Pro-poor Water & Sanitation Governance

METHODOLOGIES FOR MAPPING THE POOR, GENDER ASSESSMENT & INITIAL ENVIRONMENTAL EXAMINATION

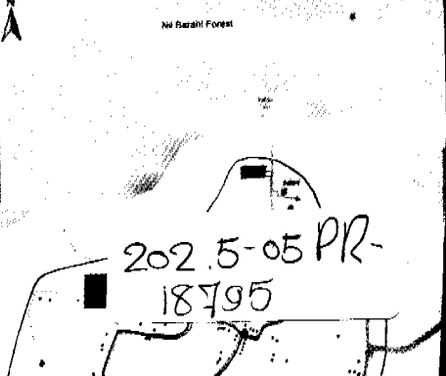
UN - HABITAT

United Nations Human Settlements Programme

In Cooperation with

Centre for Integrated Urban Development

DECEMBER 2005



UN-HABITAT

UNITED NATIONS HUMAN SETTLEMENTS PROGRAMME
(UN-HABITAT)

Pro-poor Water and Sanitation Governance

TIGNI WATER AND ENVIRONMENTAL SANITATION IMPROVEMENT PROJECT

Methodologies for Mapping the Poor, Gender Assessment & Initial Environmental Examination

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FOREWORD

The unregulated and rapid urbanization in Asian cities has led to a huge gap between demand and supply of water and the provision of adequate sanitation. The current water crisis and lack of sanitation is one of the major threats for improved living conditions for the poor and the subsequent eradication of poverty in the region. To meet water and sanitation targets of internationally agreed development goals in urban Asia, 675 million and 619 million people need to gain access to water and sanitation facilities respectively by the year 2015.

Responding to this challenge, UN-HABITAT initiated the Water for Asian Cities (WAC) programme in collaboration with Asian Development Bank to help attain the water and sanitation goals of the Millennium Declaration.

In Nepal, the WAC programme is supporting the implementation of the water and sanitation related goals in selected peri-urban areas and towns within and outside the Kathmandu Valley for improvement and expansion of urban water supply, sewerage and sanitation, drainage and solid waste management. The initiative is specifically promoting pro-poor governance, water demand management, increased attention to environmental sanitation, and income generation for the poor linked to water supply and sanitation. The programme seeks to achieve this by mobilizing political will, raising awareness through information and education, training and capacity building, promoting new investments in the urban water and sanitation sector, and by systematic monitoring of progress towards achieving the Millennium Development Goals.

However, for such initiatives to be sustainable they must address the concerns of the urban poor and the specific needs of women and children. For this reason, UN-HABITAT has partnered with the Centre for Integrated Urban Development (CIUD), a non-governmental organization based in Kathmandu, to apply methodologies for Mapping the Poor, Gender Assessment and Initial Environmental Examination. These tools have proven to be simple yet effective methods for ensuring that water and sanitation initiatives truly benefit the urban poor, include the participation of women and children in their governance, and that adequate measures are taken to minimize their impact on the environment.

I hope that this tool will contribute to addressing the water and sanitation needs of the urban poor in general and of women and children in particular, and to attaining the Millennium Development Goals in the Asian region.

Anna K. Tibaijuka
Under-Secretary-General and
Executive Director

Acknowledgements

This volume provides methodologies for addressing water and sanitation issues of low-income settlements in Asian cities and its implementation in Tigni, one of the poor settlements in Madhyapur Thimi Municipality, Nepal. While CIUD was initiating water and sanitation improvement activities in Tigni along with Water Aid Nepal, UN-HABITAT generously partnered to produce these valuable knowledge assets. Mr. Andre Dzikus, Programme Manager, Water for Cities & Human Settlement Officer, Ms. Amy Wong, Associate Human Settlements Officer, Dr. Roshan Raj Shrestha, Chief Technical Advisor, Water for Asian Cities Programme and Ms. Anjali Manandhar Sherpa, Programme Associate, UN-HABITAT deserve special appreciation for supporting this innovative study.

We would also like to appreciate the contribution of Water Aid Nepal for initiating this important activity. Valuable support was available from Mr. Bhuvan Prakash Bista and Mr. Vishnu Dutta Gautam, CEOs and Madyapur Thimi Municipality team. We would like to acknowledge their generous contributions. Special thanks goes to 'Tigni Samudayik Bikas Samiti', the users' group of Tigni, without which this endeavour would not have been successful.

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Acronyms

ADB	Asian Development Bank
CIUD	Centre for Integrated Urban Development
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EPA	Environmental Protection Act
EPR	Environmental Protection Rule
FGD	Focus Group Discussion
GIS	Geographic Information System
IEE	Initial Environmental Examination
IWRM	Integrated Water Resource Management
MDG	Millennium Development Goals
MDT	Millennium Development Targets
MOU	Memorandum of Understanding
NWSC	Nepal Water Supply Corporation
RGA	Rapid Gender Assessment
UN-HABITAT	United Nations Human Settlements Programme
WAC	Water for Asian Cities
WATSAN	Water and sanitation
WWF	World Water Forum

Organization of the Reports

This is the first of the five volumes of "Pro-poor Water and Sanitation Governance" initiative undertaken in Tigni. The original report is presented in the following five volumes.

Volume I	*Methodologies for mapping the poor, gender assessment and initial environmental examination;*
Volume II	*Mapping the poor and gender assessment in Tigni;*
Volume III	*Tigni Water and environmental sanitation improvement plan;*
Volume IV	*Maps; and*
Volume V	*Initial environmental examination of Tigni water and environmental sanitation improvement project*

Volume I, the first output of the project is the *Methodologies for mapping the poor, gender assessment and initial environmental examination.* This report was prepared after designing the methodologies for the said objectives. These methodologies were peer reviewed by UN-HABITAT and finalized in the mid of the project period.

Volume II, the second output of the project was *Mapping the poor and gender assessment* in Tigni. This was the implementation of the methodologies developed in the first output. The methodologies developed were adopted in Tigni, the outcome of which was used in preparing the Water and environmental sanitation improvement plans. This volume reports the findings of the Mapping the poor and gender assessment in Tigni.

Volume III, the third volume of the five outputs utilizes the findings of the mapping the poor and gender assessment along with the technical surveys while producing the proposed *Water and environmental sanitation improvement plan* for Tigni. This comprehensive plan was discussed and approved by the community. Later the plan incorporated the recommendations of IEE to make it comprehensive and sustainable. The proposed plans were further prioritized by the community for implementation.

Volume IV, the *Maps* generated during analysis and planning process itself is an important output of the project. A separate volume of these maps is presented so that the readers of different volumes can easily refer to the maps. These GIS based maps are produced either to demonstrate analytical outputs or to show existing as well as proposed development activities.

Volume V, *Initial environmental examination of Tigni water and environmental sanitation improvement project* was a separate study done to explore possible environmental impacts and finding out necessary mitigation measures. This separate report presents the preliminary environmental examination of the project activities as proposed in Volume I and recommended necessary steps to be considered in the design and implementation of the plan.

METHODOLOGIES FOR MAPPING THE POOR, GENDER ASSESSMENT & INITIAL ENVIRONMENTAL EXAMINATION

1 Background

The Water for Asian Cities (WAC) Programme, is a collaborative initiative between the United Nations Human Settlements Programme (UN-HABITAT), the Asian Development Bank (ADB) and Governments of Asia. The WAC Programme was officially launched at the Third World Water Forum (WWF) on 18 March 2003 and a Memorandum of Understanding (MOU) was signed between ADB and UN-HABITAT on the same day in Osaka, Japan. This programme is supporting the implementation of the water and sanitation related Millennium Developrnent Goals and Targets (MDGs & MDTs) in Asian cities, specially promoting pro-poor governance, water demand management, increased attention to water and sanitation, and income generation for the poor linked to water supply and sanitation.

Recognising the urbanising trend all over the world and specifically in Asian cities, there is a huge gap between demand and supply of water and sanitation services. The Millennium Development Goal which intends of halving the present deficiency by 2015, demands serious investments in the sector. To meet the MDG targets in urban Asia, there is a need of sanitation facilities and safe drinking water for respective estimated population of 675 million and 619 million by 2015 in this sector.

Among these cities and towns, small to medium cities are growing very rapidly in Asia. Most of these towns have annual population grown rate of 5% or more. By virtue of being small, they are politically not as much of attractive and receiving fewer investments against their rapidly increasing demand. While being economically weaker but burdened with migrant population, small towns and urban centres are most deficient in infrastructures as well as institutional capabilities. This will not only create political challenge for future, moreover, many social disorders are bound to emerge. If unattended in time, these centres will turn into slums which will be much expensive to improve in the future, economically as well as politically.

In this generalised picture of demand of the services, the focus should go to urban poor. In the case of many Asian cities, poor and rich live together in a cluster, particularly in small urban centres. There are rarely clear demarcations between rich and poor neighbourhoods. This condition creates the need of identifying the poor households for the equitable distribution of the services within the society. In the absence of such information, many of the previous initiatives geared towards the poor did not end up with facilitating the targeted group. Therefore, identifying poor households and bringing the services directly to their doorstep is imperative. For this purpose mapping the poor becomes primary activity while designing the delivery of the services. Identifying the poor, their condition and need, and addressing their requirement through pro-poor service delivery approach is the primary course to meet the MDG targets.

Water and sanitation issues are more of a cultural and behavioural issue where women play vital roles. There are literatures explaining the past stories of unsuccessful water and sanitation activities where the gender sensitivity was missing. Without the meaningful participation of women from the design stage to its implementation and operation, these projects are bound to fail. Therefore, UN-HABITAT has rightly focused the water and sanitation projects incorporating the gender issue within it.

In the past most of the water supply projects were limited to supply of water only, undermining the waste water problems. Pollution of water bodies- rivers and streams, ponds and lakes are the obvious results of this piece-meal approach. Therefore, proactive assessment of impacts on environment by the development activities has become state of the art approach. Furthermore, it has become mandatory in most of the countries to assess the environmental impacts that may be caused by new interventions. Water and sanitation projects normally are carried out to improve

the environmental condition of the targeted settlements. However, there are issues of water rights, up stream and down stream effects, social disparities and social, physical and ecological concerns. Therefore, it has become mandatory to go for appropriate environmental assessment before launching any projects and activities.

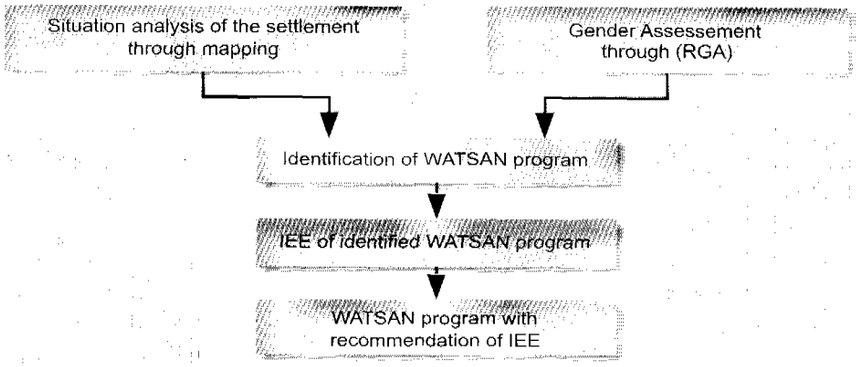


Figure 1: Proposed flow of activities

Institutional arrangement is one of the primary issues that determines the success and sustainability of water and sanitation projects. There is enormous pool of knowledge in community participation in several sectors of Asia. Learning from the past, water and sanitation projects which have a direct link with the daily household chores, meaningful involvement of the beneficiaries is need to be sought in water and sanitation activities. Their involvement is required from the feasibility stage of the project. It is expected that the project will build up capacity of the users to operate and maintain the system. Other stakeholders like governmental agencies, local government and civil society organisations will be cooperating with each other for the successful operation of the schemes. For the sustainability of the activities, good governance principles need to be incorporated in such projects. Up-scaling the present knowledge by implementing water and sanitation projects with the participation of users, local government and NGOs may bring an additional successful example of managing water and sanitation activities. Sharing of such experience under the WAC Programme could benefit many countries in the region.

