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## **Infrastructure Sector: Abridged Version by: Gilbert Llanto**

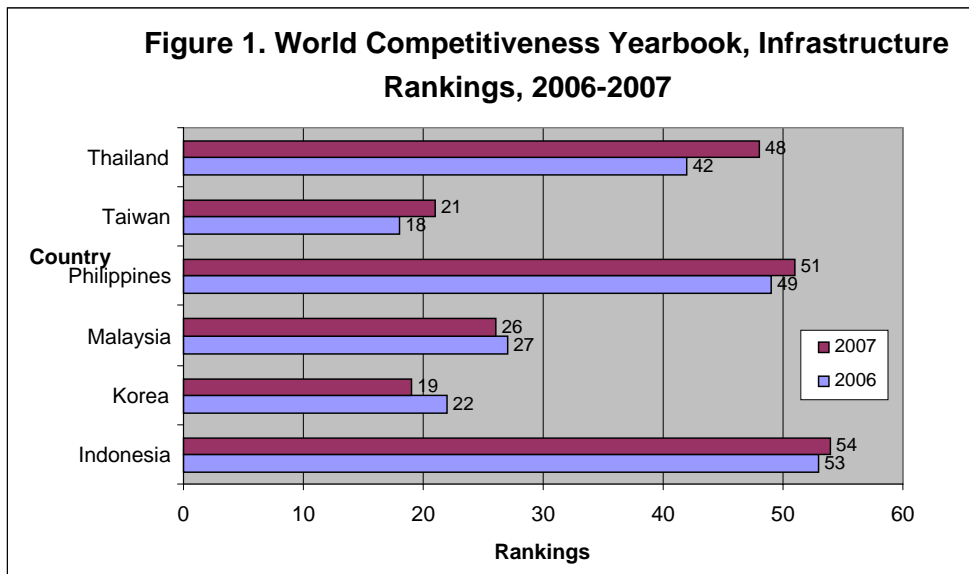
### **A. Introduction**

The importance of infrastructure for developing countries cannot be understated as it is considered a major driver for growth and poverty reduction. The lack of adequate transportation, water and energy facilities, for instance, can adversely affect the development of existing industries and may likewise preclude new entrants from coming in. An efficient transportation and communication infrastructure provides overall mobility for goods and people alike, contributes to a reduction of input and transactions costs and enhances the efficiency of markets. Local infrastructure which may have significant spillover effects spurs local economic activities while the network characteristics of infrastructure enhances connectivity of regions and promotes domestic integration. The key role of infrastructure in economic growth can not be ignored. A recent joint study by the World Bank, the Asian Development Bank and the Japan Bank for International Cooperation (2005) substantiates the decisive role that infrastructure has played in growth and poverty reduction in East Asia and the Pacific.

This section takes off from Chapter 2 where the preliminary application of the growth diagnostic framework points to the possibility that the inadequacies in infrastructure may be one of several factors constraining growth in the economy. To the extent that poor infrastructure could be shown as a binding constraint to economic growth, the section would analyze specific factors responsible for the lack of infrastructure and then provide policy recommendations to help overcome those constraining factors. This section attempts to provide an empirical basis for the often-claimed key role of infrastructure in fostering economic growth in popular discourse. Thus, it investigates whether or not poor infrastructure acts as a binding constraint to economic growth. The basis for the popular claim that infrastructure matters to economic growth seems to be anecdotal and based more on conviction than on empirical analysis. Given the current enthusiasm for evidence-based policy making, the empirical analysis of this section assumes a particular relevance. After a brief introduction, section B provides a brief review of the theory and evidence on the impact of infrastructure on economic growth, which helps to shape our understanding of the relevant questions in relation to the link between infrastructure and growth. Section C reports the results of the empirical tests and draws out the policy implications of those results. Section D provides concluding comments and submits some policy recommendations.

Infrastructure in the country has not kept pace with the requirements of a growing economy, the increase in population and urbanization. The Philippines has not provided infrastructure that is sufficient in quantity and quality to meet global economic challenges as well as poverty reduction goals under such international commitments as the Millennium Development Goals. Both the Asian Development Bank and the World Bank have noted the negative impact of low quality infrastructure on the Philippines' global competitiveness. In 2003–04, the World Economic Forum ranked the Philippines 66th out of 102 countries on its growth competitiveness index, partly because of the poor state of Philippine infrastructure

(World Economic Forum 2004). In terms of overall infrastructure quality<sup>1</sup>, the Philippines ranked 88<sup>th</sup> (out of 125 countries) in the 2006 Global Competitiveness Index<sup>2</sup>, slightly improving from 89<sup>th</sup> rank in 2004. In terms of adequacy of infrastructure<sup>3</sup>, the Philippines slid to 51<sup>st</sup> in 2007 (out of 61 countries) from 49<sup>th</sup> in 2006 according to the 2007 World Competitiveness Yearbook<sup>4</sup>. Please see Figure 1 below. Among the ASEAN countries, however, the Philippines is not far behind Thailand (46<sup>th</sup>, 2007) and slightly ahead of Indonesia (54<sup>th</sup>, 2007). The state of infrastructure in a given country is one key determinant of its competitiveness ranking.



Rapid urbanization has swelled the ranks of the urban poor and has created a tremendous demand for housing and social services, secured land tenure and serviced land, which to a great extent has remained unsatisfied<sup>5</sup>. Access to social services such as water supply and sanitation and solid waste management is on a decline both in terms of coverage and quality. The deteriorating coverage and lack of quality of infrastructure and service delivery have been widely considered as an impediment to growth and poverty reduction.

Since the 1997 Asian financial crisis, infrastructure investment has dropped from a peak of 8.5% of gross domestic product (GDP) in 1998 to only 2.8% of GDP in 2002. In this regard, the donor community has advised the Philippine government to increase infrastructure

<sup>1</sup> Overall infrastructure quality is measured in terms of Railroad infrastructure development, Quality of port infrastructure, Quality of air transport infrastructure, Quality of electricity supply and telephone lines.

<sup>2</sup> World Economic Forum, "Global Competitiveness Report", 2006

<sup>3</sup> Adequacy of infrastructure is measured in terms of the extent to which basic, technological, scientific and human infrastructure resources meet the needs of business.

<sup>4</sup> International Institute for Management Development (IMD), "World Competitiveness Yearbook, 2007"

<sup>5</sup> The Housing and Urban Development Coordinating Council (HUDCC) estimates that Philippine population is projected to increase from 80 million in 2002 to 98.2 million by 2015. The country has one of the highest urbanization growth rates in the world with an average urbanization growth rate of 5.1% between 1960 and 1995. More than half of the population is in urban areas and this proportion is expected to reach 60% by 2010 if current trends continue. While official data indicate that only about 20% of the 7.5 million urban households fall below the poverty income line (Pesos 13,915 per capita per year as of 2001), the poverty income line alone does not capture the dire situation of informal settlers (Llanto 2007).

investments to at least 5% of GDP, the average infrastructure investment norm of her neighboring countries in the past decade. The government has recognized the constraining effect of poor infrastructure on economic growth and development and has prioritized the removal of this serious bottleneck. The Medium Term Philippine Development Plan (2004-2010) provided broad strategies and identified key infrastructure that have to be completed or provided by the end of the Plan period. It stressed the importance of connectivity of an archipelagic economy by good transport and communications network. The connectivity provided by good infrastructure facilities is expected to open new economic opportunities, reduce transportation and transaction costs of business, and increase access to social services. The interconnection will also strengthen the socioeconomic, cultural and political linkages between and among regions. Eventually, connectivity will decentralize progress and bring development to the countryside.

