**Follow up on presentation in Seminar for Conseptual Design for Sustainable water supply coverage at MRRD, Nov. 2015**

# EXTENDING SERVICE COVERAGE FOR WATER SUPPLY TO ALL AFGHANS LIVING IN RURAL AREAS.

## Possible of just a dream?

A Summary of the interactive Presentation given by Dr. S. Stoveland during the Seminar where the Excel Computer model was used to highlight effects of variables such as lifetime use of water supply, technology choice, construction costs, rehabilitation costs of collapsed supplies, national investment levels and national O&M costs.

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# 1. Background

The purpose of this analysis is to assess implications of extending water supply coverage in rural areas to close the current service gaps. We believe it is important to understand **some of the key factors which may influence whether Afghanistan will have full water supply coverage or not.**

Over the last decade, much have been made of efforts to try to reach all rural people with save water supply and sanitation facilities. The success should be evaluated but there are some reasons for concern.

## 1.1. From Reports from WHO/ UNICEF the situation seems to be as follows:

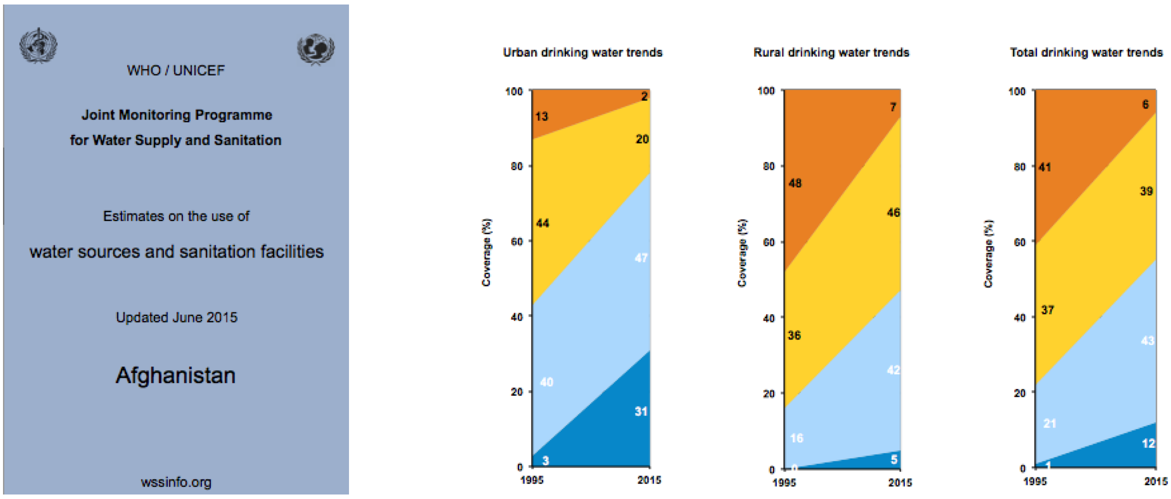



**Figure showing urban, rural and total water supply coverage from the last 20 years.**

Dark blue = water piped to premises, Light blue = other improved sources, Yellow = other unimproved sources, Orange = surface water

The information above seems interesting and possibly some of the best information available. What seems to be missing in updated information about functionality of the facilities. We are aware that DACAAR has surveyed about 30,000 water points, but this may cover agency implemented facilities and not compete overview. It will be great when such information is available for all facilities.

In the meantime we have to assess status and future based on additional information provided though different programs. One question should be: **Have we already build adequate capacity to coverall?**

## 1.2. Why do not all people have safe drinking water?

**Some statements:**

- About 39% are served with water supply today. Of about 20 million rural population this mens that about 7 million have safe water supply and 13 million have not.
- We understand that under the NSP program nearly 100,000 water points have been developed nationwide while working in close to 38000 villages.
- From the large database kept by DACAAR, they have registered close to 42000 water points.

