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Projecting the Implication of Rapid Urban Population Growth on Urban Facilities in Amhara Region: An Application of SPECTRUM Model

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Abstract
In recent times, the world is rapidly becoming urban. Such rapid urban expansion is particularly notable in Africa and Asia. Ethiopia is characterized by rapid rate of urbanization, but low proportion of urban population. Despite this, it has recorded a relatively high growth rate of urban population. However, such high growth rate is not often accompanied by the development in socio-economic infrastructure, economic and employment capacity of the urban centers to support the growing urban population. Amhara region is one of the least-urbanized regions in Ethiopia. The majority of living quarters in most cities and towns of the region are nothing more than slums. Urban infrastructures are already seriously overtaxed by the burgeoning population and providing adequate housing, water, sewerage, electricity, and other services will only become more difficult as the population living in cities continues to grow. Thus, accurate, consistent and timely projected data on urban population growth and its implication is a key input to better assess the current and future needs with respect to urban growth and to set policy priorities to promote inclusive and equitable urban development. Thus, this study aims to project and raise awareness about the implication of rapid urban population growth on urban development in Amhara region using RAPID Module in the SPECTRUM Model from 2007 to 2037 based on hypothetical assumptions. The study employed secondary data sources. For the sake of convenience, an attempt has been made to project the social and economic consequences of high fertility and rapid population growth on urban development in Amhara region using RAPID Module. The data were analyzed using SPECTRUM Suit 4 Model. Two different population scenarios were assumed using a demographic projection tool. Using RAPID module; the total urban population, number of population in major cities, annual new urban household growth and trends of urban youth growth in urban centers were projected from 2007-2037. The result revealed the proportion of people resides in urban area of Amhara region will be increasing. As a result urban facilities will be overstretched, health manpower resources will become inadequate and the situation seems to deteriorate despite genuine efforts to mitigate the extenuating circumstances. Crowded urban neighborhoods, combined with poor sanitary conditions and inadequate waste removal, create situations favorable to the spread of infectious diseases. Furthermore, housing shortage will be a serious concern in Amhara region urban areas. The housing problem will not be confined to low-income groups but also acute among the medium income groups. The projection result suggests that the urban population would grow at a higher rate in the region. Such rapid urbanization can also fail to sustain healthy urban populations when it outstrips with basic services. Thus, Amhara region has to make advance preparations to deal with the basic needs of its growing urban population in terms of jobs and housing as well as education, water, energy and health services. Moreover, the government should also create an enabling environment for inclusive local economic development that will create jobs and employment opportunities to the youth, among others.
Keywords: Urban; Urbanization; RAPID; SPECTRUM; Projection.

1. Background of the Problem

In recent times, the world is rapidly becoming urban (Weeks, 2008; UN-HABITAT, 2011). Consider that as recently as 1850 only 2 percent of the entire population of the world lived in cities of 100,000 or more people. By 1900, that figure had edged up to 6 percent, and it had risen to 16 percent by 1950 (Davis, 1972b). So for most of human history almost no one had lived in a city - cities were small islands in a sea of rurality (Weeks, 2008). But, within just one century, from 1850 to 1950, cities had pulled in one of every six human beings, and a short 50 years after that, in the year 2000, very nearly half the population was living in an urban place. By the middle of this century, that fraction will probably increase to two-thirds of all people living in urban areas (United Nations Population Division, 2006b). This unprecedented demographic change creates a more urbanized global population for the first time since 2008 more than half of human population i.e., 3.3 billion people live in urban areas. Such rapid urban expansion is particularly notable in Africa and Asia where the urban population will be expected to be increased by two fold between 2000 and 2030 (UN-HABITAT, 2010 and Angel *et al*., 2011).

Urbanization, according to Henderson, J.V., and Wang, H.G. (2004), is the increase in the percentage of the national population that is urbanized, and is the process whereby large number of people congregate and settle in an area such as government and businesses in order to support themselves (Oluwasola, 2007), is widely and increasingly accepted as an inevitable phenomenon. It is the outcome of demographic, social, economic and political developments that lead to urban concentration and growth of large cities, changes in land use and transformation from rural to metropolitan pattern of organization and governance (Weeks, 2008).

