

IUCN Pakistan Programme

**Northern Areas Strategy for
Sustainable Development**

Background Paper

Urban Environment

Haider Raza



Planning & Development Dept.,
Northern Areas

IUCN
The World Conservation Union



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Planning & Development Dept.,
Northern Areas

IUCN
The World Conservation Union



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LIST OF ACRONYMS

AKRSP	Aga Khan Rural Support Programme
AKDN	Aga Khan Development Network
AKCSP	Aga Khan Cultural Services, Pakistan
AKHS	Aga Khan Health Services
AKPBS	Aga Khan Planning and Building Services
BACIP	Building and Construction Improvement Programme
GoP	Government of Pakistan
IG	Interest Group
LB&RDD	Local Bodies and Rural Development Department
P&DD	Planning and Development Department
NAPWD	Northern Areas Public Works Department
NACS	Northern Areas Conservation Strategy
NA	Northern Areas
NAA	Northern Areas Administration
NGO	Non-Government Organisation
WASEP	Water and Sanitation Extension Programme
WSHHSP	Water Sanitation Hygiene and Health Studies Project



FOREWORD

The Northern Areas have a unique and critical role to play in the sustainable development of Pakistan. Although they span a relatively small geographical area, the Northern Areas serve as a vital catchment for the Indus River, upon which a majority of Pakistan's irrigated agriculture and hydroelectricity depends. The Northern Areas also contain the nation's most important natural forests, extensive mineral reserves, and a wealth of biodiversity. Dramatic scenery, some of the world's highest mountains, and a rich cultural and archaeological heritage make the Northern Areas one of the most visited tourist destinations in the country.

Over the last several decades, however, many of the Northern Areas' natural resources have come under increasing pressure, as a result of a growing human population and the opening of the Karakoram Highway. At the same time, it has become increasingly recognised that the isolated nature of many of the region's communities, coupled with the Northern Areas' high-altitude and fragile environment, poses special constraints and challenges to development. Perhaps more so than in any other part of Pakistan, there is a need in the Northern Areas to ensure that social and environmental considerations are fully integrated into the development process.

In response to these concerns, the Northern Areas Administration began the preparation of a Northern Areas Strategy for Sustainable Development in 1999, with the financial assistance of the Swiss Agency for Development and Cooperation, and the Norwegian Agency for Development Cooperation; technical support has been provided by IUCN–The World Conservation Union. The Strategy addresses a broad range of social, economic and environmental issues, and seeks to provide a comprehensive policy framework for the sustainable development of the region. It responds directly to the provisions and recommendations of the National Conservation Strategy, adopted by the Government of Pakistan in 1992.

In parallel, *The State of the Environment and Development in the Northern Areas* summarises in a single volume the key information gathered during the preparation of the NASSD. It is the first report of its kind to be produced for the Northern Areas, which provides a succinct, up-to-date and readily accessible analysis of the status of the most important environment and development sectors in the Northern Areas, including information on major trends and issues, the responses taken by both government and civil society to date, and strategic options for the future. It also provides a baseline against which future change can be measured and establishes the context and foundations for the Northern Areas Strategy for Sustainable Development.

During early consultations at the tehsil level, and with key governmental and non-governmental organizations 16 areas of intervention were identified as being critical for the NASSD. These include sectors like: water; agriculture; forestry; biodiversity; rangelands and livestock; the private sector; energy; urban

environment; and cultural heritage and sustainable tourism. In addition, some crosscutting themes were identified as crucial to each sector, including population, poverty and environment; communication for sustainable development; environmental education; NGOs; gender, environment and development; environmental health; and governance.

To address the needs of each of these areas, basic information was gathered through consultations and literature reviews. This data was analysed through background papers commissioned on each of the sectors and themes identified. The draft of each paper was shared with the larger community of stakeholders of the NASSD as well as experts in the relevant field of knowledge.

The papers follow a similar format: analysis of the current situation; issues; past and present initiatives in the sectors and thematic areas along with the lessons learnt; stakeholders; and recommended policy and action measures. The authors have also addressed cross-sectoral linkages and environmental concerns for the sake of more integration in planning for sustainable development.

There were constraints to developing these Background Papers and in some cases these hurdles were only partially overcome. These included the fragmented and scattered nature of information, the prevalent culture of not sharing information, contradictory and unreliable data, lack of thinking on cross-sectoral linkages and integrated planning, and lack of expertise in developing linkages with the environment.

Parts of the information of the papers were then incorporated into the State of the Environment and Development (SoED) and the main strategy, i.e., NASSD. However, since the Papers contain a wealth of extremely useful information, a decision was taken to produce a series of NASSD Background Papers.

Considering the need and importance of timely sharing information with the stakeholders, these papers are being produced without extensive editing. The authors have sole responsibility for the views expressed and data presented.

EXECUTIVE SUMMARY

The Northern Areas of Pakistan are facing a number of social, economical, environmental and natural resource management problems, because of its isolation from rest of the country. These problems are increasing steadily with the passage of time due to lack of financial and human resources and more importantly due to lack of any sectoral strategies and interest. Despite the initiatives taken by the NA Administration to address these issues but still there remains a dire need for a strategic framework to prioritise and guide activities, promote cross-sectoral coordination and ensure the incorporation of environmental considerations into the development process.

The NACS-Support Project intends to provide a strategic framework in the form of the Northern Areas Conservation Strategy (NACS) to Northern Areas Administration. In this connection NACS is preparing background papers on various sectors identified and prioritised during the public consultation process of the project. The background papers would contain current status, issues and trends, and recommendations for the specific sector. The process-oriented development of background papers ensures greater participation of stakeholders through extensive consultation.

This paper "Urban Environment" would supply baseline information for state on the environment report as well as would be helpful to formulate strategic guidelines for each sector to incorporate environmental concerns in future development projects. In the first chapter of the report general information regarding geography, demography, scope and environment at global, national and regional level has been discussed. Further more, prevailing socio-economic conditions and status of rural-urban migration in urban settlements of NA is also discussed, due to its paramount role in degradation of environmental conditions.

During Public consultations with IG on urban environment majority of the issues raised were related to basic infrastructure of service utilities, therefore in second chapter of this report an effort is made to provide the current status of service utilities, i.e. drinking water, electricity, sanitation as well as communication that covers roads and transportation. A comparison of demand and supply regarding water and power has also done to judge the nature of severity. In addition to these capacities of current capacity and role of various government departments have also been discussed being a vital counter part of development.

Main issues related to service utilities and institutional strengths have been discussed in third chapter of this report. Major issues come up during public consultations, meeting with relevant stakeholders include lack of financial and human resources (both skilled and unskilled), lack of coordination among various stakeholders in the development sectors vis-à-vis political influences and ambiguous roles and responsibilities that often led to unsatisfactory utility services or other development project. During discussion and observation it was also

noticed that in almost all government institutions the monitoring and evaluation component either does not exist is not properly functioning.

What could be the impacts of environmental degradation have been discussed in fifth chapter of this report. It is obvious that absence of an appropriate sanitation system and unavailability of safe drinking water is associated with health, therefore health problems related to water and sanitation have been discussed, and data at national and regional level have also been presented for future consideration. In addition to his the impact of electricity on economical conditions has also discussed in this chapter.

How could we improve the existing environmental situations? What are the short and long-term remedies to resolve issues in the present capacity? What should be the role of stakeholders already involved directly in urban development? Which are the potential stakeholders that could play a significant role to improve existing urban environment? How we can improve the existing service utility infrastructure technically are main questions that were answered in the last chapter of this report.

Author concludes that there is no coordination in government institutions especially those who are actively involved in development sector. Similarly, it is also not clear that who is responsible for basic service utility. Though NAPWD taking care of all service utilities in urban settlements of NA, but as these are not mentioned in NAPWD business rules therefore they are facing severe financial as well as human resources as they spare funds from B&R budget. Therefore a separate department should be established for water, electricity and sanitation like other areas of Pakistan.

1. INTRODUCTION

The Northern Areas Conservation Strategy (NACS) support project of IUCNP, is an initiative of Northern Areas Administration. Planning and Development Department (P&DD) is the counter part agency in NACS formulation with IUCN with the financial assistance of SDC and NORAD. IUCN established NACS support project to work on the formulation NACS. Project started working with the patronage of relevant government and non-government agencies and public and private sectors keeping in view their dynamic involvement in the NACS formulation process.

The project aims to formulate an acceptable and practical strategy for sustainable development in Northern Areas (NA) of Pakistan. In this connection during first two years NACS team conducted public consultation meetings in all districts and tehsils of NA for identification of prevailing issues at grass root level. More than fifteen issues identified by various communities during these PC meetings. Based on the findings of PC meetings, NACS is developing technical, strategic and sartorial guideline papers to address issues identified by general public during Public Consultations (PCs), in a practical manner for each sector to ensure sustainable and environmental friendly development projects in future.

This technical paper on urban environment is one of the series of technical papers, produced by NACS Support Project. This paper highlights existing environmental situation in urban settlements, main issues, their causes, status of service utilities, level of service and constraints, role of different stakeholders including public and short and long term recommendations to address the urban environmental issues.

1.1. Objectives

The objectives to this background paper are as under;

- m To learn current urban environmental issues
- m To identify core area of intervention for improvement on priority basis
- m To provide base-line information for state-of the environment report
- m To identify gaps in the role of stakeholders responsible for urban development
- m To recommend practical short and long term strategies for urban environmental issues keeping in view future expansion

1.2. Methodology

Information and data required for this report was collected by various stakeholders responsible for urban development i.e. NAPWD, P&DD, MCs, and general public by personal and as well as group discussions. Similarly, issues related to urban environment were identified through public consultations in a combined forum of public, relevant stakeholders and other non-government organizations involved in different type of development projects in the area. In addition to this data from

various studies conducted by different institutions (AKDN and others), and individuals on urban environment were also consulted to judge current practices and pit falls in the present systems regarding urban development sector. To the maximum possible extent the data sources were verified for reliability.

1.3. Scope

The baseline information provided in this report would be incorporated in NACS document, sectoral guidelines and state of the environment report one of the major expected outputs of the NACS support project. In addition to this the paper would be useful for various stakeholders working in urban development to find out their potential role in urban development. Similarly researchers, students and sector professionals could also use report for baseline information, current issues and possible solutions. Similarly the issues, current practices, short and long term solutions would provide guidelines for strategic planners and development workers to develop sustainable and environment friendly projects in future. In addition to this the report could be used as a sensitisation tools for various government and non-government agencies to incorporate environment as an integral part of future development projects to achieve sound, practical and environmentally sustainable projects.

