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ADAPTATION OF NATURAL RESOURCES AND DISASTER RISK MANAGEMENT: TWO APPROACHES TO ONE PROBLEM

The study introduces several notions of natural resources management under climate change. New paradigms such as adaptation, disaster risk management, ecosystem management may present old approaches under the new system. The authors emphasize the need for interdisciplinary analysis and inclusion of innovative methods in interpretation of the resource situation as well as in decision-making under certain management regime.

Keywords: *adaptation; Disaster risk management; climate change; natural resources management.*

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АДАПТАЦІЯ ПРИРОДНИХ РЕСУРСІВ ТА УПРАВЛІННЯ РИЗИКАМИ СТИХІЙНИХ ЛИХ: ДВА ПІДХОДИ ДО ОДНІЄЇ ПРОБЛЕМИ

У статті описано підходи до управління природними ресурсами в умовах змін клімату. Нові парадигми управління через адаптацію ресурсів, управління ризиками стихійних лих та менеджмент екосистем можуть представити старі підходи в умовах нової системи. Акцент зроблено на необхідності міждисциплінарного аналізу та використанні інноваційних методів при вивченні сучасної ситуації з ресурсами та прийнятті рішень за різних режимів управління.

Ключові слова: *адаптація; управління ризиками стихійних лих; зміни клімату; природні ресурси.*
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АДАПТАЦИЯ ПРИРОДНЫХ РЕСУРСОВ И УПРАВЛЕНИЕ РИСКАМИ СТИХИЙНЫХ БЕДСТВИЙ: ДВА ПОДХОДА К ОДНОЙ ПРОБЛЕМЕ

В статье описаны подходы к управлению природными ресурсами в условиях изменений климата. Новые парадигмы управления через адаптацию ресурсов, управления рисками стихийных бедствий и менеджмент экосистем могут представить старые подходы в условиях новой системы. Акцент сделан на необходимости междисциплинарного анализа и использовании инновационных методов при изучении современной ситуации с ресурсами и принятии решений при различных режимах управления.

Ключевые слова: *адаптация; управление рисками стихийных бедствий; изменения климата; природные ресурсы.*

Introduction. Frontiers of ecosystems are usually overlapping, are not precise and may cross the state borders. In the 21st century we may observe the influence of civilization in every corner of the planet, so humans should be regarded as integral part of the nature and functioning ecosystems. Ecosystems are not static body, they evolve through time and constantly change their composition and inner structure in order to adapt to new conditions. When thinking in the context of climate change, the change of the environment became quicker than usual, so human systems linked to natural ones are not keeping the same speed of adaptation. That is why we try to explain the natural structures and the interconnections between ecosystems and

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human needs with the focus of reaching the tools to be effective enough to react to rapidly changing climate conditions.

Interdisciplinary character of the problem. According to Dilley (2009) the exposure and vulnerability of human systems are the factors, which are created by social processes. That is why the overall analysis which combines the natural changes in the environment together with relevant social status of target groups and the level of development is absolutely crucial when developing relevant policies. We should also avoid excessive abstraction or oversimplification of the climate related problems, especially when it comes to scale. Girot (2002) distinguishes the scale of Earth's processes and their consequences based on their magnitude as well as the measured scale. Global issues include the decline of stratospheric ozone or radiation balance of the planet. Other processes are relevant rather on the regional scale, such as deforestation and biodiversity loss, soil erosion and land degradation, water scarcity, droughts, increased emissions from fossil fuels, bush and forest fires etc.

What are the lessons learned from the past decades of managing natural resources for preventing the disasters? There is a very tight link between preparedness of human and economic systems to natural hazards and social perception of those resources. The scale of resource is mostly reflecting the economic development of a region or a state. For many resources which cross the borders of states, transboundary management is regulated by agreements and protocols of international law. The shared waters international regulatory framework is a good example on how upstream and downstream countries should organize the use of resources (Csefalvayova, 2012). Nowadays, trade regulations on the extraction of living resources are becoming more important due to shrinking of global supplies (Brockova, 2014). Except of water resources, there is no specific regulatory framework to manage the transboundary ecosystems at the global level. Global conventions provide frame works for regional or national policies to be implemented locally.

The new phenomenon in natural resources management is the preservation of cultural landscape. Nowadays, when more than half of the Earth human population is living in urban areas with the increase of 74 mln per year (UN DESA Population Division, 2012; IPCC, 2014), the level of interaction between urban infrastructure and natural ecosystem defines the quality of environment for the years to come. These issues are of the utmost importance for both governments and citizens, so we may await various alternative approaches to emerging challenges for sustaining the quality of life. Upcoming changes will probably also require everyday lifestyle patterns alternation in the near future already. Human impact on the land defines its functioning in relation to production or crisis preparedness.

