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Primary Prevention of New Pandemic and Biomimetic-Based Adaptation to Situation Connected with COVID-19 Pandemic

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ABSTRACT

Acceleration of worldwide infection with mutant of coronavirus SARS CoV-19 require new paradigmatic of human activity based on negative feed-back system following basic mechanism of Homeostasis of all living organisms and ecosystems. Condition of efficient primary prevention is better integration of cooperation of interdisciplinary teams of experts, knowledge-based society and decision-makers on local scale with working global network focused on common action for efficient protection against contamination of the Human environment with mutagens for reduction risk of incidence new mutants [Ex: Coronaviruses and new pandemics]. Key factor for primary prevention is reduction at the sources emission of immune suppressors, carcinogens and teratogens. Efficient prevention is depended on without delay worldwide introduction of complementary good practice in innovative environmental biotechnology integrated with ecological engineering and circular bioeconomy-driven sustainable development adopted to different kind of regions. Let us recommend heuristic approach, better financial support of transdisciplinary innovative basic and research-developing studies, improvement application of new IT tools for speed dissemination of scientific and technical progress, elimination of bureaucratic barriers and progress in distance problem-solving training and lifelong learning focused on sustainable, knowledge-based society selecting decision-makers with proper imagination and responsibility. Introduction on wider scale innovative biotechnologies [Ex: Recommended by our team modern environmental ecological engineering integrated with renewable sources of energy, laser biotechnology for better adaptation to climate change, aquaculture, apiculture etc.] focused on better prevention against contamination of the air, water and food; would be beneficial for environmental health. It would be also useful for creation in the near future many green jobs all over the world and for reduction risk of unemployment and hunger. International action for greening cities adopted to climate change could be supported by introduction of proposed new generation of eco-buildings and green habitats. The most important eco-innovation would be designing and construction underground centres integrating innovative biotechnologies for waster, wastes management to biogas; useful for also underground greenhouses for wide scale hydroponic production pollutants-free vegetables, mushrooms, supported by laser biotechnology, apiculture and aquaculture.

Such life-supporting system would be following ecosystems structure and function as new contribution to circular bioeconomy, especially useful for big cities. In the case of new epidemic, self-supporting in water and food green-habitats; could be more efficient in protection inhabitants against infectors. Taking into consideration synergistic effects of chemical, physical, biological pollutants of the human environment as well as impact of immune suppressors decreasing resistance of humans to infections and carcinogenic effects; is necessary for proper evaluation of existing health hazard as well as for prognostic study and efficient primary prevention against risk of new pandemics.

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INTRODUCTION

Permanent enhancement of worldwide contamination of the natural environment and disturbance of ecological balance of whole Biosphere are associated with significant increase of related health hazard e.g. rate of incidence of new mutants including mutants of coronaviruses, associated with new pandemics, still more and more common incidence of cancer and leukemia as well as congenital malformations and many other environmentally-dependent diseases. In this situation key problem is more efficient primary prevention of health hazard related to deterioration of the human environment (Including natural environment, in door environment of buildings, food) focused on improvement quality of the human life by common action focused on improvement environmental health. Efficient prevention of risk of new pandemic has crucial importance for all. The key to primary prevention is reduction of contamination with mutagenic factors of the total human environment. Dobrowolski already in 1975 recommended reduction at the sources rate of emission of different mutagens, carcinogens, immune suppressors and teratogens as trace pollutants but the most dangerous for health at the 1st World Congress Scientists for Better Human Environment in Kyoto already in 1975 [1]. Unfortunately for the Humankind this scientifically-supported recommendation was not taking into consideration by politicians and decision-makers responsible for selection technologies and system of production. Health hazard is associated with permanent increase of number of people over the world exposed to chemical, physical and biological mutagens (usually also carcinogens). Real risk factor is much significant due to synergistic effects of different kind of mutagenic factors associated with also elevated contamination of the human environment and food with immune suppressors (decreasing efficiency of immunological system) [1-12,14]. This dangerous coincidence is connected with enhancement the risk of incidence new mutants of viruses and other microbiologic pathogens and associated hazard for people and animal health. This is also great risk factor for food production based on animals breeding, cultivation of plants, as well as for protection of biodiversity and proper function of land and aquatic ecosystems. Short-sighted cost-benefit analysis is supporting also over-dosage of pesticides (including hormone-mimetic insecticides), artificial fertilizers, antibiotics and still more and more common food preservatives. This worldwide tendency increases risk of both genetic and teratogenic disorders as well as induce new mutants of microorganisms, insects etc. Selected mutant of biological pathogens after shorter and shorter time became resistant to all kind of applied before pesticides, antibiotics and other chemical treatment. In this situation the crucial problem is efficient primary prevention against the mentioned contamination by world-wide introduction biomimetic-based clean biotechnologies of production, integrated with circular bioeconomy. Let us learn more

