



Dravinja Valley (Slovenia) as Real Inspirational Learning Region for Adaptation to Climate Change

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Abstracts

Adapting to climate change is necessary, therefore in eastern Slovenia in the valley of Dravinja we established the condition for real learning for adaptation to climate change. In Dravinja valley built natural purification systems, constructed wetlands, established the learning paths and applied systems to protect the soil with ecoremediation and permaculture Learning polygons for permaculture and ecoremediation with research points for understanding ecosystems and ecosystem services. White book and Strategy on adaptation to climate change provide a variety of approaches to adaptation, great emphasis is made on sustainable concept conditions in regions respectively countries. We have found that successful adaptation to climate change must first create social conditions, that connect environment and economy and the need for real change in the country respectively region. Dravinja valley is a good example of adaptation mainly because it also has established the conditions for education on adaptation to climate change and sustainability has environmental, social and economic dimensions.

Keywords: Climate adapting, Education, Permaculture, Ecoremediation, Dravinja valley.

Introduction

Over the next 50 years climate change will affect the economy, especially in agriculture, energy, transport, tourism and health. Accelerating loss of ecosystems and biodiversity will affect households and businesses, and especially the most vulnerable social groups (the elderly, people with disabilities and low-income households). Impacts will vary by region, most vulnerable to coastal and mountain areas and flood plains (EC, 2009 and EEA 2008).

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Many areas around the world are already experiencing the negative effects of an increase in the global average temperature by 0.8°C since 1850. Without effective policies and education on climate change mitigation, the estimates of global warming are ranging between 1.8°C and 4°C by 2010 compared to 1990 levels (FAO, 2007).

Climate change is already happening and its effects will continue to have far-reaching consequences for human and natural systems. To prevent the most severe impacts of climate change, global warming needs to be limited to 2°C above the pre-industrial temperature. That is just 1.2°C above today's level. To stay within this ceiling, mitigation actions are required that substantially reduce greenhouse gas emissions. Europe is working hard to take these mitigation actions while encouraging other nations and regions to do likewise (Farming 2009). At the same time, the EU is developing a strategy for adapting to the impacts of climate change (EEA, 2008). Because impacts of climate change vary between regions different adaptation measures must be performed. Therefore, the selection and implementation is primarily the responsibility of the Member States (EC, 2009). Adaptation means anticipating the adverse effects of climate change and taking appropriate action to prevent or minimise the damage they can cause, or taking advantage of opportunities that may arise (Mitsch, Jorgensen 2004). It has been shown that well planned, early adaptation action saves money and lives later (Shipper, 2007). Examples of adaptation measures include: using scarce water resources more efficiently; adapting building codes to future climate conditions and extreme weather events; building flood defences and raising the levels of dykes; developing drought-tolerant crops; choosing tree species and forestry practices less vulnerable to storms and fires; and setting aside land corridors to help species migrate.

Consequences of climate change are already significant in Slovenia as well. Measures in Slovenia in the last 50 years show that it warmed by more than 1°C , which is faster than the global and European average (Kajfež Bogataj, 2008). Temporal changes in annual precipitation in most areas of Slovenia for the measured time are not statistically significant, but the precipitation regime observed shows decline in rainfall in the first half of the year and the rise in the second half. Such changes in Slovenia influence the reduced availability of water and more frequent and longer-lasting spring and summer droughts in Slovenia. The drought damage due to natural disasters reached in 2008 to 80%, 70% in 2000 and 60% in 2001, as well the increase in extreme situations. So we counted more frequent severe storms, thunderstorms, heavy rain, flash floods and forest fires (Kajfež Bogataj, 2012).

White book (EC, 2009) on adaptation and reducing vulnerability to climate change in Europe, has a particular emphasis in the areas of health, agriculture, water, coast and sea. The need for timely action is exposed. Adaptation can only be successful at the local and regional level. On the basis of White Book was established an European platform for climate adaptation (European Climate Adaptation Platform CLIMATE.ADAPT). This is an online tool for the European Environment Agency AEEA) in Copenhagen (EEA, 2008). For good adaptation to climate change experts in various fields have drawn up recommendations which should be taken into account by the adjusting countries (Prutsch, 2010; Farming, 2009). The recommendations are general and focused on the awareness of the importance of adaptation. Actions about climate change require two types of responses. In the first place, which is very important, we need to reduce greenhouse gas emissions, take measures to mitigate and, in addition, we must take action to adapt to the inevitable consequences.