**Then :**

If one water point in theory serve close to 250 persons, then capacity should have been developed to serve the whole rural population. ( 250 x 100,000 water points should serve 25 million people. ) Why are the people not served? The question in important to ask and answers must be found so that development in the future becomes sustainable and the service gap can be closed. **If not, most people in rural areas can only dream of having access to safe drinking water**

In addition to looking at the computer model and understanding better what may be required for closing the service gap, one thing is important and that is collecting factual information of current situation. Existing functional water supply facilities needs to be registered and monitored to continuously monitor to show how the service gap is closing. Otherwise wrong information may not serve the government nor its people well.

# 2. The computer model. Nothing complicated?

A simple computer model has been made using excel spreadsheet. Relatively simple. We have made a table with figures from year 2000 till year 2040 to calculate population growth, and water supply coverage.

When calculation water supply coverage, we have included the following variables:

- Technology options
- Technology costs ( construction and operation and maintenance)
- Lifetime service of water supplies. ( Can be adjusted say 1, 2,3 till say 30 years)
- National rate of water point construction ,( can be varied, but in 2015 it is about 7000 water points per year)

## 2.1. On the next page is the tables with assumptions used in the spreadsheet:

### 2.1.1. Population values/ parameters

| Parameter | Value |
|---|---|
| National Population 2015, in million | 28 |
| Population growth: increase/decrease | 2.3% |
| Rural population (% of national total) | 70% |
| Annual increase/decrease of rural population ( in %) | 0% |
| Rural coverage water supply / in 2015 | 35% |
| % Scheme utilization ( of design capacity) | 70% |

### 2.1.2. Technology mixtures/ combinations

| Water supply facility | Capacity supply | Scheme life /yrs | Tech Low | Tech Med | Tech high |
|---|---|---|---|---|---|
| Community well ( open) | 250 | 20 | 30% | 0% | 0% |
| Household well ( open) | 100 | 20 | 20% | 0% | 0% |
| Dug well + Hand-pump | 250 | 5 | 20% | 50% | 0% |
| Bore-well + hand-pump | 250 | 5 | 20% | 30% | 0% |
| Small motor pump with tank / stand-post | 1000 | 10 | 10% | 0% | 0% |
| Motorized scheme with street stand-points | 5000 | 20 | 0% | 0% | 100% |

( Sum of technology mix must add up to 100%)

Planned coverage by year 2040?

### 2.1.3. Planned coverage by year 2040?

| Alternative | % Coverage 2014 |
|---|---|
| Alternative 1 | 50 |
| Alternative 2 | 70 |
| Alternative 3 | 90 |

### 2.1.4. Technology cost parameters ( all in USD)

| Water supply facility | Capacity supply | Capital cost | Annual O&M | Per cap Con-struct | Per Capita O&M |
|---|---|---|---|---|---|
| Community well ( open) | 250 | 300 | 30 | 2 | 0.2 |
| Household well ( open) | 100 | 300 | 15 | 4 | 0.2 |
| Dug well + hand-pump | 250 | 1,490 | 110 | 9 | 0.6 |
| Bore-well + hand-pumps | 250 | 2,240 | 110 | 13 | 0.6 |
| Small motor, pump, tank / stand-post | 1000 | 66,400 | 7500 | 95 | 10.7 |
| Motorized scheme with street stand-posts | 5000 | 275,000 | 14200 | 79 | 4.1 |

### 2.1.5. Financial calculation ( tariff for full cost recovery if of interest)

| Water supply facility | Capital cost | Amor-tization (Yrs) | Interest Rate | Annual Payment on Capital |
|---|---|---|---|---|
| Community well ( open) | 300 | 20 | 5% | 25 |
| Household well ( open) | 300 | 20 | 5% | 25 |
| Dug well + hand-pump | 1,490 | 5 | 5% | 193 |
| Bore well + hand-pumps | 2,240 | 5 | 5% | 290 |
| Small motor, pump, tank / stand-post | 66,400 | 10 | 5% | 6,399 |
| Motorized scheme with street stand-posts | 275,000 | 20 | 5% | 22,157 |

