



Cooperation in land management for more livable places



MAY 2016
JULY 2019

www.interreg-central.eu/LUMAT.html

LUMAT PROJECT BOOKLET

IMPLEMENTATION OF SUSTAINABLE LAND USE
IN INTEGRATED ENVIRONMENTAL MANAGEMENT
OF FUNCTIONAL URBAN AREAS



Interreg
CENTRAL EUROPE



LUMAT

European Union
European Regional
Development Fund

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— Layout and Graphic design

LINKS Foundation

— Printing

Edizioni Langhe Roero Monferrato - Casa Editrice

— Photo Credit

In the cover and chapter pages, photos from the LUMAT photocontest.

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Chapter 6: Lucio Beltrami | Peekaboo

ISBN 978-88-941765-5-1

This work is published in the framework of the INTERREG CENTRAL EUROPE project “LUMAT - Implementation of Sustainable Land Use in Integrated Environmental Management of Functional Urban Areas” (Project No: CE89 LUMAT)



The sole responsibility for the content of the publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

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EXECUTIVE SUMMARY

The LUMAT project objective is the implementation of Sustainable Land Use and pilot projects in **Integrated Environmental Management** in 7 Central European Functional Urban Areas.

The LUMAT partnership of cities and regions, environmental agencies and research institutions develop integrated “**Functional Areas Integrated Environmental Management Strategies (FAIEMS)**” with shared transnational territorial and scientific competence.

FAIEMS include planning strategies with innovative technology supported by citizen participation. Local stakeholders have initiated pilot projects by using new interactive information tools from the Urban Atlas and citizen observatories.

The ecosystem service concept has supported the assessment and decision-making process. The implementation is based on agreed Action Plans and pilot/demonstration projects for land and soil including information database and tool for the management of urban/peri-urban relationships. Action plans include financial instruments and institutional solutions, e.g. land management agencies or permanent inter-municipal working groups.

Tools on FAIEMS methodology and participation constitute an integrative part of FAIEMS (minimize threats and environmental compensation to get

more liveable places) starting with the pilots in all regions (successful brownfield redevelopment, green infrastructure, sustainable land use on contaminated land).

The LUMAT project relies on the interplay between strategies and instruments beyond existing practice, and on a suitably comprehensive deployment of tools in these areas, including terms of reference, cooperation, organization and management by Action Plans, investment and pilot actions.

Central European urban regions are challenged by urban sprawl and suburbanization as well as by the reluctance of investors to take on urban brownfield locations. Poorly integrated and unsystematic land use, development policies and environmental management regulations increase land-related conflicts and handicap economic development.

The transnational exchange of experiences and cooperation specifically with regard to land and soil as widely neglected environmental media is strongly needed.

The **LUMAT Booklet** includes in a short form the description of the most important results of the **three years’ work** performed by the project consortium in the field of integrated environmental management of land resources in functional urban areas.

The complete and rich contents of the LUMAT project obviously cannot be presented in a full framework. Several dozens of deliverables and outputs have been produced by the consortium of representatives of 13 scientific, consulting institutions but also regional and local authorities of cities creating functional urban areas.

This Booklet is presenting the results of **the integration of scientific experience and management practice** in order to provide solutions which are transferable to other regions and cities

INTRODUCTION

to make them more liveable places.

More details of the presented results and other project products are available on the project web: www.lumatproject.eu.

**Dr. Anna Starzewska-Sikorska - IETU
LUMAT project Coordinator**

1



THE LUMAT PROJECT

- 1.1 | OBJECTIVE AND CONCEPT
- 1.2 | STRUCTURE OF THE PROJECT
- 1.3 | PARTNERSHIP

1.1 OBJECTIVE AND CONCEPT

The basic premises of the LUMAT project initiative were concerning the existing and lasting negative phenomena in urban land management appearing in form of:

- Growing land use pressure leading to users **conflicts**, landscape fragmentation, biodiversity loss and soil sealing.
- Increasing unbalanced urban developments and declining urban areas with vacant and **brownfield** land.
- Jurisdiction of the respective municipalities' management ending at its **borders** which results in an ineffective management related to the fuzzy character of its borders and the fuzzy interrelation of governance systems.

In all regions, poorly integrated and unsystematic environmental and spatial policies increase land-related conflict undermining social cohesion and competitiveness in the urban context, and new concepts of ecosystem services are not sufficiently applied.

In the partner regions, one of the most challenging topics of environmental management of land resources is represented by the disparity in the territorial governance. The common objective for LUMAT partners was to strengthen the functionalities, to integrate and support **mutual cooperation** between the core city

and municipalities, and to achieve **sustainable land** use through a proper environmental management.

The project has indicated that there is a need to find ideas for interregional cooperation, tools and instruments to resolve the conundrum while respecting territorial sovereignty and reflecting the problem of fuzziness of the territorial units. An integrated approach is needed in all partner regions where multiple actors can participate and cooperate in territorial and environmental management to develop their territories.

Two assumptions have been stated presenting the idea of the project:

- First, **the urban land is a valuable and limited environmental resource** (as it is reflected in the European documents).
- Second, **land management and planning are closely connected with all development activities:** economic, social and environmental ones by locating them in space.

Therefore, we assume that since the land is an environmental resource, then the land management should be supported with environmental management methods and tools applied in relation to land.

STRUCTURE OF THE PROJECT 1.2

The creation of the common strategy and methodology was the first step of the project implementation.

The LUMAT concept of a common strategy for integrated environmental management in **Functional Urban Areas (from here on FUAs)** with the focus on the component of land and soil created a framework for the development of locally based strategies in the respective FUAs in the LUMAT project partners' countries.

The **conceptual approach** is based on integrated urban environmental management in the FUAs as a tool for the optimization of land-use and soil management and its synergy with the concept of ecosystem services, as well as management of cooperation of the city core and its suburban areas including institutional framework. A multilevel poly-centric governance was chosen as a core concept for efficient institutional framework in the field of sustainable land use and soil management.

The LUMAT concept of a common strategy for integrated environmental management works with FUAs as the functional territorial units defined on natural ties of interdependences and collaboration between the city core and peri-urban municipalities, or on collaboration agreements framing, or practical implementation of multilevel governance principle in the decision making.

The **common methodology** constituted a basis for further considerations resulting in a concept of Action Plans strengthening the environmental management of land and soil resources in FUAs. According to the idea of LUMAT, the Action Plans have used **methods and tools** that are offered by the environmental management field.

These methods included in particular ecosystem services approach to decision making, but also others like compensation measures in relation to management of brownfields and degraded areas or industrial symbiosis with environmental criteria in business co-operation.

For the needs of the project, seven regions have been selected presenting various types of FUAs which are representative of other regions in Central Europe. The project results therefore will be useful and applicable in other central European countries not included in the project.

The main land use conflicts and threats have been identified and placed at the core for formulating solutions in form of **Action Plans** and pilot actions. These threats included brownfields, urban sprawl and soil sealing (partly the result of urban sprawl, but not only). The project answer to these issues was developing ideas and concepts of Action Plans that could support the integrated land management in FUAs. These concepts were based on the common

See
chapter 2

See
chapter 3

structure developed by the partnership including:

- Diagnosis of main specific issues/ threats in the FUA
- Technical, financial and organizational actions
- Tools supporting the actions
- Pilot actions as examples of the Action Plans implementation.

The **technical actions** concerned:

- Concepts of green and blue infrastructure strengthening and development
- Program of brownfields revitalization
- Program of integrated site compensation
- Program of business development on degraded areas as inner city development
- Program of re-using post-mining sites
- Integrated, sustainable management of functional city area in the process of spatial planning with an emphasis on integrated management of environmental protection and integrated land use
- FUAs' environmental and territorial issues management model as

contribution to metropolitan strategic planning and metropolitan general spatial planning.

Organizational actions were connected with public involvement by using tools developed in LUMAT and management structures which had to be established as units responsible in the future for the implementation of the Action Plans. In addition, **trainings** of environmental and planning professionals were included, concerning ecosystem services approach, FUA identity, land use conflicts reduction and use of innovative tools for public involvement.

The Action Plans have been presented at local public meetings, with the participation of various groups of stakeholders and using tools in form of application available in mobile phones. Establishing management structures is one of the most important visible project results.

They should guarantee further implementation of the Action Plans, especially in the aspect of applying for financial means.

Pilot actions have been developed in **7 project countries** as parts of the Action Plans, showing the practical ways of Action Plans implementation.

The physically visible results of the project are pilot actions in form of two investments financed by the project. They are located in **Slovakia**

and **Poland**. These **two investments** are pilot actions of the project. The remaining pilot actions in the other **5 countries** will constitute parts of Action Plans showing how to implement the proposed actions.

INVESTMENT IN SLOVAKIA

The investment in Slovakia involves the restoration of a neglected natural park for sport and recreation zone in location Štrky in Trnava, aiming at securing the overall rehabilitation of a currently abandoned area of Štrky, suffering from many burdens, for which it could be considered as a “green brownfield”. On the one hand, through this restoration an original natural value will be brought back to this bio-centre of local importance, as achieving a strengthened and increased ecological stability in this area. On the other hand, overall rehabilitation will open up this area for the broad public of Trnava City and Trnava FUA offering possibilities for sport, leisure and relax activities in the natural environment.

INVESTMENT IN POLAND

The investment in Poland is consisting in the rehabilitation of the brownfield site located in the middle of the Ruda Śląska city. The place is a post-zinc wastes dumping site of 6,5 ha, surrounded by dwelling houses areas. Therefore, at first, to make the place safe the phytostabilization technology has been used. The investment will create an available open space of a natural, “half-wild” character; due to the progressive greening it will achieve the character of a sub-regional park. The place will become the walking and biking route connection of two districts as a key element of the peri-urban infrastructure.

See
chapter 4

1.3 PARTNERSHIP

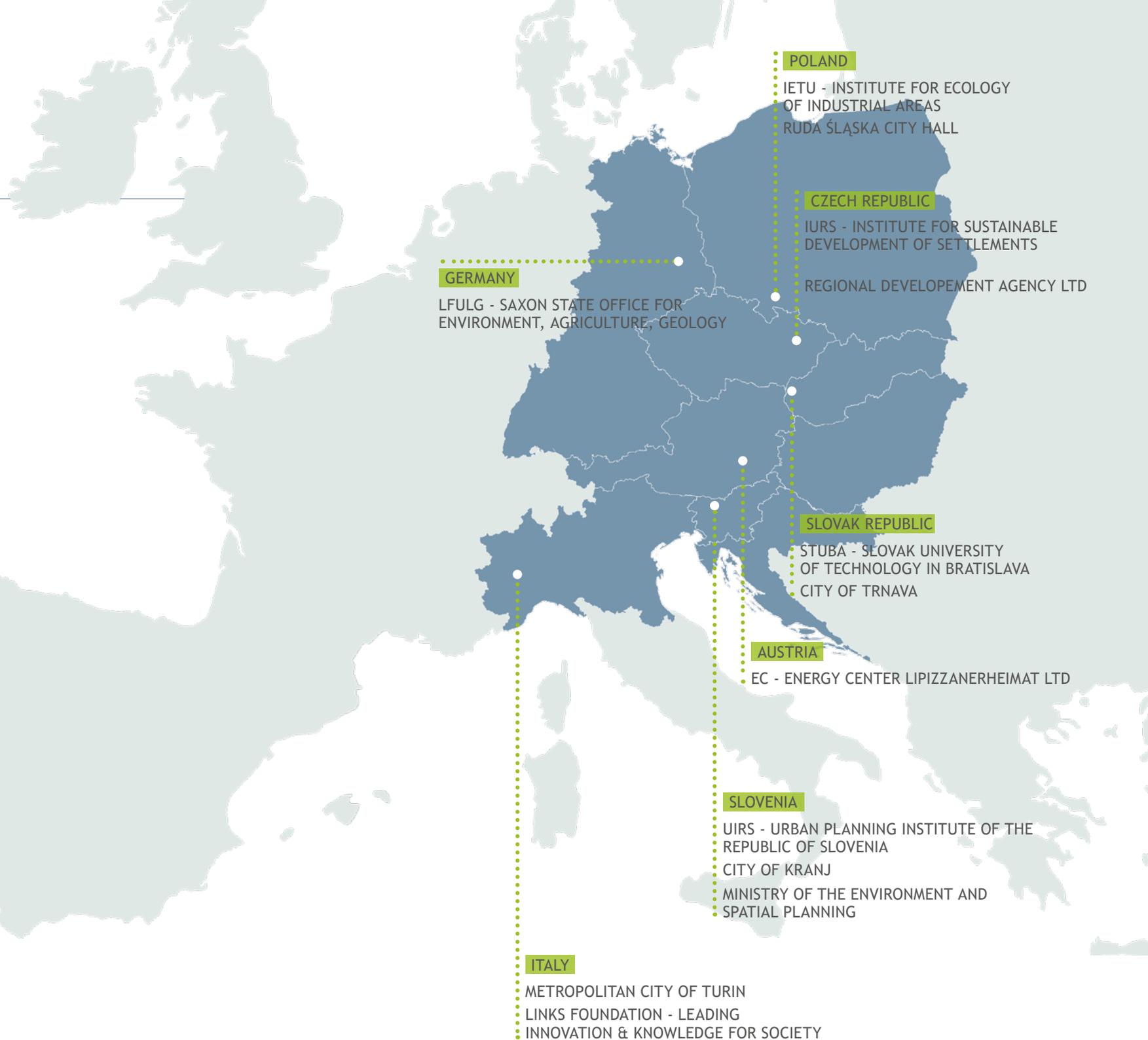
The LUMAT partnership consists of cities and regions representing FUAs and research and consulting institutions.

13 partners from 7 countries have been working in close cooperation exchanging both the knowledge and the practical experience in land and soil resources management in urban areas. A transnational approach has helped the project partners to go pass traditional national/local concepts and raise awareness by developing innovative and integrated solutions supporting peri-urban development.

As a consequence, the LUMAT partners have worked on a transnational framework in coherence with new implementation instruments and pilot actions through the transnational sharing of specific topics.

The qualification and competences of the partners are complementary to each other, and represent different national approaches as well as planning and environmental management approaches. **Transnational cooperation** has created synergies between actors with different experience of land use management, as influenced by different local/regional and national frameworks and government strategies.

This co-operation has fruited in methods and tools developed in environmental management related to land and soil which are incorporated to land use planning and management in FUAs.



2



METHODOLOGY

- 2.1 CONCEPTUAL FRAMEWORK
- 2.2 TRAININGS
 - 2.2.1. FUA identity
 - 2.2.2. Ecosystem services
 - 2.2.3. Land use conflicts
 - 2.2.4. Interactive tool for citizens involvement - InViTo

2.1 CONCEPTUAL FRAMEWORK

The LUMAT concept of integrated environmental management is based on the concept of **FUAs** as the functional territorial units defined on the basis of **natural ties, interdependencies and collaboration between the city core and surrounding municipalities**. These can be of various type, as formal institutional relations, or based on national policies implementation (including the adoption of the OECD methodology) - top-down approach -, or based on collaboration agreements framing, in addition to horizontal cooperation, or practical implementation of multilevel governance principle in the decision making.

— Functional Urban Area

The FUA is defined as a spatially continuous settlement system consisting of units separate in administrative terms. An urban functional area covers a compact urban area (core) with a functionally linked urbanized zone.

Sustainable Land Use in FUAs covers all activities concerned with the management of land as a resource both from an environmental and from an economic perspective. Integrated Environmental Management in FUAs aims to improve the environmental performance of FUA, thus contributing to a better quality of life.

identification of core municipalities.

The cores are defined using the population grid from the global dataset Landsat, referred to circa year 2000. Poly-centric cores and the hinterlands of the functional areas were identified on the basis of commuting data (travel from home-to-work) referred around the 2000 census year.

The urban hinterland was identified as worker catchment area, including all settlements from where at least 15% of the workers commute to any of the core settlement(s). (OECD,2012)

The OECD methodology makes it possible to compare FUAs of similar size across countries. A classification of FUAs into four types according to population size is proposed:

- Small urban areas, with population between 50,000 and 200,000.
- Medium-sized urban areas, with population between 200,000 and 500,000.

- Metropolitan areas, with population between 500,000 and 1.5 million
- Large metropolitan areas, with population above 1.5 million.

The FUA includes cities, towns and villages that are often physically separated by unbuilt land from the built-up city, but are at the same time economically and socially highly

dependent on the urban core. The most common-and easiest-way to understand this interpretation is the travel-to-work area, which would include all communities with more than a substantial percentage (e.g.: 20%) of resident workers employed in the core city. It is a very formal normative concept not reflecting the complexity of urban/peri-urban interrelations.

— Guiding principles

The joint concept of integrated FUAs environmental management builds on project cycle creating the core of integrated environmental management process framed by **5 guiding principles**:

1. The main feature of integrated FUAs' environmental management is its strategic character. It means the complexity of the process starting with diagnosis, via visioning, planning, programming and ending with implementing and monitoring.
2. Integrated FUAs' environment management is the platform for integration of different interests, aspects, potentials, limits in the space/territory of the FUAs across different hierarchical territorial levels, sectors of policies, stakeholders.
3. Integrated FUAs' environment management is action oriented, it means the outputs from the planning, decision making and executing

processes are the real improvements in the FUAs.

4. The basic principle of integrated FUAs' environment management is the broad involvement of all stakeholders into the decision making and implementation activities reflecting their different capacities.
5. Integrated FUAs' environment management follows the logic of gradual development with synergy effects between different interventions coordinated in the time and space. In the same time it creates preconditions for flexible use and reacting to internal and external shocks.

Five guiding principles

OECD
Organisation
for Economic
Co-operation
and
Development

The OECD made special efforts to make the concept of "Functional Urban Area" more precise, allowing to collect comparable data across European cities. Each FUA is an economic unit characterised by densely inhabited "urban cores" and "hinterlands" whose labour market is highly integrated with the cores.

The OECD developed a calculation process which started with the

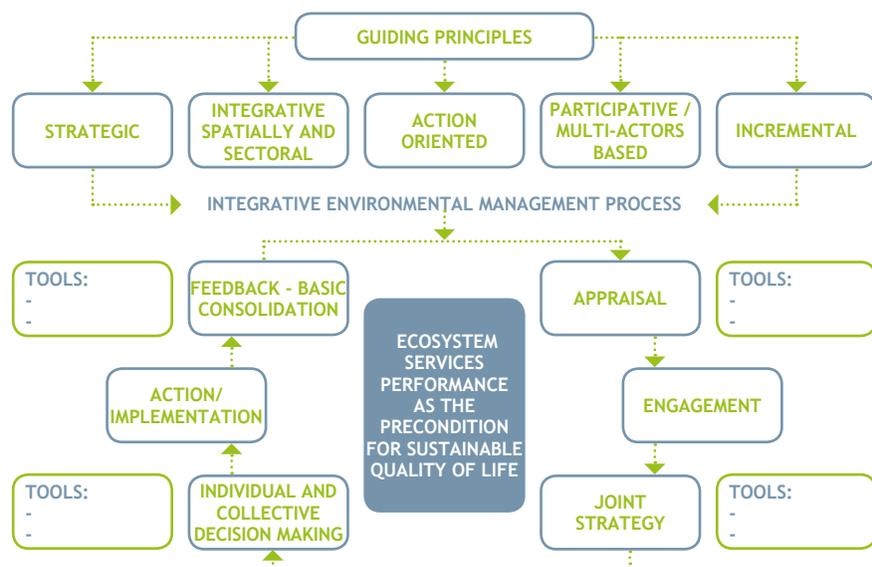


Fig.1 The concept for integrative FUA environmental management

— Project cycle

The core quality followed by the project cycle which creates the backbone of integrated FUAs’ environmental management is the quality of life in the FUAs with the special focus on whole range of ecosystem services as the precondition for sustainability of the quality of life.

The project cycle includes the appraisal phase with the identification of the problems, their system ties, casualties and synergies, the hierarchy, spatial extent and affecting the different stakeholders. The appraisal phase is followed by the phase of engagement focused on identification

and involvement of the relevant stakeholders for respective issue, being it a problem or a challenge. Important is to analyse natural and institutional responsibilities, capacities (decision making, implementation) as well as opportunities for collaboration, and based on this to identify the most proper hierarchical level for the development of the strategy, decision making, strategy implementation, actions in the harmony with the concept of poly-centric multilevel governance. The development of strategy is understood as the participatory process involving the stakeholder, following their individual engagement and capacity. The

required quality of the decision making - independently from its character - depends on the availability/accessibility to proper information, involvement of relevant stakeholders and their capacities. In this context, the inherent part of the common integrated FUAs management is the process of building up the capacities of stakeholders for active participation in its execution.

The project cycle is an iterative process in which permanent monitoring and

— Integration

The quality of life in the FUAs and quality of urban environment as the precondition for the quality of life of FUAs’ citizens are synergic qualities, to a huge extent subjectively perceived. There are substantial and processual dimensions of the integration in the integrated FUAs’ environmental management.

The substantial integration is based on contextual understanding of particular problems and challenges for the strategy development, decision making and implementation as well as the integration of different aspects, factors, views, policies (sectorial approaches).

This integration has different levels of integration, also understood as levels of abstraction or level of aggregation.

The processual dimension of integration is based on integration of different particular processes in order to

feedback allows the combination with flexibility of strategies reflecting directly the success assessment in which quality as perceived by the public plays an important role in addition to objective progress indicators.

The basic consolidation phase is the process of permanent adjustment of the strategy to changing external preconditions as well as reflecting feedbacks from the progress monitoring of the strategy implementation.

achieve complexity and in the same time efficiency of measures based on the comparison of the outputs/ effects/improvements and inputs/ used resources. Integrated FUAs’ environmental management includes the parallel and serial processual integration.

Parallel processual integration is focused on coordination and harmonisation of the parallel processes in the FUAs looking for their independences, contradictions, synergies etc. (e.g. the changes of the quality of public spaces in the core areas, the development of transport infrastructure and the processes of urban sprawl).

The sense of serial processual integration is the optimisation of interlinks between the actions in their logic time sequence. The main time axis is determined by the flow of activities starting with the diagnosis with identification of

The core principle of the LUMAT concept for integrated FUAs’ environment management

potentials, problems and challenges via visioning, planning, programming up to the implementation. Serial processual integration safeguards the coherence among the prospective activities represented by the complex of FUAs integrative planning and executive activities represented by own development activities (among them implementation activities of plans and programs) and their management - executive management.

Planning is understood as basic management function, involving formulation of plans to achieve optimum balance of needs or demands with

the available resources. The planning process identifies the goals or objectives to be achieved, formulates strategies to achieve them, arranges or creates the means required, and implements, directs, and monitors all steps in their proper sequence.

In the core of the concept for integrated FUAs' environmental management creates optimized integrative land-use management and management of cooperation (including proper institutional framework) of the city core and its suburban areas seems to be the **core instrument to face the threats** in current urban/peri-urban development.

— Concept of ecosystem services

As an attempt to express the benefits from ecosystems for human well-being by economic means, the concept of ecosystem services offers a common denominator for the harmonization of different interests in the urban/peri-urban areas and threats based on the dichotomy between core and periphery as well as seeming dichotomy between economic and social on one hand and environmental development on the other hand.

In the past, environmental dimension in the decision making in spatial development management was represented by issues as mitigating the impact of development activities or establishing areas to protect wildlife and

cultural landscape.

Ecosystems are rather complex dynamic functional units consisting of all plants and animals (biodiversity) in an area, together with the non-living, physical components of the environment (water, soil and air) with which they interact.

The cities and FUAs represent the socio-ecosystems as they include ecosystem and man as a social being.

Ecosystem services are the services provided by the natural environment which benefit people addressing their well-being, satisfying their needs existential security, social and economic prosperity.