## **B. Links between Infrastructure and Economic Growth<sup>6</sup>**

A diagnostic approach to economic growth identifies a narrow range of factors believed to constrain growth and provides a means of ordering policy priorities given scarce political capital for reform. Economists who give policy advice to developing countries often encounter problems in ranking by order of priority the policy reforms that matter most for growth. It is recognized that a wide ranging policy reform program may have a smaller likelihood of success than a more focused and nuanced policy reform strategy. A growth diagnostics framework applied to the Philippine economy has identified weak infrastructure as a constraint to growth and poverty reduction.

A review of recent literature shows the strong link between infrastructure and economic growth. Empirical studies testing the public capital hypothesis indicated that infrastructure has a positive and significant impact on growth and productivity. A pioneering study by Aschauer (1989) argued that the general decline in productivity growth in the United States may be due to a reduction in public capital investments. Those early studies triggered a flurry of empirical tests on the link between infrastructure and economic growth that used various econometric models and estimation techniques, e.g., fixed and random state effects, and different approaches to data measurement, and introduced other variables other than infrastructure variables believed to impact on growth. Summarizing the results of various estimates, Gramlich (1994) and Sturm and De Haan (1995) found output elasticities with respect to public capital of around 0.3. Other economists criticized that the estimated output elasticities were implausibly high<sup>7</sup>. Wang (2002)'s estimates for seven East Asian countries for the period 1979-1998 indicated an average elasticity of 0.2% of private production to a 1% increase in public capital.

A different view was that while there is a definite link between infrastructure investment and economic growth, the causality in either direction has not been established. Thus, physical infrastructure can be regarded as form of "complementary capital" that requires the existence of available productive capital (whether physical or human) for investment (and innovation) in order to realize the economic growth potential. Infrastructure in itself can only develop, not create economic potential but only where appropriate conditions exist (O'Fallon 2003).

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<sup>6</sup> A longer and more technical version of this paper provides a brief review of the theory and evidence on the impact of infrastructure on economic growth and reports in detail the results of empirical tests conducted by the author.

<sup>7</sup> Sturm, Jacobs and Groote (1999) mentioned the criticisms of Aaron (1990), Hulten and Schwab (1991) and Munnell (1992).

Notwithstanding the lively debate among different researchers on the link between infrastructure and growth, the preponderance of empirical evidence shows that inadequate supply of infrastructure or unreliability of infrastructure services may constrain investments of productive capital and lead to a restriction or reduction of output. There are too many pieces of evidence supporting the significant impacts of infrastructure on productivity and growth that are difficult to ignore (Rodriguez, 2006)<sup>8</sup>. Researchers investigating what type of public capital would have a significant impact on growth found that public transport, telecommunications and electricity generation were positively correlated with growth. The majority of studies trying to establish a linkage between (public) investments or capital and economic growth indicate that (a) public capital is complementary and promotes private capital formation, (b) core infrastructure such as roads and railways, tend to have the most impact on productivity, and (c) the direction of causation is from public capital to productivity and not the other way around (Infrastructure Canada, 2007). An interesting observation is that infrastructure investments may also be defended on equity grounds because interregional infrastructure increases the accessibility of peripheral regions and raises their level of competitiveness. This could help stop the process of regional divergence (Rosik, 2006)<sup>9</sup>. On balance, empirical evidence shows infrastructure provision as having a significant impact on living standards and productivity.

### **C. Empirical findings and policy implications**

This sub-section reports empirical findings on the questions motivated by the literature on the link between infrastructure and growth and essays a few policy implications.<sup>10</sup>

1. *Is infrastructure a significant determinant of economic growth?* This is the public capital hypothesis which says that higher infrastructure investment will lead to higher growth in the economy. Granger causality tests were first used to establish whether or not public infrastructure capital has a link or impact to economic growth and productivity. A Cobb-Douglas production function model with real GDP as a left-hand side variable and various types of infrastructure as right-hand side variables was then estimated. Various statistical tests were done to determine the impact of aggregate public infrastructure investments on the level and on the growth of real GDP<sup>11</sup>.

Pair-wise Granger causality tests rejected the null hypothesis that infrastructure does not Granger-cause growth. There is bi-directional causality but the direction running from infrastructure to economic growth showed a higher level of significance. The empirical results of a production function model using time series data provide supporting evidence to a positive relationship between public infrastructure capital and economic growth. Empirical tests using various measures of infrastructure capital, such as national government and local government infrastructure expenditure, and local government and national government budgetary outlay for infrastructure showed a significant relationship between these infrastructure variables and

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<sup>8</sup> According to Rodriguez, “there are good reasons to read the empirical evidence as showing that public infrastructure provision enters positively in the production function” (ibid.)

<sup>9</sup> Rosik, Piotr. 2007. Transport Infrastructure, Public Capital and Regional Policy – Review of Studies”. International Conference Shaping EU Regional Policy: Economic Social and Political Pressures. Leuven, Belgium. <http://www.regional-studies-assoc.ac.uk/events/leuven06/Rosik.pdf>

<sup>10</sup> Severe data constraints limit the extent of empirical testing that may be practicable. Availability of better data will expand the scope of empirical tests that may be done in the future.

<sup>11</sup> The tests used varying specifications and data measurement. The tests are done at growth at the aggregative level (real GDP), gross regional domestic product (GRDP) and different measures of infrastructure investments,

economic growth. Of particular interest is the significant impact of the capital utilization variable. Both public infrastructure capital and capacity utilization are important determinants of economic growth or output. The regression results showed that while there is a positive and significant link between output and infrastructure (electricity and telecommunications), it is the way the stock of capital (which includes infrastructure) has been utilized that would have a more significant impact on output. It is conceivable that high capacity utilization is correlated with high growth in output.

The results of the empirical tests confirm earlier research findings indicating that poor infrastructure and the lack of infrastructure investment have constrained growth (Llanto 2004). Reviewing the past 25 years of infrastructure development in the country, Llanto indicated that amid globalization the Philippines is failing to make substantial investments in transport, ports and shipping and communications, thereby weakening its ability to compete on a global basis. The World Bank has drawn attention to the country's poor or inadequate infrastructure, saying that "infrastructure deployment has not kept up with high population growth and rapid urbanization, with serious consequences for the country's competitiveness and in particular for its growth and poverty reduction targets..."<sup>12</sup> In sum, empirical results using both a production function approach and Granger-causality tests show the robust relationship between economic growth and infrastructure<sup>13</sup>.

