

Improvements in trainings and teaching assuring sustainable GI development and ESS provision

Output T4.1.2

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This output was prepared in the frame of:

The LUIGI project

The Interreg Alpine space project LUIGI (Linking Urban and Inner-Alpine Green Infrastructure - Multifunctional Ecosystem Services for more liveable territories) brings together 14 partner institutions and 26 observers from Austria, France, Germany, Italy, Slovenia, and Switzerland with the aim of strengthening the link between mountain ecosystems and urban centres at the foot of the Alps through sound economic and social exchanges.

By recognising the pressures on Alpine ecosystems and the services they deliver to wider areas beyond mountain regions, the project aims to strengthen the link between mountain ecosystems and urban centres at the foot of the Alps. The project's objective is to recognise and valorise the joint benefits of a GI network between mountain/rural and urban areas, as well as their potential for sustainable economic development based on natural resources and ecosystem services, ensuring a higher quality of life and better urban environments for people living in urban centres.

Work Package 4 of the LUIGI project focuses on knowledge transfer for sustainable management of green infrastructure elements in LUIGI model regions, leveraging knowledge from the Alpine region and beyond. It offers an overview of present status and tools and recommendations for improvements.

Output summary

This output brings insights of present status of GI-related knowledge pools and transfer in project pilot regions as well as recommendations for specific enhancement. It builds on previous reports (Hladnik et al. 2020; Cvelbar Weber et al. 2022), and all knowledge and insights collected in the frame of the LUIGI Interreg Alpine Space project.

The report has a general part and part specific to LUIGI pilot regions. In last short reports of the LUIGI educational modules implementation in pilot regions are presented as case studies, showing where and why additional knowledge is needed and what was achieved with implementation.

Provided information can be important support for decision and policy making on regional, national and international levels regarding GI-knowledge based support of GI sustainability. Additionally insights can be used for design of targeted and complementary courses on the GI-related topics.

The scope of the document

The knowledge is the most important tool for any decision making and quality management measures. Therefore, enhanced GI-related knowledge availability is a key investment into sustainability of present and future GI elements and development of Ecosystem services.

The aim of this output is to present insights into possible improvements of knowledge accumulation and transfer on the concrete examples from different knowledge segments in different Alpine-space regions. Special emphasis of the output is on cross-sectoral exchange of knowledge in the education and in the practice.

The secondary aim is to raise awareness on the importance of good GI-related knowledge transfer among national and regional decision-makers. Derived policies are setting the stage for development of GI and all related activities.

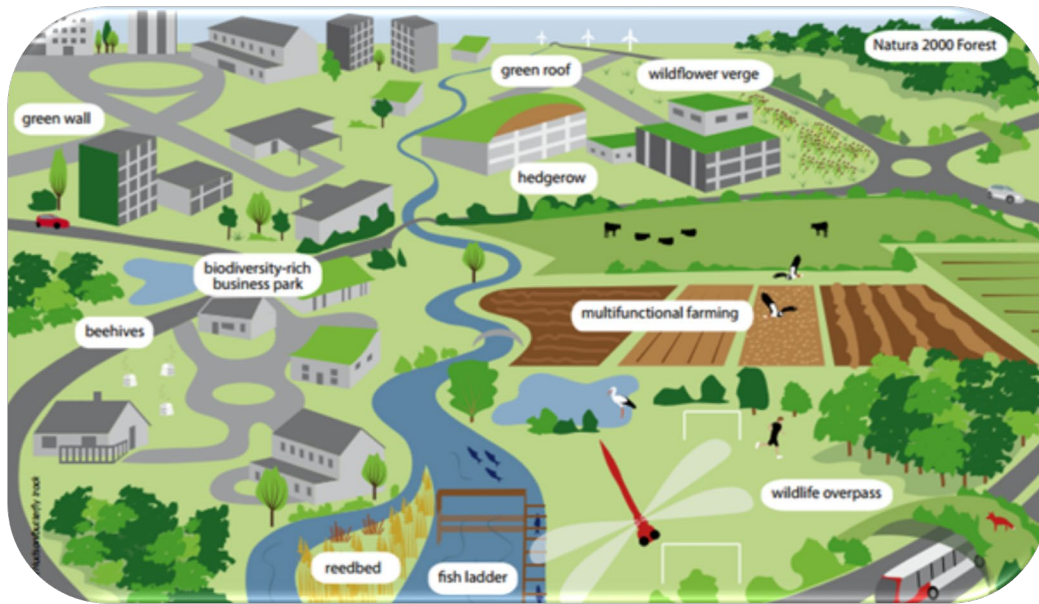
The document is to be used by local, regional and international decision-makers on the topics like education, sustainable development and human wellbeing. Similarly, it can be used by educational and knowledge providing institutions who want to enhance their impact on sustainable GI development by providing relevant and usefully packaged teaching and training opportunities.

What is green infrastructure (GI)?

Since there is no widely recognised definition of Green infrastructure GI in the scientific community, we decided to adopt the EU definition and approach within the LUIGI project. According to the European commission, a Green infrastructure is a strategically planned network of natural and semi-natural areas with other environmental features that are designed and managed to deliver a wide range of ecosystem services such as water purification, air quality, recreational space, and climate mitigation and adaptation (COM/2013/0249). It incorporates green spaces (or blue space in the case of aquatic ecosystems) and other physical features in terrestrial (including coastal) and marine areas. On land, GI is present in both rural and urban settings. It also supports a green economy, creates job opportunities and enables landscapes to recover from biodiversity losses due to environmental and human made disasters.

Green Infrastructure can provide both socio-economic and conservation benefits at different scales – from local or regional (e.g. wildlife overpasses, migratory corridors, floodplains) to continental (e.g. Pan-European Ecological Network). It is made up of a variety of natural and artificial elements at different scales, from protected core areas to sustainably used buffer zones and green urban and peri-urban spaces (CEEweb).

GI can help us reduce our dependence on 'grey' infrastructure, which is often more expensive to build and maintain for the same function. Grey infrastructure, such as water and wastewater treatment plants, pipelines, and reservoirs, is human-engineered infrastructure that can damage the environment and biodiversity.