In a nutshell, the methodologies developed and tested in mapping the poor, gender assessment and initial environmental examination have come up with appropriate tools for implementing water and sanitation projects in Asia and this will help to meet the objectives of Water for Asian Cities Programme.

Under the WAC Programme UN-HABITAT has identified six countries in South Asia. Further, several cities have been selected from each country for the pilot initiation of the programme. Identifying most potential development programs regarding water and sanitation (WATSAN) in these identified cities are very challenging.

There are three principal issues to be taken into consideration in developing any types of development programs – i) if the program has addressed every poor household in the settlement, ii) if the program has addressed gender issues, and iii) if identified development programs are environmentally sustainable. Identifying and developing development program basically involve following steps.

1. Situation analysis of the settlement
2. Gender assessment
3. Identification and design of WATSAN development program
4. Initial Environmental Examination (IEE) of proposed development program
5. Produce a final development program incorporating IEE findings

UN-HABITAT's WAC program in partnership with Centre for Integrated Urban Development (CIUD) and Water Aid Nepal has developed three methodologies to carry out these development efforts. This in result will help to identifying and develop environmentally sustainable development programmes. They are i) Methodology for mapping the poor, ii) Methodology for Rapid Gender Assessment (RGA) and iii) Methodology for Initial Environmental Examination (IEE). Methodology (i) and (ii) together help in analyzing the water and sanitation situation, whereabouts of poor, situation of the poor, gender issue and then identifying and developing water and sanitation program for the settlement. Whereas IEE helps in examining if the development programmes are environmentally sustainable. Model presented in Figure 1 demonstrates how these methodologies are implemented in developing water and sanitation programmes for urban setilement. These three methodologies are discussed in forthcoming chapters. Figure 2 illustrates the process of the implementation.

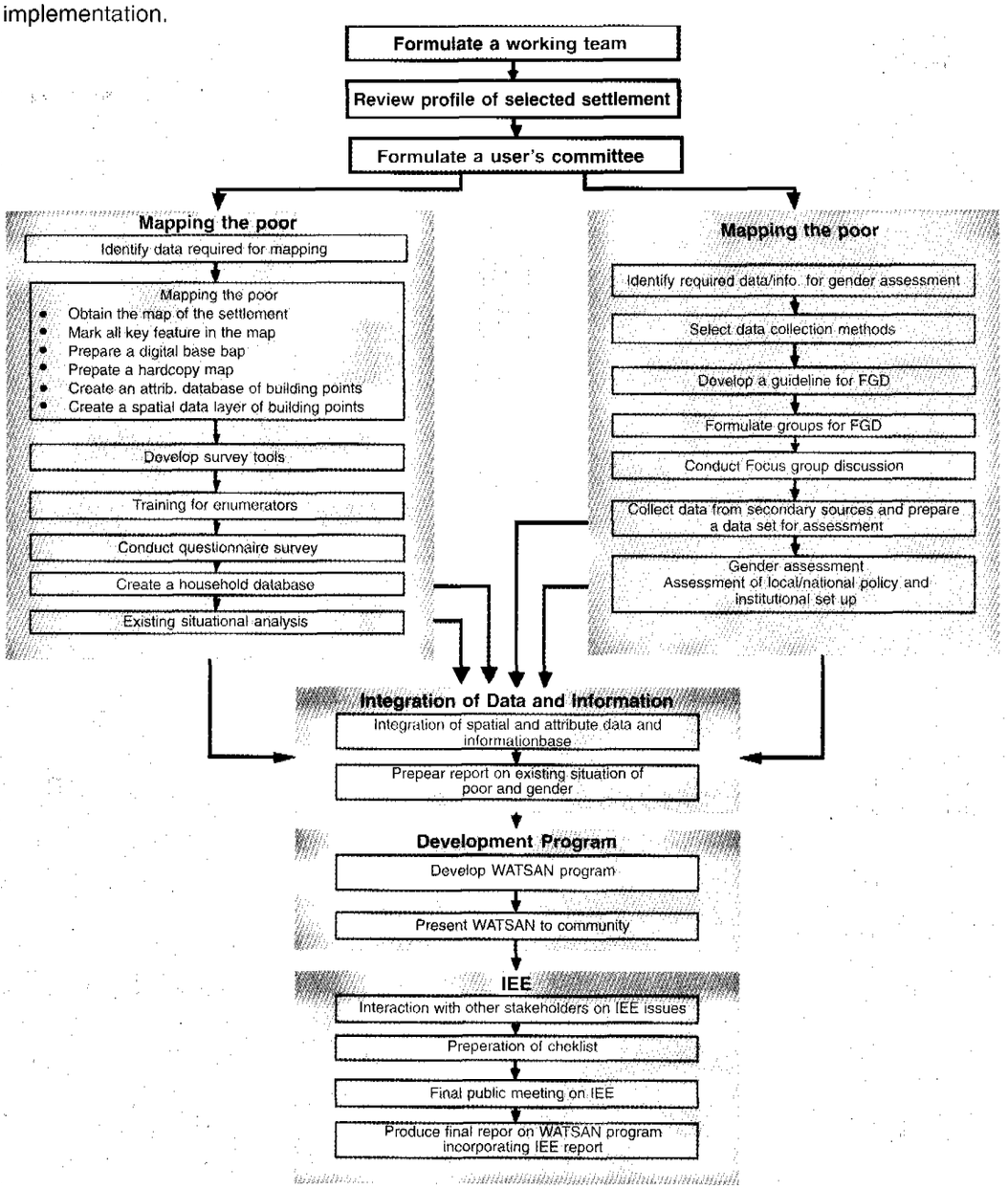


Figure 2:Process for developing WATSAN Programmes for urban settlement with implementation of Mapping, Rapid Gender Assessment and IEEMethodology for Mapping the Poor

2 Methodology for Mapping the Poor

Identifying appropriate development programmes requires information on existing condition of urban poor such as economic condition, water and sanitation condition, etc. Whereabouts of poor households and their living condition are very important in identifying appropriate development programs for the targeted low income group. There are various conventional methods such as questionnaire survey, focus group discussion, secondary data collection, etc. to review the situation. However, these methods have limitation on presenting the condition as it can only be presented in text, graph and chart formats, which is not very efficient in visualizing the situation. Mapping is an efficient visualization technique that has capability of pin-pointing each individual household in the settlement and their surrounding environment. Information provided by map is more interactive and user friendly, and is a very good tool for decision making. Advancement in information technology has developed a powerful system called Geographic Information System (GIS), which has capability of managing spatial data, integrating spatial data/information with non-spatial (attribute) data/information, analyzing them and producing interactive digital and analogue (hardcopy) maps for visualization. For mapping the poor, hybrid approach is initiated where questionnaire survey and community based mapping are merged to produce required maps.

To test the methodology developed, Tigni, a small urban settlement in Madhyapur Thimi Municipality has been selected. The detailed application of the mapping is elaborated in the other volumes. This volume will provide methodologies adopted to do so.

Steps in mapping the poor

1. Identify data required for mapping the poor

Various types of data on households and surrounding environment of the settlement are required to analyze the condition of the poor. We have to know the issues to be incorporated in mapping, key information that presents the existing condition of the poor on that issue, indicators to measure their conditions and data required to generate the identified indicators. UN-HABITAT has developed various development indicators to measure the development of water and sanitation situations in urban settlements to meet the MDGs. Various documents produced by UN-HABITAT and others such as Urban Indicators Guidelines, MDG targets in Nepal, and ADB City Data Book, profile of selected settlement, national water and sanitation issues and indicators, etc. have been reviewed to identify issues, information, indicators, data required and data collection methodology which are relevant to the selected settlement. Refer Table 1 for the information, indicators, and respective data required for mapping the poor. Types of data identified for one settlement may be different for other settlements due to many reasons.

2. Mapping

Several steps needed to be carried out for mapping the poor are described in the following paragraphs. Utilizing the data and information gathered from Tigni, several examples of maps are presented in chapters below.

2.1. Obtain the map of the settlement

Explore all potential sources of maps and obtain a best available map of the settlement. Also obtain the digital version of map if available. Figure 3 is a sample map obtained for Tigni area.

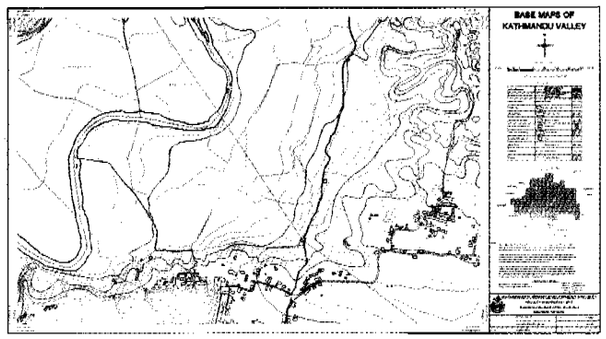


Figure 3: 1:2000 scale Map Sheet

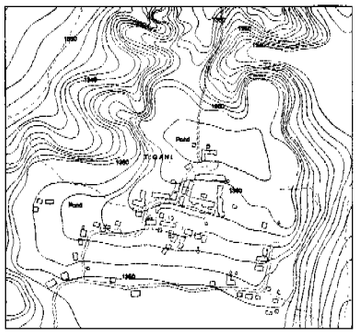


Figure 4: Tigni settlement

Figure 4 is a map of Tigni settlement, extracted from obtained sheet. Enlarge the map for convenience and to be used in field surveys.

2.2. Mark all key features in the map

Mark all key features such as important land marks in the settlement, schools, temples, government buildings, roads with local names, water bodies (river, pond, reservoir, tanks, etc), public facilities (stand posts, spring water, toilets, libraries, open spaces, etc), cultural and heritage sites, water supply network, sewerage and land use in the map prepared by using step 2.1. Community participation is very essential for marking these key features. Also mark areas which are vulnerable to various disasters, slums and squatters identified by other studies if any. Note down additional information about these features in separate sheet of paper (e.g. condition of a stand post marked in the map, condition of the road segment marked in the map, etc.). See figure 5 for scanned sample map after marking the key features.

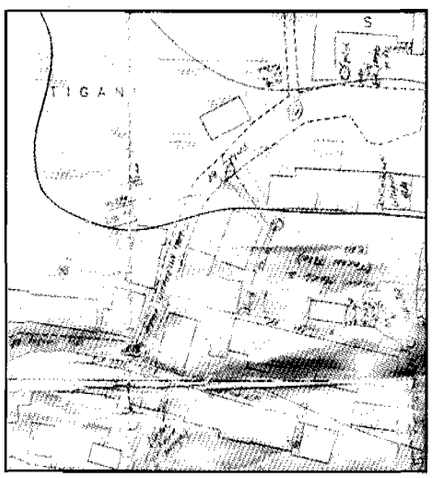


Figure 5. A portion of map after marking

Focus group discussion (FGD) is one of the efficient techniques to collect common information of the settlement. Organising formal meetings with user group and other key informants like school teachers, community workers, local government representatives, health workers of the area, women leaders, well-known people of the area, CBO and NGO representatives, etc. will help to provide significant information of various physical and social structures of the settlement. These information are collected to update the existing maps.

2.3. Prepare a digital base map

Figure 6: Digital version of map with key features

If digital version of the map of the settlement is available, update the spatial data layers according to the marked features in step 2.2. If it is not available, scan the updated map, digitize it and prepare a set of spatial data layers such as building blocks, roads, water bodies, etc. required for digital map. Any GIS or CAD software can be used for digitization. Sample digital map prepared for Tigni settlement using ESRI's ArcView is shown in figure 6.

