Take a bio-shower

Assessing the governance of soil and water management in the Utrecht Central station project

Water Policy, Governance and Law - GEO4-6002, dr. A.M. Keessen (course coordinator)
Group paper assignment

29th of June 2015

M. Elstak	m.elstak@students.uu.nl,	3473422
S. van Haaster	s.w.m.vanhaaster@students.uu.nl	5570875
T. Kivits	t.e.kivits@students.uu.nl	3632199

Utrecht University

Table of content

Abstract

The Utrecht Central station area is currently being reimagined. One of the issues regarding the continuation of this project is the pollution of the soil with volatile organic chloride solvent compounds. A bio-washing machine will combine thermal energy storage with cleaning of these pollutants. This paper evaluates the governance of the bio-washing machine using the ten building blocks method.

The ten building blocks can be divided into three levels: content, organization and implementation. Each building block receives a subjective governance score of bad, sufficient or good. The content level is scored as good due to a good understanding of the water system knowledge and engineering and monitoring. The organization level is scored as sufficient. The organization led to the bio-washing machine reaching its goals, but the stakeholder involvement could be improved. The implementation of the bio-washing machine governance is scores as sufficient, mainly due to the lack of conflict resolution mechanisms.

Overall, the governance of the bio-washing machine can be improved most on the organization level. The content level is good, and the implementation fits within the legal framework. The legitimacy and equitability could be improved by a better stakeholder involvement.

Introduction

The Utrecht Central station area is home to important landmarks for the city of Utrecht, among them are the most important hubstation in the Netherlands, an indoor mall (Hoog Catharijne) and Jaarbeurs convention center. Several issues have come to affect the perception, utility, safety and general experience of the station area, among them increasing traveler numbers through the station and the train tracks are physically dividing the city in two parts. Taken together the various issues spurred the municipality to reimagine the station area (Buijze, 2013).

Alongside the cosmetic improvements to the area, the Central station project has ambitious sustainability goals, among them to decrease the CO_2 emissions related to heating and cooling the buildings in the area. By implementing geothermal pumps in the ground the need for fossil fuel powered environmental controls would be reduced (Buijze, 2013).

The groundwater in the construction area is contaminated with volatile organic chloride solvent compounds (VOCl). Contamination with VOCl's is common in many European cities. In many cases a single source of contamination cannot be identified and the contamination dates back many years (Kremers, 2009; Fennis, 2012). A total soil volume of 180 million m^3 is mildly to heavily contaminated with VOCl's around the station area (Kremers, 2009). The scale of the pollution can be seen in figure 1.

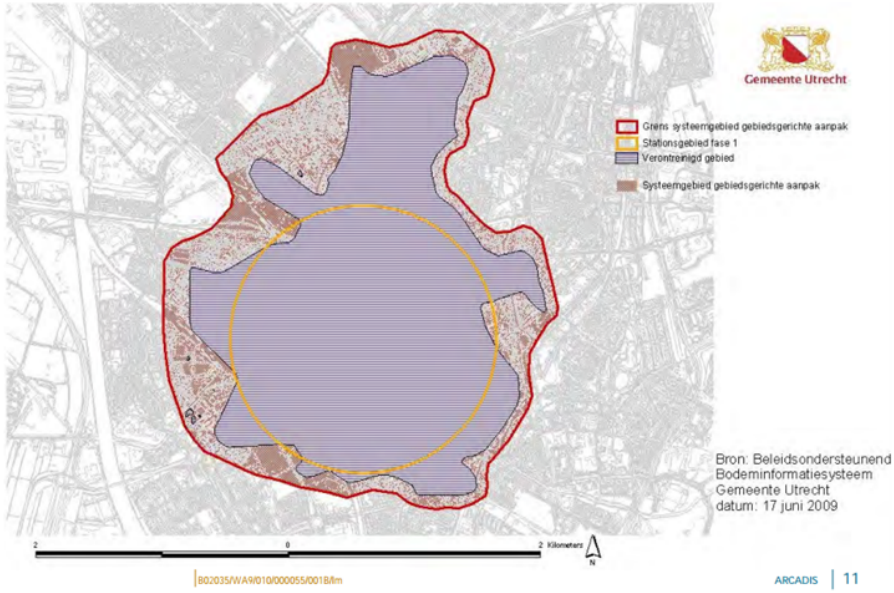

Figure 1 - Size of the polluted area beneath the Utrecht Central station area. Red line = Boundary of the area. Yellow line: Size of station area. Blue = polluted area (Dols, 2009).

VOCl's are soluble and heavier than water. Exposure to VOCl's has adverse effects on human health (Fennis, 2012). By using geothermal pumps, the groundwater will be in constant movement. This has a

positive effect on the degradation of the pollutants. The natural occurring bacteria and nutrients are better mixed with the contaminants and the quality of the soil will therefore improve. This process is referred to as the bio-washing machine (Dols, 2009). However, this project also runs up against several complications. VOCl's easily penetrate deeper in the ground and are also carried by groundwater streams vertically into the soil. This spreading can cause VOCl's to penetrate into layers that could potentially be used for drinking water. Geothermal heat storage would further mobilise the VOCl contamination in the ground, causing further spreading. The Dutch Soil Protection Act stipulates that any activity undertaken by a party that would arouse movement of such contaminations, should be prevented. Any plans of the project that would cause such a mobilisation were consequently brought into legal jeopardy by the Soil Protection Act (Kremers, 2009).

This paper will evaluate the governance of the bio-washing machine used at Utrecht Central station in regards to the soil water contamination in the context of the Dutch Soil Protection Act. Recommendations that can be applied to other similar projects in the Netherlands will be provided based on the governance of this project.

