Report on demonstration of TRUST outcomes in the urban peri-urban city cluster

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trust

D63.1

TRANSITIONS TO THE URBAN WATER SERVICES OF TOMORROW

Report on demonstration of TRUST outcomes in the urban/ peri-urban city cluster

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1. INTRODUCTION

1.1. Background and objective: Roadmapping and the demonstration of TRUST outputs

Climate change, population growth and migration, increasing urbanisation and ageing infrastructure are all expected to impose significant strains on urban water systems (UWS) in Europe and elsewhere over the coming decades. Cities across the continent will experience increasingly frequent shortfalls in the supply / demand balance, particularly during the summer months. More intense rainfall events will lead to local flooding of properties and transport systems and to pollution of receiving waters. Sustainable solutions to these challenges need to be sensitive to long-term investment needs, but also to increasing energy prices, demands for low carbon intensity solutions, and the need to reduce gas emissions from urban activities.

Innovative tools, methodologies, technologies and management options are needed to ensure more sustainable urban water services regimes. An extended understanding of the performance of contemporary urban water services will allow detailed exploration of transition pathways. Throughout Europe, water utilities and authorities are in transition. Their historical focus on primarily local and isolated issues is being replaced by challenges of a more regional or global nature. The analysis of the urban water cycle within TRUST will include use of an innovative systems metabolism model, derivation of key performance indicators, risk assessment, as well as broad stakeholder involvement and an analysis of public perceptions and governance modes.

The most promising interventions (tools, models and technologies) will be demonstrated, applied and legitimised in the urban water systems of nine participating pilot cities or regions in Europe and Africa, which are grouped into three clusters: The water-scarcity city, the green city and the urban/peri-urban cluster. The cities cover a representative range of typologies, challenges, and socio-economic framework conditions on a European and international scale.

The overall objective of WP 63 is to promote the implementation of TRUST outcomes in the 'urban peri-urban' cities cluster (Oslo, Scottish Water and Bucharest). For this purpose we will develop and demonstrate in close cooperation with all stakeholders, a roadmap of interventions to a sustainable UWCS including their associated governance (and financial) models. The topic(s) to be implemented in the roadmap process is to be decided by the end users/cities.

1.2. The urban/ peri-urban city cluster

To ensure efficiency, the TRUST research outcomes have been demonstrated in clusters of cities addressing similar main challenges. WP63 dealt with the following urban – peri-urban cluster of cities:

- Oslo, Norway
- Scottish Water, UK/Scotland
- Bucharest, Romania

We have developed and demonstrated in close cooperation with all stakeholders, a roadmap of interventions to a sustainable UWCS, including their associated governance (and financial) models. The topic(s) to be implemented in the roadmap process were decided by the end users/cities.

Bucharest is the capital city of Romania with a population of about 2 100 000 people with additional people in the peri-urban area.

Apa Nova Bucureşti, the Romanian branch of Veolia, is the concessionaire of the public water supply and sewerage services in Bucharest.

The challenge and goal of Bucharest is to make a transition to more sustainable operations in their water- and wastewater systems. Two major ambitions are to work on reducing water leaks in the drinking water networks, and to upgrade wastewater treatment.

Oslo is the capital city of Norway with a population of about 630,000 people, and is rapidly expanding in numbers. The city has its own company which serves the water- and wastewater services. The company, called Oslo VAV, governs itself and its resources.

The challenge and goal of Oslo, as with Bucharest, is to make a transition of the urban and peri urban water- and wastewater services into more sustainable operations. The objective of Oslo is to reduce the total water demand (Q) and therefore to work on a roadmap on how to reduce leakages and other relevant measures.

Scottish Water is a statutory corporation in Scotland that provides water and sewerage services. It is a publicly owned company, answerable to the Scottish Parliament. Scottish Water provides 1.3 billion liters of drinking water every day and takes away 840 million liters of waste water daily (www.scottishwater.co.uk).

The challenge and goal of Scottish Water is to provide low carbon water services in the urban and the peri-urban areas. They have focused their roadmap process on increasing the sustainability in rural areas.

More background information on the cities can be found in the second TRUST magazine, which can be downloaded from the TRUST website http://www.trust-i.net/.

1.3. Structure of report

- Oslo
- Bucharest
- Scotland
- Conclusions

2. ROADMAPPING & DEMONSTRATION IN OSLO, NORWAY

2.1. Roadmap process, topics and timeline

The roadmap planning process started evaluating sustainability status of Urban Water Cycle Status in TRUST Cities (TRUST D11.1 – Current State of Sustainability of Urban Water Cycle Services) and exploring key challenges, priorities and expectations in Oslo. In order to explore the stakeholder visions for the future of urban water services, the workshops for

- Governance bodies (Oslo VAV, other municipal departments, national government agencies) and
- Citizen groups (Environmental & community organisations) were organized in Oslo 16-17.4.2012 (TRUST WA2: report from workshops).

Workshop participants had the opportunity to articulate and communicate the key sustainability issues in Urban Water Cycle System such as:

1) How population growth, increasing urbanisation, ageing infrastructure and climate change are introduced (or not) into the strategies (Water supply concept plan, Municipal plan),
2) Pressure to improve water demand management by demand management technologies (household water-using devices stock, smart water metering), to promote behavioural changes (using rainwater for purposes which do not require potable water quality: garden watering, street flushing), and to improve the funding system (how to establish a funding system that sees water in an overall perspective, that is forward-looking rather than backward-looking and that is perceived as equitable and transparent enough so that consumers become more concerned with what they get than with what they have to pay),
3) The water governance effectiveness (the absence of delegated authority for stormwater management; issues related to drinking water regulations and the approval of water supply systems which are under responsibility of Norwegian Food Safety Authority).