2. *What is the impact of infrastructure on regional growth?* Regions with high infrastructure investments tend to have higher economic growth while regions with low infrastructure investments tend to have lower economic growth as shown by Reyes (2002), Manasan and Chatterjee (2003), Manasan and Mercado (1999), Basilio and Gundaya (1997). Reyes (2002) confirms that the regions with the lowest GRDP are also those suffering from the most severe lack of basic infrastructure. The country's richest region, the National Capital Region have access to potable water, electricity, sanitary toilet facilities and road infrastructure that is above the national average. The second-richest region, Calabarzon in Southern Tagalog,<sup>1</sup> also have above-average access to basic infrastructure, as do the third-richest region, Central Luzon. The country's poorest regions in terms of contribution to GRDP – Caraga (composed of Agusan and Surigao provinces), Cagayan Valley, Western Mindanao and the Autonomous Region in Muslim Mindanao (ARMM) – also have the least access to basic infrastructure.

Empirical tests by Llanto (2007) showed that infrastructure has a positive and significant effect on regional growth (incomes). Regional incomes also tend to increase with higher rates of participation in secondary education. The tests show that regional incomes tend to increase with an increase in the quality of road infrastructure, holding the education variable constant. The results of testing for the effects of road density are insignificant, implying perhaps that regional growth is dependent not only on the *availability* of roads but also on the *quality* of the road network<sup>14</sup>. These findings are consistent with those of other researchers. The lack of access to adequate infrastructure services and the different levels of infrastructure development have led to differences in regional growth in the Philippines (Lamberte, Alburo and Patalinghug 1993;

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<sup>12</sup> World Bank (2005)

<sup>13</sup> These results are consistent with the findings of other studies reported in the brief review of the literature.

<sup>14</sup> Ertekin, Berechman and Ozbay (2003) examined the impact of accessibility changes on the level of economic development in 18 counties in New Jersey/New York for the decade 1990-2000. They reported that "our model clearly shows that the economic growth is a function of accessibility among other things, which is related to the transportation system performance measured in terms of travel times (page 21)." More specifically, they observed that "accessibility is found to have considerable impact on employment growth and total earnings growth value (page 21)."

Basilio and Gundaya 1997). Empirical work by Manasan and Chatterjee (2003) using total net shift (TNS) analysis for 14 regions in the period 1987-2000 indicates a strong correlation between TNS values and access to infrastructure services.

Llanto (2007) observed that investing in road improvements and the construction of high-quality roads at the regional (local) level, particularly in provinces, municipalities and *barangays*, is more beneficial to the region than investments in the national road network alone. This is an important finding in view of the concern about a 'missing middle' in the country's road network. The 'missing middle' refers to the inadequate state of road infrastructure at the provincial level. The national government takes care of constructing national roads while cities and municipalities are in charge of local roads. Provinces, receive smaller block grants from the national government – that is, a smaller internal revenue allotment (IRA) – and thus have less capacity to construct and maintain provincial roads, hence the issue of a 'missing middle' in road infrastructure. This suggests a need to review infrastructure policy at the national and local levels and the associated budgetary requirements especially for network infrastructure such as road networks.

More specifically, returns from road network (energy, ports, etc.) are higher the poorer the region is. The network character of infrastructure and the existence of spillover effects indicate the great importance of infrastructure for regional growth. Hill (2007) stresses that economic development and improved infrastructure and communications systems usually result in more integrated national economies. For example, transport costs fall, relatively if not absolutely, as roads and harbors are constructed. This is important not only for facilitating labor mobility but also for lowering transaction costs, as information on commercial and employment opportunities across regions becomes more accessible to both business and labor. The literature has pointed out that network infrastructure could have important spillover effects, which could be positive or negative, depending on the specific characteristics of regions or areas where the infrastructure is located and the adjoining areas that have access to it. The importance of good infrastructure, e.g., transport infrastructure in regional development cannot be overemphasized. An initial economic impact assessment done by an independent organization on the Development Bank of the Philippines' Industrial Restructuring Program indicates that the operation of roll on-roll off (RORO) transport in the country has increased transport efficiency, promoted tourism and regional trade, and enhanced agricultural productivity and regional development<sup>15</sup>.

The importance placed by the government on creating efficient transport highways, e.g., linking the road network with the so-called nautical highway using roll-on-roll off (RORO) transport systems to connect the islands with each other shows an understanding of the beneficial impacts of network infrastructure. It binds local economies more closely together and works for better domestic integration. The linkage of the primary road network with secondary roads and with municipal ports is critical for an archipelagic country such as the Philippines in reducing high transport and logistics costs, which have contributed to low productivity and lack of competitiveness of domestic producers. Missing links in the road and ports infrastructure network create serious bottlenecks for moving people and cargo over island boundaries. An efficient network of road and ports infrastructure contributes to overall economic efficiency and has distributive effects as well.

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<sup>15</sup> Center for Research and Communications (2006).

The spillover effects of infrastructure are not self-evident notwithstanding the intuition that positive externalities may arise from having an efficient infrastructure system, e.g., road infrastructure, traversing adjoining areas. One would naturally expect that a road highway would have positive impacts in the region or area where the highway goes but also in many neighboring regions or areas. Network infrastructure may help peripheral regions to be better integrated with more developed regions.

The new economic geography models hypothesize that the development of interregional transport infrastructure is the cause of both generative and distributive effects. There will be a negative spillover effect when rich regions become the main beneficiaries of network infrastructure and the poor ones are the main losers (Rosik, 2006). This happens because both capital and labor locate in regions better endowed with infrastructure and other amenities for economic and business activity. Factor mobility is enhanced by good network transport infrastructure which may result in poorer areas or regions experiencing decreases in output<sup>16</sup>. This would have been an important aspect of the empirical tests but because of severe data limitations the study did not attempt it. Future research should look into this, data permitting.

3. *What type of infrastructure constrains growth?* Because of a limited financial resource envelope, it will be particularly important to find out which type of infrastructure, e.g., road, energy, water supply, telecommunications, etc. will be binding constraints to economic growth. A joint ADB-World Bank survey<sup>17</sup> identified electricity and transport, among other factors such as macroeconomic instability, corruption, regulatory policy, crime, theft and disorder, as crucial elements in a good investment climate.

The Philippines have missed substantial private investments because it suffers from the mediocrity of its infrastructure which contributes to the high cost of doing business in the country. Based on the World Bank-International Finance Corporation's (WB-IFC), "Doing Business 2008," the Philippines ranked 133<sup>rd</sup> (out of 178 economies) for the year 2007 from 130<sup>th</sup> (out of 175 economies) for the year 2006 and 121<sup>st</sup> (out of 155 economies) in 2005 in terms of ease of doing business<sup>18</sup>. The cost of doing business increases with inadequate infrastructure. The effects of inadequate infrastructure have been articulated in ADB's 2005 report<sup>19</sup>, which noted the following:

- 62% of the surveyed firms rate public infrastructure and services in the Philippines as "somewhat inefficient to very inefficient" in particular due to poor shipping services in the country which lead to a 4.7% loss in production.
- Firms experience delays 5.6% of the time, on the average, when picking up goods for delivery to the domestic market or delivering supplies from the domestic market.