Legislation on Climate Change, adopted by the EU, sets out concrete steps for achieving the EU's commitment that by 2020, we will achieve a reduction in emissions to 20% according to 1990's levels, and can be even modified to allow 30 percent reduction, if agreed in the framework of an international agreement, which would be that other developed countries commit themselves to comparable reductions and appropriate contributions by economically more advanced developing countries according to their responsibilities and respective capabilities (EC, 2009). Adaptation action is needed to protect people, buildings, infrastructure, businesses and ecosystems. Due to the varying severity and nature of climate impacts between regions in Europe most adaptation initiatives will be taken at national, regional or local level. Likewise, the ability to cope and adapt also differs across population, economic sectors and regions within Europe. In April 2013 the European Commission adopted the EU strategy on adaptation to climate change which sets out a framework and mechanisms for taking the EU's preparedness for current and future climate impacts to a new level. The EU strategy focuses on three key objectives: Promoting action by Member States; 'Climate-proofing' action at EU level; and Better informed decision-making.

Slovenia is also developing approaches for adaptation in terms of both climate change mitigation as well as from the perspective of prevention. For this purpose in eastern Slovenia in the valley Dravinja were in the recent years, held various projects in order to establish the conditions for experiential education on adaptation to climate change. Analysis of Strategies adaptation to climate change in Slovenia shows that it takes action approach and that without specific changes in all areas (water, soil, agriculture, industry, transport, etc.) it is not possible to derive adjustments. It is important that all stakeholders are involved, which is often a problem of strategies. In Dravinja valley we have real learning polygon for permaculture and ecoremediation.

The educational polygon for permaculture and ecoremediation

The educational polygon for self-sufficient supply in the settlement of Dole is based on the compliance with the principles of permaculture and ecovillage. The educational polygon features a yurt (a mobile nomadic dwelling), where it is also possible to stay overnight. The polygon is grown over with autochthonous plant species, namely chestnut, walnut and fruit trees. The whole principle is based on considering limited natural resources and rational spatial use. The following plantations are shown: a meadow orchard, a forest garden, a field with mixed plants as well as a fruit and vegetable garden. There is also a field and an area of natural succession. The elements of a sustainable way of living that are shown include: a solar collector for heating water, photovoltaic modules for electrical energy, a rainwater tank, a constructed wetland for the treatment of spring water and a spring water reservoir. A living building with willows, a fence with berries, a windward shield and an element of water with plants all serve to enrich the space in terms of landscape and ecosystem.

Ecoremediation, which is based on the laws of how nature operates, is used above all in protected areas (for protection) and in the areas where degradation is present (for sanitation). Ecoremediation establishes everyday practice for cleaning water, protecting soil, preventing the spreading of dust particles and erosion, accumulating sediments and improving life quality in general. The educational polygon for ecoremediation is based on innovative approaches, which enable participants to create their own experience and understanding on the basis of their own activity.

The possibilities for using the ERM include the system for climate change adaptation:

- reducing groundwater pollution by nitrates, phosphates and pesticides, as well as by organic substances and ammonium compounds from livestock farms (rainfall in certain years and its distribution);
- reducing groundwater pollution by nitrates, phosphates and pesticides in areas with agricultural and horticultural production (rainfall in certain years and its distribution);
- reducing air pollution (negative impact of air pollution on vegetation may result in the accumulation of toxic substances in plants and their fruit, causing vegetation damage)
- reducing the effects of wind erosion (which has become more pronounced since the removal of hedgerows);
- reducing landslide events;
- reducing the accumulation of pesticides in the soil (although these usually degrade in less than one year, some substances are durable and resist degradation);
- reducing salinisation of the soil (which may occur because of inadequate soil irrigation with unsuitable water; however, it is considered that in our climatic conditions, soil salinisation cannot develop in its acute form);
- preserving the existing natural environment (it is estimated that around 60% of the environment is natural or half natural);
- increasing landscape diversity (intensification of agricultural production has resulted in the loss of wet and dry grounds);
- retaining moisture and enriching the ground water;
- acting as a supplement to existing systems for prevention of pollution (e.g., tertiary treatment in farms) and
- providing comprehensive protection of nature and environment, particularly of the agricultural landscape.