Table 2.1 – Roadmapping timeline for Oslo 2013 – 2014

ROADMAPPING ACTIVITIES	DESCRIPTION	ACTORS INVOLVED	DATE
Kick-off meeting	The roadmap started in Oslo VAV with a first start up meeting to introduce the roadmap process and gather all the stakeholders. Presentation of TRUST tools. Topics for the roadmap process was decided to be: a) reduction of water use; b) reducing leakages	Oslo VAV, SINTEF, NTNU, Food Authority Oslo	27th of May, 2013
Workshop # 1	Scoping and Forecasting of the roadmap process.	Oslo VAV, SINTEF,	1st of November, 2013
Workshop # 2	Backcasting and Transfer of the roadmap process.	Oslo VAV, SINTEF	28th of April, 2014

2.2. The roadmap and monitoring strategy

The measures and their timetables that constitute the TRUST roadmap of Oslo VAV were created through group work done in the workshops. In the final workshop the participants were split into groups to discuss relevant measures to reduce water demand and to reduce water leakages. Based on this group work, a list of measures with timelines for both topics were created. The measures and their timelines were put into a synchronization diagram, functioning as the visual roadmap for Oslo VAV (see Figure 1). Figure 1 is the roadmap for the topic of reduced water demand in Oslo. Each topic (reduced water demand and reduced leakages) has their own diagram. The measures were split into four categories; technical, information, attitude and framework, signifying the type of measure.

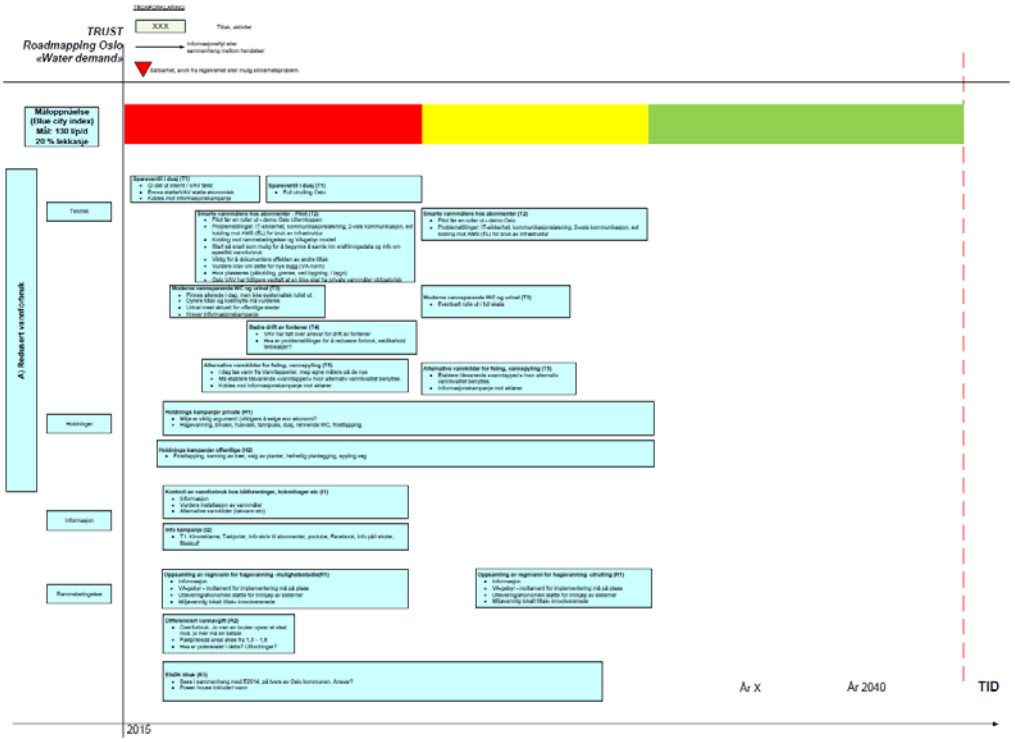
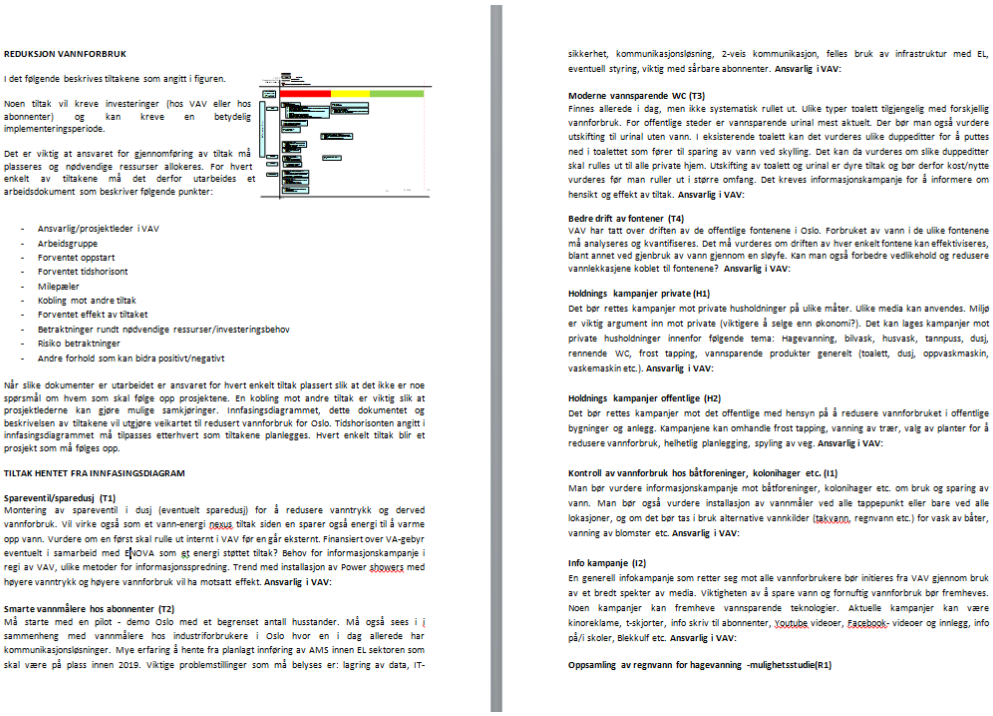


Figure 1. The roadmap of Oslo VAV for reduced water demand

See attachments for larger and better quality roadmaps. Each box in the diagrams states some background information, what the measure is about and possible obstacles and risks. When the boxes are identified, any connections between them can be identified. The remaining work of Oslo now is to connect the roadmap to their master plan, to establish a more relevant timetable for each measure and to make relevant connections between the different measures.