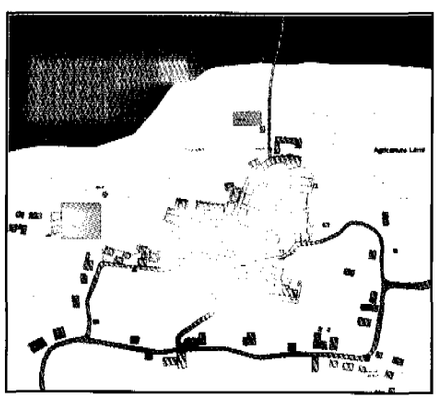


Figure 6: Digital version of map with key

2.4. Prepare a hardcopy map

Print a hardcopy version of the digital map prepared in step 2.3 in gray scale. This map has to be used for locating building points. Map may have to be divided into several clusters, so that more than one group of people can work at the same time in different clusters. Produce a separate copy of large scale map for each individual cluster. Give a unique cluster ID for each cluster. Roads can be worked out as best features for clustering the map. See figure 7 and 8 for clustering of Tigni.

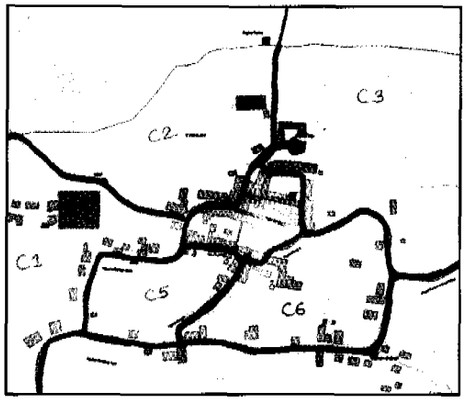


Figure 7: Scanned map after clustering

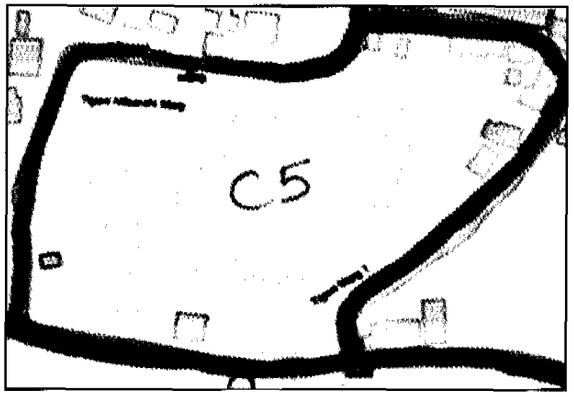


Figure 8: Scanned map of cluster 5

2.5. Locate buildings in the map

Visit each building in the settlement and locate them in point feature in the map with a unique building point ID. Every building point in a cluster has to be represented by a cluster ID and a number in sequential order for that cluster. For example house number 6 in cluster 5 is represented by C5-6. Most of the maps generally show a cluster of closed houses as a single block, therefore a block as in figure 9 may have more than one houses. Write the corresponding cluster ID and building point ID house number at the door of each house. Note down basic information about each house visited in a tabular form in separate sheet of paper. These information are Cluster ID, building point ID, owner's name, uses (dwelling or other purpose), number of households etc. A team of people led by person with mapping experience and juniors with basic knowledge of maps have to perform this task with the participation of locals. To avoid miss matching of house numbers, one team should be allowed to work in one complete cluster.

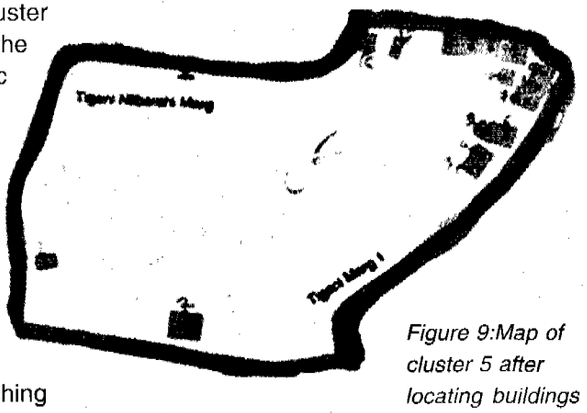


Figure 9:Map of cluster 5 after locating buildings

2.6. Create an attribute database of building points

Create an attribute database of all building points based on a tabular data prepared for each cluster while locating houses in the map. Introduce a new unique house ID "xxxx" to represent each building point in the database. Field size for this attribute has to be determined by total number of building points counted for the settlement. For example, 0100 may represent a building point C5-6 in the database.

2.7. Create a spatial data layer of building points

Create a spatial data layer for building points based on the spatial database prepared in previous step and building points located in the hardcopy cluster map. Use new unique house ID for building point reference to the attribute database created in step 2.6. Figure 10 is the map with building points.

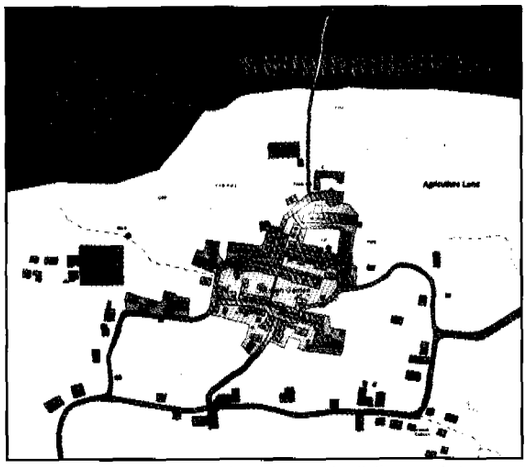


Figure 10: Digital map withbuilding points

3. Develop survey tools

Develop a set of questionnaires based on required data identified by step 1. Prepare map along with a list of houses with building point ID, owner's name etc. for each cluster to be visited by enumerators for questionnaire survey. Gender assessment related questionnaire (see Chapter 3) are also incorporated in the questionnaire survey.

4. Training for enumerators

Provide training to enumerators regarding questionnaire survey, and using the map of each cluster to identify houses for interview. Assign the number of households to each enumerator in such a way that each and every household of the cluster is visited by only one enumerator during the survey. A list of households with house numbers and a map should be provided to each enumerator to identify the houses.

5. Conduct questionnaire survey

Send enumerators for survey with questionnaire sets and cluster maps with building points and point ID. Enumerator will visit corresponding house and household with reference to the building point located in the map. He/she should verify point ID in the map with the house ID labeled in the door before filling out the questionnaire. If a house C5-6 has two households, unique ID for those households will be C5-6-1 and C5-6-2.

6. Create a household database

Create a household database of the settlement with reference to the data collected from questionnaire survey. Microsoft Access can be used to maintain the attribute database, which is compatible to integrate with ArcGIS.

7. Integration of spatial and attribute database

Integrate household database with spatial data layer of building points through building point ID given for each building point. Corresponding point ID for each building point will be the key field to integrate spatial data layers with household database, which helps in providing map based information in various aspects such as living condition of poor in the settlement. Combination of Microsoft Access and ArcView can perform this integration. Some of the sample maps of Tigni are presented in last chapter of this document.

Table 1: **Key indicators and data required for mapping the poor**

Issue	Key information	Key indicators	Data required
Demography	Population	Percentage of city (or settlement) population in municipality	Population of city (or settlement) and population of the municipality
		Population density	Total area and total population of the city
		Age-sex composition of population (m/f)	Male and female population of different age groups
		Dependency ratio	Population of age groups <15 years, 15 -59 years and >59 years
		Percentage of disabled population (m/f)	Total population and disabled population
	Household	Average dwelling size	Total number of houses and households
		Tenure type (owned/rented)	Number of households by type of tenure (owned/ rented)
		Average household size	Total household and total population
		Construction type	Number of households by type of construction of house (permanent/semi-permanent/temporary)
		Proportion of households with more than three persons per room	Number of households with more than three persons per room and total households
Education	Access to education	Number of primary/secondary school and colleges in the city	Number of primary/ secondary school
		Net enrollment rate in primary/secondary/tertiary education (m/f)	Number of girls and boys enrolled in primary/ secondary/tertiary education and population of girls and boys of primary/secondary/ tertiary education age groups
	Literacy	Adult literacy rate	Number of literate persons and total population of age 15 years and above
		Youth literacy rate	Number of literate persons and total population of age group15-24 years old
		General literacy rate	Number of literate persons and total population of age 6 years and above

Issue	Key Information	Key Indicators	Data required
Economic development	Employment	Percentage of employed persons by major economic activities (m/f)	Number of employed persons by major economic activities and total population by sex
		Percentage of economically inactive population (m/f)	Number of economically inactive persons of age 15 years and above and total population of age 15 years and above
		Unemployment rate (m/f)	Economically active population and population of seeking job of age 15 years and above by sex
		Young unemployment rate (m/f)	Economically active population and population of seeking job of age group 15-24 by sex
		Percentage of employed persons in informal sector (m/f)	Number of employed persons in informal sector (e.g., unregistered organizations) and total population by sex
		Child labour (m/f)	Number of working children of age group 10-14 and total population of this age group by sex
	Poverty	Percentage of population below poverty line ($1 day) (m/f)	Total population of the settlement and population below poverty line by sex
		Household below poverty line	Total number of households and number of households below poverty line
		Average household size of household below poverty line	Number of households and population below poverty line
		Per capita income (Rs/day)	Total income of all persons and total population
Health	Access to health	Number of primary health center, health post, sub-health post	Number of primary health center, health post, sub-health post
	Child mortality	Infant mortality rate (g/b)	Number of deaths before age 1 and population below age 1 by sex
		Child mortality rate (under five) (b/g)	Number of deaths before age 5 and population below age 5 by sex
	Immunization	Proportion of one year child Immunized (DPT, BCG, Polio, measles) (b/g)	Number of children under 1 year immunized and total population under 1 year

Issue	Key Information	Key Indicators	Data required
Environmental sustainability	Knowledge on HIV/AIDS	Percentage of households aware to HIV/AIDS	Number of households aware to HIV/AIDS and total households
	Land use	Proportion of land uses	Area of different land uses and total land area
	Cooking fuel	Percentage of household by type of fuel used for cooking (electricity, gas, wood, fodder, solid fuel, etc.)	Number of household by type of fuel used for cooking (electricity, gas, wood, fodder, solid fuel for, etc.)
	access to improved sanitation	Percentage of households with sanitation facilities - type of toilet	Number of households with sanitation facilities and total households
		Number of household per toilet	Total number of households and total number of toilets
		Person per toilet	Total population and total number of toilets
	Access to safe drinking water	Median water fetching time	Water fetching time of all households
		Median distance of water source	Distances of water sources from households
		Percentage of households unaccounted for water	Number of households unaccounted to water and total household
		Percentage of households with water treatment facilities -filtering, boiling, SODIS	Number of households with water treatment facilities and total households
	Access to piped water	Percentage of household with piped water	Number of households with piped water and total households
	Access to sewerage	Percentage of households connected to sewerage	Number of households connected to sewerage and total households
	Solid waste management	Percentage of household by solid waste management	Number of households by type of solid waste management and total households
	Access to electricity	Percentage of electrified households	Number of households with electricity and total households
	Access to telephone	Percentage of households with telephone	Number of households with telephone and total households
		Percentage of households with mobile phone	Number of households with mobile phone and total households
	Access to computer and internet	Percentage of households with computer and internet	Number of households access to computer/internet and total households

3 Methodology for Rapid Gender Assessment

Various studies in the past show that inadequate water and sanitation services have more impact on women and girls compared to men and boys as women and girls share the burden of managing water at household level. Women and girls have to travel long distance, spend more time to fetch water and have to face risks due to location of sanitation facilities. Better sanitary conditions provide real benefits to women in the form of greater privacy, convenience, safety, dignity, and safe hygiene practices in the family. Therefore gender issues have to be taken seriously while developing environment and sanitation program.