A schematic presentation of Green infrastructure elements in the landscape.

(European Commission, 2013)

The concept of ecosystem services (ESS) is often used to describe the importance of GI. Humans benefit from ecosystems in terms of environmental, social, and economic benefits (MEA, 2005). Humans depend on these services, but the valuation of these life-supporting services is a challenging task. However, only healthy and functioning ecosystems can sustainably provide these services. There are multiple ways to classify, measure, and assess ecosystem services, as described in the LUI-GI report by Giombini and Egarter Vigl (2020; WP1.1.1A).

Output introduction

Knowledge is a ground setting asset for daily work and decision-making in any working field. This is especially true in the complex subject like Green infrastructure (GI). However, GI has a broad and important influence on our living through a diverse set of Ecosystem services (ESS). For further details on GI and ESS see the LUIGI report “Green Infrastructure for the Alpine Space” by Giombini et al. (2020).

In this output, we focus on GI-related knowledge transfer in nine LUIGI project pilot regions. We explore the current status of the supply and demand and suggest where and how they could be matched and knowledge transfer enhanced in order to improve all aspects of GI governance.

The LUIGI approach

The LUIGI project recognised the importance of the GI-related knowledge for the sustainability of GI elements in landscapes already in the phase of preparation, so one work package was dedicated to exploration and improvement of knowledge transfer. As stated by Tayouga and Gafne (2016) “education is the most important factor influencing the adoption of GI”. It influences GIs in aspects like:

- Planning and establishment of new GI elements in the landscape,
- Connectivity between these GI elements that influence ESS provision beyond limits of their area,
- Quality of GI management and thereby relationship within and the cumulative amount of different ESS,
- Transfer of ESS to areas with deficit and value chains creation,
- Utilisation of ESS and thereby eligibility of GIs from an economic perspective,
- Public perception of GI and society engagement with GI,
- Policy creation and decision making related to GI.

The work on knowledge transfer within the LUIGI project focused on nine project pilot regions and their specific needs and was divided into four activities:

- An exploration of present GI-related knowledge pools and transfer within project pilot regions. The report was prepared by surveying knowledge-providing institutions, teaching and training modules they provide and defining present and target knowledge end-users (Hladnik et al. 2020a).
- Preparation of four training modules that can be executed independently, in a series or as an enhancement of existing and future teaching and training:
 - Module 1: [Spatial planning related to Green Infrastructure](#) (Bertoncelj et al., 2020);
 - Module 2: [Management of Green Infrastructure elements](#) (Hladnik et al., 2020b);
 - Module 3: [Business models related to Green Infrastructure](#) (Rekič et al., 2020);
 - Module 4: [Use of Green Infrastructure products and society engagement](#) (Hladnik et al., 2020c).
- Executions of these four modules by LUIGI project partners and local experts. These events aim at enhancing regional knowledge pools and gathering feedback on the field. These ex-

periences are summed up in this report for a better understanding of local needs and possible future activities.

- This report on possible improvements of GI-related knowledge transfer in pilot regions.

This report further elaborates on information provided in the report of Hladnik et al. (2020a) and with the integration of knowledge and insights gathered in the frame of the LUGI project suggests possible enhancements in the GI-related knowledge transfer.

Perception of the GI concept

In the course of this and previous projects, LUGI project partners found that the concept of Green infrastructure is not sufficiently known among the general public as well as within expert groups, which confirm observations by Venkataramanan et al. (2020). Also, most of in the previous report identified GI-related knowledge teaching and training does not use the term Green infrastructure but rather other, related terms. However, terminology on its own is not the main issue, but rather the lack of understanding of what the concept GI is trying to convey. The proposed term Green infrastructure (GI) as used in the EU legislation is assuming a holistic governance approach of heterogeneous landscapes taking into the consideration a wide range of ESS. The differences in the terminology are arising from different approaches of diverse sectors involved in GI planning, management and utilisation. However, common language and enhancement of cross-sectoral cooperation would greatly enhance GI perception, maintenance and sustainability, especially in the light of adaptation to climate change (Matthews et al. 2015; Johnson et al. 2019). Closer interdisciplinary cooperation between academics, as well as between academics and practitioners, can help to find new approaches to urban landscapes (Marino and Lapintie 2017). Additionally, Ugolini et al. (2015) propose that cross-sectoral networking and utilisation of modern information technologies (IKT) in GI-related knowledge transfer offer big reserves and possible enhancements.

In the frame of the LUGI project, the massive open online course was realised (Micol et al., 2020) to make accumulated knowledge broadly available.

Community engagement







Knowledge transfer in the official educational system targets mainly present and future experts and decision-makers. However, awareness rising and society participatory engagement activities are very important for the sustainability of GI and ESS provision. Alexander et al. (2013) stress the importance of the inclusion of interested professionals and researchers in the planning of GI and more generally any landscape planning. Programs for practical education of communities on green infrastructure have shown an important increase of environmental awareness in the general public (Hosterler et al. 2008). On the other hand, enhanced attention to human dimensions will improve green infrastructure design and its uptake by the communities (Venkataramanan et al., 2020). Broader society can be informed and engaged in the process of planning, construction, maintenance and utilization of GI landscape elements as well as in different value chains described in the LUGI module “Business models related to Green Infrastructure” (Rekič et al., 2020).

GI-related knowledge segments

Within the LUIGI project, GI-related knowledge was grouped into six segments presented on the next page. The six GI-related knowledge segments are often perceived as separate due to different domain sectors they are addressed at and therefore often only partially address the GI as a complex and heterogeneous system.

Connecting these segments would bring great improvements in the overall GI-related knowledge pool and awareness as well as in GI governance, management and sustainability. For example, future landscape planners are empowered with relevant landscape planning techniques (1). They usually get insights into ecological aspects (5) and policies that regulate the field of landscape planning (6). However adding some knowledge on GI maintenance measures (2), related value chains (3) and possibilities for society engagement (4) would enhance the sustainability of GI and level of ESS provision. Also, Frank et al. (2021) have concluded that systematic inclusion of GI knowledge into initial landscape planning education is needed for effective GI implementation. A similar positive effect can be expected from such a cross-sectoral approach in other knowledge segment education.