from the Nature and applied principles of function living organisms and ecosystems for elimination all kind of pollutants at their sources.

The most successful prevention against global contamination of the natural environment would replacement common model of over-exploitation natural resources and deterioration of environmental health by introduction negative feedback system, as the basic mechanism of homeostasis of all living organisms and all ecosystems within the Biosphere. This system should be supported by ecological system of thinking and wide scale application of biomimetic i.e. biological processes of production instead of chemical methods. Biology-based technologies are much less energy consuming and integrated with mimesis function of ecosystems are clean and friendly to all. This way has no alternative for successful prevention against new epidemics and pandemics. Scientifically supported recommendation for biomimetic replacement existing system of global governance was introduced by J.W. Dobrowolski during E-Conference from 15 to 19 June 2020 organised by the World Academy of Arts and Science WAAS) in cooperation with the United Nations Quarter in Geneva. This is also basic idea of human-oriented green strategy opening new perspective of efficient primary prevention of new pandemics as well as better adaptation to situation connected with new and more dangerous pandemic and climate change. The key for improvement perspective for life for all is worldwide introduction of circular bioeconomy-driven sustainable management of the natural resources, based on complementary good practice of creative teams of experts from different regions of the world cooperating with local experts and society. This activity should be supplemented by wide scale dissemination Know How about useful biotechnologies and creation many green jobs especially in poor regions facing with speed dissemination of COVID-19 pandemic as well as progress of malnutrition and hunger. Very urgent task seems to be creation international network of experts and distance training for dissemination skills connected with worldwide application of biomimetic-based clean technologies e.g. biotechnologies for wastewater treatment and wastes management for bioenergy integrated within hybrid system of renewable sources of energy and integrated with water management, food production and improvement quality of life and environmental health as the top priority. New perspective of optimization of management of the natural resources and human environment are connected with wider application of neuronal network and neuromorphic engineering for promotion human-focused sustainable development [8,9].

Synergy is a modern concept with well documented consequences for biological systems. It was the object of a transdisciplinary Seminar between 1983 and 1988 at a post-doctoral level at the Sorbonne University of Paris. This Seminar was unprecedented initiative in Europe, introducing and enhancing essential transdisciplinary

concepts with far-reaching consequences. This is evident in the published proceeding of over one hundred original lectures are published and referenced in university libraries worldwide. In particular, it has implications for mutagenic factors in viral and coronaviral infections, carcinogenic and other pathogenic manifestations in the environment and its sustainability. It reflects immunosuppressive properties and the existence of teratogenic factors, also at sub-molecular levels, for example in free radicals pathology. Eco-innovative decisions by politicians are also yet insufficiently motivated although a wide array of experimental results is available. The urgent action required now has profound implications for humanity in its holistic dimension [2]. Efficient prevention against common environmental health hazard (focused on primary prevention of incurable diseases of civilization e.g. congenital malformations, as well as against incidence of new mutations including viruses and bacteria mutations and risk of pandemics, cancer etc.) as well as promotion sustainable management of the natural resources by dissemination of biomimetic, pollutants-free, human activity, integrated with ecological way of thinking and circular bioeconomy-driven sustainable development. We have to follow good experiences of all generations contributing to the transdisciplinary concept of sustainable development introduced by Prof. W. Goetel from AGH-University of Science and Technology and adopted by GA of International Union of Conservation of Nature already in 1956. Prof. Goetel introduced also basic ideas of new science sozology supported by Open to All Seminars and gave key note lecture together with eminent expert in environmental health and pandemics director of World Health Organization Prof. Kostrzewski - already in 1968 [at initiated and leaded by me 1st National Summer School on the Human Environment in model region of the oldest in Europe border park in the Pieniny Mts. on the Polish part].

