Challenges and opportunities of ecosystem service integration into land use planning in West Africa – an implementation framework

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ABSTRACT
Despite the benefit accrued from integrating ecosystem service (ES) concepts into modern land use planning (LUP) practices, approaches to mainstream the concept in West Africa remains a challenge. The objective of this paper is to develop a framework for integrating ESs into the LUP. We achieved this by using content analysis to search for ES keywords in land use planning policies and act (LUPPA) and to identify existing approaches for mainstreaming the ES approach using Ghana and Nigeria as case-study countries. Following, the SWOT analysis was used to highlight key strength and opportunities of the existing LUPPA, and the benefits the ES concept could offer to increase these strength and opportunities while uncovering the threats to the concepts application in the study location. We suggest the adoption of a transdisciplinary planning approach which integrates strategic environmental assessment and participatory planning and geographic information systems (GIS) approaches, and human resource capacity training of all relevant actors and stakeholders in the planning process on the principles and overall benefits of the ES concept as the way forward. Our framework was developed on the basis of these recommendations for adoption.

1. Introduction

Research on mainstreaming ecosystem services (ESs) into land use planning (LUP) have emerged as key issues to both scientists and policymakers (Burkhard et al. 2009; Geneletti 2012; Baker et al. 2013) as well as governments around the world. A significant increase in research publications on mainstreaming the ES concept into LUP across continents has demonstrated that the process does not only enhance the awareness and interaction of planning actors and stakeholders but also contributes towards improving the understanding of land system functioning and its effect on human well-being (Fürst et al. 2014). Further, the effects of LUP decisions on ES supply and demand (Geneletti 2011) as well as trade-offs and synergies for better decision-making are made more evident. Despite the outlined benefits amidst growing political awareness and scientific and technical support on the ES concept particularly in Europe and America, the understanding of the ES concept and practical strategies for mainstreaming them into LUP is relatively new to several government and planning agencies in Africa.

The Millennium Ecosystem Assessment (MEA 2005) and other independent research groups initiated methods and opportunities to experiment innovative means to assess ESs condition and trends including hotspots and trade-off analysis (Van Jaarsveld et al. 2005), and scenario analysis from different scaling perspectives across Africa. More recently, Boafo et al. (2014) explored the dynamics of availability, collection, and utilization of provisioning services in rural savannah landscapes of Northern Ghana. Despite the growth in scientific research on ESs in Africa, the growth is highly fragmented with advance research on the concept predominantly undertaken in South Africa (Egoh et al. 2012). The authors emphasized that the challenge to ES research in Africa does not only dwell in the fragmented scales of scientific research but also on the lack of commitment by African Governments to implement key policies which would lead to sustainable land management for efficient ES delivery and by extension offer scientist the opportunity to explore the state of the art and model future changes to ESs on the continent.

In the particular case of West Africa (WA), the problem could be categorized into two fields. First, effective LUP in the subregion is characterized by low public participation, poor institutional capacity, and skilled manpower regarding ES knowledge, inadequate logistics to undertake planning activities, inadequate funding, and more importantly limited access to land resource-related information for proper planning (Ogbazi 2013; Fuseini & Kemp 2015). The second
challenge is characterized by the lack of awareness and education on ES concept and its underlying principles, lack of tools and approaches for mapping, assessing, monitoring, and practically integrating ES to support planning despite the growing body of tools and knowledge system outside the boundaries of the subregion.

Parallel to these challenges are the conversion of more natural ecosystems into cash crop systems (Cotula et al. 2009), large-scale timber extraction for wood, and unregulated small-scale mining which continuously threaten the functioning of WA land systems to provide needed livelihoods and ensure sustainable utilization of environmental resources. In arid and semi-arid countries (e.g. Mali, Burkina Faso, Niger) and the northern territories of Ghana, Nigeria, and Cote D’Ivoire, for example, the issue of water scarcity due to highly variable rainfall events compounded by competing uses of water for crop irrigation and household consumption (Egoh et al. 2012) affect water availability for crop production and fodder provision for animal consumption. Whereas fodder availability in the arid areas depends on biomass production from farmlands, there exist abundance of fodder along the green rainforest belt of countries located along the coast of the subregion (e.g. in the Western Region of Ghana).

In the arid zones of WA, supporting ES provided through soil fertility and water supply are minimal. Seasonal rainfall variabilities in the Upper East Region of Ghana, for instance, affect water accumulation relevant to recharge river channels and to provide adequate drinking water. Comparatively, soil fertility accumulated from soil organic matter contribute heavily to agricultural productivity in the southern belt of the subregion. Abiotic resource extraction through mining, large-scale agriculture, and unsustainable use of natural resources now threaten not only soil services and other ecosystem functions but also biodiversity, and livelihoods (Egoh et al. 2012). Faced with similar challenges outlined for WA, studies which mainstreams ESs through LUP have been conducted elsewhere to provide scientific, environmental, as well as policy solutions, and recommendations to ensure human well-being and environmental sustainability (Frank et al. 2012).

The rationale for this paper is to develop a methodological framework to support the integration of ES concepts into LUP in WA. On this basis, we hypothesize that the development of a framework to mainstream ES in LUP in WA would strengthen the integration of stakeholders in the planning process. This in effect will result in transparency of the planning process, and increase the acceptance and support for the implementation of plans with ES focus. In the end, our paper addresses the following questions:

(1) Which land use planning policy and act (LUPPA) mainstreams the ES concept and how is the concept mainstreamed?

(2) What are the strength, weaknesses, opportunities, and threats of the LUPPA to mainstream ES in the planning process?

(3) Which successful approaches could be relevant for the mainstreaming process in WA?

2. Methods

2.1. Literature search

The study adopts an exploratory research approach to profile existing LUPPAs and underscore their characterization for the ES concept. This characterization focuses on which ESs are cited in LUPPA regardless of their year of enactment, the level of planning ES is mainstreamed, and the key approach is to aid the mainstreaming process. We refer to national level LUPPA as a broad-scale collection of act and policies established by law to provide guidelines, control, organize, and manage for spatial development. To profile LUPPA, a content analysis of LUPPAs for Ghana and Nigeria was employed.

