
Stormwater management and Decision-making processes

prepared by

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1 Introduction

1.1 General

The objective of the Daywater project is to promote the integration of stormwater source control into sustainable Urban Management Strategies by an Adaptive Decision Support System. An important part of the ADSS is therefore technical information on types of BMPs, pollutants and source flux modelling. But this is not enough. In practice, the implementation of these techniques is an important bottleneck, also according to the endusers of this project (D3.1). The first contact with end-users (questionnaires and regional conferences) and the scientific experience shows that many stormwater source control projects are blocked not because of lack of technical information but because of problems in the decision making process: How to handle uncertainties? How to involve other stakeholders? How to interact with other fields of policies? To give answer to these and other questions we will take a closer look at decision-making processes in urban stormwater management.

This deliverable tries to answer these questions, by building a framework of the decision making process. The decision making process consists of all decisions or actions undertaken by stakeholders in order to manage urban stormwater. These actions may be model studies, or tuning conflicting interests of stakeholders. Elaborating the framework helps endusers to position events during water management and to reflect on them. Only then it is possible for an enduser to undertake appropriate actions. In the end, the knowledge of the dmp should enlarge the chance of implementation of source control. Also, this deliverable develops some tools to overcome specific bottlenecks in the dmp. Later deliverables of WP3 focus on the integration of stormwater management into urban dynamics, using the aspect and the complexity theory.

1.2 Decision making processes and the ADSS

For urban stormwater management we can distinguish two levels of the decision making process: the project or stakeholders level where the decision making process focuses around a specific project(s) and the public policy level where different public policies influence / create the decision making process. These two levels are inseparable: A public policy can change drastically the decision making process (participants and their means) and a project can be the reason for the change of a public policy. Subsequently we are going to study both levels for different countries. The analysis of different decision making processes in Europe will contribute to the creation of an ADSS better adapted to the existing decision processes. It will offer information and guidance for every decision phase and level and it will help the stakeholders to have a global view of the project and its interactions with other elements of the urban life (urban development, environmental protection, economic growth etc).

1.3 Aim of report

The analysis of the Decision Making Process has three main objectives:

- To give insight in the progress and evolvement of the local dmp.
- To offer some tools to overcome specific problems in the dmp, especially problems which occur by the integration of stormwater management into urban dynamics.
- To structure the information and tools, offered in the ADSS.

The analysis is conducted by describing a structure of the dmp, which suits the characteristics of urban stormwater management and applying this structure to different case studies in different countries.

The report is divided in 5 chapters. The first chapter is this introduction. The second chapter describes the structure of the dmp, following the viewing angles: legal framework, stakeholders and phasing. The third chapter contains case studies on the decision making process in different European countries. The fourth chapter elaborates the components derived of this

Deliverable and implemented in the ADSS. These components are a direct result of the work on this deliverable and can be viewed as a coherent extension of this report. The last chapter draws conclusions on the research done. The content of this report is a result of a mutual effort of ENPC and Tauw.

2 Decision making process

2.1 Introduction

The objective of this chapter is to describe a structure of the decision making process, to enable endusers to describe their local decision making process. The structure consists of three viewing angles. In first angle is the legal framework. This framework determines who is responsible for the stormwater management, who has to pay for it and how to do the management. The second angle are the stakeholders. Different stakeholders have different responsibilities in stormwater management. Furthermore, these water managers are dependent on other, non-water stakeholders. For example the traffic department of a municipality or inhabitants involved in a project. The main problem is to build fruitful cooperation between all these stakeholders, which depends on their stakes. This viewing angle gives a structure to analyse these stakes. The third angle is the phasing of the dmp. Theoretically, the decision making process is the succession of different project phases: planning, design, implementation; maintenance and operation, evaluation, with the involvement of different stakeholders with different roles and means (legal jurisdiction, financial means, expertise, specialised personnel, infrastructure, materials, political means, capability to negotiate and collaborate (Larrue 2000, Schrama 1998)) in each phase.

The project phases (planning, design, implementation; maintenance and operation, evaluation) are not necessary lineaire and they are not used in order to 'simulate' the real life procedures in a model. Real life decision processes, the interaction between different stakeholders and different phases are very complicated and ad-hoc to be 'simulated'. The phases are used in order to structure all relevant material and help the user/ 'decision maker' to choose information equivalent to his problem. The project phases have a logical sequence but all phases are interconnected so the user can define his own sequence of decision making process.

Endusers can analyse their decision making process by implementing the public policies, by the introduction of new stakeholders in the decision making process and by describing the characteristics of the different phases. This analysis gives for example the opportunity to re-evaluate the role of the existing stakeholders.

The 'decision making process' analysis is an essential part of the ADSS as it will make the software 'clever' enough to be adaptable to different decision making processes but most of all it will help in the linking of different tools of the ADSS (which tool is useful at each project phase, how to link the policy instruments database with the decision making process, water values, negotiation methods etc.)

2.2 Analysis methodology

In order to formulate a coherent analysis the following methodology will be followed. Each viewing angle (legal framework, stakeholders, phasing) will be applied to the French and Dutch situation. This means:

1. Presentation of the national policies and context: Main legislation, regulation, public policies and national tendencies that influence the urban stormwater management (Water policies, Environmental policies, Urban development policies).
2. Stakeholders and their influence in the decision making process: Presentation of the administrative structure of water management in this country and a brief profile of possible urban stormwater managers (their aims, legal jurisdiction, financial means, expertise, specialised personnel, infrastructure, materials, political means, capability to negotiate and collaborate).
3. The phases of the decision making process with examples from end-user's case studies: The decision making process in a stormwater project. Interaction between different

stakeholders as well as inter-services collaboration. Comments with a description of the means and constraints of each stakeholder, the strategies they followed and the outcome.

In this chapter we are doing the analysis of decision making process in France and in the Netherlands, which can be used as templates for the decision making process analysis in other countries.

2.3 The legal framework

The objective of this paragraph is not to describe all possible local policies, but to give an example of the structure of such an analysis. We start with a short description of the European legal framework.

European legal framework relevant to USWM

There are no European Directives directly focused on USWM but USWM is influenced by more general European Directives. The European Directive 91/271/EEC concerning Urban Waste Water Treatment is giving specific management and treatment prescriptions (sewerage system and waste water treatment plans prescriptions, detailed lists of the permitted WWTP outflows and characterisation of the water bodies). This Directive is always valid and influence all the major decisions about urban water management but it influence directly the storm water treatment only in cases of combined sewerage systems.

(<http://europa.eu.int/scadplus/leg/en/lvb/l28008.htm>)

The European Water Framework Directive 2000/60/EC is the one that has the more direct consequences on USWM by demanding an integrated Community policy on water. It aims at reaching a coherent policy all over the European Union and through all different human activities that influence the water quality (agriculture, industrial use, drinking water, waste water, urban run-off, navigation, fishery, recreation). Unlike the 91/271/EEC Directive the Water Framework does not give precise technical prescriptions but more general and ambitious objectives: "Prevent further deterioration and protect and enhance the chemical and ecological status of aquatic ecosystems". It demands long-term integrated water management with public participation. It prescribes water management at the level of "river basin districts" which should be created as institutions and carry out this long term management starting with preliminary studies and then setting specific goals for each river basin district. The main principles of this long-term management should be the preventive action, the source control of pollution and the polluter pays principle. By 2010, Member States must ensure that water pricing policies provide adequate incentives for users to use water resources efficiently and that the various economic sectors contribute to the recovery of the costs of water services including those relating to the environment and resources. (<http://europa.eu.int/scadplus/leg/en/lvb/l28002b.htm>). The promotion of integrated water management influence the USWM as storm water contributes to the pollution of water bodies.

The transcription of the European Water Framework into the national legislation of each country-member is indirectly requiring the re-structuring of a Water Management based on "river basin districts" and the integration of USWM in many Water Management policies. The European Water Framework prescribes many policy instruments as the participative decision making processes and economic instruments but most of all prescribes a new organisation (the river basin district institution).

Urban stormwater is strongly embedded in a legal and juridical framework. Each country has its own legal framework, but because of the scaling-up process in European this will become more uniform in the near future. The European Water Framework Directive (WFD) is one of those regulations that will have strong impact on urban stormwater management.

Conclusion

The influence on the EWFD on local water management is:

- Attention for the ecological quality of surface waters
- Definition of parameters by which water quality will be monitored. The list of parameters will be defined for each catchment basin, but they will be defined in 2005.

French relevant national legislation and policies

France used to be a country with a very centralised administration. It is from the beginning of the '80ies that decentralisation processes started in France and they are still in progress. The municipalities are responsible for the management of urban water but also they can create syndicates and municipalities associations and delegate them this responsibility. The combination of this old centralised administrative organisation and this new trend of municipalities associations co-operation resulted in a wide range of possible stakeholders. With these stakeholders we have to add the 6 "Agences de l'Eau" / Water Agencies that are responsible for the funding of the water management in the level off a river basin district.

Storm Water management may be influenced by many different legal documents but it is rarely the main topic. We can divide the relevant legislation in three categories that influence the storm water: The legislation about sewerage management, the legislation about water management, the legislation about risk management (flood prevention) and the legislation about decentralisation.

Like in many European countries in France the Storm Water management was for many years limited to the implementation and operation of sewerage systems. In 1894 the principle "tout-à-l'égout" (all in the sewer) started to be implemented. In 1949 the technical circular (CG 1333) gave precise prescriptions for the calculation of separate and combined sewerage systems following the rational method adapted to the French climate. In 1969 a new circular (Chalandon) promoted the separate sewerage systems and the use of natural streams for the evacuation of rain water. In 1964 the Water Agencies were founded (named at that time 'Agences Financières de Bassin') and from 1969 they start to fund the construction of WWTP. Rain water was considered as clean water. In 1977 a new circular was published (no° 77-284) that promoted separate networks, retention basins for the rain run-off. The application of the rational method was limited to small urban areas and further modelling of the systems was demanded. (Dupuy et Knaebel 1982.) This is the last technical circular. A recent guideline called 'La ville et son assainissement' (The city and its drainage) (Certu 2003) gives general guidance but has not the legal power of an inter-ministerial circular. This guide includes also a sum up of other legal documents relevant to storm water management.

Legal documents can answer 3 major questions: Who is responsible? Who pays? How to do the management?

Who is responsible?

The French legislation (Loi sur l'eau 1992) clearly defines **the municipalities** as ones responsible for urban water management. (Code des communes article L 372-3) They are responsible not only to define the areas connected (or to be connected) to a sewerage network but also the areas using individual sanitation systems. It is their obligation to define the areas where imperviousness has to be limited and to manage the urban run-off quantity and quality (drainage, storage and treatment). The municipalities can assure the urban water management or delegate it to municipalities associations¹ and private companies.

¹ Municipalities associations are special public territorial establishments. Many municipalities agree to the creation of a municipality association and delegate to this establishment some of their competencies. They start to appear in the end of 19th century and they have been favoured by the decentralisation procedures and the amplification of the municipalities' competencies and obligations. The municipalities associations have specific competencies that have been delegated to them by the municipalities. The competencies of the municipalities associations are fixed with their creation.

Important works that influence water quality have to be declared to the **“Prefecture”** (the co-ordinator of the central state services at a local level) or to its water service the MISE (Inter-ministry Mission for water, they make the co-ordination between different central state services at a local level on issues of Water Police, they make all the controls for water management projects that have to be controlled by the prefecture) (article L.241-1 of the Environment Code and decree of application no 93-743) and controlled by the Prefecture and its services. These important works (ex: pumping water from the aquifer, artificial infiltration, pumping water from rivers, lakes and sources, discharge of polluted water to water bodies e.t.c) now include discharge of urban storm water in water bodies or their artificial infiltration, creation of artificial water bodies and creation of an impermeable area. Works have to be declared and are controlled only if they exceed specific limits (ex: an impervious area of more than 5 hectares).

Who pays?

The funding of storm water is not yet a worked-out problem in France. Theoretically the price of water in France covers only water distribution and treatment and waste water collection and treatment. Storm Water management has to be funded by the general municipal budget. Counties and Regions during the last years have also funded some storm water management facilities from their general budget. Water Agencies have also started to co-fund storm water facilities (8th programme 2003-2006). Water Agencies collect a percentage of the water duties and distribute them in pollution abatement installations (sewerage networks, WWTP, detention basins in the combined sewerage system). They recently start to fund storm water management installations with the condition that there is significant pollution abatement.

A recent law about decentralisation no 2003-276 encourage local governments (municipalities, municipalities associations, Counties and Regions) to fix the level of the already existing local taxes in such a rate so as to be self sufficient. (Only the national parliament can vote the creation of a new tax). In case of tasks that have been transferred from the national government to the local government, as part of the decentralisation process, the equivalent funds will also have to be transferred. There are special funds collected from all municipalities and reserved for the financial aid of the poorest municipalities. The decree of application no 95-635 (of the water law of 1992) states that the mayor of every community has to make an annual public report about water and waste water quality and price. This is an obligation even if these services are delegated to a private company or to a municipalities association. This decree does not concern storm water management as it is a non charged service.

The Ministry of Ecology and Sustainable Development can co-fund some projects but only if they are included in a program like the river contracts (see next paragraph). In that case they fund approximately 10% of the project budget. In all other cases the Ministry and its services provide only control and technical guidance.

How to do the management?

Partly because of the decentralisation, partly because of the variety of problems to handle on national level, France has chosen to give up national laws and ministerial circulars that enforce specific methods of water management and promote water strategies adapted to the local problems. This procedure is still in progress. So the French national legislation regarding water management is not prescribing strict obligations (treatment methods, dimensioning prescriptions, run-off control) but gives only the general objectives and prescribes some policy instruments. The main objectives for USWM are the limitation of floods and the pollution caused by urban run-off. Specific water management policies are let to be negotiated in smaller scale. Strict legal obligations are partially replaced by a group of local planning and consensus procedures (Hubert 2001). However there are several legal documents promoting specific policy instruments for local USWM that we can distinguish in three categories

- Regulation instruments
- Planning instruments
- Contractual instruments

The promoted policy instruments take in consideration four aspects, separated till now: water management, urban development, environmental protection and risk management.

We are going to present these planning and consensus procedures from the national level till the level of a local water service.

National Level

The city and its drainage

In November 2003 a guideline called '**La ville et son assainissement**' (**The city and its drainage**) (Certu 2003) was published by a service of the Ministry of Equipment (public works). This guide has no legal power but expresses the national policy about storm water management. In this guide all the procedures are presented and the municipalities are encouraged to use them. BMPs are strongly promoted.