Method

A governance approach which only focuses on, for example the legal or the economic aspect of policy, ignores the holism of the various elements and can not bring integrated solutions to the water management problem (Rijswick et al., 2014). Integrated water resources management has been described as: "a process which promotes the coordinated development and management of water, land and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems" (Global Water Partnership, 2003). However, this definition is vague and not easily implementable into policy. The intent of the abovementioned description in regards to water governance evaluation was made actionable by Rijswick et al. (2014) in the ten building blocks method. This method was developed in a multidisciplinary way; water system analysis, economics law and public administration were all used to set up assessment criteria to create a common understanding of good water governance. The assessment criteria are grouped together in the following categories: content, organisation and implementation. This is summarized in figure 2.

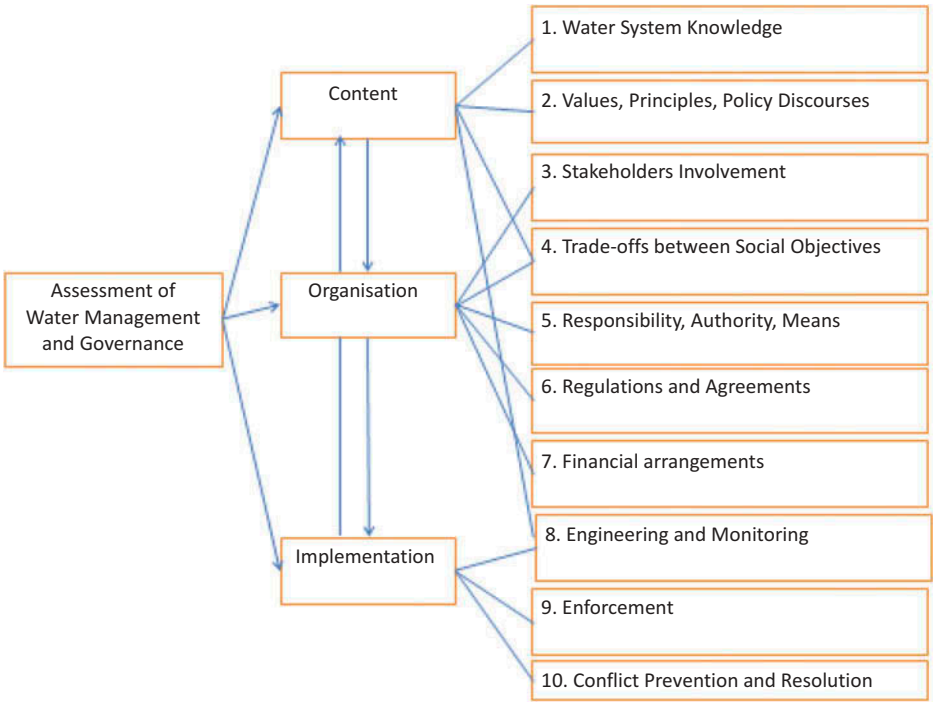

Figure 2 - Multiple dimensions of water management and governance (Rijswick et al., 2014).

Sound water governance should consider the knowledge on which policy is based, how policy is implemented and the conflicts that may arise when agreed upon water service level agreements (SLA) are enforced. Efforts have been made to develop an integrated water governance assessment method that considers various aspects such as social welfare and values, monetary cost and the legal framework in which it all functions (Rijswick et al., 2014). This approach allows the different values, interests and uses of water by various stakeholders driving policies and measures to be judged in concert.

The ten building blocks framework and assessment criteria will be used to evaluate the governance of the bio-washing machine used at Utrecht Central station. A subjective score (bad, sufficient or good) based on compliance or violation of the ideals set out in the assessment blocks will be given. Information was gathered using Kluwer Navigator search engine, Google Scholar and Google Search.

Water System Knowledge

Most of the research on the water system below the Utrecht Central station area was done by participants of the CityChlor project. This European project ran between 2008 and 2013 and had as goal a reduction of pollution and contamination of chlorinated solvents in urban environments. For this program a think-tank was set up to make a conceptual site model for the bio-washing machine. This think-tank consisted of members of Bioclear BV, Deltares, Wageningen University, Utrecht University, MWH, NL Agency, Bodem + and the municipality of Utrecht. The aim of the conceptual site model was to understand the dynamics in the subsurface. This aim is approached by a plan-do-check-adjust cycle. This approach makes

sure that the design of the model can be changed when new information about the water system is gained. For instance, the design needed to be changed when it became clear that the confining layer between the first and second aquifer was locally absent (Maas, 2013).

The conceptual site model integrates four different individual reports, which each explain a part of the water system. These four reports are:

1. Vapour intrusion;
2. Contaminant flux determination;
3. Biodegradation capacity;
4. Geohydrological modelling (Lieten et al., 2013).

The first report focuses on the possibility of vapour intrusion from the shallow groundwater layer to the surface. This may cause a risk to human health due to the contaminants in the water. During an indoor measurement campaign, no contaminants were found above the detection limit, suggesting that the harmful components are being degraded before reaching the surface (Lieten et al., 2013).

The second study researched the flux of contaminants from the shallow groundwater to the deeper layers. This is a threat because the contaminants may reach the second aquifer, which is a strategic water supply for Utrecht. The biodegradation capacity of the soil is therefore an important factor. It was further researched in the third study. This research revealed that the biodegradability of the soil is heterogeneously distributed and also locally absent (Lieten et al., 2013).

