Learning Alliance Briefing Note 12: Rapid urban water assessment (draft)

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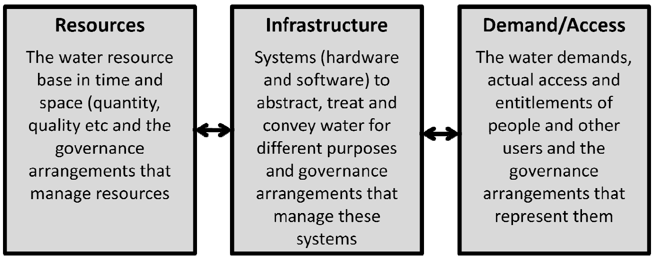
Introduction and overview

Population growth, increasing per capita water use and rapid urbanisation are all contributing to the escalating water demand of urban and peri-urban areas. Water uses in urban and peri-urban areas are also important sources of pollution that can impact on the availability of safe water to users locally and/or in downstream areas. Urban environments modify flooding risks, and at the same time people want to live and work close to attractive waterfronts. The situation is complicated by the fact that, in many areas, access to safe water (and sanitation) is far from equitable and large number of people are unable to access water according to national and international norms. The net result is that decision makers in the water sector are confronted by the challenge of meeting current levels of demand and the paradox that the more progress is made in providing water to all users at affordable prices, the more demand increases and the greater still becomes the challenge of ensuring that all demands are met, pollution mitigated and flood risks minimised.

The encouraging news is that, in most cases, a wide variety of opptions exist for tackling this challenge and associated paradox. These include, for example: managing demand, improving operation and maintenance (and thereby reducing conveyance losses), increasing stakeholder participation, improving governance and/or augmenting supply. Natural approaches to engineering offer new options for stormwater management and mitigating flooding risks. But what is the best framework for analysing, modelling and discussing the potential impacts and utility of these different options? Equally important, how can the selected option(s) be best matched and adapted to the specific context of any given urban or peri-urban area.

The Resources, Infrastructure and Demand/Access (RIDA) framework is attracting increasing interest because it can be used, in an integrated urban water management context, to structure stakeholder dialogue, data analysis and modelling. The RIDA concept is simple. The RIDA framework is based on the understanding that water resources are linked to users by supply (and water treatment) infrastructure, and that each of these three system elements (resources, infrastructure, users) has its own set of institutions, boundaries and other characteristics (see Figure 1). In other words, that there may be three sets of largely independent physical/institutional boundaries that need to be considered systematically discussing or analysing urban water issues. Just as people as have a demand for safe water, there is also a demand not to be flooded and a demand for space close to rivers and attractive waterfronts.

Figure 1. The RIDA framework



At any level of complexity, it is only possible to solve water problems once the fundamental causes have been identified properly. The RIDA framework can be used to structure analysis and discussions relating to complex water management systems that have, for example, multiple sources, complicated infrastructural systems that have been developed over a long period of time, and multiple competing demands. This can be achieved by considering the sorts of questions listed in Box 1. The RIDA framework can also be used to structure analysis of relatively simple village water delivery systems by highlighting the fundamental causes of water supply problems. For example the root causes of these problems could be infrastructural (e.g. a pump breakdown), societal (e.g. social exclusion from using certain water points) or resource-related (e.g. falling groundwater levels).

In the context of integrated urban water management, the RIDA framework can also be used by, for example, a learning alliance[1] to structure the analysis of complex governance systems and to map the level of participation of stakeholders in different aspects of the governance. The RIDA framework can also help to structure analysis of the level of legal entitlement that users have over access to water for different uses (or protection from flooding or other demands) under a range of conditions that vary both in space and time.

Finally, the RIDA framework can help in the development of appropriate sustainability indicators and in providing structure to monitoring systems aimed at tracking the performance of the components of a water infrastructure system and the urban water management system as a whole.

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[1] A *learning alliance* is a group of individuals or organisations with a shared interest in innovation and the scaling-up of innovation, in a topic of mutual interest.

Box 1. Example of a list of questions for water supply structured using a RIDA framework

Resources

- What water resources are drawn on by the water supply infrastructure?
- What is the sustainable quantity of acceptable quality water that they can supply?
- What other demands are made upon them?
- What major institutions are involved in managing water resources? What are their roles and responsibilities? How effective are they?

Infrastructure

- What are the main physical elements of the water supply infrastructure (reservoirs, canals, treatment plants, pipe networks etc.)?
- What is the capacity of this infrastructure (storage, treatment, supply) to meet demand?
- What institutions are related to water supply infrastructure?