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<sup>16</sup> In his empirical estimates for the U.S., Holtz-Eakin (1994) found no evidence of quantitatively significant productivity spillovers while those of Boarnet (1996) indicate that in the presence of negative spillovers the elasticities of output with respect to public capital tend to be smaller.

<sup>17</sup> Improving the investment climate in the Philippines, 2005

<sup>18</sup> The "Ease of Doing Business" index is meant to measure regulations directly affecting businesses and is measured based on the simple average ranking of each sub-index as follows: "Starting a business," "Dealing with licenses," "Employing workers," "Registering property," "Getting credit," "Protecting investors," "Paying taxes," "Trading across borders," "Enforcing contracts," and "Closing a business." The ease of doing business index however, does not account for a country's proximity to large markets, the quality of its infrastructure services (other than services related to trading across borders), the security of property from theft and looting, macroeconomic conditions or the strength of underlying institutions.

<sup>19</sup> Asian Development Bank, "Philippines: Moving Toward A Better Investment Climate," 2005, Economics and Research Department, Development Indicators and Policy Research Division

Firms in the National Capital Region (NCR) experience longer delays than those in CALABARZON (Cavite, Laguna, Batangas, Rizal, Quezon) and Cebu/Davao areas due to greater traffic congestion and inadequate transport network linking NCR to other regional domestic markets. The proportion of paved roads to total roads indicates that there are less dependable roads which limit transport of goods and access to inputs and markets in a timely manner.

- 54% of the firms view Philippine public works as unsatisfactory.
- It takes firms an average of 13 days to obtain telephone lines and 10 days to acquire an electrical connection.
- Electricity was considered as the most critical concern among business establishments (33%), compared with transportation (18%) and telecommunications (10%), with losses owing to power failure amounting, on average, to 8% of production. Power outages hurt small and medium-size firms most, costing them an equivalent of about 8% and 11% of production respectively, compared with 6% for large firms.
- Bottlenecks in water supply translate to an average cost of 7% of production especially in the food and food processing industry.

The empirical tests also considered three types of infrastructure: roads, electricity and telecommunications. Of these, electricity (for commercial establishments) and telecommunications have a positive and significant impact on output. This confirms the results of the survey of the ADB in 2005 where electricity was considered by the surveyed firms as a most critical concern. Good telecommunications is still a problem among those firms but not as much as electricity and transport.

Pair-wise Granger-causality tests between economic growth and various types of infrastructure showed Granger causality running from infrastructure to real GDP. Similar tests in Korea and China showed the same results. Shiu and Lam (2003) found that real GDP and electricity consumption for China are co-integrated and there is unidirectional Granger causality running from electricity consumption to real GDP but not vice versa. On the other hand, in Korea, the causality between real GDP and electricity consumption was found to be bi-directional (Seung-Hoon Yoo, 2004).

The results also seem to indicate that different types of infrastructure would have different impacts on economic growth. It seems that electricity and telecommunications have a more significant impact on growth compared to other type of infrastructure such as roads. As economic growth becomes more dependent on the output of the service sector, it is to be expected that lower cost electricity and telecommunications infrastructure would be very critical to economic performance. Cross-border transactions in the service industries done through the internet are increasingly becoming a key source of growth. The country's recent reforms in the power and telecommunications sector are starting to pay off. The greater accessibility of energy and telecommunications services and more competition in these sub-sectors have contributed to an overall decline in costs, especially in telecommunications, have increased job creation and have led to higher level of economic growth<sup>20</sup>.

It is noted that the tests did not include other types of infrastructure such as ports for lack of data. In the case of roads it would be ideal to have data measuring the network characteristic of roads, that is, together with ports they would constitute the main physical infrastructure linking the islands in an archipelagic setting. Presumably for an archipelagic country such as the

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<sup>20</sup> However, the price of electricity and telecommunications services may still be higher than those in neighboring countries.

Philippines, which depends on maritime transport for the mobility of people and movement of cargo among the islands, inadequate ports and shipping infrastructure may act as a principal constraint to economic growth. According to Limao and Venables (2000), inefficient port infrastructure explains around 40 percent of predicted maritime transport costs for coastal countries. Clark, David and Dollar (2004) noted that cargo handling accounts for 46% of sea transport costs in the Philippines. A recent survey of the World Bank (Cross-Border Trading, 2006) indicates that the Philippines has the highest cost of exporting a container among ASEAN countries (Basilio, Llanto and Rodolfo 2007)<sup>21</sup>. According to the World Bank's Doing Business Indicators, it costs 60-300 percent more to export a 20-foot container from the Philippines than from China, Singapore or Thailand.

Different types of infrastructure may not have the same kind of impact on economic growth. For instance, the impact of one type of infrastructure may be localized, that is, impacting on economic activity where it is located, e.g., local water system. Another type of infrastructure, e.g., network transport infrastructure may have positive impact in the area where it is located and have externalities or spillover effects to other areas. More work should be done in this area but the quality and availability of data would be paramount considerations.

4. *Is infrastructure critical for convergence between regions?*<sup>22</sup> Manasan and Mercado (1999) found marked disparities across regions in the period 1975-1997. Lamberte, Llanto and Manasan (1993) indicated that the National Capital Region had a per capita gross regional domestic product more than twice that of the next richest region, Southern Tagalog in 1975. However, it was observed that regional growth disparities declined more rapidly from 1975-1986 although Manasan and Mercado (1999) noted that there is a positive relationship between regional dispersion and the growth rate of GDP. Thus, high levels of economic growth may be accompanied by regional stagnation, slow regional convergence or even divergence (Cuenca 2004).

Whether there is regional convergence is an interesting phenomenon but it is equally interesting and perhaps, more important to find out why it will or will not happen. It is also interesting to find out whether infrastructure could be a key variable in convergence or income divergence across regions. Cuenca's empirical tests found a strong and consistent evidence of conditional convergence during the period 1982-2000. Secondary enrolment rate and capital stock have a positive impact on regional growth. Poorer regions grow faster than richer regions in their transition phases but towards differing steady state of growth.

Thus, if disparities in the level of infrastructure development result in uneven economic growth and income inequality across regions, improving the regional allocation of infrastructure investments is required. Such improvement should be aimed at providing opportunity for lagging regions to catch up in order to realize their growth.