The geohydrological model integrated the result of the different studies and made it possible to determine the time that it takes for the contaminants to reach one of the critical objects: the indoor air, the drinking water sources or the second aquifer. The bio-washing machine may lead to an increased risk of vapour intrusion. This risk can be reduced by increasing the indoor air circulation (Lieten et al., 2013).

Based on the biodegradation capacity of the soil, the contaminated water from the first aquifer where the bio-washing machine is deployed will reach the second aquifer within 100 years. From that time onward, it is possible that the contaminants are pumped up through the abstraction wells. However, it is unlikely that the current abstraction wells remain operable for more than 100 years. Other solutions can be discussed with the drinking water company Vitens (Lieten et al., 2013).

There remain some recommendations in the conceptual site model that could be applied. For instance, more sites need to be examined for their biodegradation capacity due to the heterogeneity of the soil. However this does not critically affect the water system knowledge needed to implement the bio-washing

machine. Also, the geohydrological model needs to be re-applied when there are further changes in the soil such as a new heat storage pump or abstraction well (Lieten et al., 2013). However, the water system knowledge is overall well researched. The possible risks are known and the impact of the bio-washing machine is clear. Based on this, the level of governance is good.

Values, Principles, Policy Discourses

The 'Soil Protection Act' (Wet bodembescherming (Wbb)), sets rules on the remediation of contaminants in the soil (Structuurplan, 2006). The values of the Province of Utrecht are no (or as low as possible) health- and environmental risk from contaminated soil- and groundwater and an optimal matching of the quality of the soil and groundwater and its (future) use. The Province works on this ambition by achieving the following goals: soil management (a good quality of the soil, both chemical and physical), soil protection (a sustainable protection of the subsurface) and soil remediation (Provinciaal milieubeleidsplan 2009 - 2011). The contaminated soil must be cleaned if it poses a threat to humans or the environment. This is the case at the station area. The point of discussion is that polluted (ground) water is not allowed to be moved, but this is required to clean it. Article 13 Wbb imposes an obligation to care for the soil in case it might be polluted (Buijze, 2013).

Soil Protection Act - Article 13 – *Anyone who acts up or in the soil as set in Articles 6 to 11 and who knows or could reasonably suspect that through those acts the soils could be contaminated or affected, is obligated to take all reasonable measures in order to prevent contamination or degradation, or if such pollution or degradation occurs, to limit the contamination or degradation and immediate consequences and maximize the cleaning. If the pollution or degradation is the result of an unusual occurrence, the measures must be taken without delay* (Soil Protection Act, Article 13, 2015).

Summarized; the Wbb requires for old cases of pollution to be cleaned up and for new cases to be prevented. The existing polluted water is not a big problem for the station area. It becomes a problem because it needs to be drained for construction of several parts of the station project. The Province of Utrecht and the municipality of Utrecht may have the same ambitions but do not share their values and interests concerning the remediation of the contaminated soil, which complicates to implement easily a solution.

The values of the municipality are to have a regional approach of groundwater contamination and is defined in the policy: 'Protect, enhance and exploit: to an area-based approach of groundwater contamination in the subsurface of Utrecht'. In this policy it is explained how the municipality should deal with contaminated subsurface or groundwater in a way that the use of renewable energy can be stimulated optimally and spatial development will be promoted as much as possible (Kremers and Herms, 2010).

The regional approach of the remediation of the area contains the following characteristics:

- Cluster approach (Art. 42 Wbb);
- Partial remediation (Art. 40 Wbb);
- Phased remediation (Art. 38, section 3 Wbb) (Kremers and Herms, 2010).

To deal with the risks, the municipality developed an intensive monitoring system by following a contextualisation of the European precautionary principle. This principle relies on the so called 'hand-at-the-tap' principle. Projects with a high risk are monitored and stopped immediately if something goes wrong. Another general principle that guides the European environmental law is the principle that preventive action should be taken, environmental damage should as a priority be rectified at the source and the polluter pays principle (Buijze, 2013). The last principle does not have a direct impact on the regional approach of the groundwater contamination. The administrative authority who performs the approach can be seen as the polluter, if his actions or remediation program cause a spread of the contamination. But even if that is the case, the same administrative authority is already on paper responsible for the entire clean up, which means that there is no problem with this environment principle (Fennis, 2012).

The values of the Province, the relevant laws and the municipality do not directly meet, but based on the criteria of Rijswick et al. (2014), the level of governance is sufficient. The Council of Utrecht understands the facts, the values, principles and especially the laws. The European values and principles are understood and expressed at the local level. Sufficient knowledge of such principles alongside understanding of the Soil Protection Act allowed for the identification of a possibility to support the use of the bio-washing machine to remediate the contaminated soil within the context of the aforementioned principles and values.

Stakeholders Involvement

The CityChlor document "Organization and Financing of Area-Oriented Approach" gives advice on how to involve stakeholders in a project such as the bio-washing machine. Firstly, it is important to make a distinguish between stakeholders with more influence and those with less influence. The amount of influence of the different parties depends on the strategic objective of the project. For instance, the objective can be the protection of the groundwater, the exploitation of the subsoil for a certain function or the improvement of the groundwater quality. Stakeholders with high influences are the owners of the contaminated soil (especially when they have a remediation obligation), the users of the heat storage and the water authorities. These parties need to be involved in all stages of the planning process so that their interests and rights are acknowledged (Schuur et al., 2011).

It is also important to involve the stakeholders who are less influential. It is the obligation of the initiator to involve these parties and to make sure that their interests are not harmed. Less influential parties can be divided in two groups: license holders for the extraction of groundwater and decision makers who have made agreements with the competent authority about dealing with the contaminated groundwater. These parties need to be approached and at least be supplied with information about the project (Schuur et al., 2011).