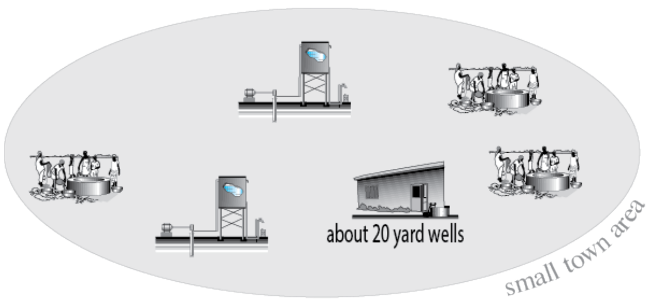
### 2.1.6. Technology mix: Explanation

For the purpose of showing some flexibility in service levels acknowledging that different technologies may be used in any village of small town, we have included some illustrations of technology mixes.

The idea is to illustrate what may be the case in a rural setting

**Technology mix Low:**

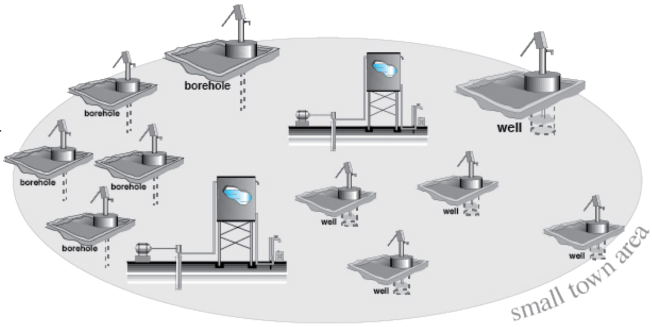
This may not be in any way desirable but for the sake of the model we include some combinations of private and public facilities. I the illustration below we have exemplified this by



showing open community and household wells which are unprotected, some and a small motorised pump and overhead tank

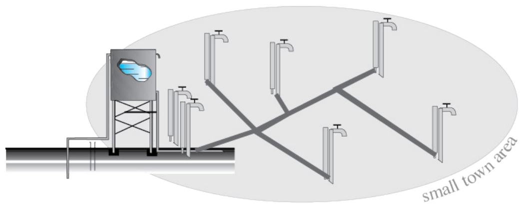
**Medium technology mix:**

In this mix, all technologies can be implemented by public projects since all facilities should give safe water supply. This includes shallow dug wells and tube-wells with hand-pumps as well as smaller motorised schemes with standpipes.




**Technology mix high:**

For this service we are looking at smaller motorised schemes with street standpipes. The schemes could be servicing between 1000 to 10000 persons.




# 3. Information from computer model ( excel)

## 3.1. General comments

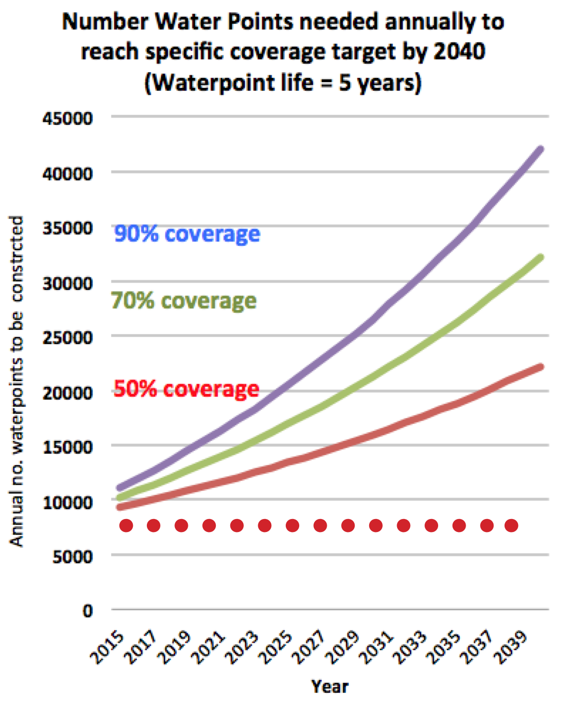
Use of the model: When using the model , all variables for technology mixes shown in table 2.1.2 can be used as long as the sum of all the percentages here shown add up to 100%.

