

A Multi-disciplinary Approach to Vulnerability Assessment and Transboundary Water Governance: The Case of the Sesan Basin

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Abstract

Water governance, especially in transboundary contexts, needs to integrate inputs from different disciplines as well as from stakeholders and the public and scientific knowledge from the natural and social sciences needs to be combined with local knowledge and stakeholder needs. There is however often a lack of suitable methods for combining these. Within the EU-financed STRIVER project (www.striver.no) integrated interdisciplinary assessment of four river basins is being conducted; the Sesan (Vietnam-Cambodia), Thunga Bhadra (India), Tejo/Tajo (Spain-Portugal), and Gomma (Norway) Rivers. The project's focus is on heavily modified rivers in Europe, India, and south-east Asia and this paper describes the approach used in the Sesan Basin, an approach that combines ecological and human vulnerability studies with future scenarios.

1. Introduction

Changes in water governance in different countries and parts of the world can be very dissimilar in character; they do however seem to have one thing in common, that the challenges facing water managers have significantly increased. Water management now has to deal with more issues that affect more people than they did in the past (i.e. water management involves not just hydro-electric power and farmers, but also industrial interests, nature conservationists and ordinary citizens). Water management has increasingly become concerned water-related risks and benefits, and whereas water management has traditionally been considered a predominantly technical field in many countries, the increase in scope, and new demands on water management, now make the political character of the field very clear. These developments from the primarily technical to a combination of technical and political-social spheres has lead to an increased interest in public and stakeholder participation in water management. It has become apparent that there is a need to truly integrate insights and knowledge from the natural and social sciences, as well as local knowledge from stakeholders and the public, in integrated and multi-disciplinary approaches. Participation is of course only one of the challenges for water management, problems arising from the production of scientific information, the communication of that information, legal systems, and institutions are also important (Gooch and Stålnacke 2006). Rapid changes in the driving forces behind water problems have also increased the levels of uncertainty under which policies must be formulated, and have increased the necessity to involve many different groups of actors. While this in turn has lead to an increased awareness of the necessity of including stakeholder and public participation in water management decision-making, as well as in other areas (OECD 2001), it is also important to stress that reliable information must be made available to the public in an understandable form. While we note that local knowledge can also contribute to water management processes, it is vital that public participation is also based on an

understanding of the knowledge provided by the scientific, engineering, and management communities.

Changes in water use, the effects of global warming, and increasing populations mean that water management also needs to focus on different aspects of vulnerability, ecological, economic and social. In order to do so new methodologies need to be developed and ways of involving actors need to be improved. The design and application of a multi-disciplinary approach to vulnerability assessment and transboundary water governance is being conducted as part of the STRIVER Project (www.striver.no). STRIVER conducts an integrated interdisciplinary assessment of four river basins (Sesan (Vietnam-Cambodia), Thunga Bhadra (India), Tejo/Tajo (Spain-Portugal), Gomma (Norway), and through twinning facilitates the exchange of knowledge and experience. The point of departure for STRIVER is the lack of clear methodologies and problems occurring in the implementation of IWRM, as pointed out by both the scientific and management communities. Building upon the development of a multidisciplinary knowledge base assessment in all case studies (policy, social and natural sciences), and the development of a conceptual framework for IWRM, the project seeks to apply IWRM methodologies within the four selected twinned catchments covering six countries in Europe and Asia. The project has received EC funding for three years (2006-2009) under the 6th framework programme (FP6). The multi-disciplinary approach described in this paper will be applied in two transboundary river basins, the Sesan and Tejo/Tajo. This paper focuses only on the Sesan basin, and provides a description of the methodology used and the results to date.