There are two aspects of gender involvement in planning and implementation of projects: the basic information depicting the condition of women and their imperative participation in design and implementation process. The conventional design approach most of the time misses to gather input from users, especially women, putting the project on high risk of failure. Gender insensitive designs, be it a water-spout or its location, or sanitation facility, not considering female physical requirements; or the socio-cultural behaviour brings the risk in sustainability. Therefore, participation of women is very crucial for the success of any WATSAN projects. Their involvement needs to be sought from the design period leading to its implementation and also during maintenance period. Moreover, participation of poor women should also be sought as a key stakeholder of the proposed activities. For these purposes pro-poor governance framework has to able direct participation of poor women and men. For the meaningful involvement of poor women in decision making process, it is necessary to have mandatory presence of poor women in the discussions and decision making positions. Good governance principles such as transparency, participation and accountability would help in generating involvement of women.

Besides their involvement in planning and implementation, different types of data and information is required to identify the situation of women in the settlement. There are several steps to be carried out in gender assessment as follows:

1. Identify required data/information for assessment

Different types of gender data are required to evaluate the situation of women and the gap between men and women in different aspects of life. A team comprised of gender expert and environmental sanitation specialist have to work out key issues to be incorporated for gender assessment, information required, indicators to measure their condition and data required for generating indicators. Refer Table 2 for key indicators and respective data required. Data and information identified for an urban settlement may vary to another settlement due to difference in socio-economic and environmental situations of the settlements.

2. Select data collection methods

For gender assessment three-prong approach is suggested *viz* household survey; focus group discussion and use of secondary source data. The opportunity of having questionnaire survey for *mapping the poor* may be utilised to add household information related to gender situation. This survey will provide household specific information which can be utilised in designing future plans and programmes with gender sensitivity. Such primary survey may be a complete survey or a sampling survey, depending upon the budget and time available. The second approach parallel to previous one, is the Rapid Gender Assessment (RGA) where women's focus group discussion (FGD) will be the primary source of information. There are many gender issues which need qualitative information and which cannot be acquired from questionnaire survey. In such cases focus group discussion could help to fulfil the gap.

Prevailing policy of the government, acts and regulations, plans and programmes, organizational structure of water and sanitation officies, and other relevant documents and data may be collected as secondary data for the purpose of gender assessment. Analysis of prevailing policies and activities will be done to keep the national and sectoral integration in the program.

3. Develop a guideline for FGD

Develop a guideline for FGD so that the required information identified in step 1 can be collected efficiently. Orient members who are going to conduct FGD in the settlement. Female members of the community are the targeted group for such discussion therefore it has to be made sure that the members going to conduct the FGD should be female as well.

4. Formulate groups for FGD

Divide the city or settlement in several clusters according to the density of population and socio economic condition of the households. Community participation is very essential in FGD; members of community have to be mobilized in clustering and formulating these groups. Set date, time and venue for discussion as convenient to community of corresponding cluster. Community workers need to be deputed to conduct groundwork to prepare for FGD.

5. Conduct FGD

Conduct focus group discussion for each cluster at the arranged venue and collect information reference to the guideline. Women from all walks of life should represent the meeting so that their understanding and concerns are informed. Especial attention should be given for the participation of poor women and women from deprived classes/groups.

6. Collect data and prepare a data set for assessment.

Collect all identified data and information from different secondary sources. However, one of the main sources of data will be from questionnaire survey from mapping the poor. Prepare a set of data and information based on these data for gender assessment.

7. Gender assessment

Analyze the data and information based on collected data from various sources and methods in different steps. Analysis includes socio-economic, health, education, status and position of women in the society, gender inclusion in local level politics, etc. and the gap between men and women.

Table 2: **Key indicators and type of data/information required for gender assessment**

Issue	Key Information	Key Indicators	Data required	Data collection method
Demography	Population	Sex ratio by age groups	Male and female population of different age groups	Survey data
	Poverty line	Ratios of female to male in households below/above poverty line	Male and female population of households below/above poverty line	Survey data
	Women-headed household	women-headed household below poverty line	women-headed households below poverty line and total number of women-headed households	Survey data
		Proportion of women-headed household with access to safe drinking water	Number of women-headed household with access to safe drinking water and total number of women-headed household	Survey data
		Proportion of women-headed household with sanitation facilities	Number of women-headed household with sanitation facilities and total number of women-headed household	Survey data
Education	Access to education	Ratios of girls to boys enrolled in primary/ secondary/ tertiary level	Number of girls and boys enrolled in primary/ secondary/ tertiary education and population of girls and boys of primary/secondary/tertiary education age groups	Survey data
		Ratios of girls to boys enrolled in public and private schools	Number of girls and boys enrolled in public and private schools	Survey data
	Literacy	Adult female literacy rate	Number of women aged greater than 15 who can read and write and total number of women of this age in the settlement	Survey data
		Ratios of literate females to literate males of 15-24 year old	Number of literate male and literate female of age group 15-24	Survey data
	Access to improved sanitation in school	Percentage of schools having separate latrines for girls	Number of schools having separate latrines for girls	FGD
Economic development	Unemployment	Ratio of women to men of age 15 years and above seeking for job	Number of women and men of age 15 years and above seeking for job	Survey data

Issue	Key Information	Key Indicators	Data required	Data collection method
		Ratio of women to men of age group 15-24 years seeking for job	Number of women and men of age group 15-24 years seeking for job	Survey data
		Share of women in wage employment in the non-agriculture sector	Number of men and women in wage employment in the non-agriculture sector and	Survey data
		Ratio of economically inactive women to men of age 15 years and above	Number of economically inactive women and men of age 15 years and above	Survey data
		Ratio of women to men employed in informal sector	Number of men and women employed in informal sector	Survey data
Health	Child mortality	Ratio of girls to boys who died before reaching age one	Number of girls and boys who died before reaching age one	Survey data
		Ratio of girls to boys who died before reaching age five	Number of girls and boys who died before reaching age five	Survey data
	Maternal health	Maternal mortality rate	Number of maternal deaths and number of live births	Survey data
		Proportion of births attended by skilled health personnel	Number of births attended by skilled health personnel and total births	Survey data
	Immunization	Ratio of girls to boys of one year immunized (DPT, BCG, Polio, measles) (b/g)	Number of immunized girls and immunized boys of one year old	Survey data
	Awareness to HIV	Proportion of women familiar to HIV/AIDs	Proportion of women familiar to HIV/AIDs	FGD
		HIV prevalence among 15-24 years pregnant women	Number of pregnant women of age group 15-24 who have HIV/AIDs	FGD
Status and position of women	Division of labour	Proportion of household where only women do everyday cooking	Number of households where women only do everyday cooking and total number of surveyed households	Survey data / FGD
		Proportion of household where only women do dish washing	Number of households where women only do dish washing and total number of surveyed households	Survey data / FGD

Issue	Key Information	Key Indicators	Data required	Data collection method
		Proportion of households where only women do house cleaning	Number of households where women only do house cleaning and total number of surveyed households	Survey data / FGD
		Proportion of households where only women do toilet cleaning	Number of households where women only do toilet cleaning and total number of households surveyed.	Survey data / FGD
		Proportion of households where only women do laundry	Number of households where women only do laundry and total number of surveyed households	Survey data / FGD
		Proportion of households where only women do water fetching	Number of households where women only do water fetching and total number of surveyed households	Survey data / FGD
		Proportion of households where only women do water treatment for drinking	Number of households where women only do water treatment for drinking and total number of surveyed households	Survey data / FGD
		Proportion of households where only women do managing solid waste	Number of households where women only do managing solid waste and total number of surveyed households	Survey data / FGD
		Proportion of households where only women do caring of children	Number of households where women only do caring of children and total number of surveyed households	Survey data / FGD
		Proportion of households where only women do purchasing of daily household goods	Number of households where women only do purchasing of daily household goods and total number of households surveyed.	Survey data / FGD
	Role of women in household decision making	Proportion of households where women can make decision in daily cooking	Number of households where women can make decision in daily cooking and total number of surveyed households	Survey data / FGD
		Proportion of households where women can make decision in children's education	Number of households where women can make decision in children's education and total number of surveyed households	Survey data / FGD

Issue	Key Information	Key Indicators	Data required	Data collection method
		Proportion of households where women can make decision in daily household purchasing	Number of households where women can make decision in daily household purchasing and total number of surveyed households	Survey data / FGD
		Proportion of households where women can make decision in large scale household purchasing	Number of households where women can make decision in large scale household purchasing and total number of surveyed households	Survey data / FGD
		Proportion of households where women can make decision in participating in various local activities	Number of households where women can make decision in participating in local activities and the total number of surveyed households	Survey data / FGD
		Proportion of households where women can make decision about family health care	Number of households where women can make decision about family health care and total number of surveyed households.	Survey data / FGD
	Behaviour towards women during monthly cycle	Types of treatment to women during monthly menstruation cycle	Types of treatment to women during monthly menstruation cycle in the settlement if exists	FGD
	Domestic voilence	Violence against women	Types of violence against women in the settlement if exists	FGD
Gender inclusion in development program	Participation in local committee	Proportion of user's committee, CBOs, local NGO, Clubs with female member	Number of user's committee, CBOs, local NGO, Clubs with female member	FGD
	Capacity building	Women's participation in local training (skill development, environment and sanitation, etc)	Number and type of local training with number of male and female participants	FGD
	Water and sanitation (WATSAN)	Proportion of women involved in planning and designing WATSAN program	Number of female members involved in planning and designing WATSAN program	FGD
		Proportion of women in operation, maintenance and rehabilitation of water and sanitation system in the city	Number of women in operation, maintenance and rehabilitation of water and sanitation system in the city	FGD

Issue	Key Information	Key Indicators	Data required	Data collection method
	Financial systems	Arrangement for inclusion of women representation in tariff setting committee	Existing structure of tariff setting committee	FGD
		Median willingness to pay of women for improved WATSAN services	Willingness to pay by female respondent for improved WATSAN services	FGD
Policy Frameworks	Gender inclusion in city/national level policy, action plan and legislative frameworks in city/national level	Inclusion of women in policy, plans and legislative framework	City/national level policies, action plans, legislative frameworks and number of position allocated for women representatives	Policy, plan and legislative frameworks of government
	Gender inclusion in central and local level politics	Proportion of seats held by women in parliament	Number of seats allocated for women and total number of seats in parliament	Policy, plan and legislative frameworks of government
		Proportion of seats in local government committee	Number of seats allocated for women and total number of seats in local government committee	Policy, plan and legislative frameworks of government
Institutional arrangements	Institutional arrangements in city to develop, provide and maintain WATSAN services	Arrangement of gender unit in organizational structure of WATSAN service provider	Name of service providers and name of units to deal with women's issue regarding WATSAN	Organizational structure of water supply authority in the city

4 Methodology for Initial Environmental Examination

In recognition to the significance of environmental considerations in project design and its implementation, Environmental Assessment (EA) is incorporated in many development activities from the beginning. A well designed EA enhances project planning because it enables project managers to anticipate and avoid environmental problems which could cause delays to the project or severely offset any intended project benefits.

UN-HABITAT activities geared towards poverty reduction, improving the human living condition and bringing social justice in societies are expected to bring positive impacts to the environment. Water supply and sanitation projects; in most of the cases, are the mitigation measures proposed for environmental improvement. Therefore, impacts of such projects are expected to be positive in general.

Nevertheless, it is always wise to examine possible environmental impacts that the project can cause from the project design stage. Initial Environmental Examination (IEE) is proposed in such projects. IEE is the first review of foreseeable effects on the environment of a proposed action. It provides brief synopsis of factual basis for a threshold decision like whether significant adverse impacts are expected or whether an EA is required. IEE also identifies mitigation and monitoring actions required.

