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New, regenerative approaches to sustainability [1]

Redefining ecosystem functions, environmental management, and heritage conservation

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Abstract – The international conference "Sustainable Management of Cultural Landscapes in the context of the European Green Deal", held in Santo Stefano di Camastra (Sicily, Italy) on November 9-14, 2021. aimed to shed light on those environmental, social, economic and cultural problems of interactions between humankind and its natural environment, which cannot be answered through one single discipline but only by applying a multidisciplinary system approach, built on applied Earth System Science intimately interwoven with social sciences, economics and heritage science. The structure of the Congress mirrored this concept, since the overlapping areas of sessions encouraged interdisciplinary thinking and practical approach to the key issues of regional development such as ecosystem protection, green infrastructures, sustainable and multifunctional agriculture, circular economy, renewable energy, regeneration and conservation of natural environments and conservation of cultural heritage.

Keywords – cultural landscapes, ecosystem services, multifunctional agriculture, renewable energy, interdisciplinary research, regional planning, European Green Deal, climate change, environmental sociology, heritage conservation

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NEW DEFINITION OF CULTURAL LANDSCAPES

From landscape management viewpoints the need to preserve natural, cultural and intangible values and develop them from an evolutionary perspective into sustainable living environments has always been of great importance, even for the particularly sensitive cultural landscapes, which are constantly changing, and also need to be developed to meet requirements from the present society. Furthermore, the fast growing tourism industry requires sustainable management practices including the use and development of cultural landscapes into touristic products without compromising sustainability issues in order to avoid the adverse impact of mass tourism.

The landscape is a part of the earth's surface with a special image, a spatial unit whose basic properties and boundaries have developed as a result of natural processes, and at the same time more or less changed as a result of human activities. Its operation and formation is characterized by the multifaceted interaction of landscape-forming factors, but at the same time its functional unity. The temporal changes of the landscape (long natural history and short but intensive anthropogenic landscape formation) are also unique for a particular landscape. According to the new definition adopted at the SUMCULA workshop in Brno, 31st January – 4th February 2018 "*A cultural landscape is a geographic area, with all its cultural and natural resources, the wildlife and domestic animals, natural and artificial ecosystems, the built and intangible heritage therein, continuously shaped by historic and present day evolutionary processes including the adverse or beneficial impacts of human activities, social relations and evolving cultures, which mirror the evolutionary trends of human society*." Thus, taking into

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consideration the fact that only very few landscapes could be defined as "natural" i.e. developed without the participation of humankind, all landscapes should be classified as cultural landscapes, since the impact of human activities influences, even if indirectly, the development of very remote areas where presence of human civilizations could not be recorded.

Understanding complexity

Landscape design is a relatively old discipline with ancient historical roots, including well-known medieval town planners and city builders such as the Pisano brothers, Alberti, Palladio - famous garden and landscape builders of their time - Olivier de Serres, André Le Nôtre, William Kent, Charles Bridgeman - and experts in river recycling and road design have used the advances of contemporary science to create a conscious, pre – planned processes. Today the multi-faceted analysis of a certain landscape requires the processing of a large number of data with different and very diverse contents, depending on very different purposes. These may relate to surface properties, geomorphology, soil, surface and groundwater, climate, air, living organisms (species and communities) and land use factors such as agriculture, industry, settlements, the built heritage, assessment of landscape remediation measures, etc. The quality and quantity of data and data sets used in a specific survey depend on the course and objectives of the planned research. According to Csorba (2006) three indicators can be selected that most optimally allow the exploration of the structural features of the landscape and the conditions and possibilities of landscape development:

1. the degree of mosaicism,
2. the ecological connectivity of the landscape details.
3. the level of hemerobia,

Mosaicism and the ecological connectivity of landscape details represent the alternation of a well-defined type of element or landscape structure (patch, corridor, matrix, dam, ecotone) that reflects the heterogeneity of the landscape, and the interoperability between landscape element types and three-dimensional landscape systems. The level of hemerobia is intended to measure the intensity of the anthropogenic effect, ie the appearance of the human effect in the landscape, and can be used as one of the important ecological tools of landscape planning.

