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ROLE OF SPATIAL PLANNING TOOLS AT MESO-SCALE IN THE MANAGEMENT OF NATURAL RESOURCES,

LESSONS LEARNT FROM AFRICAN COUNTRIES

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AFRO MAISON

EU- Research Project
INRM at meso-scale
Uganda, South Africa, Mali, Tunisia, Ethiopia

Spatial Planning Tools

SEVENTH FRAMEWORK PROGRAMME

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INRM challenges in Africa

- Africa and natural resources are synonymous
- Rapid deterioration
  (causes: rapid population growth and **poor management** (Cunningham & Cunningham 2008))
- Competing interest within user but also among the management authorities
- Various sectors involved, functioning from various jurisdictional levels
- Integration?
  complexity of natural resources and interconnected factors represents the rationale for INRM (Mitchell, 2005; Savenije and Van der Zaag, 2008)

"…..integration remains desirable but difficult and impractical"(cook & Spray, 2012: 95)

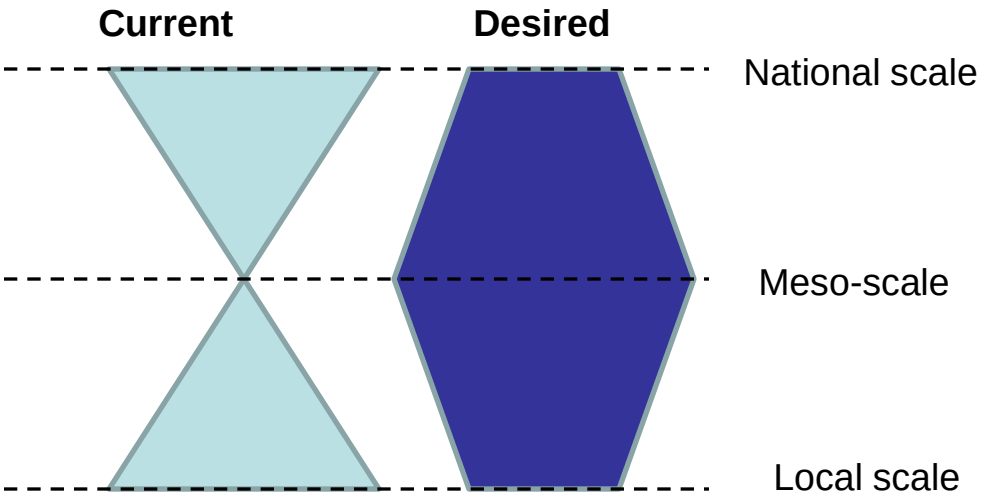
"integration of sectors is not well developed for instance in South Africa (Todes et al. 2010)"

Meso-Scale and natural resources management

- Decentralisation trend in Africa, what it means for natural resources management and is meso-scale an appropriate scale for natural resources management
- *Ecological and institutional boundaries seldom coincide* (Cash and Moser, 1998)
- *"much work has been done on policy instruments at the national level"* (Gupta, 2007) as well as at local scale (Holling, 1992; Levin, 1992)
- **Meso-scale :** the intermediate scale, where often national policies and plans are translated and implemented to the local level by considering local interests and context

Importance:

- appropriate scale for vertical and horizontal integration
- Combine spatial level interest



