

Розділ 1

Економіка природокористування і еколого-економічні проблеми

Advanced Use of Science for Global Sustainable Development*

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The article reveals the ideas of achievement of social and economic principles of sustainable development. It deals with acute economic, social and environmental problems of participation of scientific community in ensuring sustainable development. It shows issues of efficient natural resource use, education, and innovative policy, overcoming social and economic inequality. It examines harmonization of global and national efforts; education to reduce inequalities and promote global and sustainable science and innovation; responsible and ethical conduct of research and innovation; improved dialogue with governments, society, industry and media on sustainability issues and sustainable mechanisms for the funding of science.

Keywords: sustainable development, ecological safety, economic stability, social wellbeing, scientific community.

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Introduction. World Science Forum is a biennial event that since 2003 has successfully been assembling scientists, decision-makers from the world of politics, industry, representatives of the civil society and the media to discuss critical global issues and the potential contribution of Science towards helping meeting these challenges. This year it took place in Rio de Janeiro, Brazil from November 24 till November 27.

World Science Forum is an event initiated by the Hungarian Academy of Sciences in cooperation with UNESCO, ICSU, AAAS, TWAS and EASAC. It has a high reputation among stakeholders of knowledge including scientists and science policy makers. One of the main goals of the Forum is to meet the demands of growing interest and to emphasise the global nature of this enterprise. Delegates from over 100 countries pledging to advance the use of Science for global sustainable development took part in the Forum.

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This time following the ideas of the World Summit "Rio+20" (2012), the Forum was devoted to the most burning question – instruments and methods for ensuring sustainable development. The last means ensuring ecological safety, economic stability and social wellbeing for future generations of the Earth.

Principle ideas of the Forum

In speeches of leading world scientists the most acute economic, social and environmental problems of participation of scientific community in ensuring sustainable development were tackled. In particular, issues of efficient natural resource use, education, and innovative policy, overcoming social and economic inequality were touched. Plenary sessions of the Forum were dedicated to the following topics:

"Inequalities as barriers for global sustainability"

Science policy and governance: inventing the future"

"Scientific integrity"

"Science for natural resources"

"Science and engineering education"

"The fundamental roles of science in innovation"

During the Forum a number of thematic sessions were held:

"Amazonia, biodiversity and sustainable development"

"The medical challenge of old age"

"Science diplomacy"

"Sustainable planted forests"

"Applying ocean sciences and knowledge for societal benefit: demands after Rio+20".

"The role of higher education in building a critical mass for global sustainability".

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Prof. Dr. L. Davidovich told about the role of scientists in preparing social memory to progressive changes. It is especially important that managers of various levels of Government got advanced knowledge for implementation of adequate transformations in society. He illustrated his thought by the example from history: "...When the Minister of Finance asked the inventor of electricity Faraday: "Can your invention ever be of any advantage?" he answered: "Sometime thanks to it you will be able to collect much more taxes".

The Speech of Chief Scientific Advisor to the President of the European Commission Professor, Doctor Anna Glover (who is also the Head of the Chair of Molecular and Cell Biology at the University of Aberdeen in Scotland) was extremely bright. In particular, she figuratively characterized behaviour of politicians, citizens and businessmen in relation to environmental problems. Professor A. Glover is sure that "science can go where others cannot go – it is a currency which we should use much more often at global level. She also suggested that there must be conditions for business to engage with science. Science makes us homo sapience. She thinks that by engaging in political dialogue, increasingly also at global level, by creating public ownership for science and technology is the best way for society". Science can

go where other spheres of human activity cannot. Science can reveal problems that society does not understand yet. It means science can prepare solutions for urgent problems [1].

It is reasonable to mention several important ideas. Professor, Dr. Luis Eugênio de Mello (Director, Technological Institute of Vale) underlined: "Natural resources don't exist themselves. They become...". It depends on human's ability to see how to use, extract, transport, store and process them... In his speech he also mentioned that "...new technologies transform previously useless materials into useful ones".

President of Science Council of Japan New Science, Technology and Innovation Policies and Scientists' Social Responsibilities Science Takashi Onishi dedicated his speech to the following question: Changing the title of its science promotion policies from "Science and Technology Policies" to "Science, Technology and Innovation policies" in Japan. He stressed that "Innovation" means that the Government intended to stress that innovating the society through application of the advancement of science and technology is fundamentally important. Materializing the scientific knowledge and technological principles in the form of industrial products or social infrastructure is crucial for wellbeing of the people as well as safety of science and technology, science and technology and research integrity, equitable blessing of the Fruits of Science and Technology [4].

