

Chapter 7 Project Evaluation

7.1 Economic Evaluation

7.1.1 Economic Benefits

(1) General

There are two major benefits deriving from the implementation of the Project.

One is the time benefit. Under the present circumstances people in the eleven centers more or less go to the far-away springs/streams and/or public fountains every day to fetch water. The time spent in such a way comes to an enormous amount when it is aggregated as an annual total for the whole town.

If the Project is implemented, less people will go to the above-mentioned water sources as more people will use house connections or yard connections. That is to say, the time for water fetching will be greatly reduced.

The JICA Study Team calculated the time to be reduced annually for the whole town in the future years under the "with project" conditions.

Eventually, the team converted the time into financial terms. This is the time benefit.

Another is the reduction of water-borne diseases. When the Project is implemented, more people will have an access to clean piped water. It will reduce the opportunities for them to get in touch with contaminated water and contract such diseases as diarrhea, dysentery, typhoid and scabies.

However, how many such cases will be reduced is very hard to estimate. Therefore, the team just wants to remind people that such an important benefit will be realized in the "with project" case.

(2) Calculation of Economic Benefits

How the above-mentioned time benefit was calculated is summarized below:

As a result of the socio-economic questionnaire survey conducted by JICA, the following information was collected:

| Users | Time spent at a time (min.) | Daily frequency (times) | No. of persons at a time |
|------------------|--------------------------------|----------------------------|-----------------------------|
| Public fountains | 18 | 2.6 | 1.1 |
| Springs/streams | 78 | 1.7 | 1.1 |

If the number of households using public fountains and the number of households using springs/streams is estimated in both the "without project" and "with project" cases in the

target years, one can work out the total time spent fetching water every year in both cases by utilizing the above tabulated information.

The respective number of households using the above two water sources in the "with project" case was estimated based on the service population projection in the other chapter. The respective number of such households in the "without project" case was calculated on the assumption that piped water users will increase by 2% every year.

Then, the difference in the aggregated annual water-fetching time between the two cases was calculated for each year.

Finally, such a time was converted into financial terms by using the following information:

| Monthly household income (birr) | Family size (persons) | Waking hours in a day | Time value per hour (birr) |
|---------------------------------|-----------------------|-----------------------|----------------------------|
| A | B | C | $D=A/30/B/C$ |
| 248 | 5.7 | 16 | 0.0906 |

The results are shown in Table 7.1.1.

7.1.2 Cost

The cost can be divided into capital cost and operation and maintenance (O & M) cost.

Capital cost is huge compared to the economic benefits resulting from the reduction of water fetching time. If one could quantitatively incorporate the subdual of water-borne diseases, benefit related to WID and multiplier economic effect into benefits, then one could consider the total cost including capital cost. But, the reality is such that one considers O & M cost - actually, a part of it - only for the sake of convenience.

O & M cost consists of electric cost, fuel cost, disinfection cost, personnel cost, installation cost of connections, purchase cost of water meters and other cost. (For more details refer to 4.5.) It was estimated as an annual recurrent cost for future years.

It turned out that the whole O & M cost is too large in comparison with the above benefits. Eventually, personnel cost was plucked up, representing O & M cost.

The personnel cost used here is the incremental one, that is to say, the difference between the personnel cost in the "with project" case and the personnel cost in the "without project" case.

7.1.3 Economic Evaluation

Based on the data calculated in the above-mentioned way, cost benefit streams were prepared as shown in Table 7.1.2.

As it shows, the cumulative cost and benefits for 30 years come to 6,842 thousand birr and 6,816 thousand birr respectively. It means benefits are 100% of cost at the discount rate of zero.

That is to say, the cumulative benefits of the reduction of water fetching time for 30 years are equal to the cumulative personnel cost of WSS at 0 opportunity cost.

It is to be noted that time benefit resulting from project implementation is substantial, equaling to personnel cost of WSS.

