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Mining Heritage: Future-orientated Development of an Outstanding Universal Value in Germany

Mining has given the world a legacy that can be considered as a precious heritage to enhance towards the future in the best sustainable way. This paper presents an ongoing project creating a guideline for the handling of mining heritage on the basis of experiences made in Germany. Interactions of stakeholders in the "heritage network" as well as strategies for the technical proceeding will be described. An action plan for the sustainable handling of mining heritage will be explained, which includes necessary measures. Best-practice recommendations will be derived.

1 Introduction

Around the world mining has been done for thousands of years for the benefit of mankind. Mining has deeply influenced the cultural, economical and ecological development of many regions by changing the landscapes, cities and population structures. Beside of this mining has created all kinds of cultural artefacts from jewellery to miner´s songs.

Built heritage is one of the most identity-performing cultural artefacts of a modern society. Especially in our fast-moving globalized world there is a need to preserve and present these artefacts as a distinct and important contribution of each region to its country and the world. The preservation and sustainable development of cultural heritage should not only concentrate on 'architecturally beautiful' objects but should include those monuments which characterize the lives and biographies of former populations as well.

Built heritage has to be regarded and handled as a non-renewable resource. It deserves a careful and sustainable way to preserve its authenticity and historical significance. In 1972 UNESCO has defined proceedings for assessment, protection and preservation of cultural and natural heritage of outstanding universal value within its World Heritage Convention (UNESCO 1972). The World Heritage List was born and has been continually extended since then. Besides this list many countries have listed further objects of national and regional importance and have adopted statutes of monument protection.

Figure 1 / Mining heritage in Germany – mine and coking plant Zollverein in Essen. (Photo: Peter Sondermann / Stiftung Zollverein)

Handling of these monuments is strongly influenced by given basic conditions like environmental parameters, building materials, architecture, former use, state of deterioration, political influences, interests of users and/or investors. Thus, an individual solution for every object is necessary. Despite this there is a need to compare results from different examples and to look for guidelines and strategies which may help to find more general solutions for larger groups of objects.

German experiences in this field of mining heritage preservation and exploitation (e.g. Fig. 1) are presented here as an example and stimulus for the strategic proceeding within other mining heritage objects from all over the world.

2 Mining Heritage at the Ruhr (Germany)

Germany offers a manifold historical development and thus a large variety of different types of monuments characterizing its history and the history of its different regions. Cultural heritages objects range from stone- and bronze-age settlements to Roman buildings of the turn of eras, gothic cathedrals, medieval townscapes, romantic castles and town halls up to the relicts of the industrial period. A very prominent architectural example is the impressive Cologne Cathedral (Fig. 2).

Industrial development however had a formative regional importance on society and architecture in Germany too, especially in the Ruhr region in the state of North-Rhine Westphalia. Driven by the availability of hard coal an agglomeration of industrial influenced cities arose since the early 19th century. Today these cities are forming a metropolitan area with more than five million inhabitants. In this setting numerous objects of coal mining concerning extraction, production, transport and infrastructure have been built

Figure 2 / Cologne Cathedral
(Source: Jürgen-45, picture database www.piqs.de).

Figure 3 / Industrial monument: pit frame head of shaft XII of colliery Zollverein.
(Photo: Jochen Tack / Stiftung Zollverein)

and are imprinting signs of the "coal age" in Germany now (e.g. colliery and coking plant Zollverein in Essen (Fig. 3), which is a World Heritage site on the UNESCO list).

The idea of preservation of decommissioned industrial sites to keep the regional identity started in parallels to the decline of the heavy industry in the Ruhr region. First some workers' settlements were kept. Later a group of interested citizens together with monument curators and politicians recognized the historical significance of entire industrial sites, including pit frame heads or production halls with dimensions to speak of "industrial cathedrals".

A big challenge in the beginning was the necessity to convince the "man in the street" and many politicians that these 'awkward' objects of heavy industry do have a comparable status for the history and the cultural development of North Rhine Westphalia as e.g. impressive and beautiful churches like the Cologne Cathedral. More than a decade was needed to change the negative image of these objects in the mind of the inhabitants in the Ruhr region (places of donkeywork, rage because of job losses caused by closures ...). A positive feeling was created expressed in the word 'industrial culture'. People became proud of their cathedrals of industrial culture and started to look at them from a different perspective.

