolution of SSP practices at the urban-regional level).

SSP requires ‘imaginative actors’ to help forge new forms of collective action tailored to local realities (Newman, 2008). Although strategic spatial plans are increasingly formulated throughout the world, the main legally binding planning instruments for land governance are statutory local-level land-use plans (Gerber et al., 2017). The boundaries between strategic and land-use plans are, in practice, not as fixed as theoretical conceptualizations postulate (Searle, 2017). Both strategic plans and land-use plans support decision-making concerning spatial development influencing one another (Faludi, 2000). A strategic approach to land-use planning involves, in this conceptual lens, a spatial exercise as well as a social process of defining a vision for the future and strategies to reach that vision that include the interests of local communities and those of private actors and land developers (Albrechts, 2017). Douma and colleagues argue also that strategic approaches to land-use planning facilitate a higher control over misuse of natural resources (Douma et al., 1989). It also allows and further eases better coordination of the various land-use activities by governmental organizations (Henríquez-Dole et al., 2018).

Instruments used within strategic approaches to land-use planning

Table 2 provides a summary of the instruments identified in the literature. We have clustered the instruments as: (1) Supporting decision- and plan-making processes, which correspond to 26% of the retrieved publications; (2) Regulatory land-use zoning, corresponding to 27% of the retrieved publications; (3) Supporting community and/or stakeholder participation, 31% of the retrieved publications, and (4) Consolidating and improving the land-use planning process, corresponding to 16% of the retrieved publications.

Table 2. SLUP instruments retrieved from the literature search

(1) Supporting decision- and plan-making processes (in 26% of the publications)

The objective of this set of instruments is supporting various land users’ decision-making, but mainly farmers, on, for example, crop suitability or identifying agronomic conditions. Supporting the design of soil conservation policies aimed at improving agricultural productivity and overall economic efficiency of agricultural activities, are also objectives (Piquer-Rodríguez et al., 2018b).

- Land capability surveys (Hyman, 1984).
- Soil potential surveys (Laban, 1981).
- Land suitability evaluations (Gwaleba & Masum, 2018; Young, 1989).
- Mapping processes, including of agricultural potential (Chigbu et al., 2016), natural resources (Hoanh et al., 2018), land-use potential (Flego & Roić (2018) and location of infrastructures (Piquer-Rodríguez et al., 2018a)

(2) Regulatory land-use zoning (in 27% of the publications)

Land-use zoning processes divide a territory into zones with different rules and regulations for land use, management practices, and land cover change. The objective of zoning is encouraging the use of land within sustainability principles by rationalizing land uses and limiting environmental degradation and further supporting local communities to use and benefit from land and other natural resources (Nolte et al., 2017).

- Agro-ecological zoning (FAO, 1996).
- Buffer zoning i.e. zoning instruments that creates buffer zone around valuable areas e.g. for conservation, with restricted use (but not absent) (Lestrelin et al., 2012; Ebrecht & De Greve, 2000).

(3) Supporting community and/or stakeholder participation (in 31% of the publications)

Supporting land-use conflict resolution and better management of land-based resources through mobilizing the capabilities of stakeholders, institutions, and their networks for decision-making, are objectives of this set of instruments (Ezeaku & Davidson, 2008). Aligning local issues with future development aspirations as well as value indigenous and ancestral knowledge for designing long-term development trajectories (Hohl & Tisdell, 1994).

- Knowledge exchange (Gwaleba & Masum, 2018) within community consultation (O'Sullivan & Norfolk, 2017)
- Joint meetings between stakeholders and local community (Seghezzo et al., 2017).

(4) Consolidating and improving the land-use planning process (in 16% of the publications)

This set of instruments is aimed at supporting strategic allocation of resources and the provision of public services during the plan-implementation phase (Piquer-Rodríguez et al., 2015). They also have a resilience function intended to prepare territories to different scenarios, for example, including resettlement after natural disasters or armed conflicts. Scenario building and analysis include modelling of both long-term (strategic oriented) and short-term (week-by-week) decision-making (Sawathvong, 2004).

- Spatial analysis of farming systems (FAO, 1993) or farming regimes (Young, 1989).
- Area Production Model (Sandewall et al., 2001) i.e. intended to guide planning processes by simulating possible future developments of land use, mainly by defining productive land for agricultural activities or forestry (Sandewall & Nilsson, 2001).
- Scenario analysis (Yu et al., 2018).