Demand/Access

- What is the demand for water from different water-users and societal groups (quantity, quality, reliability, location)?
- What existing access do users have to water now; to what extent is demand satisfied?
- What are the key water related institutions relevant to the various water-user groups?
- What barriers to access are experienced by different water-user groups (high user fees; requirement to have membership of associations etc.)?

Getting started

As might be expected, the materials and resources needed for developing and using a RIDA framework will depend on scale and level of complexity of the delivery system. This said, the following will be required in most cases:

- A specialist or a group of specialists with a good understanding of technical and societal aspects of the complete water delivery system;
- Experienced facilitators who have a good knowledge of the water sector and are able to facilitate stakeholder dialogue at different levels;
- Specialists with good information management, data analysis and, possibly, modelling skills;
- Access to good quality information. In most cases, this will require the support and interest of senior professionals in relevant government line departments and/or water utilities;
- Sufficient time and resources to work interactively with relevant stakeholders and/or a learning alliance.

Methodology

The following are a set of generic steps that can be used to develop and use a RIDA framework. Although presented as a stepwise process, in practice it is often necessary to repeat steps iteratively.

Step 1: Discuss and agree objective. Discuss and reach agreement on the objective(s) of developing and using a RIDA framework. Objectives could be, for example, to produce a water resource assessment[2], a schematic diagram (see Figure 2) or a disaggregated vision (see Figure 3). Clearly, there is no point is using a RIDA framework unless there agreement that it will improve a planning or WASH governance process.

Step 2: Discuss and agree the area, domain and scale of interest. As a continuation of Step 1, discuss and agree on the extent and boundaries of the area(s) and domain(s) of interest to be covered by the RIDA framework and subsequent analysis. This discussion should include consideration of whether analysis of historical trends is required and, if so, over what time period. This discussions should also include consideration of the societal and technical scale(s) of interest. For example, societal scales of interest could be one or all of the following: household, community, urban district and/or city. While technical scales of interest might be 1:1000, 1:5000 and/or 1:25,000.

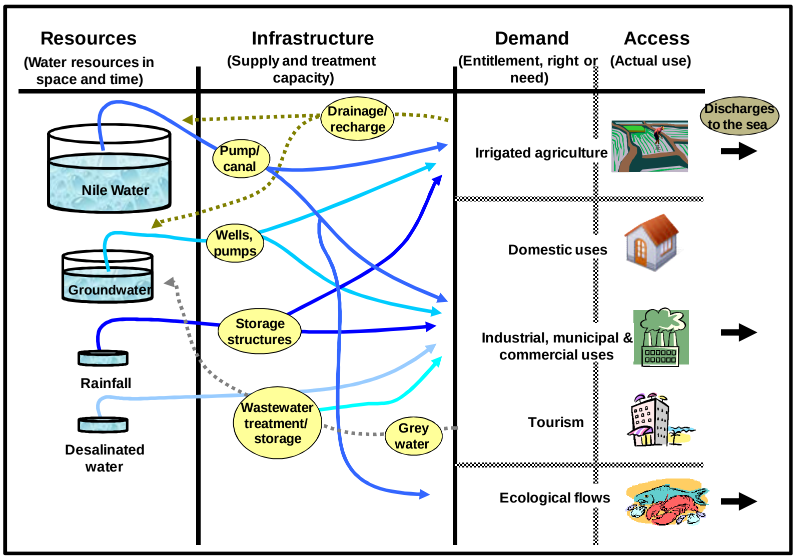
Step 3: Identify the available resources. As a continuation of Steps 1 and 2, identify the resources that are available for developing and using a RIDA framework. This will also determine the time available for analysis and/or discussions, the financial and human resources that can be used, the potential level of stakeholder participation and whether or not capacity building is required.

Step 4: Identify information that is required. Determine the information that is needed to achieve the objective(s) identifies in Step 1 and that might usefully be structured in a RIDA format. A check list of questions that might need to be answered is provided in Box 1. This list can be modified according to objectives of specific discussions or analysis. Table 1 is a check list of the components and type of information that might be needed.

Step 3: Identify sources of information. A brainstorming session with knowledgeable specialists is usually a good start point for identifying sources of existing information. At the same, it is usually possible to obtain expert opinion on the quality of existing information and whether or not primary data collection will also be required.

[2] See http://www.fao.org/docrep/009/a0994e/a0994e00.htm for an example of a water resource assessment that was structured using the RIDA framework

Figure 2. Alexandria RIDA Schematic Diagram



Step 4: Create an information base. Information collected should be quality controlled and stored in an information base. Ideally, the storage structure should reflect the RIDA components, for example, by using different worksheets within a spreadsheet to summarise each RIDA component.

Step 5: RIDA analysis. RIDA analysis can involve such activities as: institutional and decision mapping, water balance analysis and modelling. The difference between RIDA analysis and standard information analysis is the use of the framework to structure analysis and outputs.

