

Workgroup F

DeWOS

(Danube Wellbeing Operation System)

The Development of a Decision Support System for Wellbeing in the Danube River Basin

ABSTRACT

The aims of the project are to develop a decision-making support tool – DeWOS; and to establish a permanent users network using a spin-off company, which will enable international cooperation and implementation of the software. DeWOS will encompass all existing relevant data on factors affecting wellbeing: environmental (water, air, soil, food quality and quantity), social-demographic (education, prosperity, migration, tourism and mobility, health services, safety) and economic factors (employment, industry, agriculture). The tool will provide a reliable valuation of the degree of wellbeing in the Danube River Basin enabling policy makers (from the municipality to the national level) and other stakeholders to assess the current wellbeing situation and simulate possible scenarios along with the feasibility and impacts of possible interventions.

KEYWORDS

decision support tool
databases
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1. INTRODUCTION

Wellbeing, as an extremely complex concept, reflects a wide set of factors including: objective physiological and medical criteria (Fujita and Diener 2005); age (Siedlecki et al. 2008); cognitive and emotional components (Diener et al. 1991; Diener et al. 1997; Diener et al. 2006); life-ability (the capacity of an individual to cope with life's problems – Veenhoven 2009); living conditions (*liveability of the environment* – idem); education, income and employment status, gender, and marital status (Frey and Stutzer 2000, 2002; Di Tella et al. 2001; Kahnemann and Krueger 2006; Di Tella and MacCulloch 2006). The subjective assessment of wellbeing is also influenced by socio-economic factors, the state of human development, respect of human rights, political stability, economic freedom, distribution of income, and the structural and institutional aspects of labour market (Inglehart and Klingemann 2000; Saribas 2010).

Considering all these aspects, there is a need for a proper and consistent supporting tool for proper decision making. This tool should encompass all the existing relevant databases and provide a reliable valuation of the degree of wellbeing in the Danube River Basin (DRB). The indicators for Quality of Life (QL) could be a reflection of the wellbeing of millions of inhabitants of this region. On the long run, the consequences of the decision-makers and other stakeholders using such tool, can mean better prospects of education, employment, prosperity, food-security, healthcare system, safe and non-polluted natural surroundings.

Moreover, the sustainable development of DRB requires integrated solutions of the challenges identified in the Danube Region Strategy (DRS). The prosperity of the DRB is one of the pillars of territorial cohesion and an explicit objective of the European Union. In order to achieve prosperity, comparable living conditions are needed in DRB including good connections between urban and rural areas and access to infrastructure.

Therefore, the aim of this project is to contribute towards the improvement of QL among/within the countries of DRB through the following specific *project objectives*:

- to develop a decision making supporting tool entitled DeWOS (Danube Wellbeing Operation System);
- establishing a permanent users network using a spin-off company, which will enable international cooperation and implementation of the software.

DeWOS will enable policy makers (from the municipality to the national level) and other stakeholders to assess the current wellbeing situation and simulate

possible scenarios (in case of doing an intervention or not), while the spin-off company will represent the interface between science and market, being in charge for sustainability of the system.

2. THEORETICAL FRAMEWORK

This section summarizes the overall structure of the project with involving stakeholders, and shows main connections among addressed challenges, project purpose and refers to the expected result.

Moreover, due to the different meaning of the concept concerning the Quality of Life as well as to somehow specific needs of each category of stakeholder, DeWOS enables the users to target their area of interest and obtain pertinent and consistent data for reaching a sustainable decision.

