MIXED METHODS
THE UNDISCOVERED COUNTRY

Trying to flip the script
in the production of knowledge

Henrik von Wehrden - Methods I - IX

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MIXED METHODS
THE HOLY GRAIL

Combining diverse approaches
— enter the dragon

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EPISTEMOLOGICAL PROBLEMS WITHIN SCIENCE

- Data integration
- Language
- Different history of methods
- Emergence is hard to plan
- Ressources
- Different criteria to evaluate knowledge (subjective vs objective)

EPISTEMOLOGICAL AND ONTOLOGICAL PROBLEMS REGARDING SCIENCE

- Lack of facilitation
- Ignoring of historical fallacies
- Long term perspectives challenging
- Language about goals
- Lack of trust

ONTOLOGICAL PROBLEMS REGARDING SCIENCE

- How to make sense of it all (objective vs. subjective)
- Ranking of thruths
- Reflexivity and ethics
- Responsibility
- Ignoring the epistemological

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Research, part of a Special Feature on Programme on Ecosystem Change and Society (PECS): Knowledge for Sustainable Stewardship of Social-ecological Systems

A holistic approach to studying social-ecological systems and its application to southern Transylvania

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ABSTRACT. Global change presents risks and opportunities for social-ecological systems worldwide. Key challenges for sustainability science are to identify plausible future changes in social-ecological systems and find ways to reach socially and environmentally desirable conditions. In this context, regional-scale studies are important, but to date, many such studies have focused on a narrow set of issues or applied a narrow set of tools. Here, we present a holistic approach to work through the complexity posed by cross-scale interactions, spatial heterogeneity, and multiple uncertainties facing regional social-ecological systems. Our approach is spatially explicit and involves assessments of social conditions and natural capital bundles, social-ecological system dynamics, and current development trends. The resulting understanding is used in combination with scenario planning to map how current development trends might be amplified or dampened in the future. We illustrate this approach via a detailed case study in southern Transylvania, Romania, one of Europe's most significant biocultural refugia. Our goal was to understand current social-ecological dynamics and assess risks and opportunities for sustainable development. Our findings show that historical events have strongly shaped current conditions and current development trends in southern Transylvania. Moreover, although external drivers (including EU policies) set the general direction of regional development trajectories, local factors, including education, leadership, and the presence of bridging organizations, can enhance or counteract their effects. Our holistic approach was useful for generating an in-depth understanding of a regional social-ecological system and could be transferred to other parts of the world.

Key Words: *ecosystem service bundles; landscape sustainability science; Programme on Ecosystem Change and Society; regional scale; Romania; scenario planning*

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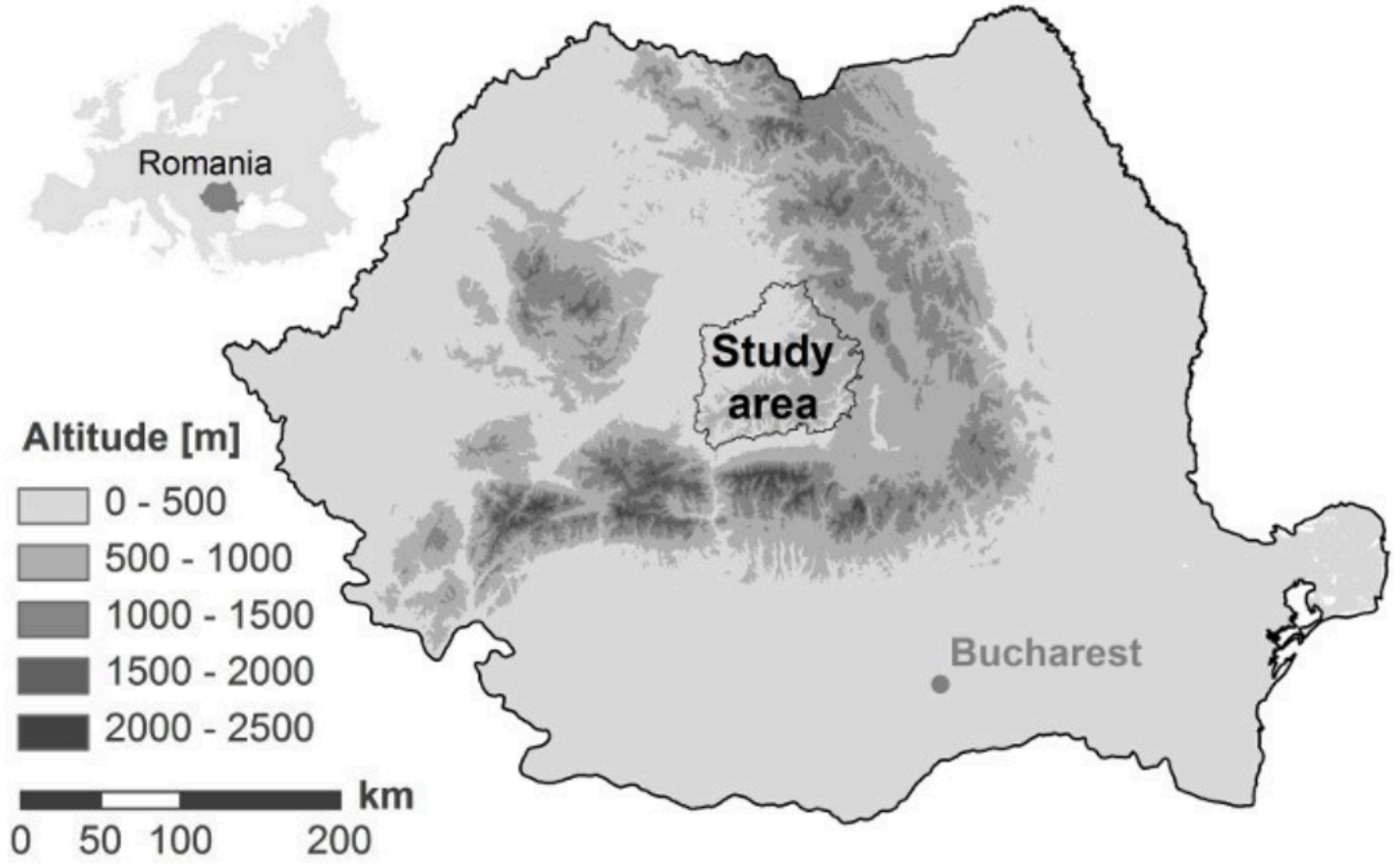
The study was conducted in central Romania and covered an area of 7440 km² at altitudes between 230 and 1100 m above sea level (Fig. 2) that is characterized by a mosaic of different land-cover types (28% forest, 24% pasture, and 37% arable land). Historically, most of the study area was shaped in terms of culture and land use by ethnic Saxons, immigrants from Western Europe who first settled Transylvania 800 years ago. However, most Saxons left the area after the collapse of communism in 1989. Today, the area is predominantly populated by Romanian, Hungarian, and Roma ethnicities.



