



10th WEDC Conference
Water and sanitation in Asia and
the Pacific : Singapore : 1984

Experiences with low cost water supply

R G Campen, C M Engelsman and H van Mulligen

INTRODUCTION

Within the course of the third five-year plan (Repelita III) the Government of Indonesia initiated a programme for the provision of water supply facilities for sub-district capitals (IKK). The aim of the programme is to provide the inhabitants of some 2200 IKKs with safe drinking water at minimum costs by the end of the decade.

To implement such a large number of water supply facilities within a relatively short period and to overcome constraints in funds and skilled human resources, an unconventional system concept has been adopted. Survey, design and implementation procedures have been standardised to the maximum extent possible.

By now several systems have been implemented and put into operation. Experience with implementation, operation, cost recovery and acceptance by the consumers has been gained. The initial experience indicated that the adopted implementation procedures enable a quick and relatively low-cost development of water supply facilities. The IKK water supply concept has several inherent problems, however, one of them being that much attention in the fields of community education and training is required for a successful implementation.

This paper gives a brief description of the IKK water supply concept and related aspects such as selection, survey, design, implementation, operation and maintenance, cost recovery, consumers' acceptance, community education and training.

The experience is mainly originating from the authors' involvement in the implementation of several IKK water supply projects in North Sumatra and Aceh Provinces. The projects are carried out as parts of the Indonesian-Netherlands bilateral cooperation programme.

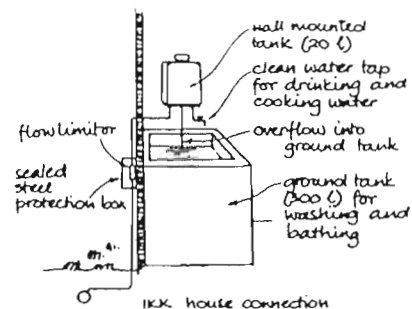
IKK WATER SUPPLY CONCEPT

The IKK water supply system has the following features:

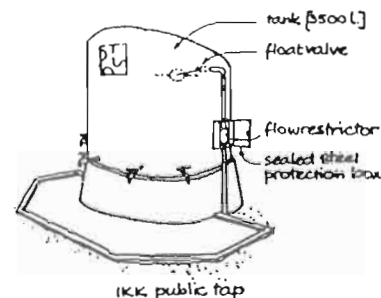
(a) system storage is completely decentralised, and located at the system outlets (public taps and house connections);

(b) at public taps, storage is provided by 3.5 m³ tanks. Public taps are designed for use by a maximum of 200 persons, who can draw up to 30 l/c/d from the tap.

(c) at house connections consumers are expected to install their own indoor ground storage tanks (approx. volume 300 l: mainly for washing and bathing) and small elevated wall-mounted tanks (approx. volume 20 l: for drinking and cooking). Water is provided at a fixed rate of 600 l/d.



(d) the inflow into public tap tanks and indoor storage tanks is restricted by pressure independent flow limiters. The use of water-meters is therefore not necessary. Fees are charged at flat rates which simplifies administrative procedures.



(e) By introducing decentralised storage and 24-hours-a-day restricted flow to the service connections, water can be distributed equally to all consumers through relatively small diameter pipes. Decentralised

storage and restricted outflows result in considerable savings in construction costs. Peak flows are virtually eliminated, allowing for a reduction of pipe diameters, of pump capacities and of capacities of miscellaneous facilities.

(f) water is provided at a rate of 60 l/c/d to house connections and at a rate of 30 l/c/d to public taps. The supply rate does not cover all needs, which implies that people still have to rely on another source such as a river, shallow well or rainwater collector.

SELECTION OF IKKs

The selection of IKK towns eligible to receive a new water supply system is carried out by the Indonesian Government through its provincial planning boards. For the first batch of IKK systems preference has been given to small and relatively cheap systems, in order to include as many IKKs as possible in the initial programme and to serve a maximum number of people.

It has been recognised however that more emphasis should be given to the needs of the community as the guiding criterion in setting a priority ranking for implementation.

SURVEY AND DESIGN

Surveys have been carried out by small teams of Indonesian Consultants. A specially developed IKK survey manual is used for this purpose.

