



# The Spatial Development Framework to facilitate urban management in countries with weak planning systems

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## ABSTRACT

There is an urgent need to develop strategic spatial planning methods adapted to the conditions of countries with weak planning systems facing rapid urbanization. These methods should allow evaluating the territorial qualities of the system of cities and to meaningfully guiding the implementation of national urban policies or strategies. In this context, the United Nations Human Settlements Programme (UN-Habitat) has developed the Spatial Development Framework (SDF) method, which is presented here for the first time, after having been tested in different countries. The SDF method helps to develop an understanding of the roles and inter-linkages of various urban settlements in the territory and to frame the territorial structure in a context of fluidity and uncertainty typical of countries facing uncontrolled urbanization. The method is then discussed and conclusions for the way forward are drawn.

## KEYWORDS

System of cities; strategic spatial planning; weak planning systems; rapid urbanization

## Introduction

This paper describes the Spatial Development Framework (SDF), which is a method initially developed in 2010–2011 and applied for the first time in Darfur, Sudan, between 2011 and 2013. It was then further improved and applied in Rwanda between 2014 and 2016. The method's main prerogative is to serve countries facing rapid urbanization with weak planning systems, thus unable to implement sound spatial development strategies according to a predefined policy discourse or approved development strategies, a situation currently occurring with some frequency in sub-Saharan Africa and, more in general, in the global South. The SDF method is able to: (i) analyse a system of human settlements in a given territory; (ii) evaluate, according to a policy/strategy and a shared understanding, the spatial structure of such a territory that empirically emerges from the analysis; and (iii) formulate strategic spatial planning recommendations or development actions according to identified priorities.

The SDF method was developed to address a gap in strategic spatial planning, which is commonly observed in countries with weak planning systems. The latter can be characterized by a combination of aspects, such as insufficient human and financial resources, poor institutional capacities at the different levels, lack of equipment, data and information, and absent or ineffective regulations, among others. In short, weak planning systems do not allow to effectively implementing approved

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policies or strategies. Politicians and officers rarely share a technical discourse concerning the strategic development of cities. Given the rapid turnover of staff and politicians and, of course, sparse and unreliable data, the understanding of the spatial complexities of urbanization in the territory is generally weak, and is often based on generalizations and existing templates, such as global cities and growth poles concepts. Ironically, weak planning systems are often products of modernist planning inherited in post-colonial societies, creating susceptibilities to favour exclusion in their 'urban imaginaries' since the role of the planner has long been associated with bringing sanitized order into perceived chaos. This is similar to the exclusionary tendencies in place-making highlighted in the introductory article of this special issue, notably in the case of 'city-doubles', where ambitions for new urban environments mirror the opposite of what already exists. Weak planning systems thus can also be understood as inadequate to support the elaboration and implementation of spatial plans and policies, such as rigid master or zoning plans that are disconnected from processes occurring in the territory, the society and the policy discourse. They can refer to an institutional set up characterized by central decision-making or in some cases, consumed by corruption. Practices of planning may not be based on formal consensus-building and participatory approaches; or legal and regulatory frameworks may not be responsive to the current and future needs of the population. In general, in these countries where urbanization is rampant, needs on the ground are outpacing existing capacities and systems in place.

The SDF method presented in this paper does not pretend to address all the problems associated with weak planning systems, yet directly and indirectly, it considers many of them, including questions of inclusion and spatial equity. Through its practical implementation in Sudan and Rwanda, the authors will demonstrate that the SDF method is simple enough, without losing sight of the complexity of the territory where it is being applied, to involve central and local governments in the planning process, including the civil society, and it allows establishing a clear link between the reality in the ground and adopted policies. In fact, these policies are often spatially-blind and characterized by broadly formulated objectives, thus the connection between policy and the territorial reality is lost. Consequently, those responsible for implementation, particularly at local levels of government or in implementing agencies, find difficulties in translating policy objectives to the local conditions, and cannot take advantage of their local data and knowledge.

In the context of this special issue on satellite cities, the case studies presented will show how existing policies and strategies fail to see the network of settlements and their functional relations and interdependencies. For instance, in the case of Darfur, the application of the SDF method provided for the first time an overall picture of the spatial structure of such a complex territory suffering from several years of continuous conflict, allowing to defining concrete spatial actions to be carried out in the different states of the region. In Rwanda, the application of the SDF method indicated the necessity to add some secondary cities to the six already defined in the Second Economic Development and Poverty Reduction Strategy (EDPRS 2) of the government, it evaluated the degree of implementation of the National Urbanization Policy in all the settlements of the country, and it will soon serve as interface between national strategic spatial plans and local development plans. Given the increasing numbers of countries with weak planning systems that are in the process of developing national urban policies (Reid and Sietchiping 2016), the need for methods that support their effective implementation is timely (Albrechts 2017).

The SDF method tries to address the following two main questions: (i) How to analyse a system of human settlements in a given territory in relation to a policy discourse or development strategy in countries with weak planning systems that are facing rapid urbanization? (ii) How to support the actual implementation of policies or strategies in such a territory by taking advantage of the emerging potentialities from the spatial structure analysis?

As mentioned earlier, the main scope of this paper is to present the SDF as a new empirical and pragmatic method adapted to the conditions of rapidly urbanizing countries with weak planning systems, which was elaborated based on relevant scientific and theoretical knowledge and several years of practical working experience of the authors in developing countries. The idea is to present the

method's *raison d'être*, features, findings, added-value and shortcomings based on its initial application in two countries, and expose it to the international scientific scene and academic interest, and not yet to evaluate it through a rigorous methodology. This may be done at a later stage of the method's maturity. This paper results from eight years of practicing the SDF method through trial and error, learning from experience and the feedback received, and continuously adapting it to the upcoming needs, thus improving it up to its current state.

In terms of paper's structure, first some underlying considerations found in literature that have led to the SDF method are provided, structured according to the two questions that the method is addressing. Then the method itself is explained, including its application in two study cases, as indicated earlier. Finally, the SDF method is discussed, highlighting its strengths and weaknesses, followed by a conclusion which provides some answers to the two questions.

## Literature review

The literature review is organized according to the two main questions the SDF method is trying to address and focuses on key issues justifying the way the method was designed. More references will be provided in the discussion and the conclusion once the method and its application are presented.

Under the first question, the following two themes are analysed: (i) the need for practical tools responding to the specific conditions of countries in the global South with weak planning systems to facilitate the management of rapid urbanization; and (ii) the current focus on large agglomerations and new towns and the subsequent neglect of the role played by existing intermediate or smaller cities in sustaining territorial development.

### ***The need for practical tools responding to the specific conditions of countries in the global South with weak planning systems to facilitate the management of rapid urbanization***

First of all, evidence is provided showing the need for contextualizing the planning practice to the conditions found in fast urbanizing countries in the global South with weak planning systems, particularly in sub-Saharan Africa where the SDF method was first applied. In recent years a new discussion has emerged about the nature of urban planning in the global South (Watson 2009; Parnell and Robinson 2012; Connell 2014; Harrison 2014; Parnell and Pieterse 2016; Robinson 2016). Watson (2009), citing Njoh (2003) and Ansari (2004), argued that models, processes, policies and regulatory measures that were transferred to developing countries in the first half of the twentieth century are still in use and the norm. However, these are generally not adapted to the governance capacities, socio-economic challenges and urbanization dynamics that can be observed in these countries.