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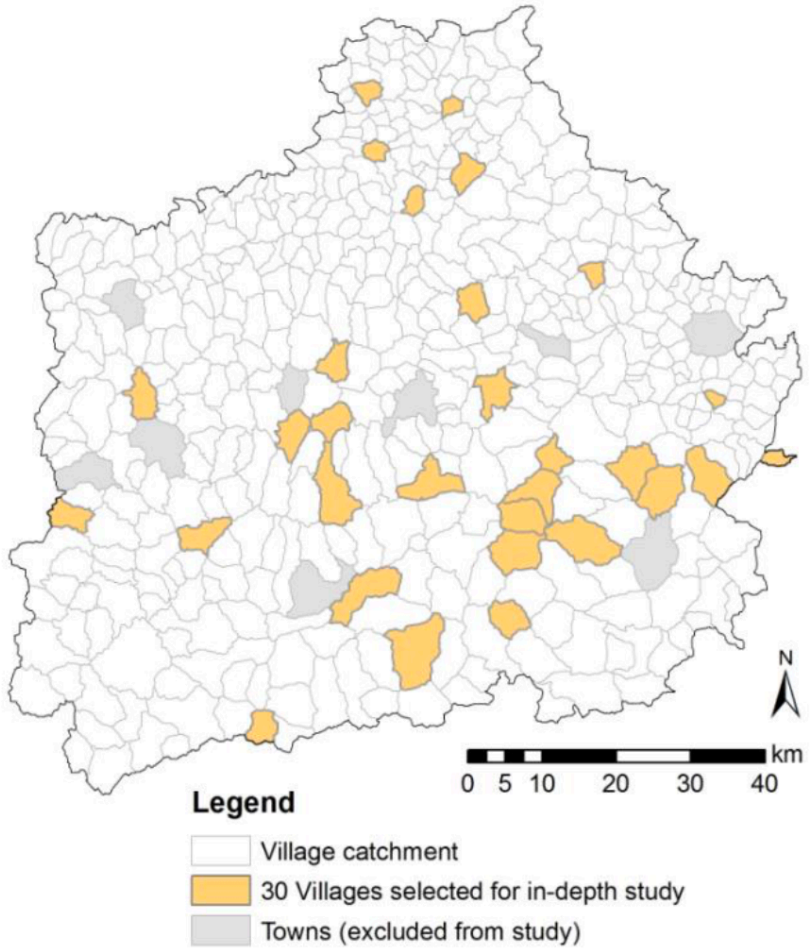
We used the village as the basic unit of analysis because it represents a useful scale for the analysis of social-ecological systems in rural landscapes (Angelstam et al. 2003). The study area contained 448 villages. Because no official village borders were available, we delineated the area belonging to a given village using a cost-distance algorithm that allocated each pixel to the village with the lowest travel cost to this pixel (slope-penalized distance, implemented in ArcGIS). We defined the area thus associated with a given village as a village catchment (Appendix 1). This algorithm performed well because most villages were located in valleys, and a screening of results revealed that many boundaries of village catchments closely matched the borders of communes (administrative units containing four villages on average).

We applied a two-fold approach to characterize the biophysical and socio-demographic conditions in the villages. First, to obtain an in-depth understanding, we assessed an extensive set of local conditions for a subset of 30 villages (Appendix 1) and then generalized our findings to all 448 villages in the study area. The