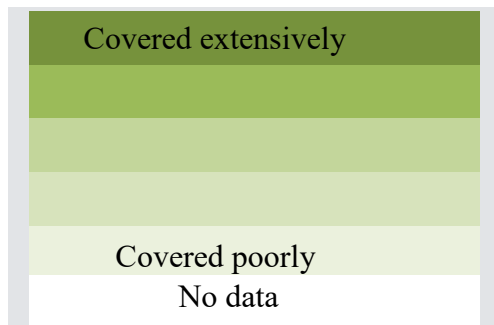
For ease of evaluation and cross-comparison of regions and educational institutions GI-related knowledge was divided into six segments:

	<p>1 – Landscape planning for GI</p> <p>These are topics covering landscape planning and placement of GI elements. These topics are also covered in the first LUIGI educational module: Spatial planning related to Green Infrastructure (Bertoncelj et al., 2020; LUIGI deliverable T.4.2.1).</p>
	<p>2 – Practical GI management</p> <p>These are topics about practical measures performed in a GI element, production of provisioning ESS and management of the GI elements present in the landscape. The goal is to maintain GI and enhance overall ESS provision. These topics are also covered in the second LUIGI module: Management of Green Infrastructure elements (Hladnik et al., 2020b; LUIGI deliverable WP4.2.2).</p>
	<p>3 – Business models related to GI</p> <p>These are topics about GI ESSs and output utilisation and value chain creation. Marketing and processing of GI products, tourism and other transfer of value from GI to society.</p> <p>These topics are covered in the third LUIGI module: Business models related to Green Infrastructure (Rekič et al., 2020; LUIGI deliverable P4.2.3).</p>
	<p>4 – Use of GI products and society engagement</p> <p>These topics include all activities where society can be included from planning, management to utilisation of product, promotion and awareness-raising. These topics are covered in the fourth LUIGI module: Use of Green Infrastructure products and society engagement (Hladnik et al., 2020c; LUIGI deliverable WP4.2.4).</p>
	<p>5 – Environmental importance of GIs</p> <p>These are topics covering environmental importance and ecological aspects of GI. These are general topics more readily available in present training and teaching while not always connected to the concept of GI and ESS.</p>
	<p>6 – Policy related to GIs</p> <p>These are topics covering governance, policy, legislation and general decision-making related to GI. These topics are a framework for the generation, transfer and implementation of knowledge from other segments.</p>

Knowledge status traffic light

In the description of pilot regions, a quick overview using knowledge segment symbols with coloured background is presented.

The green colour scale is used to represent the current status of knowledge transfer. The darker background is used for segments with more intensive knowledge transfer.



The red colour scale is used to represent where the focus of the work in the future should be put. Darker are knowledge segments where more work is recommended to enhance GI sustainability and ESS provision.





Reports of project regions

Following pages are representing reports about individual knowledge transfer events in the LUIGI pilot regions, which had been summarised in Report D.T4.4.1 Courses on sustainable GIs management and ESS enhancement. Based on partner's 22 reports we gathered and outlined possible improvements of GI-related knowledge transfer in specific project pilot region. Additionally, results of execution of LUIGI educational modules and other LUIGI project activities in the region are presented.

Central Area of Salzburg, Austria

In the LUIGI project region Central Area of Salzburg, seven educational institutions were identified as important GI-related knowledge providers. These comprise four higher schools specialised in agriculture, Paris-Lodron University, Rural training institute and the Salzburg association for fruit growing and horticulture. Most educational modules these institutions provide are covering the processing and marketing of the GI elements as well as GI management. Topics of landscape planning and society engagement is covered at leaser extend (to a lesser extent?) on/ in these institutions. Paris-Lodron University is a general university situated in the city of Salzburg and is offering a thorough education on ecological aspects of the GI. Other lectures related to GI planning, management, utilisation as well as ecology and policies related to GI are offered in their education program. However, this knowledge is scattered among different lectures and lack common concept of GI.

Salzburg regional association for fruit growing and horticulture is organising different courses, workshops, practical and on-field training and public events related to GI – especially on orchard meadows.

Educational institutions and local associations belong to the most important target groups and pass on their knowledge to students, general public, (hobby) farmers and processors. Their common point is their influence on the knowledge pool among their members and stakeholders.

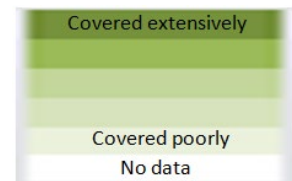
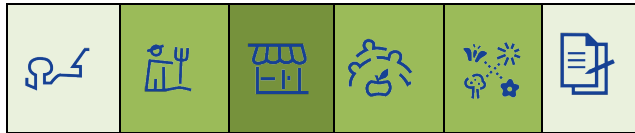
From the provided information we can conclude there is the highest demand on and provision of topics related to the GI-product processing and marketing, GI management (i.e. maintenance of orchard meadows) and the environmental importance of orchard meadows.

A general recommendation for enhancement of positive impact of GI-related knowledge transfer could be inclusion of other segments of GI-related knowledge to present knowledge transfer pathways. Integration and information of society about policy and governance would enhance integration of GI into the landscape and guarantee higher society acceptance.

The LUIGI pilot region Salzburg has already implemented multiple initiatives to preserve and enhance the knowledge of GI management, especially for orchard meadows. However, this is and will be a big challenge due to demography. The major interest group is ageing while the younger generation is often kept from preserving orchard meadows due to economic restraints despite great efforts by different local actors to support added value. Thus, it is of high importance to include GI management and environmental importance of GI in the curriculum of educational institutions to emphasize the added value of these GI elements.

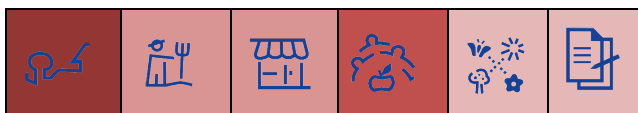
Knowledge transfer status and outlook

Current state of GI-related knowledge transfer



In the LUIGI pilot region Central Area of Salzburg considerable knowledge transfer in the segment of GI-related business models was identified. Segments of GI management, use of GI products and society engagement and environmental aspects of GI are covered in moderately. Segments of GI-related landscape planning and GI-related policies are covered poorly.

