First draft of "Recommendations on Interdisciplinary Landscape Research" - Workshop No. 2: Monitoring multifunctional terrestrial landscapes

Brandt, Jesper

Published in:
Multifunctional Landscapes. Interdisciplinary Approaches to Landscape Research and Management

Publication date:
2000

Document Version
Early version, also known as pre-print

Citation for published version (APA):
Brandt, J. (2000). First draft of "Recommendations on Interdisciplinary Landscape Research" - Workshop No. 2: Monitoring multifunctional terrestrial landscapes. In J. Brandt, B. Tress, & G. Tress (Eds.), *Multifunctional Landscapes. Interdisciplinary Approaches to Landscape Research and Management: Conference material for the international conference on "Multifunctional Landscapes: Interndisciplinary Approaches to Landscape Research and Management"* (pp. 157-161). Centre for Landscale Research.

First draft of "Recommendations on Interdisciplinary Landscape Research" – Workshop No. 2: Monitoring multifunctional terrestrial landscapes

Prepared by Jesper Brandt
Centre for Landscape Research, University of Roskilde, Bldg. 19.1, P.O. Box 260,
DK-4000 Roskilde, e-mail: brandt@ruc.dk

1. Integrating trends in the growing need for terrestrial landscape monitoring

Terrestrial landscape monitoring is still at the foundation stage, mostly seen in a goal-oriented context of a biologically oriented terrestrial monitoring for nature-policy purposes. It should however widen to a broader perspective, since there are many important development trends these years that merges together in an interest for monitoring at the landscape level. One should be aware of these other aspects that might support the monitoring, which is often an expensive, time-consuming and organisationally complicated activity. Among these trends the following should be mentioned:

1. A growing understanding of the connection between a variety of environmental problems and land use processes has been recognised at the political level resulting in different types of direct or indirect regulations of land use and its intensity. Since this connection however obviously differs between different types of landscapes at different geographical levels, a linkage of environmental monitoring to a landscape-oriented land use and land-cover monitoring is more and more recognised.
2. Landscape-related regional and local differences in population density, in intensity of economic activities as well as in traditions concerning the management of the culturally transformed landscape, offers different opportunities and obstacles in solving environmental problems. The resulting differentiation in economic activities and environmental problems will give rise to economic, social and political tensions that has to be studied also in a context of on-going changes in landscape structure and function.
3. Recent changes in agricultural policy seems to give rise to a general shift in land use strategy in many types of agricultural landscapes, often described as the post-productivist transition. Within this frame, a productivist phase of intensivation, concentration and specialisation resulting in growing contradictions between the natural structure and dynamics of the landscape and a monofunctional and homogeneous type of land use seems to be gradually replaced by a trend towards extensivation, diversification and dispersion of land use activities, that furthers a more multifunctional land use, where each function is less intensive and thus more landscape-adapted than hitherto. It is however probable that the productivist and post-productivist strategy will develop parallel and mutually, which only deepens the need for systematic studies of the trends that in any of the two cases will influence and be influenced by the different conditions given in different types of landscapes.
4. The technological changes of the productivist phase of modern agriculture were often characterised by labour-saving investments, not sensitive to a differentiation in environmental and landscape conditions. So, in general this type of 'non-spatial' technology has often focused on the shaping of common environmental conditions, not only furthering the segregation in land use and monotonisation of agrarian landscapes, but also ignoring the landscape dimension within planning and management in general.

Especially the development within information technology has recently changed this situation, so that today's land use technology is much more oriented towards the economical as well as ecological advantages of adapting the land use processes to the landscape conditions. This development will indeed also influence the trend of the post-productivist transition.

5. Regional planning in the productivist phase was often supporting the 'non-spatial' technology by economic support for homogenisation of environmental conditions in form of melioration, farm amalgamations etc. as well as zonal legislation, giving regional or local priorities to intensive monofunctional types of land use. Along with the post-productivist transition and the changing technological possibilities, growing endeavour for more sophisticated types of direct or indirect land use regulations develop, gradually replacing the former tradition of planning for a segregated land use. This is however only possible if a better understanding of the linkage to differences in landscape conditions are known and recognised, and the conflicts related to these matters are better regulated.
6. Finally trends in urbanisation processes towards much a more dispersed pattern of settlement and economic activities can be observed. This is primarily linked to the development in transport technology and networks, but also trends in information technology, growing amount of leisure time and dissatisfaction with the environmental and social conditions in the existing urban areas (e.g. many cottage settlements) is given rise to urban sprawl that in different ways calls for a more multifunctional use of our landscapes.

All these trends are giving rise to considerable changes in land use and land cover as well as in the natural and social functions of our landscapes. Whether these changes are developing in a direction towards a more sustainable use and management of our landscapes is an open question. It should however be suspected that both positive and negative trends can be found and that trends related to both changes and landscape functional consequences can be related to natural, socio-economic and cultural characteristics of landscapes nested together at different levels. An overall goal for terrestrial landscape monitoring should be to detect such trends in a systematic and reliable way. A monitoring of multifunctional terrestrial landscapes include additionally the thesis that the systematic monitoring of different aspects of landscape functionality might add to the understanding of ongoing landscape changes and widen the possibilities for the formulation of policies for a more sustainable use of our landscapes.

Based on the experiences developed mainly through landscape-ecology-oriented research on landscape surveillance gradually developing towards a '1. generation terrestrial landscape monitoring', a variety of preliminary guidelines for the further development of monitoring of multifunctional terrestrial landscapes can be stated. Three different main areas for recommendations for future research can be derived:

a. The need for **strategic conceptualisations** for the monitoring system, making it possible to integrate variables and indicators in a way that can support policy- or management-goals.
b. The need for the development of a dedicated **landscape model**, related to basic categories on landscape (multi)functionality, including a classification of functions that can take into account both more or less well-formulated policygoals and more long-sighted perspectives.
c. The need for organisational models (**'handbooks'**) for multifunctional landscape monitoring systems that can catch the variety of detailed, but important experiences on the development and maintenance of such monitoring systems.