Source: Authors' own elaboration based on the results of the literature review.

How these instruments have been used in tropical regions

Instruments supporting decision- and plan-making processes

Land capability surveys classify land, for example, according to the depending on rainfall and soil types (Hyman, 1984). Based on these surveys land is classified as suitable for agriculture, grazing, forestry, recreation, conservation or other uses (Young, 1989). Land capability surveys are described as instruments to develop context-specific land governance. Land capability was adapted for many tropical regions such as Zimbabwe (Conex, 1960), Malawi (Shaxson et al., 1977) and Zambia (ZDA, 1977). This type of surveys has been used in tropical landscapes to determine areas of prime inherent quality, which were always to be reserved to grow annual arable cash crops. *Soil potential surveys* have been used in tropical regions to evaluate, summarize and map discrete landscape segment from the best suited to the least suited based on the interacting complexes of climate, vegetation, landform, geology and soil (Laban, 1981). Hyman (1984) underlined that back in the 80s, Malaysia had one of the most effective land capability surveys supported through geological surveys and regional soil surveys. Laban (1981) underlines that Southeast Asian countries differ vastly regarding land use problems, which demands specifically adapted approaches for forestry, agricultural development and land-use planning. Regarding the implementation of strategies intended to support the rural economy in Zimbabwe and South Africa in early 1990s, Christiansen (1993) underlined that problems of productivity, agricultural growth, and sustainability of resource management, while they are challenges to land reform, can be alleviated through careful land-use planning. *Land suitability evaluations*, broadly defined, is a process of identifying the

spatial appropriateness for possible land uses according to geo-environmental conditions (Hopkins, 1977), were used for land-use planning scenarios through community participation (Gwaleba & Masum, 2018). This is in line with Laban (1981), who argued that if land as a resource is to respond to the needs of society, then land evaluation procedures could be integrated with land-use planning processes. Land suitability, with its emphasis on specifying land-utilization types, introduces a long-term dimension to land-use planning (Young, 1989) since it takes into account various limiting factors in the long-term that are essential for specific land uses (Yu et al., 2018). Land suitability for a specified use is assessed by comparing the requirements of the use land qualities; examples are moisture availability, nutrient availability, and potential for mechanization (Laban 1981). *Mapping processes* have been extensively used across the tropics to transfer data from these surveys to geographical outputs (Chigbu et al., 2016), which will help to reveal land potentials of a territory.

Regulatory land-use zoning

Land-use planning embeds formal procedures and regulations that govern the use of land (Gwaleba & Chigbu, 2020). These are composed of a number of regulatory and non-binding instruments, which aims to increase the efficacy and efficiency of the use of land and to ensure greater equity in that use (Hall et al., 1973). Regulatory land-use zoning administer particular areas are to be designated for agriculture (i.e. *agro-ecological zoning*), residential areas, or forestry (Piquer-Rodríguez et al., 2018b; Nolte et al., 2017). In tropical regions, regulatory land-use zoning co-exists and sometimes conflicts with informal, customary land tenure regimes (Lestrelin et al., 2012). Regulatory land-use zoning instruments are employed in tropical regions to designate forestry areas or other types of forest conservation or protected areas (Bruggeman et al., 2018). For example, Bruggeman and colleagues (2018) assessed the effectiveness of land-use zoning units to protect forest cover in Bhutan. Nolte et al., (2017) find evidence that provincial-level land-use zoning reduced deforestation in the Argentinian provinces of Salta, Santiago del Estero, and Chaco. Ebregt and De Greve (2000) discuss the concept of buffer zones. *Buffer zoning* is often applied to simultaneously minimise human impact on conservation areas and address the socio-economic needs and wants of the affected local communities (cf. Sayer, 1991). Buffer zones are seen as an important instrument in conserving areas of ecological importance, while at the same time addressing spatial development issues of the people in the areas surrounding it. Despite its perceived potential, the concept has so far hardly been made explicit within tropical regions nature conservation efforts and territorial development policies. For example, Bourgoin et al. (2012) provides an interesting account on the linkage between land use scenarios and land-use plan making processes in Laos. Bourgoin and colleagues refer that scenario-making exercises helped local communities to explore various options for future spatial developments. These communities could negotiate land uses and adjust and/or readapt the plans until consensus was reached among different stakeholder (i.e., villagers, district authorities, conservationists). This land use scenarios with realistic simulations resembled a rehearsal for the actual land zoning negotiations that contributed to the land-use plan. This involvement turned out to empower local participants, who could employ the lessons learned during the simulation and demonstrate local appropriation and adoption of the process to engage more actively in the planning process for their real village.

