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INTERNATIONAL COOPERATION IN UNIVERSITY TEACHING: TRAINING INNOVATORS FOR SUSTAINABLE DEVELOPMENT

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International cooperation as enabling context for new approaches and competencies for sustainable development

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POSTER

Virtual Exchange to Tackle Wicked Problems: The Case of the VAMOS Project

F. Jonsson, Uppsala University; L. Brandolin, Università degli Studi di Padova

A new place for a new future: the example of the Great Green Wall

G. Di Rosario, Department of Clinical and Experimental Sciences, Università degli Studi di Brescia, WHO Collaborating Centre for Tuberculosis and HIV co-infection and the TB Elimination Strategy

ABSTRACTS

EDUCATION, APPLIED SCIENTIFIC RESEARCH AND COOPERATION: A VIRTUOUS SYNERGY TO PROMOTE SUSTAINABLE AGRICULTURE IN THE MEDITERRANEAN

N. Lamaddalena, A. Scardigno, CIHEAM Bari

The International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM) was founded in 1962 as an intergovernmental organization under the auspices of the OECD and the Council of Europe. CIHEAM's main objectives are post-graduate education and promotion of research and development in the fields of agriculture and natural resources. Currently, CIHEAM comprises thirteen member countries: Albania, Algeria, Egypt, France, Greece, Italy, Lebanon, Malta, Morocco, Portugal, Spain, Tunisia, and Turkey. Since 1962, the CIHEAM has been devoted to the development of agriculture, fisheries, and sustainable food systems and to support the inclusive growth of rural and coastal Mediterranean territories. The CIHEAM, with its headquarter in Paris, operates through 4 institutes based in Montpellier (France), Bari (Italy), Chania (Greece), and Zaragoza (Spain).

Its missions revolve around four main objectives: Protection of the planet by combating all forms of waste: waste of natural resources, food waste and waste of knowledge and know-how; Food and nutrition security by boosting sustainable agriculture and food systems; Inclusive development by investing in new generations and fragile territories; Prevention of crises by managing tensions and working for the resilience of communities.

CIHEAM works collaboration with national authorities, as well as with the international organizations active in the Mediterranean region and beyond (e.g., FAO, EU, UfM, Arab Water Council, etc.). CIHEAM is involved in several projects financed by the EU and/or by the Italian and other cooperation agencies

In particular, the CIHEAM Bari institute works in four thematic areas: Land and Water Resources Management; Integrated pest management of Mediterranean fruit crops; Mediterranean organic agriculture; Sustainable agriculture, food, and rural development.

With the general scope of enhancing sustainable use and management of land and water resources through the development and implementation of innovative technologies and management practices, the Land and Water Resources Management department mainly focuses on: Water use efficiency and water productivity; On-Farm and Large-scale irrigation systems performance; Use of non-conventional water resources; Integration and up-

scaling at the basin level; Sustainable use and management of Mediterranean soils; Economic aspects of Mediterranean irrigated agriculture; Human resources development and capacity development. A relevant part of the research work focuses on the application of new technologies, such as GIS, Remote Sensing, Sensors and Modeling approaches for better agricultural water management.

Through a detailed analysis of the emerging problems and institutional dialogues with partners' countries, the CIHEAM training offer and its research directions are constantly updated, reviewed, and implemented by adopting a problem-solving approach. Special attention is devoted to empowering younger generations and improve their employability opportunities by promoting their active involvement in the economic development of the Mediterranean region. Entrepreneurial culture and knowledge transfer are promoted by introducing business innovation processes and methods.