2. The need for strategic conceptualisations for the monitoring system

To support policy- and management goals, a landscape monitoring system should go beyond the detection of changes in the state of the landscape and reflect information on landscape processes, including its socio-economic aspects. Although landscapes – and also historically developed cultural landscapes - functions as integrated systems, where all parts can be mutually dependent on each other, problems of landscape management can often be conceptually linked to an environmental disturbance chain. Such chains should be reflected in the monitoring system. Models like the Pressure – State – Response (PSR) Model of the OECD or the Driving forces – Pressures – State – Impact – Responses (DPSIR) Models used by the European Environmental Agency (EEA), are examples to be transformed into a landscape context. Although short-termed specific policy goals might dominate the immediate demands on a landscape monitoring system, these should be subordinated more broader goals linked to a long-sighted maintenance of the landscape monitoring system that will increase its value considerably.

3. The need for the development of a dedicated landscape model

If emphasis shall be given to the opportunities to include functionality-shifts and other functionality-considerations in the monitoring system, these aspects have to be integrated at all levels. Basically it will be necessary to develop

a. a hierarchically structured classification of landscape functions with a basic division into ecological functions for the maintenance of the integrity of the landscape system and related ecosystems, and socio-economic and cultural functions related to different types of land-use more or less adapted to the landscape.
b. A functionality-relevant landscape classification system of natural land units, land cover and land use, supporting a time-dimension in the allocation of spatial functionality.
c. A system for analysis and description of functional potentials of natural land units that allow for a systematic analysis of the spatial conformity of land use and management with the natural conditions.

Integrating the functionality-classification in a time-sensitive landscape model will allow for a spatial distinction between three main different types of multifunctionality:

a. Multifunctionality as a spatial combination of different functions related to separate land units.
b. Multifunctionality as different functions devoted to the same land unit, but separated in time, typically in a certain cycles.
c. Multifunctionality as integration of different functions at the same or overlapping land units, at the same or overlapping time.

Since a land use segregation strategy is based on a systematic implementation of type a - eventually related to a zoning that furthers a simplification of the spatial land use pattern – even this strategy will express a certain multifunctionality, that increases with the spatial level of registration.

A land use integration strategy should however rather follow the technical and social possibilities for spatial integration of functions based on flexible, 'soft' or extensive ways of land use, thus of type c, where the degree of multifunctionality is less related to the spatial level of registration.

Due to chorological connections between most functions in landscapes, integration of or conflicts between different functions will however exist in all three types of multifunctionality, with the degree of multifunctionality much related to the chorological structure of the functional land units, and a clear distinction between the three types will probably be difficult. A supplementary analysis of landscape multifunctionality should be related to a spatial analysis of boundaries between different functions in the landscape ('functional ecotones').

4. The need for organisational models ('handbooks') for multifunctional landscape monitoring systems

A system for monitoring of multifunctional terrestrial landscapes has to be based on extremely strict scientific principles. Due to the complex scientific character, and to the complicated organisational way of data collection and storage there will be a strong need for systematic collection of experience from scientific practise devoted to the development of landscape monitoring systems. Among guidelines already collected the following should be mentioned:

a) Remotely sensed earth observation data is an indispensable source for landscape monitoring. Either air photos or recent developed satellite data with high geometrical resolution are indispensable tools by the detailed preparation of the survey, by the survey of many types of land cover, by the detection of many different types of structure and changes and for the extrapolation of results derived from a landscape monitoring system. Due to the detailed character of much ecological oriented landscape information and due to the need of integrating functional information related to land use, a landscape monitoring system has however basically to be performed through detailed field surveys.

b) The extent and components of the total landscape being monitored must be explicitly stated as a baseline for the monitoring, to sharpen scope, accuracy and statistical confidence in any results or descriptions.

c) For economic, time-, and organisational reasons landscape monitoring has mostly to be based on a very limited sample of the total area surveyed. The targeting of samples is crucial to maximise returns on effort, and should in general be related to an appropriate and statistically rigorous stratification.

d) All land units, land covers and land uses within each sample area should be surveyed in a mutually exclusive way to allow for comparable time-series analysis. No types of units should be omitted.

e) The same sample locations should be revisited, so that real change can be recorded, and the time between surveys should be long enough to allow change.

f) Since surveys has to be based on interdisciplinary teams with different experiences and altering from survey to survey all terms and methods should be fully explained in a field handbook, and a clear communication between all involved should be established and controlled, e.g. through field training courses that can ensure a standard level of expertise for surveyors/interpreters.

g) Standard methods of recording that minimise modifications, additions and subjective decisions and judgements among the field workers should be established for all types of

information collection. Decisions and judgements should be made in the field, not by the data storage.

h) The very different approaches for the monitoring, ranging from remote sensing to detailed ground photos, and from field surveys and to interviews and archive searches can be difficult to standardise and integrate. It is however important to combine different sources of information to maximise their strengths. By reclassifications, and by data-correction related to later observed data-errors different information sources (e.g. air and ground photos) can be a necessary support.

i) Data-control should be an inherent part of the monitoring system. This should not only be related to field survey checks, but also by systematic control in connection with the data storage. Integrated GIS-layer model that can support detailed time-series analysis of the monitored data, can be an important tool for the successive control and improvement of data quality among different stages of the monitoring process.

j) By result communication, accuracy should be tested through quality assurance exercises and results guided by descriptions of confidence where possible. Due to the complex character of landscape dynamics, result should preferably be presented in a variety ways.