Unlike Ghana which formalizes policies at the national level for adoption at regional and local scales, Nigeria’s administrative state systems allow some states to develop local laws for within state implementation. The selection of documents was based on a web search of legally binding and published LUPPA of both countries (see Table 1). Whereas majority of our search was limited to the Google search engine, most documents were obtained from the official website of planning institutions of both countries. Whereas some have been published already, others are bills awaiting passage into laws as well as planning frameworks currently under implementation. In all, 19 official documents (10 from Nigeria and 9 from Ghana) were selected on the basis of their direct relevance to LUP and enactment in both countries. For instance, some development regulations plans might have both land use and economic development planning focus, thus qualifying to be included in our list. Our temporal scope included documents published between 1930 (before LUP was formalized in both countries) and 2015.

2.1.1. Content analysis

To narrow down on key search terms which captures ES types for our content analysis, we used the specific ES categories (i.e. provisioning, regulating, supporting, and cultural) and examples (aesthetic, food, climate regulation, etc.) presented in the MEA publication (Millennium Ecosystem Assessment (MEA) 2005). We also included the word ‘environment’ in our key terms as both countries previously used this word to reflect the biophysical space in their policies (De Wit & Verhey 2003). We looked at the denotative occurrence of these key terms either as
Table 1. Documents consulted in the content analysis.

| Policies/Act                              | Year enacted | Policies/Act                             | Year enacted |
|-------------------------------------------|--------------|------------------------------------------|--------------|
| Town and Country Planning Ordinance       | 1917 and 1946| Town and Country Planning Ordinance (CAP 84) | 1945         |
| National Development Plan (1970–1974)     | 1970–1974    | Ghana's Local Government Act, Act 462    | 1993         |
| Land Use Decree Number 6                  | 1978         | National Development Planning Commission Act (Acts 479 and 480) | 1994         |
| Local Government Reform 1976              | 1976         | Environmental Protection Agency (EPA) Act (Act 490). | 1994         |
| National Development Plan (1975–1980)     | 1975–1980    | National Land Policy                     | 1999         |
| National Development Plan (1981–1985)     | 1981–1985    | National Biodiversity Strategy           | 1992 and 2002|
| Nigeria Urban and Regional Planning Law   | 1992 revised | Land Use and Spatial Planning Bill, 2011 | 2011         |
| Decree No. 88                             | in 2012      | Environmental Impact Assessment Decree No. 86 | 2012         |
| Urban and Regional Planning Decree No. 18 | 1999         | National Urban Policy Framework, 2012    | 2012         |
| Nigeria’s Vision 20: 2020                  | 2009         |                                         |              |

standalone words or in combination with other concepts in the policies and acts, and additional messages conveyed in connection with these words. In the event where neither ES type nor environment is mentioned, we used ES examples as proxies in the identification process. This approach is in line with Bauler and Pipart (2014) who argued that empirically verifying the first stage of conceptual adoption stems from asking the question of how much the concept has been referred to in policy documents.

This method of explicitly analysing the inclusion of ES types or examples eliminates subjective interpretations (Mascarenhas et al. 2015). The adoption of content analysis helped to narrow our scope to (1) ES reference in existing policies, and (2) guidelines for mainstreaming ES. In addition to the keyword-based analysis, we adopted direct content analysis (Genelletti & Zardo 2016) which involves reading all available LUPPA to identify the content related to each of two categories. The emphasis on ES reference reflect whether the ES concept was given cognizance in the published planning policy or acts, which specific ES types are mentioned, and the planning scale (national, regional, and/or local) for its incorporation. This assisted us to answer research question 1. In addition to the content analysis, we performed a SWOT analysis on the policies and act to facilitate the ES mainstreaming process.

2.1.2. SWOT analysis

SWOT analysis highlights the interaction of a systems internal and external features and how they affect the success or otherwise of a specific goal and for the purpose of developing and implementing future strategies (Houben et al. 1999; Bull et al. 2015). Further application of the SWOT approach on the ES framework has been provided in Bull et al. (2015). However, in adapting to their approach, we focused on applying a secondary data source (published policies and act) instead of primary data sources used by Bull et al. (2015). When applied in policy review, strengths are considered as the internal feature of the policy document to cite specific ES types, examples, and provide strategic messages to increase ES awareness and its contribution to the implementation of the planning goal. Internal properties of policies which can hinder the achievement of mainstreaming ES are considered as weaknesses.

In order words, the inability of policies and act to possess the internal character for mainstreaming ES are considered a weakness. We adopted Bull et al.’s (2015) conceptualization of opportunities and threats. We considered opportunities include political, economic (financial), and technical factors external to the policies and acts and provides the enabling environment for the achievement of the ES mainstreaming into plans. Opportunities are viewed as a means to overcome weaknesses and increase strength. Lastly, we referred to threats as external factors which may impede the achievement of mainstreaming ES into land use plans in both countries.

The SWOT analysis aided in answering question 2. For mainstreaming ES into planning, we employed deductive approaches based on the result from questions 1 and 2 to explore workable methods and approaches and logically aligned them to existing planning practices and methods in our case-study countries. For this exercise, workable examples were drawn from Europe. The nexus of both, to some degree, influenced the development of a practical implementation framework for ES integration adaptable to our study sites. Equally relevant in this assessment was the issue of appropriate scale for ES implementation. This approach helped to answer question 3.

2.2. Case-study countries

The decision to focus on WA is because despite being recognized as the potential resource basket, the sub-region has been severely impacted by the interaction of climate change and continual land use changes leading to significant alteration of terrestrial and marine ecosystems which forms the basis of livelihood dependencies in the region (Roudier et al. 2011).
Gonzalez (2001) documented a large-scale decline in forest species richness and tree densities which could have provided ESs such as soil erosion control, carbon sequestration, and the formation of plant and animal species habitat in the subregion. We selected Ghana and Nigeria as case-study countries as representatives of all WA countries with British planning systems.

