Developing transformation strategies for Alpine industrial landscapes shown by the Styrian Iron Route in Austria

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Abstract: The Alpine Space is one of the most important industrial regions in Europe. The transformation from manufacturing to service industry in the last decades and the decrease of traditional heavy and manufacturing industry are leaving impressive former productive landscapes of relevant size and complexity, so-called Alpine industrial landscapes behind. The potential value of these landscapes is linked closely to ecological, economical and social challenges in the development of these regions. No significant strategies or programmes for a transformation of industrial brownfields exist currently. The INTERREG project "trAILs " deals with the topic of industrial brownfields and aims to generate knowledge about Alpine industrial landscapes. It shows how future development paths for these sites can be developed and visualised and thus serve as a basis for discussion, decision-making and planning for the definition of concrete planning recommendations for municipalities. The overall objective of the project is to discuss and develop ways of raising awareness of the strategic development of brownfield sites, a topic that will continue to gain in importance in future. The following contribution focuses on the first project phase, in which a process for developing a transformation strategy was elaborated and tested in one of four pilot regions.

Keywords: industrial brownfields, alpine industry, transformation strategies, sustainable transition

1. Introduction

1.1. Motivation

When thinking of the Alps, most people think of the beautiful mountainous landscape, alpine agriculture, tourism or winter sports. The term "industry" is probably not associated with the Alps by most people at first. Nevertheless, the Alpine region is one of the most important industrial locations in Europe.

Industry in the Alpine region developed mainly in the 19th and 20th centuries, but its importance is still greatly underestimated. Industry in the Alps evolved for a number of reasons, amongst others due to the occurrence of raw materials such as ore or minerals, the presence of a sufficient number of workers or due to the usage of hydropower for production with high-energy consumption. Depending on the local conditions and potentials, different types of industry, such as aluminium, chemical, magnesite, steel or textile industry, originated. (cf. Bätzing 2003: 136ff.)

Another important impact on the development of the industrial sector in the Alps was the development and provision of infrastructure, especially of rail-borne infrastructure. Therefore, from a European point

of view, the Alpine region represents an important trade link from north to south and vice versa. Many European transport corridors lead through the Alps. Valleys with good access to the transport network are then and now important transit routes for the carriage of industrial goods.

As in many regions of Europe, the decline of the traditional heavy and manufacturing industry can also be observed in the Alpine region. The massive mining of raw materials in recent decades has exhausted or even extinguished many of these sources. In addition, the increasing degree of automation in mining and production processes means that fewer and fewer workers are needed in industry. With the retreat of industry, a decline in the population can therefore often be observed.

This process is leaving impressive former productive landscapes of relevant size and complexity behind, so-called Alpine Industrial Landscapes**.** The potential value of these landscapes in terms of sustainable transformation is strongly linked to Alpine-wide ecological, economical and social key challenges, such as the regeneration and improvement of blue and green infrastructures, the reactivation and upgrade of regional economies and the promotion of local identity and cultural heritage. (cf. trAILs 2018: online)

To use the potentials and to face the challenges that arise within former industrial landscapes, an alpine-wide overview of the location and situation of these sites is needed. Currently no reliable quantification and qualification of industrial brownfield areas exists. Furthermore, no significant transformation attempts or conversion strategies have been developed yet and the awareness about potentials and challenges in connection with industrial brownfields has not been mentioned in previous Alpine development programs and projects. (cf. trAILs 2018: online)

An INTERREG Alpine Space project called “trAILs – Alpine Industrial Landscapes Transformation” deals with this lack of information about industrial brownfields in Europe, aims to generate knowledge about Alpine industrial landscapes and depicts how to transform such sites and how to raise awareness of this increasingly important issue. The motivation is to create overviews, not only across the Alps or on a national level, but also on a regional and local level. At the local level (in the pilot communities), the development of future pathways will enable concrete support in the transformation of brownfield sites and the derivation of concrete planning recommendations for local planning actors.

1.2. State of the Art

As mentioned in the introduction, there is currently neither a general overview about industrial brownfields in the Alpine region nor is the topic sufficiently anchored in regional, national or European policies, legislations or funding programs. Therefore, there are few or no strategies for dealing with industrial brownfield sites at present. One task of the project "trAILs - Alpine Industrial Landscapes Transformation" (see chapter 1.3) is to develop a strategic and transferable process that enables the sustainable transformation of brownfield sites.

It is therefore necessary to place different methods or sets of methods in a particular order or context which, in a first step, allows to locate industrial brownfields on different scale levels and to add selected quantitative and qualitative information to these sites. The methods and information must be chosen in such a way that in a next step, the potentials of the industrial region and the brownfields can be shown, as well as the framework conditions for a transformation of the brownfields.