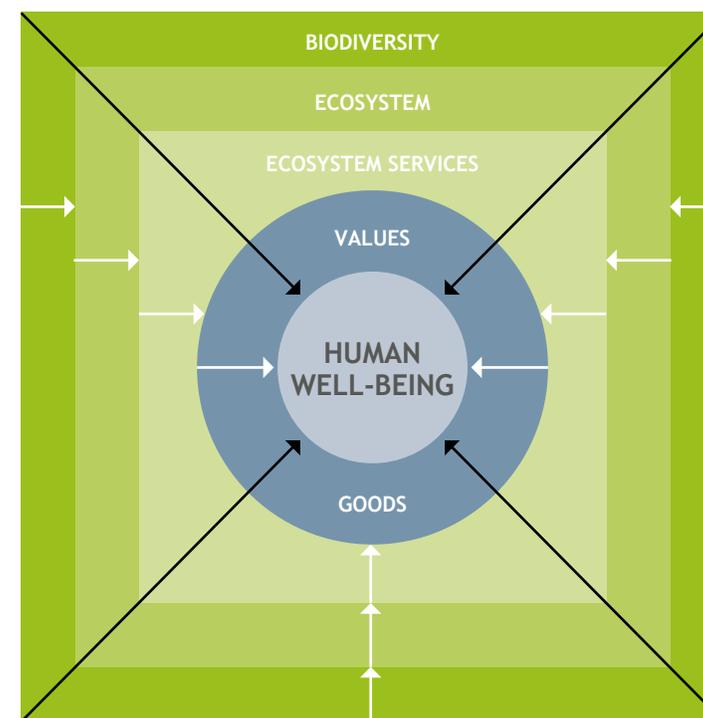


Fig.2 Biodiversity, Ecosystems, Ecosystems services and Human Well-Being

The confrontation of the demand (represented by the needs) and offer (represented by the availability of services and their ability to satisfy the needs) represents the value of services. We need to consider not only mitigation and protection although within a broader approach, but the fact, that the people in their daily lives depend on a range of services that ecosystems provide and our role is not only to protect but to develop them in parallel. These services

are fundamental to attaining quality of life of the citizens as main integrative development goal. There is no single way to implement an Ecosystem Services Approach.

FUAs represent very complex, dynamic socio-ecological systems of biophysical and social factors defined at several spatial, temporal and organizational hierarchically linked scales. The ecosystems are significant with different

Within LUMAT Project ecosystem services is the conceptual basis for integrated environmental management including the land and soil management

The value of ecosystem services

levels of self-organisational and adaptive abilities. The social factors are represented by social units consisting of citizens, visitors, local economy players, and other subjects of social life in the FUA, their mutual interactions as well as interactions with the subjects of society they are embedded in.

The main task of the FUA development management is to safeguard that they regularly interact in a resilient, sustainable manner, especially in the context of the presence of critical resources whose flow and use is regulated in the interaction between natural and societal processes.

This concept of the cities and their peri-urban areas as socio-ecological systems is crucial in the integrated concept of FUAs sustainable development management as it stress the fact that the delineation between social systems and ecological systems is artificial and arbitrary.

It also draws heavily on systems ecology and complexity theory incorporating ideas from theories relating to the study of sustainability, vulnerability, resilience and robustness, which makes this theoretical framework much more relevant for the common FUAs integrated development management in the context of challenges resulting from climate change and growing uncertainties, and from the growing role of multi-actors of FUAs development and their individual decisions.

For the LUMAT concept of the common FUAs integrated development management is important the conceptualized knowledge resulting from the research of the teams around Elinor Ostrom, that the management processes in such complex systems as cities and **FUAs can be improved only** by making them **adaptive and flexible**, able to deal with uncertainty and surprise, and by building capacity to adapt to change.

The object of the integrated FUA development management are the processes in both - social systems and ecosystems and especially their mutual interaction where the biggest challenge represents the question of harmonisation of different demands of different elements of social systems as well as ecosystems in the confrontation with the limitation of the available resources and preferences in the access to them and function of sustainability.

There is a whole scale of different conceptual frameworks for addressing this tasks of harmonisation of social systems and ecosystems development (e.g. circular economy), but the complexity of the tasks of integrated FUA development management is not in every time properly covered by them, as they mostly use to focus on particular human activities and are not fitting to the complexity of FUA functioning and development processes.

As proper interface between social aspects and ecological aspects of this

harmonisation can be understood the concept of ecosystem services- services provided by the natural environment which benefit people. Understanding of ecosystem services is ‘challenging the misconception that we must choose between the natural environment and economic growth’ (Natural Environment White Paper Consultation, Sept. 2010).

The ecosystem services reach from providing the products satisfying basic needs of humans as biological

elements - food, clean air, fuel, timber (provisioning ecosystem services) via creating proper framework for their existence by influencing climate, floods etc. (regulating ecosystem services), safeguarding sustainability of the processes framing the existence of humans - water cycling, soil formation (supporting ecosystem services) up to human needs at the top of Maslow’s pyramid - aesthetic and cognitive inputs, health, recreation and tourism (cultural ecosystem services).

Maslow’s Pyramid

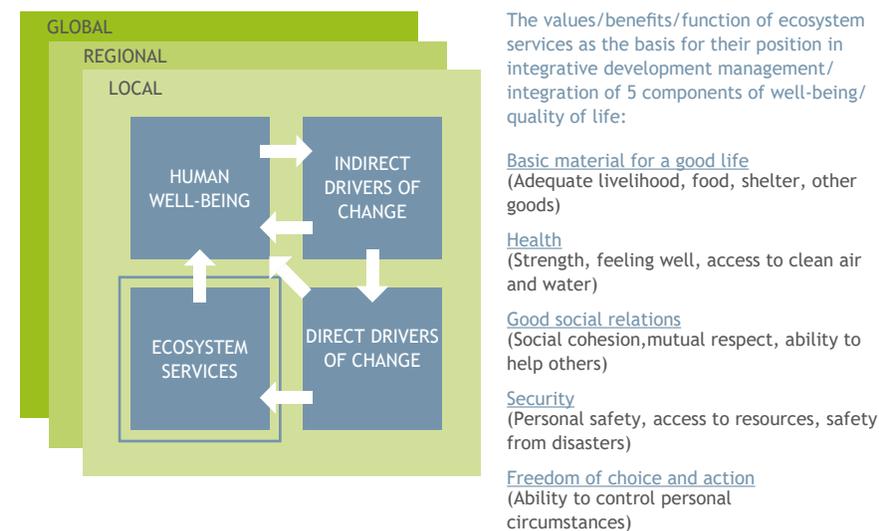


Fig.3 Ecosystem services as an object of integrative FUA environment management

Based on: Millennium Ecosystem Assessment (2005). Ecosystems and human well-being: synthesis (PDF), 2014. Washington, DC: Island Press. ISBN 1-59726-040-1

One of the crucial connected questions for FUAs’ integrated environment management is the problem of multi-dimensional impacts of landscape

fragmentation on ecosystem services which is one of main features especially in urban and peri-urban areas.

At this scale one of the main challenges is how to optimise the allocation and management of different land uses and their sprawl and how to minimise the

implications for ecosystem services (see: Rodriguez, et al, 2006).

— Multilevel poly-centric governance

Integrated environment management of the FUA development has to be understood as a task of the system of territorial governance.

Territorial governance is mainly understood as “the manner in which territories of a national state are administered and policies implemented with particular reference to the distribution of roles and responsibilities among the different levels of government (supranational, national and sub-national) and the underlying processes of negotiation and consensus building” (COM 2007).

The FUAs belong to such spatial structures including the territory of several municipalities but only seldom creating institutionalised territorial unit with adequate governmental or self-governmental bodies. Such open systems allow high level of individual freedom (e.g. decision-making freedom, individual mobility), allowing and initiating not only changes in individual and collective behaviour and attitudes (e.g. new definition of belonging, territorial responsibility, shift **from local to regional and global thinking**, social control), but even the changes of territorial systems themselves.

The definition of “hard” borders and institutionalisation of the FUA as governmental or self-governmental territorial units would be even in the

contrast with the nature of FUAs and processes there, as they are related to different, only partially overlapping spaces and it is no more possible to define exactly the borders of functional space of a city or of a region.

The administrative borders lose its importance for spatial organization of citizens’ activities. We can speak about soft spaces and their fuzzy borders, about poly-centric governance, fuzzy and soft governance modes.

The **multilevel poly-centric governance** model creates the basis for:

- inclusion and participation, broad participation of public and private actors (self-governmental bodies, NGO, firms, individuals, association) directly or through legitimate intermediate institutions, strengthening of collaborative decision-making
- subsidiary by decentralising most of the decisions concerning the particular issues to the decision-making level consistent with efficient and cost-effective delivery of outputs non-hierarchical modes of guidance, such as persuasion and negotiation

acknowledgement of diversity, as crucial mean to improve well-being of FUA citizens

- accessibility and equity (equal access to the participation on decision making, to the services, work...)
- accountability/transparency of decision makers across different levels of territorial government involved, in the private sector and in the civil society organisations should be accountable to the public as well as to institutional stakeholders (publicizing planning and programmes, performances), etc.
- sustainability in all dimensions of FUA development
- efficiency and effectiveness, (in the delivery of public services, promoting FUA economic development, production that meet needs, while

making the best use of resources)

- security and safety of individuals and their living environment (crime and conflict prevention and disaster preparedness);diffusion of information and learning, self-learning, knowledge affordability (iterative process of monitoring and target readjustment, networks, etc.)
- diffusion of understanding of complexity of FUA development among decision makers
- rising awareness about necessity of strategic thinking and long term perspective thinking
- comprehensive and innovative management
- flexibility of strategies and tools and capacity of adjustment using soft tools.

— Public participation

The implementation of the Action plans for FUA is directly depending on the participation of the whole scale of stakeholders. The analysis of relevant subject for public participation has to use both a multi-criteria and multi-factor approach, which includes, as its main objectives, involvement, mediation and facilitation of information and participation. The integrated FUA environmental management plans frames integrative approach considering

all relevant subject of FUA development (especially from the point of view of environment) continuous consultation in various stages of environmental management plan production to be the most appropriate since this approach also respects to the highest degree the requirements of the Aarhus Convention on Access to Information, Public Participation and Access to Justice, and the Convention on Biodiversity (the management of land and water and

The public participation is crucial for integrated environmental management in the fuzzy soft spaces as FUAs

living resources as a social choice).

Stakeholders should be involved when all options are still open and **engagement should continue throughout the planning process.**

There are different tools for involvement of different groups of stakeholders, nevertheless, the logic remains the same, to achieve collective decision making in form of partnership empowerment.

The objective of the procedure of public participation is to engage the stakeholders in the processes of the FUA environmental management starting with the planning and programming, via practical implementation up to the monitoring. This needs to be done in gradual steps as it is continuous process with its internal logics. The procedure has **5 main steps** in which the decision makers are engaging with the stakeholders with one initial phase of stakeholder mapping which provides the essential early information about the stakeholders of the project. All the steps need to be performed as one is related to another, from a passive

— **Situation Analysis**

Following the principle to build sustainable FUA development on use and capitalisation of local and supra/ local potentials, important part of the proposed algorithm of the development of integrated FUA environmental

process to an active one. The whole process of participation is a process of trust building between the decision maker and stakeholders, inherently a two-way process. It is crucial to make stakeholders feel listened to and appreciated in practice, not only in theory for the whole duration of the process. Following Figure describes the phases of the procedure and its internal logics and Table 2 provides a sheet of main phases with brief explanation of each phase which is to be used by practitioners as a tool for running the procedure in the projects.

The executive management with the tool of Action plans focuses on efficient implementation of planned interventions (e.g. investments, regulations, subsidies, etc.) and harmonisation of various activities driven by different stakeholders of FUA development.

The main reference quality related to the executive management is represented by the goals defined by the strategy of FUA development aimed on achievement improvement of the quality of life and its sustainability.

management plans is the analytical phase.

The diagnosis is an initial step to identify and monitor emerging issues and signals of change in the internal

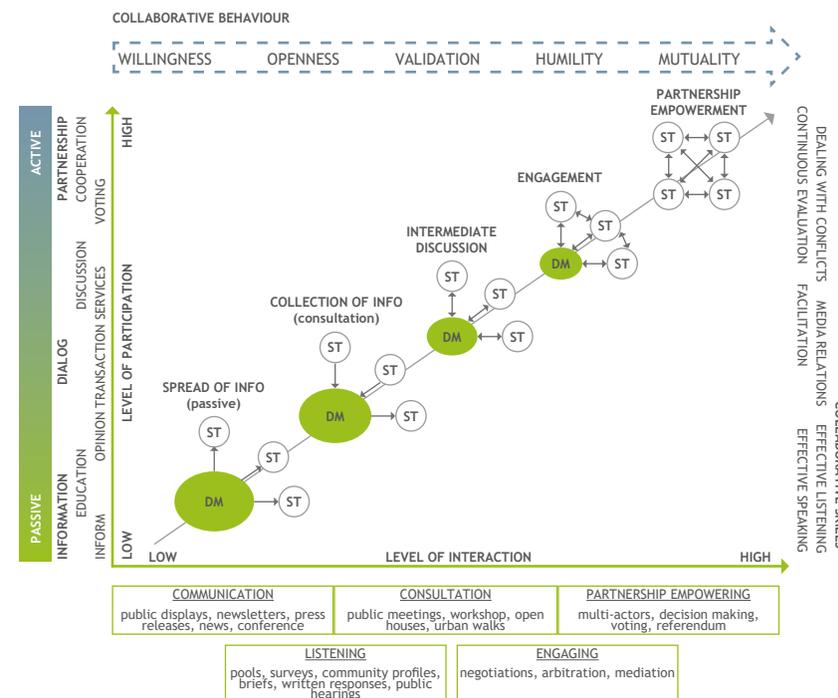


Fig.4 Phases and quality of the stakeholders involvement (Finka M., Ondrejicka, V. 2017)

and external environment of FUA. Important part of the diagnosis is the identification of the drivers of these changes. The **drivers** and issues can be developed through the use of the different scanning techniques. The diagnosis should be not limited to the collection of background data concerned with the FUA (GIS data, statistical data, analytical documents, photos) but should include **in-depth analyses** in order to understand the processes in the FUA not only as state of art description but as development trends as well.

Data collection tools, comparative methods (e.g. benchmarking) generic visioning techniques and other prospective methods are employed at this stage. Procedures such as strategic environmental assessment may also start at this stage in conjunction with the plan development process.

The definition of development strategy, its goals, structures, instrument but as well the definition of progress indicators can be formulated. These two elements form a reciprocal relationship:

The core issue are the identification of potentials and definition of problems

- problems and potentials will be used as the basis for a sub-set of issues integrated in the developed indicator set
- the core indicators will be used as part of a SWOT analysis in order to identify the problems and potentials of the FUA.

— Formulation of a vision and strategy for the plan

This phase is the most interactive stage of the FUA environmental management process in terms of assessment and devising a plan.

Goals, alternatives how to react to the identified challenges, problems and potentials of the FUA, expected outcomes of the plan and the associated objectives and targets should be developed and assessed from the point of their coherence, achievability, and responsibilities. Usually some scenarios are generated, discussed and assessed. The linked necessary interventions should be tested against policy options and identified consequences.

The second part of the planning phase is focused on preparatory work for plan implementation. The main instruments are the Action Plan, programs and projects, which are in detail described by the programming/operational part of the Action plan. The Action plan will involve a series of projects and sub-projects which will include diverse interventions in the form of regulations, investments, physical developments, socio-economic and environmental measures. The objectives of the plan should be used as a benchmark against which the performance of alternatives of actions in the Action Plans should be appraised.

— Implementation

After the design of integrative plan, assessment of alternative options and formulation of executive (programming/operational) part of the Action Plan/ plans including the definition of priority action areas based on socio-economic and environmental goals for FUA development the prioritisation of pilot

or flagship projects should be carried out in close collaboration with the stakeholders. Their involvement and division of responsibilities and work is crucial including the agreement on organisation of responsibilities to implement the plan as whole and particular projects.

— Monitoring

Monitoring should be inherent part of the core strategy of the integrative FUA

environmental management plans. It includes:

- the strategy implementation monitoring focused on investigation and assessment of the implementation process and feed-back including strategic impact assessment and ex-ante evaluation
- permanent development monitoring concentrated on sustainability development assessment
- flexible adjustment of the strategies in accordance with the monitoring results and dynamic development of framework preconditions and new requirements.

The LUMAT methodology of specific integrated FUA environmental management plans creates a framework

for the development of locally based strategies in the respective FUAs and executive part of the actions plans in the project LUMAT partners' countries.

The conceptual approach to the development of Action Plans is based on common understanding and common strategy for integrated management of FUAs as a tool for optimization of land-use and soil management and its synergy with the concept of ecosystem services as well as management of cooperation of the city core and its suburban areas including institutional framework.

In this context the methodology supports the implementation of the concept of multilevel poly-centric governance as a leading managerial concept.

2.2 TRAININGS

The concept of local training for professionals of environmental management and land use planning has been prepared and implemented in the training seminars of the LUMAT partnership and in national training sessions in the partner countries of the LUMAT project. The aim of the internal training seminars of LUMAT partnership was **to discuss the knowledge needed to prepare and organise national training sessions** in FUAs and implement also country-specific national policies and conditions.

The concept is based on four modules that cover the most important issues for professionals of environmental management and land use planning in FUAs:

Four
modules

1. FUAs - FUA Identity
2. Ecosystem services
3. Interactive tools for citizen involvement
4. Reduction of land-use conflicts.

The concept has been prepared by PP7 STUBA in two formats: the **lectures** and the **workshop format**. The partners could choose which format is suitable to be used in the partner countries for national trainings.

All four modules have been elaborated as presentations of the topic in power point as .PPT files and support to the trainers of national trainings has been prepared in the form of the file Guidelines/Advice to the trainers that have been elaborated in the proposed structure:

- Tasks for self-study of the trainers should be reached
- Training methodology with explanation what training objectives
- Training materials that should be used for the chosen training format.

In addition to the logistics of training the Comment/advice to the trainers has been added to each slide in the ppt file. The training materials have been translated into 6 national languages (CZ, DE, IT, PL, SI, SK) and provided to the participants of national trainings on FUAs integrated environmental management.

— 2.2.1 FUAs Identity

The training materials have been prepared by dr. Justyna Gorgoń (IETU). The training is composed of introductory lecture and interactive session. The aim was to define FUAs identity with respect of its characteristics and with reference to the methodology (OECD/national). Interactive session was focused on:

- FUAs definitions
 - FUAs typology
 - FUAs delimitation and criteria for FUAs identity
 - Discussion on criteria selection
- FUAs Identity (interactive exercise based on FUAs presented in the Project)
 - Conclusions on further steps in building FUAs identity.

Focus of
interactive
sessions

— 2.2.2 Ecosystem Services

The incorporation of the ecosystem services in the concept of integrated FUAs development management allows to take the value of the natural environment into account in cost benefit analysis and to solve the problem of the imbalance between beneficiaries and losers. The training was composed of an introductory lecture and an interactive session, both led by Prof Maros Finka (STUBA).

The introduction focused on:

- ecosystem services approaches a framework by which ecosystem services are integrated into public and private decision making
- environmentally oriented land use planning
- urban landscape quality and ecosystem services as a phenomenon of urban life quality
- position and structure of ecosystem services management instruments in integrative planning systems.

Introductory
lecture

The interactive session discussed:

- Factors of urban landscape quality.
- What is the city of the best quality about?
- Setting priorities of urban life quality factors.
- Choosing the priorities from the point of view of different groups of stakeholders.
- What are ecosystem services about?

Subjects of
interactive
session

— 2.2.3 Land use conflicts

The reduction of conflicts in spatial development begins already at the stage of

elaborating land use plans. Techniques and methods of solving conflicts are based on broadly understood principles of conflict management, but should take into consideration the basic issues important in spatial planning and land use management, i.e. public interest and the value of land related to the planned functions.

The aim of the training, prepared by Dr. Justyna Gorgoń (IETU), was to explain how to reduce land use conflicts in the FUA's with respect to different kind of possible conflicts and with reference to the proposed toolbox for conflict resolution. The interactive session focused on the classification of land-use conflicts in the FUA's according to:

Focus of interactive sessions

- Framework for classification of land-use conflicts
- Conditions for existence of conflicts
- Causes of conflicts
- Parties involved in the land-use conflict's process
- Toolbox proposed
- Proposal of methods for conflicts resolution

The results of trainings have been reflected in the participatory process of Strategies and Action Plans in the LUMAT project pilot areas' development and implementation, since the knowledge and skills of stakeholders involved are crucial for efficient achievements of strategic goals. There have been altogether 164 professionals of environmental management and land use planning trained in all relevant target groups in the countries of the LUMAT project partnership.

— 2.2.4 Interactive tool for citizens involvement - InViTo

The methodology shared among LUMAT partners includes the use of spatial Decision Support Tools (sDSS) as instruments for facilitating the decision-making processes in a complex environment such as the inter-municipal agglomeration. Italian team proposed the use of the **Interactive Visualisation Tool (InViTo)**, a web based mapping tool developed by LINKS (Pensa & Masala, 2014; Pensa et al., 2014).

InViTo is conceived as a toolbox, which provides a visual support to the analysis and communication of both georeferenced spatial and non-spatial data. It aims at facilitating

the processes of policy and decision making, focusing on data sharing and information visualisation as a vehicle for the public involvement in the planning processes. It generates maps, where information and localisation are correlated so to provide an essential instrument for the knowledge of urban dynamics in the definition of specific policies (IBM, 2014; Ringenson, et al., 2018; Google LLC, 2018).

This platform has a double function. First, it allows geo-data to be mapped and filtered in order to monitor the present land uses, pointing out critical issues or outlining opportunities. Second, it allows the production of maps which can be weighted on the basis of different parameters thus enabling the discussions among the involved stakeholders.

The training materials were prepared by Elena Masala and Matteo Tabasso (LINKS Foundation).

The scope of the training covers:

- Functionalities of InViTo
- Opportunities offered by interactive visualization tool InViTo
- Practical session - how to use and adapt InViTo tool to the different FUA's.

For more details see chapter 4.3

InViTo training

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3



FROM CONCEPT TO ACTION

- 3.1 URBAN-PERIURBAN ACTION PLANS, STRATEGIES AND TOOLS
- 3.2 TOOLS
 - 3.2.1. LUMATO
 - 3.2.2. InVITo
 - 3.2.3. Brownfieldy
- 3.3 ACTION PLANS
 - 3.3.1. Polish FUA
 - 3.3.2. German FUA
 - 3.3.3. Italian FUA
 - 3.3.4. Austrian FUA
 - 3.3.5. Slovakian FUA
 - 3.3.6. Czech FUA
 - 3.3.7. Slovenian FUA

3.1 URBAN-PERIURBAN ACTION PLANS, STRATEGIES AND TOOLS

— What is “More Liveable” in this “FUA”?

According to the social and economic aspects, the quality of life has a direct connection to urban sprawl. The standard approach of normal life is more consumption of resources. From the view of urban planners, new “more liveable places” are being created every day and all year long.

Everything involved in the construction of new settlement areas is defined “more liveable” in terms of the priority given to new settlement and traffic areas all over Central Europe. These construction projects for “improvements” mostly take place in outer city zones and outside of the already existing settlement structure.

According to the general public, “more liveable places” are places where they

can live in newly built up outer zones and where they are able to realize their own satisfaction there, can realize their own desires of a “normal” and “successful” life.

From the view of commercial developers, “more liveable places” are places where it is easily possible to use economic services in the outer urban zones, there is a highway within close reach and accessibility is performed.

For decades, these views have been the standard rule of living in growing FUAs with its urban and peri-urban components. These standards are correlated with a type of consumption that is not sustainable out of a common perspective of environmental, social and economic consideration.

their importance, and prioritized for

To be done are actions for revitalisation, environmental compensation and the improving of living conditions for FUA residents. By placing importance on threatened areas, LUMAT tries to make more liveable places in a different manner than that which has been pursued by others in the past.