Though the idea was not to compare Anglophone to Francophone WA LUP systems, attempt at including Francophone countries failed as a result of time limitation and availability of LUPPA documents of these countries online. Some of the planning department and agencies in some Francophone countries did not have official website or online presence at all. Where available, a translation of the document into English would be necessary. However, this process could be capital intensive and time consuming. Thus our choice of Ghana and Nigeria (Figure 1) rest on their similarities as leading oil producers within the subregion, the resemblance of their formal planning structures, and processes as well as the online accessibility of planning policies and acts. More critically, both countries lie along the coast where sea level rise and other extreme events are expected to destroy coastal ecosystems (IPCC 2014) thus requiring strict spatial and marine coastal planning laws to propel adaptation to future extreme event particularly in the phase of oil exploration in commercial quantities.

2.2.1. A brief account of land use planning in Nigeria

Several specific planning initiatives and legislatives at Federal and State government levels have been undertaken since independence (Aka 1993; Ogbazi 2013). The implementation of the Town and Country Planning Ordinance of 1946 (see Ola 1977) created a situation where planning and development of the urban area was equated to provision of more physical attractive layout and well-designed housing estates. In 1947, the three-tier planning concept was introduced, and served as the bedrock for the 1992 planning Law No. 88. The subsequent two National Development Plans (NDPs) focused extensively on physical development resulting from sectoral and economic planning rather than conscious efforts towards resolving physical planning challenges emanating from the pre-independence laws.

There are observable similarities with the third and fourth NDP’s particularly as both focus on urban and regional planning by defining the role physical planning plays as a tool for achieving national development objectives with policy measures relevant to the planning interest. Under this plan, the State Housing Corporation and Town Planning Authority were institutionalized and charged with the preparation of master plans for cities with funding from Infrastructure Development Fund. However, the Town and Country Planning Ordinance (1946) and the Land Use Decree in 1978 continued to be the main planning legislation and Land Administration Decree until the Urban and Regional Planning Decree (No.88) of 1992 was passed. These policies and acts targeted economic growth and physical development at the expense of environmental and ES provision or protection until the introduction of environmental planning within the NDP (1981–1985). The Town and Country Planning Department is the main institution mandated to implement policies and planning laws in Nigeria with implementation support from stakeholders such as the National Economic Council, legislators, traditional leaders, civil societies, and non-governmental.

Figure 1. Selected countries for the evaluation of ES mainstreaming into land use planning within West Africa.
2.2.2. A brief account of land use planning in Ghana

Formal planning in Ghana started with a 10-year development plan commissioned by the then British Governor, Gordon Guggisberg for the development of the then Gold Coast (Leith 1974). This plan focused on infrastructural development such as roads, housing and institutional development, and upgrades (Fuseini & Kemp 2015; Acheampong & Ibrahim 2016). The passing of the Town and Country Planning Ordinance in 1945 (CAP 84) initiated the countries first spatial planning framework which amongst other things institutionalized the Town and Country Planning Department to enact and implement planning proposals for the orderly development of settlements particularly along mining areas. Following, post-independence demands for economic growth and development led to the amendment of sections of CAP 84. For instance, Act 30 was amended in 1958 (Act 30 of 1958), while Act 33 in 1960 (Act 33 of 1960) (Town and Country Planning Department 1945).

The principles for sustainable development amidst economic take off in the country led to the development of the National Physical Development Plan spanning from 1963 to 1770 to control the spatial organization or economic activities and accompanying infrastructure (Fuseini & Kemp 2015). Decentralized planning in Ghana commenced with the enactment of the National Development Planning Systems Act in 1994 (Act 479 of 1994) (Acheampong & Ibrahim 2016), and the 1993 Local Government Act to manage planning and orderly development of human settlement structures and to regulate land development (Fuseini & Kemp 2015). The collaborative planning effort from other department was possible through the enactment of the Environmental Protection Agency (EPA) Act (Act 490 of 1994).

Planning mandate at all levels resides with the Town and Country Planning Department with support from key stakeholders such as EPA, traditional heads, Survey Department, and the Lands Commission in the design and implementation of plan. Despite all efforts at passing the Ghana Land Use and Spatial Planning Bill, critiques of the planning system argue that planning in Ghana continuous to focus on planning to manage physical growth and development of cities, towns, and villages, and follows the principles of CAP 84.

3. Results and discussion

3.1. Mainstreaming of ES into land use planning policies and acts

3.1.1. The case of Nigeria

Major planning policy documents focused on planning for infrastructural development with less emphasis on environmental sustainability. The ES keyword was found to have made superficial appearances in LUPPA from the early 1980s and 1990s. We found that out of the 10 documents reviewed for Nigeria alone, 5 of them enacted after the 1980s had ESs or the other related terminology stated in those documents (Table 2). For example, Parts 2 and 3 of the repealed Town and Country Planning Law (CAP 130) of Northern Nigeria contained more elaborate provisions for the distribution of human pressure on the physical environment to improve aesthetic quality (i.e. a cultural service). The reviewed documents also captured that, despite the popularity of the keywords in the various documents, a key challenge remained the inability to name specific ES classification types and methods for streamlining into the main planning process. For example, the Medium Term Implementation Plan (2010–2016) of Nigeria’s Vision 20:2020 emphasized the conservation and

| Land use laws | Enactment year | Policy focus | ES reference | Guidelines for integration |
|---------------|----------------|-------------|--------------|---------------------------|
| Town and Country Planning Ordinance | 1917 and 1946 | Use and allocation of land for infrastructural development | No | None |
| National Development Plan (1970–1974) | 1970–1978 | Structural centric planning | No | None |
| Land Use Decree Number 6 | 1978 | To ease government access to land for physical development | No | None |
| Local Government Reform 1976 | 1976 | Local scale infrastructural development | No | None |
| National Development Plan (1975–1980) | 1975–1980 | Infrastructural development | No | None |
| National Development Plan (1981–1985) | 1981–1985 | Introduction of environmental planning | Yes | None |
| Nigeria Urban and Regional Planning Law Decree No. 88 | 1992 revised in 2012 | Orderly guide physical development in modern Nigeria | Yes | None |
| Environmental Impact Assessment Decree No. 86 | 1992 | Make environmental concerns mandatory in development project | Yes | None |
| Urban and Regional Planning Decree No. 18 | 1999 | Environmental Planning and protection | Yes | None |
| Nigeria’s Vision 20: 2020 | 2009 | Functional cities for rapid economic growth; good governance of the planning system to achieve environmental sustainability | Yes | None |
development of coastal ESs without mention of the specific ES types.