2. The Sesan Basin

The Sesan River is one of the largest tributaries of the Mekong River with a drainage area of 17,000 km², (11,000 km² in Vietnam and 6,100 km² in Cambodia). With its origin in the Central Highlands of Vietnam and the southernmost part of Laos, the river flows through mountainous areas in Vietnam's Dak Lak, Gia Lai and Kon Tum Provinces before entering Northeast Cambodia, where it moves into relatively lowland areas. In Cambodia, the Sesan winds from east to west through Ratanakiri Province and into Stung Treng Province, where it merges with the Srepok River, another large tributary of the Mekong and then flows east into the Se Kong River just before this river entering the Mekong River close to the Stung Treng Town. Traditionally people have relied on subsistence agriculture and fishing, developing techniques suited for small-scale water utilization. The increase in population and modernisation has created a demand for more intensive utilization of the water resources, such as large-scale hydropower production, large-scale irrigation and increased water supply for urban populations. This has resulted in more discharge of effluents. While small-scale hydro-electric power production is often managed locally, it is the central authorities that drive large scale water projects. Both forms can create problems, but it is often the large-scale production that has created unforeseen negative impacts for local communities which are still embedded in an older subsistence oriented system. The intensified use of water for power production is also at odds with the needs of agricultural irrigation. If Vietnam and Cambodia are to meet the growing demand for hydropower, water for irrigation and urban water supplies as their economies develops, there is a need to modernise the management of the water sector. In both countries reform of the management of the water sector has started, but there is still a long way to go to be able to secure the "rights" of all water user interests, as well as to maintain a healthy aquatic environment.

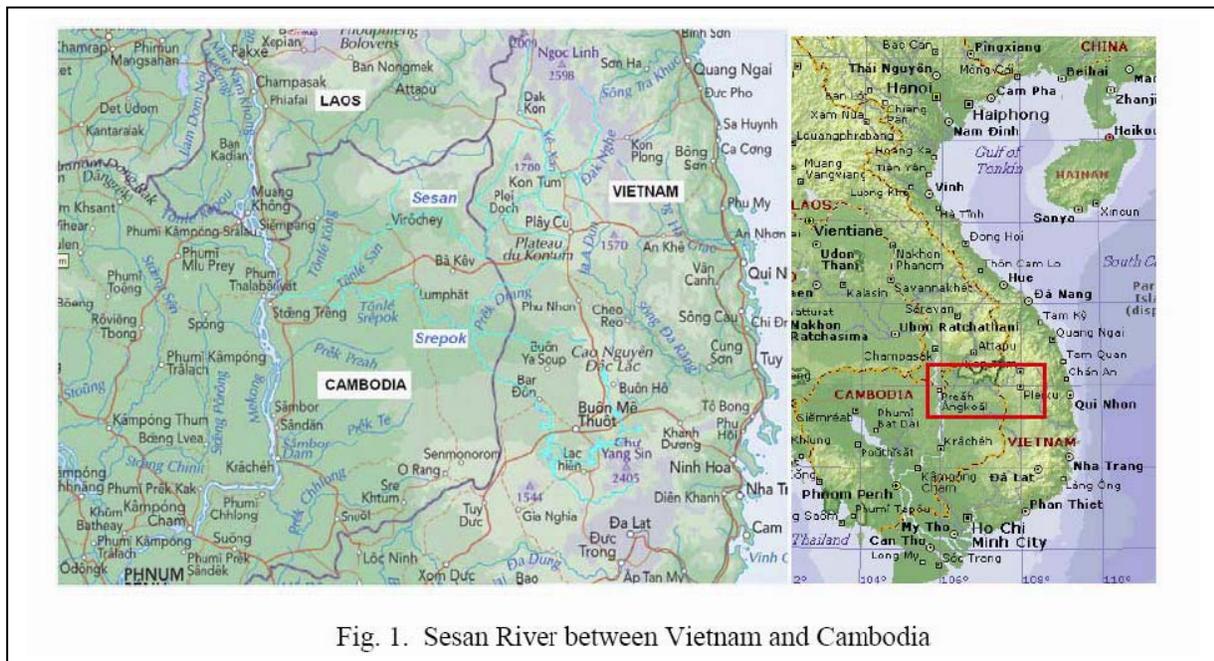


Fig. 1. Sesan River between Vietnam and Cambodia

In both Vietnam and Cambodia, authorities exist at the national, provincial, and district level. The organisation of these authorities is based upon a communist administration system with a strong central-state role. However, due to the large number of research institutions and multilateral and bilateral aid programmes working on the Great Mekong Sub-Region (GMS), the Sesan represents a case with a multitude of actors, both national and international. The national ministries responsible for the management of the Sesan interact in the context of their work on the Mekong and Srepok Rivers and Cambodia and Vietnam are both members of the Mekong River Commission, a co-operative forum for both the utilization and protection of the Mekong River and its tributaries. Also, an *ad hoc* Sesan River Committee has been established, but no permanent basin commission has yet been established.