On the average surveys have taken one week per IKK. Single check visits to each of the IKKs have been carried out by experts, to verify source selection and to evaluate the survey manual procedures.

Designs have been prepared by the same teams as for the surveys. Use has been made of the IKK design manual and standard drawings, standard bills of quantities and specifications, which were specially developed for the IKK programme. On the average a two-week period is required for completion of detailed designs and tender documents.

Modifications on the original design approach have been made to allow for more flexibility in terms of numbers of house connections and public taps. To increase revenues from water sales and to match the needs of the community more closely, more house connections are presently installed, while simultaneously the number of public taps is reduced. Further simplification of the production unit designs is being contemplated, to enable easier and more reliable operation and maintenance.

CONSTRUCTION

For the supply and installation of materials specific approaches have been adopted such as stockpiling of materials and packaging of construction components.

Standardisation of type and quality of materials has allowed for the interchange of materials from one system to another without too many problems. In addition the central purchase of materials has the advantage that relatively low prices can be achieved. Construction costs for IKK systems, if built in batches and with stockpiling are as follows:

Source type	Module size l/s	Pop. served	Average construction costs	
			US\$	US\$/c
Spring	2.5	3600	54 000	15
	5	7200	72 000	10
	10	14400	115 200	8
Deepwell	2.5	3600	100 800	28
	5	7200	144 000	20
	10	14400	216 000	15
Treatment	2.5	3600	118 800	33
	5	7200	151 200	21
	10	14400	230 400	16

The construction of deepwells, the supply and installation of pumps, generator sets and other mechanical/electrical equipment, and the standardised water treatment plants have been covered by larger contracts, in which works for groups of IKK systems were combined. The packaged contracts were made sufficiently large to be able to attract the larger and more qualified contractors.

All civil works, pipe laying works, construction of public taps and installation of house connections have been executed by small contractors from regency level. As in some areas experience with construction of water supply systems is low or even absent, the supervisory staff sometimes had to put considerable effort into coaching and training of the contractors. It should be noted that some years ago tender regulations were introduced by Presidential Decree, which prescribe the involvement of contractors from regency level for all small and simple construction works.

To further improve the quality of construction work it is presently considered to arrange for training programmes for contractors, suppliers of water supply materials and their staff as well as local consultants.

It has furthermore been recognised that the implementation planning should be modified to enable a smooth and speedy starting up of the system once the construction has been completed. Slow starting-up with irregular supply in the initial stage of operation of the system leads to disappointment among the consumers.

Construction is now carried out in the following order: (1) production unit, (2) transmission main and distribution system including public taps, (3) testing of the entire pipe system, (4) trial running and full operation, (5) installation of house connections.

Installation of house connections, which during the first phase of the programme was carried out by contractors, is now being done by trained staff from the water enterprise. House connections are only made after the applicant has installed his indoor ground storage tank, to enable him to use the full allocated daily flow of 600 l directly from the beginning.

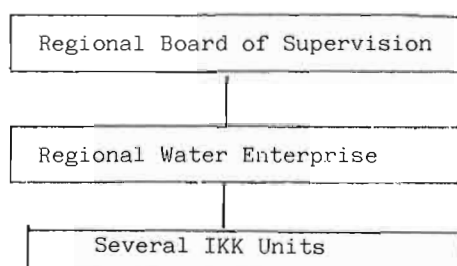
Installation of a 20 l wall-mounted closed container in addition to the ground storage tank is now being planned to be included as a standard facility for all house connections.

These tanks enable the users to draw an adequate volume of unpolluted water straight from the tap, hereby eliminating the possible annoyance from consumers who draw directly from the flow-restricted house connection or from their open ground storage tank.

To make future owners of a house connection fully aware of the benefits but also the limitations of the IKK type of house connection, people are encouraged to view the model house connection before an application for connection is made. The model house connection is now being made available at the IKK unit.

OPERATION AND MAINTENANCE

Although other organisation alternatives exist in North Sumatra and Aceh the IKK units which are responsible for operation and maintenance are being integrated with the regional water enterprise which is supervised by a regional board.