Additionally, March and Olsen (2006) suggest that 'an institution is a relatively enduring collection of rules and organized practices, embedded in structures of meaning and resources that are relatively invariant in the face of turnover of individuals'. Indeed, developed countries with well-established institutions are able to readjust their spatial plans with frequency, confirming that they benefit from an *infrastructure of planning* that most stakeholders are able to understand and apply. Meanwhile, for countries with weak planning systems, the implementation of planning practices is rather challenging, because they assume shared policy discourses amongst different levels of government and the society, as well the existence of means to implement them. Evolved planning practices are comprehensive policy discourses, adapted legal frameworks, a body of well-organized and experienced professionals, full data availability, and many other conditions which generally do not exist in countries with weak planning systems. In these countries, plans are not well linked to a shared vision or an overall development strategy, implementation is not coordinated with service and land provision, or supported by a proper financing strategy, and the powers of local planning authorities are limited to jurisdictional boundaries instead of the functional cities within their regional contexts, among other issues.

In response to both the very large scale of metropolitan spatial frameworks, and critiques of their ineffectiveness, several metropolitan municipalities in South Africa have been exploring ways

to ground their spatial plans. Initiatives include, inter alia, attempting to link spatial planning to infrastructure planning (Todes et al. 2010). According to Todes (2012), infrastructure plays important roles in shaping the spatial organization of cities, their sustainability and inclusiveness, thus linking spatial planning, infrastructure and budgets are critical, also thanks to the use of GIS-based decision-support systems. However, the same author argues that this kind of planning is demanding and questions as to whether it can be supported in other contexts where capacities are more limited.

In that respect, the SDF method fills in a gap as it tries to maximize the use of existing data, which are assessed in terms of accuracy, assuming that their effective use will create need for improvement. It also includes self-taught training materials to implement the method and cover for turnover of staff. In particular, while explaining how the SDF method has been applied in Sudan and Rwanda later in this paper, it will be shown how it actually helped understanding the specific attributes of each settlement in order to compare their functions, organize them in hierarchical categories and analyse the spatial relationships between them, even with scarcity of data, uncertainty, rapidly evolving urban processes and weak planning systems. This is particularly useful in countries of the global South experiencing uncontrolled urbanization patterns. The method adapts to the reality it analyses and includes a spatial evaluation against a policy discourse to ground and value the identified spatial structure of settlements within the policy context. The information derived can enhance the understanding on whether urban settlements have special characteristics, qualities or functions, and how they work in clusters of interrelated urban centres that make them unique in the territory, other than having simply been tagged as growth poles.

This partly responds to the question raised by Harrison (2014), an experienced South African planner, on 'How do we reunite "theory of" and "theory in" planning and reconnect planning theory with the "real world"?' He finds an answer in speculative realism, which is concerned with speculating on the nature of reality independent of thought and of humanity. In the case of the SDF method, these would be the structure of the territory 'as is'. Speculative realism is appealing since 'it may bring together the open-ended experimentalism of the pragmatic tradition in planning tradition with the discipline of empiricism' (Harrison 2014).

### ***The current focus on large agglomerations and new towns and the subsequent neglect of the role played by existing intermediate or smaller cities in sustaining territorial development***

The universe of the ordinary city, the middle or small town, where the majority of the world urban population lives, is not a passive object awaiting redistribution and spill overs from the growth carried by metropolises. On the contrary, it actively participates in sustaining territorial development and in the dynamics of growth. In the World Development Report of 2009 (World Bank 2009), the distribution continuum of the settlements, starting from the top of the hierarchy of the agglomerations, is truncated far too high neglecting thousands of smaller agglomerations (Moriconi-Ebrard, Denis, and Marius-Gnanou 2010; Denis, Mukhopadhyay, and Zérah 2012).

It is not being disputed here that uneven territorial development and agglomeration of scale can stimulate investments and contribute to economic development. However, the idea that agglomeration will result in better opportunities for all and in lower inequalities can be contested (Rodríguez-Pose 2009). This is especially true in the global South, as this logic tends to ignore the alternative ways places can grow, and the unintended consequences of continued and concentrated urban growth (e.g. depletion of surrounding natural resources, environmental impact and sprawl of informal settlements). Gibson-Graham (in Rigg et al. 2009) states that different development pathways exist, which can build on local assets, experience and expectations (Gibson-Graham 2005). The 2009 Barca Report on the reform of the European Cohesion Policy advocates the adaptation of development strategies to local conditions as a means

to reduce persistent inefficiency and inequality in specific places, through the promotion of bundles of integrated, place-tailored public goods and services, designed and implemented by eliciting and aggregating local preferences and knowledge through participatory political institutions, and by establishing linkages with other places. (Barca 2009)

Furthermore, Phelps (2004) argues that intermediate locations, i.e. between consolidated urban centres, embody a meshing of potentially different types of external (and internal) economies. Although ‘there is nothing new about new towns’, as stated by Wakeman (2016, 1), the recent surge of investments into new towns calls into question whether the diversion of public funds away from nodal/strategic cities in the national system of cities is spatially or politically strategic.

The SDF method, especially through the Matrix of Functions, builds on the logic that, by having an inventory of local assets and given the possibility to choose which functions to strengthen further in a given cluster or along a specific development corridor, local and regional development might build sustaining economies that start with the assets at hand in any place. This is particularly important for countries of the global South with weak planning systems while they try to identify sustainable spatial development paths. In addition, the method captures functions and growth dynamics in different types of settlements, large and small and everything in between that has a local administration, which is quite relevant in rapidly urbanizing countries where the classification and governance of intermediate locations are also likely to change from rural to urban. Furthermore, the SDF method allows for a broader exploration of the causes of ‘performance’ in these locations and helps to answer place versus space-based questions, which has been a long-standing debate in economic geography around theories of agglomeration.

As for the second question of SDF method’s interest regarding the need to support the actual implementation of policies or strategies in the territory, the focus of this literature review is on *strategic spatial planning*.

Comprehensive reviews and discussions on the state of the art of strategic spatial planning are well dealt with by Albrechts, Balducci, and Hillier (2017), which defines it as

a socio-spatial process through which a range of people in diverse institutional relations and positions come together to design plan-making processes and develop contents and strategies for the management of spatial change; an opportunity for constructing new ideas and processes that can carry them forward; collective efforts to re-imagine a city, urban region or region and to translate the outcome into priorities for area investment, conservation measures, strategic infrastructure investments and principles of land-use regulation.

Albrechts (2017) summarizes the logic of strategic spatial planning in that it provides direction without destination, movement without prediction.