To maximize the efficiency of common action of experts and the whole society focused on better quality of Life. It is necessary to provide inter-generations integration [versus isolated action of only staff of experts or only separated young enthusiastic people] - based on life-long interactive learning focused on common action for Nature-based solution of crucial problems including both better Adaptation to Climate Change and Circular Bio-economy-driven Sustainable Development adequate to new situation connected with COVID-19 pandemic.

Scientific leader of the team Dobrowolski could offer methodological experiences of over fifty years voluntary training of scientific clubs (NGOs) , voluntary teams of thousands interested students of more than thirty natural, social, technical and other subjects of studies and graduates from different university centres and mainly European countries as well as other continents; focused on problem-solving integrated with interdisciplinary case study and education of local society and visitors about skills for practical join action focus on integration with Sustainable

Development - efficient protection of the top quality nature, culture heritages (e.g. in some Polish, Italian, Spanish and other parks, health resorts and historical cities e.g. Krakow and Firenze in linkage with qualified tourism and open for all education).

Dobrowolski has also useful experiences connected with long-term Open for all Seminars, and over twenty five years activity in this field of AGH-UST Open University (as author of innovative concept and the founder), background materials from several International Schools, Workshops and 15 International Conferences on Sustainable Development and Eco-innovation (Bio-economy) from 1989 [3-6].

Leading by Dobrowolski team of experts from different countries have complementary good practices recommended for Trans-disciplinary Network and dissemination via Internet and by series of International Workshops, Schools and Postgraduate Courses e.g. for talented leaders - in particular young creative people - and contribution to the academic mission of education for improving human wellbeing and creative contribution to low investment creating green jobs e.g. by tele-work, self-employment in innovative enterprises promoting sustainable biotechnology focused on - inspired by Leonardo da Vinci, Alexander von Humboldt , several precursors of environmental health and their contemporary followers - BIOMIMETIC integrated with ecological engineering and founded in 1950 s by Goetel transdisciplinary sozology) in feedback of forecasting trends of sustainable labour market on regional and international scale. Let us also take into consideration very basic philosophical and ethical problems related both to discovery of Copernicus and Nature-inspiration creativity of Leonardo da Vinci, as well as human-oriented activity making reasonable life of hero of Goethe's poem - Faust, etc.

Let us contribute to exchange of ideas about modern concept of the International Centres of Sustainable Development and Circular Green Economy (Bioeconomy) and also survey perspective of foundation International Network of Experts in this field (including distance education for dissemination Know How and good practice in environmentally-friendly biotechnology and ecological engineering) for training by international and local experts staff for green jobs for different regions and countries (as creative contribution to international cooperation e.g. with the World Academy of Arts and Science) , integrated with Life-Long Education of knowledge-based Society (including both voluntary teams of young people as well as mid and third age generation) focused on Common Action with Experts for Better Quality of Life as Action Open to All for Benefit of All .

Creation of the International Network of Experts as Scientific Leaders of Interdisciplinary Cooperation on Green Economy and Innovative Environmentally-friendly Eco-technologies [including Data-Base of Good Practices from

different countries] would be very useful for stimulation integrated training and education on this priority area – Sustainable Development Goals recommended by [Ex: The United Nations].

Development of Internet-based distance education on System Approach to Solving Problems of staff of experts and stakeholders (including progress in cooperation with mass media including IT modern tools e.g. data mining, simulation focused on optimisation of environmentally-friendly biotechnologies and complementary eco-innovations, as well as technologies of distance interactive learning based on transdisciplinary system approach – seems to be a proper way for wide-scale international cooperation . Postgraduate Courses (based especially during pandemic period on distance training of experts staff both young people from developing and European countries) may be especially helpful for sustainable management of the natural resources and adaptation green economy to climate change in developing countries [Including protection of biodiversity and health of local population]. Good practice is connected with cooperation for promotion sustainable development for open for circa 3.5 millions of students National Open University in India [7].

