URBAN GROUNDWATER QUESTIONAIRE

Lessons learnt from Bishkek and Narayanganj

Lessons

Neither of the cities studied had previously been the subject of a water Master Plan, or a study to assess the groundwater resource size, its scope for future exploitation and its development constraints. There is also no prospect of such a study in either city. In Bishkek, river basin-scale investigations had been undertaken in the 1970s to assess available resource on a broad regional scale as a standard national economic resource procedure under the former Soviet system. In Narayanganj, investigations were very localised, limited to estimates of safe yield funded by Japanese technical assistance for the small municipal wellfield. In effect, groundwater has been developed opportunistically in both cities. This situation is so common as to be almost the norm for urban groundwater, and not just in developing countries.

There was therefore in both cities a premium on identification of either basic data arrays already collected for other purposes, or simple parameters easily collated from operational records. In Narayanganj, the standard of basic hydrogeological data was relatively poor, being limited to a handful of borehole logs in the centre of the city. In Bishkek, the standard of basic hydrogeological data was good, being comprehensive in parameters covered (geology, hydrogeology, water levels, location of wells etc), internally consistent and relatively up to date (mostly less than 20 years old). In both cities however routine monitoring information was poor, so that trends in aquifer usage and water quality were unknown. The groundwater setting in each city is included in the case studies summary in the orientation material .

The Urban Groundwater Questionnaire was used in both cities to collate available information on the key topic areas. Table 1 shows the degree of completeness of the resulting questionnaire and Table 2 summarises the types of agency that provided data.

These data were used for:

- Conceptualisation of the hydrogeological setting
- Development of an aquifer vulnerability scheme appropriate for existing city groundwater use, and likely future trends

Mapping of activities within the urban area likely to generate a subsurface contaminant load. These might generate an actual diffuse load (such as districts with on-site sanitation) or a potential point-load (certain industries and some services such as solid waste disposal sites or fuel-filling stations)

Table 1 Questionnaire completeness at end of each case study's available data collation stage

Section	Subject	Completeness	
		Bishkek	Narayanganj
A	Socio-economic context	✔✔	✔✔
B	Hydrogeological setting	✔✔	✔
C	Groundwater development and use	✔	✔
D	Contaminant loads	✖	✔
E	Groundwater management	✔✔	✔✔
F	Degradation impacts	✖	✔

✔✔ Comprehensive ✔ Partial ✖ Absent/severely deficient

Table 2 Pollution risk assessment information sources in Narayanganj and Bishkek

Organisation/Agency	Narayanganj	Bishkek
Municipal Water Supply Utility	✔✔	✔
State Geological/Hydrogeological Survey	✖	✔✔
State Water Resources Agency	✔	✔
National Environment Agency	✖	✖
National Map Survey Department	✖	✖
National Government Census/Statistic Agencies	✔	✔
Other State Ministries/Departments/Agencies	✔	✖
National/Municipal Public Health Department	✔	✔
University or Other Water Research Institute	✔	✔✔
Municipal Planning/Public Works Departments	✖	✖
Chamber of Commerce/Trade Organisation	✖	✖
Consultants report	✖	✖
Commercial directories/institutions	✔	✔✔
External Support Agency e.g. UNDP, JICA	✔	✖

Key:

✔✔ Important source of data ✔ Provided some data ✖ Unable to provide relevant data/not available

- In both cities the collection of available data formed a vital first stage but it is important to note that the lists of useful (and not-so-useful) sources were quite different in each city. It can be inferred that sources will be quite case-specific. Other cities will have their own national and municipal arrangements and the locations of data will reflect these differences.
- For historical reasons of state security, in both cities it proved difficult to obtain modern large-scale map coverage suitable to use for basemap purposes. Despite the particular political history of both Bangladesh and Kyrghyzstan, it is suspected that this may be a more widespread hurdle for urban planning than is generally anticipated.
- Although government organisations at both national and municipal level were invariably the principal locations for the groundwater-related data needed for the aquifer vulnerability assessment, this was not the case for potentially polluting activity assessments. Instead, helpful information came from material produced primarily for commercial marketing or economic statistics purposes. For instance, a database of businesses and industry funded by the German technical assistance programme to help Kyrghyz business development in Bishkek and a development bank's investment-funding register in Dhaka were both used, and both discovered by chance. Each proved helpful aids to identifying the location and nature of industrial activities in their respective project areas when official statistics were either absent or too opaque/unreliable/generalised to be of use.
- The information collection using the questionnaire tool showed that there were adequate data to undertake a groundwater vulnerability assessment for Bishkek, but insufficient for Narayanganj, where it was necessary to undertake a 21-well manual drilling programme to establish the extent and thickness of the near-surface aquitard.
- The cross-sectoral nature of the required information meant that in both cities the individual/team compiling the questionnaire responses was collecting information from diverse sources that were outside their professional field or pool of contacts. Each study team found sections difficult to complete, either because the questions needed some interpretation to be able to identify the right level of detail, or because they were not sure

where to find the statistics. Unless the team is well resourced either in personnel or staff time, which will be unlikely in a typical study, it is challenging to cover all areas comprehensively. Of course in some cities the data may not be there to be collated anyway. The questionnaire is not however a fixed document, and the summary that it represents could, with advantage, be updated periodically to represent the current position.

- The team completing the Bishkek questionnaire noted the importance of district heating as an urban groundwater use in many cool temperate and continental climate cities, especially in Eastern Europe and the former Soviet Union. The questionnaire needs to be expanded to include this important use in the relevant climatic setting.
- Data on contaminant load were completely absent in Bishkek, due in part to an endemic secrecy culture arising from the military-industrial nature of much of the industry operating until the demise of the Soviet Union and latterly both to a reluctance to fetter new enterprise in a depressed economy and to lack of support by government for state agencies nominally charged with regulation.
- The team completing the Narayanganj questionnaire were able to locate only the most general information on the nature and properties of the shallow aquifer which is widely used as a source of rural/periurban water supply and of course as the receptor for on-site disposal of waste waters or solid waste leachate. This pointed to the need for a supplementary survey on the shallow geology. This was possible within the very limited resources of the project because drilling by hand to depths of <30m in Bangladesh is inexpensive. The questionnaire proved to be a useful way to identify early on in a programme where vital data deficiencies occurred and to prioritise those that needed to be compensated for by supplementary fieldwork.

Points added to Urban Groundwater Questionnaire Guidance Notes from applying them to case-study cities

- Helpful information may come from material produced primarily for commercial marketing or economic statistics purposes.
- The questionnaire needs to be expanded to include district heating for this important use in the relevant climatic setting.
- The questionnaire proved to be a useful way to identify early on in a programme where vital data deficiencies occurred and to prioritise those that needed to be compensated for by supplementary fieldwork.
- The cross-sectoral nature of the required information may mean that sections are difficult for an individual to complete, either because the questions need interpretation to be able to identify the right level of detail, or it is unclear where to find the statistics.