The magnitude of urbanization, however, differs in developed and developing nations. A UN Habitat estimate show that more than 82% of the recent urban population growth (UN Habitat, 2012b) and more than 70% of the world mega cities with populations larger than one million are found in developing countries (Cohen, 2006). According to Benhart *et al*. (2004) Asia and Africa are known for fast urbanized countries in the world. Similarly, according to population revision of United Nations (2012), half of the population of Africa is likely to reach at 50% urbanization rate by 2035. The key contributing factors for rapid urban population growth in developing countries is mainly the movement of people from rural to urban areas (Gyabaah et al., 2006), natural increases of urban population (Potts, D., 2009) as well as the reclassification of rural communities to include as part of urban areas (Drescher and Laquinta, 2002; Redman and Jones, 2004; Beall and Fox, 2007).

Although cities command an increasingly dominant role in the global economy as centers of both production and consumption (World Bank, 2009 and Sanayal, 2011), rapid urban growth throughout the developing world is seriously outstripping the capacity of most cities to provide adequate services for the growing urban population (Teller and Assefa, 2010). Over the next 30 years, virtually all of the world's population growth is expected to be concentrated in urban areas of developing world (Cohen, 2006 and Thou, 2010). This rapid urban population growth has a major implication on land use pattern, energy and water consumption as well as socio-economic aspects on household consumption and inequality (Tegegne, 2002; G.D. Squires, 2002; Muggah, 2012).

Ethiopia is characterized by a low proportion of urban population, but rapid rate of urbanization compared to other countries in sub-Saharan Africa (UN-HABITAT, 2008; Teller and Assefa, 2010). The proportion of total population living in urban centers was 6 percent in 1960, 10.4% in 1980, 15% in 2000 and slightly more than 16% in 2007 (CSA, 2008, Selome and Assefa, 2010). Despite this, it has recorded a relatively high growth rate of urban population (4 percent annually) double that of rural areas (2.3 percent). However, such high growth rate is not often accompanied by the development in socio-economic services and infrastructure, and economic and employment capacity of the urban centers to support the growing urban population (CSA, 2010 and Teller and Assefa, 2010).

On the other hand, the number of urban centers increased by 7.4% per annum between 1967 and 1984 and by 6.7% between 1984 and 1994, while urban population increased by 5.1 and 5.8%, respectively. Urban centers with 50,000 or more inhabitants increased by 6.9% per year between 1967 and 1984, by 12.1% between 1984 and 1994, and by 5.8% between 1994 and 2007. There was no change in the number of localities with 100,000 or more inhabitants between 1967 and 1984 but between 1984 and 1994, it increased by 28.9% and between 1994 and 2007 by 5.1%. According to MUDHCo (2015a) the proportion of people currently living in cities are quickly changing with an urbanization rate of around 5 percent per year. This could mean that in 2035, 37 to 40% of the national population will be living in cities.

Despite the long history Amhara region, where this study is conducted, remains the least-urbanized region in Ethiopia. Only 12.3 percent of its population lives in urban areas (CSA, 2008). The majority of living quarters in most cities and towns of the region are nothing more than slums that have mushroomed overnight as people flocking to cities found it impossible to find descent accommodations upon arrival. A study made by Solomon and Ruth (2004) has characterized the city as …nothing but a gigantic slum interspersed with modern high-rise buildings and a few affluent neighborhoods. With the second most populous region in Ethiopia (CSA, 2008), Amhara region's low percentage of the urban population share is still high and represents a number far beyond its capacity to serve, educate, employ, feed, house, or entertain.

One of the visible sign of rapid urban population growth in Amhara region is the congestion apparent in all urban areas. The effect of urbanization is clearly evident in the regional capital city and other major urban centers of the region. Urban infrastructures are already seriously overtaxed by the burgeoning population, and providing adequate housing, sewerage, electricity, and other services will only become more difficult as the population living in cities continues to grow (Tegegne, 2002). Thus, accurate, consistent and timely projected data on the urban population growth and its consequence on urban development is a key input to better assess current and future needs with respect to urban growth and to set policy priorities to promote inclusive and equitable urban development. In order to systematically track the implication of rapid urban population growth on urban services, population projection is important. Population projection is a tool for packaging reliable data on the probable future size, structure and distribution of the population to inform decision-making, implementation, monitoring and evaluation of different development programmes (George, M.V, Stanley K., Swanson, D.A., 2004).

As the population continues to urbanize the question of access to basic infrastructure and the way urbanization interacts to these infrastructures generally becomes more critical (Paravaker, *et al*., 2010). However, as obvious as the case might appear, the multi-fold relationship between rapid population growth and urbanization still lacks a proper attention it deserves in both academic and policy environment. Considering the pattern of urbanization in Amhara region, the case is indisputably crucial. Thus, this study aims to project and raise awareness about the implication of rapid urban population growth on urban development in Amhara region using RAPID module in the Spectrum model from 2007 to 2037 based on hypothetical assumptions.