1.4. The Environment

The environment in its broader sense covers all natural, physical, chemical and human resources. The human environment is usually defined by ecologists as the conditions and processes affecting the life and the development of human beings. The environment is affected in several different ways – beneficial and harmful, desirable and unwanted – by the development process in low-income countries and many of these effects have important health implications. Environmental deterioration, for example, occurs in economically more developed as well as less developed countries, but its character and its effects—at least in the short-and medium-term – are more serious in poor countries for essentially two reasons. First, it rapidly becomes a serious life threat to the most vulnerable groups and individuals and, second, resources for corrective actions are much more scarce in very poor countries. Hundreds of millions of people globally live in poor health conditions and in extreme poverty in an unhealthy environment, and the number is increasing. Most of them live in countries in Africa, Asia and Latin America characterized by very low average per capita income, low educational level, chronic and seasonal malnutrition, high levels of morbidity and mortality in all age groups and particularly in children, and low agricultural productivity. The quality of the environment is of fundamental importance for these people and the future development of their health situation.

To address these issues the world commission on environment and development was established by the 1983 UN General Assembly to formulate "a global agenda for change" towards sustainable long-term environmental strategies. In its 1987" Tokyo Declaration" it emphasized 1. the need for revived economic growth while protecting and enhancing the environmental resource base; 2. a growth which is sustainable, equitable and socially just; 3. conservation and enhancement of environmental resources such as clean water, air, forests, sanitation and soils e.g. by

reducing per capita consumption of natural resources; 4. ensuring a sustainable level of population, e.g. by reforming policies on education, health care and expanding the livelihood of the poor; 5. reorientation of technology and improved management of its risks; 6. integration environmental concerns and economics in decision-making; 7. reforming international economic relations to support sustainable growth; and 8. strengthening international cooperation. If implemented, this agenda would clearly have a positive effect on health. But will the necessary political consensus be established? And will the resources necessary for sustainable development available? These two questions have a significant role in addressing the environmental issues in Northern Areas of Pakistan.

According to 1998 censuses around 5 district headquarters were declared as urban settlements in NA based on population size. Overall environmental situation of these urban settlements is becoming worst with the passage of time due to rapid population growth, changing in life style, influx of rural population towards big towns and cities due to provision of better job opportunities, main centre for trading (national and international level), administrative head offices, and provision of better health facilities are the vital factors migration of rural population towards towns and cities. In addition to this every year national and international visitors visit northern Pakistan for recreational and business purposes. All these factors ultimately effects urban environment of big towns and main centres of the NA. Various departments are trying their best to manage this situation, but due to resource constraints (human and financial), it become very difficult to tapered off environmental degradations process not only in big towns but in rural areas as well. In my opinion lack of awareness on environmental issues and ignorance of on the job-role and responsibilities in development workers are the key contributing factors in deteriorating the environment as a whole. In Northern Areas, of Pakistan it is difficult to categorize urban areas, however in big towns like Gilgit, Skardu, Chilas, Ghahkuch and to some extent Khaplu, that are growing and very soon will become big urban areas, some environmental issues already exists that needs to be addressed right now. The main areas where some practical and realistic initiative must start now are the provision of safe drinking water and its continuity, safe disposal of all kinds of waste, provision of healthy environment in public places and development of places for recreational activities. It is worth mentioning that in NA more than 50% mortality rate in children of <5 years of age is due to inadequate water and sanitation facilities. This figure might be increased if all cases had been reported properly. According to 1999 data available at DHQ Hospital more than 60% of diseases reported were water and sanitation related infections. How can we address this alarming figure? who is working in different sectors of development? Are they considering the environmental issues properly? If not then what are the major constraints. These issues will be discussed in detail in next chapters of this report.

1.5. Geographical Setting

Northern Areas, is a parcel of land of approximately 72,500 square kilometres (War drop-Acres, 1989) in northern Pakistan (see Map 1). Since 1947, it has been among the disputed territories between Pakistan and India, as a result of being joined with the newly formed Pakistan. Due to its undefined status, it has a unique political and administrative system when compared to other regions of Pakistan and not

included in any of the four provinces of the country, however administratively it is control by the Federal Government. The Northern Areas is comprised of five districts: Gilgit, Skardu, Diamir, Ghizar and Ghanche.

The Northern Areas connect Pakistan with China's Xin Jiang province in the north. India's occupied Kashmir in the East, and Afghanistan's Wakhan Corridor in the northwest. The bulk of the area in the region is occupied by a series of three mountain ranges, Himalayas, Karakoram, and Hindu Kush. Most elevations in the region are minimum 1,500m above sea level with more than half the area above the 4,500m level (World Bank, 1987). The region contains many of the highest peaks in the world including K-2, Nanga Parbat, and Rakaposhi.

Esson et al.(1988) classifies the northern parts of Pakistan as warm temperature climate areas with average monthly temperatures varying between 0 and 30. In fact, large variations of temperature and precipitation are observed over relatively short distances due to rapid elevation changes in the region. Within the habitat areas, temperatures can range between 40 during summer and -20 during winter (Blais, 1991). Precipitation below an elevation of 3000 m rarely exceeds 200mm annually but there is a strong gradient with altitude, at 6000m the equivalent of 2000mm precipitation a year falls as snow (World Bank, 1987). The climate is hot in summer and cold in winter, with temperatures below freezing at higher elevations. In general, precipitation is limited, with most coming as snowfall in the winter.

1.6. Socio-Economic Conditions of Northern Pakistan

The local languages of northern Pakistan are Shina, Balti, Khowar, and Broshiski. Shina language is dominant in Gilgit, Ghizar and Diamir Districts. The language of the people living in Chitral region is Khawar. Whilst in some parts near china border Broshiski and Wakhai are the common languages. It is worth mentioning that Wakhai is also the local language of the people living across the border with China and Afghanistan. More than 97% of the population is Muslims belonging to Shia, Suni, Ismaili and other sects.

Socio-economical evolution started in late 1970s after the construction of Karakoram highway, which connects Northern Areas to rest of the Pakistan as well as with China and now the south east Asia. Since 1974, due to the revolutionary reforms in the political systems of the region these towns became centres of new employment, business, education and as well as improved communication. New facilities and rapid development resulted in migration of a large number of people towards these towns from different rural areas of the regions as well as other parts of the country. Like many other towns in the South Asian countries, these exhibit mixed rural and semi-urban features. The bazaar areas are usually congested with shops and adjacent housing and often very intense with people and traffic. Surrounding the towns are the rapidly growing rural areas, which are better facilitated with living utilities as compared to the rest of the rural parts. Government colonies are common in all towns, which are better planned and have adequate facilities.

Income source for majority of the people living in northern Pakistan is agricultural, horticulture, livestock and its related products. However in late 1980s after the inauguration of Karakoram Highway with China and Pakistan brought economical revolution as majority of the people are being involved directly or indirectly with border trade as well as hoteling and transport. The other sources of income include labour, services in government or non-government organizations.

Even though the prosperity and rapid development resulted by the KKH, however environmental problems certainly increase since no attentions was given to address the basic needs of water, sanitation, solid waste and proper sewerage systems. Similarly, rapid depletion of natural resources could be observed in the area due to easy accessibility. Natural forests are one of the significant areas affected by construction of roads to remote valleys.

Lack of knowledge on the mentioned needs in the health perspective, especially in the policy and decisions makers resulted in severe environmental as well as health problems in lager towns explicitly and villages in general.

1.7. Population

Population statistics for this paper are based on the Northern Areas Population Censuses carried out in 1998, according to which total population of Northern Areas is approximately, 0.8 million and 85% of the total population lives in rural areas. According to 1998 census number of villages in NAis about 750. Subsequent to the topographic contours, most of the villages expand from bottoms up to steep slopes. Obviously, these tough features make living conditions harsh and pitiable on the inhabitants in all aspects of common life. The area is traditionally male dominated, with women working primarily in the home or in agriculture. Average household size is approximately eight people. The average literacy rate is 24%, although for women the figure is below 3% (GoP., 1999). Table 1 shows district wise population and average growth rate.

District	No. of Households	Population			Ave. Annual Growth Rate
		Male	Female	Total	
Gilgit	31,065	128,028	115,296	243,324	2.66
Ghizar	13,731	59,248	60,970	120,218	3.03
Ghanche	13,103	45,585	42,781	883,366	1.11
Skardu	28,033	114,917	99,931	214,848	2.12
Diamir	241,853	105,443	98,148	203,591	3.02
Total	110,785	453,221	417,126	870,347	2.47

Source: Population Census Organization, 2000.

1.7.1. Urban Areas

Northern Areas of Pakistan topographically are mountainous area, almost all settlements are situated in deep gorgeous valleys comprising various small and large towns, and cluster of villages. The central part of the villages are usually

congested and densely populated, however many of the villages are also fairly spread out or consists of more than one cluster urban area size varies from as small as 1000 households to >3000 households. As there is no defined rules as per se therefore settlements pattern is mostly unplanned, scattered, semi-scattered and congested depending upon the availability of land. Various households formed clusters known as mohallahs or in older times as khots on ethnical religious or some times based on tribes. Household size varies region to region, depending upon the prevailing economical, cultural and religious norms of that particular area.

Construction design and material also varies depending upon the prevailing climatic, economical and environmental situations as well as availability of local material and absence of basic infrastructure.

For instance in Baltistan earthen blocks and wood are the main construction material due to sever winters and high cost of stones or its unavailability, whereas in other parts of NA where economical conditions permit, stone is fairly available as compared to soil stones are used as a construction material. However, in most of the villages households are constructed in clusters locally known as Khots, in the basin of the mountains and or near river bunks, because of mainly two reasons a) easy accesses to available water sources and b) form where they can use natural resources at a maximize level both in winter and summer. In some valleys where availability of land is a problem seasonal village settlement is a common practice (in Skardu, Ghizar and Diamir districts) so that more land could be acquired for agricultural use.