Further, the implementation of the Biodiversity Target 3 of the National Biodiversity Strategy and Action Plan (2016–2020) specifically point to the establishment of a national ecosystem-based spatial planning process to promote ES-based inclusion in spatial plans. Specific targets included the development of habitat connectivity axes and Green infrastructure to safeguard wildlife corridors as a requirement for spatial development. The scale for this implementation is at the subnational scale. Again, the two key issues missing included; (1) ES types and/or specific examples to be considered, and (2) the methods to be used in the mainstreaming process despite existing progress made in participatory planning and strategic environmental assessment (SEA) in Nigeria. While the application of SEA has received attention in other sectors (Ogbonna & Albrecht 2014), its application in LUP is minimal. We found no connection between the stated ES term and the relevant land use types to supply the ES. Acknowledging specific land use types and their supply of specific ES is a necessary step in mainstreaming ES into the planning process.

Of equal relevance was the Land Use Act of 1978 enacted to ensure mutuality in land and environmental development, preserve ecologically sensitive areas, and to promote aesthetic value. However, activities of government and private organizations derailed this objective. A further revision of the 1992 NDP in 2012 established the Urban and Regional Development Boards to supervise the overall planning, monitoring, and management of urban development. This establishment however did not outline strategies to incorporate aesthetic quality as an ES in the plan.

3.1.2. The case of Ghana

In the case of Ghana, we found that out of nine documents reviewed (Table 3), four mentioned the ES concept, while one out of this four provided an exhaustive approach towards mainstreaming it. For instance, the Ghana National Spatial Development Framework (2015–2035) publication emphasized the sustainability dimension of the ES concept. So far, this is the sole document where specific reference is made to ES. The framework emphasized the principles of ensuring environmentally sustainable development where the benefits accrued from natural ecosystems would meet development needs. A section of the report underscored the proposed development of a Green Infrastructural Network and water provisioning services with the objective of delivering multiple environmental benefits and water provisioning services to urban and rural dwellers while protecting and restoring natural systems and open spaces. Other emphasis were placed on coastal ESs delivery from mangrove sites (specifically from the Amansuri wetlands in the Western Region, Ghana). This approach falls in line with Fürst et al. (2014) who opined that Green infrastructure provides services such as water purification, species protection, and creates landscape identity. In spite of the adoption of buffer zoning as a simple technique to safeguard ES supply areas, what is unclear is a broad category of related ES types, the scale, and/or boundaries of focus, and primarily how priorities for these identified ES could be mainstreamed through planning.

The Town and Country Planning Department (1945) (CAP 84) focused mainly on infrastructural development along resource rich enclaves of the country (Table 3). This ordinance had neither ES biodiversity nor the environment in its content. The passage of the Local Government Act (Act 462) in 1993, the National Development Planning Commission Act 479 and 480 in 1994, and the National Building Regulations’ (LI 1630) in 1996 did not feature the ES concept as greater focus was placed on physical development. However, the EPA Act, Act 490, enacted in 1994 focused on ensuring environmental compliance from the initial planning

Table 3. Overview of selected LUPPA with emphasis on ecosystem services in Ghana.

| Land use laws                                           | Enactment year | Policy focus                                      | Ecosystem reference | Guidelines for integration |
|--------------------------------------------------------|----------------|--------------------------------------------------|---------------------|---------------------------|
| Town and Country Planning Ordinance (CAP 84)           | 1945           | Zoning and building code with physical development centred | No                  | None                      |
| Ghana’s Local Government Act, Act 462                  | 1993           | Physical development                             | No                  | None                      |
| National Development Planning Commission Act           |                | Infrastructural development                      | No                  | None                      |
| (Acts 479 and 480)                                     | 1994           |                                                   |                     |                           |
| Environmental Protection Agency (EPA) Act (Act 490)     | 1994           | Ensuring environmental compliance in land use allocation | Yes                 | None                      |
| National Land Policy                                   | 1999           | Employ sustainable resource management principles in maintaining viable ecosystems | Yes                 | None                      |
| National Biodiversity Strategy                         | 1992 and 2002  | Conserve and sustain management of biological diversity | No                  | None                      |
| Land Use and Spatial Planning Bill, 2011               | 2011           | Integrative three-tier Hydraphical Spatial Development Framework; but with socio-economic planning in scope | Yes                 | None                      |
| National Urban Policy Framework, 2012                  | 2012           | Urban infrastructural and service delivery         | No                  | None                      |
| Ghana National Spatial Development Framework (GNSDF)   | 2015–2035      | Economic and Spatial Infrastructural Development using a sectoral approach | Yes                 | In                        |


phase through to its implementation phase (Ministry of Lands and Forestry 1999). What was missing was a guideline to facilitate the integration of environmentally sensitive areas in planning. Between 2003 and 2011, the National Land Policy driven by the Land Administration Project resulted in the drafting of Land’s Bill and the LUP Bill. Though socio-economic in scope, the LUP Bill made partial reference to recovering degraded ecosystems (Section 12) through institutional collaboration (EPA, the Minerals Commission, and the Forestry Commission) and the development of SEA of the spatial development framework (Section 50; 1f).

This approach is in the right direction even though former application of SEA in Ghana focused on mining oil and gas (Foluke 2012), economic (poverty reduction), transport, energy, water, and agricultural sectors respectively (OECD 2012; pp. 71–73). A recent considering for SEA inclusion in LUP was implemented under SEA for Ghana’s oil and gas sector led by the Netherlands Commission for Environmental Assessment. In all SEA applications, particularly in the later which focused on LUP, no emphasis was placed on the ES concept.