Instruments supporting community and/or stakeholder participation

Participatory instruments help to shape and frame land-use plans and play an important role in land zoning (Suhardiman et al., 2019). Overall, instruments supporting community and/or stakeholder participation have been extensively debated in the retrieved literature (e.g. Henríquez-Dole et al., 2018, FAO, 1993). Participation in land-use planning processes lead to more legitimate and fair decisions by offering a chance for those who are likely to be impacted by the decision to expose their concerns, preferences and future visions for the use of land. *Knowledge exchange within community consultation*, for instance, is primarily used to value indigenous and ancestral knowledge in long-term land-use planning (e.g. Boutthavong et al. 2017; O’Sullivan & Norfolk, 2017). Participatory instruments have also been used to identify classes of farming system (Wood, 1995). For example, the report on the technical validation and policy dialogue for the land governance assessment framework in Malawi recommended local authorities to include instruments to assure civic participation in process of land-use planning (Jere, 2012). Other studies have showed benefits of *joint meetings between stakeholders and communities* (Seghezzo et al., 2017) in land policy and planning. This participation can accrue to all the parties involved, including public or private stakeholder as well as smallholder farmers (Ezeaku & Davidson, 2008). In Burkina Faso, community participation in land-use planning was presented as a mechanisms supporting community-land demarcation (Steppler & Nair, 1987). In Ethiopia, the federal constitution stimulates active community participation in the development of land use policies that affect their livelihood. However, Suhardiman et al., (2019) contend that direct participation of local communities in land-use planning processes does not in itself guarantee the plan’s actual efficiency, because it is challenging to fulfil the rationales behind the plan through its implementation if powerful groups within the local communities lack any incentive to do so in the first place. A case study involving conflicts between various ethnic groups in Thailand, which were integrating crops into different levels in forestland, highlighted the need for intra-community negotiations in land-use planning processes (Steppler & Nair, 1987).

Instruments for consolidating and improving the land-use planning process

These set of instruments complement the above clusters and boost strategic approaches to land-use planning (Henríquez-Dole et al., 2018; Hoanh et al., 2018). For example, Henríquez-Dole et al. (2018) argues that SLUP attempts to integrate and further balance social and ecological systems to achieve sustainable spatial development by incorporating future *scenario analysis* in plan-making, *spatial analysis of farming systems* complemented with land-use potential maps. Scenario analysis is a powerful tool to explore how future changes in agricultural land use may affect the environment, and how policies may influence land-use patterns (Rockström et al., 2017). Mascia et al. (2014) argue that if *spatial analysis*, articulated with regulatory land-use zoning, are not part of a long-term land-use planning process both protected areas and concessions may be re-zoned (often in an illegal manner) to develop land units for more profitable land uses, such as mining, forestry or agribusiness (cf. Lambin et al., 2014). Complex issues involving meteorology, topography, and landform need to be taken into account when making land-use decisions for land-based policy and planning (Yu et al., 2018). In this context, scenario analysis, i.e. exploring future land-use perspectives,

which include extreme land-use patterns, historical land-use information and trend extrapolation of land uses have also been employed as instruments in long-term, strategic oriented land-use planning in the tropics (e.g. Chigbu et al., 2016).

How these instruments can contribute to improve land governance in tropical regions

Understanding how land and land-use changes are governed is essential to address global sustainability challenges (Tellman et al., 2020). However, the extent to which SLUP instruments could be effective in supporting land governance in tropical regions remains understudied. This is particularly challenging because the latest trends in land-use planning across the developing world indicate a dynamic of strengthening local and global forces (Rudel & Meyfroidt, 2014). In addition, Sachs et al., (2019), call for strategic land-use, ocean-use and water-based planning approaches to help manage competing claims on land and water for food production, sustainable spatial development, industry and mining, ecosystem management, carbon sequestration and biodiversity conservation (cf. Schmidt-Traub et al., 2019).