Planning scales for natural resources management

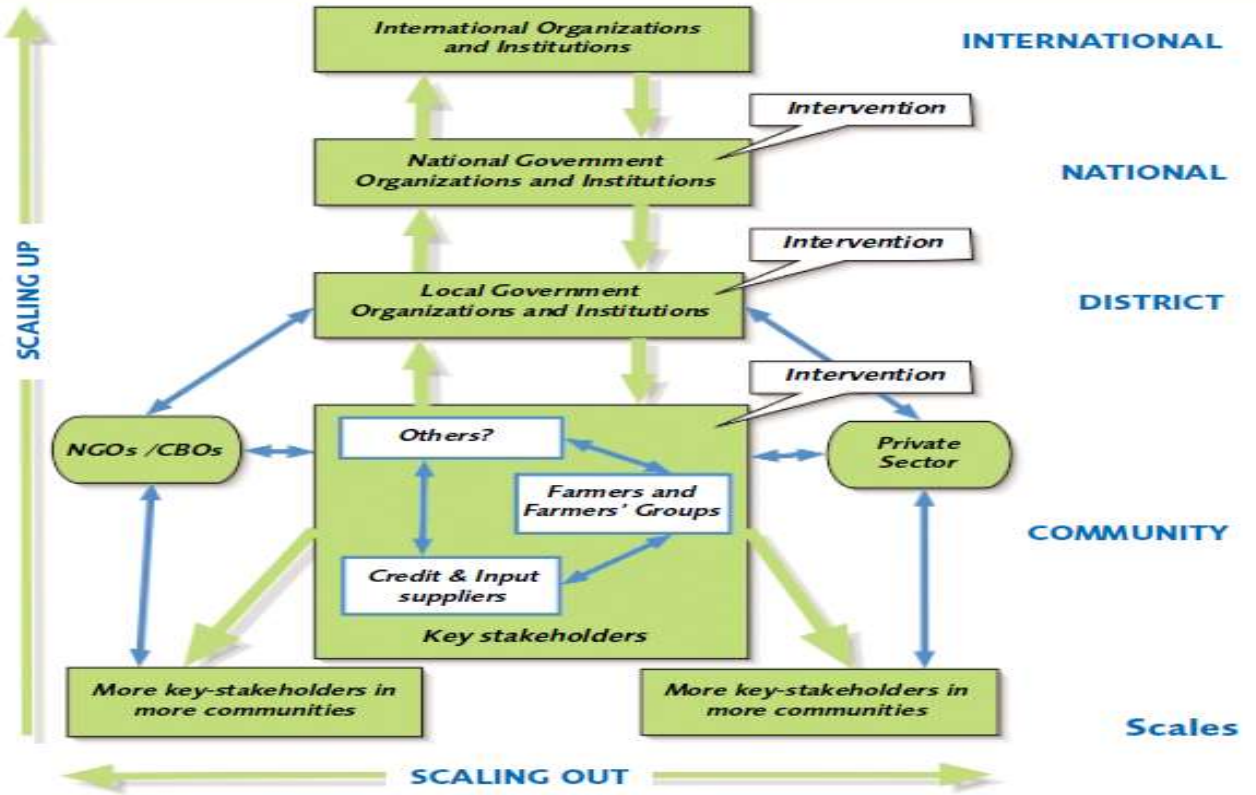
Spatial planning at meso-scale

..is a public sector approach which offers long and medium terms strategies for territories, **incorporating different perspectives**/objectives of sectoral policies (CEMAT (2006)) , e.g Integrated Development Plan

"…*NRM requires spatial management*" (Ostendorf 2011, p. 98)

Spatial Planning Tools can help **increase understanding of multi-sector and multi-level processes** and trade-offs between policy objectives of different sectors and between different planning scales