Recommendations for enhancement



Training courses on GI product utilisation are offered to a satisfying level. The biggest discrepancy between current knowledge transfer and demand for knowledge in the region is in the segment of landscape planning. A further increase is needed in the knowledge segment of society participatory engagement, environmental aspects and integration into spatial planning. Other segments seem to be balanced.

LUIGI module executions

On the 6th of November 2021 the LUIGI module on the use of GI products and society engagement was executed in the frame of a conference organised by the Agricultural Chamber Salzburg and the Salzburg association for fruit growing and horticulture. Organisers and participants acknowledged the need for additional dissemination of the importance and speciality of orchard meadows for the sustainability of local GI landscape elements/ to the broad public.



South Burgenland, Austria

In the LUIGI project pilot region Burgenland, 28 educational institutions providing knowledge related to GI were identified. The majority of these institutions are part of higher education where most knowledge is provided to the future decision-makers and practitioners on local GI elements. However, an important institution for knowledge transfer in this region is also the agricultural chamber which is with cooperation with other associations providing knowledge to people working with or on concrete local GI elements.

The majority of identified GI-related educational modules were covering agricultural production, which is the most tangible ESS of local GI. Landscape planning is mostly covered by the University of Natural Resources and Life Science Vienna (BOKU), while GI-products value chain generation and is mainly covered by higher schools and the Agricultural chamber.

Departments for Infrastructure and Landscape planning of the BOKU is providing most of landscape planning knowledge available in the region. To enhance its positive effect they should be encouraged to integrate more information on GI management and business model creation as well as participatory engagement of society. Their students could also be encouraged to attend relevant courses of other departments to consolidate their knowledge on GI. This would enhance the sustainability of planned and integrated GI elements.

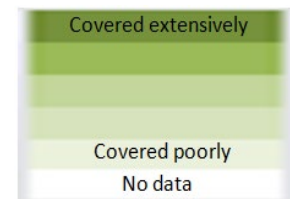
Identified courses on higher schools are mostly covering the knowledge segment of GI management and a bit less GI-product utilisation and ecological aspects of GI elements. Adding more knowledge on society engagement and integration of GI into landscapes would enhance positive perception of GI elements and enhance ESS provision.

The majority of identified relevant knowledge end-users are from the economy and marketing sector since the focus of the pilot region is in enhancing the economic foundation for local GI. These are farmers/landowners, owning GI elements, but also businesses and local markets providing value chain from GI to customers. The goal of the Regional management Burgenland is to enhance the GI-products value chain and thereby improve the sustainability of local GI elements. Important roles are playing also local nature parks and sectoral agencies that are supporting local landscape development.

Some discrepancy between provided knowledge and interest of identified GI-related knowledge end-users can be noted since GI-related landscape planning and ecological topics are fairly covered while identified groups are interested in topics of GI management and utilisation.

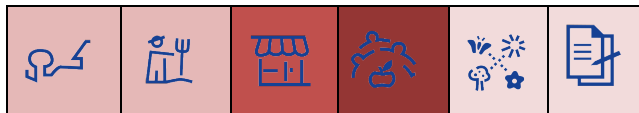
Knowledge transfer status and outlook

Current state of GI-related knowledge transfer coverage



In the project pilot region Burgenland GI management knowledge segment is most extensively covered. Some less is covered the segment of GI ecological importance. Segments of GI planning and business models are covered moderately, while GI products utilisation and society participatory engagement is covered poorly. Knowledge transfer on GI-related policies was not detected in this research.

Recommendations for enhancement in the knowledge segments



In this region big need and demand for knowledge on the topic of GI products use and society participatory engagement was detected. Knowledge on GI business models and value chains generation should also be enhanced to meet the demand in the region. Knowledge transfer in other segments seems to be more balanced with landscape planning and GI management being a bit more important.

LUGI module executions

On Saturday the 23th of November 2021 a workshop for trimming old orchard trees and mistletoes took place in the nature park Weinidylle as part of the project LUGI. 16 very interested participants learned about the meaning of orchard meadows and old trees varieties as they are hotspots for biodiversity and acquired skills to care for the trees in their orchards.



On 4th of April 2022 there was a meeting with 6 participants in the Nature Park "Geschriebenstein" in Burgenland. The aim of the meeting was to develop a business model that would contribute to the preservation of orchards. The idea was to build a mobile juice presser that is used to increase the attractiveness of the orchards among the population. Companies are to be approached with sponsorships linked to individual labels.



Metropolitan city of Milano, Italy

In the LUIGI project pilot region Metropolitan city of Milano, 34 educational institutions were identified to have an important role in the GI-related knowledge transfer (Hladnik et al., 2020). The majority of these institutions are universities with their departments. Universities are covering all six segments of GI-related knowledge (Landscape planning, Management, Business, Engagement, Environment and Policy), but strong separation among segments can be noticed. None of the studies is offering the entire spectre of GI-related knowledge and often are used other expressions and concepts instead of GI and ESS.

Four agricultural secondary schools in this pilot region are providing knowledge on GI management and utilisation of GI products and services with the addition of ecological and policy aspects of GIs. Less information is provided on society participatory engagement possibilities, while landscape planning and GI connectivity aspects does not seem to be addressed in these secondary schools.

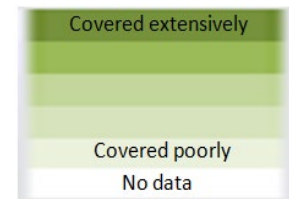
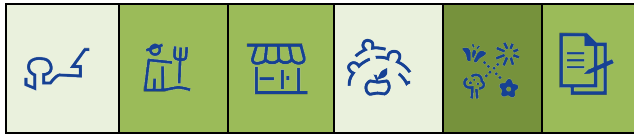
Knowledge on GI management in the Metropolitan city of Milano region is provided also through educational farms, farmers associations and cooperatives and regional agency for nature protection (i.e. ARPA). The ecological aspect of GI and applied measures is ordinary stressed in provided courses.