There are real perspectives of more efficient protection of Life both at personal level as well as on the scale of the Biosphere by the adaptation human activity to Nature-based mechanism of protection homeostasis based on negative feed-back system (learning from basic mechanism of Homeostasis and ecological balance of the whole Biosphere) as necessary condition for efficient protection of environmental conditions for Proper Reproduction of Biological Resources and Biodiversity [8,9].

Let us recommend also the development of international cooperation on Open for All – Games for Better Quality of Life for All supplemented by experts in psychology and socio-technology – (with active contribution of representatives of all age and professional groups) – related to cooperating regions (facing with similar problems e.g. historical cities, area for cooperation, rural or industrial regions, etc.) as well as common action focused on better adaptation to climate change and to sustainable transport e.g.by minimization of negative effects of motorization, greening cities in Europe [10,11].

Replacement of task oriented training with problem-solving training (focused on system approach to the protection of homeostasis of all living systems from the human body in connection with personal environmental health to the Biosphere, based on interdisciplinary case studies with practical output for common action open for all).

Modern monitoring for early detection environmental risk factors for reproduction (important for health, sustainable breeding of animals and protection of

biodiversity) should be supplemented by environmental biotechnology for better prevention against contamination the natural environment and related health hazard, as well as by also innovative biotechnology for more efficient therapy of common diseases connected with contamination drinking water, food and the air [12–15].

Integration of training with the prediction of needs and trends in labor market; focused on promotion Green Jobs [Eg: Enclosed brief proposals of wide scale application laser biotechnology for better adaptation for enhancement food production and innovative concept of new generation underground centers of environmental biotechnology integrated with production of pollutants-free food-in big cities in particular as subject for discussion and welcome for supplementation with complementary eco-innovations].

Integration of professional training with problem-solving life-long education of all age groups (including inter-generation linkage) for common action of experts and knowledge-based society for better quality of life for all by better application of progress in different (complementary) fields of science and technology. Supplementation of up-to-day knowledge with ecological culture, ethics, sense of common responsibility and stimulation of individual talents and creativity as well as needed skills and efficient cooperation in multidisciplinary teams of scientists and practitioners and knowledge-based society for more efficient solving crucial common problems e.g. adaptation to climate change and mutant of coronavirus (SARS CoV-19) pandemic.

Better understanding among both producers, consumers and decision-makers that sustainable management of the natural resources (including renewable and clean sources of energy) is the best way to permanent development, sustainable society and circular bio-economy.

Improvement of socio-technological tools for better motivation of partners toward Common Action on local scale integrated with regional, international and global cooperation (reflecting integration of the natural environment and technological with bio- economical network on the global scale). Very promising for the future outcome is interdisciplinary and international cooperation initiated by eminent scientific partners of the first author; Prof. Belsare in India and Prof. Carioca in Brazil. This long-term activity and innovative concepts are focused on improvement quality of life by introduction innovative know-how in environmentally-friendly biotechnology for improvement quality of environmental health and creation green jobs in very poor regions by adopted to local needs and possibilities bioeconomy-driven sustainable development.

Replacement of popular socio-pathogenic computer games with attractive for young generation Games promoting interactive education, stimulating the sense of common responsibility for better future based on Green

Economy and team action useful for dissemination of positive motivation, skills and abilities for sustainable management of the natural resources adopted to different regions and Human environment in buildings, green-habitants on local scale as contribution to the Open to All Game for better future of the Humankind making human life more reasonable and focused for more effective protection of LIFE (see enclosed as motto reflection of the Nobel Prize Winner Prof. C. Milosz) including bio-ethics aspects and Common responsibility for the Better Future starting as soon as possible with Common Action for solving common problems of adaptation to COVID-19 Pandemic and Climate Change in different regions of the indivisible Biosphere .

