Roadmap guideline:
A manual to organise transition planning in Urban Water Cycle Systems

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trust

D13.1

TRANSITIONS TO THE URBAN WATER SERVICES OF TOMORROW

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A manual to organise transition planning in Urban Water Cycle Systems

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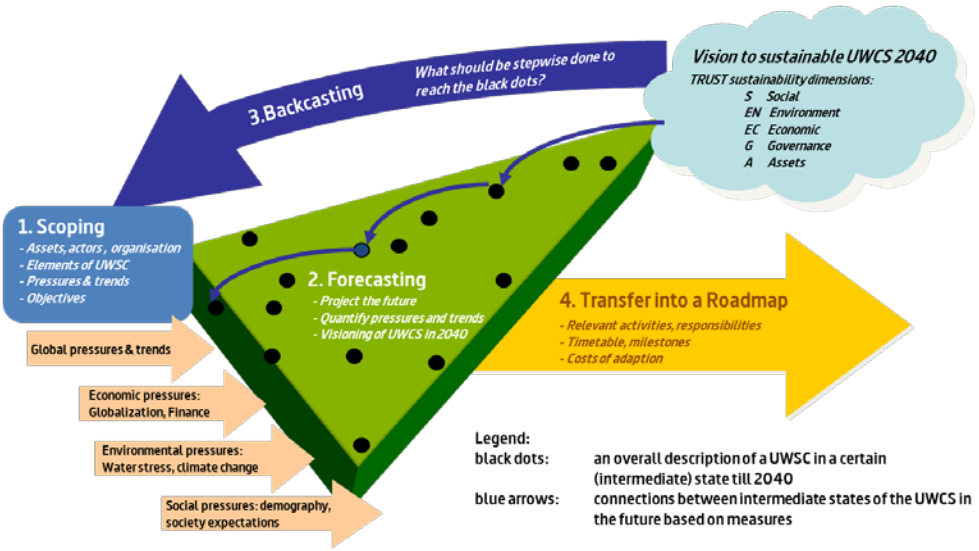
Deliverable 13.1

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 265122.

EXECUTIVE SUMMARY

This **roadmap guideline** is the **official deliverable D13.1** from WP 13.2 in the European research project "**TRUST** – Transitions to the urban water services of tomorrow". It provides a description of how transition planning efforts in Urban Water Cycle Systems (UWCS) can be organised by a roadmap approach and offers templates to support the working process. This roadmap guideline illustrates diverse aspects in **water supply and waste water management** in terms of **sustainability** with its five TRUST sustainability dimensions: social, environment, economic, governance and assets.

The guideline considers the **classical stages of the roadmapping process** (Scoping, Forecasting, Backcasting and Transfer) and allows representatives of the UWCS to identify individual pathways for sustainable water cycle services in the future. The manual offers the application of qualitative and quantitative information from different sources. If performance indicators will be applied, selected **IWA performance indicators** for drinking water and wastewater are integrated in the TRUST roadmap approach. The guideline also discloses a creative process for an **interdisciplinary planning procedure** that allows a lot of expert discussions – the level of discussion needed will depend on the overall objective of each planning process. A roadmap enables the planning and implementation of the path to achieve desired objectives, while serving as an excellent **communication tool**. Roadmaps link strategy to future actions and explicitly incorporate a plan for needed capabilities and technologies to be in place at the right time.



Scoping defines the scope of analysis in terms of system descriptions and its boundaries. It provides a baseline understanding of the UWCS status quo and elements. This stage identifies relevant actors, asset structures, today's status and the impact of existing pressures and trends on the individual UWCS. **Forecasting** creates a vision of the sustainable UWCS of the future - in the TRUST project the reference year is 2040. It furthermore projects future scenario(s) of the external system and their potential impacts on the UWCS. The

rationale of forecasting is to extrapolate current trends into the future, to anticipate potential barriers and to obtain a perspective for a future scenario e.g. in 2040. It is a very creative working step. **Backcasting** looks iteratively back from the envisioned future state of the UWCS and works backwards via (at least one) intermediate state(s). It identifies the needs for a multi-step transition from today's status quo to intermediate state(s) and from these intermediate state(s) to the vision 2040 (the desired state in the future). The stage of **Transfer** translates the identified measures into transfer action fields. This includes chronological information, recommendations, milestones, responsible actors etc. Identified transfer action fields and associated transition measures will be documented in the final reporting document called the "roadmap".

This manual has been designed for **organising sustainable UWCS planning in general.** It is the first manual developed for practitioners taking into account the roadmap methodology and provides a generic understanding of the roadmapping process and structure. The guideline was tested by the demonstrators of the TRUST city clusters in work area 6 of the TRUST project.

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1. TRUST ROADMAP APPROACH IN A NUTSHELL

A roadmap enables decision makers to plan and implement a pathway to achieve desired objectives. At the same time it serves as an excellent communication tool. **The TRUST roadmap links strategy to future needs and actions and (explicitly) incorporates a plan for necessary adaptation measures to be available at the right time.** It is addressed to managers and decision makers of urban water services and related institutions in each city or region and can be adapted more or less in general for all strategic UWCS (Urban Water Cycle System) planning activities. The roadmap process can consider 'good practices' of water service institutions (e.g. drinking water/wastewater utility, local administration, local government, NGO's etc.) for both urban water management and its sustainable planning. It will help to find the individual pathway to sustainable UWCS focussing on individual/regional/local adaptation needs and the ambitions of the cities/regions and demonstration clusters in TRUST. The idea of an interdisciplinary bottom-up approach is implemented through the TRUST roadmap concept and will (hopefully) improve transparency and acceptance by all institutions and persons involved, even though the first steps appear highly complex.

The roadmap is the result of analysing sustainable transitioning of UWCS in existing literature and combining these with the TRUST sustainability dimensions towards a sustainable UWCS outcome in TRUST pilots. **This guideline can be a useful instrument for achieving sustainability goals in the mid and long term perspective and provides diverse instruments and methods to achieve this goal.** This guideline describes in detail how a roadmap can be developed with a focus on any city, regardless of its location or cultural norms, in order to develop sustainable transition goals, and outline what tools can be used to perform the necessary tasks and to give flexibility in reacting to changing circumstances.

The roadmap process follows in the broader sense the BEHRENDT (2007) roadmap approach.[1] **The TRUST roadmap procedure is structured in four main stages: Scoping (S), Forecasting (F), Backcasting (B) and Transfer (TR).** Each stage has a different number of working steps that are designed to help organise the communication and iterative work of collecting information, assessing complex coherences and defining measures to adapt towards identified future needs and the desired elements of a sustainable future UWCS.

The TRUST roadmap is designed as a **communication approach** that organises a **collaborative strategic planning process** for sustainable UWCS in 2040. It supports a direct exchange between all relevant actors who are essentially in charge of adaptation issues in their city/region.

The roadmap procedure should be organised by a **roadmap core team**. This core team can use the supporting templates of this guideline. The core team should be led and organised by a responsible person known as the "**roadmap manager**". The roadmap manager and the

[1] Behrendt, S. (2007).

core team will organise data collection, sum up the results of data collections and input information, provide interpretation of data and organise workshops at the city location with its actors. He/she is a key figure in this process and should support any communication during the roadmap procedure.

The roadmap approach will be tested in the TRUST project through the demonstration in WA6. The proposed timelines take the strict time management of the TRUST project description of work (DoW) of the demonstrations into account. These demonstrations will show the practicability and feasibility of the concept and will give feedback to the authors of this guideline. However **the general applicability of the TRUST roadmap approach is a key issue**. For implementation outside of TRUST the time scale of the roadmap procedure should be extended to a duration of one or two years, in order to accommodate the fact that because the roadmap core team and the participating institutions and stakeholders have to launch a continuous, common process and a mutual understanding for the roadmap exercise.

An important issue is ensuring high motivation and an active role for the cities and the involved participants. **An open interest in transition and adaptation issues is a very significant element for a successful roadmap demonstration.** Of course, data and information about the status quo and (realistic) assumptions about selected future trends and pressures of each participating city are needed for the roadmap exercise. This information will be collected, analysed and assessed with the active participation of the cities and their actors in different workshops to define a catalogue of measures for a stepwise implementation of the urban water system and service transition.

2. INTRODUCTION

The European research project "TRUST – Transitions to the urban water services of tomorrow" produces knowledge and guidance to support transitions of Urban Water Cycle Systems (UWCS) of tomorrow and enables UWCS to achieve sustainability without decreasing service quality. The design of the planning process towards a sustainable UWCS and its sustainability dimensions and objectives on the level of regional/local urban water systems is crucial for successful planning procedures and adaptation measures. One of these planning procedures is the roadmap approach that will be demonstrated in the TRUST project and will be made available for further transition[2] processes.

This document provides a guideline that is designed to help and to support the application of the roadmap process. It explains the roadmap structure and the working process and provides templates and illustrating examples for an effective application. The procedures of this guideline can be adapted to all transition efforts in water related services in any region, city or demonstration case. The suggested timetable should be adapted to locally and regionally specific responsibilities and decision making procedures. This guideline can help to organize the roadmap process to ensure a systematic proceeding and a comparable adaptation of transition needs in terms of methodological and practical aspects.

This report is the official deliverable D 13.1 ("Template on roadmap structure and process, protocols and guidelines") and is written in strong interlinkage to the guideline of Urban Water Strategic Planning (TRUST deliverable D12.1). This approach can support the transition activities of cities or regions in strategic planning processes.

[2] A "transition" in the urban water context is defined as a structural transformation that is "a radical switch from conventional socio-technical systems to next generation integrated and sustainable urban water systems." Jefferies, C./Duffy, A. (2011).

3. STRATEGIC PLANNING OF TRANSITION IN UWCS VIA ROADMAPS

Strategic planning is a core issue in the TRUST project. TRUST includes a wide perspective on transition needs, ambitions and adaptation. In the TRUST project sustainability has been defined in line with the Triple-bottom-line approach (TBL-approach) with the social, economic and environmental dimensions as the skeleton of the UWCS, and adding with assets and governance as supporting dimensions.[3]

Sustainability assessment is carried out by evaluating a critically and carefully chosen set of data, e.g. performance metrics/indicators, and how they comply with predefined sustainability objectives and criteria. The performance metrics/indicators, which can be both quantitative and qualitative, are specifically chosen in order to represent the particular challenges of a given urban water cycle system, in a short- and long-term transition context. This guideline provides templates for compiling different sets of information and data on such metrics/ indicators that are important to derive transition activities and that can describe current and future urban water related situations.

This guideline is based on a "Guideline for Urban Water Strategic Planning"[4] that provides the theoretical background. A roadmap is one instrument of strategic planning that gives guidance to concrete aspects of expected facts on the one hand. On the other hand, it can help with managing and communicating the roadmap exercise by using templates, e.g. for needed data, analyses and procedures in implementing a roadmap.

Notice: Before starting the roadmap work the authors suggest to read the "Guidelines for Urban Water Strategic Planning, inspiration from theory and best practices" (TRUST deliverable D12.1), that provide theoretical background information on strategic planning methodologies.

The roadmap concept will be tested first within the TRUST project. TRUST provides different instruments to assess transition needs and processes of UWCS, for example

- Self-assessment tool (WP 31): Assessment of any city's actual path to a sustainable UWCS: "Is the city on track for 2040?"
- Baseline assessment (WP 11): Quick scan of TRUST cities for adaptation needs: "Where are we now?"[5]
- Roadmap (WP 13): Finding the individual pathway to sustainable UWCS focusing on individual/regional/local adaptation needs and ambitions
- Metabolism model (WP 33): Assessing the impact of adaptation measures

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3 Marques, R./Zouwen, M./Van Leeuwen, K./Rostum, J./Cruz, N. (2012).

4 TRUST Deliverable 12.1 (2012).

5 Van Leeuwen, K./Frijns, J. (2012).

Each instrument has a specific focus on certain aspects of urban water service development towards future needs and is – of course – intended for adaptation in other cities or regions beyond of TRUST and after TRUST has ended.

A short word to the user of this guideline

The structure, proceedings and templates provided in this guideline should be seen as a general approach for the development of a roadmap for UWCS. The authors of this guideline developed it as a "tool box" for organising, communicating and developing future transition needs in urban water cycle related systems.

You can orientate yourself and refer to the suggested results (see outputs of each working step). This guideline provides some fundamental instruments that allow a detailed analysis of the current situations related to the urban water cycle system (status quo). The TRUST roadmap approach is designed to provide practical "consulting assistance" for the users that expect some urban water system transition needs, but have not already located their action fields. This approach enables every city or region to develop strategic goals and visions based on their own status quo. Furthermore it can help to identify the main steps towards transition according to specific challenges and needs.

Readers are advised not to take this guideline and its particular aspects too literally but to treat them instead as suggestions, templates and ideas, which can be adapted to suit a given context. The roadmap approach is intended to be a very flexible instrument that needs a lot of communication between the organizations and individuals involved, in order to instill a mutual understanding of the process.

The roadmap guideline focuses on identifying individual pathways to a sustainable UWCS by facing specific, regional or local adaptation needs and ambitions. However, readers are invited to pick only some of the suggested tools of this roadmap guideline for their own exercises.

If you find a less quantitative way to realise the goals of the roadmap exercise (e.g. via intensive discussions or more moderated workshops with the urban water cycle related stakeholders) then you are free to organise this process in an adequate way – keeping in mind the main idea of the roadmap approach as demonstrated by this guideline.

4. HOW TO ORGANISE THE ROADMAP WORK

This guideline is designed to support responsible partners, cities and persons for the organisation and preparation of a roadmap to a sustainable UWCS. It will help to organize the roadmap process and explains the central theme for each working step to assist users in adapting the process to suit their own contexts. The guideline addresses the target audience as follows:

- For general application in any city or region (outside of TRUST):
  Actors of water related services in a city or region are addressed.

Suggestion: Please read this guideline carefully before you start your roadmap exercise. This guideline provides general and specific information and suggests a common understanding of the roadmap work in the TRUST project.

This chapter describes important general aspects to organise the roadmap exercise for the adaptation in any city or region. For specific information on the roadmap stages, working steps and methods see chapter 5.

Organising the general application of roadmap work in any city or region

Notice: This chapter is dedicated to the **general application in any city** or region (outside of TRUST).

For a successful roadmap exercise a responsible project leader and a working group should be installed during the working procedure in the city pilot. This working procedure consumes significant time and budget and should be installed officially as a strategic project in the city or region. In terms of reliability of the results, we suggest that all responsible actors of the cities and their water related institutions should be involved in the roadmap work somehow. A basic assumption for a successful implementation of the TRUST roadmap approach is the active participation of the cities and involved participants with an open interest in transition and adaptation issues related to the UWCS.

Roadmap core team and roadmap management

For developing a roadmap a *roadmap core team* must be installed. The roadmap core team should consist of 3 to 6 persons including consultants/external experts or researchers and selected representatives of the key actors related to the urban water cycle system and other relevant disciplines. The roadmap core team should be managed by a project leader who acts as *roadmap manager* (Figure 1). The roadmap core team has the task of delivering and demonstrating the roadmap exercise in very close collaboration with the city's institutions and their representatives. The goal is to implement the roadmap results within the urban water system in a collaborative way that includes intensive communication with the relevant actors from the cities.

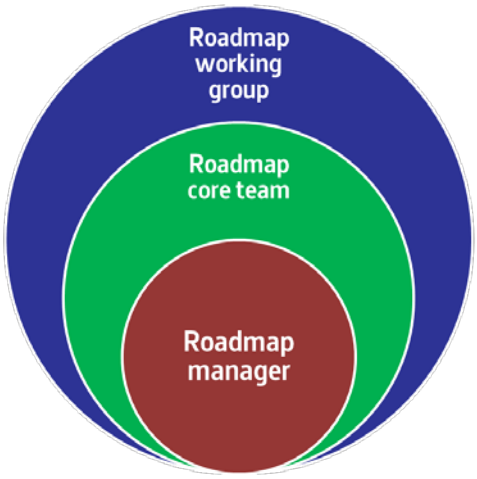

Figure 1: Roadmap manager, roadmap core team and roadmap working group

We suggest a core team size that is not too big to avoid very specialized (internal) decision making in the working process. The roadmap has a strategic focus and will provide general action fields for transition needs, ideally including expected measurements for each water related discipline (e.g. water supply, drainage, flooding risks etc.). The core team should include one member of each participant institution that is involved in the above mentioned tasks and responsibilities. Core team members should possess experience in strategic planning and strategic communication. Equally important are their interpersonal and group communication skills. Ideally, the core team members should have different educational backgrounds (engineers, economists, social scientists) and be able to integrate various professional viewpoints (managers and engineers from the water industry, politicians, government, citizen representatives, environmental NGOs). A good gender balance and a strategic perspective are desirable. These aspects can ensure that the core team will cope better with uncertainties, emerging developments and possible resistances. The actors should be aware of the whole roadmap process in order to concentrate their efforts on the overall target. The decision of the core team configuration should be made by the roadmap manager and should be handled in a cooperative way. The roadmap core team plus the actors from the cities comprise the roadmap working group. This roadmap working group is also explained in detail in section 5.1.1 in detail.

Expected duration of the roadmap exercise for general application (outside of TRUST)

Of course, the duration of applying the roadmap approach can be different from the very ambitious project plan of the TRUST demonstration clusters. The process to launch the roadmap exercise will take some time to reach consensus about the relevant contents and the complexity of discussions and topics. This initiation phase is not included in the documented timeline of the roadmap application as follows.

The duration of the roadmap exercise is not easy to predict, because each roadmap exercise will be quite different in terms of its contents, complexity of discussions and challenges. Each roadmap exercise will address different topics and key aspects and will be influenced by different facts, opinions and boundary conditions. Additionally, the availability of information and the data needed will be very different in each case. Of course, data collections cannot necessarily be easily scheduled in general. Roadmap managers are requested to make sure that the roadmap exercise won't take longer than 18 months (M18) overall, because participants and decision makers usually prefer results on a short or mid-term time scale. As a realistic target for initiating, launching, working and finishing the roadmap exercise, a total project duration of 18 months should be considered.

Figure 2 suggests a timeline for the roadmap stages and their duration during the roadmap exercise. The working procedure should include five workshops which are scheduled according to the stages and milestones. The workshops prepare milestones that are located at the end of each stage. Each stage provides results to be incorporated in the next stage/working step.[6]

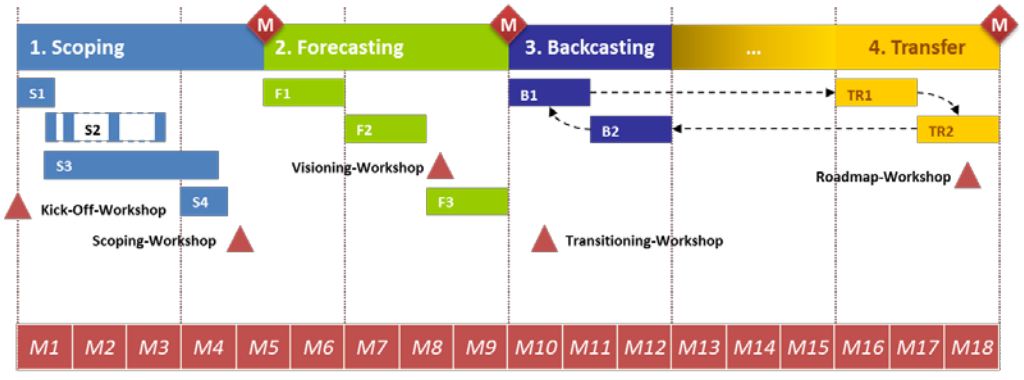

Figure 2: Suggested timeline for roadmap proceess as general application

6 For a detailed description of the stages and working steps see chapter 5.

Organisation

For the development of a UWCS roadmap outside of TRUST, four stages (Scoping, Forecasting, Backcasting and Transfer) are suggested. These stages are explained in chapter 5 in detail. As mentioned above, five workshops should be organised by the roadmap core team as recommended: a Kick-off Workshop, Scoping-Workshop, Visioning-Workshop, Transitioning-Workshop and a Roadmap-Workshop. They are placed in the timeline and explained in chapter 5. These workshops represent communicative platforms to involve external actors and stakeholders from the cities into the roadmap work. The roadmap manager firstly has to manage the internal communication of the core team (e.g. internal work flows) and secondly, she/he has to ensure a transparent and clear communication to the city/region.

Furthermore the work will likely require internal meetings or adjustments by the roadmap core team. These internal organisational aspects are not included in the timeline of the roadmap process (Figure 2) and should be organised by the involved partners themselves referring to their project management experiences.

5. TRUST ROADMAP APPROACH IN DETAIL

The European project initiative TRUST produces knowledge and guidance to support transitions of Urban Water Cycle System (UWCS) of tomorrow and enables communities to achieve sustainable, low-carbon water futures without losing service quality. The design and planning process towards a sustainable UWCS on the level of an individual urban system in TRUST is following the framework of "roadmapping". A roadmap enables the planning and implementation of the path to achieve desired objectives, while serving as an excellent communication tool. Roadmaps link strategy to future actions and explicitly incorporate a plan for needed capabilities and technologies to be in place at the right time. The TRUST roadmap concept is defined as an iterative four-stage process, consisting of Scoping, Forecasting, Backcasting and Transfer as shown in Figure 3.

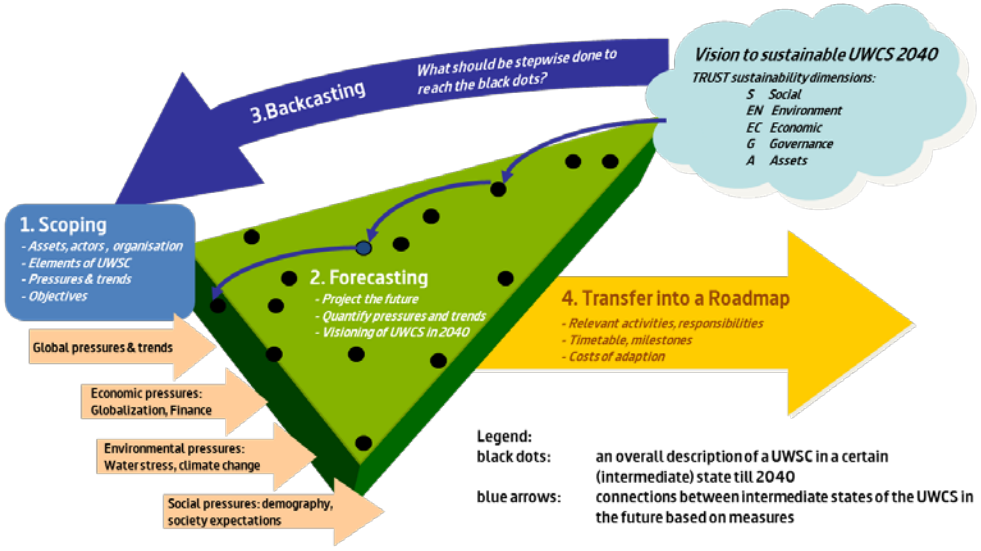

Figure 3: Stages of the roadmap process for UWCS transition[7]

Figure 3 shows the methodology in a general multi-stage process of the TRUST roadmap which should be applied in any city or region. The main stages have the following contents:

- Scoping defines the scope of analysis in terms of system descriptions and boundaries. It provides a baseline understanding of the UWCS status quo and elements. This stage identifies relevant actors, asset structures, today's status and the impact of existing pressures and trends on the individual UWCS.

[7] Modified after Grêt-Regamey, A./Brunner, S. H. (2011).
The black dots describe each intermediate state of the UWCS between the current status and the future vision. Each intermediate state should be described with quantitative data and explanatory information. For the TRUST project, it will be suggested to define at least one intermediate state between 2010 and 2040, for example 2025. The blue arrows show the concept of the Backcasting stage for thinking backwards from the vision to the present state in intermediate steps.

- **Forecasting** creates a vision of the sustainable UWCS of the future – in the TRUST project the reference year is in 2040. It furthermore projects future scenario(s) of the external system and their potential impact on the UWCS. The rationale of forecasting is to project current trends into the future, to anticipate potential barriers and to obtain a perspective for a future scenario in 2040. It is a very creative working step.

- **Backcasting** looks iteratively back from the envisioned future state of the UWCS and works backwards via (at least one) intermediate state(s). Backcasting identifies the needs for a multi-step transition from today's status quo to intermediate states and from intermediate state(s) to achieve the future desired state (vision 2040).

- The stage of **Transfer** translates the identified measures into transfer action fields. This includes chronological information, recommendation with milestones, responsible actors and so on. Identified transfer action fields and associated transition measures will be documented in the final document called "roadmap".

Why "Backcasting"?

The aim of the Backcasting is to develop a "story" from the future to the present. A definition of Backcasting is given by the World Health Organization (WHO) glossary: "Moving step-wise back in time from a future scenario to the present in order to identify the decisions and actions that must be taken at critical points if the scenario is to be achieved."

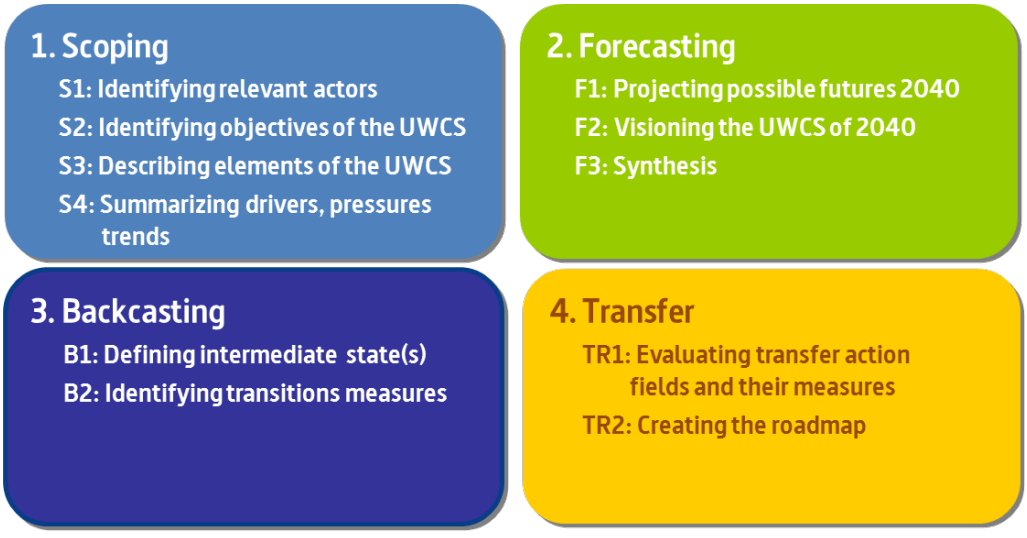

Figure 4: Main stages and working steps in the TRUST roadmap process

The four main stages are structured into different numbers of working steps as illustrated in Figure 4. Each working step is described in the following chapters by reflecting similar key aspects:

- T: What is the TARGET?
- M: What METHODS are used?
- P: Who will PARTICIPATE?
- D: What DATA are relevant?
- R: What information/format/design does the REPORT/RESULT have?
- O: Where will the OUTPUT be used as input in the roadmap?
- TL: Definition of the suggested start- and endpoint (TIMELINE)

These key aspects (T, M, P ...) are summarized in tables for each working step. The tables outline the instruments and operational recommendations for every key aspect. Furthermore each working step will be illustrated in the next chapters with an example or some additional suggestions and/or explanations. These hints are usually following the description in a separate info box.

Developing a single set of roadmap guidelines for a systematic strategic planning process for the whole urban water cycle system has not yet been attempted. Nevertheless, a diverse number of methods and instruments do exist and are more or less available for its practical use. Results of the research of roadmap associated projects from Task 13.1 of WP13 are taken into account in this manual.[8]

[8] TRUST Task 13.1 (2011).

5.1. SCOPING: Defining the search area and target setting

Scoping is the first main stage of the roadmapping exercise and defines the scope of analysis in terms of system descriptions and boundaries. It provides a baseline understanding of today's UWCS and delineates the system boundaries. This stage identifies relevant actors, asset structures, today's status and the impact of existing drivers, pressures and trends on the UWCS of the city/region as a reference point against which future developments will be addressed.

Scoping focuses on collecting information and gathering knowledge about the objectives. This stage has to ensure, that all relevant parameters and information related to the objectives are available to the core team in order to draw a realistic picture of the today's UWCS.

Objectives show important challenges related to the UWCS. They are different in each city/region and can evolve from current problems or challenges in everyday urban water cycle management. Strategic ambitions such as "green city", "innovative city" or "climate change adapted city" can also be objectives.

Drivers could be caused by structural or population change, increasing urbanisation, strong financial restrictions, flooding risks, competitive water usage, condition of the assets and others. Also strategic ambitious such as "green city", "innovative city" or "climate change adapted city" can be an objective.