The challenge is to have spatial strategy-making efforts become part of the institutional infrastructure of a community (Healey 2009). Healey argues that spatial strategies ‘work’ when providing an orientation, or reference frame, which gets shared by many stakeholders in urban development processes. She defines four critical dimensions for this purpose: (i) *mobilizing attention* on neglected opportunities and challenges that lie behind immediate agendas – the SDF does this by presenting spatial challenges and critically analyzing the reality of the territory through the Matrix of Functions, as it will be explained later; (ii) *scoping the situation* by identifying ‘energy’ or building coalition for change – the SDF organizes consultative workshops with various stakeholders at different stages; these stakeholders participate actively in the planning process, thus also contribute to the third dimension stated by Healey, which is of: (iii) *enlarging intelligence* by recasting problems, actions and stakes by accessing multiple knowledge sources – this is done specially through the Spatial Multi-Criteria Evaluation as part of the SDF method; and (iv) *creating frames and selecting action*, by aligning with existing strategic plans or policy discourses and deriving concrete spatial action plans, as per the SDF method’s prerogatives.

The SDF method is meant to facilitate the management of urbanization in countries with weak planning systems. For this purpose, it first tries to improve strategic spatial planning by creating shared situational awareness, both through process and through spatial and temporal analysis,

identifying opportunities or territorial potentialities, and formulating recommendations to adapt existing and recurring planning towards strategic developmental choices. Importantly, the SDF does not create new plans, rather a framework where to adapt existing plans or strategies to facilitate their implementation. In particular, the method tries to inform on-going and planned investments of the potentials and pitfalls of the territorial fabric and strategically focus on selected clusters of cities/settlements and development corridors to improve the qualities of life across the region being analyzed. For example, if a planned investment connected to a neighbouring settlement is more effective or not in terms of benefits to a larger population. In this sense, the role of regional planning is contextualized to become more place-based and spatially selective. Decision-making can be based on scenarios or options of which settlements' functions need to be strengthened in a given territory and what type of regional development strategy is needed. Thus, the SDF is a method generating evidence to answer policy questions such as whether investing in a new town is strategic or not in the first place.

### The Spatial Development Framework method explained

The SDF method has been designed to support national, regional and local government decision-making by setting out a spatial vision and strategy specific to a given region with a view to maximizing the benefits from investments and bringing about more spatially balanced (in terms of optimal location) and efficient regional development patterns. The method was first developed in 2011 by the United Nations Human Settlements Programme (UN-Habitat) to support the reconstruction and the donor-pledged investments for the war-torn region of Darfur in Sudan. The SDF method provided understanding to the different stakeholders of the spatial structure of the Darfur region, a structure that had been altered and become unknown with years of conflict.

The SDF method is based on the adequate combination of three methodologies:

*The Matrix of Function (MoF)*, conceived by Spaliviero (1989, 2004) and based on the administrative, marketing and traffic principles from Christaller (1933), which evolved from the scalogram practice from Guttman (1950) that was successively improved by Rondinelli (1985), is used to analyze and categorize existing settlements based on the mere availability or non-availability of key functions, and to identify clusters of settlements strategically interconnected within a given region. The MoF is a strong methodology for data scarce areas and provides an unbiased and overall vision of the actual distribution of functions in the analysed territory.

*Consultative Workshops*, which take place in the different parts of the analyzed region, and help ensuring a participatory approach during the regional planning process by allowing stakeholders to discuss and confront their opinions.

*The Spatial Multi-Criteria Evaluation (SMCE)* is a spatial decision support system used to refine the spatial analysis and assess the performance of key themes against existing development policies within the identified network of urban settlements, in order to formulate planning recommendations for the short, medium and long term. The SMCE can provide good results if sufficient and reliable data are available.

As shown in Figure 1, the combination of the first two methodologies leads to the emergence of the *spatial structure of the region*, in which economic development areas, development corridors and nodal towns are identified. The third methodology concludes Phase A and allows evaluating this spatial structure against development criteria or policies. Therefore, *spatial action plans* are derived, which are then politically validated and can be included in budgeting planning or other policy implementation processes (Phase B).

The SDF method is carried out by a multi-disciplinary team, which works in coordination with an inter-sectoral technical committee including members from the concerned governmental institutions to ensure local ownership. Except from the specific information collected for the MoF through simple questionnaires, the method uses data provided by the national bureaus of statistics. According to Figure 1, it includes the following steps:

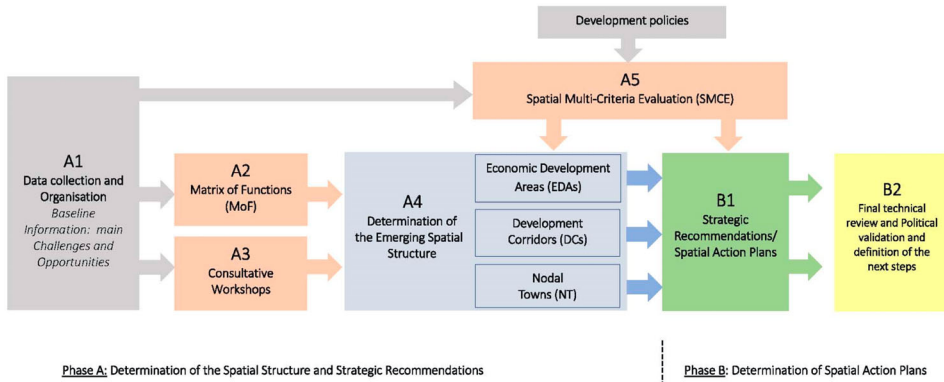


Figure 1. Flow chart depicting the Spatial Development Framework method.

*Step A1:* The spatial analysis starts with the preparation of baseline information through the collection and organization of existing spatial and non-spatial data, including approved plans, strategies and policies related with spatial development at the different levels (national, regional, local, etc.). As a result, the main spatial challenges and opportunities of the region are defined.

*Step A2:* The MoF for a given region helps determining the functional hierarchy of settlements based on availability and diversity of their services, infrastructure and socio-economic activities. It identifies a network of settlements with their *territorial influence* (i.e. the geographical reach of different settlements' functions in the surrounding territory) and the existing socio-economic linkages between them. The analysis is based on data collected through a questionnaire filled by local government representatives at the basic administrative unit of reference, to check whether specific functions (e.g. primary school, police station, pharmacy, mechanic, lawyer, transport services, etc.) are available or not. It is important to establish a list as comprehensive as possible of these functions and ensure their complete adequacy to the context of the region being analysed.

The data collected is organized in a spread sheet and the weight of each function is obtained by summing the number of times it occurs (function's frequency) divided by hundred. Hence basic functions which occur often will show a low weight while rare functions will weigh the most. In Figure 2, each black square shows the presence of a function. When the weights of all functions present in each administrative unit are summed, the centrality score emerges. The ordered MoF is derived after sorting the settlements by function's weight and centrality score, establishing a hierarchy of basic, intermediate and central settlements, each one with a set of functions that should be ideally covered.

It is assumed that any hierarchical level higher than basic settlements should contain the set of functions of the precedent level(s) plus their own specific functions. Thus, the ordered MoF identifies

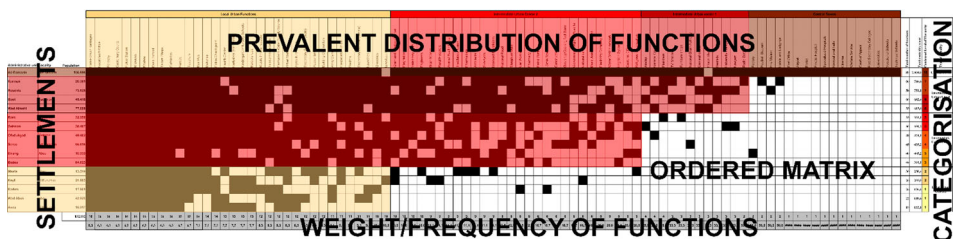


Figure 2. Schematic representation of an ordered Matrix of Functions.

settlements where functions are missing or whether functions of higher levels are present. In addition, the geographical distribution of the different typologies of settlements helps visualizing how balanced the spatial development of the region is and gives already some indications where investments would be needed.