Because the Dravinja valley lies in the western part of the Pannonian Basin it may experiences from this region become a model for the establishment of a broader adjustment in Europe. The educational region Dravinja valley are in fact established practical opportunities for education on adaptation to climate change, so it may be that part of the Slovenian educational association for education on adaptation to climate change for other countries.

Methods

One of the greatest challenges for cost-effective adaptation measures is to achieve coordination and coherence at the various levels of planning and management. The recommended instrument at global level, under the UN Framework Convention on Climate Change, is national adaptation strategies (*Fig. 1*). These are key analytical instruments designed to inform and prioritise action and investment (COM 2013, final).

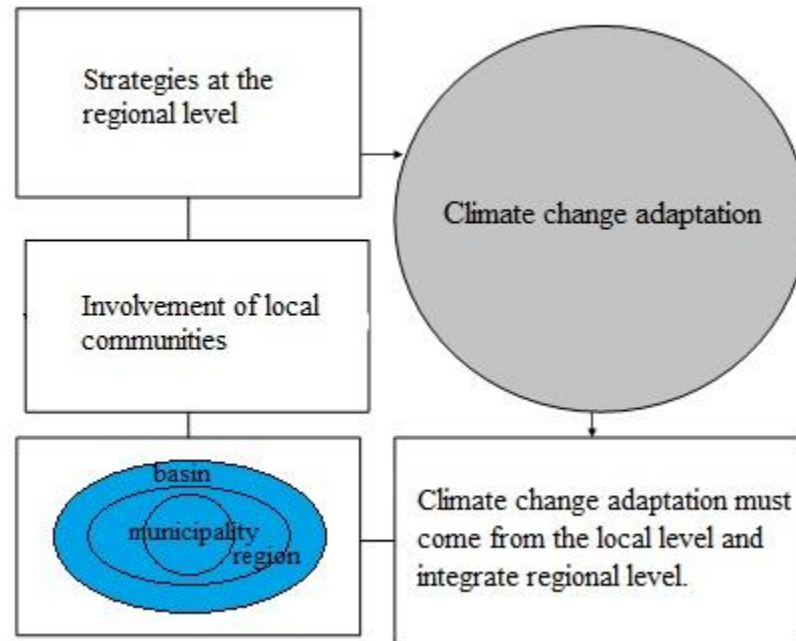


Figure 1. On the case Dravinja Valley adaptation activities are concentrated in the basin Dravinja that connects a number of municipalities. The biggest application is in experiential education, namely the introduction of permaculture and ecoremediatio (Ana Vovk Korže, 2013).

The changing climate presents different challenges to local communities. Local authorities are free to decide how best to address these challenges and take advantage of opportunities. There are a number of initiatives and a variety of sites that provide information on adaptation at a local level, including:

The Center for ecoremediation (www.erm.si) of the Faculty of Arts of the University of Maribor develops new approaches adaptable to local characteristics for the full use of a regional potential, identifies natural processes for their use in the protection and rehabilitation of natural landscape and proposes concrete measures for adaptation to climate change for the local and regional level authorities.

Data on the organisation and physical arrangements in Dravinja valley, which are designed to adapt to climate change, we have gained with terrain visits, from the websites of municipality Poljčane (<http://www.poljčane.si/>) and interviews with the Mayor of Poljčane Stane Kovacic and employees in Development Center of Nature.

Sustainable approach of educational Dravinja valley region were measured by the method of "sustainable flowers" (Fig. 2). This is an evaluation approach, where we evaluated four groups of criteria (Table 1), these are economy, environment, society and ethics. With the evaluation process in the region Dravinja valley we have gained insight into the long-term orientation of Dravinja Valley. We evaluated data from municipalites documents and took into account the field experiences. For sustainable flower we assessed situation in the region, the ethical conditions, procedures and decision-making processes, the integration of

environmental, social and economic conditions (Regionale Netzwerke für lokales Handeln, 2007).