FIGURE 1 Concepts of vertical and horizontal scaling



Source: Douthwaite and Schulz (20

Spatial planning tools

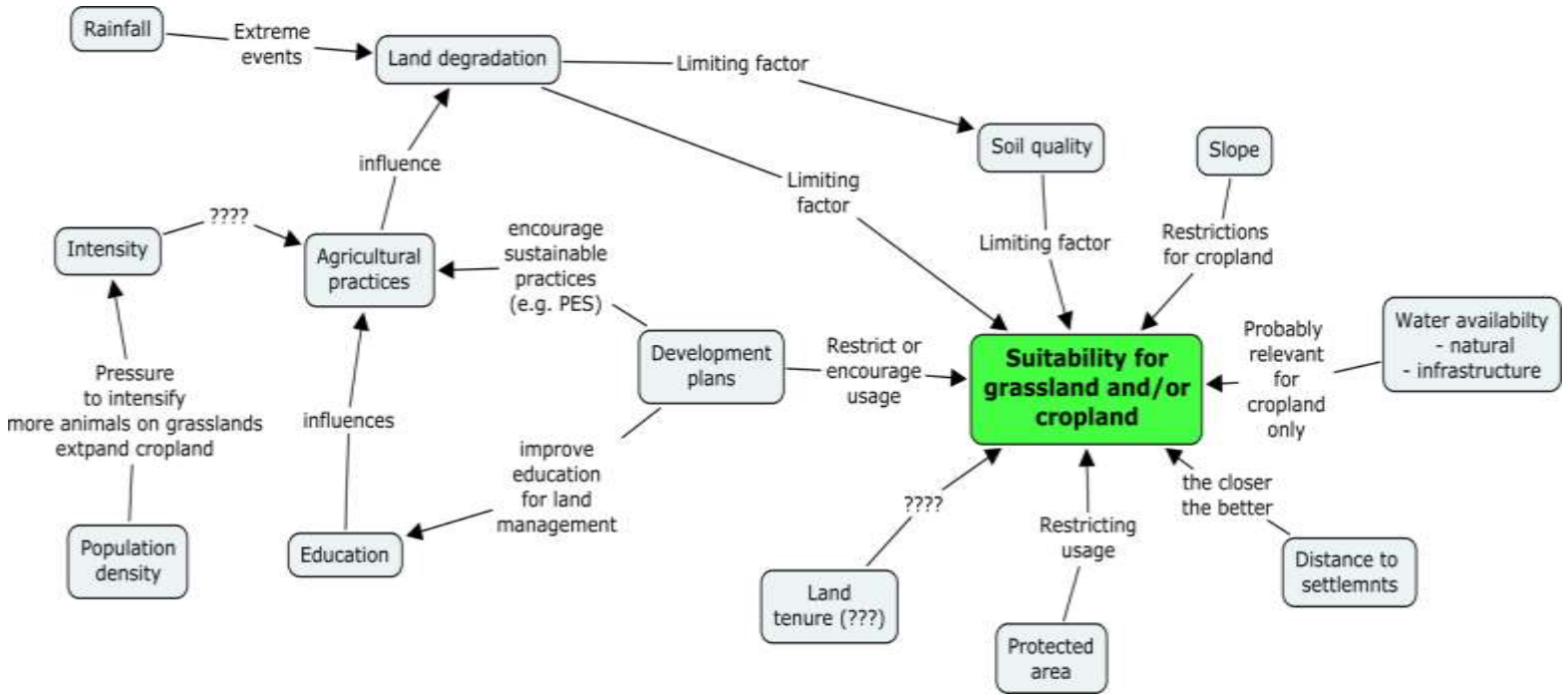
- Analyse multi-scale impacts of current and foreseen future developments;
- Analyse similarities and possible conflicts between national and local objectives, interests, and distance to ideal (sustainable use and allocation);
- Analyse similarities and possible conflicts sub-catchments, sectoral objectives, interests and similarities and possible conflicts;
- Design process / integrate strategies national and local objectives and interest in a meso-scale plan;
- Analyse trade-offs between multi-scale and multi-sectoral objectives given different strategies;

Spatial planning tools -Examples

Objective: A GIS-based method to assess land suitability
Purpose in (spatial) planning: Implementation of land reallocations recommended by this tool should help achieve suitable use of land resources and prevent land degradation.
Level of users: Tool developers. GIS analysis skills are needed for implementation of the tool
Data requirements: Remote sensing data, field data, GIS layers (DEM, soil, vegetation)
User friendliness: Users should be experienced in GIS analysis

Spatial planning tools -Examples

Mapping



Spatial planning tools -Examples

Objective: Develop a role-playing approach to GIS suitability analysis

Purpose in (spatial) planning: The tool aims to improve regional planning by identifying probable areas of future land use conflict