District	Households		Population		Household Size	
	Rural	Urban	Rural	Urban	Rural	Urban
Gilgit	23,639	7,426	186,623	56,701	7.9	7.6
Ghizar	12,427	1,259	110,076	10,142	8.8	8.1
Ghanche	11,263	1,840	75,483	12,883	6.7	7.0
Skardu	24,507	3,526	188,825	26,023	7.7	7.4
Diamir	23,005	1,848	187,016	16,575	8.1	9.0

Source: Population Census Organization, 2000.

1.7.2. Seasonal and Long-term Rural-Urban Migration: Status and Trends

Generally in NAMigration from rural areas to urban areas is not as high as it is fond in lower Pakistan, but still the figure is quite high considering the existing facilities in urban areas. Better education, health facilities, and broader job opportunities both for skilled and unskilled labours, are the main encouraging factors for rural population to migrate in big urban town i.e. all districts headquarters of NA, resulting extra burden on urban areas. As far as the educated people are concerned those prefer to stay in their respective villages or regions as most of them are employed either with health or education department. Another reason of migration from rural areas is business opportunities in big towns like Gilgit, Skardu, and many small town situated in Nagar and Hunza valleys near China Boarder. Majority of non-local business community have migrated from villages of NWFP and Punjab.

Seasonal migration of people from rural to urban areas is also common in NA, the main reason for this seasonal migration is poverty, that's why winter is the peak season for rural urban migration. As the poor people in rural areas either don't have any work in winter seasons and nor they have better job opportunities. Young people or children of <14 years of age could easily be found working in hotels, restaurants and in homes. Only in Gilgit town there are more than 22 hotels and around same number of restaurants, working round the year. A large number of rural migrants prefer to move towards lower Pakistan for the sake of better job opportunities.

1.8. Availability and Reliability of Data

Primary information for this report was collected through public consultations with various stakeholders both from government and non-government as well as public and private sector. For confirmation of the acquired data and information two ways were adopted I) meetings were held with the relevant staff to find out the current picture of a particular issue and ii) literature search was done at local and regional level. Majority of the data used in this report is either taken from documents from Govt. i.e. population census reports, Aga Khan Development Network's work and Army Hospital. Few figures are calculated on assumptions as per defined rules for example expected population of the area after five or ten years etc. However, the data, research work and related information are fairly reliable to draw a conclusion or to comment options suggestion, for future.



2. STATUS OF SERVICE UTILITIES AND LAND USE PATTERN

2.1. Drinking Water

Freshwater is a finite resource, essential for agriculture, industry and even human existence. Without freshwater of adequate quantity and quality sustainable development will not be possible. Water pollution and wasteful use of freshwater threaten development projects and make water treatment essential in order to produce safe drinking water. It has been unequivocally demonstrated that water of good quality is crucial to sustainable socio-economic development. The main factors responsible for water degradations of water channels (main source of domestic use) in urban settlements include lack of sanitation facilities, absence of environmental legislations and competitive authority especially in the developing world.

According to WHO more than 80% diseases in the developing world are attributed to inadequate sanitation or due to polluted water. A water related disease is one which is in some way related to water or impurities in water. Water related diseases are of two types; infectious water related diseases which include biological pollutants and non-infectious water related diseases which are caused by the chemical pollution water resources. The four distinct route of transmission are categorized as: (a) Faecal-Oral (water-born and washed, (b) water-washed, and (c) water-based and water-related.

2.1.1. Sources and Water Delivery System in Urban Areas

Like various types of continental water bodies, flowing water, lakes, reservoirs, springs and ground water are common potential sources of water. Glaciers and seasonal snow deposits are the principal sources of all flowing water in the northern Pakistan. The melted water enters streams called nullahs, which subsequently ingress in rivers. There are more four major rivers in northern Pakistan, named as Gilgit, Hunza, Baltistan and Chitral. A large number of small rives emerging from various glaciers of different glaciers and big springs including lakes as well also mix in these rivers. The four big rivers mixed near Diamir District and forms the famous big river of Pakistan known as Indus river. Seasonal variations create significant effect on the discharge of primary rivers resulting significant decrease in the discharge flow in peak winter seasons. The four rivers of northern Pakistan is greatest from July to September, when snows are melting in the mountains and Southwest as well as northern monsoon brings torrential rain resulting land sliding, high flood levels and increase in the turbidity of water. After rushing 800 kilometres through steep gorges and mountainous area of the northern Pakistan, it flows in the southwest and pours onto the hot, dry plain of the western Punjab in Pakistan. Next the Indus crosses the Sindh plain of southern Pakistan and reaches the Arabian Sea of the Indian Ocean through a delta about 210 kilometres wide. The total length of the rivers right from its beginning to end at the Arabian Sea is about 2900 kilometres.

Almost every village and town in the Northern Areas and Chitral has a network of water channels, feed by streams locally called as nullahs and rivers. These channels are 2-4 feet wide and of similar depth. These channels are a symbol of the region's ancient history, indigenous art and collective effort, since many of these were built centuries ago, cutting through rocks and difficult terrain. Where no pipeline existed, nearby households fetched water for domestic consumption. The surplus water in the channels generally discharge into the river flowing in the valley bottom. In villages the activities like washing cloths, utensils and foodstuff is undertaken along the channel edge. In all town or urban areas these water channels are used to feed the drinking water supply systems. To get sufficient water quantity and continuity these water channels are desilted and repaired by villagers on self-help basis.

In Gilgit Town there are five drinking water supply complex are situated in the south of Gilgit, charged by two water channels built around 30 years ago. For population living in the north side of the Gilgit, main source of water for piped water delivery system is river. However in the some parts of Gilgit town, dug wells are also in used for drinking purposes. In Skardu, major source for piped water supply for Skardu town is Sadpara lake. In Chilas town and Ghahkuch drinking water supply systems are smaller as compared Gilgit and Skardu.

Socio-economic survey conducted in 1994 by government of Pakistan, revealed that 92% of the households in Gilgit have piped connections. In Skardu almost 80% of the town have access to piped water supply system. In other urban areas the household coverage may be lower as 50% of the total household.

2.2. Electricity

In NA surface water is abundant and there is good potential of hydropower generation. At the moment there are 80 power stations (hydro and thermal) are functional in five districts of NA. The capacity of these power stations is 43 MW, partially fulfilling the requirement of 45% of the total population of NA. The current electricity demand only in Gilgit town is estimated as 24 MW@ 1.25 KW per household where as present hydropower generation is 8 MW only in summer and only 2.7 MW in winters. Based on the figure mentioned per household consumption of electricity power i.e. 1.25 KW we can also calculate the electricity demand for other urban areas of NA as per household numbers mentioned in population census 1998 report. Please see Table 3.

Table 3: Electricity Supply in NA (in MW)

Districts HQs	Current Demand	Current Production		Difference	
		Summer	Winter	Summer	Winter
Gilgit	24.0	8.00	2.70	8.00	13.30
Diamir	2.3	2.00	1.50	0.30	0.80
Ghizar	1.5	0.32	0.16	1.18	1.34
Ghanche	2.3	0.98	0.45	1.32	1.80
Skardu	4.4	3.96	1.98	0.44	2.42

Source: NAPWD

It is worth mentioning that above electricity demand has been calculated only on household bases. If small scale industries and commercial consumption like hotels, restaurants taken into account that this figure might be doubled. In winter season the consumption of electricity is doubled in urban areas due as majority of the people living in urban areas use electricity for heating, cooking and other domestic facilities like warming water etc. In summer season electricity consumption also increases as due to increase in the commercial purposes like hotels, small industries and even in shops where refrigerators are used for cooling down the cold drinks. Similarly in household the use of refrigerator is a common practice nowadays and almost every fifth household has this luxury.

2.3. Sanitation

2.3.1. Sewerage System

Owing to rapid socio-economical development almost every households in urban settlements have pour-flash latrines. In all urban settlements of NA, due to lack of any proper sewerage system on-site disposal (sock-pits) of sewage is a common practice. This situation is common in all urban settlements of NA, however the degree of intensity is much lower in case of Skardu, Nagar, lower and upper Hunza and Ghanche valleys where use of pour flash latrines are not so common. People are still using their traditional latrines known as chukhan, for defecation because the use of human excreta as manure is a common practice. WASEP PRA studies conducted in 400 villages of NA revealed that due to socio-economical and increasing literacy rate the use of Chukhan is reduced up to 30 percent and in future will be ultimately phased out.

2.3.2. Municipal Solid Waste Disposal

Due to absence of any proper municipal solid waste (MSW) disposal system majority of the households in urban settlements and as well as rural areas dispose off solid wastes in the near by open fields or plots. Dump of household solid waste could also be seen in front of households or streets. However in main town areas where provision of dustbins are available (mostly in bazaar areas) people dispose off wastes in these dustbins. In Gilgit town households situated along the water channels dispose off their garbage directly into nearby water channels. According to a survey conducted by IUCNP the average MSW generation (estimated) in Gilgit town is around 0.4 kg of waste per person per day. According to IUCNP survey conducted in 1998 the estimated MSW generation only in Gilgit town is around 70-80 tons per day. On the basis of this estimated figure MSW generation in other urban settlements of NA have been shown in Table 4. This estimated figure of MSW generation might be doubled in summer seasons due to increase in tourist influx.

2.3.3. Drainage

All settlements either urban or rural are situated on slope of the valleys towards river. In every urban settlement has a network of roadside sanitary drains downtown area constructed by NAPWD, and are being maintained by MCs. These kinds of drains could also be observed alongside KKH constructed by FWO. Basically these drains are not constructed for grey water effluent from the households but instead are basically for roads to collect storm water. The household drains in Mohallahs or cluster of mohallahs are collected in katcha – paka drains

constructed by self-help basis by the inhabitants or by members of MCs. Frequent blockage and over flowing of all kinds of drains whether roadside drains or drains for collection of household waste water could be observed due to common practice of garbage being thrown in these drains by the inhabitants or due to improper maintenance. This drainage water is used for irrigation of fields as well at various locations whilst, surplus water is naturally disposed off in near by rivers or streams – thus polluting the fresh water bodies. It is worth mentioning that in Gilgit town two big water channels constructed in ancient time now become open sewers but the most alarming thing is that these two water channels are the major source of drinking water complexes for Gilgit town.