Through the process of their master plan and the roadmap work Oslo VAV has come to the conclusion that it is desirable to maintain (and not increase) the current total water use until 2030. The population of Oslo is expected to increase with more than 150 000 through 2030 meaning that the water use per person must be reduced. New technologies, leakage reduction, renewal of water networks etc. will help to maintain a stable water demand. "Low hanging fruits" will first be exploited to reduce current total water demand. An example of a low hanging fruit that is cost efficient and that is being assessed is pressure reduction for reduced leakages. Oslo VAV will probably establish a pilot study on this subject before rolling it out city-wide.

Figure 2 is an illustration of the document that follows the roadmap to further explain the content of each measure.



REDUKSJON VANNFORBRUK

I det følgende beskrives tiltakene som angitt i figuren.

Noen tiltak vil kreve investeringer (hos VAV eller hos abonnenter) og kan kreve en betydelig implementeringsperiode.

Det er viktig at ansvaret for gjennomføring av tiltak må plasseres og nødvendige ressurser allokeres. For hvert enkelt av tiltakene må det derfor utarbeides et arbeidsdokument som beskriver følgende punkter:

- Ansvarlig/prosjektleder i VAV
- Arbeidsgruppe
- Forventet oppstart
- Forventet tidshorisont
- Milepæler
- Kobling mot andre tiltak
- Forventet effekt av tiltaket
- Betraktninger rundt nødvendige ressurser/investeringsbehov
- Risiko betraktninger
- Andre forhold som kan bidra positivt/negativt

Når slike dokumenter er utarbeidet er ansvaret for hvert enkelt tiltak plassert slik at det ikke er noe spørsmål om hvem som skal følge opp prosjektene. En kobling mot andre tiltak er viktig slik at prosjektlederne kan gjøre mulige samkjøringer. Innfasingsdiagrammet, dette dokumentet og beskrivelsen av tiltakene vil utgjøre veikartet til redusert vannforbruk for Oslo. Tidshorisonten angitt i innfasingsdiagrammet må tilpasses etterhvert som tiltakene planlegges. Hvert enkelt tiltak blir et prosjekt som må følges opp.

TILTAK HENTET FRA INNFASINGSDIAGRAM

Spareventil/sparedusj (T1)
Montering av spareventil i dusj (eventuelt sparedusj) for å redusere vanntrykk og derved vannforbruk. Vil virke også som et vann-energi nexus tiltak siden en sparer også energi til å varme opp vann. Vurdere om en først skal rulle ut internt i VAV før en går eksternt. Finansiert over VA-gebyr eventuelt i samarbeid med ENOVA som gi energi støttet tiltak? Behov for informasjonskampanje i regi av VAV, ulike metoder for informasjonsspredning. Trend med installasjon av Power showers med høyere vanntrykk og høyere vannforbruk vil ha motsatt effekt. **Ansvarlig i VAV:**

Smarte vannmålere hos abonnenter (T2)
Må starte med en pilot - demo Oslo med et begrenset antall husstander. Må også sees i j sammenheng med vannmålere hos industriforbrukere i Oslo hvor en i dag allerede har kommunikasjonsløsninger. Mye erfaring å hente fra planlagt innføring av AMS innen EL sektoren som skal være på plass innen 2019. Viktige problemstillinger som må belyses er: lagring av data, IT-sikkerhet, kommunikasjonsløsning, 2-veis kommunikasjon, felles bruk av infrastruktur med EL, eventuell styring, viktig med sårbare abonnenter. **Ansvarlig i VAV:**

Moderne vannsparende WC (T3)
Finnes allerede i dag, men ikke systematisk rullet ut. Ulike typer toalett tilgjengelig med forskjellig vannforbruk. For offentlige steder er vannsparende urinal mest aktuelt. Der bør man også vurdere utskifting til urinal uten vann. I eksisterende toalett kan det vurderes ulike duppeditter for å puttes ned i toalettet som fører til sparing av vann ved skylling. Det kan da vurderes om slike duppeditter skal rulles ut til alle private hjem. Utskifting av toalett og urinal er dyre tiltak og bør derfor kost/nytte vurderes før man ruller ut i større omfang. Det kreves informasjonskampanje for å informere om hensikt og effekt av tiltak. **Ansvarlig i VAV:**

Bedre drift av fontener (T4)
VAV har tatt over driften av de offentlige fontenene i Oslo. Forbruket av vann i de ulike fontenene må analyseres og kvantifiseres. Det må vurderes om driften av hver enkelt fontene kan effektiviseres, blant annet ved gjenbruk av vann gjennom en sløyfe. Kan man også forbedre vedlikehold og redusere vannlekkasjene koblet til fontenene? **Ansvarlig i VAV:**

Holdnings kampanjer private (H1)
Det bør rettes kampanjer mot private husholdninger på ulike måter. Ulike media kan anvendes. Miljø er viktig argument inn mot private (viktigere å selge enn økonomi?). Det kan lages kampanjer mot private husholdninger innenfor følgende tema: Hagevanning, bilvask, husvask, tannpuss, dusj, rennende WC, frost tapping, vannsparende produkter generelt (toalett, dusj, oppvaskmaskin, vaskemaskin etc.). **Ansvarlig i VAV:**

Holdnings kampanjer offentlige (H2)
Det bør rettes kampanjer mot det offentlige med hensyn på å redusere vannforbruket i offentlige bygninger og anlegg. Kampanjene kan omhandle frost tapping, vanning av trær, valg av planter for å redusere vannforbruk, helhetlig planlegging, spyling av veg. **Ansvarlig i VAV:**

Kontroll av vannforbruk hos båtforeninger, kolonihager etc. (I1)
Man bør vurdere informasjonskampanje mot båtforeninger, kolonihager etc. om bruk og sparing av vann. Man bør også vurdere installasjon av vannmåler ved alle tappepunkt eller bare ved alle lokasjoner, og om det bør tas i bruk alternative vannkilder (takvann, regnvann etc.) for vask av båter, vanning av blomster etc. **Ansvarlig i VAV:**

Info kampanje (I2)
En generell infokampanje som retter seg mot alle vannforbrukere bør initieres fra VAV gjennom bruk av et bredt spekter av media. Viktigheten av å spare vann og fornuftig vannforbruk bør fremheves. Noen kampanjer kan fremheve vannsparende teknologier. Aktuelle kampanjer kan være kinoreklame, t-skjorter, info skriv til abonnenter, Youtube videoer, Facebook- videoer og innlegg, info på/i skoler, Blekkulf etc. **Ansvarlig i VAV:**

Oppsamling av regnvann for hagevanning -mulighetsstudie(R1)

Figure 2. An outtake from the word document that follows the roadmap with more details on each measure. (it is in Norwegian)

Each measure must be delegated to a project manager which can establish a project team, timetable, risk plan, resource plan etc. Some of the measures will demand huge investments and can involve long periods of implementation.