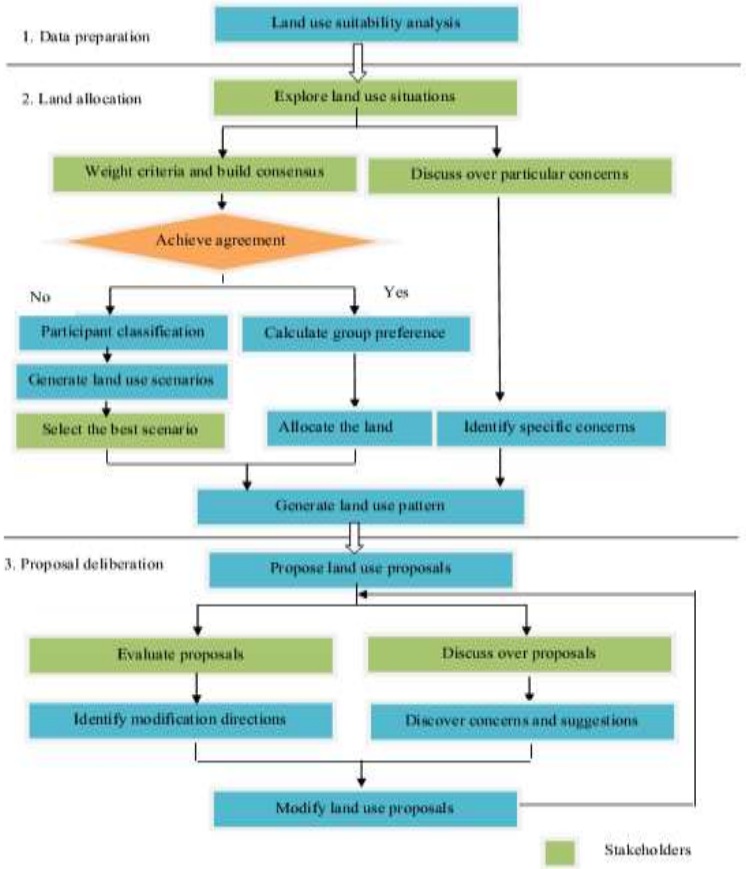
Level of users: Role play with stakeholders, planners and decision makers. GIS analysis supporting the role play is performed by tool developers

Data requirements: Remote sensing data, field data, GIS layers (DEM, soil, vegetation), land suitability maps

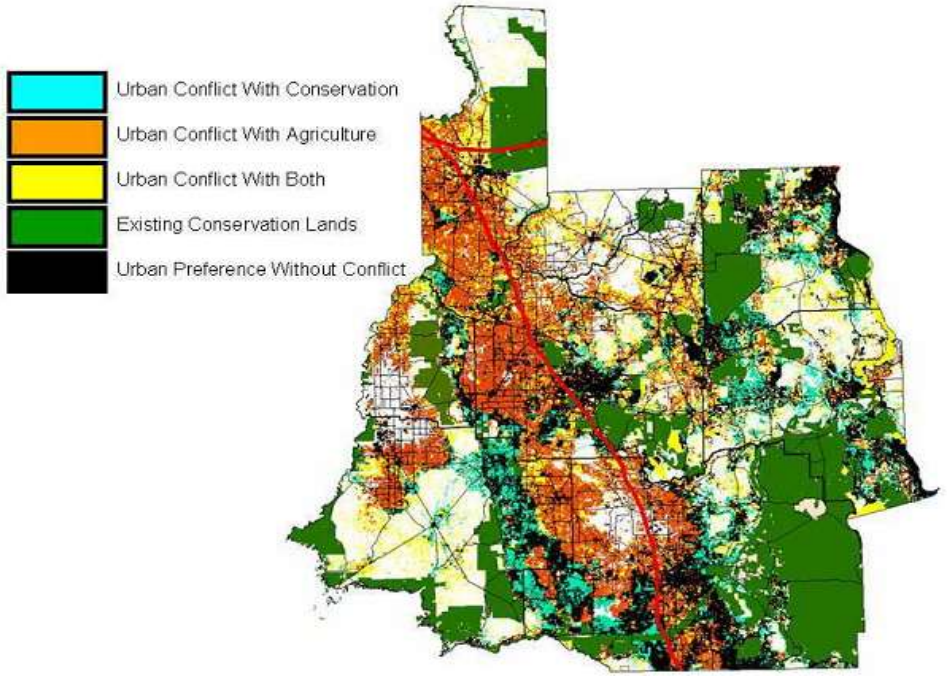
User friendliness: Easy implementation. Some training needed for the role play. Easy GIS analysis for suitability mapping.

