The Future Of The Dutch Drinking Water Sector:
Scenario Planning resulting in Four 'Jules Verne-like' Scenarios For 2020

Willem Koerselman & Marc W.M. van Eekeren
Kiwa Water Research, PO Box 1072, 3430 BB Nieuwegein, The Netherlands.

Keywords: drinking water, scenario planning, business strategy

Abstract Four scenarios were developed for the Dutch drinking water sector in 2020. The scenarios mainly differ in the degree of technological development (leader vs. follower) and the dominant citizenship style (individualistic society vs. a coherent society with a collective citizenship style). In the 'Me, myself & I' society, people are self-centred. There has been strong technological growth with the focus on consumer demands for luxury, leisure and amusement. The role of the government is subservient. Private drinking water companies use membrane technology to produce high-quality drinking water from any water resource. Point-of-use equipment is used to further 'upgrade' the water for various consumer functions. In the 'Sustainable community' citizens focus on the meaning to life, a peaceful existence and paying attention to the environment and our fellow human beings. Technology is flourishing and is mainly used in aid of a better living environment and health. Drinking water is sustainably produced by public water chain companies, which include recreation and nature conservation among their primary tasks. In 'Thriftiness' there is a coherent society with a collective citizenship style. Due to low economic growth, there is little financial leeway, and we are a follower in the field of technology. Public drinking water companies focus on cost reduction and go back to their core activity: the production of high quality drinking water with conventional techniques. In 'Solitary & Frugal', there is an individualistic society with low concern of social and environmental issues. It is a harsh society, in which cost-consciousness and self-interest rule. Water companies return to their core activities, and stretch the operational life of production means.

Several business strategies to cope with these four future scenarios are discussed.

Introduction

Anticipating and preparing for the future is important for the drinking water sector, especially now that society is changing so rapidly. Currently, the drinking water sector is in a phase of transition and change. Future challenges are:
- the ever intensifying use of space, which strongly affects maintenance and construction of underground infrastructure;
- pollution of water resources (organic substances, medicine residues, etc);
- the need for new and affordable technology for water treatment and infrastructure;
- internationalisation of the global water supply.

Scenario planning offers decision and policy makers an unrivalled methodology to learn from the future before it happens, and act pro-active. Within the scope of the Joint Research Program of the Dutch Water Sector, representatives of Dutch and Flemish drinking water companies and Kiwa developed four 'Jules Verne-like' scenarios for the year 2020. Based on trend analyses we established two driving forces that have a major impact on the society and the drinking water sector. The first is the citizenship style. Will the individualisation of society continue and will we face extremely critical consumers who focus on their own interests? Or will we have a coherent society in which we pay attention to each other and the living environment? The second driving force is the pace of technological development and the degree to which society will actually implement new technology. Will the Netherlands become a leader in the field of technology or will we mainly implement 'proven' technologies developed elsewhere?
The approach
The technique of scenario planning consists of a number of steps that are described below.

1. The first step in scenario planning is to produce an overview of all relevant trends that can directly or indirectly influence the drinking water sector. The trends concerned are socio-cultural, economic, political, technological, ecological and demographic. Based on existing sources (CPB, OECD, CBS, CIBIT etc.), we started with a shortlist of 70 trends which could have an effect on society in the future.

2. Of these 70 trends the project team selected 28 which they believed could have a significant effect on the water sector.

3. A trend exploration exercise was then performed on each of these 28 trends in order to map out what kind of effect they might have on the water sector. This effect was described in respect of three effect areas:
   - products and services ('what will the customer ask for')
   - production and distribution ('what does the trend mean in terms of how we produce and distribute our drinking water') and
   - cooperation and organization ('what other players are our natural cooperation partners').

4. The results of the trend exploration showed us that not all trends would affect the sector to the same significant extent. We earmarked those trends whose future development is as yet uncertain for a follow-up study. Will they gain a foothold or not? One example of these trends is the knowledge economy. This subject is in the spotlight at the moment, but the question is whether the Netherlands will develop into a knowledge economy or whether plans to do so will run aground.