Brownfield sites are a social, economic and environmental burden upon the surrounding community. They hinder soil

functions from performing, for example water retention or climate regulation, due to **unnecessary soil sealing** for an urban use which is no longer in need. The same applies to sprawling settlement structures, which cut into landscapes and consume natural and agricultural land resources with new infrastructure and streets.

Technical infrastructure can even become a financial threat upon communities, especially if they are shrinking in population and there are fewer people expected in the future to pay for their maintenance.

The danger of flooding is raised when more land is consumed and made impermeable through construction activities. The deficiency of urban green in urban cores due to speculative building can create over warming and heat island effects, which can negatively **affect the health** of residents.

There are many types of threats to urban and peri-urban land and soil that have come to exist today. Threatened land, when properly revitalised, can provide

vital ecosystem services to areas most in need and can also remove a barrier to realizing improved living conditions. LUMAT wants to implement sustainable land use management that recognizes the potentials offered by threatened sites to realize more “more liveable places” in FUAs. For example, the development of a brownfield site into a green urban site can be beneficial for the people living in the neighbourhood and the FUA. It can improve the quality of ecosystem services, which residents can experience directly in front of their door to their residence. Addressing threatened sites can directly improve the sustainability of land use and the unsustainable consumption of land.

The hinterland of the FUA does often have other aspects of threats and risks. Mono-culturally used landscape with agro-industrial practices lead to a reduced biodiversity. Fertilizers and pesticides poison the environment. Water and soil resources are often in a high level of risk. It is necessary to reduce fertilizing and to increase the landscape greenery.

— The LUMAT Action Plan Approach

As recognized in Work Package (WP) T1 - Methodology, trainings and Common Understanding of Land Use in Integrated Environmental Management, Action Plans focus on the efficient implementation of planned interventions (e.g. investments, regulations, subsidies) and the

harmonization of activities by different stakeholders of FUAs development.

The importance of dealing with threats for improving the living environment and the provision of ecological services are recognized in the common transnational

Make places more liveable through implementing sustainable land use.

The LUMAT goal is to open and create a sustainable standard. A new approach is necessary to reduce land consumption. More focus should be directed towards threatened areas that are vacant, left behind and forgotten. **Threatened areas** are to be mapped for FUAs, evaluated in

Action plans target the improvement of the quality of living in FUAs.

format of Action Plans. The Action Plans are interdisciplinary in content and they consider stakeholders processes of elaboration as well as scientific inputs on governance and ecosystem services in the form of decision support tools.

and operational programming by linking sustainable strategic urban management with concerns of practical implementation and stakeholders involvement. **LUMAT WP T2 - Urban/peri-urban Action Plans, strategies** and tools created a methodology for Action Plan development: the common transnational format of Action Plans defines the LUMAT approach to enhance the integrated environmental management.

For the 7 FUAs Action Plans see pp. 50

The Action Plans are not formal instruments but rather efficient tools for following the interests of the wide range of stakeholders. Action Plans interconnect strategic planning

— Steering Instrument for a FUA

Because it is a steering instrument for a FUA, the management strategy and Action Plans for soil and land use in FUAs should contain the necessary background information, a description of the **challenges** to be addressed and establish the **reason** why action has to take place.

implementation. Important is the identification of who is responsible for implementing sustainable land management in the FUA. Sustainable land management is influenced by many different types of stakeholders: citizens, sectoral agencies, regional and local planners, scientist, etc.

The Action Plan should detail out the goals to be reached, and prioritize and establish main thematic points. They should collect **action recommendations** and **pilot projects** to be realized. An Action Plan within the LUMAT project should be developed in a participative manner and include non-governmental stakeholders. With the adoption of the LUMAT Action Plans, the stakeholders are expressing their political will to implement these actions for a sustainable development.

An Action Plan must manage the wide range of interests present with stakeholders for pursuing sustainable land management. In practice, this requires meetings and discussions to develop Action Plans in a participative manner. Once the stakeholders' interests are managed and a vision is agreed upon, the responsibility to then carry out the Action Plan ideas should be incorporated into existing administrative structures and organizational duties in the FUA. **Stakeholder management** widens the support for implementing an Action Plan.

LUMAT is creating change in 7 FUAs through the Action Plans

— Four Steps Process

The LUMAT Action Plans were developed over a four step process:

1. analysis of the LUMAT “specific” regional background information
2. link to the regional development plan and creation of functional area management strategy
3. Action Plan development
4. pilot project implementation.

Seven Action Plans were developed, based upon a common template so that similar aspects could be considered in each territory with their own specific challenges.

Table.1 Action Plan Content, Process and Guide for Application

1 BACKGROUND	Introduction and presentation of the regional framework Strategic development plans Environmental information Management strategy for the implementation of (existing/new) strategic development plan Scientific input - ecosystem services and threats for land and soil
2 ACTION PLAN (for the implementation of strategic development plans)	Vision/mission description Objectives and priorities Definition of areas Actions Time and financial planning, organisation Financing programs
3 PILOT PROJECT	Description and planning
4 TOOLS	LUMATO InViTo Brownfieldy
5 CAPACITY BUILDING AND INSTITUTIONAL APPROACHES	Institutional solutions (management structures)

TOOLS 3.2

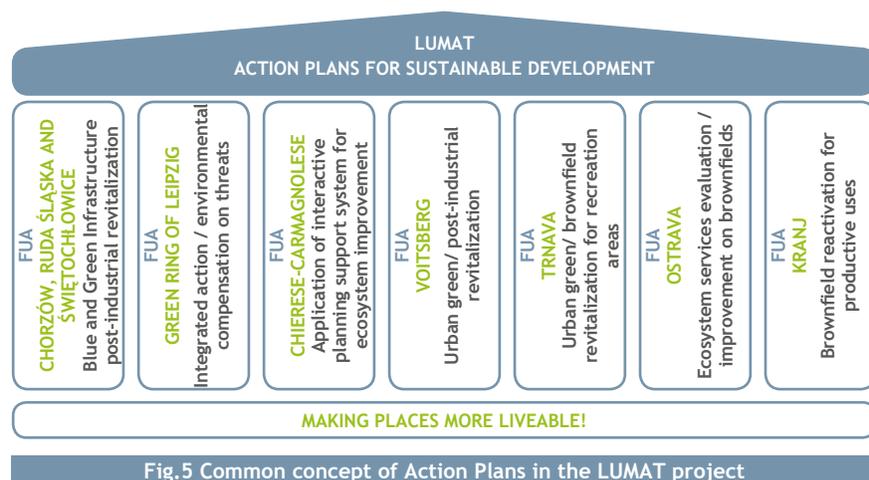
Common threats

In WP T2 - Urban/Peri-urban Action Plans, Strategies and tools, all LUMAT partners identified the soil and land threats existing in their regions; common threats present in Central European FUA regions are: new urban sprawl, brownfield sites, contaminated sites and flooding hazards.

These are central themes of the LUMAT approach and define Action Plan content. The evaluation of these threats and the potential for addressing them to make places more liveable will have to take place on a local basis since the

means for evaluation vary according to the needs of political, economic, social and environmental aspects.

The resulting LUMAT approaches to making “more liveable places” in FUAs of Central Europe are manifold. The figure below summarizes the main focus of each LUMAT Action Plan. Though the actions are specific to the FUA character of the partner regions, each **action leads to the LUMAT goal of making “more liveable places”** by addressing the threats that exist in the FUAs and the sustainable use of land resources.



The LUMAT tools (for details see pp.42)

Tools are important means for helping stakeholders to reach the new goals that are set out by the project. One tool was directly developed within the context of the project (LUMATO) and further tools found their application. LUMATO tool was created within the project to cater directly without compromise to the

organization of information to carry out integrated environmental management at the FUA level. A new platform that was characteristic of the challenges that exist on this spatial level was required and for this reason an entire new concept was created for the project partners to utilize.

3.2.1 LUMATO

Soil and natural soil functions are threatened in FUAs by intensive land uses in various manners. LUMATO carries out integrated environmental analysis for FUAs by identifying and evaluating soil threats and the potentials for revitalization. There are three main layer “working”-categories in LUMATO: threats sites, sites of risks and relevant land use information.

First, information is collected in the tool on threats on land to the naturally existing ecosystem services provided by soil (i.e. soil functions). The threats are to be identified from stakeholder feedback and are responsive to local needs. Considered are important city planning threats such as brownfields, soil sealing and urban sprawl, but also the risk of over-fertilization on agricultural land plots or the risk of over-warming on sealed surfaces in urban areas. Interdisciplinary information is analysed to identify potentials for integrated environmental management. An INSPIRE conform georeferenced grid was established in which the various soil relevant information are aggregated into grid cells 100 by 100 meters large. The integrated INSPIRE grid has the advantages of:

- A homogeneous data foundation which is then compliant with EU-wide standards (use in other areas possible)
- Protection of personal information because the grid cells do not correspond to the property lines of land parcels
- Possibility to intersect interdisciplinary information for a single plot of land.

LUMATO advantages

A summary of steps for the LUMAT tool creation are:

1. Standardization of environmental data collection methods FUA wide
2. Evaluation of the IT framework of the stakeholders
3. Gathering of relevant environmental and soil information
4. Creation of new useful information (as required)
5. Geo-spatial connection of data from various sectors to each other
6. Development and application of an evaluation system
7. Creation of an open system for “Ecosystem Servicing”
8. Creation of Decision Support Layers for identified stakeholders.

LUMATO tool creation

The tool has been made to cater to the needs of city administrations based upon the example given by the municipalities of the Green Ring of Leipzig. LUMATO gives an initial recommendation of sites for sustainable development to make places more liveable: **Decision Support Systems**.

The role played by soil to improve ecosystem services is qualitatively recognized here. Soil information coupled with information from other environmental disciplines allows for integrated environmental management to be reached. For example in cases of new soil sealing, compensation for building structures and the consumption of land should be directed to sites that are suitable for de-sealing: brownfields in hinterland areas.

Recommendations for the revitalization of threatened land in the form of Decision Support Systems are given. The concrete planning and implementation shall only follow through the locally responsible authorities and will undergo a more detailed analysis.

— Sustainable Land Use on Brownfields

DSS
1

LUMATO recommends the following planning evaluations according to brownfield location: built to urban green solutions in core urban areas, urban green solutions for brownfields in the periphery and the green

use of brownfields in hinterland locations (compensation measures). Soil sealing for the compensation of new soil sealing is quantitatively compared in this DSS.

— Achieve Cooling through Urban Green

DSS
2

Over-warming of urban areas on hot summer days with a lot of sunshine through excessive soil sealing can be alleviated through creating urban green sites on suitable brownfield sites (within the surrounding of ~100 meters of areas

prone to extreme overheating). This can lead to cooling impacts for the local area through ecosystem services, creating a possible “oasis effect” (Böhm, Böhme, Bunzel, et. al. 2016).

— Raising the Water Retention in Flood Hazard Zones

DSS
3

One ecosystem service provided by natural soils is the regulating function of water retention, and unused sealed brownfield sites in flood zones must be de-sealed and re-cultivated for the

purpose of increasing water retention.

— Reduce the Distribution of Harmful Substances on Sites of Risk

An awareness of the fact that soils have a limited range to varying retention capacities of the soil (among other factors) is often missing in the wider public. In the case of agricultural land uses, the use of pesticides and fertilizers

on soils with a high permeability rate of water should be considered for the cessation of harmful agricultural practices due to the potential for the contamination of soil and water resources.

DSS
4

— Compensation Site for Soil in Protected Zones

Information about the location of protection zones for nature, landscapes and water resources are displayed in DSS 5 along with the neighbouring brownfields. Protection zones should be

expanded upon by de-sealing brownfield sites which are in spatial proximity to these areas for the purposes of improving natural capital.

DSS
5

— Support for the Hinterland

The information about the agricultural value of land in the region has been gathered for the comparison of brownfield sites located near these so that the revitalization may be carried

out for the improvement of agricultural land.

DSS
6

FUAs are distributed across Central Europe. Their size and importance are dependent upon the scale of their urban area. LUMATO was developed and tested for use in the urban and peri-urban region of Leipzig, yet it is possible to create a LUMATO for other cities and FUAs also with other priorities and other soil threats.

— 3.2.2 InViTo - Interactive Visualization Tool

InViTo is conceived as a toolbox for **supporting the analysis**, the exploration, the visualisation and communication of data in order to **facilitate policy and decision-making**, improving the communication between actors coming from different backgrounds.

In its current version, InViTo can be classified within the category of spatial Decision Support System (sDSS) as a Web-GIS tool. In fact, it is a web platform conceived to present GIS data and let people to play with those in order to increase the level of knowledge on spatial issues among both expert and non-expert people. Nevertheless,

InViTo:
sDSS +
Web-GIS

new developments allow the exploration of non-spatial data too, so that interactive info-graphics can be visualised and analysed.

The building of a **web platform structure** was the first essential step to develop the instrument creating the general framework of the tool. Its building took several months and has been progressively adapted to the development of other elements composing the tool. In order to be really accessible, the tool was based on an open source structure and open source initiatives. InViTo is composed by two main sections: the back-end and the front interface.

The back-end is destined for GIS technicians, planners and administrators of projects. Here the logged-in users can create new projects and manage existing ones deciding the information that need to be seen by final users. Moreover, in the back-end interface, the logged-in users **can decide the filter modality** choosing among check-box, drop down menu, range sliders or single choice range sliders. Finally, specific buttons provide possibilities for customising the visualisation or for enabling particular elements such as tables, analysis grids or background maps.

The front interface is destined for final users. In fact it can be public and **allow people visualizing**, filtering and exploring data related to specific projects. The front-end interface is graphically structured by two main elements: a viewer window containing an interactive map and a vertical menu on the left side containing all the parameters settled by the logged-in users in the back-end interface (Figure 6).

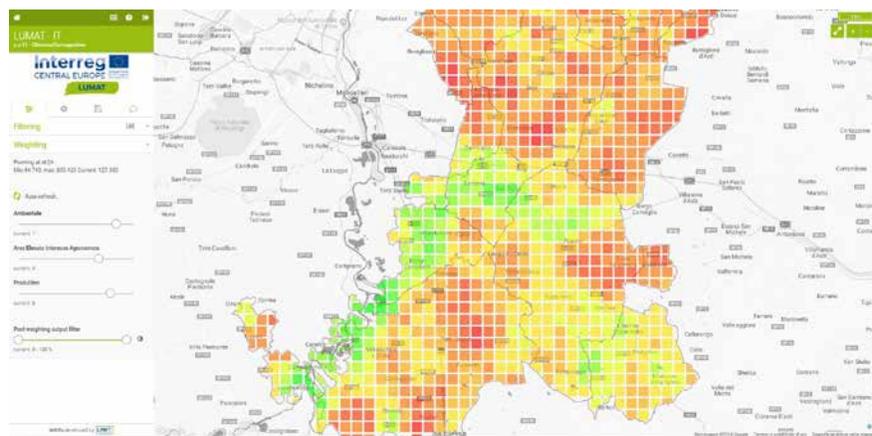


Fig.6 Front interface of InViTo: a window containing an interactive map on the main frame and a vertical menu on the left side

The structure of the front interface can in turn be divided into three subsections:

DATA FILTERING

The data filtering section allows data to be interactively selected and filtered by the end users in order to customise the visualisation. Despite InViTo basically works as other GIS viewers, it does not visualise only the different layers of a set of data, but it allows users to explore the single records of a dataset by the use of different kind of pre settled filters. Moreover, the filters can be grouped in panels, so that the visualisation can be driven through a particular path to follow. Moreover, InViTo allows data to be investigated at different levels with also intersection of attributes, in order to analyse data clusters in relation to specific parameters. In this sense, InViTo overcome the data-map representation to arrive to the visualisation, intended as the discipline to see the unseen.

DATA VISUALIZATION

The data visualization settings allows a high level of customization on colours, dimensions, styles, map styles (between Open Street Maps or different Google Maps styles) and on a series of utilities by means of which the tool is expected to offer a wide range of possibilities for users to improve their analytical skills and enhancing the discussion. Furthermore, users can visualize tables and charts showing data according to the filters activated in the filtering section. The tables show the attributes related to the filtered data, providing pre settled additional information field by field. The charts show the values of the filtered data in relation to the whole set of data, highlighting the selected geometries.

The distinctive features of InViTo are therefore dynamicity and interactivity, which make it **open to variously skilled users** and suitable to be part of instrumental equipment for meetings and workshops. In fact, it can be used by a single person or collectively during discussion sessions. In this case, the displayed map can become

MAP WEIGHTING

The map weighting section allows the filtered maps to be overlapped and weighted on the basis of their priority. The aim of the map weighting section is to provide users with a tool for analysing the localisation of expected effect of specific elements and evaluating the sum of effects on the basis of a specific mathematical curve associated to the layers.

This section is an on-going part of the research. In fact, the map weighting is currently based on the sum of maps as in the basic methodology of Multicriteria Decision Analysis (MCDA). Further developments of InViTo will improve this section in order to integrate the opportunity to develop MCDA directly in the tool as the spatial Multicriteria Analyses combining GIS and MCDA.

the interface for sharing opinions and reasoning. In fact, its quick responses and visual interface offers possibilities for improving the discussion among people, providing a shared basis for enhancing the debate. The **high level of customisation** of the filtering and weighting sections as well as of the visualisation provide a large amount of opportunities for the information sharing between large groups of people. The use of **visualisation** goes against a technocratic vision of cities and increases the power of experts. It allows planners, city administrators, technicians, but also common citizens, to **improve their awareness of urban problems**. A higher knowledge enhances the decision-making process, providing opportunities for better choices. Furthermore, a high flexibility of the tool allows the instrument to be adapted to the case study and not, as often, the planning adapted to the possibilities given by the tool. By this way, the urban tool is not a constraint but a real support to the urban planning. Future developments of InViTo will foresee the improvement of the MCDA section currently drafted in the tool in order to better weight the maps provided and enhance the usability of InViTo in supporting urban planning.

Professionals' knowledge and common understanding was enriched by:

- providing information about the logic of InViTo concept and mediated the best practice examples
- improving the understanding of the interplay between ecosystem services planning in FUA's and multilevel governance concept
- supporting the perception of both concepts as a part of the integrated and iterative approach
- increasing the capacity of stakeholders to be involved in the decision-making providing proper platform for visualisation and better understanding of the objects for the decision.

— 3.2.3 Brownfieldy

Czech Tool was newly created within the framework of the LUMAT project as an interactive tool for citizens' involvement in brownfields, which is a key topic of the LUMAT project. Company Moravian-Silesian Investment and Development, author of the tool, develops for years the database of regional brownfields, which is an internal document (there are almost 600 brownfields registered in the database).

There was need of creating the public tool because there was no-platform like that in the Moravian-Silesian Region, where citizens could comment, insert new brownfields or get information on the topic.

This platform has a wide usage: it was used for example to get feedback from public on prepared Action Plan for Brownfield Revitalisation within the LUMAT project.

The tool makes **brownfields more visible for citizens** (interactive map of brownfields), which is one of the goals in the Action plan. Citizens can comment on already entered brownfield sites, they can also insert new brownfields with all information they know, which gives a feedback to managers of the Regional Brownfield Database.

The tool also informs about already revitalized brownfield sites and shows the examples of best-practices to those who want to redevelop their brownfields. They can send information on their intention of the revitalisation through the form and get feedback with a suitable grant program for the project or other help. The tool is variable, so it might be upgraded in future with new items, like news, subsidies, events, publications, etc.

The tool has been developed for NUTS 2 (Moravia-Silesia) which corresponds to NUTS 3 (Moravian-Silesian Region). It is a universal tool: it could be applied in other NUTS or all over the Czech republic and worldwide without any big additional changes needed.

Given the need to create an interactive tool for citizens' involvement, it had to be designed as **user friendly** as possible and in their national language. For better understanding of all tool options a step-by-step illustrative **manual** with printscreens has been created. The promotion of the tool was crucial, that is why a **Facebook profile** was created and managed to promote the tool and brownfields in general.

Citizens, investors or development agencies can contact the authors of the tool through a question form on the website or on Facebook and ask questions on the brownfields, comment recent status of brownfield or add new pictures of the brownfield. They may also be informed about the current subsidies available for revitalizing brownfields for both private and public sector owners. For this purpose, the **disqus.com** communication platform is used. When giving contact information to the web administrator, the consent to GDPR is resolved.

There are 145 brownfields registered so far in the interactive map of brownfields (Figure 7). The goal of the tool is to make this number higher in order to promote more and more existing brownfields to citizens and private or public investors.

Promotion of these locations should lead to their return back to life, to their temporary use, pressure on state aid authorities in order to prepare subsidies according to real

Direct involvement of citizens

Working with Brownfields

Expectations

ACTION PLANS 3.3

needs. It may be platform for promotion of abandoned areas to developers, who are searching new locations for their intentions.



Fig.7 Printscreen of the main page of the tool (Source: www.brf-msk.cz, 2019)

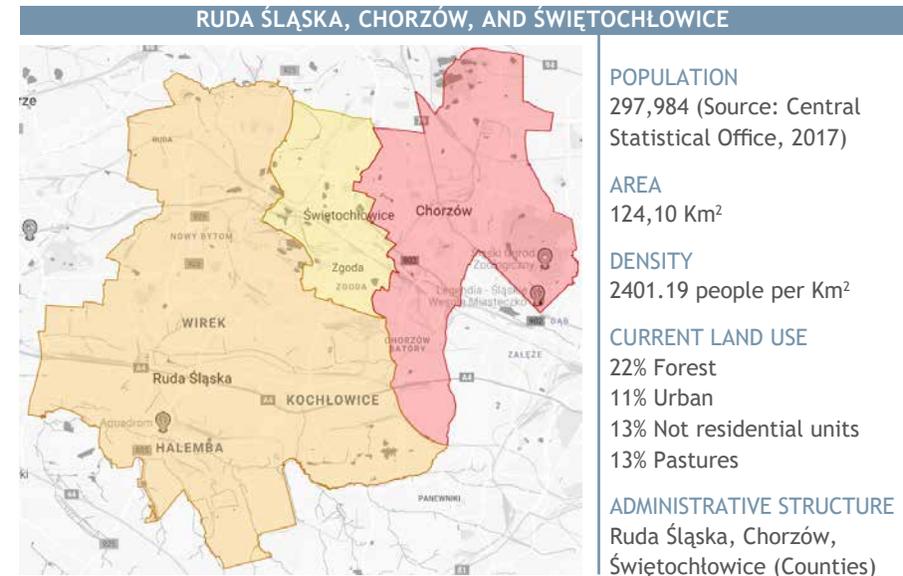
Goals The goal of the tool is to make this number higher in order to **promote** more and more existing **brownfields to citizens** and private or public investors. Promotion of these locations should lead to their return back to life, to their temporary use, pressure on state aid authorities in order to prepare subsidies according to real needs. It may be platform for promotion of abandoned areas to developers, who are searching new locations for their intentions.

The tool serves to promote good practice examples and tries to make the regenerated brownfields the trend of today's time. Old textiles, breweries and other industrial or agricultural unused buildings derail, while hundreds

of hectares of fertile land are halted annually. The use of devastated brownfields offers a unique opportunity to save our heritage and it is the way to get original housing or further use as offices, department stores, museums or industrial sites. At the same time, new industrial zones occupy hundreds of hectares of fertile farmland and have serious impacts on the state of the landscape, such as the ability to retain water and many others.

The aim of the tool is to **promote maximum revitalization of brownfields to preserve** the sustainable development of **the territory** and the countryside as well as for future generations.