3 Preservation and Development of Mining Heritage: Risks and Opportunities

A lot of new and unsolved questions appeared when starting with preservation measures for mining heritage sites in its entirety or even in parts of it. Persons responsible had to think about the handling of objects as well as to look for any kind of future reutilization. Meanwhile there is not just a curatorial interest, to save historical traces of the cultural development. Former industrial sites attract investors who want to transform them by keep-

	Impact	Risk
1	enormous spatial dimensions of former industrial sites	difficulties in developing entire company ground regarding monument restrictions
2	specific construction details with regard to former production process	problematic conversion/ reuse (restricted effective space, construction without utilisation)
3	large material variety of construction regarding former production necessities	corrosion effects, high maintenance effort
4	high contamination load resulting from former production (metal dusts, toxic chemicals, etc.)	safety risk for visitors & operators
5	assignment as monument long-time after plant closure	high degree of vandalism, corrosion problems, safety risk for visitors

Figure 4 / Risks of mining sites with regard to preservation and sustainable development.

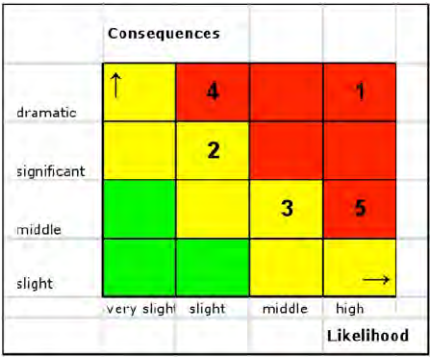

Figure 5 / Risk analysis of industrial sites with regard to preservation and sustainable development.

ing the historical appearance. Some entrepreneurs want to produce goods on the sites, others use factory buildings temporarily as sports centers or theaters respectively musical halls. Even lofts had been built in this unusual surrounding. Museums were within some of these monuments. These objects appeal a new fascinating challenge for architects and engineers who tried to find a way to combine both new use and old structure and significance. A prominent example for this attempt is the colliery Zollverein in Essen which is a World Heritage Site since 2001. The main idea has been to establish a kind of incubator center for creative businesses (especially design).

Mining sites, which are highly valued today as important cultural artifacts, were however never seen and planned to survive permanently. Because of this reason traditional approaches of monument protection could not be used efficiently. Operators and preservation authorities had to face new challenges, because of some features on the sites, which are bearing as risks for the preservation and development (Fig. 4):

- complex and specific material and structural characteristics (material and structural variety),
- enormous spatial dimensions,
- high level of pollution resulting from former production process (critical example: chemical residues from former production processes (benzene, asbestos and others),
- the special character as 'an object just for production lifetime' (construction is chosen economically, not to last forever),
- vandalism caused by a long time of disregarding before getting into the focus of heritage preservation.

	Impact	Opportunity
1	enormous spatial dimensions of former industrial sites	landscape park, industrial-nature (biosphere area)
2	specific construction details with regard to former production process	cultural identity formation, unique characteristics for location & region
3	large material variety of construction regarding former production necessities	attractive for new cultural activities (music halls, galleries, lofts, offices, etc.)
4	high contamination load resulting from former production (metal dusts, toxic chemicals, etc.)	simple cover of contamination because of temporary stay of visitors (events, visit, etc.)
5	vandalism caused by long time of disregarding after plant closure	prevention of future vandalism because of identity creation and new utilisation

Figure 6 / Opportunities of (former) mining sites.

Figure 7 / Opportunity analysis.

Owners of mining sites, which shall be turned into a heritage site, often feel confronted with the fact that industrial heritage preservation is not comparable with standard maintenance procedures in the normal production life cycle or periodical inspections and repairs applied to traffic constructions (like steel bridges).

Therefore in the past insufficient budgets for extensive restoration and conservation measures often lead to decisions to break down large parts of the sites as a kind of a 'precaution action'. An often discussed alternative – keep things as they are and prevent visitors to get into dangerous areas (philosophy: 'let the object die in dignity') - is more a postponement than a solution of the task. Uncontrolled decay causes a high hazard potential and thus much higher costs if there is a later change in mind to start with even a partly preservation of the site.

A risk analysis for industrial sites with regard to preservation and sustainable development is needed (Fig. 5). Impacts and resulting risks are listed, risk assessment then bases on consequences and their likelihood. As a consequence risk treatment measures can be defined, depending on the risk potential.