2. Methods and Materials

2.1 Description of the Study Area

The Amhara National Regional State is located in the North Western part of Ethiopia between 9°20' and 14°20' North latitude and 36° 20' and 40° 20' East longitude. Its land area is estimated at about 170,000 square kilometers (BoFED, 2008). The region is divided into 11 Zones, and 140 Weredas. Based on the 2007 census, the Amhara region has a population of 17,214,056 of whom 8,636,875 are men and 8,577,181 are women (CSA, 2008). With regard to spatial distribution, only around 12.3 percent of the population lives in urban areas (CSA, 2008 and CSA, 2010); this is a very low level of urbanization compared to the national average (16%). However, the rate of urbanization is quite high with an average growth rate of 3.94 percent per year.

2.2 Data Sources

In this study secondary data sources was used. The secondary data for demographic, economic and social parameters for the base year (refers to the period of 2007) were collected from: (a) Amhara Region Health Bureau and Federal Ministry of Health and Health Related Indicators (2007-2010), (b) Central Statistical Agency, Agricultural Sample Survey (2007-2010), (c) Population and Housing Census of Ethiopia (2007), (d) Amhara Region GTP (2010/11-2014/15), (e) Amhara Region Urban Development Bureau and other published and unpublished document: annual report, statistical abstract and so on.

2.3 Methods of Projection

Population projection can be done by any one of the several methods depending upon the wide variety of local situation represented and the difference in the type of data available. For the sake of convenience, in the present study an attempt has been made to project the social and economic consequences of high fertility and rapid population growth on urbanization and urban development in Amhara region using RAPID (Resources for the Awareness of Population Impacts on Development) module in the SPECTRUM model.

2.4 Data Analysis

The data were analyzed using SPECTRUM Suit 4 Model developed by Health Policy Project (Stover, J. and Kirmeryer, 2005). SPECTRUM is a window-based system of integrated policy model designed to produce information that is useful for policy formulation and dialogue within a framework easy to use computer programs (Stover, J. and Kirmeryer, 2005). SPECTRUM is an integration package based on DEMPROJ, which is used to create the population projections that support many of the calculations in the other components: FAMPLAN, RAPID, AIMS (Stover, J., 2005). Thus, in this study RAPID module in the SPECTRUM model was used for analysis.

2.5 Description about the Model

RAPID is one of the computer models contained in the SPECTRUM Suit Policy Models, designed by the Futures Group International for projecting social and economic indicators for country or region (Stover, J. 1997). It helps in-country stakeholders manipulate data to analyze different scenarios and encourage policy dialogue about the effect of population factors on socio-economic development (Stover, J., 2005).

RAPID projects the social and economic consequences of high fertility and rapid population growth for development sector such as urbanization. Hence, it is intended to provide projections up to 30 years and above that can stimulate policy formulation and dialogue about the importance of population factors to urban development (Stover, J. 1997 and Stover, J., 2005).

2.6 Model Assumption

Two different population scenarios were assumed using a demographic projection tool in a computer model called SPECTRUM. Using RAPID module in the SPECTRUM model; the total urban population, number of population in major cities, annual new urban household growth and trends of urban youth growth in urban centers were projected in the next 30 years (2007-2037) under the two different growth scenarios.

3. Result and Discussion

Human development and improvement in quality of life are the ultimate objectives of all planning. Planning takes into account the resources required for human development and human resources available for carrying out the plan (Charles, H., 1981; Sorensen, A., 2001). Population projection, is a scientific attempt to peep into the future population scenario, has useful role as a tool to plan and design the crucial infrastructure service in urban area without which urbanization and urban development cannot be turned into an opportunity to ascertain improved in economic conditions at an optimized cost of larger investments (Parvaker, S., Ranjan, K.D. and Geethanjali, N., 2010).

As discussed in the methodology section the projection and analysis in this study is based on the data collected and entered in the model. Hence, RAPID, a computer projection model, was used to make urban population projection. The projection starts in 2007 (the most recent census period) and ends in 2037 (by this time the region will assume a third of its population reside in urban area; TFR will continue to decline and the region will assume to reach middle income category).