3.3.1 Polish Functional Urban Area



Administration

Ruda Śląska FUA is composed of three cities: **Chorzów, Ruda Śląska and Świętochłowice**. It is located inside

Use of the area

The three cities of the FUA have raised and developed relying on heavy industry, mainly coal mining and ferrous as well as non-ferrous metallurgy.

The spatial structure of these cities constitutes a mosaic of functions and areas of various predestination. It has been defined mainly by the development and **many-years functioning of industrial plants** located within their borders. In the neighbourhood of the

the Silesian Metropolitan Area, which includes 41 municipalities.

urban centres, the industrial and post-industrial objects and areas are located, such as **spoil heaps and dumping sites**. Post-industrial areas present a characteristic environmental resource, which is also valuable due to vegetation succession.

The stake of anthropogenic areas reaches 55,71% of the whole surface area of the FUA, which means a high level of its transformation.

CURRENT STATUS

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— Environment

The Ruda Śląska FUA is characterized by a large number of brownfields and degraded areas. In Chorzów and Ruda Śląska there are 44 sites (ca. 687 ha), while in Świętochłowice the degraded urban tissue is the main problem requiring regeneration activities. Most of the sites are post industrial wastes dumping places or areas with polluted soil being the sites left after

metallurgical industry (ferrous and non-ferrous). Two basic groups of land-use conflicts have been identified:

- built-up areas neighbouring to areas of industrial production
- natural areas neighbouring to transformed areas.

— FUA identity

The FUA includes three cities: Chorzów, Ruda Śląska and Świętochłowice. It is an integrated area, identified as a result of delimitation of areas characterized by **common problems** as well as areas with features deciding on its strength and development potential. Identification of **development factors and barriers** in

this area allowed to define the optimal final range of the functional area from the view point of transport and settlement efficiency, life quality and access to public services. Therefore the range of the functional area has been defined basing on real connections, not formal ones.

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— FUA objectives and priorities

Enhancement of green and blue infrastructure system in the FUA

of Chorzów, Ruda Śląska and Świętochłowice.

— Planning and Strategic Framework

Natural resources constitute an important element connecting three cities as well as a potential, which can and should be used as a development factor which contributes to raising the quality of life and touristic attractiveness of

the area. It is recommended in the Integrated Development Strategy of the FUA of Chorzów, Ruda Śląska and Świętochłowice until 2030 to create a **common policy concerning ecology and environmental quality**.

— Methodology

The activities connected with enhancement and development of green

infrastructure can be presented in three groups: technical, organization (legal)

and information (education) activities.

Technical activities include all kinds of investments presented in the Action Plan as well as complementary activities being implemented in the framework of other programs or projects (e.g. Rudzki Route Program in Ruda Śląska) or projects based on other contracts or initiatives (Adaptation Plans to Climate Change being elaborated

for Chorzów and Ruda Śląska). **Legal and organizational activities** include changes of land use planning documents by introducing records on green and blue infrastructure. **Information and education activities** constitute a wide spectrum of ideas and initiatives directed towards informing the local society on natural values and possibilities of using the recreation potential of these areas.

— The use of tools (InViTo, LUMATO, etc.)

For identification, delimitation of Action Plan sites and assignment of actions to the individual site a loosely coupled spatial information system composed of project and city spatial data, CAD software (ARCADIA) for landscape design, ArcGIS and Qgis software for integration of all spatial data as well as InViTo tool for communication of the results has been used. This system was applied for panel discussions during meetings of FUA members and partners. The emphasis was put on interactive discussion and decisions making with the use of above

mentioned data and system in video-conference room equipped with digital touch board. For instance, the extent of the sites has been determined by the application of existing survey data including map of registered plots. The final result was the **publication of digital maps** of the elaborated Action Plan sites and bicycle paths, in form of the homepage elaborated by use of InViTo tool. This homepage constitutes a platform for communication of the project results, especially to the general public.

— Strategies for the implementation

Establishing a structure for the Action Plan implementation is a consequence of the acceptance of the LUMAT project initiative expressed earlier as well as a will of co-operation for the elaboration of the Action Plan concept. Following these declarations, the city of Chorzów has established a team for the realization of these tasks, and the city of Świętochłowice has accepted the

idea in a special letter issued by the Mayor. The city of Ruda Śląska - being a project partner - is involved in the works in the framework of its tasks in the project. The **letter of commitment** has been signed by the authorities of the three FUA cities, establishing the Task Force for Implementation of Green Infrastructure in the FUA of Chorzów, Ruda Śląska and Świętochłowice.

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It includes the group of teams that have been working on the concept of the Action Plan in the framework of LUMAT. This group will be composed of officials from the three cities of the FUA, representing the departments of environmental management, land use planning, municipal and development. Participation of these

— Expected impacts

The Action Plan will strengthen connections of the natural system of the FUA cities as an essential component of the Metropolis, creating **blue and green infrastructure**. The efficient natural system with active ecological corridors connecting natural valuable areas will provide strengthening of self-regulation processes, resistance to climate change and stability of ecosystem services. The Action Plan will promote the idea of healthy life styles by **creating biking and walking routes** in areas with high

— Conclusions

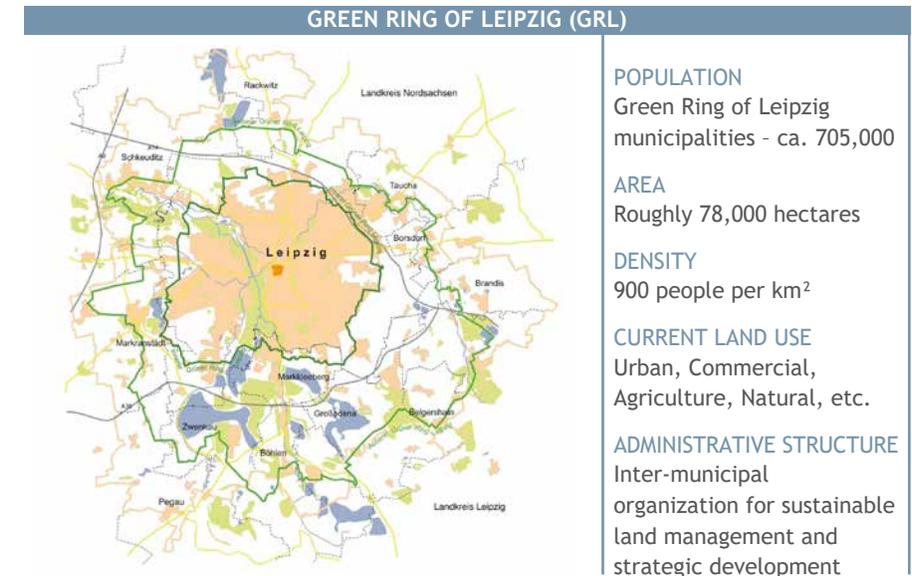
The conclusions related to the ecosystem services approach that has been applied assure functionality of the cities regarding a stream of benefits connected with services and values offered by nature, realized in a strong link between economy and society. Ecosystem services as benefits offered by nature to humans are a basis for well-being, economic development and employment, particularly in areas of high level of urbanization as it is in the case of the Chorzów, Ruda Śląska and Świętochłowice FUA.

people is coherent with the idea of the LUMAT, whose objective is **integration of sustainable environmental management** with land use planning and management in FUAs. Implementation of the plan concerning strengthening and development of green infrastructure requires co-operation of these departments.

natural potential, improving at the same time the access to ecosystem services connected with bio-climate benefits for people, necessary for a proper functioning of the human organism. In the economic aspect the proposed system of communication connections, based on biking traffic inside cities and between them, as well as their recreation attractiveness, will affect **reduction of the car traffic and costs** connected to it.

Application of ecosystem services approach in urban areas management as one of the elements necessary for the functioning of urban areas enables making responsible decisions in the planning and infrastructure development on these areas. Preservation of ecosystem services as well as their supporting and restoring will allow to create and use the “natural capital” and to **strengthen environmental potential** of functional areas of the FUA cities.

— 3.3.2 German Functional Urban Area



— Administration

The Working Group Green Ring of Leipzig is an established part of the city administration of Leipzig. The members include the main city of Leipzig as well

as representatives from the surrounding 12 municipalities. 2 Counties are also members in the organization.

— Use of the area

The **Action Concept 2015** formulated the following strategic framework, “in and around Leipzig a landscape with a high quality of living, environment and recreation will be established”. The duties related to nature and soil protection and the upkeep of the landscape, of environmentally friendly agriculture and forestry as well as the requirements of recreation and relaxation are all to be holistically

managed and thematically connected to each other. The landscape which follows as a result of these actions will be maintained and developed sustainably.

The respective fields of action are as follows:

- strong landscapes / stable ecosystems
- a landscape to be experienced

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- edible landscape

— Environment

The current ecosystem services provided by soil in the region include those of regulating, provisioning, supporting and cultural in nature. The soil threats that exist include brownfields, urban sprawl,

— FUA identity

Elements of FUA identity include the established cooperation of inter-municipal governance introduced in 1996 by the working group for the Green Ring of Leipzig upon which common projects and common strategies have been pursued. Stakeholders in the

- innovative landscape.

the risk of over-warming and the risk of over-fertilization. Land use conflicts in the FUA are to be understood as the conflict of the threats with land use information categories.

LUMAT project are the Green Ring of Leipzig and the 13 associated municipalities, Saxon Central Agency for Land Management and the Saxon State Office for Environment, Agriculture and Geology.

development potentials

- targeted de-sealing actions on brownfields in outer areas (compensation areas)
- development of the green infrastructure and the strengthening

— Planning and Strategic Framework

The strategic framework of the region is defined by a number of planning documents, all of which have been assessed for the creation of the LUMAT Action Plan:

- “Landesentwicklungsplan Sachsen 2013” (State Development Plan Saxony 2013)

— Methodology

The City administration of Leipzig and Green Ring of Leipzig currently both have access to an IT system supported by GIS application for land use management in the Green Ring. LUMAT Germany is updating this system with LUMAT information (threats, Decision Support System, Ecosystem Services) to renew the existing system into an “integrated environmental and land use management” system.

1. The **first step** for this was to reach a stakeholder agreement on environmental management, including goals and the threats that are important to consider for evaluation.
2. The **second step** is the recognition of the current IT-System that is being used by decision-makers.

of the amount of green land present in the city and region

- effective land management and brownfield regeneration management structures through inter-municipal cooperation.
- Regionalplan Westsachsen 2008 (Regional Plan for Western Saxony 2008)
- “Handlungskonzept 2015” (Action Concept 2015)

ACTION PLAN

ACTION PLAN

— FUA objectives and priorities

Goals of the Action Plan Saxony:

- the direct living environment of the citizens in the GRL will be improved through the protection, development of urban and peri-urban green spaces in FUAs
- brownfields are to be revitalized through demolition/de-sealing and the carrying out of compensation measures on these sites. This will further develop the quality and interconnection of the green infrastructure, help reduce land consumption and optimize local ecological services
- to direct the demand for new urban land uses onto inner city brownfields or

in other cases onto suitable brownfields in outer city areas (should the demand for this exists) through land recycling

- to improve the water retention of soil through the de-sealing of brownfield sites.

To integrate risk areas of the FUA to support the minimization of over fertilisation on land and the filtration of substances into ground and surface water reservoirs. The objectives for the Action Plan in the Saxonian pilot region of the GRL are as follows:

- restrict the consumption of land in the region of the city of Leipzig through the use of the existing inner

3. The **third step** consists of the gathering of LUMAT information in the pilot area.

The LUMAT information on soil threats and environmental management is to be integrated with one another so that important conclusions can be made on the basis of intersecting threats and soil information. Through the activities the LUMAT information will reach a wide range of the different stakeholders in the territory of the GRL (which is to ensure the integration into the processes of the GRL). The integration of information serves as a Decision Support System for integrated environmental management and allows for an initial evaluation of ecological system services. The work was carried out through a consequent and **continual dialog process** in the GRL.

ACTION PLAN

— The use of tools (InViTo, LUMATO, etc.)

LUMATO is being developed for the Green Ring of Leipzig to create Decision Support Services, which are to be used as a foundation for the improvement of the ecosystem services of land and soil in the FUA (core and hinterland areas). An evaluation system will help guide stakeholders towards recommended actions on threatened sites.

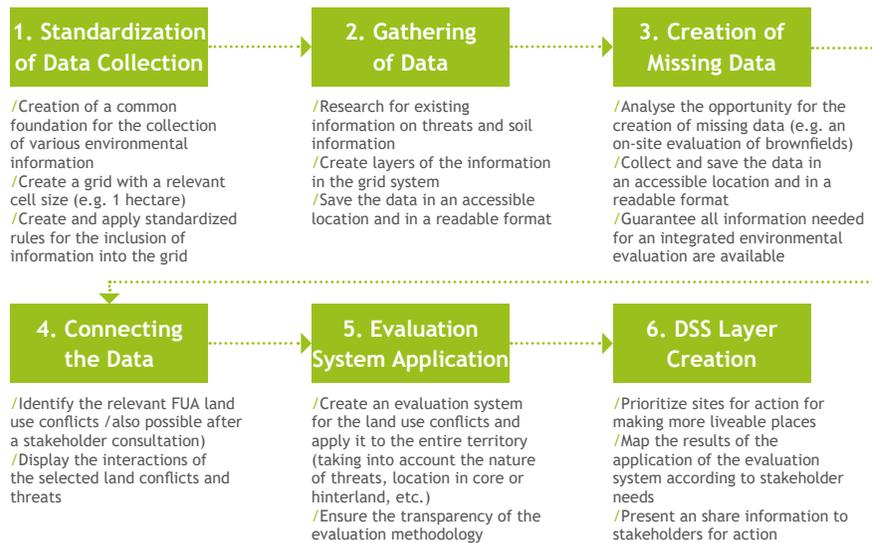


Fig.8 Steps of LUMATO

— Strategies for the implementation

Relevant stakeholders for determining time, financial planning and general organization are:

- the municipalities as the holders of planning policing powers and spatial policies
- property owners, ranging from public owners to state owners such as the “Central Land Management Agency of Saxony”

- the Free State of Saxony with its regulative powers and funding strategies.

The financing of the activities mentioned in the Action Plan is to follow via a combination of various financing mechanisms:

- **management:** the inter-municipal activities are to be generated through

an appointment mechanism gathered from municipal contributions. Beyond this, the further development of the use of national and European funding programs (e.g. the BMBF on the German national level, HORIZON 2020 on the European level) are to be pursued

- **pilot actions:** three streams of funding are possible for the carrying out of pilot actions

— Expected impacts

Integrated environmental management will be carried out by the existing stakeholders using their existing IT systems that are currently in place. LUMATO will provide a new information foundation upon which action on brownfields in the area for sustainable land management, as well as other threatened sites, can be initiated. Further, stakeholders will be made **aware of the important role that soil plays for making places more liveable**. The ecosystem services provided by

— Conclusions

It is required to develop new approaches to land management that take into account the various sectors of environmental information that are available today in the FUAs of Central Europe. In the German case, this information will be evaluated to create sustainable land use management on sites that present very real problems for urban and rural residents alike. The combination of the information in the framework of LUMAT will provide new

municipal finances as well as the possible expansion of available funds from the Central Land Management Agency

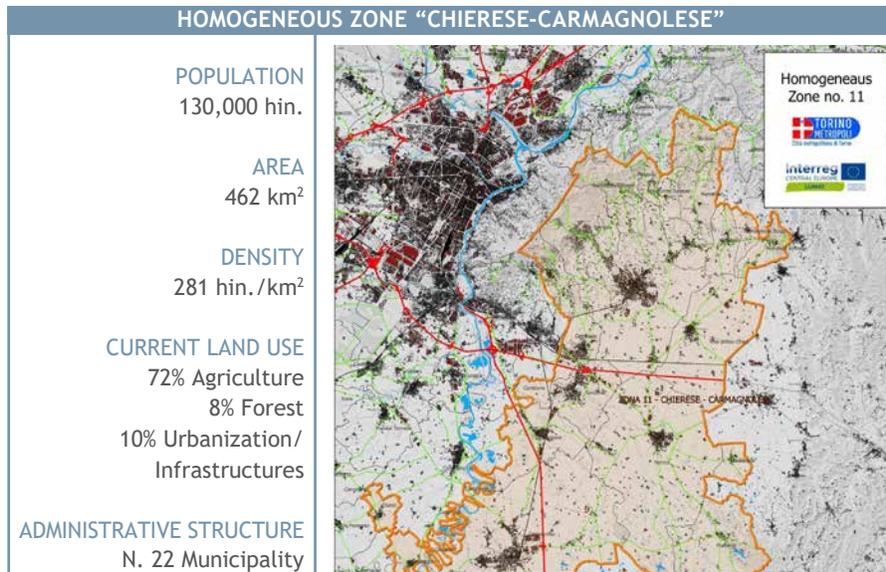
- Financing dedicated to environmental compensation measures
- Financing from the Saxonian state program for brownfield revitalization.

unsealed land will be better recognized in the city administrations of the 13 municipalities. Capacity building will help the management structures which exist on the inter-municipal and state levels to carry out sustainable land management activities on brownfield sites. Pilot projects for the improving of ecosystem services in the Green Ring of Leipzig will be carried out based upon the information gathered and processed in the LUMAT project.

impetus for action to happen. To not do so, and continue the same path of land consumption as in the past, would be unsustainable and irresponsible. Instead, interests have to be combined to make sustainable land use in FUA regions a reality; land threats have to be revitalized and the various stakeholders involved in making land use decisions have to be properly informed through Decisions Support Systems.

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3.3.3 Italian Functional Urban Area



CURRENT STATUS

Administration

The institution/s in charge of the area administration/management. Administrative level. The Metropolitan City of Turin (Piedmont Region, Italy) is divided in 11 Homogeneous Zones, each of them being represented by a "Zone SpokesMayor" at the CMT Assembly

Use of the area

The territory of the pilot area is 77,4% flat and 22.6% hilly. The south portion of the Homogeneous Zone (HZ) is characterized by the presence of forest cover of high conservation interest, in particular the Ternavasso forest which is an important relic of the vegetation in lowland oak-hornbeam with oak

of Mayors. The pilot area identified for LUMAT project is represented by the Homogeneous Zone 11 "Chierese-Carnagnolese" composed of 22 Municipalities, each of them with an own Mayor and a Council.

highland of Poirino Municipality, almost disappeared as a result of **past extensive deforestation** to leave space for the agriculture. On the slopes of the Poirino terrace, in particular the **border with the hilly area of Monferrato**, there are interesting remains of lowland forests in Quercu-hornbeam, alneti and mixed oak

woods with various beeches (Cellarengo Municipality). Also in the portion of the Po River hills (between the City of Turin and the Chierese-Carnagnolese area), there are areas of natural interest, as the **Lake of Arignano**, being recovered, and the large forested area between the Municipalities of Moncucco Torinese and Marentino. The Chierese-Carnagnolese .H.Z. is also characterized by the presence of **many protected natural areas**. In addition, in the 2016 the Turin's hill area

(in the north of the HZ) and the Po river protected area have been recognized by **UNESCO** as "CollinaPo Man and Biosphere Reserve" as first recognition of Urban MAB in Italy. It is an area of 171,233.85 hectares which **includes over 80 municipalities** and sectors characterized by both natural and human causes. Each municipality has its own Master Plan and framework for identifying land use and future use.

CURRENT STATUS

Table.2 Land use in HZ Chierese-Carnagnolese

LAND USES	AREA m ²	%
Continuous urban fabric	11.605.099	2,5%
Discontinuous urban fabric	20.493.036	4,4%
Industrial and commercial facilities	4.533.488	1,0%
Road and rail networks and ancillary spaces	8.434.642	1,8%
Mining dumps and construction sites undifferentiated areas	725.460	0,2%
Artificial green areas non-agricultural undifferentiated	6.776.742	1,5%
Service areas	565.947	0,1%
Arable undifferentiated	335.392.061	72,1%
Vineyards	2.606.966	0,6%
Orchards and fruit trees	2.836.800	0,6%
Wood Arboriculture undifferentiated and poplars	10.599.026	2,3%
Permanent meadows, pastures, important natural areas	16.830.835	3,6%
Forested areas	41.085.385	9,0%
Basins of water, water bodies and the like	2.552.277	1,0%
TOTAL	465.037.765	100%

Environment

The main problems of the area are:

- compromised readability of the settlement system due to land consumption in industrial-manufacturing purposes and
- brownfield sites (underutilized industrial sites or disused industrial areas)
- landscape deterioration, in the

widespread residential

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hilly areas and in the valley systems (Pecetto, Madonna della Scala, Cambiano and Trofarello; Andezeno, Mombello, Moncucco Torinese and Baldissero). Here the strong residential building expansion threatens to completely alter the settlement reports and historical production

- urban expansion in the plan areas of HZ (along the main transport way), and sprawl in the hill and valley areas
- high values of environmental insularisation because of infrastructure and industrial presence
- soil consumption on the south slope of the hill in particular in Pino Torinese, Chieri and Pecetto due to urban sprawl and daily commuting City of Torino - City of Chieri
- loss of biodiversity and environmental connectivity caused by soil consumption, forest sporadic cuts but overly with expansion of invasive species
- risk of loss of traditional cereal crop because of the introduction of crops

— FUA identity

Some of the FUA municipalities have been working for many years to affirm their local identity also through the drafting of Local Strategic Agendas. With the establishment of the Metropolitan City, **11 homogeneous zones with FUA characteristics** were

that provide higher yields, such as corn; the presence of cereal crops and arboriculture in the plain has partly caused the transformation of the landscape, subtracting space to the traditional grassland

- progressive loss of productive land and farms sectoral specialization
- spread of exotic species (*Sicyos angulatus*, *Clematis vitalba*, *Reynoutria japonica*) in the Carmagnola's river areas (Po river, in the south-west of the HZ) due to problems in the management of forest environments, in particular for the renewal of wild native species; the reduced riparian forest vegetation in a small linear band, often in decay with age and non-renewal of the trees
- involution towards a set of simplified agro-ecosystems and industrialized in the Carmagnola area due to urban expansion that is concentric along the linear connection between Villastellone and Carmagnola and between Carmagnola and Candiolo municipalities, in areas with good attitudes of niche crops.

identified. The 22 municipalities of FUA Chierese-Carmagnolese, therefore, felt the need to identify and consolidate a new territorial governance based on cooperation and collaboration between municipalities and on integrated territorial and environmental planning.

— FUA objectives and priorities

The objective is to solve wide-area problems related to land use and to strengthen the identity of the FUA with respect to the Capital City of Turin and the other CMTo's FUAs. The citizens of the Homogeneous Zone are involved through the local representatives of the individual municipalities. The Action Plan identifies the path to build an **inter-municipal Structure** for an **integrated management** of territorial and environmental issues at large area (FUA). Starting from a transnational strategy developed jointly by the LUMAT partners the representatives of the area have been invited to start, the practical experimentation of the management model. Through a Pilot Project the FUA n. 11 was involved in the definition of an integrated environmental territorial program composed of supra-municipal interest actions.

The general objectives of Action plan are:

- defining an integrated environmental management model of the territory, replicable in all CMTo's FUAs able to deal with various problems types related to conflicts arising from different land uses
- testing the model inside the FUA "Chierese-Carmagolese". The Action Plan intends to test the functioning of the management model and at the same time solve some specific FUA environmental problems

- defining ways to resolve/mitigate conflicts between different land use needs.

The priorities are:

1. involving all the Municipalities of the FUA in the integrated management of the territory (also starting from cooperation experiences at the level of the vast area already underway), to obtain a structure able to dialogue in a constant and constructive way. The objective is to identify strategies, solutions and actions that guarantee a return in terms of environmentally sustainable socio-economic growth for the entire FUA
2. combining the green areas protection needs with development, including brownfields retraining and re-use (disused or underused production areas), and the enhancement of areas with high environmental and landscape value
3. using, for the management, the existing municipal technical structures, without additional costs
4. providing the FUA with support tools for data sharing, monitoring of activities on land and decision-making process
5. providing the FUA with a "proposals/ projects package" ready to be candidates when appropriate

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economic resources become available

metropolitan context.