Transdisciplinary studies mechanism of the influence of environmental factors on transmission of viruses and improvement cooperation among experts in environmental and medical fields are recommended for more efficient primary prevention against wide scale spreading enveloped viruses through the air, water etc [16–21].

Dissemination of experiences and case studies useful for improvement adaptation water management and food production to climate change have crucial importance also for enhancement resistance of people to COVID-19 pandemic and for better adaption to environmental and social outcome of this worldwide health hazard.

Recommended by the United Nations Organization right to safety, good for health of consumers drinking water (United Nations GA /Res/64/292 in 28 July 2010) and recognized as the top priority Sustainable Development Goals and by WHO, FAO and other international authorities water management adopted to climate change (including drought periods) was taking into model activity of the Municipal Waterworks and Sewer Enterprise (MWSE) in Krakow [22–24].

Innovative activity of our Enterprises is focused on sustainable water supply (based by integrated, modern technological center providing safety use of surface water) not only for the city but also several rural communes in region of Krakow. All national and international standards were taking into consideration for promotion eco-innovative technologies for efficient protection consumers of drinking water against health hazard. Enveloped viruses were detected in fecal samples of patients suffering with severe acute respiratory syndrome [17] and mutant of coronavirus SARS CoV-2 was found during COVID-19 pandemic in fecal samples in China [18], Singapore [19] and other countries as well as in some samples of wastewater in France [20]. As contribution to primary prevention monitoring control focused on this virus in wastewater is a subject of cooperation among experts from the Jagiellonian University and the Municipal Waterworks and Sewer Enterprise which is following recommendation of WHO related to water sanitation from 2020 including e.g. using ozone and UVC for water disinfection [21]. This innovative enterprise is

focused both in protection environment and health as well as contribution to promotion Renewable Sources of Energy (RSE). Multidisciplinary team of experts in complementary fields; introduced new technologies promoting RSE e.g. use of gravitation energy connected with downfall flow of treated wastewater, as well as cogeneration of electricity based on biogas produced by management of sewage sediments. The Municipal Enterprise is involved also in research-developing studies integrating contribution to protection health of consumers of drinking water with contribution to adaptation to climate change and reduction both operating cost and use of energy also by application Activated Sludge Model as well as energy from wastes burning. This Company introduced hybrid of renewable sources of thermal energy and electricity including integration of the mentioned sources of energy production with development photovoltaic network. In result of testing different computer based models for cost-effective optimization of energy consumption at the air blowers in aerobic bioreactor (consuming over half total energy use by the wastewater plant) was recommended the Lazy Scheduling Algorithm due to higher reduction of energy use. Application of this numerical model is connected with significant fluctuations of pressure at the aeration collector [22]. Complementary case study on was contribution to application of renewable source of clean energy by supporting generator by gravitation flow of water after wastewater treatment. They produce this way 2773 MWh electric energy annually. MWSE in Krakow in result they reduce very year emission of carbon dioxide by 2257 tones, sulfur dioxide by 2.11 tones , carbon oxide by 0.6 tone and the total dust emission to the air by 0.127 tone. Another kind of eco-innovation is connected with on situ test study on the influence kinetic and stochiometric parameters on efficiency of the wastewater plant in Krakow-Plaszow (by a sample-based numerical procedure), using the Activated Sludge Model implemented in the Benchmark Simulation Model and focused on enhancement biological processes of treatment [23,24]. Reduction of the operating costs of the wastewater treatment plant can be achieved by optimizing the algorithm of the efficiency control. The energy efficiency could be supplemented by integrated hybrid approach including also installation of photo-voltaic system of electric energy production. The area of this innovative municipal enterprise is big enough also for introduction new laser biotechnology for more efficient management of green areas surrounding artificial lake as main source of drinking water for inhabitants of Krakow municipal agglomeration. In result of application of empirical selected algorithms of irradiation with mobile low power lasers seedling and cutting of selected bushes their assimilation of CO₂, rate growth, biomass production and water retention could be significantly increased. This way we could introduce model eco-innovation useful both to adaptation to climate change, as well as for protection of biodiversity and for integration local society both for contribution to nature protection and for physical activity good for their health and well-being.

