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METHODOLOGICAL EXPERIENCES OF 45 YEARS ACTIVITY OF SUSTAINABLE DEVELOPMENT AND COMMON ACTION OF EXPERTS AND KNOWLEDGE-BASED SOCIETY FOR PROMOTION OF INNOVATIVE GREEN ECONOMY

Motto:
Everybody for the better Quality of Life for All

Abstract: Methodological experiences connected with long-term voluntary education supporting recommendation of supplementation task oriented education by problem-solving education promoting common action of experts and knowledge-based society focused on green economy based on innovative environmental biotechnology as key factor for creation many new green jobs, more efficient improvement quality of the natural environment, protection of the nature and culture heritage, primary prevention of health hazard and sustainable design and management of the natural resources.

Model Interuniversity Center of Sustainable Development and Ecoinnovation was founded in Krakow as contribution to International Network within new World University.

Key words: *green economy, laser biotechnology, environmental health, biodiversity, culture heritage, green jobs, life long learning, sustainable society*

INTRODUCTION

Sustainable Development is connected with *the balance of efficient protection of LIFE*, ecological balance in the whole Biosphere *and good economy based on* low resources and low energy, *environmentally-friendly technologies, as ecoinnovation*. This concept *is connected with sustainable model of consumption and Sustainable Society in the future…*

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Sustainable Development is recommended by the United Nations, the European Union and large majority of countries all over the world. The turning point in understanding the importance of sustainable management of the natural resources were; the Report of the former UNs Secretary General U'Thant, Report of the Club of Rome and Bruntland's Team Report "Our Common Future".

The concept of sustainable management of the natural resources facing the needs of the future generation *has been introduced by* former rector of the AGH University of Science and Technology in Krakow *Prof. Walery Goetel over 60 years ago*. GA of the IUCN in UK adopted his concept at 1956 and change the name into the International Union for Conservation of Nature and Natural Resources. Prof. Goetel *recommended also interdisciplinary cooperation of experts* in natural, technical and social sciences *within so called sozology and sozotechnology focused on human oriented activity*. He also *introduced open for all seminars* on the protection of nature and sustainable management of natural resources for the future, about a half century ago.

Representatives of 4 generations [both scholars and practitioners] took active part in the related activities in Poland.

The leading idea of the series of our International Conference from 1989 to 2012 *was the Common Action of experts and knowledge-based society for sustainable management of the natural resources* (including energy) *focused on improvement* of the quality of the Human Environment and *quality of life for all* [3, 4, 5, 21].

The key factor for better efficiency seems to be *INTEGRATION of problem-solving training* of the future experts *with the progress in science and technology* (based on *interdisciplinary case studies*) as well as *with the implementations in selected regions* as a result of cooperation with local stakeholders and decision-makers [Dobrowolski, 1, 2, 4, 6].

1. SUSTAINABILITY GOOD PRACTICES AND RECOMMENDATIONS

Promising for the future activity is *integration* of common action in different regions and countries *with International Network for Cooperation focused on Common Global Problems* e. g. adaptation to climate change, ozone layer depletion, as well as prevention of deterioration of the natural environment. The crucial problem is more efficient protection of the natural resources for sustainable society in the near future…[Dobrowolski, 5, 6, 7].

Let us hope that *it is still possible to change the trends of overexploitation of the biological resources* (as a result of the positive feed-back system of common consumption model and "cheap" but polluting technologies) *into environmentally-friendly model of consumption based on clean biotechnologies as a way toward Green Economy* This basic *change of the model of civilization is necessary for* the Mankind to go into negative feed-back system of *keeping homeostatic balance in the whole Biosphere* [6, 8].

Let us hope that recommendations of the United Nations as well as by the European Commission (at the beginning of 2012) *the top priority of bio-based Green-*

Economy is the direction which international scientific community would like to support. There are *good experiences of sustainability of e. g. Chinese economy for centuries based on biotechnologies* connected with rice, silk, tea, vegetable and other food products. Our hope is connected not only with *great progress in new fields of technology* as a result of *learning from the Nature*-like *bio-mimetics* (bionics), *bio*-materials engineering; [including *bio*-nanotechnology], photobiology, applications of *bio*-mining and extremophiles in environmental engineering, but also development on international scale of *ecological engineering*-initiated by the Polish professor Henryk Zimny in Warsaw more than 40 years ago.