The Regional Water Enterprise which, during the first years of operation is technically and financially supported by the central government through its provincial project offices, is responsible for:

- support for trouble-shooting and repair of equipment
- financial assistance, where required in the early stages
- technical planning concerning major extensions of enterprise facilities
- monitoring of the overall performance of the IKK system
- training support

The staff of the IKK unit itself is kept as small as possible, with a senior operator/head of IKK unit, assisted by two to four operators/administrators. At IKK-unit level the following responsibilities are assumed:

- day-to-day operation and maintenance of facilities
- repairs to pipelines
- purchasing and controlling stocks of consumable materials
- billing and collecting payments
- preparation of budgets
- installation of house connections

It has been recognised that IKK unit staff and staff from the Regional Water Enterprise should play an increasing role in consumer information and education.

COST RECOVERY

The Government has adopted as a guiding principle that cost recovery from water sales should be sufficient to cover operation and maintenance costs, while replacements and system extensions are covered from government grants. Operation and maintenance costs for treatment systems and the small deepwell systems however, are at such a level that subsidies appear to be unavoidable.

For IKK schemes the monthly O&M costs are as follows:

Source type	Module size l/s	Approximate O&M costs in US\$ per month
Spring	2.5	300
	5	350
	10	470
Deepwell	2.5	650
	5	980
	10	1530

River water/	2.5	1230
treatment	5	2020
	10	3230

Particularly for the systems using river water and requiring treatment facilities, water bills would have to be as high as US\$ 4-6 per month for house connections and US\$1-1.5 per month per household for public tap users.

The impression is obtained that such high levels of water bills would not be accepted by the community and would lead to a high rate of bad debtors. Although no firm information is available yet a monthly bill of around US\$ 2 per household is considered to be a maximum. Only the systems using spring sources and the larger size deepwell systems are therefore expected to reach the break-even point. The smaller deepwell systems and treatment based systems will require a continuing subsidy on operating cost deficits.

Monthly water bills to recover O&M costs

Source type	Module size l/s	House connections		Public taps	
		No.	US\$	No.	US\$
Spring	2.5	180	1.5	9	0.4
	5	360	0.9	18	0.2
	10	720	0.6	36	0.15
Deep-well	2.5	180	3.2	9	0.8
	5	360	2.4	18	0.6
	10	720	1.9	36	0.5
Treatment	2.5	180	6.1	9	1.5
	5	360	5.0	18	1.2
	10	720	4.0	36	1.0

(a ratio between house connection and public tap consumers of 50/50 has been assumed).

To improve cost recovery and limit subsidy requirements the following steps are taken:

- installation of as many house connections as possible
- instruction and training of fee collectors to increase the number of paying consumers and disconnect bad debtors
- introduction of alternative methods to enable fee collection from public taps

COMMUNITY INVOLVEMENT

From the start of the programme community

involvement has been recognised as an important feature to increase acceptance of the programme. During the various stages of development of the water supply systems future system users have to a limited extent been involved in locating public taps and supply areas. Consumers have been informed about the specific features, benefits and particularly the limitations of the IKK system. It has been observed, however, that officials and communities only slowly gain sufficient understanding of the typical features of the IKK water supply system and it is recognised that a much greater effort will have to be made to inform, educate and involve the community.

CONCLUSIONS

The IKK water supply concept as introduced to Indonesia in 1981 has been applied on a limited scale so far. Presently gained experience with the implementation and operation of IKK systems indicates the following:

- the IKK concept provides a low cost water supply facility which can be designed and constructed within a very limited time span
- inherent system features such as the restricted 24 h flow at the system outlets and the limited per capita water quantity are difficult to understand by the consumers
- a thorough and comprehensive supporting community education and training programme is required to achieve a sufficient level of acceptance of the system

REFERENCE

Rahardjo, Engelsman, C M, Mathijssen J. "Mass provision of water supply to sub-district capitals (IKK) - Experiences in Aceh, North Sumatra and West Java Provinces, Indonesia". 4th Asia Pacific Regional Water Supply Conference and Exhibition, Jakarta, Indonesia, 5-11 November 1981.