



## Editorial

## Impact assessment of land use policies: Introduction

## ARTICLE INFO

## Keywords:

Integrated assessment  
Ex-ante analysis  
Policy options  
Modelling tools  
Participatory approach

## ABSTRACT

This special issue is built around a series of impact assessments of land use policies and sustainable development in developing countries, carried out in the EU-funded project LUPIS (Sixth framework programme, Global Change and Ecosystems, Contract 36955). The project targeted at the development and testing of impact assessment tools of land-use-related policies in seven developing countries: Brazil, India, China, Indonesia, Kenya, Mali and Tunisia. This issue presents the current understanding of ex-ante assessment and includes contributions with comparative work across several countries, and case studies in individual countries, addressing important land-use related concerns.

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The 'tragedy of the commons', introduced by [Hardin \(1968\)](#) is an increasing reality for people that mainly depend on the availability of natural resources for their livelihoods. This well-known dilemma occurs when several individuals act in a way which is in their own self-interest, yet the sum effect is to deplete a valuable resource, leaving all worse off ([Conner, 2012](#)). The common example is the overgrazing of pastures, when a rational herdsman tries to put as many of his animals on a common pasture, and so does each and every rational herdsman sharing a commons. Freedom in a commons leads to the inevitable result of overexploitation and ruin. In a reverse way, the tragedy of the commons reappears in problems of pollution ([Hardin, 1968](#)). The rational person finds that their share of the cost of the wastes they discharge into the commons is less than the cost of purifying their wastes before releasing them. In the case of developing countries, where primary production (agriculture and forestry), is one of the main sectors of economic activity, this creates conflicts around the use of land and water, if not or poorly regulated. In those cases, the benefits of an additional production unit exceed the costs. Whether it is about utilising forest area for agricultural and wood production in Brazil ([Verburg et al., 2011](#)), overuse of water for irrigation in Tunisia, increasing conflicts with other users like tourism and industry ([Jeder et al., 2011](#)), agricultural pollution of Taihu lake in China serving as water reservoir to thousands of people ([Reidsma et al., 2011](#)), conflicts between environmental, social and economic interests can easily evolve. [Hardin \(1968\)](#) saw two solutions to this problem: (1) resource regulation through government intervention and (2) privatization. Government intervention cannot be effective unless supported by individuals and communities, as follows from the work of [Ostrom \(2009\)](#), who challenged the work of Hardin arguing that individuals and communities can manage their own collective resources. There is thus a clear role for land use policies in effectively preventing conflicts on overusing land and water, in leading the society towards more sustainable development, provided that responses of individuals to government intervention is accounted for. But what are the suitable policy instruments and how general or specific should they be?

Research on possible impacts of (land use) policies can provide insights to sustainable ways of regulating the commons and also to the acceptance of policies that makes them effective (see for example [Bezlepikina et al., 2011a](#)). In Europe, for example, before a (land use) policy is implemented, an impact assessment must be conducted on its possible impacts, following Impact Assessment Guidelines ([EC, 2009](#)). Aiming at sustainable solutions globally requires knowledge on performing Impact Assessments to be available as well. In the LUPIS project (Land Use Policies and Sustainable Development in Developing Countries), researchers from different countries, cultures and backgrounds collaborated in developing a common methodological framework and modelling tools for implementation, to address issues of land use problems in seven case studies ([Reidsma et al., 2011](#)). Although each case study dealt with a specific land use problem requiring targeted land use policies, all contributed to understanding conflicts around competing claims. In order to assess these consistently, a methodological framework for sustainability impact assessment (SIA) has been developed that allows ex-ante assessments including (1) multiple land use sectors, (2) multiple dimensions of sustainability, (3) multiple spatial scales, and requires the involvement of stakeholders and use of solid (modelling) tools for analysis.

## This issue

This issue presents six research papers that contribute to the understanding of conflicts arising from collective (over)use of publicly owned resources and the role of policy in dealing with those. The case studies analysed in this issue are all part of a bigger research project (LUPIS) and their choice was driven by current needs of policy to propose solutions to existing conflicting claims in the case study areas. The research papers in this issue present impact assessments of land use policies in the case studies of Brazil, India and China, as well as comparative work on the basis of the case studies.

As was stated in the introduction, in selecting policy options, and in assessing their impact, it is important to be realistic about

the willingness and ability of the government to implement them, as well as the support for these policy options by individuals and communities. It is thus crucial to build this institutional aspect into the assessment methodology. In the paper of [McNeill et al. \(2014\)](#), the authors develop 'policy-specific governance indicators', that is, indicators not of general government performance across all sectors, ministries and types of policy and policy instrument, but rather indicators of the actual performance of particular policies and instruments (or, if necessary, suitable proxies derived from similar policies and instruments). The paper not only highlights the importance of considering governance in impact assessment tools, but also explores means for its implementation. One option, as the authors suggest, is to introduce this consideration right at the beginning of the analysis, so that the alternative scenarios that are taken as the basis for subsequent analysis are designed to include alternative levels of governance. A second option is to introduce it at the end of the process, seeing poor governance as a sort of 'dampening effect' on policies. The paper illustrates how such an approach may be applied by reference to three case studies: Indonesia, India and Brazil. Case study papers in this issue illustrate these aspects further in detail.

