

Brown coal mining and rehabilitation: a landscape chronicle

Designing the rehabilitation of brown coal mines in Lusatia by integrating landscape narration with a landscape based approach to rehabilitation.

Introduction

Lusatia is one of the four major brown coal production regions in Germany and played a big role in the energy supply of the former German Democratic Republic (GDR). The brown coal production will stay important in the near future. There are still productive mines and plans to open new ones, although the dimensions of the production are smaller than the period between the fifties and the nineties of the last century. The main reason for this continued production is the importance of brown coal for the national electricity supply, to which it contributes 24% at the moment (<http://www.euracoal.org>, accessed 1 February 2009).

The brown coal mines in Lusatia are large open cast mines, in which the second brown coal layer, till 100 metres deep, is excavated. Landscape rehabilitation measures follow the brown coal mining, but sometimes not directly after closure of the mines. From the peak production in the GDR still unrehabilitated sites exist, but these are now rapidly reconstructed by the Lausitz and Central-German Mining Administration Company (LMBV). For the rehabilitation of present and future mines the mining operator is responsible. For these mines counts that rehabilitation follows directly after the mining. In Lusatia there is only one mining operator, Vattenfall. Obligatory steps in the rehabilitation process are surface reconstruction, restoration of the water household and soil stabilization and soil amelioration for agricultural cultivation or forestry (<http://www.lmbv.de>, accessed 21 March 2009).

To research the mining and rehabilitation in Lusatia more precise, a specific site is chosen. The mine Klettwitz is excavated between 1951 and 1991 counter clockwise around the village Kostebrau. Originally the landscape existed here for 86% of forest. The other land uses were small villages, heath lands and agriculture on the higher parts and ponds and wet areas in the lower part. The stream direction of the ground water was from north-east to south-west and ultimately ending in the Schwarze Elster (Der Braunkohlensusschuss, 1993).

The mining equipment in the mine Klettwitz existed of bucket wheel excavators and bucket dredgers to excavate overburden, a conveyer bridge to transport overburden to the other side of the mine and rail and conveyer belt spreaders to replace the overburden on the dump area. Under the conveyer bridge smaller excavators removed the brown coal. On rail and conveyer belt systems the coal was transported to the power plant

In Klettwitz the reconstruction is organized by LMBV and runs from 1993-2015. A research led to an integral spatial plan working towards a safe situation with new land uses of water, agriculture and forestry. This is called a reconstruction plan. Later initiatives add windmills, a biomass forest and the extension of the nature area Grünhaus to the plan.

Problems caused by mining

The mining causes in Lusatia environmental, mental and social problems. Environmental problems are degraded and instable soils, changed landscape contours, water quality and quantity problems and removed topography and connections to the surrounding landscape. Landscapes that are destructed by mining activities are a manifestation of placelessness according to Edward Relph (1976). This is a mental problem that comes to exist when the mining removes everything from the surface of the mining area. There is nothing left for people to relate to anymore (Figure 1).

In the GDR, Lusatia was entirely arranged for energy production and related industries. As Germany got reunified, energy and other products could be imported from the West better and

the economy in Lusatia collapsed. Now there is a low economic activity, a high rate of unemployment and the composition of the population got unbalanced (Scholz, 2008). Young and higher educated people moved to the west because of better job opportunities.

Landscape architects know about the working of the landscape and the underlying processes and systems, but also how people behave in the landscape and perceive it. Landscape architects have a problem solving attitude, use an integral approach to assignments and have visualization skills to project a future situation on maps or images. Landscape architecture is the profession that is able to solve all three kinds of problems caused by mining in an integrated way (Berger, 2008). Nevertheless, they are not often involved yet in Germany, in designing the rehabilitation for brown coal fields (Scholz, 2008).