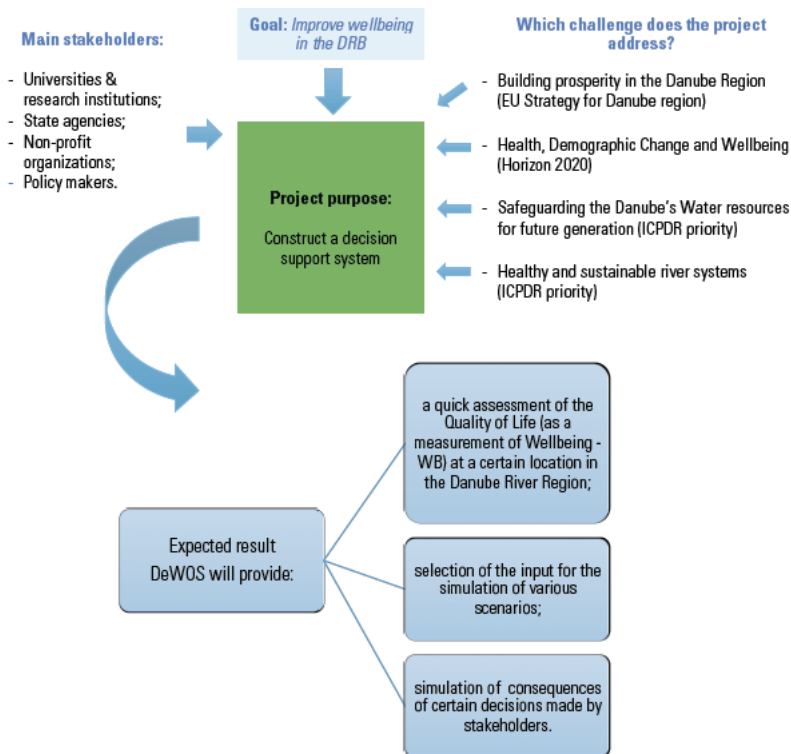


Figure 1: Project framework

3. PRE-ASSESSMENT ANALYSIS OF THE QUALITY OF LIFE

In this pre-assessment analysis we identified the ranks of DRB countries according to their QL through the following series of steps:

a) *Select relevant databases:* Word Bank; United Nations Development Programme (for HDI);

b) *Select the composition of an aggregate indicator regarding the Quality of Life in the DRB:*

The QL is a multidimensional aggregate, thus, we have constructed **intermediate indicators** of the Global Quality of Life Index in the form of the following dimensions:

- The indicator of the quality of the environment;
- The indicator of final consumption, tourism and tax;
- Infrastructure indicator;
- The indicator concerning age, health status and the labour.

Moreover, we have added the already computed *Human Development Index (HDI)*, which is a composite statistic of life expectancy, education and income indices.

c) *Establish the econometric methodology of computing intermediate and global indices:*

- in a preliminary stage, the data are rescaled accordingly with the next formula: $(X - \text{average values of } X) / \text{standard deviation of } X$;
- each dimension is computed based on a Principal Component Analysis (PCA) with the inclusion of the corresponding variable;
- the global score is computed based on PCA with the inclusion of the mentioned dimensions;
- these scores are translated in ranks.

d) *Build a global indicator and establish the ranking.*

After computing the intermediate indices and by considering HDI, we have constructed a global index regarding the Quality of Life, which allowed us to rank, for the period 2007-2010, the sample countries in the Danube River Basin consisting of 17 jurisdictions for which data were available in the selected databases. The 4 year period allowed us to perceive if there were changes in the ranking due to effects of policies in all fields related to well-being in the Danube River Basin.

Table 1: The final ranking according to the Quality of Life Index

	2007	2008	2009	2010
Albania	16	16	16	16
Austria	3	3	3	3
Bosnia and Herzegovina	15	15	15	15
Bulgaria	13	13	13	13
Croatia	8	7	7	7
Czech Republic	6	6	6	6
Germany	1	1	1	1
Hungary	7	8	8	8
Italy	5	5	5	5
Moldova	17	17	17	17
Poland	11	11	11	10
Romania	12	12	12	12
Serbia	10	10	10	11
Slovakia	9	9	9	9
Slovenia	4	4	4	4
Switzerland	2	2	2	2
Ukraine	14	14	14	14

The pre-assessment analysis of the QL in the sample countries reveals that Germany has best QL index, while Moldova has the worst from the DRB countries. We observed that both positions were maintained during the four years of analysis. In addition, Croatia improved the quality of life of its inhabitants from 2007 to 2008 as well as Poland from 2009 and 2010. Hungary and Serbia dropped a place in the period of analysis. Thus, we consider that an extended and more detailed analysis should be carried out during the project, as well as the development of a methodology dealing with extensive data concerning the Danube River Basin.