The municipality of Utrecht is the main stakeholder and also benefits directly from the bio-washing machine. The municipality owns a substantial amount of the polluted ground and therefore bares the responsibility to comply with standards set in the Wbb (Buijze, 2013).

At the start of the project, the municipality sought support from the Province and national government. These supported the project since it could be used as a pilot project for an area-oriented approach for soil contamination. The municipality failed to involve the water authority at an early stage. The water authority subsequently submitted an official statement with their concerns around the contaminants reaching the second aquifer, a possible future drinking water reserve. Following this statement, the municipality has reached out to the water authority and discussed and addressed the concerns. Extensive monitoring must prevent the contamination from reaching the second aquifer (Buijze, 2013).

The municipality was only partially successful with involving the large private owners. Most of these parties were supportive of the initiative but they didn't give financial support. The private parties took a long time negotiating, but the municipality needed a quick solution. The argument of the private parties was that they didn't want anyone profiting from their investment without also contributing to some of the costs. However, the municipality couldn't guarantee this since it is impossible to determine all of the parties which would profit from the project now and in the future. The private parties therefore didn't contribute to the costs, but they will disproportionately profit from the bio-washing machine. However, cost recovery of these kind of projects has always been difficult under the Wbb (Buijze, 2013).

The municipality also failed to actively communicate about the project to the general public and NGO's . Only the required announcements and decisions were published. The reasoning behind the limited involvement the municipality is that the bio-washing machine is a technologically advanced project with limited consequences for most of the users of the Central station area. Since the project is based on an interpretation of the Wbb which is questionable (see Regulations and Agreements), the municipality wanted to decrease the risk of being challenged in court (Buijze, 2013).

To conclude, the most important stakeholders were involved in the project, however they were not all involved from the start of the project and their participation was limited. Also, the involvement of the general public and NGO's were minimized by the municipality to protect their own interests. This approach was effective in terms of reaching the goal of the bio-washing machine, however there is a lot to be improved thus leading to a bad governance score.

Trade-offs between Social Objectives

In 2001 the newly chosen town council of Utrecht decided to present two visions of how to renovate the Central station area in a consultative referendum. The council wanted to increase the involvement of the population of Utrecht to achieve support and a guarantee that something would happen. 'Doing nothing is not an option' was the slogan. On the 15th of May 2002 the population of Utrecht could choose between Vision A; an enlarged city centre, or Vision 1; a compact city centre (Masterplan Stationsgebied Utrecht, 2003).

Both visions were developed in consultation with residents, shoppers and other users of the station area. There were also consultations with parties who have interest in the station area, for example Cório (the owner of shopping centre Hoog Catharijne), NS real estate, the Jaarbeurs and the government. Both visions have common parts, for example the flow of travellers from, to and through the Utrecht Station area. Vision 1 gives the station area an international and dynamic sphere. The public areas will include nice paving, terraces and water. The station area will be clearly different from the surrounding area. Vision A gives a more relaxed and exudes a surprising atmosphere. The station area will includes more housing that the current situation and greener public spaces. The station area gradually merges into the surrounding neighbourhoods. In the following table the different characteristics of the two visions are presented (Referendumkrant, 2002).

Table 1 - An overview of the different characters of Vision 1 and Vision A (Referendumkrant, 2002).

Vision 1	Vision A
One main route – One main route from east to west; the centre boulevard.	**Two main routes** – Two main routes from east to west; the centre boulevard and a second main route.
Music centre moves – The relocation of music centre Vredenburg, together with Tivoli to the Smakkelaarsveld. At the place of the music centre, a space is created for 10.000 m² for shops with flats above.	**Music centre rebuilt** – The music centre Vredenburg will be renovated on the current location.

Westplein spruced – Traffic on the Westplein remains above the ground, but the traffic square will be refurbished.	**Westplein tunnelled** – the ongoing traffic on the Westplein goes underground. Above the ground is room for routes for cyclist, pedestrians and buildings.
Accent on the offices – A greater focus on offices. There will be 240,000 m² office space and at least 850 homes.	**Accent on housing** – A greater focus on homes. There will be at least 1,700 homes and an addition of 190,000 m² space for offices.
Catharijnsingel lively – The single will be a lively canal with stone quays, shops and restaurants.	**Catharijnsingel quit** – The single will have a tranquil atmosphere with green banks.
Construction 10-15 years – Implementation of Vision 1 runs over the next 10 to 15 years.	**Construction 15-20 years** – Implementation of Vision A runs over the next 15 to 20 years.
Revenue – The revenue amounts 15 million, this is 1 million per year for 15 years.	**Investments** – The additional investments amounts 91 million. This is 4,55 million per year for 20 years.

There was an attendance of 65.3% at the referendum polls. 70.7% of the voters had chosen for Vision A. The elaboration of Vision A was presented in a couple of public meetings and a couple of meetings for special groups like the residents' associations group and other interest groups. The referendum and the participation program together tried to incorporate as much as possible the residents, the business people, travellers and other stakeholders to make a planning for the Utrecht Central station area (Masterplan Stationsgebied Utrecht, 2003).

When faced with the burden of cleaning up the polluted groundwater, the plan of using a bio-washing machine originated from the municipality itself. Other technical alternatives were considered, but were rejected because of legal problems put up by the Wbb (Buijze, 2013).