While Ghana’s entry point for mainstreaming ES approaches into LUP could be through the Ghana National Spatial Development Framework 2015–2035, Nigeria’s option could stem from the National Biodiversity Strategy and Action Plan (Nigeria Vision 20: 2020), where Target Actions 2 and 3 with focus on the adoption of a national ecosystem-based spatial planning process and plans to promote the values of biodiversity and ES to achieve sustainable development could be strategically achieved through practical methodologies. Nigeria CBD Fifth National Biodiversity Report (2015) suggest mainstreaming payment for ES and goods into the national budget (Target 2), while creating a network of stakeholders to enhance integrated biodiversity management through participatory LUP, knowledge sharing, and capacity building across all levels of government (Target 3). However, the concern is that these targets might never materialize if the appropriate methodologies are not employed.

A key consideration is to develop an integrative approach which cut across all levels of planning, and utilizes actors and stakeholders throughout the stages of the planning process particularly at the identification of which ES types to include in the plan, the scale or level of implementation, and the accompanying goals to drive the process.

3.2. Outcome of SWOT analysis on mainstreaming ES in LUPPA

Figure 2 presents the outcome of a SWOT analysis performed on the ES mainstreaming potential of LUPPA for Ghana and Nigeria. The outcome of this analysis makes it possible to derive a conceptual framework which highlight operational methodologies to aid ES integration. The outcome of the SWOT analysis is presented in the following discussions. Whereas some of the outcomes cut across both countries, particularities of each country are highlighted.

3.2.1. Strengths

Across the documents assessed, we identified how different terminologies have been used to give...
recognition to the ES concept. Awareness created through reference to the ES concept suggests the recognition of the concept and its benefit to sustainable development. Recent attention the concept has received in currently running action plans (for e.g. Ghana National Spatial Development Framework 2015–2035) suggest a possible understanding by implementation agencies on the expected demands to be met before the specified goals are achieved. A similar case in point is the Nigeria’s target to develop national ES-based spatial plans target set by the National Biodiversity Strategy and Action Plan (2016–2020). Coincidentally, Bull et al. (2015) found that awareness creation of the ES concept in itself forms a strong basis for the concept to support and improve decision-making.

3.2.2. Weaknesses

With reference to weaknesses of the assessed LUPPA to mainstream ES, we found that institutional structures, lack of human resource capacities, and logistical constraints could hinder the mainstreaming process. Relative to the planning process, we identified inefficient institutional collaboration and coordination as being the justification for the continuous amendment and delayed implementation of policy instrument in both study sites (see State of Planning Report in Nigeria for further details).

Unavailability of skilled and qualified planners with education and knowledge on ES concept to influence the planning process is a key weakness in both countries. This outcome positively relates with Albert et al. (2014) who cautioned that planners’ unclarified understanding and divergent perspectives concerning the opportunities and benefits of including ES information in different decision-making contexts suggest that a short-term integration of ES information in existing planning procedures is rather unlikely. As a matter of relevance, the use of ES in planning does not only stem from receiving rudimentary training on the concept but also on what is hidden behind the service and it’s benefits to the security of the socio-ecological system of which planning plays a crucial role (Fürst et al. 2011).

Though Ghana National Spatial Development Framework (GNSDF) mentioned ES, its content are minimal on the medium to communicate, for example, the types of ES, specific examples of the types, and the scale of emphasis of the ES in the plans. In some cases, there were inconsistencies in the use of the ES terminologies. This result is in line with Bull et al. (2015) who found divergent views on the application of the ES framework. Lack of funding on the part of governments was identified as a key weakness not only for mainstreaming ES but also for funding general planning activities in both countries. In Ghana, for instance, clauses which enforce locally generated funds makes it difficult if not impossible to undertake essential planning and land management activities at local level LUP. If funding for the actual LUP process is a challenge, then the investment in a step up approach to incorporate the general requirement and the stage-by-stage ES integration process would be a fallacious conception. Another key weakness identified is the uni-disciplinary approach towards planning. Authors such as Albert et al. (2014) and Geneletti (2011) have underscored the key relevance of interdisciplinarity as a medium to fulfil the objectives of mainstreaming ES into planning. Bull et al. (2015) found that the key success of the application of the ES framework lies in its interdisciplinary character. Another relevant thing absent was a well-formulated LUP and ES mainstreaming framework developed strategically to target relevant steps, identification of key stakeholders, methods of ES assessment, scale, and the interactions of the above mentioned into a holistic approach to achieve planning and development goals.

Though spatial distribution of land and ecosystems for management decisions is required in planning to respond to questions regarding the state and locations where change is relevant to enhance ES provision, access to such land-related information within both countries is inadequate. Due to the inexistence of, for example, base maps, improper inventory and poor record keeping of well demarcated land resources, obtaining the required proxy information from land cover and land use is challenging.

3.2.3. Opportunities

With reference to opportunities, several entry points could emerge from a system’s inherently untapped options. For instance, in Ghana, EPA Act (Act 490), Forestry Commission Act (Act 571), the 2011 Land Use and Spatial Planning Bill (Town and Country Planning Department 2011) and the recent GNSDF operationalized in 2015 though without guidelines for mainstreaming ES presents entry point for that country. The newly introduced spatial development framework concept in Ghana’s Western Region incorporated planning at the local, district, and regional levels while training planners and technicians on coastal mangrove ecosystems and their value for ecological balance and contribution to fisheries resources. The main was to consider coastal mangroves and their accompanying services as critical inputs for planning particularly at the coastal belts of Ghana’s oil discovery. With the introduction of NigeriaSat-2 in 2012, it is anticipated that challenges with land resource-related data and information particularly land resource monitoring will be minimized in Nigeria.
Further, increasing availability and decreasing cost of land use and ecological modelling toolsets (InVEST, Geographic Information System Cellular Automaton Multicriteria Evaluation (GISCAME) etc.) and technology relevant for LUP (global positioning system, GIS, cell phones; quantum-GIS (QGIS)) offers a cost effective contribution for LUP, monitoring ecosystem, and biodiversity depletion for stakeholder intervention for planning. For instance, Ghana’s Land Use Planning and Management Information System developed during the Land Use Planning and Management Project in 2007 is a software tool developed to support integrated planning (developing local and structural plans, district, regional, and national spatial development frameworks) and creates links to QGIS for extra GIS capabilities. The progress made by the Nigeria’s National Space Research and Development Agency regarding satellite image acquisition presents an alternative to introduce a robust technological intervention to provide data set to aid the ES mainstreaming process.