Table 1. Evaluation criteria for sustainable flower (no is-1, partly is 0, yes is+1)

THE CRITERIA	
1	Dravinja valley and Economy
1.1	Support regional economic flows
1.2	Accelerate of new quality jobs
1.3	Accelerate participatory processes in the company and the quality of social
1.4	Are aimed at innovative projects and processes
1.5	Accelerate attractive and innovative environment
1.6	Contribute to economic use and low consumption of scarce natural resources
1.7	Improve the financial situation of public and private holdings
1.8	Minimize material flows
	<i>The total value of minus and plus points</i>
2.	Dravinja valley and the Environment
2.1	Promote natural and semi-natural habitats in urban areas
2.2	Reduce the consumption of space respectively. soil sealing
2.3	Reduce the entry of harmful substances into the air, water and soil
2.4	Reduce noise
2.5	Reduce consumption of non-renewable energy sources
2.6	Reduce the consumption of renewable energy sectors, promote material flows
2.7	Promote diversity in habitats
2.8	Promote environmentally friendly models of transport and reduce excessive mobility
	<i>The total value of minus and plus points</i>
3.	Dravinja valley and Society
3.1	Contributes to the material security and the security
3.2	Contribute to communication and participation of people
3.3	Promote quality of life and existential
3.4	Promote educational opportunities and offer for all residents
3.5	Increase personal responsibility, awareness towards sustainability
3.6	Promote cultural, social and regional identity
3.7	Help to health and support the health
3.8	Foster a sense of security
	<i>The total value of minus and plus points</i>

4	Dravinja valley and Ethics
1	Equality between groups
1.1	Accelerating social cohesion
1.2	The promotion of material equality
1.3	Accelerating connections between the involved groups
1.4	Gender equality
2	Equality between municipalities
2.1	The active involvement of all
2.2	Support for regional approaches
2.3	Accelerate cooperation with neighbouring regions
2.4	Accelerating activities in neighbouring regions
3	Equality between generations
3.1	Reducing the consumption of non-renewable energy sources
3.2	Reducing dependence on foreign capital
3.3	Compliance with young people
3.4	Expansion of sustainability vision
	<i>The total value of minus and plus points</i>

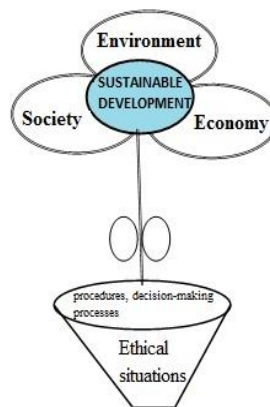


Figure 2. Model of sustainable flowers is used to evaluate the sustainable approach in the region with Ethical, Society, Economy and Enviroment (one question is one unit (A. Vovk Korže, 2013).

We also evaluated the situation in the Dravinja valley in the dimensions of sustainability criteria that are economic dimension, the dimension of integrity and well-being and self-sufficiency criteria. With this approach, we wanted to obtain further information on sustainability Dravinja valley.

Content criteria for the analysis of the Dravinja valley learning region according to the dimensions of sustainability

ECOSYSTEMIC CRITERIA

Promoting habitat diversity
Promoting natural and sustainable elements in settlements
Reducing building plots
Reducing the release of harmful substances into the air, water and soil
Reducing the use of non-renewable sources of energy
Reducing the use of non-renewable resources, promoting the preservation of ecosystems
Reducing excessive mobility with transport /vehicles
Supporting environmentally friendly forms of transport

CRITERIA FOR INTEGRITY AND PROSPERITY

Developing activities arising from the local environment
Complementary combining of activities
Emphasizing multipurposeness of individual activities on the basis of tradition, natural and cultural heritage
Promoting educational opportunities for all residents
Increasing personal responsibility and long-term awareness
Supporting cultural, social and regional identity
Responsibility for individual health and the health of others
Promoting residential and life quality

CRITERIA FOR SELF-SUFFICIENT SUPPLY BASED ON COOPERATION BY THE LOCAL COMMUNITY

Promoting local products
Supporting trade routes within the region
Creating innovative working environments
Promoting new local quality jobs
Connecting local environment (countryside) to urban centres (towns) by offering original services and products
Promoting distinct but harmonized interests
Providing an opportunity to include all interested parties in all spheres of regional activities
Ensuring equality, dialogue and connection among people in the region

Evaluation of the learning region and its arrangements for education for sustainable development is a result of assessment according to the criteria dimensions of sustainability:

+ yes
- no
0 partlv

**the sum of the positively evaluated measures + is the basis for the calculation of % (maximum number is 8, which is the number of rows within each criterion; the total is therefore 100 %, the number of negative ratings by – must be deducted from the sum +), 0 does not affect the result.*

By connecting both criteria - sustainable approach and dimensions of sustainability in the region, into a model of sustainability we achieved a comprehensive insight into the conditions that must be established in the adaptation to climate change in practice.