5. Ultimately we earmarked 11 trends for in-depth study: the trend elaboration process. In some cases the names of trends were changed to enable us to do more justice to the trend, and some individual trends were combined and given a new working title. The following 11 trends were earmarked for the trend elaboration process:
   - The individualization of society
   - The leaning towards greater efficiency and effectiveness in business management
   - The development of the knowledge economy
   - The role of government
   - Membrane technology
   - Sensorization
   - ICT and automation
   - Infrastructure technologies
   - Biotechnology
   - Sustainable society
   - Climate change

We created a subproject for each of the 11 trends, in which each trend was explored in greater depth by a team member. Besides describing the trend in more detail, the team member also mapped out the uncertainties inherent in the trend and the factors that determine whether the trend would gain a foothold or not. The impact of the trend on the sector was also described more accurately. For this purpose we used interviews, company visits, conversations with futurologists, desk research, the Internet, discussions etc.

6. The elaboration of the trend was followed by a complicated exercise in which the outlines of four scenarios were determined by defining the so-called driving forces: two developments that have a significant influence on the trends studied and a major impact on the water sector. These two driving forces are the extent of technological development and the citizenship style. The two driving forces then determine the coordinate system with which the four scenarios are defined (see below).
The coordinate system alone is insufficient to enable us to come up with a detailed impression of the four scenarios. For that reason, the other trends studied in the trend exploration and the trend elaboration were incorporated in the coordinate system in a plausible and consistent way in a subsequent step.

**Figure 1.** Summary of the four scenarios for the year 2020

**Four future scenario’s**

Scenario planning (see box 1) was used to develop four ‘Jules Verne-like’ scenario’s, which are all realistic and just as probable. The four scenario’s, that are summarized below, mainly differ in the degree of technological development (leader vs. follower) and the dominant citizenship style (individualistic society vs. a coherent society with a collective citizenship style).
Box 1. Outline of Scenario Planning

Scenario 1: Me, myself and I

Social picture
The individualisation of society has continued. Economic growth is strong in 2020 and most of us are well paid. We live in a true economy of experiences that is the age of individual freedom and amusement. We zap from one experience to the next. We are interested in things that make life more pleasant: leisure, luxury and comfort. Our social involvement is limited to things in which we have a direct interest. We set high requirements for the quality of services and products, and claims are soon brought, if our requirements are not fulfilled. Poorly educated people miss out on the opportunities in the economy of experiences. As modern hedonists, we don’t have much sympathy for them, believing “they only have themselves to blame”.

There has been strong technological growth with the focus on consumer demands for luxury, leisure and amusement. The Dutch government has lost most of its ideals about the creatable society; its paternalistic role has been superseded by a subservient role. The government focuses on health care, security and education, and leaves other tasks and functions to the market, to the satisfaction of (almost) everyone.

The drinking water company
The drinking water sector has responded in good time to these developments. A few large companies supply drinking water on the basis of short-term concessions. Membrane technology now enables us to produce high-quality drinking water from any water resource. The production process is fully automated and surrounded by sensors that generate information for immediate use. We are continually modifying the treatment operations in line with quality fluctuations in the input water. The Netherlands is a world leader in the drinking water sector. Each drinking water company has its own research and development department and markets its knowledge abroad. We supply drinking water that meets all the drinking water requirements. At home, our customers often ‘upgrade’ it to a quality that is perfectly tailored to its various functions: washing, showering, drinking water or table water. Many small niche players serve the market ‘on the consumer’s side of the water meter’. Widespread use of point-of-use equipment has given consumers the impression that the quality of the basic water is
inadequate on its own. Drinking water at home that has not undergone further treatment to produce table water is seen mainly as only being for poor people. In spite of its almost perfect quality, the water we supply is no longer A-status water!

**Infrastructure**

Municipalities pursue a strict policy for co-ordination of all activities in the subsoil. No-dig techniques and the use of multi-utility tunnels have increased significantly. Municipalities have taken integral measures for the location of cables and pipes (including multi-utility tunnels) to enable the transport of wastewater and waste material through the underground infrastructure. Therefore, there is no need anymore to work in open sludges and the risk on catastrophes has been minimalized. Complaining citizens increased the use of no-dig techniques. They forced the government to install ‘curfews’ for 10 years, in which it is not allowed to break open the street.