Table 4: Current Municipal Solid Waste (MSW) Generated in Urban Areas

District	Urban Areas	Population	MSW Generation (in tons) @ 0.4 kg/person/day
Gilgit	Gilgit city	56,701	23
Ghizar	Gahkuch city	10,142	4
Ghanche	Khaplu city	12,883	5
Skardu	Skardu city	26,023	10
Diamir	Chilas city	16,575	7

Source: Population Census Organization, 2000; and NACS Support Project, 2001.

2.4. Current Land-use Pattern

2.4.1. Residential Areas

Presently in all urban settlements of NA there is unplanned and uncontrolled construction is in practice since 1947. Though there is no clear distinction in residential and commercial areas however, the size of residential plots in urban settlements ranges from ten marlas to 2 kanals albeit a small fraction of population have constructed households in 3-5 kanals. This unplanned construction in urban areas lead to haphazard growth and expansion resulted in irregular shapes of plots with narrow streets and lack of infrastructure facilities to the need of the growing population. These streets thus developed are narrow and zigzag which are only used by pedestrians and in some areas it is quite difficult to address the basic infrastructure facilities of urban population such as sewerage, drainage, provision of electricity and easy access to rescue services in case of emergencies.

The residential plots have a lesser degree of plot coverage. Only in Gilgit town 51% of the plots have covered an area of up to 25% and as many as 84% have a site coverage of up to 50%. The same situation can be found in other urban settlements of NA. On average only 3% of the urban population have double stories buildings. Only 2% of the households have one room, 22% have up to 2 rooms whilst 74% households have more than 3 rooms. On average 40% of the households are semi-pacca, 15 percent are pacca and the remaining 45 are kacha houses majority of which are situated in Baltistan Region.

2.4.2. Sites for Recreation Activities

Except Baltistan region, in other urban settlements of NA there is no any proper site for recreational activities. In Gilgit town only one public park in the town known as

Chinar Bagh is the only option for recreational activities, which covers an area of 8.5 acres. However, Polo which is a traditional game in every urban settlements there are polo grounds used for holding polo games as well as other cultural and social activities. A large number of spectators come to watch such events in different times of the year. However in big administrative centres like Gilgit, Skardu and Chilas armed forces and local administration have their own complexes those are limited only for officials. Out of 5 urban settlements only in Gilgit town there are three cinema halls having a seating capacity of 800 seats. In other urban areas mini-cinema houses with dish antenna are common.

2.5. Communication

2.5.1. Roads Traffic and Transportation

All urban settlements have metal and un-metal roads ranging from 15-70 Kilometres of paved roads consisting of radial roads, distributaries links and access roads. Encroachment on the right of way especially in the central business areas is common. In some urban areas the roads are very narrow ranging from 20 to 45 feet e.g. Karimabad centre some parts of Gilgit town. Similar situation is found in other urban settlements of NA. The haphazard on-street parking by various modes of transport is also very common. The loading and unloading activities both by heavy and light transport can be seen easily. However in Baltistan region, Skardu town have better roads than any other part of the urban settlements of NA, the main reason for uniqueness is late start of development work in Skardu and better planning amongst others.

Table 5: Numbers and Types of Vehicles in Northern Areas, 2000

S. No.	Type of Vehicle	Registered	On-Road
1	Motorcycles/Scooters	4,014	3,986
2	Motorcars	3,000	2,974
3	Jeeps	3,563	3,552
4	Station wagons	700	690
5	Tractors	1,557	1,487
6	Buses/Mini Buses	330	329
7	Motorcar Cab	39	39
8	Delivery Van	54	50
9	Public carrier truck	7,939	7,917
10	Private Carrier Truck	47	47
11	Pickup Datsun	767	762
12	Ambulance	12	12
13	Oil Tanker	179	172
14	Water Tanker	2	2
15	Suzuki Pickup	1,799	1,755
16	Grand Total	24,002	17,774

Source: Northern Area Traffic office & Federal Statistics office

The number of vehicles plying the on roads is increasing with the passage of time while the roads' widths remain same, and the effective carriageway widths on certain roads sections are unable to meet the present day requirement.

Apart from Gilgit, Karimabad and main Skardu town the flow of traffic from lower town is higher in urban areas situated along the main connecting roads like KKH, GCR.

The traffic and transportation problem being faced by most of our urban centres are of typical nature like overcrowding, traffic jam etc.

These numbers don't cover vehicles registered in Pakistan and those applies for newly registration after 2000 as at the moment there is ban on new registration of vehicles of any kind. The number of vehicles becomes higher in summer season due to tourism and opening of boarder trade with China. Similarly vehicles used by Armed forces are not included in this data as exact figures are not available.

2.6. Air Quality

An air quality survey carried out by IUCNP and SUPARCO revealed that current air quality of urban settlements in NA is good as compared to the big town and urban settlements of Pakistan (see Ambient air quality report). This study provides base line data of the current ambient air quality of the urban settlements in NA. The parameters monitored during survey comprise heavy metals and other omissions mainly released by vehicles. However, other parameters like noise levels and density of particulate matter were not included in this survey. However, keeping in view the current urbanization, overpopulation, increasing number of vehicles and lack of alternatives for power and energy there is likelihood of air contamination in future. Seminally, current increasing trend of vehicles in NA may be a great threat to air pollution due to vehicles emissions especially in summer season due to increase in traffic load.

2.7. Government Service Infrastructure

In the present circumstances following are the main departments active in all Districts and to some extent tehsil headquarters of NA. These departments are responsible for all kind of urban as well as rural development projects. Although at the moment none of them played an important role however each department has the capacity and can act as a potential actor regarding environment and development. Following text supplies main role and responsibilities of each department in the present scenario, however potential role of these departments in urban environment will be discussed under recommendations.

2.7.1. Planning and Development Department (P&DD)

P&DD is the principle institution responsible for approving various kind of development projects of all line departments. It is nice that currently a separate department for environment has been established in the P&DD secretariat and is in the process to establish an environmental protection authority at Northern Areas' level.

2.7.2. Northern Areas Public Works Department (NAPWD)

NAPWD, is mainly involve in construction of Roads, Buildings, construction of power supply stations (hydro power, thermal), for bigger towns and rural areas. However the aforementioned working areas the environmental impacts have not been considered seriously due to lake of awareness, resources and time constraints. In addition to this NAPWD is also responsible to construct and maintain drinking water supply systems in NA, unfortunately due to lake of resources (both financial and skills) quantity and quality of drinking water in urban settlements doesn't match with WHO standards set for developing countries.

2.7.3. Local Bodies and Rural Development Department (LB&RDD)

LB&RD is the main player active in rural development, main areas of interventions includes construction schools, link-roads, irrigation channels, water storage tanks and provision of water supply and sanitation facilities to rural communities of NA. In addition to this LB&RDD is providing funds to all municipalities for various kinds of urban development projects i.e. retaining walls, protection bans, culverts, sport etc.

2.7.4. District Councils

There are five district councils functional in district headquarters of NA headed by a chairperson. Construction of retention walls, bans etc and financial assistance to sport clubs, vocational schools and water supply projects, irrigation channels are the main core areas of intervention. In past District councils managed their financial resource though revenues by means of octroi. For the last three years after abolish of octroi LB&RDD is responsible to provide financial assistance both for staff management and development projects.

2.7.5. Municipalities

Municipalities are main political institutions at grass root levels are involved directly to maintain urban environment. Five municipalities are functional at the moment in districts headquarters of NA. According to business rules of Local Bodies and Rural Development Department (LB&RDD), municipal committees are responsible to carry out all kinds of development works in their respective jurisdiction vis-à-vis other service utilities i.e. water supply, electricity, MSW management, town planning, enforcement of laws regarding building and constructions etc. However, in NA due to financial and human resources especially technical staff all municipal committees in NA are currently responsible only for keeping cleanliness in main urban settlements of NA.

2.7.6. Department of Health

In Northern Areas of Pakistan, Health Department is one of major actor in urban and rural development projects amongst others. It has Districts head officers in all five districts as well as a number of BHUs, Dispensaries, First Aid Centres and Hospital providing primary health facilities to the communities. In addition to this health department is also have CHWs, LHVs and Health Houses in every village and even in towns.

2.7.7. Department of Education

Education Department is almost functional in all districts of NA but yet they haven't directly involved in urban environment development programme.

2.7.8. Forest Department

Forest is another important department who has its sub-offices in almost all districts. Apart from its major concern regarding deforestation and afforestation, they are playing vital role in establishing nursery at cluster levels. Though in urban infrastructure development their role is limited however they can play a vital role for the improvement of urban as well as rural environment.

2.7.9. Agriculture Department

Agriculture Department has its branches in all districts of NA. They can play an important role in improving the existing environmental situation of the area. So far they have no role in the urban planning and development however they can play a significant role in improving the existing urban environmental situation of NA by using environment friendly fertilizers and pesticides. Since most of the pesticides and fertilizers being used now a days have severe environmental impacts and may pollute water bodies and air in future.

3. KEY ISSUES

3.1. Drinking Water

In all urban settlements of NA, the water delivery systems were constructed in early 1980s, though few modifications are being made with the passage time. Following are the major problems associated with drinking water in urban settlements:

3.1.1. Continuity and Quantity

In all urban settlements the continuity and quantity of drinking water is unreliable albeit there is enough amount of water in the feeding channels or main sources. Water demand for water supply mainly depends upon the socio-economical conditions of the population, its distribution, density, type of dwelling, climate and more importantly on the quality of raw water. Following are the main reasons for shortfall in supply of drinking water.

3.1.2. Design Criteria

Existing piped delivery systems in urban settlements doesn't match with the current domestic and non-domestic water demands. For instance the five complexes supplying drinking water to Gilgit town were designed in late 70s, base on the population demand to that time. The existing systems were designed on the criteria of 67 litres per capita per day that 11, 3 and 2 times lesser as compared to the design criteria of water supply systems for urban settlements of Islamabad, Quetta, Peshawar. It is worth mentioning that since 1998, Water Sanitation Extension Programme of AKPBS is designing rural water supply systems on design criteria of 70 litres per capita per day. Table 6 shows the water supply demand required for Gilgit town in the next decade base on the current growth rate.