Results

Established systems for adaptation to climate conditions in the Dravinja valley

The Dravinja valley is divided in flatland along the Dravinja river valley and its tributary streams at the altitude of 250–270 m, where there are Holocene sandy loams and sandy clay alluvia accumulated; in those parts of the area, where the influence of underground water is periodic, prevail deeply gleyic-, pseudogleyic- and riverbank soils with meadow use. From Pohorje hills to Drava river is 74 km long with area 15000 km².

The Dravinja Valley is a young, flat area with its origins in the glacial period, but primarily after that time (Fig. 3).

The average annual temperature is 9.5 °C, in the vegetation period 15.5 °C, the average summer temperature is 18.1 °C and the average winter temperature is 0.4 °C. The annual precipitation is 1076 mm and surpasses the annual potential evapotranspiration by 40.4 % and since a negative difference between the quantity of precipitation and the height of the potential evapotranspiration does not appear in any month, an annual surplus of 406.4 mm of water occurs. Because there is no lack of water, the soil moisture index is high (63.3) and this denotes a humid climate. Shallow riverbank soils, the deeply gleyic hypogley and the flatland pseudogley differ according to the influence of underground and precipitation water (Vovk Korže, 2010). In shallow riverbank soils water is not retained in the soil profile because of the presence of stones over 2 mm and the smaller proportion of clay fraction; therefore, the structure of the profile is A-C. In the deeply gleyic hypogley water is retained in the lower part of the soil profile, usually below 50 cm, which does not directly hinder the growth of plants (Picture 1). Almost half of the precipitation (40.3 %) outflows on the surface, which causes denudation and erosion. Numerous streams gather the surface running water, contributing to a high river system density.



Figure 3. Position of Dravinja valley with center Poljčane.

The Dravinja Valley as real learning region for adaption to climate changes

The Poljčane municipality with its Nature Development Centre is one of the learning communities with an established infrastructure for education and research in the real environment. From 2009 to 2011, various activities in the specifically equipped areas of Dravinja valley were carried out, with the aim of creating the conditions for real education. In 2010 the Municipal Council of the Poljčane Municipality approved the investment program of the “Razvojni center narave“ (Nature Development Centre). In this way, the area

of the municipality became an official learning region for education about nature, ecoremediation and permaculture (Kokot and other 2011, 2012). The establishment of the learning region opened the opportunity to protect nature and to include in further development priority items for protecting nature and the environment, in order to be able to offer such an environment to the interested public in the form of educational, leisure, tourist, cultural, environmental, economic and public agricultural programs. The Dravinja valley has become an example of good practice, demonstrating that nature and protection of the natural environment provide the opportunity for economic and social development. To achieve this goal, active integration of the local population was necessary. The Poljčane Municipality has become an educational and promotional centre for educational activities in Slovenia and Central Europe.

In Dravinja valley were in the years 2009 to 2013 edited technical facilities and learning environments for education on adaptation to climate change (www.ucilnicavnaravi.si).

- Constructed wetlands;
- Permaculture and Ecoremediation polygon with recovery of wetlands, extension habitats of Phytoremediation plants, expansion of vegetation zones, planting of forest islands, extending of hedgerow pattern, conservation of forest edges, an extension of smoothing strips along watercourses and the maintenance of hydrophilous plants, permaculture garden, soil profile (*Fig. 4*);
- The learning polygon for ecoremediation (established ecosystems - pond, waterfall, swamp, fishpond, oxbow lake, stream, swamp forest, coniferous forest, deciduous forest, forest edge, clearing and cave ecosystem; built ecoremediation - hedgerow, sound insulation, anti-erosion protection, filter vegetation belt)
- The learning polygon for permaculture and self-sufficiency: high beams, terraces, herb beds, an orchard meadow, scrub, compost beds, cultivation of earthworms, ladybugs home, solar system, fountain, natural toilet and living buildings.
- Learning paths to get to know watercourses, floods, natural ecosystems, wetlands, plants and animals);
- Observation points with observatories for birds, animals, flood areas and animals in protected areas;
- Cycle learning paths between organic farms and
- Ethnological learning village for learning about way of life in the past (old tools, old techniques of food production).