Based on the ordered MoF, an isopleth<sup>1</sup> map is derived showing the levels of centrality from which the spatial structure of the region emerges. It visualizes the territorial linkages of each settlement and identifies clusters of settlements which are strongly interconnected and work cooperatively.

*Step A3:* Consultative workshops are organized in the region under study, gathering national, regional, and local authorities, technical and financial partners, community representatives, the private sector, among other stakeholders. During these sessions, while participants familiarize themselves with the SDF method, preliminary results are discussed. In particular, areas/settlements are ranked according to their specific development potential, and suggestions are made for their future development.

*Step A4:* The emerging spatial structure of the region results from the combination of the MoF and of the workshops' findings. It includes three main elements: (i) *Economic Development Areas (EDAs)*, i.e. clusters of settlements that support and complement each other in terms of socio-economic functions and connectivity, which are considered high priority areas for investment; (ii) *Development Corridors* along the main (existing and proposed) transportation axes enabling connectivity between urban centres, nodal towns and/or EDAs, adjoining countries or regions, etc.; and (iii) *Nodal Towns* that are urban settlements located strategically at border crossings (international/national gateways) or as nodes between EDAs to improve the performance of a Development Corridor.

*Step A.5:* The SMCE is used to assess the performance of the emerging spatial structure based on a decision atlas on different themes that are relevant to guiding policy documents. Using a geographic information system (GIS), a criteria tree is defined, consisting of the overall objective and sub-objectives of the evaluation (aligned with existing policies), and criteria (according to national standards and norms) that are applied to indicator maps. Each choice in the criteria tree, whether it is the data used for indicators, the norms used for criteria, or the objectives defined, is made explicit in the criteria tree by reference to data sources, policy documents or discourse events so that it adapts to the policy discourse. The criteria tree and priorities of different objectives should be assessed and validated during the consultative workshops.

Criteria are used to evaluate the performance of territorial units with respect to the objectives formulated. Indicator maps are standardized raster maps with pixels' value between zero (i.e. unsuitable for the objective they aim to measure) and one (i.e. suitable for that objective), aggregated by means of a weighted summation.

*Step B.1:* Based on the emerging spatial structure, strategic recommendations are formulated on where priority investments should be made. They form the basis for elaborating the spatial action plans, which should be ideally discussed with the concerned entities, taking into consideration on-going/planned interventions.

*Step B.2:* Finally, the SDF is *politically validated* through a workshop bringing together high-level representatives from government and interested partners, and then disseminated.

## The Spatial Development Framework method applied

As mentioned earlier, the SDF method was first applied by UN-Habitat in Darfur, Sudan, between 2011 and 2013, and then in Rwanda (2014–2016), whose results are presented here. It has been a 'learning by doing' process, and the method has evolved up to its current status. It had other partial applications in Myanmar (on an environmental basis) and in Mozambique (in Nam-pula Province, at the metropolitan level) in 2016, and will soon be applied in Ethiopia and Cabo Verde.



For the Darfur region, the main document of reference while applying the SDF was the Recovery and Reconstruction Strategy of Darfur (DJAM 2013), as part of the Doha Peace Agreement signed in 2011. In fact, several years of armed conflict in Darfur caused huge population displacements in camps located close to the main urban centres, hence the need to shift from humanitarian aid to reconstruction aroused. In this case, the SDF method was meant to support the implementation of the regional strategy by providing a better understanding of the spatial structure of Darfur and define priority areas of investment to guide the reconstruction process.

First, it was necessary to get an understanding of the spatial challenges and opportunities of the region, which were grouped into five main themes: (i) conflict; (ii) environment; (iii) demography and urbanization; (iv) infrastructure and basic services; and (v) economic recovery. The MoF then helped categorizing the 62 localities of the region by assessing the presence or absence of 80 functions in each of them into four categories: local urban settlements (showing the lowest levels of urbanization), two levels of intermediate urban settlements and central towns, showing the highest levels of development.

The map of isopleths (see Figure 3) shows that Al Fashir, Niyala and Alginaina are the most developed settlements and are located along the main transportation corridors crossing the region. Interestingly, the map shows a clear predominance of Al Fashir (ancient capital of Darfur) over the other localities. Meanwhile, Aldiain and Zalingay, capitals of Central and East Darfur states created in 2012, belong to the first level of intermediate urban settlements. The north-western and southern

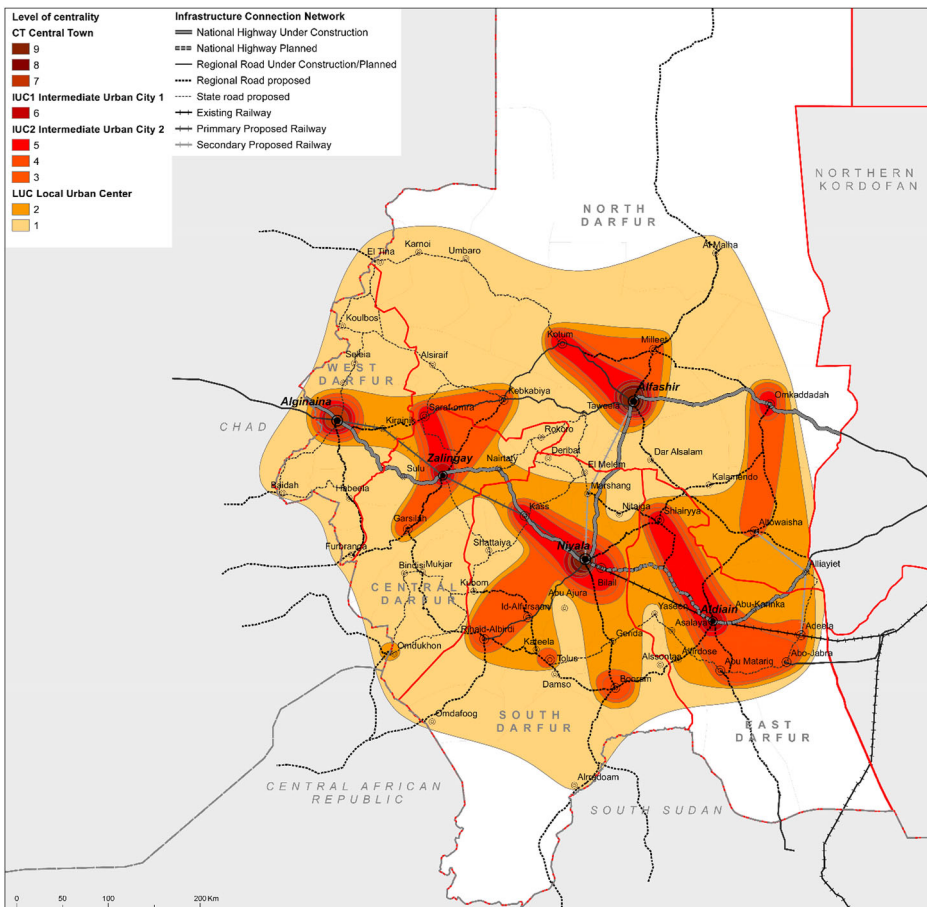


Figure 3. Map of MoF isopleths for Darfur.

parts of the region are the least developed, concentrating much of the local urban centres. Further analysis of Figure 3 allows visualizing the degree of territorial influence of each settlement over neighbouring settlements and to identify clusters of settlements.