Wide scale *introduction of new*, adequate to these challenges *model of professional training and education for all*, *is necessary for* the proper use of the lesson from the Nature and *successful cooperation of experts* (in *sozology*, *sozotechnology*, and *ecological engineering*) *with knowledge-based society and decision-makers*.

2. TRANSDISCIPLINARY IN SCIENCIE AND PRACTICE

In Poland, there is a very long tradition of interdisciplinary research (beginning from Copernicus in XIV c., Czyrniański and Skłodowska-Curie in XIX c.) and education for sustainable management of the natural resources in linkage with humanisation of technical subjects.

Following inspiration of Prof. Goetel *we have to recommend (e. g. within Bologna Process of Modernization of Universities*) *the basic knowledge in sozology and sozotechnology as obligatory element of basic education necessary for efficient partnership of experts and knowledge-based society*.

This would be the way promising for *the creation of Sustainable Society as responsible community for sustainable use of natural resources* (focused on the protection of ecological balance in the whole Biosphere) *and proper reproduction of biological resources* [related to nutrition of the future generation and protection biodiversity]-in particular.

Let us start with the recommendation of *introduction this kind basic knowledge as obligatory* for all the students of AGH University of Science and Technology [the birth place of concept of sustainable management of the natural resources based on interdisciplinary science and technology] as the starting point for dissemination such good practice on international scale. Referring to long-term tradition was founded in Krakow, Poland at March 2014 *as a model the Interuniversity Centre of Sustainable Development and Ecoinnovation (based on innovative environmental biotechnology and human ecology)as joint action initiated by the AGH-University of Science and Technology, the PK-Cracow University of Technology and the UR-University of Agriculture*.

The great challenge was dissemination good practice from different leading universities and cooperation with teams of top experts from *the World Academy of Arts* and *Science and the Royal Academy-Institute of Spain* contributed to 14th International Conferences on Sustainable Development and Ecoinnovation at AGH-UST at 2012.

Let us refer to some examples of good practice already tested for a long time. The author as the chairman of 14 Conferences (as well as several other interdisciplinary International Meetings of experts *focused on Sustainable Society*, since 1989) *introduced 45 years ago the concept of problem-solving training in this field* [1, 21]. This concept was based on regional *common action of experts* (in natural, technical, social and other disciplines) *and local society* [2, 4, 8, 21].

The symbolic logo of our preparatory Seminar in 1967 and Polish Summer Schools on the Human Environment (since 1968) as well as International Summer Schools on Sustainable Development (since 1972) was the image of the European bison (*Bison bonasus*) – a symbol of the Nature protection – combined with the images of the Earth and a spaceship [1, 6].

This was a starting point for *the integration of global thinking with local* (on a regional scale) *activity for better use of new technical achievements* e. g. space technology as useful for better knowledge about limited natural resources on global scale and importance of protection of ecological balance (like in long-term manned outer space missions).

The author, during his university studies, introduced –during seminar's discussion with prof. Goetel and well known science fiction writer Lem introduced at 1967 *the idea of interdisciplinary and international cooperation for better protection the natural environment outside the Earth* (including the Moon or the Mars).

This idea seems to be very up-to-date, especially if we take into consideration contamination of the upper part of the Earth atmosphere with still more and more anthropogenic waste materials. Only recently introduced the first satellites for prevention against production new wastes in the upper part of the atmosphere. There are some potential risk factors for the life on the Earth connected with possible contamination of the Mars with some anaerobic bacteria during automatic and/or manned missions on this planet and the reintroduction of mutants adapted to much more extreme environment back to the Biosphere. New task is training staff of experts for prevention this kind of potential global risk as well as for sustainable management of the resources and protection of the natural environment out of the Earth e. g. on the Moon, the Mars and another plants…

3. FOR THE FUTURE

50 years of voluntary life-long learning focused on common action for promoting Sustainable Development based on Eco-innovation as the community of elder and younger experts and new inspiriting idea [12] took *into consideration* two basic groups of *the topics for the future cooperation*:

I. *How experts* (scientists and practitioners) *could contribute more in common action, together with the knowledge-based society, for better use the progress in different fields of science and technology for the improvement of the quality of human life* (facing daily problems as good motivation to the society).