Some examples of the application of the above said approach are the recent approved project and initiatives such as: SPIS Lab (Promotion of Energy and Water Efficiency of Solar Powered Irrigation System) financed by the German cooperation (GIZ) to CIHEAM Bari Institute; WAGRINNOVA, proposed in the framework of the LeapAgri program, with 32 different EU and African scientific institutions; SUSTLIVE (Burkina Faso e Niger) and WATDEV (Egypt, Sudan, Sud Sudan, Ethiopia e Kenya), financed in the framework of the EU-DeSIRA program, involving several scientific institutions of each partner country; WATER KNOWLEDGE, financed by the Italian Cooperation, dealing with higher education in the field of water resources management for Egyptian and other Arab technical stakeholders; WES project (Water and Environment Support) finance by the ENI Neighborhood South Region, where CIHEAM Bari is involved in the activities of capacity-development to improve water use efficiency and water productivity in selected case studies in Tunisia and Palestine; WATERMEDYIN, financed by the Italian Cooperation and implemented by CIHEAM Bari, aiming at contributing to sustainable development, promoting youth entrepreneurship, youth inclusion and socio-economic opportunities in the water and marine-coastal sectors in the Mediterranean Region; REACT4MED (Inclusive Outscaling of Agro-ecosystem REstoration ACTions for the MEDiterranean) and SALAM-MED (Sustainable Approaches to LAnd and water Management in MEditerranean Drylands), recently approved in the context of the Partnership for Research and Innovation in the Mediterranean (PRIMA).

All projects and initiatives are conceived and implemented by CIHEAM Bari in full awareness that the role of technical and professional education, lifelong learning, applied scientific research and cooperation are crucial for the sustainable development of the Mediterranean region. The support of green technologies is considered, along with the particularly disadvantaged position of girls and women and the imbalance between the skills of young graduates and the extremely dynamic and ever-changing labour market.

SUSTAINABLE OUTCOMES THROUGH IMMERSIVE EXPERIENCE AND ENTREPRENEURIAL ENGAGEMENTS: GRASSROOTS TO GLOBAL MODEL

Anamika Dey, CEO, GIAN and visiting Faculty, IIMA; Anil Gupta, VF, IIMA, IITB, AcSIR and NIPER-A

Engaging students around the world with grassroots innovations and enterprises will deepen the empathetic bond between youth and the larger societal aspirations. Absorbing immersive experience about unmet social

needs and creative experiments through Shodhyatras (learning walks) will help create deeper understanding of obstacles and opportunities for achieving SDGs. Courses that expose the students and the youth about the interaction of eight Es (empathy, ethics, equity, environment, excellence, efficiency, entrepreneurship, and education) can help them uncover the latent inertia that prevents social transformation to speed up.

We describe the experience of several course taught by us at Indian Institute of Management, Ahmedabad and also online course for the solution mappers of 90 innovation UNDP Acceleration Labs in 115 countries. The students will need to encounter not just the paradoxes underlying the developmental realties but also address them through proactive action-research. Some of the student projects can generate unicorn as it happened with one of the students in CINE course in 2010-12 batch. But even if most students don't pursue entrepreneurial path, their exposure to innovative and entrepreneurial approach will guide their professional pursuits in different roles, thus helping in achievement of SDGs. A self-critical look at the practices of using (or misusing) natural resources say water or energy inside the campus will also create a sense of responsibility among future leaders of the society. International exposure was facilitated through a class having exchange students, cases based on international experience of faculty's global engagements and outstanding examples of global awards given by honey bee network through GIAN called as HBN creativity and inclusive Innovation awards (HBNCRIIA). How grassroots innovations can reach global markets has been tried at Norway Technical national University (NTNU) where NTNU students work with grassroots innovators in India and try to develop strategies for scaling their ideas globally.

Courses like MIIST (Management of Inclusive Innovations for Social Transformation) and Meeting the Unmet needs for doctoral students of various technology labs of Council of Scientific and Industrial Research (CSIR), CINE (Creativity, Innovation, Knowledge Network and Entrepreneurship), ISIKG (institutions, social innovations and Knowledge systems at Grassroots) provide diverse insights about how to bring international partnership and experiences in the courses aimed at motivating students to pursue achievement of SDGs in their future career. They will have to see the connections between policy, institutions, culture and resources through various analytical prisms to help achieve SSGS faster and in a frugal innovative way. The innovators learn from the students and vice versa. Special courses will need to be designed with international faculty to include the outstanding models of achieving sustainable development goals through youth engagement involving science and technological innovations from and for grassroots.