Figure 1: Bückgen, a part of a Lusatian village before and after mining, a manifestation of placelessness

Landscape architectural criticism

Based on what we saw in the landscape and read in the literature, we criticized the current rehabilitation as being a solution to the environmental problems most, and insufficiently addressing the mental and social aspects. Besides, the solutions to the environmental problems from mining should be more landscape based according to us. In our view, a landscape based approach means that the processes and systems in the landscape are used in the functioning of the design, instead of artificial solutions only. Also, the mental and social problems need to be addressed more because we experienced no sense of place in the rehabilitated areas yet. The observed criticism together with the environmental, mental and social problems led to the following three statements:

1. the environmental problems should be based upon a more landscape based approach when this is a good alternative to the current practice;
2. the social and mental problems need a landscape narration approach to prevent the problem of placelessness in mined areas;
3. and integration of landscape narration with a landscape based rehabilitation approach is a necessary contribution to the current rehabilitation practice.

This criticism results in the following thesis statement:

‘To solve the problems in Lusatia caused by the mining, the integration of landscape narration with a landscape based approach to landscape rehabilitation is needed’.

To research this thesis, landscape rehabilitation and landscape narration are further elaborated. Literature is studied, but also reference projects concerning rehabilitation were researched to find out more about the two topics.

Landscape rehabilitation measures for Lusatia using a landscape based approach

The principles of landscape rehabilitation applicable for land rehabilitation in Lusatia concern improvement of soil conditions by means of stabilization, fertilization and prevention from erosion, water quality and quantity improvement and the creation of a new topography and connections of the mine site to the surroundings. For the improvement of the soil conditions for example, agricultural systems like alley- and strip cropping can be applied as a more landscape based alternative for extended application of mineral fertilizers and artificially improving the soil structure.

The rehabilitation principles are partly substitutes for each other. When there is a choice, the most landscape based opportunity should be chosen according to this thesis. Suggestions for a landscape based approach to landscape rehabilitation, based on the four steps towards ecologically sound rehabilitation from Peter Del Tredici (Berger, 2008) can help in the choice for particular rehabilitation measures:

1. Improve the chemical and physical conditions of the present mine soil substrates so that the growth of plants is supported;
2. No efforts need to be spared to enrich the degraded soils with organic matter like cover crops or mulch; this is important because it increases the speed of soil forming processes, it increases the water holding capacity, and it facilitates nutrient cycling;
3. When plants need to be selected, choose native species that are well adapted to the circumstances because they will grow most sustainable and at a low cost. Sometimes for aesthetic or other reasons new species can be chosen. The selected trees and shrubs have to have a strong capacity to produce new shoots because they are the start in revegetating the entire area;
4. There is a need for ongoing maintenance. Maintenance is needed in all phases for all constructed landscapes on all scales. 'Sustainable is not self-sustaining' (Berger, 2008). Some examples of maintenance are irrigation, weeding, pasture, mulching and replanting.

Landscape narration in Lusatia

The theory on landscape narration that is used in this thesis, is developed in the master thesis of Van der Westen and Westerink, tutored by prof. dr. J. Lenkeek and ir. P.A. Roncken from Wageningen University in the Netherlands. Van der Westen and Westerink based their theory on important works on landscape narration from Anne Whiston Spirn and Potteiger and Purinton (Van der Westen & Westerink, 2006).

First it is explained what a landscape narrative is, which four types of landscape narratives can be articulated in the landscape and how a story can be articulated in the landscape. Based on Spirn, figures of speech are translated into a landscape language.

To determine the content of the narrative to be told in brown coal mine rehabilitations in Lusatia, an inventory of existing stories has been made. Other media than landscape, like photographs and books, show that bizarre features of the mining landscape and the large scale landscape transformation are favourite subjects. It is concluded that the landscape narration in Lusatia should tell about the transformation in the landscape, which means that the type of the landscape narrative is the landscape chronicle, added with references to the bizarre mining landscape from the past, which is the landscape narrative type of the memoirs.

Reference projects on rehabilitation, like the Fresh Kills park in New York by James Corner and the Landscape Park Duisburg Nord by Peter Latz, have been studied to see how the process of landscape transformation is articulated in these projects. In this case, the theory of van der Westen and Westerink is used as an analysis tool. Figures of speech could indeed be recognized in the designs, although we assumed that they are not purposely designed so. This analysis was however promising to use the theory also as a design tool.

Design principles

The current image of Lusatia, together with the quite similar divisions in land uses before and after mining and rehabilitation, led to a trend analysis into future land uses in Lusatia.