There are e. g. good practice in two fields of integrated action of experts and society, namely common action on local scale within *the habitat* (e. g. village, town,

or a district of a large city) as well as common action of inhabitants and visitors involved in *qualified tourism in linkage with education* about nature and culture heritage and protection of cultural landscape [5, 7].

Our common hope *for improvement of the quality of the Human environment* and *changing the model of over-exploitation of the natural resources into sustainable management of the resources and energy, can became reality if basic knowledge in this field is incorporated as obligatory element of training for students of all subjects of study*. This is the target group for knowledge-based society as well as the future decision-makers…

II. *Sustainability of universities* as well as *daily habits* (including Eco-campuses) and also promotion of sustainable society by qualified tourism seems to be the proper way *towards changing the contemporary model of civilization* based on new concept of consumption. One of new elements of scientific-based action in this field is development of interdisciplinary cooperation related to *Sustainable Design of Eco-houses and Eco-cities* [in progress e. g. at the PK-Cracow University of Technology] including cooperation of creative architects with experts in innovative biotechnology in linkage with human ecology, material engineering, nanotechnology, geo-engineering, etc. Recently our multidisciplinary team of experts and creative students from the students scientific clubs (NGOs) in Krakow city started such cooperation. At the near future we will try to introduce new pilot project in this field…

Our good experiences of my scientific leadership 45 years voluntary activity of the students' scientific club (NGOs) on the national scale in Poland indicated real perspective of involving students of all subjects of study (from natural, technical, social and many other sciences) into common action in cooperation with both top experts and local inhabitants of different regions [1, 6, 8].

Complementary experiences from different countries should be gathered into open for all database supplemented by effective system of data mining. As experts we have to face common expectation and interest of young generation e. g. in *wide scale application information technology IT including games* focused on sustainable management on local scale as well as adaptation to climatic change, water and energy management etc.

Instead of very popular games promoting pathological behavior we have to develop cooperation with teachers involved in all levels of education (from kindergartens to postgraduate courses) *to motivate young generation* (involved both in formal and voluntary forms of education) *to take active part for the improvement* of both in-door environment as well as natural *environment* in the *area they are living in or visiting* for recreation connected with education and physical activity in clean environment, good for health. Keen interest of young generation in games may be very valuable tool to make them involved in improvement of the quality of their environment *in a heuristic way*. They have to understand the importance of wide scale introduction of clean technologies as good for environment and health, as well as necessary for securing proper quality and quantity of the natural resources *for the stabilization of the development in the future* (in linkage with training curricula for the university students and whole young generation).

Interdisciplinary and intergeneration cooperation would be supported by *founding International Network for Promoting Training of Staff* focused on *eco-innovation and green economy* is important both for developed as well as developing countries (including training of experts in industrialized countries to help less developed regions of the world) in *cooperation with new founded the World University.*

Let me mention about good practice in *promoting innovative biotechnologies* as contribution to more efficient prevention of environmental health hazard, protection biodiversity and contribution to promotion sustainable development based on green economy in several countries [8]. I am involved in problem-solving training activity of creative students from developing countries for introduction such *eco-innovation as laser biotechnology* [for more efficient treatment waste water, reclamation of deteriorated areas out of use, new methods of multiplication of cultivated plants [useful both for production pollutants-free food as well as for protection rare species].

Another good practice useful for many countries in the Polish innovative system of beekeeping and nutritional prevention and apitherapy; as useful tool for creating many new green jobs in different regions of the world [10, 21].

Referring to long-term good experiences in this field let me propose contribution WAAS and other interested institutions in development distance education using e-learning technology [14, 15, 16, 13, 17, 18, 19, 20]supplemented by international and interdisciplinary workshops, schools and postgraduate courses.

Dissemination of good practice in common action of knowledge-based society and products (as Corporate Social Responsibility e. g. in Scandinavian countries) seems to be very promising for better future for all (including feedback system between *expectations of consumers* forcing *introduction* of low-resources and *low energy clean technologies*).