4. WORK PLAN OF THE PROJECT

We have regrouped tasks into components according to the aforementioned specific project objectives. Activities are briefly explained and summarized in an activity sheet in the form of table describing specific objective, scope of work, outputs and key staff responsible.

- Component 1: Software Development
- Component 2: Establishing permanent users network

In addition to these 2 groups of activities we have considered a horizontal component, which is the Project Management.

4.1 HORIZONTAL COMPONENT – PROJECT MANAGEMENT

WP 1: PROJECT MANAGEMENT

The establishment of a solid management foundation is a precondition for the successful implementation of any project. The essential goal of this component is the need to ensure the timely delivery and co-ordination of all inputs (human and technical) and outputs in order to ensure the achievement of the project objectives. The Activity Sheet for this horizontal component provides a clear overview of the principal tasks to be accomplished.

Activity sheet 1 HORIZONTAL COMPONENT: PROJECT MANAGEMENT	
Objective	To establish professional project management structures and processes
Activities	WP 1: Project Management <ul style="list-style-type: none"> • Leader Team establishment • Development of Team's Quality Assurance Systems • Backstopping and invoicing • Visibility measures • Preparation of project publicity materials • Kick-off meeting
Outputs	<ul style="list-style-type: none"> • Establish international standards of project management • Establish Advisory board • Good project co-ordination and reconciliation procedures in place • Inception Report • Draft and confirmed Final Assessment and Recommendation reports • Report on methodology for defining wellbeing assessment
Key staff responsible	<ul style="list-style-type: none"> • Leading Team • Project Director

Leading Team is responsible for the co-ordination of all activities regarding project management, and it is supposed to be located in Vienna where central office was planned to be established, due to all necessary administrative, technical and scientific support that city of Vienna provides.

Leading Team is also responsible for stakeholder analysis (Activity 2.1.), to insure workshops and implement their feedback in the project process. Project management will insure promptly engagement of all identified internal stakeholders, partners which will present research team responsible for certain activity sections.

Within DeWOS development project several calls will be set to engage different academic institutions in order to deliver assessment reports and about established indicators regarding quality of life, existing databases and operation systems, GIS systems.

4.2 COMPONENT 1: SOFTWARE DEVELOPMENT

The Implementation of the project will benefit from the Project management horizontal component set up in the above activity sheet.

WP 2: PLANNING

Planning is concerned as one crucial activity in this project, especially because it includes identification and definition of indicators, methodology and stakeholders.

Based on the synthesized data from database assessment (Activity 2.3), need assessment (Activity 2.1), and through literature review we will identify and select indicators regarding the QL.

ACTIVITY 2.1 – NEEDS ASSESSMENT

Leader Team will do a comprehensive stakeholder analysis to define internal stakeholder who are going to be included in project itself and also external stakeholder including local communities representatives, NGOs, health institutions, media and the most important policy and decision makers who will be more involved.

We will hold active workshops where we will use focus group methods, consulting key stakeholders, and distribute the questionnaires to collect information about the problems related to the wellbeing in the DRB.

Wellbeing, except being a political goal (Borsdorf A. 1999), represents an integral and wide concept consisting of environmental factors (water, air, soil, food quality and quantity), social-demographic factors (education, prosperity, migration, tourism and mobility, health services, safety), economic factors (employment, industry, agriculture). It's obvious how much factor groups are intercepting with each other; hence a unique tool for connecting all of those to generate an overall assessment is needed.

Identified internal stakeholders are consulting companies, institutes and universities with their branches related to IT and communication systems, database management, new technologies, environmental and social-environmental studies, social-demographic, tourism management and social-economic studies are going to be involved as responsible partners obliged to deliver detailed reports about existing situations and improvement ideas. They are encouraged to include students at different levels of study, depending on final budget they will be allowed, but their internal structure is independent of main leading partners.