Environmental screening is considered at as early as the feasibility study level of the project. Such screening ensures

- Level of environmental assessment that suits the nature and scale of the project;
- Gaps in a potential project are identified or environmental opportunities are highlighted; and
- Process is in accordance with national legislations and other environmental requirements.

UN-HABITAT has proposed that small to medium scale projects of water, sanitation and infrastructure (including rural and urban water supply and sanitation) would most likely fall under IEE category, which however requires professional judgement[1]. In the case of participatory water and sanitation projects, local community is involved from the feasibility stage. Therefore, there is less risk of overlooking the social, cultural and natural environment. Furthermore, most of the water and sanitation projects are intended to improve the environmental quality of the area. The major environmental concern in such projects may be social inclusion, gender sensitivity, equitable distribution of the resources and management of waste water and its safe discharge in the natural environment. The possible environmental issues to be taken into consideration for IEE is provided in the form of checklist in Table 3.

[1] Guidelines for Environmental Assessments for UN-HABITAT Activities, UN-HABITAT, Nairobi, 2004.

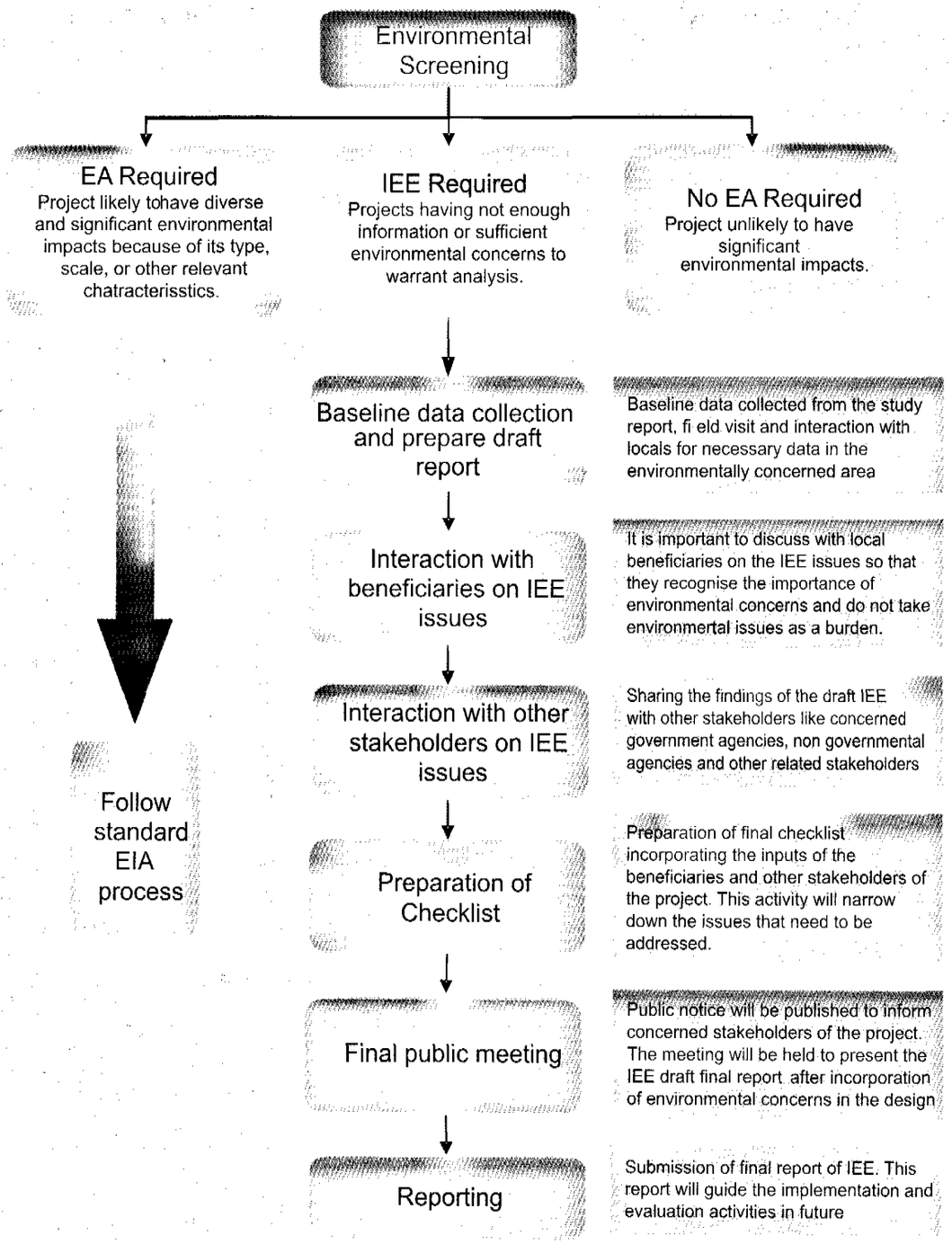


Figure 11 Steps followed in IEE process

Recognising the importance of environmental assessment, many governments and development agencies including UN-HABITAT have proposed several tool kits and assessment models. With the same objectives, these models differ from place to place as the context and scope of the development interventions differ. In the case of water and sanitation projects the final IEE report may be presented with table of contents as proposed below.

Final Report on Initial Environmental Examination
Table of Contents

Table 4: **Checklist for initial environmental examination of small and medium scale community based water and sanitation projects**

	Environmental Issues	Description of possible environmental impacts	Evaluation							Observation in the context of proposed activities	Mitigation measures
			Yes			No			Unclear		
			Strong	Moderate	Weak	strong	Moderate	Weak			
	Water Supply										
A	Social Environment										
1	Social life	Involuntary resettlement									
		Disparity in water distribution									
		Social exclusion within community									
		Occurrence of conflicts among communities									
		Loss of existing jobs									
		Affects existing water use downstream									
		Hardship to women and children in general									
		Gender insensitive design of water spouts									
		Water rights conflict									
		Despute in location of intake structure									
		Ownership status of water intake and treatment area									
		Community unaware of the negative effects of untreated or semi-treated water supplied									

	Environmental Issues	Description of possible environmental impacts	Evaluation							Observation in the context of proposed activities	Mitigation measures
			Yes			No					
			Strong	Moderate	Weak	strong	Moderate	Weak	Unclear		
		Design and construction works done in isolation with the community									
		Water supply structures occupy playground of children, rest place of elderly or festivity space of the public									
		Import of human resource for the construction of the project									
		Poor communities are deprived of water supply facilities									
2	Cultural heritage	Encroachment of heritage or cultural activity areas for intake and treatment structures									
		Encroachment of openspaces									
		Digging of existing brick and stone paved walkways									
		Impacts on historical sites and cultural heritage									
B	Natural Environment										
3	Source water	Over exploitation of water from stream/river									
		Negative effects to aquatic life, indigenous flora and fauna of the stream									

	Environmental Issues	Description of possible environmental impacts	Evaluation							Observation in the context of proposed activities	Mitigation measures
			Yes			No			Unclear		
			Strong	Moderate	Weak	strong	Moderate	Weak			
		Destruction of wetlands and habitat of wild animals									
		Change in the slope of water course of the stream									
		The intake structure will deviate, deroute or disturb the natural flow of the stream									
		Effect on intake water quality due to point sources of pollution like industries, or raw sewage from upstream settlements									
		Effect on intake water quality due to none point sources of pollution up stream									
		Destruction of forest, natural resources for the construction of intake and other structures									
		Adversely affects the down stream use									
		Disaster triggered downstream due to failure of the intake structure									
		In case of ground water sources draw down of water table in surrounding wells, ponds and springs									
4	Topography and soil	Land subsidence									
		Deterioration of soil quality									

	Environmental Issues	Description of possible environmental impacts	Evaluation							Observation in the context of proposed activities	Mitigation measures
			Yes			No					
			Strong	Moderate	Weak	strong	Moderate	Weak	Unclear		
		Unsafe disposal of chemical wastes and sludge from water treatment system									
5	Hydrological condition and natural water quality	Pollution of water bodies with the waste water produced from the community									
		New construction damage traditional water distribution system									
6	Ambient air	Generation of air pollution and dust									
	Sanitation										
1	Social life	Disparity in sanitation facility distribution									
		Toilet design insensitive to women, children, elderly, and culturally unacceptable design									
		Gender imbalance in sanitation management									
		Social exclusion in sanitation practices									
		Absence of precautionary measures from occupational health hazards to waste management workers									

	Environmental Issues	Description of possible environmental impacts	Evaluation							Observation in the context of proposed activities	Mitigation measures
			Yes			No					
			Strong	Moderate	Weak	strong	Moderate	Weak	Unclear		
	Cultural heritage	Drainage and sewer lines deteriorating heritage sites									
	Natural environment	Negative impact to ground water, surface water bodies, and local environment by flow or accumulation of night soil									
		No or incomplete treatment of waste water i.e. grey water and night soil									
		Destruction of forest and other resources to construct toilets and other infrastructures									
		Discharging night soil in storm water drainage									
		Poor management of sanitation facilities both at household level and community level									
		Disposal of solid waste in open spaces									

5 Testing of Methodologies in Low Income Settlement

5.1 Tigni as Selected Piloting Area

Madhyapur Thimi Municipality is one of the few cities identified by UN-HABITAT in Kathmandu Valley for water and sanitation improvement under Water for Asian Cities programme. In this newly established municipality, Tigni is the least developed settlement which is left out from the development initiatives from the previous time. The municipal profile prepared by the municipality and study reports of other NGOs has also identified Tigni as one of the poorest settlement of Madhyapur Thimi Municipality which needs immediate attention. Recognizing the need to improve the livelihood of Tigni people, Centre for Integrated Urban Development (CIUD), a partner organization of UN-HABITAT has been working in Tigni settlement for past few months. Along with Water Aid Nepal, CIUD is initiating water and sanitation improvement activities with the participation of local community and the municipality. Tigni has been selected as a low-income settlement to test and implement the methodologies developed for mapping the poor, rapid gender assessment and IEE. Volume II, III, IV and V of the study report elaborates in detail.

5.2 Identification of Low-Income Settlement

Whole-to-part approach was adopted to identify the poor households to address their needs. In the case of Tigni, a recent study done by *NGO Forum for Urban Water and Sanitation* and *Water Aid Nepal* was employed. The Study called *"Study on Stand post and Water Accessibility of Slums and Squatters of Kathmandu Valley"* was instrumental in identifying urban poor clusters in Kathmandu valley. Using several indicators related to economic condition, social disparity and environmental situation, the study designated and mapped urban poor settlements. Among the few dozens of clusters of urban poor settlements identified in this map based study, Tigni in Madhyapur Thimi Municipality was chosen as test case. Other available secondary information was also utilised to cross check before taking Tigni as a pilot area.

Within Tigni, the majority of housholds were found poor. Maps and their attribute information in different volumes of the study elaborate more about their situation. Moreover, the study also demonstrate how GIS based mapping is significant in addressing the true and needy poor, which otherwise are being left behind in the development process until today.

5.3. Introduction to Tigni

Madhyapur Thimi Municipality has 17 wards and consists of 6,053 houses. Tigni lies in Ward No. 3 of this municipality. It is about 11 km east of Kathmandu, the capital of Nepal (see Figure 12). Review of past studies and reports show that Tigni consists of 146 households with 809 inhabitants. Tigni is the Newar[1] settlement well-known for the production of very good quality "Beaten Rice" called *Tigni Baji*[2]. The dominant caste of this village is *Rajbahak*[3]. In the pace of urbanization the hand made beaten rice lost its market in competition to its mechanized production. The poor community could not afford the mechanized rice mills. Thus in the search of alternative jobs they have shifted to many secondary jobs besides their limited farming. Preparing dry fried gram,

[1] Newars are the predominant caste resided in the Kathmandu valley. The Newars are famous and known for their rich cultural heritage in Nepal.