Table 6: Demand and Supply of Drinking Water (in million gallons per day)

Year	Domestic			Non-domestic	Storage Capacity	
	Population served	Supply rate	Demand (in mg/day)		Current	Needs to be improved
2000	84,804	15	1.3	0.16	0.324	14.0
2004	101,080	60	6.0	0.17	PC-1 has been submitted	
2008	118,249	65	8.0	0.18	PC-1 has been submitted	
2012	140,897	70	9.0	0.19		
2016	164,830	70	11.0	0.20		
2020	196,334	70	14.0	0.21		

Source: NAPWD

3.1.3. Storage Capacity

The storage capacity of the existing water supply complexes generally in all urban settlements and particularly in Gilgit is not enough to cope present and future demands, tertiary treatment as well as to distribute the water accordingly basically of two reasons; i) there is not enough space to expand the existing systems according to demand; ii) lack of financial and human resources. The existing water storage capacity of water supply complexes in Gilgit town is given in Table 6. It is obvious that at the moment the storage capacity of all water supply complexes is 15 times less than the actual demand. Therefore the improvement of the existing water storage capacity is far most important than other aspects of water supply i.e. quality, as according to studies carried out worldwide quantity of water plays a vital role in reduction of water and sanitation related diseases see Table 7.

Table 7: Reduction Levels in Diseases

	All studies		Rigorous studies	
	n	reduction (%)	n	reduction (%)
Water and sanitation	7 ^a /11 ^b	20	2 ^a /3 ^b	30
Sanitation	11/30	22	5/18	36
Water quality and quantity	22/43	16	2/14	17
Water quality	7/16	17	4/7	15
Water quantity	7/15	27	5/10	20
Hygiene	6/6	33	6/6	33

Source: Esrey et al., 1991.

n= number of studies conducted

a= the number of studies for which morbidity reduction calculation could be made.

b= the total number of studies that related the type of facility to diarrhoeal morbidity, nutrition, and mortality.

3.1.4. Distribution Network

The existing pipe-network (distribution system) appears to have been laid in accordance with the previous expansion of the town and now it is found inadequate to supply the required amount of water with adequate pressure. Similarly in some areas the pipe is very old and because of laying on the surface it is rusting not only causing damage to the pipe but affecting the other consumers at the end of network. In urban areas situated at high altitude in winter season the pipes get freeze or broken see Figures-8, 9 and 10.

3.1.5. Treatment Options

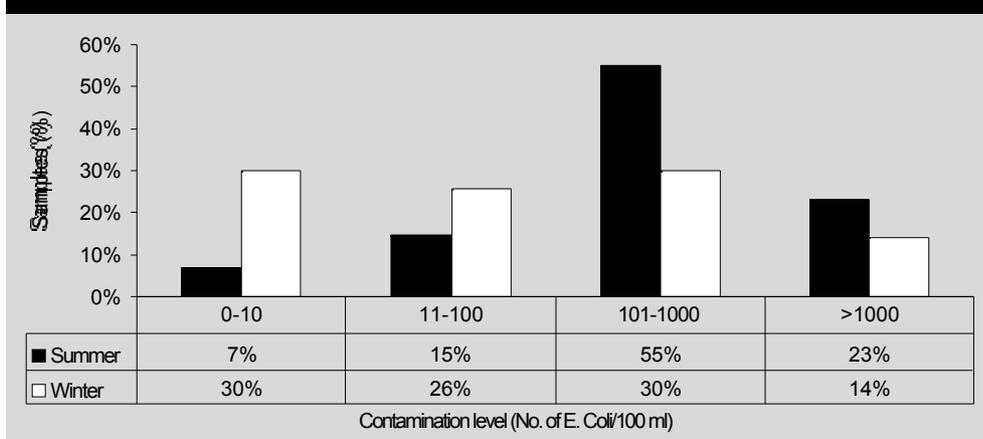
Majority of the water supply systems in urban areas have primary treatment options, whereas in big urban centres secondary and tertiary treatment options there. But due of high demand of water quantity especially in summer seasons it become very difficult for relevant authorities to even carry out emergency treatment.

3.1.6. Quality

Drinking water quality in almost all urban settlements doesn't comply with the WHO drinking water recommendations i.e. the biological contamination of drinking water must be in the range of 0-10 E.coli/100 ml. Almost all drinking

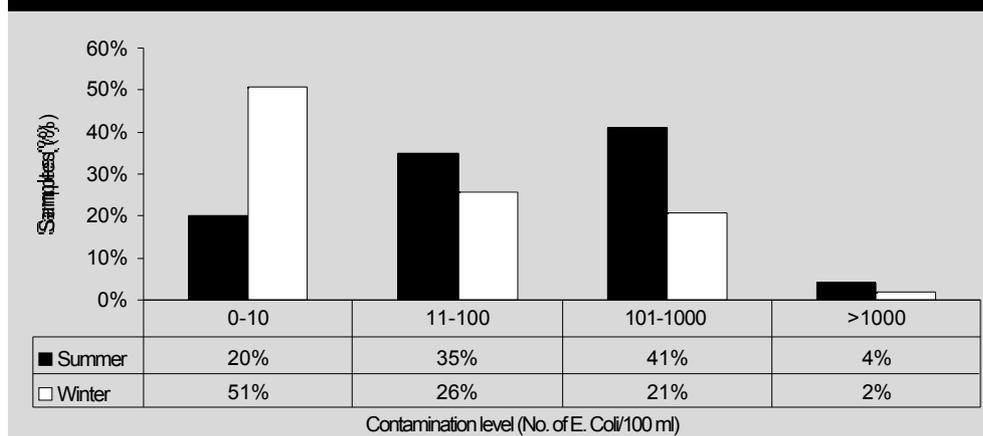
water supply systems are contaminated with faecal material since the catchments area is not protected right from the source. A water quality survey conducted by WSHHSP revealed that majority of the drinking water sources are grossly contaminated with faecal material see Figure 1:

Figure 1: Consolidated Data of Water Quality at Traditional Drinking Water Channels



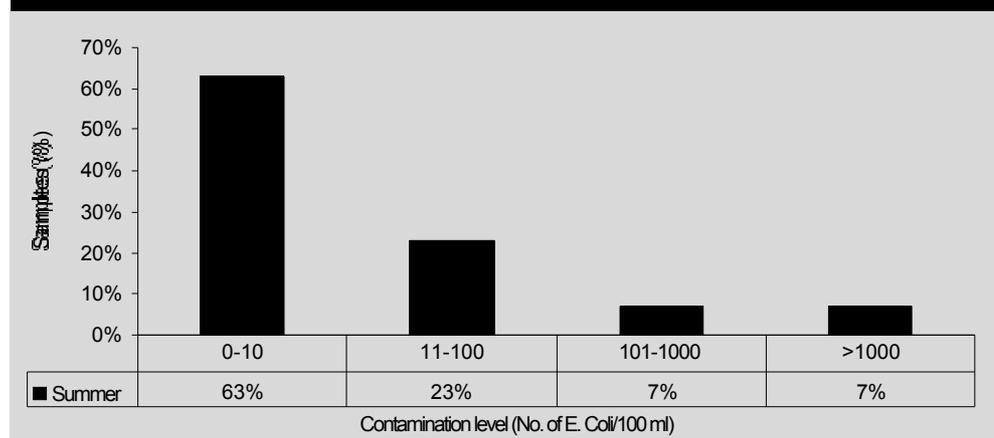
These water channels are the primary source of drinking water and all other domestic usage including irrigation. High contamination levels were observed in mid and end points of the drinking water channels, in all urban and rural settlements of NA. Drinking water quality in taps is also not fit for human consumption see Figure 2 shows the results of tap water quality in urban settlements of NA.

Figure 2: Consolidated Data of Water Quality at Taps



Groundwater is uncommon in the area, albeit in some areas of Gilgit town people rely on dug wells due to unreliability of the water supply system. A survey conducted by WSHHP in 1995 revealed that ground water wells are relatively of good quality as compared to the piped water supply system. Out of 30 water samples collected from various wells situated in Gilgit town 63 percent samples matched with WHO guideline values of drinking water for developing countries (0-10 E. Coli / 100 ml). Only 14 percent of the total samples were found grossly contaminated having contamination levels in the range of 101->1000 E.coli/100 ml.

Figure 3: Consolidated Water Quality Data of Ground Water Wells



Similarly water samples collected from water delivery complexes of Gilgit town indicates the presence of faecal material higher than WHO recommendations. In June 1999, WASEP again carried out a water quality survey of water supply complexes of Gilgit town, which revealed that almost all systems are grossly contaminated with faecal material.

3.2. Sanitation

3.2.1. Lack of Sewerage Systems

The extensive use of on-site disposal (soakage pits) in the urban settlements is not only raise the water table in lower areas of the towns but as well as there is great threat of ground water contamination with faecal material. Due to lack of proper sewerage systems the waste effluents generated by households or various services stations situated at various locations in the urban settlements have serious environmental impacts. The waste generated by commercial activities is more hazardous than other organic and inorganic effluents. In almost all urban settlements commercialising due to rapid economic growth and business opportunities. Small and medium size industries are growing every urban settlements e.g. automobile workshops including service stations, flour industries and dry fruit industries. Only in Gilgit town there are more than 20 service stations are working the hazardous effluent from these service stations are directly ingress into the nearby small water rills and ultimately to water channels thus contaminate the water bodies. In addition to this in every urban settlement there is no proper arrangements to deal with hazardous effluents generated by hospitals.

3.2.2. Drainage

In almost all urban settlements there is no any proper drainage system exists. Due to lack of any proper drainage systems waste water such surface run off in rainy seasons, grey water from households, and waste water from the fields either directly enter into the fresh water bodies or become stagnant in nearby flat areas causing severe health and aesthetic problems. The stagnant water sites are could be the potential sites for vector born water related disease like malaria etc. Similarly, absence of any proper drainage systems also effects on the water table of the area. For instance currently Gilgit town is facing problems of high water table in areas

situated at the tail of the town i.e. Kashrot, Majenee Mohallah, Amphrey and Airport Area. Water table in these areas is too much high that it create problems for building and construction projects in the down town areas. Similarly the current drains along roadsides can not capture the storm water in rainy seasons.