Spatial planning tools -Examples

Mapping → **Conflict analysis**



with conflict resolution for public participation (Zhang et al., 2012).



Areas of potential urban conflict and no potential urban conflict (Carr & Zwick, 2005).

Spatial planning tools -Examples

Objective: Develop a multi objective land-use optimization tool to be used in a spatial decision support system

Purpose in (spatial) planning: Assist planners in finding the optimal land-use pattern

Level of users: Spatial planner who is skilled in using complex tools

Data requirements: Extensive data requirements

User friendliness: Graphical user interface is present, but needs a skilled operator

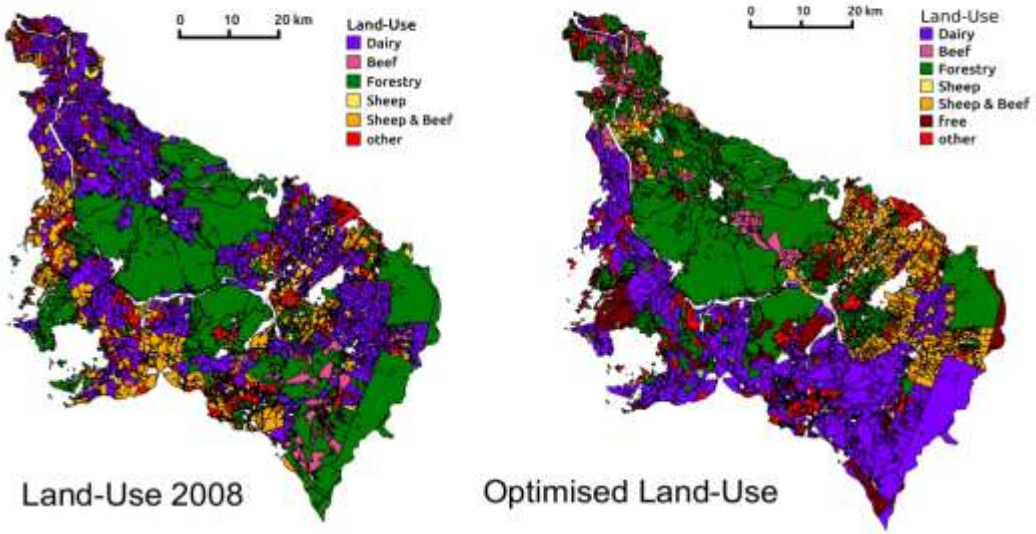
Spatial planning tools -Examples

Mapping → **Conflict analysis** → **Optimization and Multicriteria analysis**

Objective: min soil erosion; min nitrate leaching

Constraints: $$ = $$ (2008); n. l.<= 6573809 [kg/a]

Land-Use	Area	Nitrate Leaching	Erosion	Milk Solids	Wood	Meat	Wool
Total	-7	-8	-14	0	0	0	0



- Quantifying ecosystem service trade-offs using multicriteria decision analysis
- Multi-objective optimization of areal resource allocation

Spatial planning tools -Examples

Objective: A framework for development of Integrated Spatial Decision Support Systems

Purpose in (spatial) planning: explore future developments, combining autonomous developments with alternative policy options, in relation to the quality of the environment in which citizens live, work and recreate. Three scale levels are taken into account: national, regional and local. Spatio-temporal indicators can be derived and presented to planners

Level of users: Implementation of this ISDSS is done by IT-specialists in close cooperation with policy makers and scientists.