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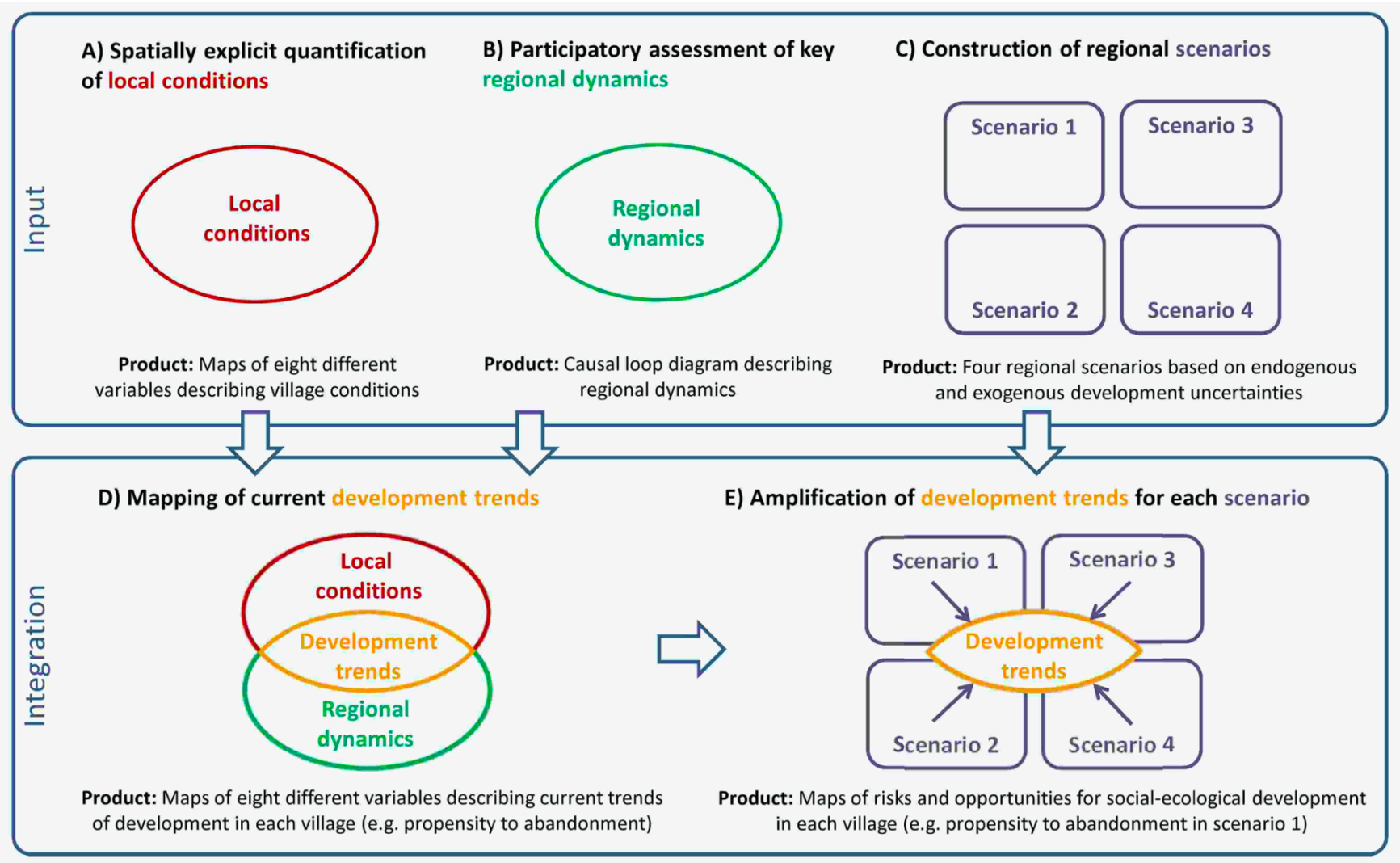

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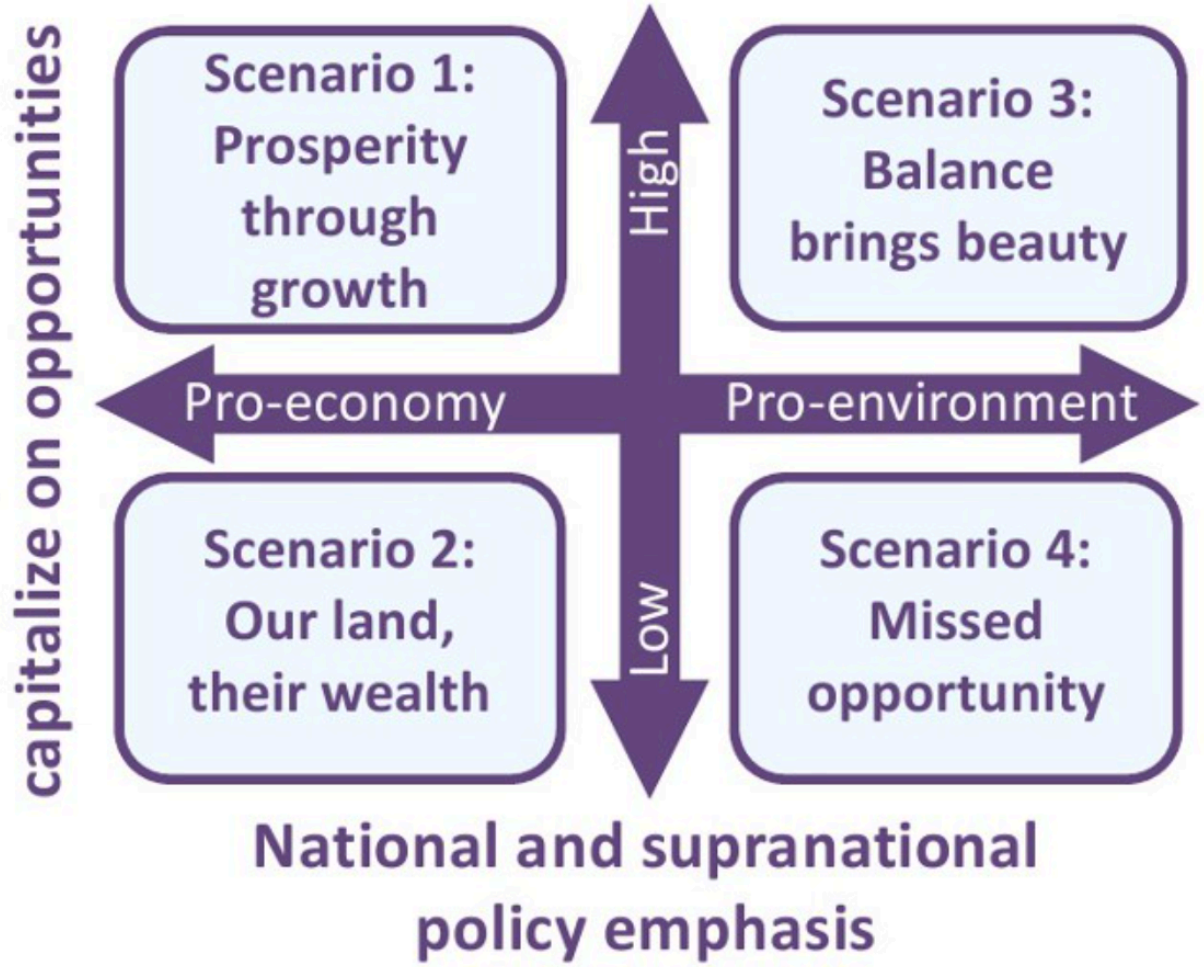
Scenario planning workshops broadly followed the suggestions by Henrichs et al. (2010). Workshops were led by us, and stakeholders provided input via consultations and a review of the final products. In a first round of workshops (summer 2012), we separately met representatives of 16 local organizations to collate their understandings of changes in the region, as well as of social-ecological system dynamics and key uncertainties. Organizations were asked to list the main social, economic, and ecological changes in the past and present, as well as potential changes in the future. We asked participants to focus on the most important changes and to indicate how they influenced one another, leading to the development of causal effect chains and draft causal loop diagrams. We also asked which possible changes were within and beyond their control, and how uncertain they were (Daconto and Sherpa 2010).