3.2.3. Municipal Solid Waste Management

In urban settlements of management of solid wastes are growing as a big issues, presently Municipal Committees functional in the urban areas are responsible for the management of MSW generated both at household or commercial level. But due to resource constraints almost all MCs are facing problems to manage MSW properly. The practice of mixing hazardous waste with municipal is a matter of great concern. Following are the main issues of MCs regarding municipal solid waste management:

3.2.3.1. Lack of Human Resources

Lack of skilled and appropriate numbers to deal with MSW is crucial problems for all MCs working in urban settlements of NA. There are five MCs in NA among which Gilgit MC is the biggest as Gilgit town is the main hub of all administrative set-up, there are 22 wards in the MC's jurisdiction. There are 85 numbers of staff responsible to dispose of 23 tones of MSW generated in the Gilgit town. Only two tractor trolleys and 20 wheelbarrows are in these wards is around 85 including sanitary and assistant sanitary inspectors and jamadars. Same situation can be found in other municipalities of NA for example in Skardu town there are around 20 staff responsible for collection of MSW from 16 wards. Lack of skilled personals is another problems facing by MCs of NA, with the passage of time and rapid development the type of MSW is also changing the composition of MSW is becoming more inorganic than organic as it was in past. Based on the current situation of NA attention must be given to hire or recruit skilled staff or as an alternative the present staff could be trained in especially handling the hospital waste management that is a combination of both infectious, hazardous, and radioactive wastes.

Similarly in NAPWD, especially in water and electric sector there is lack of skilled personnel, both at management and support staff levels.

3.2.3.2. Lack of Financial Resources

With the passage of time the number of dwellings, population, tourists have been doubled but the resources (financial and human) either still on the same level or the incremental increase in the financial resources were not so significant. That's the reason that most of the projects related to urban development and environment could not be executed well in time or even can not operational as per requirement. Financial constraints even though is a major issue of all Government departments but all municipal committees in NA are the most effective institutions. In the past few years all MCs have their own financial resources i.e. funds generated from octroi. However, since the abolition of octroi, the MCs of NA are facing a huge shortfall in revenue and are unable to meet even their basic financial requirements. At the moment LB&RDD is providing financial requirements to all MCs of NA.

3.3. Roads Traffic and Transportation

The road and intersection geometry is poor. On street parking and roadside encroachments are common which have reduced the road capacities to a great extent. Motor workshops, transport terminals and other incompatible uses are spread all over the urban settlements of NA, which are generating /attracting a great number of trips with in the busy areas of the urban settlements creating congestion, noise and other environmental pollution. Lack of planned and properly organized public transport systems in the town i.e. movement of buses, wagons on the narrow streets network is creating frequent bottlenecks and thus hindering the flow of traffic. In addition to this there is lack of traffic control devices such as traffic signals, traffic signs, road markings etc., and their absence is a constraint in maintaining the smooth flow of traffic. It is obvious from data given in Table-5, that existing roads and traffic facilities could not cope the current load of transportation and this might be increase in coming years albeit recently government with the assistance of Army have completed operation against encroachments and have widen the roads but in most of the case alignment of roads was not taken into account that may result serious road accident if not done properly.

3.4. Electricity

Insufficient electric power supply is one of the major issues in almost all urban settlements of NA. Lack of sufficient power and unreliability is creating severe problems not only for households but as well as it affects the general economical growth in urban settlements of NA. The situation becomes worst in winter seasons when due to low temperatures the water level in streams falls far below the amount of water required for power generation. In addition to this some other critical issues i.e. line losses due to distribution faults, lack of grid stations to upgrade and maintain the power, overloading, lack of experienced staff (both technical and non technical) as well as financial constraints are the main hurdles for addressing the power needs in a perfect manner.

Similarly, due to unreliable power supply, people of NA are used to keep diesel and petrol generators to cope electric power demand both at domestic and commercial usage. Emissions of these individual generators not only are the major contributor to pollute air quality of the surroundings areas but as well as it contributes a lot in noise pollution as well. Long hours load shedding also affects the routine work in offices. At night almost all urban areas look like black out which is a security threat to settlers of urban areas. The economical implications of individual power generators are more serious as per other issues. For instance the medium and small scales industries in NA, e.g. the cost of final product of flour mills, service stations and automobile industries become very high as compared to the other areas of Pakistan.

3.5. Government Service Infrastructure

Main issues in current government service infrastructure include lack of human and financial resources, skilled personnel, community participation and lack of coordination among various government and non-government organizations working for development of NA. Among these the most important issue is lack of

coordination especially in government sector that usually lead to either replication of development projects or fictitious projects often run for a very short-term. Because in most of the projects lessons learned by any other government and non-government organization(s) could not be incorporated or address in project planning and execution, and secondly no one knows which kind of expertise department can hire to address various issues related to developmental projects i.e. socio-economic, political, cultural and environmental threats related to that specific project for urban as well as rural areas. For instance AKDN institutions have carried out various impact and monitoring studies in NRM, drinking water, community participation, education and health, etc. These studies could be used for better understanding of project management.

Another important issue in government sectors is ambiguous roles and responsibilities of particular department that often led to unsatisfactory service utilities in urban as well as in rural areas due to mainly two reasons: (i) absence of rules and regulation for that particular project, and (ii) lenient project staff due to lack of mentoring and evaluation. In addition to this absence of monitoring and evaluation component in the present government service infrastructure is the main factor leading to development projects to failure or outcomes of that specific project could not be achieved in a desirable manner. And ultimately the given project not only loses its real essence but as well as it also impacts on the cost effectiveness of the development project.



4. CURRENT INITIATIVES

With the passage of time people's understanding and awareness regarding environmental issues have been growing. Various organisations and their activities have played a significant part in bringing out a public realization in this regard. Although, most of these initiatives are designed as project, time and area specific, lacking systemic linkages, coordination, correlation and monitoring as well as follow up mechanisms.

4.1. Drinking Water

Water sector of NAPWD has initiated new projects for up gradation of existing drinking water delivery systems in the urban settlements of NA to cope existing and future demand of the area. Greater water supply project designed for Gilgit town comprises three Phases. In Phase-1 water supply complexes will be connected with main source Kargah nallah with 600/500 dia pipe. The length of the catchment is around 8.5 km from Gilgit town. In second and third phase of the proposed projects water treatment plants and distribution network will be improved. The total cost of the project is about 123.247 million. It is envisage that this project will fulfil the drinking water demand of Gilgit city for next 16 years.

Similar kind of project has been initiated for Skardu town. This project is designed for next 36 years and estimated cost of the project is around 130.300 millions. Hargisa nallah will remain as water source for proposed dinking water supply system. Initially 300 mm dia pipe will be laid from Hargisa nallah to the proposed treatment plant, water supplied by this pipe will be sufficient to supply drinking water for the population of Skardu town up to the year 2015. Beyond 2015, same water treatment plant will be connected to Sadpara dam with 450 mm dia Ductile iron pipe to meet the water demand of exhaustive population of Skardu town.

Similar projects for modification and improvement of existing water delivery systems in other three urban settlements of NA is in its initial stage.

4.2. Electricity

Power sector of NAPWD has initiated work on various projects to fulfil current and future demand of electricity in urban settlements of NA. To fulfil the existing and future power demand of Gilgit town, construction work on 4 MW hydel power station at Juglote Gah, is in progress and will be accomplished by the end of 2003. Another hydel project of 18 MW, at Naltar Nallah is in the pipeline and it is hopped that by the end of this year modalities and timeframe for the same would be finalised.

For Skardu town and adjacent semi-urban areas WAPDA is currently started working on the construction of Sadpara Dam near Skardu town. From Sadpara dam

12 MW power will be generated. In addition to this dam also provide drinking and irrigation water for Skardu town and adjacent semi-urban areas.

Similarly, construction of 1 and 1.5 hydel power stations in Ghizar and Ghanche respectively are in progress.

4.3. Roads Traffic and Transportation

In 2002, civil administration and Army carried out a joint activity to remove the encroachments in almost all urban settlements of the NA. In this connection cleanup operations had been taken in all urban settlements. Widening and metalling of roads are now in progress, albeit problems associated with road alignments, drainage and rights of way are still needs to be addressed. Keeping in view transportation loads in town areas, bus terminals have been sifted out the city in Gilgit and Skardu. Similar kind of actions will be taken in other urban settlements in near future.

4.4. Sites for Recreation Activities

A number of projects have been initiated by Army and local administration to develop city and children Parks in Gilgit and Skardu towns. A children park in Gilgit town will be completed by end of June 2002. Whilst site for new city park has been selected and by the end of 2003, this will be operational.

4.5. Solid Waste Management

On the request of NA administration IUCNP has developed a project proposal for solid waste management of Gilgit town. Now NACS support project is assisting municipal committee Gilgit to form PC-1 for the same. Final PC-1 will be completed by the end of June 2002. Similar kind of PC-1 for other urban settlements will be prepared by the end of this year.

5. CONSEQUENCES OF INACTION

The health problems associated with environmentally unsatisfactory conditions are closely related to the development process. This is so regardless of whether they are directly linked to the home, to the workplace, to the transport system, or make their impact indirectly through infertile soils, shortage of energy, poor water supply and inadequate sanitation interventions. No development model so far presented that offers a solution to the problem of combining economic growth with environmental conservation and a well maintained resource base. Majority of the strategies seems to remain based upon ideas, technologies and institutions in NA where the environmental deterioration has been allowed to reach critical levels in almost whole NA especially where desperate countermeasures of dubious efficiency are underway. On the other hand economic recession in NA and the adjustment measures applies in the recent years to promote economic growth are likely to accelerate environmental degradation rather than reversing it. Therefore, it is imperative to integrate environmental issues discussed in the previous chapter more seriously. It is worth noting that UNICEF, in its study on "adjustment with a human face", has stated that active support for greater community action in such areas as housing, water and sanitation often need to be part of this. mentioning that the primary health care strategy, formulated in Alma Ata in 1978, emphasized disease prevention, universal coverage, appropriate technology, community participation, safe water supply and basic sanitation as one of its "elements".

It is evident from data given in previous chapter that drinking water at the point of ingestion (taps) in urban settlements of NA especially in summer season is highly contaminated with faecal material. Microbial contamination is the most critical risk factor in drinking water quality with high potential of causing water born diseases. A recent survey carried out in developing countries shows that 1.2 billion people suffer from diseases caused by unsafe drinking water or poor sanitation, more than four million children die from water born diseases and fifteen percent of will die before reaching the age of five to diarrhoea-deaths that might be avoided with reasonable water and sanitation services (Juha I Uitoo et al, 1999). Similarly, in Pakistan 60 percent of child mortality is attributed to water born diseases (Editorial, Daily Dawn, Nov.19, 1999), the situation is even worst in northern Pakistan.