Dr. Ricardo Paes de Barros, Strategic Secretary of the Brazilian Presidency's Strategic Affairs spoke on "Challenges to the Sustainability of the Brazilian Process of Inclusive Growth". He stressed that "decline in labor earnings is one of the consequences of inequality" and such inequality in earning decreases chances for ecoeducation and ecoliteracy as well as sustainable development [3].

A number of scientists spoke on the leading role of scientists in transition to sustainable development. Dr., Prof. Zhang Linxiu Deputy Director of the Centre for Chinese Agricultural Policy dedicated his speech to "Human Capital Inequality as a Challenge to Sustainable Development: The Case of China". The key question was: "What is the inequality like in the near future?" The way to sustainable development is liquidation of inequality [5].

During the Forum polemic Dr. P. Kabat was asked: Are there any problems concerning the fact that "green energy" actually becomes the competitor to agricultural production for example, on those lands where the raw materials for biodiesel and bioethanol are grown? The answer was:

Certainly, problems arise where "green power" is developed light-headedly. It must be directed at waste processing... However it is not the biggest problem. I am afraid; for example, even to think about the time when cheap shale gas will rush in world economy. It will preserve power-intensive (so, environmentally dangerous) industries and will sharply slow down scientific and technological progress. Today high prices of traditional energy resources force to search for "green" alternatives and to fight for essential increase in production efficiency.

Participants came to a conclusion that learning process has to be mutual. Students as potential carriers of interests of future generation have to be active subjects of educational process, and teachers who absorb experience of mistakes and past victories, have to act as peculiar carriers of social memory. Thus, the role of interactive training methods has to rise constantly.

The World Science Forum Declaration on 2015 Millennium Sustainable Development Goals

The declaration will be taken forward by UNESCO as a key starting point for preliminary planning of the Post-2015 Millennium Sustainable Development Goals. The declaration

contains 5 main recommendations for action [2]:

1. Harmonization of global and national efforts
2. Education to reduce inequalities and promote global and sustainable science and innovation
3. Responsible and ethical conduct of research and innovation
4. Improved dialogue with governments, society, industry and media on sustainability issues
5. Sustainable mechanisms for the funding of science.

1. Global sustainable development, implying the environmental, economic and social dimensions of sustainability, as well as the need to face the challenges of growing complexity, requires intense research efforts, interdisciplinary and transdisciplinary approaches. Population growth, climate change, food, energy and water shortages, growing urban concentrations, natural and technological catastrophes, epidemics, social inequality and poverty all require that the world's scientific establishments assume new roles necessitating the integration of all knowledge systems.

2. Scientific achievements coexist with strong inequalities in access to knowledge, natural resources, water and food supplies, economic and human capital, health care, education, research infrastructure and, in general, to the benefits of science. These inequalities require a rethinking of the scientific enterprise and cooperation. Consequently, inventing and constructing the future we want will require strong input from science policy and decision-making processes will need to be supported by the best available science. This implies building a new paradigm of development, which combines the possibility of regional social and economic development with the conservation of nature and the culture of indigenous people.

3. The global economic crisis, prevalent since 2008, has created a situation in which national science policies have been subject to fundamental revision. Many countries have cut their science budget, while others have increased the support for science and engineering in order to stimulate innovative research, which historically has given rise to technological break-throughs and new cycles of development contributing to the enhancement of Science, Technology and Innovation (STI) systems at national and regional level.

4. Accelerating "knowledge economies" have generated new migration patterns for scientists and an increase in mobility. The need for greater cooperation between universities, public research organizations, and industry has become pressing in education both at graduate and post-graduate level and in the training of scientists to open up new opportunities for young scientists.

5. Scientists are individually and collectively ethically responsible for the advancement of Science and the use of its benefits for society. Developments in many research fields (e.g. genetics, biotechnology, neuroscience, nuclear physics, etc.) have considerable moral and ethical implications that require an urgent and global dialogue between scientists and the wider public. While conceiving, proposing and developing research, in communicating research results and in cooperating and mentoring relationship with other scientists, researchers shall conduct their enterprise guided by intellectual honesty, objectivity and impartiality, veracity, justice and responsibility.

6. The growing intensity in the competition for natural resources, highly skilled talent, strategic information resources and research infrastructure induces political and economic conflicts around the globe. New development models are needed and these should be innovative, informed by scientific evidence and locally relevant. Under these conditions,

science diplomacy continues to gain relevance in international relations, especially in crisis management and the establishment of peaceful cooperation among countries when traditional political and diplomatic relations cannot fulfil their roles. The rational use of the vast natural resources of the planet has to be permanently incorporated into development strategies and this will not be possible without strong input from Science.