MULTIDISCIPLINARY APPROACH

The approach of the Congress is truly multidisciplinary, including all the key disciplines of Earth System Science.

Earth System Science cannot be described with any single discipline alone. Referring to the Bretherton diagram, a road map toward better understanding of global environmental change, developed by Francis P. Bretherton (NASA, 1986), fluxes and interactions between Earth systems and the impact of human activities on biogeochemical cycles and ecosystems is clearly demonstrated (Fig. 1). This concept has been adopted and developed when the Congress was planned to link natural sciences, agriculture, humanities and heritage conservation into one holistic system through the aforementioned concept of cultural landscape management. As it is well visible on the Bretherton Diagram, soil has a central role in terrestrial ecosystems (in fact, soil is also an ecosystem) and in nutrient cycling processes (Amundson et al. 2015; Bouma, 2020). Soil conservation is therefore important for ecological reasons and in agriculture, the use of different pedotechniques should be applied carefully in order to avoid soil degradation (Dazzi et al. 2019). Based on the Bretherton Diagram, the Social Processes Diagram developed by the Human Interactions Working Group within The Consortium for International Earth Science Information Network (CIESIN) led by William Kuhn and Harold Jacobson of the University of Michigan, clearly explains the connections between economic development and environmental management (Fig. 2; CIESIN, 1992).

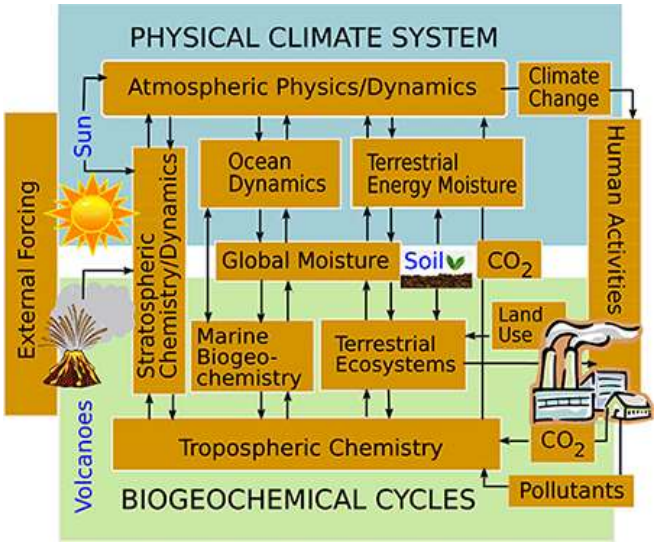

Figure 1. The Bretherton Diagram.
Source: https://oxfordre.com/

The impact of climate change

Climate change may aggravate the environmental problems through changing temperatures, reduced precipitation, enhancing the adverse impact of excess nutrient discharge and entry of invasive species. Thus, the environmental viability of development programmes depends on the right assessment of ecosystem services, counterbalancing adverse environmental impacts of developments by creating and/or restoring habitats.

The state of environment on landscape level

Even if the study of the state of the environment does not necessarily takes place in a landscape context, individual social activities often affect entire landscape units. The landscape is a territorial unit organized only in its own way: its vegetation, soil, etc. reacts differently for environmental stress such as acid rain, discharge of toxic substances, deforestation, excess nutrient discharge, etc. than neighbouring landscapes with different features. The European Union launched an action plan for the sake of clean air, water and soil, and for the health of ecosystems and the

environment, to prevent, remedy, monitor and report on pollution more effectively, to reflect its decontamination objectives in all its policies; to ensure that economic growth does not lead to an increase in pollution, in line with United Nations efforts (European Commission, 2020 a).