The MoF results were then discussed during multi-stakeholder consultative workshops organized in the five states of Darfur during which the localities were ranked according to their socio-economic potential. Interestingly, most of the localities belonging to the clusters identified in the MoF were ranked the highest (see Figure 4).

The spatial structure of the region was then derived by combining the results of the MoF with the outcomes of the workshops, giving due consideration to the challenges and opportunities identified earlier (see Figure 5). This spatial structure was assessed focusing on the suitability of each identified Economic Development Area for urban development and return and/or reintegration of internally displaced persons. The SMCE was structured in five themes: (i) infrastructure; (ii) healthcare (see Figure 6); (iii) education; (iv) water, sanitation and hygiene; and (v) economic activities. Finally, this analysis provided the basis for preparing State Spatial Action Plans for the whole Darfur region, which were then validated during a high-level conference held in Khartoum in 2014.

Rwanda decided to become a middle-income country, among other strategies, by reaching 35% of urban population in the coming years. For this purpose, the government selected six secondary cities as priority poles of growth and developed a National Urbanization Policy (NUP) with the technical

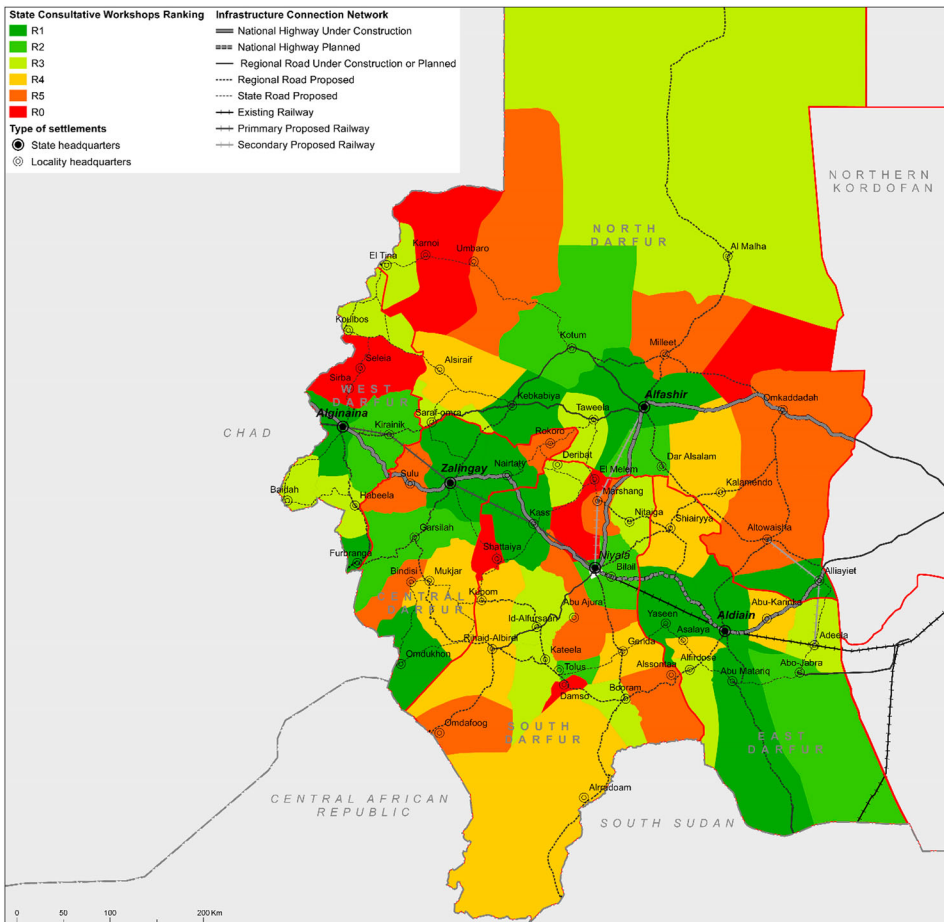


Figure 4. Ranking of Darfur localities based on the state consultative workshops.