It is important that responsibility for the implementation of measures in the roadmap is placed and that resources are allocated. For each of the measures a working document should be prepared, containing the following topics:

- Responsible project leader in Oslo
- Working group
- Expected start date
- Expected time horizon
- Milestones
- Links to other measures
- Expected effects of the measure
- Necessary resources and investment needs

- Risks
- Other aspects that can have positive or negative impact

Such documents secures that all measures are followed up and monitored in a suitable manner. Links to other measures are important to identify possible cooperation. The synchronization diagram/visual roadmap, the document describing the measures and the working document for each measure will constitute the roadmap for Oslo to reduced water demand. The time horizon given in the visual roadmap will be adapted as the more detailed planning of each measure and scenarios take place.

2.3. Demonstration and implementation of TRUST outcomes

What TRUST tools have been demonstrated/ implemented and what have been the results?

Table 2.2 - TRUST tools and their results

TRUST TOOLS	RESULTS
WaterMet2 and DMM	Development of long-term scenarios (valuing the benefits of alternative options for demand management and benefits of consumption reduction, energy and carbon footprint of rehabilitation technologies, etc.)
SUDS techniques	The Hoffselva case study in Oslo is used for demonstration of a novel chain of models for design and optimizing of green infrastructure and conveyance facilities for storm water management
Technologies for IAM	Condition assessment with the BIT Pipe Scanner: The use of data from inspections to plan and prioritize tasks in rehabilitation program

How do city utilities intend to use the TRUST outputs in the foreseable future?

The outputs of the TRUST roadmap process, which are the roadmap itself with included measures, and outputs from the DMM and the Watermet2 models are intended to be part of the master plan for water supply in Oslo. The current roadmap will be basis for strategic decisions as some of the measures will help Oslo to make decisions on how to proceed with the topics of the roadmap.

3. ROADMAPPING & DEMONSTRATION IN BUCHAREST, ROMANIA

3.1. Roadmap topics, process and timeline

A simplified version of the roadmap process has been adopted. The following activities have been conducted to implement the roadmap exercise.

Table 3.1 – Roadmapping timeline for Bucharest 2013 – 2014

ROADMAPPING ACTIVITIES	DESCRIPTION	ACTORS INVOLVED	DATE
Kick-Off Workshop	The road mapping process was discovered at the 1st TRUST city platform, which resulted in a kick-off meeting to start the roadmap process in Bucharest	TRUST project partners	4-5 October 2012
Workshop #1	A first workshop enabled to set up the Scoping and Visioning parts of the roadmap	ApaNova, FHNW, KWR, VERI	1st July 2013
Workshop #2	A second workshop was the place to identify potential action points for the roadmapping process of the water distribution system for 2040	ApaNova, FHNW, KWR	9-10th December 2013

3.2. The roadmap and monitoring strategy

Scoping:

Apa Nova Bucuresti (ANB) is in charge with water supply and sanitation for the city of Bucharest, under a concession contract signed in 2000 for 25 years. The company is owned by Veolia (74%), the municipality of Bucharest (16%) and the employees (10%), and provides water and sewage utilities for about 2 million inhabitants. The company has about 2150 employees.

The conditions of the concession contract between ANB and the municipality are:

1) The Bucharest municipality remains the owner of the public goods for the water supply and sewerage (treatment stations, pumping stations, distribution network, tanks etc.)
2) Apa Nova received together with the Service Contract; the goods administration right and the goods exploitation right.
3) Apa Nova has the responsibility to manage, operate, maintain, upgrade, renew and expand, where appropriate, all of the public services and assets concessioned.
4) The contract is a "results contract", letting to the Concessionaire the liberty to choose the means to fulfil it.
5) Apa Nova is responsible to ensure the necessary investments in order to obtain the "Services Levels" mentioned in the contract.
6) The control of the fulfilment and of the maintenance of the Services Levels is ensured by AMRSP (The Regulatory Agency for the Water and Sewerage Services in Bucharest).
7) The evolution of the tariffs is under the responsibility of different factors from national and local levels, and an International Experts Commission provide binding opinions on tariff adjustments proposals and solves potential disputes on this subject.
8) The Contract is signed for 25 years.

Regarding population awareness in Bucharest, it has been identified that a comprehensive approach of sustainable development would not be the most efficient approach to introduce the roadmap process. Therefore, a basic option for road mapping has then been identified the most suitable for ApaNova, with a focus on defining the state of the present system and qualitatively project the changes at the 2040 horizon. Due to other political agendas of the municipality, the roadmap process is used as an internal anticipation exercise. A list of potential interventions to integrate in the ApaNova master plan is extracted from these analyses.

Figure 3 presents the anatomy of the water distribution system in Bucharest with a smaller part of the network of 240 km with high pressure, and another part of 1682 km with low pressure.