CHALLENGES AND OPPORTUNITIES IN HIGHER EDUCATION ON CLIMATE CHANGE MANAGEMENT BY ERASMUS + NETWORKING IN EGYPT - THE ADAPTTM PROJECT

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Climate Change Management through Adaptation and Mitigation (AdapTM) was a three year project (2017-2020, extended to July 2021 due to the Covid-19 pandemic) funded by the Education, Audiovisual and Culture Executive Agency (EACEA) of the European Commission, in the framework of the Erasmus + Programme

(Action KA2 - Capacity building in the field of Higher Education). The network of Partners included eight Higher Education Institutions from five different countries: University of Catania – Italy (Lead Partner), the Programme Partners of University of Klaipéda (Lithuania), Euro-Mediterranean University (Portroz, Slovenia), National Observatory Athens (Greece) and the Project Partners of Alexandria University (Alexandria, Egypt), Arab Academy for Science and Technology and Maritime Transport (Alexandria, Egypt), Suez Canal University (Ismailia, Egypt) and South Valley University (Qena, Egypt). The University of Catania acted as coordinator and leading partner of the Project, offering its contribution in the general management of the project, the scientific support for the development of customised curricula, the setting up of updated contents of the new courses for MSc, along with the organization of seminars and workshops for presentation of the curricula and the organization of local dissemination events, the development of didactic material and the organization of activities and lectures for an e-learning platform.

The AdapTM Project aimed to continue the reform of the Higher Education system in the field of Environmental Sciences and to improve the quality and efficiency of educational process in Egypt according to the requirements of Bologna Declaration (1999) and Strategic Framework for European Cooperation in Education and Training (ET 2020). The main objective of the project was to ensure the design and implementation of an interdisciplinary Master Degree Study Programme in the field of climate change, in order to support Egyptian Universities with the integration of emerging technologies in climate change management in a competence-based education system, hence advancing higher education according to the European standards for quality of education. The eight partners have been working on designing, accrediting and delivering the Master Degree 'Smart Environment and Climate Change Management (SECCM)' focused on Physical and Environmental Sciences and fully compliant with ET2020 and the Bologna Declaration.

Among the preliminary activities, the re-training of Egyptian Universities academic staff was delivered for developing their teaching expertise and improving their ability on organise courses in climate change management with the integration of Information Technologies.

For supporting SECCM with innovative teaching materials, AdapTM network worked on conceptualising, editing and publishing newsletters, textbooks, mobile lectures, e&m-learning modules. With the objective to provide innovative learning methods, AdapTM network also implemented a Collaboration Platform (Google Suite) as learning and academic environment to share materials and information among scholars, lecturers and students and to establish their joint participation in the educational process and research. Last but not least, AdapTM consortium has been organising mobility of students and teachers between European and Egyptian Universities. European Universities academic staff have been travelling to Egypt for giving lectures within the SECCM Master Course modules whereas European students had a chance to attend selected modules taught by Egyptian academic staff. From Egypt, SECCM local students will be travelling to visit European Institutions (Covid19 restrictions permitting) for finalising their Master thesis. This on-going and in-coming International mobility (possibly to be replaced with online tailored lectures and activities in case of persisting pandemic) has been designed within AdapTM Project in order to maximise the opportunity to get a wider, deeper and effective educational and cultural experience. The students and teachers mobility that was implemented, as well as the intense work for the master preparation and accreditation, was a valuable experience, useful to overcome organisational and cultural differences among the project partners. This can be considered one of key outcomes of the project.

INCLUSIVE AND INTERDISCIPLINARY HIGHER EDUCATION PROJECTS. A DISCUSSION ON SOME EXPERIENCES OF CISAO

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The university education projects promoted by CISAO (Centro Interdipartimentale di Ricerca e Cooperazione Tecnico Scientifica con l'Africa, University of Torino) were partly addressed to the enrichment of quality and relevance of higher education to increase the impact on food security, sustainability and resilience to face the climate changes in some African countries. From the first beginning both the projects were directed to strengthen the higher education curricula in Agriculture and Animal Production, including different disciplines (technical, economic, social, politic) using a holistic approach. The basic principle was the improvement of excellence and regional integration of local and European Higher Education Institutions by the exchange of experiences between Italian and African universities. The main projects developed in this direction were: RUSSADE (Réseau des Universités Sahéliennes pour la Sécurité Alimentaire et la Durabilité Environnementale), financed in the ACP-UE Cooperation program in higher education EDULINK II (FED/2013/320-115), and CLICHA (CLImate CHange in Agriculture), an ERASMUS+ project (Key Action 2 Cooperation for innovation and exchange of good practices - Capacity Building in Higher Education).