According to this, some basic information has to be identified and collected:

- Involved actors, stakeholders, institutions and persons that are important for decision making in any operating assets of UWCS or parts of it
- General information about geographical area, spatial boundaries, legal frameworks and recent developments of the pilot city referring to the demonstration cluster topic
- Information and data about the elements of UWCS to be analysed in metrics (performance indicators, context information)
- Identification and adjustment of existing pressures and trends on UWCS
- Determination of the key objectives of the roadmap, its timeframe and perspective

Relevant actors and stakeholders are people and representatives of institutions, who are competent to contribute to the roadmap process and who are crucial for a successful transfer of the roadmap measures and results. They should be involved from the very beginning of the roadmap exercise by the roadmap manager because their contributions to the objectives and goals of a sustainable UWCS have to be included into the whole planning process.

Scoping consists of four working steps:

- S1: Identifying relevant actors
- S2: Objectives of the UWCS
- S3: Elements of the UWCS
- S4: Drivers, pressures and trends

The following chapters describe the working steps of Scoping in detail.

S1: Identifying relevant actors

In this working step the core team has to identify the actors for the roadmap exercise. Actors are acting institutions and their representatives that are in charge of UWCS management (e.g. decision makers of water supply, wastewater service, storm water management, local and regional administration/policy, business developers, interest groups, non-government organisations, water related associations, researchers, other representatives, according local specifics and other stakeholders). The relevant people from the actors should participate actively in the working group and will support the work of the roadmap core team. After identifying the representatives of the acting institutions they have to be informed about the roadmap exercise and listed in a contact management document by the roadmap core team. The roadmap manager should keep in close contact with these actors.

The core team has to decide how to contact the city's representatives for the roadmap exercise. All relevant actors are going to participate in the work periodically in close collaboration with the roadmap core team. Actors also have the task of filling out data collection sheets in working step S3, taking part in strategy discussions during Forecasting and supporting the development of transition measures during the stages Backcasting and Transfer. Finally they are going to review the final roadmap for their city/region. Therefore, external participants must have profound insight into urban water systems from their point of view/profession.

Suggestion: Try to attract representatives from the second management level, with some experience and insight, but flexible enough to think in new dimensions. The top management level is often not able to devote sufficient time to the roadmap process. Make sure that the top management has endorsed the whole process and will be available for the final presentations. This procedure will support the acceptance of the roadmap exercise.

Table 1: Overview S1: Identifying relevant actors

Key aspects	*S1: Overview of instruments and operational recommendations*
Target	• Identification of relevant actors • Establishing contact to the actors

Methods	• Initiation of establishing contacts
	  • Identify relevant actors
	  • Get into first contact with relevant persons and institutions and check their interests, responsibilities, motivation and availability
	  • Motivate actors to participate in the roadmap work (S1_1: Factsheet)
	• Documentation of contact details in a contact management document
	• Kickoff-Workshop to launch the roadmap working group and explain the roadmap concept to city representatives (optional, if needed)

Participants	• The *roadmap working group* consists of the roadmap core team plus these actors under leadership of the roadmap manager
	• Actors depend on different subjects of consideration. An expected typical setting of participants consists of e. g.
	  • Local water and wastewater utility
	  • Representatives of local administration, government, regional planning departments, possibly policy makers
	  • Promoter of economic development
	  • Possibly researchers, possibly NGO's, possibly other
	• Roadmap manager has to organise a group of actors that will ideally provide high motivation for the roadmap application
	• The optimal group size (core team plus actors) should be around 8-10 persons. The core team and these actors form the roadmap working group (Figure 1).

Data	• None
Report	• None
Output	• Contact management and document address list of all relevant actors, that includes their interests and responsibilities in urban water cycle issues , direct input to S2
Timeline	• Start: asap Duration: max. 1 month
Templates	• Template S1_1: Factsheet • Template S1_2: Actors management document • Template S1_3: Pool of slides for workshops

Concerning the group design, it is suggested that different educational and professional backgrounds (engineers, economists, social scientists etc.) should be included into the roadmap working group. Various perspectives (e.g. from managers and engineers, from the water industry, politicians, citizen representatives, environmental NGOs etc.) will ensure a good balance for a strategic urban water cycle perspective – depending on the agenda of the city/region. This will ensure that the actors will be part of the whole planning process in order to concentrate their efforts on the overall target. This should be actively supported by the roadmap manager, because one major objective of the roadmap is to transport expert knowledge into local decision making processes.

It can be helpful, if the roadmap core team is experienced in moderation techniques and can collaborate with different perspectives (e.g. technical, economic, political challenges etc.) on UWCS.

At the regional and city level the roadmap work should start with all relevant stakeholder groups, which represent the main UWCS sectors in the region. The group should consist of a disciplinary mix of people, which are capable of achieving the roadmap goal and have influence on UWCS decisions.

Starting the work:

Please start with the proposed template for the actors analysis and then check if all relevant water sectors are included. Please give some thought as to whether any actor's role will change – e.g. some actors may have less significant roles at the beginning, but their role may become more active as the work progresses.

The list should provide additional information about the identified actors as well - i.e. if they have bridges (or networking activities) to other relevant sectors and stakeholders, or if they have a problem-solving capacity or a specific decision making competence. Furthermore it is important to mark in which stage of the roadmapping process the actors should be included; it is also possible that not all actors will participate in the whole roadmapping process. Please note that the actors management document is a living document in your roadmap work and will have a different composition for each city depending on the regional vision 2040.

S2: Identifying objectives of the UWCS

The working step S2 will define the cornerstones and the major trend lines of the UWCS development and will support the collection of information in S3. S2 and S3 are meant to run in parallel. The output of S2 will be an overview of objectives for urban water cycle transition. Existing information, knowledge and perspectives on transition needs will be collected by the roadmap core team via (internet) research, analysis of official reference documents like reports, statements or existing studies, or (if affordable) via individual interviews (one-to-one) with the actors identified as important participants/stakeholders in S1. The core team can use the key question proposal (template S2_1) for structuring the interviews and to start the identification of relevant objectives. The goal is to identify existing adaptation plans (if applicable), the perspective and transition needs and – if relevant – potential conflicts that are expected by each member of the roadmap group. The topics of the output of S2 should be in line with the TRUST dimensions of sustainability.

Table 2: Overview S2: Identifying objectives of the UWCS

Key aspects	*S2: Overview of instruments and operational recommendations*
Target	• Analyse objectives from the individual perspective of the external participants • Find out similarities and potential conflicts for the vision of the UWCS
Methods	• (Internet) research, analysis of official documents, reports, studies etc. • One-to-one interviews with actors from S1 (and others if needed) and a Workshop in S4 held by the core team
Participants	• roadmap working group (external participants will be individually interviewed by a core team member)
Data	• For each identified action field the objective should be discussed and summarised
Report	• Objectives map that illustrates the analysed action fields and their objectives
Output	• A quick overview of today's objectives and potential conflicts between different interests • Direct input to S3, F1, F2, B2 and TR1
Timeline	• Start: month 1 Duration: 2 to 3 months
Templates	• Template S2_1: Objective map - documented in the guideline • Template S2_2: One-to-one-interviews

The following examples illustrate possible outputs of this working step: Figure 5 clusters relevant topics (such as water resources, drinking water, waste- and storm water) and their objectives (such as keeping a good quality, reducing interruptions and energy consumption). In the illustration the objectives are not weighted, but it is also possible to assign weights on each individual objective at this stage. Figure 6 shows examples of topics and lists the motivation for an objective (What is driving this objective?). If available, existing plans, their

duration and the responsibilities should be collected. It is very important to incorporate existing objectives and associated existing plans in the roadmap work for the successful development of a roadmap.

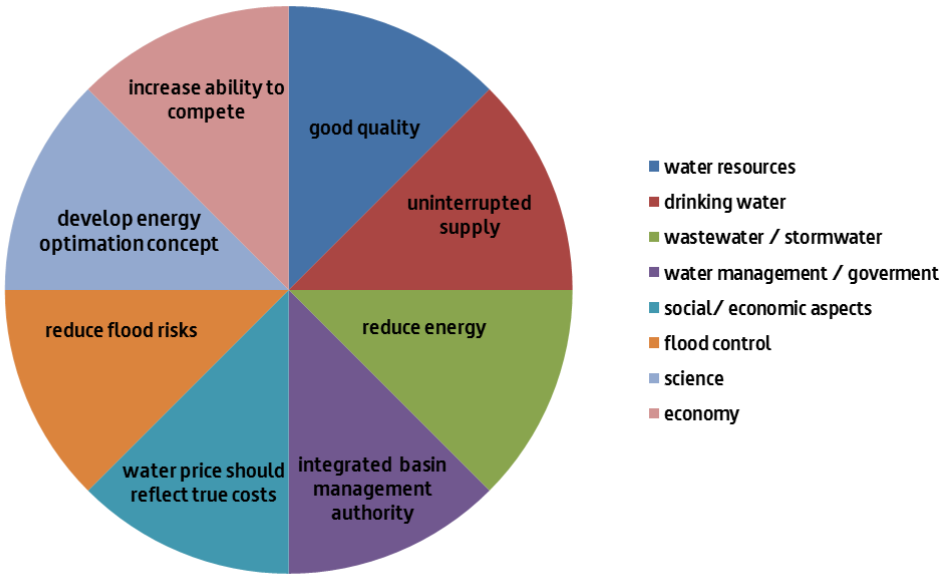

Figure 5: Example 1 of an objective map

Topic	Objective	Motivation	Existing Plans	Responsible	Due
effluent quality, wastewater treatment	micro pollutant removal in effluents	legal requirement	no	WWTP operators	2020
infrastructure, sewerage network	pump replacement	cost and energy optimisation	yes, replacement rates, annual invest	utility	2015
climate change	flood protection	legal requirement, city planning	no, regional global plans	government	no

Figure 6: Example 2 of an objective map

S3: Describing elements of the UWCS

In the third working step of Scoping, the urban water cycle system will be described by selected data and context information that will be collected in S3 by prepared questionnaires. The questionnaires also include the types of information that are already available in the city (like a city storyline, studies, GIS data etc.).

The data collection itself incorporates the TRUST sustainability approach with its five dimensions: social, economic, environmental, governance and assets. The number of performance indicators used for each sustainability dimension and its assessment is shown in Figure 8.

The data collection process can support the roadmap work significantly, because the existing UWCS can be described and visualized by qualitative and quantitative characteristics at an early stage of the roadmapping process. According to the quick overview of objectives (as an output from S2) the data collection in S3 should be focussed on these objectives and should leave out not relevant ones. The data collection will set the basis for the progress in the next stages and particularly in the Forecasting and Backcasting stage. Furthermore by using the data collection the relationships between UWCS elements are clearer or even prioritized at an early stage. The data collection offers a first confrontation with one's own UWCS.

To organise the quantitative data collection in S3, this guideline provides a questionnaire (template S3_2) with respect to the above mentioned components of UWCS. This data sheet is mainly based on IWA performance indicator[9] definitions for water and wastewater and includes the complete data set and definitions to each question. If needed the IWA performance indicators are modified or further performance indicators are developed. Furthermore, the data collection goes in line with other data collections in the TRUST project. If a city is taking part in the baseline assessment of WP11, data with similar focuses have identical definitions. That allows a city to share data with other tools of the TRUST project (e.g. WP11 and partly with WP31 and WP33; see chapter 2).

9 Alegre, H./ Baptista, J.M./Cabrera Jr, E./Cubillo, F./Duarte, P./Hirner, W./Merkel, W./Parena (2006); Matos, R./Cardoso, A./Ashley, R./Duarte, P./Molinari, A./Schulz, A. (2003).

Sustainability dimensions	Sustainability objectives	Sustainability criteria	No of PI's	No of PI's
Social	S1) Access to urban water services	S11) Service coverage	9	20
	S2) Effectively satisfy the current users' needs and expectations	S21) Quality of service	7	
		S22) Safety and health	2	
	S3) Acceptance and awareness of UWCS	S31) Affordability	2	
Environment	En1) Efficient use of water, energy and materials	En11) Efficiency in the use of water (including final uses)	8	23
		En12) Efficiency in the use of energy	6	
		En13) Efficiency in the use of materials	2	
	En2) Minimisation of other environmental impacts	En21) Environmental efficiency (life cycle emissions to water, air and soil)	7	
Economic	Ec1) Ensure economic sustainability of the UWCS	Ec11) Cost recovery and reinvestment in UWCS (incl. cost financing)	4	13
		Ec12) Economic efficiency	3	
		Ec13) Leverage (degree of indebtedness)	4	
		Ec14) Willingness to pay (accounts receivable)	2	
Governance	G1) Public participation	G11) Participation initiatives	2	9
	G2) Transparency and accountability	G21) Availability of information and public disclosure	1	
		G22) Availability of mechanisms of accountability	4	
	G3) Clearness, steadiness and measurability of the UWCS	G31) Clearness, steadiness and measurability of policies	1	
	G4) Alignment of city, corporate and water resources planning	G41) Degree of alignment of city, corporate and water resources planning	1	
Assets	A1) Infrastructure reliability, adequacy and resilience	A11) Adequacy of the rehabilitation rate	2	20
		A12) Reliability and failures	3	
		A13) Adequate infrastructural capacity	9	
		A14) Adaptability to changes (e.g. climate change adaptation)	1	
	A2) Human capital	A21) Adequacy of training, capacity building and knowledge transfer	2	
	A3) Information and knowledge management	A31) Quality of the information and of the knowledge management system	3	

Number of PI's for Scoping	85
General information (context info) for Scoping	38
Total number of PI's and general information	123

Figure 7:Sustainability dimensions, their objectives and criteria

This file will support the collection of quantitative data and qualitative information for Scoping. It can also be used in the stages of Forecasting and Backcasting. The file automatically generates outputs called modules 1-7. For these modules five questionnaires are relevant and they are listed in the file next to them:

- Quest1: Water supply (water resources, catchment, treatment and distribution)
- Quest2: Wastewater and storm water
- Quest3: Water management and governance
- Quest4: Social and economic aspects
- Quest5: General description

The file generates automatically these modules:

- Mod1: Water supply
- Mod2: Wastewater and storm water
- Mod3: Water balance
- Mod4: Water management and governance
- Mod5: Social and economic aspects
- Mod6: General description
- Mod7: Sustainability dimensions

It is also possible to develop the roadmap without such detailed data collection. This also depends on available resources in the pilot city. As a trade-off, target-setting and actions plans in the Forecasting and Backcasting stages will be more qualitative and probably less rewarding.

The idea of confidentiality: Working with real data requires respecting data privacy needs. For a productive work with status quo information and strategic aspects a confidential environment can be officially agreed by all participants signing the "Code of conduct", if required.

Before you start with the questionnaire it is recommendable that you discuss the "sustainability overview" with the proposed PI's with the pilot city. Some PI's may not be relevant for the pilot city but other PI's that are not listed should be added by the roadmap working group later. The questionnaire offers the possibility for changes and extensions after discussion and feedback from the pilot city.

If you need some special agreements on confidentiality of the data and the data analysis, a template for "Confidentiality Agreement and Code of Conduct" is provided (template S3_1). Of course, necessary adjustments can be made by the working group.

Table 3: Overview S3: Identifying elements of UWCS

Key aspects	*S3: Overview of instruments and operational recommendations*
Target	• Provide information about the elements of UWCS and water related components incl. asset structures and responsibilities of actors/institutions related to the pilot cluster
Methods	• Comply with rules of confidentiality, if needed (template S3_1) • Data collection by the actors using the questionnaire (template S3_2) • Support during data collection will be provided by roadmap core team

Participants	• Actors identified in S1
	  • provide data and information and fill out the questionnaire
	  • decide, what information will be made available for the pilot demonstration
	• Roadmap core team
	  • provides support to fill out the questionnaire
	  • explains data classifications and definitions
	  • provides results of the data collection via reports

Data	• Data variables and context information, mostly documented in the IWA performance indicator system • Each question is clearly defined in the questionnaire • The questionnaire calculates performance indicators in a separate spread sheet and provides illustrations for the report
Report	• UWCS city profile incl. qualitative and quantitative sustainability aspects, structured into five modules: a general descriptions, factsheet water supply, factsheet wastewater and storm water, water management and governance and sustainability PI's.
Output	• Overview about the elements of the city's UWCS, action fields and relevant actors of the city • Direct input to S4 and F1, F2
Timeline	• Start: month 1 Duration: max. 3 months
Templates	• Template S3_1: Confidentiality Agreement and Code of Conduct • Template S3_2: City profile (incl. questionnaire)

S4: Summarizing drivers, pressures and trends

The last working step of Scoping (S4) addresses existing drivers, pressures and trends that affect urban water systems in the pilot city. A key element of S4 is a Scoping-Workshop with all members of the roadmap working group. The Scoping-Workshop can be organised as a joint workshop with the Forecasting-Workshop 1 (Figure 2). The goal of this workshop is a common understanding of the existing drivers, pressures and trends. This workshop finalises the stage of Scoping and summarizes the actual challenges and developments in the city/region that have to be taken into account for the forecasting stage.

The analysis should follow the DPSIR framework. The DPSIR framework was developed to describe the interactions between society and the environment. It analyses the "chain of causal links starting with '*driving forces*' (economic sectors, human activities) through '*pressures*' (emissions, waste) to '*states*' (physical, chemical and biological) and '*impacts*' on ecosystems, human health and functions, eventually leading to political '*responses*' (prioritisation, target setting, indicators)"[10].

In the context of developing the roadmap (structure) this DPSIR method should be applied to UWCS. The DPSIR method can use the outcomes of WP12 (report on 'Driving forces' and 'pressures' components - developed from the review undertaken in WP12, in relation to global change pressures and trends). These findings and results have been incorporated into the roadmap structure. Figure 8 shows the relationship between the TRUST roadmap and the DPSIR framework.

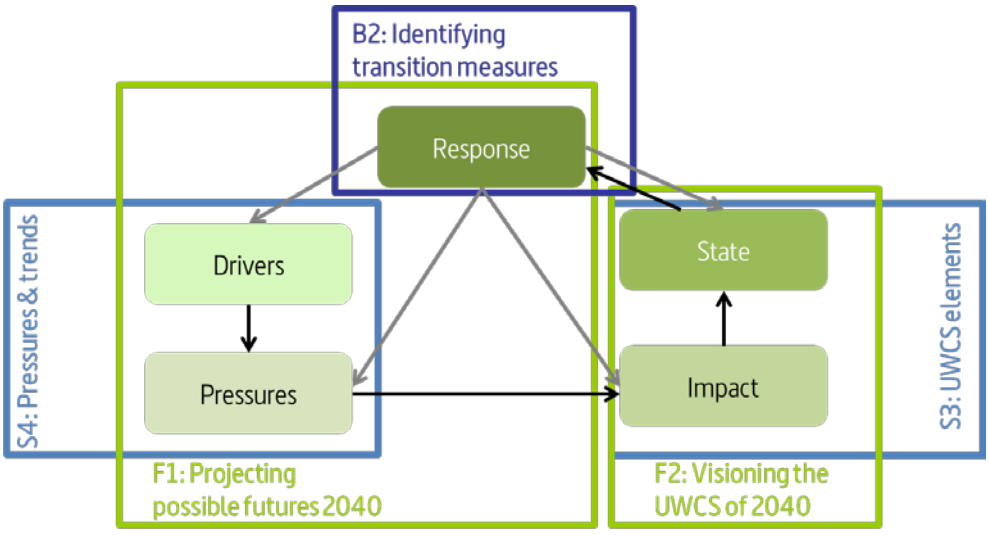

Figure 8:DPSIR causal framework[11]

[10] Kristensen, P. (2004).

[11] Modified after EEA Integrated Assessment Porta (2007).

Driving forces can be considered as needs that are imposed by the external system (population growth, climate change) and happen independently of the UWCS activities. On the other hand, measures designed in response may become new driving forces (e.g. the need to comply with legislation, CO2 reduction targets, etc.).

The Scoping-Workshop should be organised by the roadmap core team. The workshop content will be very dependent on the results of preceding working steps. The starting points for the roadmap work and the Scoping workshop are the existing results in TRUST. One relevant result is the quick sustainability scan of WP11.[12] Furthermore an important **starting point for a general application by non-TRUST cities** is the internal report of the TRUST project from WP12 (Task 12.1) [13]. The core team can communicate the general trends of this TRUST report "Review of global change pressures on Pilots of TRUST" that are induced by environmental, social and economic pressures. This report provides a basic perspective for focussing the objectives (see working step S2) and trends for the city/region to be analysed. This document can provide the initial starting point to launch the communication with the roadmap working group and starts discussions on sustainability issues with the pilots. This should identify the actual "big points" of existing pressures and trends the pilot city has to face. Pressures are framed according to the trinity of sustainability factors, i.e., according to the environmental, social and economic dimensions (triple bottom line approach). Based on RAMOA et al. (2011) Figure 9 shows the sub-issues into which pressures were broken down.

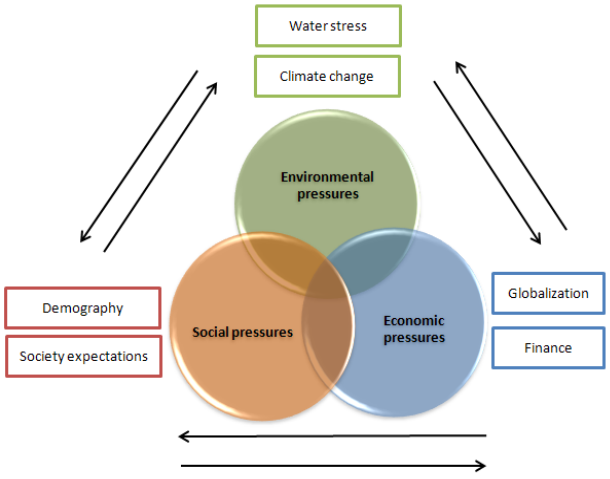

Figure 9: Global change pressures according to the sustainability dimensions[14]

12 At the time of writing the roadmap guideline the results of WP 11 are not available. But to have this linkage in mind is from the authors point of view very important.

13 Ramôa, A./Monteiro, A. J./Proença de Oliveira, R. (2011).

14 Ramôa, A./Monteiro, A. J./Proença de Oliveira, R. (2011).

Table 4: Overview S4: Summarizing drivers, pressures and trends

Key aspects	*S4: Overview of instruments and operational recommendations*
Target	• Analyse pressures and trends of each objective • Identify potential action fields (e.g. competitive water use, flood protection, water resource management, sciences, urban climate, ...)
Methods	• Scoping-/Forecasting-workshop: organise a workshop involving the roadmap working group • Results from WP 12 (report on general pressures and trends) have to be discussed and aligned to existing challenges and needs of the pilot city
Participants	• Roadmap working group (core team plus actors; external experts if needed)
Data	• Qualitative and quantitative information on relevant drivers, trends and pressures
Report	• Short pressures and trends report to be incorporated into the city profile (template S3_2)
Output	• Direct input to F1, F2, B2 and TR1.
Timeline	• Start: end of month 1 Duration: a workshop format
Templates	• Template S1_3: Pool of slides for workshops • Template S3_2: City profile (incl. questionnaire) • Template S4_1: Example for trends and pressures (internal TRUST report)

5.2. FORECASTING: Envisioning UWCS in a future world

As Niels Bohr stated "It is exceedingly difficult to make predictions, particularly about the future". However, this forecasting step undertakes to anticipate how the environment might change and tries to envision the future state of the UWCS.

In the frame of this guideline forecasting will comprise the following three aspects:

- F1: Projecting possible futures 2040
- F2: Visioning the UWCS of 2040
- F3: Synthesis

It thus comprises both a projection of the possible future of the external system and a vision of the desired state of the UWCS in the sphere of influence of the utilities. A synthesis will test the compatibility of both and identify possible conflicts and needs for remedial adaptive action to be taken into account in designing the Transfer step.

The rationale of forecasting is to extrapolate current trends into the future, to anticipate new future trends and to obtain a prospective view.[15] The parameters to be forecasted will largely follow the elements of S3 of the scoping stage – the inventory of the water cycle elements- but should also anticipate factors which are not considered today.

Eventually the Forecasting stage will look again into the different elements of the DPSIR framework to project their future state/level. It will not always be possible to derive sound cause-effect relationships, but if the assumptions for driving forces, pressures, state and impacts are reasonably well described, this will be sufficient to develop at least a set of different scenarios.

From a methodological point of view, several methods, both quantitative and qualitative, can be used to perform this task, including (amongst others) time-series methods, statistical interviews with experts and Delphi surveys (with the main actors). The choice of the optimal method depends on each individual case and the data availability and its degree of detail, but it is common to use a mix of different techniques.

The following chapters describe the working steps of Forecasting in detail.

[15] Kajikawa, Y./Yoshikawa, J./Takeda, Y./Matsushima, K. (2008).

F1: Projecting possible futures 2040

The specific task of this working step will be to project future changes in boundary conditions and to forecast what the future will look like 30 years from now outside the water sector.

This activity can take the form of a broad analysis along the DESTEP method[16] which considers the development of Demographic, Economic, Social, Technological, Ecological (Environmental) and Political factors. Collecting and processing this information is an ambitious task and can probably best be accomplished using a mix of in-house research and expert consultation.

Predictions for a variety of factors may extrapolate from past trends drawing on time series and statistics. Where no such sound data base is available, the projections can be based on assumptions (e.g. increase of a parameter by x %), derived from literature, expert interviews or the like. Practically, these ideas will be developed in the Scoping-Workshop (S4) which can be organised as a dual purpose event to collect data on past and current trends as well as to describe their future progression.

It is likely supposed that many water utilities already have some (limited) agendas in place for adapting to pressing needs and challenges. This task will draw significantly on the outputs of the S4 Scoping-Workshop where current pressures and trends for the water sector are analysed and reflected.

As exemplified in Table 5, a semi-quantitative description of current and future trends should be documented for the various factors, along with defined, region-specific subfactors. Additionally, the analysis should provide a first indication of which UWCS elements might be impacted. A more detailed causal relationship between pressures and impacts can be elaborated in a subsequent step. This may include quantitative estimates of specific key indicators for 2040, as already used in S3 for 2010. This can also elaborate the kind of impacts that may occur related to more specific operational and sustainability performance indicators.

The range of factors to be considered depends on the past experience of the participants but should be complemented by information from a wider area (e.g. state of the environment reports, regional climate change scenarios, etc.).[17]

Finally the different future trends can be clustered into scenarios that combine (for instance. conservative assumptions on the development of factors, or, technology oriented changes, or the like.

16 Leemann, J.A. (2010).

17 Barber, M./Anstis, P. (n.y.).

Table 5: Examples of factors to be assessed in projecting different futures

Factor	Sub factor	Observed trends (in the UWCS / region / country)	Future trend or development	Water resources	Water abstraction & treatment	Water distribution	Water use	Wastewater collection, treatment & discharge
Demographic	Age structure	Ageing population			x		x	
	Residential population	Declining	Stabilise at current level		x	x	x	x
	Seasonal population Immigration ...	Increasing	Will grow further	x	x	x	x	
Economic	Household income Public funding programmes ...		Will be cut due to financial constraints				x	
Social	Participation in decision finding Mobility & Flexibility ...	Resistance against costly top-down decisions						
Technological	Nano materials use in consumer products ...	Issue not closely observed	Increased used in materials in households		x			x
Ecological (Environmental)	Climate change	Prolonged droughts More frequent extreme rainfall events		x				x
Political factors	Legislation CO2 Emission reduction targets	Integrated management of water resources Development of alternative power supply Increasing energy efficiency		x		x		X

It may also be possible to use pre-defined, existing scenarios developed by other institutions, for example to model CO_2 emissions and related climate change, and assess the related impacts for the water sector (Business as Usual – BAU; the water sensitive society; self-sufficient communities; economy rules; etc.).[18] This can be accomplished in a moderated workshop that confronts the working group with a variety of existing scenarios. The roadmap manager, supported by the core team, will have to select those whilst the working group will judge how probable or applicable this may be for their UWCS.

Either way, the **consequences for the UWCS** will be analysed within the range as defined in the Scoping stage. The exercise will identify those areas and aspects of the UWCS where adaptation has to take place to counteract detrimental changes and developments. As this step is to analyse future expected changes of the external system, which is by definition not under the sphere of influence of the water utilities, it may require a different set of experts and actors to be involved.

Table 6: Overview F1: Projecting possible futures 2040

Key aspects	*F1: Overview of instruments and operational recommendations*
Target	• Description of possible future environment(s) • Identification of relevant external pressures and trends for the specific UWCS and characterisation of their impact on performance of the UWCS
Methods	• Description and future projection of trends by time-series analysis of data (joint workshop with S4, Scoping-/Forecasting-Workshop) • Calculate or estimate impacts on operation, derive future Performance Indicators • Down-scaling and transfer of national or regional scenarios • Own scenario building
Participants	• Roadmap working group
Data	• Quantification of a range of projected futures, isolate major trends (low, medium, high scenarios)
Report	• Mindmap with relevant environments and expected implications
Output	• Portfolio of context scenarios • Set of updated comparison with S3 components inventory, state major differences, updated summary flow sheet / matrix • Basis for identification of options or transfer action fields (T), Input to F3
Timeline	• Start: month 2 Duration: 2-3 months
Templates	• Template F1_1: Examples of factors to be assessed in projecting different futures

[18] Makropoulos, C./Memon, F.A./Shirley-Smith, C./Butler D. (2008).