One method is the visualization of data using GIS and web-based mapping. Different javascript based libraries like Leaflet, Open Layers (two-dimensional) or Cesium (three-dimensional) allow the creation of a web visualization of spatial data. Information can be viewed on different scales and overviews can be generated. In addition, the data can be stored sustainably, transferred and accessed from any location.

As there is currently no database on brownfields and related relevant information such as location, size, type of industry or former use, ways must be found to collect this kind of data. The “Raum+”-method, developed by the Chair of Spatial Development at ETH Zurich, is a method for collecting spatial

information and creating regional and national overviews. This method is essentially concerned with the survey of settlement area reserves in Switzerland. From these overviews, "spatial development strategies and measures for mobilizing settlement area reserves can be developed in a targeted manner" (ETH Zurich, online). These data are collected jointly with cantonal and municipal representatives who have knowledge of the areas. (cf. ETH Zurich, online) This approach could also be applied to the survey of industrial brownfield sites. Who can be responsible for collecting the data is still open. Cooperation between municipalities, regions and federal states as well as planning experts will, however, be indispensable.

Based on these spatial overviews, key areas for the development of industrial landscapes can be identified. Large brownfield areas are quite easy to locate, but small, significant areas can also be identified through a comprehensive, nationwide data collection.

Architectural, urban design methods are suitable for the elaboration of development paths and scenarios after the identification of key areas. The resulting concrete and analyzable visions can be used to examine structural effects and their effects on the local, regional and supra-regional level.

By using the test design method (cf. ETH Zurich, 2013; Schnepper, 2012) and the current methods of future and scenario analysis (cf. Kosow & Gaßner, 2008), concrete and integrated approaches to settlement and infrastructure development and the associated design requirements can be developed.
It is necessary to consider these development paths and scenarios on all spatial levels (from the building level to the supra-regional level). A purely superordinate consideration by the preparation of a spatial overview is not purposeful, it needs a concrete and detailed investigation of the local conditions, in order to be able to draw conclusions from the effect on superordinate levels.

1.3. Project overview

The project „trAILs – Alpine Industrial Landscapes Transformation“ is part of the INTERREG Alpine Space Programme 2014-2020 and co-funded by the European Union. The project concentrates on former productive landscapes in the Alps, understanding their ecologic, economic and social regeneration as key priorities for the sustainable development of the Alpine region. The project consortium, comprising academic partners from different universities and research institutions as well as local or regional development agencies from five different countries, aims to generate significant knowledge about Alpine industrial landscapes, and develops and tests concrete and transferable strategies for the transformation of these landscapes. The support of local and regional stakeholders and the active involvement of the local communities are essential for this process. The four pilot regions are Eisenerz in Austria, Borgo San Dalmazzo in Italy, L’Argentière la Bessée and La Roche de Rame in France and Tržič in Slovenia. (cf. trAILs 2018: online)

The paper focuses on the first project phase, where a first process for the development of a transformation strategy was set up and tested in the pilot region Eisenerz.

1.4. Case study region

The Austrian pilot region Eisenerz is a municipality in the northern part of the federal state of Styria. Eisenerz and nearby municipalities are part of the so-called “Styrian Iron Route” region, a region that has been characterised by mining and related industries for centuries. Mining traditions and montanhistorical heritage are of great importance and give the region its identity.

Eisenerz lies in a deep circular valley and is surrounded by the steep wooded slopes of the Eisenerzer Alps and the Hochschwab mountain range, which reach altitudes of approximately 2,200 meters (see Figure 1). The natural environment and landscape in the region have a high value and potential as touristic and local recreation area. A large part of the municipality is covered by nature and landscape protection areas.

Tourism is becoming an important economic sector in Eisenerz for the last years, as the municipality tries to find a new development focus beside the industrial sector. Especially close-to-nature and sports tourism such as hiking, mountain biking, climbing in summer or skiing and biathlon in winter find perfect conditions in Eisenerz.

As shown in Figure 3, the municipality can be reached from Graz via Leoben and Vordernberg, from Salzburg via Admont and Hieflau and from Linz via Hieflau. Difficult road conditions in winter mean that the town cannot always be reached via the southern mountain pass Präbichl. There is an existing railway infrastructure in the direction of Hieflau and further via the Ennstal to Linz, or via Liezen to Salzburg, which is only occasionally used for freight traffic. A rail connection for passenger service does not exist anymore.

The region has been subject to a large population decrease in recent decades as a result of the technological change in industry and various competitive disadvantages due to its peripheral location in alpine terrain. From the early 1970s until today, the municipality of Eisenerz lost two-thirds of its population. The emigration of well-known companies, a lack of education opportunities and jobs, as well as the poor accessibility of the town move especially the younger generations to leave their home. More than 40 percent of the remaining population are over 65 years old. What remains is a shrinking mining city that is struggling with vacancies in housing, trade and industry, the maintenance of social and technical infrastructure and with the preservation of their mining culture and heritage. The municipality has tried to tackle these challenges for many years. Currently a new development strategy and a mission statement are being elaborated.