Table 7.1.2 Cost Benefit Streams

CC=Capital Costs; OM=O/M Costs; CS=Costs; BF=Benefits
 CF=Cash Flow (=BF - CS)

| NO. | YEAR | CC | OM | CS | BF | CF |
|-----|------|----|-----|-----|-----|------|
| 1 | 1996 | 0 | 0 | 0 | 0 | 0 |
| 2 | 1997 | 0 | 0 | 0 | 0 | 0 |
| 3 | 1998 | 0 | 0 | 0 | 0 | 0 |
| 4 | 1999 | 0 | 161 | 161 | 45 | -116 |
| 5 | 2000 | 0 | 184 | 184 | 83 | -102 |
| 6 | 2001 | 0 | 192 | 192 | 102 | -90 |
| 7 | 2002 | 0 | 199 | 199 | 121 | -77 |
| 8 | 2003 | 0 | 206 | 206 | 142 | -64 |
| 9 | 2004 | 0 | 213 | 213 | 163 | -50 |
| 10 | 2005 | 0 | 220 | 220 | 185 | -36 |
| 11 | 2006 | 0 | 232 | 232 | 209 | -23 |
| 12 | 2007 | 0 | 244 | 244 | 234 | -10 |
| 13 | 2008 | 0 | 256 | 256 | 259 | 3 |
| 14 | 2009 | 0 | 267 | 267 | 285 | 18 |
| 15 | 2010 | 0 | 279 | 279 | 312 | 33 |
| 16 | 2011 | 0 | 279 | 279 | 312 | 33 |
| 17 | 2012 | 0 | 279 | 279 | 312 | 33 |
| 18 | 2013 | 0 | 279 | 279 | 312 | 33 |
| 19 | 2014 | 0 | 279 | 279 | 312 | 33 |
| 20 | 2015 | 0 | 279 | 279 | 312 | 33 |
| 21 | 2016 | 0 | 279 | 279 | 312 | 33 |
| 22 | 2017 | 0 | 279 | 279 | 312 | 33 |
| 23 | 2018 | 0 | 279 | 279 | 312 | 33 |
| 24 | 2019 | 0 | 279 | 279 | 312 | 33 |
| 25 | 2020 | 0 | 279 | 279 | 312 | 33 |
| 26 | 2021 | 0 | 279 | 279 | 312 | 33 |
| 27 | 2022 | 0 | 279 | 279 | 312 | 33 |
| 28 | 2023 | 0 | 279 | 279 | 312 | 33 |
| 29 | 2024 | 0 | 279 | 279 | 312 | 33 |
| 30 | 2025 | 0 | 279 | 279 | 312 | 33 |

Table 7.1.1 Saved Time and Benefit

| Year | Saved Time (hours) | Benefit (birr) |
|------|--------------------|----------------|
| 1996 | 0 | 0 |
| 1997 | 0 | 0 |
| 1998 | 0 | 0 |
| 1999 | 498,587 | 45,194 |
| 2000 | 911,128 | 82,588 |
| 2001 | 1,121,112 | 101,621 |
| 2002 | 1,338,514 | 121,327 |
| 2003 | 1,563,643 | 141,734 |
| 2004 | 1,796,819 | 162,870 |
| 2005 | 2,038,380 | 184,765 |
| 2006 | 2,304,618 | 208,898 |
| 2007 | 2,577,675 | 233,649 |
| 2008 | 2,857,802 | 259,041 |
| 2009 | 3,145,252 | 285,096 |
| 2010 | 3,440,293 | 311,839 |
| 2011 | 3,440,293 | 311,839 |
| 2012 | 3,440,293 | 311,839 |
| 2013 | 3,440,293 | 311,839 |
| 2014 | 3,440,293 | 311,839 |
| 2015 | 3,440,293 | 311,839 |
| 2016 | 3,440,293 | 311,839 |
| 2017 | 3,440,293 | 311,839 |
| 2018 | 3,440,293 | 311,839 |
| 2019 | 3,440,293 | 311,839 |
| 2020 | 3,440,293 | 311,839 |
| 2021 | 3,440,293 | 311,839 |
| 2022 | 3,440,293 | 311,839 |
| 2023 | 3,440,293 | 311,839 |
| 2024 | 3,440,293 | 311,839 |
| 2025 | 3,440,293 | 311,839 |

7.2 Financial Evaluation

7.2.1 Calculation of FIRR

Regarding detailed information on revenues and cost, refer to Section 4.5.