Four levels of protection have to be taken into account when defining the urban and drainage master plan: The first level is the small rainfalls. In this level all rain run-off should be treated and should be managed the best way possible by BMPs (reuse, retention, infiltration). The second level is the median rainfalls. In this level BMPs and the network are still sufficient, there are some overflows in the water bodies but they are controlled and their impact is limited. The third level is the intense rainfalls. In this level the network is no longer sufficient, storm water is evacuated by streets and public spaces that are planned to help the discharge but also the retention of the storm water (submersible public space). The main objective is to avoid flooding, the water quality is deteriorated. The fourth level is the extreme rainfalls. In this level flooding and pollution is unavoidable but there is an emergency evacuation plan in order to protect human lives. This fourth level is taken in consideration in the urban planning in order to limit the vulnerability of the city (important installations should be protected even in such rain). Roads and public space should be linked in a way as to create an "important superficial network" for run-off discharge. This run-off discharge should be calculated and "managed" so as to create the less possible human losses.

In order to achieve these functions of the urban space: imperviousness should be limited to the strict minimum, small BMPs should be promoted on private and public ground, many open air facilities (sport facilities, parks, etc) should be planned as to have a water retention capacity for intense rainfalls, the whole urban planning should take into consideration the extreme rain events in order to limit the vulnerability of the city.

SDAGE

In the water law of 1992, 6 **SDAGE** (Schémas Directeur d'Aménagement et de Gestion des Eaux) are prescribed for the 6 French river basin districts. The SDAGE are general plans for water planning and water management with a 15 year planning horizon. The SDAGE have been prepared by the 6 Water Agencies, have been presented and approved by the River Basin Comity (that includes important local water stakeholders) and have been discussed with the counties and regions comities and the big cities representatives, they have been presented to the Inter-ministerial Water Service (MISE) and the National Water Comity (CNE). The final documents have been approved by all concerned prefectures in 1996. These documents take into consideration all water uses (agriculture, industrial use, drinking water, waste water, urban rain water, navigation, fishery, recreation). The SDAGE have to be respected by all future administrative documents (urban plans, water plans, drainage plans).



Figure 1: The 6 French ‘river basin districts’. Everyone of them has a Water Agency that has prepared a SDAGE.

PPRi

The law about environmental protection of 1995 introduces the **PPR** (Risk assessment plans). PPR are plans that combine environmental protection, protection of people and properties from natural risks (fire, flood, earthquake, landslide and etc.). Their application decree no 95-1089 states that they are prepared by the central state’s services at a local level (departmental services) presented and discussed with the county and regional comities and presented to all concerned municipal comities. Mayors have a month to make their observations. PPR must include a map indicating the areas at risk, prescriptions to the public services for the improvement of the public networks (roads, water, sewerage and etc.) for better evacuation of the public and better intervention of the special services, prescriptions for the urban and rural development (areas that should not be constructed, areas that should not include vulnerable installations like schools and hospitals), prescriptions to citizens and citizens associations about necessary private works to be done in order to limit the vulnerability of private properties, prescriptions for the construction and maintenance of special works dedicated to risk prevention. The PPR defines which works are compulsory and which optional and with which deadline. The restrictions and recommendations of the PPR have to be included into the urban planning documents in order to be implemented. The approved PPR is a public document that everyone can consult. Flood prevention PPR are called **PPRi**, till now only river flooding PPRi have been made. Future PPRi about urban flooding are possible and they will most probably include prescriptions for source control of USW. In the existing river flood PPRis there are prescriptions for the maintenance of the river flood zones and the control of urbanisation in zones with high flooding risk. These zones could be used for BMP projects like the “natural” wetlands or storm water retention ponds.

The SDAGE and PPRi are managed by national services at a local level so they still stay largely under the control of the national government. There are other procedures that can emerge directly from the local needs and priorities.

Regional level

River contracts

The **river contracts** are such a procedure. It has first been instituted with the ministerial circular of the ministry of the Environment (5 February 1981) and its importance has been amplified by the ministerial circular no 3 of the 30 January 2003. The municipalities or other important local stakeholder can start a river contract and find other municipalities and local stakeholders also interested. The river contract is not compulsory and the common link between different

participants (municipalities, port authorities, fish associations etc.) is that their activities influence or are influenced by the river. Important information about the river quality and water uses is gathered. Problems are studied and the most important ones are identified. A representative of one of the municipalities becomes the ambassador of the contract. Preliminary studies are done and the main objectives (amelioration of the river quality, improvement of the river's coast, limitation of the floods etc.) and tasks to be accomplished (limitation of the combined sewage overflows, improvement of the WWTP efficiency etc) are specified. An application with this information is submitted to the ministry of environment by the "prefecture". The application also includes the advice of the national services at a local level, the water agency and the fish council. Once the river contract is approved by the ministry, a local river comity is created representing all stakeholders participating in the contract, the president of the comity has to be an elected representative of a local government. The river comity elaborates the final contract, decides on tasks to be accomplished, how they will be funded (participation of all the stakeholders and funding from other larger institutions) and makes the annual planning and control. From 1981 till today 170 river contracts have been signed involving more than 2ME of investments (source: www1.environnement.gouv.fr). Many USWM projects have been realised in the context of a river contract

SAGE

The **SAGE** (plans for water planning and water management) are the continuation of the SDAGE but at the level of a river catchment area. The SAGE have to follow the general directions given by the SDAGE. A SAGE is a facultative procedure prescribed in the water law of 1992 (article 5 in the application decree no 92-1042. The initiative for a SAGE can come from one municipality or other local stakeholders and many local stakeholders and municipalities can team up. The "prefecture" approves the perimeter of the SAGE, a pre-evaluation is done; a Local Water Comity (CLE) is created and approved by the prefecture. The SAGE is elaborated by this comity (where, ideally, all local stakeholders are represented) and approved by the "prefecture". The Local Water Comity follows up the realisation of the plan. The SAGE has only administrative power. Municipalities have to promote its implementation. However in an area already covered by a SAGE it is easier to implement USWM because many of the planning, negotiation and authorisation procedures have already been done. Till 21 of June 2004 19 SAGE where elaborated and approved, 64 where elaborated and 40 where on preparation. (source: www.sitesage.org)

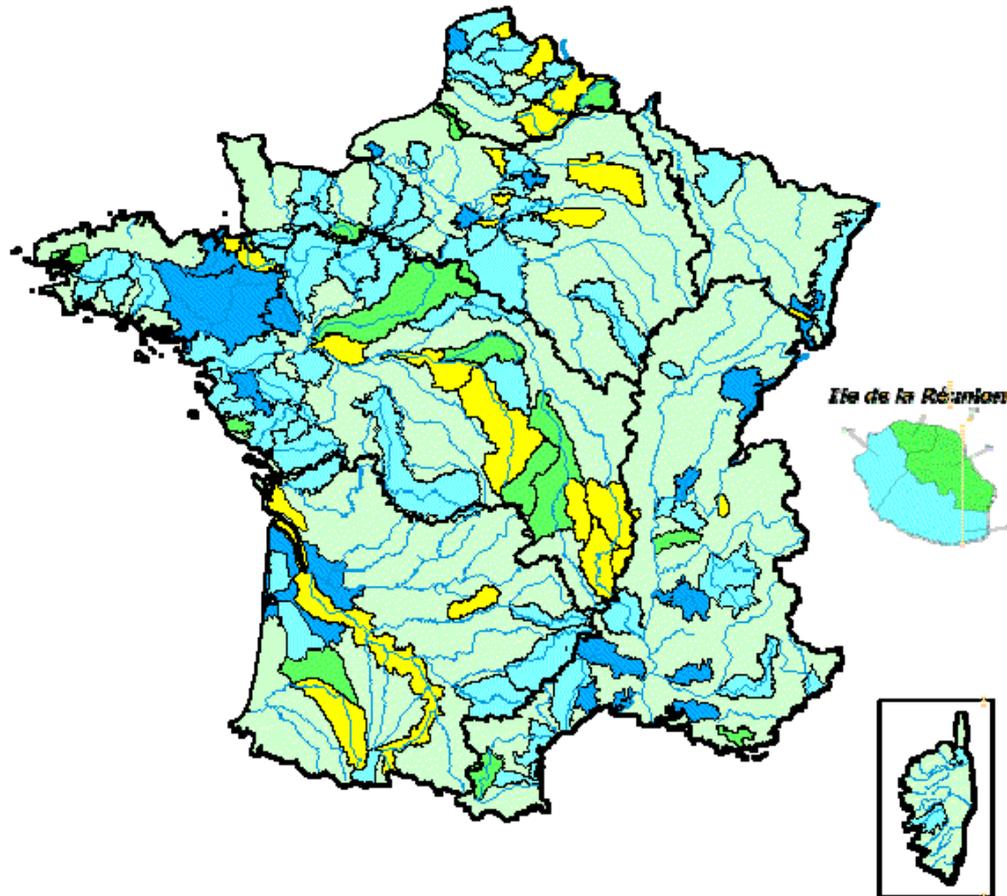


Figure 2:Map with the existing SAGE in France: blue for SAGE already implemented, turquoise for SAGE in elaboration, green for SAGE where only the perimeter is approved, yellow for SAGE in emergence, light green areas with no SAGE.

(source: www.sitesage.org)

The procedures described till now (SDAGE, PPR, River Contract, SAGE) try to overcome the administrative borders (municipalities, counties, regions) and establish a water management connected to river catchment areas. The elaboration of River Contracts and SAGE guaranties better chances of funding of a project from larger institutions (counties, regions, water agencies). Most of the tasks planned in these documents have to be realised from the municipalities or the municipalities associations. What are the planning and negotiation instrument of the municipalities and the municipalities associations?

Municipal level

Sanitation and Drainage zoning

As already mentioned every municipality (water law 1992) must establish **Sanitation and Drainage zoning** of its territory (old, new and future urbanisation). This zoning is the delimitation of areas/zones that are served by a sewer system and the expected future rain run-off of these areas. The zoning can set areas with individual sanitation systems. This zoning must take into consideration all the existing approved documents (SDAGE, PPR, River Contract, SAGE). The drainage zoning includes hydro-geologic and hydrologic calculations for the calculation of the rain run-off. Once the calculations are done it is decided in which zones the run-off will be limited by BMPs. In some zones source control methods can be prescribed. The prescriptions depend from the hydro-geologic characteristics of every zone. At the end the drainage zoning prescribes a maximal rain run-off for each zone (ex: 12l/ha).

Sanitation and Drainage master plan

This zoning is taken into consideration when the **sanitation and drainage master plan** is elaborated from the municipality or the municipalities association. The drainage master plan is specifying the objectives of the sanitation and drainage service for the future and the tasks to be undertaken (new works, operation and maintenance of old works etc.). A sanitation and drainage master plan can include the obligation of citizens to implement source control management on private lots. Often the obligation is defined as l/ha of run-off. The sanitation and drainage master plan after concertation with the public is approved by the city council.

Urban planning documents

The zoning and the prescriptions that derive from the drainage master plan as well as the other approved documents (SDAGE, PPR, River Contract, SAGE) should be included in the **urban planning documents (Scot, PLU)**. In these documents the necessary space for BMPs can be foreseen, private BMPs can be demanded from the land developers. Even if the urban planning documents are old and do not include drainage prescriptions, the approval of the drainage service is necessary for a construction permit to be issued (urban planning code article L 421-5).

Sewer system management regulation

Another local document is the **Sewer system management regulation**. In this document the sewer system service makes several commitment about the quality of the services (waste water and rain water) but also expresses the limits of these services (for example that the network can overflow during intense rainfalls or that the service is not obliged to offer drainage to underground constructions). In this document imperviousness restrictions or storm water storage obligation can be included. Citizens are obliged to respect this regulation if they want to be connected to the sewer network.

Overview

The most important planning and consensus procedures are mentioned in the following table

Table 1: Planning and consensus procedures

Name	Level	Responsible actor	Participants	Deriving Obligations
A guideline "The city and its drainage"	National	Certu (a service of the ministry of equipment)	It was written with the participation of many specialists, it is a guideline for all public services and private companies working on drainage and urban development projects	None, A proposition of technical and management practices to be adopted for USWM
SDAGE	National, river basin district (6)	Water Agencies, River basin Comity	Counties, Regions, Big cities, MISE, National Water Comity, Prefectures	Administrative obligation for the future water planning and management.
PPRi	National, an area at flood risk	Prefecture	Counties, Regions, Municipalities	Administrative obligation for the prevention of installation of different activities in areas at risk and information of the public about the existing risk

River Contracts	Regional- a river catchment area	Local River Comity	Municipalities, local stakeholders (port authorities, fishing associations, etc), the ministry of Environment approves and offers some funding	Obligation of all participants to implement the river contract by co-funding and promoting the implementation of different water management projects and co-ordination of different activities (limitation of pollution sources etc.)
SAGE	Regional - a river catchment area	Local Water Comity	Municipalities, local stakeholders (port authorities, fishing associations, etc), the prefecture approves	Administrative obligation of all participants for the future water planning and management.
Sanitation and Drainage Zoning	(Inter)Municipality	(Inter)Municipality drainage service	(Inter)Municipality	Limitation of urban rain run-off, limitation of imperviousness,
Sanitation and Drainage Master Plan	(Inter)Municipality	(Inter)Municipality drainage service	(Inter)Municipality public participation,	Planning of future objectives and projects for the urban drainage
Sewer system management Regulation	(Inter)Municipality	(Inter)Municipality drainage service	(Inter)Municipality	Description of the drainage services and their limits
Scot, PLU	(Inter)Municipality	(Inter)Municipality urban planning service	(Inter)Municipality, public participation,	Planning of future objectives and projects for the urban development

Useful links

All French legislation can be found in the internet site : www.legifrance.gouv.fr.

Specific laws and other official documents for the environmental issues can be found on the internet site of the ministry of Ecology and Sustainable Development: www1.environnement.gouv.fr

There is a special site for the SAGE: www.sitesage.org

2.4 Dutch Legal framework

Introduction

This paragraph describes the relevant Dutch legislation and policy, giving (Dutch) users of the ADSS insight into the organization of USWM in the Netherlands. Dutch endusers can gain more insight into the specific conditions for USWM, by following links to Dutch websites. The legal framework for water management in The Netherlands is described on the National, Regional and Local level. Also the most important plans on water management are demonstrated, including prescribed strategies for doing the water management.