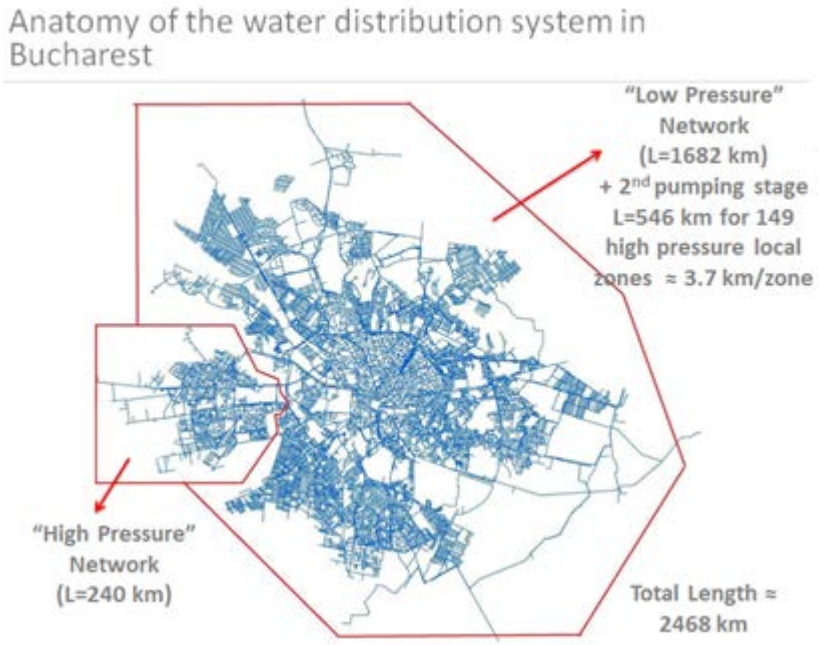


Figure 3: Anatomy of the water distribution system in Bucharest (Apa Nova, 2013)

A first analysis of the profile of the city utility enlighten that water losses represents a key concern to secure the operation of the firm. Its reduction is set as a contractual target, with a loss rate that was decreased from 50% in 2003 to 35% in 2013. The ongoing development of the wastewater treatment system is also a key step toward a complete urban water service.

Forecasting:

During the workshops, three main challenges have been identified for the water service in Bucharest by 2040:

- An uncertain evolution of water demand:
  - Demand per capita that is expected to decrease until 2020 (from 155 l/day/capita to 120 l/day/capita). Then slightly increase from 2020 to 2040 (from 120 l/day/capita to 130 l/day/capita).
  - Population is expected to grow by around 5% by 2040, and economic growth should be in a range >2% per year according to OECD projection.
- Some impacts from climate change:
  - Increase in number of storms and mean annual temperature
  - A slight decrease of water availability but not leading to water stress

- Maintaining an optimal network efficiency with already planned actions:
  - Installation of smart water metering for big accounts
  - Increase flow monitoring on main distribution pipes
  - Fragmenting monitoring into district metering areas to enhance leak detection.

Potential interventions:

As the sewerage system is still on development, the roadmap checklist mainly focuses on drinking water production and distribution. The different interventions that emerged from the workshops are listed in the following table:

Table 3.2. Interventions in Bucharest that emerged from the workshops

TARGETED CHALLENGE	ACTION	VISION
Water demand	Initiate discussion with fire-fighters to discuss about the amount of water they really need at hydrants.	Short term
Network efficiency	Optimising the number of valves for selected DMAs using the software "Cavlar".	Short term
Network efficiency	Prepare a blueprint of the selected priority areas of the network as possible guidance for new maintenance, repair, planning, extensions, etc.	Short to mid term
Water demand	Many consumers have very low consumption and involve high fix costs. Possibility to introduce a new tariff structure where the bill is composed of a fixed amount and a "smaller" volumetric part.	Mid term
Water demand	Monitor and survey the consumption behaviour of a selected area, in-depth analysis of water demand, leakage, etc.	Mid term
Water demand	Increase the number of DMAs in low-pressure areas. Smaller size that can allow a better optimization.	Mid term
Network efficiency	Consider branched network/self-cleaning network as one option when designing new parts of the network or when replacing pipes for one area - new extensions.	Mid-term
Climate change	Explore technical options with CAPEX, OPEX to deal with the issues of storm water.	Mid to long term
Network efficiency	Reconsider pressure management and pressure distribution within low and high pressure areas (considering high buildings, etc.). When the consumption will have reached its "minimum" by 2020, reconsider using cost benefit analysis considering pumping costs, etc.	Long term

These actions will be further evaluated by ApaNova and potentially integrated in their master plan. However, these also need to be discussed with the municipality, which was not possible within the TRUST project timeline due to other political agenda in Bucharest.

3.3. Demonstration and implementation of TRUST outcomes

What TRUST tools have been demonstrated/ implemented and what have been the results? See also D81.5

Bucharest has been a case study for an impact assessment of water demand management interventions, integrated in D42.1 of the project. A prospective assessment have been conducted, assessing the impacts of three different intervention strategies of introducing household micro-components to reduce water demand by 10 to 30%. However, the two water saving strategies come with an increased energy consumption leading to an increased cost and the BAU option might be the most realistic solution.

How do city utilities intend to use the TRUST outputs in the foreseable future?

The checklist of actions that resulted from the workshop might be considered for the master plan of ApaNova.

4. ROADMAPPING & DEMONSTRATION IN SCOTLAND, UK

4.1. Roadmap topics, process and timeline

Scottish Water is a publicly owned company providing 99% of the drinking water and sewage services across the whole of Scotland. While their engagement in TRUST is based largely around improving their urban services, they also face significant challenges in improving the sustainability of their rural services. The company has therefore recently instigated a Sustainable Rural Communities initiative, and felt that such an initiative could benefit from a structured roadmapping approach to help unpack how to take it forward.

The roadmapping process therefore did not identically follow the procedure outlined in the TRUST roadmapping procedure, but nonetheless addressed most of the elements. The kick-off process was not a formal workshop but consisted mainly of teleconference meetings between Cranfield and key actors within Scottish Water. Two formal workshops were then organised. Workshop 1 involved a wide range of external actors, and was focused on 1) understanding what's encompassed under the umbrella of 'rural water services', including the links between water and energy systems (Scoping), and 2) understanding the emerging trends and challenges in Scottish rural communities, and developing a shared vision for the future of rural water services (Forecasting). Workshop 2 involved only key stakeholders from within Scottish Water, and was focused on developing a strategy to try and address that shared vision (Backcasting and Transfer).