3. Vulnerability Assessment and Transboundary Water Governance

The analysis of transboundary water governance within the Sesan Basin adopts *vulnerability* as a unifying idea between different disciplines. UNEP have defined vulnerability as ‘the interface between exposure to the physical threats to human well-being and the capacity of people and communities to cope with those threats’ (UNEP GEO3). Vulnerability should therefore be considered a combination of social and bio-physical processes, as human ability to manage physical threats is of vital importance. A region may be faced with significant physical problems, yet because of a good economy, competent management systems, and political will, still be considered less vulnerable than a region with smaller physical problems that does not have these human resources. Four vulnerability assessments are therefore considered in the Sesan Basin: i) bio-physical; ii) socio-legal-economic; and iv) stakeholder-based. The bio-physical based identification of vulnerability involves conducting an analysis of areas considered vulnerable according to certain natural science criteria. Key variables include; land use, land cover and river bank use (irrigation systems, location and type of dams); infrastructure (roads, trains, canals, river navigation); possible future developments; topography, including river bed profiles; water levels and water flows; water level fluctuations; and the location of protection areas. The socio-

economic vulnerability assessment involves an assessment of population of the basin, including ethnic groups; administrative divisions and maps; education levels and training programmes; economy (distribution of wealth and income, employment); literacy; literacy; urban-rural divisions; economic policies; ownership patterns; activities of civil society (levels of participation); HEP regulations; environmental flow regulations; drinking water needs and availability; fishing; recreation and tourism. The legal analysis involves an assessment of the gaps within the existing system; identification of any barriers to the implementation; and, through an indicator based evaluation, a measurement of compliance and enforcement. Added to these two we are also conducting stakeholder-based vulnerability assessment that involves an identification of the main areas of concern through stakeholder group discussions (workshops and interviews), creating 'mind maps' of these areas of concern, then comparing the maps of concern to those produced in the other two vulnerability assessments. Having conducted the analyses of areas considered vulnerable in terms of natural science, socio-economics, law and policy, and stakeholder perspectives, maps are then constructed in a GIS system. The aim of the maps is to identify basin 'hot-spots', ie., places where there is a high risk (according to natural science criteria), and a low capability (according to the socio-economic, law and policy criteria). The stakeholder perspectives data will then be superimposed to look at similarities and differences. Finally, using the method developed by Gooch and Stålnacke (Gooch and Stålnacke 2006) scenarios will be developed. These scenarios will take into account the two main perspectives; natural/hydrological risk and socio economic ability to cope with effects of this risk. Working in a 15-year perspective, the scenarios will examine future possible trends and developments in nature/hydrological risk and socio-economic ability to manage risk.

The method thus follows the following schema:

1. An overview of the areas considered vulnerable according to natural science criteria.
2. A similar overview of the areas considered vulnerable from a socio-economic, legal and political point of view, including law.
3. The construction of maps that can be used in GIS systems.
4. The incorporation of both aspects (1 and 2) into a GIS database.
5. The identification of the basin 'hot-spots', that is, the places where there is a high risk (according to the natural science criteria) and a low capability to manage those risks (according to the socio-economic and political criteria).
6. The identification of the main areas of public concern through stakeholder group discussions.
7. The creation of 'mind maps' of these areas of concern.
8. The use of the knowledge gained in these processes to construct combined qualitative-quantitative scenarios (Gooch and Stålnacke 2006).