For an outline of all relevant Dutch policy on disconnecting paved areas, see www.afkoppelwinkel.nl. This site also contains a lot of other useful (technical) information with regard to USWM and in special disconnecting of paved areas.

Dutch national legislation

The legal framework for disconnecting storm water for the Netherlands is as follows (based on Groot, 1999).

Impact EFWD on Dutch legislation

The European Commission has formulated a water policy in full for the European member states, named European Framework on Watermanagement (EKW). The EKW implies prescriptions about surface waters and groundwater, water quantity and water quality. Aim of the EKW is to create a framework for the protection of all the surface waters and all the groundwater in the land and coastal zones. The protection has its focus on (see article 1 EKW):

- The endurance of aquatically ecosystems;
- Durable use of water;
- Better protection and improvement of the aquatically ecosystems;
- Decrease of the pollution of surface waters;
- Decrease of the effects of floods and dryness.

These goals are elaborated in article 4. For surface waters are two goals formulated:

(1) all surface waters have to be in good condition in 2015 and (2) the pollution by primary substances have to be decreased and the discharge of primary substances have to be stopped gradually. The goals for groundwater are to decrease the pollution of groundwater and to restore the groundwater balance. (Balance between withdrawing and supplementing groundwater). Protected areas have to fulfil the tightest norm for those areas in 2015. The EKW have a plan to perform the protection of (ground) water and water related ecosystems. You can find this plan on the internet: www.kaderrichtlijnwater.nl. The proposal to implement the EKW in the Dutch law is in consideration in de Lower House. The proposal implies a change in the Wet op de Waterhuishouding – Law on water management – and the Wet Milieubeheer – Law on Environmental Management –. The Wet Verontreiniging Oppervlaktewateren (WVO) – Law on pollution of surface waters – already complies with the EKW.

Wet Verontreiniging Oppervlaktewateren

The Wet Verontreiniging Oppervlaktewateren (WVO) – Law on pollution of surface waters – is important when storm water is discharged to surface waters, which include open water storage facilities (ponds). The WVO does not allow to discharge polluted water to surface water, without a permit. Thus, discharged storm water to surface water may not contain pollutants, added while flowing to the surface water, for example by zinc gutter. Furthermore, it is possible to sharpen pollution regulations on surface waters by discharge of stormwater by matter of an order in council.

The Wet verontreiniging oppervlaktewateren (Wvo)–Law on pollution of surface waters– has the aim to protect the surface waters against pollution. The Wvo provide a permission based system: a discharge of waste water or polluted water is prohibited unless permission is granted. The Wvo is an important link in the implementation process of the EKW in Dutch regulation. The Wvo meets for a significant part the EKW and keeps thereby unchanged in the ‘EU-water framework implementation law’. The Wvo distinguish two different kinds of discharges: direct and indirect discharges. Direct discharges take place immediate on the water surface. Indirect

discharges are discharges through a medium, such as a company discharging on the municipal sewer system.

Direct discharges

For discharges from the sewer on surface water is, generally, a Wvo- permission demanded. The causes of requests for Wvo- permission are different:

- In case of a new discharge point, such as a new flow over point;
- In case of changing a present discharge point, such as adapt a present sewer system;
- At the end of the period of validity.

A Wvo licence contains regulation (prescriptions) for the discharge on surface water. These prescriptions are based on the water quality manager's policy. This policy is formulated in the water management plans: the water quality policy. The outlines of the water quality policy compared to the municipal sewer systems are formulated by the Commissie Integraal Waterbeheer (CIW) –Commission for Integral Watermanagement– in the report: Overstorting en riolering uit rioleringstelsels en regenwaterlozingen –Flow over of sewer systems and storm water discharges–. Water discharged via the sewer system on surface water, always contains traces of priority chemicals (the so-called black list and grey list chemicals). According to a European directive (76/464/EG) permission is given to discharge such chemicals for a limited period. This directive is implemented in the Dutch 'Regeling tijdelijke vergunning voor lozing van zwartelijststoffen' –Regulation for temporary permission on discharging black list chemicals–. This regulation determines that the permission is granted for at the most 10 years. The CIW has published a report about how to deal with little and short time discharges. This kind of discharges has just a little effect on the water quality, so it is a rough remedy to demand a request for permission. An alternative is, according to the CIW, to give publicly regulation on this kind of discharges. Other kinds of direct discharges are:

- Untreated sewage in the countryside;
- Temporary discharges, such as source drain for the construction of a sewer system.

Indirect discharges

Indirect discharges don't necessarily need Wvo permission. An important exception is made on this principle. This exception is made for companies who discharge such highly environmental pollution materials, that it becomes a danger for the surface waters. The sewer system manager is not compelled to have permission for discharge. The procedure for permission is regulated by the General administrative law, completed by a part of the Wet Milieubeheer –Law on Environmental Management–.

Wet op de Waterhuishouding

The Wet op de waterhuishouding (Wwh) –Law on water management– regulates a cohesive and suitable policy and management of the integral water balance (groundwater and surface water). The first part of the Wwh obligates several different authorities to create a policy for the water balance. The state government formulates a Nota Waterhuishouding (Note for Water balance) and a water management plan for state waters. The provinces formulate a plan for water balance. Procedural aspects of plan formation are mentioned in a provincial regulation on water balance. The water agencies formulate water management plans. Above-mentioned plans are hierarchic: the water management plan has to reckon with provincial plans and the provincial plans have to reckon with the Note for Water balance.

Wwh use four management instruments: a permission license, the Level decision, the water agreement and the Uitvoeringsregeling waterhuishouding –Implementation regulation on water management–. The Wwh demands a licence for discharge on, or withdraw water from the water surface. Permission is also needed when non- water quantity managers bring water to or remove water from surface waters. This is defined as: when water naturally flows from the one to the other surface water, through a work. Mention of method of supplying, removing,

discharging or withdrawing is obligated when water is supplied, removed, discharged or withdrew. In some cases a measure, note or report is obligated. These cases are mentioned in the Uitvoeringsregeling waterhuishuiding –Implementation regulation on water management– and the Verordening op de waterhuishouding en waterkeringen Noord-Holland –Regulation on the water balance and water works in the province of Noord-Holland–. In some cases, according to article 16 of the Wwh, the water quantity managers are obligated to determine a level decision. The cases when a level decision is needed are mentioned in the Uitvoeringsregeling waterhuishuiding –Implementation regulation on water management– and the provincial regulations. Beside this obligates this article to maintain the determined levels.

Uitvoeringsregeling waterhuishuiding

The Uitvoeringsregeling waterhuishuiding –Implementation regulation on water management– contains an elaboration of the Wet op de Waterhuishouding –Law on Water management–. Relevant is the elaboration of the permission regulation and mentioning regulation for discharges and withdraws on state waters. The regulation determines certain waters as main waters. Main waters are waters managed by the state. In article 2 of this regulation is decreed that non- state waters (or waters according to Besluit aanwijzing zijwateren –Decision for indicating side waters–) should be a part of the provincial plans for water management. The state is for the time being manager of these waters and make an own management plan. The guideline for the Besluit aanwijzing zijwateren –Decision for indicating side waters– makes clear that these waters in the future be transferred to the local water managers.

Conform this regulation permission is demanded for discharge of more than 5000 m³ per hour or withdraw of more than 100 m³ per hour on or from the state waters. Discharge, withdraw, transport on non- state waters is regulated in the Verordening op de waterhuishouding en waterkeringen Noord-Holland –Regulation on water management and waterworks in the province of Noord-Holland–. The criteria for mentioning and registration are:

	discharge / supply	unless:	withdraw / removal	unless:
registration obligation if:	$Q > 1000 \text{ m}^3/\text{h}$	$Q < 5000 \text{ m}^3/\text{h}$ en $V_{\text{total}} < 1.000.000 \text{ m}^3$	$Q > 20 \text{ m}^3/\text{h}$	$Q < 100 \text{ m}^3/\text{h}$ en $V_{\text{totaal}} < 20.000 \text{ m}^3$
measuring obligation if:	$Q > 5000 \text{ m}^3/\text{h}$ and insight necessary	measuring obligation in water agreement	$Q > 100 \text{ m}^3/\text{h}$ and insight necessary	measuring obligation in water agreement

In case of obligated permission or water agreement is mention obligation not applicable. In part II of chapter 3 of this regulation is specified for which main waters a level decision is determined. The cases in which a water quantity manager has to effect a water agreement are mentioned in part III of chapter 3 of this regulation. A water agreement contains appointments for the transport of water from en towards surface waters which are managed by several different water quantity managers. Water agreements have to be concluded for the transport of water to the North Sea canal and the Amsterdam-Rhine canal.

Grondwaterwet

The Grondwaterwet (Gww) –law on groundwater– regulate the divide of the groundwater areas with attention to the different interests of the involved actors. This law provide a regulation for withdraw of groundwater and infiltration of water in the soil. This kind of infiltration has nothing to do with the infiltration or disconnection of storm water. The Gww regulates the groundwater quantity. The groundwater quality is regulated by the Wet bodembescherming –law on protecting the soil–. In this law the infiltration of storm water is regulated. This law prohibited withdraw of groundwater without the permission of the province. Beside that is registration of

the amount withdrew and infiltrated groundwater obliged. The quality of infiltrated water has to be measured and reported. In some cases counts an inform obligation in stead of a license obligation. These things are regulated in the Uitvoeringsbesluit ex. Artikel 11 en 12 Grondwaterwet –decision to perform the Law on groundwater– and the Grondwaterverordening Noord-Holland 1999 –Groundwater regulation Noord-Holland– The Provincial States can, to reduce the costs, levy taxes on withdraw of groundwater. This is regulated in Uitvoeringsbesluit ex. Artikel 11 en 12 Grondwaterwet –Decision to perform the Law on groundwater– .This law is relevant for source drain for the realisation of, by example, sewer projects. See Sewer Guideline module A2000, paragraph 3.3.5.

Uitvoeringsbesluit ex. Artikel 11 en 12 Grondwaterwet

The Uitvoeringsbesluit ex. Artikel 11 en 12 Grondwaterwet –Implementation decision ex. article 11 and 12 of the Law on groundwater– is an elaboration of the articles 11 and 12 of the Law on groundwater. In this decision is described which data have to be supplied to meet the registration regulation of the amount of planned withdraw or infiltrate water. Beside that is regulated the method and frequency of measuring the amount.

Bouwstoffenbesluit bodem- en oppervlaktewaterbescherming

The Bouwstoffenbesluit bodem- en oppervlaktewaterbescherming (Bsb) (resolution on building materials for the protection of soil and surface waters) controls the use of primary and secondary building materials in the civil engineering. The Bsb is the implementation resolution of the Wet bodembescherming (Law on protection of the Soil), Wet verontreiniging oppervlaktewateren (law on pollution of surface waters) and the Woningwet (Law on houses). The definition of building materials in Bsb is: ‘material in quality as it is meant to be used in a work and in witch the total content of silicon, calcium or aluminium together contain more than 10% (m / m) of that material’. A work is defined as: ‘groundwork, road building work, hydraulic work or building work’. The bsb distinguish 5 different building materials:

1. Clean ground;
2. Category 1- building material;
3. Category 2- building material;
4. Building material containing tar containing asphalt;
5. AVI- bodemas -

If clean ground is used, the compound of the ground has to be available till one year after use, unless no more than 50 m³ is used. The use of building materials on or in the soil has to be reported to the authority at least two working days before use in case of category-1 building materials, unless it isn't ground. If the other building materials are used it have to be reported at least one month before use. For the use of Category-2 building material on surface waters a license is compelled. The use of Category-1 building materials has to be reported. Every excavated amount of ground has to be tested.

Ontgrondingenwet

The aim of the Ontgrondingenwet –Law on excavation– is to give insight in the amount of excavated materials and to handle carefully with different interests involved with the exploitation of these materials. This law prohibit excavation of materials without permission. After consideration is concluded that, according to current law, the Ontgrondingenverordening Noord-Holland 1998 –excavation regulation of the Province Noord-Holland 1998– and the Rijksreglement Ongrondigen –State regulation on Excavation–, practically no permission is demanded for works in the relevant sector. To create a basin in state waters is a possible exception. The term excavation is not defined in this law, but the laws guideline makes clear that excavation is a lowering of a land or a water bottom. In the guideline for Ontgrondingenverordening Noord-Holland 1998 –excavation regulation of the Province Noord-

Holland 1998– is defined what excavation is not. There is also a description of the permission system.

The Rijksreglement Ontgrondingen –State regulation on Excavation– contains a prescription for excavation in the North Sea and some waters managed by the state. In this regulation is also a description of the permission system. In case of an urgent excavation project an authorisation of the province can legalize the project quicker. In this case a bank guarantee is demanded to cover possibly repair costs. For more information see Sewer Guideline module A2000, paragraph 2.7.9.

Rijksreglement Ontgrondingen

The Rijksreglement Ontgrondingen –State regulation on Excavation– is a implementation decision of the Ontgrondingenwet –Law on excavation–. For Amsterdam the regulation is relevant for the following waters:

- The IJsselmeer, waters connected to the IJsselmeer and waters in the past connected to the IJsselmeer but nowadays disconnected because of drain works, managed by the state;
- Canals managed by the state;
- Waters connected to waters named in front of this.

Based on the regulation, permission is not needed for the construction, maintenance, change or cleaning of buildings, basements, graves, making a boring or drip-feet. Even so for installation, maintenance, change or clear out of tubes, cables, stakes and materials like that. Permission is also not needed for the construction, maintenance, change or clear out of wells, reservoirs, basins and constructions like that, if the bottom surface is less than 50 m² and the volume is less than 50m³ and the treatment of the soil is not deeper than 3,00 m below ground level. Request for the grand, changing or cancel of permission have to be done by the minister of the department of public works. A request for the grand of permission has to contain:

- Name, address and occupation or company of the applicant;
- Idem for the owner of the properties who is subject of the request;
- Description of the terrain or water which is object of the request with mention of the present use of the object and the municipality or the water agency area in which it lies.
- A state of the volume of solid materials to excavate and the method to excavate these materials;
- Reasons for excavation and the destination for the excavated materials;
- Description of the planned condition of the area after excavation and a mention of the planned purpose of that area;
- A blueprint of the area, with cadastral data and planned activities, on a scale at least 1:2500 (cm);
- A cadastral database excerpt of every parcel involved in the excavation plan.

For more information see Sewer Guideline module A2000, paragraph 2.7.9.