Based on the previous sections assessing the instruments that are considered as part of strategic approaches to planning, here, we will discuss how, in principle, SLUP could support land use governance in tropical regions. We could hypothesize that SLUP would be expected to counteract, for instance, the recent land acquisitions actions of speculators and sovereign funds from food insecure nations that have disrupted the strategic action field that has emerged around land-use planning in rural tropical landscapes. Drawing from SSP literature, SLUP would involve relevant place actors and the specific activities of citizens, politicians and spatial planners (Albrechts, 2001). Proactive community participation in a collective strategy and vision for a territory that may generate trust and legitimize spatial interventions (e.g. land-based investments; resettlement of rural populations and interlinked processes of polycentric spatial development). Those involved in these efforts to strategically plan land and its potential uses, are likely to find that some visions present a future that certain individuals, including rural populations, would feel accomplished while other possible futures are considered highly undesirable (Kalliomäki, 2015). The features of SSP identified by, among others, Hersperger et al. (2019) and Albrechts (2001) evidence the need to develop more strategic oriented planning instruments that would support land use governance. These would involve a spatial exercise as well as a social process of defining a vision (or development-pattern scenarios) for the future and strategies to reach that vision that include both local and distal actors and their often profit-oriented interests (cf. Rudel & Meyfroidt, 2014). The results of these spatial exercises would allow the integration of the efforts with the broader field of other land policies, conservation strategies, forest law, economic policies and management of land-based resources such as agricultural policies or soil management as well as with private based forms of planning and governance (Piquer-Rodríguez et al., 2018a; Sawathvong, 2004). Thus, ideally, SLUP would be visionary, integrate different instruments and be the result of trans-disciplinary, trans-policy and trans-scalar governance efforts.

We concur with Piquer-Rodríguez et al. (2018a) and with Rudel and Meyfroidt (2014) on their call for integrative, strategic oriented and trans-scalar approaches to land-use planning

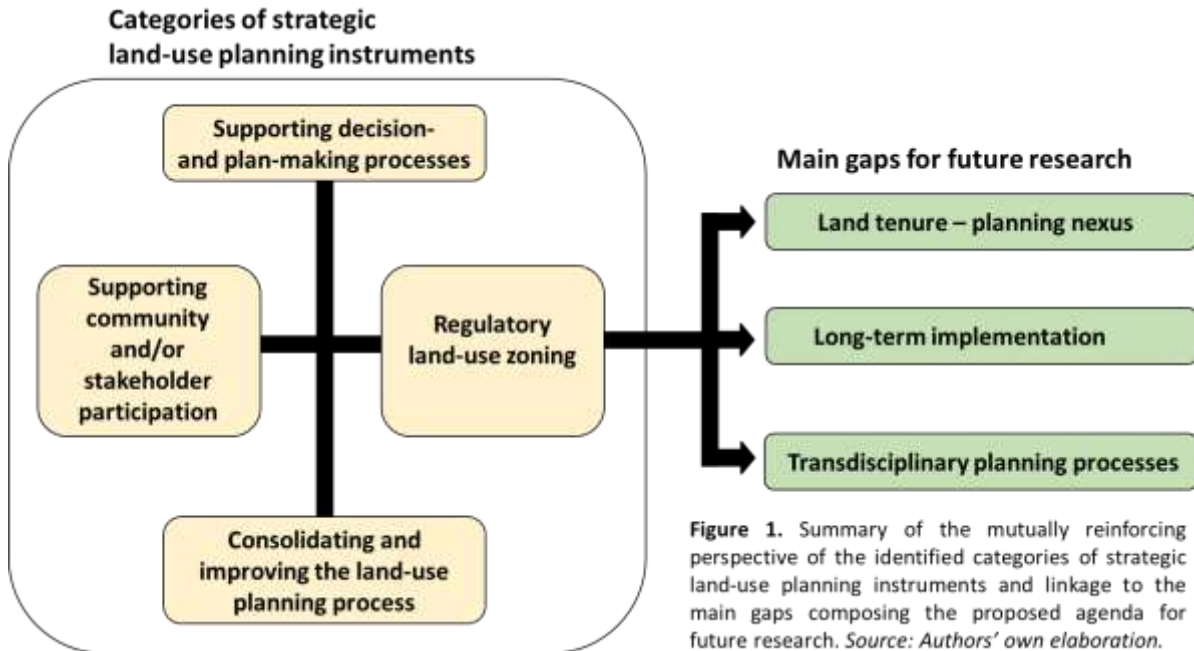
in tropical regions as a means of supporting land governance. This kind of strategic and wider approach to the planning process of land and their future uses would bring closer together the views of economists, spatial planners and investors and it could ideally be done for broad development issues as well as different agro-ecological zones. The integration of urban, rural, and environmental systems is fundamental for resource management and achieve the social, economic and ecological goals of sustainability. SLUP attempts to balance these systems to reach sustainability by incorporating future scenario analysis (e.g. Sawathvong, 2004), land suitability evaluations (e.g. Yu et al. 2018), mapping land-use potential (e.g. Flego & Roić 2018) among other instruments. A strategic approach to land-use planning would be effective in reducing potentially negative impacts of spatial dynamics created by both local and distal governance actors by creating a land use configuration that attempts to balance all actors' needs, including those of rural populations, in a specific territory and thus co-design sustainable land governance configurations (Verburg et al., 2002).