(1) Initial Trial

Initially it was assumed that the central government would provide subsidy to the Debre Tabor WSS amounting to 80% of initial cost.

It is to be noted that the cost related to the construction of accommodation facilities as well as WSSD's management is not included in the above initial cost.

Based on the revenues and cost estimated in Section 4.5 under such an assumption, cost benefit streams were prepared for the 30 years starting in 1996.

Using them, financial internal rate of return (FIRR) was calculated. As a result, it worked out to 8.3%.

The value was judged to be too high in consideration of the nature and objective of the Project.

Besides, it is important for the central government to be paid back initial cost as much as possible, thus lessening its budgetary burden.

After repeated simulations, it was finally decided that the subsidy ratio of initial cost would be 55%.

(2) Final Results

Under the above-mentioned subsidy conditions, cost benefit streams were prepared as shown in Table 7.2.1.

Using the streams, FIRR was calculated. As a result, the value of 3.7% was obtained.

The value exceeds 1%, which is the assumed interest rate of external loan by 2.7%. It is judged to be sufficiently and reasonably high considering the nature and objective of the Project.

7.2.2 Sensitivity Analysis

To see how the value will be affected under different circumstances, sensitivity analysis was conducted. The conditions and results are shown below:

| Item | Conditions | Results | Difference from Base Case |
|-----------|---|------------|---------------------------|
| 1. Case 1 | Benefits : -10% | FIRR: 2.5% | -1.2% |
| 2. Case 2 | Initial Cost : +10% | FIRR: 3.0% | -0.7% |
| 3. Case 3 | Progress of : 1997=70% Construction 1998=30% | FIRR: 3.9% | +0.2% |
| 4. Case 4 | Progress of : 1998=70% Construction 1999=30% | FIRR: 2.7% | -1.0% |

In Cases 3 and 4 detail design will be done in 1996 and 1997 respectively.

As the table shows, the value of FIRR is robust enough by maintaining the level of substantially more than 1% under adverse circumstances conceivable.

Case wise, the shortage of revenues will deal the strongest negative impact on the financial feasibility of the Project, followed by the delayed progress of works and cost overrun, while earlier completion of works will raise the feasibility by a significant margin.

Table 7.2.1 Cost Benefit Streams

CC=Capital Costs; OM=O/M Costs; CS=Costs; BF=Benefits
CF=Cash Flow (=BF - CS)

(Unit: thousand birr)

| NO. | YEAR | CC | OM | CS | BF | CF |
|-----|------|------|-----|------|------|-------|
| 1 | 1996 | 1314 | 80 | 1393 | 32 | -1362 |
| 2 | 1997 | 7189 | 81 | 7270 | 32 | -7238 |
| 3 | 1998 | 7189 | 83 | 7272 | 33 | -7239 |
| 4 | 1999 | 0 | 362 | 362 | 491 | 129 |
| 5 | 2000 | 0 | 401 | 401 | 821 | 420 |
| 6 | 2001 | 0 | 504 | 504 | 947 | 443 |
| 7 | 2002 | 0 | 522 | 522 | 1052 | 530 |
| 8 | 2003 | 0 | 540 | 540 | 1158 | 618 |
| 9 | 2004 | 0 | 558 | 558 | 1263 | 705 |
| 10 | 2005 | 0 | 577 | 577 | 1369 | 792 |
| 11 | 2006 | 0 | 725 | 725 | 1571 | 846 |
| 12 | 2007 | 394 | 755 | 1149 | 1745 | 596 |
| 13 | 2008 | 1970 | 784 | 2753 | 1918 | -835 |
| 14 | 2009 | 1970 | 813 | 2783 | 2092 | -691 |
| 15 | 2010 | 0 | 842 | 842 | 2265 | 1423 |
| 16 | 2011 | 0 | 555 | 555 | 2195 | 1640 |
| 17 | 2012 | 13 | 555 | 568 | 2195 | 1628 |
| 18 | 2013 | 13 | 555 | 568 | 2195 | 1628 |
| 19 | 2014 | 0 | 555 | 555 | 2195 | 1640 |
| 20 | 2015 | 0 | 555 | 555 | 2195 | 1640 |
| 21 | 2016 | 0 | 555 | 555 | 2195 | 1640 |
| 22 | 2017 | 0 | 555 | 555 | 2195 | 1640 |
| 23 | 2018 | 0 | 555 | 555 | 2195 | 1640 |
| 24 | 2019 | 0 | 555 | 555 | 2195 | 1640 |
| 25 | 2020 | 0 | 555 | 555 | 2195 | 1640 |
| 26 | 2021 | 0 | 555 | 555 | 2195 | 1640 |
| 27 | 2022 | 0 | 555 | 555 | 2195 | 1640 |
| 28 | 2023 | 0 | 555 | 555 | 2195 | 1640 |
| 29 | 2024 | 0 | 555 | 555 | 2195 | 1640 |
| 30 | 2025 | 0 | 555 | 555 | 2195 | 1640 |