The ultimate agreed service level decision is based on trade-offs between the different stakeholders, namely the residents, shoppers, travellers, Cório, NS, Jaarbeurs, other offices, the council of Utrecht and the government. They have made a decision based on costs, benefits and distributional effects between two alternatives. The municipality has done a good job in the overall project of the station area, but with the trade-offs between social objectives in relation to the bio-washing machine, the municipality fails. They ignore important parties and involve others in a very late stage (see Stakeholders). Due to this fact, the service level agreement applied to the groundwater contamination problem is not that good. Different

parties only had limited influence on the rule, regulations and procedures. Based on this, the level of governance is bad.

Responsibility, Authority, Means

The developing locations of the station area are both on private, but mostly on state property (around 70%) (Dols, 2009). The necessary contracts between the partners were developed in two steps. At first, an intention agreement was made in which parties express the intention to develop the proposed construction program along the path of a process-oriented approach. Second is the cooperation agreement, which covers the entire period of implementation of the relevant program and provides the basis for implementing agreements for each subproject.

The municipality of Utrecht directs the project. Only the tasks and responsibilities that have an added value to the collective parties are placed in a common project (Structuurplan, 2006). The municipality of Utrecht has the desire and the need to have the control of the project. This need is balanced against the importance of multiple involvement of the different actors and their responsibility. The municipality wanted to work together with private actors to realise the bio-washing machine, but they didn't dare to trust on it. The contribution of these actors were less than the municipality had anticipated, because of that fact, the municipality couldn't depend on the private actors and crafted the bio-washing plan in such a way that the project could succeed even without the involvement of the private actors. They carry the responsibility compliance with respect to the Wbb (Buijze, 2013).

The 'Bestemmingsplan' (Development plan) includes the legal background of the Masterplan. About one third of the investments are paid for by the government. Because of the long lead time of the whole project, economic influences could have effect on the feasibility of the project. Therefore a risk profile is developed. The realisation of the Masterplan is based on a phased approach in four implementation clusters (Structuurplan, 2006).

The municipality benefits directly from the realisation of the bio-washing machine because it owned a large part of the polluted ground. Because some part of the projects are taking place on publicly owned land, the municipality had to realise the bio-washing machine or had to comply with the Wbb. The last option is very expensive, probably technological impossible and there would result in a delay in the projects. The authority of the project lies thus with the municipality. They take all major planning decisions around the bio-washing machine but do depend on the cooperation of the private actors, because the private actors develop their own plans for their own properties, which could lead to conflicts with the bio-washing machine project (Buijze, 2013).

The responsibilities for each actor are clear, but it is not in a participative and integrative way, therefore the governance level is only sufficient. The municipality of Utrecht has the most responsibilities because of their own failure to involve other parties at an early stage. The authorities lies therefore also with the municipality.

Regulations and Agreements

When the municipality of Utrecht initiated the bio-washing machine solution, they needed a way to circumvent the traditional ways of dealing with contaminated soil set by the Soil Protection Act (Wbb). The Wbb is mainly applicable for individual cases of pollution rather than the area-oriented approach of the bio-washing machine. The contaminants in the soil below the Utrecht Central station area are mainly volatile organic chlorine compounds (VOCl's) which spread easily. The construction works in the area would likely lead to the spreading of the contaminants, which is prohibited by the Wbb. Article 42 of the Wbb gives the possibility of a cluster approach, where several contaminated sites can be cleaned up simultaneously. This approach still requires the different cases of contaminants to be identified. This is not possible for the Utrecht Central station area, since the contaminants have dispersed and become mingled. However, Article 42 gives discretionary room for the municipality to decide if a cluster of cases exist, which was justified by the clear benefits of the bio-washing machine (Buijze, 2015).

Another issue with the Wbb is Article 13, which prohibits the re-infiltration of contaminated groundwater. The article states that everything that can reasonably be required must be done to prevent new cases of contamination or to clean them up immediately. The thermal heat storage system would move the contaminants and thus create new cases of contamination. The municipality complied with Article 13 by stating that they have met the duty of care of preventing new contaminations since the overall plan would lead to an improved soil quality (Buijze, 2015).

To comply with the regulations set by the Soil Protection Act, agreements had to be made between the parties. One of the more important agreements was the declaration of intent "Bodem, WKO en Bio-wasmachine Stationsgebied Utrecht". This declaration was signed by the ministry of VROM (Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer), the Province and municipality of Utrecht, water authority Stichtse Rijnlanden, Hoog Catharijne BV, Cório Nederland BV, NS Poort Ontwikkeling BV and ProRail BV. The goal behind the declaration of intent was to make sure that the bio-washing machine would gain support from the government and that the required permits would be given (Schipper et al., 2010).

The municipality adopted a cleaning plan in 2010 based on the interpretation of the Soil Protection Act as described above, which was supported by the ministry. However, this plan only concern contaminations

by VOCl's. For the other types of contamination, there is still the requirement to do research and formulate a cleaning plan. These obligations were reduced by the Crisis and Restoration Law (Chw) by assigning the bio-washing machine as an innovative project. Based on the Chw, the policy rule "afwijking wet bodembescherming in Stationsgebied Utrecht en omgeving" was adopted by the municipality in January 2012, which led to the adaptation of the Soil Protection Act in July 2012 to facilitate the area-oriented approach (Buijze, 2013).

The bio-washing machine is thus a recontextualization of the Wbb. This contextualization goes so far as to influence the original law which forced the recontextualization. The governance pertaining to the regulations and agreements is scored as good. The legitimacy of the bio-washing machine had to find its grounding but appears to at this time garnered that support.