In the Metropolitan city of Milano heterogeneous GI-related knowledge end-users were identified (Hladnik et al., 2020). Farmers and their associations, local, regional and park administrations, non-governmental organisations, journals representatives and other associations of experts who are working on fields related to GI.

Considerable interest for society participatory engagement knowledge was noted with a larger number of stakeholders. According to this information high deficit in knowledge transfer of this segment can be assumed. Educational farms, nature park administration and NGOs could play a crucial role in filling up this gap.

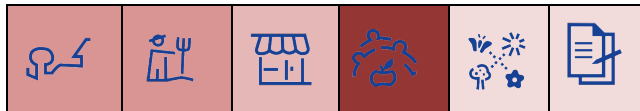
Knowledge transfer status and outlook

Current state of GI-related knowledge transfer coverage



In the project pilot region Metropolitan city of Milano most extensively knowledge is transferred in the segment of ecological aspects of GI. Quite substantial is the knowledge transfer also in segments of GI management, possible business models and policies related to GI. Segments of GI-related landscape planning and use of GI products and society participatory engagement are covered poorly.

Recommendations for enhancement in the knowledge segments



According to collected information on knowledge provision and demand, the largest improvements are needed in the segment of use of GI products and society participatory engagement. Further enhancements are needed in knowledge segments of GI-related landscape planning and GI management and also GI-related business models.

LUIGI module executions

In the frame of the LUIGI project, the module on business models related to GI was executed as an online event for the wider public on 13th of July. Knowledge about the economic evaluation of ESS and value chain generation was presented to the participant. In following session concrete examples were shown on how to maximize efforts and capital flows towards local GIs by implementing the concept of Integrated Territorial Investments (ITI). The event had 24 participants.



Metropolitan City of Torino, Italy

In the LUIGI project region Metropolitan city Torino 16 educational institutions were identified to have an important influence on the GI-related knowledge transfer. The majority of these institutions are local and regional higher secondary schools who are providing knowledge to students in the area of their operation. Three institutions offer GI-related knowledge on university level of education in order to train experts and professionals in the fields of land planning, rural and forest land management, biodiversity, natural capital and hydrogeological protection.

At the regional level two public administrations are actively engaged in the development of local GI elements and enhancement of ESS the Piedmont Region and the Metropolitan city of Torino.

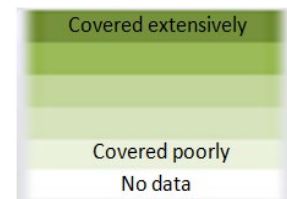
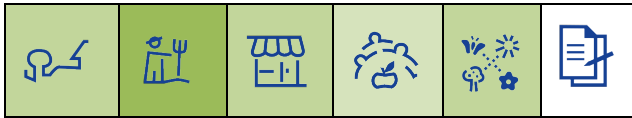
Most of the identified GI-related educational modules, as well as the recommendations of the regional and metropolitan territorial plans are dealing with ecological and landscape planning aspects of GI elements. An important topic is also the use of GI to mitigate climate change effects and to enhance a more sustainable land management, also with a participatory engagement.

The priority knowledge end-users identified were municipalities in the Piedmont region who use GI-related knowledge for their daily decision-making tasks. They are primarily interested in landscape planning and GI management topics. Other institutions were NGOs, a Local Tourist Organisation and a Local Action Group whose interest was focusing predominantly on participatory society engagement.

According to collected information, more knowledge transfer on engaging participatory education related to GI benefits and ecosystem services is needed.

Knowledge transfer status and outlook

Current state of GI-related knowledge transfer coverage



In the metropolitan region of Torino according to the collected information highest knowledge transfer is related to the policies, legislations and general decision-making related to GI and to the training and teaching covering environmental importance and ecological aspects of GI. The knowledge transfer in the segment of GI landscape planning, GI practical management is covered poorly, as well the use of GI products and society engagement. No information is available on business models related to GI has

Recommendations for enhancement in the knowledge segments



In this pilot region highest need for improvement of knowledge availability and transfer was detected in the segment of GI landscape planning as well as in the product use and society engagement. Moderate improvements are needed also in the segments of GI management while in other two segments, policy related to GI and environmental importance of GIs only slight enhancements are needed to meet the present demand.

LUIGI module executions

In the frame of the LUIGI project the module on Landscape planning was executed on 3rd of November 2021 as an in presence event. There were 15 participants who received useful information about the benefits of GI and ESS for the community. Received knowledge is very useful for administrators to be able to support decision making on how to manage and use lakes area in a sustainable way, for example by adopting an approach that distinguished the consumption of natural recourses. This derives from purely economic purpose, from their use, which instead take place bearing in mind that the territory has to be used in a way that safeguards its liveability and ability to maintain and reproduce not only natural but also cultural and landscape resources.



South Tyrol, Italy

In the LUIGI project pilot region of South Tyrol, eight institutions were identified to have high influence on the GI-related knowledge transfer (Hladnik et al., 2020). Considerable coverage of landscape planning and ecological aspects of GI in knowledge transfer was identified in the pilot region Province of Bolzano. Studies at five higher schools are covering landscape planning where GI is conceptualised and placed in the landscape, but other related expressions are used instead. Broadening the provided GI-related information with knowledge on ESS provision and sustainable management practices will benefit the sustainability of local GI elements. Knowledge on possible GI-related business models and society participatory engagement could increase awareness and enhance the probability of GI being preferred to grey infrastructures in competition for available areas.

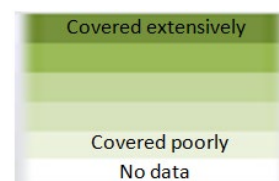
The Free University of Bozen is offering three courses covering some topics of GI management: “sustainable mountain agriculture and development”, “sustainable development of mountain areas” and “mountain agriculture”. The term ESS and its importance is often mentioned and discussed within these courses, while the GI concept is not as commonly used and thought to students, and there is a potential for improvement.