The industrial pilot site Münichtal, see Figure 2, is located in the northeast of Eisenerz. The area has a size of approximately 150.000 square meters. Parts of the site are still in use by a metal recycling company, but most of the buildings are vacant. They used to be part of an iron blast furnace, a gas power station, an automotive glass factory and an aluminium recycling factory/smeltery. Beside the mentioned problems the whole municipality and region has to face, the main challenges in the development of the site are the mix of old and new buildings and their strongly varying quality (some buildings are more than 100 years old with a high architectural value, but derelict, some are modern functional industrial halls). The mix of used and abandoned buildings and infrastructure as well as the complex ownership of the different plots and buildings on the site make a transformation additionally difficult.

(f.l.t.r.) Figure 1: view on Eisenerz and the Erzberg, source: Bwag/Wikimedia and Figure 2: view on the pilot site Münichtal, source: TU München, Udo Weilacher, 2019

2. Methodology

In the following, the applied procedure and the use of selected methods and tools are explained. It should be mentioned that it is not the application of a single method, but the combination of several methods, i.e. the application of a repertoire of methods, that is productive. This must be put together individually depending on the object of investigation and the interest in research (cf. Hübler 2005: 635).

The procedure is basically divided into four steps: the analysis, the formation of possible development paths, the stakeholder workshop with discussion of the proposed development paths and the subsequent development of planning recommendations for the Münichtal industrial area in Eisenerz.

The chosen procedure is a first process test, a kind of experiment, which was carried out in the pilot region Eisenerz. It can be adapted step by step for the other pilot regions if necessary. The aim of the project is to define an approach in all four pilot regions that is transferable to other industrial regions and should be able to contribute to the transformation of industrial brownfields.

2.1 Analysis

In order to get an impression of the local and regional conditions and to evaluate the situation in the pilot areas in a comprehensive way, the analysis covers environmental, social, economic and spatial issues. As a framework for these different analyses, a separate policy analysis is acquired. In detail, the following issues are addressed in the different analyses:

- the environmental analysis covers the analysis of the topographical situation, the landscape, the natural environment and the ecologic status of the brownfield site,
- the settlement analysis contains information about the settlement structure and the existing building stock, the protected and characteristic types of buildings,
- the mobility network analysis covers the analysis of the reachability, the traffic and transport network and the public transport services,
- the supply and disposal infrastructure is analysed through a description of the access to information and communication technology and energy infrastructure, water supply and disposal infrastructure,
- the socio-economic analysis deals with the demographic and economic characteristics as well as the qualitative valuation and perception of the industrial site by the local population and
- the policy analysis contains the evaluation of policy documents of different sectors and administrative levels with regard to their recommendations and strategies for the transformation of industrial brownfields.