Sustainable approach of region Dravinja valley

A view to strengthening activities at the local level, we evaluated the region Dravinja valley with criteria for sustainable flower (*Table 1*) and results are in *Table 2 and Fig. 4*.

Table 2. Sustainable approach of region Dravinja valley

1	Dravinja valley and the Economy	
	<i>The total value</i>	+8

2.	Dravinja valley and the Environment	
	<i>The total value</i>	+6
3.	Dravinja valley and Society	
	<i>The total value</i>	+8
4	Dravinja valley and Ethics	
	<i>The total value</i>	+15

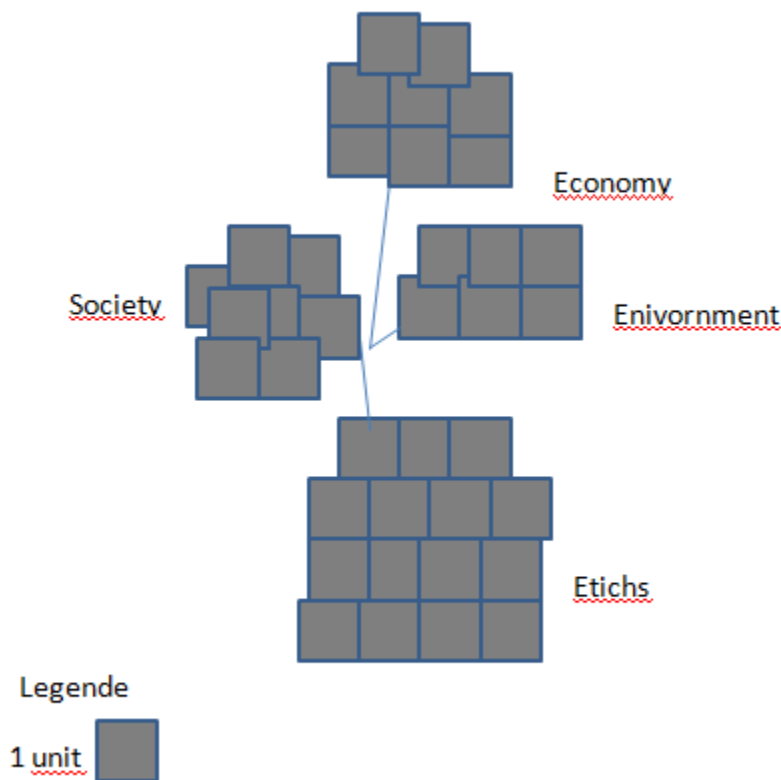


Figure 4. Sustainable flower as results of sustainable evaluation Dravinja valley.

Dimensions of sustainable development in Dravinja valley as a basis for adaption to climate changes

The Dravinja Valley learning region was analysed according to the 4 dimensions of sustainability (Vovk Korže, 2011):

- the ecosystematic dimension
- the dimension of integrity

- the dimension of prosperity and
- the dimension of self-sufficient supply and active public involvement

Sustainable development is generally understood as an approach that has a great role in connection of environmental, economical and social politics in order to control the natural resource use, create redirection of current politics of farm subventions, traffic and energy resources into more sustainable direction. Further more is getting urgent to transform the current tax politics into the the politics of the taxes for the natural resource usage and creation of high technological standards. In recent decades has current approach only created more problems and threatened to all life on Earth. This is why sustainability has to be clearly redefined. Sustainability has more dimensions:

- ecosystematical (this dimension is coherent with the ecosystematical approach and can be referred as the most important dimension of sustainability), (Table 4);
- integrity (failure of sustainable development is so called schism between economical, social, ecological, human and local development and supporting of each individual, but only partial item), (Table 5);
- welfare (economical growth, directed to the production of material goods should not so fatally affect the society and nature processes as it does now);
- self-suply with the inclusion of publicity (activation of all available potentials, their connections and motivations as well the law regulations) (Table 6).