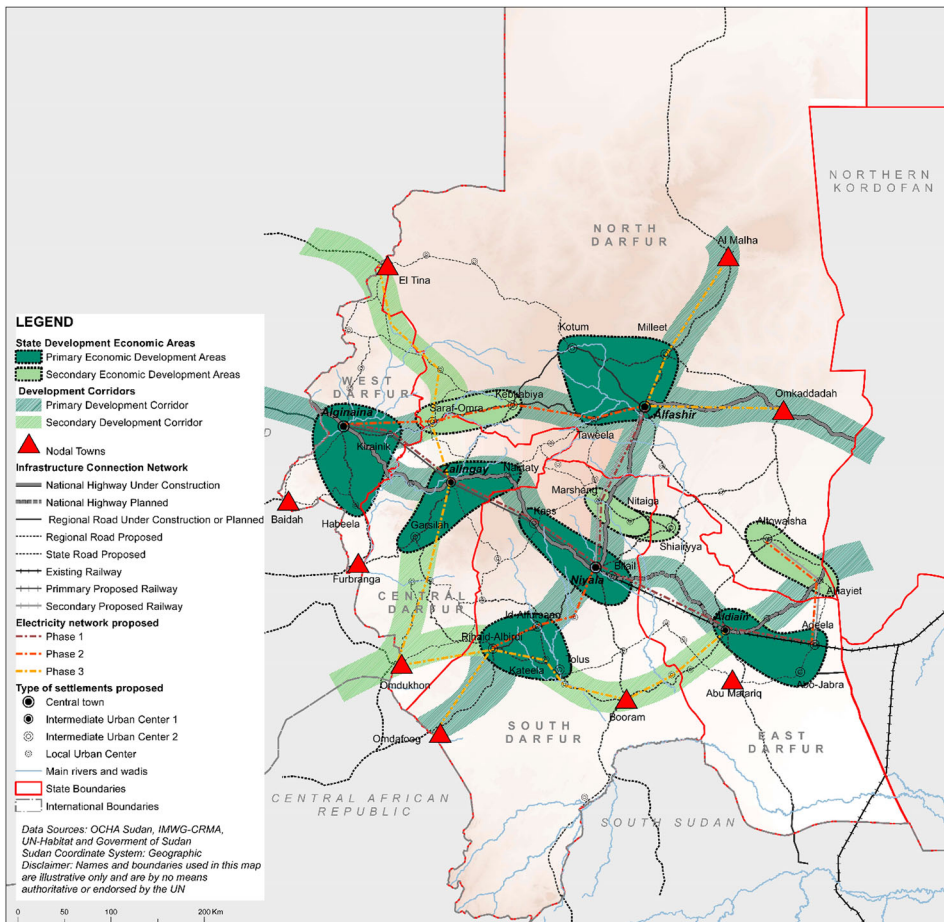


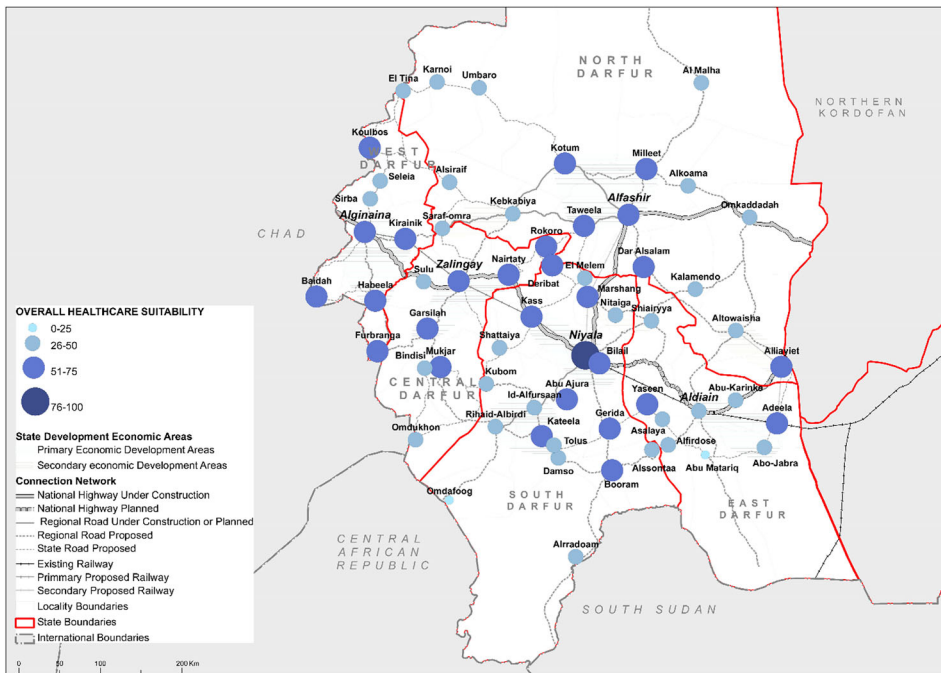
Figure 5. Emerging spatial structure of Darfur.

support of UN-Habitat. The latter was approved in December 2015 and served as main reference document for applying the SDF method.

The main spatial development challenge in Rwanda is topography, with less than 60% of its territory suitable for urbanization. In 2002 the urban population was mainly concentrated in the central and southern parts of the country, while in 2012 urban growth continued in the centre and started also in the western and south-eastern parts of the country. To better understand these urbanization dynamics, the SDF method proposed a classification of urban settlements not only based on their demographic characteristics, but also on their spatial arrangements (connectivity, compactness, density, etc.), the existence or non-existence of urban functions and services, economic productivity and urban-rural linkages.

The MoF analysis helped classifying 416 sectors of the country by defining a functional hierarchy of settlements based on the presence or absence of 79 functions. The same four categories of settlements as Darfur were defined with Kigali appearing as the sole main urban centre of the country.

The map of isopleths (see Figure 7) shows clearly that Kigali is the centrally located economic and logistic hub of Rwanda, while all secondary cities, except for Nyagatare, have some degree of territorial influence over neighbouring settlements. An urban corridor linking the Democratic Republic of Congo to Uganda can be seen in the north-western part of the country, as well as several clusters



**Figure 6.** Spatial evaluation of health care services in Darfur.

distributed in a rather fragmented manner, due to the topographic constraints, often located at main cross-junctions.

After the organization of four consultative workshops to identify the main economic activities and potentialities of key districts, the spatial structure of the country emerged. It shows Kigali as the administrative and economic capital, some gateway and secondary cities strategically located in cross-border areas, two main Economic Development Areas located west and east of Kigali, several Nodal Towns located at the cross-junctions of main roads, four Primary Urban Corridors and six Secondary Urban Corridors (see Figure 8).

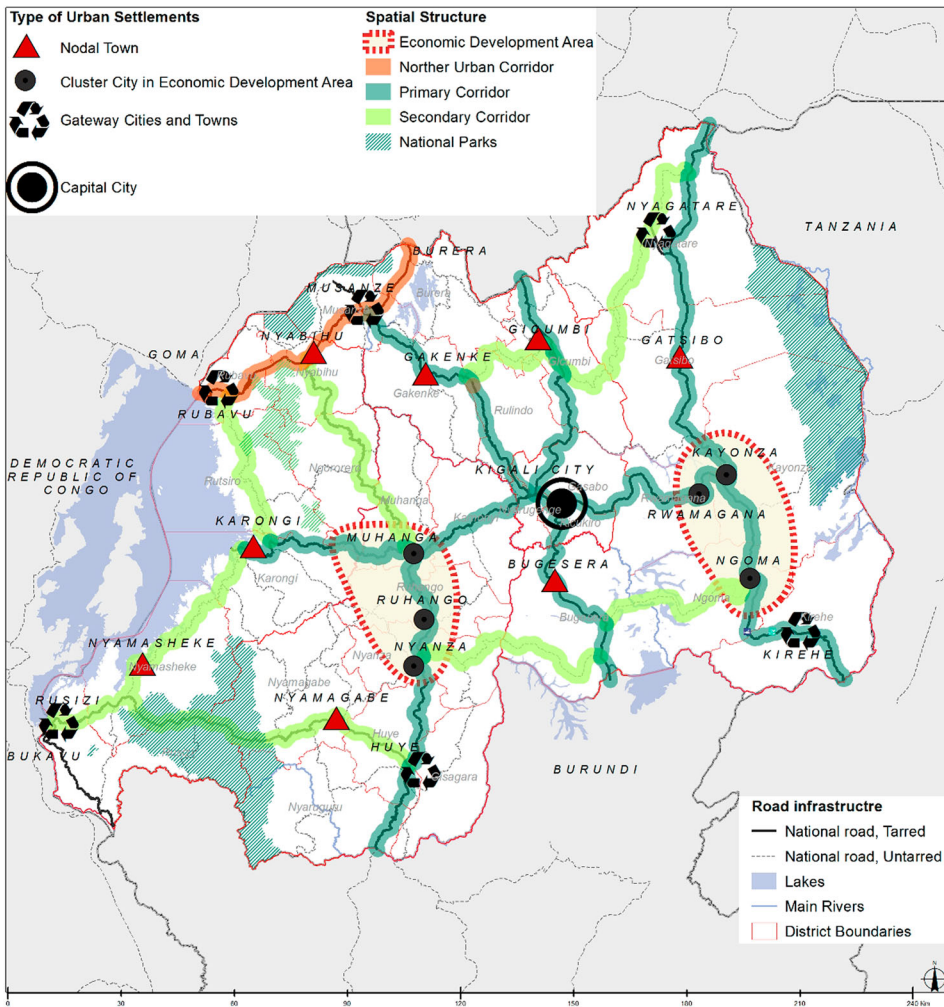
The SMCE was then structured around the four pillars of the NUP, i.e. Coordination (governance and institutional capacity), Densification (spatial issues), Conviviality (social issues) and Productivity (economic issues). For each pillar a separate spatial evaluation was undertaken and a decision atlas prepared, allowing to measure the performance of all urban settlements in implementing the NUP. The SMCE was much more developed than the Darfur case because of the greater availability of data and better GIS capabilities.