6. providing contributions to metropolitan strategic planning and metropolitan general spatial planning
7. strengthen the FUA identity within the

In addressing these issues, the soil protection and the ecosystem services value improvement involved in the transformation of the territory are priority.

— Methodology

- Collect information on land, soil, environment state (baseline).
 - Highlighting the main local and supra-local problems, needs and opportunities for FUA development.
 - Share information with the entire territory of the FUA (through the filing and mapping/InViTo) and open the discussion with administrators, technicians, citizens.
 - Identify action and priorities.
- Identify the resources.
 - Activate an integrated management structure (formalized through the signing of a letter of intent) for the planning and implementation of interventions
 - Share identified solutions and best practices with the other Homogeneous Zones with the support of the central CMT0 structure.

— The use of tools (InViTo, LUMATO, etc.)

The activities include a working method and an instrument (InViTo). The tool was used for:

- open the discussion with local administrators and technicians, illustrate problems, local projects

- mapping in a homogeneous way the information on the soil and the environment of the different municipalities, integrated the information with those coming from CMT0, Region and other sources (Environmental Agency, ...)
- propose different solutions and scenarios
- identify priorities for action
- communicate with citizens and stakeholders

— Strategies for the implementation, timeline and funding programme

The timeline definition for the actions

implementation is strictly linked to

available funds. **The strategy of Action Plan intended to proceed with a simple model, without other superstructures.** The entity entitled to intercept financial resources will be (in addition to the single municipality) the Homogeneous Zone as a whole (as recognized by the Statute of the Metropolitan City of Turin). In this respect, the proposed management model is also aimed to facilitate public

— Expected impacts

Starting from the consideration that territorial planning must satisfy different kind of interests of and must resolve conflicts between different kinds of land use (protection of the green areas, productive fields, residence, ...), the Action Plan is based on the idea that an effective supra-municipal management plays a fundamental role in the pursuit of sustainable development in environmental, social and economic terms. The implementation of Action Plans aims at improving the FUA public administration management and solve supra-local issues through a

— Conclusions

The final impact that is expected by the implementation of the Pilot Actions included in the Action Plan is to improve the attractiveness of the whole territory, by enhancing the existing landscape and environmental elements,

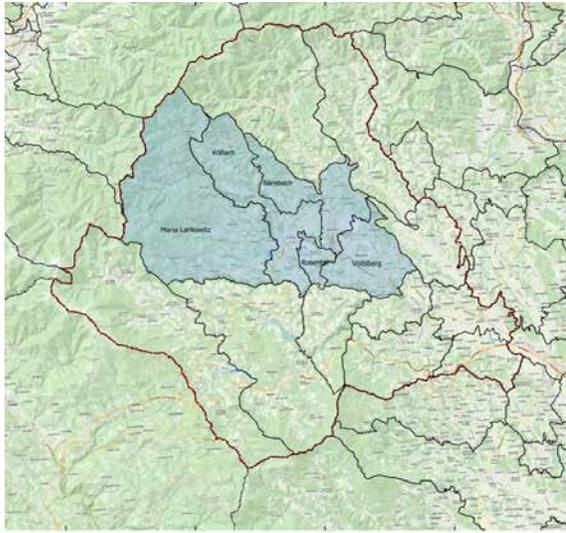
(Regional, National, European) and private (banking foundations) financial resources interception thanks to the identified projects significance. For the implementation of projects, the municipalities are thinking about financial compensation targeted **re-utilization of the urbanization costs** envisaged by the implementation of the municipal building plan.

participatory and shared approach. The approach proposed for the H.Z. includes a new planning model that includes the use of user-friendly tools for municipal technicians who do not have specific skills in the GIS environment, nor much time to devote to their training. It also **supports integrated environmental planning** through the application of a new approach that provides the possibility of **assigning an economic value to ecosystem services** and to implement forms of “payment in order to maintain/improve the ecosystem services quality.

and abandoning the productive vocation. The objective is to transform the territory of the HZs, and therefore of the whole CMT0, into a more quality place where people want to live and work.

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3.3.4 Austrian Functional Urban Area

VOITSBERG	
POPULATION 29,500 hin.	
AREA 210 km²	
DENSITY 140.57 people per km²	
CURRENT LAND USE 59% Forests 15.4% green areas 11.5% urban areas 11.3% agricultural areas 1.5% industrial areas	
ADMINISTRATIVE STRUCTURE 5 municipalities, organised in Regional Development Association (REV)	

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Administration

The Austrian pilot-region is a union of five communities “Kernraumallianz Lipizzanerheimat” - Voitsberg, Köflach, Bännbach Rosental, Maria Lankowitz- and represents a typical shrinking region. The crucial organization is the **Regional Development Association “Lipizzanerheimat” (REV)**, which

consists of these 5 communities. With the new City-regional land management, which will start in 2019 the necessary administrative structures for the FUA should use the existing structures. The necessary harmonization is in preparation.

Use of the area

The region of Voitsberg is a traditional **former coal mining** region and is now facing structural transition. Today, service industries have a share with about 60% of the industrial strength of the region. Around the 5 municipalities of all other municipalities are focused

on agrarian production, but there is an ongoing change of the structure (reduction of full-time farmers to part-time farmers).

Land use is represented by the respective local zoning plans, which

are revised every 10 years. Due to the municipal mergers in 2016 and a planned community merger, there are changes. In the last few years the municipalities in the region have developed several project ideas in the context of urban development, sustainable energy systems, brownfield regeneration. The District of Voitsberg expects to **intensify the regeneration** through the LUMAT activities and the dialogue with public and private stakeholders on new usage concepts, interim use options and financial models for re-engaging the initiative on the

Environment

An important goal of the LUMAT Action Plan for the Lipizzanerheimat is to communicate and integrate the experience of stakeholders and the current status of the evaluated threats to land and soil into an **integrated environmental management strategy**.

A concept of ecosystem services is to be achieved through a process of experts and stakeholder involvement, which will aim for a more sustainable approach to land and soil in the region. There are currently four identified threats which will be displayed in a newly developed tool for the pilot area Lipizzanerheimat.

The threats identified and their definitions in the LUMAT project include:

- brownfields (mostly former mining

model sites:

- many plots of land and buildings which are unused or underused due to the decline of heavy industry
- the plots of land, which are grouped together under the term “brownfields” shall be brought back into use according to the regional framework for development
- economic transformation and the reuse of brownfields (“more jobs”).

areas) - using the methodology developed in the CENTRAL EUROPE CircUse project

- flooding hazard risks - sites which are threatened to be under water given the data available for the HQ 100 flood (flooding event occurrence = ca. every one hundred years)
- uncompetitiveness of brownfield areas due no clear situation with the mining company as land owner
- urban sprawl (typically for the region - spatial planning is not always harmonized).

The evaluation of the identified threats in the territorial context is based on the available data on threats within the GIS Steiermark.

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— FUA identity

Based on the results of a LUMAT workshop within the partnership the

following table shows the criteria for The FUA identity for the FUA Voitsberg:

Table.3 Criteria for Voitsberg FUA identity

Country: Austria FUA: Voitsberg - region	Common feature	Common problems	Common potential
1.Demographic: population, density of the population, migration,demographic trends	Shrinking population	1) Lack of workforce 2) Aging society 3) Negative birth rate 4) ageing population	Migration is positive
2.Functional: functional relationships, type of common functions	1) REV - Regional Development Association, 2) EU Regional Management, 3) WOF (economic offensive), chambers and social partners, agriculture, economic, trade	Different political parties, information exchange doesn't always work	Working on common solutions without political influences', capacity building works
3.Planning: land use, type (state) of built-up areas, soil sealing, peri-urban relationships	New requirements for the planning region "Steirischer Zentralraum", land use planning on municipal level	1) No common strategy for 5 municipalities 2) no strategy for soil sealing 3) peri-urban relationship with Graz is still in the development	1)Stronger planning partnership 2)peri-urban relationship partly via the Leader Programme, 3) planning for the "Steirischer Zentralraum" expects good ideas
4.Economic: number and character of firms (entities, SME), GDP, industry decline GDP lower as average in Styria	Industry (metallurgy, Electro parts - automotive industry), glass industry Trade, handicraft, public- administration, Tourism (Lipizzan stud Piber), health => jobs	Lack of professionals in Metallurgy industry	Education (ABV)
5.Infrastructure: level of technical infrastructure/water/ sewage system/roads/ railways/ Peripheral located; Traffic	Beside the main routes	Bad connection to motor way	Electrification of Railways and better connection to Styria Railway system (Graz)

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6.Social: education, Professional structure & skills; Sleeping region (educated young people migrate to Graz or others)	Technician apprenticeship with higher school certificate, Apprenticeship with A-level, commercial academy	Missing science technical college & Universities	High qualify. ABV, Education system through the leading companies
7.Management: politics will co-operate with neighbouring administrative units, common strategic vision, ability to solve conflicts	Regulation Central region Styria, Leader Region "Lipizzaner Heimat"	Weak cooperation among 5 municipalities, and weak cooperation with Graz	Better cooperation with Graz, realization by LUMAT
8.Spatial Cohesion: continuity of ecological systems, lack of "spatial island"	Low awareness raising for connected ecological systems	Reduction of agriculture areas (based by settlements), weak re-cultivated mining areas, fragmentation, conflicts of usage	Realisation of LUMAT

— Process of cooperation

The key stakeholders are to be involved with periodic information events (for example, periodical information at the REV meetings, information to the mayors, close contact with the regional management). When developing the implementation strategy, the objectives or requirements of the regional programs (SDR, Regional Development Program, Leader) should be taken into account:

(decision maker, mayors, land owner/ mining company, etc.)

- Close co-operation with the Regional Development Association Lipizzanerheimat (REV)
- Several stakeholder workshops

- Individual meetings with mayors/heads of administration (5 municipalities of the "Kernraumallianz")

- Close co-operation with actual running project ."Stadregionales Flächenmanagement (SRFM)" of the REV

A close contact to the planning department of the Styrian Administration is important.

— FUA objectives and priorities

How to set the objectives and priorities:

- joint introductory workshop with

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the local stakeholders (including landowners)

- one-on-one interviews with the mayors and / or heads of office and / or construction manager
- preparation of a project proposal per municipality
- identification of funding opportunities for the implementation of the proposals
- coordination with the region

Problems that **must be solved**:

- landowner in most of the cases is the mining company - no commitment with the municipalities concerning the price for the land

— Planning and Strategic Framework

As a first step in the development of an Action Plan, surveys of potential threats / threats in the region were foreseen.

An update of the data of **CircUse project** takes place. In a second step, the definition and setup of monitoring activities takes place: workshop (s) in the region, catalogue of measures, needs of the companies, creation of proposal list, and involvement of

— Methodology

Requirements to be considered:

- respecting the new planning strategy of the “Styrian Central Region”

- no common landuse policy of the municipalities (will be established)

Objectives:

- improved use of under-used areas related to the theme of “gardening” (including job creation)
- networking existing gardens and parks for better use (“recreation area”)
- coordination with current or planned projects (via RMSZR)

Priorities:

- project with job creation.

Each of the Kernraumallianz municipalities has to be involved.

decision makers.

In addition, the field of administration / governance is dealt with, with a focus on:

- impact on regional development (coordination with regional management)
- pilot project(s) - coordinate with the communities.
- modifying the regional development concept
- respecting the specific characteristics

of the 5 municipalities

Interaction with local stakeholders:

- close co-operation with the Regional Development Association Lipizzanerheimat (REV)
- several stakeholder workshops (decision maker, mayors, land owner/ mining company, etc.)
- individual meetings with mayors/heads of administration (5 municipalities of the “Kernraumallianz”)
- close co-operation with actual running project “Stadtregionales Flächenmanagement (SRFM)” of the REV

Ideally, each community contributes a “flagship project” to the broad topic of gardens:

- Köflach: “vertical gardening” - Cooling of buildings by plants (green roofs - new approach!)
- Voitsberg: development of a community garden, connection to existing parks (for example energy park) and gardens (Schloßberg)
- Bärnbach: energy optimization of an

— The use of tools (InViTo, LUMATO, etc.)

The management of soil and land in FUA in the LUMAT regions is mostly based on GIS tools. In Austria these

office property with 1,600 m² usable area with a special greening

- Rosental: vegetable cultivation in glasshouses on a former ash deposit using mine water for heating
- Maria Lankowitz: new garden design at the basilica (topic wedding garden)
- Maria Lankowitz: extension of vegetable cultivation at the prison (increase self-sufficiency, including training of inmates)
- “Garden route”: creation of a connection of all garden and park elements over the cycle way network currently under development with regard to a recreational area for the region and Graz

Important requirements for the use of land as well as possible business settlements:

- preparation of a mediation process region - mining company because of the problems in the last years concerning the provision/sale of land owned by the mining company (high priority!)
- concept of introducing land as “equity” to business settlements.

tools and data are stored, managed and distributed via the GIS of the provinces. In the Voitsberg region, because of the

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requirements and conditions of the GIS Steiermark as the working tool on municipal and provincial level these tools will have no great opportunities for implementation. Compatibility with the

Landes-GIS is mandatory; all spatial data or data exchange must be coordinated with it. Nonetheless, the two tools were tested.

— **Strategies for the implementation, Timeline and funding programme**

Collaboration and coordination with another ongoing project in the region “City-functional land management” (also seen as a continuation of the land management agency of CircUse) -requirement of the REV. These structures have to be used as soon as they are implemented. Until then, the information will be sent to the REV, which is the relevant decision maker in the region. Administrative structures in the respective communities can be used for activities. For the implementation of the planned actions/projects different funding possibilities can be claimed:

applications under the approved LEADER program 2014-2020

- as part of the new Styrian Provincial and Regional Development Act 2018, applications can be submitted from the summer of 2018 onwards
- the Austrian Rural Development Program 2014 - 2020 offers specific subsidies for “village renewal” (see Action Plan for Maria Lankowitz).

The political representatives and stakeholder of the region are members of the different boards and can influence the specific programs.

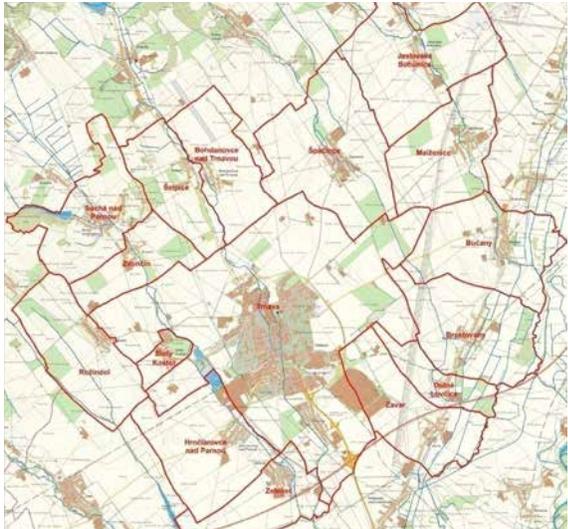
- the Lipizzanerheimat is also a LEADER region, the mayors can still submit

— **Conclusions**

The austrian partner Energetic Center (EC) is not allowed to create a new administrative structure for LUMAT (condition for the co-financing by the office of the Styrian Government), so EC has to find a “creative solution” on which EC is working intensively. For this solution a need the political acceptance by the region which is in the moment not so easy to get it. As of June, there will be a budget decision of the Province of Styria for the SZR by the provincial

government, which will for the first time make available regional budget resources for certain implementations (e.g. city-regional city location agency). On the basis of this allocation projects can be prepared in the following. As the planned actions have been developed in close contact with the communities, the municipalities will also try to implement them in their full content.

— **3.3.5 Slovakian Functional Urban Area**

TRNAVA	
	POPULATION 92,287 inhabitants
	AREA Approximately 283 km ²
	DENSITY 341 people per km ²
	CURRENT LAND USE Agricultural and wine production, fruit raising and gardening, industrial and energy production
	ADMINISTRATIVE STRUCTURE N. 16 Municipality

— **Administration**

The Trnava FUA consist of all together 16 municipalities, out of which the biggest is regional capital city Trnava which had 64,252 inhabitants by 30.6.2017. On the basis of Strategy for Spatial Development in Slovakia 2001 as amended by KURS 2011 and in line with respective EU legislation, with aim to safeguard and support sustainable integrated spatial and urban development, the Trnava FUA was set up in 2016 consisting of the **core city Trnava** and further **15 surrounding municipalities** including Biely Kostol, Bohdanovce nad Trnavou, Brestovany, Bučany, Dolné Lovčice, Hrnčiarovce nad Parnou, Jaslovské Bohunice, Malženice, Šelpice, Špačince, Zavar, Zeleneč,

Zvončín. On the basis of local relations and functional links, the Trnava FUA was extended with the municipalities Ružindol and Suchánad Parnou. In order to set up management structure enhancing and securing integrated approach towards the FUA Trnava development, ZOMOT association was set up in 2016 by Trnava city. This inter-municipal association plays and will play a key role in safeguarding coordination, networking, mutual communication and transfer of know-how within Trnava FUA municipalities in order sustainable and integrated approach including also integrated environmental management will be continuously applied in the

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process of the area development in its broadest context. Thus, the **ZOMOT association** is the main management and administration structure for the Trnava FUA - its members are all the above given municipalities represented by their mayors. The ZOMOT association office has two representatives - head of the office and administrative employee executing every day management and related communication. However, responsibility for administration and management of individual municipal areas in the Trnava FUA, resp. their cadastral areas, lays with

— Use of the area

The FUA Trnava is located on the Danubian lowland belonging to fatty areas with a very suitable climatic conditions and high-quality soils, mainly mucks and brown soils what favours to intensive agricultural production, characterized by growing of densely sown corns, maize and sunflower mostly. Also wine production, fruit raising and gardening is largely present. However, FUA Trnava belongs also to one of the **most industrially developed areas** in Slovakia, mainly due to machine and automotive industry, as well as food and textile production. Moreover, due to presence of nuclear power plant in municipality of Jaslovské Bohunice this region is important from energy production point of view. Furthermore, vicinity

— Environment

As partially mentioned above, in the Trnava there is a prevailing abundance

of the municipalities themselves, which are in line with the Slovak law, basic spatial and administrative self-governing units. Every municipality has its own plenary assembly and a mayor voted by their inhabitants every four years. Moreover, every municipality / city has its municipal/ city office, which serve as a main executive authority being responsible for many local competences including issue of spatial and building permits, maintenance of the whole municipal/city area, to mention some of them.

of the Slovak capital Bratislava and in broader context also of the Austrian capital Vienna as well as presence of further important transport corridors mainly to Žilina and Košice in the northeast of Slovakia, makes this area important **transport node**. In summary, this area can be characterized as a territory intensively used by industrial and agricultural activities with specific environmental problems coming from highly contaminated environment, e.g. quite high degree of air, water and soil contamination, soil sealing and degradation. FUA Trnava belongs to areas strongly influenced by anthropogenic activities, with consequently low degree of ecological stability and rather low quality of environment.

of **agricultural land**, i.e. 80% of the whole area. Almost all this area is

represented by arable land intensively used for growing of cereals and forage plants, e.g. wheat, barley, maize, sunflower and rape. With regard to natural eco-stabilizing elements in the Trnava FUA, these are mainly **water and wood ecosystems** presented. Regarding water ecosystems, mostly they are represented by water courses (e. g. HornýDudváh, Blava, Trnávka, Parná, KrupskýPotok) and water reservoirs (e. g. Suchá and Parnou) favourable for fish farming, water sports and recreation activities. However, the Trnava FUA, resp. Trnava region in a broader context, is known as region with a very little presence of wood ecosystems and permanent grasslands - wood ecosystems represent only 1,1% of the whole Trnava FUA area and permanent grassland only 3,86% of it. Thus, the Trnava FUA with a very little presence of natural eco-stabilizing elements belong to regions with the lowest ecological stability in Slovakia. Moreover, as also mentioned above, due to **intensive anthropogenic activities** (agriculture, industry, transport) environment in the Trnava FUA is characterized by rather high degree of ground and underground water, air and soil contamination, together with considerable local water and air erosion, low retention ability of this area and its drying out caused by **climate change**. Moreover, current trends in management and use of the Trnava FUA area are not very favorable - there is an increasing urban sprawl, extensive urbanization and inappropriate human interventions in local river basins resulting in accelerated

surface water outlet concentrating water in local river courses increasing threat of floods. An important side effect of these phenomena is also oversized drying out and over-warming of the whole area and the whole process is not sustainable anymore. Within the Trnava FUA Action Plan elaboration an analysis of ecosystem services was performed, and the following ecosystem services were depicted as relevant for the Trnava FUA area:

1. Supply (production) ecosystem services:

- biomass for food production - i.e. provision of soil for agricultural production and the provision of harvest itself (including gardening)
- water for drinking and for technical purposes - i.e. provision of drinking water, water for irrigation, industry, etc.

2. Regulative and supportive ecosystem services:

- air quality regulation - i.e. improving the quality of air, hygienic and well-being benefits
- water quality regulation - i.e. improving the quality of groundwater and surface water, again hygienic and well-being benefits
- water flow control, flood protection - i.e. water retention and drainage and

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flood control

- micro and regional climate regulation - i.e. local climate regulation
- support of natural soil composition - i.e. erosion regulation
- support for biodiversity, life cycles, pest control - i.e. protection of biotope, biodiversity, etc.

— FUA identity

As mentioned above, the Trnava FUA has been set up in 2016 consisting of 16 municipalities together with the regional capital city Trnava, which is also constituent member of the ZOMOT association set up again in 2016 associating all the Trnava FUA municipalities. With regard to its position the Trnava FUA is located in metropolitan region of Bratislava (40 km far from Bratislava and 100 km far from Vienna) belonging to so called Central European region in a broader context which has more than 4,5 mil. inhabitants and the main poles of growth: Bratislava, Brno and Vienna. Due to this suitable position, suitable natural and climate conditions as well as historical factors, the Trnava FUA belongs to “richer”, more developed

3. Cultural and aesthetic ecosystem services:

- services related to provision of recreation, sport, relax and leisure activities
- Services related to provision of cultural, moral and intellectual aspects of life.

and competitive parts of Slovakia, with higher population density and well developed economic, social and transport infrastructure in comparison to regions in the northeast and southeast of Slovakia. In generally, in the Trnava FUA urban settlements inhabitants living in cities prevail. The average number of inhabitants in the Trnava FUA municipalities is 2,872 inhabitants, while average population density is 341 inhabitants/km². However, in Trnava city itself there is an obvious trend in declining number of inhabitants within 2010 - 2016 in comparison to majority of the Trnava FUA municipalities where the number of inhabitants has been continuously rising, what indicates a process of suburbanization.