Both the projects were addressed to enhance academic curricula in some African countries, enforcing the South-North link in teaching and promoting the engagement of the civil societies and of the private sector (commercial companies and enterprises).

RUSSADE (2013-2016) was a second level Master Course (CISAO was the project leader) that involved:

- 10 students (1 woman) with different previous curricula (agronomist, biologist, zoo-technician, environmental engineer, geographer, geologist, quality control engineer) from Niger, Burkina Faso and Chad;
- 47 teachers (8 women, professionals and academics), from Niger, Burkina Faso, Chad, Mali and Italy.

All of them interacted in distance and in co-presence teaching.

CLICHA (2018-2021, CISAO was a partner) was a more structured project with the aim to assess the current curricula in each Tunisian High Education Institution and its relevance to the climate change dimension and agriculture resilience. The project consortium selected the sustainable agriculture topic as a leading subject for the environmental protection, since agriculture is among the most important income of the Tunisian economy. Several academic institutions and academic courses were involved (from Greece, Italy, Latvia and Tunis), as well as national centers of scientific researches on climate and agriculture. Business and private companies participated also to dissemination events. Differently by RUSSADE, CLICHA focussed on the social media

(Facebook, Twitter, YouTube, LinkedIn) and on online meetings and participatory events (probably also due to the pandemic COVID-19 situation).

RUSSADE took action in countries with the lowest human development indices, and difficulties to promote high education interdisciplinary curricula with the double view of the food security and the environmental protection. The project did not only offer theoretical and practical training to the applicants, but also renewed the ICT resources and capabilities in a perspective both to join experiences and to give to the students more chances for eco-friendly work opportunities.

CLICHA, on the other hand, had the valuable objective to give to the students (high school and university) the opportunity to understand the importance to acquire methods to analyse the climate changes questions related to the agriculture and to face the consequent problems, also making sustainable changes in their lifestyle and behaviour. CLICHA introduced a new way to have 'climate change agriculture' academic curricula.

Both the projects, in a different way, were successful, but the question is always the same: how to maintain the good practises aroused from these experiences? How to guarantee follow-up actions to make possible to other future students to take advantage of the positive actions carried out by these projects? Young people is now protagonist of the challenge to afford the environmental 'big' questions (Friday for Future is only one example) and they need new training opportunities, also in the so called developing countries. Even though interdisciplinary academic education alone is not sufficient to cope with the climate change and, as a consequence, with the food security and the environmental protection, it is therefore necessary and it must be present in the national and international policy interventions.

INTERNATIONAL COOPERATION AS ENABLING CONTEXT FOR NEW APPROACHES AND COMPETENCIES FOR SUSTAINABLE DEVELOPMENT

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Environmental problems pose new challenges to Engineering schools, as the capacity of explanation and prediction offered by science is scarce. Uncertainty is deep, values are in dispute and show a plurality of legitimate perspectives, stakes are high and decision are urgent. These problems thus require to encompass what has been called "post-normal science" (Funtowicz and Ravetz, 1997), i.e. a new conception of the management of complex science-related issues, which consider uncertainty, value loading and plurality of perspectives as an integral part of the problems. How to enable University students to combine traditional models with logical-cognitive models and approaches of post-normal science to become change agents for societal transformation towards a more sustainable future is a core challenge.

In this context, real-life problems coming from international cooperation may constitute an excellent context for University students to understand this paradigm shift and to experiment new approaches and innovative solutions for sustainable development outside taken-for-granted frameworks. Starting from this idea, between 2009 and 2010 we asked students enrolled in a master program in territorial and environmental engineering of the Polytechnic University of Bari to develop a project work dealing with the identification of sustainable solutions for the energy and water supply, accessibility and waste management of a small hospital in a remote

African village, Kimbau, located in the Democratic Republic of Congo. This project work was undertaken thanks to the support of a multidisciplinary team of experts from the Polytechnic University of Bari (among them, Profs Ubaldo Ayr, Umberto Fratino and Massimo La Scala) as well as to the active involvement, in student tutoring, of volunteers of the association Engineers without Borders. The project was then made possible thanks to the involvement of Dr. Chiara Castellani, a volunteer doctor at the Kimbau hospital who interacted with students to discuss the problems and the characteristics of the project area.