The NGO KlimaHaus and the local order of architects are promoting GI like vertical gardens and green roofs among professionals in the urban areas. Additional stress on sustainable management, possible business models and participatory engagement knowledge may enhance the quantity and quality of ESS provided by these urban GI elements.

Most of the identified knowledge end-users were different associations predominantly expressing interest in GI management, utilisation of GI products and society participatory engagement. The knowledge supply and demand seem to be balanced in this region. However, additional spreading of GI and ESS concepts understanding and cross-sectoral cooperation could enhance GI sustainability and ESS provision.

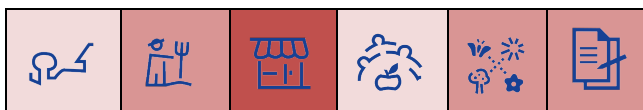
Knowledge transfer status and outlook

Current state of GI-related knowledge transfer coverage



In the project pilot region of South Tyrol, the highest knowledge transfer is represented by the segment of GI-related landscape planning. GI management and society participatory engagement are less covered. The knowledge segment of possible GI-related business models is moderately covered, whereas the segment of environmental aspects of GI is only poorly covered. For policies related to GI no data was provided.

Recommendations for enhancement in the knowledge segments



In this region, highest demand for knowledge was detected in the segment of businesses related to GI where extensive enhancements are suggested. Improvements in knowledge transfer are recommended also in segments of GI management, use of GI products and participatory engagement and policies related to GI.

LUIGI module executions

In the frame of the LUIGI project, the modules on the topics of spatial planning, society engagement and business related to GI modules were executed. Regarding the situation, all three events were held on line as e-learning courses.

Spatial planning related to GI course is available on line (<https://e-learning.eurac.edu/it/>) from January 2022. Target groups are mainly higher school students; however the course could be of interest also to university students in the field of landscape planning, mapping, nature conservation, landscape ecology, rural development and other related subjects. The courses give comprehensive and straightforward introduction and overview about GI and ES. Interactive e-learning course is a composition of five lessons.



Business planning related to GI course available on line (<https://e-learning.eurac.edu/it/>) from January 2022. Target groups are mainly higher school students; however the course could be of interest also to university students in the field of landscape planning, mapping, nature conservation, landscape ecology, rural development and other related subjects. The course provides an insight into the meaning of business models related to GI and explains why preferring green infrastructure to grey infrastructure could be economically profitable. The course explains the idea of pro-biodiversity business and on how protecting biodiversity and posturing the conservation of natural habitats can be integrated into business activities and turn into financially profitable opportunities.





Improvements in trainings and teaching assuring sustainable GI development and ESS provision

Society engagement related to GI course was held hybrid in EURAC research headquarter on 5th of November 2021. Target groups were the general public such as citizens and owners of orchard meadows, institutional representatives of the municipalities in the province of Bolzano. The aim of the event was to involve major regional stakeholders and citizens to raise awareness on the importance of orchard meadows as GI elements and ES providers.



European metropolitan region Munich, Germany

In the LUIGI project pilot Metropolitan region Munich, twelve organisations were identified to have an important influence on GI-related knowledge transfer (Hladnik et al., 2020). Most of these institutions are different associations of experts and people interested in GI-related topics. The majority of identified educational modules these institutions provide were covering GI management, ecological aspects of GI elements and landscape planning.

HSWT and TUM are covering a broad spectrum of GI-related knowledge. Further integration of policies related to GI management and systematic introduction of GI concept would enhance positive influence on local GI elements. In addition to regular studies, they could offer their GI-related knowledge in form of dedicated courses to local decision-makers and thereby indirectly improve GI planning, management, utilisation, and public perception.

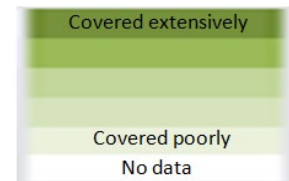
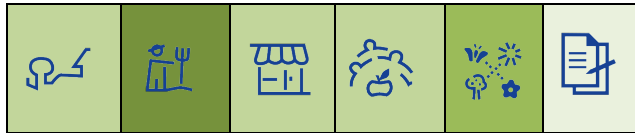
VhT, DWT and DEULA are offering an adult education on different segments of GI-related education, mainly ecological aspects of GI elements and management. In addition, different associations are offering knowledge on GI management and other GI-related topics in accordance with their interests.

A State Nature Protection Associations (BNKR and Obershof) conducts regular training, workshops and excursions on topics of management and ecology of GI for all age and background groups. Integration of landscape planning, business and society engagement topics into their knowledge transfer would enhance their positive influence on local GI sustainability and ESS provision.

Identified knowledge end-users are to a considerable extent providing knowledge further to their students and local stakeholders. This also displays the need for knowledge exchange among different education institutions and cross-sectoral knowledge exchange.

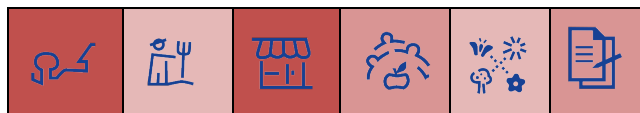
Knowledge transfer status and outlook

Current state of GI-related knowledge transfer coverage



In the pilot region Metropolitan region of Munich highest knowledge transfer related to the GI is in the segment of GI management. Intensive is also the knowledge transfer in the segment of the environmental importance of GI. The segment of policies related to GI is covered poorly.

Recommendations for enhancement in the knowledge segments



According to available information, highest enhancements are needed in segments of GI-related landscape planning and business models related to GI knowledge segments. Considerable enhancements are recommended also in segments of GI products use and society engagement and policies related to GI and some less for segment GI management and environmental aspects of GI.

LUIGI module executions

In the LUIGI pilot region European Metropole Region of Munich (EMM) the focus was set on the enhancement of Landscape planning of GI elements knowledge segment. Therefore, the execution of the module on landscape planning was executed as an enhancement of the subject titled "Development of a transnational green infrastructure in the Alpine region" at the Technical University of Munich. Students from the MSc program gained a better understanding of GI in particular orchard meadows and their importance in ESS provision. They felt encouraged, empowered with knowledge on GI, and suggested participatory strategies for a better GI management.