Besluit aanwijzing zijwateren

The Besluit aanwijzing zijwateren –Decision for the indication of side waters– is based on a part of the Law on water management and a part of the Law on pollution of surface waters. Main goal of the decision is to create unity in the management of waters directly connected to main waters, so-called sub waters. Nowadays these waters are not managed by the state, but by several other authorities. This management frontier is not a logic one, because if pollution is discharged on sub waters, it is discharged on the main water too. So, all sub waters become the responsibility of the state. An exception in this decision is made for sub waters in the built-up

area with are difficult to navigate. Reason for this exception is the assumption that no large discharges or withdrawing will take place on these sub waters. These sub waters remain the responsibility of the water agencies.

Wet Milieubeheer

The Wet Milieubeheer – Law on Environmental Management – defines storm water as a flow of waste water. The municipality has the obligation to collect waste water in order to ‘prevent soil pollution, groundwater pollution, change of the level of groundwater and pollution of surface waters.’ Within these pre-conditions, the municipality is allowed to infiltrate storm water, as long as it is efficient. If local infiltration of storm water is efficient depends on financial and environmental considerations and on possible alternatives for infiltration.

Wet Bodembescherming

The Wet Bodembescherming – Law on protection of the Soil – has the aim to prevent pollution of the soil and on sanitation of the soil, if needed. Part of the Wet Bodembescherming, is the order in council Lozingenbesluit Bodembescherming – Decree on discharge and soil protection – which states that non-polluted storm water may be infiltrated into the soil, even if storm water has contacted paved surfaces as a roof or a road. This decree is the implementation of the EU-directive on discharge into the soil. Infiltration of storm water is not allowed when it is mixed with other types of waste water.

Article 13 of the Wet Bodembescherming states the general duty to provide for pollution of the soil. This legal provision implies amongst others to refrain from every possible act of which in all fairness might be presumed by that the soil will be affected or polluted. Thus, if it is presumed flowing storm water will pollute the soil, disconnecting is not allowed.

Conclusion

Provided that applied legal regulations are satisfied, different alternatives for collecting, utilizing and discharging of storm water are allowed. Besides technical criteria for choosing alternatives, also the spatial tailoring and the regulations on property, maintenance and operations are important.

Dutch regional legislation

This paragraph sums up two important laws for water management for Provinces. The Province of Noord-Holland is taken as an example.

Ontgrondingenverordening Noord-Holland 1998

The Ontgrondingenverordening Noord-Holland 1998 –Excavation regulation of the Province Noord-Holland 1998– is a provincial regulation. It’s based on the Ontgrondingenwet –Law on excavation– . The guide line of this regulation said that excavation in this context is not: to trench and fill up slits for the install of cables, drains and tubes and for the deposit of permanent objects. One of the meanings of the regulation is to make clear when a license is obligated and when a reporting to the Provincial Executive is enough. A license is not necessary in the following cases:

- The construction or changing of watercourses, ponds, basins, of waterworks, channels, harbours, wells or reservoirs, if the amount of excavated surface materials is less than 10.000 m³;
- The construction or changing of railways, airports, building sites, industrial sites, public road, streets, squares, sport facilities, parks, public gardens, if the lowering is less than 3,00 m*;
- The construction or changing of fundamentals or underground constructions of buildings*;

- The construction or changing of permanent depots for excavated surface materials if these are part of an depots as meant in the Wet milieubeheer –Law on Environmental Management– *;
- Soil sanitation by the third party;
- The realisation of certain parts of a land use project meant by the regulation.
- Certain excavations are expelled from license obligation. For these excavations is a report obligated. These certain excavations are market with *.

For more information see the Sewer guideline, module A2000, paragraph 2.7.9.

Grondwaterverordening Noord-Holland 1999

The law on groundwater describe the divide of the groundwater areas. The Grondwaterverordening Noord-Holland 1999 –Groundwater regulation Noord-Holland– is based on this law. It is a provincial regulation. If withdrawing groundwater is intended and this withdraw contains more than 1000 m³ per month or an emergency drain, it has to be reported to the province of Noord-Holland. In case of infiltrating water and withdrawing it later, it has to be reported too. A withdraw license is demanded in case of:

- Temporary withdraw longer than 6 months or withdraw with a volume more than 15.000 m³ per month;
- Temporary withdraw longer than 6 months and volume more than 8.000 m³ per month on the island Texel, the polder Wieringen and east of the river Vecht (province of Utrecht);
- Permanent withdraw with a volume more than 50.000 m³ per year;
- Permanent withdraw with a volume more than 12.000 m³ per year on on the island Texel, the polder Wieringen and east of the river Vecht (province of Utrecht).

This regulation also said witch data else have to be attached to the request for a licence.

Dutch national policy

The Dutch Government is responsible for national strategic planning and for that a new Nota Waterhuishouding – Water Management Plan is formulated. The most recent one is from 1998. The most recent policy of Dutch Government is

- The Nota Waterhuishouding (NW4),
- Waterbeheer 21e eeuw (WB21) (Water Management 21e century), see www.nederlandleeftmetwater.nl
- The Nationaal Bestuursakkoord Water (NBW) (National Administrative Settlement Water), see www.nederlandleeftmetwater.nl.

For an overview of Dutch policy, see www.dgwater.nl

Vierde Nota Waterhuishouding

The NW4 has the aim to have and maintain a safe and habitable land and the preservation and the reinforcement of healthy and resilient water systems, by which sustainable use stays guaranteed. The four fields of attention for the NW4 is to repair, prevent, maintain and develop water systems. The subjects of attention for USWM are according the NW4

- To draw up a waterplan
- Improvement of the living environment by water
- Attention for the water chain

- Disconnecting storm water.

Waterbeheer 21e eeuw

Because of climate change and growing intensive use of land, the water management has to change in the Netherlands, compared to the 20th century. The main idea of WB21 is to prevent the shift of:

- Water
- Administrative Responsibilities
- Costs

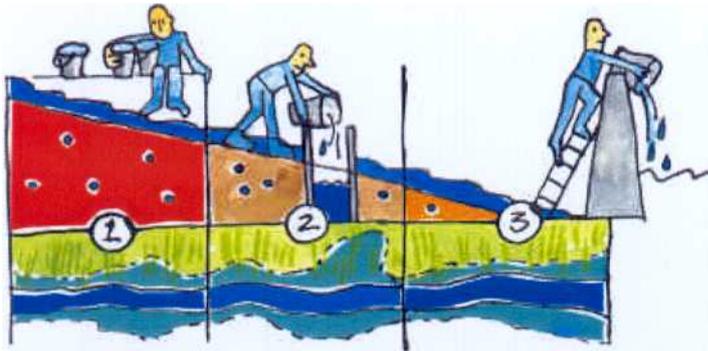


Figure 3 Hold water, slow it down and then release it.

The three folded strategy is to ‘hold water, slow it down and then release it’. Important consequences are:

- Strict testing spatial development plans to the effects on the water system by the legal instrument ‘Watertoets’ (The Water Test)
- Building storage facilities in rural areas
- Source control in urban areas

For an English outline of this policy, see www.verkeerenwaterstaat.nl

Nationaal Bestuursakkoord Water

The NBW is a settlement between the National, Regional (Provinces and Waterboards) and Local authorities about the improvement of the water management in 2015. The settlement deals with high waters, pollution of water, draughts and the ecological quality of waters.

Dutch regional policy

Provinces

The Province is responsible for strategic planning on the regional level, as elaboration from national policy. Every four years the province draws the Waterhuishoudingsplan – The plan for water management – in which functions are attributed to surface waters. Next to the Waterhuishoudingsplan, is the Milieubeleidsplan – Environmental policy plan – of direct importance. The third important plan is the Stroomgebiedsvisie – The catchment area vision – in which the qualitative and quantitative objectives of the water system are described. The last plan of great importance is the Streekplan – The regional plan – in which the province lays down her vision on regional spatial development. For more information, see www.ipo.nl

Waterboards

The waterboards are responsible for the execution of regional policy on water management. They draw up the Waterbeheersplan – Water management plan – in which aims for water management in urban and rural areas are defined. An introduction on the waterboards, their legal tasks and the funding, see (also in English): www.uvw.nl

Dutch local policy

The primary responsibility of the municipality with regard to water management is to take care for transportation of water. Therefore, the municipality realizes services in public space. The sewage management is an important task. The most Important local plans for water management are:

- The municipal sewerage plan
- The water plan

For much more detailed information on local water policy, see www.vng.nl (only in Dutch)

Municipal sewerage plan

A national law on pollution of surface water obligates municipalities to write a plan for coping with sewage systems. In this municipal sewerage plan (GRP) the municipality has to pinpoint how she thinks to cope with her juridical responsibility to take care of transporting used water and rainwater. Relevant laws for arranging the sewage system are law on the protection of the soil and the Law on pollution of surface water. Permission is needed for drainage on surface water. The GRP must fit into the provincial or regional policy, the WHP.

What is the 'basisinspanning'?

The guideline for the municipal sewerage plan is the 'basisinspanning', which states that:

- New sewage systems must be separate systems.
- Overflows must have a minimal storage capacity of at least 2 mm.
- The pump capacity of a combined sewage system must be at least 7 mm/h.
- On-going conversion of combined systems to improved separate systems.

When the environment of overflow basins require a specific quality of the surface water, the waterboard obliges the municipality to implement the 'waterkwaliteitsspoor'. Goal of this policy is to fine-tune the water quality to the environment.

Waterplan

Municipalities can choose to draw a waterplan, there is no legal obligation to it. A growing number of Dutch municipalities decide to write a waterplan, in tight cooperation with the waterboards. The aim of the waterplan is to develop an integral vision on local water management for the (nearby) future. The waterplan is very suited to attune municipal and regional water management and it can integrate spatial development, environmental issues, and sewage policy.

The above mentioned policy framework is described in general terms. Figure 4 demonstrates the coherence between the Dutch policies and plans.

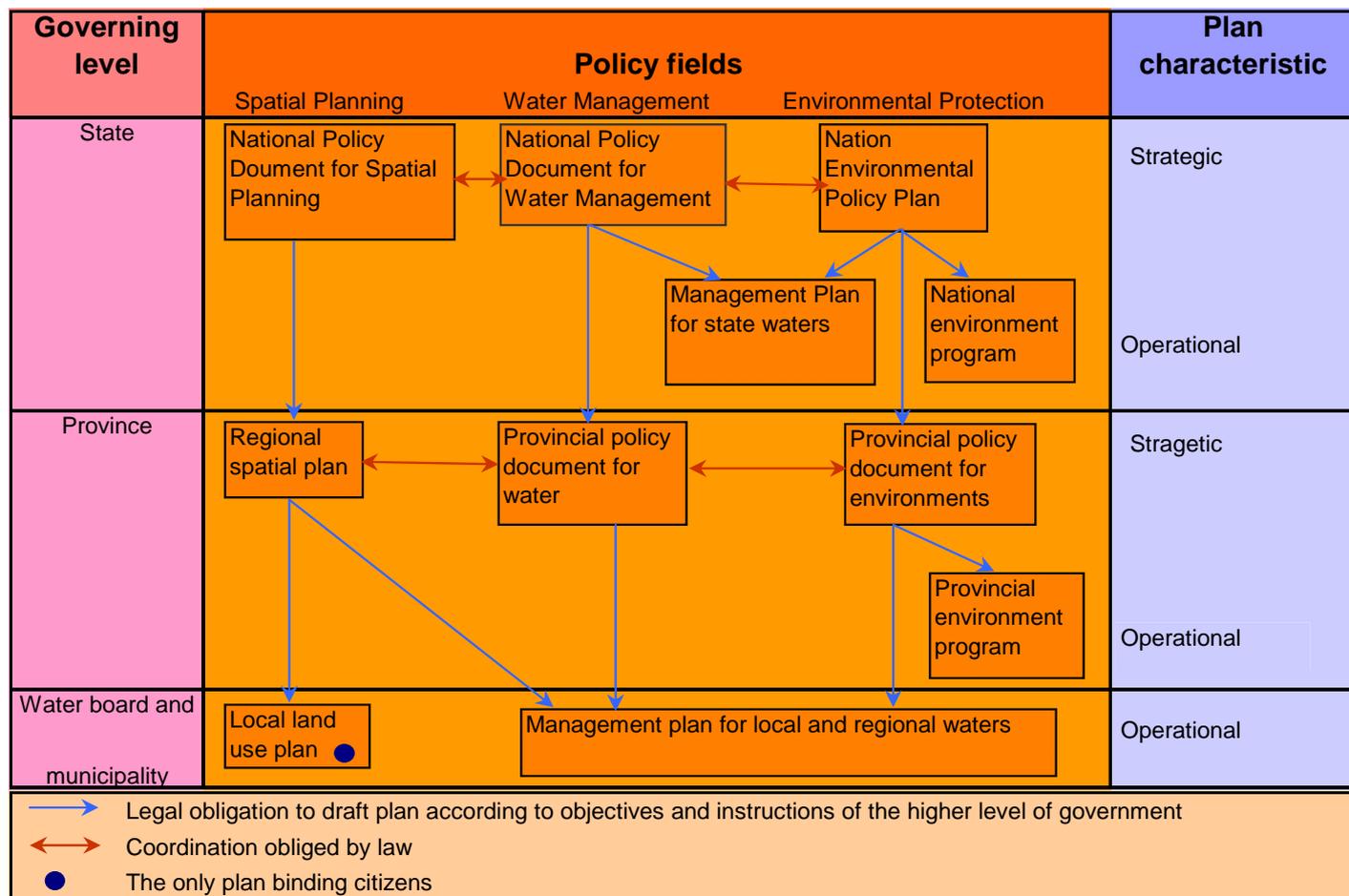


Figure 4 Dutch Policy Framework (Huisman (red.), 1998).

2.5 Stakeholders

The second viewing angle are the stakeholders. This paragraph characterises the stakeholders for France and The Netherlands. The decision process is defined as “the sum of interactions, confrontations and synergies, between different actors, with different competencies and powers, under a certain regulation context, leading to a decision” by Roi. The final decision depends on the decision process and the participating (Roi, 1985).

French stakeholders and their influence

Taking into consideration the French legislation and the available planning procedures we could divide the French stakeholders in five categories: the governmental stakeholders and the national services at local level, the local elected representatives and the local technical services, the private companies, the specialists and the citizens.

Government and the ministries

The governmental stakeholders is the **government and the ministries** that make the general planning. In theory their power is decreasing because of the decentralisation process. They have the planning authority, they prepare and vote the national budget, they manage all the decentralised national services. They are not immediate stakeholders-actors in the decision making processes for USWM but they create the general policies in the context of which the decision making process takes place.