Figure 1 presents the total urban population projection of Amhara region (2007-2037). The projection result revealed under high fertility declining scenario, Amhara region's urban population is projected to increase from 2.4 million in 2007 to 9.1 million in 2037 as shown in Figure 1, an increase of about 7 million which is about 4 times the 2007 census urban population number. In the same way, under low fertility declining scenario, Amhara region's urban population is projected to increase from 2.4 million in 2007 to 8.2 million in 2037 as presented in Figure 1, an increase of about 6 million people which almost three times the urban population number of the 2007 census.

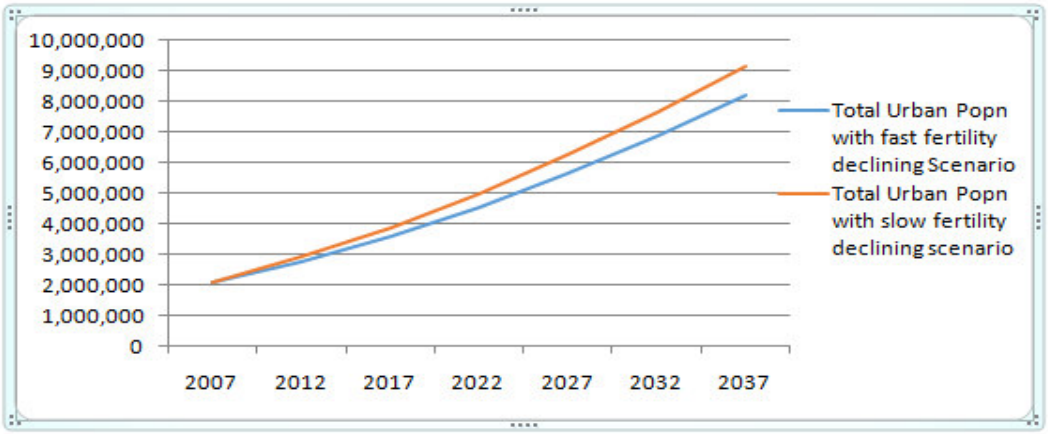

Figure 1- Total Urban Population of Amhara Region with the two scenarios

From the result one can notice that the proportion of people reside in urban area of the region is increasing because urban border has been extending regularly through migration, sub-urbanization and introduction of newly formed satellite cities. As King (2008) clearly stated cities are now becoming the center point for information, media, film production, entertainment, education, government etc. all of these together made the cities in many ways attractive for inhabitants. This is the reality in Amhara region urban centers. Hence, as the population resides in urban area increases the region will gain a lot: industries will benefit from concentration of suppliers and consumers and allow savings in communications and transport costs, cities serve as commercial, administrative, and growth centers and are generally places for production and consumption of goods and services.

In contrast, studies (Meheret, 1999 and Nazem, 2001) revealed that the increase magnitude of the urban population will exacerbate the already poor living conditions for low-income populations and people in urban slums, who face overcrowding, inadequate shelter, lack of clean drinking water and adequate sanitation, and increased vulnerability to exploitation and abuse. Without these important services, the urban population's health and well-being will suffer, creating undesirable health outcomes, social unrest and large sub-groups of vulnerable/marginalized urbanites.

Figure 2 shows the projected population of major cities in Amhara region (2007-2037). The result revealed an increasing tendency of population in major cities of the region. As indicated in Figure 2, the annual change rate of the population in major cities in the next thirty years period will be very high in both fast and slow declining scenario. If one would like to maintain for the new comers at least the same standards of living of the already existing population, this means that all the resources - financial, economic, administrative, and managerial - should increase at the same rate to face a so high change rate. The challenge is to accommodate in the urban areas an additional number of about 100 thousand people on average a year along a thirty year period. In only thirty years, the population of major urban centers of the region will be multiplied 4 times. A very rapid and intense growth of population of major cities in the region requires an enormous amount of resources

necessary for housing, service, jobs, infrastructure, environmental protection, and more in general for economic development.