In the second implementation of the segment "Social event" a cooking event in autumn 2021 (16th of September 2021) has been organized with the goal to share knowledge about traditional food preparation using local fruit. The target group for this event were media representatives, in order to act as multipliers for the production and exploitation of orchard meadow crops. Experts from the cultivation field of fruit science gave the media representatives a variety of background information on the traditional form of cultivation and on the challenges for the farmers and the processors. In the summary 21 people attended the event.



Goriška statistic region, Slovenia

In the LUIGI project region Goriška statistical region, 32 educational institutions providing GI-related teaching and training were identified (Hladnik et al. 2020). These institutions were predominantly different associations, universities and secondary schools. From the associations the highest impact can be credited to the Agricultural chamber of Slovenia (KGZS) with its local office in Nova Gorica, with a variety of courses and practical knowledge transfer by advisory service. The KGZS is supporting its members from the agricultural sector with the knowledge needed for their daily work. Mainly topics of GI management and utilisation of GI products are covered. The KGZS have an important influence on GI management in Slovenia, therefore integrating GI and ESS concepts and broadening the topics also to landscape planning, ecology and society engagement into their GI-related knowledge transfer efforts could have a great positive influence on GI.

In comparison to KGZS local fruit growers associations have a more direct influence on orchard meadow management – the GI element of interest in the region, so they shall be supported by the national and regional decision-makers by their efforts for acquiring and transferring knowledge.

Strokovno sadjarsko društvo Slovenije (SSDS) is a professionals and scientist oriented association of fruit growing experts. It is organising lectures and meetings with specific GI management topics and GI product exhibitions that are engaging the wider public. Adding more emphasis on ecological aspects and ESS provision will enhance positive ecological influence.

Higher secondary and university education in accordance with their programs and concrete lectures influence knowledge pools of all six knowledge segments. The Biotechnical faculty of University of Ljubljana is the most influential GI-related knowledge provider for the project region Goriška. GI-related knowledge is scattered across different departments, studies and courses. Systematic introduction of GI-concepts into courses and connecting information among different sectors will enhance positive GI perception and raise awareness of ESS they provide.

Upper secondary schools Biotehniški center Naklo and Kmetijska šola Grm are geographically not located in the project region Goriška but are influencing its knowledge pool. They are providing knowledge on GI management, utilisation, ecology as well as policy and the society engagement to their students and specific target group. As in other educational institutions concept of GI is not specifically presented although all six knowledge segments are covered. Adding some additional references to appropriate planning of GI for enhancement of ESS provision and biological connectivity as well as introducing GI concept and cross-sectoral exchange of information will improve the beneficial influence of these secondary schools.

The majority of identified GI-related educational modules were covering landscape planning, ecology and a bit less GI management, however, society engagement and GI-related business opportunities are covered in a much smaller extent. Knowledge about GI and ESS is scattered within different courses and trainings and the concept of green infrastructure is used in a very limited way.

As interested stakeholders for the GI-related knowledge were identified local organisations and associations who are responsible or interested in the development of the local environment, society and economy. These organisations like municipalities, tourist boards, sectoral agencies and farmer organ-



isations are passing this GI-related knowledge to their members and users and are thereby extending the knowledge transfer reach.

As mentioned we could notice a deficit in knowledge transfer on the topics of GI-related business and society engagement opportunities. Enhancing these segments could significantly improve the sustainability and public perception of present and future GI-elements in this region. Private and public financing into the design, installation and maintenance of GI landscape elements is the decisive factor for quantity and quality of GI.

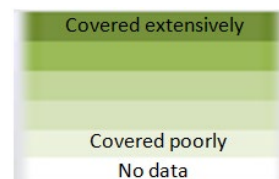
On the other hand, the landscape planning segment of GI-related knowledge seems to be covered sufficiently in the higher and university education. However, the question remains if this knowledge is effectively transferred to the decision-making on local and regional levels. Namely, we noticed a lack of overarching GI concept in the education on one hand, while on the other hand scattered responsibilities in local (green) infrastructure planning.

Knowledge transfer status and outlook

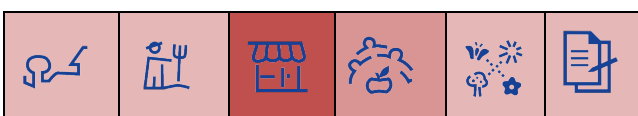
Current state of GI-related knowledge transfer



In the pilot Goriška statistical region, highest knowledge transfer is in the segment of GI management and some less in the landscape planning. Segments of GI environmental aspects and policies related to GI are covered moderately, while GI-related business models and the use of GI products are covered poorly.



Recommendations for enhancement



In this region highest positive impact on GI is expected to be reached by enhancement of knowledge transfer in the segment of GI-related business models. All other knowledge segments need further enhancement with some more highlights on the segment of use of GI products and society engagement.



LUIGI module executions

In the frame of the LUIGI project in the Goriška statistic region the biggest deficits was noted in the segment of GI utilisation knowledge segment. However, GI management knowledge is still widely available by the older generation but it does not jump over the generation gap to future users of GI. Therefore we executed following LUIGI [Modules](#).

Since the knowledge of proper GI management is most directly influencing the GI and ESS we have executed a theoretical lecture and a practical training with the representative of the Slovenian alliance of fruit-growing associations and leading expert for orchard meadows in Slovenia Janez Gačnik

On the 4th of March 2021 only limited number of interested people could participate in the demonstration of orchard meadows management measures in a meadow orchard in Orehek by Cerklje due to COVID-19 restrictions. The event was recorded and video was made available to the broader interested public afterwards.



On the 18th of March 2021 an online event on orchard management was executed. Mr. Gačnik has presented in a live lecture all important aspects of orchard meadows and what measures are needed for proper initiation, upbringing and management of them. Afterwards, the video the event from 4th March was presented. These two events have displayed a great interest of local people for practical knowledge and workshops on practical GI management measures.



On 29th of September 2021 an online lecture was organised on the topic of fruit processing. The topic was recognised as an important factor for society engagement with local GI, orchard meadows. Additionally, provided knowledge enhances preservation of GI and enhances local value chains. Knowledge provided by Zavod jabolko will enhance usage of lower quality fruits from local orchard meadows that would otherwise be wasted.