National services at local level

The **national services at local level national services** are different services controlled directly from the ministries. Every **Prefecture** has these services the prefectures have the same territorial limits as the counties. These services used to do most of the water management. With the decentralisation process most of their competencies have been transferred to the county or municipality services. Some of these services have been detached from the ministries and been included to the county services. These services assure the water police (quality control) and almost all projects and planning procedures need the approval of the Prefecture and its services. These services are a stakeholder in all big USWM projects (example the development of an impervious area of more than 5 hectares). They guaranty the respect of the laws. Important projects including BMPs have to pass from this control. Small BMP projects are not concerned. These services also have a lot of experience in water management issues and in these services we can find many specialists.

Some of them that intervene in the water management are: the **DDAF** (central state service at a local level of Agriculture and Forestry depends from the ministry of agriculture), the **DDE** (central state service at a local level of Equipment depends from the Ministry of Equipment (public works) but all services relatives to water issues depend from the Ministry of Ecology and Sustainable development), the **DDASS** (central state service at a local level of social and sanitary issues depends from the ministry of health), the **MISE** (Inter-ministry Mission for water, they make the co-ordination between different central state services at a local level on issues of Water Police, they make all the controls for water management projects that have to be controlled by the prefecture). (Berry 2004)

Water Agencies

The **Water Agencies** are national agencies depending from the Ministry of Ecology and Sustainable development and the Ministry of Finance. Their singularity is that their assigned territory is not the county or region but a river basin district (see also figure 1). There are six water agencies in France and every one has a **River Basin Comity** where most of the important water stakeholders are represented (regions, counties, municipalities, socio-professional associations, citizens associations). The Water Agencies collect water duties and distribute them in pollution abatement installations (sewerage networks, WWTP, detention basins in the combined sewerage system). The money they collect depend of the pollution emitted from a specific activity (urban waste water, industrial waste water, commercial activities) if a municipality or a big industry decrease its water pollution the "pollution fees" of the Water Agency are also decreased. The money collected this way are given as subsidies to pollution abatement installations. The best the efficiency of the installation the bigger the subsidy. Water Agencies have also started to co-fund storm water facilities (8th programme 2003-2006). Even if they don't manage USW projects directly they influence USWM by choosing which projects to fund.

Local government and their services

The **local elected representatives** could be divided in two categories. The ones that are directly elected in the 17 **regional** , 100 **county** and 36679 **municipal comities** (source: Ministry of interior, census 1999) and the ones they represent their municipality (or county) in **municipalities association comities**. The **municipalities associations** are special public territorial establishments. Many municipalities agree to the creation of a municipalities association and delegate to this establishment some of their competencies. They start to appear in the end of 19th century and they have been favoured by the decentralisation procedures and the amplification of the municipalities' competencies and obligations. The municipalities associations have specific competencies that have been delegated to them by the municipalities. The competencies of the municipalities associations are defined from their creation. These competencies often are the waste water management, urban planning and storm water management. The creation of an municipalities association depends of the local problems and the good will off different municipalities to collaborate. The initiative for the creation of municipalities associations it is not controlled by the central government.

Municipalities associations are often the manager of the sewage network. A municipality can be a member of many municipalities associations delegating to them different competencies. As a result one municipalities association can be responsible for the drainage network of an area and another responsible for USWM and another for Urban planning. This makes difficult the collaboration of the different services, the negotiations for common objectives and the realisation of the USWM. Even a simple inventory of all different BMPs can become complicated.

In 1999 France had 14885 **SIVU** (syndicates of municipalities with only one competence), 2165 **SIVOM** (syndicates of municipalities with multiple competencies) and 1454 **Syndicats Mixtes** (syndicates of municipalities and counties). In 2003 France had 14 **Urban Communities** (municipalities association in an urban area of more than 500.000 inhabitants), 143 **Agglomeration Communities** (municipalities association in an urban area of more than 50.000 inhabitants with a main municipality of more than 15.000 inhabitants), 8 Syndicats of new Agglomerations and 2195 **Municipality Communities** (municipalities association of rural municipalities) and **Districts** (municipalities association of rural municipalities and a urban municipality pole) (source: Ministry of the interior, census 2003). The Urban Communities, Agglomeration Communities and Municipality Communities can impose local levies as to fund their activities. All municipalities associations are funded by the contributions of the municipalities. (Girarden 2001)

All local government have their **technical services** (region, county, municipality, municipalities association). As local government vary a lot (in size and in structure), so do local technical services. Some local technical services are very competent and experienced in storm water management and others have no experience at all because they always delegated this responsibility to other institutions (national services at a local level, municipalities association, private companies). Local technical services have a good knowledge of the local problems and theoretically they should be able to solve them but some are unfamiliar with their new obligations (sanitation and drainage zoning, storm water management) and the CERTU guideline as well as BMPs as a whole appear as too complicated techniques to be implemented. Many municipalities and municipalities associations have delegated the water and waste water management to private companies. The major problem is the lack of funds and of experience. The complicated bureaucracy in order to obtain authorisation and funding for a BMP project discourages the small technical services. It is mostly these small services that need detailed information about the procedures to follow in a USWM project.

Private companies

The water management 'à la française' is a unique co-existence of public and private water services. As already mentioned the municipalities have the responsibility of water management (water treatment and distribution, waste water and rain run-off collection and treatment). They can choose to assume this competence directly, to delegate it to a private company or to a municipalities association. Private companies can assure the design of projects, the construction of new installations, the operation and maintenance of the existing installations, even the control of the respect of the Sewer system management Regulation by the citizens. Private companies have to respect the same regulations as public services and officially they water management is always controlled by the municipality. Private companies concentrate many specialists and can afford very specialised expertise. Private companies are mostly interested on the design and construction of private and public BMPs, contracts for the maintenance and operation of BMPs are rare. Some private companies are specialised in the conception and implementation of BMPs. Private companies already in charge of waste water and rain run-off collection and treatment will propose expensive future projects (new bigger sewer system, end-of-pipe solutions). Rain run-off will be neglected by private companies if there is no extra funding (water fees only cover waste water services). So private companies are everywhere and they promote every method that can be profitable.

New stakeholders-New expertise

In order to put together a well integrated BMP project, most of the time, many specialists are necessary. They can work in public technical services or in private companies. The traditional drainage specialists are always useful for their expertise in **urban hydrology**. Once the BMP have to be integrated to the urban tissue the expertise of **urban planning** specialists is useful. In some urban projects the **architects** also make the integration of BMPs, into buildings and in the urban tissue, easier. A very French expertise is the one of **landscape architects**, who now start to get specialised on the integration of BMPs in the urban landscape. Some private companies and technical services try to make mix teams of these specialists in order to propose BMPs well integrated in the urban space. In many 'green' BMPs the expertise of a **biologist** is necessary in order to choose the right vegetation that can stand the pollution charge and the difference on the water level and in the same time increase the pollution abatement. Some BMPs demand a **chemists** and a **sanitary engineering** expertise in order to insure that the public health is not threatened in the short term or in the long term.

Participation of the Public

The citizens play many different roles in storm water management. As **users of the drainage service** they will complain to the authorities every time there are flooding problems. **People leaving near rivers and lakes** are very much concerned for the quality of water in rivers and lakes, **users of the water bodies**: fishermen, people bathing, people doing water sports will also be concerned for the water quality. **People living in a neighbourhood** will be concerned for the good use of the public space and the life quality in the neighbourhood, the same people will complain about the inconvenience linked to the construction of BMPs (noise, heavy traffic, water stagnating). **Businessmen** (commercial stores, tourism) are concerned for the economic development of a city so as to attract more clients. **Industrialists** are concerned about the cost of private BMPs and many times about the quality of water they use for their activities. **Land owners** are preoccupied about the land price. **Land developers** are preoccupied about the building restrictions and their cost. **House owners** are preoccupied about the cost private BMPs and how these will affect their everyday life. Most of these citizens are also **tax payers** so indirectly they fund the storm water management and **voters** so they elect the national and the locals governments. All these different categories of citizens can act **alone or through associations** in order for their opinion to be heard. They are better heard and understood in the scale of the municipality but theoretically the new planning procedures (SDAGE, SAGE, River Contract) facilitate their participation in the decision making process.

Overview

The most important stakeholders in USWM, with their responsibilities, their costs, policy instruments and funding are mentioned in below table.

Table 2 Stakeholders and their position in USWM in France

Stakeholders	Responsibility	Financial interest	Policy instruments	Financing of policy instruments
Government, Ministries	Strategic framework	Better financial management of USWM	Loi sur l'eau (Water law 1992), Environmental Code, Communities Code, SDAGE, PPRI, guideline 'The city and its drainage'	Taxes
Prefecture (coordinator of the central states services at a local level)	Water Police, Approval-Control of all important projects	Better financial management of USWM	Permits, approval of projects,	From the national budget
Region and its services	Co-ordination	Better financial management of	Co-ordination Participation in River	Regional Taxes

Stakeholders	Responsibility	Financial interest	Policy instruments	Financing of policy instruments
		USWM	Contracts and SAGE, co-funding of USWM projects	
County and its services	Co-ordination, for 4 counties the management of the county's drainage network	Better financial management of USWM	Co-ordination Participation in River Contracts and SAGE, co-funding of USWM projects	County Taxes
Water Agencies	Quality and quantity of surface water, control watersystem. Limiting water pollution	Financial manager of fees on water pollution	Funding of different projects that limit water pollution	Fees on water pollution from water consumption and other polluting activities
(Inter) Municipality and its services	Manager of USWM, Urban planning, Water distribution, public transport etc	Limit the cost of USWM, limit the cost from floods	Participation in River Contracts and SAGE, Drainage Zoning, Drainage master Plan, Drainage regulation, Urban plan,	Municipal taxes, Water fees but not for USWM, Subsidies from the Water Agencies, the Region and the county.
Private Companies	Responsibilities delegated from (Inter) Municipalities as water and waste water management. Contracts on BMPs projects	Company's gains	Contract	Water fees and/or funding from the (Inter) Municipality. Price of the contract
Inhabitants	Respect the urban planning documents, the civil code and the drainage regulation, construction and maintenance of private BMPs	Reduce cost or avoid Private BMPs	Complaints Vote (municipality, county, region, national government)	Income of inhabitants

Dutch stakeholders and their influence

This paragraph summarizes the main responsibilities, the financial interests, the policy instruments and the financing of these instruments of Dutch stakeholders.

Table 3 Stakeholders and their position in USWM in the Netherlands

Stakeholders	Responsibility	Financial interest	Policy instruments	Financing of policy instruments	More information
National	Strategic framework	None	Policy Water housekeeping (NWH)	Taxes	www.minvenw.nl www.vrom.nl
Province	<ul style="list-style-type: none"> - Control of groundwater: - Soil sanitation (decontamination) 		<ul style="list-style-type: none"> - Water household plans. - Concessions as part of the groundwater law - Approbation as part of the soil sanitation. 	Provincial groundwater rates	www.ipo.nl
Waterboard	<ul style="list-style-type: none"> - Quality and quantity of surface water, control watersystem. - Managing and control sewage works, treatment of wastewater. - Drainage. 	<ul style="list-style-type: none"> - Cost control of water system (quantity and quality) - Cost of treatment municipal wastewater 	<ul style="list-style-type: none"> - Construction of infrastructure (water collection, drainage, watercourses, ditches) 	Land draining rates	www.uvw.nl
Municipality	<ul style="list-style-type: none"> - Quality of groundwater (soil sanitation) - Construction and maintenance of sewage systems. - Draining public spaces. 	<ul style="list-style-type: none"> - Construction and maintenance of sewage systems. - Costs of nuisance reduction measures. 	<ul style="list-style-type: none"> - Zoning and reconstruction policies and regulations Municipal policies and regulations. - Construction of infrastructure (water collection, drainage, watercourses, sewerage). 	Municipal taxes	www.vng.nl
Drinking-water company	<ul style="list-style-type: none"> - Drinking-water supply - A suitable public water supply - Supply of industry water 	<ul style="list-style-type: none"> - Supply of high quality drinking-water against social justified costs 	<ul style="list-style-type: none"> - Choice of areas suitable for water collection (groundwater or other sources) 	Profits of water collection	www.vewin.nl
Inhabitants	<ul style="list-style-type: none"> - Discharging (annoyance) water of own parcel / property 	<ul style="list-style-type: none"> - Damage done by groundwater inconveniences 	<ul style="list-style-type: none"> - Complaints - Voting right (municipality, waterboard). 	Income of inhabitants	

2.6 The phases of the decision making process

Introduction

The third viewing angle is the phasing of the decision making process. This paragraph presents several models for describing the phasing and applies these phase on the French situation.

Every decision making process is unique and probably it can not be repeated twice. In order to study the decision making process and to provide decision support, it is important to “simulate” the decision making process in phases. Other similar problems have been “simulated” in phases in order to be better analysed and studied.

For example Simons (1947) sets also five phases of a ‘problem solving’ procedure: the problem recognition, the search of possible existing solutions, the elaboration of innovating solutions, the choice of a solution and the application of the solution.

Mintzberg (1976) proposes a model for strategic decision making with 9 phases: identification, decision recognition, diagnosis, solution search, design, selection, screen, evaluation-choice, authorisation.

Le Moigne (1983) proposes the “simulation” of the decision process in five consecutive phases, the iteration of which leads to the construction of the project: initialisation with the definition of the project objectives, representation with the collection and analysis of existing information, diagnostic of the problem and the possible solutions, elaboration of solutions, choice of a solution.

Larrue (2000) divides the life cycle of a public policy in five phases: emergence, introduction in the political agenda, conception of the public policy, application of the public policy and evaluation.

All authors use the phases as an analysis tool and many insist that these phases can be parallel and reiterating. These authors have adjusted the phase to their topic of their analysis. Following their example and taking into consideration the existing national legislation and local policies but also the life cycle of a BMP project. We propose the following 5 phases in the decision making process of a BMP project: problem identification, planning, design, implementation, maintenance and operation and evaluation.

Problem identification

A problem is emerging or an opportunity arises (a new land development project for instance). The concerned public or the responsible service think something has to be done. They try to find partners in this task (other services, other municipalities, other stakeholders), partners that can offer his funding, expertise or any other means. Somebody is the project promoter. He has an idea of the project (location, budget, utility). He tries to find out what are the necessary administrative steps to be taken. If no planning documents exists (SAGE, River Contract, Drainage zoning) he has to do all the necessary studies in order to respect the environment protection code and the Water Law (hydrologic studies, environmental impact studies). If these documents exists, he has to respect them. He can also try to enter his project in the actions foreseen from these planning documents. This way he can get funding from the different institutions who have signed the planning document, the region and the county. He has also to find out if there are other legal documents that can influence his project (PPR, drainage regulation, urban plan, civil code, public health code). He has to take this documents in consideration. Finally he has to get informed about the type of storm water projects that the Water Agency, the region, the county and the municipality co-fund. Once all these information is gathered he can decide with his partners about the kind of project they want to implement.