Table 3 – Roadmapping timeline for Scotland 2013 – 2014

ROADMAPPING ACTIVITIES	DESCRIPTION	ACTORS INVOLVED	DATE
Kick-off meetings	Identifying relevant stakeholders and planning the next stages of the process	Scottish Water, Cranfield	July-August 2013
Workshop 1	Scoping and Forecasting stages	Scottish Water, regulators, academic institutions (incl. Cranfield), community organisations	September 2013
Workshop 2	Backcasting and Transfer stages	Scottish Water, Cranfield	March 2014

4.2. The roadmap and monitoring strategy

What emerged from the workshops was a well-defined strategy for further research under the Sustainable Rural Communities (SRC) initiative. In both workshops there was an understanding that what is considered the most 'sustainable' approach will be different for different communities, and that the communities themselves should be involved in defining what their 'sustainable' future could look like. The research roadmap therefore highlighted four key areas to be pursued through further research projects:

1) Understanding how the scale of rural communities affects the relative practicality and viability of traditional centralised services vs. smaller scale communal services vs. wholly private systems (e.g. septic);
2) Understanding how contextual factors (e.g. regulatory regimes, performance metrics, predominant business models) might enable/constrain any shifts towards new configurations of rural water services;
3) Understanding the range of options available for new configurations of rural water services, including technological options and options for service delivery and oversight;
4) Understanding how to approach community engagement and work towards co-development of appropriate solutions.

Future research projects under this SRC initiative will be monitored and evaluated on the basis of how they contribute to these four research areas. New research projects are now underway to help address #2 and #3. In effect, the roadmapping process itself provided a starting point for #4, as it provides a structured mechanism for engaging with community members that Scottish Water can potentially adapt.

4.3. Demonstration and implementation of TRUST outcomes

Because the roadmapping process was adapted for looking at rural communities, none of the other TRUST tools were directly suitable for this purpose.

5. CONCLUSIONS: DEMONSTRATION OF TRUST OUTCOMES IN THE URBAN/ PERI-URBAN CLUSTER

In the final workshop of the roadmap process in Oslo VAV the participants were split into groups to discuss relevant measures to reduce water demand and to reduce water leakages. Based on this group work, a list of measures with timelines for both topics were created. The measures and their timelines were put into a synchronization diagram, functioning as the visual roadmap for Oslo VAV. A document that follows the roadmap was made to further explain the content of each measure.

The remaining work of Oslo now is to connect the roadmap to their master plan, to establish a more relevant timetable for each measure and to make relevant connections between the different measures. The roadmap has thus worked well for Oslo as a guide to choose and implement different measures in their master plan. The current roadmap will be basis for strategic decisions as some of the measures will help Oslo to make decisions on how to proceed with the topics of the roadmap.

Through the process of their master plan and the roadmap work Oslo VAV has come to the conclusion that it is desirable to maintain (and not increase) the current total water use until 2030. The population of Oslo is expected to increase with more than 150 000 through 2030 meaning that the water use per person must be reduced. New technologies, leakage reduction, renewal of water networks etc. will help to maintain a stable water demand. "Low hanging fruits" will first be exploited to reduce current total water demand

ApaNova in Bucharest is in the beginning of looking at sustainability issues. Regarding population awareness in Bucharest, it has therefore been identified that a comprehensive approach of sustainable development would not be the most efficient approach to introduce the roadmap process. A basic option for road mapping has instead been identified the most suitable for ApaNova, with a focus on defining the state of the present system and qualitatively project the changes at the 2040 horizon. Due to other political agendas of the municipality, the roadmap process is used as an internal anticipation exercise. A list of potential interventions to integrate in the ApaNova master plan is extracted from these analyses.

Topics that were identified as crucial in Bucharest were water demand, impacts of climate change and optimal network efficiency, with focus on drinking water systems. Bucharest has made a list of interventions, which will further be evaluated by ApaNova and potentially integrated in their master plan.

For Scottish Water, their engagement in TRUST was based largely around improving their urban services, but they also face significant challenges in improving the sustainability of their rural services. The company has therefore recently instigated a Sustainable Rural Communities initiative, and felt that such an initiative could benefit from a structured

roadmapping process to help unpack how to proceed. The roadmapping process therefore did not identically follow the procedure outlined in the TRUST roadmapping procedure, but nonetheless addressed most of the elements.

What emerged from the workshops that were held was a well-defined strategy for further research under the Sustainable Rural Communities (SRC) initiative. In both workshops there was an understanding that what is considered the most 'sustainable' approach will be different for different communities, and that the communities themselves should be involved in defining what their 'sustainable' future could look like.

6. ATTACHMENTS

6.1. Oslo Roadmap on water demand

The following parts describe some actions for the reduction of water consumption, as identified in the WS &S (Water Supply and Sewage) workshop, which was a part of the TRUST project.