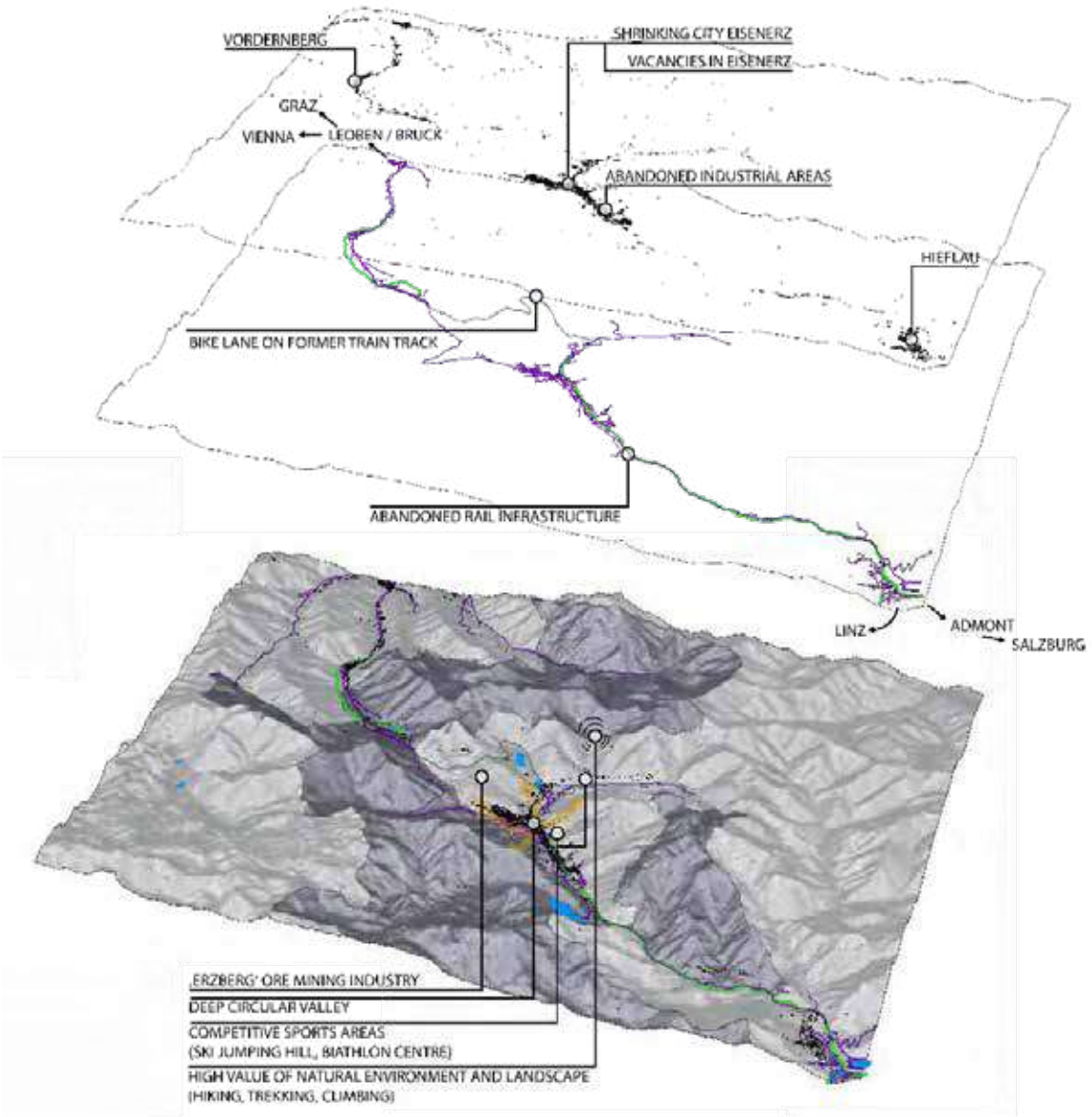

Figure 3: 3D-modelling as method for the spatial analysis showing the valley of Eisenerz and the main challenges, source: TU Wien, Julia Forster, 2019

Beside desk-research on the mentioned analysis topics, on-site research was essential for this first phase in order to experience the local and regional conditions and peculiarities with all senses. First impressions about possible strengths and weaknesses can be perceived, the contact to local or regional actors and the population can be produced and experiences in the participation in the life in the region can be collected. The project consortium visited the municipality Eisenerz and the pilot site Münichtal two times before the development of possible future pathways. Within these on-site researches, a first contact to local stakeholders has been established.

Qualitative interviews and discussion rounds, a visit of the buildings on the industrial site and a strolling around the town served to gather initial information. A photo and video documentation as well as 360° photographs were produced, to reflect and discuss the findings afterwards.

After the analysis of the different topics with various methods, the interdisciplinary team brought all the results together to find out the key problems and challenges (see Figure 3 and chapter 1.4). The project consortium established a first set of methods of different domains. This set should be transferable to all the other regions, but can be adapted in order to adress the specific regional/local needs.

2.2 Building possible pathways for future development

Following the analysis phase, various development paths were developed for the Münichtal pilot area. After an initial brainstroming of the project team on possible future uses of the area, two main directions for transformation emerged - "de-construction" and "re-construction" (see Figure 4).