Planning

The planning phase can be very complicated. Once the project promoter and his partners decide what kind of project they want to implement the preliminary project start to takes form (construction and operation/maintenance), the basic objectives of the project are set. Preliminary expertise take place (urban hydrology, urbanism, architecture etc). The preliminary project is discussed between partners. According to the project the prefecture's authorisation is necessary. Once the authorisation is taken the project promoter can start looking for funds. Negotiations take place about who will fund what (construction and operation/maintenance). For public services the project has to be voted from the local comity. For some projects a public hearing is necessary in the planning process.

Design

Once all necessary authorisations are taken and appropriate funds are available the design phase starts. The design can be done only by specialists or it can be done in working groups where the different partners, the public and the specialists interact. In the final design all technical details are calculated (construction, operation/maintenance, performance, evaluation/refurbishment of the project), all financial calculations are done, all partners roles are detailed (who does what and when), all possible useful expertise is consulted. The final design has to be approved by the partners.

Implementation

The implementation can be undertaken by only one partner or even delegated to another service or private company. It can also involve many stakeholders (implementation of different BMPs in different municipalities, implementation of BMPs from the house owners, supervision from different experts and public services). Events not foreseen by the design can arouse during the implementation (a material is not suitable, the cost is more or less, other stakeholders or concerned citizens block the project). In all these cases the design has to be reviewed. During implementation the operation, maintenance and evaluation constraints have to be taken in consideration.

Maintenance and operation

The maintenance and operation can also be undertaken by only one partner or delegated to another service or private company. It can also involve many stakeholders. During this phase new data can force to the revision of the design or even of the implementation.

Evaluation

The evaluation helps not only to evaluate a specific project and in which percentage it has achieved the goals put during the planning procedure. But also helps to have experience feedback and improve future project planning. The evaluation can be only on the technical aspect but also on a decision making aspect (Which information or stakeholder should have participated and in which phase?).

The different decision making phases interact with each other, they can run in parallel or we can have many decision making rounds. It depends of the project and the stakeholders. In the following figures we present some random possibilities.

Figure 5: Schemas of decision making process: simple linear and linear with iterations

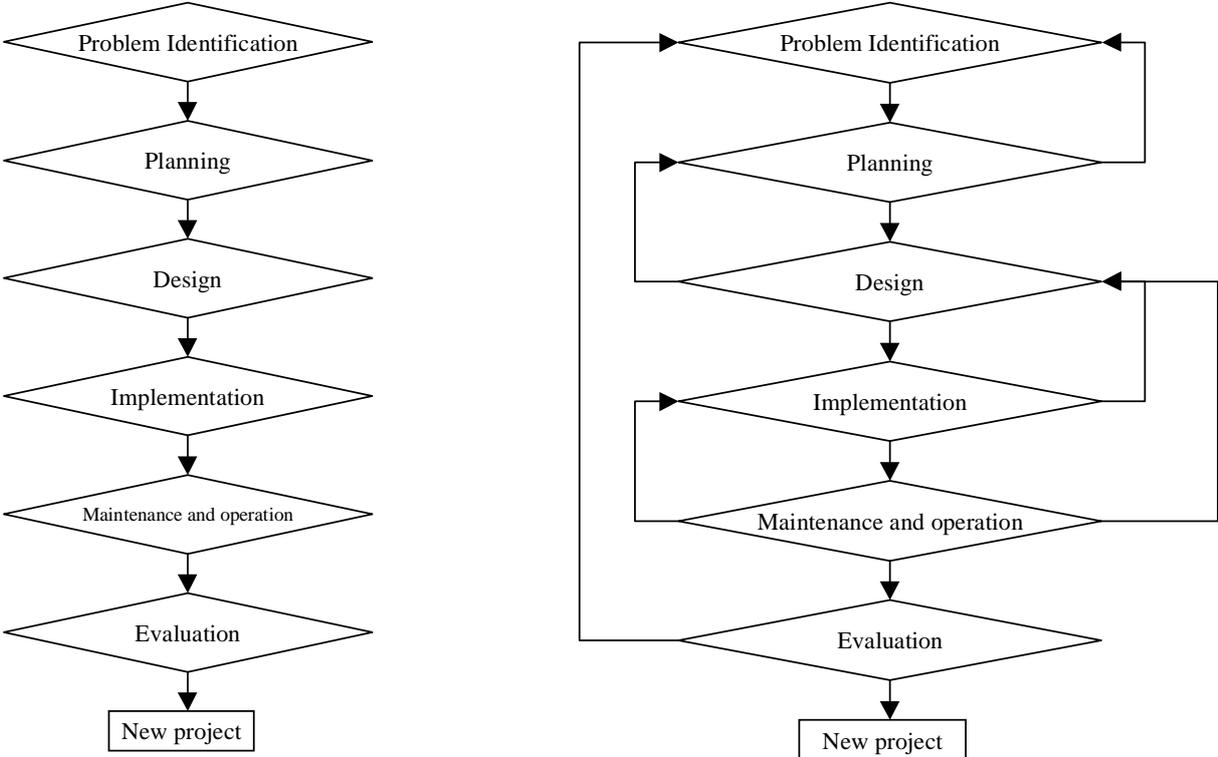
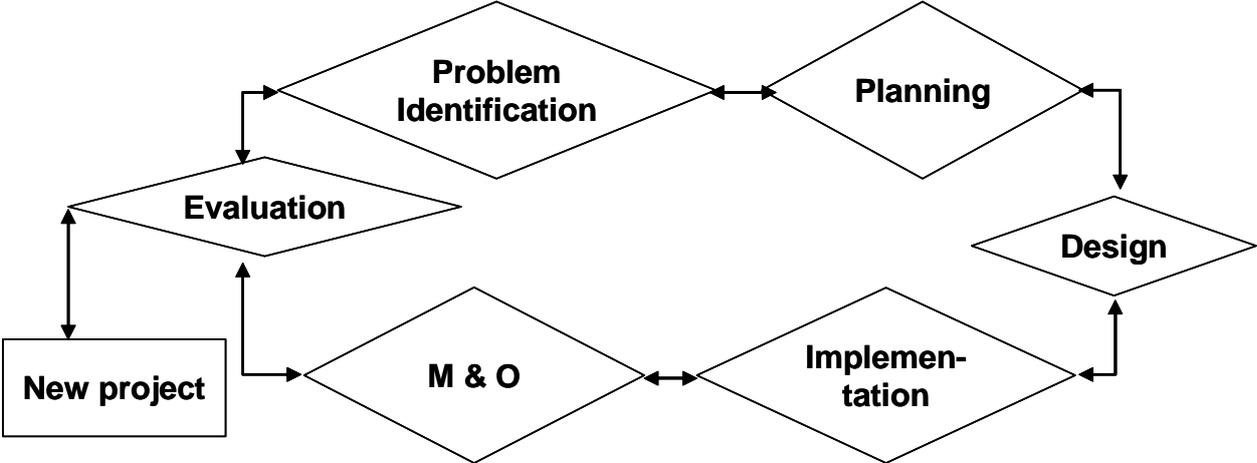


Figure 6: Schemas of decision making process: circular with repeating iterations, circular with various iterations.



The phasing of the AUDACE project of Seine Saint Denis County

The county's water and drainage service

Seine Saint Denis is a County located north of Paris. The County's Water and Drainage Service (DEA) has inherited the county's drainage network (combined and separate). This network transports rain water and storm water from the municipal networks (who are the municipalities responsibility) to the water bodies and to the inter-county sewage network that transports the waste water to the WWTPs (the inter-county network and the WWTP are managed by another public organisation called SIAAP). The DEA used to be a central state service but now it is a county service. The DEA used to assure the management of many municipal drainage networks, this was possible through contracts signed between the DEA and every municipality interested. Today this practice is becoming difficult to implement because municipalities have to make an open competition in order to choose the manager of their network. So the DEA has to built a stronger communication policy in order to accomplish an homogeneous planning of USWM projects all over its territory.

The county is densely urbanised and faces severe flooding problems because it was developed in a former swamp area. From 1976 the county has a firm policy to promote retention basins on the counties' but also on the municipal projects. Infiltration techniques are rarely possible because of the high ground water level and the clay soil. The county from 1992 promotes private BMPs by imposing limited rain run-off in all new urban development. The County has already edited 2 Sanitation and Drainage Master Plans one in 1976 and another in 1993. The DEA in order to promote BMPs and to improve the function of their drainage system has close collaboration (formal and informal) with the municipalities.

The DEA has to respect the Environment Code and limit all discharges to water bodies. They also have to limit the urban floods in order to gain the trust of the citizens and contribute to the economic promotion of the county.

AUDACE : an open planning and evaluation process

The AUDACE (County's Urban Drainage and Concertated Actions for the Water) is a planning process. The main mission of this process is to fix the objectives of sanitation and urban drainage in the county to be achieved until 2012. It is a proposition for a sanitation and urban drainage master plan. In the same time AUDACE is an evaluation procedure. Its secondary mission is to evaluate the actions of the DEA after 28 years of existence and more particularly from 1993 to 2003.

As a planning process AUDACE started by setting the main objectives and making the diagnostics for the future needed actions. As an evaluation procedure it collected all information relevant to the objectives set by the 1993's sanitation and urban drainage master plan, their accomplishment and the difficulties encountered. All the personnel of the DEA regrouping different expertise participated to this first draft of the AUDACE. In this first draft the main objectives of the DEA and the county are illustrated: urban drainage and conservation of the existing network, flooding control, urban water pollution control and protection of the receiving waters, solidarity and partnership with all local services. This first draft was presented to and validated from the county's council.

The second phase of planning is to discuss the AUDACE with the operational partners: Other technical services of the county (schools' service, roads service, green space service etc), technical services of the municipalities (drainage service, urban planning services, etc), representatives of the municipal councils, private companies (civil engineers, architects, urban developers, construction companies, real estate companies), citizens. This discussion is promoted by the AUDACE document it self and organised public presentations and hearings. The main objective is to make people of different disciplines meet and talk about urban drainage. The meetings are organised in three themes: a) Public hearings with elected representatives and technicians from different municipalities of the county and the county's

elected representatives b) Meetings for each river catchment area with technicians, associations and other stakeholders active in this area c) Discussions on specific subjects (ex. how to keep a separate sewer network, how integrate an open air retention pond into a public space, etc). In these discussions technicians with different disciplines and tasks are invited. People participating in these planning procedure not only realise the importance of urban drainage and BMPs but also add new ideas to AUDACE and they take initiatives for local urban drainage projects.

The third phase of planning is open public participation by the dissemination of a leaflet to citizens called 'l'eau parlons-en avec AUDACE' (lets talk about water with AUDACE). In this leaflet the water cycle is presented, the role of urban drainage and BMPs is illustrated, the water and drainage service and many other public stakeholders are presented and finally the objectives of AUDACE are illustrated with examples of how cityzens can participate in the achievement of these goalds (rain water reuse, passive protection of underground structures etc.). Citizens are also invited to participate to the planning process through the county's internet page (www.cg93.fr) where AUDACE figures as a main issue. There is an e-mail address for citizens comments but in the first 9 months no important comments where made. It is mostly municipalities that send comments through regular mail. The public participation phase will close in September 2004 in County's Environmental forum 'Biennalé de l'Environment' which is organised by the county every 2 years and these year main theme is urban drainage.

This procedure is an open consertation: All stakeholders mentioned above are invited to learn about the 28 years of urban drainage policies and work of the DEA (former objectives and its accomplishment) and discuss on the new objectives. Citizens and associations are encouraged to participate to these debates. There is a specific consertation method. There are special focus groups invited to these presentations-discussions (the stakeholders mentioned above) and specific topics of discussion (the objectives of the urban drainage master plan, how to promote BMPs).

The final outcome of these open planning process with be validated in 2005 from the county's comity and become officially the third sanitation and urban drainage master plan.

Official objective

Formal objective of these planning process is the information of other stakeholders on the DEA's work, discussion on the former actions of the DEA and the consertation on the urban master plan objectives.

Unofficial objective

Informal objective is to promote BMPs to other stakeholders who influence the urban planning and development because the DEA has no such jurisdictions and to validate their former actions and future policies by the city councils.

What is missing?

There is no specific protocol on how these discussions will be taken under consideration. Public participation is not as important as it should. They believe that the municipalities and the private companies should pass the message to the rest of the population.

AUDACE didn't present the responsibilities of every official stakeholder (county, municipalities, SIIAP, Water Agency) to the realisation of AUDACE and the legal restrictions that AUDACE had to respect (ex. river water quality). This was a remark from the first public discussions and a new chapter was added to AUDACE answering to this question.

As the different phases if decision making interact, the AUDACE ,as a planning and evaluation procedure, has an immediate influence to the rest of the decision making process of other urban drainage projects.

Influence of the design phase

Official objective

Give good examples about:

- The hydraulic and hydrologic design of BMPs (take into consideration different rain return periods, manage the risk for different return periods, ‘acceptable’ risk for different BMPs)
- Aesthetic and Urban planning considerations for the better insertion of BMPs in the urban tissue (BMPs integrated in parks, sport facilities, recreation areas, parking lots, visual harmony with the surrounding buildings, protection of the pedestrians so as other uses will be possible even during rain events, gradual interruption of the other activities according to the rain return period².)

Unofficial objective

Promote multi-functional BMPs versus underground installations. Promote open-air drainage installations where people see and respect the rain water. Draw attention to the importance of the social acceptance of BMP projects. Promote “new” BMPs by presenting existing projects of open-air BMPs and infiltration facilities because many stakeholders prefer the underground retention tanks.

What is missing?

The municipalities do not have the “know-how” to make or to supervise this design process. More specific technical recommendations are necessary or a technical support- supervision by the DEA. The DEA can offer this technical support but to a limited number of projects.

Influence on the implementation phase

Official objective

Give good examples about “New” technical aspects to take into consideration as:

- The necessity to level exactly the ground so as to determine the rainwater detention volume and avoid the stagnating waters
- To choose the right vegetation that can support the different water levels
- To make the installations easy and simple to maintain

Unofficial objective

Promote “new” BMPs by presenting existing projects of open-air BMPs and infiltration facilities. Answer to the question of stagnating waters. Show that open-air BMPs can be simple. Show that open-air BMPs can be as invisible as underground BMPs.