The World Science Forum Recommendations

1. International scientific cooperation and coordinated national actions for global sustainable development.

In the complex global system of environmental, economic and social interdependencies, sustainable development can only be addressed when global and national efforts are coordinated. International coordination and common principles are required to harmonize national science policy actions and research projects focusing on global sustainability issues. Coordinating actions must however respect regional disparities and inequalities in current national capacities. Global challenges offer a unique opportunity for collaborative research on an equitable basis

Excessive inequalities in natural resources, highly skilled talents, strategic knowledge resources and research infrastructure are inhibitors of meaningful cooperation and are the foundation of political, social and economic tension. For this reason, policy actions to promote sustainability must also aim at decreasing inequalities around the globe, with special attention directed to education, research infrastructure and access to strategic knowledge resources.

2. Education to reduce inequalities and promote global and sustainable science and innovation

Providing high quality education in Science, Technology and Engineering must be understood as a priority: in basic education, as a fundamental element of modern culture and later as a vital component of a country's capacity to compete in the global economy. Governments need to understand that strong investment in education, and deep changes in science education, are closely linked with social inclusion, prosperity, effective citizenship, and the building of a sustainable future for the planet. Global Sustainability requires the involvement of all members of society particularly, the inclusion of more women in science

In higher education inter- and transdisciplinary approaches should be encouraged; in order to address the complex needs of contemporary societies and industries. In the current age when the mobility of both students and researchers is steadily increasing, international cooperation is essential to meet the needs of highly skilled human capital for future generations.

3. Responsible and ethical conduct of research and innovation

In the era of global science, the scientific establishment needs to implement continuous self-reflection and action to appropriately evaluate its responsibilities, duties and rules of conduct in research and innovation.

The world's scientific community should share a universal code of conduct addressing the rights, freedoms and responsibilities of scientific researchers, and universal rules of scientific research. These rules and policies should be respected by the states and adopted by their national legislations. Scientists should strengthen their individual and institutional responsibilities towards present and future societies in order to avoid possible harm due to ignorance or misjudgement of the consequences of new discoveries and applications of scientific knowledge.

It is the responsibility of both those who promote science and scientists to maintain the

primacy of moral and social concerns over short-term economic and political interests in the selection and implementation of Research Development and Innovation (RD&I) projects by governments or private industries. Social inclusion, as a key part of sustainable development is an ethical and strategic imperative of scientific research, technology, and innovation.

4. Improved dialogue with governments, society, industry and media on sustainability issues

In order to meet global sustainability goals, it is of utmost importance to engage societies and empower them to participate as knowledge holders in the discussion and evaluation of environmental, moral and ethical questions on globally unsustainable consumption levels. It is the responsibility of policy-makers to promote new patterns and attitudes for the sustainable and responsible use of the resources of the Earth.

In cooperation with the science community and political decision makers, industry is required to develop new production methods that enable it to both meet economic goals and avoid over-exploitation of resources at the same time.

The involvement of media is paramount to communicate scientific knowledge and the consequences of policy decisions to people.

Therefore it is of key importance that the science-policy-society interface is strengthened as a space for dialogue and engagement, and for the social transformation required for sustainable development. In this regard, the integration of natural sciences, engineering and social sciences is essential in designing effective policy actions that address global sustainability issues.

5. Sustainable mechanisms for the funding of science

Scientific discoveries provide the foundations for innovation and social and economic development. Investment in science delivers the capacity for future development at a national level and an opportunity to face global challenges internationally. It induces new and unforeseen pathways of technological and social development; mitigating economic crises and promoting sustainable routes at the national and international levels. It is therefore the primary responsibility of governments, particularly parliamentarians in both the developed and the developing world, to establish sustainable mechanisms for the funding of scientific research and to guarantee that it fulfils its role to serve for the benefit of societies.

Conclusions

The Forum called for concerted action and will mobilize the international academies and scientific community to play their role, supporting, for example, the Future Earth, Research for Global sustainability programme. Currently national governments and the UN are continuing discussions on the design of the Post-2015 Development Agenda and reviewing the Hyogo Framework for Action on Disaster Risk Reduction. The implementation of this Agenda and of the proposed Sustainable Development Goals may represent an even bigger challenge. Therefore, scientists, decision makers and society need to be engaged in this process at the national, regional and global levels, as this will be crucial to pave the way to achieving global sustainable development. The World Science Forum, held in Rio de Janeiro, therefore commits to advance the use of science for sustainable development.