[2] Chiura is a regular diet in Newar's food habit and consumed extensively specially during the Newari festivals.

[3] Rajbhaks are considered one of the deprived caste in Newar community who were responsible for transporting people in earlier times.

peas, beans, etc. is one of the occupations they have shifted to. Some grow vegetables and others go for various types of works, dominantly as laborers. More than 90% of the families own less small parcels of agricultural land which is very insufficient to uphold a family. With the increase in population these small parcels are also fragmenting with every generation. In recent years, their limited agricultural land is converted to other urban purposes further expelling them from their livelihood.

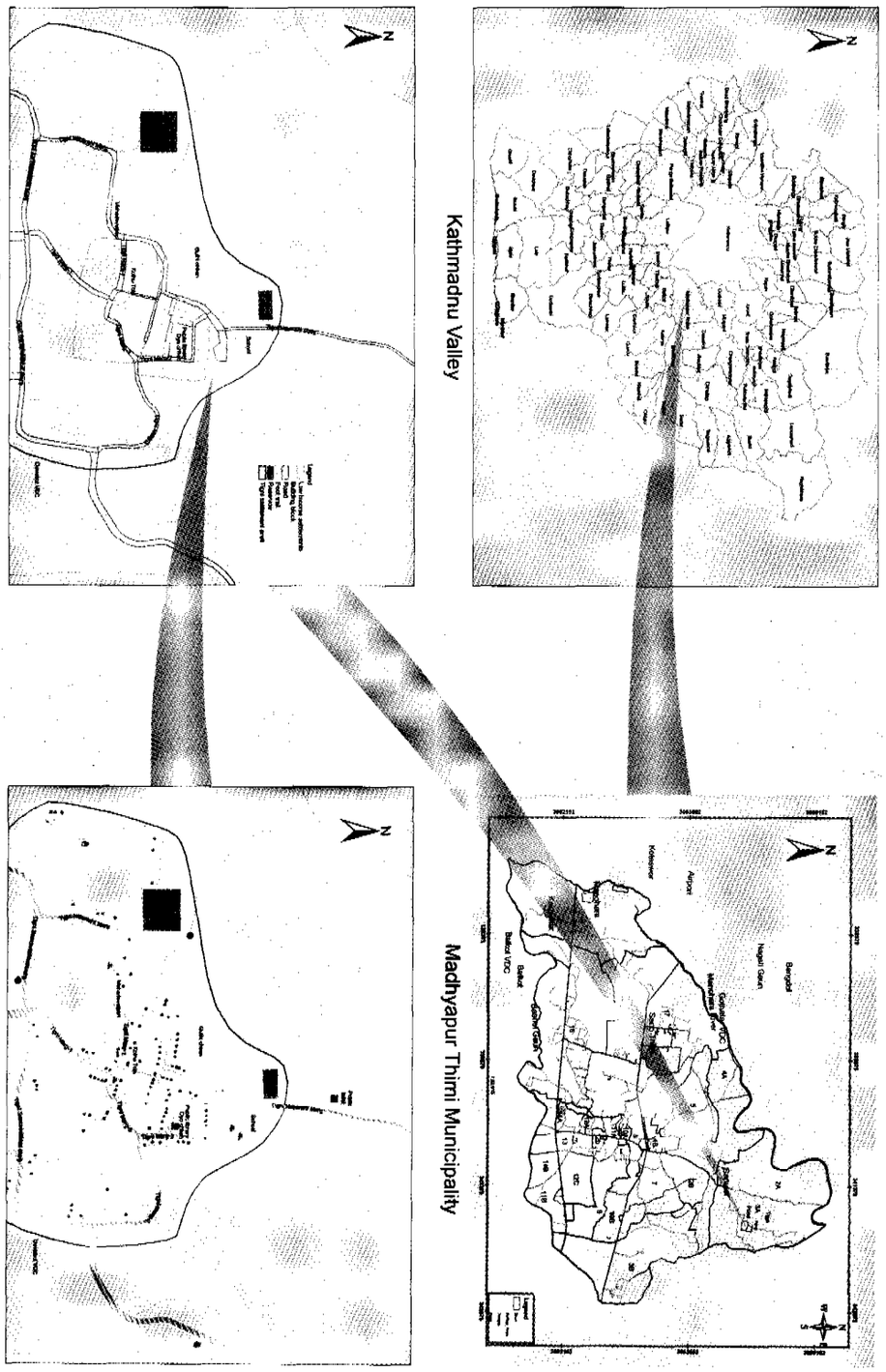


Figure 12

The water and sanitation situation of the settlement is very poor. One of the largest drinking water reservoirs of Kathmandu Valley lies in this settlement, however, the supply of Nepal Water Supply Corporation (NWSC) water to the settlement is very limited and not reliable. NWSC is providing only 1-2 hours of supply of water in a day. There are very few private water taps. The settlement is served by one traditional well, three spring water sources called *Kuwa*, and one stone spout besides five stand posts. However, the past studies show that quality of drinking water and the hardship to the women in collecting water are major difficulties Tigni people are facing. In the case of sanitation, poor sanitation practices like open defecation, water source pollution, poor solid waste management practices, waste water management problem are very common besides poor personal hygiene practices. Majority of the houses do not have toilet facilities. Most of the houses are of temporary nature made of sun-burnt bricks with inadequate light and ventilation. Smoky environment in the kitchen due to fire wood burning is deteriorating the health of women and children.

There is only one government school in Tigni serving up to the primary level of education. School drop out rate is very high and people in Tigni rarely complete School Leaving Certificate (10th Grade). Women are obviously the disadvantaged group among them. There is not even a single health centre to provide even the first aid services. The existing socio-economic, environment and sanitation situation are explained in details in Volume II and Volume III; and presented in maps in Volume IV. The maps demonstrate the existing situation of Tigni, improvement plans and the expected situation after implementation of the plans with respect to socio-economic, gender, and water and environmental sanitation condition of the settlement. Some of these maps with brief explanation are presented in the following pages.

Environment and Sanitation Situation of Tigni

This map provides the overall scenario of the existing environment and sanitation situation with photographs of particular locations of Tigni.

Households by Level of Poverty

This map classifies each primary household into one of three levels of poverty defined on the basis of living standard such as extremely poor, very poor, and least poor. Further, the poverty level of men-headed and women-headed household is also shown in the map. The level of poverty is differentiated by color and gender of head of primary household is indicated by shape (e.g., red circle denotes the extremely poor men-headed household and green square denotes the least poor women-headed household). It addresses economic condition of households in Tigni by general households as well as the gender of household head in the settlement.

Sanitation Situation

The main purpose of this map is to address environmental and sanitation issue of Tigni. It shows the existing sanitation situation of the settlement. The households with and without toilet are distinguished by different colors and symbols, e.g., the red circle indicates the households without toilet and triangle indicates the households with toilets. Further, the type of toilet in the household with toilet is shown by different colors of triangle. The open defecation area along the roadside and in forest area is also shown in the map.

Major Sources of Drinking Water

This map shows the major sources of drinking water of households in Tigni. Five types of sources - NWSC, spring, stone spout, tube well and well are shown in different colors in the map according

to the type of the source used for drinking purpose. The map also shows the type of water sources available in the settlement for different purposes (e.g. stand post for drinking, spring for drinking, spring for bathing & washing, stone spout for ritual and well for animal). The purpose of this map is to address the drinking water issue in the settlement.

Quality of Drinking Water at Source and its Influenced Households

Main objective of this map is to address the water quality issue of drinking water in Tigni. This map shows quality of water at sources which is tested in laboratory and the household using water from these sources for drinking purpose. These households are influenced by the quality of water of those sources. The source 1 (i.e., spring) is contaminated by nitrate and microbial coliform and the households drinking water from this source are denoted by red color. The water from sources 4, 6, 7, and 9 (i.e, stand posts) contain excessive chlorine at the time of test and the households drinking water from these stand posts are labeled by blue color. Since all tested standposts have high chlorine concentration, the households which are using private NWSC water tap are also highly vulnerable to high chlorine. Therefore, houses which have private connection and drinking water from same tap are also labeled by blue color. Other sources are not tested and households using water from these sources for drinking purpose are labeled by yellow color.

Criteria of Selecting Households for Toilet

This map reveals the distance between public toilet to each house without toilet, poverty level of primary household and the number of female members residing in the house. These information can be used to prioritize households for selection for toilet construction. The distance is labeled by large circle with different color for different classes of distance. The poverty level is labeled by small circle with three colors for three levels. The number of female members in the house is also classified into three groups with different color. With this criteria, the household denoted by large red circle with the small red circle and red square will be given first priority for toilet construction.

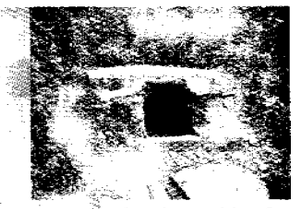
Municipal Infrastructure after Improvement

This map shows the municipal services for public use such as public toilet, school, public library, Guthi chhen, Dyo chhen, telephone cabinet, telephone post, electric post, roads by their type, public water sources, water supply pipe network and all residential and non-residential houses in Tigni after implementation of proposed water supply and road improvement plan.