F2: Visioning the UWCS of 2040

Visioning will define the future desired state of the UWCS. Though this is mainly targeted to the services that water utilities deliver, it has to be seen in the larger context of societal and political aspirations and thus involve stakeholders from these fields as well. It will be beneficial to involve customers and the more general public and to establish a consultation process to arrive to an agreed vision.

The governing idea is to describe the future UWCS in terms of service and sustainability, having regard to the circumstances, restrictions and boundary conditions of the specific region as identified in F1. Consequently the approach should develop realistic but still ambitious expectations based on the knowledge of the current status of the infrastructure, the service expectations of the users, relevant trends and pressures, financial abilities of the region etc. If sufficient time is available, this can be supported by customer and stakeholder consultations in order to investigate their preferences, expectations and willingness to pay (for example). As this process takes considerable time, preliminary research can be performed on similar studies to identify a range of potential priorities.

Drawing on the current city profile and identified pressures and challenges on the UWCS elements, visioning will define how the UWCS will look in the year 2040 and formulate the ambition of the city. Within the UWCS context the central goal is to define the vision having regard to the sustainability criteria / indicators. The vision shall describe the desired future state of the considered UWCS in a qualitative and if possible, quantitative way.

To this end the roadmap working group and defined participants (see table below) can update the matrix of sustainability indicators (deemed relevant) from the current state to the future desired performance. This can take a qualitative or semi-quantitative description such as increase or reduction, more, less, better, no deterioration. For quantitative results the application of Template S3_2 from Scoping is recommended for Visioning, too.

The vision statement should:

- Express the commitment for improvement,
- Summarise targets for performance (indicators).

Table 7: Overview F2: Visioning the UWCS of 2040

Key aspects	*F2: Overview of instruments and operational recommendations*
Target	• Picture the future desired state of the UWCS • Identify preferences and sustainability ambitions • Open trajectories for transition • Anticipate countermeasures to identified trends (F1)
Methods	• Visioning and projecting exercise in expert workshop • Visioning-Workshop or survey to elucidate customer and stakeholder expectations of water services • Delphi surveys (with the actors)
Participants	• From within the water utilities: high level management representative, broad representation across functions and division (operational, R&D …), imaginative people with open minds • From outside the utility: o NGOs, e.g. consumer protection organisation, o Politicians
Data	• Defined ambition for operational performance (selected PIs) • Possibly quantify a range of underlying parameters such as future demand patterns, resource pattern, demand reduction targets
Report	• Vision Statement / Declaration of development objectives / • Updated City Profile from S3
Output	• To F3
Timeline	• Start: month 3 Duration: 2- 5 months
Templates	• Template S3_2: City profile (incl. questionnaire)

F3: Synthesis

In the synthesis step the information generated in F1 and F2 will be processed to generate a consolidated vision with prioritised ambitions. This step analyses the probable impact anticipated changes may have on UWCS, as they exist and operate today. As a result the compatibility of the vision and the diagnosed major trends in the environment shall be ensured.

This will be done by the roadmap core team and be presented to the public in a hearing.

Table 8: Overview F3: Synthesis

Key aspects	*F3: Overview of instruments and operational recommendations*
Target	• Define, visualise gaps between projected changes and future vision, compliance • Identify areas of priority action and core competence
Methods	• Internal evaluation round • Public consultation, hearing
Participants	• Roadmap core team, public, end-users, NGO or only roadmap working group
Data	• None
Report	• Ambition report with prioritised elements of a vision
Output	• Input to Backcasting stage • Descriptive characterisation of future services and how they will be delivered
Timeline	• Start: month 3 Duration: 2 months
Templates	• None

5.3. BACKCASTING: Projecting possible visions back into present

Backcasting: a methodological element of strategic planning

Backcasting is a planning approach which originated in the 1970s. It involves working backwards from a particular desirable future end-point, in order to define what measures are required to reach that end point, and the rough timeframe in which those measures should be implemented. As a result, backcasting is often used in conjunction with forecasting methods, which can help to define the desirable future end point (Höjer, M./Mattsson, L. (2000). Backcasting has also been characterised as a key feature within the transition management approach (Rotmans, J./Kemp, R./Asselt, M. v. (2001)).

While they started as narrowly focused, technical planning processes, backcasting approaches have since been expanded to address wider societal issues (e.g. sustainability), to be applied at much broader scales (e.g. city-regions) and to include a much wider range of stakeholders – this is described as a shift towards 'participatory backcasting'. Importantly, stakeholders are often involved in defining the desirable futures, as well as in determining the means to achieve them (Quist, J./Vergragt, P. (2006)). This is the case for the Roadmap approach, where key stakeholders are involved at all stages, including Forecasting and Backcasting.

In the roadmap, the Backcasting stage builds directly from the Forecasting stage, using the outputs from steps F2 and F3 as a starting point. The overall purpose of this stage is to characterise how a UWCS might shift from its present state to the desired end point. This stage therefore consists of two basic working steps (see Figure 10):

- B1: defining intermediate state(s)
- B2: identifying measures to facilitate transitions from state to state

The stage of Backcasting is shown in the following figure.

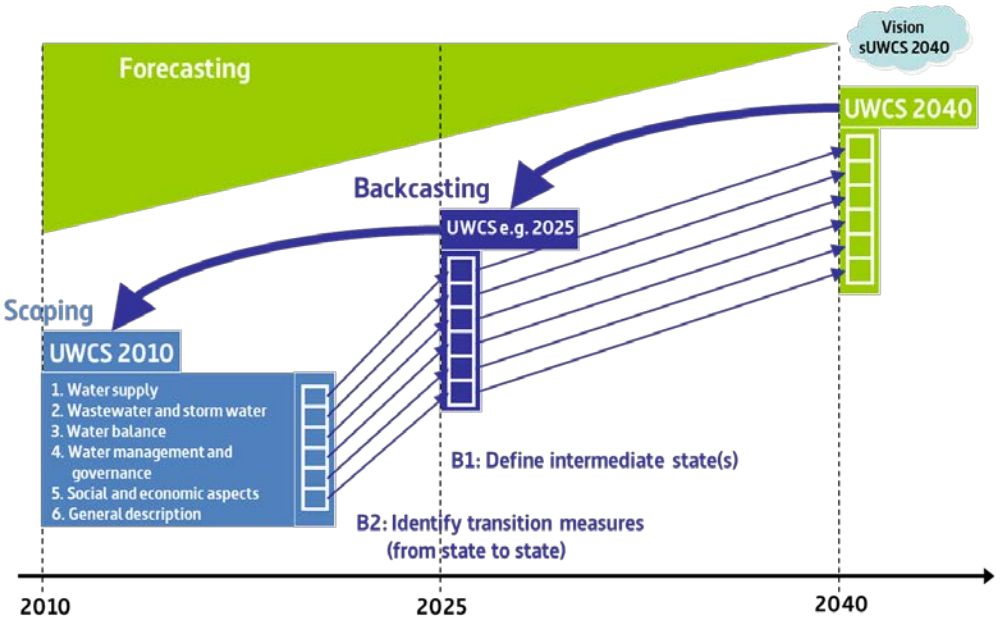

Figure 10: Backcasting stage in the roadmap process: definition of intermediate states (B1) between current state UWCS (2010) and UWCS vision (2040), and identification of transition measures from state to state (B2)

The following chapters describe the working steps of Backcasting in detail.

B1: Defining intermediate state(s)

The purpose of this working step is to identify and describe at least one intermediate state between the present situation and the (future) vision. For the roadmap, one of these intermediate states for UWCS should be centred on a year (e.g. 2025) or a time period (e. g. midway between 2010 and 2040) as indicated in Figure 10. Whether or not additional intermediate states are deemed necessary/useful can be left to the discretion of the roadmap core team.

Each intermediate state should be described both with qualitative and quantitative information. The data/ performance indicators used here should be consistent with those used in the Scoping and Forecasting stages. However, for the sake of maintaining an efficient and timely process, it is suggested that the roadmap core team should take the lead in initially defining and describing the intermediate state(s), rather than repeating the Visioning-Workshop.

For describing the intermediate states of the UWCS the template S3_2 can be used by feeding forecasted or predicted/assumed data. As a result, a partly quantitative description

of the intermediate states can be made available for the UWCS or parts of it only (e.g. technical facts wastewater, water governance etc.). Otherwise, it is also possible to describe the intermediate states with qualitative information.

Once the core team has described the intermediate state(s), they should seek feedback from the rest of the roadmap working group (actors and/or a wider audience if deemed necessary). This process should follow a Delphi-style technique, as illustrated in Figure 11 (for a full review of the Delphi approach see Rowe, G. et al. (1991)). This involves sending the descriptions to each member of the roadmap working group, along with a set of questions to elicit their feedback. Once responses are received, they are collated and anonymised. Then the complete set of responses is sent back to working group members, along with a revised version of the intermediate state descriptions, and a second round of feedback is elicited. This allows participants to adjust their feedback based on others' responses. This cyclical process is repeated (ideally) until a degree of consensus is achieved around the intermediate state descriptions.

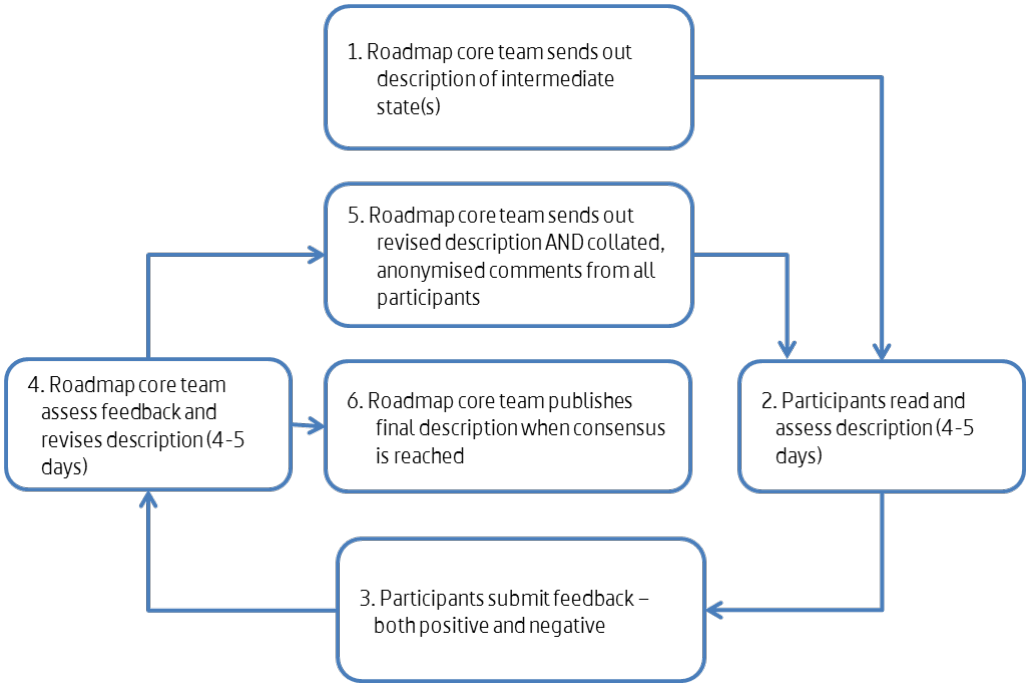

Figure 11: Illustration of Delphi-style feedback approach for B1

In practice, each round of the feedback exercise should be kept within a very short (ambitious) time frame (i.e. a few days/one or two weeks). This means that participants will have a short window in which to submit feedback, and the core team will likewise have a short window in which to analyse, collate and re-send responses. In order to ensure that all participants are prepared for such a time frame, they should ideally be briefed on this process at the Visioning-Workshop. Ultimately, it will be up to the roadmap core team to determine how many rounds of feedback are necessary and/or feasible. However, the situation might be different for applications outside TRUST.

Table 9: Overview B1: Defining intermediate state(s)

Key aspects	*B1: Overview of instruments and operational recommendations*
Target	• Identification and description of agreed intermediate state(s) between 2010 and 2040
Methods	• Initial description of intermediate states using qualitative information, data/performance indicators of the template S3_2 that are consistent with the future scenarios identified in the Forecasting stage • Elicitation of feedback from a wider range of actors, using a cyclical (Delphi-style) consultation approach, in order to develop consensus around intermediate state descriptions.
Participants	• The roadmap core team sets out the initial descriptions • The roadmap working group should be invited to participate in the cyclical feedback exercise • Ideally the actors in this step should be the same as those who participated in the Forecasting stage
Data	• Similar to S3, F1, F2
Report	• Qualitative and / or quantitative descriptions of intermediate state(s)
Output	• See above "Report" • Direct input to B2 and Transfer stage
Timeline	• Start: month 4 Duration: 2 months
Templates	• Template S3_2: Questionnaire on UWCS elements

B2: Identifying transition measures

The purpose of this working step is to identify transition measures that will allow the UWCS to shift from its present state towards the intermediate state and the vision (of the UWCS). To that end, the step could be split into two phases:

- B2a – The identification of short/medium-term measures to achieve the intermediate state(s) described in B1.
- B2b – The identification of longer-term measures to move from the intermediate state(s) to the end point state identified in the Forecasting stage.

For completing this step it is advisable to refer back to the UWCS description prepared in S3. Ideally, transition measures should be identified for each of the elements of the UWCS or other action fields that are relevant from the perspective of the UWCS for transitioning.

Furthermore, each transition measure should be accompanied by a brief description of its necessity and viability, including a general assessment of:

- How it will help achieve the desired state
- Its relative importance in achieving the desired state
- Who is responsible for its delivery
- Estimated timeframe for its delivery
- How much investment is needed (rough estimate)
- What are prospects and risks
- Where are stumbling blocks
- Socio-political factors that may facilitate and/or hinder its implementation

As with the previous step, the roadmap core team should have primary responsibility for developing an initial (limited) set of measures as a starting point, and then obtaining additional input from the roadmap working group. However, the primary mechanism for obtaining that input will be the Transitioning-Workshop (see Figure 2) – with one session in the workshop devoted to the short/medium-term measures (B2a) and one devoted to the longer-term measures (B2b). The roadmap core team should decide whether this procedure is time-mapped and useful. On the other hand, the Roadmap-Workshop could be used to get the results of B2.

In order to help actors be prepared for the workshop, the core team can distribute the initial set of transition measures for consideration. To facilitate this process, they could potentially ask each member of the working group to focus on one particular component of the UWCS, and the transition measures associated with that component. During the workshop, actors could discuss the merits of the measures, and potentially propose additional ones. After the workshop, the core team could then summarize the outcomes in an outline document.

Table 10: Overview B2: Identifying transition measures

Key aspects	*B2: Overview of instruments and operational recommendations*
Target	• Identification and description of transition measures
Methods	• Circulate an initial set of measures (both short/medium-term and longer-term) corresponding to each component of the UWCS • Optional: organize the Transitioning- Workshop • Utilise the Roadmap Workshop to discuss the proposed measures and obtain feedback from the working group
Participants	• The roadmap core team sets out the initial measures • The actors should be invited to participate in the relevant sessions of the Roadmap Workshop
Data	• None
Report	• Outline document describing agreed measures (both short/medium-term and longer-term)
Output	• Outline document (see above) • Direct input to Transfer stage
Timeline	• Start: month 4/5 Duration: 2 months (general application
Templates	• Template S3_2: City profile (incl. questionnaire)

5.4. TRANSFER: Creating the roadmap

The last stage of the roadmapping process is to evaluate the results of analysis and transfer them into a roadmap. This includes providing some chronological information of activities undertaken and results. Creating a roadmap means documenting and transferring identified action fields and measures into prioritized recommendations for responsible people and institutions. An adaptive roadmap normally includes listings of relevant action fields and identified measures, indications of prioritisation, time scales and milestones, progress monitoring aspects and an illustration of possible or expected prospects and risks, including stumbling blocks (see B2). In order to organise the transfer of this knowledge into the roadmap effectively, the relevant topics and measures of the UWCS as identified in the preceding step B2 should first be summarised in transfer action fields, and then secondly be evaluated to create the roadmap (Figure 12).

Therefore Transfer consists of two working steps:

- TR1: Evaluating transfer action fields and their measures
- TR2: Creating the roadmap

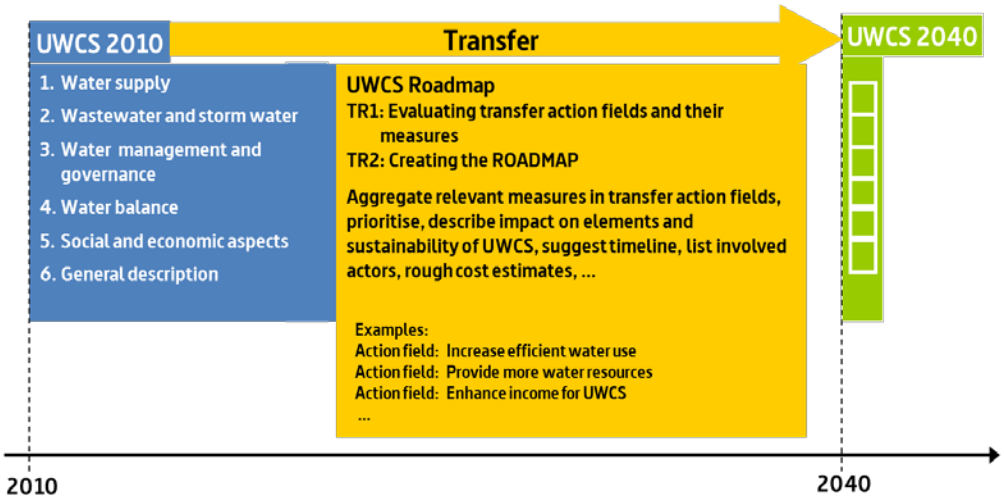

Figure 12: Transfer stage in the roadmap process: definition of transfer action fields (TR1), and describing measures and development steps in each action field (TR2)

The result of the Transfer stage is the roadmap itself. It will be helpful to establish an editorial team, or nominate members of the roadmap core team, to be responsible for the preparation of the document (writing, editing, graphics etc.). After the development of the roadmap it is also recommended that it should undergo a detailed content review. The roadmap manager should select some

Final workshop

Optionally, the roadmap manager can organize a final workshop with all actors and participants or select the communication tool of publications.

members of the roadmap core team and/or from the roadmap working group that are able to review the final roadmap from different (expert) perspectives. This will raise the public acceptance of the final document in the end.

All relevant results and databases (outcomes of the further working steps) should be documented in the roadmap. Furthermore, the participants in workshops, involved experts and partners or contributors in a specific roadmap stage should be listed with full names for reasons of transparency, because the roadmap itself represents a “collective result”. It may often be appropriate to hold a final workshop as a closing session of the roadmap exercise.

TR1: Evaluating transfer action fields and their measures

The purpose of this working step is to evaluate the transfer action fields (TA). The measures as defined in Backcasting step B2 should be organized/listed according to this aim (e.g. by a systematic numbering or similar) in a prioritised action plan. In a first step the transfer action fields should be listed with all available information collected in B2 in this plan and then subsequently they should be prioritized by a qualitative traffic-light-approach (e.g. priority 1, 2, 3 or similar) to clarify those most critical issues in terms of a sustainable UWCS. Categories of prioritization are very dependent on the action fields and local conditions and should be defined in collaboration with the members of the working group.

Furthermore TR1 should analyse possible interactions between action fields, the chronological sequence with milestones, progress monitoring, responsibilities, risks and prospects and stumbling blocks for the implementation of measures and a range of (roughly estimated) costs. Table 11 shows an example of how the output from TR1 can be systemised. The format and design of the prioritised action plan will be defined within the project by the core team. Transfer action fields should be listed with their short-term and long-term measures as well as other relevant information. The output of this working step deals as preparation for the last Roadmap-Workshop in TR2.

Table 11: Examples of transfer action fields: prioritised action plan

TA and priority	Measures till 2025	Measures till 2040	Responsible Actors	Range of cost	Interaction with...	Stumbling blocks
increase efficient use of water (priority 1)	2015-2025	- reduction of water losses from the supply network - raise water tariffs (making efficient use of water more attractive) -effective control of water use by authorities	utility, scientists, city planners	2, 0 Mio. €	TA-6, Government	-financial gap
provide more water resource (priority 2)	- Desalination - Reuse	- reservoir management - clean-up of resources	engineers	4, 5 Mio. €	TA-3	-very innovative technologies, -acceptance in the urban area
enhance income for UWCS (priority 3)		- efficient use of energy - adequacy of the rehabilitation rate for water distribution network	utility itself	1, 5 Mio. €	TA-2	-no reserves
...	...	...	...	...	...	...

Table 12: Overview TR1: Evaluating transfer action fields and their measures

Key aspects	*TR1: Overview of instruments and operational recommendations*
Target	• Evaluating the transfer action fields and their measures • Define a prioritization scheme • Analyse interactions between action fields, the chronological sequence of measures, and their risks and prospects
Methods	• Use the output from B2 (measures and all available information) • Collection of data from previous stages, chronological information for activities, first recommendations for milestones and categorization for prioritization of TA
Participants	• Roadmap working group (core team plus actors)
Data	• Results from Scoping, Forecasting, Backcasting
Report	• Overview of transfer action fields with their measures and level of priority
Output	• Direct input to TR2.
Timeline	• Start: month 5 Duration: 2-3 months
Templates	• Template S1_3: pool of slides for workshops • Template TR2_2: prioritised action plan – documented in the guideline

TR2: Creating the roadmap

The purpose of this working step is to transfer the results from TR1 and the other working steps into a final reporting document called a roadmap. This chapter does not give a fixed structure for the roadmap design, but rather points out aspects for an illustration of contents in the roadmap. TR1 evaluates transfer action fields and acts as preparation for TR2. The mechanism for obtaining the roadmap will be the Roadmap-Workshop. If the objectives of B2 and TR2 are complementary, it may be useful to use the Roadmap-Workshop to address both working steps (see chapter 5.3.2).

It is also recommended that separate sheets be developed for each sector (e.g. drinking water, wastewater or governance/management etc.) of the UWCS to give a detailed overview and to include the sectors in the final roadmap, e.g. on the seven UWCS elements (S3) or on the TRUST sustainability dimensions. This has to be decided by the roadmap working group.

The result of TR2 is the roadmap itself. Of course, the table of contents can be adapted by each roadmap working group. The basic structure of the roadmap contains the following examples (template TR2_3):

Final review

In order to increase the acceptance and consistency of the roadmap, it is very important that the document is read thoroughly from various expert perspectives.

Template_TR2_1: Basic structure of the roadmap for the UWCS

1. Scoping the today's UWCS
    a. Actors management document *(template S1_2)*
    b. UWCS elements and objectives *(template City profile of five modules S3_3)*
    c. Relevant pressures and trends *(Results of the Scoping-Workshop)*
2. Visioning the UWCS of 2040
    a. Vision 2040
    b. Separate sectors and their vision / objectives *(Results of the Visioning-Workshop)*
3. Develop the measures with Backcasting
    a. Measures and transfer action fields *(template TR1_3 Prioritised action plan)*
    b. Priorisation of transfer action fields separately *(Results of Roadmap-Workshop)*
4. Illustration and summary
    a. Create the roadmap *(template aspects for the structure of the roadmap)*
    b. Sustainability dimensions
5. Conclusions
6. Appendix

Table 13: Overview TR2: Creating the roadmap

Key aspects	*TR2: Overview of instruments and operational recommendations*
Target	• Create the roadmap
Methods	• Roadmap-Workshop: organisation of an external workshop involving external participants from relevant actors of the pilot city • Graphical representation and writing the roadmap • Review of the final roadmap document
Participants	• Roadmap working group (core team plus external participants) • Establish an editorial team for graphical representation and writing
Data	• Results TR1, Scoping, Forecasting, Backcasting
Report	• Roadmap
Output	• Roadmap
Timeline	• Start: month 5 Duration: 2 months
Templates	• Template TR2_1: Basic structure of the Roadmap

6. CONCLUDING REMARKS

From research to practical application

This roadmap guideline provides a description how transition planning efforts in Urban Water Cycle Systems can be organised. It illustrates differences from "conventional planning approaches" in water supply and waste water management in terms of sustainability. The TRUST project provides a test demonstration of this approach in different city clusters (green city, urban/peri-urban, scarcity). This manual has been designed for organising sustainable UWCS planning in general. This guideline is the first manual developed for practitioners taking into account the roadmap methodology and provides a generic understanding of the roadmapping process and structure. Indeed, after being tested, some practical aspects will be identified to improve the clarity and understandability of this document and its templates.

The guideline considers the classical stages of the roadmapping process (Scoping, Forecasting, Backcasting and Transfer) and allows representatives of the UWCS to identify individual pathways for sustainable water cycle services in the future. The manual offers users the opportunity to apply qualitative and quantitative information from different sources. If performance indicators will be applied, selected IWA performance indicators for drinking water and wastewater are integrated in the TRUST roadmap approach. The guideline also discloses a creative process for an interdisciplinary planning procedure that allows a lot of expert discussions – it depends on the objective of each application.

The roadmap guideline and the data collection itself incorporate the TRUST sustainability approach with its five dimensions: social, environmental, economic, governance and assets.

The role of communication and synthesis

A core element for a successful roadmap exercise is the role of communication and exchange between the partners. Participants in the roadmapping procedure should have an open interest in the transition and adaptation needs of "their" existing UWCS. The development of a roadmap supports communication between involved operators, stakeholders, administration and the public, which is necessary for establishing a mutual understanding of the needs of transition, and for supporting a collaborative planning process. Hopefully, its implementation for a sustainable future UWCS within a city or region will be supported by this collective preparation.

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APPENDICES

Scoping

Template S1_1: Factsheet (pages 54-55)

Template S1_2: Actors management document (pages 56-57)

Template S1_3: Pool of slides for workshops (pages 58-77)

Template S2_1: Objective map - *documented in the guideline (page 23)*

Template S2_2: One-to-one-interviews (page 78)

Template S3_1: Confidentiality Agreement and Code of Conduct (page 79)

Template S3_2: City profile (incl. questionnaire) (pages 80-120)

Template S4_1: Example for trends and pressures (internal TRUST report)

Forecasting

Template F1_1: Examples of factors to be assessed in projecting different futures - *documented in the guideline (page 33)*

Transfer

Template TR1_2: prioritised action plan – *documented in the guideline (page 46)*

Template TR2_1: Basic structure of the roadmap for the UWCS – *documented in the guideline (page 48)*

All templates of this guideline are available as separate documents. They are designed as useful tools to support the roadmap work. You can download the templates from the TRUST website.

Template S1_1: Factsheet

TRUST PROJECT

Transitions to the Urban Water Services of Tomorrow at a glance: Over four years, and driven by the need for transformation and the wish to protect natural resources, 30 partners in 11 different countries will research innovations and tools to create a more sustainable, low-carbon water future. The results will be implemented and tested in nine participating pilot cities or regions. TRUST is an integrated project, funded by the European Commission.

TRUST ROADMAP APPROACH

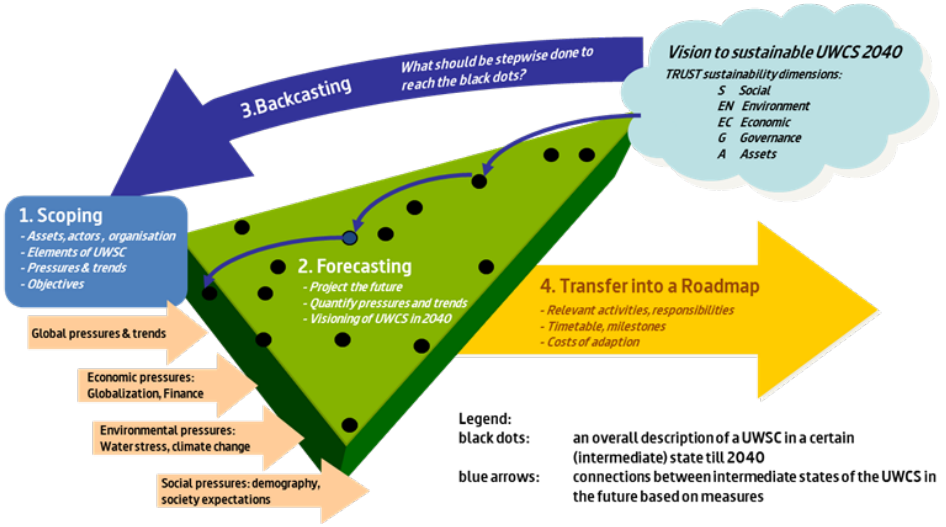
The TRUST roadmap approach considers the classical stages of the roadmapping process (Scoping, Forecasting, Backcasting and Transfer) and allows representatives of the UWCS to identify individual pathways for sustainable water cycle services in the future. Roadmapping offers a common strategic planning process. It links strategy to future needs and actions and (explicitly) incorporates a plan for necessary adaptation measures to be available at the right time. The roadmap process also sets out a creative process for establishing an interdisciplinary planning procedure, which facilitates a lot of expert discussions.