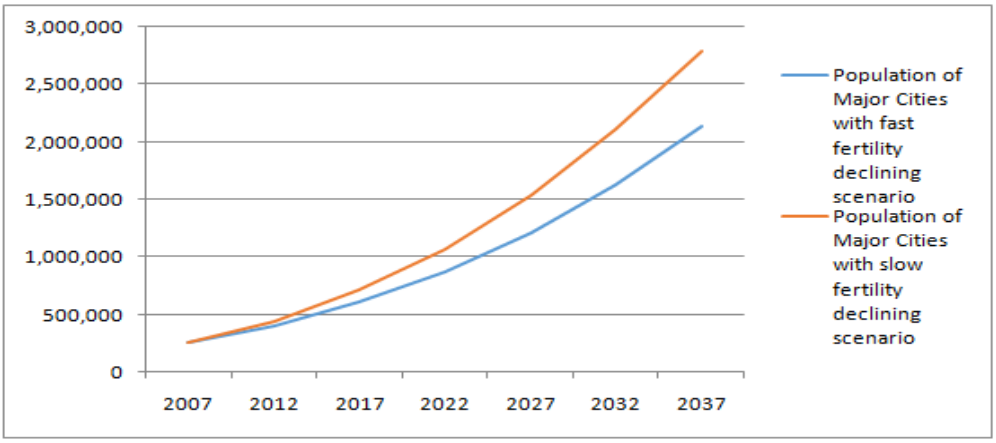

Figure 2: Population of Major Cities in Amhara region with the two scenarios

It can be seen in the figure that as the number of population in major cities increased, it will have a number of implications on urban infrastructure. Transport service, for instance, is considered as an indicator of the level of urbanization and urban development. Transport creates a favorable condition for transaction, exchange, knowledge transfer and economic efficiency. On the other hand, congestion, traffic accidents, pollution, and access problems have been the critical challenges of transport and traffic management sector throughout urban areas. This puts transport planner and traffic management on top of an urban development agenda in the coming 30 years and require appropriate intervention by the regional government.

Additionally, as the urban populace grows facilities are overstretched health manpower resources become inadequate and the situation seems to deteriorate despite genuine efforts to mitigate the extenuating circumstances. Since, urbanization is associated with changes in diet and exercise that increase the prevalence of obesity with increased risks of diabetes and cardiovascular disease. Crowded urban neighborhoods, combined with poor sanitary conditions and inadequate waste removal, create situations favorable to the spread of infectious diseases: pneumonia, HIV/AIDS, tuberculosis and diarrhea.

Furthermore, housing shortage is a consequence of urbanization. According to UN-HABITAT (2005), Africa is the most rapidly urbanizing yet economically poorest region of the world, almost every country experiences housing shortage. Ghana, for instance, had an annual housing deficit of about 400,000 units in 2002 while the annual requirement for new dwellings in Ethiopia is estimated to be between 73,000 and 151,000 housing units (UN-HABITAT, 2005). This is also true in Amhara region urban areas. The housing problem is not confined to low-income groups but is also acute among the medium income groups which are mainly caused by severe poverty in the growing urban centers. This means that without interventions to improve housing supply to the urban area, the housing situation in the urban area would considerably worsen in the coming years unless serious effort will be made by the regional government. The present finding is consistent with UN-HABITAT (2003) and (2005) report that as country or region most urbanized housing shortage could be a reality.

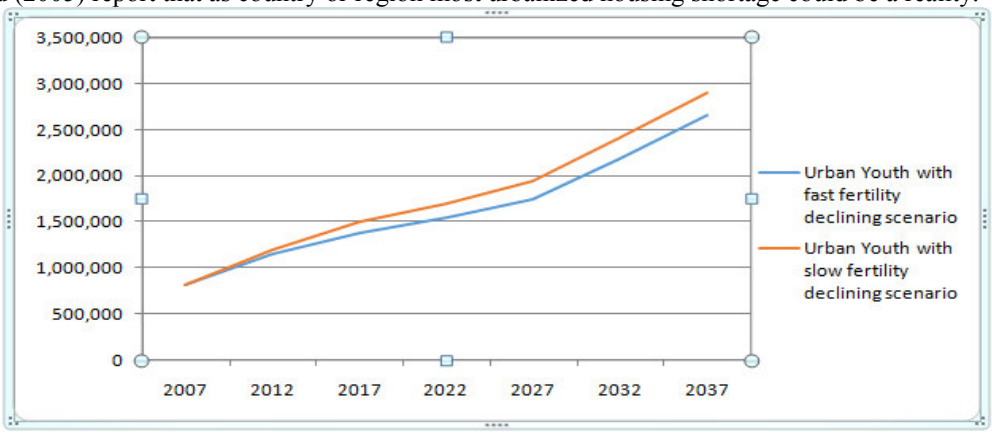

Figure 3 Urban Youth Growth in Amhara Region with the two scenarios

Figure 3 presents the projected urban youth in urban areas of Amhara region (2007-2037). As shown in Figure 3, the urban youth population is expected to increase from 821,568 in 2007 to 2.6 million and 2.9 million, respectively according to fast and slow fertility declining scenario, respectively by the year 2037, a difference of nearly 300,000 fewer urban youths. Currently, youth unemployment is a serious concern in urban areas of the