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— FUA objectives and priorities

In line with the ZOMOT association statutes, general, however, also the overwhelming objective of the Trnava FUA are to initiate, support and

implement an integrated development of the Trnava FUA area in its broadest context, including the main pillars of 2020 agenda, i.e. local economic and

social development well balanced with local environmental protection. Such **integrated development** should be based on the program of economic and social development which is a strategic midterm document mutually elaborated for the Trnava FUA for a period of 2016 - 2023. This document is the most important strategic platform for both integrated development of the Trnava

— Planning and Strategic Framework

In Slovakia spatial planning was delegated to the Ministry of Environment in 1990 with clear definition that it is an important tool of environmental protection. However, since 2002 competence of spatial planning at national level had been shifted several times. Nowadays, competence of spatial planning “without ecological aspects” is under the Slovak Ministry of Transport and Construction, and competence of spatial planning including all “ecological aspects” has stayed with the Ministry of Environment. Nevertheless, concrete execution role of spatial planning lays with municipalities, which are responsible for development of their spatial planning strategies. Cities as well as municipalities are legislatively obliged to develop their spatial masterplans and update them every four years. However, in case they do incorporate partial changes and updates of their master plan continuously in line with actual needs, they do not have to do these “four years” amendments. This is a case of Trnava city which has the latest spatial masterplan elaborated

FUA area as well as for fundraising of external financial sources mainly from EU funds within current programming period of 2014 - 2020 - and this is the second important objective of the Trnava FUA and its managing and administrative structure (the ZOMOT association) - to prepare and implement integrated development projects co-financed from external, mainly EU funds.

by 30.6.2015 and since then the city updates it continuously in line with arisen needs. All changes of master plans in case of cities as well as municipalities must be approved by their plenary assemblies. In accordance with the above given institutional framework, the following priorities for the Trnava FUA region were selected in the above mentioned mutual program of economic and social development. Economic development:

- transport and better accessibility
- general development including tourism and preservation of cultural heritage
- better conditions for investors including elaboration of complex up to date analysis of current investment conditions and support of local production
- marketing including development of current marketing strategy for the Trnava FUA.

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Socially and environmentally responsible region:

- high quality regional and local education system including enlargement of existing capacities of basic and infant schools and enhancing their cooperation; development of complex up to date strategy for educational policy
- accessible high quality social services including development of the social center for the whole FUA region and elaboration of complex up to date social strategy
- climate change adaptation including effective flood protection and water management and revitalization of

— Methodology

Action plan for integrated environmental management for the Trnava FUA represents up to date unique pilot study providing basic characteristics of this area, evaluation of its potential using methodology of ecosystem services, identification and specification of potential and recent geo-ecosystems, evaluation of services and benefits of identified geo-ecosystems together with analysis of endangering and supporting factors. Moreover, inventory of investment plans and projects, identification of land use conflicts and vice versa mutual synergies was given there together with vision on the direction of integrated environmental management in Trnava FUA. The **main principles to be applied**

Parna river basement

- effective waste management including mainly introduction of effective schemes of municipal waste management
- remediation of environmental burdens including revitalization of green fields and brownfields.

Effective public administration and integrated land and resources management:

- effective and open public administration including open and E-government
- effective integrated environmental and land use management.

in planning, management and decision-making process **in order to enhance integrated environmental management** in the Trnava FUA in relation to environmental protection including sustainable land use and sustainable use of ecosystem services were selected and linked to the following main areas:

- protected areas and areas with natural resources protection
- areas negatively influenced by stress factors and areas without negative influence of stress factors derived mainly from human activities
- areas of hygienic protection of

agricultural objects

- areas with polluted surface waters
- protection zones of transport corridors
- areas threatened by surface runoff

— The use of tools (InViTo, LUMATO, etc.)

During the Trnava FUA Action Plan, an outsourced company responsible for its development used **web GIS tool** to elaborate all maps accompanying its textual part. However, also an InViTo tool has been used for the very first time to investigate its possibilities for the integrated environmental management in the Trnava FUA. The first “results”, respectively the process and the first “findings” from the work with the InViTo tool during the process of Action Plan development were introduced to local stakeholders and decision makers at the **2 workshops** that took place in February 2018 in the ZOMOT association premises in Trnava, as well as during the Slovak two days local training taken place in September 2018 at the Trnava

— Strategies for the implementation, timeline and funding programme

Although well-developed theoretical basis of integrated environmental management, in Slovakia currently the most prevailing practical approach is still sectoral, i.e. environmental planning, management and protection is still divided between all basic environmental components such as water, air, soil,

- areas endangered by landslides
- areas largely endangered by negative impacts of climate change, wind erosion and extensive drying out
- areas with the lowest ecological stability.

City Hall. The authors of the Trnava FUA Action Plan succeeded in “feeding” the inViTo tool with selected data from the Trnava FUA and got basic “impressions” concluding the InViTo tool and IT systems currently used in the Trnava city (Cora Geo WebGIS and Bentley Microstation) could be well compatible. However, the work with inViTo tool should be further processed, investigated and fine-tuned in cooperation with the tool authors. In future perspective, after adding more information-bearing layers, the InViTo tool could be well used as an **analytical** as well as **visualization** tool supporting decision making process in the Trnava city as well as in the Trnava FUA mainly during the process of integrated projects preparation and implementation.

fauna, flora, natural resources and waste. Thus, one of the key steps in relation to enhance integrated approach in environmental planning and management in Slovakia starts with analysis and deeper integration of existing legal and executive tools which encompass the following main fields:

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- nature and landscape protection
- spatial planning including landscape and ecological planning and ÚSES (i.e. spatial systems of ecological stability)
- landscape planning with regard to European Landscape Agreement
- land reforms
- wood/forestry planning and management
- ground and underground water and water basins management
- flood protection
- integrated pollution prevention and control (IPPC)
- environmental impact assessment (EIA) and strategic environmental assessment (SEA).

The above given requires concrete steps and actions at national level (top-down approach), which, however, could be accelerated also from local/regional level.

The Trnava FUA and its Action Plan developed under the LUMAT project could well accelerate such bottom-up initiative. In line with the above given, the Action Plan of integrated environmental management for the Trnava FUA encompasses measures in

the following key aspects:

- nature and landscape protection
- eco-stabilizing measures safeguarding sustainable use of ecosystem services
- mitigation of the stress factors negative influence
- development of spatial information system.

Furthermore, in every key aspect given above, the Trnava FUA Action Plan describes framework actions to be implemented. However, these actions should be further detailed into concrete investment intentions and integrated projects at the Trnava FUA level, resp. at level of the Trnava FUA municipalities.

Regarding funding for implementation of such integrated projects, definitely, they will be implemented more less only with support from external financial sources as in general, they are quite large and expensive infrastructure projects. This external financial support is represented mainly by EU funds (the Slovak national operational programs within EŠIF 2014 - 2020, interregional or cross border cooperation programs or Norwegian/EHP funds) or by the Slovak national subsidies managed by individual Slovak ministries, from which, however, could be co-financed smaller investment or soft projects. Regarding time-frame, in line with the above given, it is

expected that these integrated projects will be prepared and implemented during this programming period 2014-2020 as well as during the following programming period, which should be under preparation already now. Support from the subsidy mechanisms of the Slovak ministries is not divided

into so called “programming periods” in generally, it is determined with the scope of the Slovak governmental program.

Just to illustrate the measures proposed within the Trnava FUA Action Plan the following map can be seen:

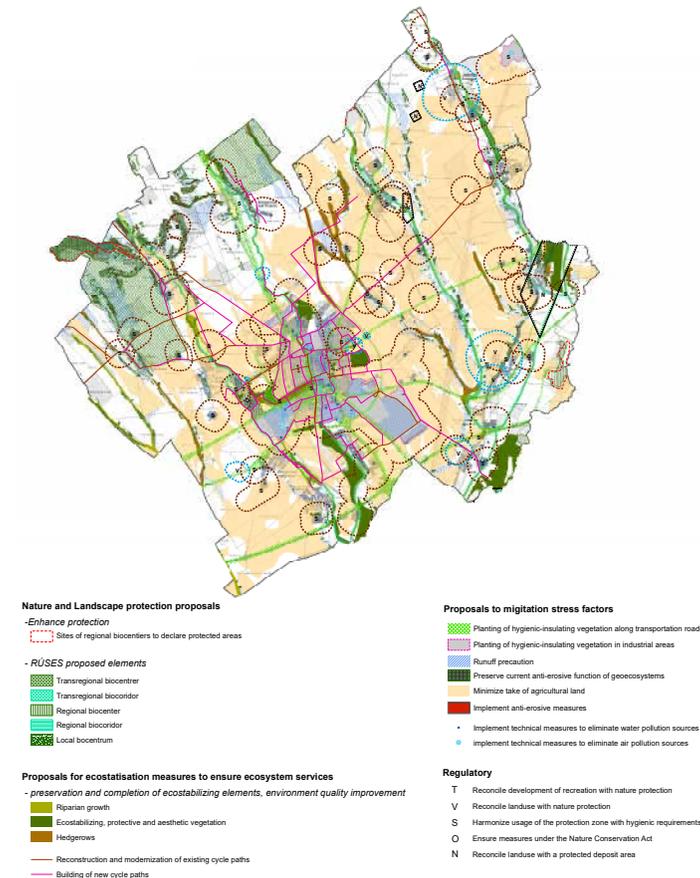


Fig.9 Proposals for measures to remove conflicts of interest and promote mutual synergies

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Expected impacts and Conclusions

In accordance with the above given it can be concluded that the Trnava FUA Action Plan for integrated environmental management represents a pilot midterm strategic document developed for the Trnava FUA for the very first time - so far there has not yet been developed so complex analysis of current state of environment in the Trnava FUA as well as of actual analysis of processes in the field of integrated environmental management and drafted framework actions to enhance such integrated attitude toward the land use planning in this area.

Moreover, an aspect of integrated environmental management is quite unique element here, because it is a specific topic not frequently elaborated in strategic documents and here this document developed under the UMAT

The Action Plan was elaborated in March 2018 and it can be found on: <http://www.trnava.sk/userfiles/file/Ak%C4%8Dn%C3%BD%20pl%C3%A1n%20MFO%20Trnava%20LUMAT.pdf>

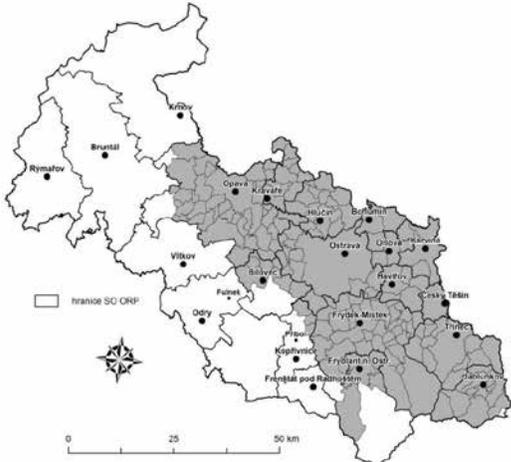
The Action Plan with an English concise summary can be found and on: <http://www.trnava.sk/sk/clanok/strategicke-dokumenty> where under the point 9. "mapy" can be found map annexes.

projects has done its pioneer work.

Thus, expected impacts of the Trnava FUA Action Plan could be seen both at national as well as at regional level, as this document can serve as a **best practice** example for other Slovak FUAs (regional level) and to support drawing more attention to this topic and contributing to institutional and legislation changes at national level.

And at local level, i.e. at level of the Trnava FUA itself, it is expected that this document will serve as the main instrument in planning and decision making in the process of preparation and implementation of integrated projects in the Trnava FUA safeguarding its integrated development in relation to sustainable use of natural resources.

3.3.6 Czech Functional Urban Area

OSTRAVA	
	POPULATION 965,338 inhabitants
	AREA 1949.74 km ²
	DENSITY 496 people per km ²
	CURRENT LAND USE Urban areas, industrial areas, forest mixes, agricultural activities
	ADMINISTRATIVE STRUCTURE Part of Moravian-Silesian region

Administration

FUA Ostrava is part of the Moravian-Silesian region. Implementation of the Action Plan is focused on the level of the Region and therefore the key authorities (Regional Assembly, Regional Council) of the Region are mentioned here. The Regional Assembly performs self-government, its legal assignment is to submit bills to the Chamber of Deputies, submit proposals to the Constitutional Court to annul legislation, issue generally binding regulations of the Region, coordinate the development of

the territorial area, approve territorial planning documents, determine the extent of basic transport services for the region, make decisions on international cooperation, approve the regional budget, establish and dissolve state-funded institutions, etc. The Regional Council is the executive body of the Region within the area of independent authority; the Council prepares proposals and documents for meetings of the Regional Assembly.

Use of the area

The Spatial Development Principles of the Moravian-Silesian Region, even in

its update from year 2015, generally describe brownfields as areas whose

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use should serve to protect agricultural land, the document deals only with the **industrial zone** RPZ-1 Nad Barborou (92.3ha) in order to establish a strategic industrial zone, in relation only a part identified as RPZ-3 Barbora - Area for the location of “**Regional Integrated Center for Utilization of Municipal waste**” is mentioned with an energy source directly linked to the Nad Barborou zone. In the

— Environment

As part of the project solution, it was verified that brownfields are a threat to environmental management in the area. On the one hand threat from the point of view of contamination, but also there are opportunity to **protected agricultural land (soil)**. In the preparation of Action plans identification and evaluation was made in relation to the individual components of the environment, including the socio-economic component of the FUA Ostrava. Area differences and increase of buildings between 2006 and 2016 have been calculated using the GIS analysis performed by the author with use of CÚZK data. The result of the calculation is the

— Elements of FUA identity, Citizens and stakeholders involved

FUA Ostrava is an area historically influenced by industrial activity. These are mining and heavy industry. The inhabitants live mostly in cities and the whole territory has a poly-centric structure. The main stakeholders are the Region, municipalities, landowners

area of strategic planning at the regional level, the Development Strategy of the Moravian-Silesian Region for the years 2009 - 2020 update from year 2012 deals with **brownfields in general**. Specifically, it mentions only one brownfield in the territory of Ostrava, namely the Hrušov site.

fact that, during this period, in the more precise delimitation of the Ostrava agglomeration there was an increase of buildings with total area of approximately 202.8 ha, In FUA Ostrava, a total of 238 locations have been identified to have brownfield features. These are formerly used or underused areas which for their future development need an intervention for their future development, they need intervention. These are, therefore, seemingly easily **accessible and usable sites**. A number of regenerations of brownfields took place in FUA Ostrava in the last decade, and yet, more than 200 ha of agricultural land were consumed. Brownfields within FUA Ostrava represent 665 hectares of land.

- several large owners, universities, entrepreneurs and the public. Public interest is high; especially the young generation has a positive relationship to the region and is interested in its development

— FUA objectives and priorities

The main objective of the Action Plan, to be implemented through sub-targets, is to facilitate the regeneration or re-use of brownfield sites. Specifically, **improve possibility of temporary brownfields utilization**, prevent new brownfields emergence through private sector and public sector support. At the same time, an increase in awareness of the extent of **potential risks** arising from the existence of historically used sites will be monitored.

By achieving the main objective, the region will also pursue other partial **goals**:

- reduction of loss of agricultural land
- local reduction of air pollutant concentrations by increasing the share of green areas
- reduction of potential hazards resulting from historically created but only partially acknowledged

— Planning and Strategic Framework

This Action Plan is prepared for the needs of the Moravian-Silesian Region. Therefore, its focus is in line with the key planning documents of the Region They are - The Development Principles and Development Strategy of the Moravian-Silesian Region Development Principles are the zonal planning document for the entire region. They mainly set the fundamental requirements for effectively and

contamination of the soil environment

- reintroduction of unused localities into functions of the municipalities / cities.
1. Priority 1 - Use of the legislative initiative to create a legislative environment for brownfield regeneration support
 2. Priority 2 - A dedicated fund for brownfields regeneration support
 3. Priority 3 - Mapping brownfield sites and managing their database, mapping sites with assumed contamination, and defining priorities for solution
 4. Priority 4 - Initiation and activation of owners and promotion of brownfields problematic for the public
 5. Priority 5 - Supporting human capital in brownfield regeneration problematic.

efficiently organization of areas and corridors of supra-local importance, especially public works areas and corridors (transportation and technical infrastructure, production and storage, etc.) and publicly beneficial measures (flood control, land-based ecological stability system, etc.). The Strategy for Development of the Moravian-Silesian Region in 2009-2020 (hereinafter the “Strategy”) has been

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prepared as a mid-term strategic document to meet conditions provided

— Methodology

The implementation method is based on the horizontal and vertical participation system. On the horizontal level, it is about creating a working group. The vertical level implies the cooperation of individual municipalities with the region, the cooperation between the

— The use of tools (InViTo, LUMATO, etc.)

The concrete implementation tool for FUA Ostrava is the web site, which has been prepared directly for the needs of FUA Ostrava with overlap to the Moravian-Silesian Region. This is an interactive environment with the possibility of public access.

Visitors may:

- read the Action Plan and comment it (discuss about it)
- input new brownfields including photos and related information
- input examples of successful brownfield revitalizations including photos

— Strategies for the implementation, timeline and funding programme

The strategy for the implementation of the Action Plan is closely related to the process of its creation. A number of analyses, including an analysis of the organizational structure in the area

in Act 248/2000 Coll., on promoting regional development.

stakeholders and the constructive entry of the public. It is clear that the coordination role must be taken over by the Moravian-Silesian Investment and Development. As a Project Partner, it is motivated to support the implementation of the Action Plan.

- suggest future use for individual brownfields
- add comments to the individual brownfields
- lookup brownfields
- input project intention for brownfields regeneration
- communicate with MSID agency - send questions, comments, students can send internship inquiries, diploma works, etc.

The goal is to strengthen public involvement in the brownfield regeneration process.

of self-government at FUA Ostrava, were prepared for the preparation of the strategy. The conclusions of the evaluation showed two ways for a possible implementation. The first one is

a bottom up system, based on individual municipalities. This system would imply the possibility of agreement and joint action of more than 100 municipalities, which is not realistic. Therefore, the second is the top down system, passing the implementation to the parent level - to the region level.

Implementation group has three levels:

- **Regional Council** - executive body of the region in the area of independent competence. The Council is preparing proposals and documents for meetings of the Regional Assembly, therefore it is most suitable for implementation itself
- **Working group** is an executive group composed of representatives of the Departments. The Working group is proposed with respect to the current organizational structure of the Region, with the rule that in case of change

— Expected impacts

The Action Plan aims to streamline and accelerate the brownfield regeneration process. This will have a positive impact on the environmental situation of the entire region (FUA Ostrava) and the

— Conclusions

The first important step in the implementation is the letter of commitment. The Moravian-Silesian Region, by letter dated 11 October 2018, accepted the commitment to establish a Working Group. The Working Group

the agenda is transferred to the successor department. The task of the Working group will be to specify measures and activities to be decided by the Council. At the same time, it will fulfil its tasks as a result of the Council's decision. It will monitor the results of implementation of already implemented activities and measures. This information they will hand out to the Council of the Region. The Working group will also be in contact with the Consultative group.

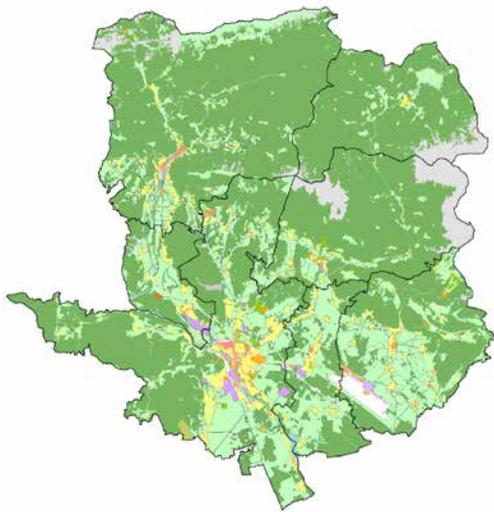
- **Consultative group** - prepares suggestions for the Working group. It will consist of citizens, non-profit organizations, private business sphere, experts and public administrations. The main task of the Consultative group is to monitor the impacts of the actions already undertaken and to propose modifications and amendments to the Action Plan in reaction to the current situation.

improvement of ecosystem services. Improving the environment will have a positive impact on all the inhabitants of the region, therefore it will have a positive impact on all the target groups.

will continue with Moravian-Silesian Investment and Development agency organizational support in the preparation of individual steps towards the gradual implementation of each Priority (Action) of Action Plan.

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3.3.7 Slovenian Functional Urban Area

KРАНJ	
POPULATION 96,658 hin.	
AREA 708.7 km ²	
DENSITY 145.14 people per km ²	
CURRENT LAND USE Degraded urban areas	
ADMINISTRATIVE STRUCTURE N.7 Municipalities	

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Administration

The FUA of Kranj is located in the Gorenjska region in north-western part of Slovenia. The Gorenjska statistical region is divided into two parts managed by two Regional development agencies,

the RAGOR for upper, north-western part and BSC Kranj for lower, south-eastern part of the Gorenjska region. The City of Kranj is the capital city of the of the Gorenjska region.

Use of the area

In general, the Spatial development plans in Slovenia use the state's legislation's determination, that settlement's development is to be provided also with Degraded urban areas (DUA) renewal and determine renewal for some specific areas of DUA but on the other side, there are very few guidelines for business zones development in spatial development

plans in the FUA Kranj. Apart from Spatial development plans, the City of Kranj and the Municipality of Tržič have documents called Urban Development Strategy, that focus also on treating DUA and business zones development, including objectives and some actions.

Environment

In FUA Kranj there are several threats on soil and land:

- brownfields (large areas of former textile industry in FUA Kranj, more than 100 ha just in Kranj)
- land contamination
- high water and flood hazard (presence of settlement structures in flood zone areas)
- over-fertilisation (intensive farming close to urban areas and on protected areas for drinking water)
- soil erosion (mountainous area and climate change)
- urban sprawl and soil sealing (despite large number of brownfields and underused areas, new greenfield developments are identified).

FUA identity

For the LUMAT project, the FUA Kranj was selected as an un-institutionalised area of intervention located in the lower Gorenjska region. It is a highly industrialized area. The FUA Kranj area was defined based on OECD criteria and eco-system services approach. There are several eco-system services with important impact on the quality of life spreading across more municipalities. Protected forest of Udinboršt and supply of fresh drinking water are recognized as two the most important ones.

municipalities:

- City municipality Kranj
- Municipality Šenčur
- Municipality Preddvor
- Municipality Naklo
- Municipality CerkljenaGorenjskem
- Municipality Jezersko
- Municipality Tržič.

In the FUA Kranj there are the following

FUA objectives and priorities

The scope of the Action plan for the FUA Kranj is dedicated to the development of strategies, plans and instruments of comprehensive management dedicated to sustainable development and environment embedded into the

integrative land management in FUA. The Action Plan for integrated environmental management for the FUA Kranj is **focused on the development of the Master Plan** for developing industrial zones which are now either degraded or

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without any communal infrastructure as part of the Functional Area Integrated Environmental Management Strategy. The Action plan of the FUA Kranj have to be understood not as formal instrument but as a steering instrument, an efficient tool used following the interest of the whole scale of stakeholders, first of all municipalities representing public

Priority objectives include:

- efficient management of business zones
- encouraging the renovation of degraded and underused areas

(Sub)-objectives include:

- conservation and efficient management of natural resources

- ensuring the quality of the living and working environment
- integrated management of business and economic zones
- re-activation of degraded and underused areas and prevention of new brownfields
- promoting sustainable mobility for business zones
- restrictive approach to greenfield developments and supporting approach to brownfields
- supporting the consolidation of ownership structure in zones with fragmented ownership.

— Planning and Strategic Framework

The findings of the Action plan of the FUA Kranj like identified threats, provisions of services as development potentials of degraded areas together with identified tools and measures should be in the mid and long term perspective directly usable in **designing and implementing regional and local municipal spatial and development plans as programmes**. The vision and strategy for the plan as the most interactive stage of the process is devoted to the development of goals, alternatives how to react to the identified challenges, potentials and problems of the FUA. Expected

outcomes of the plan and associated objectives and targets should be developed and assessed from the point of their coherence, achievability and responsibilities of actors. Usually scenarios are generated, discussed and assessed. the linked interventions should be tested against policy options and identified consequences. The second part of the planning phase is focused on preparatory work for plan implementation. The main instruments are the Action Plan, programs and projects, which are in detail described by the programming/operational part of the Action plan. The Action

plan involves a series of projects and sub-projects which will include diverse interventions in the form of regulations,

— Methodology

The development of the Action plan for the FUA Kranj is based on the multidisciplinary approach, which includes interdisciplinary content, stakeholder processes of elaboration as well as scientific inputs on governance and ecosystem services in the form of decision support tools.