YOUR MOTIVATION TO PARTICIPATE

- Need for a strategic plan and its implementation
- Fine tuning existing visions and strategic concepts
- Dissemination of own sustainability strategies
- Anticipation of non-sustainable developments in advance
- (Re)launch of a systematic discussion on sustainability issues
- Examination of an innovative planning procedure

YOUR EXPERTISE IS WELCOME

- The pathway to a sustainable UWCS requires a fundamental understanding
- The roadmap approach provides a broad foundation and considers existing strategies, plans, studies and visions.
- Stakeholders who are related to urban water management can provide their own experiences for a mutual vision of a sustainable future for UWCS



THE ROLE OF COMMUNICATION AND SYNTHESIS

- A core element for a successful roadmap exercise is the role of communication and exchange between the partners. Participants in the roadmapping process should have an open interest in the transition and adaptation needs of "their" existing UWCS.
- The development of a roadmap supports communication between involved operators, stakeholders, administration and the public, which is necessary for establishing a mutual understanding of the needs of transition, and for supporting a collaborative planning process.
- The implementation of a sustainable future for UWCS within a city or region will be supported by this collective preparation.

CONTACT

Name, institution and contact details of the project leader, roadmap manager and/or the researcher

ROADMAP STAGES AND WORKING STEPS

The methodology of the TRUST roadmap is a multi-stage process. The main stages have the following steps and contents:

1. Scoping
- S1: Identifying relevant actors
- S2: Identifying objectives of the UWCS
- S3: Describing elements of the UWCS
- S4: Summarizing drivers, pressures trends

Scoping defines the scope of analysis in terms of system descriptions and boundaries. It provides a baseline understanding of the UWCS status quo and elements. This stage identifies relevant actors, asset structures, today's status and the impact of existing pressures and trends on the individual UWCS.

2. Forecasting
- F1: Projecting possible futures 2040
- F2: Visioning the UWCS of 2040
- F3: Synthesis

Forecasting creates a vision of the sustainable UWCS of the future – in the TRUST project the reference year is in 2040. It furthermore projects future scenario(s) of the external system and its potential impact on the UWCS. The rationale of forecasting is to project current trends into the future, to anticipate potential barriers and to obtain a perspective for a future scenario in 2040. It is a very creative working step.

3. Backcasting
- B1: Defining intermediate state(s)
- B2: Identifying transitions measures

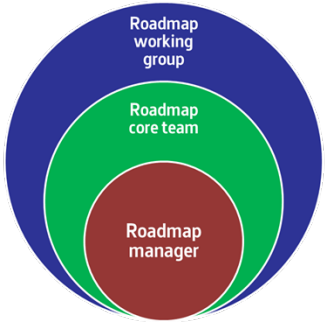
Backcasting looks iteratively back from the envisioned future state of the UWCS and works backwards via (at least one) intermediate state(s). Backcasting identifies the needs for a multi-step transition from today's status quo to intermediate state(s) and from intermediate state(s) to achieve the future desired state (vision 2040).

4. Transfer
- TR1: Evaluating transfer action fields and their measures
- TR2: Creating the roadmap

The stage of **Transfer** translates the identified measures into transfer action fields. This includes chronological information, recommendations with milestones, responsible actors and so on. Identified transfer action fields and associated transition measures will be documented in the final document called "roadmap".

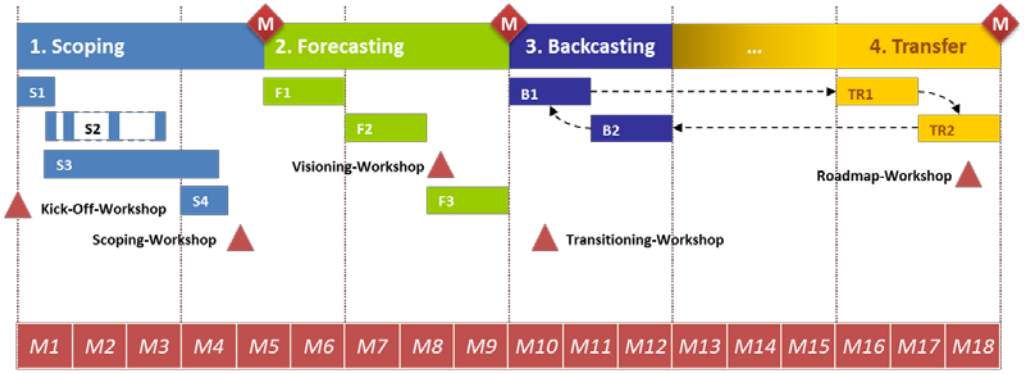
ORGANISATION OF THE ROADMAP WORK

For developing a roadmap a **roadmap core team** must be installed as a working group. The roadmap core team should consist of 3 to 6 members, including relevant actors of the city/utility. The roadmap core team should be managed by a project leader who acts as **roadmap manager**. The roadmap core team has the task of applying and demonstrating the roadmap exercise in very close collaboration with the city/ utility. The roadmap core team plus the actors from the cities comprise the **roadmap working group**.



The figure below suggests a **timeline** for the roadmap stages and their duration during the roadmap process.

The roadmap process should include **five workshops** which are scheduled according to the stages and milestones. These workshops prepare milestones that are located at the end of each stage. Each stage provides results to be incorporated in the next stage/working step.



Template S1_2: Actors management document

At the regional and pilot city level the roadmap work starts with the identification of the relevant actors and stakeholder groups, which represent the main UWCS sectors in the region or city to be investigated. The meaningful group (roadmap working group) should consist of an interdisciplinary mix of people, which are capable of achieving the roadmap goals, and have some influence on UWCS decision making. For more detailed suggestions, please see chapter 5.1.1 (S1: Identifying relevant actors) in the roadmap guideline.

You can start the analysis of actors and stakeholders by using this general list without any ranking or classification. Please check if all water sectors (water supply, wastewater, storm water, others) are identified for your area of analysis. Relevant stakeholders can have a crucial role in future working steps, although some stakeholders may not be crucial in the first stages of the roadmapping process. The proposed 'actors management' document should provide additional advice and information about the identified actors, their bridges/connections to other relevant sectors and stakeholders, their problem solving capacity or their decision making capacity and responsibility. Furthermore it is important to mark in which stage of the roadmapping process the actors should be involved; while it is likely that many actors will participate through the whole roadmapping process, some may be only partially involved.

UWCS sectors and institutions in the region/pilot city	Actor(s)	Name and contact data of person/representative	Mediator/ bridges (yes, no); type of mediator	Problem-solving-capcity/decision competence	Roadmap involvement: Scoping Foecasting, Backcasting, Transfer	Task description in roadmapping
Regional water supply utility						
Regional wastewater service / storm water management						
Other relevant authorities, regulators or public officials (different policy sectors at different policy levels)						
Economy - firms, business representatives (e.g. service companies for water supply, waste water treatment, energy						

UWCS sectors and institutions in the region/pilot city	Actor(s)	Name and contact data of person/representative	Mediator/ bridges (yes, no); type of mediator	Problem-solving-capcity/decision competence	Roadmap involvement: Scoping Foecasting, Backcasting, Transfer	Task description in roadmapping
production, farming, fishing…)						
Administration, political decision makers (local and regional)						
Interest groups (different sectors, e.g. farmers union, chamber of commerce, …)						
Non-government organisations and civil activist (water related associations, environmental NGO's, etc.)						
Researchers (fields such as natural and social science, engineers)						
Engineering and consulting offices						
Media, Journalists						
Other relevant authorities and public officials						
Others (according to local specifics)						


Pool of slides
Developing roadmaps for UWCS transition
> Day. Month. Year <
> Location <
> Referent, Institution <
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SUSTAINABILITY IN THE TRUST PROJECT

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Sustainability in the TRUST project

- UWCS sustainability assessment includes the dimensions of
  - Social (S)
  - Environment (En)
  - Economic (Ec)
  - Governance (G)
  - Assets and resources (A)
- Assessment is made operational by critically and carefully chosen set of performance metrics/indicators
- Performance metrics/indicators may be quantitative and qualitative to account for the particular challenges

⇨ TRUST offers different assessment approaches/tools for the cities

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Demonstration of roadmaps in TRUST

The "generic template for an integrated UWCS roadmap" will be demonstrated in the TRUST pilot areas

WP 61: Demonstration cluster '**water scarcity**'
Task 61.1 Demonstrate the UWCS roadmapping process
(IST, NTUA, UNIBO, ADP, IAG)

WP 62: Demonstration cluster '**green cities**'
Task 62.1 Demonstrate the UWCS roadmapping process
(IWW, KWR, HWW, SNBV, WATNL)

WP 63: Demonstration cluster '**urban peri-urban**'
Task 63.1 Demonstration the UWCS roadmapping process
(VERI, UNEXE, SINTEF, LNEC, ADP, SW, OW, ANB)

WP 6.4:Exchange of experiences on TRUST cities platforms

⇨ **Use the guideline/templates developed in WP13**

⇨ **Apply and demonstrate the roadmap exercise**

⇨ **Implement the roadmap in the planning and policies of the cities**

TRUST „toolbox" on sustainability

Self Assessment Tool (WP 31)

- Assessment of any city's actual path to sustainable UWCS: "Is the city on track for 2040?"

Baseline Assessment (WP 11)

- Quick scan of TRUST cities for adaptation needs: "Where are we now?"

Roadmap (WP 13)

- **Finding the individual pathway to sustainable UWCS focussing on individual/regional/local adaptation needs and ambitions**

Metabolism model (WP 33)

- Assessing the impact of adaptation measures

STRATEGIC PLANNING VIA ROADMAPS

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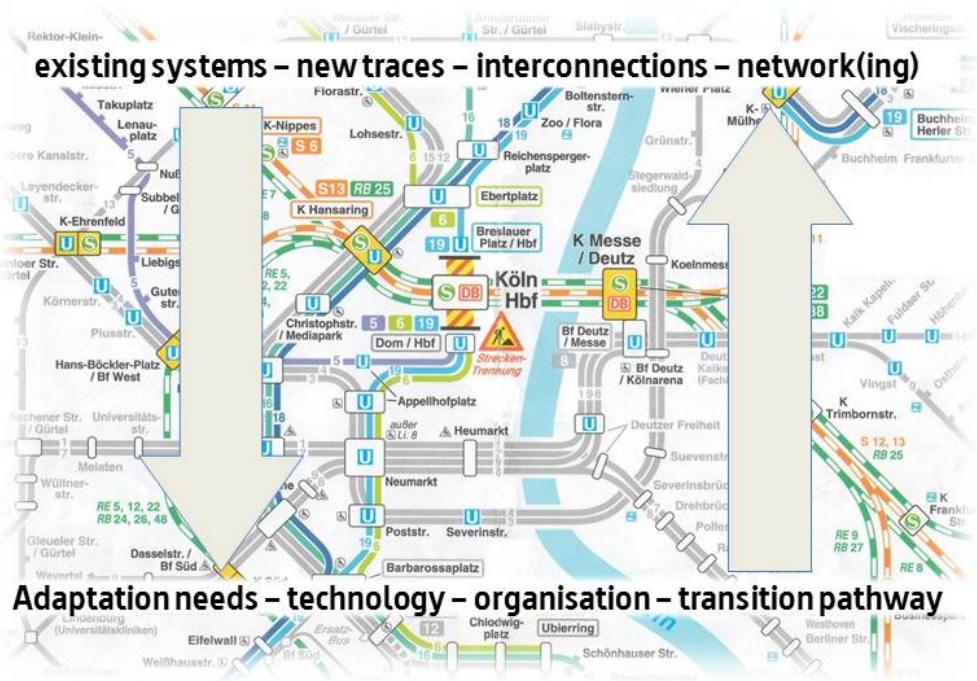
Roadmapping

existing systems – new traces – interconnections – network(ing)



Adaptation needs – technology – organisation – transition pathway

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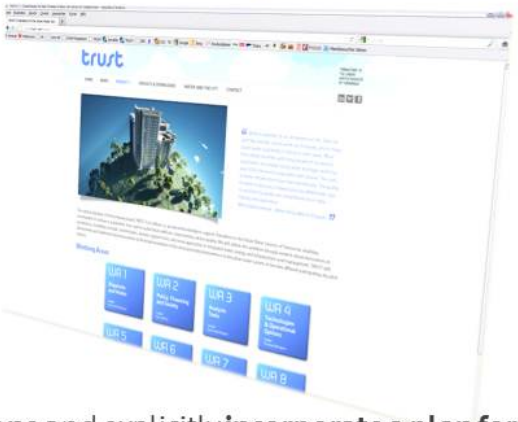
Definition: What is meant by a "roadmap"?

"The central objective of the European project TRUST is to deliver co-produced knowledge to support Transitions to the Urban Water Services of Tomorrow, enabling communities to achieve a sustainable, low-carbon water future without compromising service quality. We will deliver this ambition through research driven innovations in governance, modeling concepts, technologies, decision support tools, and novel approaches to integrated water, energy, and infrastructure asset management. TRUST will demonstrate and legitimize these innovations by the implementation of the most promising interventions in the urban water system of the nine different participating city pilot regions."



- **Roadmaps link strategy to future actions** and explicitly **incorporate a plan for needed capabilities and technologies** to be **in place at the right time**.
- A roadmap **enables to plan and implement the path to achieve desired objectives**, while serving as excellent **communication tool**.
- The roadmapping process should consider 'best practices' of the involved institutions.

Why this guideline?

- Character of an „user manual" – DoW: structural document (!)
  - Guidance to methodology of the roadmapping process
  - Guidance with respect to organisational issues
  - Guidance with UWCS related topics (structure of information & data)
- Guideline is supplemented by the guideline of WP12 (Guidelines for Urban Water Strategic Planning inspiration from theories & best practices)
- The roadmapping procedure can use information from other TRUST working activities
  - Pressures and trends analysis
  - Baseline assessment
  - Technology options ...

Motivations for adapting a roadmap approach

- Need for a strategic plan and its implementation
- Fine tuning of existing visions and strategic concepts
- Dissemination of own sustainability strategies
- Underline (existing) own concepts with sustainability PI's
- (Re)launch a systematic discussion on sustainability issues
- Anticipate non-sustainable developments in advance
- Examine an innovative planning procedure
- ...

Many reasons...

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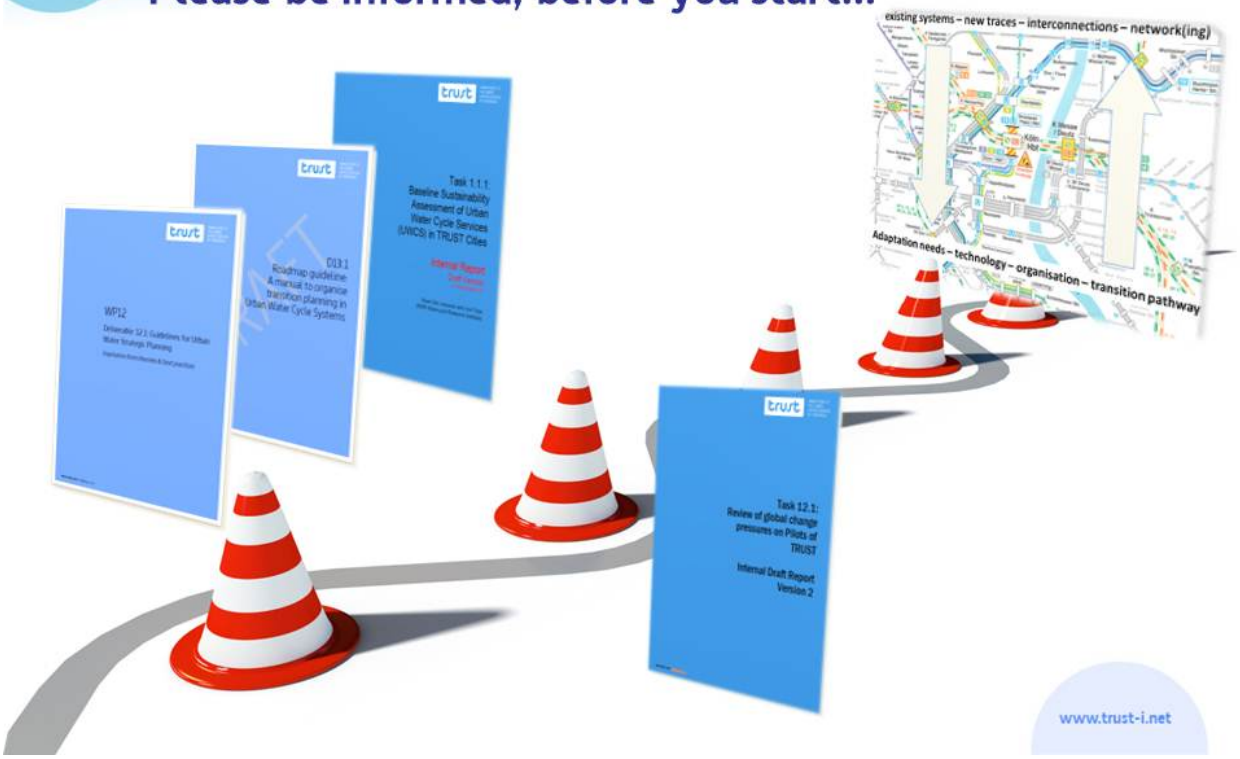
Please be informed, before you start...



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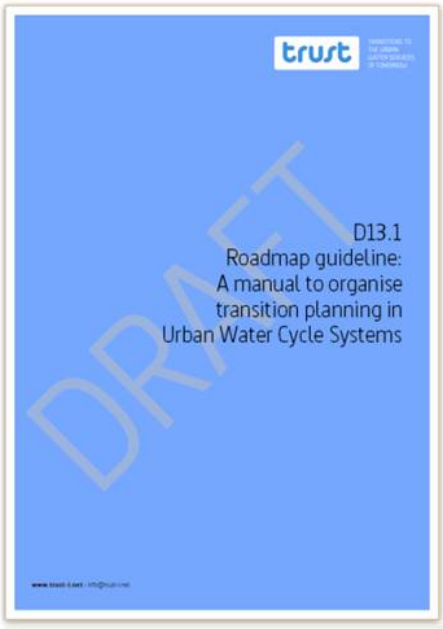
Structure of the roadmap guideline



Templates provided

APPENDICES

e. g.

Scoping

Template S1_1: Factsheet

Template S1_2: Actors management document

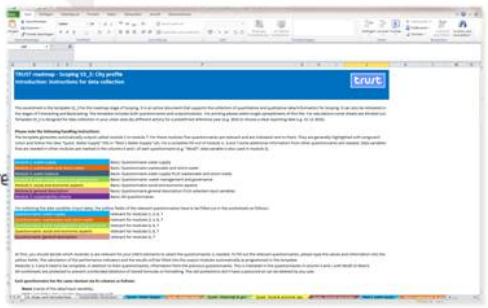
Template S1_3: Pool of slides for workshops

Template S2_1: Objective map - *documented in the guideline (page 27)*

Template S2_2: One-to-one-interviews

Template S3_1: Confidentiality Agreement and Code of Conduct

Template S3_2: City profile (incl. questionnaire)



Template S4_1: Example for trends and pressures (internal TRUST report)

Forecasting

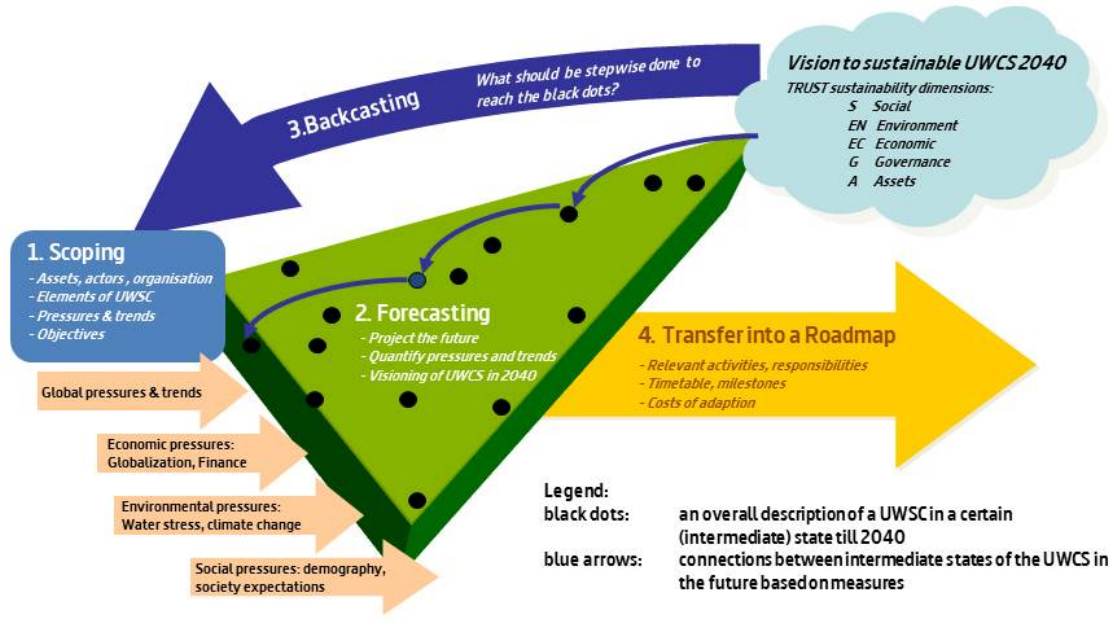
Template F1_1: Examples of factors to be assessed in projecting different future *documented in the guideline (page 37)*

Transfer

Template TR1_2: priority plan – *documented in the guideline (page 50)*

Template TR2_1: Basic structure of the Roadmap – *documented in the guideline (page 52)*

TRUST ROADMAP APPROACH



SOURCE: Stages of the roadmap process for UWCS transition (modified after Grêt-Regamey, A./Brunner, S. H. (2011)

Stages in the TRUST roadmap

1. Scoping
- S1: Identifying relevant actors
- S2: Identifying objectives of the UWCS
- S3: Describing elements of the UWCS
- S4: Summarizing drivers, pressures trends

2. Forecasting
- F1: Projecting possible futures 2040
- F2: Visioning the UWCS of 2040
- F3: Synthesis

3. Backcasting
- B1: Defining intermediate state(s)
- B2: Identifying transitions measures

4. Transfer
- TR1: Evaluating transfer action fields and their measures
- TR2: Creating the roadmap

Different steps in a roadmap stage

1. Scoping
- S1: Identifying relevant actors
- S2: Identifying objectives of the UWCS
- S3: Describing elements of the UWCS
- S4: Summarizing drivers, pressures trends

2. Forecasting
- F1: Projecting possible futures 2040
- F2: Visioning the UWCS of 2040
- F3: Synthesis

3. Backcasting
- B1: Defining intermediate state(s)
- B2: Identifying transitions measures

4. Transfer
- TR1: Evaluating transfer action fields and their measures
- TR2: Creating the roadmap

- Stages of the TRUST-roadmap will be described in the guideline
- Each stage has different working steps (S1-S4; F1-F3; B1-B2; TR1-TR2)
- Each working step is systematically described by key aspects
  - T: What is the TARGET?
  - M: What are the METHODS used?
  - P: Who will PARTICIPATE?
  - D: What DATA are relevant?
  - R: What format/design can have the REPORT/RESULT?
  - O: Where will the OUPUT be used as input in the TRUST roadmap?
  - TL: Definition of the suggested start and endpoint (TIMELINE)

Overview of instruments & operational recommendations for each working step

e.g. Scoping

S3 Describing elements of UWCS

Key aspects	*S3 Overview of instruments and operational recommendations*
Target	• Provide information about the elements of UWCS and water related components incl. asset structures and responsibilities of actors/institutions related to the pilot cluster
Methods	• Comply with rules of confidentiality, if needed (template S3_1) • Data collection by the actors using the questionnaire (template S3_2) • Support during data collection will be provided by roadmap core team

Participants	• Actors (external participants) identified in S1
	  • provide data and information and fill out the questionnaire
	  • decide, what information will be made available for the pilot demonstration
	• Roadmap core team
	  • provides support to fill out the questionnaire
	  • explains data classifications and definitions
	  • provides results of the data collection via reports

Data	• Data variables and context information, mostly documented in the IWA performance indicator system • Each question is clearly defined in the questionnaire • The questionnaire calculates performance indicators in a separate spread sheet and provides illustrations for the report
Report	• UWCS city profile incl. qualitative and quantitative sustainability aspects, structured into five modules: a general descriptions, factsheet water supply, factsheet wastewater and storm water, water management and governance and sustainability PI's.
Output	• Overview about the elements of the city's UWCS, action fields and relevant actors of the city • Direct input to S4 and F1, F2
Timeline	• Start: month 1 Duration: 4 to 6 weeks (TRUST dem. cluster) Duration: max. 3 months (general application)
Templates	• Template S3_1: Confidentiality Agreement and Code of Conduct • Template S3_2: City profile (incl. questionnaire)

Scoping – Defining the search area and target setting

1. Scoping
   - S1: Identifying relevant actors
   - S2: Identifying objectives of the UWCS
   - S3: Describing elements of the UWCS
   - S4: Summarizing drivers, pressures trends

Scoping...

- identifies relevant actors: people/representatives of institutions, who are competent to contribute and are crucial for a successful implementation
- provides a baseline understanding of today's UWCS
- defines the scope of analysis (system description, boundaries)
- identifies relevant actors, asset structures, today's status and impact of existing drivers, pressures and trends
- collects information and knowledge about the objectives and elements of UWCS
- Kick-off (if needed), Scoping workshop (probably combined with Forecasting workshop)

Objectives show important challenges related to the UWCS. They are different in each city/region and can evolve from current problems or challenges in urban water cycle management.

Drivers could be caused by structural or population change, increasing urbanisation, strong financial restrictions, flooding risks, competitive water usage, condition of the assets and others. Also strategic ambitions such as "green city", "innovative city" or "climate change adapted city" can be an objective.

⇨ **Reference point against that future developments will be adressed**

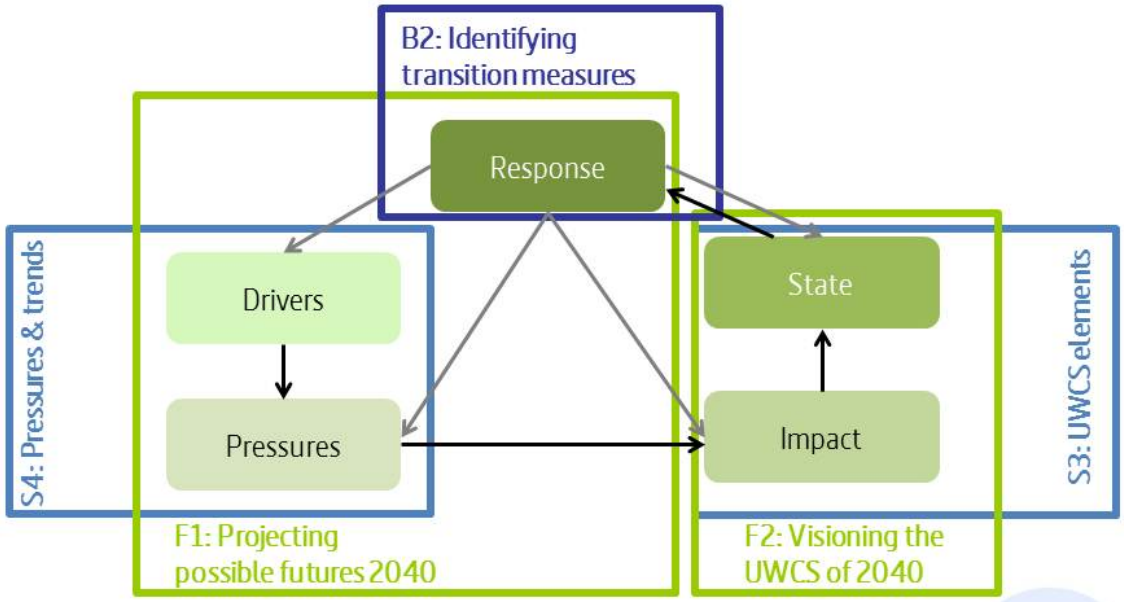
Sustainability PI's are available – a "tool box"

Sustainability dimensions	Sustainability objectives	Sustainability criteria	No of PI's	No of PI's
Social	S1) Access to urban water services	S11) Service coverage	9	20
	S2) Effectively satisfy the current users' needs and expectations	S21) Quality of service	7	
		S22) Safety and health	2	
	S3) Acceptance and awareness of UWCS	S31) Affordability	2	
Environment	En1) Efficient use of water, energy and materials	En11) Efficiency in the use of water (including final uses)	8	23
		En12) Efficiency in the use of energy	6	
		En13) Efficiency in the use of materials	2	
	En2) Minimisation of other environmental impacts	En21) Environmental efficiency (life cycle emissions to water, air and soil)	7	
Economic	Ec1) Ensure economic sustainability of the UWCS	Ec11) Cost recovery and reinvestment in UWCS (incl. cost financing)	4	13
		Ec12) Economic efficiency	3	
		Ec13) Leverage (degree of indebtedness)	4	
		Ec14) Willingness to pay (accounts receivable)	2	
Governance	G1) Public participation	G11) Participation initiatives	2	10
	G2) Transparency and accountability	G21) Availability of information and public disclosure	1	
		G22) Availability of mechanisms of accountability	4	
	G3) Clearness, steadiness and measurability of the UWCS policies	G31) Clearness, steadiness and measurability of policies	2	
	G4) Alignment of city, corporate and water resources planning	G41) Degree of alignment of city, corporate and water resources planning	1	
Assets and Ressources	I1) Infrastructure reliability, adequacy and resilience	I11) Adequacy of the rehabilitation rate	2	20
		I12) Reliability and failures	3	
		I13) Adequate infrastructural capacity	9	
		I14) Adaptability to changes (e.g. climate change adaptation)	1	
	I2) Human capital	I21) Adequacy of training, capacity building and knowledge transfer	2	
	I3) Information and knowledge management	I31) Quality of the information and of the knowledge management system	3	

Number of PI's for Scoping	86
General information (context info) for Scoping	38
Total number of PI's and general information	**124**

- TRUST sustainability definition is implemented in the roadmap approach
- Definitions are similar to the baseline assessment definitions for selected PI's
- Most of the PI's are IWA-PI's (water supply, waste water)
- PI's can be used for Scoping and Forecasting

DPSIR causal framework



Qualitative or quantitative data/information?