7.3 Organizational Evaluation

The existing organizational situation related to water supply and sanitation in Debre Tabor can be summed up as follows:

- The WSS of Debre Tabor is expected to financially stand on its own feet. But, it is not given the power commensurate with financial independence.
- The WSS of Debre Tabor is financially deeply in the red. As a result, workers are under-paid, they have little supplies and equipment for operation and maintenance and there is a shortage of skilled manpower.
- Sanitation functions in the WSS of Debre Tabor have been totally neglected. But, the sanitary situation in the town is such that organizational/institutional countermeasures are urgently required.
- A key for a successful implementation of water supply/sanitation projects lies in community involvement. It seems that the authorities have not given proper consideration in this regard.
- Another key for a successful implementation of water supply/sanitation projects lies in female participation. It appears that the authorities have not been properly aware of it.

To rectify the above situation, the following organizational/institutional measures have been proposed.

- Autonomy is a trump for a financially good performance. It is essential for the WSS to be institutionally given its own decision-making power regarding the revision of water tariff, hiring and firing of staff, remuneration, execution of small-scale rehabilitation or new works, purchasing of supplies and equipment, etc. Approval will be given by the regional organization, and it will be reported to the central organization.
- The fundamental conditions for any WSS to have a successful financial performance are to have a sufficient supply of water on one hand and to have a reasonable level of water price on the other. Both conditions are hopefully expected to be satisfied through the Project. If the WSS of Debre Tabor has a successful financial performance and its own decision-making power as well, then the accompanying difficulties such as low remuneration, shortage of skilled manpower and little availability of equipment and supplies will be eventually overcome.
- The organization related to sanitation will be newly established in the organizational set-up of WSS after the Phase 1 Project is completed in 1998. It will perform loan service and promotion activities regarding the installation of sanitation facilities.

- Sanitary/Health Committee will be organized in the town. The members will be composed of representatives from schools, hospitals, Weroda council, municipality, the bank, central and regional water supply organizations, WSS and community. The major objective of the committee is coordinating and unifying the related activities so that sanitary awareness of the townspeople and the installation of sanitation facilities will be effectively promoted.
- Public fountains to be newly constructed in future will be managed by the community if people are overwhelmingly in favor of it. According to the socio-economic questionnaire survey conducted by JICA, they strongly side with it. People will be freed from the frustrations and constraints they experience every day today in connection with the opening hours, breakdowns and repairs, water tariff, etc. The community will have decision-making power in financial, personnel and technical terms subject to WSS's approval. The community is expected to financially stand on its own feet.
- Construction of community toilets will be promoted. Financial resources may come from the community itself or other sources. Sanitary/Health Committee and WSS will assist in the acquisition of fund. A strict financial management of the toilet will be required. The maintenance and operation, payment and collection of the user charge, the decision on user charge, etc. will be totally in the hand of the community. Sanitary/Health Committee and WSS will be always ready for helping the community in this regard.
- It is also proposed that the female participation ratio in the workforce of WSS, the community managed public fountain and the community toilet be more than 50%.