## Discussion

Similarly to the literature review, the discussion is structured according to the two main questions the SDF method is attempting to address, further exploring some critical topics after the practical use of the tool. Under the first main question regarding the analysis of a system of human settlements in a given territory in countries facing rapid urbanization, there is a need to clarify how the SDF method helps to develop a meaningful understanding of the roles and inter-linkages of various settlements in the territory, as part of an urban system, in a context of data scarcity.

The SDF method and its outputs place satellite and intermediate cities in the context of the system of cities. By analysing the functions and the relative location of all urban settlements of the territory under analysis through the MoF, the method's outputs make clear the functional linkages between settlements and how these cities are served by the primary cities.





**Figure 8.** Emerging spatial structure of Rwanda.

metropolitan area exhibiting some of the characteristics of a larger city if it is near other population concentrations'. The main argument is that the spatial patterns of borrowed functions and borrowed performance, as well as agglomeration shadows, are likely to be dissimilar for primary and secondary cities (Partridge, Rickman, and Ali 2009; Burger, Meijers, and Hoogerbrugge 2015; Meijers and Burger 2015). Meijers and Burger (2015) distinguish between borrowed functions, which are related to growth potential, and borrowed performance that depends on population growth or income per capita. Burger, Meijers, and Hoogerbrugge (2015) have looked at the spread of high-end cultural amenities in north-west Europe to conclude that larger cities do cast a shadow on the smaller surrounding centres, as predicted by new economic geography models. This means that growth near primary cities, such as in satellite cities, can be limited due to spatial competition effects (Dobkins and Ioannides 2001). However, they simultaneously gain access to the agglomeration benefits of their larger neighbour.

In this context, the China's New Urbanization Plan (2014–2020), which represented a shift from physical construction and spatial expansion focus in the past to a quality-focused and people-centred approach, integrates urban and rural development in particular by defining three large city clusters. Although it simultaneously proposes to foster smaller city clusters, their development in a short

period cannot be compared with the three larger clusters, creating a likely regional imbalance in the future (Hu and Chen 2015).

Another interesting case is the Brazilian strategy of Regional Influence of Cities (REGIC 2007) that establishes a hierarchy of urban centres and their regional influence. This strategy is meant to support planning and decisions regarding the location of economic activities and to enhance the understanding of the current socio-spatial relations. Similarly, the recently approved National Policy for Regional Development of the country includes multi-scalar/dimensional and cross-cutting approaches to overcome regional inequalities, thus providing new perspectives for territorial governance instruments (Dos Santos, Bessa, and Lúcio 2017).

Meijers, Burger, and Hoogerbrugge (2016) explore whether city network connectivity can translate into a higher level of urbanization economies, which are proxied with metropolitan functions, also to understand how important this network connectivity is in comparison to local factors. These authors conclude that both size and connectivity in (inter)national networks positively contribute to the presence of metropolitan functions, and that cities borrow size through being well embedded in these networks. Interestingly, according to these authors, being well embedded in regional networks does not translate into more metropolitan functions, hence the importance of scale (national/international versus regional) regarding network connectivity.

Although in the empirical development and application of the SDF method the authors could not yet differentiate increasing or decreasing returns to either size or scale, in principle, because of the way it is designed, the SDF method is capable of answering these questions. In particular, it could reveal the status and the decision needed to increase or not for more connectivity in a given region.

Under the second main question of the SDF method: 'How to support the actual implementation of policies or strategies in a territory', there are two sub-sets of issues to be investigated. The first one regards the need to understand how the SDF method can meaningfully assist in a context of rapid urbanization, especially by developing a stable framing of territorial structure in a context of massive fluidity and uncertainty. The second concerns the difficulty to operate independently in countries with more or less authoritarian regimes, and the influence of conflicts and tensions among groups in the planning process. In short, how adaptive and flexible is the method in reacting to foreseen or unforeseen obstacles in such challenging planning contexts?

The implementation of the SDF method in different contexts and at various scales, such as in Sudan and Rwanda, as well as in Mozambique and Myanmar (although these two study cases are not reported in this paper), demonstrate that it is adaptive and flexible. The example provided above for Darfur, suffering from severe territorial fluidity and a complex and unstable political scene, is emblematic in this sense. In addition, thanks to its multi-scalar approach (i.e. it can be applied at the national, regional, metropolitan and even at district level), the SDF method responds to the call made by Hise (1997) regarding the need for 'an elastic analytical and interpretative framework that can expand to the region and contract to the district or neighbourhood level and encompass all points in between ... as no event or intervention takes places at only one scale'.

The combination of three different methodologies, i.e. MoF, consultative workshops and SMCE appeared not only complementary but also compensatory. Weaknesses in one method were compensated by strengths in another. The MoF is relatively simple to be understood, provides a snapshot of how functions are distributed over the territory (NB: since developing the MoF is fairly quick, this operation can be repeated over time to analyze spatial changes), while the SMCE can define different scenarios by shifting priority to other criteria, and provide spatial indicators that can also be used for policy monitoring purposes. Yet it is more data intensive and requires advanced GIS skills which in the case of Rwanda were present. Hence the SDF method can be adapted according to local skill capacity and availability of data. Last but not least, the consultative workshops ensure an inclusive and participatory approach and also the integration of relevant political decisions in the planning process.

In the first phase of the SDF method the analysis of the structure of the territory is organized, independently from policies and based on the reality in the ground, then the emerging spatial

structure is evaluated in view of a policy discourse. In the second phase existing and planned projects are assessed and strategic recommendations formulated in the form of spatial action plans for a given territory with the required institutional capacity for overseeing their implementation. Although the second phase has so far only been implemented in Darfur (NB: its implementation in Rwanda is ongoing and about to be finalized), the authors learned that a single implementation of this phase is not sustainable and less useful. Since the method basically works as an interface between the territorial reality and a policy discourse, and considering that these two dimensions change over time, the first one progressively and the second one at every cabinet shuffle, the method would need to be repeated with appropriate frequency, ideally every five years. This would be possible if an adequate planning infrastructure exists or is put in place.

The government of Rwanda, after validating the national SDF outcome in December 2016, is determined to make efforts for embedding the SDF method in recurrent planning processes. A national strategic action plan of the SDF is currently under finalization. UN-Habitat is supporting the government to use the method for mainstreaming the guidelines of the recently approved 7-year national development plan into the thirty districts' plans of the country, thus reinforcing their spatial component. And vice-versa, the aggregation of the districts spatial plans in the form of a mosaic can better inform the national SDF. In this way, the SDF method can be used at its full potential as a standard strategic planning practice.