Water and sanitation diseases prevail as endemic in northern Pakistan especially in peak summers when the faecal contamination levels in the drinking water sources as well as in delivery systems becomes significantly high. A case control study conducted in Oshkandas Village, in 1996-97, revealed a significant association of drinking water contaminated with *Cryptosporidium parvum* and diarrhoeal disease incidence cases (Raza 1997). Apart from these case studies the anecdotal data collected from different GPs working in the area shows that in summer season more than 70 percent of the population suffered from water born diarrhoeas. On the other hand in almost all villages and towns the other water related infections such as typhoid and hepatitis A have been frequently reported through out the year. According to a survey conducted by District Health Office of the Northern Area,

56,581 water related infections were dealt in various hospitals and BHUs in the Northern Areas in the year 1999. Details of each infection are given in Table 8.

Table 8: Water-related Infections Reported in Northern Areas (1999)

Infection	Number of cases		Total
	Male	Female	
Typhoid	925	870	1,795
Shigellosis	7,680	7,270	14,952
Amoebiasis	6,476	6,404	12,880
Hepatitis	925	721	1,646
Trachoma	872	620	1,492
Malaria	955	790	1,745
Arthropod born	310	260	570
Scabies	11,260	10,241	21,501

Source: No.1434-1/DHQ/Stat/96/265, May 2000

In January 2000, Army Hospital Gilgit, circulated a report on the incidence of cholera cases in five districts. According this report 47152 cholera patients were treated in different hospitals of the Northern Areas, out of which 113 were died for detail see Table 9.

Table 9: Cholera Epidemic in Northern Areas (June 99-September 99)

District		Cases	Deaths reported
Gilgit	DHQ Hospital	11,186	43
	DHO	06,439	12
	Total	17,625	55
Skardu	DHQ Hospital	7,464	44
	DHO	2,625	00
	Total	10,089	44
Diamir	DHQ Hospital	1,493	1
	DHO	7,135	11
	Total	8,628	12
Ghizar	DHO	4,779	
Ghanche	DHO	6,031	02
Grand Total		47,152	113

Source: Army Hospital, Gilgit Cant.

If other infections related to sanitation are taken into account then the number of water and sanitation related infections may be doubled as mentioned above. The main reason for this high number of water related infections are attributed to lack of water quality and quantity wise as well as inappropriate sanitation facilities. Nonetheless, provision of only safe water is not alone be a barrier for the reduction of these diseases, if other cross-cutting issues are not addressed properly which include continuity, reliability, health and hygiene education including safe disposal of human and animal waste amongst other pivotal issues.

Based on the data given in Table 10, it is obvious that after 10 and 20 years, population in urban settlements will be doubled and definitely there would be more burden on current service utilities, such as water, health and education. In addition to this there would be more consumption of basic needs of live such more food, more energy and it definitely results in increase in waste both solid and sewerage waste that ultimately pose a great threat urban environment. Therefore it is imperative to design service utilities keeping in view future population, On the other hand increase in population size would definitely effects on current natural resources especially forests as in NA, firewood is the only source of energy used for cooking as well as for heating purposed in winter seasons. Similarly number of households will also increase and if current situation of unplanned constructions continues then there would be severe problem to construct sewerage and other domestic wastes. It is obvious from data given in Table 12 that quantity of solid waste will be doubled in coming years by two times.

Table 10: Projection of urban population after 10 years'increment

Urban Areas	1998	Population after 10 years	Population after 20 years
Gilgit	56,701	72,350	92,365
Chilas	16,575	21,149	20,986
Skardu	26,023	33,205	39,126
Khaplu	12,883	16,438	42,391
Gahkuch	10,142	12,941	55,996

Table 11: Water demand for projected population for 10 and 20 years

Urban Areas	1998	After 10 Years	Population after 20 years	Water Demand after 10 years	Water demand after 20 years
Gilgit	56,701	72350	92365	1.125444444	1.436789
Chilas	16,575	21149	20986	0.201304444	0.256993
Skardu	26,023	33205	39126	0.255702222	0.326449
Khaplu	12,883	16438	42391	0.516522222	0.659416
Gahkuch	10,142	12941	55996	0.328984444	0.42462

Table 12: Projected population and estimated MSW generation after 10 and 20 years

	Pop. 1998	MSW Generation Tons	Population after 10 years	MSW Generation Tons	Population after 20 years	MSW Generation Tons
Gilgit	56,701	23	72350	29	92365	36
Chilas	16,575	7	21149	8	20986	9
Skardu	26,023	11	33205	13	39126	15
Khaplu	12,883	5	16438	7	42391	16
Gahkuch	10,142	4	12941	5	55996	23

Current traffic load and transportation trends as well as the conditions of existing roads in all urban areas are not very poor but its seems that the existing traffic and

transportation facilities can not cope the requirements of future growth see Table 13. There is strong need to improve the existing transportation facilities keeping in view the future needs and expansion of the urban settlements.

Table 13: District-wise distribution of vehicles and estimated projection after 10 years

Districts	1995	1996 (%)	1997 (%)	1998 (%)	1999 (%)	2000 (%)	2010
Gilgit	14,825	15,142 (2.13)	15,386 (1.61)	15,615 (1.49)	15,723 (0.69)	15,928 (1.30)	17,042 (14)
Diamir	1,769	1,808 (2.20)	1,833 (1.38)	1,909 (4.14)	1,914 (0.26)	1,934 (1.04)	2,108 (19)
Skardu	2,190	2,240 (2.28)	2,292 (2.32)	2,302 (0.43)	2,355 (2.30)	2,443 (3.73)	2,711 (23)
Ghizar	734	842 (14)	864 (3)	877(1.5)	901 (2.7)	938 (4.1)	1,191 (62)
Ghanche	340	385 (13)	393 (2)	418 (6.3)	432 (3.2)	459 (6.3)	619 (82)

Existing unsatisfactory power supply in urban settlements is not only effecting the general environment of the town but as well as it will serous impact on socio-economic well being of the people of NA. If the current situation remains same then economical reforms could not be in place like establishment of small and medium size industries in NAAs the cost of final product becomes much higher by using their own thermal power units and ultimately they can not compete with products coming from down country.

6. THE WAY AHEAD

6.1. Water Supply Sector

Provision of safe and enough quantity of drinking water are closely associated with environmental health and also have its socio-economical impacts. Existing situation of drinking water in urban settlements have been discussed in the previous chapter elaborately based on various studies conducted by AKDN revealed that existing water delivery systems in all urban settlements of NA failed to provide good quality and quantity of drinking water to the target population. Many issues related to quantity and quality of drinking water and associated health risks have been also highlighted in previous chapters. In the following text remedial both short- and long-term will be highlighted.

6.1.1. Short-term

It is evident that piped water is highly contaminated with faecal material and is the main cause of water related infections in urban populations of NA. Following are the short terms remedies that must be adopted on urgent basis, especially in summer season when incidence of gastroenteritis is much higher as compared to winter seasons.

- m Protection of catchment area(s) right from source to intake of water delivery systems so that animate activities could be reduced
- m Enforcement of laws to minimize activities i.e. household drainage, surface run-off from nearby agricultural fields, situated along the feeding channels.
- m Treatment options like chlorination (batch) must be adopted regularly especially in peak summers, however concentration of residual chlorine must be in the range of 0.2-0.5 mg/L at tap stands.
- m Awareness raising campaigns could be used an effective tool to control misuse of water leading to an adequate use of the current facility.
- m Street hydrants should be repaired well in time to control leakages/loses so that required pressure could be maintained in the distribution line.
- m Prompt attention should be given to repair or replace the existing broken pipelines especially those lying inside dirty water rills to maximize chlorination effect, and to avoid back-spionage during intermittent flows.
- m Option for replacing the existing slow sand filters with rapid sand filters should be taken to increase the present capacity of water supply complexes from 0.35 m³/g/d to 3.9 m³/g/d.

6.1.2. Long-term

- m Rehabilitation of old water delivery systems so that primary, secondary and tertiary treatment options for drinking water could be ensured. During planning of these rehab schemes issues regarding quantity and continuity must be dealt as an integral part of the proposed scheme(s).
- m Establishment of a water authority either under by NAPWD and Health separately or with the representation of both, so that quantity and quality issues of drinking water could be addressed simultaneously.

- m Establishment of water testing laboratories in all districts of NA under the supervision of health department as they have experienced lab technicians, and lab facilities to carry out water quality tests.
- m Establishment of laws/legislations to ensure the water quality issues
- m Awareness raising campaigns should be launched to minimize water usage and developing sense of ownership among the users regarding management of water delivery systems
- m Introduction of tariff culture to cope existing financial problems for managing the water delivery systems and to minimise the misuse of water.
- m For Gilgit town the options mentioned in the Master plans must be addressed to cope the current and future demand of drinking water that is around 24 mg/d keeping view the current urban growth pattern.

6.2. Sanitation

6.2.1. Drainage

In almost all urban settlement in NA are situated at higher elevations ranging from 3000 to 1000 feet above the mean sea level. Each settlement slopes towards nearby rivers or streams. Mean annual rain fall in NA is 5" to 6" evenly distributed round the year. Maximum mean rain fall varies from 0.8" to 0.96" in spring seasons. Keeping in view the topography and climatic conditions of the urban settlements in NA provision of surface drainage systems rain and snow fall along the road side. These drainage systems can work to carry storm as well as wastewater, that will eventually be converted into separate storm water drainage system with the induction of sewerage system. Following criteria may be adopted for the design of drainage system.

- m Minimum cleansing velocity must not below 2.5 feet /sec
- m Minimum design size shall not be less than 12"x12".
- m Drains must be constructed on both side of the streets in order to connect households located on either side of the road.
- m House connection to waste water drain may be collected in 6" diameter RCC or asbestos pipes
- m Before designing the drainage systems a two years storm frequency for tertiary drains and five year's storm frequency for primary and secondary drains must be adopted.