7.4 Technological Evaluation

The proposed water supply system is composed of relatively simple facilities, those of which are not quite different from existing ones. Although new material made of fiberglass reinforced plastic is to be introduced into such work as well casing, the light material could facilitate the construction work very smoothly. The material is also expected to be long life-span comparing to other conventional material, thus maintenance and renewal cost could be reduced in the long run.

In the Project, six and four number of boreholes are newly required in years of 2005 and 2010 and those including existing ones are located with certain distance from each other or sometimes away from another. Therefore, mobilization is due required for the daily operation of those boreholes. In this regard, transportation must be strengthened by means of vehicle or motorbike, otherwise well attendant is additionally required in the number.

7.5 Environmental Impact Assessment (EIA)

Currently, there are not Ethiopian laws or regulations which stipulate that development activities represented as a project require an EIA prior to the approval of the project.

However, the procedure to establish the EIA is going on within the relevant authority as of 1995.

In this Study, Initial environmental examination (IEE) firstly had been carried out throughout Phase I study and supplemented during the field survey of Phase II, based on the "Guidellne of Environmental Consideration for Groundwater Development" prepared by JICA. IEE conducts preliminary assessment in terms of social environment, natural environment and public nuisance, as summarized on the formats in relevant appendix "Result of Initial Environmental Examination". The formats of project and site descriptions brief the content of the Project and the site, thus facillitate the relating person/organization to understand the outline of the Project at the early stage. The scoping format categorizes the environmental component with a classification mentioned below by screening the each component.

- A; Advance impact is expected by the Project,
- B; Negligible impact is expected by the Project,
- C; The Impact is Unknown at present, and
- D; Enhancement is expected by the Project.

No advance impact classified "A" above is shown on the format, and most components are expected to undertake negligible impact from the Project. Also enhancement is expected in some components such as economic activities, public health and hygienic condition.

The components classified as "C" are identified as the ones to be considered for EIA. The result of EIA is described below, and no negative environmental impact is expected.

7.5.1 Vested Rights

Although the facilities planned are small in the scale, a part of dwelling and commercial areas, and such properties as houses and trees might be affected, to which compensation shall be made in accordance with government regulation. With consideration above, facilities have been so planned that such circumstance be avolded as much as possible in the design stage. With reference to the outcome of GEP survey, probable water sources had been planned away from dwelling areas, and new reservoir sites planned nearby existing ones or away from dwelling areas, from which little effect is expected. Also, main distribution lines had been designed alongside existing roads to avoid any considerable resettlement.

There are water vendors whose income source relies on selling water, however the income is conjectured to occupy a part of their whole income. Therefore, the loss of vending water is not expected to give any considerable effect.

As mentioned above, any vested right in terms of properties, land right and vending water could not be serlously affected by the Project.

7.5.2 Public Health and Hygienic Condition

The improved water supply will increase the quantity of waste water. If the drainage system was not accompanied, it could lead to unhygienic condition and leave people vulnerable to water-borne diseases.

In this Study, sewerage is regarded as a component of the Project and not as a mitigative measure. During field survey, the areas had been delineated, which were suffering from poor drainage condition at present and also toilet condition had been investigated. Based on those assessment, the improvement of drainage and toilet had been proposed in this Study. Disposal of spillage water at public fountains has also been designed in such manner of soakaway pit or connecting to an existing drainage.

With the implementation above, public health and hygienic condition could be enhanced rather than negative impact by the Project.

7.5.3 Accidental Damages to Existing Facilities

Although construction of pipeline network and reservoir may be expected to give damages accidentally to the dwellers and existing facilities, such cases have not been reported based on the previous construction experiences. Under proper supervision of the construction, such damages can be avoided or reduced to negligible level even if any.

7.5.4 Soil Erosion

Judging from the construction scale, little soil erosion is expected both during and after the construction. Although minor soil erosion may be expected in case of sandy and silty formation of the ground, such erosion has not been reported in noticeable level based on previous construction experience. It is also recommended that construction work be carried out during dry season not only to facilitate the construction work but also to reduce the soil erosion as much as possible.