The empirical tests showed that coefficients of the infrastructure variables (road density, energy) have the correct positive sign but they are insignificant. Infant mortality rate, a proxy for health status of the population has the wrong sign and is not a significant conditioning variable. It is only the secondary enrolment rate, a proxy for human capital that is a significant conditioning variable. The finding on enrolment rate validates Cuenca's earlier finding that regions that invest more in education have higher growth. The rate of conditional convergence

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<sup>21</sup> Basilio, Henry, "Trade in Maritime Transport Services," unpublished paper, March 2007.

<sup>22</sup> Convergence is the reduction of income disparities across regions or countries. It is the tendency of poorer economies to grow faster than richer economies which would result in a reduction of income differential between them (Cuenca 2004).

shown by the coefficient of per capita gross regional domestic product ranges from 26% to 28%. Cuenca found a rate of conditional convergence ranging from 24% to 30%. These results indicate the importance of investments in human capital as well as specific types of infrastructure. For the latter, electricity (energy) has consistently come out as a determinant of aggregate output (in the regressions using annual time series) and of regional output (in regressions using panel data for a convergence hypothesis).

Overall, the empirical tests showed the following:

- Infrastructure is a significant determinant of economic growth and lack of it results to poor growth outcomes. It is a binding constraint to economic growth.
- Regions with better infrastructure tend to have higher economic growth. Infrastructure development is critical at the sub-national level implying that underinvestment in local infrastructure will have serious consequences on local growth and poverty reduction efforts.
- Electricity and telecommunications services are critical factors to economic growth especially in an economy where the service sector is a strong growth driver.
- Infrastructure and human capital are key conditioning variables in regional convergence. The quality of human capital (soft infrastructure) interacting with hard infrastructure (electricity, telecommunications, integrated road and port networks) are significant drivers for domestic integration and regional growth.

### ***Policy implications***

Infrastructure is a binding constraint to economic growth because of its critical importance in private enterprise, the locomotive of growth that is responsible for generation of output and job creation. While infrastructure is not a direct input into the production function, “inadequate supply of infrastructure or unreliability in infrastructure services may inhibit the investment of productive capital, restrict or reduce output” (O’Fallon, *ibid.*). For private enterprise to produce output and create jobs, it has to make investments and locate itself where the cost of doing business is relatively low. In Asia, the globalization of private capital, initially Japanese capital and in the future, Chinese capital and the drive for competitiveness among firms has led to the unbundling of production processes and cross-border division of labor among a few countries that present the most conducive investment climate. The few countries, basically, Malaysia, Singapore and Thailand, have one thing in common: very good infrastructure that can be combined with relatively good human capital. Unfortunately, the Philippines may not be a preferred country for investments because of several deterrents of which poor infrastructure is a major item. In 2006, the Japan External Trade Organization (JETRO)<sup>23</sup> Survey of Japanese Firms’ International Operations<sup>24</sup> noted that 32.2% of the Japanese businesses in the Philippines considered “underdeveloped infrastructure” as a critical bottleneck similar to respondents in India (57.2 percent) and Vietnam (47.9 percent).

Poor or weak infrastructure has a serious constraining effect on economic growth and poverty reduction. Relative to neighboring countries, the Philippines has performed relatively

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<sup>23</sup> JETRO is a Japanese government-related organization that works to promote mutual trade and investment between Japan and the rest of the world. Originally established in 1958 to promote Japanese exports abroad, JETRO is currently promoting foreign direct investment into Japan and helping small to medium size Japanese firms maximize their global export potential.

<sup>24</sup> The survey covered 729 Japanese companies, of which 177 are doing business in the Philippines. Other major concerns are political and social instability (52.5%) and lack of accumulation of related industries (20.9 %).

poorly in providing this indirect input to growth and productivity and has paid dearly for it in terms of low competitiveness ranking, lower level of investments, resulting in poor development outcomes, e.g. high incidence of poverty and a lower standard of living for the population relative to other ASEAN countries. That the country has registered modest economic growth in the past few years is not a reason to be complacent about the state of infrastructure. Investments in both human capital and infrastructure will have to be high priority in the development agenda of the government. Future growth will depend on the quality of human capital and infrastructure capital especially in lagging regions. Improving the access of the regions to funding for infrastructure should be part of the priority agenda for infrastructure development. Local governments have also under-invested in infrastructure. Various studies have shown that while total infrastructure investments by all local government units combined grew by 6.4 percent annually between 1990 and 2001, the share of LGU infrastructure spending in total LGU capital outlays contracted from 59.6 percent in 1985-1991 to 34.6 percent in 1993-2002.

Because of the importance of transport infrastructure and other infrastructure in domestic integration and regional convergence, the national government and the local government units should work for better integration and consistency of national, regional and local infrastructure plans. Policy and planning coordination between the national government and the LGUs in infrastructure development has been poor and ineffective. There is no regional budget allocation system that puts flesh to regional plans and priorities and an acceptable methodology for ranking interregional priorities (Llanto 2007). In a review of regional development councils in the Visayas, Llanto and Lasam (2004) found that the councils lacked the political clout to transform regional plans into budgetary allocations. This may be attributed to poor national-regional-local linkages in planning, programming and budgeting.

The current inadequate state of infrastructure was the product of years of under-investment and poor maintenance of built infrastructure. The narrow fiscal space has constrained the ability of the government to invest in infrastructure and to maintain existing infrastructure stocks. Relatively low tax effort and leakages in terms of government inefficiency in project implementation and reported corruption in the government were principal reasons for the lack of funds for infrastructure. To augment scarce resources, the Philippines has largely relied on official development assistance (ODA) for infrastructure development. The sad fact though is that ODA has been on the decline in the past seven years, from US\$13 billion in 2000 to US\$9 billion in 2006. The most recent ODA Portfolio Review reported that infrastructure accounted for a total of US\$ 5.5 billion in 2006 (71 loan projects) or 58% of the total ODA loans for the said period. This is broken down into Transportation with US\$4.0 billion (42.2%), Energy, Power and Electrification with US\$639 million (6.7%), Water Resources with US\$615 million (6.5%), and Social Infrastructure with US\$199 million (2 %).

Implementation bottlenecks such as (a) cost overruns, (b) delays in procurement arising from non-transparent and inefficient procedures, (c) right of way problems brought about by lengthy judicial processes on the titling of acquired properties, unresolved issues on land ownership, unavailability of relocation sites and others, (d) poor performance of the contractors, e.g weak management, late mobilization and/or insufficient equipment and materials on site, insufficient technical manpower, among others have hampered the efficient utilization of those funds, resulting in project delays and non-implementation of projects already approved by both donor and Philippine government. The government has tried very hard to address those implementation bottlenecks but it has to exert more effort and greater political will to remove them completely because those bottlenecks have remained as such in the past seven years of ODA portfolio reviews.

The Medium Term Philippine Development Plan rightly identified the private sector and local government units as partners in addressing the infrastructure lack. Through Build-Operate-Transfer (BOT) arrangements and other modes of private sector participation, the government would be able to take advantage of the private sector financing, technical and management expertise. This strategy was used to solve the energy crisis of the nineties but the BOT approach has since faltered after the Asian financial crisis. The government would have to address a number of issues constraining private sector participation: (a) uncertainty over government policy on contracts and contract review; (b) regulatory and political risks; (c) inability of government line agencies to identify and prepare good projects for tender; (d) corruption; and (e) constraints in the provision of guarantees due to budgetary problems of the government.