Step 6: Disseminate outputs. Although the analysis and modelling may be sophisticated, the resulting outputs should be in a form that can be understood easily by potential users of the information and structured in a RIDA format.

Challenges and tensions

A well-worked RIDA framework helps to bring order to apparent complexity and, in so-doing, helps to structure stakeholder dialogue and specialist analysis or modelling. However, a number of challenges and tensions often crop up. These include the following:

Fuzzy boundaries: The societal and technical boundaries between the three components of a RIDA framework (i.e. between Resources and Infrastructure and Ifrastructure and Demand/Access) can be quite fuzzy. For example, in a heavily-engineered river basin almost all surface and ground water resources are related to infrastructure . In such cases, a decision has to be made on, for example, whether regard a river system should be classified as a resource or part of an infrastructural system. Similarly, the boundaries between components of a governance system are often indistinct and judgements often have to be made.

Quality and availability of information: It is always easier to produce a schematic diagram of a water delivery system in RIDA format than it is to populate this diagram with good quality information. The quality of information is always quite varied. Although some information may be acceptable in terms of its quality, other information may be out of date or plain wrong. The key is to ensure that sufficient time and other resources are allocated to quality controlling and groundtruthing information. The accessibility of information can also pose a major challenge. Data are often fragmented in that they are held by different organisations and, in some cases, by different departments or individuals within these organisations. Restrictions may also exist on the sharing of information particularly information that is regarded as being sensitive (e.g. costs of constructing infrastructure).

Spatial and temporal scales: The spatial and temporal scales at which data have been collected by different organisations are often far from consistent. This can necessitate disaggregating or aggregating information on different components of a system.This takes time and, in many cases, results in a reduction in confidence in the information.

Level of detail: There is a tendency, particularly in interdisciplinary teams, for specialists to want to collect information in more detail than is really necessary. Collecting and processing information is costly, and should therefore always be clearly linked to actual decisions and problems within a paradigm of optimal ignorance and appropriate imprecision[3].

Range of formats: Information is usually held in a wide range of different formats (e.g. text, tables, figures, maps, remotely-sensed images etc) and media (e.g. reports, hard disks, the internet, journals etc). It is easy to underestimate the time needed to reconcile information that has been stored in different formats using different media.

Tips and tricks

- An important aim of using the RIDA framework is ensure that the analysis of urban water systems considers both technical and societal aspects of the systems. The trick is to ensure that an appropriate balance is achieved when considering these two aspects.
- The boundaries between elements of RIDA are not

[3] *Optimal ignorance* means understanding the difference between what is worth knowing and what is not. This avoids collection of too much irrelevant data. *Appropriate imprecision* recognises that in conventional assessments, much of the information collected has a degree of precision that is really unnecessary and/or is inconsistent (in terms of precision) with the other information that is being collected.

Table 1. Information check list (not exhaustive and focusing on water supply issues as an example)

Main Components		Information
Resources	Rainfall	Rain gauge locations, rainfall records and rainfall intensity information
	Inter-basin transfer	Canal gauging data (in and out of areas of interest)
	Runoff	River gauging data and water quality information Catchment areas and characteristics (slope, soil type, land use etc)
	Groundwater (sustainable yield, recharge)	Geological information Ground water level and water quality information Research study outputs
	Waste-water return flows	Gauging and water quality information Capacity of treatment plants
	Infiltration	Soil type, land use and slope Research study outputs
	Evaporation	Published potential and/or actual evaporation data Land use information (especially irrigated areas)
Infrastructure	Storage structures	Size, location and operating rules
	Irrigation and drainage networks	Location, layout and operating rules of irrigation schemes. Including pumping stations and major canal headworks
	IBT supply	Location, layout, capacity and operating rules of IBT systems
	Urban water supply networks	Location, layout, capacity and operating rules of urban water supply networks
	Wells	Location, depth, size of pumps Information on extraction rates
	Unaccounted for Water	Research study outputs Supply company estimates
	Household and user connections	Metering information Supply company estimates
Demand	Irrigation demand	Terrestrial and remotely-sensed information and statistics
	Domestic demand	Estimates based on census data and government norms, on household surveys and water supply company statistics
	Demand for small-scale productive water uses)	Estimates based on census and market survey data and household surveys
	Industrial, municipal and commercial demand/access	Estimates based on surveys. Local government and water supply company statistics
	Environmental and ecological demand	Hydro-ecological modelling and surveys of aquatic habitats
Access	Irrigated agriculture	Comparison between irrigable and irrigated areas using remotely-sensed information. Farmer surveys
	Domestic use	Comparison between supply and demand measurements Household surveys and analysis of complaints information
	Small-scale productive uses	Comparison between supply and demand measurements Household surveys
	Industrial, municipal and commercial demand	Comparison between supply and demand measurements Surveys and analysis of complaints records
	Environmental and ecological use	Comparison between supply and demand measurements Surveys and habitat monitoring