Financial arrangements

The continuation of the Utrecht Central station area improvement plans were initially put at risk due to the contamination of the soil. Any construction activity beyond five meter from the topsoil would possibly mobilise the present soil contamination. Mobilisation of the VOCl's would present a risk to the environment and to the future plans of abstraction of groundwater in that area. The Soil Protection Act prohibits further contamination of soil or makes activities that would lead to mobilisation exorbitant expensive. The efforts that would be undertaken to investigate and prevent mobilisation of contamination would have been prohibitive to the project and would likely had led to the project being put on hold. As one of the municipalities plans, the exploitation of the geothermal potential, would result in mobilisation of VOCI's the municipality was left with finding a way to prevent this (Buijze, 2013).

The Soil Protection Act also brought one of the more ambition goals of the project, the geothermal energy storage aimed to reduce the CO_2 output of the renovated area, at risk (Buijze, 2013). The bio-washing machine that the Utrecht municipality proposed, provides a solution for the geothermal energy storage and the clean up of the VOCI contamination. The cluster approach (as opposed to the case-by-case approach) of the bio-washing machine has several advantages for the owners and users of the area being remediated. It has been expressed that these advantages should be equally compensated, even beyond the avenues allowed in the Soil Protection Act, by those that profit from the bio-washing machine (Kremers, 2009).

The financing of the bio-washing machine however is not equitably divided among the public and private parties. No legal instruments have been identified in literature that is available to the municipality with which they could enforce a financial contribution by the private parties towards the bio-washing machine. The only option available to the municipality of Utrecht was to negotiate and ask for voluntary

contributions from the private parties (Buijze, 2015). While the private partners do contribute to the bio-washing machine, their financial contribution is limited. The municipality also involved and engaged the private parties too late in negotiations and in the process to ensure an equitable division in the financing of the machine by one account. The lack of legal instruments, within or outside of the Soil Protection Act, results in the municipality carrying most of the burden of the bio-washing machine (Buijze, 2013). The financing of the bio-washing machine thus comes primarily from tax money of the municipality of Utrecht. The private parties consequently are advantaged not having to contribute financially to the remediation of the soil but sharing in the benefits that come from it (Mars and Herms, 2011). The most obvious of which is the continuation of the projects without exorbitant financial costs related to the soil pollution (Kremers, 2009).

The financing of the remediation of the soil and water quality by the bio-washing machine is thus not equitably shared by all the parties and fall for a majority to the public partner; the municipality of Utrecht. The financing of the bio-washing machine does consequently not follow the profit principle. While the polluter pays principle can in theory be applied (see Soil Protection Act Article 75, section 1) to the financing of the bio-washing machine this poses several problems. Among them that it becomes increasing difficult to identify who is responsible for the VOCl pollution in the area and even if such an entity can be identified if it can pay for the clean up (Fennis, 2012). The bio-washing machine is however a (financially) sustainable solution for the municipality, certainly when placed next to the alternative of individual clean up efforts. Based on the assessment criteria set out in Rijswick et al. (2014) and the evaluated information around the governance of the financial management of the bio-washing machine is assessed to be poor. Cost recovery is not possible for the service provided, the financing of the bio-washing is not equitable divided. Nonetheless the clean up of the VOCI contamination is successfully being executed.

Engineering and Monitoring

The municipality of Utrecht's approach to ensure that the Soil Protection Act was observed and action was taken that fit within its boundaries took enginering form in the bio-washing machine. The bio-washing machine would achieve many goals. It would allow for geothermal storage of energy, clean up the VOCl's in the ground and the through the movement of the water also accelerate the process. However the bio-washing machine's main advantage was that it allowed the planned developments to continue without causing large increases in financial costs. However neither public support nor innovation in the private sector involvement was sought by the municipality in support of the bio-washing machine. There was only a limited role by the private parties of the Utrecht station area project in the bio-washing machine. The lack of private party involvement has one clear advantage. The success of the bio-washing machine is not dependent on the cooperation of the private partners of the project.

The success of the bio-washing machine as a consequence depends mostly on the efforts of the municipality.

Concerns have been expressed on the effectiveness of the bio-washing machine and contamination of the currently non contaminated secondary water layer by responsible water authority (De Stichtse Rijnlanden). The water authority is involved in the procedural process of the planned construction by issuing licences for the abstraction of groundwater. These management concerns are addressed by the main party responsible for the bio-washing machine, the municipality, by implementing an extensive monitoring program. The monitoring program aims to limit the concerns and risks of the bio-washing machine. Following the precautionary principle the municipality monitors risky projects such as these intensively. The precautionary principle flows from the hand-at-the-tap principle which dictates that during monitor if something were to go wrong the activity can be halted immediately (Buijze, 2013).

The municipality ensures that the quality of the soil and water (in the long run) improves and does not affect the groundwater to be used in the future as a source. No service level agreement beyond this can be identified that is relevant to the bio-washing machine. As a result the monitoring program of the municipality is the most important engineering monitoring aspect. Present and future values are taken into consideration in this enginering and monitoring program. Taken together, the assessment criteria set out in Rijswick et al. (2014) relating to the engineering and monitoring of the bio-washing machine are more than adequately met.

Enforcement

The initiative for the Utrecht Central station project comes from the municipality of Utrecht. Private actors such as Cório (Hoog Catharijne) and Jaarbeurs (convention centre), both of which flank the Central station, play an important part in the success of the overall project. Development plans were made in agreement between the private parties and the public parties such as the municipality of Utrecht.