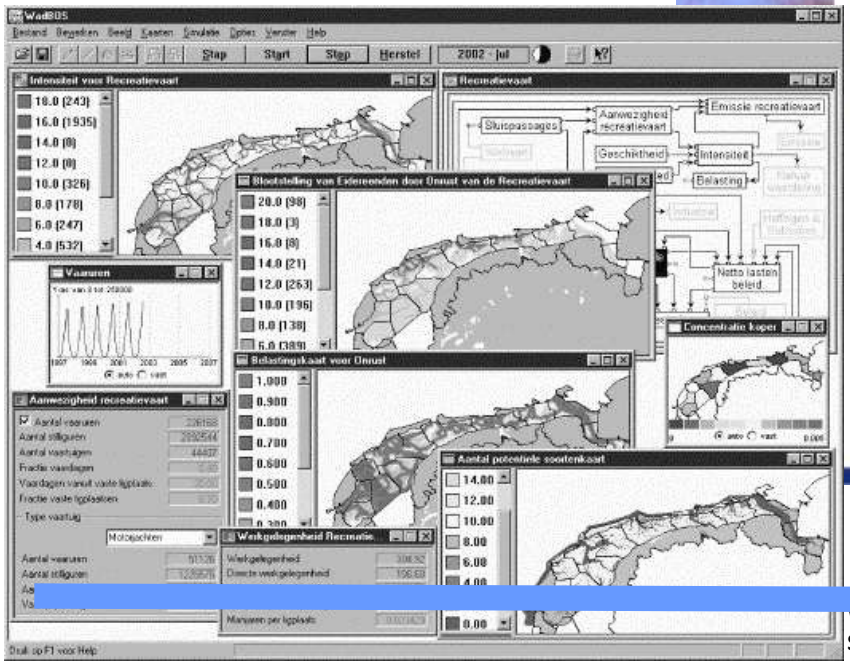
Data requirements: Socio-economic data (trends, GIS data), physical and environmental data (GIS data)

User friendliness: Although a graphical user interface is present, training is needed to operate it due to the complexity of the integrated tools.

Spatial planning tools -Examples

Mapping → **Conflict analysis** → **Optimization and Multicriteria analysis** → **Integrated Spatial Decision Support System**

Environment and Nature Outlook, based on an Integrated Spatial Decision Support System (courtesy: VITO, 2012), http://rma.vgt.vito.be/verkenner/verkenning.jsf



WadBos interface showing disturbing consequences of recreational boat Sea.

Spatial planning tools

The use of spatial planning tools in INRM process should result in:

- transparency in decision-making;
- knowledge and awareness of stakeholders (learning cycles);
- More sustainable decisions;
- Early-warning and prevention of resource overuse and sectoral conflicts

Method :

- Natural resources problems identification
- Participation in stakeholders meetings
- Inventory of existing spatial planning tools (web based: http://129.194.231.195/WP5_survey/form_WP5.php)
- Analysis and recommendations

Case study description

Uganda:

The Rwenzori Mountains region- deforestation, water pollution and soil erosion
Spatial planning tools at meso-scale: not used in the region, subject to further investigation,

Tunisia:

Oum Zessar watershed, located in Medenine governorate in south of Tunisia, water scarcity

South Africa:

uThukela watershed: soil erosion, caused from overgrazing, weak implementation of environmental policies