Poorly managed spring

Public toilet away from settlement

Stand post serving the poor



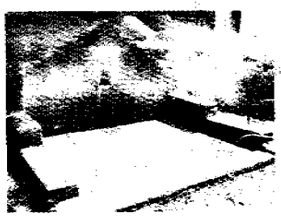
atural spring waiting for renovation

Streetscape of a lane

The earthen road broken by heavy vehicle movement

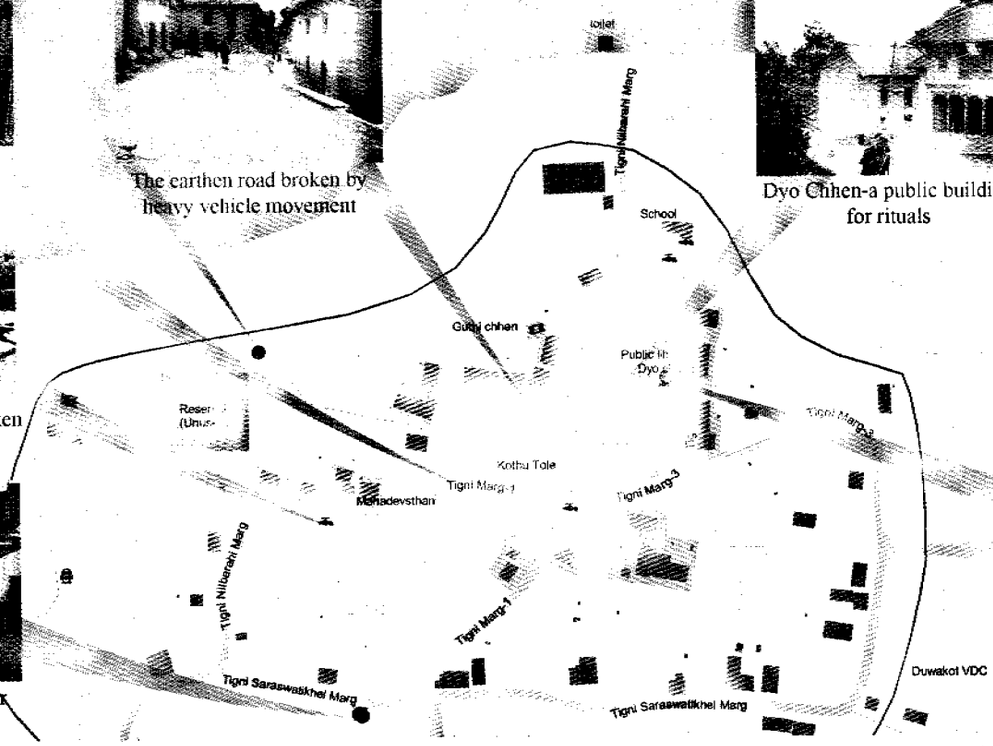
Dyo Chhen-a public building for rituals

Old stone spout used for rituals



Existing stand post with broken tap

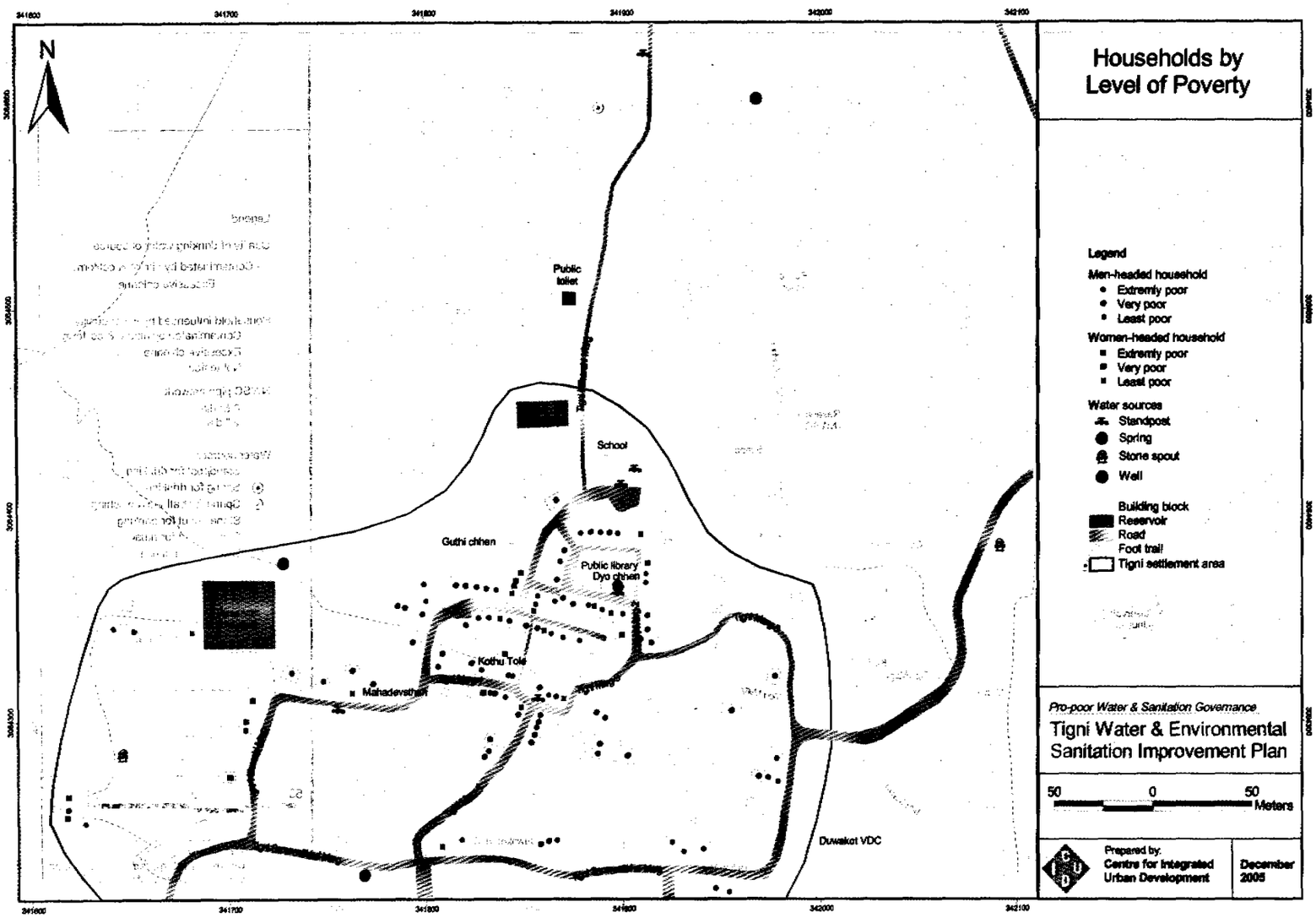
Natural spring water used for drinking purpose



Public well & stand post mainly used for laundry and cattle feeding

Image of "Environment and sanitation situation of Tigni"

Image of "Household by level of poverty"



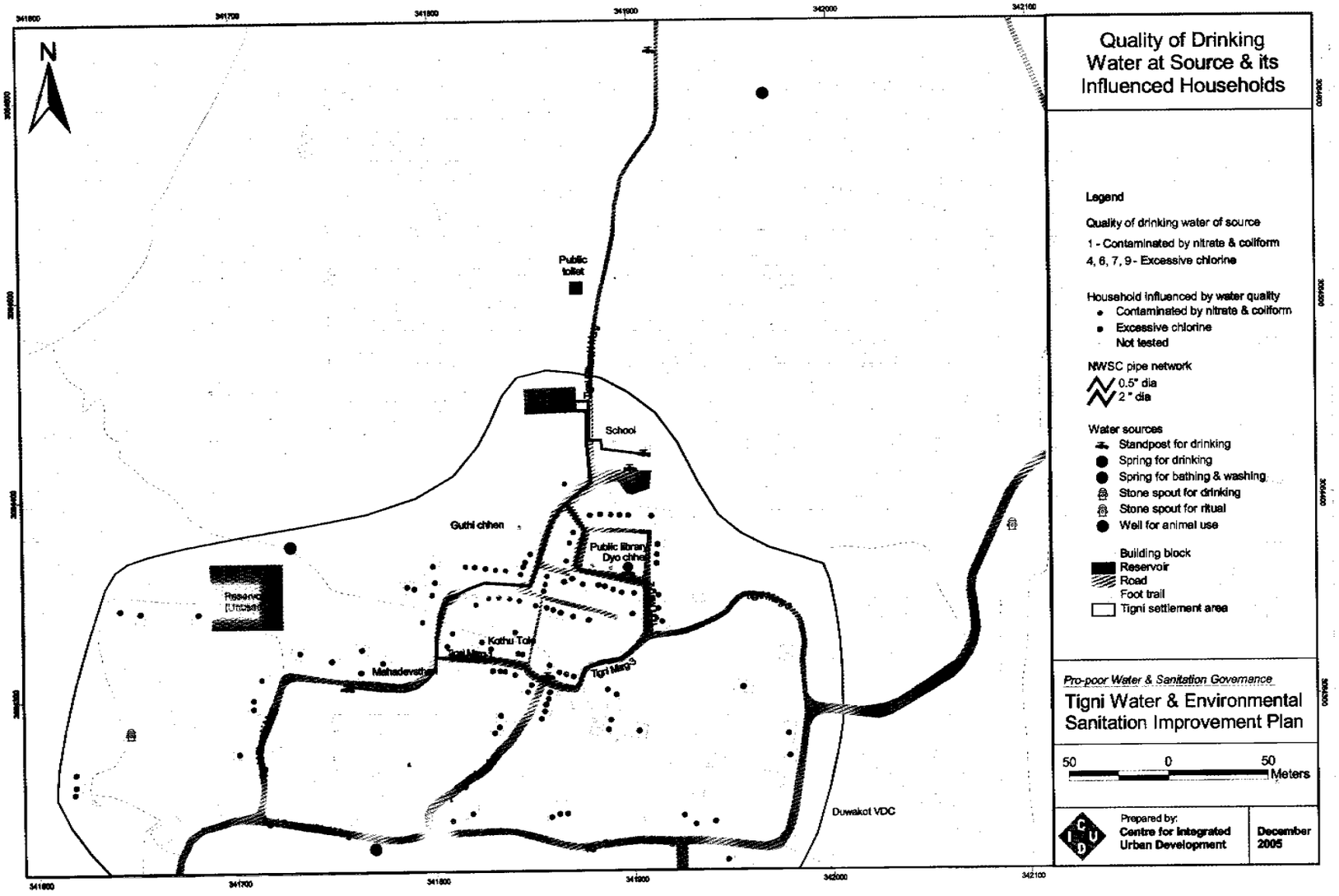
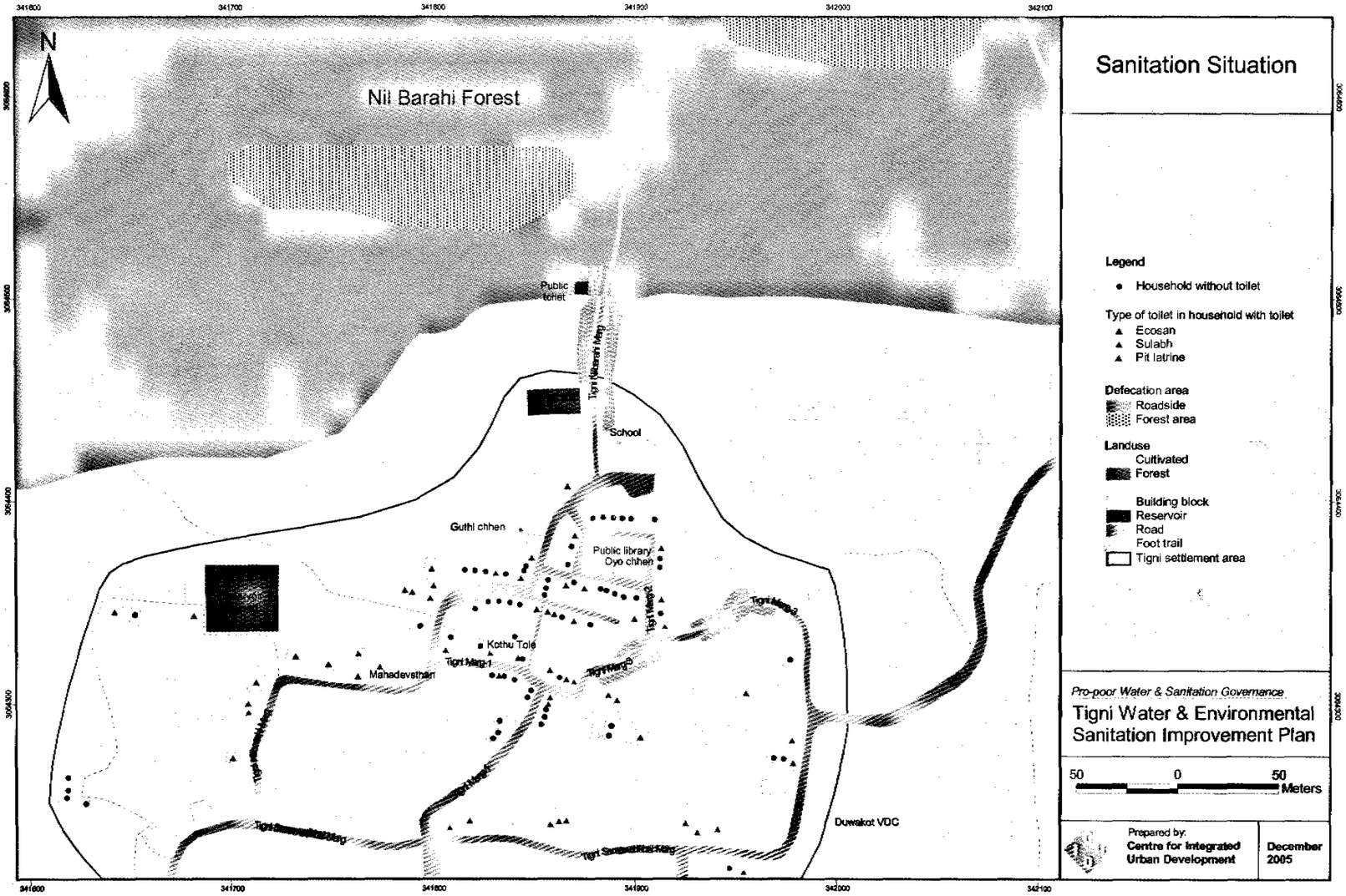