7.5.5 Groundwater Quality and Quantity

The current water source is groundwater, and there are springs undertaken for drinking water. There may be a possibility that the existing sources could be affected due to over-exploitation of groundwater by this Project. However, with reference to the scheme mentioned below, employed in the design of this Project, it is expected that any noticeable effect to the existing sources could not be arisen.

The location of new boreholes has been designed with a distance from the existing sources enough to avoid any influence to the water table for the existing ones.

The maximum of groundwater extraction in this Project has been designed to be within the recharge in five (5) year return period of drought. This concept enables the new well designed in this Project to avoid noticeable over extraction of groundwater, leaving the existing sources unaffected.

7.5.6 Traffic Nuisance

Some water distribution pipelines had to be designed to cross a road, and the installation work may interrupt traffic and cause nuisances. Based on the site investigation, two (2) installation methods were identified; namely to install the pipe through existing drainage under across the road, and to install half of the pipe first and then the remainder by shift. The shifting installation method usually requires one (1) day work. Therefore, any traffic nuisance to be caused by the installation of pipeline could be avoided, because the nuisance could be acceptable judging from the installation term of just one (1) day even in the case that the sifting installation method is employed.

7.6 Indirect Benefit Evaluation

7.6.1 Subdual of Excreta and Water Borne Diseases

Excreta and contaminated water are the major sources of diseases in Debre Tabor. From the field survey that has been carried out by the Project, the incidence of diseases as reported by Debre Tabor Hospital and Health Center for the year July 1993- June 1994 shows the following as the top ten diseases.

(1) Top Ten Diseases reported by the Hospital

| <u>Diseases</u> | <u>Number of Cases</u> |
|---------------------------------------|------------------------|
| 1. Lower respiratory tract infection | 2,870 |
| 2. All types of TB | 2,143 |
| 3. Intestinal parasite | 1,608 |
| 4. Eye infection | 1,276 |
| 5. Other diseases of the eye | 1,096 |
| 6. Gastritis and duodenitis | 983 |
| 7. Trachoma | 909 |
| 8. All forms of diarrhea | 760 |
| 9. Urinary tract infection | 734 |
| 10. Upper respiratory tract infection | 666 |
| Total | <u>13,045</u> |

(2) Top ten diseases reported by the Health Center

| <u>Diseases</u> | <u>Number of Cases</u> |
|--------------------------------------|------------------------|
| 1. Lower respiratory tract infection | 1,558 |
| 2. Skin infection | 1,338 |
| 3. Helminthiasis | 1,225 |
| 4. Upper respiratory tract infection | 1,054 |
| 5. Acute fever illness | 1,052 |
| 6. Sexually transmitted diseases | 498 |
| 7. Urinary tract infection | 432 |
| 8. Diarrhea | 417 |
| 9. Malnutrition | 387 |

10. Conjunctivitis

Total

365

8,326

The number of cases per year as a percentage of population comes to about 25.0%. These cases are very high; and the excreta and water borne diseases among above could be subdued on condition that the followings are made in line with improvement of water supply.

- Provision of toilets that will eliminate the use of open field for excreta disposal.
- Undertaking regular and timely operation and maintenance of the toilet facilities.
- Providing effective user's education to properly use the toilets and care for them.
- Identification and elimination of faecally contaminated sites that breed insects.
- Treatment of sewage and sullage, if possible, prior to discharge.
- Improvements of domestic water supply of Debre Tabor to reduce the effect of contaminated water to health.
- Launching sustained and effective sanitary education programme to improve environmental, domestic and personal hygiene.
- Making the communities in Debre Tabor to participate in the planning, choice and constructing toilet facilities; and to take over the operation, maintenance and management of these facilities.

7.6.2 Benefit Related to WID

By improving the piped water supply to Debre Tabor, the intended benefits will include reduction of time and energy women and girls spend in collection and cartage of water. It may also reduce the amount of time men and women spend in looking after the sick. This will allow women with some more time for other activities including relaxation or income generation and improved sanitary behaviors. It will allow girls more time for other things including studying. This should make some improvement in the quality of life for these female groups making Debre Tabor a better place for them to live in.