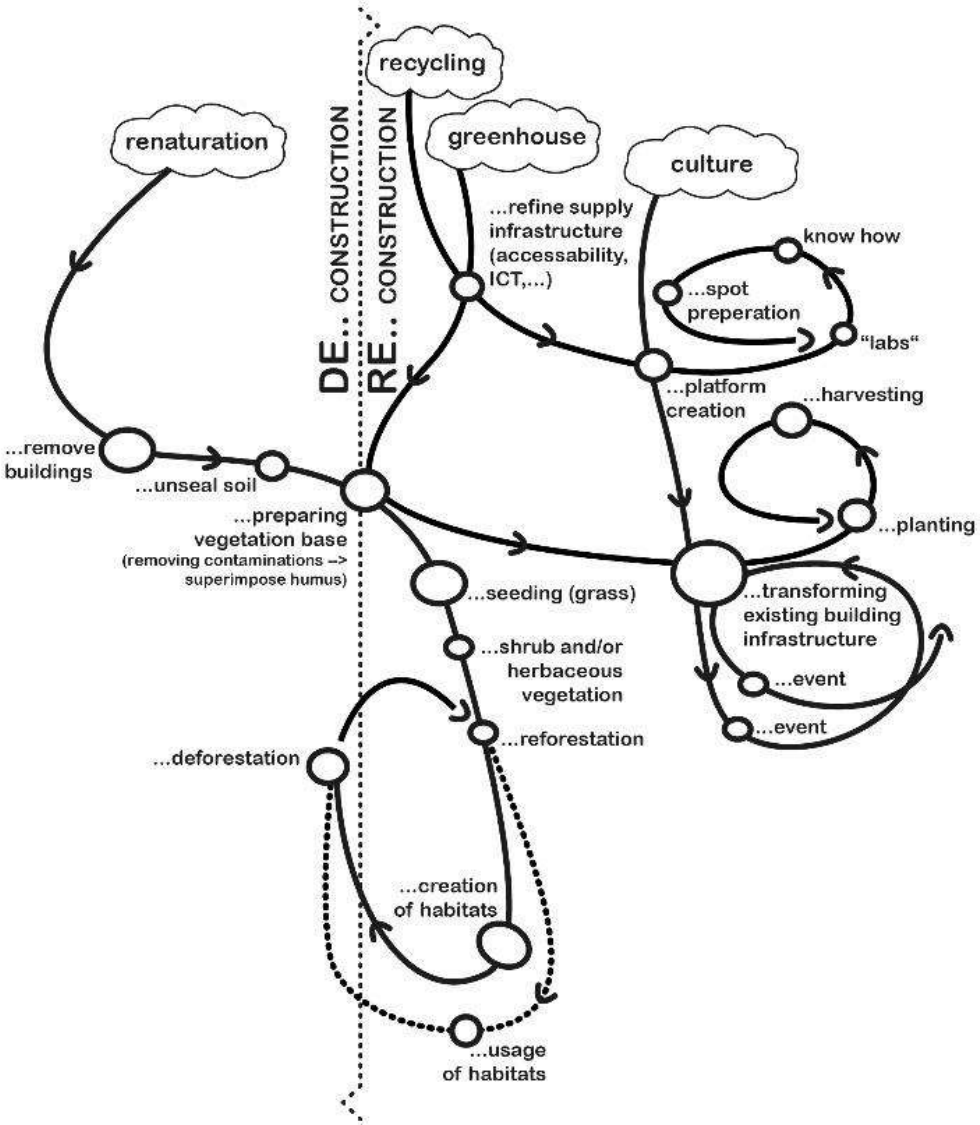

Figure 4: main directions “de-construction” and “re-construction” for the transformation of the site, source: TU Wien, Julia Forster, 2019

Figure 4 illustrates possible pathways within these two development directions for the pilot site in Eisenerz. A precise differentiation within these development directions is not possible. The elaborated pathways rather describe development approaches bridging, combining and interlinking the direction of deconstruction with the direction or single elements of reconstruction (e.g. soil remediation, planting, etc.).

The direction of deconstruction describes a stepwise dismantling of the existing building stock and uses. Thereby the quality of life of remaining residents as well as affordability are important markers for sustainable future developments.

The direction of reconstruction describes new usages and transformation of the existing building stock and the whole area. Possible resumption of former usages or completely new uses might include transformation and adaption as well as addition of buildings and building parts.

After this initial brainstorming and the elaboration of two basic directions of development, the different ideas generated were put into practice on several scale levels - at regional or municipal level, at pilot area level and at building level.

This multiscale approach was an important step in the idea generation process. It quickly became clear which possible future uses in the former industrial halls would be possible and for which the area and the halls are rather unsuitable. The comprehensive consideration made it possible to assess the effects of the future use ideas on the community and region.

The ideas ranged from cultural, tourist and industrial uses to unusual, utopian ideas for use. Here are a few examples: Use of the empty halls as film studios, as production halls for wood-based materials, as art and exhibition halls, as indoor sports centres, as apprentice training centers or as halls for urban farming.

Out of all these ideas and after several discussion rounds and under consideration of the analysis results to the local and regional circumstances, the project team decided to suggest three different pathways for a future development of the pilot site. Some important fundamental thoughts occurred:

- the usage of local and regional resources should be considered - usage of ore, wood, craftsmanship, knowledge
- a connection to the regional education and research cluster should be established to use local knowledge – the site could be a research and education spot with a special focus on product development, product testing and industrial fabrication; focus on special vocational education as complement to academic facilities in the region (Montanuniversität Leoben, FH Kapfenberg, TU Graz – important universities in Styria)
- a focus on processes, products and (local) materials should be given – e.g. processes/products related to ecological energy production, processes/products concerning the building industry,
- a focus on recycling is useful and beneficial - product life cycles, upcycling, re-use of materials within the existing abandoned building stock, research of building conservation technologies - using vacant local buildings as test area, a recycling company is already located on the site
- a focus on interdisciplinary collaboration can be an advantage – use of buildings as co-creation space, shared workspaces

Out of these fundamental thoughts, the mentioned three pathways have been elaborated:

Pathway "Back to nature":

The photomontages (Figure 5 to 7) show a complete deconstruction of the area towards a near-natural use (meadow/pasture, forest).