The local government units could help provide much-needed local infrastructure, e.g. critical road links to the national arterial highway, port terminals for the government's roll-on-roll-off (RORO) strategy, etc. However, many local government units are dependent on the cash-strapped national government for their internal revenue allotments (IRA) to fund local development and service delivery. The share of the IRA in total LGU income net of borrowings rose from 38 per cent in 1985–91 to as high as 65 per cent in 1992–2003 for all LGUs combined. The IRA thus effectively substitutes for own-source revenue generation, which could have been used as an effective tool for financing local development. Only the bigger cities and a few big towns have been able to raise substantial locally-generated resources to finance local infrastructure development. There is also the problem of local infrastructure projects as tending to be 'governor-centric; or 'mayor-centric' meaning that local infrastructure projects are typically pursued for the furtherance of the parochial political objectives of the local chief executive. Worse, there is also a reported syndrome of "dividing by N" the local infrastructure budget appropriated by the local sanggunians, that is, apportioning a share of the local infrastructure budget among local legislators as pork barrel. The local infrastructure budget is divided among as many members of the ruling administration for implementation. This approach, an imitation of the pork barrel funds for legislators, fragments already scarce local resources and results in uncoordinated and unrelated "infrastructure projects." The lack of integration of those infrastructure projects with regional and national development plans has resulted into a waste of local resources and the sorry state of sub-national infrastructure (Llanto 2007). Thus, the expectation that local government units could fill the gap in infrastructure development should be tempered by (a) the fact that local government units themselves face fiscal constraints unless they become really serious about local revenue mobilization and (b) the experience showing that local infrastructure development projects may not be integrated with overall regional or national development plans. The latter is a critical issue that the national government and the local government units should address.

The case for using government-owned-and-controlled corporations (GOCCs) has to be assessed relative to their readiness to take on the task in view of fiscal problems hounding a good number of those corporations. Lenders would typically demand sovereign guarantees for loans to be taken by those GOCCs. The issue of the increasing size of contingent liabilities arising from those guarantees has to be closely examined by the government because of the fiscal risk they will create once they become actual liabilities. Total estimated contingent liabilities of the government as of 2003 was Php1,672 million. The contingent liabilities of the infrastructure sector comprised 54% of total contingent liabilities as estimated by the Department of Finance. Of total contingent liabilities of the infrastructure sector, BOT projects had a share of 18.5% while buy-out costs of independent power producers made up 35% (Llanto (2006)).

This is not to say that GOCCs should not be part of the strategy to address the infrastructure lack. However, only a few of those GOCCs may have the resources to engage in infrastructure development. In fact, many of the GOCCs depend on government subsidies for their continuing operation and thus, they are contributory to the consolidated public sector deficit. For those GOCCs that have the resources to engage in infrastructure development and can borrow from the capital markets, the government should ensure good corporate governance, transparency and transparent procurement procedures and efficient management of contingent liabilities.

The decision to invest in infrastructure is an endogenous variable that is influenced by both technocratic and political forces. Government sometimes make the myopic decision of making across the board cuts in capital expenditures, which include infrastructure investments without due regard for the productivity-loss implications of severe cutbacks. This is usually done during times of fiscal stress when adjustment policies would dictate cuts in government spending. The most expedient spending item for a cut back is capital expenditures since governments usually succumb to political pressure to avoid lay-off of personnel. The risk posed by indiscriminate cutbacks in capital expenditures is that the cutback may have deleterious impact on the economy's productivity, especially private sector productivity, in the long-run. The other complicating factor is the equity aspect of the exercise. Should the reduction in the budget for roads be applied equally or differentially across regions? Should poorer regions be made to suffer the same proportionate cutback in road expenditures? Should the richer region be spared because infrastructure spending has to be supported in view of agglomeration and dispersion forces which to a large extent determine the spatial distribution of economic activity?

In this regard, the government has the following immediate tasks, among others: (a) expand its narrow fiscal space by improving the tax effort, eliminating inefficiencies in government procurement procedures and implementation, and combating graft and corruption; (b) reduce political risks and uncertainties which either avert potential private sector investments or delay the implementation of vital infrastructure projects, (c) establish a policy environment that promotes competition and that provides a regulatory framework that safeguards both consumer welfare and investor interest, (d) address implementation bottlenecks and (e) ensure the support of local government units in providing infrastructure.

In view of the findings showing the specific type of infrastructure that matters most to economic growth, the following discussion focuses on issues surrounding energy, telecommunications and transport that the government must address. Because of space limitation, only a summary of those issues are presented.

## Transport

The Philippines' transport system relies heavily on the road network which handles about 90 percent of the country's passenger movement and about 50 percent of freight movement (MTPDP 2004-2010). The existing road network provides the most common means of transporting passengers and economic goods within the islands as well as inter-island, using the recently inaugurated roll-on-roll-off shipping facilities under the Strong Republic Nautical Highway. A light rail transport system is presently concentrated in the Metro Manila area, while a partially functioning heavy rail system operates a few kilometers outside Metro Manila. A string of domestic ports and airports forms the remaining components of the network of transportation infrastructure to major economic centers in the country. There are several outstanding issues. While the Philippine road network is extensive, a large portion continues to be in poor condition. Only 70% of the national road network is paved<sup>25</sup>. The national road network is a mere 12% of the total public road network, with barangay roads mostly unpaved and in poor condition covering almost more than half of the network. The bulk of the road network consists of roads that are devolved to local government units. In general, the road network has deteriorated over time because of the central government's and local government units' neglect of basic road maintenance and under-investment in new roads. This is ironic because it seems that the problem does not lie with insufficiency of funds for road maintenance. RA 8794 created the Road Fund, a fund earmarked for the maintenance of national and local roads and the control of air pollution from motor vehicles. The Road Fund has accumulated to a substantial amount since the collection of a motor vehicle user charge (MVUC) from motor vehicle owners started on May 2001. Available data from the Road Board show MVUC collections from May 2001 to April 2005 of around Php 22.6 billion on a cumulative basis. The Land Transportation Office forecasts that total vehicle registration will grow at an average 3% per annum and thus, around Php 44.5 billion of MVUC collections are expected on the period 2005-2010. The uncoordinated road works, e.g., excavation, digging, paving done by various utilities (telecommunications, water supply, sewerage) in the urban centers contribute to the deterioration of already poor road conditions. Thus, poor road maintenance, poor traffic management and uncoordinated and wasteful road works produce the daily road congestion in many urban roads especially in Metro Manila.