By facilitating the access to latrines in Debre Tabor, women and girls can have more privacy than has previously been enjoyed by them while performing necessary bodily functions. They may be more secure and free, particularly because of this increased privacy.

Through the CPPs, income generation activities, particularly among the poorest and low income female headed households. It will greatly relieve their suffering and blocks in access to resources, including water and sanitation facilities. This should also bring about benefits of empowerment and an improved sense of well-being in these groups.

In the long term there should be more opportunities for women in employment through the project. These will particularly benefit poorer social groups, particularly the vulnerable female headed households.

7.6.3 Economic Activities

There are prerequisites for a town to grow economically. Physically, it must have a sufficient level of basic infrastructure such as, road, electricity and water. Socially, it must have, above all, a sufficient educational and medical level.

Road is essential for exchange of materials, finished goods and persons with outside areas. Both electricity and water constitute indispensable components for manufacturing industry. Also, they are a necessity for commercial activities.

A sufficient level of education begets an enlightened type of people with a desire and will for better life. A sufficient medical level makes a healthy people and a healthy people can easily turn a hard working people.

If these five factors are satisfactorily combined, a town is ready for an economic growth.

Debre Tabor has a certain level of road, electricity, education and medical facilities. Regarding water, the center suffers from an acute shortage of it. This problem is going to be resolved through this Project.

The center can be said to have a capacity and prospect for future economic growth.

Water has especially strong impacts on manufacturing industry such as food & beverages, chemicals, mineral products, iron & steel and machinery & equipment, hotels, restaurants & bars, and hospitals. In an event water is sufficiently supplied through this Project, Debre Tabor's economic activities may be stepped up centering on them.

7.6.4 Benefit Related to Others (i.e. religion and tribe)

The benefits relating to religion and tribe include:

The level of access to water and sanitation facilities was not picked up in the household survey, however Muslims are definitely a minority group in Debre Tabor. The project will help to provide them with time and energy savings, allowing them to undertake more other things, including income generation and study. They should feel improvements in health and well-being as a consequence.

The improvements in sanitation will particularly help the poor and Muslims who at present have less access sanitation facilities. This should have the effect of improving their health status and release more time for other activities.

The improvements from the sanitary education program, particularly with the minority ethnic groups and religions will ensure that benefits are shared equally and that some benefits are accrued by these groups.

All of these benefits will have to be monitored with segregated data collection and analysis to ensure that the changes are positive to all social structures within the Debre Tabor community.

Chapter 8 Conclusion and Recommendation

8.1 Conclusion

Study on Water Supply and Sanitation Improvement has been carried out in Debre Tabor along with other 10 centers. The center is suffering from acute water shortage and deteriorating sanitary condition.

Water service coverage in Debre Tabor is currently 34 % only, and the water consumption per capita per day is extremely low with the amount of 3.7 lpcd in average. Although water quality of the sources is acceptable according to WHO drinking water guideline in terms of physico-chemical aspects, many faecal coliforms have been detected in samples collected from connections and household containers. This means the contamination is expected in such ways of through cross-connections, leaking and back-siphonage associated with aged facilities.

Sanitation condition prevailing in Debre Tabor stays at low level. Although their awareness is relatively high, the majority of the people dispose off their body wastes in open fields and in traditional pit latrines. Toilet coverage is 63 %, and those are mostly ill-maintained and poorly designed/constructed in terms of emptying and ventilation. Emptying toilet usually has to wait for long time due to unavailability of vacuum truck, and also there is no dumping site prepared for the emptied disposal near the center. Drainage facilities are not well equipped except ones along the main road, constructed by road authority. However the existing drainages are not well maintained and often blocked with garbage and refuse, creating stagnation of water.

Taking above situation into consideration, water supply has been planned in terms of both rehabilitation and new-construction with the target years of 2005 and 2010. In this Study, water coverage in year 2010 is targeted to be 75 % with reference to the current condition. Water demand is to be realized after completion of the Project with the volume estimated on the basis of 15 lpcd for public fountain, 35 lpcd for yard connection and 60 lpcd for household connection respectively.