New perspective for sustainable development of global process of urbanization and sustainable management of great con-urbanizations in particular may be innovative concept of Eco-buildings and Green-Habitats. Following Biomimetic concept of learning from the Nature let us propose designing in model areas Underground Centers Environmental Biotechnology. Under surface of habitats would be constructed biotechnology-based centers of wastes management to biogas and wastewater biotreatment integrated also with bio-energy production from microalgae biomass. This renewable energy would be supporting also Underground Green Houses for hydroponic production of pollutants-free vegetables and ever green underground gardens for healthy recreation. This way could be introduced also new areas with life-supporting systems similar to natural ecosystems, based on knowledge about human ecology and ecosystems function. This could be not only model of application circular bioeconomy for sustainable development focused on improvement quality of life. Such isolated centers free from chemical pollutants for the air, water, soil and food would be also good isolated modern Noe's arcs with life supporting system in the case of new dangerous epidemics. This is also new perspective for adaptation to climate change and optimal re-use of water. Following biomimetic approach new generation of eco-buildings could be constructed of biomaterials and designing following shape of some skeletons of animals resistant to even very strong winds connected also with climate change all over the world. This would be real challenge for creation sustainable labor market for many millions green jobs...

New also very real perspective is connected with wide scale introduction of reasonable for cost-benefit analysis laser biotechnology for sustainable development and better adaptation of water management and food production to climate change e.g. in protected forests areas, as well as other kind of regions including semi-arid (See Annex) . This eco-innovation could be integrated also with modern aquaculture and apiculture as complementary contribution to construction artificial ecosystems as promising for the future model of sustainability of food production and prevention of risk of hunger related to coincidence worming of climate with negative input of COVID-19 pandemic on economy in different regions of the world.

CONCLUSION

Worldwide tragedy of still more and more victims of premature death in result of new mutant of SARS CoV-2 coronavirus ; is motivation for so called KATHARSIS of common myths of independence of human existence from the Nature and ecological principles and „free of ethics” omnipotence of big financial resources and high position in social structure. Better, common understanding of strong dependence of quality of life and health hazard for all human beings on quality of the only one natural environment within the Biosphere as well as understanding of indivisibility of

common for all human beings natural environment and existential risk including premature death of even millions people in result of pandemics. In whole history of the Humankind there were much more victims of pandemics than all wars and natural catastrophes. Opposite to common opinion at present time risk of pandemics is increasing in result of synergistic effects of different anthropogenic pollutants and permanent great of exposition to mutagens, carcinogens, teratogens and immunosuppressors. In result of coincidence of decreasing efficiency of immunological system and enhancement of exposition of still more and more people to anthropogenically originated pathogenic factors in the natural environment, food, drinking water and in the buildings environment. Risk of very quick and wide scale transmission new mutants is still increasing in result of technical progress in long-distance transport. Related risk of incidence of new pandemics is increasing. Therefore let us support - (the proposal introduced in 19th June 2020 at WAAS E-Conference by the first author proposal) - common action starting from memorandum of scientific community to the top decision-makers for recognition as the top priority on the global scale common action of all for benefit of all . This action focused on more efficient primary prevention against contamination with mutagenic factors and focused on reduction of risk of incidence of new worldwide pandemic. Efficient common action should be supported by better use of complementary knowledge of the most experienced scientists from natural, social technical and other fields and good practice of especially effective engineers and managers from different countries. We are convinced that due to ethical reasons all of us as experts; should do our best for much better application scientific knowledge and already existing alternative biotechnologies and other eco-innovation for significant reduction of contamination of the human environment and food with chemical, physical and biological mutagens. Let us initiate worldwide action of collection (in Open for all Database) useful - for human-oriented action - knowledge about eco-innovations for reduction at the sources different kind of mutagenic factors by wide-scale dissemination of knowledge and application of alternative, safety technologies for sustainable cultivation of plants and animals' breeding and for replacement in industry and all fields of human activity technologies and management systems connected with high energy consuming and contamination of the human environment by biomimetic system approach . This system based on biology and environmental friendly biotechnologies would be proper for efficient protection natural environment, human and animals food chains and environmental health as well as ecological balance and biodiversity in all regions all over the world. For useful for whole Humanity action; including better use of IT for dissemination useful knowledge focused on ecological innovations and skills within problem-solving training of experts, as well as for lifelong learning of knowledge-based society; as crucial partner in common mission for sustainable, focused on reduction environmental