When assessing effect of service coverage of different types of technologies, it may be easier to look at one technology type at a time before looking at combinations of technologies. This is so because of the significant difference in per capita costs, operation costs and necessary management arrangements needed for the different technology options. This in this short example/ illustration we have a brief look at use of water point service ( Dug or bore wells fitted with hand-pumps) which are extensively used and typically community managed facilities. We also look at piped schemes for comparison. Costs for gravity schemes, and larger piped schemes can also be included. The budget costs does not include management/ administrative costs which UN/ WHO has stipulated to of the magnitude of 30%-35% nor does the costs cover water treatment.

The examples of costs here for illustration of construction may be useful to vary when working with plans for full rural water supply coverage using water points and standpipes.

## 3.2. Water point implementation rate affected by expected service coverage level (%).

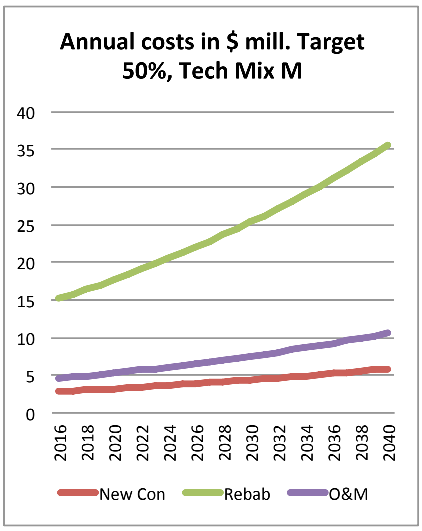
The graph below shows how the target water supply coverage for your 2040 will affect the implementation rate of water points of the coverage increase were to be covered with this technology. For comparison, the annual construction rate of water point are about 7000 today ( as indicated by the dotted red line). Of cause there are other types of schemes constructed, but in terms of coverage, the water points have been the main type of facility.

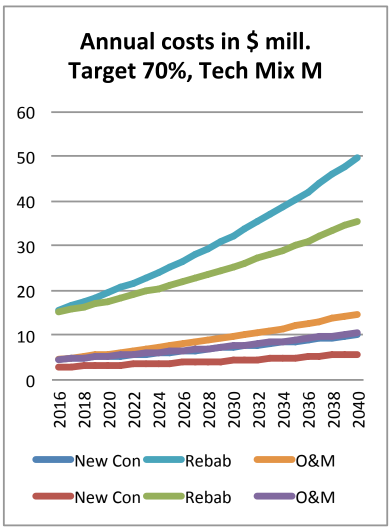


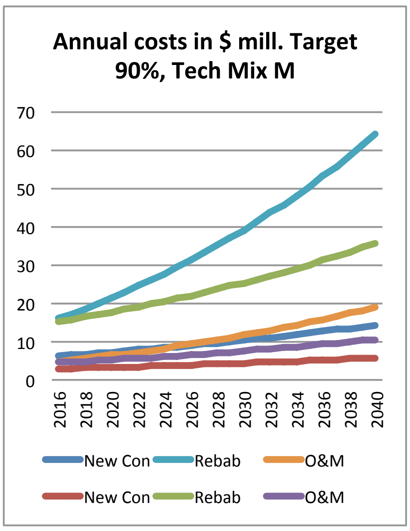

In this case the likely construction rate will have to be 2-3 times higher that the implementation rate today. This calculation shows scenario for the water point facility having a 5 year lifetime. (Tech mix M). Will the capacity be there for this level of increased activities.