region due to rural-urban migration (Tegegne, 2002), the mis-match between the demand for and supply of labor, the low entrepreneurial capacity of the youth (Getnet, 2001), the growth and job creation performance of the economy (EEA, 2005/2006), and the growing youth labor force in need of government employment (Serneels, 2004). As a group in transition to adulthood, multi-dimensional and integrated support should be provided to the youth encompassing their education, employment, health and civic engagement, which is also stated in the Ethiopian Youth Policy (FDRE, 2004). Thus, youth are the region's greatest asset to benefit from the region's demographic dividend for the present and future. But, they also represent a group with serious vulnerabilities unless serious attention will be taken into consideration by planners and decision makers in the future period.

Figure 4 presents annual new urban households in Amhara region (2007-2037). As shown in the figure under high fertility declining scenario, the annual number of new urban houses required - assuming there are 3 persons per household - is projected to grow more rapidly. The projections suggest that the annual new urban households would grow at a higher rate and government has to make advance preparations to deal with the basic needs of its growing new urban households in terms of jobs and housing as well as education and health services.

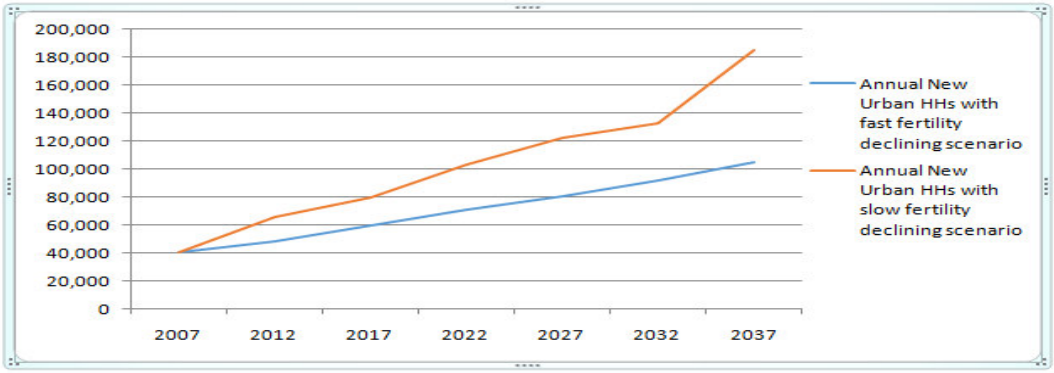

Figure 4 Annual New Urban Household Growth with the two scenarios (2007-2037)

4. Conclusions and Policy Implication

Amhara region remains a predominantly rural. Nonetheless, the cities and towns in the region continue to grow in size and as a proportion of the overall population because of natural increase and migration from the countryside to the urban areas. Rapid pace of urbanization in conjunction with the associated urban problems: youth unemployment, poverty, inadequate health facilities, housing problems, water problems, poor sanitation, urban slums and poor infrastructure facilities pose a formidable challenge in urban areas.

The projection result suggests that the urban population would grow at a higher rate in Amhara region. Amhara region has to make advance preparations to deal with the basic needs of its growing urban population in terms of jobs and housing as well as education and health services. For example the current (2007) urban population of about 2.4 million is expected to grow to about 9.1 million in 2037. This would mean that there would be close to 7 million additional urban populations by 2037. Taking into account the projected population about 2.9 and 2.6 million additional youth population is expected by 2037, which translates into higher demand for jobs and basic social services. Therefore, the government should create an enabling environment for inclusive local economic development that will create jobs and employment opportunities to the youth, among others. Failure to achieve these will result in exposure of the youth to social problems such as juvenile delinquency, drug addiction and violent crime as well as forced engagement in commercial sex or desperate migration.

In terms of households, there will be close to 105,311 and 184,568 additional new urban household for which 105,311 and 184,568 housing units will be required in the coming periods with slow and fast fertility declining scenario assuming a one to one household-housing unit ratio, even without including current backlogs in housing supply. Failure to address the future demand of housing unit will result in proliferation of informal settlement and of congested slum settlements.

Rapid urbanization and urban population growth could severely limit development if it is not managed in such a way that supports economic development and buttresses social welfare improvements. Indeed excessively rapid urbanization could out-strip the region's capacity and capability to manage the process of urbanization if appropriate actions are not taken in a timely manner. New tools will be necessary in order to deal with the challenges of rapid urbanization. Meeting these challenges will necessitate enhanced cooperation amongst different levels of government, and between urban government administrations.

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