When dealing with environmental problems at the landscape level, the aim is to show the path of a specific external effects between the different elements of the landscape system, thus we get to know the role of landscape factors in the system, more resilient or vulnerable elements of the landscape system, what is the carrying capacity of the landscape and for what social purposes can the landscape be used.

exploring corporate strategies for sustainable land use and CSR; policy making, decision support systems in regional development (landscape observatories), natural park management, etc. Particularly important institutions are landscape observatories, representing a bridge between the general public and policymakers and providing decision support for local and regional authorities and governments. The European Landscape Convention (ELC), concluded in Florence in 2000, is the "first international agreement to fully address all dimensions of the European landscape" (Council of Europe, 2000). Among the most important aims of the European Landscape Convention are to increase democratization in decisions concerning the landscape, to

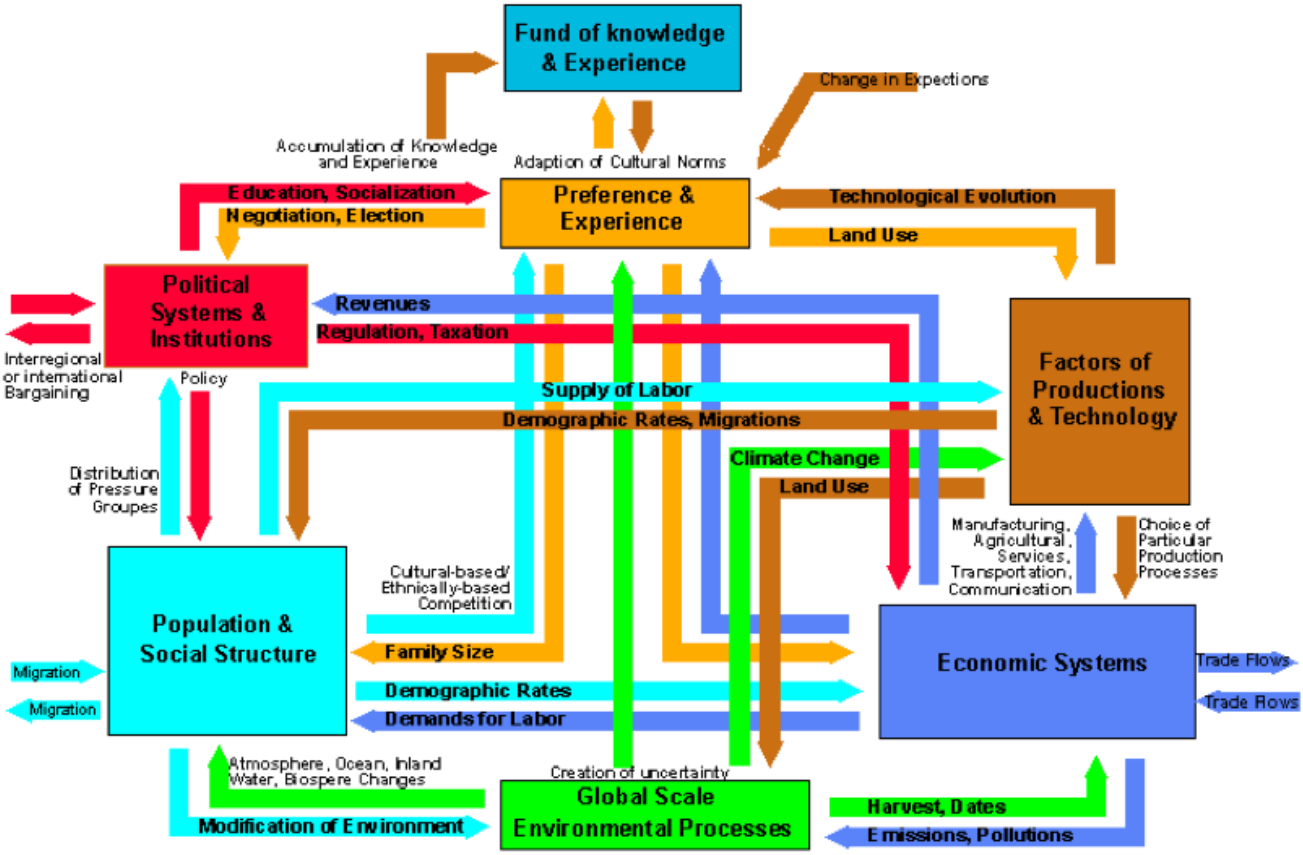

Figure 2. The social process diagram shows the three key elements of the human relationship to the environment: the structure, connections, and dynamics. The Bretherton Diagram here is represented by the green "Global Scale Environmental Processes" box. Source: http://gaia.jhuapl.edu/FocusAreas/StrategicSimulations