The methodology of the FUA environmental management plan of Kranj is based on:

- integrated management of urban development in the FUA of Kranj understood as a tool for optimization of land-use management overarching

investments, physical developments, socio-economic and environmental measures.

sectoral policies

- incorporation of the concept of ecosystem services as the framework for the integration of different optimization functions representing variety of interests and stakeholders in FUA with the focus on sustainable soil and land use
- poly-centric multilevel governance as the basic management model for cooperation management of the city core and its suburban areas and institutional framework for the development and implementation of integrated FUA plan of Kranj.

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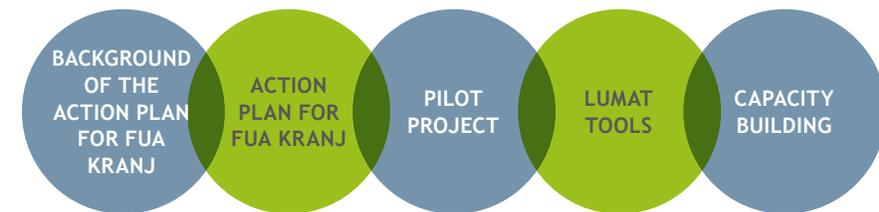


Fig.9 The Action plan of Kranj FUA is divided into following main sections

— The use of tools (InViTo, LUMATO, etc.)

The development of the LUMAT Action plan of the FUA Kranj was supported by the use on the open source web GIS based platform called InViTo. The main DSS tool used in the FUA Kranj was InViTo GIS tool. With the InViTo GIS tool,

we were able to integrate all data from different GIS data sources used in FUA Kranj mentioned above. Integrated data with graphical representation was used to better communicate proposed actions with stakeholders. The LUMATO tool was

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presented just to local authorities within the FUA Kranj as a possible additional DSS tool which can be integrated with their existing GIS environment. Further use of presented methodological approach (LUMATO) is considered in the

— Strategies for the implementation, timeline and funding programme

Successful implementation of the FUA Kranj Action Plan require a very well-prepared management strategy. From the experience of other partners in the LUMAT partnership, but also experience from all Slovenian partners, the main issue to be handled was to define an institution or create (choose) a network, that would implement the Action plan. As this means new tasks for every potential (managerial) organisation or a network, the **main objective** of the implementation strategy was **to find a right stakeholder** whose daily **responsibilities** could relate to the topics of the Action plan. To avoid later difficulties, Slovenian partners already discussed about potential key stakeholders for the implementation of the FUA Kranj Action plan at the beginning of the process. During the process, the most appropriate key stakeholder for the Management structure responsible for implementation the Regional Development Agency of Gorenjska Region was identified. Engaging the

— Expected impacts

The main objective of the Kranj FUA Action Plan is focused on inner

process of preparation of the regional development strategy. This document, that will also use the other project results as an expert input, is going to be prepared as a part of Slovenian regional development programme for 2021-2027.

Regional Development Agency of Gorenjska at the beginning of the development of the FUA Kranj Action plan was important to get their interest in the topic and to **define possibilities for the implementation of the Action plan**. Also, the early inclusive process was important for the definition of realistic tasks and roles, that the Regional Development Agency could do to support the implementation of the FUA Kranj Action plan. In January 2018, the **Letter of intent** was signed by the director of the Regional Development Agency of the Gorenjska Region. One of the important goals was also the sustainability of the results and the Management structure, so the results of the Action plan are prepared in a way that it can be used as an expert basis for the preparation of the new spatial document (according to the new spatial planning legislation, valid from 1.6.2018 on), the Regional Strategic Spatial plan. The document will be prepared by the same Regional development agency.

urban development, preventing greenfield developments and urban

sprawl and searching synergies within FUA municipalities with their public and private stakeholders. The FUA Kranj Action plan will be used as an expert basis for regional development programme, regional spatial development strategy (new spatial legislation, 2017) and other local development documents. This will

— Conclusions

One of the most important results of the project will be the establishment of communication and **cooperation between individual stakeholders at different levels**. By raising awareness and sharing experiences, the project will build on the acquired new knowledge and build trust among stakeholders. At the same time, comprehensive action and management plans will enable a balanced and economically efficient development of

ensure sustainability of the FUA Kranj Action plan after the end of the LUMAT project. The Regional development agency of the Gorenjska region, who also covers the role of business support centre, was identified and engaged as the Management and monitoring organisation for the FUA Kranj Action plan implementation.

new economic zones and reactivation, revitalization of existing degraded areas. The desire is to raise the interest and offer a tool that will stimulate the participation of stakeholders and enable the successful and comprehensive development of FUAs. The goal is to establish a methodology that can be applied to each FUA depending on the specific areas of the territory.

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4



PILOT ACTIONS AND INVESTMENTS

- 4.1 APPLICATION OF INTEGRATED ENVIRONMENTAL LAND MANAGEMENT IN FUAS
- 4.2 PILOT INVESTMENT IN RUDA ŚLĄSKA
- 4.3 PILOT INVESTMENT IN TRNAVA
- 4.4 OTHER AREAS

4.1 APPLICATION OF INTEGRATED ENVIRONMENTAL LAND MANAGEMENT IN FUAS

As the next step - based on the developed common strategy for integrated environmental management in FUAs and subsequent Action Plans for the project FUAs - the pilot actions were developed and implemented, located in **7 project countries**.

The involvement of stakeholders and citizens played an important role in this phase. These pilot actions are showing the practical ways of Action Plans implementation and, of course, physically visible results: they aimed to reach the project objectives on protection of land resources and reduction of urban sprawl in FUAs.

The content of the pilot actions refers to the specific problems in the 7 countries concerning integrated environmental land management identified in the individual FUAs.

In the foreground these pilot actions have a strong demonstration character, showing possibilities and solutions which are transferable and replicable also in other areas. Another important reason concerns the experiences made thereby relating to all aspects of the common approach, the acceptance of the actions within the regions and the sustainability of the results.

Physically visible results of the project are pilot actions in form of **two investments financed by LUMAT project**, they are located in Slovakia and Poland:

- The investment in Slovakia involves restoration of neglected natural park for sport and recreation zone in location Štrky in Trnava, aiming at securing overall rehabilitation of currently abandoned area of Štrky. This overall rehabilitation opens up this area for broad public of Trnava City and Trnava FUA offering possibilities for sport, leisure and relax activities in natural environment.
- The investment in Poland consists in rehabilitation of the brownfield site located in the middle of the Ruda Śląska city. The investment creates an available open space of a natural, “half-wild” character; this place will become the walking and biking route connection of two districts as key element of the peri-urban infrastructure.

In the other 5 areas pilot actions demonstrate the implementation of integrated environmental land management based on different actions such as site revitalization plans, business plans for restructuring areas with environmental requirements, mine water use for heating greenhouses.

All these pilot actions are addressed mainly to the general public-the inhabitants of these regions who will have better living conditions and standard due to improving aesthetics, quality and safety of places where they live, work and rest. During the development phase the target groups were involved giving the possibility to express comments and ideas on the project partly on municipalities website, partly by information events organized in the regions.

Also the local and regional public authorities have the possibilities to see the actions which are examples of improving environmental land management and show the implementation of the developed Action Plans.

All the project partners were involved in pilot actions implementation using the common transnational concept developed in the framework of Action Plans, due to specificity of each of the 7 pilot areas.

4.2 PILOT INVESTMENT IN RUDA ŚLĄSKA

— Design targets

According to elaboration of revitalization design of zinc spoil heap, in Ruda Śląska vital targets were indicated such as:

- remediation and **phytostabilization of heavy metals contaminations** in

the area

- biodiversity protection
- social participation.

— Actions preceding the construction design

The following actions and studies were provided:

- social participation lead by ARCA Studio
- meeting with inhabitants of local community which gave range of expectations and propositions; prime conception plan for area developing was a result of meeting
- mineralogical and chemical characteristics of the area done by prof. Iwona Jonczy from Silesian University of Technology, Gliwice
- study of utility features of zinc spoil heap deposit done by CB Project and

GIG Institute

- plant cover studies lead by specialists from Department of Biology and Environmental Protection, Silesian University, Katowice
- various actions undertaken by municipality
- greenery inventory of trees on the area dedicated for ground level changes
- indication of metallophyte plants spots on the area concerned
- analysis of application possibility of inhabitants expectations.

— State of the heap before the redevelopment

Most of the surface of spoil heap area was covered by meadow of mixed herb plants and sparse woodlots. Majority of herb plants represent **metallophyte species**. All above the ground parts of mentioned herbs were contaminated, that could bring health problems to people while having frequent skin contact with them.

In northern part of the area there were sharp crags of height about 2-3m, above them steep slopes bringing danger of falling down to space users.

Some patches uncovered by plants had revealed rough spoil contaminated deposit. Partially there could be found boulders of parched slag with sharp

edges. They were present on northern slopes and in woodlots. There was a need to cut down dangerous crags, make

even slopes and hide exposed parts of spoil heap material.

— Construction design range

Design followed results of above actions and contained the elements listed below:

- remediation and phytostabilization of top layer of the spoil heap
- northern slope and spoil heap top formation

- road path system
- lighting design

- surveillance infrastructure design
- recreation infrastructure: view points, grill area, outdoor gym equipment, industrial playground, education path.

— Design assumptions

Main problem and target of actions designed for area of zinc spoil heap in Ruda Śląska was the soil contamination and the process of the situation improving with remediation, **to reach safe recreation open space there**. Additional targets were: to mitigate

dangerous sharp and high crags on the northern heap edge; to build possibly low cost in maintaining leisure infrastructure with possibly broad offer, vandalism resistible, and with deep connections with local identity and history.

— Remediation

Remediation of topsoil in the area concerned was provided by **phytostabilization** on the top of spoil heap and covering northern slopes with clay and new soil layers. That should prevent inhabitants from the contact with dangerous substances. That was important especially on the top of spoil heap where the most of sport and leisure activities would occur. To protect people against heavy metals present in metallophyte plants there was planned destroying of green cover on the spoil heap top with chemicals and replacing

them with proper safe species. Southern slope remained nearly untouched with minor activities provided. Nearly all designed activities are connected with northern and top area. For southern slope **gradual exchange of plant species was planned**, and was realized by cutting grass before seed maturity and sowing target species of grasses, similar as for phytostabilization. Phytostabilization design involves the reduction of the mobility of heavy metals in soil. That can be accomplished by decreasing wind-blown dust and

minimizing of soil erosion according to creation of tight plant cover. Reducing contaminant solubility or bioavailability to the plants depends on pH level and presence of stabilizing substrate.

The addition of soil amendments, such as brown coal, and alkalizing agents in form of lime fertilizers, can decrease solubility of metals in soil and minimize leaching to groundwater. Most of active chemical compounds of heavy metals are blocked this way and neutralized.

The **mobility of contaminants is reduced** by the accumulation of contaminants by plant roots, absorption onto roots, or precipitation within the root zone. To provide proper habitat for planned grasses there was designed addition of fertile soil to the top layer of the ground. There were chosen grass species especially suitable to limit contaminations in roots and restrain

— Social participation

Since 2014 consultations were conducted with local community within the EU program participation within FUA of Chorzów, Ruda Śląska, Świętochłowice. The social needs and comments were indicated, concerning:

- **values:** accessible green open space, attractive landforms, connections with wider open space system, neighbourhood of shopping centre
- **disadvantages:** lack of monitoring, menace of violent hooligan

their migration to aboveground stems.

Three species of grasses with diverse form varieties were used. They are:

- Lolium perenne - rye grass
- Festuca rubra - creeping red fescue
- Miscanthus x giganteus - giant miscanthus.

According to some scientific research these grasses can grow on zinc spoil heap habitat and have very limited traces of heavy metals in leaves:

- Phytostabilizing area - 12266 m²
- Covering of northern slopes with clay and new soil area - 12366 m²
- Southern slope for gradual species exchange - 17778 m².

behaviour, garbage in area, nearby industry, high voltage line

- **needs:** bicycle and ski infrastructure, sport facilities, view point, playground of industrial connotations.

According to the first consultations, a first conception plan was designed. After thorough assessment of local conditions, treats and relations were prepared final conception plan in February 2017. Its assumptions were presented to the local community on the

meeting in 23.02.2017. Main direction of paths were kept as well as localization of playground, open space sports facility and playing field. Places for grill were

— Development elements

According to landform change, northern slope was transformed. Limited part was left untouched as the “essence of the place” - high crag with moss and grass plant cover, with matured birch tree and some outcrop of spoil heap material with slag sinters. Some information points of **educational path** connected with slag features and metallophyte plants are placed nearby. The slope has been planted with birches, oaks and ash trees in geometrical groups to support expression of man-made landscape, but with use of native trees. On the area of the northern edge there was designed **Land Art** made of hornbeam trees. On the middle of the heap top there was designed a view point in form of hill about 4 m high.

That was made of spoil heap material and covered by clay, soil and sown by grass. There was installed lunette, some benches and educational path point. To the north of the view point there was designed a sledge slope. Other top area was flattened and treat with phytostabilization to neutralize heavy metals contamination. To the west of the view point there was located a **playing field**. It will be sown more densely than other places, and will be well maintained. Around the playing field, there is a low dike with tubes-tunnels

moved to the west, to be far from high voltage line. New elements of functional structure were added - mentioned in description of construction design.

for children play. Furthermore to the west there is situated the grill area under canopy of birches. Places for grill stands are in a form of gravel square pits surrounded by timber kerbs. Dark basalt gravel correspond to zinc slag but is not contaminated. **Stands for grill** are separated by the dashed lines of miscanthus. That will give sense of intimacy providing kind of a green wall maze for children play. By the centre of the area there was build a main path joining 1st Maja Street with “Trakt Rudzki” path. Near western end, on the place where the path reaches top ground platform there are concrete **hammocks**. These constructions have timber cover suitable to sit on and handles to mount own hammock. Leaving hammock for days in open space could be not reasonable because of possible vandalism and high fall of furnaces dust which makes textile dirty, especially during rainfall.

Quite near to them there are view concrete boxes with two deck **chairs** in each. **Intimate space**, with view outlined by edge of the box have boards of educational path with information about local history, industrial revolution, zinc production technology, features of spoil heap material and metallophyte plants. To the south of main path are located three iron factory vats on the slag spot.

Vats are filled with soil and planted *Lycium barbarum* - boxthorn. That shrub has falling down branches, bright silver-green leafs and can symbolize liquid metal in high temperature. Around vats are small basin with slag gravel and educational board with zinc and iron production technology. Next groups of hammocks are placed near vats. On the side path curve there is a second - "small" view point. Following that path one can find open space gym. There is either the place for boulder of zinc ore with educational board. Some additional hammocks stand there on the slope edge. On the east border is jumping track for BMX bicycles located in dean made of coal mine rock. Slopes of dean will be covered by clay and grass. Track path is covered by clay and lime gravel. The same surface is designed for BMX circus in eastern border of area. Circus has a form of round dike with ramps about 2m high, with walls suited to bike extreme rides and jumps.

On the south border there is another path going to a playground. Most of paths on the area are covered by gravel and lime stone dust. Only two paths leading

from the top of spoil heap to playground are made of mineral-and-resin surface because of steep slope. They provide extreme steep for walking path to give expression of spoil heap height. Along one of that paths there is a line of slides for children play. On the main area of the playground there is a wooden construction in the form of industrial structure with some connotations to coal mine lift tower, drift or some iron and zinc factory dwellings. Additionally there are various slides and modern play equipment which may be associated with industry but giving the same time high quality play proposition. On southern slope there are some spots of metallophyte plants left.

They create rhythms of rectangular forms or circles. Nearby there are put educational boards with information about that kind of plants. On the whole area there are boards of educational path with information about local history, industrial revolution, zinc production technology, features of spoil heap material, metallophyte plants, spontaneous flora, birds living around and area information system.

— Recapitulation

Revitalization design for zinc spoil heap in Ruda Śląska is an attempt to solve as many problems as possible. According to the sustainable development rules there were taken under consideration technology of remediation and phytostabilization and were applied to all accessible area.

On northern slope there were the most heavy works of land formation to neutralize all health hazards connected with contamination and sharp crags. The slope was flattened. Ground surface was covered with clay and clear soil layer.

Central area of the top of spoil heap was threaten with phytostabilization and southern slope was maintained in the way to rebuild flora structure with the target to get plant cover not concentrating heavy metals in above the ground shoots. On that area, recreation activities are highly limited.

All solutions are meant to provide safe environment for people to rest, spend their leisure time and enable some sport activities with no health threat. Some limited parts of the area were left untouched to preserve local flora and provide source for natural succession.

To support biodiversity nearly all designed trees are native. Most grass species except ornamental miscanthus are native too. Only groups of shrubs obscuring electricity transformer stations are introduced ornamental plants with the highest drought tolerance.

Various small architectural forms and sport facilities were applied. The form of them should support local identity. Educational path is providing information about history of the place, industry connected with the area, local flora and fauna and sustainability issues.

Spatial and architectural solutions have original form and should be legible and easy to use. Small architectural elements, within that area information elements, are resistible for vandalism and possibly not too much expensive, easy to maintain, repair or exchange.

All solutions were deigned to follow spatial, social, economical and natural demands of sustainable development and following ideas of green urbanism, the local action for biodiversity, European Landscape Convention and others.

Table.4 Design in numbers

Construction area	63,735 m ²
Northern slope for transformation	12,366m ²
Remediated area with phytostabilization	12,266 m ²
Southern slope for gradual species exchange	17,778 m ²
Bicycle facilities for BMX	2,071 m ²
Path system	4,387 m ²

4.3 PILOT INVESTMENT IN TRNAVA

The neglected natural park Štrky located in the north edge of cadastral area of Trnava City in Southwest Slovakia, originally a valuable bio-centre of local importance, had gradually changed into an abandoned and polluted greenfield in the past, mainly due to the intensive deforestation accompanied with industrial, agricultural and construction activities, plus the lack of public financial sources, allocated to other investment priorities in the city residential area.

The main aim of this LUMAT pilot action is the overall rehabilitation of this currently abandoned area, and its change for sport and recreation zone accessible for all Trnava FUA inhabitants. Through the restoration, an original natural value will be brought back to this area and will be strengthened as well as ecological stability will be increased considerably. Moreover, overall rehabilitation will open up this area for broad public of Trnava City and Trnava FUA inhabitants, offering possibilities for sport, leisure and relax activities in natural environment.

Trnava City as a regional capital city with more than 64,500 inhabitants still substantially lacks publicly accessible natural areas suitable for leisure activities such as parks and forest parks - nowadays there is only one bigger area called “Kamennýmlyn” (in English “Stone mill”), which has been intensively used for recreational, leisure and cultural activities of Trnava City inhabitants for many years.

— Background and present state

As mentioned, the Štrky area is located in the north edge of cadastral area of Trnava City and is of app. 300 m². Part of the overall area serves as a shooting range, which neighbours Štrky area from north-west side.

From southwest side there is a local communication, parking place and small cottages of local gardeners. From northeast and southeast, the Štrky area neighbours with arable land.

From north to south a small local river “Trnávka” flows, which is an over-regional bio-corridor. Its river basin was regulated in the first half of the 20. century, what together with intensive

agriculture, industry, transport activities and extensive building up producing air, water pollution and noise, have been negatively influencing this area for many years. Originally, this area belonged to so called “hard floodplain forests” composed mainly of ash, elm and oak trees, however, majority of original floodplain forests had been deforested and changed into arable land. This deforestation had considerably contributed to overall deterioration of this area and slow spread of invasive and flight wood species.

Other factor considerably contributing to alteration of this area to a “green brownfield” had been illegal dumping

of municipal and construction waste by local inhabitants for several decades -

scattered waste dumps could be about 40 years old.



Fig. 10 Picture of the Štrky area before the LUMAT pilot investment implementation

— Development elements and restoration range

In accordance with the Realisation Project Documentation for Building Permit (PD DSP) restoration of the Štrky area within the LUMAT project composes of the following main parts:

- **Water surface**

In the central part of the Štrky area an artificial water surface (lake) should be built up, creating dominant part of the whole investment. Water surface consists of water basin and two lagoons, a depth of the water

should be up to 40 cm. It mainly includes preparatory terrain works, deepening of depression for water basin, adjustment of basin strands, installation of sealing layers and drilling of water well. A small artificial hill called “sunny hill” will be made from earth left over after water basin deepening. It will represent another significant point in the revitalised area serving for relax, sun catching and leisure activities of future visitors.



Fig. 11 Visualisation of the water surface realized within the Trnava pilot investment

- **Vegetation and greenery**

Surroundings of water surface should be grassed by meadow greenery of 4,500 m². Moreover, water and marshy vegetation (835 pcs.) will be planted on water surface strands, contributing to the water cleaning, to consolidating of the basin strands

and underlining dominant character of the water surface in overall restoration. Furthermore, 120 pcs. of broadleaved trees will be planted in the area. Also, footpaths will be surrounded by natural under brush what will contribute to natural character of the whole area.



Fig. 12 Visualisation of vegetation and greenery realized within the Trnava pilot investment

- **Unpaved footpaths**

A network of unpaved footpaths of 1,065 m² totally made from milled gravel will be created, starting from three entrances to the area, leading to the water surface and joining main footpath rounding around the water surface. Moreover, educational footpath should be constructed at peripheral parts of the Štrky area where visitors could learn about the local fauna and flora.

been designed for pilot investment: wooden benches with seat back and wooden benches without seat back placed around the stone grill; also wooden table place under wooden resting shelter; dustbins with small shed; info panels with small shed; circular stone grillas well as wooden boxes for birds and bats. All these items should be certified, with simple, natural design, made of wood and stone, underlining natural character of the Štrky area.

- **Small architecture and mobiliari**

Several types of small landscape architecture and mobiliari have

- **Lighting and electricity distribution network**

Within the Trnava pilot investment also lighting will be installed composing of lights with light columns 5 m high. Parking lights with LED bulbs will be used. Furthermore, distributor and ground cable electricity distribution network will be constructed, serving not only for lighting but also for other electricity devices, e.g. water pumps.

- **Maintenance of vegetation and greenery during the 1st year of sustainability**

This maintenance will be realized during the first year of the investment operation and it will be covered from the city's own financial sources. Within maintenance of grass plots cutting of grass will be done, together with weeding,

additional setting of grass and leaves scrabbling, if needed. Moreover, within maintenance of water and marshy vegetation its cutting will be done together with weeding. Within maintenance of newly planted trees their irrigation will be realised. Finally, within maintenance of existing trees and greenery mainly removal/cutting of invasive and flight wood species will be realised.

The proposed design has a significant positive impact on the local environment, because it supports fauna and flora biodiversity and restoration of the whole area to its original state, improves water regime and micro-climatic conditions of this area, thus also partially contributing to adaptation of this area to climate changes.

— Pilot investment implementation

Due to repetition of public procurement for the Trnava pilot investment supplier, its commencement had to be postponed from June 2018 to November 2018 when a contract for works was signed with a winning bidder-the Slovak company Swietelsky-Slovakia, spol. s r.o., Bratislava. Actually, the first works on the site started in December 2018 with rough clean up of the area and first cutting off invasive trees. Accordingly, these works had to be interrupted because of a winter season by the beginning of March 2019 with expected end by June 2019. Such solution, of course, supposes extension of the project duration by the end of July 2019.



Fig. 13 Commencement of the works at the Štrky site

4.4 OTHER AREAS

The remaining pilot actions in the other 5 countries will constitute parts of Action Plans showing how to implement the proposed actions. During the development phase also of these pilot actions the target groups were involved and informed about the progress of the related actions. Different events and presentation were organized the pilot areas accompanied by publicity activities.