One of the key issues at this stage of the project is accomplishing the ownership attitude with policy and decision makers, as they will be final users of the product.

ACTIVITY 2.2 – INDICATORS IDENTIFICATION AND DEFINING CRITERIA

We identified indicative indicators which were used for rapid assessment of the quality of life in DRB, and also to identify case studies that are going to be used in Activity 4.

After detailed work with stakeholders, the list of indicators will be updated and also methodology for identifying them will be developed.

ACTIVITY 2.3 – DATABASES ASSESSMENT

Whether it is remotely sensed, in-situ, ocean based, or surface-based, earth observation (EO) data is essential for making informed public policy decisions in many areas involving societal benefits like climate variability and change, energy management, agriculture, biodiversity, human health and epidemiology, weather forecasting and water management (Barbara J. Ryan: *The economic value of EO data is in its utility*) and those are all issues that impact general wellbeing. Data, in and of itself, is of little value unless it is used.

While many existing databases systems were primarily designed for a single purpose, it is both beneficial and cost effective if these systems can be multipurposed, therefore special reports will be done in order to deliver compre-

hensive assessment of existing databases and recommendation to connect them integrally. There are already initiatives and ongoing projects which are working on standardization of existing and adoption of new data on international level like GEOSS, EO, Balkan GEONet within FP7 scheme, hence this project intends to use them as a baseline and then systematically upgrade it to the required level.

WP 3: PROGRAMMING

At this stage we will focus on the lab work and programming. First through different bids for contracts we will identify IT specialists and engineers who will develop the program. They will create a friendly Graphic User Interface (GUI) and they will consult the target user about GUI. Based on the identified indicators and database, we will integrate them in the software process.

ACTIVITY 3.1 – CREATING PORT THAT CAN COMBINE ALL DATABASES

Teams of experts for IT, communication and databases management are going to be involved at this stage to recommend and develop solutions for building a collecting interface console that would gather necessary data from those existing databases.

ACTIVITY 3.2 – INTEGRATE DEFINED INDICATORS AND CRITERIA IN SOFTWARE PROCESS

Software developers will include previously defined process of indicators identification and methodology for criteria. Key issues in this activity concern computer resources limitations that programmers will have to solve, and an important collaboration between developers and stakeholders defined in Activity 2.1. need to be established. Leader team has the key role to establish that communication path.

ACTIVITY 3.3 – CREATING SIMULATION CONSOLE

This activity will result with simulation console that can use the existing data, accept continuous data updates and calculate defined level of quality of life at certain location. Created software will enable user to change certain parameters to simulate some interventions that could be done in order to improve the quality of life. This activity is over when DeWOS software itself is ready to be used.

ACTIVITY 3.4 – CREATING FRIENDLY GRAPHIC USER INTERFACE AND CONSULTATION WITH TARGET USER

Friendly graphic user interface (GUI) is a key issue for the good implementation of the software and its utility to the final user – decision maker. Hence, an iterative process of communication between developers and sample of final users will be established.

WP 4: TESTING

This stage of the project is considered to be rather vulnerable as it will generate lot of issues that will have to be solved as soon as possible. Key issues will be

Activity sheet 2 COMPONENT 1: SOFTWARE DEVELOPMENT	
Objective	To create a joint interface software for decision support regarding wellbeing in Danube River Basin – DeWOS
Activities	WP 2: Planning 2.1. Needs assessment 2.2. Indicators identification and defining criteria 2.3. Databases assessment
	WP 3: Programming 3.1. Creating port that can combine all databases 3.2. Integrate defined indicators and criteria in software process 3.3. Creating simulation console 3.4. Creating friendly graphic user interface 3.5. Consultations with target user about the GUI
	WP 4 : Testing 4.1. Basic testing 4.2. Case studies (Germany and Moldova) 4.3. Calibration and verification
Outputs	<ul style="list-style-type: none"> • Indicators clearly defined and identified • Methodology for defining priority impact factors • Databases assessment reports • DeWOS blueprints • DeWOS software • Documentation (recorded errors, creating Help Menu) • Report on software efficiency • Draft Manual
Key staff responsible	<ul style="list-style-type: none"> • Leader Team • Research teams by areas of interest • Project Director

adoption of the model to each location databases and their integration in calculation process. Activities within the testing stage solve the following tasks:

- basic testing – basic numerical and conceptual operation check,
- rapid assessment of wellbeing at case studies location to check the software applicability and ability to adopt in extremely different conditions,
- calibration and verification – this processes will apply directly on case studies but using different set of data.