There are, however, a few caveats. SLUP processes cannot be designed and imposed from the top down. Broad public support are needed for each land-use plan, and their implementation can draw on a broad range of rural communities and sectors. The major number of publications with a stronger focus on land-use planning, suggest that land-use plans can result in rational land governance configurations, influencing environment as well as use of natural resources and living conditions of the population (e.g. Laban, 1981). The scientific community should take on the challenge of developing SLUP instruments and arrangements for multi-stakeholder engagement and co-design that help identify perceived trade-offs, ensure technical feasibility of long-term pathways and explain the urgency to act in favour of more sustainable and pro-active (rather than reactive) land policies. The next section takes these and other shortcomings into account to propose future research domains.

Future Research

This review shows that to improve land governance in tropical landscapes, both, planners and policy makers need reliable information about the existing land and their potential (Kaufmann, 1999). However, we could not find instruments that articulate, for example, land capability surveys with land-use rights or land tenure regimes i.e. the relationship, whether legally or customarily defined, among people, as individuals or groups, with respect to land (FAO, 1993). Therefore future research could investigate what instruments could be used to support SLUP by accounting for the different interests impacting land tenure, that is balancing complementary or competing interests i.e. when different parties share the same or competing interest in the same land plot, respectively. Exploring trade-offs between complementary and competing interests would clarify not only how land-use planning is performed beyond the spatial allocation of land uses, but also how SSP can enrich land-use planning processes through initiatives for securing land tenure, assist land registration, and supporting rural populations dealing with large-scale land acquisitions (i.e. competing interests). In the following, we suggest a succinct list of the main gaps i.e. tasks and priorities, in the form of a research agenda intended for all actors at the interface of SSP, land-use planning and land governance in the tropics. At the outset, we acknowledge, however, that the availability of funding, power relations, governance arrangements, challenge the potential

application of some of the recommendations that could emerge from additional research within these gaps (cf. Oliveira & Hersperger, 2018). They require also long-term and multi-disciplinary research (cf. Bai et al., 2018). Figure 1 provides a summary of the mutually reinforcing perspective of the identified categories of strategic land-use planning instruments and linkage to the main gaps composing the proposed agenda for future research. The bold arrows illustrates the interconnectedness between the SLUP instruments and the main gaps.



The articulation between land tenure and strategic land-use planning: Research on instruments supporting wider tenure land security, including but not only in the form of tenure registration would aid in the role of land-use planning in land governance. On one hand, land titles are fit to prevent or help settle conflicts or disputes between a landowner and individual households, but not necessarily between households themselves. Market instruments used to turn households over, are not inhibited by the provision of title deeds (it is exactly the opposite, since markets are supposedly more active and attractive where land is legalised). On the other hand, legal disputes to land tenure are terminated by securing title deeds to households occupying land illegally, but legal title *per se* does not prevent the physical disputes or market pressures (De Souza, 2001). For example, Russo Lopes et al. (2021) on a study focused on the social impacts of soy expansion over Brazil's Cerrado in Matopiba, argue that even when smallholders or local communities do have land titles, they still report being subject to what they call 'silent evictions'. It refers to when distal stakeholders deliberately undermine the community's ability to remain settled, thus gradually forcing them out. In Salta (a provincial capital in mountainous northwestern Argentina), land tenure conflicts have not been appropriately taken into account during the land-use planning process. As indicated above, the only provision made by the government to acknowledge land rights during this process was to classify some of the areas claimed by indigenous peoples (Seghezzo et al. 2017). Land tenure or a land registration to be sustainable if it manages to administer land effectively and to reflect the actual ownership relationships between people and land. At the very least a land register should be updated to reflect inter-