No-dig techniques are used for maintenance and replacement of underground infrastructures as well. Since there is joint co-operation in installing cables and pipes in multi-utility tunnels, the costs for installing and maintenance decreased. Costs for solitary cables and pipes decreased as well; due to ameliorated techniques that could calculate the lifetime of the infrastructure, maintenance cycles are planned more efficiently. All maintenance activities are contracted out to private companies.

All owners of cables and pipes register their infrastructure in uniform co-ordinates. Co-ordinates are accessible through a centralized and computerized system for authorized users of the subsoil. However, the registered location of especially old infrastructures does not always match the real location. To avoid catastrophes and nuisance, the condition of these cables and pipes needs to be examined periodically. Sensors will be helpful in finding the exact location of the cables and pipes, determining their defects and maximum technical life-time.

**Scenario 2: Sustainable community**

**Social picture**

We attach importance again to giving meaning to life, a peaceful existence and paying attention to the environment and our fellow human beings. Senseless violence, the degradation of old cities and a number of major environmental disasters have brought individualisation to a standstill and social cohesion has returned to society. Consumers demand high-quality products with a sustainability quality mark. Sustainable production and a transparent production process are requirements for a successful business. Technology is flourishing and is mainly used in aid of a better living environment and health. The government rules with a firm hand; it encourages sustainable enterprise and provides strong incentives for our knowledge economy, in which there is close cooperation between the business community, universities and knowledge institutions. The Finnish model has been successfully implemented in the Netherlands.

**The drinking water company**

Besides public drinking water companies in the drinking water sector, we also see water chain companies, organised at the catchment area level. Non-sustainable groundwater abstraction sites have been reallocated. Membrane filtration is increasingly being deployed in water treatment plants and the
use of biotechnology in wastewater treatment has increased markedly. Most production processes are fully automated and monitored remotely via sensors. The production processes are transparent. An end has come to the underground ‘infra-chaos’, now that the government tightly coordinates maintenance of all underground infrastructures. Joint research in the Netherlands water sector sets the trend throughout the world. We export our knowledge to developing countries through twinning projects. Recreation and nature conservation are among the water company’s primary tasks. This has resulted in a slight increase in the price of drinking water, but neither consumers nor the government make a fuss about this, as long as all the costs are accounted for properly. Water companies therefore invest considerable sums in communication with consumers.

*Infrastructure*

Government controls all activities concerning installing and maintenance of cables and pipes that are an integral part of all other building activities, above as well as below ground. There are clear 3D-guideline for communal development that comprise of 3D networks for cables, pipes, underground transport systems and the transport of waste.

A governmental organization named KBel N.V. was founded. KBel N.V. co-ordinates all underground activities and registers in detail all relevant data of cables and pipes. The founding of the government-owned KBel N.V. was necessary, since the integration of activities of the individual cable-owners appeared to be impossible. This situation had led to a lot of incidents and near-disasters, after which government had decided to intervene. Now that all activities are co-ordinated by one organization, nuisance for citizens has decreased to a minimum and no-dig techniques are widely used.

There are many innovations in installing and maintenance of cables and pipes, especially in new conurbations. Innovations may concern mains systems, new no-dig techniques, new materials or e.g. multi-utility tunnels as an integral part of the foundation of new-built houses in new estates. Inside old parts of cities, all cables and pipes are localized and well maintained. No-dig techniques are well developed.

The dimensions of new pipes have become smaller to avoid quality problems that occur frequently in old, over-dimensioned pipes. Alternative extinguishing means replaced the traditional means for extinguishing water used by the fire brigade. High pressure sprinklers systems are installed in each new house. However, persistent sediment in pipes and its effects on water quality remain a problem for the water companies, until the next maintenance operation in 2030 has taken place.