Opportunities were analyzed in the same way (Fig. 6, 7): Benefit for the society is contrasted with benefit of cultural development for the society. The identity forming effect for the region has to be seen as most significant and important factor.

The project of Ewald Colliery serves as an excellent example to illustrate this. Until 1999, the colliery produced an output of approximately 2.5 m metric tons per year. Its premises included around 0.44 km^2 (109 acres) of surface area, 2 shafts and more than 90 buildings.

Figure 8 / Ewald Colliery 1962.

Figure 9 / Ewald Colliery 2015.

In 2002 a team consisting of architects, urban planners, technical authorities, municipalities and individual citizens developed a concept of how to utilize the surface areas. After that, the area was redeveloped. By now, a number of companies have found a new home there, including industries such as logistics, technology, services, crafts, commerce, leisure time and real estate, as well as catering and even a theater.

At the same time, mine gas is extracted from the old shafts and sold. At the mine dump nearby, a wind wheel is being built to generate energy; in the medium term, a hydrogen competence center is to be established at Ewald Colliery to promote the energy generation from hydrogen as a fuel.

All of these developments show that the former colliery is being revamped as a world class location which fulfills all criteria of sustainable development: new values, new jobs, and ecological recovery.

4 Handling the Mining Heritage Sites: Guidelines and Action Plan

Mining heritage preservation needs to develop special techniques and to communicate them to the stakeholders. Within one site there is a possibility to work with graded security levels, which will be defined for fixed periods (with regard to the potential decay during that period). It may range from simple maintenance up to the application of considerable repair measures if there is a need to guarantee stability if a visitor trail is planned through this area or visitors are allowed to explore this part by themselves.

Temporary measures, for example additional reinforcements or dismantling and storage, are sometimes an option to keep an object in a condition that later conservation measurements are possible. Closures of dangerous parts for a certain period of time (knowing the decay during that time) may also be a suitable solution to keep the site in a condition which enables preservation later when there is a need for an immediate reconstruction. This kind of temporary measures are helping to prolong the lifetime of industrial sites without spending a huge budget but and without inacceptable safety risks. The basis of these measures is known from so called 'builders huts' at cathedrals in medieval

times. There was a priority setting for measures concerning materials and construction with regard to its risk potentials. Standard procedures were developed and workers were trained to keep the object in a good condition. Sometimes this can be a model for today and for the use of volunteers in this process.

Guidelines are a very important factor for an effective proceeding in the development of an industrial site. Monitoring is a mandatory part of the UNESCO convention for the protection of the cultural and natural heritage. Monitoring is intended to provide effective information on the heritage site and to evaluate changes of condition and significance. These reports are for instance ordered every six years by the World Heritage Committee (Ringbeck 2009). But until now no special indicators are defined to describe the preservation and sustainable development of industrial heritage sites.

The desideratum will be eliminated in a current project in Germany. A number of selected positive examples will be used to develop general guidelines and indicators for the different steps in the preservation process. A manual will occur which includes several checklists. As much as possible information and experiences from former activities in the field of industrial heritage preservation will be collected, evaluated and edited in special way. Experts from different disciplines will work together to create a widespread interdisciplinary approach. Single components of the guidelines can be used afterwards for training of inspectors or to instruct (volunteer) stuff working on the sites. An action plan (Goetz 2009) can be a useful tool for people responsible for the sites. It will help them to find a guided way through the complex task in dealing with the different steps of preservation. The action plan will deliver decision support and examples to enable decision makers choose the best specific measures for their individual object.

The action plan is not only including the technical procedures of the preservation process but is also taking into account the interaction of concerned stakeholders (like owners, government agencies, investors and different technical experts). This can be very important if different 'languages' or restricted expert sights are causing misunderstandings and issues which may result in ineffective decisions, time delay and paralyzing anger. To convince stakeholders of the best strategy and measures it is helpful to give best-practice examples

Another part of the action plan is dealing with questions of a possible future use of the site. With the help of concrete examples acceptable alternatives for a new use can be presented thus guaranteeing a sustainable development and preserving the character.

The technical proceeding within the preservation process is given the main space in the action plan. Figure 10 presents an overview on different topics and tasks in this field. A toolbox with standards, technical rules and standard procedures will complete the explanations in the different chapters.