What is missing?

The DEA presented only existing and future projects in-order to be more convincing living all other possibilities, that the participants maybe ignore, un-presented. The DEA wants to present only well planned projects in order to show the good examples and also to gain the trust of other stakeholders. No rain harvesting projects where presented because the sanitary services have blocked some of them so it is uncertain if in the future rain harvesting will be permitted. “Small” BMPs where not presented because the DEA is interested only in big projects involving the management of many cubic meters of rain water.

² For example a park with a playing ground: For a 6 months return period rain, all the park is accessible and little creeks are created. For a 1 year return period rain, a little pond is created at the lowest part of the park. For a 5 year return period rain, a the pond becomes bigger but all the rest of the park is still accessible. For a 10 year return period rain, the playing ground is not accessible but people can still cross the park. For a 20 year return period rain, the park is all flooded but it is still safe to cross the park (10cm of water on the main pedestrian trails). For a 50 year return period rain or more the park is flooded and no access is permitted.

Influence on the maintenance and operation phase

Official objective

Attract participants attention to:

- The necessity to collaborate with different services or stakeholders in order to assure the operation and maintenance.
- Simple maintenance using the same material as for the maintenance of gardens or the existing sewerage network.
- The importance of continues maintenance.

Unofficial objective

Remind to other stakeholders the importance of operation and maintenance of BMPs. Many existing projects have failed because of lack of maintenance. Operation and maintenance procedures can be simple and not so costly and their lack can cause severe damage to the installations and to the rest of the drainage system. Motivate municipalities and private companies to assure on their own the operation and maintenance.

What is missing?

The proposition of a procedure in order to establish co-operations for the operation and maintenance of BMPs. DEA proposes that the other 'functions' of a multifunctional BMP (sport facility, recreation, green space, parking) could undertake the operation and maintenance of the BMP but this is not always possible.

3 Case studies

3.1 Introduction

The aim of this chapter is to demonstrate the solution of characteristic problems in the decision making process in a case study, so endusers can apply learning lessons in their own situation. This chapter contains one Dutch case study, as an example for more case studies, to be found in the ADSS. The structure of the previous chapter helps to describe the case studies.

One of the important aspects of the decision making process, is the planning phase. The planning gives the framework for the design, implementation and maintenance of water measures. But experience learns that, although planners put a lot of effort in writing a plan, the plan is not executed and ends on the bookshelves. This is a common shared problem of the decision making process, also by the endusers. The case study of Nijmegen shows a way to work on a plan, which enlarges the chance of implementation of it.

The present case study starts with a short introduction of USWM in the city of Nijmegen by a short description of legal framework and the main stakeholders. Then we will focus on the process which has lead to the water plan of Nijmegen. The case study concludes with a generalization, enabling endusers from other countries to learn from this case.

3.2 The water plan of Nijmegen

The Dutch core end user participating in the Daywater project is the municipality of Nijmegen. Nijmegen is with more than 150.000 inhabitants one of the bigger cities's in The Netherlands. A map of the city of Nijmegen is given in Figure 7.

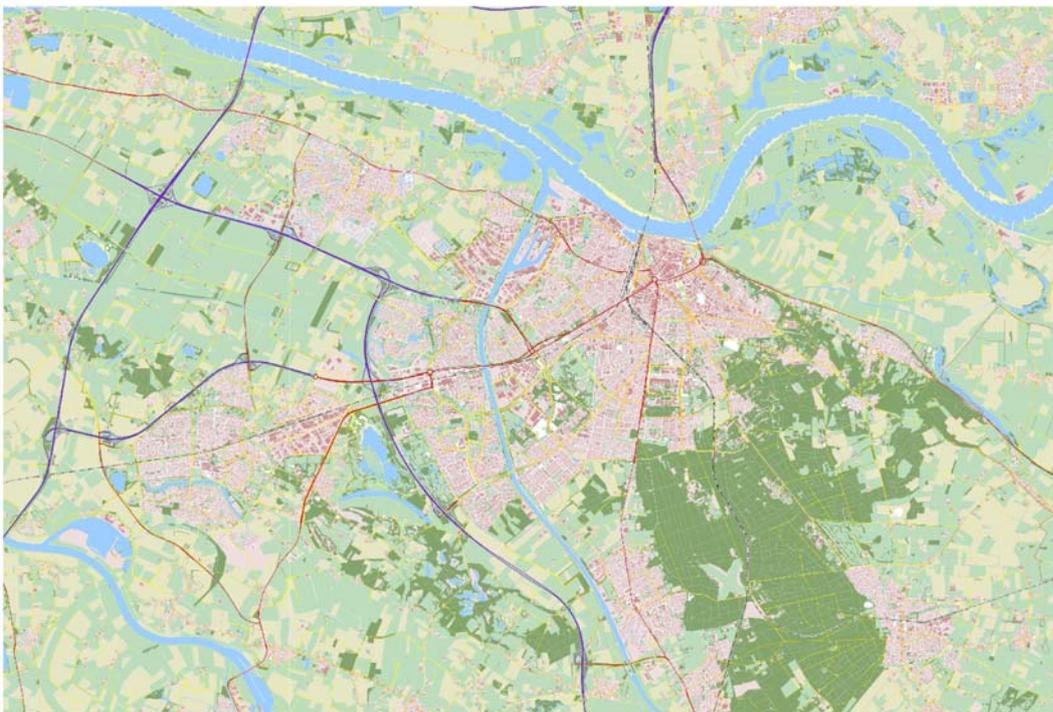


Figure 7 Map of Nijmegen.

A brief overview of the water history of Nijmegen

The development of Nijmegen is strongly related to the River Waal, which is the biggest downstream branch of the River Rhine that flows at north of the city. For that reason Nijmegen is used by the Romans for a fortress to defend the northern borders of the Roman Empire. The Romans brought cultural development to Nijmegen, which still can be seen. After the Roman occupation in the 5th century A.D. Nijmegen has developed as a trade centre. Because of the lack of healthy sanitary conditions, inhabitants of the old Nijmegen were often stroke with a fatal decease. The most devastating decease was the Plague. In the year 1635 40% of the of Nijmegen population died. When it was discovered that public use of polluted water was an important carrier for epidemics, the city of Nijmegen decided to develop a sewage system. It lasted until 1975 that every household was connected to the sewage system. The last centuries not only the sewage system was developed, but also the system for drinking water. Because Nijmegen is built on a gentle hill of sand, groundwater could be used. Nowadays almost 13.000.000.000 liters of groundwater are pumped up to supply all the households in Nijmegen and surrounding suburbs.

A few years ago Nijmegen made an historical step by developing a new residential area of 8000 dwellings of the North bank of the River Waal. This is called "De Waalsprong", the 'jump' over the Waal. In the development an important USWM played an important role.

Nijmegen local policy

The sewage plan and the waterplan are demonstrated for the city of Nijmegen.

Municipal sewerage plan

The Nijmegen Municipal Sewage Programme, which was set up in 1994, involves the construction of underground wastewater depositories. These can store the rainwater temporarily before it is transported to the sewage treatment plant

Waterplan Nijmegen

The 11th of June 1997 is a memorable day in the history of Nijmegen. That day a workshop was organised about how to cope with urban water. During the workshop presentations were given and discussion were held. This workshop resulted in a statement of the city of Nijmegen in which Nijmegen declares to switch to a more 'source controlled' way of handling stormwater. This is quite remarkable, because in 1997 source control and disconnecting drainage systems was not usual in The Netherlands. In the following years several projects started in which streets and districts of the city of Nijmegen were confronted with the enthusiasm of the participating organisations.

Stakeholders in Nijmegen

The stakeholders which participated in the water plan of Nijmegen, and their position in USWM are summarized in Table 4.

Table 4 Waterpartners and their responsibilities in USWM Nijmegen.

Waterpartner	Responsibilities
– Ministry of Transport, Public Works and Water management	– Water quality national rivers as the river Waal (flood protection, space for rivers)
– Province of Gelderland	– Stimulating the execution of provincial policy on water management. – Deep groundwater stock management
– Waterboard Rivierenland	– Sewage treatment – Waterlevel management local / regional

	<ul style="list-style-type: none"> – Water quality local / regional (flood protection, dikes)
<ul style="list-style-type: none"> – Drinking water company Vitens 	<ul style="list-style-type: none"> – Production, transport and delivery of drinking water
<ul style="list-style-type: none"> – Municipality of Nijmegen 	<ul style="list-style-type: none"> – Sewage transport – Stormwater transport and infiltration – Drainage

The cooperation of this stakeholders, on initiative of the municipality of Nijmegen, has resulted in the waterplan Nijmegen.

An overview of the water plan of Nijmegen

The waterplan starts with a vision on USWM, described by a walk through Nijmegen in the year 2050. In this walkthrough those places in Nijmegen were visited where water projects has been used to upgrade the living environment. Main point is that Nijmegen is daylighting stormwater. In this way the natural process of infiltration of precipitation is restored and CSO's of the sewerage belong to the past. Next to this the visible water is used in many different forms to improve spatial quality.

The vision is translated in goals for the year 2015. Focus of this description is source control in different districts of Nijmegen. Every district gets its own strategy. Specific goals can be seen in Figure 8

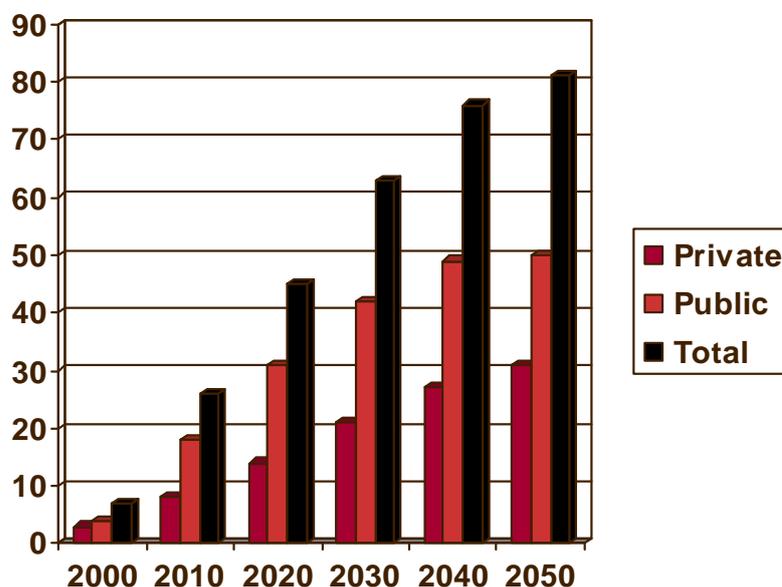


Figure 8 Goals for disconnecting paved areas in percentages, divided for public and private landownership.

The third step in the urban water plan of Nijmegen is the action plan to the year 2005. This action plan contains specific actions for improving the urban stormwater system. These measures are mostly taken on the scale of the street. The next paragraphs sum up the main characteristics of the water plan and the process.

What topics is the waterplan about?

- Saving of drinking water.
- Rainwater refilling the deep groundwater stocks instead of discharging the water by mixing it with sewage.
- Bringing down the stealthy pollution of the water by using sustainable building materials, and by reduction of the use of poison by government / inhabitants.
- Creating a sound and resilient system of open water (local, regional and national water).
- Using water to create an attractive living environment.
- Proclamation of the waterplan.

How did the waterplan come into being?

- Four years of plan process, which started with the formulation of a global vision by the main stakeholders (also referred to as water partners). Subsequently, this vision is practiced in numerous pilot projects to build practical experience and to gain trust among stakeholders (water partners and inhabitants). Only then the plan process is finished by writing the waterplan itself.
- Signing at the start of the plan process a 'cooperation contract' by which water partners speak out their desire to contribute and to co-operate in the plan process.

What are the agreements among stakeholders?

- Getting permissions for reduced overflows of the sewage system, within the framework of the 'basisinspanning' (see for 'basisinspanning' the municipal sewerage plan).
- Optimization of the water chain by closing the chain as much as possible, on behalf of the reduction of sewage emission on the river Waal as prescribed by the government.
- Taking of source control measures (disconnecting stormwater from the sewage system).
- Reduction of the emission of dirt and sewage water on the local waters and redesigning of the local waters in the city (Waterkwaliteitsspoor).
- Communication of the urban water plan to the public to obtain co-operation and co-finance for implementing the water plan.

What makes the waterplan Nijmegen so special?

- Children of Nijmegen are directly involved in monitoring the effects of the water plan, since children are the carriers of sustainability.
- The waterpolicy is closely interwoven with spatial policy.
- The water plan has a high ambition, but is still feasible.
- Close co-operation between water partners.
- The planning process: A global vision of water in Nijmegen is worked out in pilot projects, before the official plan was written.

The Urban waterplan of Nijmegen marks a structural change in the way water is managed. The plan is more than a beautiful coloured piece of paper, the plan lives in the minds of people working with water and more than 50% knows the main content of the plan. Moreover, the plan was already worked out, before the official launch, which made it possible to aim for realistic goals.

This case study focuses on the next problem in Nijmegen: How to start a alteration from a traditional end-of-pipe to a more sustainable approach on USWM?

How to start up new policy on USWM?

The problem

Nijmegen started in 1997 with a new approach on USWM, as one of the first cities in the Netherlands. But a change to a new approach doesn't happen automatically, also in Nijmegen. Once an approach has become standard, legislation adapts to this approach and stakeholders get used to it. The approach is structurized. To integrate a new approach a lot of effort is needed. In Nijmegen a few employees of the environmental department wanted to start a more sustainable approach, but they did not know how. Nowadays the new approach is standardized. Three reasons caused this huge change, partly initiated by the environmental department.

1. *The opportunity of reducing costs by a new approach*

In the Netherlands, it has been customary to construct sewage systems which have a main artery, shaped like a belt around the city. In flat areas, this is a logical system: wastewater is collected in the belt and is transported slowly towards the lowest point in the system. In countries with a more undulating landscape, fork-patterned sewage systems are more common. The fork pattern slows the gravity-induced speed of wastewater in the system.

Because Nijmegen is situated on the slope of a hill, it would have been better to use a fork-shaped sewage system too. Nevertheless, like all other Dutch cities, the sewage system in Nijmegen was constructed in a circular form. As you can see from the picture, it gives the effect of a lopsided lifebelt – during heavy rain, all the water runs to the lowest point of the belt where it starts to flow into surface water or, in extreme situations, onto streets. For this reason, Nijmegen is confronted with a sewage problem that is very difficult to solve.