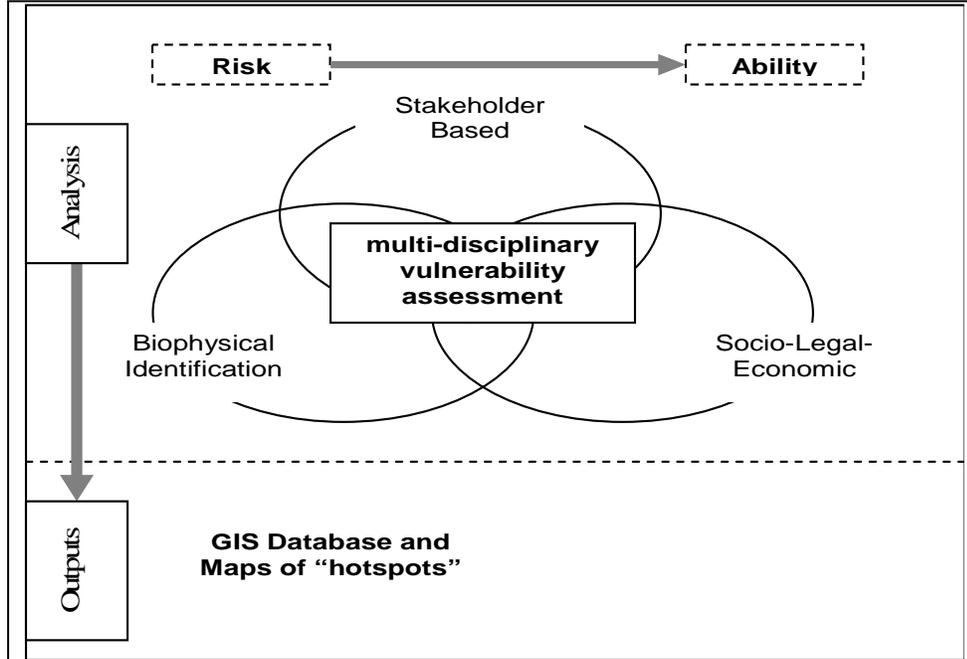


Figure 2. Methodology used for vulnerability analysis in the Sesan Basin

4. Vulnerability scenarios

During recent years the use of scenarios for environmental policy-making has attracted considerable attention from both the scientific community and policy-makers (see, for example, (Greeuw, Asselt et al. 2000)). Many of these applications have however either focussed on larger spatial scales, such as countries (Kahane 1997), or have utilised relatively well-known cases where information, while not comprehensive, has been comparatively readily available (Greeuw, Asselt et al. 2000). In the case of regions, and especially Transboundary water management, scenarios have not yet been so widely used. Scenarios are not precise predictions of the future (Porter 1985) but should be seen as simulation tools, as a technique similar to, but different from, models (Jouvenel 2000). Alcamo (Alcamo 2001) identifies five main elements of scenarios; these are a description of the changes that may take place; of the main factors and driving forces that influence these changes; a definition of the beginning year of the scenario, the base year; the selection of the time frame for the scenarios and the adoption of time steps; and the construction of the storylines, which are narrative descriptions of possible futures. Scenarios, through their simplification of available information and their use of alternative, possible futures, can make the process of challenging uncertainty in water management easier. Utilising past and present trends, scenarios attempt to see which factors might lead to likely futures. A qualitative/quantitative method will be used in the Sesan Basin, where qualitative/explorative scenarios will be used as input into computer-generated models that can best be described as quantitative/explorative in the first stage, and quantitative/normative in a second stage. This combination of storylines and set of model calculations is similar to that used in the 'World water vision scenarios – the world water situation in 2025'. The European Environment Agency report 'Scenarios as tools for international environmental assessments' (Alcamo 2001) also proposes a 'story-and-simulation' (SAS)

approach to developing scenarios and a variant of the SAS model will be used in this study.

5. Conclusions

The Sesan Basin study is part of a larger project that facilitates knowledge and experience exchange between river basins in Europe, India and South East Asia. The methodology used in the project aims at facilitating the utilisation of scientific and local knowledge in an integrated manner and the use of physical and human vulnerability studies, combined with qualitative/quantitative scenarios, will allow many different actors to become involved in water governance in the region. A first stakeholder workshop, held in Pleiku in Vietnam in December 2006, has initiated the process and more meetings with stakeholders and water managers are planned for the spring of 2007. The project aims at integrating perspectives from the polity, water managers, stakeholders and the public, and as such is expected to contribute to the development of our knowledge of governance mechanisms and perspectives in the South-East Asian region.

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