A participatory integrated approach for promoting sustainability in developing countries: The case of the Mekrou River basin in West Africa.

Transboundary river basins support a range of economic, social and ecological services that are of fundamental importance to people in developing countries. A more efficient use of river basin water resources streamlined with development policies and specific measures are important for the economic development and poverty alleviation of such countries.

Within this context, this paper provides an evaluation framework of techniques for assessing the socioeconomic and ecological impacts of transboundary river basin development policies in developing countries. An empirical application of this framework is proposed for the Mekrou river basin in West Africa (Benin, Niger, Burkina Faso). Within this framework, achieving sustainable development in the Mekrou river basin requires a balance between securing the conservation of river ecosystems, promoting sustainable economic activities (e.g. more efficient agricultural crops) and adapting to the social and cultural characteristics of the local population.

The underlying overall objective of this article is to provide adapted tools to evaluate and to promote welfare in the Mekrou river basin, in relation to water use and to water conservation. The latter is further analyzed regarding some more specific objectives:

- Development of a framework in the Mekrou river basin where water resources and water-related ecosystem services can contribute to growth and sustainability in the three countries.
- Understanding the values of the Mekrou water resources and estimate how they contribute to regional economic sectors of great importance.
- Identification and presentation of the state of the art regarding the available socioeconomic data and methods/tools for analysis.

In order to achieve the above-mentioned objectives, this paper is organized as following.

The *first* part provides a participatory approach to identify sectors and priorities for the socioeconomic analysis. In close cooperation with local academic partners, the starting point of the socioeconomic analysis has been to define which sectors had to be investigated. This process has resulting in identifying the following 7 sectors of interest:

1. Households, 2. Agriculture and livestock, 3. Fishing, hunting, forest residues collection, 4. Industry/Transport/services, 5. Energy, 6. Ecosystem services / environment, 7.Tourism

For each of the predefined socioeconomic sectors specific priorities (in terms of problematic to be specifically addressed within the project) must be further assigned. The socioeconomic analysis will focus on these priorities, depending also on data availability and feasibility of the particular methods. Defining the development priorities for each sector is crucial for addressing and implementing the relevant methods and tools towards local development. These priorities of socioeconomic analysis have been assessed and validated, again by local partners and stakeholders.

Additionally, the sectors of analysis and their policy priorities are evaluated by conducting a Web survey to local stakeholders. Further assessing the sectors of analysis and their priorities a participatory approach has been used to identify sectors of interest and priorities related to water

and development in the Mekrou area. In October 2014, a web survey has been designed using the EU-survey tool. Based on discussion with local partners, a listing of potential stakeholders relevant for the project (individuals to be asked to pass the web-survey) was identified. The selection of the relevant stakeholders had to insure a valid representation of the three countries (Benin, Burkina Faso and Niger), a multiplicity of field of expertise (water, development and environment) and a diversity of type of institutions (NGOs, administrations, research and universities). We ended up with a listing of 75 potential stakeholders. Eventually, 40 out of them responded, which translates to a response rate equal to 53%, a quite high value for this kind of survey.

For each of the seven sectors under analysis, each respondent was asked to assess its level of relevance on a 5-level scale (not relevant, possibly relevant, relevant, strongly relevant, I don't know). Restricting our view to sectors which have been considered by respondents as "strongly relevant" for the analysis, four sectors appear to be of particular interests: Ecosystem services and Environment (77.5%), Agriculture (75 %), Fishing, hunting and residue collection (62.5%), Households (57.5%). The three following sectors have a lower priority in terms of pertinence for the project: Tourism (37.5%), Energy (35%), Industry/transport/services (20%). Regarding the four more important sectors as stated by the stakeholders, a further analysis for each sector has been done, where respondents evaluated a list of priorities which had been discussed with local experts, and they were asked to select their level of relevance of a 5-level scale scale (not relevant, possibly relevant, relevant, strongly relevant, I don't know). The last part of this web survey refers to the elicitation of preferences related to long term issues, which should be taken into account: population urbanization, demographic development, risk of conflicts, climate change, risk of water scarcity, pollution of water resources, ecosystem protection, extreme natural hazards, regional cooperation.

The *second* part of the article presents the core of the methodological framework, where the main theory as well as the specific methods and tools for estimating the economic values of the Mekrou water resources for various economic sectors are analyzed. The analysis and evaluation of the priorities mentioned in the previous section reveal the needs to develop an integrated assessment framework that will be able to respond to the specific needs of the Mekrou river basin and to perform economic analysis for the most important sectors of interest. In this context, the methods and tools that can be applied to address the development assessment framework in each sector are analyzed. The purpose of the economic tools we propose is twofold:

1) Predict water use by sector under current and future conditions;

2) Predict economic value of water use by sector under current and future conditions.

We explain here the various economic tools, which can be used to feed this integrated approach, we present these tools sector by sector, and we explain the type of priorities which are adressed by each of them.

Assessment tools per priority category

Tools / Methods	**Priorities adressed**
Tool 1. System of indicators	Households / Agriculture and livestock,
Tool 2. Household survey / contingent valuation / choice experiment	Households / Ecosystem services, environment

Tool 3. Travel cost survey	Ecosystem services, environment / Tourism
Tool 4. “TEEB-style” analysis	Ecosystem services, environment

The implementation strategies are presented in the *third* part. The criteria applied to evaluate the feasibility of the methods/tools relate to a) the different categories of available data b) the availability of resources and c) the participation and active involvement of the local stakeholders and actors. In regards to these issues, potential outcome is analyzed as well as the limitations and challenges of the methodology.

Summarizing, we present a participatory integrated approach based on a set of methods to assess the socioeconomics and environmental aspects of transboundary river basins in developing countries. This approach is applied to the Mekrou river basin in West Africa (Benin, Niger, Burkina Faso). The proposed framework has various potential policy implications. Such a framework can be applied within an integrated approach of hydro-economic modeling and the estimated socioeconomic and environmental values can be used by policy makers in order to evaluate development plans taking into account the use of river basin resources.