Due to the infrastructure installed (pipes, canals) and the previous uses on the site, it can be assumed that extensive soil remediation measures would be necessary for these pathway. Figure 5 shows a variant, where only the buildings are dismantled, recycled and disposed. Existing infrastructures (pipelines, traffic routes) will be retained. Without further measures, the areas will be "reconquered" (within a few years) by pioneer plants.

Figure 6 and 7 show deconstruction variants aiming at a short- to medium-term agricultural or forestry use of the land. For this purpose, the technical infrastructure (pipes, traffic areas) must also be removed and the surface layer be replaced.



(f.l.t.r.) Figure 5: deconstruction with no further measures of renaturation, source: TU Wien, Julia Forster, 2019; Figure 6: deconstruction with renaturation - soil remediation - grassland, source: TU Wien, Julia Forster, 2019; Figure 7: deconstruction with renaturation - soil remediation - forest, source: TU Wien, Julia Forster, 2019

Pathway "Greenhouse":

The pathway "Greenhouse" opposes shrinkage (in means of the shrinking city) with growth (in means of growing plants). The spacious hall areas on the site as well as good freight transport connections offer potentials for industrial plant breeding and sustainable ecological food production. For example, mushroom cultivation (with the local raw material wood as a carrier material), other fruit or vegetables as well as medical plants and herbs can be produced on an industrial scale. The spacious halls allow controlled conditions of growth and protection against intruders. The supply of water can be ensured via storage basins for slope and precipitation water.

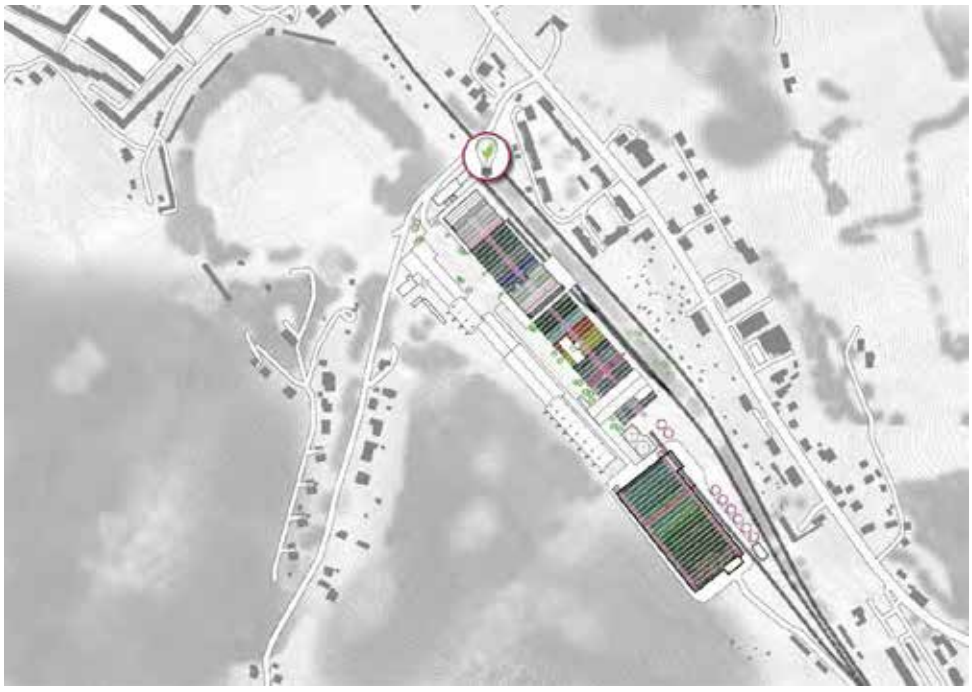

Figure 8: pathway "Greenhouse" - usage of the industrial site as a place for growing plants, source: TU Wien, Julia Forster, 2019

The sewer system is designed for large flow rates. The controllable ventilation and lighting required for optimal growth and predictable harvesting is guaranteed by the existing electrical infrastructure supply. Figure 8 shows the spatial transformation and developments for the outlined approach of industrial agricultural use on the site.