Table 4: Results according to ecosystemic criteria

ECOSYSTEMIC CRITERIA	Evaluation
Total score %	75

Table 5: Results according to criteria for integrity and prosperity

CRITERIA FOR INTEGRITY AND PROSPERITY	Evaluation
Total score %	87,5

Table 6: Results according to criteria of self-sufficient supply based on cooperation by the local community

CRITERIA OF SELF-SUFFICIENT SUPPLY BASED ON COOPERATION BY THE LOCAL COMMUNITY	Evaluation
Total score %	100

The total score evaluation of the Dravinja Valley learning region as the basis for the definition of the sustainability model (Table 7) and (Table 8).

Table 7. Evaluation of the Dravinja valley sustainability model

EVALUATION OF THE DRAVINJA VALLEY	Evaluation in %
ECOSYSTEMIC CRITERIA	75
CRITERIA OF INTEGRITY AND PROSPERITY	87,5
CRITERIA OF SELF-SUFFICIENT SUPPLY BASED ON COOPERTAION BY THE LOCAL COMMUNITY	100
<i>Total score in (%)</i>	87,5

Table 8: Models of sustainability

Class	Model of sustainability
under 50 %	VERY WEAK SUSTAINABILITY MODEL (CLASSICAL MODEL OF POLLUTION-CONTROL)
from 50 to 75 %	WEAK SUSTAINABILITY MODEL
from 75 to 90 %	STRONG SUSTAINABILITY MODEL
over 90 %	ECOCENTRIC MODEL

Discussion

This evaluation of the Dravinja Valley enables classification according to a model of sustainability. Among the four models of sustainability (very weak sustainability model; weak sustainability model; strong sustainability model and ecocentric model), the Dravinja Valley learning region ranks in the top model; this is a strong sustainability model, counting as an ideal sustainable model. Strong sustainability model is an ideal model: this results in a radical change of the relationship of humanity towards the environment. It emphasizes a pure form of sustainable development, according to which humanity returns just as much to the ecosystem as it takes, while striving to enhance and protect biological diversity. In this approach there is no common increase in the quantitative sense, as traditionally measured. Humanity lives within the environmental limitations; development is not measured by living-standards, but through the quality of life (Trajer and other, 2013). The living and nonliving worlds are ascribed intrinsic value, independent of humanity. It emphasizes the social dimension of development, within which a special place is dedicated to the work of associations and non-profit organizations, where everyone can participate according to his interests.

The review of the established conditions for experiential education for sustainable development and prepared teaching materials for education in nature shows that the characteristics of the landscape ecosystem are taken into account, that the local population

participates in the programs and that the learning region receives broad support from the municipal administration. Furthermore, people are well informed and show great interest in promoting the learning region. Interested landowners make a particularly notable contribution by acting as investors.

Knowing sustainable concept and dimensions of sustainability in local communities is essential because climate change will cause significant changes in the quality and availability of water resources, in number of sectors, including food production, where water plays a crucial role. More than 80% of agricultural land is dependent from rainwater. Food production also depends on available water resources for irrigation. Limited water availability already poses a problem in many parts of Europe and the situation would be aggravated by climate change worsened, so that the proportion of areas in Europe with a large water scarcity is expected to increase from the current 19% to 35% in the 70ies of 21 century. Climate change will increasingly damage ecosystems including marine ecosystems and biodiversity, affecting individual species and significantly impacting ecosystems and their services upon which society depends. Ecosystems play a direct role in climate regulation with peat lands, wetlands and deep-sea important carbon stores. In addition, ecosystems provide protection against storms. It will affect as well other ecosystem services such as drinking water supply, food production and building materials, that's why it is important that local communities adapt to the projected long-term climate change.

Successful adaptation to climate change requires establishing the conditions where people can successfully acquire the knowledge, experiences and activities at home. In the Dravinja valley are exposed to many natural cleaning systems, permaculture organization, ecoremediation and educational points where it is possible to gain knowledge of the individual systems to adaptation. So the first requirement is an active approach to regulation regime for adaptation. However, you can implement this requirement, it is necessary to pre-measure the state of sustainability. In this paper, we used two ways, this is a sustainable flower and dimensions of sustainability. Both methods show that it is important to local communities to establish an ethical level, which allows the active participation of the public. Public participation is taken into consideration for a high proportion of people involved in subsistence. With this is round of the conditions that are necessary for adaptation to climate change concluded. Evaluation table shows many of the criteria of economic, social and societal dimensions that we need to take into account in the sustainable concept of Dravinja valley. We believe that only the legislative framework and recommendations will not be enough and that they should have already paid to the analysis of the regions also from the point of view of sustainability.