Notably, scenario planning inherently focuses on endpoints, that is, the outcomes of possible social-ecological developments in the future. In this way, it leaves space for complementary methods such as backcasting or adaptation, which provide a normative framework and tools to decide which development would be most desirable and which steps should be taken to achieve certain future conditions (Dreborg 1996, Wise et al. 2014).

Fig. 6. Scenario matrix highlighting four plausible alternative futures arising from the combinations of two axes describing key uncertainties regarding future development. The horizontal axis relates to exogenous uncertainties, namely, whether national and supra-national policies emphasize economic development or environmental sustainability. The vertical axis relates to uncertainties within the study area, namely, whether local communities are able to capitalize on social and economic opportunities that may arise in the future.



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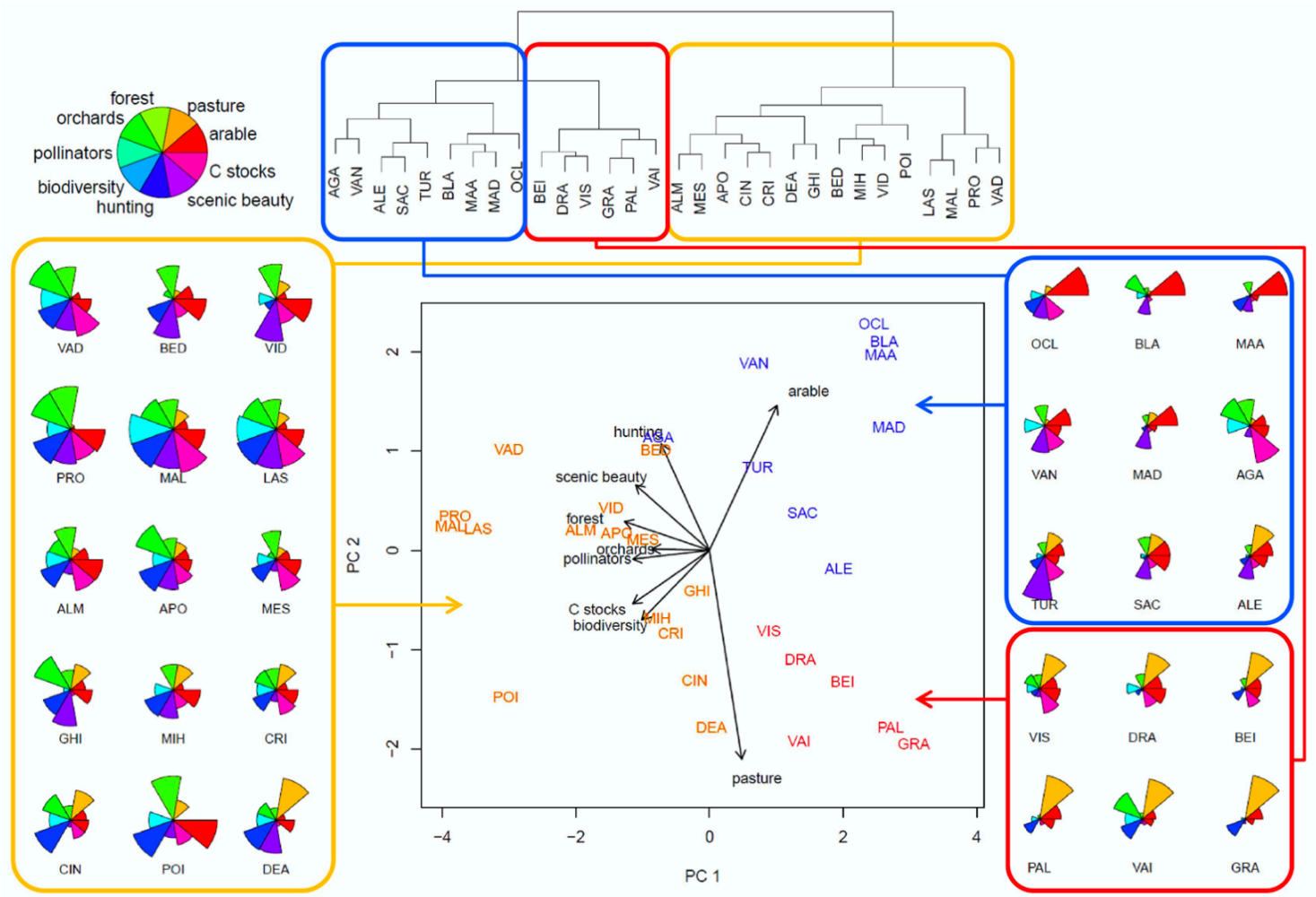
The main gradients and groups of the local characteristics in the 30 villages were analyzed using cluster analysis (Wards clustering based on Euclidean distances) and principal components analysis on standardized data (zero mean, unit variance), separately for natural capital and socio-demographic data (Fig. 3, Appendix 1). Based on the initial in-depth analysis of a subset of 30 villages (Fig. 3, Appendix 1), we concluded that the proportion of the main land-cover types (arable, pasture, forest) provided a good indication of the natural capital bundles in a given village, and that the proportion of Hungarians and Roma could be used to summarize the main socio-demographic characteristics of a given village. Therefore, we used these variables to summarize local conditions in all 448 villages (Fig. 4). Finally, we estimated village area, terrain ruggedness, and isolation from the nearest town for all villages in the study area. While we acknowledge that our