Curricula of training of experts and education of the whole society should take into consideration up-to-date knowledge and ability in *application of scientific and technical achievements for early detection of potential risk factors* (e. g. for health, nature, culture heritage, as well as for ecological balance, climate, natural resources for the future) as well as for *common action* of experts and whole society *focused on effective improvement quality of* the Human Environment and for better, sustainable management of the natural resources e. g. waste management, use of renewable clean sources of energy as well as *disseminate better biotechnologies for bioremediation and prevention from ecological catastrophe.* [8].

This seems to be connected with transition to New Knowledge-based Sustainable Society…

We could introduce *international guideline based on good practice of effective environmental monitoring (including synergistic effects* of different environmental factors and *control of individual, personal exposure and related health hazard*) as well as *new cheap and simple biotechnology e. g. laser biotechnology* for both improvement of the quality of natural environment and for significant increase of biomass and bio-energy production not instead food production in many developing and developed countries [5, 8].

There are also good examples of international cooperation helping victims of ecological catastrophes e. g. in the Minamata region in Japan [11], see also documental educational film "Living silver'), Bhopal region in India, Chernobyl region in Ukraine and more recent one in Fukushima region in Japan.

Let us start with training experts for more efficient help for the victims of these or similar catastrophes in the future as well as for better adaptation to green-house effects and related processes of desertification and more frequent and bigger flood incidences.

Let us also *develop* different form *of life-long education* and intergeneration of *inter-generations and international solidarity* and dissemination of good practice on wider scale.

Let us refer e. g. to Open Seminars introduced by Prof. Goetel more than 50 years ago, long-term activity of AGH-UST Open University and new concept of co-operation between this Open University with the Jawaharlal Nehru National Open University, focused on modern distance learning, for common action of experts and contemporary information society for promoting sustainable development in such countries as Poland and India [9].

Complementary, these good experiences of long-term activity of national network of the students scientific clubs (within founded in 1972 Polish University Youth Committee of Environmental Management and Protection), some other nation-wide environmental NGOs e. g. the Polish Ecological Club, as well as international NGOs, especially founded over 40 years the Youth Federation for Environmental Studies and Conservation (IYF) and 30 years of activity of Youth and Environmental Europe (YEE).

Creating of modern system for permanent exchange of useful information among experts from different fields as well as scientific clubs and environmental NGOs of young generation seems to be much needed for more efficient common action integrating top quality experts in the bodies like WAAS and national academies with voluntary activity of university students' NGOs and other interested bodies.

Let us focus on problem of *contamination of the natural environment and climate change*. According to the report of the European Environment Agency of 2011, the Carbon Capture and Storage Technologies require additional 15 to 25 per cent more energy produced by burning more coal. Therefore the application of these technologies will be connected with the increase of nitrogen oxides and particulate matter emission already exceeding permissible level in many regions. According to the forecasting, it is also expected that there will be an increase in the pollution by ammonia, as well as expansion of eutrophication process already affecting ca. 70 per cent of sensitive ecosystems in EU countries.

In result of anthropogenic pollution more than 80 per cent of EU urban population is under health hazard connected with high exposure to particulate matter of size less than 2,5 nm and Nanoparticles (becoming more and more important as a new kind of harmful pollutants for human health and ecosystems).

Scientific community has to develop interdisciplinary and international case studies followed by *problem-solving education of experts and society* supported by

dissemination good practice, as necessary condition for efficient prevention of risk factors connected with new antropogenic stresses including their synergistic effects after long-time of exposure…

In this situation as *extensive as possible dissemination of biological methods of fixation of CO_2 and biodegradation and bioremediation, as well as wider application of biomass* [of organic wastes as well as biomass produced by algae and other water plants in hydrobotanic waste water plants and in energy plantations in areas out of use], *should be recommended as the best method of contribution to the prevention of the pollution of the natural environment*, disturbance of ecological balance as well as the best contribution to the reduction of green house gasses [Dobrowolski and team of students from Laos, Nepal, Madagascar, Uzbekistan and other countries unpublished reports]…The methods are the best both from ecological and economical points of view. As a new tool for promotion green economy in different regions of the world.

Large-scale dissemination of Good Practice e. g. in *Laser Biotechnology* may be *creative contribution to Ecological Engineering* and *Green Economy* on international scale; including *better adaptation to Climate Change* [8, 9, 21].