It depends ...

- on existing ("official") information
  - plans, maps, reports, etc.
  - agendas, strategies and developments in the city
- on the availability of data with respect to relevant elements/objectives
- on time of participating institutions and their representatives
- accurateness of existing visions (desired futures of UWCS) in the city

but: Concrete numbers (e.g. PI's) can

- provide transparency about the facts of the UWCS
- help to define goals and intermediate states
- help to identify practicable measures

Forecasting – Envisioning UWCS in a future world

2. Forecasting
   F1: Projecting possible futures 2040
   F2: Visioning the UWCS of 2040
   F3: Synthesis

Forecasting...

- undertakes to anticipate how the environment might change and tries to envision the future state of the UWCS
- comprises both
  - a projection of the possible future of the external system (DESTEP) and
  - a vision of the desired state of the UWCS in the sphere of influence of the utilities/cities
- Working programme (e.g. based on parameters of Scoping – S3 Elements of UWCS)
  - Extrapolate current trends into the future; anticipate new future trends
  - Develop a prospective view for realistic but still ambitious vision – having regard to sustainability criteria/indicators
- Forecasting workshop (probably combined with Scoping workshop), Visioning workshop

⇨ **Ambition and vision: generate a consolidated vision with prioritised ambitions, summarise targets for performance**

Backcasting – Projecting possible visions back into present

3. Backcasting
B1: Defining intermediate state(s)
B2: Identifying transitions measures

Why "Backcasting"
The aim of the Backcasting is to develop a "story" from the future to the present. A definition of Backcasting is given by the World Health Organization (WHO) glossary: "Moving step-wise back in time from a future scenario to the present in order to identify the decisions and actions that must be taken at critical points if the scenario is to be achieved."

Backcasting...

- characterises how a UWCS might shift from its present state to the visionary endpoint
  - Identify and describe the intermediate state(s)

    Generate a cyclical process that follows the Delphi approach to harmonise (initial) intermediate state descriptions developed by the RM core team
  - Identify action fields/transition measures to facilitate transitions from state to state (short/medium-term and long-term)

    Circulate an initial set of measures corresponding to each component of UWCS and intermediate state and obtain feedback from the RM working group
- Transitioning workshop

⇨ **Intermediate states are identified; visualise gaps; action fields and first transition measures are proposed**

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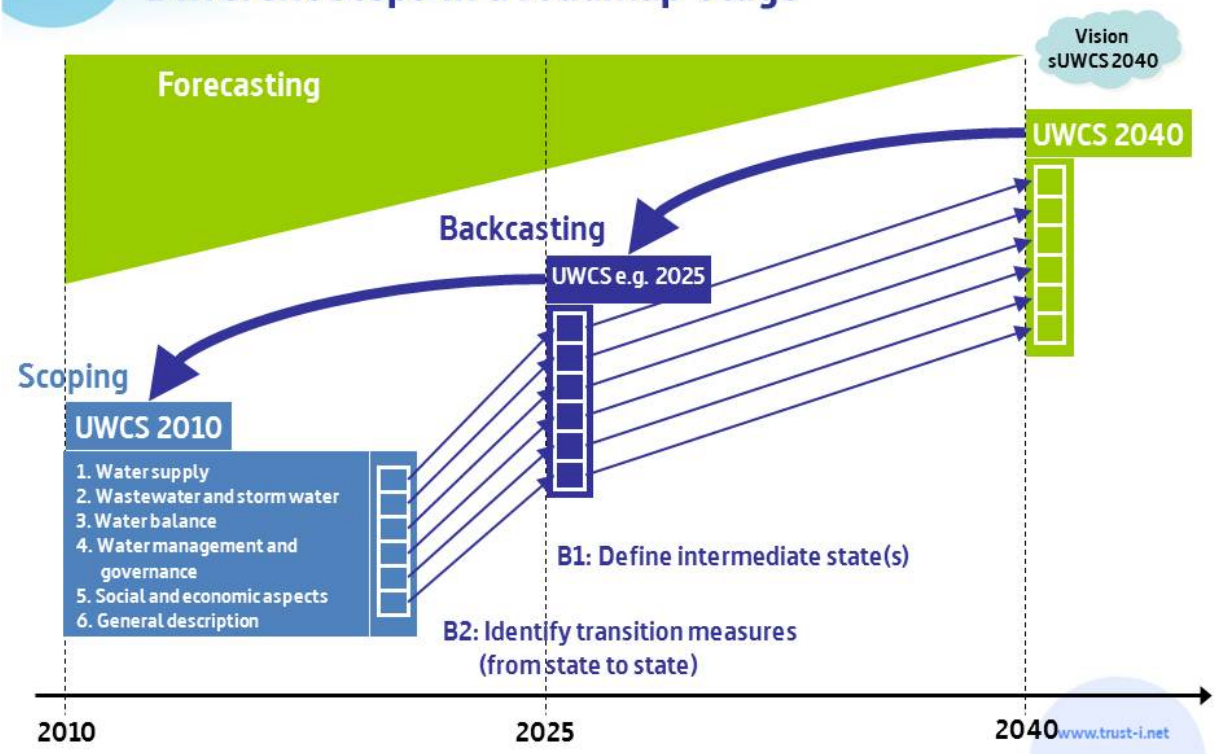
Different steps in a roadmap stage



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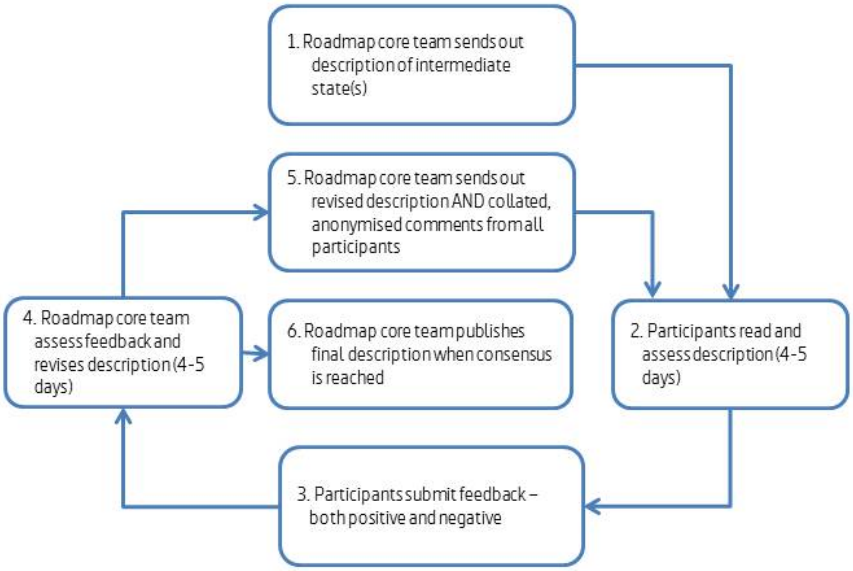
Delphi-style feedback approach for B1



Transfer – Creating the roadmap

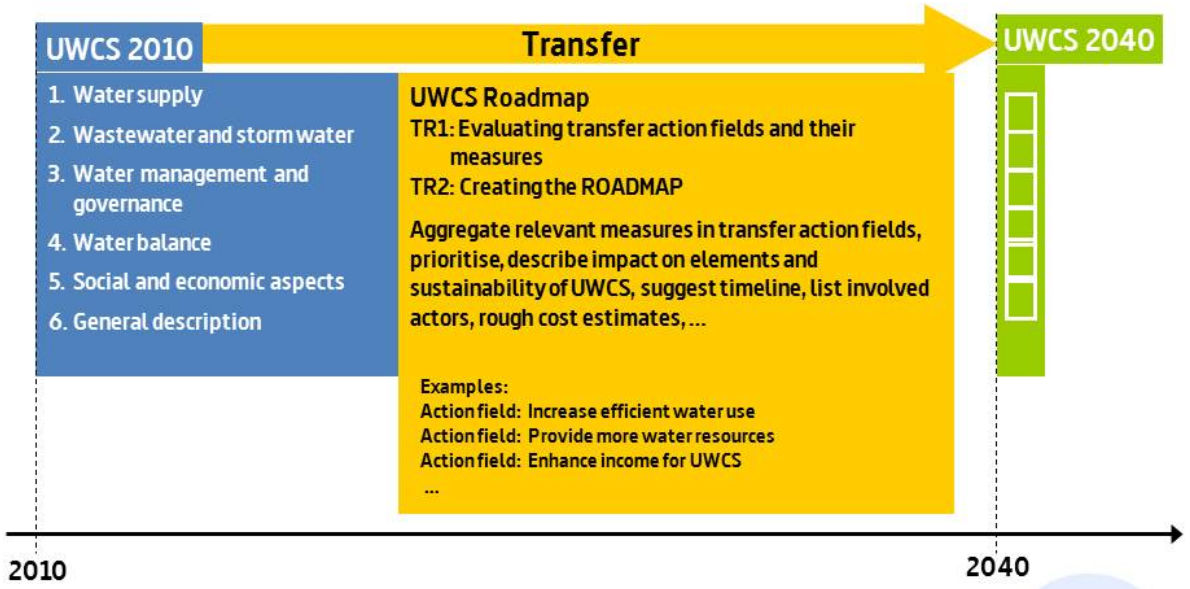
4. Transfer
TR1: Evaluating transfer action fields and their measures
TR2: Creating the roadmap

Transfer...

- Evaluate action fields and their measures to clarify critical issues ("traffic-lights")
- Design a priority scheme/plan with implementation needs
  - Time scale, milestones, responsibilities, rough cost estimate
  - Risks and prospects, stumbling blocks for implementation
- Transfer the results into a final summary
- Roadmap workshop, final review from diverse perspectives

⇨ **Roadmap: Final reporting document as a "living" document ("open folder")**

Definition of transfer action fields (TR1), and describing measures and development steps in each action field (TR2)

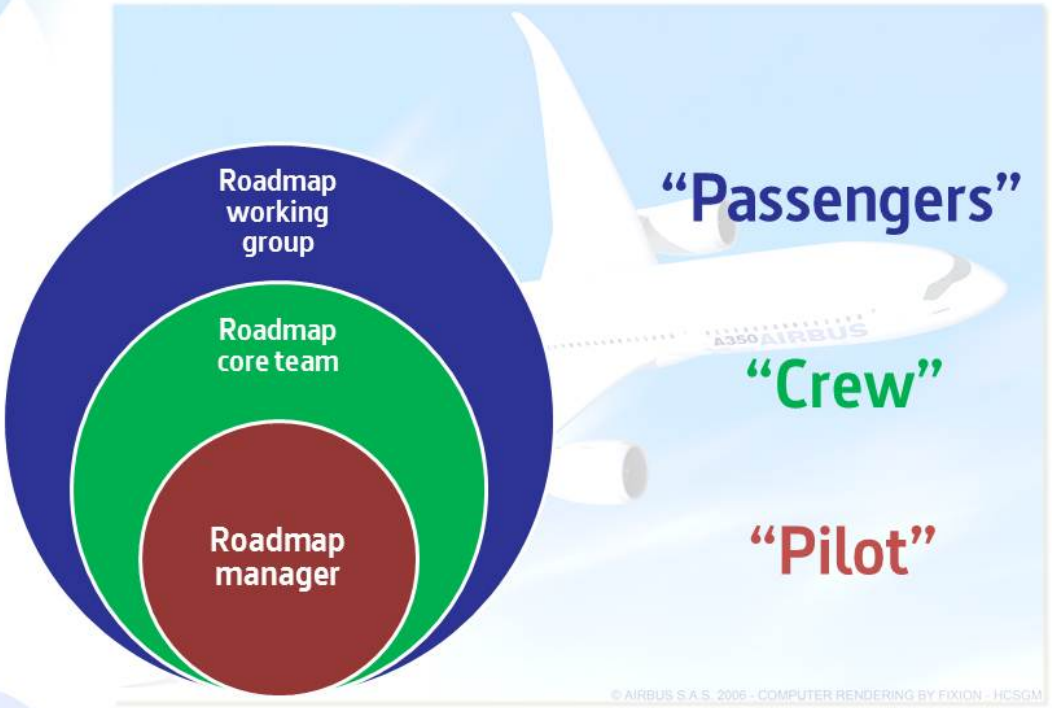


Possible contents of the roadmap

Template_TR2_1: Basic structure of the roadmap for the UWCS

1. Scoping the today's UWCS
   a. Actors management document *(template S1_2)*
   b. UWCS elements and objectives *(template City profile of five modules S3_3)*
   c. Relevant pressures and trends *(Results of the Scoping-Workshop)*
2. Visioning the UWCS of 2040
   a. Vision 2040
   b. Separate sectors and their vision / objectives *(Results of the Visioning-Workshop)*
3. Develop the measures with Backcasting
   a. Measures and transfer action fields *(template TR1_3 Prioritised action plan)*
   b. Priorisation of transfer action fields separately *(Results of Roadmap-Workshop)*
4. Illustration and summary
   a. Create the roadmap *(template aspects for the structure of the roadmap)*
   b. Sustainability dimensions
5. Conclusions
6. Appendix

Organisation of the roadmap work

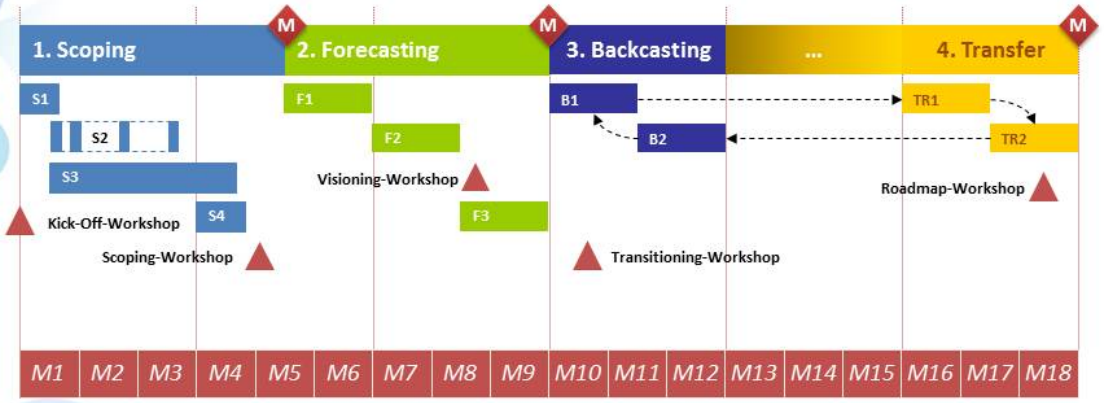


How to start your work – some aspects might help

- Please start with the proposed topics and expected actors identification to check if all relevant urban and water sectors are included. (**=> today**)
  - Identify relevant actors in each city
    - that will be informed, but that aren't member of the roadmap working group.
    - Identify their knowledge, capacity, decision making competence,
    - Document it in an "living" actors management document (e.g. template S1_2)
  - Spend some thoughts on the aspect if any actor's role will change over time.
    - e.g. some actors may have no significant role at the beginning, but their role may become more important/active as the work progresses
    - Establish contacts to relevant persons/representatives after today's workshop
- Have exchange about a suitable roadmap process in each cluster/city (**=> today**)

Timeline of the roadmap exercise

Draft timeline general application



CONCLUDING REMARKS

Concluding remarks (I)

- Planning and implementing transitions of UWCS – from research to practical application
  - The roadmap guideline provides descriptions how transition strategic planning efforts in UWCS can be organised
  - The guideline is designed for direct practical use (in general)
  - The guideline provides different ways for analysis: ^qualitative, quantitative – it depends on your needs to choose the appropriate way
  - The TRUST roadmap approach will be tested in the demonstrations

Source: JPT Consulting

Concluding remarks (II)

- Communication and synthesis
  - Roadmap work is a „creative" process (interdisciplinary planning procedure)
  - Adapting a roadmap supports the interaction between involved partners
    - for a mutual understanding of the needs of transition
    - for a collaborative planning process
  - Core success factors
    - partners should have an open interest in transition and adaptation of „their" UWCS
    - communication with and between the partners/participants

Source: JPT Consulting

Please, communicate with involved institutions...

The European Commission is acknowledged for funding TRUST in the 7th Framework Programme under Grant Agreement No. 265122

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 265122.
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Template S2_2: One-to-one-interviews

In working step S2 of Scoping (S2: Identifying objectives) the roadmap core team can arrange interviews with important actors to define the cornerstones and the major trend lines of the vision of UWCS. This basic information will support the follow-up in working step S3 of Scoping (S3: Identifying elements). S2 and S3 are designed to run in parallel. The output of S2 will be an overview of objectives for urban water cycle transition (such as maintaining drinking water quality, reducing interruptions and energy consumption, introducing sustainable water tariffs and so on.).

Existing information, knowledge and perspectives on transition needs will be collected by the roadmap core team via research activities, analysis of official reference documents like reports, statements or existing studies, or (if needed) via individual interviews with the actors identified as important participants/stakeholders in S1. The core team can use this supporting questionnaire as a proposal for structuring their interviews and to start the identification of relevant objectives.

Supporting questions:

- What are relevant topics (such as water resources availability, water quality, interruptions, service quality storm water management, financial issues, demographic changes, …)?
- What are the objectives associated with these topics (such as maintaining good water drinking quality, reducing interruptions, improving access to urban water services and so on)?
    - Are these objectives prioritized?
    - If so, what are the criteria?
- What are drivers for the objectives (such as legal requirements, demographic changes or energy optimisation)?
- Are there any existing efforts or plans to achieve these objectives?
    - If so, what?
    - Are they already completed or still underway?
    - Why should they be taken into consideration?
- Are there responsible institutions/persons for the relevant topics and their objective (such as the water utility, government and so on)
    - Do you already have experience with this actor/ institution?
    - What experiences are these?
    - Are there any other/additional important actors for this relevant topic/objective?
- Do knowledge gaps exist from your point of view?
    - If so, what gaps do exist from your perspective?
    - Do you see any other barriers/risks to this objective?
- What kind of uncertainties do you expect from any possible future trend? What trends do you take into consideration (such as demographic changes, climate change or high energy prices…)?
    - Are there pre-defined, existing scenarios developed by other institutions? (e.g. CO2 emissions modeling related to climate change)
    - Have you already worked with IWA performance indicators?
- Is there anything else that we have not addressed, which you would consider important in terms of strategic planning of sustainable urban water cycle systems?

<To be completed by the roadmap core team>

Template S3_1: Confidentiality Agreement and Code of Conduct

Roadmapping – the process of Scoping, Forecasting, Backcasting and Transfer – is an instrument for strategic planning and provides transparency in strategies, planning and measures from different types of institutions and scientific disciplines. TRUST developed this code of conduct to

- guide roadmapping efforts
- advance the professionalism and effectiveness of roadmapping
- help protect its members from harm.

This code of conduct is adapted from the Code of Conduct used by APQC for Benchmarking activities. Adherence to this code will contribute to an efficient, effective and innovative roadmapping exercise.

1 Principle of Confidentiality

- Treat roadmap findings as confidential to the individuals and organisations involved. Such information must not be communicated to third parties without the prior consent of the Benchmarking partner who shared the information. When seeking prior consent, make sure that you specify clearly what information is to be shared and with whom.
- Neither the roadmap team nor the utility may distribute results of the roadmap work without the permission of the participating companies. The _____ (in the following: "roadmap team") [Insert the name of all institution that belong to the roadmap core team. (Please, delete these comments after filling in)] will treat all information and data given by the _____ (in the following "actor") [Insert the name of the participating actor for the roadmap procedure (Please, (delete these comments after filling in] as strictly confidential, unless they are already in the public domain.
- Adjustments to this non-disclosure agreement may be decided by the members of the roadmap working group

2 Principle of co-operation and communication

- Demonstrate commitment to engagement with the roadmap procedure by being prepared prior to participating in the roadmap working group.
- Make the most of your roadmap partner's ("actors" and "roadmap core team") time by being fully prepared for each exchange. Use roadmap contacts designated by the partner organization if that is its preferred procedure.
- Help your roadmap partners by providing them information needed for the roadmap work in a co-operative and transparent way. Communicate fully and early in the relationship to clarify expectations, avoid misunderstanding and establish mutual interest in the roadmap exchange.
- Respect the corporate culture of partner organisations and work within mutually agreed procedures.
- Publications are to be agreed with all members of the roadmap working group.

3 Principle of Legality

- Take legal advice (if needed) before participating in the roadmap working group and before providing information or data.
- Avoid discussions or actions that could lead to or imply an interest in restraint of trade, market and/or customer allocation schemes, price fixing, dealing arrangements, bid rigging or bribery. Neglect any activity in terms of dispersion of information by any means that could be interpreted as improper, including the breach, or inducement of a breach, of any duty to maintain confidentiality.

Any participating company/institution ensures the content of the non-disclosure agreement at the start of the roadmap procedure.

Place, Date	Authorized signatory of the participating utility/company/institution
	Actors stamp

Template S3_2: City profile

TRUST roadmap - Scoping S3_2: City profile
Introduction: instructions for data collection

This excelsheet is the template S2_3 for the roadmap stage of Scoping. It is an active document that supports the collection of quantitative and qualitative data/information for Scoping and provides the information in so called output modules. It can also be retreated in the stages of Forecasting and Backcasting. The template includes both questionnaires and output modules. For printing the spreadsheets of this file are formatted into DIN A4 landscape format. The calculations of performance indicators (PI's) are blinded out in unvisible sheets.
Template S3_2 is designed for data collection in your urban area (by different actors) for a predefined reference year (e.g. 2010 or choose a clear reporting date e.g. 31-12-2010).

Please note the following handling instructions:
The template generates automatically outputs called module 1 to module 7. For these modules five questionnaires are relevant and are indicated next to them. They are generally highlighted with congruent colors and follow the idea "Quest. Water Supply" fills in "Mod 1 Water Supply" etc. For a complete fill-out of module 3, 6 and 7 some additional information from other questionnaires are needed. Data variables that are needed in other modules are marked in the column J of each questionnaire (e.g. "Mod3": data variable is also used in module 3).

Module 1: water supply	Basis: Questionnaire water supply
Module 2: wastewater and storm water	Basis: Questionnaire wastewater and storm water
Module 3: water balance	Basis: Questionnaire water supply PLUS wastewater and storm water
Module 4: water management and governance	Basis: Questionnaire: water management and governance
Module 5: social and economic aspects	Basis: Questionnaire social & economic aspects PLUS selected input variables
Module 6: general description	Basis: Questionnaire general description PLUS selected input variables
Module 7: sustainability criteria	Basis: All questionnaires

For collecting the data variables (Input data), the yellow fields of the relevant questionnaires have to be filled out in the worksheets as follows:

Questionnaire: water supply	relevant for modules 1, 3, 6, 7
Questionnaire: wastewater and storm water	relevant for modules 2, 3, 6, 7
Questionnaire: water management and governance	relevant for modules 4, 6, 7
Questionnaire: social and economic aspects	relevant for modules 5, 6, 7
Questionnaire: general description	relevant for modules 5, 6, 7

At first, you should decide which module(-s) are relevant for your UWCS elements to select the output module(-s) needed. To fill out the relevant questionnaires, please type the values and information according to the definitions provided into the yellow fields. The calculation of the performance indicators and the results will be filled into the output modules automatically as programmed in the template. To complete the modules 3, 5 and 6, in addition to the corresponding questionnaires, some information from previous questionnaires is needed. This is indicated in the questionnaires in column J ("Also required for..." with an indication of e.g. "Mod5" or "Mod6".

All worksheets are protected to prevent unintended deletions of stored formulas or formatting. The cell protections don't have any passwords and can be deleted by any user.

Each questionnaire has the same stucture via its columns as follows:

Derivation of the IWA PI (PI from IWA-PI system water supply (**WS**) or from IWA-PI system wastewater (**WW**))
IWA-No. or TRUST No. (unique codification of the data/input variable; TRUST-No. are indicated with "(TRUST)" and are developed for this project. They are not part of existing IWA-PI systems)
Name (name of the data/input variable),
Definition (the definition of the data variable)
Used for (provides information about the use of the data in PI calculations)
Link to other WP in TRUST (provides information about the use of the data in other TRUST assessment approaches, e.g. baseline assessment, self-assessment tool)
Unit (unit of the data variable: for example km or €)
Input Data (THIS FIELD HAS TO BE FILLED OUT BY YOU WITH DATA/INFORMATION according to its definition)
A**lso required for...** (indicates for which extra module the input variable is needed for)

To start the data collection, some very basic information is needed to name the city, cluster and assessment period:

IWA-PI	IWA-No. or TRUST No.	Name	Definition	Used for	Link to other WP in TRUST	Unit	Input Data
	NOTC (TRUST)	Name of the City	Name of the Pilot City			Text	
	CC (TRUST)	City Cluster	Please select a cluster: green city, urban / peri-urban, scarcity or none			List	
WS	H1	Assessment period water supply	The IWA PI system aims to be used annually and therefore it is highly recommended that the year is used as the reference assessment period. However, since the undertakings may need to track the evolution of their performance within the year, the PI system is prepared to accommodate other assessment periods for most indicators. In this case, and in order to ensure unit coherence and allow for PI comparison, all the PI expressed in terms of time are formulated in such a way that the values calculated for other assessment periods are converted into annual values. Attention is drawn to the fact that the behaviour of most variables is not uniform during the year, due to random or seasonal effects, or to activity planning. All comparisons based on PI assessed from non-annual data must take this fact into consideration, in order to avoid any bias.	diverse PI's		days per period	
WW	wH1	Assessment period waste water	The IWA PI system aims to be used annually and therefore it is highly recommended that the year is used as the reference assessment period. However, since the undertakings may need to track the evolution of their performance within the year, the PI system is prepared to accommodate other assessment periods for most indicators. In this case, and in order to ensure unit coherence and allow for PI comparison, all the PI expressed in terms of time are formulated in such a way that the values calculated for other assessment periods are converted into annual values. Attention is drawn to the fact that the behaviour of most variables is not uniform during the year, due to random or seasonal effects, or to activity planning. All comparisons based on PI assessed from non-annual data must take this fact into consideration, in order to avoid any bias.	diverse PI's		days per period	

TRUST roadmap - Scoping S3_2: City profile
Elements of UWCS and their sustainability dimensions

The data collection itself incorporates the TRUST sustainability approach with its five dimensions: social, environmental, economic, governance and assets. The number of performance indicators used for each sustainability dimension and its assessment is shown in column "No of PI's". The sustainability dimensions have objectives and they have corresponding sustainability criteria. Sustainability dimensions, objectives and criteria are described in detail in TRUST WP 11.