### Annual Costs affected by coverage level

Using the same parameters as above the annual costs in million dollars for the intervention using Water points for coverage ( tech Mix M) is shown below: Please note that cost for rehabilitation/ replacement of defunct schemes by far exceeds the costs for new facilities. Also note that the O&M costs are nearly as high as the costs for constructing new capacity to meet increased new coverage. Since the government is not providing funding for O&M, the system for maintenance must be viable and proven to work before scaling up. The government need a good monitoring system to assure that services are functional.



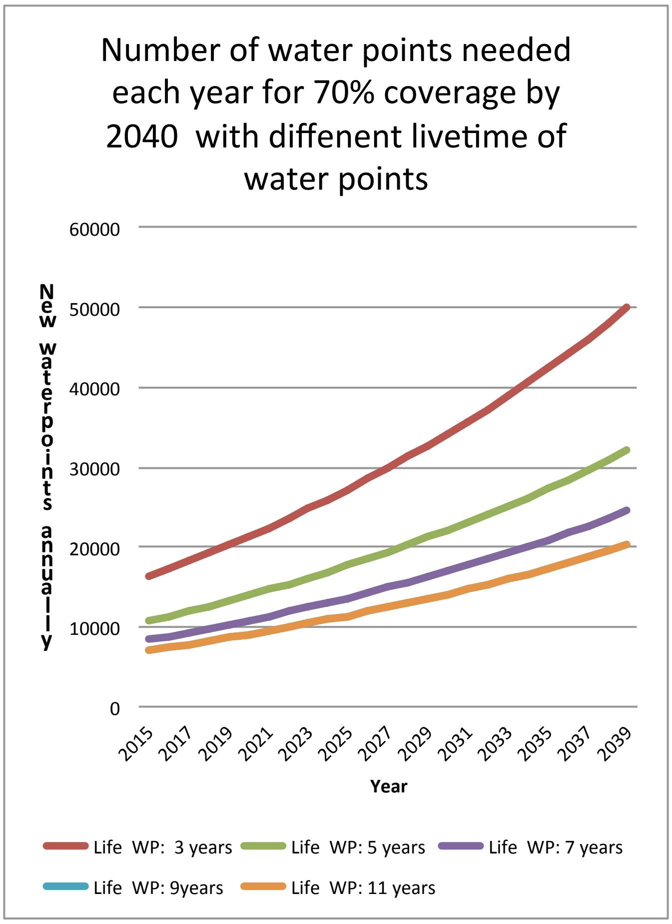



The investment costs indicated here show that if only hand-pumps are to be constructed , about 30 million dollars are needed annually in 2016 and this could be increasing to $60 mill in 2040. The life-time of the pumps the key factor governing the rehabilitation costs. (The graphs may look alike, but the scale changes.

### 3.3. Water point implementation rate affected by lifetime of water supply.

In the model, we just listed changed the lifetime of the water points as shown from 3 to 11 years. As can be seen, the this is the issue of sustainability of the water points and it makes all the difference. The rate of collapse/ dysfunctional of existing water points are directly linked to the operation and maintenance system which sustain service delivery.




If we were to cover rural water supplies by hand-pumps, how many do we need to construct to reach , say 70% coverage by 2040?

As can be seen on the graph on the right, the annual rate of construction requirements for water points would increase fro about 20,000 to 50,000 if the life of water point was reduced from 11 to 3 years.