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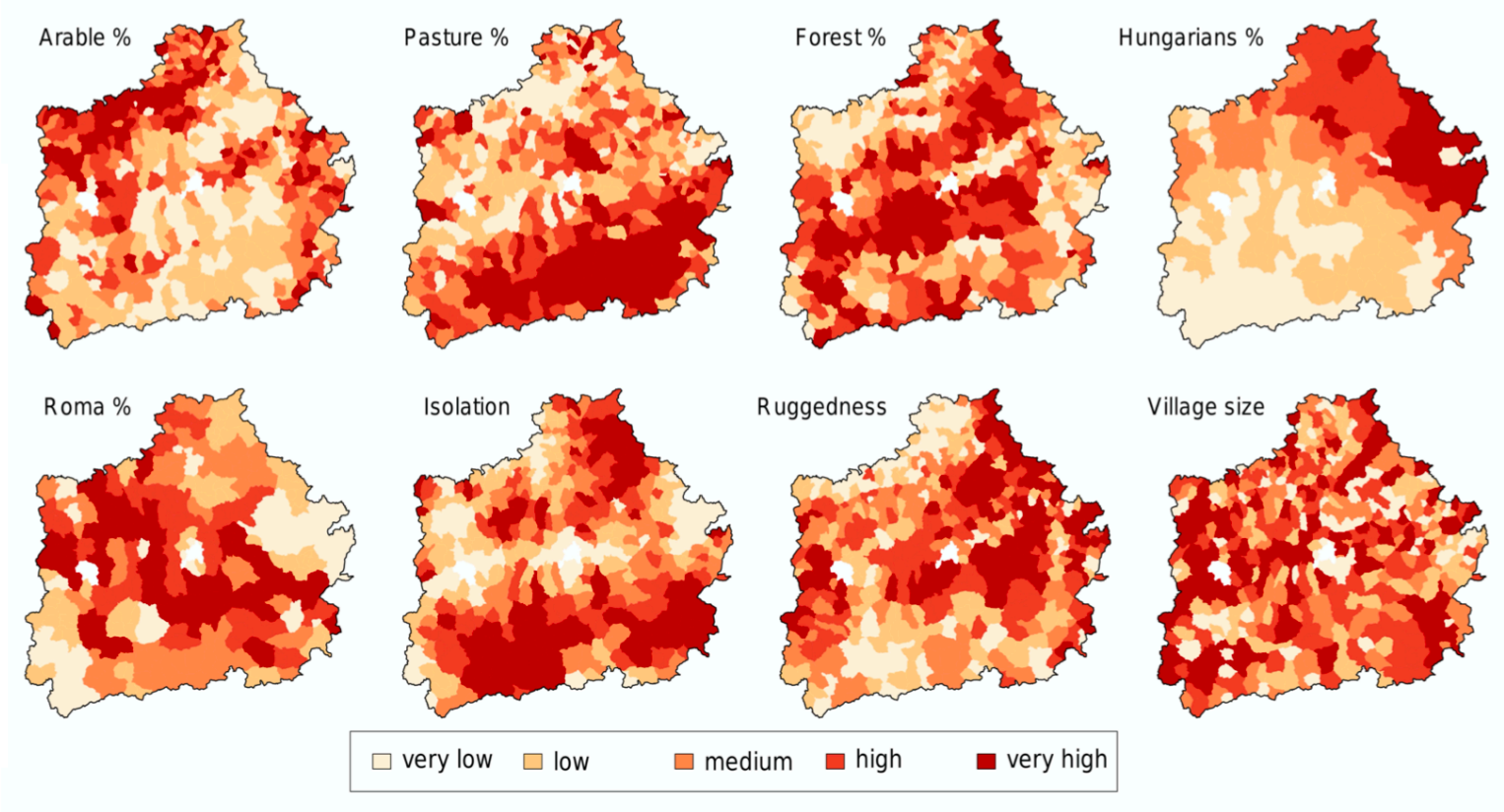
Variables describing the natural capital of a given village catchment were based on the proportions of arable land, pasture, orchards, scenic beauty, utility as hunting area, carbon stocks, farmland biodiversity, and pollinator abundance (for details see Appendix 1). Socio-demographic data, derived from commune-level statistics, were: total population size, proportions of the main ethnic groups, unemployment rate, net migration levels, and the number of pupils relative to the total population in a given commune (Appendix 1). We intended no judgment by the use of ethnic group as a variable to describe socio-demographic conditions, and we emphasize that possible relationships with other socio-demographic variables (see below) indicate correlations, not causalities. Moreover, no alternative socio-demographic data were readily available for the whole study area.