Image of "Quality of drinking water at source and its influenced households"

Image of "Sanitation situation"



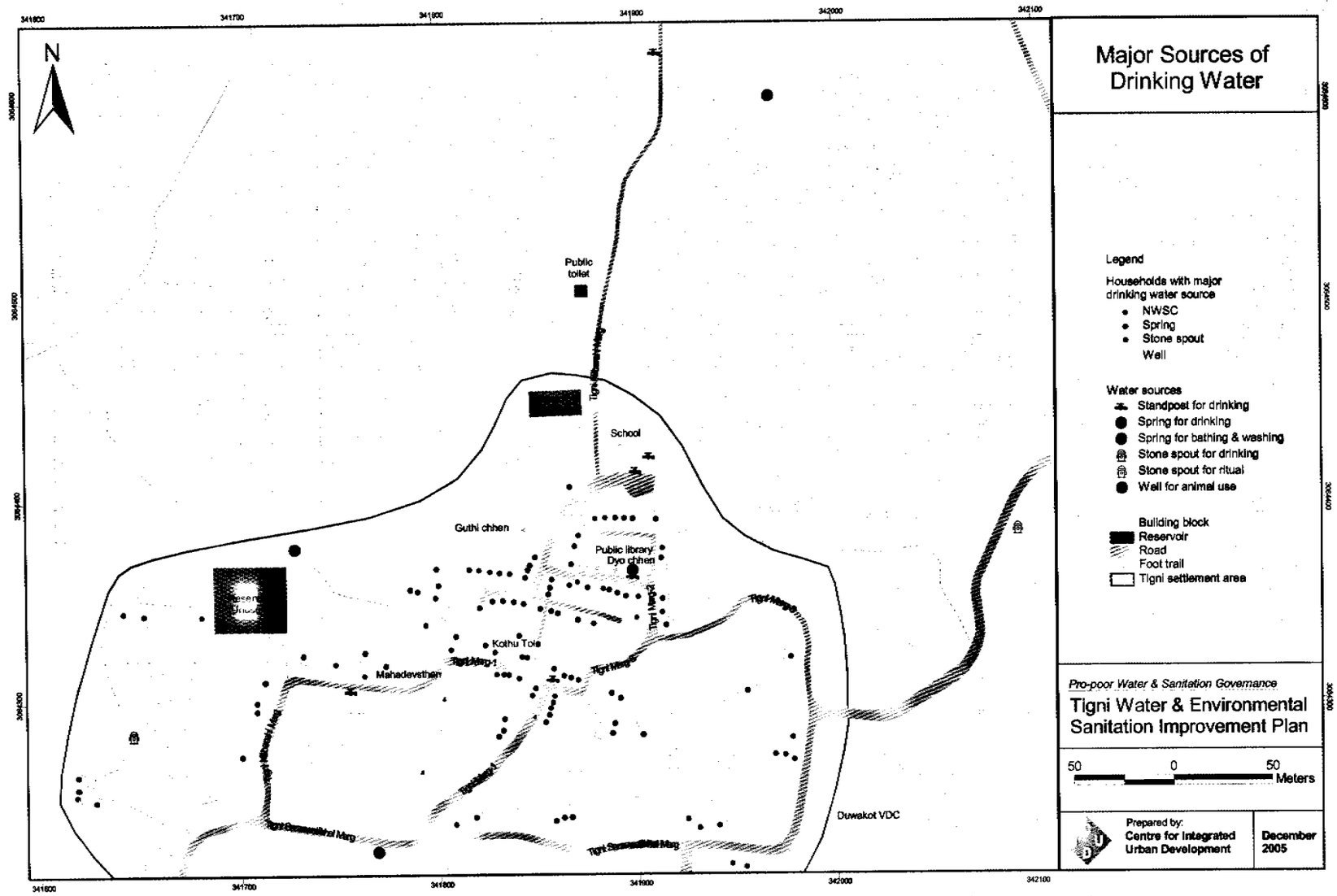
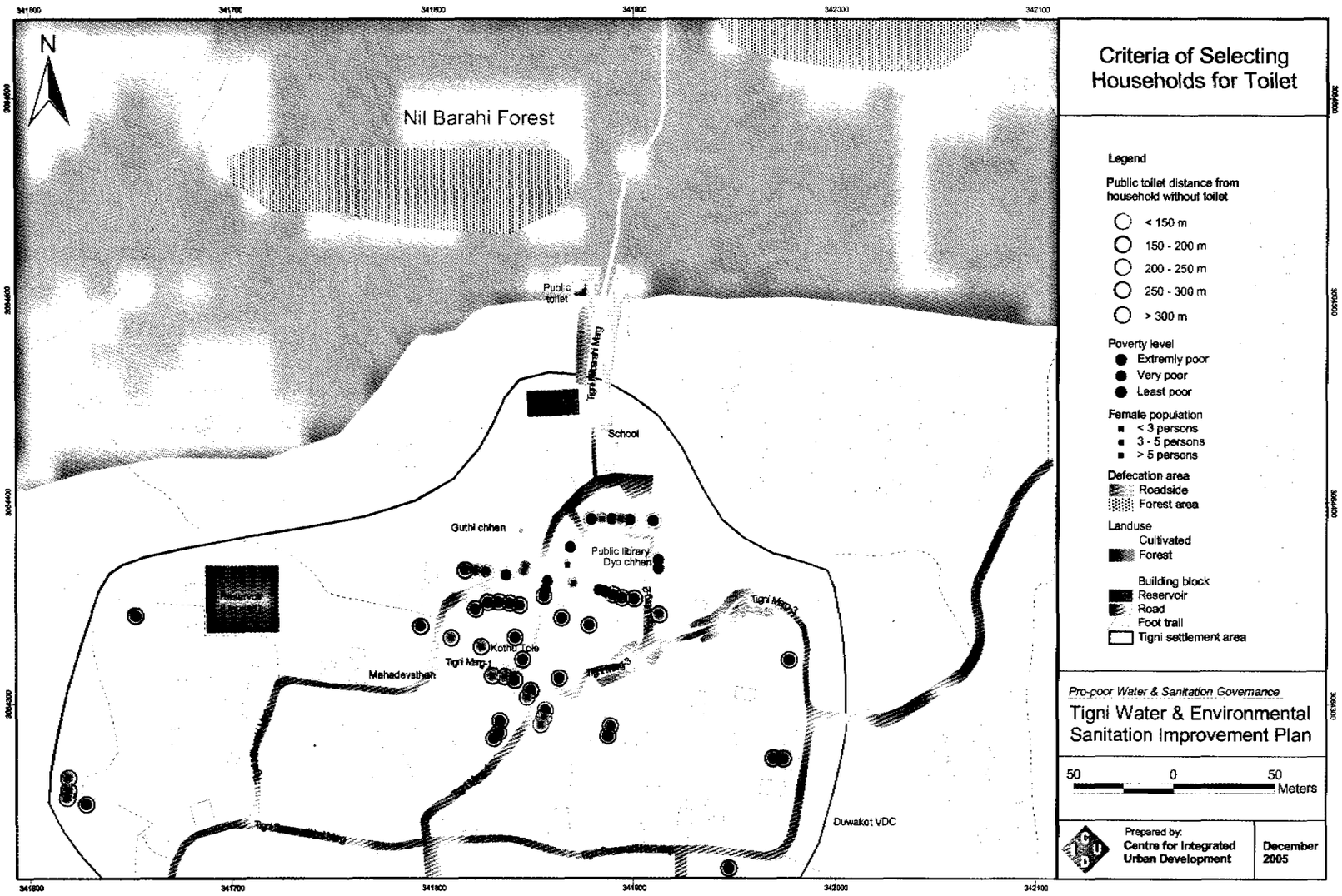


Image of "Major sources of drinking water"

Image of "Criteria of selecting households for toilet"



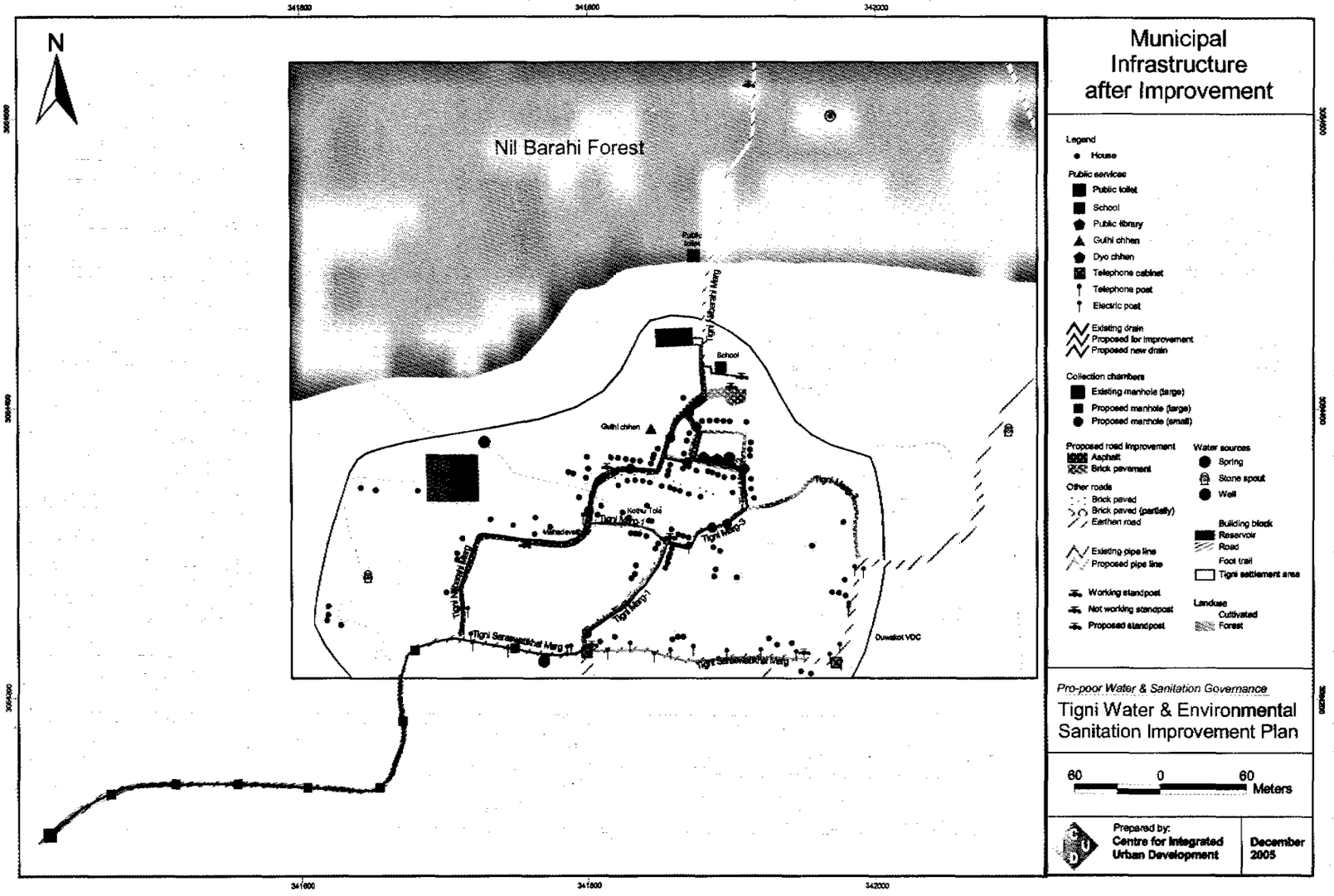


Image of "Municipal infrastructure after improvement"