family alienations and land parcel mutations, due dead, for example. However, in terms of sustainable land governance this is not enough. Land tenure and land registration to be effective need to promote social cohesion and environmental justice (Chigbu et al., 2016).

Securing long-term implementation of strategic land-use planning decisions: Haggith et al., (2003) proposes a strategic decision-making model for SLUP, which includes (1) employment, (2) land-use intensification, and a (3) wider range of strategic choices. A key objective of the model is simulating how decision-making agents within the system (individuals, households or an entire community) go about making their decisions. Therefore, forthcoming research could explore instruments that could secure long-term decisions that have been jointly defined and are binding to public and private actors. For example, Mazza (2010) highlights that because the public decision-maker may not be in charge when the decision becomes effective or when plans are actually implemented and, more important, it is usually very difficult, if not impossible, to change or cancel the future consequences of a decision, SLUP decisions should require a large majority agreement and be politically supported and, ideally, legally binding.

Developing transdisciplinary strategic land-use planning: Instruments could be developed to strengthen engagement and knowledge exchange initiatives across disciplines such as land science, spatial planning, economics, and political science (cf. Oliveira et al., 2018). To our knowledge, no such efforts exist. From the SSP literature, Albrechts (2015) suggests co-production as a way to identify who is involved in the planning process and definition of strategies and how these strategies can be co-produced or co-designed. Co-production acknowledges the value of multi-actor collaboration in SSP; it opens consensus-based governance networks more widely, to cover diverse interests related to not only economic but also social and environmental issues (Kalliomäki, 2015). Whitaker (1980), cited in Albrechts (2016), argues that co-production with citizens and grassroots organizations is needed for more effective management of some initiatives/issues/projects, but also for the dynamic that encourages transformative practices. Co-production in SLUP contributes to respond to Sachs's et al. (2019) who propose several instruments for the implementation of the six transformations to achieve the Sustainable Development Goals, including combining top-down visions with bottom-up experimentation across many sectors, and stakeholder engagement and co-production.

The three research domains outlined are not exhaustive. In addition, and despite efforts to systematically assemble a sound set of studies, there are of course limitations to this review paper. First, the study is limited to published literature in English, as it relies mainly on scientific journal articles retrieved through the selected databases; it is likely that there are undocumented cases of instruments used to support land governance in tropical regions that are not linked to publications on strategic or land-use planning. Second, the content analysis is based on results reported by other authors in those selected publications, and there is little space to control for the quality and completeness of their results, or for their selective biases. Notwithstanding, this research presents a broad reading of the state of the literature on

strategic approaches to land-use planning. The paper finds noteworthy insights and proposes sound future research domains addressing challenges linked to land use changes in tropical regions that have been changing at an accelerating pace over the last decades, potentially threatening both the natural environment and human well-being.

Conclusion

We situate our study at the forefront of contemporary studies bridging the strategic-foresight visions of social, economic and ecological sustainable spatial development with the actual land changes in tropical landscapes. The results of this systematic literature review have revealed a number of instruments that are applied in support of the preparation and implementation of land-use plans. In addition, the results have revealed that papers that specifically focused on land registration and land both omit references to land-use planning or other strategic oriented land policies. These raises land-use conflicts that could be addressed through a strategic approach to land-use planning where long-terms visions for the use of land are combined with short-term actions, which would better respond to local needs and thus secure livelihoods for rural populations and the overall governance of natural resources. Strategic land-use planning cannot be seen as something permissive and unfair. Instead, it should create a perception that government and planners can work together with the different land use actors to their own benefit. Strategic land-use planning can work as precursor to getting the “right” mix of the integration of conservation and spatial development objectives, including socially just land management, the protection of biodiversity, preventing loss of ecosystem services. Therefore, strategic oriented land-use planning processes have the capability to respond to current global land use challenges and thus support land governance.

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