3.2.4. Threats
Political interferences and lack of political interest are key threats to a potential ES integration into LUP in both countries (see Ogbazi (2013) in the case of Nigeria and Awuah et al. (2014) in the case of Ghana). The success of enacted LUPPA depends on the extent of political engagement and commitments on the part of political actors to continue the implementation process. Without political interest and support by the way of drafting, enactment, and enforcement of policies, the effectiveness of the policies to mainstream ES concept will be significantly compromised. Further threat regarding funding rests on the political commitment to ensure the continuity of existing policies in the event of a takeover of a political tenure. Most LUPPA till date have been funded as part of multi-donor (e.g. World Bank) projects. Moving forward, the onus to maintain this momentum has shifted to national and local government. The accompanying cost for increased stakeholder involvement, transdisciplinary dialogue, amidst investment in geotechnologies for mapping ES as well as an investment in locally adapted methodical framework to ensure the successful within country integration of the concept could be a challenge for both countries moving forward. Limited donor funding amidst uncertainties in accumulating internally generated funds’s at the local level continuously presents the most eminent threat for effective and efficient LUP with elaborated focus on ES integration particularly for Ghana.

Loss of political interest and funding limitations were found to be in line with threats identified by Bull et al. (2015) as key hindrances to the implementation of the ES framework. However, an effective LUP which mainstreams ES is achievable if the outlined threats, coupled with the understanding of the relevance of the concept, at all levels of planning is eliminated. This relates with Albert et al. (2014) who argued that an encouragement to incorporate the ES concept depends on the extent of understanding, acceptance, and experience of the different spectrums, agencies, and/or sectors of planning. Thus, the initial conceivable idea is for governments in both countries to envision mainstreaming ES as a way to better identify synergies between economic developments on one hand and environmental interest on the other.

In the following section which answers question 3, we explore highly considerable methods and tools, some of which has been adopted in the subregion, to aid the ES mainstreaming process. It is not in the place of this paper to provide the core of these approaches (see OECD 2008) except to emphasise their applicability, relevance, and improvement of already existing practices in our study sites.

3.3. Integrative framework for mainstreaming ES concept into planning in WA
In the absence of methodical framework to mainstream ES in WA coupled with the outcomes of the content analysis and SWOT analysis, a four-tier conceptual framework (see Figure 3) for adoption by government, planners, planning agencies and department, and stakeholders in the planning process for both countries. This proposal was developed on the basis of tried and tested approaches practised outside our region of focus. The main idea was to employ only workable approaches, tools, and techniques for consideration irrespective of the characteristics of the regions where they have been applied. In the end, we see this proposed framework as an initiator of scientific discourse on adaptable strategies coupled with local content to successfully mainstream ES.

First involves adopting the SEA method. The approach offers a scenario-based analysis option to analyse expected changes in the distribution of ES at a particular land use change or strategic decisions are made during the planning process. This inherit scenario analysis capability offers planners the opportunity to assess the sustainability of proposed plans by identifying beneficiaries of particular ES, their characteristics regarding their spatial organization and distribution, and their demands for and contribution to ES provision. The entry point for mainstreaming ES in planning with SEA in our case-study areas must occur at the scoping and objective-setting stages, followed by the identification of suitable actions to achieve such objectives, drafting, and refining of the plan, and finally at the plan implementation stage. Public participation and
engagement are relevant throughout these stages. Application of SEA begins with stakeholder identification of a minimum set of ES from the location where the plan will be designed. The Millennium Ecosystem Assessment (2005) or the Common International Classification of Ecosystem Services (CICES) classification provides the basis to select specific ES types required for the implementation of the spatial plan and other areas the plan will affect (see Organization for Economic Co-operation and Development (OECD) 2008; p. 11). An alternative means to select a core set of ES stems from providing answers to questions regarding what the objective of the plan is, and how the plan will affect identified ES. For example, if the objective of the plan is to protect high biodiversity areas, then this would positively influence regulation services like erosion control while cultural services like recreation could be impacted negatively as this zone could be restrictive to human use. Geneletti (2011) offers classical examples on linking planning objectives to specific ES.

Additional consideration of SEA application in LUP is spatial and ecological scales. This is because the difference between the area under planning, and the areas where a service is impacted could complicate the process of ascertaining actual effect of land use plans on ES. Spatial and ecological scales could be used in slightly different ways (Malinga et al. 2015). For instance, depending on the boundary areas where services are supplied and demanded, and given data availability, stakeholder participation through joint planning approaches could be employed at the municipal or regional scale to ascertain scales where benefit and cost to ES accrue. An example is the joint planning area established for the mapping and assessment of coastal ESs (through mapping of mangroves and wetlands) and the development of coastal management and marine spatial plans in Ghana’s Western Region (GNSDF 2015-2035).

This is in line with Fürst et al. (2010) who argued that the regional scale is particularly adequate for ES integration, since regions frequently have territorial delimitations that follow natural features (e.g. distinct landscapes) more closely. Practical research has demonstrated that several LUP and ES linkages have been undertaken at municipal and provincial levels (Egoh et al. 2012; Malinga et al. 2015) to reflect levels at which land use policies are more applicable. However, focus ought not to be lost on small-scale (≤5 km²) initiatives as they could provide more rigorous management interventions for scarcely available or depleted services. The decentralized planning system in both countries could facilitate this initiative.