During the development of the project work, students were continuously challenged to apply their disciplinary competencies in a context, which was very different from those they were accustomed to. They were prompted to see problems from different perspectives, to understand that there was no single problem definition as this is influenced by value systems and people's worldviews.

They understood that conflict is part of the problem and that a broader range of solutions may be opened up through an inclusive and cooperative perspective. Students learned that technical skills are not enough to find sustainable solutions for a problem, as they also need listening skills, dialogue and inclusive decision-making.

They furthermore learned that the goal of their assignment was not to find a scientifically "valid" solution, but to make sure that solutions were also "relevant and pertinent" with respect to Kimbau and to the local knowledge and practices of its inhabitants. This entailed a dialogue between local and global knowledge, which is very important in international cooperation.

Students applied the Project Cycle Management methodology in tackling challenging problems such as: logistics, procurement of materials, the presence of skilled labor, management, control and maintenance of electrical and hydraulic machines. The collection of relevant information and the stimulus received from the experts in asking the right questions to approach the problem from different points of view helped students in the decision-making process. They also reflected on technology-induced changes and on the long-term impacts of the technology's lifecycle.

Finally, during the project work students used critical thinking, communication and negotiation, analytical skills as well as creativity, and started learning intercultural skills. As a further value added by the inclusion of international cooperation in University teaching, students thus improved their "soft skills", which are increasingly acknowledged as important competencies to gain within University programs (see eg. EU Council Recommendation of 22 May 2018 on key competences for lifelong learning).

VIRTUAL EXCHANGE TO TACKLE WICKED PROBLEMS: THE CASE OF THE VAMOS PROJECT

F. Jonsson, Uppsala University; L. Brandolin, Università degli Studi di Padova

Virtual Exchange to Tackle Wicked Problems: Latin American and European Collaboration on Education for Sustainable Development (VAMOS) is a capacity-building project within the framework of the Erasmus+ programme. The project gathers six Latin American universities (in Brazil and Honduras), two European universities (Uppsala and Padua), and one NGO with leading experts in virtual exchange (UNICollaboration).

The aim is to co-create virtual pilots in which students from all our universities will work with the local and global (GLOCAL) sustainability issues (i.e. wicked problems).
The GLOCAL Education for Sustainable Development (ESD) pilots are developed in VAMOS as bottom-up initiative by an international group of teachers (from eight universities from Honduras, Brazil, Italy and Sweden). The pilots brings together teachers and students in a virtual learning environment. The aim is to facilitate a joint learning experience between students and teachers in Europe and Latin America on wicked problems through an international, multicultural and multidisciplinary exchange.
A good example is for instance climate change, which is an issue without borders, yet the impacts vary locally and it known to be a 'wicked' sustainability issue that does not have predetermined answers. Climate change and other wicked problems, a multidimensional world and a society in transition all challenge traditional learning methods and ideas about learning (Lehtonen A., Salonen A.O., Cantell H, 2019). Collaboration is a crucial skill for education for the future and is required of both learners and teachers (Pyhältö et al. 2014).
Yet, climate change and global pandemics such as COVID19 have highlighted the limitations and fragility of the prevalent model of internationalisation. To address this inherent paradox - the need for enhanced global cooperation on the one hand, and restrictions of global mobility on the other - universities are called upon to develop more innovative and sustainable forms of internationalisation.
Virtual Exchange (VE) provide frameworks and models for shaping internationalisation in a way that it uses the international differences as an asset for cross-disciplinary learning and for creating the global mind-set necessary for addressing sustainability issues. In particular, students need skills to prepare them for a world which is increasingly marked by uncertainty and complex ("wicked") problems which are often an entanglement of local, regional and global issues. They can only be understood and solved by joining international and interdisciplinary perspectives.
While there is an abundance of technology for virtual collaboration, universities are still looking for ways to develop virtual exchange initiatives together with international partners to facilitate global learning in order to prepare our students with the competences and skills needed to meet the local and global challenges of the 21st century and beyond. With this abstract, we want to share our experience of collaborating around wicked problems and working with students as agents of change within the project VAMOS.