Extension and connection of nature areas, renewed production forests, the production of renewable energy and tourism are important for the future.

The landscape rehabilitation principles are combined with the landscape narration principles. The principles of landscape rehabilitation and narration partly overlap; we consider this to be the field of the landscape architect (Figure 2).

So part C is the most important part of the diagram for this thesis, because it will show that the steps that have to be taken in landscape rehabilitation can be integrated with creating the articulation of a landscape narrative.

We suppose, that doing so is essential in three ways:

- the landscape chronicle is about mining but also about rehabilitation itself, and a landscape chronicle can be expressed best by using a landscape based approach to rehabilitation;
- because it is only possible to authentically articulate the site's history before characteristics are eventually erased by landscape rehabilitation measures already. This is necessary to be able to articulate the landscape memoirs;
- and integrating landscape narration principles with the obligatory landscape rehabilitation measures is efficient and prevents that it will cost more effort and or money than necessary.

A typical ground plan for Lusatian brown coal mines is deduced from analyzing the mine Klettwitz, which consist of a dump area with a 'Randschlauch' at both sides, an open cast final void at the end and the context of the mine (Figure 3). Together with a location on one of the subdivisions of the typical Lusatian brown coal mine, the rehabilitation and narration principles are integrated into design principles. As a first try-out, seventeen combinations are made of which seven articulate the landscape chronicle in the landscape (the transformation process) and ten articulate the memoirs (the references to the history and identity of the place). The design principles are built up like this:

Narrative principle + location on the dump + rehabilitation principle: (new) typology

The combinations result in an image of a landscape typology for either the dump, 'Randschlauch', or open cast final void. The context got no separate design principles, because it plays only a passive role.

To look whether the landscape typologies fit together, two experimental compositions are made for the typical Lusatian brown coal mine. From the two compositions one could say that:

1. it is certainly possible to design all of the four subdivisions of the mine, using design principles based on integrated landscape narration and rehabilitation principles;
2. in fact it is necessary to design the entire mine site in one plan, because the different design principles mutually influence each other, mainly in the construction of a

narrative. When for example a contrast is to be created, to emphasize the contour of the former mine site, the design for the three subdivisions of the mine should be tuned to each other;

3. and sometimes more than one design principle can be applied on one of the subdivisions. The design can be made more complex, and more interesting when applying more design principles.

It appeared that a coherent plan for the typical mine site can be composed based on the design principles.

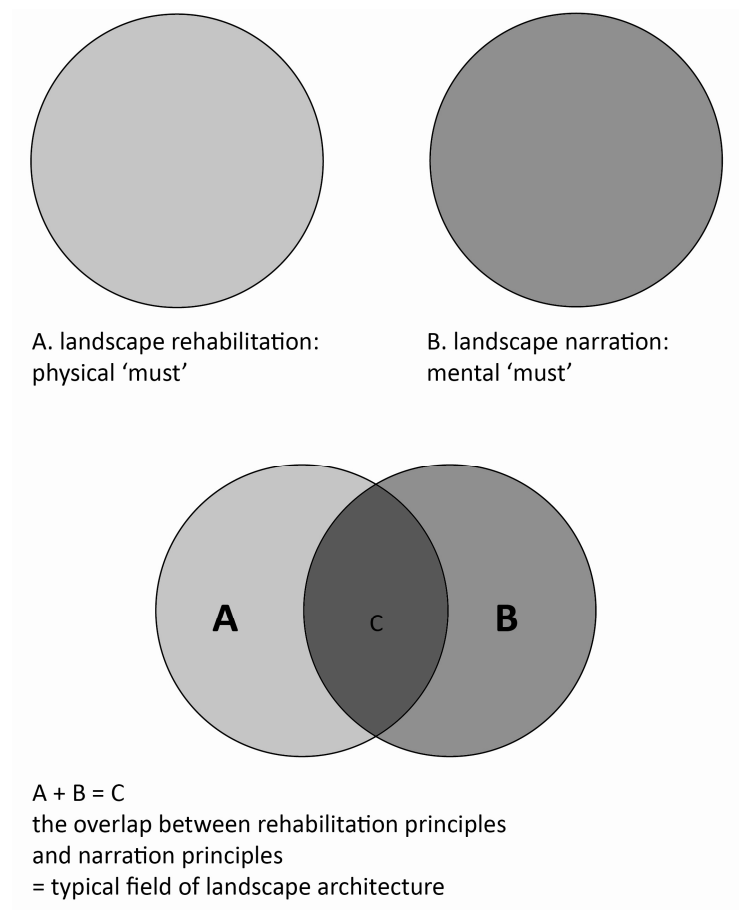


Figure 2: Overlap in the design principles of landscape rehabilitation and landscape narration