The development of a light rail system in Metro Manila was envisioned to provide an alternative and efficient means of transportation to the traffic stricken metropolis and to address the urban migration and congestion problem by encouraging people working in the metropolis to reside outside Metro Manila. The Philippine light rail system is administered by the Light Rail Transit Authority (LRTA)<sup>26</sup>. Metro Manila has three (3) light rail transit lines, LRT line 1, LRT line 2, and the Mass Rail Transit (MRT). The main issues here are (a) the failure to link a five kilometer portion from North Avenue, Quezon City to Monumento, Caloocan City, (b) insufficient capacity and number of coaches, which is felt especially during rush or peak hours, causing stress on many passengers (c) interruption of operations due to mechanical and or electrical failure, especially during adverse weather conditions; there is no dedicated power source for the light rail system, and (d) the huge subsidy burden on the government arising from failure to adjust the fare.

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<sup>25</sup> Roads Paved refers to the length of all roads that are surfaced with crushed stone (macadam) and hydrocarbon binder or bituminized agents, with concrete or with cobblestones.

<sup>26</sup> LRTA is a wholly owned government corporation created on July 12, 1980 under Executive Order (EO) No. 603, as amended by EO No. 830 dated September 1982, and EO No. 210 dated July 7, 1987. The LRTA is primarily responsible for the construction, operation, maintenance and/or lease of light rail transit systems in the Philippines.

## Ports

An efficient and effective port system is essential to the Philippines, an archipelagic country. As of 2005, there are 414 registered ports nationwide, more than half of which (222) are privately-owned. The remaining 192 public ports are classified as base ports, terminal ports and other national or municipal ports<sup>27</sup>. The port of Manila ranked 31<sup>st</sup> among the top 50 worldwide in the 2005 World Port Rankings<sup>28</sup> in terms of Container Traffic with a total of 2,665 TEUs<sup>29</sup>. The Philippines is way behind other ASEAN ports in the top 50 list: Singapore (1<sup>st</sup>), Hong Kong (2<sup>nd</sup>), Busan, South Korea (5<sup>th</sup>), Port Klang, Malaysia (14<sup>th</sup>), Tanjung Pelepas, Indonesia (19<sup>th</sup>), Laem Chabang, Thailand (20<sup>th</sup>), and Tanjung Priok, Indonesia (24<sup>th</sup>).

The Medium-Term Philippine Development Plan (MTPDP) 2004-2010 has identified some key policy issues for the port sector as follows<sup>30</sup>:

- the restructuring of the port institutions to improve port service.
- amendment of EO 170 to facilitate further expansion of the RORO Terminal System coverage
- privatization of the remaining government-owned SRNH RORO ports/ terminals
- deregulation of routes and rates to attract new players and to make the maritime transport more cost-efficient
- a comprehensive review of the present port tariff system to pave the way for a cost-based tariff system.
- modernization of vessels by owners by means of incentives pursuant to RA 9295, An Act Promoting the Development of the Philippine Domestic Shipping, Shipbuilding and Ship Repair and Ship Breaking, Ordaining Reforms in Government Policies Towards Shipping in the Philippines, and for Other Purposes.
- the establishment of a Maritime Equity Corporation of the Philippines which will acquire modern RORO vessels that can be leased to qualified operators under a lease purchase agreement.
- Transfer of regulatory functions to an independent regulator (or regulators), which shall have jurisdiction over all ports.
- an amendment of the PPA Charter to address, among other things, the dual role of PPA as port regulator and operator.

## Power

The passage of the EPIRA law was instrumental in introducing important reforms in the power sector in the following areas:

- Separating the competitive from the monopolistic components of the industry such as generation versus transmission, distribution versus supply of electricity.

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<sup>27</sup> National Statistical Coordination Board, "Philippine Statistical Yearbook", 2006.

<sup>28</sup> World Container Port League 2005 (Top 50), Containerisation International Yearbook, 2005

<sup>29</sup> TEU = "Twenty-Foot Equivalent Unit," a standard linear measurement used in quantifying container traffic flows. As examples, one twenty-foot long container equals one TEU while one forty-foot container equals two TEUs (i.e.,  $40' \div 20' = 2$ ).

<sup>30</sup> National Economic and Development Authority (NEDA), "Medium-Term Philippine Development Plan (MTPDP) 2004-2010".

- Unbundling the cost components of power rates to ensure transparency and to distinguish the efficient utilities from the inefficient ones
- Promoting efficiency and providing reliable and competitively priced electricity, while giving customers a full range of choices

Thus far, a few reforms have already been achieved under the EPIRA: (a) creation of the National Transmission Corporation (TransCo), (b) creation of the Power Sector Assets and Liabilities Management Corporation (PSALM) to dispose of government-owned generation assets; (c) establishment of a wholesale spot electricity market, (d) unbundling of power rates and (e) review of the independent power purchase (IPP) contracts of NPC.

However, generation remains a regulated industry with NPC<sup>31</sup> plants and its IPPs dominating the generation sector (71%). NPC ownership is expected to give way to private ownership as the privatization of generation assets picks up. At the transmission side, are issues of reliability, adequacy, security, stability and integrity of the grid. The TransCo has approximately 21,319 circuit-kilometers of transmission lines including a submarine cable system, considered the first of its kind in Asia, 93 substations with approximately 24,310 million volt amperes substation capacity<sup>32</sup>. Due to imminent domain and right-of-way issues, the transmission assets cannot be auctioned completely. Instead, the assets (grid interconnections) and ancillary services are being offered thru open, competitive bidding, in the form of a 25-year concession, with the possibility of renewal for another 25 years. Under this arrangement, the government, through PSALM, will retain the ownership of TransCo's assets. The winning bidder will be operate and maintain these assets.

The EPIRA<sup>33</sup> provides for the establishment of a wholesale electricity spot market which will provide the mechanism for determining the price of electricity not covered by bilateral contracts between sellers and purchasers of electricity. Since it is a spot market, electricity is traded in real time. As a wholesale market, it is open to distributors, directly connected customers, large users and supply aggregators. The Luzon market operations started in June 2006 while the Visayas market is still under trial operations. The WESM has yet to evolve into an efficient electricity spot market traded in real time and open to a wider range of players. The EPIRA also provided for the privatization of the transmission and generation assets of NPC by the Power Sector Assets and Liabilities Management Corporation (PSALM). Thus far, PSALM has succeeded in privatizing a total of eight (8) plants with a combined capacity of 1,080 megawatts (MW) since 2003, despite some difficulties<sup>34</sup>. Five (5) more plants are being firmed up for privatization by end 2007, that is, Calaca Coal-Fired Power Plant (600 MW), Palinpinon Geothermal Power Plant (192.5 MW), Panay (Dingle) Diesel Power Plant (146.5 MW), Tiwi Geothermal power Plant (275 MW) and Mak-Ban Geothermal Power Plant (410 MW). As of 2006, the Philippines had a total installed generation capacity of 15,803 MW, slightly increasing from previous year's 15,619 MW<sup>35</sup>.