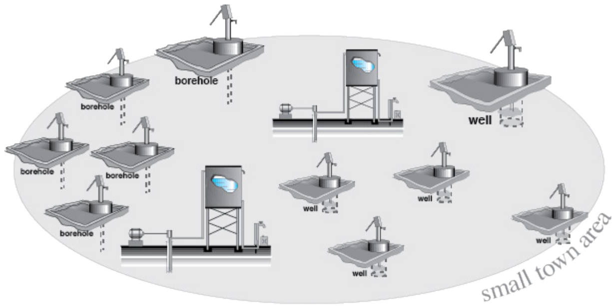
Again, if full coverage is the target by 2040 then the figures will be even higher. Understanding the issue of financial constraints is important. It is not possible to provide sustainable water supply coverage by merely constructing new water points. As in the case of NSP national program me which have indicated that 100,000 water points have been construed, full coverage in rural areas should have been achieved if these mentioned facilities were operational/ functional.

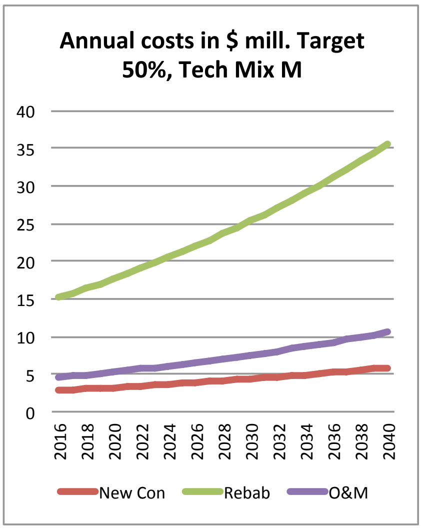
Excessive construction costs will or should increase focus on sustainability of water supply scheme from both a technical, financial and managerial point of view.

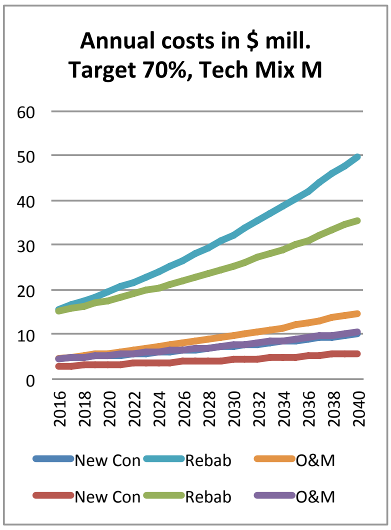
For comparison, If a water point today cost about $2500, then annual construction of 10,000 water points could require about $25 million plus project management costs. It may be difficult to see that in the short run more funds may be available for Rural Water supplies. This increase focus on sustainability and long life of developed water supplies.

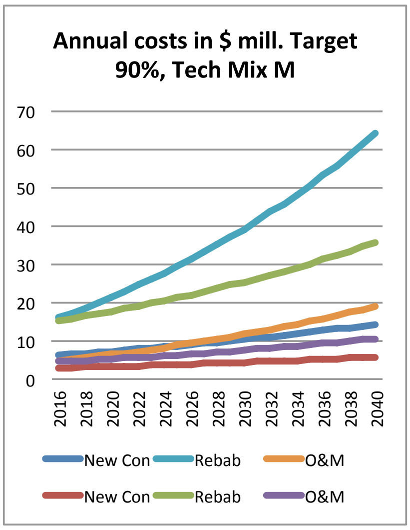
## How does investment costs affect coverage and government and user affordability?

Lets look at **medium technology mix** first and at and capital needs for investment. The graphs below showing annual investment costs using water points ( hand-pumps) with a 5 year life of each water facility. Adding new and rehabilitation costs investment will require from $ 30 mill annually.