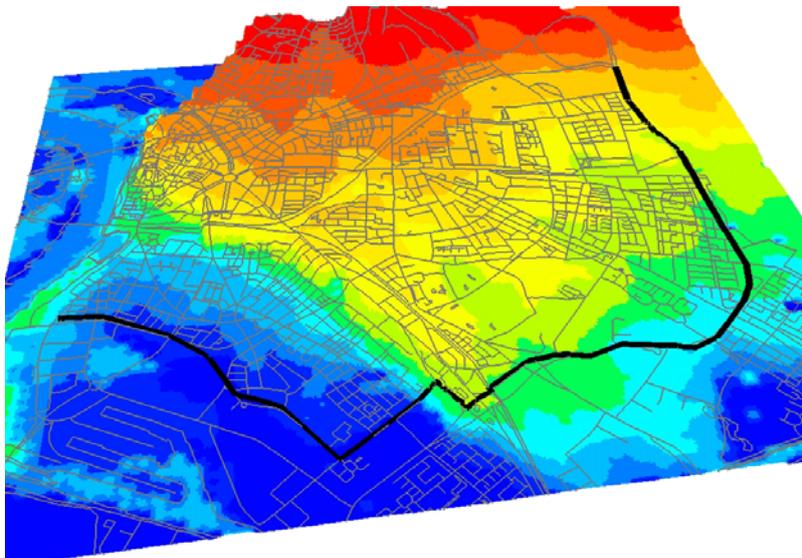


Figure 9 Sewage system in elevation map of Nijmegen.

The disadvantages of these systems have become more and more evident. In case of a downpour, combined sewage systems simply cannot cope with the amount of water they have to transport. Moreover, in such situation rainwater, mixed with wastewater, flows into surface water such as the river. In order to deal with this problem, special ponds were dug which are located at various locations around the city. These ponds are not connected, so the water in the ponds can not flow. This reduces the cleaning capacity of the waters.

As a result of stronger European legislation on norms for water quality, those emissions, which were taken for granted in the past, were a barrier to obtaining water-quality standards as prescribed by the Ministry of Water Management.

To reduce the emissions into surface water, created by combined sewer overflows (CSO's), city councils in the Netherlands were forced to draw up a sewage programme. This programme included measures to reduce the overflow by 50% within ten years. In 1994, the Nijmegen City Council set aside € 40 million for revitalizing the combined sewage system. At that time especially end-of-pipe measures, like the enlargement of the capacity of sewer sedimentation tanks, were believed to offer good solutions to this problem.

In Nijmegen, the problem seemed to be even worse than in other cities, because of the specific geographic situation. Nijmegen is located at the top of a gentle sand hill that stretches out from the east of the city to the Southwest. Normally, hills slope towards the river, which is the lowest point in the landscape. In Nijmegen, the hill slopes away from the river. This unusual situation developed during the previous glacial period when the ice pack pushed soil up into this region and then started to withdraw. In the following period, sedimentary deposits formed under the influence of rivers and wind, especially on the south-west side of this hill. This means that the Nijmegen sewage system does not flow down towards the river in a natural way. In fact it flows off towards the lowest point in the south-west of the city, where the sewage treatment plant is also located.

Persistent problems on the quality of water, combined with stricter legislation were for Nijmegen a trigger to alter to a new policy for USWM. The traditional way of repairing the sewage system would cost far too much. Besides, the effects on the water quality by the traditional approach remained doubtful. This was one of the triggers to try to formulate a new policy.

2. Stimulating experiences on sustainable USWM in a new housing estate

In 1990, Nijmegen Municipality started preparations for the building of 12,000 new houses North of the River Waal. In this totally new part of the city called 'De Waalsprong', a sound and sustainable water system has been a fundamental aspect of the spatial planning for the area.

In De Waalsprong, rainwater that falls onto buildings and small streets is diverted from wastewater. This daylighted water is transported to three large lakes or water basins, located to the North of this area. One reason for daylighting water is to increase the awareness of inhabitants concerning handling water in urban area. When it is hidden underground, people forget about the system, which results in a lot of troubles (illicit connections, careless behaviour of inhabitants, etc.).

To ensure the quality of water, measures are taken to prevent pollutants from entering the system, for example when washing cars or taking the dog for a walk. Furthermore ecological vegetation is used. As part of this system, areas have been created with drainage that is not connected to the sewer system.

The main function of the three storages lakes receiving rainwater, is to store the water for use during dry periods. It can be used to supply fresh water in the polder area. Currently water with a relatively high level of pollution is still used for this purpose.

One of the lakes contains a high water quality that it can be used for flushing toilets and washing clothes in all 8,000 dwellings built in De Waalsprong. By using this, so called 'household water', the amount of drinking water used in this area, which is extracted from groundwater in Nijmegen, will be reduced by almost 50%. This is in line with the policy of the municipality and its partners to save drinking water.

The new principles that were used in the development of De Waalsprong, have led to a different approach to the sewage problem in the old part of the city, by both environmental policy-makers and spatial planners. A new suburb called Grootstal was built using the same principle as used for the first time in De Waalsprong. In this part of Nijmegen, the soil is very sandy and the groundwater is extremely deep, which are ideal conditions for the infiltration of rainwater into the ground.

The advantages of this new approach are the following:

- The existing groundwater supply is supplied with new water over the long-term, the mixed sewage system is not unnecessarily burdened with rainwater and the sewage treatment plant works more effectively, without being overloaded with large amounts of rainwater.
- Another modest but important advantage is, that by retaining the water in its own area instead of allowing it to drain immediately into the river, a contribution is made to the prevention of river flooding. For that reason, one project in the centre of Nijmegen is subsidised by the European IRMA-programme (Interregional Rhine-Meuse Activities). The main objective of this programme is to prevent future river flooding of the rivers Rhine and Meuse.

As a result of the new insights, the municipality decided, in co-operation with other water management authorities to continue daylighting water. In fact there is nothing new about this principle. As showed, until the past century it was quite normal to infiltrate rainwater into the sandy soil. Off course the technique of separating clean and wastewater has been improved in the present. Nowadays, the principle of infiltration is being brought into practice in more and more existing suburbs as well

3. Sustainable USWM as image builder for Nijmegen

Since the bombardment of the historic centre of Nijmegen in WO II, the city has struggled with its identity. Inhabitants state that they are not very proud of their city, proven by several researches. The lack of identity has led to a negative development of the living environment through the years, with rock bottom the illegal transport of polluted soil in 1995 and 1996 without a licence. This event caught the national news, resulting in a lot of negative publicity on Nijmegen. In 1997, the new policy on USWM was initiated by the environmental department of the municipality, to change the image of Nijmegen to an environmental friendly city. In that time no city in the Netherlands had realized source control on a large scale. The new policy was also seen as an opportunity to enlarge the involvement of citizen to environmental issues. Nowadays we can conclude that the new water policy has realized these goals. By relating the desired change to sustainable USWM to the image problem of Nijmegen, political attention was assured. By integrating urban dynamics, the new water policy could adopt a wider perspective and became sensitive in the mind set of politicians and citizens.

Generalisation

Starting the development of a new approach on USWM in Nijmegen, comes down to three factors:

- By proving that the new approach can be cheaper then the traditional approach
- By building positive experiences by implementing the new approach in practice (making it visible) in situations with a high opportunity for success (such as a new housing estate)
- By connecting the new approach of USWM to a wider problem experienced by citizens and thus politicians.

The employees of the environmental department played an important role in initiating and using these factors.

The main problem in Nijmegen was: How to develop a 'through-lived' plan? Good ideas can result in beautiful plans, which are not implemented. A plan which also will be implemented is defined as a 'through-lived' plan. In Nijmegen it was a significant problem to translate the great ambitions in sustainable USWM into large scale implementation of source control. To realize the implementation of the new policy, a whole new process architecture is developed, refered to as Interactive Implementation. Out of the Nijmegen case studies we see the next tools and skills (both are important!)

Reflection in Action

One important principle applied in Nijmegen is 'reflection in action' (Schön, 19xx). This principle is translated in the following management steering concepts.

- Distinguish physical, social and intellectual processes. These three levels need attention and ask their own way of handling.
- Accept complexity, not fight it. Complexity can be seen as a condition for new chances for structural changes, which can't be made without introducing complexity. Contingency is an important concept. Despite complexity coherence can be seen in so called attractors. Work on different spatial scales. Problems in USWM on the level of the street ask for complete different solutions then problems on the level of the city as a whole.
- Wait for the right time to undertake an action, with as a consequence to be flexible in planning.
- Have an eye for formal and informal structures and use these structures to reach goals.

Cooperation beyond legal borders

In Nijmegen, a new strategy between stakeholders is followed. Whereas under the old situation the water management authorities could limit themselves to their own legal tasks, they now have to work together closely. Furthermore, the new policy also depends on the willingness of citizens to disconnect rain pipes and allow rainwater to infiltrate the water in their gardens. Or, at least, they have to give permission, allowing authorities to disconnect water of the parcels.

Recognizing opportunities

Something which can hardly be learned, but is very important is to recognize changes for source control. These changes mostly occur when a measure (for source control) is connected to the valuation of a certain (group of) stakeholder(s). In other words: to connect USWM with the Urban Dynamics. This is the topic of the following deliverable of this WP, D3.3. A pre-condition to take a chance is to have sufficient information and the familiarity of the source control policy to all kinds of [stakeholders.sions water plan Nijmegen???](#)

Phasing the decision making process

Phasing is a major problem for uswm, in special when the policy shifts from end-of-pipe control to a source control approach. It is for a large part at the hand of a water manager to organize activities in order to implement source control. The knowledge, abilities and attitude of the water manager is therefore from utmost importance. D3.4 characterizes three different attitudes of a storm water manager, connected to the results of such an attitude in USWM.

4 Derived components and links with other ADSS components

4.1 Introduction

The work realised for D3.2 and the case studies analysed give a first idea about useful components of the ADSS and their function. Some needs are analysed and the future components are described.

4.2 Policy instruments database

The analysis of the legal framework and policies in France and in the Netherlands have showed how important are these elements in USWM. In the same time, the legal framework and policies change a lot from country to country and even from one project to another. The spatial level proved to be very important (European, national, regional, local) in the determination of USWM. But from the Case studies it was proven that many projects are promoted by local policies and policy instrument.

Stakeholders are interested in learning about the relevant legal framework and also about policy instruments that have been applied in their country or other countries. In order to meet these need a policy instruments database has been created. This database includes the legal framework and policies.

As the relevant information is huge and its translation to English demands specialists (legal terminology official translators) the database will only include a brief summary of each document in English and a link with the original document in the national language. This way all users can have a first idea in English of what is happening all over Europe. For their own country they can find the National legal framework already gathered up.

One part of the database includes information about the European and national legal framework and policies. This part will be completed for the prototype. Another part includes information about regional or local or project specific legal framework and policies. This part will be completed partially by the end-users and scientific partners during the field testing as an example for further development. Future users could be able to complete it by their local data. This user specific part of the database permits to the user to save and stock all information relevant to its project and pass this information to his collaborators and other stakeholders. Local data can be used in the long term in order to keep track of the changes in local policies but also to give ideas to other cities.

4.3 Case studies database

The case studies database structure was also influenced by the D3.2. Case studies are characterised according the legal framework (if relevant), the stakeholders and the phasing. The case studies serve as examples for illustrating the theory. The data from the examples of Seine St. Denis water and drainage service and Nijmegen municipality will be used in case studies database.

4.4 Stakeholders database

The D3.2 shows how the identification of the stakeholders and their role in each decision making process is important. It is important not only to know the stakeholders already involved in the decision making process but also others that could participate. The comparison between France and the Netherlands shows that the main stakeholders are not very different but their role can easily change from project to project.

Taking this information in consideration and other data available from all core-end users questionnaires, it was decided to incorporate in the ADSS a Stakeholders database. This database includes a standard list of stakeholders types. Every type has some general characteristics. This database is linked with the case studies database. For each case study the involved stakeholders are characterised. This information enters directly in the stakeholders database. This way, in the long term, the stakeholders database under every stakeholder type will have information on several 'real stakeholders' and projects they have participated.

Another way to fill the database is to enter directly information about stakeholders and this way create a personal or project-specific agenda. That way the opinion of every stakeholder is written down and we can keep track of this information.

5 Conclusions

In the decision making process the implementation of water measures gets its form. By offering the three viewing angles legal framework, stakeholders and phasing, end-users can characterise their decision making process. This characterisation helps them to analyse problems.

The legal framework determines who is responsible, who has to pay and offers tools for water management. Constraints and resources offered to stakeholders by the legal framework are obviously different from one country to another. Dutch stakeholders are involved in a water management process very prescriptive; every activity impacting the receiving water bodies has to be declared and controlled. The way experimented solutions are monitored is standardised. On the contrary, in the French case, urban runoff is not a matter of public policy at the national level: The Central State is source of recommendations but there is no compulsory prescription imposed to local governments. As a matter of consequence, there are sensible differences in the planning processes implemented in Netherlands and in France. The degree of integration between the various plans (at the various scales) seems to be higher in the Dutch case than in the French one. France, well known for its centralisation, is experimenting a high degree of subsidiarity concerning its urban storm waters.

The analysis of stakeholders helps to position them in the process, to build a shared problem perception and to take chances. A chance occurs when a stakeholders sees an opportunity to realise his goal by means of water. This is an important issue, especially in France where stakeholders' roles are often unclear, as a decentralisation process is ongoing. As shown in the detailed example of Audace, source control appears as a solution for the County Council to keep their key-role in the water management, promoting a new expertise.

The phasing of the decision making process tells what kind of actions when to undertake in the decision making process. It is very important not to follow a linear sequence, but to interact between the phases. Only then experience of implementation and maintenance can be made fruitful for the planning phase. The case studies give end-users inspiration to apply these ideas to their local situation. The analysis of these case studies also helps to understand why some types of BMPs are preferred to others. The planning procedure implemented by the County Council of Seine Saint-Denis obviously favoured BMPs that are sufficiently "visible" and have a significant impact on the global water retention at the County level.

The two scientific teams in France and The Netherlands started the analysis for this report by studying information from their own respective countries. From this analysis and the examined case studies, guidelines are created in order to build the derived components where more information from all participant countries (UK, Germany, Denmark, Sweden, Czech Republic, Greece) will be included by the partners with possibility of including more countries in the future.

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