Fundamental and more general statements in the action plan will be relined by a large number of different examples (experiences drawn within real measures) giving advice for special situations. The action plan is set up as a website, which is under construction right

objectives to be handled	tasks that will be elucidated
documentation and creating of inventories (capacity-building measure)	guidelines for assessment of objects and evaluation of monument significance
interaction between parties involved (communication)	description of interests and strategies for best collaboration
examination of decay (conservation)	assessment of material condition
statical calculation (conservation)	assessment of stability + planning of necessary measures with regard to monument character
pollution / contamination (conservation)	assessment of polluting factors and deciding ways of decontamination or encapsulating
corrosion protection and coatings (conservation)	choice of best option for protection with regard to material, structure and condition state
economical calculations (conservation, community)	evaluating most economic proceedings of the preservation processes
information of building owners (communication)	preparation of exemplary terms of references and plant-specific experiences
visitor safety (community)	bringing together accessibility of the object and visitor / user safety
monument orientated development of sites (community)	balancing proposed measures with monument compatibility and costs
information of the public (communication, community)	explaining measures and costs with regard to cultural significance

Figure 10 / Action plan factors.

now. We will first start with a German version but an English one is seen to follow in the near future. The industrial heritage community will be asked to comment on starting information and to generate further knowledge on the web by themselves. Thus we hope to generate a continuously improving tool to foster a global knowledge transfer. With the help of this tool the difficult task of industrial heritage preservation may be performed more target-orientated to promising solutions than nowadays.

5 Role Model for Mining Regions

As the presented action plan is still in an early construction state we can not present detailed results right now. Nevertheless there are some general findings to be stated that will create a suitable strategy and successful measures.

Sustainability and originality

Considering sustainability in all processes is a decisive premise with regard to the success of all activities. A positive result in the preservation and development of an industrial site will be achieved only in a consensus between the stakeholders concerned. Many discus-

sions will arise if there is an enforcement of singular interests to the disadvantage of others. It may result in short-term success of one stakeholder, but a missing long-term acceptance will generate sticking points on the way to a successful realization.

Thus, a very puristic preservation of a mine site just keeping most of the object in an original condition may be a success for the preservation authorities but may also cause the disinterest of owners and investors regarding the future use of the object. A resulting lack of funding is of great disadvantage because it will prevent necessary maintenance and repair. A surviving of an industrial monument without a new compatible use is possible only under very rare circumstances, because a reuse of the site just with the consideration of user interests might result in a reconstruction which has nothing to do with the former monument. But if the uniqueness, the positive image and the charisma of the object are gone the value of the object for the region is concerned and reduced.

Sustainability has to be considered within the technical measures of the sites too. The given monument substance should be regarded as a non-renewable resource. Any work at the object should take this originality into account any time. For example, an additional supporting structure, which allows the continuation of a weak original beam or pillar at the place, has to be seen long-termed as a more valuable measure than an apparently easier or cheaper replacement of the original. A copy is never the original although it looks in the same or even better. Lost originality can not be regained. Originality and sustainability are two sides of the same coin when it comes to preserve and develop a mine site.

Creating a positive image for an entire region

Actual attempts and successes at the Ruhr demonstrate that former ugly brownfields have been transferred into appreciated and accepted objects of mining culture. An important factor of success is the explanation of measures to the public. People were invited to join the long way of conversion from the state of industrial functional buildings (with sweat and tears) to the identity forming objects of mining culture (with joy and pleasure). The aim of the people in charge was to explain the social significance of these objects to the public. Potential problematic objects were turned into places with a positive image, because measure which are just enacted by certain experts and not discussed in public will fail to be accepted as social valuable.

The attempts in the last 30 years in the Ruhr region have created a new atmosphere in the entire region. The declaration of the town of Essen together with the Ruhr region as the cultural capital of Europe in 2010 was an important milestone on this way to a bright post-mining future. Enthusiasm of the inhabitants foreign tourists, indicated by enormous visitor numbers in 2010 (Ecorys UK Ltd 2011), illustrate that industrial, especially mining culture has become an important brand of this region.

Transferability

Experiences of mining heritage preservation and development in the Ruhr region are a

decisive basis for further activities in this field in other mining regions. The action plan structured as a guideline for users and scheduled as an instrument continuously enlarged and improved by the industrial heritage community will serve as an important knowledge transfer instrument in this process. It is very useful for experts but also for the interested public. The strategy to extract general rules form a large number of examples and thus to formulate recommendations for further proceedings is an approach which can be useful in other countries and other fields of heritage site protection in mining regions all over the world.

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