Pathway "Recycling":

The pathway "Recycling" introduces a new concept dealing with the city of Eisenerz as a living lab for building element recycling processes as well as new technical methodologies for the preservation and renewal of decayed or destroyed buildings (e.g. due to natural hazards). In close cooperation with regional research institutions, the regional construction and timber industries, a competence center and platform for deconstruction, recycling and re-utilization of buildings and settlement structures is elaborated. Figure 9 sketches a spatial concept of the transformation of the analyzed pilot site, creating the spatial environment for the research and industrial platform. Within the "Redesign Eisenerz" concept, a concept which deals with the deconstruction of residential buildings in the shrinking city, already mentioned spots of deconstruction become first living labs. So the city is understood as a source of raw materials as well as a test laboratory to develop procedures and methods for the recycling of building parts/buildings, for the repair of damp/damaged building materials and for the transformation of brownfield settlements into functioning spatial structures. Through these processes, a supra-regional showcase and competence center will be created, which will act as a trigger for sustainable regional value chain.

Figure 9: pathway "Recycling" - using the pilot site and the existing building stock in the city as living lab for research on the recycling of materials, source: TU Wien, Julia Forster, 2019

For the last two pathways, the conceptual integration of the existing institutions for vocational training, education and research within the region is essential for sustainable long-term development cycles. Therefore the existing resources of the region (raw materials, skilled workers, outputs and know-how of regional organizations) are further pathway- overarching drivers in strategic considerations and developments.

These three pathways/ideas for the brownfield transformation serve as a discussion base for the stakeholder workshop. The pathways should build a basis for the creation of new ideas. Topics can be added, combined or removed. The pathways should not be seen as project proposes, but should stimulate the discussion with the local stakeholders.

The approach of building different, in a sense also provocative or utopian pathways is an experimental approach. By testing and discussing the ideas and their advantages and disadvantages for the site, the municipality and the whole region, suitable transformation ways can be found or at least help to find a future direction.

2.3 Involvement of the stakeholders

As mentioned in chapter 2.1, some stakeholders have been involved in the development of the process already during the analysis phase to gain information about the local conditions and challenges in Eisenerz.

To involve the stakeholders more intensively in the development of a transformation process for industrial brownfields, the project team organized a stakeholder workshop in Eisenerz. Important local and regional actors from different professional fields have been invited - representatives of the municipality Eisenerz, owners of the different sections of the pilot site, representatives of the government of Styria, former workers of the site, local planners, regional development agencies, historians, local citizens and students and representatives of cultural and tourism associations. This interdisciplinary mix allows to gain information of various professional and personal backgrounds.

The stakeholder workshop took place in three rounds. The first round was a plenary session, where the stakeholders were introduced to the trAILs-project, the aims of the workshop and the suggested and elaborated transformation pathways.

The second round formed the core of the stakeholder workshop. The participating stakeholders were separated in three groups on three different tables. Each table had the same basic materials for discussion at disposal. The stakeholders have been separated by their professional background and their relation to each other and brought in their perspectives on the topic of industrial brownfields and the pilot site Münichtal.

On each of the three tables the following main questions have been discussed:

- What do the stakeholders associate with the topic of industrial brownfields? Have they already dealt with industrial brownfields in their professional field?
- Which of the presented pathways were the stakeholders interested in? Which aspects did they like, which not? Which topics/issues did they miss?
- What are their own ideas for the transformation of the pilot site? Which impacts arise with these new ideas for the site, the municipality and the region? Which actors or organizations are needed for these new ideas? Which timeframe can be set for the implementation of the idea?

After the round-table session the participants came back to a plenary discussion, where all the findings and important aspects of the three tables have been presented. The discussion included important topics for the site and the municipality of Eisenerz, local stakeholders and citizens had the chance to talk to each other under the guidance of the project consortium. A fruitful discussion arose, and many of the participants got to know each other for the first time within this workshop - and this is one of the most important results - the “trAILs” project started a discussion process between local and regional stakeholders.

2.4 Planning recommendations

It turned out that the discussion groups on the three roundtables had different foci due to their professional field and interest. One group mainly dealt with the recycling pathway, one focused a bit more on a possible touristic and cultural use of the site, the third group discussed alternative industrial uses.