Stakeholder involvement through the SEA process is a key issue. Albert et al. (2014) proposed an ES model for planning applications with particular emphasis on stakeholder involvement to capture both biophysical and socio-economic dynamics in the integration process. For instance, while cognitive mapping favour exploring and communicating the relationship and interaction of ES providers and beneficiaries, combined biophysical modelling and expert or social evaluation favours the validation and enhancement of the ES assessment and evaluation process. Options which handicaps stakeholder participation (e.g. low public education on planning and ES) have to be avoided while steps are taken to engage and incorporate opinions of a substantial number of stakeholders particularly during combined biophysical modelling and expert evaluation. In a related modelling and scenario-based study to aid erosion protection, Frank et al. (2014) demonstrated how ES assessments using stakeholders can explicate the trade-offs effects of different management scenarios.

The second approach involves mapping ES of biophysical and social properties to understand the ability and capacity of landscape entities to provide ES. This helps to make decisions on areas of minimal supply and high demand of a particular service. In the case of Ghana, where no suitable observation data on ES supply data are available, De Groot et al. (2010) suggest the use of process models to map landscape functions and services or obtain landscape properties, landscape functions and services derived from literature. Several studies have combined spatial data sets to map a range of supplied ESs (e.g. Haines-Young et al. 2006; Egoh et al. 2008). Alternative pathways to building landscape pattern scenarios and testing hypothesis for potential ES delivery exist with the aid of neutral landscape models (NLM). NLM represents null models of landscape structure used as a baseline for evaluating the effects of landscape structure on ecological processes (With & King 1997).

Thus, in cases where satellite images are unavailable, NLM present the least cost solution to test landscape hypothesis in order to identify which spatial patterns or compositions of land uses favours ES provision and satisfies planning options. Simpler platforms such as NLMPy (Etherington et al. 2015), and the recent Structure Generator module implemented in GISCAME (SG4GISCAME) could be employed. In the event of data gaps caused by cloud cover in Ghana (see Forkuor et al. (2014) for a discussion of cloud cover in WA), the gap-filling option in SG4GISCAME offers a good option to aid ES mapping.

The next approach, public participation geographic information systems (PPGIS), emphasizes the production of high-quality, place-based spatial data for integration into formalized LUP processes (Brown & Kyttä 2014), to increase public awareness in mainstreaming ES information into policy and
governance (Opdam 2013). PPGIS amongst other options could be an initial step considered particularly at the scoping stage of the planning process. A simple random sampling of actors with supervision from experts (e.g. ecologist, biologist, sociologist, geographers, and planners) in a transdisciplinary atmosphere to identify and map the presence and location of ES could result in a near precise minimum level of ES maps to serve as input into land use plans. In the event of technical challenges, group workshops instead of self-administered interviews could be an option to engage actors. This eliminates the uni-disciplinary approach considered as a weakness in mainstreaming ES in both countries. However, Frank et al. (2013) caution that variations in culture, gender, lifestyles, and knowledge must be considered when drawing actors into the participatory mapping and planning process. Fürst et al. (2014) recommend that the inclusion of actors should be based on their demand of a service on one, and a supplier of a service on the other. In the end, results from this approach are spatially explicit, and could provide support the development of explicit land use decision criteria. To facilitate complementarity amongst actors through a transdisciplinary participatory planning process, Frank et al. (2012) and Fürst et al. (2014) adapted GISCAME (Fürst et al. 2010) as a planning support tool to develop participatory scenarios and impact assessment to analyse ES trade-offs. Here, effective collaboration of actors in the participatory process is successful if they agree to first include specific ES types from the initial goal-setting phase.

Key milestones in the integration of SEA in planning are achieved by identifying and quantifying ES (Partidario & Gomes 2013). This relies on the assessment of the landscape structure and composition and features the evaluation of patch sizes, shapes, and edges. The assessment result reveals inferential information about patch capabilities to specific ES provisions (e.g. soil erosion control on large territories) and to set benchmarks for setting planning goals (Li 2008). Landscape metrics such as intensity, abundance, richness, and diversity have been developed and used as proxies to quantify the distribution of mapped ES across multiple scales within various study locations (see Fagerholm et al. 2012; Plieninger et al. 2013). For instance, additional food, fibre, and biochemical product could potentially be found in large patches of agricultural landscapes (Forman 1995), thus unearthing the relevance of the largest patch index metric.

In LUP, the quantitative outcome of the Euclidean Nearest Neighbour (ENN) metric, for example, is useful to understand the distances between patches identified as productive in producing certain ESs (Leitão et al. 2006). Though this process provides a means to compare ES across different landscape units within a study area, it requires that the planning area be partitioned into meaningful spatial units for analysis. Frank et al. (2012) assessed the potential to improve the understanding of how landscape structure contributes to the provision of ES using effective mesh size and hemeroby index to compare the degree of landscape fragmentation and assess naturalness, respectively. When adopted, these indicators serve as a proxy to assess, for instance, ecologically functional land use types as a criterion for ES provision. For cultural services like the aesthetic value of a

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**Figure 3.** A four-tier integrative framework based on the outcome of content analysis and SWOT analysis of LUPPA from Ghana and Nigeria to mainstream ES into LUP. ES types for consideration could be based on the MEA (2005) or the CICES (http://cices.eu/applications-of-cices/) classifications, respectively, and preferably selected under water, energy, forest, and agricultural ecosystems, respectively. LUCI – Land utilization and capability indicator (Source: http://www.lucitools.org/); TESSA – Toolkit for ecosystem service site-based assessment (http://www.es-partnership.org/esp/82222/9/0/50); InVEST – Integrated valuation of ecosystems and trade-offs (http://www.naturalcapitalproject.org/invest/) Legend to landscape metrics: ENN – euclidean nearest neighbour; PROX – Proximity; IJI – Interspersion & Juxtaposition Index; SI – Shape Index; ED – Edge Density; SD – Shape Density; NP – Number of Patches; FD – Fractal Dimension; LPI – Landscape Patch Index.
landscape, Shannon’s Diversity Index and the Shape Index can be assessed (Frank et al. 2012).

Fragstats, an open-source option, is an exhaustive tool for a wide-range indicator assessment (see McGarigal et al. 2002). Critical operational values for assessing the ranges at which a landscape retains its positive effect on the evaluation of for instance landscape aesthetics as a cultural service must be collectively agreed upon by stakeholders in the planning process.