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Современное использование науки для глобального сестейнеблогого развития

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Статья посвящена вопросам достижения социальных и экономических принципов сестейнеблогого (устойчивого) развития. В статье рассмотрены экономические, социальные и экологические проблемы участия научного сообщества в обеспечении сестейнеблогого развития. Уделено внимание вопросам эффективного использования природных ресурсов, образования и инновационной политики, преодоления социального и экономического неравенства. В статье рассматриваются вопросы гармонизации глобальных и национальных усилий, образования, нацеленных на сокращение неравенства и содействия глобальной и сестейнебловой науке, а также актуальные вопросы развития инновационной деятельности; ответственности и этического проведения в процессе исследований и внедрения инноваций, улучшения диалога с правительствами, обществом, промышленностью и средствами массовой информации по вопросам сестейнеблогого развития и механизмов финансирования науки.

Ключевые слова: сестейнеблоговое развитие, экологическая безопасность, экономическая стабильность, социальное благополучие, научное сообщество.

Сучасне використання науки для глобального сестейнеблогого розвитку

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Стаття присвячена питанням досягнення соціальних і економічних принципів сестейнеблогового (сталого) розвитку. У статті розглянуті економічні, соціальні та екологічні проблеми участі наукової спільноти у забезпеченні сестейнеблогового розвитку, які були обговорені під час проведення Всесвітнього наукового форуму, що відбувся у Ріо де Жанейро з 24 по 27 листопада 2013 року і який продовжив ідеї Всесвітнього саміту «Ріо+20» (2012). В роботі приділено увагу питанням ефективного використання природних ресурсів, освіти та інноваційної політики, подолання соціальної і економічної нерівності. У статті розглядаються питання гармонізації глобальних та національних зусиль, націлених на скорочення нерівності та сприяння глобальній та сестейнебловій науці, а також інноваційній діяльності; відповідальності та етичними питанням в процесі проведення досліджень і впровадження інновацій, поліпшення діалогу з урядами, суспільством, промисловістю та засобами масової інформації з питань сестейнеблогового розвитку та механізмів фінансування науки. В центрі уваги наукові питання, що пов'язані із засобами і методами забезпечення сестейнеблогового розвитку. Останнє означає: забезпечення екологічної безпеки, економічної стабільності і соціального добробуту майбутнім поколінням Землі. В статті порушуються проблеми щодо ролі вищої освіти у створенні критичної маси освітнього потенціалу для сестейнеблогового розвитку. Світова наукова спільнота наголошує, що студенти, які є потенційними носіями інтересів майбутнього покоління, повинні бути представлені як активні суб'єкти освітнього процесу, що формують його проблематику, а викладачі, які ввібрали досвід помилок і перемог минулого, повинні виступати в якості своєрідних носіїв соціальної пам'яті. При цьому повинна постійно підвищуватися роль інтерактивних методів навчання.

В статті порушуються питання, що були в центрі уваги Форуму в рамках роботи секцій: «Нерівність як бар'єр глобальної стійкості», «Наукова політика та управління: створюючи майбутнє», «Наукова інтеграція», «Наука за природні ресурси», «Наука та інженерна освіта», «Фундаментальна роль науки у сфері інновацій». Розглядаються питання, що були порушені під час проведення ряду тематичних сесій Форуму: «Амазонія, біорізноманіття та сестейнебловий розвиток», «Медичні виклики похилого віку», «Дипломатія науки», «Стійкі лісопосадки», «Застосування океанічних наук і знань для блага суспільства: вимоги після Ріо +20», «Роль вищої освіти у побудові критичної маси для глобальної стійкості».

В статті висвітлені основні рішення Форуму, які втілись у прийнятій декларації та рекомендаціях Форуму: 1. Гармонізація глобальних і національних зусиль у досягненні сестейнеблогового розвитку. 2. Роль освіти у скороченні нерівності та сприяння глобальній науці та інноваціям. 3. Відповідальність та етика проведення наукових досліджень та впровадження інновацій. 4. Покращання діалогу з урядами, суспільством, промисловістю та засобами масової інформації з питань сестейнеблогового розвитку. 5. Сестейнеблові механізми фінансування науки.

Реалізація прийнятих положень щодо досягнення сестейнеблогового розвитку може стати ще більшим викликом для сучасної науки. Реалізація зазначених принципів та рішень має відбуватися на національному, регіональному та глобальному рівнях. Тільки за такої умови світова спільнота матиме змогу досягти успіхів на шляху до досягнення глобального сестейнеблогового розвитку.

Ключові слова: сестейнебловий розвиток, екологічна безпека, економічна стабільність, соціальне благополуччя, наукове співтовариство.