risk factors for all and for better quality of life for people of all age groups and nations. The key factor for successful common action is integration of proper use of scientific and technical potential of contemporary civilization with ethical progress and better understanding existential interdependence of all human beings as condition of real civilization progress and surveying of the Humankind.

ANNEX

Laser Biostimulation for Better Adaptation to Climate Change and Reduction of Health Hazard by Enhance Biodegradation of Hydrocarbons Bioremediation of Metals, Reclamation of Deteriorated Areas, Increase of Biomass Production and Protection of Environmental Health and Biodiversity in different regions of the world

Distinguish Professor Jan W. DOBROWOLSKI, chairman of the International Team of Sustainable Development and Ecoinnovation, founding member of the European Institute of Ecology and Cancer, International Union of Elementologists, chairman of 15 International Conferences on Sustainable Development and Eco-innovation (Circular Bioeconomy) from 1989 to 2014, fellow of the World Academy of Arts and Science, Royal Academy-Institute of Spain, Consortium of the World University, AGH-University of Science and Technology, Kraków, Poland, E-mails: dobrowol@agh.edu.pl or dobrowol@dobrowol.pl, Tel: +481-263-34764

Brief review of perspective of wide scale applications

In the result of long-term laboratory and field experimental study were selected the optimal algorithms of laser photostimulation of different species of plants and selected microorganism as well as whole consortium of microorganisms (soil bacteria and fungi adopted for more than 150 years to hydrocarbons and selected from the soil in the region of the oldest all over the world oil drill in south east Poland) for much more efficient biodegradation of oil originated hydrocarbons [in particular carcinogenic PAHs] (as well as selected from soil in over 300 years old mining and metallurgical region in Silesia, Poland) for better bioremediation of toxic trace metals e.g. Pb, Cd, as well as hydro-botanic methods of wastewater bio-treatment, and also for better efficiency of reclamation of areas out of use [including better adaptability to contaminated environment including salted soil] and to dry period, enhancement of biomass and bioenergy production. This innovative environmentally-friendly biotechnology could be applied on wide scale for primary prevention of water-born diseases, more efficient energy plantations, and for better adaptation (water management, food production in particular) to climate change integrated with creation a lot new green jobs as contribution to biologically-based green economy and sustainable development of many regions all over the world.

Keywords: Laser biotechnology, Adaptation to climate change, Hydro-botanic plants for wastewater treatment, Reclamation, Energy plantations, Bioremediation PAH, Trace

metals, Biomass and bioenergy production, Green economy (Circular Bioeconomy), Green jobs, Sustainable labor market

Expected Social Outcome of introduction Innovative Eco-Technologies [New Know How]; Better Quality and Management of Water, Food, Human and animal Health, creation during short time many New Green Jobs both in developing and developed countries, including stimulation of international human-oriented training and cooperation of experts with knowledge-based sustainable society (including pilot projects for different regions of the world).

Remarks

The above-mentioned perspective of applications laser biotechnology for improvement quality of the natural environment, environmental health and for promotion circular bioeconomy-driven sustainable management of the natural resources were taking into consideration within innovative projects and problem-solving training and lifelong learning at the Team of Environmental Biotechnology and Ecology for Promotion Environmental Health and Sustainable Development at AGH University of Science and Technology in Krakow, Poland many interested diploma and doctoral students from different regions of Europe, America, Asia, Africa, as well as participants of Postgraduate Courses on Innovative Biotechnology, Sustainable Development based on Circular Bioeconomy, Adopted to Climate Change and focused on Better Environmental/ Nutritional Health and Sustainable Labor Market supported by Common Action of Experts and Knowledge-based Society.

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