4.3 COMPONENT 2: ESTABLISHING A PERMANENT USERS NETWORK

After DeWOS has been developed and launched, there is a need to establish permanent users network, which will ensure the real implementation and global objective of increasing WB in DRB.

WP 5: ESTABLISHMENT OF SPIN-OFF COMPANY (NAMED SPIN-WOS)

Leader Team in accordance with main stakeholders will define and establish spin-off company which will be in charge for:

1. Promoting and selling the final product – DeWOS
2. Organizing capacity building program, workshops
3. Public relations and technical support service
4. Establishing focal points in every country or sub-region of the DRB
5. Operation and maintenance of the system

Table 2: Key issues regarding Spin-WOS

How Spin-WOS contributes to increasing the WB of people in the DRB?	Why fund Spin-WOS?
<ul style="list-style-type: none"> • job creation; • better image of public sector research; • improved ability to attract young researchers. 	<ul style="list-style-type: none"> • it helps to justify funding for a research project that has direct applications; • local governments support these companies because the dynamic image of the region; • there is a tendency to fund similar projects, when it exists a legal framework encouraging the creation of such companies and especially when one of the home countries of partner institutions has a long and productive cooperation with spin-off companies.

Spin-WOS is a research spin-off (also, entitled spin-out or start-up) representing a company licensing technology from a public research university (leading institution) and being directly established by such entity. The relationship between the company and the partner institutions refers to cooperation in research activity and exchange of personnel (lecturers, scientific consultants, PhDs, etc.).

WP 6: CAPACITY BUILDING PROGRAM

This activity will include workshops and organized courses for teaching wide user audience how to use the program and implement it in their analysis or decision making process. Researches that have been included in software development together with their colleagues from other field of research are going to be key personnel in this phase.

After education system at this level has been established, final manual document will be produced together with detailed guidelines on DeWOS application and suggested analyses that it can enable.

WP 7: IMPLEMENTATION

Once critical mass of trained users is reached, next step is to start implementing this system at different level of decision making stages. Establishment of local focal points responsible to manage, operate and maintain on national level or at least sub-regional is the crucial task at this stage. When this regional centres are operational they can continue with implementation at smaller scale.

WP 8: OPERATION & MAINTENANCE

This activity is ongoing process that continues even after the end of the project and it will enable system to be sustainable and slowly reach the final goal of wellbeing improvement in DRB.

Activity sheet 3
COMPONENT 2: ESTABLISHING PERMANENT USERS NETWORK

Objective	to establish permanent users network
Activities	WP 5: Establishment of spin-off company (Spin-WOS) WP 6: Capacity building program WP 7: Implementation WP 8: Operation & Maintenance
Outputs	<ul style="list-style-type: none"> • Spin-off company – Spin-WOS • Trained users • Report about capacity building program • Guidelines for implementation and using of DeWOS • Local focal points • International cooperation
Key staff responsible	<ul style="list-style-type: none"> • Leader Team • Project Director

LIST OF ABBREVIATIONS

DeWOS	– Danube Wellbeing Operation System
DRB	– Danube River Basin
EO	– Earth Observation
EU	– European Union
FP7	– Frame Programme 7
GEOSS	– The Global Earth Observation System of Systems
GIS	– Geographic Information System
GUI	– Graphic User Interface
HDI	– Human Development Index
ICPDR	– Commission for the Protection of the Danube River
IT	– Information Technologies
PCA	– Principal Component Analysis
QL	– Quality of Life
Spin-WOS	– Spin-off Company for implementing DeWOS
WB	– Wellbeing
WP	– Work Package

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