Website for the project: https://vamos-erasmus.eu/.

A NEW PLACE FOR A NEW FUTURE: THE EXAMPLE OF THE GREAT GREEN WALL

G. Di Rosario, Department of Clinical and Experimental Sciences, Università degli Studi di Brescia, WHO Collaborating Centre for Tuberculosis and HIV co-infection and the TB Elimination Strategy

The Great Green Wall (GGW) is an extraordinary project with the ambition to grow an 8,000km natural wonder of the world across the entire width of Africa (from Senegal to Djibouti), taking roots in Africa's Sahel region, at the southern edge of the Sahara Desert-one of the poorest places on the planet. [1]Poverty and health have a

complex albeit well-known relationship. Living in poverty means that important health determinants—such as access to healthcare, nutritious food, clean water and safe shelter—are compromised. The relationships between poverty and health are bidirectional. As a result, living in poor health can also prevent from making a living wage to care for oneself and one's family. These issues, therefore, feed on one another.With the view of influencing the reciprocal interaction in a positive way, the Great Green Wall can represent a huge turning point for the socio-economical-spiritual future of the whole of Africa. [2]The initiative aims to provide food security, jobs and a reason to stay for the millions who live along its path, by bringing life back to Africa's degraded landscapes, achieving by 2030:

-restoration of 100 million hectares of degraded land

-sequestration of 250 million tons of carbon

-creation of 10 million green jobs in rural areas, through capacity building on sustainable land and water management

More than anywhere else on Earth, the Sahel is on the frontline of climate change and millions of people are already facing its devastating impact. Persistent droughts, lack of food, conflicts over dwindling natural resources, and mass migration to Europe are just some of the many consequences.[1]The GGW is already helping households to support more livestock, grow more food and have better access to water. It also aims to create better environmental conditions globally. This enormously contributes to create means of subsistence for local populations, that will translate into new economic opportunities for the world's youngest population and the acquisition of tangible tools necessary to tackle the problem of hunger. That would hopefully improve living conditions of people in the arid zones of Africa–home of 232 million people [3] and reduce their vulnerability to climate change.Having the possibility to cultivate their own land and grow their own food would definitely represent for the African people a chance of achievement of basic livelihood standards and fundamental human rights, therefore contributing to self-determination and human development (there are also more complex interactions between deforestation and health, such as an increased prevalence of infectious diseases. Research has shown that as trees are cleared and spaces are urbanized,populations of disease-transmitting species like bats and rodents grow). [4]Growing traditional foods can be an important track in finding solutions to chronic disease and malnutrition as well as ensuring food and health security in low-income countries.[5]The idea of theGGWis strictly related to the 2030 Agenda for Sustainable Development, influencing almost all Goals, creating attention on the Social determinants of Health(conditions in which people are born, grow,work, live, and age[6])and on the interdependence of human, natural and economical capitals (examples from the book "Effetto Farfalla", by Grammenos Mastroieni, will be shown).Questions are, how can this be implemented without a strong system of widespread knowledge and education? How we can avoid burning forests and melting glaciers? How can we achieve the objectives decided during the major world summits (Kioto, Paris, Rome G20, Glasgow COP26) and the Green New Deal Agreement (which motto is no people and place is neglected).Ultimately, which can be the role of Italian (and European) Universities and Academies in instilling will power, learning and innovation for human development, in a strategic area of the world?The GGW can act as a formidable emblem of a strategy that aims to unify human prosperity with environmental preservation.That's because the effect of growing a green barrier goes beyond land restoration, addressing many issues of the 2030 Sustainable Development Agenda (2015) such as fighting poverty and hunger,building local resilience to climate change, quality education, improving health and well-being,creating jobs, boosting

economic opportunities, etc.The destiny of all life forms depends indeed on conditions of health and stability of the planetearth.In conclusion, The Great Green Wall can become a new model of human coexistence among diverse cultures and harmony with nature, which could act as a revolutionary driving force for the implementation of Global Health(the bio-psycho-social model of health)and the achievement of fairer and more just world.

In this article the reciprocal influence among human well-being and environmental health is explored, by focusing on the role of education (Goal 4.7) and international cooperation as tools of transformation for the promotion of healthier, happier lives.