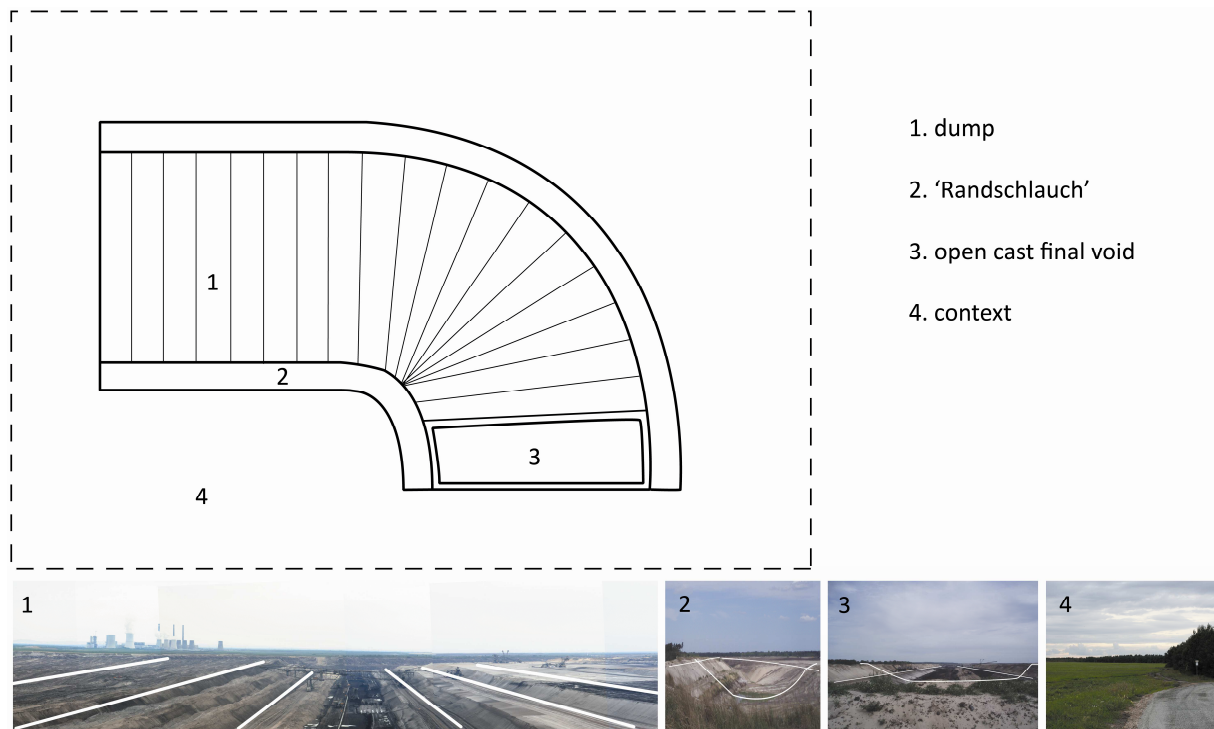


Figure 3: The subdivisions of a typical Lusatian brown coal mine

Application of design principles on Klettwitz

In a second test of the design principles, the site of Klettwitz is used. In the same way as the first test, the design principles are combined into an experimental composition. This composition is more precise and based on an actual situation. The case is imaginary in the way that the case as it is studied is mined already, and for the new plan the mining is to start in 2010.

A phasing in 6 time stages towards the composition for the site in 2060 as the mining ended, is added. Nine design principles are used in the composition for the mine site Klettwitz. One example is:

aposiopesis + 'Randschlauch' + (re)connecting ecological areas

Figure 4 shows an impression of this design principle. In this example the 'Randschlauch' is used to connect important ecological areas. A corduroy path for hiking gives people the chance to walk through the 'Randschlauch' and the curves and uncertain endings of the path makes that this path is an aposiopesis.