Regional development, eco-sociology and the European Landscape Convention

Regarding regional development, important areas include Sustainable Rural Planning (agro-ecosystems and natural ecosystems, renewable energy and multifunctional agriculture, infrastructure planning, revitalisation of traditional trades and crafts), constructing viable socio-economic models and development strategies for recovery of areas suffering from economic and social depression, developing rural communities through heritage based local economies, sustainable rural tourism and ecotourism,

notice landscape changes and to spread awareness of the landscape. In several European countries that have joined the ELC, regional and local landscape observatories have been set up for this purpose. At landscape observatories, activities take place to impart knowledge about the landscape, to increase awareness of the landscape's values and to monitor landscape changes. Landscape observatories are often run in collaboration between regional or local authorities, voluntary organizations and academic institutions (Gambino et al. 2013).

Sustainable tourism

Experience has shown that the continuous and often uncontrolled growth of the industry can lead to a severe deterioration of the natural and cultural environment. Increased awareness of natural values and beauties, damage to and overuse of classic resorts have led to an increase of interest in 'untouched' and less developed exotic sites, which used to have a low tourist density. Today, tourism to natural destinations accounts for about 50% of international tourism and is growing by 10-30% a year, much faster than the industry as a whole. Distant areas that were previously overlooked are "explored" by tourists, with more and more people visiting these places, placing an increasing burden on the host areas. The faster and more intensively tourism develops in destinations with natural attractions, the more it will change the natural and socio-cultural environment of the region concerned. It has become clear that efforts need to be made to minimize the harmful effects on the tourism sector (UNWTO, 2021).

Conservation of cultural heritage

Today's society can in many respects be seen as a turning point between modernism and the postmodern. If you go back about a hundred years, it was a completely different turning point, which was about the older peasant society being transformed into the modernism of industrial society. The general development of society and the development within special branches of society, such as cultural policy, must be analyzed and understood in relation to each other (Gren, 2010).

In Europe, strategic work has been underway for several years to develop infrastructure, networks and collaborations for scientific application and research for cultural heritage, Heritage Science. The area is interdisciplinary and is based on collaboration across subject boundaries to increase and impart knowledge about cultural heritage. It includes analyzes of individual objects, access to mobile analysis instruments or large-scale research facilities, as well as providing increased access to archives and reference collections as well as digital cultural heritage data.

MULTIFUNCTIONAL AGRICULTURE IN FOCUS

The multifunctionality of agriculture is in many cases a prerequisite for the economic and social sustainability of organic farming and of businesses based on local products produced in this way. This, of course, requires a reinterpretation of agricultural production, the product structures that can be developed, and the services that can be linked to agriculture and the sale of agricultural products. Modern multifunctional agriculture therefore involves the use of state-of-the-art precision technologies, which of course does not preclude the revival of certain environmentally friendly traditional methods, the use of renewable energy sources, zero- waste management, complex finished product-based management structures and related services. Furthermore, agrotourism, which can be key both as an ancillary service and for the local sale of products is an increasingly important source of income for rural businesses. Based on the good practices of organic farms in general, particularly in Italy and France (Alsace), the well-known Azienda Agricola Model combines the production, food processing and service (including tourism) functions of organic farming into a holistic system based on the sustainable use of ecosystem services. The Azienda Agricola Model (Némethy et. al. 2016) was originally developed on the basis of the activities of viticulture and wine production, given their extraordinary tourism potential, but it is also excellent for all agricultural production systems, fisheries, forestry and even the game sectors.