Figure 3. Disaggregated vision targets for Enugu State, Nigeria

Resources

Water resource management targets

By end of 2008:

- **Information system**: Establishment of a state-wide water management information system. As a minimum, this system must ensure that stakeholders at all levels have access to good quality information.
- **Integrated water resource management (IWRM)**: Establishment of state-wide IWRM plans aimed at sustainable, efficient and equitable water management and protection of fragile ecosystems.
- **Regulatory framework.** Identification of river systems and aquifers at highest risk to overexploitation and/or pollution. Establish a monitoring programme that focuses on high-risk areas and informs an acceptable regulatory system

Infrastructure

Water supply coverage targets:

	2007	2010	2013	2015
Urban	20%	40%	80%	90%
Semi-Urban	15%	35%	80%	90%
Rural	30%	50%	80%	90%

Sanitation & hygiene education (SHE) coverage targets

All tiers of government shall henceforth appropriate and release a separate vote for water sanitation of an amount equivalent to not less than 15% of their annual appropriation for water supply to achieve the following targets:

- Review and improve SHE coverage to 60% of the population by 2007.
- Extension of SHE coverage to 65% by 2010.
- Extension of SHE coverage to 80% by 2015.
- Extension of SHE coverage to 90% by 2020.
- Achieve 100% SHE coverage by 2025
- Sustain 100% SHE coverage beyond 2025

Demand/Access

Water supply service level target:

By the year 2015, 90% of the entire population of Enugu State should have access to at least 120 lpcd of safe water at an affordable cost

Sanitation service level target:

Separate water supply and sanitation are made to match the three socio-economic profiles of the population as follows:

- **Rural:** Each household in rural areas (community of population of less than 5,000) must own and have access to safe sanitary facility of at least upgraded pit latrines.
- **Semi-urban:** Each household in semi-urban areas (population of 5,000 to 20,000) must own and have access to safe sanitary facility of at least sanplat latrine.
- **Urban:** Each household in urban areas (population above 20,000) must own and have access to safe sanitary facility of at least pour-flush toilet.

always clear. Defining them is something that is best done in a local context as part of the stakeholder dialogue process. Deciding how to treat and interpret different data may also call for expert involvement.

- A key part of populating a RIDA framework is deciding on information that can be collected from secondary sources and information that will involve primary data collection. Typically user-related data (demand, access, local institutions) requires mostly primary data collection, often collected using a range of PRA tools[4]; while water resource data is usually collected from secondary sources. Information about infrastructure typically requires a mix of both.
- RIDA analysis rarely takes place at a single scale. The area of interest may start with the area where demand and access are being assessed – but it must follow the logic of the system to identify problems and opportunities to meet that demand, which could lead to considering an entire city, looking at supply infrastructure and identifying potential water resources.
- It is usually more useful and efficient in terms of resources to collect and reconcile information that relates specifically to the interfaces of the RIDA framework (see Table 2) . As opposed to collecting information haphazardly across the whole urban water system.

Table 2 RIDA interfaces

RIDA interfaces	Example focus of RIDA analysis
Resources – Infrastructure	Extraction estimates: Volume and quality of water in space and time entering into water supply infrastructure. Volume and quality of return flows to rivers or groundwater
Infrastructure- Demand	Delivery estimates: Volume and quality of water delivered at the point of supply to different users in space and time. A measure of *unaccounted for water* can be based on difference between extraction and delivery estimates.
Demand-Access	Water poverty estimates: The extent to which delivery of water meets the demands of users (including the environment) in space and time.

References and websites

www.project.empowers.info/page/120

The Empowers project adapted visioning and scenario-based planning methods to participatory planning of water projects in the Middle East.

For more information please contact: John Butterworth, IRC International Water and Sanitation Centre (butterworth@irc.nl) who coordinates the learning alliance workpackage for SWITCH or Charles Batchelor (batchelor@irc.nl) and Patrick Moriarty (moriarty@irc.nl) who adapted a joint planning methodology for the project.

SWITCH (Sustainable Water Management Improves Tomorrow's Cities' Health) is a research partnership supported by the European Community (Framework 6 Programme) and its partners www.switchurbanwater.eu/learningalliances

[4] Participatory rural appraisal (PRA) tools are designed to involve stakeholders in the collection and analysis of information and, therefore, to involve them actively in processes of improvement and change. Orginally devised for use in rural settings, they are now widely used and usually know simply as PRA tools.