A downside of the method is that, in its current state of development and with insufficient means for implementing it properly, it is not yet quick, considering also the difficulty to analyse and understand properly development dynamics over a large territory, the involvement of many parties and the time-consuming political validation process (since the method's results need time to be digested and owned by the competent authorities). So far, an application of the SDF method in full has taken two years from start to political validation in the case of Darfur and about one and a half year for implementing the first phase in Rwanda. However, if the planning infrastructure and capacities in the studied country or region are reinforced over time, and the SDF method becomes a standard practice which only needs updated data to produce new results, these time periods could be much shortened. This is actually what UN-Habitat is attempting to do in Rwanda nowadays, by linking the SDF to a spatial decision room and embedding it into existing development planning and budgeting systems at both central and district levels. Thus, a more frequent analysis of the territory would provide the necessary conditions to better frame the rapid urbanization dynamics.

In fact, the spatial structure determined through the combination of the MoF results with the consultative workshops is not rigid, reflects the reality of the territory and is of strategic planning nature. It does not yet go into the detail, which is something done mainly by applying the SMCE. Therefore, unless unplanned major investments take place (e.g. new infrastructure or industrial area, mining activity, etc.), the main features of the emerging spatial structure, particularly the location of the development corridors and economic development areas, can be assumed as valid for strategic planning purposes during an estimated temporal scale of 10–15 years, approximately.

Importantly, Hesse (2010) states that hierarchies of cities in the system of chains and flows are not fixed in time, which makes it particularly challenging to capture the transitory nature and attributes of cities. He defines cities as both a product of place and flows and shows how flows are having an increasing impact in shaping cities and intermediate places, as the latter may lose or gain from rerouting of flows. Thanks to the flexibility of the MoF, the SDF method is able to capture such a changing relationship between site and flow and to adequately assess the transitory character of cities. By extension, the SDF can also help capturing the 'global-local intersection' mentioned in the introductory article of this special issue, and further defining the research agenda on satellite cities and new towns, which are both shaped by and shaping the larger territory.

The National Physical Plan (NPP) of Malaysia revised in 2010 aims, among other issues, to foster development in the four conurbations and along selected, potential growth corridors. This strategy has not yet managed to reduce the income and development disparities between the eastern and western coast due to the excessive focus on developing core centres, which are predominantly positioned



on the western coast (UN-Habitat 2015). Running the SDF method could help identifying suitable areas to re-balance the spatial distribution of investments between these two regions.

Regarding the influence of politics, conflicts and tensions among groups in the planning process, consultative workshops play an important role in the SDF method. Thanks to these consultations, decisions can be made consensually, in an inclusive manner, and based on the evidence brought by the MoF analysis. The latter allows to quickly identifying territorial imbalances that all participants can recognize, and the key nodes of the urban system where to strategically make investment for the benefits of a greater population/area. Complementary deeper analysis could then be provided through the SMCE. In Darfur, the SDF method was used as part of a conflict resolution process and to transparently decide on how to geographically distribute the limited resources made available for the reconstruction. Experience of the SDF in such a difficult region has shown that through: (i) the application of a rigorous, technocratic and, as much as possible, unbiased method that all stakeholders could understand; (ii) led by an external group of recognized experts with no vested interests in the territory being analyzed; (iii) providing evidence at each step to meaningfully justify why a certain decision was taken; and (iv) combined with a carefully designed participatory process for which consultations were organized at the different levels and at key moments in time, consensus could be reached despite all contextual difficulties. In so far as it can, and while noting that data can be easily politically manipulated, the SDF method provides an evidence-based approach for directing investment in the territory, perhaps even more relevant today given the increasing complexity and nexus between global capital circuits and local political economies.

## Conclusion

The SDF was designed to provide countries with weak planning systems a regional planning tool adapted to their development context, which can be used to effectively manage urbanization according to the actual needs and territorial opportunities. The SDF is not a theoretical model, but a logical analytical and planning process that is grounded on the reality of the territory where it is being implemented. It attempts to work based on unbiased assumptions and is meant to be sufficiently flexible to adapt to different contexts, as demonstrated through the two study cases described in this paper. It also ensures a consultative and participatory approach by involving all the relevant stakeholders. In this way, it has the intention to address exclusionary tendencies of place-making processes driven by the needs of only selected interest groups such as speculators, developers or political elites, as highlighted in the introductory article of this special issue.

Importantly, the SDF needs to target a country or a region which has a proper and inter-sectorial governance system in place, without compulsively creating a new governing structure and defining new legislation for its implementation. It is meant to be a tool that creates a common understanding on the challenges and development opportunities of a given territory, and that supports the effective implementation of development policies from a spatial perspective.

In response to the first main question the SDF method is addressing: 'how to analyse a system of human settlements in a given territory in relation to a policy discourse or development strategy in countries with weak planning systems that are facing rapid urbanisation?' the method assesses the fit of cities in their territorial fabric. Rapid urbanization, typically occurring in Africa, requires a spatial analysis able to categorize urban settlements not only based on demographic statistics but also on aspects such as the spatial configuration of the given settlement (compactness, density, etc.), the existence or non-existence of key/basic urban functions and services, the economic productivity of the settlement and its linkages with the rest of the territory. Therefore, the SDF helps to obtain a more comprehensive classification of cities as per the requirements of each country. Therefore, it supports the definition of what functions a satellite city or a secondary city should have and what is their role in the territory, and eventually helps to assess the actual need for building new towns or not.

In Rwanda, for instance, the SDF method was used to strategically define and reinforce the system of urban settlements, especially the role of secondary/intermediate cities, to foster adequate urbanization on the principles laid out in its national policy.

As for the second research question: ‘how to support the implementation of policies or strategies in such a territory by taking advantage of the emerging potentialities from the spatial structure analysis?’ the following can be stated: in both Rwanda and Darfur, based on the existing spatial challenges of the territory, the application of the SDF method helped decision-makers to determine the most suitable locations for encouraging future urban development and urban extensions, allowing for an optimal use of available resources. Hence the paper offers a useful, flexible and practical method for countries to plan at their appropriate scale and density, according to their needs and existing development capacity.

In Rwanda, the SDF method is meant to facilitate both the implementation and the monitoring of the NUP. As follow-up, district administrations are now being trained and empowered to use the SDF method directly to harmonize annual planning and budgeting from a spatial perspective in coordination with central government, working as a common platform for such a purpose.

Importantly, it is the opinion of the authors that regional planning should not be prescriptive, but rather adapt to the context and maximize the use of existing assets, infrastructure, resources and capacities, in line with existing territorial dynamics. Forcing development, by making planning choices that are not fit to the particular situation a country is going through, can be counter-productive and even generate unwanted consequences such as social tensions and conflict.

Finally, this paper has also helped to bridge the knowledge-practice interface. The SDF is indeed an analytical/planning method, which has been harnessed based on knowledge, experience and practice, and which also applies some theoretical basis for each applied methodology, i.e. Christaller (1933), Guttman (1950), Rondinelli (1985) and Friedmann (1987) for the MoF, Chambers (1998) regarding participatory planning theory, and decision support system theory for the SMCE. The development of the SDF method resulted from embedded researchers and practitioners in co-production to form translational research.

## Note

1. NB: In meteorology, an isopleth indicates a geographical line connecting points showing an equal level of incidence of a specific meteorological feature. In the case of the MoF, the term is used to indicate a geographical line representing a specific aggregate ranking.

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