Sustainability dimensions	Sustainability objectives	Sustainability criteria	No of PI's	No of PI's
Social	S1) Access to urban water services	S11) Service coverage	**9**	**20**
	S2) Effectively satisfy the current users' needs and expectations	S21) Quality of service	**7**	
		S22) Safety and health	**2**	
	S3) Acceptance and awareness of UWCS	S31) Affordability	**2**	
Environment	En1) Efficient use of water, energy and materials	En11) Efficiency in the use of water (including final uses)	**8**	**23**
		En12) Efficiency in the use of energy	**6**	
		En13) Efficiency in the use of materials	**2**	
	En2) Minimisation of other environmental impacts	En21) Environmental efficiency (life cycle emissions to water, air and soil)	**7**	
Economic	Ec1) Ensure economic sustainability of the UWCS	Ec11) Cost recovery and reinvestment in UWCS (incl. cost financing)	**4**	**13**
		Ec12) Economic efficiency	**3**	
		Ec13) Leverage (degree of indebtedness)	**4**	
		Ec14) Willingness to pay (accounts receivable)	**2**	
Governance	G1) Public participation	G11) Participation initiatives	**2**	**9**
	G2) Transparency and accountability	G21) Availability of information and public disclosure	**1**	
		G22) Availability of mechanisms of accountability	**4**	
	G3) Clearness, steadiness and measurability of the UWCS policies	G31) Clearness, steadiness and measurability of policies	**1**	
	G4) Alignment of city, corporate and water resources planning	G41) Degree of alignment of city, corporate and water resources planning	**1**	
Assets	A1) Infrastructure reliability, adequacy and resilience	A11) Adequacy of the rehabilitation rate	**2**	**20**
		A12) Reliability and failures	**3**	
		A13) Adequate infrastructural capacity	**9**	
		A14) Adaptability to changes (e.g. climate change adaptation)	**1**	
	A2) Human capital	A21) Adequacy of training, capacity building and knowledge transfer	**2**	
	A3) Information and knowledge management	A31) Quality of the information and of the knowledge management system	**3**	

Number of PI's for Scoping	**85**
General information (context info) for Scoping	**38**
Total number of PI's and general information	**123**

TRUST roadmap - Scoping S3_2: City profile
Questionnaire module 1: water supply
reference year: 2010
No. of input data: 66

IWA-PI	IWA-No. or TRUST No.	Name	Definition	Used for	Link to other WP in TRUST	Unit	Input Data	Also required for…
Water ressources								
	APU (TRUST)	**Abstraction per user (agricultural, industrial, utility and so on)**	Is the annual volume of water abstraction per type of users (agriculture, industry etc.) known? How much they are?			Text		
	DWR (TRUST)	**Description Water resources**	Description: climate changes and their impacts, major water resources, imported water, major pressures on resources, pollution of lakes, rivers and groundwater, water surplus/ deficit in the cities, are solutions affordable?,...			Text		
	DQQ (TRUST)	**Description on quantity and quality, pressures, …**	Are there pressures like: Nitrate concentration in water resource (mg / l) / a): Annual modification of the average nitrate concentration (increase, decrease) in the drinking water resource area with the highest nitrate concentration [positive values: Increase in concentration; negative values: decrease in the concentration] Pesticides in the water resource (µg / l) / a): Annual modification of the average pesticide concentration as sum of all agents (increase, decrease) in the water resource area with the highest pestice concentration; positive values: Increase in concentration; negative values: decrease in the concentration Are critical values like the following exceeded? nitrate <50 mg/L, pesticide in the sum µg/L and in each case 0,1 µg/L, arsen 10 µg/L, cadmium 0,5 µg/L, plumb 10 µg/L, quicksilver 0,2 µg/L, ammonium 0,5 µg/L, chloride 250 mg/ L, Chlorid <250 mg/L, sulfate <240 mg/L , sum of tri- and tetrachlorethene 10 µg/L; Are there pressures / hazards for the water resource through agricultural use? Are there pressures / hazards for the water resource through industrial/ commercial use? Does the utility take active action to minimise hazards, like cooperatuion with the agricultural use, participations in working groups for the cultivation, monitoring of already regulated cultivation (the participation of an informative meeting is not sufficient!) Are there measurable hazards through the introductions by industry? Does the utility take active action to minimise these industrial hazards, like statements to building project, accompany projects in the reference year and so on.			Text		
WS	CI86	**Annual average rainfall**	Annual average rainfall (average for the past 30 years)	WB	WP11	mm/year		Mod6
	IDC (TRUST)	**Installed desalination capacity**	Total of annual desalination capacity			m^3/year		

WS	C1	**Total net volume of raw water reservoirs included in the system, at the reference date.**	In the cases of multi-use reservoirs, the net volume available for the provision of the water supply service shall be used. This variable aims to measure the usable physical capacity of the impounding storage facilities (i.e. raw water reservoirs) regardless of the water availability to fill them in.	Ph2		m^3		
	IWRC (TRUST)	**Installed water recycling capacity**	Available treatment capacity for upgrading wastewater			m^3/d		
WS	A1	**Annual yield capacity of own resources**	Maximum annual volume of water that can potentially be abstracted from own resources, based on the availability of water resources and on any legal or contractual allowance constraints. It is most advisable that target confidence grades, specified in terms of reliability and accuracy, are defined for every input data variable, according to I-2.3. If the maximum annual yield capacity is not clearly established as an allowance, it shall be estimated as accurately as possible based on technical studies. In the latter case, the assessment of this variable requires an hydrological study that takes into account the definition of failure scenarios resulting for instance from scarcity or water quality problems, their probability of risk and general water resources management procedures. Constraints derived from the abstraction infrastructures shall not be considered.	WR2, WB		m^3/year		Mod3, Mod 6
WS	A2	**Annual imported water allowance**	If the maximum annual allowance is not contracted with the supplier, an estimate based on the knowledge of the existing situation may be used. If no data to support this estimate exists, the sum of the imported raw water and of the imported treated water.			m^3/year		Mod3
	A2 (TRUST)	**Annual volume of imported water (resource outside the regional area, for all types of uses (drinking water, agriculture, industrial …))**	Annual imported water volume during the assessment period (resource outside the regional area, for all types of uses (drinking water, agriculture or industrial consumption and so on).	WB		m^3/year		Mod3, Mod6
WS	A3	**System input volume**	The water volume input of the global system during the assessment period. System input should include water abstracted and all imported water (raw and treated).	WR2, WR4, WB, Ci70	WP11	m^3		Mod3, Mod5, Mod6
WS	CI95 + CI96	**Surface water sources**	Annual abstraction of upland and lowland surface water / total annual abstraction x 100	Ci19 (TRUST)		%		Mod3, Mod6
WS	CI97	**Natural springs and wetlands sources**	Annual abstraction of natural springs and wetlands water / total annual abstraction x 100	Ci19 (TRUST)		%		Mod3, Mod6
WS	CI98	**Well water sources**	Annual abstraction of well water / total annual abstraction x 100		WP11	%		Mod3, Mod6
WS	CI99	**Borehole water sources**	Annual abstraction of borehole water / total annual abstraction x 100		Wp11	%		Mod3, Mod6
WS	CI100	**Saline and brackish water sources**	Annual abstraction of saline and brackish water / total annual abstraction x 100		WP11	%		Mod3, Mod6
WS	A5	**Exported raw water**	Total volume of raw water transferred to other water undertaking or to another system from the same supply area during the assessment period.	CI70		m^3		Mod5, Mod6

Collection and treatment								
	NoWS (TRUST)	**Number of water supply units**	Number of utilities/organisations responsible for operation of supply systems (drinking water) in the region			No.		Mod6
WS	C2	**Treated water storage capacity**	Total volume of transmission and distribution service reservoirs, at the reference date. The customer storage tanks must not be included. If appropriate, this variable can be split into different components, e.g. equalisation capacity, capacity for fire flow protection and emergency storage.	Ph3		m^3		
WS	CI26	**Number of treatment plants**	Number of treatment plants			No.		
WS	C3	**Daily treatment capacity**	Maximum daily global capacity of the existing treatment plants, at the reference date.	Ph1		m^3/day		
WS	A4	**Maximum water treated daily**	Maximum daily volume of water treated in treatment plants during the assessment period. This variable is the maximum of the sum of the individual daily volumes treated in the system, and not the sum of the individual daily maximums treated by each treatment plant, in order to take into account that the treatment peaks are not simultaneous in all treatment plants.	Ph1		(m^3/ day)		
	TOT (TRUST)	**Type of treatment**	Description of treatment technologies			Text		
WS	CI27 (modified)	**Water delivered without treatment or disinfection only**	Water delivered to users without any treatment or disinfection only			m^3/day		
WS	CI29 (modified)	**Water delivered with treatment (conventional, advanced; without desalination)**	Water delivered to users from conventional treatment plants and from advanced treatment plants. Calculation: CI29 + CI30			m^3/day		
WS	A7	**Exported treated water**	Total volume of treated water exported to other water undertaking or to another system from the same supply area during the assessment period. These transfers can occur anywhere downstream of the treatment plants or at any point where the water is assumed as treated by the water undertaking.	CI70		m^3		Mod3, Mod5, Mod6
WS	E9	**Bulk customer meters**	Total number of bulk customer water meters at the reference date. 'Bulk' includes all customers that achieve water to the water undertaking to deliver to a third party. Bulk customer meters correspond to the delivery points of raw and treated water exports.	QS14, QS15		No.		
WS	D53	**Aesthetic tests carried out**	Total number of tests carried out by the water undertaking laboratories during the assessment period. This variable includes not only the treated water tests but also raw water and process control tests. Outsourced tests shall not be included.	QS18, D51		No.		Mod6
WS	D54	**Microbiological tests carried out**	Number of microbiological tests of treated water carried out during the assessment period. For each parameter, all treated water tests carried out shall be accounted for, even though the number of tests that are required by applicable standards or legislation is exceeded.	QS18, D51		No.		Mod6
WS	D55	**Physical-chemical tests carried out**	Number of physical-chemical tests of treated water carried out during the assessment period. For each parameter, all treated water tests carried out shall be accounted for, even though the number of tests that are required by applicable standards or legislation is exceeded.	QS18, D51		No.		Mod6

WS	D56	**Radioactivity tests carried out**	Number of radioactivity tests of treated water carried out during the assessment period. For each parameter, all treated water tests carried out shall be accounted for, even though the number of tests that are required by applicable standards or legislation is exceeded.	QS18, D51		No.		Mod6
WS	D62	**Compliance of aesthetic tests**	Number of aesthetic tests of treated water carried out during the assessment period, which complies with the applicable standards or legislation. Standards may be of general use, be defined by the undertaking or result from specific contractual agreements.	QS18		No.		Mod6
WS	D63	**Compliance of microbiological tests**	Number of microbiological tests of treated water carried out during the assessment period, which complies with the applicable standards or legislation. Standards may be of general use, be defined by the undertaking or result from specific contractual agreements.	QS18		No.		Mod6
WS	D64	**Compliance of physical-chemical tests**	Number of physical-chemical tests of treated water carried out during the assessment period, which complies with the applicable standards or legislation. Standards may be of general use, be defined by the undertaking or result from specific contractual agreements.	QS18		No.		Mod6
WS	D65	**Compliance of radioactivity tests**	Number of radioactivity tests of treated water carried out during the assessment period, which complies with the applicable standards or legislation. Standards may be of general use, be defined by the undertaking or result from specific contractual agreements.	QS18		No.		Mod6

Distribution								
WS	C8	**Mains length**	Total transmission and distribution mains length (service connections not included), at the reference date.	Op31	WP11	km		
WS	C24	**Service connections**	Total number of service connections, at the reference date.	CI61, Op23, Op16	WP11	No.		
WS	D20	**Mains rehabilitations**	Length of transmission and distributions mains rehabilitated during the assessment period	Op16		km		
WS	D28	**Mains failures**	Number of main failures during the assessment period, including failures of valves and fittings. For ease of assessment, mains failures can be considered equivalent to the number of recorded main repairs, assuming that all failures detected are repaired and recorded. If mains failures are to be used for regulating objectives, the use of a complementary indicator, similar to Op31 but excluding failures by third parties is advisable, as they are not a direct fault of the water undertaking. This variable shall exclude repairs under active leakage control.	Op31	WP11	No.		
WS	D35	**Water supply interruptions**	Sum, for all the water interruptions, of the population subject to a water interruption multiplied by the duration of the interruption in hours), during the assessment period. In this context, only the unplanned (even if notified) or un-notified water supply interruption to customers with a duration (measured to full restoration of supply) of more than 12 hours, caused by bursts or failures in the water supply system and the subsequent repair/renewal measures, shall be accounted for. Includes those planned interruptions that exceed the notified period.	QS13		person x hour		
WS	D36	**Service interruptions**	Total number of water service interruptions, during the assessment period. In this context, only the unplanned (even if notified) or un-notified water supply interruption to customers with a duration (measured to full restoration of supply) of more than 12 hours, caused by bursts or failures in the water supply system and the subsequent repair/renewal measures, shall be accounted for. Includes also those planned interruptions that exceed the notified period.	QS14, QS15		No.		
WS	A15	**Water losses**	Water losses can be considered as a total volume for the whole system, or for partial systems such as transmission or distribution. In each case the components of the calculation would be adjusted accordingly. Water losses consist of real losses and apparent losses. Calculation: A15 = A3 - A14	Op24	WP11	m^3		Mod3
WS	A16	**Unauthorised consumption**	Total amount of unauthorised water consumption during the assessment period, including water theft.			m^3		
WS	A17	**Metering inaccuracies water losses**	Total amount of water consumed during the assessment period, but unaccounted-for due to metering inaccuracies.			m^3		
WS	A18	**Apparent losses**	Total amount of water unaccounted-for due to unauthorised consumption and metering inaccuracies, during the assessment period.			m^3		Mod3
WS	A19	**Real losses**	Total amount of physical water losses from the pressurised system during the assessment period, up to the point of customer metering.			m^3		Mod3

WS	CI73	**Monthly peak factor of supplied and exported water**	Actual monthly peak supplied and exported water x 12 / supplied and exported water during the year (peak month / annual average)			-		
WS	D1	**Pumping energy consumption**	Total energy consumption for water pumping (customer pumping systems excluded) during the assessment period. This variable is the sum of the actual energy consumption of every water pumping equipment of the system. It shall be assessed from energy consumption meters. When accounting for the total energy consumption for pumping, the consumption of small pumps can be excluded if their influence in terms of global confidence grade of the variable is negligible.	Ph7		kWh		
WS	D5 (modified)	**Total energy recovered by turbines or reverse pumps or generated from renewable energy sources (wind, water, biofuels, …)**	D5: Energy recovery may be cost-effective in gravity transmission lines where the potential energy available is excessive for the hydraulic transport needs.	Ph7		kWh		
WS	D3	**Standardisation factor**	Sum of D3(i) for all the pumps of the system, D3(i) being: D3(i) = V(i)x h(i) / 100, where V is the total volume (m3) pumped by pump i during the assessment period and h(i) is the pump head (m). For pumps with significant variation of pump head throughout the assessment period, it may be necessary to break down the period into a limited number of time intervals. For instance, if a pump works 1/3 of the time with a flow of 10 m3/h and a pump head of 50 m, and 2/3 of the time with a flow of 12 m3/h and a pump head of 42 m, D3(i) will be: D3(i) = ((10 x 24 x 365 /3) x 50 + (12 x 24 x 365 x 2/3) x 42) / 100 The contribution of small pumps can be excluded if their influence in terms of global confidence grade of the variable is negligible.	Ph5		m^3 x 100m		
Water use and supply								
	WU (TRUST)	**Water usage**	Description: Major consumers, water demand report, (rising) demand from agriculture trends in water usage/technological developments, improved treatment methods, efficient use by water of consumers, new technologies and new issues such as the availability of new measuring devices or components which will make systems more efficient, new generation systems (for example waterless toilets, water saving devices, ..)			Text		
	WSE (TRUST)	**Water supply environment**	Description: system elements, main pillars of supply, central-decentral systems, peak supply seasons, important trends, energy costs (also for pumping water), ageing infrastructure , water quality standards becoming increasingly stringent?, …			Text		

WS	E10	**Registered customer**	Total number of registered water supply customers at the reference date. Registered customers include residential, industrial, bulk and other registered customers. 'Residential' includes all customers that have the same type of contract with the water undertaking as the residential consumers (i.e. businesses). 'Industrial' includes all customers that have the same type of contract with the water undertaking as the metered industrial consumers (i.e. with meters above a given diameter or above a given average consumption). 'Bulk' includes all customers that achieve water to the water undertaking to deliver to a third party. Bulk customers correspond to the delivery points of raw and treated water exports. 'Other' includes all the registered customers not accounted for as 'residential', 'industrial' or 'bulk', such as commercial, public and institutional.	QS27		No.		Mod6
WS	CI65	**Domestic demand**	Domestic consumption during the assessment period / authorised consumption (including exported water) x 100	WB		%		Mod3, Mod6
WS	CI66	**Commercial consumption**	Commercial consumption during the assessment period / authorised consumption (including exported water) x 100	WB		%		Mod3, Mod6
WS	CI68	**Industrial consumption**	industrial consumption during the assessment period / authorised consumption (including exported water) x 100	WB		%		Mod3, Mod6
	ACON (TRUST)	**Agricultural consumption**	Agricultural consumption during the assessment period / authorised consumption (including exported water) x 100	WB		%		Mod3, Mod6
WS	CI67	**Public or institutional consumption**	Public or institutional consumption during the assessment period / authorised consumption (including exported water) x 100	WB		%		Mod3, Mod6
WS	CI69	**Bulk water consumption**	Exported water (raw and treated) during the assessment period / authorised consumption (including exported water) x 100	WB		%		Mod3, Mod6
WS	A8	**Billed metered consumption**	Total amount of billed metered authorised consumption (including exported water) during the assessment period. This input data results from the sum of customer meter readings. As in general readings dates do not refer to the exact audit period, interpolations will be required to have the best possible estimate of the true value.	WB, A10, A14(A10), A15(A14), A19(A15)		m^3		
WS	A9	**Billed unmetered consumption**	Total amount of billed unmetered authorised consumption (including exported water) during the assessment period. This input data is the best available estimate, based on surveys or any other forms of assessment the water undertaking can make use of.	WB, A10, A14(A10), A15(A14), A19(A15)		m^3		
WS	A10	**Billed authorised consumption**	Total amount of billed authorised consumption (including exported water) during the assessment period. Calculation: A10 = A8 + A9	WB		m^3		Mod3
WS	A11	**Unbilled metered consumption**	Total amount of unbilled metered authorised consumption (including exported water) during the assessment period. Note that unbilled metered consumption may include items such as firefighting and training, flushing of mains and sewers, street cleaning, watering of municipal gardens, public fountains, frost protection, building water, etc, if these are unbilled and metered.	WB, A13, A14(A13), A15(A14), A19(A15)		m^3		Mod3

WS	A12	**Unbilled unmetered consumption**	Total amount of unbilled unmetered authorised consumption (including exported water) during the assessment period. This input data is the best available estimate, based on surveys or any other forms of assessment the water undertaking can make use of. Note that unbilled unmetered consumption may include items such as firefighting and training, flushing of mains and sewers, street cleaning, watering of municipal gardens, public fountains, frost protection, building water, etc., if these are unbilled and unmetered.	WB, A13, A14(A13), A15(A14), A19(A15)		m^3		
WS	A13	**Total amount of unbilled authorised consumption (including exported water) during the assessment period**	Note that unbilled metered consumption may include items such as firefighting and training, flushing of mains and sewers, street cleaning, watering of municipal gardens, public fountains, frost protection, building water, etc., if unbilled. These may be, metered or unmetered, according to local practice. Calculation: A13 = A11 + A12	WB		m^3		
WS	A14	**Authorised consumption**	Total volume of metered and/or non-metered water that, during the assessment period, is taken by registered customers, by the water supplier itself, or by others who are implicitly or explicitly authorised to do so by the water supplier, for residential, commercial, industrial or public purposes. It includes exported water. Calculation: A14 = A10 + A13	WB, A15, A19(A15)		m^3		Mod3

TRUST roadmap - Scoping S3_2: City profile
Questionnaire module 2: wastewater and storm water
reference year: 2010
No. of input data: 47

IWA-PI	IWA-No. or TRUST No.	Name	Definition	Used for	Link to other WP in TRUST	Unit	Input Data	Also required for…
	WSEN (TRUST)	**Wastewater / storm water environment**	Description: tasks, wastewater/storm water collection, treatment, system elements, main pillars of sewerage and wastewater treatment system, central-decentral systems, receiving water bodies, quality issues, important trends, nutrient cycle, use of sewer sludge and energy crops, ...			Text		
	wNoww (TRUST)	**Number of wastewater units / institutions related to storm water**	Number of utilities/organisations responsible for operation of sewage collection/wastewater treatment systems in the region			No.		Mod6
WW	wC1	**Total sewer length**	Total length of sewers managed by the undertaking at the reference date. Service connections excluded.	WOp37, WOp21, Wop34		km		
WW	wC28	**Connected properties**	Number of properties connected to the sewer system managed by the undertaking, at the reference date.	wQS15	WP11	No.		
WW	wC29	**Service connections**	Total number of service connections	wCI61 (TRUST)	WP11	No.		
WW	wC6	**Wastewater systems pumping stations**	Number of wastewater pumping stations in the sewer system, including wastewater treatment plant inlet pumping stations, at the reference date.			No.		
WW	wD41	**Flooding from sanitary sewers (sewer flooding)**	Number of sanitary flooding that occurred during the assessment period. Include only incidents related to sanitary sewers that are the responsibility of the wastewater undertaking.	WOp37 (modified)		No.		
WW	wD38	**Sewer blockages**	Number of blockages that occurred in sewers during the assessment period. pumping station blockages shall not be included. Include blockages in service connections only where these are the responsibility of the wastewater undertaking.	wOp34	WP11	No.		
WW	wD25	**Sewer rehabilitation**	Length of sewers rehabilitated or renewed during the assessment period. This variable includes not only wD26 and wD27 but also the length of sewers rehabilitated with other techniques. For the assessment of this variable, only the length of defect shall be considered.	WOp21		km/year		
	SD (TRUST)	**Sewage disposal**	Is the annual volume of sewage disposal per type of users (agriculture, industry etc.) known? How much they are?			Text		
	CSO (TRUST)	**Combined sewer overflows**	Events per year of discharging untreated wastewater to the environment			no/year		

WW	wF1	**Annual collected sewage (domestic, commercial, industrial inputs to the sewer system)**	Collected sewage, corresponding to the volume of domestic, commercial and industrial inputs to the sewer system during the assessment period.	wQS7, wQS8, WB	WP11	m^3		
	ws1 (TRUST)	**Annual collected storm water**	Collected storm water during the assessment period	WB		m^3		Mod3
WW	wCi	**Exported wastewater**	Annual volume of exported wastewater during the year / 365	WB, wCi61		m^3/ day		
	wCi67 (TRUST)	**Industrial wastewater**	Volume of collected industrial wastewater / collected sewage x 100			%		Mod3
	wCi68 (TRUST)	**Domestic wastewater**	Volume of collected residential wastewater / collected sewage x 100			%		Mod3
	wC61 (TRUST)	**Total number of Wastewater Treatment Plants (WWTP)**	Total number of wastewater treatments plants at the reference date.			No.		
	wTCH (TRUST)	**Hydraulic treatment capacity**	Hydraulic design capacity of all wastewater treatments plants			m^3/ day		
	wTCL (TRUST)	**Treatment capacity (load)**	Total installed treatment capacity (load [p.e.])	wpU (TRUST)		1000 p.e.		
WW	wA2	**Wastewater treated**	Wastewater treated by wastewater treatment plants or by on-site system facilities that are the responsibility of the undertaking, during the assessment period.	WB, wQS5	WP11	m^3		Mod3
WW	wA11	**Wastewater treated by one-site systems**	Volume of wastewater treated at on-site systems, during the assessment period.	WB, wQS5		m^3		
WW	wA5	**Primary treated water**	Volume of wastewater receiving only primary treatment at wastewater treatment plants, during the assessment period. primary treatment: wastewater treatment process that uses settling, skimming, and (optional) chlorination to remove suspended solids, floating materials, and pathogens from sanitary, combined, storm, and industrial wastewater. Primary treatment typically removes about 35% and 65% of 5-day biochemical oxygen demand (BOD5) and SS, respectively. For higher suspended solids removal, chemicals (coagulants and polyelectrolytes) are added (into a coagulation chamber and the wastewater is then flocculated in another chamber) prior to the sedimentation tanks (adapted from Ellis et al., 2003).	wQS7		m^3		Mod3, Mod6
WW	wA7	**Secondary treated water**	Volume of wastewater receiving secondary treatment at wastewater treatment plants, during the assessment period. secondary treatment: step in purifying wastewater for removing fine particulate, colloidal and dissolved organic (and inorganic) by using biological processes, including trickling fixed-film filtration and suspended growth (activated sludge). Recently, a sequential system providing aerobic, anoxic, and anaerobic environments is being used instead of the conventional activated sludge aeration process for effective biological transformation of toxic organic pollutants to less or non-toxic constituents. The mixed liquor flows from the aeration tank to the secondary sedimentation tank to remove the mixed liquor suspended solids. In a number of countries disinfection of the effluent prior to discharging into receiving water completes secondary treatment (adapted from Ellis et al., 2003).	wQS8		m^3		Mod3

WW	wA8	**Daily peak secondary treated wastewater**	Maximum daily volume of wastewater treated in secondary wastewater treatment plants, during the assessment period.	wPh3		m^3/ day		
WW	wA9	**Tertiary treated water**	Volume of wastewater receiving tertiary treatment at wastewater treatment plants, during the assessment period.	wQS9		m^3		Mod3
WW	wc14	**Daily peak secondary treatment capacity**	Sum, for all secondary wastewater treatment plants, of the daily maximum treatment capacities (evaluated during the assessment period).	wPh3		m^3/ day		
WW	wA1	**Population equivalent with satisfactory wastewater treatment**	population equivalent that is served by wastewater treatment plants complying with discharge consents at the reference date. Discharge consents refer to effluent quality standards that apply. The compliance is assessed regarding the loads and their potent environmental impacts.	wEn1		p.e.		Mod6
WW	wE5	**Population equivalent served by WWTP**	Population equivalent served by wastewater treatment plants managed by the undertaking, at the reference date.	wEn1		p.e.		
	AL1 (TRUST)	**Annual load discharged**	Amount of COD, BSB and nutrients discharged during assessment period (year)	AL (TRUST)		kg / a		
	AL2 (TRUST)	**Annual load treated**	Amount of COD, BSB and nutrients treated during assessment period (year)	wpU (TRUST), AL (TRUST)		kg / a		
	AL3 (TRUST)	**Annual load removed**	amount of COD, BSB and nutrients removed during assessment period (year) Calculation: AL3 (TRUST) = AL2 (TRUST)-AL1 (TRUST)			kg / a		
WW	wA12	**Volume of wastewater reused**	Volume of wastewater treated at on-site systems, during the assessment period. On-site system: system whereby all the waste and wastewater produced is handled locally on the site near to point of origin, by means of septic tanks, soakaways, composting toilets, evaporation beds, reed beds etc. The waste may subsequently be utilised directly for fertiliser and/or used in energy recovery processes. Solid matter may be transported elsewhere and liquid effluents may discharge to main sewers. The term includes wet and	WB, wEn2		m^3		Mod3
WW	wD12 modified	**Total energy consumption for pumping and treatment of sewage/treatment**	Total energy consumption for pumping and treatment of wastewater Calculation: wD12 modified = wD12+wD13	weeL (TRUST)		kWh		
WW	wD12	**pump energy consumption**	Sum for all pumps installed (pump nominal power x pump working hours during the assessment period).	wOp20		kWh		
WW	wD13	**WWT energy consumption**	Energy consumed during the assessment period by wastewater treatment processes managed by the undertaking. WWT includes on-site systems; thermal processing of sludge should not be included.	wOp19 (modified)		kWh		

	SI (TRUST)	**Sludge „imported“**	Dry weight of sludge received from outside the waste water treatment plant			Mg DS/a		
WW	wA14	**Sludge handled**	All dry weight of sludge handled by the undertaking during the assessment period, including not only the dry weight of sludge produced in the wastewater treatment plants, but also dry weight of sludge inputs from other sources. Sludge handled may include sludge from on-site systems.	wEn7, wEn10		ton DS		
WW	wA15	**Sludge utilised**	Dry weight of sludge, handled by the undertaking that is utilised during the assessment period, including for example agriculture, forest, products and materials.	wEn7		ton DS		
WW	wA18	**Sludge thermally processed**	Dry weight of sludge thermally processed during the assessment period.	wEn10		ton DS		
WW	SP (TRUST)	**Sludge production**	dry weight of sludge produced per year by the undertaking / from wastewater treatment at the wwtp, may distinguish between **primary** and **secondary** sludge (as both types have different organic content)	PI: kg DS/p.e.		Mg DS/a		
WW	wF7	**Wastewater service interruptions**	Sum, for the assessment period, of the number of properties affected by service interruption multiplied by the respective duration of interruptions in hours.	wQS15		No.		
WW	wD16	**Standardisation Factor**	Sum, for all the pumps of the system, of D2(i), D2(i) being: D2(i) = V(i) x h(i), where V is the total volume (m 3) pumped by pump i during the assessment period and h(i) is the pump head (m).	wOp20		m^3 x m		
WW	wD17 (modified)	**Energy recovery/renewable energy**	Total energy recovered by co-generation processes or own production from renewable sources (wind, hydropower, …)	wOp19 (modified		kWh		
WW	wG11	**Energy costs (per year)**	Total cost of energy regarding the wastewater service. Income from power generation out of biogas (from sludge or wastewater fermentation) must be deducted from energy costs		WP11	EUR/year		

TRUST roadmap - Scoping S3_2: City profile
Questionnaire module 4: watermanagement and governance
reference year: 2010
No. of input data: 43