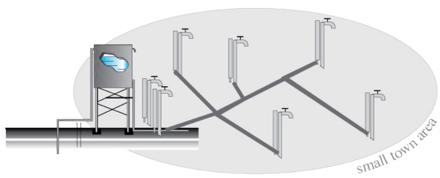


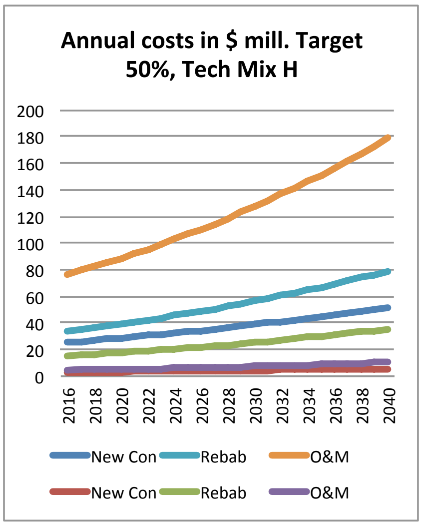



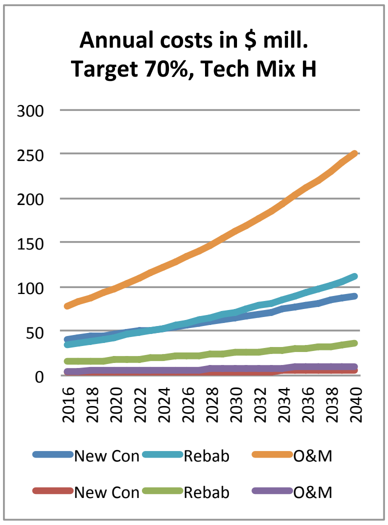



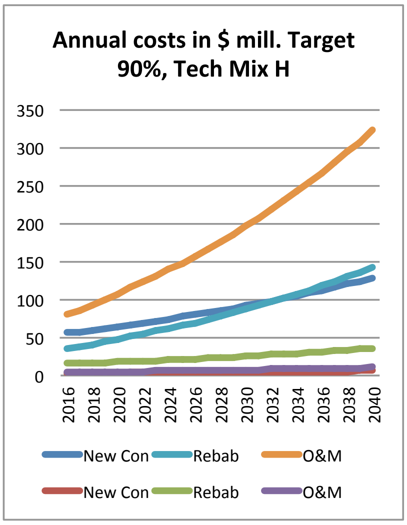




Lets compare this with **High technology mix** and see how the capital costs are affected. Here the life of a piped scheme is assumed to be 20 years. For 70 % coverage investment would be in the magnitude of $100 million per year and above.






The figures show that the rehabilitation costs are relatively lower because of the 20 years lifetime stipulated for the scheme. The cost examples are based on per capita costs of $95 and annual O&M cost of 10 dollar. ( Table 2.1.2 above)

# 4. Concluding remarks

The computer model is only a crude tool to highlight what may be required to provide water supply coverage for all rural Afghans. The model does not cover all eventualities but enough to know that unless the key issues are included in the future, full water coverage will be a only a dream.

### The key issues are:

Existing water supply will collapse faster than new ones are constructed unless a viable O&M system is put in place. Currently the government does not have the capacity for developing sustainable community based O&M systems which are adequate to sustain facilities. The rehabilitation costs will be far higher than construction of new facilities unless the O&M management framework is taken seriously.

The capital investment costs required for service coverage are high. Using basic technology with water points the annual investment would be required to be around $20-40 million per year. Changing to piped schemes will increase the investment needs to well over $100 million per year assuming that a sustainable O&M system be put in place ( which is not there yet). With today's investment level, annual investment in Rural Water Supply of $100 million is unlikely.

This is not surprising since the per capita construction cost for a piped scheme is typically 3-4 times higher than point water sources. See table above.

The investment costs indicated are exclusive of administrative government costs. There are in UN connections estimated to be about 30-35% of the capital costs.

The excel model will be made available for analysing more details and the more planning data which will be available the better the model.

It is proposed that PROVEN SUSTAINABLE WATER SUPPLY SYSTEMS should be scaled up. Learn from best practices. Building big does not provide easy solutions for sustainability. The institutional framework and capacity needs to be in place.

Possible ideas to be consider closer links to smaller and larger private sector actors. (PSP)

*Ideas for disucssion and thought*
by Svein Stoveland, Norplan

Note, the Excel file will be made available for downloading if of interest, but need to write some short user instructions first)