The crucial problem is *the development of interdisciplinary studies and training focused on proper adaptation of environmental management and economical activity to climatic change on global scale* (as network of cooperating regions).

I*ntroduction of new curricula and international network for adequate to new situation training activities at university level, could contribute also to a very significant development of the labor market* and *Green Economy* referring to long-term good experiences in this field of some developed countries.

According to the forecasting of the Political Economic Research Institute of the University of Massachusetts *introduction of new technologies* connected with new air clean rules *could create a large number a new jobs* e. g. in USA about 1.5 millions jobs during five years. Development of global investments driven by promotion sustainable development seems to be important factor for reducing unemployment among graduates of universities. The crucial factor for optimal use of related financial sources is modernization of training activity at universities (by development of problem-solving interdisciplinary and innovative approach) in linkage with large scale education of whole society for common action focused on better quality of life and proper management of the natural resources in the future…

This may be a contribution to searching the New Model of Reasonable Life instead of the Overconsumption of the contemporary society, depending on computers, cars and other machines. It is important how experts, decision makers (politicians, owners and managers of enterprises) could *contribute in the development of labor market* (especially by dissemination of innovative eco-technologies, useful for sustainable management of the natural resources and energy), as well as protection of the proper quality of the human environment for the future generations.

*New challenges for the Mankind connected with sustainable exploitation of the resources under extreme conditions [*e. g. in the depths of the oceans], introduction of new environmentally-friendly technologies for production of new generation mate-

rials in the industrial centers on the Earth orbit as well as in the outer space (mines and industrial centers on the Moon, Mars etc.), *including training of experts in the protection of the natural environment and development of new technologies adopted to new needs of sustainable development in the future.*

Let us start with the database (including cooperation on modern data mining and application of artificial intelligence for automatic knowledge discovering) *and IT supported network for permanent international cooperation* related to both practical use of progress in science and technology for everybody as well as *training of experts for the future system solving of crucial problems based on Heuristic approach and dissemination of Good Practice*, supplemented by the Internet-based training, International Schools and Workshops are steps in the proper direction for such projects and network of experts supporting permanent cooperation in linkage with *Life Long Learning* focused on *Bio-based Green economy* and sustainable management of the Human environment and resources for the future…

I have already positive effects of tested in practice for very long time concept; that *active contribution is open for students and graduated of all subjects of studies* [e. g. in National since 45 years and International since 40 years Summer Schools and Workshop under my scientific leadership took part representative of over 30 subjects of technical, natural, social, economical, studies people active in culture, policy etc.].

Our team has also good experiences in out of university education of over 4000 university students (from Voluntary Scientific Clubs as *NGOs*) contributing to interdisciplinary studies and common action for the improvement of the quality of life, together with local communities and visitors of the regions of national parks, health resorts areas for recreation etc. in different regions in Poland, as well as in Spain and Italy (especially in Florence in cooperation with the Del Bianco Foundation on International Workshops promoting Sustainable Development of historical cities and their regions), and also in the European Projects promoting Sustainable Society in linkage with qualified tourism and education like in the model area of Cinque Terre National Park in Italy and within Union des Terres de Rivieres as the International Network of River Regions promoting Sustainable Development (cooperation of 18 universities and local administrative bodies from Portugal, Spain, France, Italy, UK, Germany, Hungary, Slovakia and Poland).

There is also a good practice of a long-term cooperation with creative experts from Japan, beginning form *1st International Congress of Scientists for Better Environment in Kyoto in 1975* and common action in Poland (by introduction of Japanese method for the detection of the air and water pollutants as risk factors for ecosystems, human health and culture heritage) as well as for efficient and cheap biotechnology of wastewater treatment, as well as international action helping victims of ecological disasters both in the Minamata area in Japan [followed by *global Action 0 Mercury*], as well as cooperation with Indian scientists from 1983 e. g. in Bhopal region in India at 1985 etc.