**Scenario 3: Thriftiness**

*Social picture*

Frugality is a characteristic of society in 2020. No headway is being made with the economy. Government, the business community and consumers are mainly concerned about cost savings. There are few traces left of the far-reaching individualisation of society that emerged at the end of the 20th century. The ‘emptiness’ of existence and the outgrowths of individualisation resulted in the revival of a coherent society around 2010, with a collective citizenship style. We attach little
importance to material wealth and luxury. We are more concerned with calm and regularity. Government has little financial leeway; the budget deficit demands a lot of attention. Society realises that always pointing the finger at the government doesn't work. Citizens take their responsibility. We often take the initiative to set things right and the government helps to do so. The government facilitates developments and concentrates on education, health care, spatial planning, nature conservation, the environment and revitalising the major cities. It leaves many other matters to the market but it sets (and enforces) rules. In spite of all the wonderful plans, the knowledge economy failed to get off the ground. Neither the government nor the business community could afford to make the effort required. In the field of technology, the Netherlands has become a 'follower'. Technologies developed elsewhere are implemented sometime later in the Netherlands, especially if they contribute to cost savings or protection of the environment.

The drinking water company
All drinking water companies are in the government's hands. Our main aim is cost reduction and we focus exclusively on the core activity: producing sufficient drinking water of the highest quality. Nature conservation and recreation are not a drinking water company's main task. We pay a lot of attention to the management of plant and equipment because doing so enables us to optimise maintenance and replacement work. ICT has penetrated far into production-location management and provides cost-benefits. Production processes have been optimised and the efficiency of the treatment plant has been further increased. The few research activities that are carried out focus on improving existing techniques. Consumers have faith in the quality of the drinking water. Partly under the influence of the 'just act normal' mentality, bottled water sales have reduced considerably. Why pay a lot for something that you can get for almost nothing out of the tap?

Infrastructure
Government aims for underground spatial planning, but fails in its efforts due to lack of money and the availability of innovative techniques. The underground chaos that had developed in the past decades can hardly be structured by replacement and installing of cables and pipes. Old pipes or empty pipes that are out of use, are removed only if the street has been opened for other purposes.

A large part of the underground infrastructure is out-of-date and needs replacement. Especially in old inner cities this causes frequent trouble and interruptions. Drinking water companies have designed plans to replace deteriorated pipes with lowest costs possible. The governmentally installed 'curfews', periods of about 10 years during which it is not allowed to break open the street, hinders the realization of these plans. However, many municipalities still allow necessary replacements, even if they fall within the curfews.

Owners of infrastructure carefully register the position of all new pipes. Moreover, new pipes are equipped with magnetic strips, so that they can easily be traced. The registration systems of the various owners of cables and pipes have been standardized, in order to facilitate the mutual exchange of information. However, each user of the subsoil needs to contact different owners, to obtain the necessary information, a time- and cost intensive system.

Current techniques for installing, maintenance and replacement of underground infrastructure do not differ significantly from those that were in use 20 years ago. Open sludges are common practice, except when highways or densely populated areas have to be crossed. Often, foreign companies are hired to perform these crossings, e.g. from Japan, where there is a lot of experience with these techniques.
Scenario 4: Solitary and Frugal

Social picture
Individualisation has continued and the Netherlands is not prospering economically. With its limited financial resources, the government is unable to meet all the wishes of a multiform society. It was having to deal with increasingly more claims from self-assured citizens and it finally decided to place more responsibility with the business community and citizens and to limit its efforts to the most important public tasks: primary and secondary education, spatial planning, security and health care. We are extremely cost-conscious because we are afraid our purchasing power will continue to decrease. We concentrate on giving meaning to life and on self-development; material wealth is not achievable for the majority. We are not concerned with social problems, unless we are directly confronted with them. We fairly often unite in pressure groups concerned with a particular topic, so that we can look after our own interests. Most people are satisfied. After all, we have more space than in the past to turn things to our own advantage. As long as you stick up for yourself! Technological development has come to a halt in the ailing economy; the financial resources are simply unavailable.

The drinking water company
Cost-consciousness also rules in private water companies: a return to the core activity and efficiency first! There is little need for innovative research. We optimise trusted production techniques and stretch the operational life of our means of production to the limit. Pipes are only replaced if they are demonstrably ‘finished’ but that sometimes leaves the street under water. The number of claims against water companies has increased steadily since 2010 but the resulting costs are low in comparison with the premature replacement of pipes. Moreover, with excavation work, we always run the risk of damaging the cables and pipes of other parties, which also leads to large claims. There is chaos underground. The quality of water resources is also cause for concern. Consumers are concerned about water quality because unwanted substances may not be removed properly in conventional treatment plants. The result is that the drinking water sector’s image of integrity no longer exists.