— Pilot action in region Voitsberg

The development of the pilot action in Voitsberg covers building basic elements of a sustainable cross-community “garden show Lipizzanerheimat” as a recreational and producing space for the peri-

urban metropolitan area of Graz (final goal: permanent character). Several communities of the region are involved by renaturation of “brownfields” / former mining areas by individual projects.

Step 1: potential analysis for the heating of greenhouses with mine water (winter vegetables using the waste heat) on a former mining area provides clarity for

the implementation and at the same time provides a comprehensible data basis for interested parties.

COMMUNITY ROSENAL: MINE WATER USE FOR HEATING GREENHOUSES

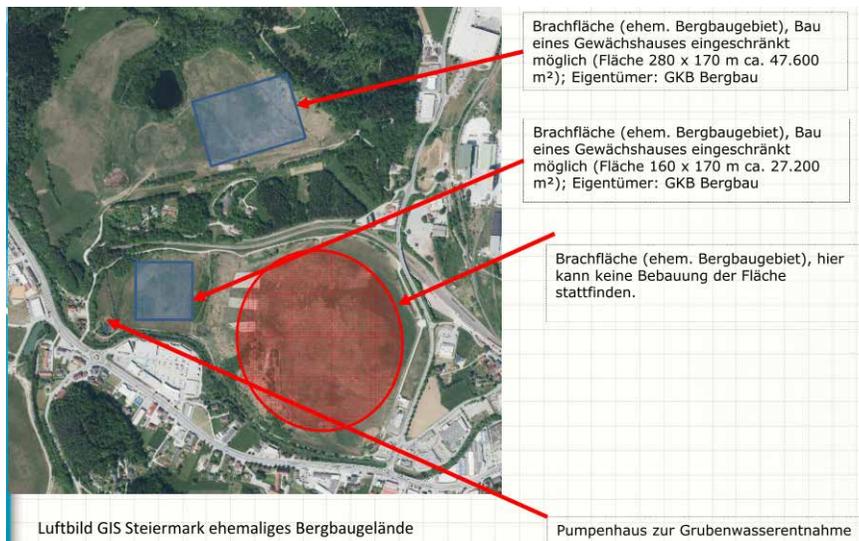


Fig. 14 Overview pilot area

Step 2: the garden house is set up and the marketing measures for interested

parties start.

Development of a concept of a garden project on a club basis - **urban community garden**. This serves as a nice “entrée” for the energy park

by “beautification” of the current entrance area (former mining area). The implementation will follow within a LEADER-project.

CITY OF VOITSBERG

In the course of **optimizing the energy use** of an office property with 1,600 m² floor space, the south-facing façade will

be enriched with a special greening in terms of energy efficiency.

CITY OF BÄRNACH

Creation of a connection of all garden and park elements over the cycle way network currently under development

with regard to a recreational area for the region and Graz.

LIPIZZANE-RHEIMAT: GARDEN ROUTE

A financial model is developed for the potential industrial areas in the core area of the Lipizzanerheimat, where young companies are offered the opportunity to obtain space in a cost-effective manner without making large capital investments.

This involves the development of a venture capital-like fund that should be set up by the communities and possibly also by the property owners. This fund acquires the land and makes it available to the founders.

FINANCIAL MODEL

— Pilot action in Torino

The Metropolitan City of Turin is organized in 11 “Homogeneous Zone (HZ)”.

The pilot area is the HZ n.11, named Chierese-Carmagnolese, in the Southeast territory of the CMT0 territory, within the boundaries of the Piedmont Region.

Phase 4: Integrated Programme implementation

The model proposed by CMT0 within LUMAT project is embodied in the Management Structure which is experimentally tested in the HZ Chierese-Carmagnolese, with elements of replicability to all the other homogeneous Zones of the CMT0.

Phase 1: Integrated Environmental Management structure for the HZ “Chierese-Carmagnoles

Phase 2: Development of technical skills for the Management Structure (CAPACITY BUILDING)

In particular, the Management Structure was set-up in order to:

Phase 3: Integrated Environmental and Territorial Programme of supra-municipal projects and actions

- stimulate the collaboration, planning and implementation of inter-municipal scale actions

- research, improve and aggregate data for an analysis of the context of the vast area
- exchange good practices on issues of interest
- facilitate the interception of regional, national and European resources, in particular with reference to the 2014/2020 Structural Funds
- contribute to the definition of the Strategic Plan of the Metropolitan City of Turin.

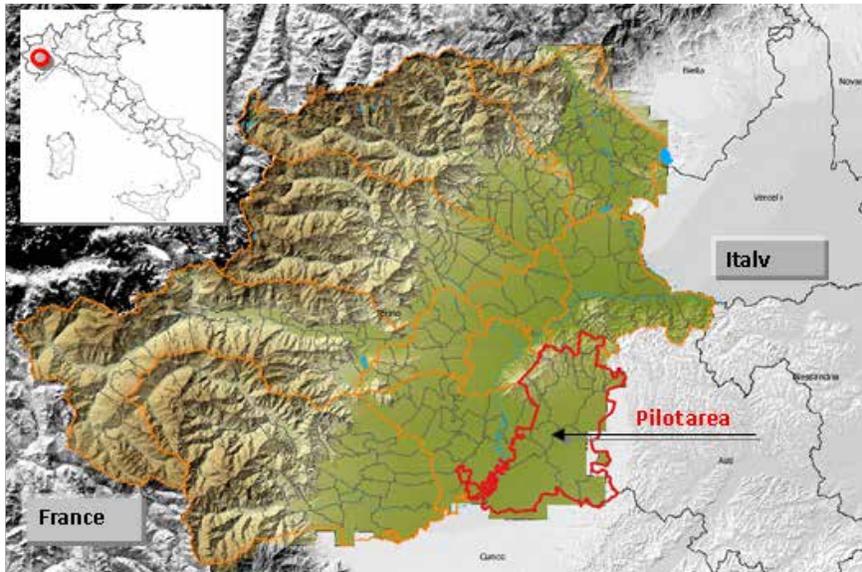


Fig.15 Metropolitan City of Turin and Pilot area “Chierese-Carmagnolese”

The Structure is therefore configured as an instrument of “territorial cooperation” capable of implementing a real action program, whose implementation responsibilities, coordinated by the individual identified, can be identified, on a case-by-case basis, by the participating bodies (Municipalities).

The Structure can define the policies, strategies and projects at the FUA level, ensuring both the satisfaction of the specific needs of the specific reference context, and adherence to the strategies and general objectives of the Metropolitan City of Turin (Territorial Plan and Metropolitan Strategic Plan). The Integrated

Territorial and Environmental Plan identified by the Structure defines the priority intervention strategies for the FUA and details the operational areas of intervention. The implementation of the Integrated Program by the Management Structure involves the implementation of the projects contained therein. The time schedule depends on three elements:

- recognized supra-municipal level priority (defined by the control room)

- design level (assigned to the Project Unit, possibly assisted by external technicians)
- availability of resources.

On the basis of these elements, the Management Structure of the Homogeneous Zone 11 identified as the first project to be developed within the LUMAT project, the intervention located in the area called “Fontaneto”, in the Municipality of Chieri.

— Pilot action in Leipzig Nordraum

There based on three feasibility studies which have been carried out in the Leipzig pilot region the following

The unused buildings and sealed areas on the site are to be deconstructed. The size of the site is 21,260 m². After the deconstruction of the building and sealed spaces, a greening of the site in the frame of compensation actions is foreseen.

The former pig sty is located within an area characterized by agricultural uses and which is broken up in character by the neighbouring forest and trees along the train tracks. The ruinous building and the lack of safeguarding for the property create a visually unpleasant and planning non-compliance situation. These are to be addressed first. With consideration given to the landscape, the agriculturally used part of the property can continue to be used. The construction for the former pig sty is to be deconstructed. Through

pilot projects have been chosen and developed with the involvement of stakeholders.

- **Result:** 2,1 hectares of ecological compensation
- **Costs** (Start-Up plan) 600,000.00 €
- **Monitoring:** to take place during the upkeep of the property.

LEIPZIG

this deconstruction land will become available that can be used as a free open space as well as a site for compensation measures or as an alternative for solar panels.

- **Result:** Roughly 1 hectare of ecological compensation land
- **Costs:** (Startup plan) 140,000.00 €
- **Monitoring:** to take place during the upkeep of the property.

GROSSSTEINBERG

NAUNHOF/ FUCHSHAIN

The site is not possible to be used for a constructional use and for this reason should instead be used as a compensation site. This can enrich the surrounding agricultural landscape and strengthen the ecological function of the surrounding green axes of the Threne. A design that improves the landscape can be done as a type of compensation action according to section 15 of the federal nature protection law. After an initial evaluation of the site, the surrounding areas of land, which are not

— Pilot action in Ostrava

Priority map for areas underused, abandoned and formerly affected by use includes estimation of the potential risk of selected areas. This map shows location of 20 selected sites and includes an assessment of the potential

— Pilot action in Slovenia

The pilot action explores the non-systematic management of degraded urban areas (DUOs) and business zones in the Municipality of Kranj and adds to the purpose of the LUMAT project, which is to strengthen integral land management in FUAs with special emphasis on sustainable use land and the development of ecosystem services.

The objective of the pilot project is to stimulate industrial symbiosis (IS), based on management of industrial sites. At the same time, the pilot project implements the Action Plan of the Functional Urban Region of the Municipality of Kranj.

sealed can be left to the succession of nature and the central sealed areas can be partially de-sealed and ecologically improved.

- **Result:** Roughly 0.6 hectares of ecological compensation land
- **Costs:** Start-Up plan - to be determined
- **Monitoring:** to take place during the upkeep of the property.

risks according to the methodology of the Ministry of Environment. It is implemented according to regional integrated environmental management system.

The pilot action steps are:

- selection of the most important materials and activities in IS in Slovenia, including an overview of established networks, European projects and programs, published documents etc.
- an overview of basic concepts and definitions of IS, based on a decision by private stakeholders motivated to exchange (waste) resources for economic reasons
- an overview of production, services,

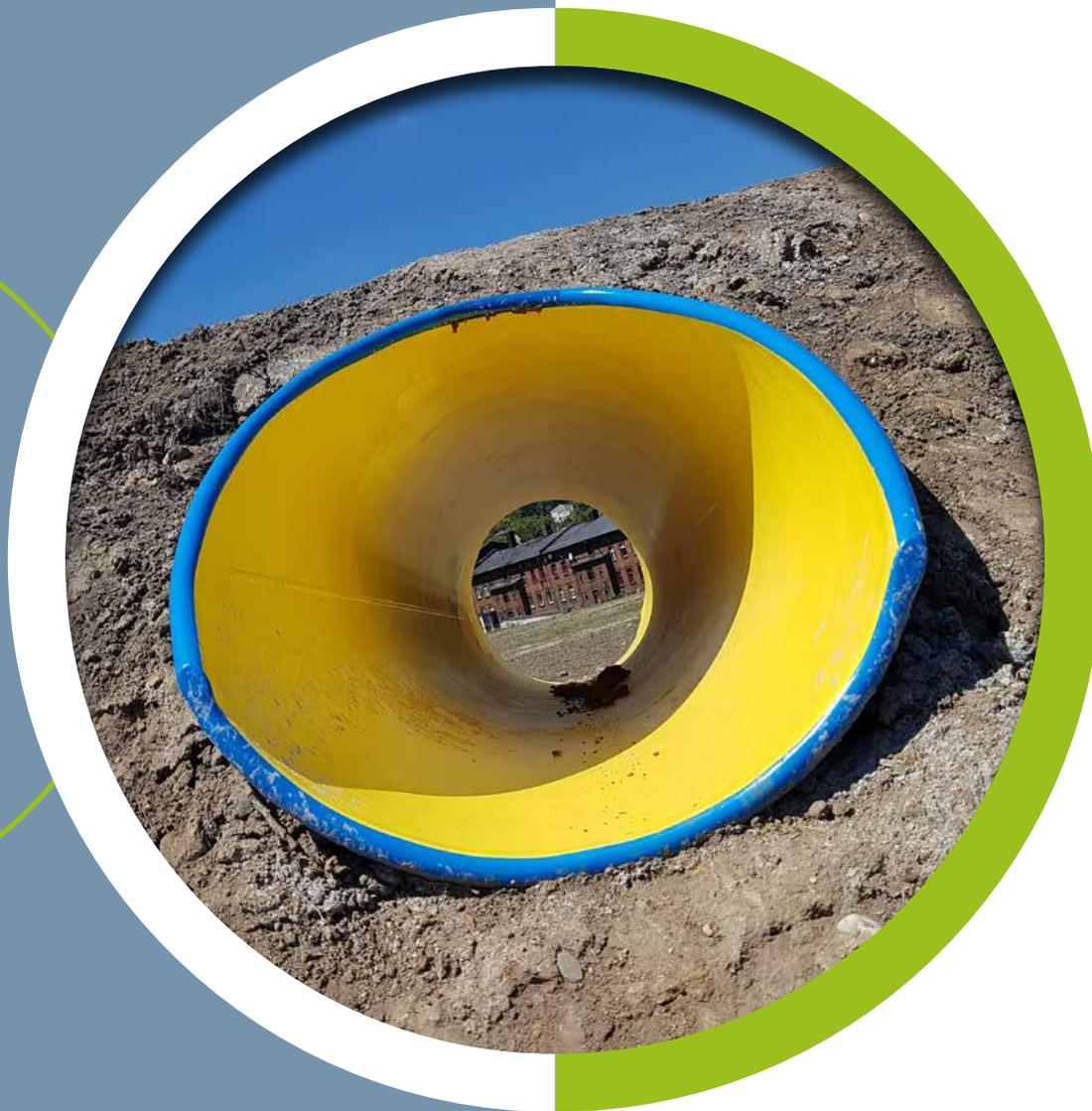
and waste from these activities in the Municipality of Kranj

- a list of major companies in the Municipality of Kranj in terms of the type and quantity of waste generated by business activities, and the manner in which it is handled
- the presentation of possible IS scenarios between companies in the Municipality of Kranj with regard to waste resources and demand for raw materials and energy
- the presentation of possible IS scenarios between selected

companies in the Municipality of Kranj, depending on the location of the companies and DUO sites. The purpose of this part of the pilot action is to check the location interaction of DUO and possible IS cases on the assumption that the key to a successful IS is based on collaboration and synergies offered by geographical proximity

- educating stakeholders about IS. This envisages informing companies about IS, where cooperation between different industrial partners is essential in order to achieve common economic and environmental benefits.

5



PHOTOCONTEST

PHOTOCONTEST

The LUMAT project, in order **reach a wider audience** and to disseminate its results, raising awareness on the delicate balance between man and nature, has promoted a photocontest.

The request was to describe through a photographic image the project's **keywords or key-sentences** such as:

- “Cooperation in land management for more liveable places”
- “Integrated environmental management”
- “Functional Urban Areas”
- “Urban-periurban relationship”
- “Brownfield redevelopment”
- “Sustainable Land Use”.

The photo enthusiasts who applied took successfully the challenge, and **captured in images the complex concept of sustainable environment management**, in different declinations: denied, desired, possible, realized. They stressed the LUMAT approach, which focus on cohesion of environmental, social and economic aspects.

Thirty-eight images participated to the contest, representing **five different countries** of Central Europe. A jury of three experts evaluated the anonymous entries according to the coherence

with the LUMAT contents, the technical quality and the aesthetic impact.

The **first prize** was awarded to Lucio Beltrami for the picture “Dotted line: infrastructures can connect and be beautiful”, shot in Cuneo (IT). The jury recognized a picture with great visual strength, symbolized by the various patterns. The shot underlines the contrast between the impetus of the river and the highway. It metaphorically recalls the flowing of life. The photo also poetically recalls the concept of integrated environmental management. All the elements of the picture (river, road, forest) are potentially infinite, not forced or compelled within boundaries; the blanket of snow homogenizes the landscape and erases elements of recognizability, highlighting only the relationship between nature and the functional work of man. Finally, the gaze from above admirably emphasizes the vast scale. It won for the originality in the composition, its technical excellence and artistic merit.

The **second prize** was won by Marta Fudala from Poland, with “Focus on citizens” taken in the LUMAT investment area in Ruda Śląska, for the section “Cooperation in land management for more liveable places”. In the opinion of the jury, the frame capturing the building through an unusual point of view offers a perspective that recalls enclosure, the willing to escape and freedom. Through the skilful contrast of

colours is effectively communicated the new vitality for polluted ground fields, recovered through innovative techniques of environmental management. It has won for the originality of the caption, its courageous and interesting composition, and the stimulating overall impact.

Miroslav Beňák won the **third prize**, with “Chemical factory in Horné Orešany, Slovakia”, shot in Pálffy’s chemical factory. The author explains that the former chemical factory in Horné Orešany was found in 1880-1883 by count Jozef Pálffy, who built the castle in Smolenice some years later. The factory produced acetone, spirit, calcium acetate, varnish, and other chemical products. It is located in woods of mountain Malé Karpaty, which were the main source of wood used in dry distillation. There was complete infrastructure around the factory - with colony for workers, which later transformed to the little settlement. Wood was transported from the hills with the narrow-gauge track. Fragments of it are still preserved in the country. Today this location is more used for recreation, but there is still some specific (post) industrial character integrated into country with a lot of historical and architectural values. The whole area of factory is used partially, the oldest buildings are without purpose. In the context of tourism in Malé Karpaty and historical importance of the Pálffy’s chemical factory there is potential for adaptation

and revitalization for new functions such as the museum of industry in Malé Karpaty. In the opinion of the jury, the shot evokes a sense of loneliness and abandonment, thanks to the wise use of sepia colours. It shows an elegant composition, with a clear bound to the subject of the LUMAT project in relation to brownfield conservation.

In addition to the three winners, also **two mentions** have been awarded to:

- “It all looks good from the above” (author Boštjan Cotič), shot in Šmarna Gora, Slovenia. The image represents a glimpse of the territory of the Kranj FUA. The photographic composition includes on different levels all the elements of the FUA: the urban, infrastructural and natural element. An interesting composition well described by the caption of the author, who underlines “a balance between natural capital and the needs of society
- “Path in Trnava forest” (author Tomáš Tvaroška), captured in Kamennýmlyn, Trnava, Slovakia, showing a sustainable land use concerning a greenfield, in particular a forest open to human interaction.

All of the photos are visible at the webpage: www.lumatproject.eu/photocontest and listed in miniatures in the following pages.

PHOTO CREDIT

MENTION	1.	Boštjan Cotič	It all looks good from the above	
	2.	Tomáš Tvaroška	Forest and small river - Kamenný Mlyn	
	3.	Tomáš Tvaroška	Playground - Kamenný Mlyn	
	4.	Tomáš Tvaroška	Amphitheater - Kamenný Mlyn	
	5.	Tomáš Tvaroška	Trnava lake	
MENTION	6.	Tomáš Tvaroška	Path in Trnava forest	
	7.	Tomáš Tvaroška	Forest, path and small river - Kamenný Mlyn	
SECOND PRIZE	8.	Tomáš Tvaroška	Forest and playground - Kamenný Mlyn	
	9.	Tomáš Tvaroška	Playground in the forest - Kamenný Mlyn	
	10.	Tomáš Tvaroška	Forest playground - Kamenný Mlyn	
	11.	Tomáš Tvaroška	Place for seating - Kamenný Mlyn	
	12.	Marta Fudala	Towards urban green areas	
	13.	Marta Fudala	Focused on citizenz	
	14.	Lucio Beltrami	X	
	15.	Lucio Beltrami	Mirror mirror	
	16.	Lucio Beltrami	Home on the Delta	
	FIRST PRIZE	17.	Lucio Beltrami	Dotted line
		18.	Lucio Beltrami	Ladybug
		19.	Lucio Beltrami	Slash
		20.	Lucio Beltrami	Towers
21.		Lucio Beltrami	Needle	
22.		Lucio Beltrami	Peekaboo	
23.		Lucio Beltrami	Horizontal lines	
24.		Elena Masala	Project building	
25.		Elena Masala	Green tube	
26.		Elena Masala	Dreaming Sustainable Places	
27.		Matteo Tabasso	Growing with/in the nature	
28.		Matteo Tabasso	Memories	
29.	Miroslav Beňák	“X” Roof in the train depot		
30.	Miroslav Beňák	“Illegal skatepark” in the train depot		
31.	Miroslav Beňák	The wavy roof in the train depot		
THIRD PRIZE	32.	Miroslav Beňák	Palffy´s chemical factory in Horné Orešany	
	33.	Miroslav Beňák	Hall of distillery of Palffy´s chemical factory	
	34.	Miroslav Beňák	Steam Mill in Trnava	
	35.	Miroslav Beňák	Water reservoir in sugar refinery in Trnava	
	36.	Miroslav Beňák	Details of sugar refinery	
	37.	Miroslav Beňák	Perspective with riveted columns	
	38.	Miroslav Beňák	Windows in the main hall	

1. MENTION



2.



3.



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5.



6. MENTION



7.



8.



9.



10.



17. FIRST PRIZE



18.



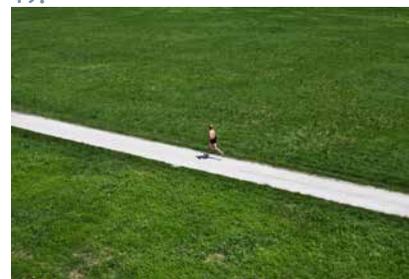
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13. SECOND PRIZE



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32. THIRD PRIZE



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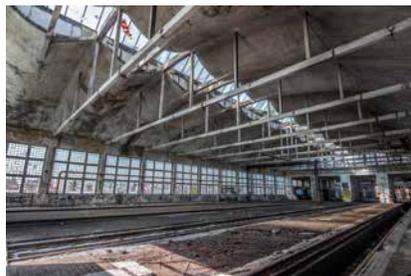
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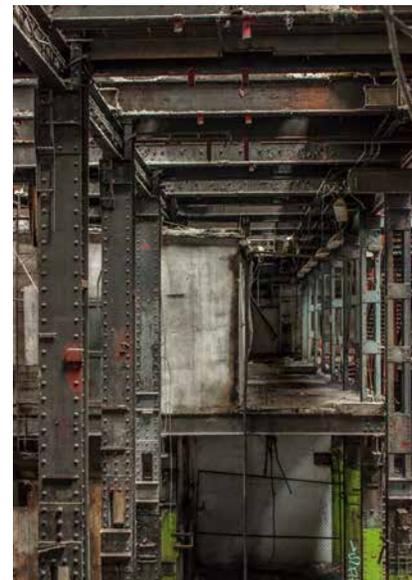
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6



CONCLUSIONS

CONCLUSIONS

The main aim of the project was to respond and contribute to solving urban land management problems visible in growing negative phenomena such as urban sprawl, soil sealing, still existing brownfields and climate change threats, as a consequence of all above-mentioned problems.

The LUMAT project has indicated how to make some steps forward to get closer to achieve the objectives included in the EU strategic documents concerning “**zero land take until 2050**”.

LUMAT has also contributed to better understanding and perceiving land and soil as environmental resources, to be protected and managed in a sustainable way. Especially land is a limited resource in urban areas where all development objectives have to be achieved, and all the tasks implemented in a limited territory. The LUMAT results show the ways to manage, what methods and tools are useful and how they can be used.

The main LUMAT’s purpose is the **integration of environmental methods and tools** referred to land as a resource with the land use management and planning in FUAs. It was an answer to the priority concerning environmental resources in general. However, it should be stressed that another effect of the project has very clearly appeared, which is a **significant contribution to the climate change adaptation** methods and activities. It can be compared to a climate interactive approach which is using term of “multi-solving”¹, when people pool expertise, funding, and political will to solve multiple problems with a single investment of time and money. It is an approach with great relevance in this era of complex, interlinked, social and environmental challenges.

¹ https://ssir.org/articles/entry/the_magic_of_multisolving.

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ISBN 978-88-941765-5-1



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