IWA-PI	IWA-No. or TRUST No.	Name	Definition	Used for	Link to other WP in TRUST	Unit	Input Data	Also required for...
	PIN 1 (TRUST)	**Participation initiatives 1**	What is the role of NGOs and the involvement in decision making of other stakeholders?			Text		
	PIN 2 (TRUST)	**Participation initiatives 2**	Description of actual and future cooperation with stakeholders and the level of cooperation (e.g. local agenda etc.)?			Text		
	PIN 3 (TRUST)	**Participation initiatives 3**	Which stakeholders were addressed in which frequency?			Text		
	LE (TRUST)	**Local engagement**	If available use information of existing documents (reports, flyer, studies etc.). Short Description of the local / regional engagement of the utility in terms of financial and material advancement (serving the public good, sponsorship etc.)			Text		
	AIPD 1 (TRUST)	**Availability of information and public disclosure 1**	Do you have a customer service center?		WP31	yes/no		
	AIPD 2 (TRUST)	**Availability of information and public disclosure 2**	Do you have a homepage that provides actual information of your services and your institution / organisation?			yes/no		
	AIPD 3 (TRUST)	**Availability of information and public disclosure 3**	Do you have reliable financial information internally readily available all time (incl. accounting)?			yes/no		
	AIPD 4 (TRUST)	**Availability of information and public disclosure 4**	Is this information audited?			yes/no		
	AIPD 5 (TRUST)	**Availability of information and public disclosure 5**	Do you make selected financial information publicly available?			yes/no		
	AIPD 6 (TRUST)	**Availability of information and public disclosure 6**	If **yes**, by which medium? Internet; newspapers; written documents distributed to customers?			Text		
	AIPD 7 (TRUST)	**Availability of information and public disclosure 7**	Do you have reliable quality of service information internally readily available all time?			yes/no		
	AIPD 8 (TRUST)	**Availability of information and public disclosure 8**	Is this information audited?			yes/no		
	AIPD 9 (TRUST)	**Availability of information and public disclosure 9**	Do you make selected quality of service information publicly available via an easy to access means?			yes/no		
	AIPD 10 (TRUST)	**Availability of information and public disclosure 10**	If **yes**, by which medium? Internet; newspapers; written documents distributed to customers?			Text		
	AIPD 11 (TRUST)	**Availability of information and public disclosure 11**	Do you publish information beyond the legal or contractual requirements?			yes/no		
	AIPD 12 (TRUST)	**Availability of information and public disclosure 12**	If **yes**, by which medium? Environment report; corporate responsibility report; quality of service report; customer satisfaction surveys, detailed accounting aspects e.g. tariff calculation, explanation of invoice components?			Text		

	QIKMS (TRUST)	**Quality of the information and of the knowledge management system**	Do you have implemented a systematic knowledge management procedure in your organisation?			yes/no		
	CSMP 1 (TRUST)	**Clearness, steadiness and measurability of policies 1**	Are there developments of alternative supply concepts for the supply area by the water supply utility, e.g. involving utilisation of rainwater, separation technology or sewage water reuse?		WP31	yes/no		
	CSMP 2 (TRUST)	**Clearness, steadiness and measurability of policies 2**	Are there programs for development of protection areas: cooperation with the agricultural, wetlandsprograms, management of biodiversity, agreememt for nature protection and so on?			yes/no		
	CSMP 3 (TRUST)	**Clearness, steadiness and measurability of policies 3**	Does a certified technical security management system exist (e.g. in Germany DVGW-W1000)?			yes/no		
	CSMP 4 (TRUST)	**Clearness, steadiness and measurability of policies 4**	Do guidelines in a system of rules sorted (organisation manual, operation manual) exist?			yes/no		
	CSMP 5 (TRUST)	**Clearness, steadiness and measurability of policies 5**	Does a certified quality managment system exist (e.g. in Germany DIN ISO 9000)?			yes/no		
	CSMP 6 (TRUST)	**Clearness, steadiness and measurability of policies 6**	Are there global policies related to UWCS clearly defined?			yes/no		
	CSMP 7 (TRUST)	**Clearness, steadiness and measurability of policies 7**	If there **are** global policies related to UWCS clearly defined: How long?			list		
	CSMP 8 (TRUST)	**Clearness, steadiness and measurability of policies 8**	Are your corporate objectives clearly stated?			yes/no		
	CSMP 9 (TRUST)	**Clearness, steadiness and measurability of policies 9**	If your corporate objectives **are** clearly stated: How long?			list		
	CSMP 10 (TRUST)	**Clearness, steadiness and measurability of policies 10**	Do you have measures to assess them?			yes/no		
	CSMP 11 (TRUST)	**Clearness, steadiness and measurability of policies 11**	Do you have targets associated to the stated objectives?			yes/no		
	CSMP 12 (TRUST)	**Clearness, steadiness and measurability of policies 12**	Do you have revision and continuous improvement procedures in place?			yes/no		

	DA 1 (TRUST)	**Degree of alignment 1**	Are there mechanisms to ensure alignment between city planning and UWCS planning?		WP31	yes/no		
	DA 2 (TRUST)	**Degree of alignment 2**	Are there mechanisms to ensure alignment between water resource planning and UWCS planning?		WP31	yes/no		
	DA 3 (TRUST)	**Degree of alignment 3**	Have you ever been asked to participate and did participated in any of the following more global strategic planning process? - city planning process - UWCS stakeholder planning process - consultants boards for legal / formal requirement for regular UWCS coordination - UWCS license boards or processes		WP31	yes/no		
	DA 4 (TRUST)	**Degree of alignment 4**	Which of the following participations do you consider of most importance to ensure you a better integrated planning system for your activity: - Direct participation in the city planning process - Direct participation in UWCS stakeholders planning process - Direct participation in consultants boards for legal / formal requirement for regular UWCS coordination - Direct participation in UWCS license boards or processes		WP31	list		
	AMAC 1 (TRUST)	**Availability of mechanisms of accountability 1**	Do you have cost type accounting?		WP31	yes/no		
	AMAC 2 (TRUST)	**Availability of mechanisms of accountability 2**	Do you have cost center accounting?		WP31	yes/no		
	AMAC 3 (TRUST)	**Availability of mechanisms of accountability 3**	Do you have product cost accounting?		WP31	yes/no		
	AC 1 (TRUST)	**Adaptability to changes 1**	Are regional studies of the demographical, climate change are available and also used for the strategy of the utility?		WP31	yes/no		
	AC 2 (TRUST)	**Adaptability to changes 2**	Has your organisation analysed trends and prognoses according to their impact on your existing system?		WP31	yes/no		
	AC 3 (TRUST)	**Adaptability to changes 3**	Have you built future scenarios in order to ensure adequate system resilience?		WP31	yes/no		
	AC 4 (TRUST)	**Adaptability to changes 4**	If reply to question AC 3 is yes: 'What instruments (software and so on) do you use for adaption to changes?		WP31	Text		
	AC 5 (TRUST)	**Adaptability to changes 5**	If reply to question AC 3 is yes: 'What factors are taken into account in your scenario building (Check box: urban development; demography; rainfall events (flood or droughts); temperature; consumption habits; resources availability (water, energy, capital))		WP31	Text		
	AC 6 (TRUST)	**Adaptability to changes 6**	If reply to question AC 3 is yes: 'Are these scenarios considered in your rehabilitation plan?		WP31	yes/no		
	EE (TRUST)	**Economic efficiency**	Does your organisation have procedures in place to assess productivity (like economic regulation; external efficiency controls from investors / lenders; participation in benchmarking initiatives, publishing of detailed cost information to the public; internal incentives for efficiency goals; efficiency audits)? Please give a short description here or information via existing documents (reports, flyer, studies etc.).			Text		

TRUST roadmap - Scoping S3_2: City profile
Questionnaire module 5: social and economic aspects
reference year: 2010
No. of input data: 51

IWA-PI	IWA-No. or TRUST No.	Name	Definition	Used for	Link to other WP in TRUST	Unit	Input Data	Also required for…
WS	E1	**Households and businesses supplied (No.)**	Total number of households and businesses connected to the water supply system at the reference date.	QS1		No.		Mod6
WS	E2	**Buildings supplied**	Total number of buildings connected to the water supply system at the reference date.	QS2		No.		Mod6
WS	E3	**Households and businesses**	Total number of household and businesses of the area of influence of the water undertaking regarding water supply, at the reference date. Whenever the national surveys consider this type of data, the official number should be used.	QS1		No.		
WS	E4	**Buildings**	Total number of buildings of the area of influence of the water undertaking regarding water supply, at the reference date. Whenever the national surveys consider this type of data, the official number should be used. Intermediate estimates published between census questionnaire are considered valid.	QS1, QS2		No.		
WS	E6	**Direct costumer meters**	Total number of direct customer water meters at the reference date. Direct customers include residential, industrial, or any other types of existing customers (e.g. commercial, public, institutional), excluding bulk supply customers.	Op38		No.		
WS	D44	**Operational meters**	Number of direct customer meters that are not out-of-service at the reference time.	Op38		No.		
WW	wE3	**Resident population served by on-site systems**	Resident population served by on-site systems managed by the undertaking (e.g. septic tanks, latrines)	wQS3		inhab.		
WW	wE2	**Resident population served by wastewater treatment plants**	Resident population served by wastewater treatment plants managed by the undertaking	wQS2		inhab.		
WW	wE4	**Resident population connected to SE**	Resident population connected to the sewer systems managed by the undertaking, at the reference date.	wQS1		inhab.		Mod6
	WP (TRUST)	**Water price per year**	Annual price of the first 120 cu. m per year.	Aff1 (TRUST)		EUR		
	Awwb (TRUST)	**Average Wastewater bill**	Average annual wastewater bill for a residential consumption.	wAff1 (TRUST)		EUR		
WS	F15	**Service complaints**	Number of direct, telephone, and written complaints of quality of service during the assessment period. Number of complaints as a result of pressure, continuity, water quality and due to water supply interruptions during the assessment period.	QS27		No.		Mod6

WW	wF12	**Total complaints**	Total number of complaints relating to wastewater system performance, during the assessment period. Number of complaints as a result of blockages, flooding, pollution incidents, odours, rodents, costumer accounts or something else during the assessment period. This variable includes all direct, telephone, and written complaints.	wQS19		No.		Mod6
	ROM1 (TRUST)	**Recovery of materials 1**	Recovery: Do you have nutrient recovery procedures, recycling, recovery of recyclables, chemical recovery?		WP31	Text		
	ROM2 (TRUST)	**Recovery of materials 2**	Recovery: How much is the recovery, please repeat with quantitative information.		WP31	Text		
	EUOM 1(TRUST)	**Efficient use of materials 1**	Use: Is the use of materials efficient?		WP31	Text		
	EUOM2 (TRUST)	**Efficient use of materials 2**	Use: Is the use of chemicals optimised in function of the actual inputs and target outputs?		WP31	Text		
	EUOM3 (TRUST)	**Efficient use of materials 3**	Use: What are the drivers for selecting the construction materials (investment cost; life cycle cost; functional capability; experience of use; technological requirements; quality requirements)?		WP31	Text		
WS	G1	**Total revenues water supply**	Total operating revenues minus capitalised costs of self-constructed assets, regarding the water supply service, during the assessment period. Capitalised costs of self-constructed assets shall be considered as an economic correction of the operating cost. Consequently it should be entered as a negative quantity in order to obtain the total revenues. Calculation: G1 = G2 - G35	Fi30		EUR		
WS	G3	**Sales revenues**	Operating revenues from sales during the assessment period, regarding the water supply service.	Fi32		EUR		
WS	G5	**Running costs**	Total operations and maintenance net costs and internal manpower net costs (i.e. not including the capitalised cost of self-constructed assets) during the assessment period, regarding the water supply service	Fi30		EUR		
WS	G28	**Depreciation costs**	Depreciation costs (on book values), regarding the water supply service, during the assessment period.	G4(G6), G6(G31), G31		EUR		
WS	G45	**Cash-flow**	Total available is the sum of net income, depreciation and the net value of decrease or increase in working capital, regarding the water supply service, during the assessment period. Exchange rate of local currencies shall be referred to the end of the year.	Fi39		EUR		
WS	G46	**Financial debt service**	The financial debt service contains the expenditures for interest (G29), the cost of loans, and the principal (= capital) repayment debt instruments, regarding the water supply service, during the assessment period. Exchange rate of local currencies shall be referred to the end of the year.	Fi39		EUR		
WS	G38	**Accounts receivable**	Accounts receivable from drinking water, at the reference date. To assess the annual PI's, the year-end accounts receivable shall be used.	Fi32		EUR		
WS	G39	**Investments subject to depreciation**	Investments for assets subject to depreciation according to the accounting principles generally accepted, regarding the water supply service, during the assessment period.	Fi33		EUR		

WS	G47	**Total debt**	Sum of long term liabilities (bonds and long term financial debts) and current liabilities, at the end of the fiscal year, regarding the water supply service / wastewater service. Calculation: G47 = G52 + G53	Fi43, Fi40 G48		EUR		
WS	G48	**Shareholders' equity**	Surplus of the asset over the liabilities, at the end of the fiscal year, regarding the water supply service. Shareholders' equity includes subscribed share capital, capital reserves, other reserves and net income for the year.	Fi43, Fi40		EUR		
WS	G56	**Net income**	Net income after interest payment and taxes, regarding the water supply service, at the end of the fiscal year. This variable refers to annual values. Net income represents the final profit after taxes on EBT have been paid.	Fi43		EUR		
WW	wG1	**Total revenues**	Total operating revenues (wG2) minus capitalised costs of self-constructed assets (wG33), regarding the wastewater service, during the assessment period. Capitalised costs of self-constructed assets have more correctly to be intended not as revenue but as an economic correction of each type of cost to negative apportion. These capitalisations have consequently to be negative allocated even for the calculation of annual revenues.	WFi30		EUR		
WW	wG3	**Service revenues**	Operating revenues from wastewater services, during the assessment period.	wFi32		EUR		
WW	wG5	**Total costs**	Total costs, including capital and running costs, regarding the wastewater service, during the assessment period. Exchange rate of local currencies shall be referred to the end of the year.	wFi30		EUR		
WW	wG6	**Running costs**	Total operation and maintenance costs and internal manpower costs, excluding the capitalised costs of self-constructed assets, regarding the wastewater service, during the assessment period.	wG5		EUR		
WW	wG26	**Depreciation costs**	Depreciation costs (on book values), regarding the wastewater service, during the assessment period.	wG5(wG7) , wG7		EUR		
WW	wG34	**Accounts receivable**	Accounts receivable, regarding the wastewater service, at the reference date	wFi32		EUR		
WW	wG35	**Investment subject to depresciation**	Investments for assets for which the general accepted accounting principles demands to practice depreciation, regarding the wastewater service, during the assessment period.	wFi33		EUR		
WW	wG41	**Cash Flow**	Total available is the sum of net income, depreciation and the net value of decrease or increase in working capital, regarding the wastewater service, during the assessment period.	wFi39		EUR		
WW	wG42	**Financial debt service**	The financial debt service contains the expenditures for interest (wG27), the cost of loans, and the principal (= capital) repayment debt instruments, regarding the wastewater service, during the assessment period.	WFi39		EUR		

WW	wG43	**Total debt**	Sum of long term liabilities (bonds and long term financial debts) and current liabilities, at the end of the fiscal year, regarding the wastewater service. Calculation: w G43 = wG48 + wG49	wFi43(wG44)		EUR/ year		
WW	wG44	**Shareholder's equity**	Surplus of the asset over the liabilities , regarding the wastewater service, at the end of the fiscal year. shareholders' equity includes subscribed share capital, capital reserves, other reserves and net income for the year.	wFi43		EUR / year		
WW	wG52	**Net income**	Net income after interest payment and taxes, regarding the wastewater service, at the end of the fiscal year.	wFi43		EUR / year		
WS	B1	**Total personnel**	Total number of full time equivalent employees of the water undertaking at the reference date.	Pe4, Pe19		No.		
WS	B3	**Human resources management personnel**	Total number of full time equivalent employees of the water undertaking dedicated to personnel administration, education and training, occupational safety, and health services and social activities, at the reference date.	Pe4		No		
WS	B18	**Total number of training hours during the assessment period.**	Total number of training hours during the assessment period. Calculation: B18 = B19 + B20	P19		hour		
WW	wB1	**Total personnel**	Total number of full time equivalent employees of the wastewater undertaking at the reference date. Employees include every person who works for the undertaking in return for wage.	wPe4, wPe17		No.		
WW	wB20	**Training time**	Number of training hours for wastewater personnel, during the assessment period. In the case of multi-utilities, a proportion of the wastewater in the overall productive activities has to be established. For the accounting of this variable, the training hours provided to employees working in general activities shall be affected by this proportion. Employees may include permanent and temporary personnel.	wPe17		hour		
WW	wB5	**Human resources management personnel**	Number of full time equivalent employees dedicated to personnel administration, education and training, occupational safety and medicine services and social activities, at the reference date.	Pe4(B1)		No.		
	CFWS (TRUST)	**Carbon Footprint**	How much is the carbon foot print of your services?			Mio. t CO2		
	CFWW(TRUST)	**Carbon Footprint**	How much is the carbon foot print of your services?			Mio. t CO2		
	CfredWS (TRUST)	**Carbon Footprint reduction goals for 2040**	What goal for CO2-reduction do you have?			%		
	CfredWW (TRUST)	**Carbon Footprint reduction goals for 2040**	What goal for CO2-reduction do you have?			%		

TRUST roadmap - Scoping S3_2: City profile
Questionaire module 6: general description
reference year: 2010
No. of input data: 16

IWA-PI	IWA-No. or TRUST No.	Name	Definition	Used for	Link to other WP in TRUST	Unit	Input Data	also required for…
	BIOUA (TRUST)	**Basis information of urban area**	Description of major landscape, geography, major economic players (sectors, branches, industries, …), urbanisation (additional stress on existing systems), (poor) governance, developed city or developing city, trans boundary water issues, barriers to change (infrastructural dependency, socioeconomically and cultural factors, development of fringes, slums			Text		
	OAGS (TRUST)	**Organisational and governance structure**	Who is the owner of the water and wastewater supply? What is the legal status (e.g. under public or private law)			Text		
WS	CI14	**Supply area**	Area that can or is intended to be served by the distribution network.			km²		
	wCI14 (TRUST)	**Catchment area (waste water)**	Area that can or is intended to be served by the distribution/sewage network.			km²		
WS	CI78	**Population density**	resident population / area under the responsibility of the UWCS undertakings			No./km²		
WS	CI80	**Current population growth rate (% per year)**	Population variation during the last ten years / population in first year of this period / 100 (In fast growing areas a 5-year period should be adopted.)			% per year		
WS	Ci81 (modified)	**Estimated population growth until 2040**	Forecasted average annual population growth until 2040			%		
WS	E5	**Residential population (water supply)**	Total population who lives on a permanent basis in the area served by the water undertaking, at the reference date. Whenever the national surveys consider this type of data, the official number should be used. Intermediate estimates published between census questionnaires are considered	WAPC (TRUST)	WP11	No.		Mod5
WW	wE1	**Residential population (waste water)**	Total population living permanently in the area that is the responsibility of the wastewater undertaking, at the reference date.		WP11	No.		Mod5
	SEAP (TRUST)	**Seasonal population**	Total number of seasonal additional population and factor by which population increases in peak seasons			%		

WS	F1	**Population supplied**	Resident population served by the water undertaking at the reference date.	QS13, CI70, QS3		person		Mod1; Mod5
WS	F2	**Population supplied with service pipes**	Resident population served by the water undertaking through service connections at the reference date.	F1, QS13		person		
WS	F3	**Population served by public taps or standpipes**	Resident population served by the water undertaking by public taps or standpipes at the reference date.	F1, QS13		person		
	NoU (TRUST)	**Number of utilities/organisations**	Number of utilities/organisations responsible for UWCS in the region			No.		
	GDPPC (TRUST)	**Gross Domestic Product per capita**	Gross Domestic Product per capita			EUR per capita/a		
	AHI (TRUST)	**Average household income**	statistical data; please use local value; if not available, please use country value	Aff1 (TRUST), wAff1 (TRUST)	WP31	EUR/a		Mod5

TRUST roadmap - Scoping S3_2: City profile Module 1: water ressources, collection, treatment, distribution and water use and supply

Name of the city/demonstration

-

TRUST city cluster

-

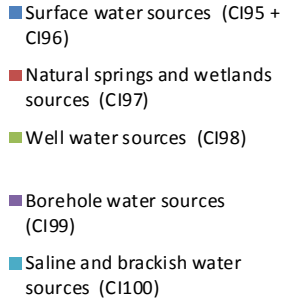
(for demonstration in TRUST only)

Water resources

General description of water resources

Annual average rainfall (CI86)	-	mm/year
Annual abstraction of surface waters (lakes, rivers, wetlands; without seawater) (Ci19 (TRUST)	#WERT!	%
Installed desalination capacity (IDC (TRUST))	-	m³/year
Water resources availability (WR2)	-	m³
Water availability per capita (WAPC (TRUST))	-	%
Installed water recycling capacity (IWRC (TRUST))	-	m³/d

raw water resources (%)



Abstraction per user (agricultural, industrial, utility and so on)

-

Qualitative description of water resources

-

Description on quantity and quality, pressures, ...

-

Collection, treatment and distribution

Number of water supply units (NoWS (TRUST))	-	No.
Raw water storage capacity (Ph2)	-	days
Treated water storage capacity (Ph3)	-	days
Number of drinking water treatment plants (Ci26)	-	No.
Treatment plant utilisation (Ph1)	-	%
Water delivered without treatment or disinfection only (CI27)	-	m³/day
Water delivered with convential treatment (CI29 (modified))	-	m³/day
Water delivered with advanced treatment (CI30)	-	m³/day
Type of treatment (TT (TRUST))	-	(-)

Water losses per mains length (Op24)	-	m³/km/year
Water losses per network input (WLpNI (TRUST))	-	%
Mains failures (Op31)	-	No./100 km /year
Mains rehabilitation (Op16)	-	%/year
Interruptions per connection (QS14)	-	No.(1000 connections/year)
Water supply interruptions (QS13)	-	%
Bulk supply interruptions (QS15)	-	No./ delivery point /year
Quality of supplied drinking water QS18)	-	%
Service connection density CI61)	-	No./km
Monthly peak factor of supplied and exported water (CI73)	-	-
Standardised energy consumption (Ph5)	-	kWh/m³/100m
Energy recovery (Ph7)	-	%

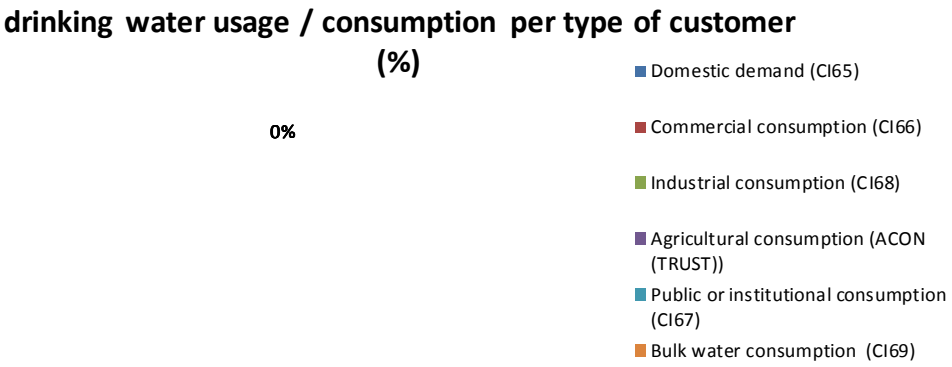
Water use and supply

Water usage

-

Water supply environment

-



TRUST roadmap - Scoping S3_2: City profile Module 2: wastewater and storm water

Name of the city/demonstration

-

TRUST city cluster

-

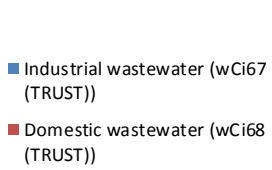
(for demonstration in TRUST only)

Description wastewater / storm water environment

-

Number of wastewater units / institutions related to storm water (wNoww (TRUST))	-	No.
Wastewater systems pumping stations (wC6)	-	No.
Total number of Wastewater Treatment Plants (WWTP) (wC61 (TRUST))	-	No.
Hydraulic treatment capacity (wTCH (TRUST))	-	m³/ day
Annual load removed (AL3 (TRUST))	-	kg / a
Sludge „imported“ (SI (TRUST))	-	Mg DS/a
Service connection density (wCI61 (TRUST))	-	No. / km
Sewage disposal (SD (TRUST))	-	Text

wastewater service by type (%)



Wastewater treatment

Treated wastewater in WWTP (wQS5)	-	%
Primary treatment (wQS7)	-	%
Secondary treatment (wQS8)	-	%
Tertiary treatment (wQS9)	-	%
Secondary treatment utilisation (wPh3)	-	%
Wastewater reuse rate (wEn2)	-	%
Plant utilisation (wPu (TRUST))	-	%
Energy efficiency of load removal (wEEL (TRUST))	-	kwh/kg COD
Sludge production (SP (TRUST))	-	Mg DS/a
Sludge utilisation (wEn7)	-	%
Sludge thermally processed (wEn10)	-	%

Interruptions wastewater collection and transport services (wQS	-	%
Sewer rehabilitation (wOp21)	-	%/year
Number of blockages in sewers/total sewer length * 100 (wOp34)	-	No./100 km/year
Flooding from sanitary sewers (wOp37 (modified))	-	No./100 km/year
WWTP compliance with discharge consent (wEn1)	-	%
Energy recovered or from renewabel sources (wOp19 (modified)	-	%
Standardised energy consumption (wOp20)	-	(kWh/m³/m)
Removal efficiency for organic load or nutrients (AL (TRUST))	-	%

TRUST roadmap - Scoping S3_2: City profile Module 3: water balance

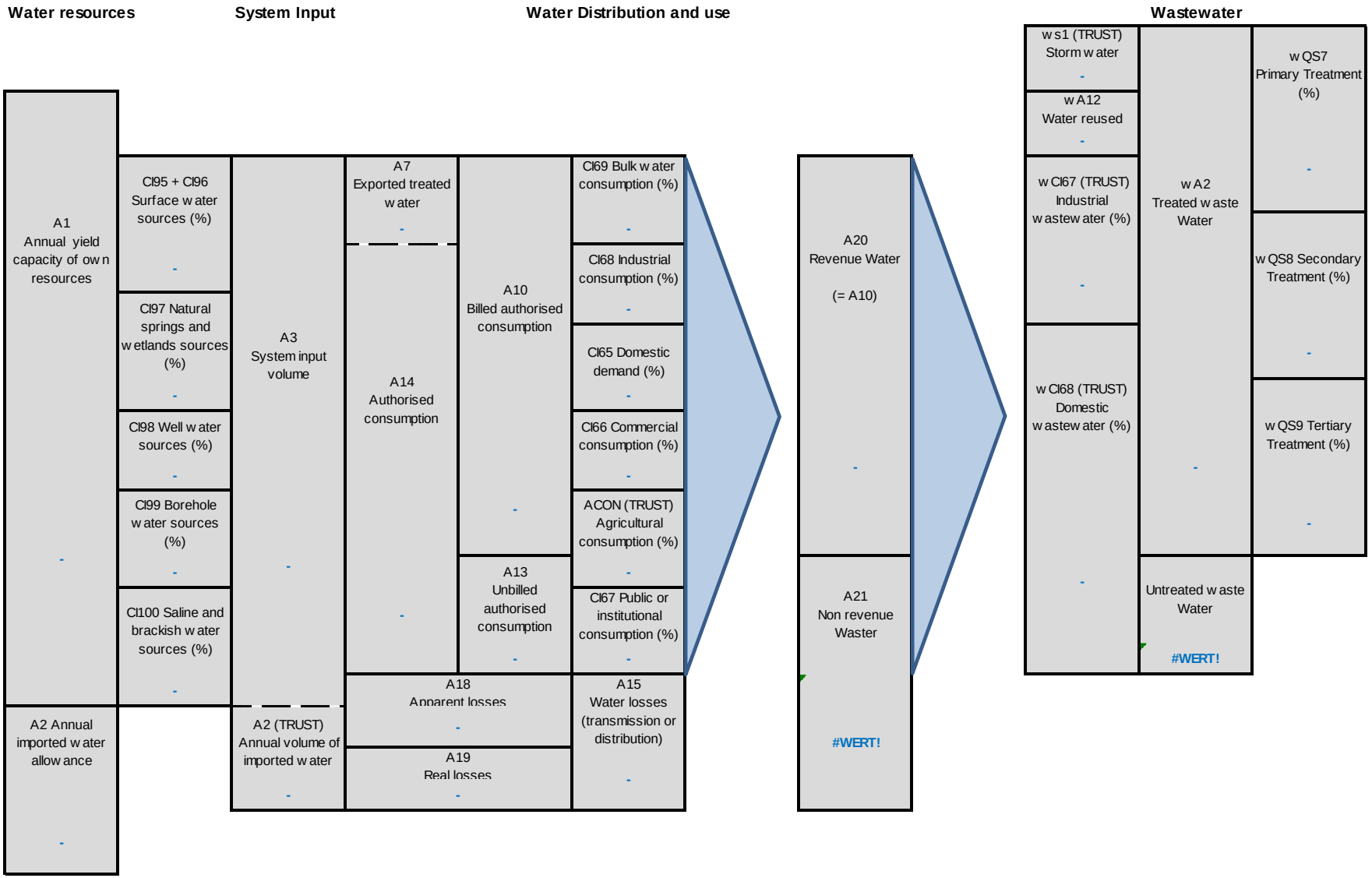
Name of the city/demonstration

-

TRUST city cluster

-

(for demonstration in TRUST only)



TRUST roadmap - Scoping S3_2: City profile Module 4: water management & governance

Name of the city/demonstration

-

TRUST city cluster

-

(for demonstration in TRUST only)

Sustainability criteria

G11 Participation initiatives

What is the role of NGOs and the involvement in decision making of other stakeholders?