Infrastructure
Around 2030, the drinking water companies are faced with a large amount of pipes that have to be replaced. Although money has been reserved for the replacement of these pipes, the water companies try to extend the life of their infrastructure by effective maintenance. During the past years, they therefore invested in developing an optimal maintenance strategy. Due to aging of the infrastructure, the frequency of disturbances of cables and pipes increases. Since many pipes are hard to find or to reach, digging activities, that become more and more dangerous and expensive compared to the situation in 2003, cause a lot of damage to the surface. Disturbances in water supply occur frequently.
Government performs rules and guidelines for use of the subsoil. However, due to lack of supervision and long lasting procedures, the confidence in these rules has been minimalized. The governmental budget for spatial planning is insufficient to preserve the rules.

Cost effectivity is the main criterion for installing new cables and pipes and the maintenance of registration systems. Diversity in installing techniques and registration is the result. Although many data on the localization of cables and pipes are available, it is hard to find the necessary information. In general, governments perform curfews during which it is not allowed to break open the street. However, due to the frequent occurrence of catastrophes, the street will be frequently broken open for maintenance activities. Some municipalities have taken fine measures for these occurrences.

When pipes are damaged by others, insurance claims may be high. Due to these insurance claims, repair activities will be performed in the sludge by the organisation that caused damage. By the time problems become obvious, it will be impossible to trace the damage cause.

**Anticipating the future: how do we deal with four scenarios?**

Scenario planning is an important tool for strategy development of the drinking water sector and of individual drinking water companies. In order to be successful, uncertainties presented in the scenarios must be dealt with. Box 2 explains stepwise how scenario planning can be adequately implemented in business strategies.

Through roadshows, we support implementation of the four scenarios and their subsequent business strategies. This led to new insights in the future of Dutch water supply, such as technological and research needs, long term investment plans, human resource management strategies, the drinking water directive, and possible coalitions with other actors.

### Step 1. Determining opportunities and threats for each of the scenarios

**Checklist**

- What will be important (new) customer needs in the future?
- Which of the current services provided by drinking water companies will not be required by consumers in 2020?
- Which technologies will develop, and which technologies will become less important?
- Which opportunities offer new technologies for the production and distribution of drinking water?
- What knowledge and competencies will we need in the future to keep customers satisfied?
- Are the knowledge and competencies concerned available, or will we have to develop them?
- What investments will all of this involve?
- Are there other actors that drinking water companies may co-operate with?
- How robust are current management or investment decisions in each of the four scenarios?
- Etc.

After this exercise, a clear picture exists of what the future means for a drinking water company, or the drinking water sector. Often, this will show that certain investments work out well for one of the scenarios but are irrelevant for others. The subsequent conclusions from this depend on the type of strategy of the company. The two most relevant ones are described below.

### Step 2. Choice of business strategy to deal with uncertainties

**Robust strategy**

In the robust strategy, you focus on the issues that are relevant in three or four scenarios of
the future and you do not invest in matters that are only relevant in one or two scenarios. It is a 'middle-of-the road' strategy, which excludes risks and leads to a position that is adequate for all the scenarios of the future. However, it is not tailor-made to any of them! Whatever scenario of the future becomes reality, there may always be a more well-suited competitor for that specific scenario. This will not pose any problems as long as water companies have a monopoly position.

*Flexible strategy*

With the flexible strategy, you invest in matters that are relevant in any scenario of the future (as you can't go wrong with that) but you keep your options open for the others until you have more clarity about the future. In the meantime, you monitor developments so that you will quickly see which scenario of the future is becoming reality ("horizon scanning"). You develop scripts for each of the four scenarios, but investments start no earlier than after horizon scanning shows which of the four scenarios is becoming reality.

*Box 2. Two-step programme to incorporate scenario planning in the business strategy.*