Example of the affected natural resource: the agenda of forests. UN FAO report on the world's forests (2014) emphasizes the need for more reliable information about the socioeconomic benefits from forests which may help raise awareness and monitor progress in sustainable forest management. The report notes that information on socioeconomic benefits from forests available to policymakers is often poor, especially when it comes to quantitative information on particular socioeconomic benefits from forests provided by services, or indirect benefits. This shortage should be overcome by collaboration with specialized agencies using innovative approaches and most advances technologies. Seppala et al. (2009) highlights the need for the creation

of appropriate international policy regime for forests biotopes for promoting its policy to enable the interaction with other international policy regimes. At the same time they present poor coordination at the international level directed mainly at reducing deforestation rather than addressing the full range of climate change adaptation issues and options. The importance and complexity of the issue of forests could be also demonstrated on the non-existence of global forest convention as well as any other large scale regional forest convention. Agenda of forests is good to look at when assessing the process of adaptive incentives into practice. The burning issue of the day should be how forest ecosystem management is reflecting constantly changing climate conditions (EESC, 2009)? REDD plus or other tools are already in place with their financial background. Other adaptation tools are hard to implement and so there is still plenty of work to do. This shows that forests are still an example of how one relatively abundant ecosystem may provide the playing field for international policy mechanisms.

The old problem to be multiplied by the climate change linked to forests is the forest dieback when considering natural factors and deforestation caused by anthropogenic interference. Deforestation in one of the largest ecosystem problem in the world, the tropical rain forests of Amazon, for example, are strongly linked to the development of agricultural products market. Growing of soya and coffee beans as well as beef production are the main non-timber drivers causing the demand and competition for land. At the same time the problem of tropical forests is that only a fraction of harvested biomass is merchantable and exploitation is naturally producing a lot of green waste thus destroying the whole ecosystem by turning it to bare land. Adaptation in this case should go hand in hand with trade and tenure measures because of the complex nature of deforestation. In the last decade significant reduction of deforestation rate was recorded (more than 70%) due to the policy intervention by governments stating the concessions rules. For example, Brazil and Cameron have managed to reduce deforestation by more than half in comparison to previous decades. In the process of such policies implementation the measurement of the resource stocks and flows, their relation and importance for human society is crucial (Girot, 2002). The altitude of a resource also plays significant role. Upland and lowland interactions are mostly influenced by water gravitation which may interact with land degradation, supply of water in lowland ecosystems, food security and consequent social changes. "Mountain ecosystems are less constrained by these factors than flat-land ecosystems, but have additional impediments for species already close to the top of the mountain" (IPCC, 2014). Examples of these complex changes could be observed in Himalayas, Karakoram, Alps, Andes or Carpathians.

Implication of uncertainty. Uncertainty is the most common word explaining the effects and development of climate change. It covers all the stages from research to policy making and implementation of measures in this field. The IPCC reports as well as other studies present their scenarios of probability. They are mostly concerned with a certain degree of warming in a given time period. Most of the predictions are headed to the year 2050 or to the end of the century. Scientific and policy community must deal with uncertainty in all the steps of searching for proper decisions. Uncertainty may have several elements, e.g. the climate one, which could be partially overcome by considering more than one scenarios in calculations. The other one to be considered

is technological uncertainty which counts on scientific engineering contribution to mitigation and adaptation of potential. Excessive thinking or belief that today's science and technologies may form and significantly improve the environment was already criticized by several authors, including those outside the climate science (Clemens, 1972).

The race we take in the 21st century now is the race with time. Important is not the scale of temperature change but the timeline in which this change is occurring. It means when postponing adaptation we should consider the risk of unavoided impacts and vice versa when applying adaptation measures, the risk of ineffective impact due to the lack of information or higher costs may occur (Fussel, 2007). However, the precautionary principle tell us to act even under such uncertainty.

European Environmental Agency report on climate change (2012) emphasizes on the indicator approach for analysing various factors influencing vulnerability and impacts of climatic changes to the European region. It highlights that in the context of uncertainty of climate predictions, adaptation options and monitoring needs several alternatives. A more holistical view is needed for understanding the complexity of the current socioeconomic conditions and also their inclusion in natural processes. Girot (2002) cites Hewitt (1997) highlighting the importance of holistic analysis of the relations of natural hazards to human society in the statement that "separation of society and environment in the hazards paradigm creates geographical and ecological fiction". Oversimplification may cause inadequate reactions and potentially damage ecosystems as it was proved by several examples e.g. Tatra mountains bark beetle infestation, Himalaya forest logging myth or migration schemes with land lease in Indonesia.