-

Description of actual and future cooperation with stakeholders and the level of cooperation (e.g. local agenda etc.)

-

Which stakeholders were addressed in which frequency?

-

G11 Local engagement

Description of the local/regional engagement of the utility in terms of financial and material advancement (serving the public good, sponsorship etc.):

-

G21 Availability of information and public disclosure

This index shows the degree of public information and disclosure: (0 = no public disclosure; 9 = very high public disclosure)	0	[Index 0-9]
1. Do have a customer service center?	-	[yes/no]
2. Do have a homepage that provides actual information of your service and your institution/organisation?	-	[yes/no]
3. Do you have reliable financial information internally readily available all time (incl. accounting)?	-	[yes/no]
4. Is this information audited?	-	[yes/no]
5. Do you make selected financial information publicly available?	-	[yes/no]
If **yes**, by which medium? Internet; newspapers; written documents distributed to customers?	-	
6. Do you have reliable quality of service information internally readily available all time?	-	[yes/no]
7. Is this information audited?	-	[yes/no]
8. Do you make selected quality of service information publicly available via an easy to access means?	-	[yes/no]
If **yes**, by which medium? Internet; newspapers; written documents distributed to customers?	-	
9. Do you publish information beyond the legal or contractual requirements?	-	[yes/no]
If **yes**, by which medium? Environment report; corporate responsibility report; quality of service report; customer satisfaction surveys, detailed accounting aspects e.g. tariff calculation, explanation of invoice components?	-	

A31 Quality of the information and of the knowledge management system

Do you have implemented a systematic knowledge management procedure in your organisation?	-	[yes/no]

G31 Clearness, steadiness and measurability of policies

This index shows the degree of intensity of UWCS policies: (0 = no measurability of UWCS policies; 9 = very high measurability of UWCS policies)	0	[Index 0-9]
1. Are there developments of alternative supply concepts for the supply area by the water supply utility, e.g. involving utilisation of rainwater, separation technology or sewage water reuse?	-	[yes/no]
2. Are there programs for development of protection areas: cooperation with the agricultural, wetland programs, management of biodiversity, agreement for nature protection and so on?	-	[yes/no]
3. Does a certified technical security management system exist (e.g. in Germany DVGW-W1000)?	-	[yes/no]
4. Do guidelines in a system of rules sorted (organisation manual, operation manual) exist?	-	[yes/no]
5. Does a certified quality management system exist (e.g. in Germany DIN ISO 9000)?	-	[yes/no]
6. Are there global policies related to UWCS clearly defined?	-	[yes/no]
If there **are** global policies related to UWCS clearly defined: How long?	-	
7. Are your corporate objectives clearly stated?	-	[yes/no]
If your corporate objectives **are** clearly stated: How long?	-	
8. Do you have measures to assess them?	-	[yes/no]
9. Do you have targets associated to the stated objectives?	-	[yes/no]
10. Do you have revision and continuous improvement procedures in place?	-	[yes/no]

G41 Degree of alignment of city, corporate and water resources planning

1. Are there mechanisms to ensure alignment between city planning and UWCS planning?	-	[yes/no]
2. Are there mechanisms to ensure alignment between water resource planning and UWCS planning?	-	[yes/no]
3. Have you ever been asked to participate and did participated in any of the following more global strategic planning process?	-	[yes/no]
4. Which of the following participations do you consider of most importance to ensure you a better integrated planning system for your activity? - Direct participation in the city planning process - Direct participation in UWCS stakeholders planning process - Direct participation in consultants boards for legal / formal requirement for regular UWCS coordination - Direct participation in UWCS license boards or processes	-	

G22 Availability of mechanisms of accountability

This index shows the accounting status: (0 = no accounting standards implemented; 3 = standard accounting practices implemented)	0	[Index 0-3]
1. Do you have cost type accounting?	-	[yes/no]
2. Do you have cost centre accounting?	-	[yes/no]
3. Do you have product cost accounting?	-	[yes/no]

A14 Adaptability to changes (e.g. climate change adaptation)

This index shows the status of regional climate, demographic sciences, information and prognoses status (short information status): 0 = no information; 3 = high	0	[Index 0-3]
1. Are regional studies of the demographical, climate change available and also used for the strategy of the utility?	-	[yes/no]
2. Has your organisation analysed trends and prognoses according to their impact on your existing system?	-	[yes/no]
3. Have you built future scenarios in order to ensure adequate system resilience?	-	[yes/no]

If reply to question 3. is **yes**:

4. What instruments (software and so on) do you use for adaption to changes?	-	
4.1 What factors are taken into account in your scenario building? (Check box: urban development; demography; rainfall events (flood or droughts); temperature; consumption habits; resources availability (water, energy, capital))	-	
4.2 Are these scenarios considered in your rehabilitation plan?	-	[yes/no]

Ec12 Economic efficiency

Does your organisation have procedures in place to assess productivity (like economic regulation; external efficiency controls from investors / lenders; participation in benchmarking initiatives, publishing of detailed cost information to the public; internal incentives for efficiency goals; efficiency audits)?

-

TRUST roadmap - Scoping S3_2: City profile Module 5: social and economic aspects

Name of the city/demonstration

-

TRUST city cluster

-

(for demonstration in TRUST only)

Water supply

Social aspects		
Total per capita consumption of drinking water (CI70)	-	l per capita/day
Households and businesses water supply coverage (QS1)	-	%
Buildings supply coverage (QS2)	-	%
Population coverage (drinking water) (QS3)	-	%
Service complaints per customer drinking water (QS27)	-	No. complaints/customer/year
Delay in accounts receivable (Fi32)	-	day equivalents
Affordabilty of water supply	-	%
Human resources management personnel (Pe4)	-	%
Total training (Pe19)	-	(hours/employee/year)
Operational meters (Op38)	-	(%)
Economic aspects		
Total cost coverage ratio (Fi30)	-	-
Investment ratio (Fi33)	-	(-)
Debt service coverage ratio = DSC (Fi39)	-	%
Debt equity ratio (Fi40)	-	(-)
Return on equity (Fi43)	-	%
Carbon Footprint		
Carbon Footprint (CFWS (TRUST))	-	Mio. t CO2
Carbon Footprint reduction goals for 2040 (CfredWS (TRUST))	-	%

Wastewater & storm water

Social aspects		
Resident population connected to sewer system (wQS1)	-	%
Resident population served by WWTP (wQS2)	-	%
Resident population served by on-site systems (wQS3)	-	(No/1000 inhab./year)
Total complaints waste water (wQS19)	-	day equivalents
Delay in accounts receivable (wFi32) Receivable	-	%
Affordabilty of wastewater service (wAff1)	-	%
Human resources management personnel (wPe4)	-	(hours/employee/year)
Total training of personnel (wpe17)	-	(hours/employee/year)
Economic aspects		
Total cost coverage ratio (wFi30)	-	(-)
Investment ratio (wFi33)	-	%
Debt service coverage ratio = DSC (wFi39)	-	(-)
Debt equity ratio (wFi40)	-	%
Return on equity (wfi43)	-	%
Carbon Footprint		
Carbon Footprint (CFWW(TRUST)	-	Mio. t CO2
Carbon Footprint reduction goals for 2040 (CfredWW (TRUST))	-	%

Recovery of materials

1. Do you have nutrient recovery procedure, recycling, recovery of recycables, chemical recovery?

-

2. How much is the recovery? (quantitative information)

-

Efficient use of materials

1. Is the use of materials efficient?

-

2. Is the use of chemicals optimised in function of the actual inputs and target outputs?

-

3. What are the drivers for selecting the construction materials (investment cost; life cycle cost; functional capability; experience of use; technological requirements; quality requirements)?

-

TRUST roadmap - Scoping S3_2: City profile Module 6: general description

Name of the city/demonstration

-

TRUST city cluster

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(for demonstration in TRUST only)

General description of the city area

Supply area water supply (CI14)	-	km²
Catchment area waste water (wCI14)	-	km²
Residential population (water supply) (E5)	210.000	No.
Residential population (waste water) (wE1)	-	No.
Population density (CI78)	-	No./km²
Seasonal population (SEAP (TRUST))	-	%
Current population growth rate per year (CI80)	-	% per year
Estimated population growth until 2040 (CI81 modified)	-	% (until 2040)
Gross Domestic Product per capita (GDPPC (TRUST))	-	EUR p. cap./a
Average household income AHI (TRUST))	-	EUR/a
Annual average rainfall (CI86)	-	mm/year

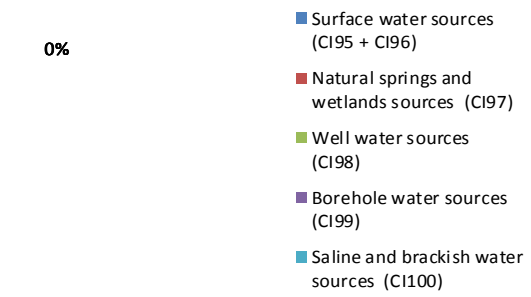
General description of UWCS elements

elements of UWCS	FALSCH	FALSCH	
Number of utilities/organisations responsible for UWCS	-	No.	
Number of utilities water supply	-	No.	
Number of institutions waste water and storm water	-	No.	

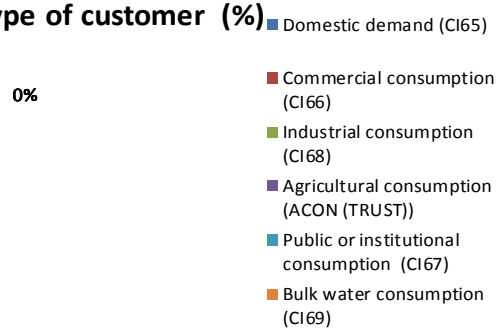
Basis information of urban area

-

raw water resources (%)



drinking water usage / consumption per type of customer (%)



Organisational and governance structure

-

Water related general information

Social and economic aspects on UWCS (selected)

Service related aspects

Total per capita consumption of drinking water (CI70)	-	l p. capita/day
Households and businesses water supply coverage (QS1)	-	%
Resident population connected to sewer system (wQS1)	-	%
Service complaints per customer drinking water (QS27)	-	No. complaints/ customer/ year
Total complaints waste water (wQS19)	-	(No/ 1000 inhab. / year)
Quality of supplied drinking water (QS18)	-	%
WWTP compliance with discharge consent (wEn1)	-	%
Water resources availability (WR2)	-	%

TRUST roadmap - Scoping S3_2: City profile Module 7: sustainibility criteria

Name of the city/demonstration

-

-

(for demonstration in TRUST only)

	Sustainability criteria	Name of PI	Water supply or wastewater	Code	Output data	Unit
Social						
S11	Service coverage	Service connection density	WS	CI61	-	No./km
S11		Monthly peak factor of supplied and exported water	WS	CI73	-	-
S11		Service connection density	WW	wCI61 (TRUST)	-	No. / km
S11		Households and businesses water supply coverage	WS	QS1	-	%
S11		Population coverage (drinking water)	WS	QS3	-	%
S11		Buildings supply coverage	WS	QS2	-	%
S11		Resident population connected to sewer system	WW	wQS1	-	%
S11		Resident population served by WWTP	WW	wQS2	-	%
S11		Resident population served by on-site systems	WW	wQS3	-	%
S21	Quality of service	Interruptions per connection	WS	QS14	-	No.(1000 connections/year)
S21		Water supply interruptions	WS	QS13	-	%
S21		Bulk supply interruptions	WS	QS15	-	No./ delivery point /year
S21		Annual load removed	WW	AL3 (TRUST)	-	kg / a
S21		Interruptions of wastewater collection and transport services	WW	wQS15	-	%
S21		Service complaints per customer drinking water	WS	QS27	-	No. complaints/ customer/
S21		Total complaints waste water	WW	wQS19	-	(No/ 1000 inhab. / year)
S22	Safety and health	Quality of supplied drinking water	WS	QS18	-	%
S22		WWTP compliance with discharge consent	WW	wEn1	-	%
S31	Affordability	Affordability of water supply	-	Aff1 (TRUST)	-	%
S31		Affordability of wastewater service	-	wAff1 (TRUST)	-	%

Environment

En11	Efficiency in the use of water (including final uses)	Description on quantity and quality, pressures, … Are there additional abstraction of water from residentials, agriculture, industrial and how much are these abstractions?	WS	DQQ (TRUST)	-	Text
En11		Water resources availability	WS	WR2	-	%
En11		Water availability per capita	WS	WAPC (TRUST)	-	m³/cap
En11		Water losses per mains length	WS	Op24	-	m³/km/year
En11		Water losses per network input	WS	WLpNI (TRUST)	-	%
En11		Treated wastewater in WWTP	WW	wQS5	-	%
En11		Wastewater reuse rate	WW	wEn2	-	%
En11		Total per capita consumption of drinking water	WS	CI70	-	l per capita/day
En12	Efficiency in the use of energy	Standardised energy consumption	WS	Ph5	-	kWh/m³/100m
En12		Energy recovery	WS	Ph7	-	%
En12		Plant utilisation	WW	wPu (TRUST)	-	%
En12		Energy efficiency of load removal	ww	wEEL (TRUST)	-	kwh/kg COD
En12		Energy recovered or from renewable sources	WW	wOp19	-	%
En12		Standardised energy consumption	WW	wOp20	-	(kWh/m³/m)
En13	Efficiency in the use of materials	Recovery of materials 1	WW, WS	ROM1 (TRUST)	-	Text
En13		Recovery of materials 2	WW, WS	ROM2 (TRUST)	-	Text
En13		Efficient use of materials 1	WW, WS	EUOM 1(TRUST)	-	Text
En13		Efficient use of materials 2	WW, WS	EUOM 2(TRUST)	-	Text
En13		Efficient use of materials 3	WW, WS	EUOM 3(TRUST)	-	Text
En21	Environmental efficiency (life cycle emissions to water, air and soil)	Sludge utilisation	WW	wEn7	-	%
En21		Sludge thermally processed	WW	wEn10	-	%
En21		Removal efficiency for organic load or nutrients	WW	AL (TRUST)	-	%
En21		Carbon Footprint	WW	CFWW(TRUST)	-	Mio. t CO2
En21		Carbon Footprint reduction goals for 2040	WW	CfredWW	-	%
En21		Carbon Footprint	WS	CFWS (TRUST)	-	Mio. t CO2
En21		Carbon Footprint reduction goals for 2040	WS	CfredWS (TRUST)	-	%

Economic

Ec11	Cost recovery and reinvestment in UWCS (incl. cost financing)	Total cost coverage ratio	WS	Fi30	-	(-)
Ec11		Investment ratio	WS	Fi33	-	(-)
Ec11		Total cost coverage ratio (=wG1/wG5)	WW	wFi30	-	(-)
Ec11		Investment ratio	WW	wFi33	-	(-)
Ec12	Economic efficiency	Productivity	WS, WW	-	-	Text
Ec12		Return on equity	WS	Fi43	-	%
Ec12		Return on equity	WW	wFi43	-	%
Ec13	Leverage (degree of indebtedness)	Debt service coverage ratio = DSC	WS	Fi39	-	%
Ec13		Debt equity ratio	WS	Fi40	-	(-)
Ec13		Debt service coverage ratio = DSC	WW	wFi39	-	%
Ec13		Debt equity ratio	WW	wFi40	-	(-)
Ec14	Willingness to pay (accounts receivable)	Delay in accounts receivable	WS	Fi32	-	day equivalents
Ec14		Delay in accounts receivable	WW	wFi32	-	day equivalents

Governance

G11	Participation initiatives	Participation initiatives 1	WW, WS	PIN 1 (TRUST)	-	Text
G11		Participation initiatives 2	WW, WS	PIN 2 (TRUST)	-	Text
G11		Participation initiatives 3	WW, WS	PIN 3 (TRUST)	-	Text
G11		Local engagement	WW. WS	LE (TRUST)	-	Text
G21	Availability of information and public disclosure	Availability of information and public disclosure 1	WW, WS	AIPD 1 (TRUST)	-	yes/no
G21		Availability of information and public disclosure 2	WW, WS	AIPD 2 (TRUST)	-	yes/no
G21		Availability of information and public disclosure 3	WW, WS	AIPD 3 (TRUST)	-	yes/no
G21		Availability of information and public disclosure 4	WW, WS	AIPD 4 (TRUST)	-	yes/no
G21		Availability of information and public disclosure 5	WW, WS	AIPD 5 (TRUST)	-	yes/no
G21		Availability of information and public disclosure 6	WW, WS	AIPD 6 (TRUST)	-	Text
G21		Availability of information and public disclosure 7	WW, WS	AIPD 7 (TRUST)	-	yes/no
G21		Availability of information and public disclosure 8	WW, WS	AIPD 8 (TRUST)	-	yes/no
G21		Availability of information and public disclosure 9	WW, WS	AIPD 9 (TRUST)	-	yes/no
G21		Availability of information and public disclosure 10	WW, WS	AIPD 10 (TRUST)	-	Text
G21		Availability of information and public disclosure 11	WW, WS	AIPD 11 (TRUST)	-	yes/no
G21		Availability of information and public disclosure 12	WW, WS	AIPD 12 (TRUST)	-	Text
G21		Availability of information and public disclosure 13	WW, WS	AIPD 1 3 (TRUST)	0	Index (0-9)

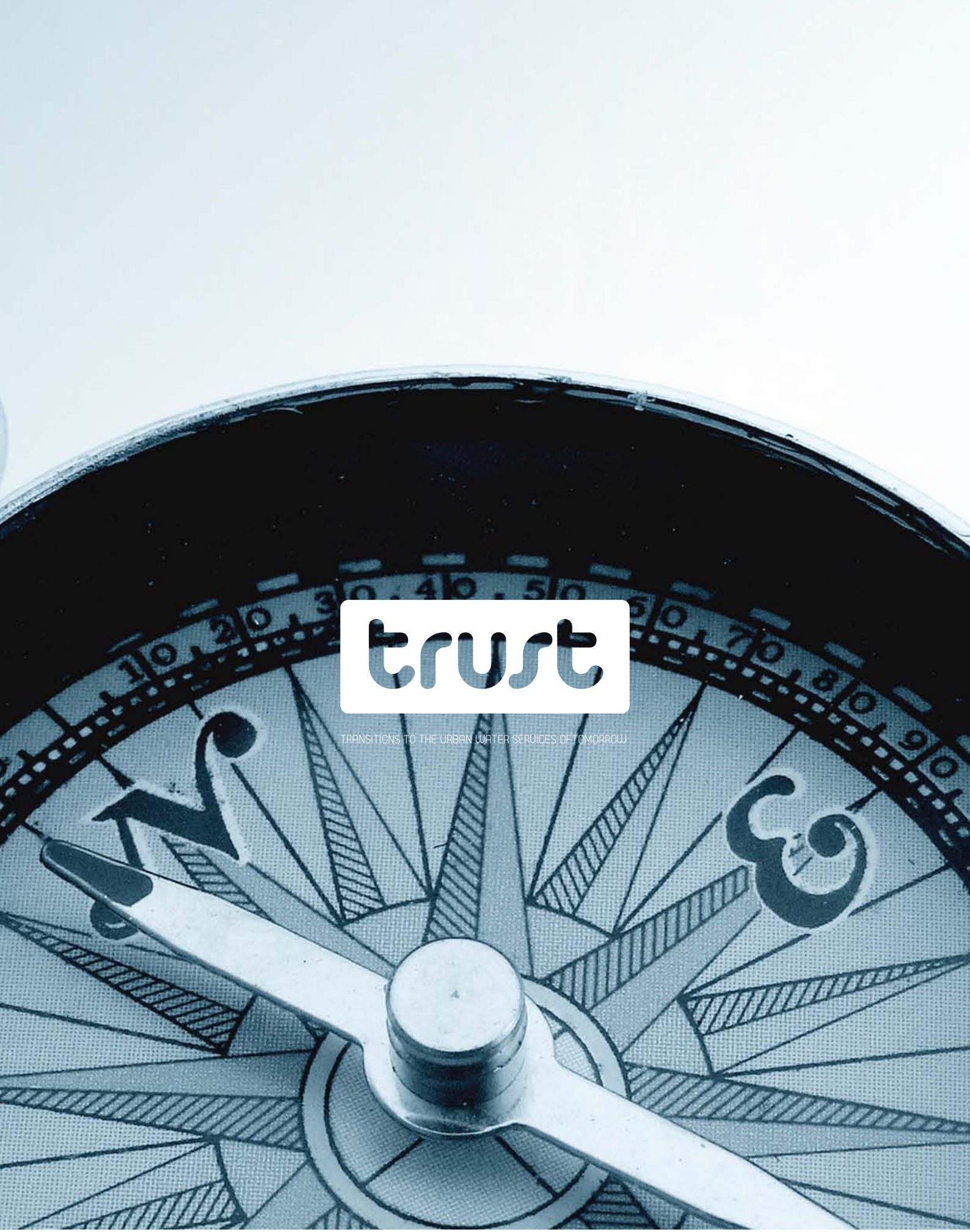
G22	Availability of mechanisms of accountability	Abstraction per user (agricultural, industrial, utility and so on)	WS	APU (TRUST)	-	Text
G22		Sewage disposal	WW	SD (TRUST)	-	Text
G22		Availability of mechanisms of accountability 1	WW, WS	AMAC 1 (TRUST)	-	yes/no
G22		Availability of mechanisms of accountability 2	WW, WS	AMAC 2 (TRUST)	-	yes/no
G22		Availability of mechanisms of accountability 3	WW, WS	AMAC 3 (TRUST)	-	yes/no
G22		Availability of mechanisms of accountability 4	WW, WS	AMAC 4 (TRUST)	0	Index (0-3)
G22		Operational meters	WS	Op38	-	(%)
G31	Clearness, steadiness and measurability of policies	Clearness, steadiness and measurability of policies 1	WW, WS	CSMP 1 (TRUST)	-	yes/no
G31		Clearness, steadiness and measurability of policies 2	WW, WS	CSMP 2 (TRUST)	-	yes/no
G31		Clearness, steadiness and measurability of policies 3	WW, WS	CSMP 3 (TRUST)	-	yes/no
G31		Clearness, steadiness and measurability of policies 4	WW, WS	CSMP 4 (TRUST)	-	yes/no
G31		Clearness, steadiness and measurability of policies 5	WW, WS	CSMP 5 (TRUST)	-	yes/no
G31		Clearness, steadiness and measurability of policies 6	WW, WS	CSMP 6 (TRUST)	-	yes/no
G31		Clearness, steadiness and measurability of policies 7	WW, WS	CSMP 7 (TRUST)	-	list
G31		Clearness, steadiness and measurability of policies 8	WW, WS	CSMP 8 (TRUST)	-	yes/no
G31		Clearness, steadiness and measurability of policies 9	WW, WS	CSMP 9 (TRUST)	-	list
G31		Clearness, steadiness and measurability of policies 10	WW, WS	CSMP 10 (TRUST)	-	yes/no
G31		Clearness, steadiness and measurability of policies 11	WW, WS	CSMP 11 (TRUST)	-	yes/no
G31		Clearness, steadiness and measurability of policies 12	WW, WS	CSMP 12 (TRUST)	-	yes/no
G31		Clearness, steadiness and measurability of policies 13	WW, WS	CSMP 13 (TRUST)	0	Index (0-10)
G41	Degree of alignement	Degree of alignment 1	WS, WW	DA 1 (TRUST)	-	yes/no
G41		Degree of alignment 2	WS, WW	DA 2 (TRUST)	-	yes/no
G41		Degree of alignment 3	WS, WW	DA 3 (TRUST)	-	yes/no
G41		Degree of alignment 4	WS, WW	DA 4 (TRUST)	-	list

Assets and Ressources

A11	Adequacy of the rehabilitation rate	Mains rehabilitation	WS	Op16	-	%/year
A11		Sewer rehabilitation	WW	wOp21	-	%/year
A12	Reliability and failures	Mains failures	WS	Op31	-	No./100 km /year
A12		Number of blockages in sewers/total sewer length * 100	WW	wOp34	-	No./100 km/year
A12		Flooding from sanitary sewers	WW	wOp37	-	No./100 km/year
A13	Adequate infrastructural capacity	Installed desalination capacity	WS	IDC (TRUST)	-	m³/year
A13		Raw water storage capacity	WS	Ph2	-	days
A13		Treated water storage capacity	WS	Ph3	-	days
A13		Treatment plant utilisation	WS	Ph1	-	%
A13		Hydraulic treatment capacity	ww	wTCH (TRUST)	-	m³/ day
A13		Primary treatment	WW	wQS7	-	%
A13		Secondary treatment	WW	wQS8	-	%
A13		Tertiary treatment	WW	wQS9	-	%
A13		Secondary treatment utilisation	WW	wPh3	-	%
A14	Adaptability to changes (e.g. climate change adaptation)	Adaptability to changes 1	WW, WS	AC 1 (TRUST)	-	yes/no
A14		Adaptability to changes 2	WW, WS	AC 2 (TRUST)	-	yes/no
A14		Adaptability to changes 3	WW, WS	AC 3 (TRUST)	-	yes/no
A14		Adaptability to changes 4	WW, WS	AC 4 (TRUST)	-	Text
A14		Adaptability to changes 5	WW, WS	AC 5 (TRUST)	-	Text
A14		Adaptability to changes 6	WW, WS	AC 6 (TRUST)	-	yes/no
A14		Adaptability to changes 7	WW, WS	AC 7 (TRUST)	0	Index (0-3)
A21	Adequacy of training, capacity building and knowledge transfer	Total training (hours/employee/year)	WS	Pe19	-	(hours/employee/year)
A21		Total training of personnel	WW	wPe17	-	(hours/employee/year)
A31	Quality of the information and of the knowledge management system	Quality of the information and of the knowledge management	WW, WS	QIKMS (TRUST)	-	yes/no
A31		Human resources management personnel	WS	Pe4	-	%
A31		Human resources management personnel	WW	wPe4	-	%

General

general	Name of the City		NOTC (TRUST)	-	Text
general	City Cluster		CC (TRUST)	-	List
general	Basis information of urban area	-	BIOUA (TRUST)	-	Text
general	Organisational and governance structure	-	OAGS (TRUST)	-	Text
general	Supply area	WS	CI14	-	km²
general	Catchment area (waste water)	WW	wCI14 (TRUST)	-	km²
general	Population density	-	CI78	-	No./km²
general	Current population growth rate (% per year)		CI80	-	% per year
general	Estimated population growth until 2040		Ci81 (modified)	-	%
general	Residential population (water supply)	WS	E5		No.
general	Residential population (waste water)	WW	wE1	-	No.
general	Seasonal population		SEAP (TRUST)	-	%
general	Number of utilities/organisations	WW, WS	NoU (TRUST)	-	No.
general	Gross Domestic Product per capita	-	GDPPC (TRUST)	-	EUR per capita/a
general	Average household income	-	AHI (TRUST)	-	EUR/a
general	Description Water resources	WS	DWR (TRUST)	-	Text
general	Annual average rainfall	WS	CI86	-	mm/year
general	Annual abstraction of surface waters (lakes, rivers, wetlands; without seawater) for all types of uses (drinking water, agriculture, industrial …)	WS	Ci19 (TRUST)		%
general	Installed water recycling capacity		IWRC (TRUST)	-	m³/d
general	Surface water sources	WS	CI95 + CI96	-	%
general	Natural springs and wetlands sources	WS	CI97	-	%
general	Well water sources	WS	CI98	-	%
general	Borehole water sources	WS	CI99	-	%
general	Saline and brackish water sources	WS	CI100	-	%
general	Number of water supply units	-	NoWS (TRUST)	-	No.
general	Number of drinking water treatment plants	WS	CI26	-	No.
general	Type of treatment	WS	TOT (TRUST)	-	Text
general	Water delivered without treatment or disinfection only	WS	CI27 (modified)	-	m³/day
general	Water delivered with convential treatment	WS	CI29 (modified)	-	m³/day
general	Water delivered with advanced treatment	WS	CI30	-	m³/day
general	Water usage	-	WU (TRUST)	-	Text
general	Water supply environment	-	WSE (TRUST)	-	Text
general	Domestic demand	WS	CI65	-	%
general	Wastewater / storm water environment	WW	WSEN (TRUST)	-	Text
general	Number of wastewater units / institutions related to storm water	WW	wNoww (TRUST)	-	No.
general	Industrial wastewater	WW	wCi67 (TRUST)	-	%
general	Domestic wastewater	WW	wCi68 (TRUST)	-	%
general	Total number of Wastewater Treatment Plants (WWTP)	WW	wC61 (TRUST)	-	No.
general	Wastewater systems pumping stations	WW	wC6	-	No.
general	Sludge „imported“	WW	SI (TRUST)	-	Mg DS/a
general	Sludge production	WW	SP (TRUST)	-	Mg DS/a



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TRANSITIONS TO THE URBAN WATER SERVICES OF TOMORROW

Roadmap guideline:
A manual to organise transition planning in Urban Water Cycle Systems **D 13.1**

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 265122.

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SEVENTH FRAMEWORK PROGRAMME