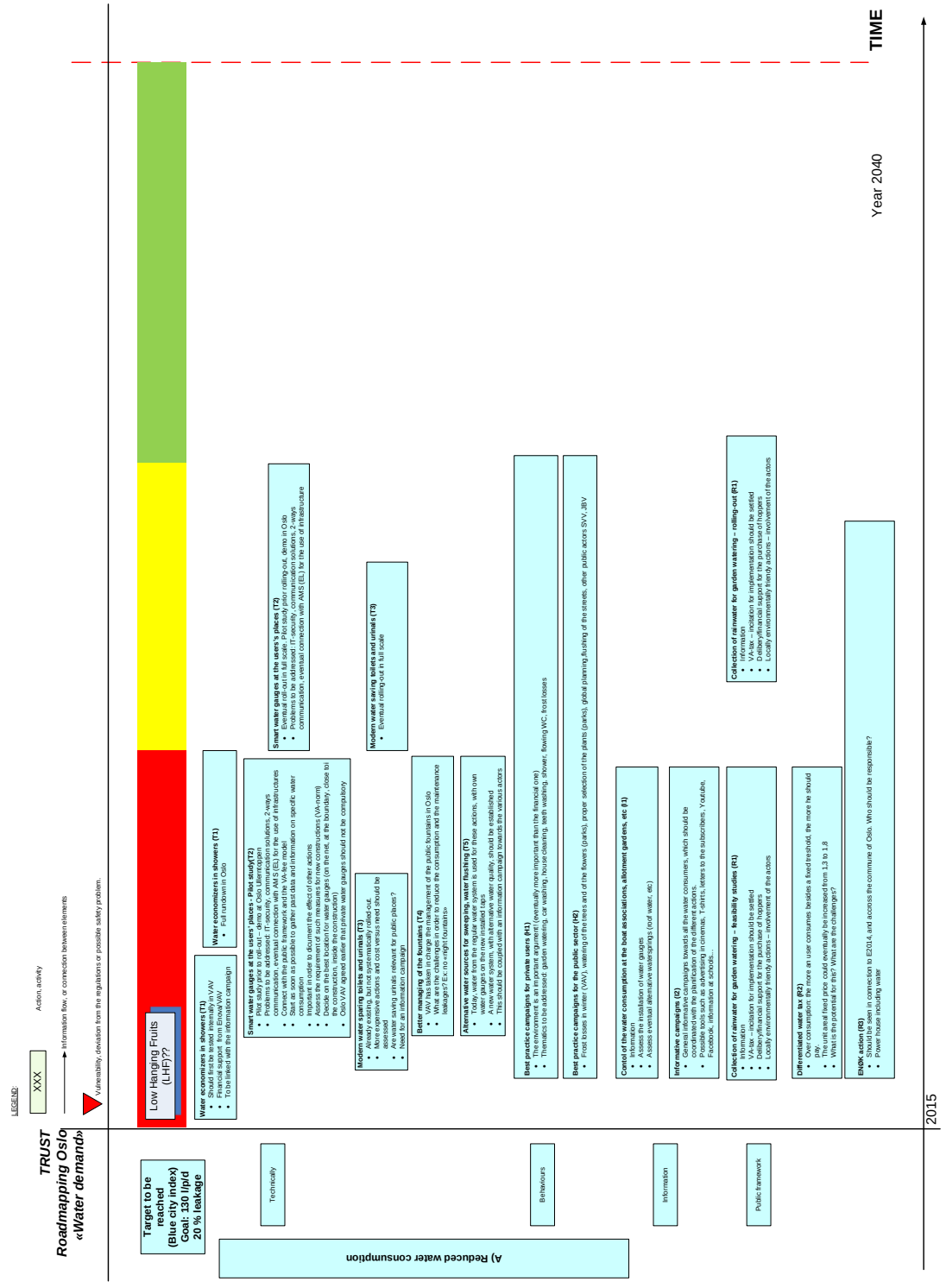
The level of preparation for implementing the suggested actions is variable: some actions are very easy to take, while others not. It is important to start as soon as possible the complex actions which can have a strong positive effect.

In order to allocate the necessary resources, a working document must be created, which describes the following points for each action:

- Responsible/Project leader in WS & S
- Working group
- Expected kick-off date
- Expected duration
- Milestones
- Connection with other actions
- Expected effect of the action
- Assessment of the necessary resources/investment needs
- Risk analysis
- Other parameters which can have a positive/negative influence

Connecting the different actions is important so that the project leaders can work together. The procedural diagram, the present document, and the description of the actions will constitute the road map for water consumption reduction in Oslo. Each action will be taken as a separate project to be followed.

Procedural diagram "reduction of water consumption"



Description of the actions of the procedural diagram

Economizer valve/shower (T1)

Installation of an economizer valve in showers (eventually, shower economizer) to reduce the water pressure and hence the water consumption. This action also reduces the energy necessary to warm up the water. Could be financed by a VAV fee, eventually in collaboration with ENOVA.

Responsible in VAV:-

Smart water gauges for the customers (T2)

Need for a pilot study in Oslo in a limited area. The main challenges are: recording data, IT safety, communication solutions, two-ways communication, common use of infrastructure with EL, eventual control (in particular with vulnerable subscribers), placing of the gauges. A proposal has been sent to RFF (Regional Research Found) in fall 2014.

Responsible in VAV:

Modern water saving toilets (T3)

Such toilets are already in use, but their installation is not automatic. The use of dry toilets (without water) should also be assessed. Some solutions are also possible to reduce the water consumption of existing toilets.

Responsible in VAV:

Better management of the fountains (T4)

VAV is now in charge of the public fountains in Oslo. The optimization of the running of these fountains needs to be assessed, in particular with possible re-use of the water via a closed-loop.

Responsible in VAV:

Alternative water resources for sweeping, water wash (T5)

Currently, the water cleaning of the streets and of the outlet pipes is done with drinking water, whereas the water quality could be less for such purposes. An eventual action should be combined with an information campaign towards the relevant actors.

Responsible in VAV:

Campaigns for best practice in the private sector (H1)

The different actions should be combined with sensibilisation of the private persons, with advice on garden watering, car washing, teeth cleaning, shower, etc. Thinking environmentally friendly is often a better argument than economy for such campaigns.

Responsible in VAV:

Campaigns for best practice in the public and industrial sectors (H2)

Some sensibilisation campaigns should be taken towards the public and industrial sectors to reduce the water consumption. They should consider: frost losses, watering of the trees, choice of the plants to reduce water consumption, overall planning, cleaning of the streets.

Responsible in VAV:

Control of the water consumption at the boat associations, allotment gardens, etc (I1)

Campaigns of sensibilisation for the reduction of water consumption should also be taken towards these communities. Some water gauges could be installed.

Responsible in VAV:

Information campaign (I2)

A general information campaign towards all the water consumers shall be initiated. Many different media could be used: advertising at cinemas, T-shirts, letters to the customers, Youtube, Facebook, presentations at schools, etc.

Responsible in VAV:

Collection of rainwater for garden watering – potential studies and eventual later rundowns for all (R1)

An information campaign could be driven on this thematic. A VA fee should be created to incite people, and economic support could be given to buy tools such as compost units for the gardens.

Responsible in VAV:

Differentiated water tax (R2)

The water tax could be better differentiated so that the cost per m^3 can be higher when the consumption exceeds a fixed threshold. The advantages and drawback of such a measure should be assessed. In addition, the areal fixed price could be increased. Such actions could incite the users to get water gauges.