After a final discussion round the following ideas and aspects, independent from the preferred pathway, can be recommended for the transformation of the industrial brownfield test site in Eisenerz:

- the environmental and touristic compatibility and the ecologically and economically sustainability within the transformation process is the topmost priority
- the usage of local resources (ore, wood, space, natural environment, knowledge) should be forced

- the diversification of economy is necessary - not only looking for big companies like in past days, but trying to attract small and medium sized enterprises can be useful
- the transformation process has to be seen as a long-term development, profits will happen at different times (maybe not in the first years, but after some time the transformation projects can bring profit)
- the unique selling point is the size of the site - the large halls can be attractive for uses that need much space
- a combination of different pathways was seen as good way for a future development - e.g. deconstruct and renaturate parts of the site, new use for the remaining parts; combine small cultural uses with focus on industrial heritage and industrial use; mix different sectors
- research and education institutions should be seen as an important resource and actor, all kind of future uses can be linked to education (life-long-learning)
- elaborating an investor-brochure was seen as an essential step - the site and the vacant halls need a good marketing strategy and advertisement to call the investors' attention
- an awareness raising process for the local community has to attend the transformation process, only then the acceptability of the inhabitants will be ensured
- thinking of deconstructing parts of the site should be allowed (deconstruction is often seen as the worst-case scenario), because not everything can be preserved for the future - but, characteristic and unique structures should be preserved as they propose a great potential of the municipality/region and give the place its identity
- because of the huge number of owners, it needs a provider or an operator on the site, somebody who coordinates the different actions on the site (umbrella organization)
- the municipality needs an official pathway (currently they develop one) - this clear direction will be helpful for the transformation process too

3. Conclusion and prospects

Some elements of this first developed process turned out as very useful and expedient for the project aim and can be transferred to the other pilot regions.

The set of analysis methods of different domains was useful to get a holistic view of the problems and potentials of the pilot region and site. Different analogue and digital tools have been applied - e.g. statistic data analysis, qualitative interviews, GIS based spatial analysis, 3D-visualizing and -modelling - by using different format for processing the results (words, images, numbers). The on-site research was probably the most important step in this analysis phase. Suitable transformation ideas can only be elaborated after getting to know the local conditions with all senses. A multiscale view on the problems, challenges and potentials is essential to elaborate sustainable and useful transformation ideas. Designing these ideas and concepts can be seen as an essential step in the process - due to this communication base concrete discussion results can be gained.

Many of the analysis elements (see chapter 2.1) can be analyzed in the other pilot regions as well. Due to the interdisciplinary approach a holistic and integrated view on the potentials and problems on various scale levels can be generated. Stakeholders often have just one specific view or interest on the transformation possibilities - investors and owners concentrate on an economically efficient way, the municipality tries to integrate the site transformation in the development concept of the whole municipality, inhabitants have many different ideas but not always the appropriate information about the site. These perspectives can be brought together in an interdisciplinary workshop, like the "trAILs" project has shown. With the expertise of the project consortium and the knowledge of the local and regional stakeholders the necessary information for starting a transformation process can be collected.

It is very important to involve the stakeholders as early as possible in the process. Only then the local actors can prepare themselves for discussing about the topic of industrial brownfields, as most of them do not directly deal with this issue in their daily professional life. The participants of the process have to

be as open-minded as possible and should try to switch in other's perspectives and interests on the issue. It needs a lot of imaginative power to open to the different suggested pathways, as it is sometimes difficult to detach oneself from a worn image. The visualization of the pathways (see chapter 2.3) was a great help within this step.

The project consortium currently develops concrete planning recommendations for the pilot site Eisenerz. These recommendations should help the stakeholders to develop further transformation ideas and projects by assessing the most important information about the local and regional conditions and by using the resources of the newly established stakeholder network.

The described procedure is an iterative process and will be tested in the three other pilot regions of the project "trAILs" in the next one and a half years - always looking back to the previous processes and trying to learn from them and adapting the process components. Although the pilot regions are different in their local conditions and industrial uses, some key criteria can be identified. At the end of the project, a process should be set up, which helps municipalities and local stakeholders to deal with the transformation of industrial brownfields.

At the same time, a prototypical, web-based platform will be developed over the course of the project, in which the locations of the industrial brownfields can be represented on different scales by locating the pilot regions and areas in GIS, subsequently converting them into a geo-json file format and implementing them in the web environment. In addition, important analysis results and transformation ideas can be implemented in different formats (texts, images, numbers, tables or geo-objects in the web map). The platform is password protected and access can be granted at any time. This form of data storage is very sustainable as it is permanent, can be extended at any time and can be accessed from anywhere.

The developed process and the web-based platform should help municipalities and local/regional actors and interest groups on the one hand to deal with the transformation of brownfields and on the other hand to draw the attention of the federal and state governments to the topic of brownfield sites. The project shows how an overview of brownfield sites in Austria and the entire Alpine region can be established and how the necessary technical environment and relevant information can be developed.

The web-based presentation of results enables the transfer of the developed future pathways to other regions. This allows stakeholders in these regions to develop ideas and initiate discussion processes on the future use of brownfield sites too and enables a more sustainable use of industrial brownfield sites and the existing development structures in the sense of economically and ecologically sustainable development.

4. Acknowledgements

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Figure 10: project logo "trAILs - Alpine Industrial Landscapes Transformation", souce: trAILs, 2018

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