6.2.2. Sewerage System

Discharging the waste water from the community as well as commercial areas into the nearby water bodies with out any treatment is a common practice in almost all urban settlements of NA. This practice is a great threat to health of people who are utilizing the same source at down stream for human consumption. A water quality survey conducted by WASEP-AKPBS of Gilgit river revealed that faecal contamination levels in river water ranges from 100-500 E.coli/100 ml. According to figures calculated in the Mater plan for Gilgit town the waste water generation only in Gilgit town will be around 25 cusecs by the end of 2024 or may be earlier. At the moment only in Karimabad, AKCSP has constructed sewerage system with treatment facility (combination of septic tank and biological filters). Efforts for selection of an appropriate sewerage system with feasible treatment options must be started right now. AKCSP's module could be used as a case study.

- m Collection of baseline data on wastewater generation and its consistency
- m Selection of treatment systems
- m Induction of sewerage systems at pilot scale
- m Replication of pilot project at larger scale.
- m Keeping in view the existing climatic conditions it seems that WSP could not be a good option to select for sewerage treatment as it needs sufficient land and warm weather. Following factors should be given due consideration whilst selecting any method for sewage treatment.
- m Availability of sufficient land at suitable location and its costs.
- m The system should be easy to operate and maintain.
- m The selected system should be cost-effective and efficient

6.2.3. Municipal Solid Waste Management

Solid waste management systems only exist in large urban settlements like district head quarters, though the service level is not satisfactory due to many reasons mentioned in previous chapters. According to IUCNP survey at moment only in Gilgit town 70-80 tones of solid waste is generated per day. Based on the current situation of MSW generation and constraints of relevant authority to manage it properly following steps may be taken to handle MSW in a proper way. Following criteria is proposed for designing of municipal solid waste management:

6.2.3.1. Short-term

- m Awareness raising campaigns to minimize the MSW generation by reuse options
- m Community based pilot projects to find-out a practical, self-sustainable, and environment friendly, and practical approach towards MSW management in NA
- m Identification of type of MSW its categories and opportunities for reuse, recycling and dispose of materials
- m Capacity building of staff handling MSW especially for hazardous hospital wastes.
- m Opportunities for involvement of private sector related to health, Automobile, wood for on site disposal of infections/radioactive material.
- m Willingness and affordability to pay studies in selected urban settlements of NA and revenue generations polices may be develop during there studies.
- m Legislation regarding MSW generation and handling may be prepared with close consultation of health, NAPWD, Municipalities and public.
- m Identification of suitable sites for disposal of MSW
- m Motivation of health department to establish incinerators for disposal of infectious material on site.

6.2.3.2. Long-term

- m Execution and construction of landfills sites/ incinerators for MSW disposal
- m Replication of pilot projects at large scale in all urban settlements of NA.
- m Induction of tariff collection from various wards located in a particular urban settlement.
- m Implementation of legislations/laws for an appropriate use of MSW management facilities with close patronage of local administration.

6.2.3.3. Design Concentrations

- m Whilst designing a MSW management systems following criteria may be adopted for an effective and sustainable system:
- m Typical values for municipal solid waste generation should be assumed as 0.4 kg including trade and animal wastes.
- m Average density of garbage to be taken as 475 kg/m³
- m Portable metallic containers of 50 kg are recommended for small streets whereas large waste collection (intermediate disposal points) should be constructed on main roads where tractor trolleys can easily be accessible.
- m Recruitment of new staff to handle MSW and capacity building

6.3. Electricity

Lack of electricity is main issue of all urban settlements of NA. As due to human and financial constraints it is not possible for GoP to initiate mega projects immediately therefore short-term recommendations may be adopted for an effective and efficient use of the current production.

6.3.1. Short-term

- m Construction of storage reservoirs to manage water shortage problems in winter.
- m Fixing of transformers at ward of Mohall levels to control line losses and effective shade dings. In addition to this overloading may be controlled by fixing circuit breakdown switches so that in peak winter and summer seasons problems associated with overloading could be controlled.
- m To replace low power line with HTV to control line losses.
- m To separate commercial and residential tariffs
- m To ensure collection of tariffs well in time
- m Selection of new potential sites for power generation
- m Identification of potential villages to initiate community based hydro power systems

6.3.2. Long-term

- m Construction of mega dams to meet the future demand of electricity in NA.
- m Execution of community based hydro power systems
- m Capacity building programmes for technical staff

6.4. Roads and Traffic

The following recommendations may be adopted for future development plans, however it may be emphasized here that no positive results in the traffic flow conditions can be achieved unless the enforcement aspects is given due reorganization and the projects identified are implemented accordingly:

- m Proposals for road improvement in all urban settlements should be prepared according to future needs.
- m Control haphazard on-street parking by taking appropriate actions such as by ;
- m Provision separate lanes for on-street parking
- m Acquiring off-street parking areas at convenient/suitable locations
- m Introduction of parking charges on important traffic corridors
- m Induction of fines/penalties to check haphazard parking

- m Developing a policy that every prospective builder is required to provide parking spaces within the premises as per standards
- m Proposals for construction of new roads/link roads and bridges
- m Rights of way for new roads must be calculated according to future needs where as for old roads rights of way should be acquired immediately.
- m Development activities in all urban settlements of NA must be controlled as defined in town planning in order to increase rights of way.
- m Existing bus/truck terminal should be shifted outside of the urban settlements, where as in new development plans this option should be part of urban development programme.
- m All automobile workshops and small scale industries must be shifted out of the urban settlements as well.
- m Encroachments in all urban settlements should be removed immediately

6.5. Government Service Infrastructure

Based on the current situation and lack of coordination among various government and non government organizations working for development programmes, it is imperative to either develop synergy among various departments or to establish a development authority in each urban settlement responsible for urban planning and development. In addition to this these urban development authorities may play an important and responsible role as basic service provider i.e. building and construction, service utilities of all kinds etc. the benefits of establishing local and regional development authority would be as follows:

- m Job opportunities at local and regional level
- m Easy to identify, execute, monitor and control the urban development plans as per specified rule and regulations on need and right bases
- m Effective use of available funds at local and regional levels
- m Internal and external coordination may be enhance
- m Further more following recommendation may be useful for proactive involvement of various government and non-government organizations active in development of NA.

6.5.1. Planning and Development Department (P&DD)

It is envisaged that after PEPA's role in NA will confirmed than hopefully P&DD's Environment Section will make environmental assessment of every project as a compulsory part of PC-1. However, still there is need to think about having a separate regulatory authority that will be responsible for implementing the specified rules and regulations.

6.5.2. Northern Areas Public Works Department (NAPWD)

NAPWD, may contribute towards improvement of urban environment by making it compulsory that all micro-projects must have IEE and mega project must appear with EIA by a recognized institution. Similarly, NAPWD can provide technical assistance or guidance to other institutions such as municipal committees and district councils. In addition to this another significant contribution may be done on the capacity building of their staff especially those who are dealing water supply and sanitation projects so that issues regarding water and electricity might be addressed properly.

6.5.3. Local Bodies and Rural Development Department (LB&RDD)

LB&RDD is the main player active in rural development, main areas of interventions includes construction schools, link-roads, irrigation channels, water storage tanks and provision of water supply and sanitation facilities to rural communities of NA. A water and sanitation inventory conducted by WSHHSP in 1995 revealed that 80% of water supply schemes completed by LB&RDD are malfunctioning or quite out of order. However if the continuity and quality of In my opinion LB&RDD can not only play a significant role in improving the environmental conditions of the rural areas but as well as a significant impact urban environs can also be achieved by assisting the municipal committees and districts councils by providing necessary resources i.e. both technical and financial.

6.5.4. Department of Health

Keeping in view the existing scenario of environmental impact on health and society it is necessary to involve health department as in IG/RT and later on in steering committees to improve the quality of life generally and in particularly present health and hygiene behaviours of the communities in NA. LHVs, CHWs, and health houses staff could be used to create awareness raising campaigns and for motivation of target community for effective use of service utilities.

6.5.5. Department of Education

Education Department is almost functional in all districts of NA. Environmental education component of IUCN have already done an excellent job in this sector, however it is necessary to identify some members from education department for Urban Environment IG group, because teachers can play an important role in influencing the behaviours of school going children which are the most vulnerable group for environmental diseases. Various programmes at international, national and in northern areas revealed that children can be used as an effective tool not only for improving the existing environmental conditions but as well as they found to be key actors in improving the personal hygiene of their parents, peers and siblings. Education department can play vital role in influencing the existing behaviours of school children that not only improve the environment of the schools itself but as well as children can disseminate and implement these at their homes, village and towns.

6.5.6. Forest Department

In context of urban environment their role can not be neglected. For instance they can work as primary actors in tree plantation in urban areas by involving local NGOs on roadsides and as well as with the close consultation with P&DD some green areas can be develop which definitely improve the urban environment. IUCN can assist in design and identification of potential NGOs for taking care of plantations campaigns.

6.5.7. Agriculture Department

Agriculture Department is also have branches in all districts of NA. They can play an important role in improving the existing environmental situation of the area. For instance the impact of chemical used in pesticides and chemical fertilizers have carcinogenic effects, and are the potential sources of water and soil contamination.

Farmers in NA usually prefer to use chemical fertilizers and pesticides to get enormous quantity and better quality of crops and fruits. Similarly use of human and animal excreta as a manure is a common practice in Hunza, Nagar, and Baltistan valley. All afore mentioned practices lead to ill health and also effects on the socio-economical conditions of the communities. Agriculture department can use its resources to create awareness on the proper use of chemicals and un-compost fertilizers and its hazardous health effects.

6.5.8. Animal Husbandry Department

What should be the role of animal husbandry and its line departments in improving the urban environment? To my understanding they can play a vital role in reducing the diseases and aesthetic problems associated with live stock slaughtering in the town. Similarly currently there is no any systems for checking of animals before slaughtering. If we consider catchment area of the existing water delivery complexes of Gilgit town the situation is alarming since all waste water from the agricultural fields is ingress in the feeding channels used as a source of drinking water supply for the whole city. According to a survey conducted by WASEP lead levels at the point ingestions were found to five times high as per WHO recommendations.

6.6. Private Sector

Private sector is active in multiple kinds of business activities that include transport agencies, automobile workshops, hotel industries, general trade, import, export, tourism and contraction companies/societies. Among these hotels, transport and automobile workshops are the major contributor for enhancing the urban environmental problems by generating enormous amount of solid and liquid waste. NACC&I is the important institution that can play a vital role in sensitisation of these particular sectors to encompass environmental issues by carrying out IEE report before project submission. In addition to this private sector could be involved in water supply, solid waste management, health and education sectors.

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