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<sup>31</sup> NPC was first established under Commonwealth Act No. 120 approved by President Manuel L. Quezon on November 3, 1936 and reorganized pursuant to RA 6395 as amended. The Corporation has evolved through the years responding to the mainstream needs of the economy and will continue to maintain its mandated functions until its gradual privatization as stipulated under the EPIRA

<sup>32</sup> National Transmission Corporation

<sup>33</sup> Sec. 30 of the EPIRA

<sup>34</sup> Masinloc Power plant was bidded out in December 2003 and was awarded to YNN Consortium for the purchase price of US\$ 561 million. YNN Consortium, however, defaulted on its obligation to pay the 40% and Masinloc was bidded anew and awarded recently to AES Corporation. Privatization of TransCo concession was also unsuccessful.

<sup>35</sup> Source: Department of Energy

The government has to address the following issues: (a) financial viability of both NPC and PSALM, (b) attracting new investments in the power sector in view of a forecast of a power shortage in the near future, (c) better management of WESM, (d) privatization of the rest of the generation assets, and (e) a more efficient regulatory framework

## *Telecommunications*

The removal of monopoly and promotion of competition has resulted in an impressive improvement in tele-density. The number of telephone subscribers has increased dramatically from the period 1992-1999 with the implementation of RA 7925. The advent of mobile technology however, has slowed down the rate of subscription to fixed telephone lines because it provided the much-awaited access to telecommunications services at affordable levels. PLDT continues to dominate the local (domestic) exchange carrier market, the inter-exchange (domestic long-distance) carrier market as well as the international gateway facility (international long-distance). For the domestic market, PLDT's installed lines accounted for 41% of the total installed lines nationwide, while its subscribed lines represents 55% of the total subscribed lines nationwide as of 2006<sup>36</sup>. The remainder is divided among Innove (21% market share on installed, but only 9% subscribed) and other small, private, or municipal companies providing services in various areas.

The low price mobile handsets and the relatively cheap cost of short messaging service (SMS) has made mobile telecommunications more popular than fixed-line in the Philippines. As of 2006, there are 42 million cellular phone subscribers nationwide. The number of cellular phone subscribers has been significantly increasing and the trend is expected to continue as incomes grow and as phone companies establish a wider and more efficient cell network. Compared to other ASEAN countries, the Philippine mobile market is quickly catching up with the Indonesian and Korean markets. In 2005, Indonesia and Korea registered a total of 47 million and 38 million subscribers respectively, while the Philippines registered a total of 35 million<sup>37</sup>.

The liberalization of the sector in the nineties and the subsequent market-oriented stance taken by NTC are the foundations for a competitive telecommunications market. The NTC has issued on December 2005 a consultative document on the development of a competition policy framework for the information and communications technology sector. The NTC document cites the inequality in market power in the Philippine telecommunications sector where the largest two among 73 local exchange carriers account for 75% of the subscribers base, while the biggest two cellular operators control 96% of the mobile service market.<sup>38</sup> In 2004, the two largest carriers showed a net income of Php 39.2 billion against the net loss of Php 2.3 billion of the next two largest carriers. While this extreme inequality in market shares and performance is not necessarily caused by a lack of fair competition, the NTC points out that it provides opportunities for anti-competitive behavior, and hence grounds for regulatory attention. The dominant firms or incumbents who are first movers in the market currently control essential bottleneck facilities and have vertically integrated facilities that may be used to cross-subsidize services and engage in predatory practices to ruin its competitors.

These developments in the ICT sector have started to yield dividends in terms of a greater accessibility of telecommunications services by a growing number of the population and a declining trend in telecommunications costs. The NTC ruling that VOIP is value added service and not a franchise has resulted in an increase of VOIP providers and a decline in telecommunications costs. Telecommunications carriers are offering as low as 5 cents per minute for overseas calls made using VOIP technology, an 87.5% drop from the usual 40 cents per minute. At least 17 firms have been given licenses to provide VOIP services.

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<sup>36</sup> National Telecommunications Commission, 2006

<sup>37</sup> World Bank, "World Development Indicators, 2006"

<sup>38</sup> Based on 2004 NTC Annual Report figures on subscription base.

Realizing the lack of effective competition in the market, the NTC is considering the introduction of four pro-competition policies, namely: (a) imposing obligations on carriers with significant market power (SMP), (b) mandating local loop unbundling, (c) requiring carriers to allow for resale of their services, and (d) changing the basis of price regulation from ex ante to ex post. An important component of SMPOs is the development of an approach called reference access offers (RAO). The RAO will contain the terms and conditions for which an access provider is prepared to provide access to its telecommunications network or facility to any requesting service provider. The end goal is to introduce more competition in the telecommunications market, which will further drive down communication costs for the consumer and business sector.

#### **D. Concluding comments and some policy recommendations**

This section provides an empirical basis for the popular assertion that poor infrastructure has a negative impact on economic growth. The empirical tests not only served to confirm this observation but also provided specific results with deep policy implications. Notwithstanding the limitations imposed by severe data constraints, the empirical tests showed that infrastructure is a binding constraint to economic growth on an aggregative basis and at the sub-national level. In other words, the empirical tests showed that infrastructure is an important channel for influencing the level and trajectory of growth. Together with investments in human capital, infrastructure is a significant conditioning variable for regional convergence. Regions with good infrastructure tend to have higher economic output and lower poverty incidence. The empirical tests also showed which type of infrastructure matter most for economic growth: electricity, telecommunications and roads. Finally it has identified broad policy issues as well as sector specific issues that the government must immediately address in the near future.

Given these findings, the government has the following immediate tasks, among others: (a) expand its narrow fiscal space by improving the tax effort, eliminating inefficiencies in government procurement procedures and implementation, and combating graft and corruption; (b) reduce political risks and uncertainties which either avert potential private sector investments or delay the implementation of vital infrastructure projects, (c) establish a policy environment that promotes competition and that provides a regulatory framework that safeguards both consumer welfare and investor interest, (d) address implementation bottlenecks and (e) ensure the support of local government units in providing infrastructure.

This section also highlighted the main issues in power, transport, road and ports infrastructure, and telecommunications that the government has to immediately address. It will be important for government to address implementation bottlenecks as well as sector-specific issues pointed out in the sub-sectors of the infrastructure sector.

An important area that was not treated in this section but will be discussed in the section on inclusive growth and poverty reduction is the issue of water supply that impacts on the well-being of households. Ravallion and Jalan (2001) found that children aged 0–5 in families with access to piped water had a lower incidence and duration of diarrhea than children in families without such access. A related issue is irrigation, which may have some impact on rural development and poverty reduction to the extent that it is a factor for increased rural productivity. A recent assessment of the situation in this area indicated that the problem in irrigation gravitates along the following issues: (a) need for rehabilitation of existing irrigation

facilities rather than new construction, (b) operation and maintenance issues, (c) focus on small-scale irrigation systems, (d) diversification of irrigated crops, (e) creation of river basin authorities for efficient water allocation, and (f) more effective regulation of water resources (Inocencio and Barker2006).