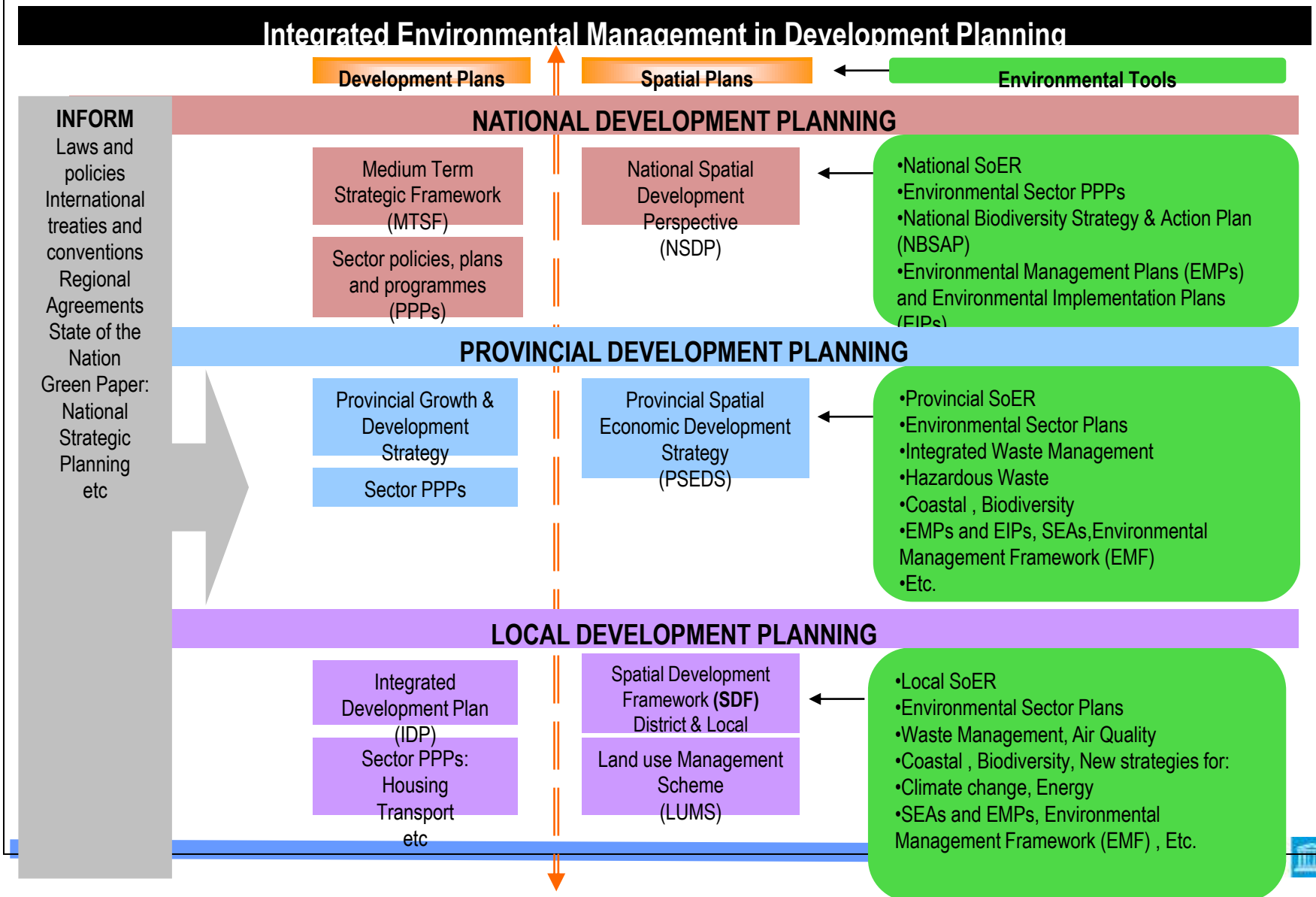
Mali :

Inner Niger Delta -the Mopti Region: **Diafarabé**, **Mopti** and **Akka-** main issue is seasonal **flooding**

Ethiopia:

Fogera located in the north-east of the Blue NIle basin:
Erosion and expansion of agriculture land – food security, poverty, population growth and land tenure system

Case Study Analysis –South Africa



Preliminary results and conclusion

- There is growing recognition of meso-scale planning for natural resources management in all the case studies
- Spatial planning tools do exist in the case studies,
  Hydrological models, water resource planning tools , species distribution mapping, agriculture resources mapping, geographical information systems (GIS), information technology (IF), Drivers of Land Use Change Analysis (DriLUC), Participatory Poverty, Livelihoods Dynamics (PAPOLD)
- Integration of these tools generally does not occur
- Tools are not accessible to local government,
  lack of capacity in government institutions to operationalize spatial planning tools
- Implementation gap – link between natural resource management and poverty alleviation is not clear and strong enough

Thank you!

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