Referring to great progress in activity of *Open Universities* [integrating people of different age groups] in many countries all over the world and so called Universities

of the Third Generation in Europe, let me inform you briefly about good practice in voluntary education of knowledge-based sustainable society. We started at 1989 with common reflection of the Bruntland's Report "Our Common Future" and we have also *good experience of 25 years of the activity of AGH-UST Open University*. This University is open for different age groups, beginning from teenagers – candidates to became academic students to over 80 years old persons. Among lectures are well known experts from the majority of Polish universities, Polish Academy of Sciences, research institutes, scientists from other countries of Polish origin, as well as representatives of local and central self-governing bodies, administration (including mayors, members of the Polish and European Parliaments, ministers), as well as people of culture, etc. [5, 6, 9].

4. CULTURE AND THE HUMAN ENVIRONMENT

In connection with Support to European Networks and Creative Europe I would like to introduce our good experiences connected with interdisciplinary and international cooperation focused on more efficient protection of culture and nature heritage against environmental pollutants. I started this cooperation with Japanese experts prof. Amaya and prof. Sugura at 1982 using their innovative screening monitoring. The pilot study was supplemented by more than 30 years comparative measurement of exposition of the World Culture Heritage in old city Krakow to some air pollutants connected with motorization, heating system and industry. In this long-term case studies took part experts from complementary fields [e. g. environmental engineering, history of architecture and conservation of monuments, chemistry, microbiology, human ecology, medicine, etc.] as well as university students both members of Scientific Club of Environmental Protection as NGO as well as diploma and doctoral students. The basic study in historical city and in the oldest in Europe border park in the Pieniny Mts [including also valuable culture heritage connected both with wooden and renaissance architecture] were supplemented by short term monitoring of exposition of the World Culture Heritage in Florence and Bologna as well as nature and culture object in Italian National Park Cinque Terre. The results of this study are useful for more efficient and cheaper conservation of the top quality architecture and monuments, as well as for protection cultural landscape, biodiversity and human health.

Another field of recommended activity [based on environmental-based NGOs) was introduction of new model of voluntary education focused on integration of ecological culture, knowledge and dissemination of ecoinnovative technologies and ecological culture among tourists and inhabitants of historical cities and regions of high culture and nature value.

I am convinced that this Forum of WAAS intriduced new ideas, useful methodological experiences and good practice as creative contribution *to development permanent cooperation focused on better protection of the quality of human life, making also our life more reasonable and useful* following the poem "*An hour*" I re-

ceived from the Nobel Prize Winner prof. Czesław Milosz from the University of California in Berkely in 1981:

Before the five senses were opened, and earlier than any beginning,
They waited, ready for all those who would call themselves mortals,
So that they might praise, as I do, life, that is, happiness.

Let us start with a fascinating *Game open for all* and good for all by developing *common action open for All for Better Future to All* focused on permanent development of *Life-Long Learning* on international scale, based on innovative tools.

CONCLUSIONS

1. Let us try to change contemporary model of consumption into low resources and based on removable sources of energy model of consumption and promote permanent cooperation of experts with knowledge-based society *focused on transformation to Sustainable Society.*

2. Linkage of green economy based on dissemination ecoinnovation and ecological engineering for better quality of the human environment, sustainable management of the natural resources and creative contribution to development of labour market by creation many new green jobs and more efficient protection of the biodiversity and elimination of environmental risk factors for health.

3. Recommendation of modernization university education [including postgraduate courses] toward problem-solving education based on transdisciplinary case studies and networking regions from different countries facing with similar problems as well as global cooperation related to application of environmental biotechnology and ecology for better adaptation of human activity to change of climate.

4. Recommendation of *foundation of the multidisciplinary Centers of Sustainable Development and Ecoinovation [like the Center founded in March 2014 in Krakow, Poland] and integration their activity within International Network in cooperation with new founded the World University.*

5. Interdisicplinary and international cooperation focused on culture, environment and better quality of life following the best European and world tradition like the human right to proper quality of the environment for efficient protection environmental health, as well as culture and nature heritage.

6. Permanent exchange good practice connected with solving similar problems and Life-Long Learning [based on voluntary education in cooperation experts from natural, social, technical etc. disciplines both scientists and practitioners and focused on local problems in linkage with international cooperation] as heuristic contribution to foundation green jobs based on ecoinnovation.

7. Stimulation cooperation for development of distance learning as common action of experts and students both from developed and developing countries for promotion new environmental biotechnology and system approach to sustainable management of the natural resources for the future, *development of sustainable labour market* focused on better quality of life for all.

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