Since an exhaustive list of ES to be mainstreamed in a plan are relatively expensive to achieve in a short time frame, we suggest that food and water provisioning, biomass production, soil erosion control, flood control, recreational use of urban and rural water, and land for aesthetics and tourism, for example, should be adopted at the initial stages of planning. We find our recommended set of ES to be in line with the core set of services to be assessed by the Intergovernmental Science-policy Platform on Biodiversity and Ecosystem Services (IPBES) of which both countries are members. Thus, a technical support for their assessment could be anticipated.

3.4. Study limitation

Despite the underlying benefit of SWOT analysis, Pickon and Wright (1998) opine that the approach entails limitations which could emanate from unclear and subjective classifications of issues. Indeed, key outcomes from the SWOT analysis identified in this research represent the views of the authors alone and cannot be assumed to represent the views of a panel of LUP practitioners drawn from the case-study countries. Despite the underlying factuality’s identified, some of the point raised were generalized for both countries and represent the subjective views of the authors. That notwithstanding, the outcomes of the SWOT analysis allow us to understand how LUP policies in our case-study countries are strategically developed to successfully mainstream the ES concept to aid decision-making. Our main focus was to highlight the initial commitment of both countries to the ES concept after committing to the IPBES conceptual framework. Moving forward, we recommend using stakeholder workshops or interviews with heads of planning departments, planners, and other stakeholders in the planning process, drawn from all levels of planning in both countries, to examine the extent to which their feedbacks on the topic confirms or refutes the views of authors in this research. Finally, our four-tier integrated framework developed on the grounds of SWOT analysis should be viewed as suggestive and not a complete guideline in the absence of an operational framework. Our framework combines already existing planning practises in Ghana and Nigeria (e.g. participatory planning) and workable practical methods and experiences drawn from the European setting. However, weaknesses such as unavailability of skilled and qualified planners with ES education and knowledge, lack of functional institutional structures and funding amidst threat such as political interferences, and lack of political interest as established in the outcome of the SWOT analysis are amongst the risk which could block the timely adoption of our proposed four-tier framework. Thus, though the approaches in the framework have successfully worked for other countries, they stand the chance of failing in our case-study countries if the identified weaknesses and threats are not holistically dealt with through the intervention of government and planning authorities of both countries. For instance, without political will and government intervention the adoption of SEA as a mandatory practise in spatial planning in both countries will not materialize. As observed in the strength and opportunities section of the SWOT analysis, advantages for upscaling the practise of participatory planning into PPGIS exist in both countries. Future research should aim at exploring one or multiple tiers of the suggested framework to test it feasibility for application and replication in the study region.

4. Conclusions and outlook

In this paper, we adopted content analysis and SWOT analysis to describe the relevance of the ES concept in planning policies and acts, and to summarize the key challenges and opportunities encountered in mainstreaming ES concept into LUP in WA drawing on experiences from Ghana and Nigeria. Increased awareness of the ES concept in current LUP document for both countries was identified. Aside poor land resource information, low technical knowledge and appreciation for the ES concept, uni-disciplinary approaches to planning, as well as unclear goals and target in the existing laws for ES mainstreaming in the planning process, the main challenge for mainstreaming was the absence of an appropriate framework to aid the integration process. As Fürst (2015) opines, it is not enough to criticize whether or not ES application is relevant in planning, but rather, how the implementation is undertaken. Thus, the relevance rest not only in enacting new land use policies but also on the political will to strengthen existing opportunities and make them methodologically viable by investing in spatial data acquisition and training planners and other stakeholders on the ES concept.

We suggest the application of a four-tier synoptic framework to facilitate the implementation of the ES concept in LUP in WA. Notwithstanding the opportunities outlined, planners are cautioned against using landscape metrics to appraise all aspects of a
landscapes capacity to provide ES. At best, assessment based on the potential of a single land cover type to provide regional ES, for example, is relevant. Questions regarding pattern of urban areas and best location for urban development within the planning context could be answered with the aid of a core set of shape-, edge-, area-, and cluster-related metrics (Leitão & Ahern 2002).

Nonetheless, the objective the plan seeks to achieve, the scale or extent of the plan, as well as the direct and indirect consequence during and after the implementation of the plan must be taken into consideration ahead of the decision to apply a specific metric. Opportunities for sponsorship and partnership from donor agencies to develop locally suitable integrated planning and modelling software tools (in relation to tier 2) could facilitate ES integration into different levels of spatial planning in both countries. The adoption of the PPGIS (i.e. tier 3) in the proposed framework will be effective if collaborating actors in the participatory process agree to consider and include specific ES types from the initial goal-setting stage of planning. Relatedly, participatory scenario building and impact assessment to analyse ES trade-offs (Fürst et al. 2010) is crucial to this tier. Finally, based on trade-off and synergy analyses considering a set of planning alternatives, supply and demand areas for ES provision should be revealed in the course of a SEA (tier 4). It is relevant to acknowledge that while the other two are strictly methodological approaches, SEA and PPGIS are strictly policy and governance instrument and would require political will and tenacity to incorporate them mandatorily. A formidable SEA policy in tier 4 is dependent on inputs derived from tiers 1, 2, and 3, respectively. Though the option to choose a tier is flexible, an attempt should be made at making them mutually inclusive. For instance, PPGIS can be applied in both SEA and integrated assessment tools. Very important is a clear identification of core sets of ES, integrated at the goal-setting and scoping stages of plan developing, and allowing a scientific robustness of the process through inter- and transdisciplinary processes by engaging planners, geographers, ecologists, social scientist, and citizens more closely.

Further collaboration with non-governmental organizations and civil society organizations with ecosystem mapping and SEA capabilities could be an alternative to support local planning agencies. At best, mainstreaming ES should be done at all spatial planning levels to allow consensus building and ownership of the process. Based on the recommendations derived from this study, we will apply one of the suggested tools to the northern region of Ghana in future works to test the feasibility of the proposed framework.

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