Responsible in VAV:

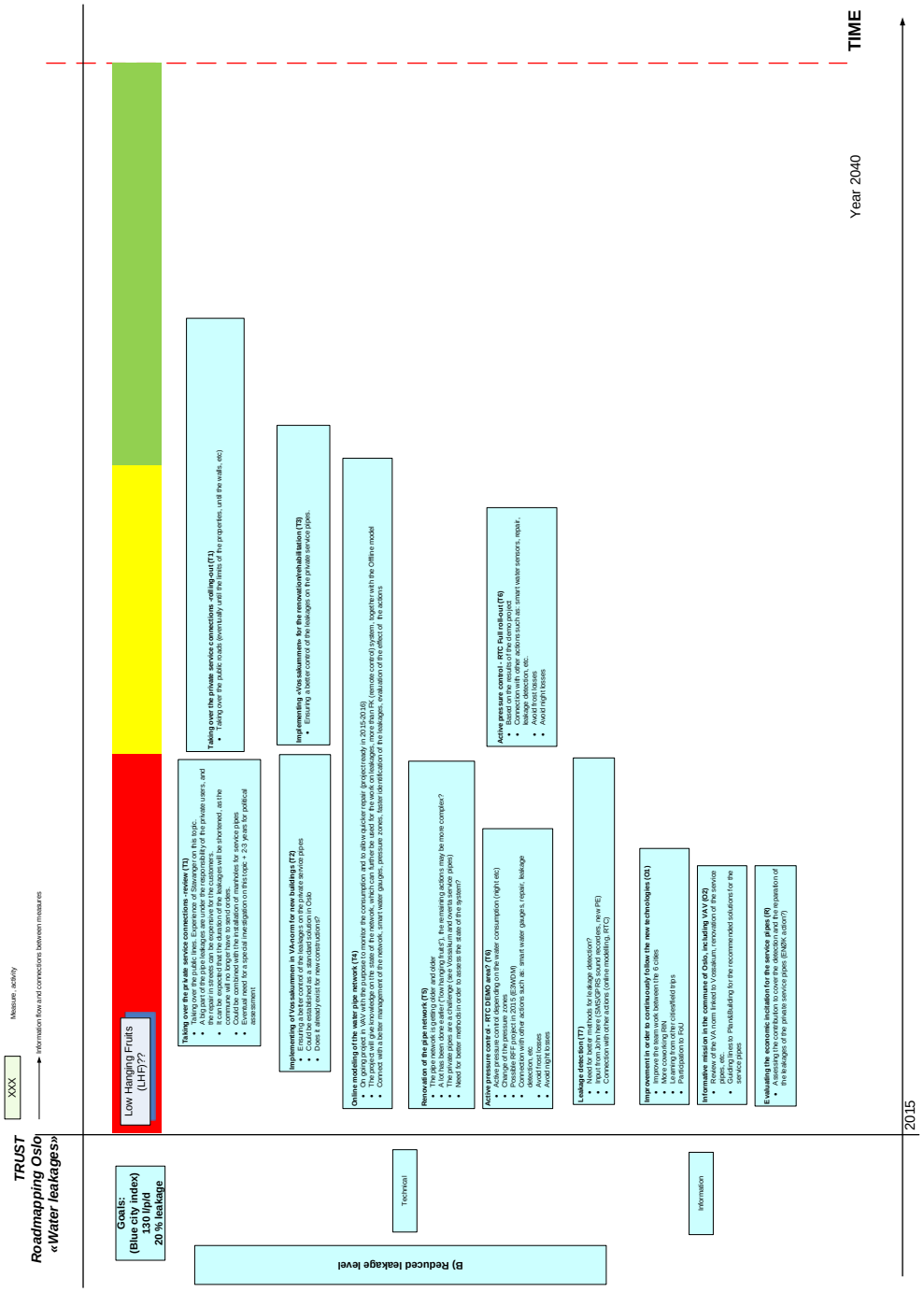
ENØK action (R3)

The action in the water sector could be inspired and connected to the actions in the energy sector (ENØK, E2014).

Responsible in VAV:

6.2. Oslo Roadmap on reducing leakages

Procedural diagram "reduction of the water leakages"



Actions presented in the procedural diagram

Moving to a public management of the current private service pipes – to be studied (T1)

The leakages of the private service pipes represent a significant fraction of the total leakages of the network. Their repair can be very costly. The commune should assess the eventual relevance of taking over all the private service pipes positioned outside the street ground, as it is done in Stavanger since 2012. Such action would avoid the heavy administrative part consisting of sending notices to the private users. Assessing this option is estimated to take about 2-3 years, which includes also a political survey.

Responsible in VAV:

Introducing "Vossakummen" in the VA-norm, for new constructions (T2)

The introduction of "Vossakummen" for private service pipes as a requirement of the VA norm will give a better control of the problems related to private service pipes. However this will not solve the issues associated to existing constructions.

Responsible in VAV:

Introducing "Vossakummen" for existing constructions (T3)

This will give better control on private service pipes. How should this be put in place: information, incitation?

Responsible in VAV:

Online modeling of the water pipes network (T4)

Ongoing project in VAV with the purpose to monitor the consumption and to permit faster repair (expected to be ready in 2015-2016).

Responsible in VAV:

Renewal of the pipe network (T5)

The pipe network is getting older and older, and its state is variable. The previous project Saneringsplan allowed renewing a big fraction of the network, in particular towards the pipes in obviously bad shape. More should still be done, and there is a need for better evaluating the state of the pipes.

Responsible in VAV:

Active pressure management – RTC (T6)

Pressure reduction is a cost effective method to reduce water leakages, there is therefore need for a more active pressure management, for example via RTC.

Responsible in VAV:

Better methods for leakage detection (T7)

The improvement of leakage inspection methods will reduce the repair delay.

Responsible in VAV:

Adaptation of VAV for continuous following of new technology (O1)

It is important for VAV to be proactive in terms of following possibilities for new technologies, and this involvement should always be improved and supported.

Responsible in VAV:

Internal information work in the commune of Oslo, including VAV (O2)

There is need for a better information work internally in the commune between the various actors working with water leakages and challenges linked to them: increase teamwork, increase informative actions, be sharp on the deadlines for improvement of private service pipes, improve the following of the leakages on own networks.

Responsible in VAV:

Report on demonstration of TRUST outcomes in the urban peri-urban city cluster

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