Choosing the right tools. Proper combination of adaptation and disaster risk management according to Dilley (2009) may yield higher returns on investments comparing to separate interventions of each field alone. Dilley works with the idea of high prevailing uncertainty which applies for both adaptation (with its long-term orientation) as well as disaster risk management (in relation to predictability and frequency of disaster events). The combination of these two could cover the whole time scale of intervention planning from short-term reactions of catastrophic agents to visionary predictions and infrastructure investments of transboundary importance. Climate change should be currently of premium importance theme to be considered in the multitude of policies for mid- to long-term intervention, and on the other side, flexible time responses in disaster risk management would serve well for strengthening the immediate response and understanding the climate impacts to better design the reaction options. Synergies that are brought by both areas are to be used for increasing several elements of the whole process of implementation of concrete measures. Both these notions requires multistakeholder participation, because they constitute relief and development plans, and both are subject to common political agenda and their measures must be applicable at the very local level (ProAct, 2008). In order to keep the processes easy to implement, simplicity at all levels must be maintained which also allows the participation of the public thus reducing the need for highly skilled experts in some cases (Sudmeier et al., 2006). Intersectoral coordination at the national level is to be applied and the overall process administration should be done through respective ministries.

Kelly (2004) highlights the need for integration of humanitarian and environmental interventions in order to effectively address the nature of crisis or catastrophe because the environment is the major contributing factor to the origins of all humanitarian crises. Usually humanitarian workers do not have sufficient data on the state of environment, so the synergic effect of mutual improvement by humanitarian/environmental measures could not be applied which otherwise may benefit both. The integration process should be done step by step by each level of intervention, from strategic planning to bottom-up perspectives in order to understand local actions (World Bank, 2010). The subsequent benefits include the provision of sustainable solutions, reduction of long-term costs by linking humanitarian tools to development process as well as better coordination of prevention mechanisms. The challenges of such an initiative cover the increase of environmental awareness among humanitarian workers, higher prioritisation of environmental issues in planning and the existence (development) of performance indicators in assessment tools (Barrett et al., 2007). Policy analysis should be afterwards targeted to the compliance with sustainable development indicators as for example in the case of the MDGs. Regarding the differences that are visible, disaster risk reduction is implemented on the basis of historical perspective, deals with existing risks, is relevant to all hazard types and uses more ad hoc funding sources. Climate change adaptation focuses on future perspective, measures are long-term and of global importance, covering mostly new risks or new factor multiplying traditional risks, has its relevance to climate-related hazards and funding sources are becoming more significant (Venton and La Trobe, 2008 in ProAct, 2008). The current development of global policies on climate change makes adaptation a useful tool to increase financial means for affected regions. There are many possibilities from afforestation practices, river basin management, risk preparedness to community education and training. Cost of adaptation could be significantly lowered by integrating the adaptation into other sectorial policies or directly into behavioural changes. In urban areas, for example, the extension of green infrastructure improves life quality, and also offers flood reduction, cleaning the air and temperature stabilisation. What is a challenge for today is to make climate-proof the areas of already built cities (EEA, 2013).

Conclusions. Adaptation to climate change as a focused process ensuring survivability for humans will bring more issues related to political as well as practical measures keeping the quality of life in world regions in the near future. The task of governments should be the continuous support of green technologies, which should in due time replace the fossil fuels or technologies damaging the environment other way. The topic for assistance coordination to developing countries should be tackled within the framework of the adaptation commitments as the climate sector could bring immediate funding for existing projects. Integration of biodiversity and ecosystem services in adaptation strategies may bead to win-win situation with the proper combination of risk reduction, local community benefits coupled with carbon storage management (Settele et al., 2014). EU countries may serve as a global leader in this effort with their long-term effort of green economy promotion as well as by the ability of coordination of crisis management, prevention and monitoring of environmental risk factors by specialized agencies.

Interlinkage of active intervention functions in natural resources management and at the same time commitment to regional development will create new challenges to intersectoral policy implementation as well as to active involvement of managers under new climatic and economic conditions. The role of research should be to frame social interests into common natural resources. It may be focused on the natural ecosystem as a primary target of management and protection or it is going even further to the analysis of mutual interlinkages between social factors and ecosystem response. Priority for the near future should be to identify the most urgent needs for the development of interaction between human systems and natural areas. This may result in common strategies formation to initiate the dialogue on strengthening the collaboration at higher levels thus increasing the level of resilience from local to global. What counts is management as the learning process, so managers learn to react to emerging conditions with rigorous and profound experiences backed by science.

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