For sanitary improvement, some types of toilet such as individual, community and public have been designed, those of which can be easily copied to facilitate the diffusion of such toilets. Typical sections of drainages are also shown in this Study, and those can be constructed by community level. Also, sullage disposal pit was shown, contributing to the disposal of household waste water. Sanitary education video and education manual will greatly contribute to the diffusion of sanitary education program, getting community involved, participated and motivated.

With reference to above, this Project shall be put high priority in the water supply sector for rural towns and be commenced immediately to mitigate the deteriorating condition. With completion of this Project, the followings are to be realized:

- Improvement of current deteriorating water supply
- Improvement of poor sanitary condition prevailing centers

- With both above completed, subdual of water/excreta born diseases, enhancement/strengthening of community, motivation of community, reduction of overburden incurred by fetching water for specially women and girls, and enhancement of economic activities, thus achieving the sound life in Debre Tabor.

8.2 Recommendation

As mentioned above, this Project was concluded to be carried out immediately taking into consideration both current deteriorating condition and the effect to be born by the Project. Followings are recommendations to be undertaken during construction work as well as after completion of the Project:

- Coordination among related departments located under Ministry of Water resources (central government) shall be made with Water Supply and Sewerage Service Department being the pivot, and coordination among the central, the regional and the center shall also be effectively made. For this purpose, the Project Manager shall be appointed and a committee composed of above three level is required under the manager in order to coordinate and facilitate the implementation.
- In line with the implementation of water supply project, progressive water tariff structure and double entry accounting system should be introduced. The former scheme can raise the average water tariff without affecting low-income households. The latter can draw real picture incorporating depreciation and interest payment so that WSS can have not only enough operation and maintenance cost but also fund to expand the water supply system by themselves.
- The related organizations, specially WSS, should be strengthened as programmed in order to manage the enhanced water supply and sanitation facilities effectively. WSS will have authority to revise water tariff, dismiss or employ its staff and launch on new investment subject to regional office, so that WSS will have self-independent sense and can stand on their own feet.
- A committee, composed of health/sanitary relating organizations, shall be established in the center in order to improve sanitary and health condition. This committee can also coordinate communities in preparing sanitary facilities such as toilet, sullage disposal site, drainage and etc. WSS should facilitate the coordination of the committee.
- Survey shall be carried out along planned rising and distribution pipelines, at well sites and reservoir sites during detail design stage. Land acquisition, where required in such works of rising main, reservoir and well, shall be made in time before the commencement of the construction.
- To get the community motivated and empowered, it is very efficient if the management and operation of facilities are made by the community itself. In this regard, " Community Management of Public Fountain " and " Community Management of Community Toilet " are recommended. According to the household

survey, the majority of people are in favor of the public fountain managed by the community.

- Community, particularly women and girls, must be involved in confirmation of the water supply and sanitation facilities design, system and devices at the commencement of the implementation stage. This is made specially for finalization of public fountains' design and location, design of toilet facilities, and management scheme of those facilities. Exercises of involving the community are extremely motivating factor. It provides them with a feeling of involvement and thus provides empowerment.
- Community participation promoter should be assigned in line with the implementation of the Project, who will be responsible for coordinating instructions for the community members on the design, construction and operation and maintenance of the water and sanitation facilities as part of the long term sustainability. Also, a CPP supervisor shall be dispatched from WSSD on occasional basis to facilitate the CPP's work.
- Sanitary education manual and video titled "Simple Steps...for Better Health" should be fully utilized for the purpose of diffusion of sanitary education program as well as motivating the population for better sanitary activities. The sanitary education manual will be modified, if necessary, according to the response of the attendants, since the manual has not been tested.
- Results of the analysis for access and control suggest that they share resources with men equally within the home but that female headed households tend to be poorer than their male counterparts. Female headed households are particularly vulnerable and special attention must be paid to them during implementation to make sure that they are benefiting adequately from the Project, and this should be monitored.
- Monitoring should be made in line with the project cycle to confirm and measure the benefits to be born by this Project, those of which are increase of water coverage and water amount, subdual of water/exoreta borne diseases, motivating community, reduction of time for fetching water and activating economy.

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