Real learning on adaptation to climate change

The learning region include several observation points, testing and measurement sites, lookouts and materials for teachers and students (at various levels of education). The thematic learning trails in the Dravinja valley form ideal network connections to natural, sociological and sporting activities, with the aim of offering all generations (with an emphasis on youth) the chance to experience the landscape holistically, to learn about processes in natural environment and in settlements, and to gain the ability to evaluate and make contact with nature. The educational moment and the importance of students' developing a positive attitude towards nature are also emphasized. A key objective of the

project is to establish a technical and professional basis for a network of learning trails that will promote integrated learning (incorporating teaching methods that promote perception of the landscape and nature with all the senses perception, observation, experimentation, experiential perception of the landscape, self activity as well as exercise and movement in the natural environment.

In the context of professional backgrounds for the preparation of educational curricula and modules for classroom practice, field work and excursions, four curricula were prepared, namely:

- Curricula in accordance with the knowledge catalogues for compulsory and elective modules of the Environment Preservation Technician educational program;
- curricula for research, field work and learning at the established ecoremediation polygon in the fields of:
 - o nature preservation,
 - o environmental protection and
 - o environmental education, with cross-curricular links to mandatory general education courses, such as biology, geography and chemistry, as well as elective courses in subjects such as beekeeping and environmental chemistry,
- And preparation and implementation of educational curricula for natural science days and field work within primary education, focusing on:
 - o the environmental subjects (1. triad of the 9-year primary education),
 - o natural science and technology (2. triad);
 - o biology and geography (3. triad) and in particular on
 - o the elective course environmental education at all stages of primary education (www.ucilnicavnaravi.si).

Conclusions

The process of establishing of the Dravinja Valley real learning region is based on its well preserved natural environment, since more than half the area is under special protection (Natura 2000). Legislation in the field of nature protection in the Republic of Slovenia assigns protected and preserved areas different development targets, with some limitations, particularly in terms of intensive land management, while emphasizing their major educational potential. For many people in Slovenia, nature represents a barrier to development, but in the case of the Dravinja valley learning region, we have shown that it can be just the opposite. The latest knowledge about the preservation and protection of the natural environment that is being developed at educational polygons for ecoremediation will be freely handed over to school systems all over Slovenia and abroad. For sustainable design of learning regions, ethnological, art-historical, technical and urban heritage are also crucial and thus are included in the learning trails, observation- and research points.

The establishment of learning regions has showed several advantages:

- the local community supports the promotion of their own region and is therefore actively involved in education (also from the economic point of view - the sale of food and beverages);
- sustainable development as an interdisciplinary science, has exceptional potential for the development of learning regions in Slovenia, with the aim of connecting natural and cultural potential and upgrading them by using traditions of the landscape and innovative approaches;
- examples of good practice of sample application of ecoremediation and permaculture show that, through the local approach to using natural systems we can significantly reduce the impact of climate change.

Prerequisites for the establishment of a real learning region thus include a good relationship with the local community and the municipality, as well as a wise choice of professional manager. In the case of the Dravinja Valley learning region, the head of the project is the International Centre for Ecoremediation, which links Slovenian municipalities in the direction of new developments. By adapting to climate change, ERM can significantly reduce the costs of environmental damage. We will also establish technical cooperation with ministries in this area.

Notes

¹ The educational polygon for permaculture and ecoremediation is a part of an area, equipped with teaching and research resources and facilities, aimed at educational activities for primary and secondary schools as well as for faculties.

² Permaculture; the term “permaculture” was coined by Bill Mollison, an Australian ecologist, and his student David Holmgren. It is an abbreviation for permanent agriculture or permanent culture.

³ Ecoremediation – systems for restoration and protection of the environment in a natural way.

⁴ Natura 2000 is a network of protected areas in Europe. In Slovenia this area comprises 36.4 % of the total area. Natura 2000 includes a specific protection regime and the prohibition of changing the environment.

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