On the 2nd of October 2021 a traditional autumn market in Idrija (Jesenska tržnica) took place. With support of LUIGI project special focus was put on the local GI especially Orchard meadows and their products. Producers presented and gave to testing their fresh and processed products from local GI. An event attracted interest of wide public and raised awareness of importance of orchard meadows for local environment and society.



On the 13th of October 2021 an online lecture was organised on the topic of old, traditional and indigenous fruit cultivars in orchard meadows. It is an important knowledge for preserving traditional orchard meadows with its full ecological potential. We were happy to see there was substantial interest in this topic from orchard meadow owners as well as from general public.



To support GI utilisation and creation of new GI products value chains an online workshop “Developing business models from green infrastructure” was executed on 20th October 2021. We noticed that topic and execution of the event was really well accepted by stakeholders taking part on the event. But to attract individuals who most benefit from such workshop much direct communication and market research is needed by the organisers.



In spring 2022, on the 28th of April Goriška region made a video recipe. Video was targeting wider public and was recorded to show practical product preparation instructions for Pa-jtičke – regional specialty, the miniature version of the real savoury onion loaf, stuffed with onion and walnuts/ or dried fruit. Video was made with the aim to promote local products, local food from green infrastructure. The video is a good opportunity to raise awareness of the importance of orchard meadows and their ecological, economic, cultural, aesthetic and gastronomic value.



Canton of Grisons, Switzerland

In the LUIGI project pilot region Canton of Grisons research was focused on five nature parks as LUIGI implementation areas. There are 4 regional parks, a national park and a biosphere reserve in the canton of Graubünden. In the narrower perimeter of the LUIGI implementation areas, there are only one regional nature park and one national park, which is part of the UNESCO biosphere reserve Engiadina Val Müstair. Therefore, only 2 parks were included for the following analysis. Nine educational institutions were identified to have an important influence on the GI-related knowledge transfer in this area (Hladnik et al. 2020). Most of identified GI-related courses and training were covering landscape planning and management of GI.

FH Graubünden is an applied science university that is providing among others knowledge related to sustainable utilisation of GI. Business development topics and tourisms are most directly connected to GI elements in the landscape. Additional stress on topics of GI ecological importance and management within offered courses would enhance public perception and longevity of GI landscape elements.

KL Domelschg is an association and a museum in one. They are dedicated to the promotion of traditional culture landscapes preservation and thereby are promoting also sustainable management of local GI elements. With the integration of landscape planning and ecological importance of GI elements they would even enhance their positive influence on the GI sustainability.

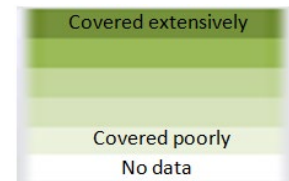
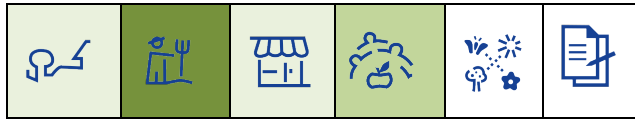
Adult education centres in the region are mainly covering GI management knowledge to interested people. It would be beneficial to fortify this knowledge transfer with GI landscape elements planning and interconnectivity as well as GI utilisation through different value chains

Nature parks (Beyerin and Swiss national), as well as enterprise Polo Pachiavo, are offering knowledge on GI management and ecological aspects to its visitor and organised groups. Additional stress on ESS provision and GI utilisation could additionally support the preservation of local cultural landscapes.

Identified knowledge end-users were from different sectors and were mostly interested in knowledge related to landscape planning and society engagement. According to provided information is in the Canton of Grisons the GI-related knowledge segment where most enhancements need to be done the landscape planning while knowledge on the GI element management is sufficiently covered.

Knowledge transfer status and outlook

Current state of GI-related knowledge transfer coverage



In the project pilot region Canton of Grisons highest emphasis is on the transfer of knowledge in the segment of GI management. A considerable amount of GI product usage and society engagement knowledge is available too. There is some knowledge on GI-related landscape planning and business models related to GI. There was provided no information of knowledge transfer of ecological importance of GI and policies related to GI.

Recommendations for enhancement in the knowledge segments



The highest enhancement in knowledge transfer is needed in the segment of GI-related landscape planning. Also for other segments considerable improvements are recommended except for the GI management where current knowledge provision seems to be sufficient.

LUIGI module executions

In accordance with above-listed information, LUIGI project partners' interest and available resources following LUIGI educational models were executed:

To enhance the accessibility of GI-management knowledge in the region Grisons one practical demonstration of tree pruning course was held on 13th of March 2021. The course was primarily advertised for land owners and farmers. The course was held by landscape gardener Thomas Kohl in a nearby orchard. Land owners received useful knowledge on origin of standard fruit trees, their ecology and various pruning techniques.



The sustainability of local GI elements can be greatly enhanced with proper utilisation. Good value chains also enhance positive public perception and improve political support. Two events were organized in the frame of Business model related to GI.

First event was a workshop held on 30th June 2021 in a hybrid way, with 12 participants. The existing ideas were compiled from all participants. Range of possible product developments was colourful and exclusive. Business planes were prioritised with regard to the production of fruits, the quality and availability and seasonal characteristics.



Second event was held on 1st of April 2021 as a live workshop, with 9 participants. They were representatives from different interest groups (production, gastronomy, hotel industry, sales). The work shop was held to present product ideas, to taste samples and to discuss which ones would be suitable for further development. Participants learned that regional products are appreciated and should be used more often in the region hotels and restaurants.





Improvements in trainings and teaching assuring sustainable GI development and ESS provision

In the frame of LUIG project Society engagement segment, there was organised a Summer school on the 2nd September 2021. The participants came from different backgrounds (students, practitioners and tourists) and were interested in the changes of the landscape that are becoming more and more noticeable in the lack of GI. Fruit variety exhibition and tasting of different varieties gave the opportunity for the in-dept. discussions about the value of the fruit trees.



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