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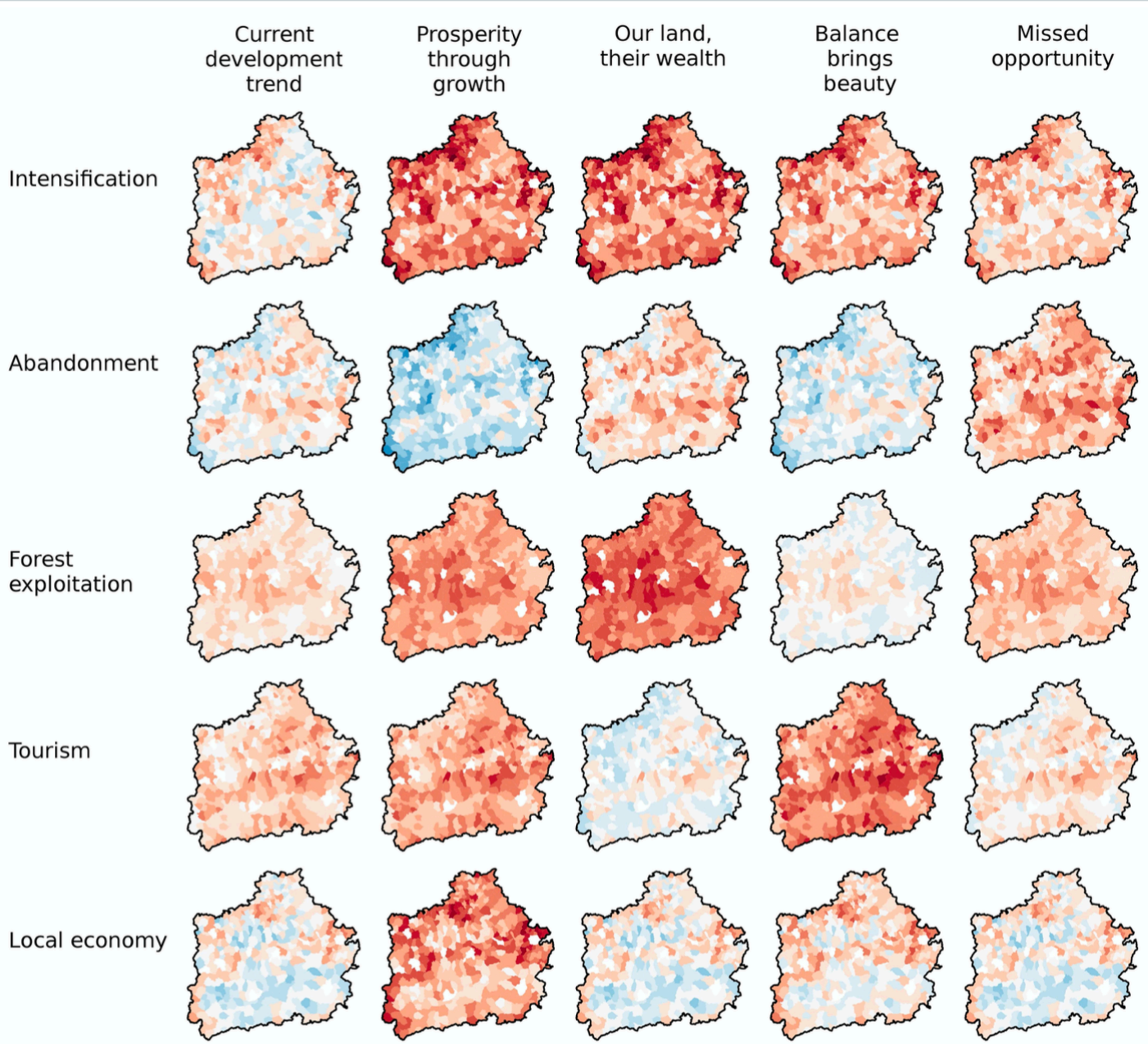
Scenario maps

Finally, we combined regional maps of development trends with changes taking place in the four different scenarios to describe the possible amplification or dampening of current trends in the future. Drawing on the scenario narratives, we subjectively rated the main changes relating to the eight variables under each scenario by adding scores ranging between −3 (strong dampening) and +3 (strong amplification) to the existing scores of social-ecological development trends (Appendix 1). For example, a village with a moderate trend toward abandonment (e.g., a score of 2) would, under a scenario with fairly strong dampening of that trend (e.g., a score of −2), result in a scenario-specific land abandonment score of 0 (i.e., no trend toward abandonment). Notably, this simple scoring system served as a heuristic tool to compare relative differences between villages and scenarios, and not as an absolute indication of specific levels of any given variable.



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ecological, and economic changes. In a second set of two separate workshops, we presented our draft integrative causal loop diagram and drafts of our scenario logics and narratives to the local organizations initially consulted and to some additional local experts who were interested in participating (nine organizations and three individual experts in total; December 2012). Based on the (positive) feedback obtained in this second set of workshops, we refined and finalized our causal loop diagram and scenario narratives and considered these as final products representing local expert consensus (Fig. 7).