The legal instruments needed to achieve an equitable agreement between the private parties and the municipalities in regard to the bio-washing machine were absent at the time of its inception. This left the municipality without the ability, to among others, direct the efforts related to the geothermal energy storage. Preferably licences for the storage of geothermal energy and water abstraction would go to the party who would make (the best) use of energy storage capacity of the soil. Such considerations are not made by the Province when they issue such licences (Buijze, 2013). On the other hand, the issuing of licences by the regional water authority does show a degree of flexibility in relation to the Soil Protection Act. When water needed to be extracted for the construction of an underground car park and could not

be returned after construction. The water authority nonetheless issued the licence, in part because concerns for the quality of the water were being met by the bio-washing machine (Buijze, 2013).

The possible separation of the soil clean up into multiple parts may have further complicated the management of the clean up efforts. Under the best conditions, clean up would take place in an integral manner. Seeing the clean up as an integral process was due to "creative interpretation" of Article 13 of the Soil Protection Act. By allowing the area to be seen as a cluster of diffuse pollution the soil quality was allowed to get worse before it was actually remediated in the long run (Buijze, 2013). Article 13 of the Soil Protection Act requires that any soil degradation be prevented through all reasonable measures (Soil Protection Act, Article 13). The aforementioned reinterpretation reframed the duty of care principle by allowing the pollution to, on the short turn, get worse before getting better (Buijze, 2013).

As stated above, if the Soil Protection Act were followed to the letter, the Utrecht station project would be extortionate expensive and technically difficult. Much of the pollution in the area cannot be distinguished, so-called blending of the pollution plumes. Enforcing the polluter pays principle, as in the Soil Protection Act then becomes technically impossible (Buijze, 2013). The bio-washing machine and the monitoring that goes along with it allows for enforceable rules in regard to the Soil Protection Act by the municipality of Utrecht. The credibility and legitimacy of the approach may be helped if the private sector was more involved in the process. Overall, the assessment criteria set out in Rijswick et al. (2014) related to the enforcement of the bio-washing machine are sufficiently met on the part of the executing party, the municipality, but poorly met by the current provisions and procedures set out by the Wbb relating to stakeholder involvement.

Conflict Prevention and Resolution

The municipality of Utrecht foresaw several conflicts related to the bio-washing machine. It could firstly possibly be brought to court for the contextualization of the bio-washing machine under the Soil Protection Act it. The bio-washing machine requires a creative interpretation of the cluster clean up approach mentioned in the Wbb and that the quality of the soil become worse before it becomes better. The municipality mediated this by limiting the amount of communication about the project to the general public. The municipality also made sure that they had the support of the ministry of VROM and the Province of Utrecht, so as to strengthen the legal basis of the bio-washing machine. Besides, the bio-washing machine doesn't directly affect a large part of the users of the Utrecht Central station area, making the chance of the municipality actually being brought to court by one of theses parties quite small (Buijze, 2013).

Another possible conflict is that the municipality could be held liable by landowners of property that would be contaminated by the initial spreading of the contaminants due to the bio-washing machine. However, the landowners would have to prove that the value of their property would diminish to successfully sue the municipality. Due to the depth of the contaminants, this wasn't seen as likely by the municipality so this wasn't an issue for the realization of the bio-washing machine (Buijze, 2013).

Overall, the chance of a conflict over the bio-washing machine is quite small. The municipality succeeded in getting a wide support for the project by involving the ministry, the Province, the water authority and the private owners. The change of a conflict with other entities is small. Therefore, the municipality hasn't accounted for any conflict resolution measures. Based on this the governance is effective, but it could be better if there were conflict resolution measures in place.

Conclusion

The ten building blocks framework and assessment criteria were used to evaluate the governance of the bio-washing machine used at Utrecht Central station. Using the subjective score of the ten building blocks as described above the following conclusions are drawn about the governance of the bio-washing machine. This will be done on the collective aggregate levels of content, organisation and implementation, see figure 1.

On the content level, the knowledge of the water system is adequately taken into consideration in regards to the project by the municipality, information on the risks and possibilities are available and used. The municipality is also aware of what future knowledge should be gained if the situation changes. Engineering and monitoring governance is also sufficiently addressed in the bio-washing machine project. Various European values and principles are applied and placed in the wider legal framework. Possible conflicts between the values of the municipality and province have been adequately addressed and expressed in the recontextualization of the Wbb that supports the bio-washing machine. Overall the content on which the bio-washing machine governance is based is good.

Stakeholder involvement by the municipality is lacking in several respects. Not only were relevant stakeholders only involved in the project at a very late stage, the municipality appears to eschew transparency in favour of the project continuing without (further) interruption. While the municipality takes (almost) full responsibility that the SLA related to the groundwater in the Central station area will be met, the path that was taken to achieve this goal leaves room for improvement. Trade-offs made do ultimately support the SLA dictated by the Wbb, but weigh the possible contributions that can be made by the private partners as secondary to meeting these SLA's. Leaving the private partners only superficially involved in the bio-washing machine. The private parties to the project placed financial equitability among those profiting from the bio-washing machine higher than an equitable contribution to the clean up effort, having the municipality shoulders most of the authority for the bio-washing machine. Here again, the municipality appears to place the continuation of the Utrecht station project rather than stakeholder involvement as its highest priority. The bio-washing machine remains the least expensive option to achieve the clean up and, at this time, stands on strong legal ground within the contextualization of the Wbb. Overall the organization of the governance pertaining to the bio-washing machine fulfills its end goals of cleaning up the VOCI's in the area and allowing the geothermal heat storage to continue without increasing the project costs significantly. However, at various stages the organisational involvement in the project by the private parties could have been more. This leads to an overall barely sufficient governance organisation score.