Two papers on the case study in Brazil ([Verburg et al., 2014a,b](#)), refer to the conflict that the states of Mato Grosso and Pará are facing in the process of agricultural expansion due to an increase in the international demand for commodities like soy and beef on the one side and conservation of the Amazon rainforests, important for carbon storage and biodiversity, on the other side. As the introduction suggests, a way to overcome this conflict between forest and agricultural land could be the design of a new policy protecting current forest land and regulating the expansion of agricultural area. The Brazilian government applies two main kinds of policies to protect part of the species-rich Amazon forest; first by establishing conservation units that include an array of reserve types from natural areas to indigenous lands, and second by enforcing the Forest Code, a law that limits the occupation and use of forests in Brazil. The question is: what is the potential impact of such policies on the deforestation in Brazil and on the sustainability in the regions of Mato Grosso and Pará? This question is dealt with by developing and employing a land use simulation model ([Verburg et al., 2014a](#)). To deal with institutional aspects, land conservation policies that are assessed in scenarios include the effectiveness of their implementation and maintenance through low or high governance. The authors conclude that the modelling projections on the Forest Code reform show substantial increase of deforestation rates and suggest that deeper discussions overcoming the old dilemma between economic development and environment are necessary.

[Patil et al. \(2014\)](#) focus on policies stimulating organic agriculture in the state of Karnataka, India. Organic agriculture is seen as a way to address socio-economic problems in the region ([Purushothaman and Kashyap, 2010](#)). The impact is assessed by comparing the impacts of conventional and organic farming practices along a set of environmental, social and economic indicators (see also [Purushothaman et al., 2012a,b](#)). It is shown that organic farming has potential to increase net returns, reduce the risks of crop failure and reduce environmental impacts. However these advantages are shown to be site-dependent and organic farming might lead to soil nutrient depletion and decreasing yields, if the livestock density and manure production is insufficient. Authors conclude that policies stimulating organic farming should consider differences in agro-climatic conditions, farmers' preferences on the choice of management practices, and thus be region specific. In the Indian case, the role of NGOs was to raise awareness among farmers on the importance of sustained soil productivity through training in organic techniques, market facilities and certification. This was very important in achieving impacts of the organic policy as quantified in this study for the period 2006–2009 ([Purushothaman et al.,](#)

[2012a](#)). Social indicators, which were not addressed in the modelling study in this issue ([Patil et al., 2014](#)), were also an important reason for adoption ([Purushothaman et al., 2013](#)). Farmers want to be independent and more labour is seen as a benefit rather than as a cost.

It remains a challenge to quantify impacts that various governance options may have on the final outcome of policies. In a case study of China, the use of chemical fertilizer has played a vital role in increasing agricultural production which, however, results in water pollution of Taihu lake. Experiments and demonstrations indicate that stimulation of Site-Specific Nutrient Management (SSNM), a very important policy in the scheme of Payment for Environmental Services, not only increases agricultural yields as well as farmers' income, but also reduces pollution and protects the agricultural environment ([Asai et al., 2010](#); [Reidsma et al., 2011](#)). Therefore, improving the understanding of farmers' willingness to accept SSNM and the effect of implementing SSNM on economic and environmental sustainability is of great importance. The paper by [Ma et al. \(2014\)](#) attempts to quantify factors influencing farm decision-making regarding the application of chemical fertilizers by farmers. By employing ex-post technical efficiency analysis, the authors conclude that improving farmers skills (on e.g. the use of fertilizer) and more importantly raising environmental awareness is the key entry point to increase efficiency of fertilizer use and thus to reduce the pollution, keeping the same level of rice yields. Thus, for improvements of nutrient management in Taihu Basin in China to be continued into 2025, next to setting buffer zone strips, subsidies, and encouragement of applying SSNM ([Reidsma et al., 2012](#)), efforts by e.g. extension bodies or NGOs are expected.

The comparative analysis of seven cases (including Kenya, Mali, Tunisia and Indonesia not otherwise presented in this issue) regarding their current sustainability concludes the issue ([Nesheim et al., 2014](#)). The DPSIR framework which was applied in all LUPIS case studies to scope the problem and to narrate baseline and alternative scenarios of sustainable land uses, was also used to compare the studies. The paper briefly narrates the problems in all case studies. It illustrates that, although the nature of land use conflicts is very diverse, all case studies experience similar types of pressure through land use change leading to similar types of losses in commons: land degradation, reduced biodiversity, reduced water availability and quality. In every case the solutions studied deal with regulatory mechanism (as proposed by [Hardin \(1968\)](#)), but also do build on the ability of the communities to govern the commons. However, the challenge is in finding the right mechanisms to utilize this ability of communities to organize for proper implementation of such mechanisms, and to monitor the process of their implementation.

While [Nesheim et al. \(2014\)](#) provide a comparative analysis of the so-called pre-modelling phase, [König et al. \(2013\)](#) employ a comparative analysis that includes the modelling and post-modelling phases. As each case study had different land use problems, data availability, etc., not in all case studies modelling tools were applied; and if used, they were different. However, in all cases the Framework for Participatory Impact Assessment (FoPIA) could be applied, and five cases were compared. It was shown that using stakeholder knowledge and the Land Use Function (LUF) framework, with three LUFs per sustainability dimension (economic, environmental, social), allows comparison of impacts of different kinds of land use policies in different environments.

## Lessons learnt

Linking the on-going policy debates in the developing countries studied (e.g. new Forestry Code in Brazil, organic agriculture policy in India, establishment of buffer strips around Taihu lake in

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