However, in order to achieve sustainable multifunctionality, the original relationships need to be reinterpreted, production systems often must be significantly transformed, and the concept of traditional agriculture needs to be expanded both horizontally and vertically. In multifunctional agriculture, in addition to original production, there are also "deepening" activities that can ensure both the economics of production and the protection of the natural environment and cultural heritage. In this way, agriculture produces new products that meet changing societal needs in a way that is competitive in terms of quality and value for money, especially if they are sold with as few intermediate links as possible, ideally directly from the producer or through local and regional distribution networks. through (Gonda, 2012). The acceptance of multifunctional agriculture is growing, and in several places it is already present in periurban (peri-urban) agricultural activities (Zasada, 2011). The change in consumer attitudes (the need for environmentally and health-conscious nutrition, or the need for additive-free, organic food and organic products) and the related market and service sector also merge with the demand for natural raw materials. Exploiting and developing local innovation skills, promoting manufacturing, small and medium-sized enterprises, folk crafts, nurturing the progressive exploitation of folk arts, traditions and cultural heritage, developing communities and civil society broaden the economic activity of the countryside, create new jobs and increase the population retention capacity of the countryside. An essential condition for this is the launch of a "re-establishment" process in the field of resource utilization, which takes into account the ecological, economic and social carrying capacity of the regions, which of course includes the sustainable utilization of ecosystem services (Némethy et al. 2016).

CONCLUSIONS

Examining the system of a society the dominant goal can be defined as improving the well-being or quality of life of the population. Accordingly, when examining a design system and reviewing theoretical systems, it is important to determine the exact goal. In the system of regional development, development is concentrated around five areas, such as:

1. specific environmental, ecological (state of natural values, protection of environment and biodiversity, ecological developments, etc.) objectives.

2. economic, (efficient companies, low unemployment, high incomes, consumer, etc.)
3. social (power structures, cultural web, level of education, demography)
4. political, (democratic public life, good urban governance, direct advocacy, etc.)
5. cultural, (rich cultural life, quality education, various events, sports and scientific life, etc.)

Sustainability is not enough – we need a regenerative approach to solve environmental, social, economic and cultural problems. Therefore, the concept of ecosystem conservation and the sustainable use of ecosystem services shall constitute tha basis of regional development projects.

The modern sustainable agriculture is organic and multifunctional because it not only produces food, but also plays an important role in maintaining economic activity, preserving the natural environment and the traditional landscape. Agricultural activities are supported only if they contribute to preserving jobs, protecting natural resources and improving food quality. These functions are part of the services and are in the interest of society as a whole. Most of the production and services other than basic activities are also related to rural development. Expanding alternative income generation opportunities, environmentally friendly farming, improving agricultural (rural) infrastructure, developing human resources, and preserving local communities and traditions are all tasks for agriculture and rural development. In order to achieve all this, it is important to strengthen the role of local initiatives, agriculture and the advocacy of the countryside.

Addressing new, particularly complex issues also poses fundamental new challenges for rural development policy. These main new challenges, individually or in combination, are: climate change, water, bioenergy, biodiversity, globalization (in this context, the EU Post Lisbon Strategy), trade liberalization. The negative effects of not tackling the new challenges will further exacerbate and even accelerate the slow but irreversible processes in rural areas for the time being: the depopulation of the areas; the gradual cessation of farming, thereby the development of the cultural landscape; or, on the other hand, intensification; biodiversity loss.

Conservation of cultural heritage on landscape level includes the preservation, regeneration and pragmaticuse of cultural resources from an evolutionary perspective. This requires an interdisciplinary approach, since in Heritage Science natural scientific methods, social sciences and huimanities constitute one system.

The Congress has successfully brought forward the aforementioned complex problems embracing a wery wide range of scientific fields and creating new international partnerships in scientific research concerning the problems of sustainability and regenerative development in one holistic system.

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