Altogether, the plan is evaluated to be:

- an answer to the environmental problems as much as the current reconstruction plan, but then making use of landscape based systems when possible. In this case alley cropping systems and succession processes are employed to improve the soil conditions over time;
- better equipped to solve the mental problems than the current reconstruction plan because a landscape narration is used. A landscape chronicle is articulated that makes the process of landscape transformation legible in the landscape, as well as the

- landscape memoirs that refers to the mining landscape and activities in the past. It is expected that this makes that people can relate better to the place again; and a better solution to the social problems than the current reconstruction plan, because more renewable energy production will be realized which is profitable now and in the future. The plan takes the development of tourism more into account, by creating a special landscape with experiences which can be explored from Kostebrau and the new visitor centre in the plan. Since this is expected to be profitable too, the economy diversifies which gives more certainty for the future.

The way the new composition is designed differs a lot with the existing reconstruction plan. While the existing plan rather seems to be composed by coincidence, the new rehabilitation plan is based on the design of the mine in the past with the 4 typical subdivisions, because apart from a reference to the past, this provides a coherent basis for a composition for the future. Still the composition is very flexible, because for each subdivision numerous design principles can be designed and also one or more principles can be applied on the subdivision if this is desired.

The former dump can be flexibly adapted to new land uses, while the other parts of the former mine form a long term structure with references to the past. From the whole, the processes that took and take place in the landscape are legible, and an identity as energy region is clearly established. This is directly the result of taking along landscape narration into designing.



Figure 4: Impression of the 'Randschlauch' with nature development and corduroy road for hiking

Conclusions

In answer to the thesis

'To solve the problems in Lusatia caused by the mining, the integration of landscape narration with a landscape based approach to landscape rehabilitation is needed.'

can be said, following the methodology of the experimental design (Steenbergen, 2008), that the thesis is true, with the addition of a trend analysis into land uses of future importance. To be able to prove the thesis in practice, a detailed mine site design has to be made based upon this landscape based approach which integrates landscape rehabilitation and narration. Then the design should be executed, tested and evaluated.

Discussion

Main discussion points on the outcomes of this design research are about the extent to which the landscape based approach can be an alternative for current landscape rehabilitation methods, and whether the theory on landscape narration explained by Van der Westen and Westerink is an applicable tool for design analysis and designing a landscape narrative. Organizing a participative planning process, which is suggested by Edward Relph (1976) might be even a better solution to create a sense of place, but we think that the landscape narration is at least a good contribution. In designing a detailed mine site rehabilitation, landscape rehabilitation and narration principles will be employed apart from each other too, and the extent of integration of landscape narration with landscape rehabilitation depends on the specific situation and the rehabilitation plans of the site.

Recommendations

- to do extended research into landscape based but less time consuming alternatives for land stabilization and improvement of the water quality and quantity, can support the ability to solve also the land stabilization and water assignment with a landscape based approach;
- to calculate if and how much longer a landscape based approach to mine site rehabilitation would take compared to the current practice. The same counts for the financial costs;
- to use this approach so far to make a detailed plan, and refine the approach by the findings;
- to test whether people experience that the place is different from other mine rehabilitations when the landscape narrative is added, and if this approach really enhances the sense of place in rehabilitated mining areas again;
- to organize the plan making interactively with the people following a participative approach, then the interest of people in landscape rehabilitation is increasingly taken into account. The people can play with the design principles together with landscape architects and other professionals until a plan originates that is broadly supported and not only the choice from the landscape architect;
- to intertwine this approach with the current practice. The current experiences in landscape rehabilitation from LMBV and Vattenfall are necessary to be sure that the safety of the landscape is guaranteed, and the environmental damage will be handled professionally. The proposals done in this thesis might however inspire to choose for a more landscape based approach to improve the soil quality;
- the landscape architect and the approach to rehabilitation from this thesis should be integrated into the obligatory rehabilitation plan, that is to be created in order to get the mining permission. Only then the coordination will be fully efficient.

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