The governance of the bio-washing machine was implemented in a sufficient manner. The solution suits the context from an engineering perspective and is sufficiently monitored by the executing party. As most of the executive power lies with the municipality, it can also enforce the contextualization of the Wbb needed to implement the bio-washing machine. As this approach is supported by the Province and ministry of VROM, not many conflicts can arise so long the municipality maintains the SLA's. Were these to be broken, conflicts may arise about the financing of a solution. Will the private partners so easily be dismissed by the municipality then to contribute to a clean up effort? The municipalities extensive monitoring is designed to prevent such as situation from arise. All-in-all, the implementation of the bio-washing machine governance is sufficient.

Taken together the governance of the bio-washing machine can most be improved in its organisation. The knowledge on which decisions are made are sound and the implementation is grounded within the larger legal framework. However the legitimacy and equitability of the bio-washing machine could have been improved by involving private partners to the project more actively.

Recommendations

Based on the identified gaps in the governance of the bio-washing machine the following recommendations can be made to other similar future urban development projects in the Netherlands.

Every project should account for conflict resolution measures that may arise from conflicts with private or public partners. Not doing so from the start can leave a project without adequate measures to handle such as situation. Flexible rules and legal tools should be developed that allow for appropriation of water abstraction licences related to geothermal energy, these licences are at this time not awarded to those who will make the best use of the geothermal potential of the subsurface. There should be more room in the Wbb for a cluster cleanup approach and long term environmental gains as opposed to the rigid framework that can cause large projects to become financially impossible. The Wbb should also incorporate more robust legal avenues to stimulate cost recovery of cleanup efforts of polluted soil. Such cost recovery is difficult at this time within the Wbb. Finally it is advised to involve (private) parties at an earlier stage in the development and financing of such projects.

Literature

Buijze, A. (2013). *Case Study Utrecht Station Area, the Netherlands: How PPPs Restructured a Station, a Shopping Mall and the Law*. Context Report 4. AISSR programme group Urband Planning, Amsterdam.

Buijze, A. (2015). Promoting Sustainable Water Management in Area Development: A Regulatory Approach. *Journal of Water Law*, 24(1), 166-173.

Dols, P. (2009). *Saneringsplan Ondergrond Utrecht, Gefaseerde Gevbiedsgerichte Aanpak*. Arcadis Nederland BV, Hoofddorp, Nederland.

Fennis, R. (2012). *Gebiedsgerichte aanpak van grondwaterverontreiniging*. Universiteit Utrecht, 106.

Global Water Partnership. (2003). *Integrated water resources management toolbox*, Version 2. Stockholm, GWP Secretariat, 2.

Kremers, M. G. J. (2009). *Bouwrecht, Saneringsdoelstelling voor historische bodemverontreinigingen in de Wbb.*

Kremers, G.J. and Herms, M.H.J. (2010). Gebiedsgerichte aanpak van het diepere grondwater in de gemeente Utrecht. *Bouw* (6).

Lieten, S.H., Henssen, M., Nipshagen, A., Wittebol, J., Valstar, J., Langenhoff, A., Gehrels, H., Stuurman, R., Stuut, R.J., Grotenhuis, T., Sommer, W., Mars, J.F., Maas, T. and de Vries, A. (2013). *Integration of results CSM 'Bio-washing machine'- Different innovative characterization methods and models for optimisation of the area-oriented approach.* [Cited on 01-06-2015] .
http://www.citychlor.eu/sites/default/files/06_0_integration_of_results_csm_bio-washing_machine.pdf

Maas, T. (2013). *CityChlor Think-Tank Conceptual site model - Bio-washing machine.* [Cited on on 01-06-2015].
http://www.citychlor.eu/sites/default/files/06_00_csm_model_bio-washing_machine_v3.0.pdf

Mars, F.J. and Herms, M. (2011). *A new perspective on area- oriented soil remediation in urban development*. (5).

Masterplan Stationsgebied Utrecht. (2003). Gemeente Utrecht, Projectorganisatie Stationsgebied (POS).

Provinciaal milieubeleids plan 2009 - 2011. Provincie Utrecht.

Referendumkrant. (2002). Referendum aanpak stationsgebied. Gemeente Utrecht.

van Rijswick, M., Edelenbos, J., Hellegers, P., Kok, M. and Kuks, S. (2014). Ten building blocks for sustainable water governance: an integrated method to assess the governance of water. *Water International,* 39(5), 758-742.

Schuur, G., Kroone, E. and Koenraadt, R. (2011). *Organisation and Financing of Area-Oriented Approach Number.* [Cited on on 01-06-2015].
http://www.citychlor.eu/sites/default/files/organisation_and_financing_of_area-oriented_approach.pdf

Schipper, L., de Bruijn, P., Kerkhoven, P. and Walenberg, R. (2010). *Casusboek Gebiedsgericht Grondwaterbeheer.* SKB Duurzame Ontwikkeling Ondergrond, Gouda, Nederland.

Soil Protection Act, Article 13. [Cited on 20-5-2015].
http://wetten.overheid.nl/BWBR0003994/geldigheidsdatum_07-06-2015#HoofdstukII

Soil Protection Act, Article 38. [Cited on 20-5-2015].
http://wetten.overheid.nl/BWBR0003994/geldigheidsdatum_07-06-2015#HoofdstukIV

Structuurplan. (2006). Stationsgebied, Gemeente Utrecht, Dienst Stadsontwikkeling.

Photo on cover page: Conceptulization of the reimageined Utrecht Central station area. [Cited on 24-06-2015].
http://cu2030.nl/page/ovterminal