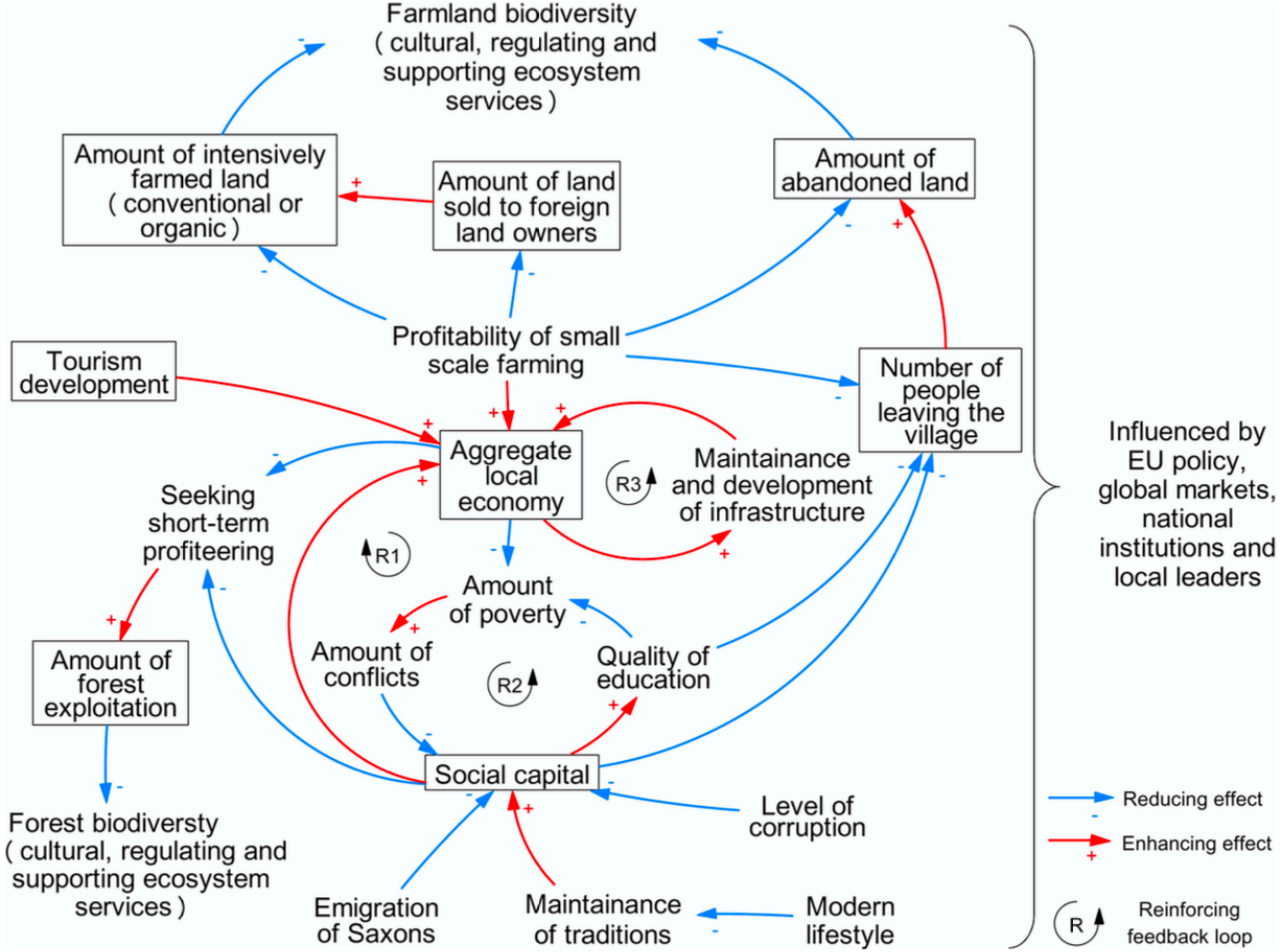

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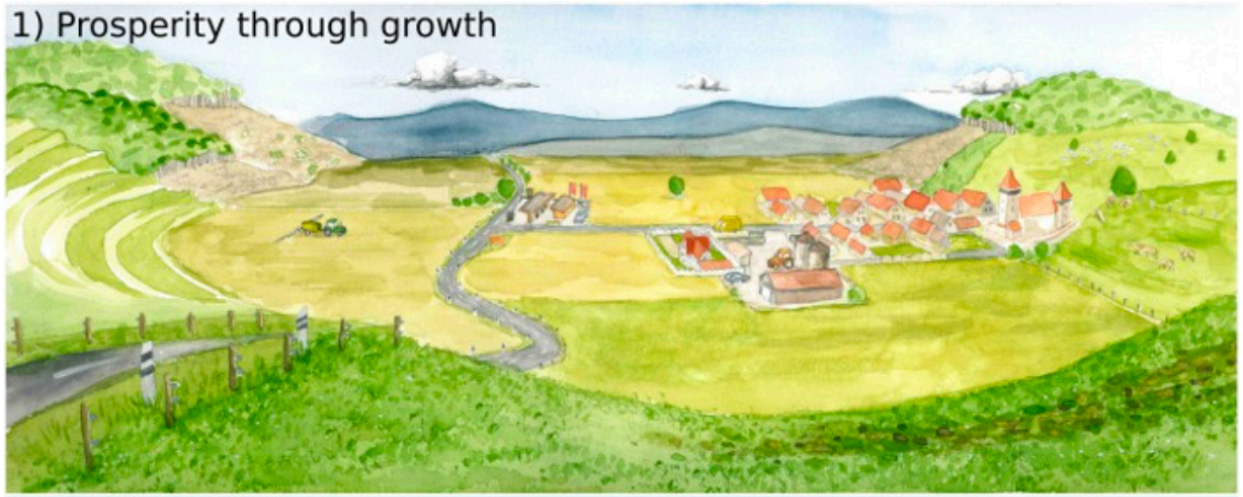
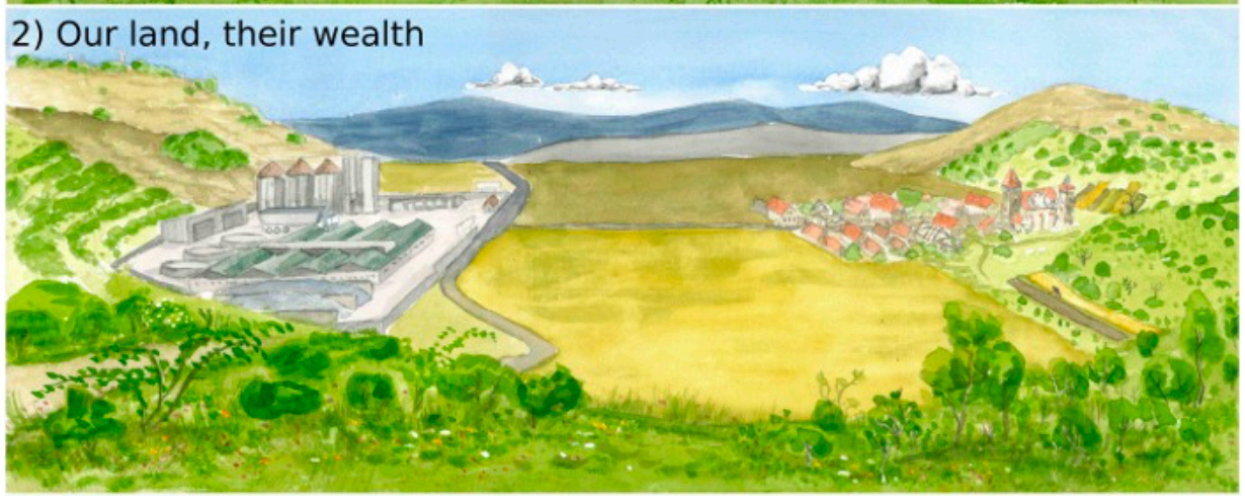
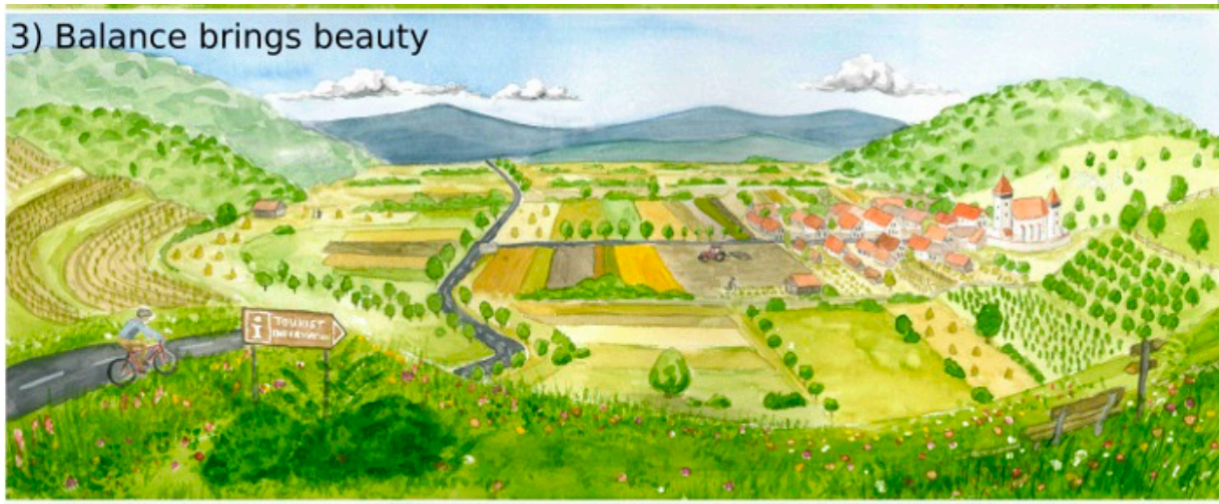
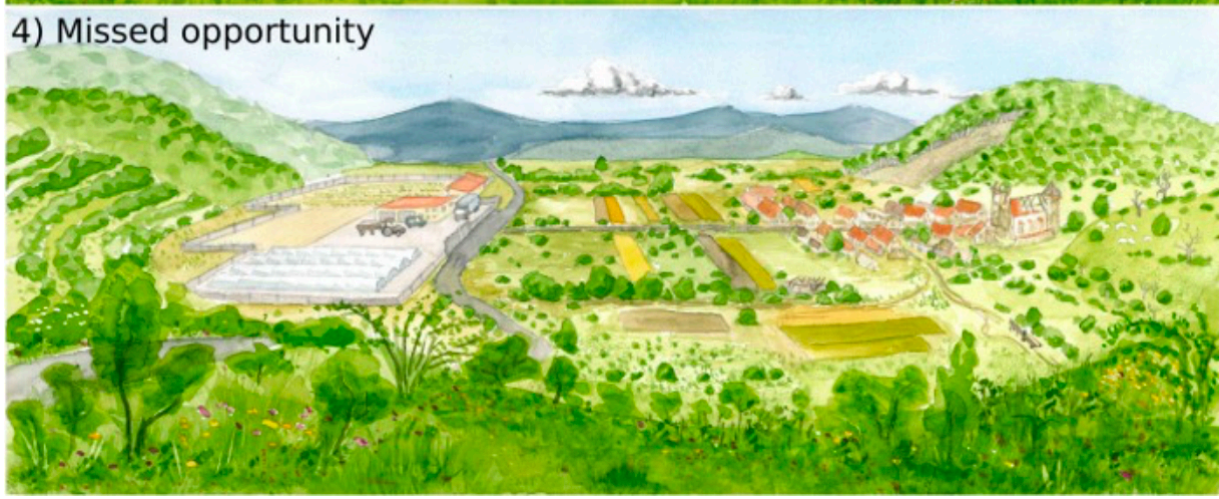
Fig. 7. Visual representations of key features of the four scenarios in terms of their effects on the landscape. Pro-economy settings lead to landscape simplification (scenarios 1 and 2), whereas pro-environment settings are likely to maintain landscape heterogeneity (including some land abandonment in scenario 4). Social and economic development for local villagers is particularly poor in scenario 2, and to a lesser extent in scenario 4; in both cases, villages are physically isolated from international farm businesses.









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COMING BACK TO THE DESIGN CRITERIA REGARDING MIXED METHODS

- Quantitative vs. Qualitative
- Inductive vs. Deductive
- Spatial scales and systems
- Temporal scales
- What else is relevant in your discipline?

SUMMARY

- Mixed methods are trial by fire
- You need experience in one or several method
- Diverse data is a starting point
- Diversity increases the possibility of solutions
- Language barriers are a starting point
- Trust is key
- The frontier is between the epistemological and the ontological

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