

Ministry of Agriculture and Agrarian Reform

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Development of Infrastructure in Syria during the Past 25 Years and it's Prospects Current Situation and Investments

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1-Introduction

1.1. Definition of infrastructure and its context

The essential concept of infrastructure is a simple one: The infrastructure is a set of assets needed to supply certain desired services. For example, it is the capital stock needed to generate electrical services, or the land transport assets needed to supply (land) mobility and access services. However, we can define infrastructure as the following characteristics:

- Physical infrastructure meets a variety of economic, social, cultural and environmental needs of people;
- It is typically large, accumulated, slow to install, has long life and serves a diverse set of users;
- Links between infrastructure networks are important;
- Technological and social change is constant and means alternative infrastructure forms gradually emerge
- If the most is to be gained from infrastructure investment, altogether, the quality of investment, the supporting conditions for investment and usage are important.

1.2. Poverty and Accessibility

Based on sustainable livelihood approach¹, accessibility to each of pentagon assets (human, natural, financial, physical, and social capital) is an indicator to assess the livelihood of poor rural people. In other words, beside lack of income, the lack of access to basic goods and services is a contributing factor and causing poverty. Lack of access to market and employment centers (financial capital) reduces income opportunities. Furthermore, poor access to education (human capital) leads to poorly educated people; moreover, poor health is caused by lack of access to adequate health services (human capital) and lack of access to clean water (natural capital). Access to information (human capital) can help poor rural people in many ways, including better understanding of the agricultural techniques, which can lead to increased productivity; alternatively, it contributes to improved education and better health standards being applied.

Generally speaking, rural poor people don't have proper access to employment, financial resources, skills and information. Consequently, there is a need for new investment in rural infrastructure to improve access of population to goods and services. This infrastructure is necessary but not sufficient to achieve the goal of reducing poverty, so the important things are:

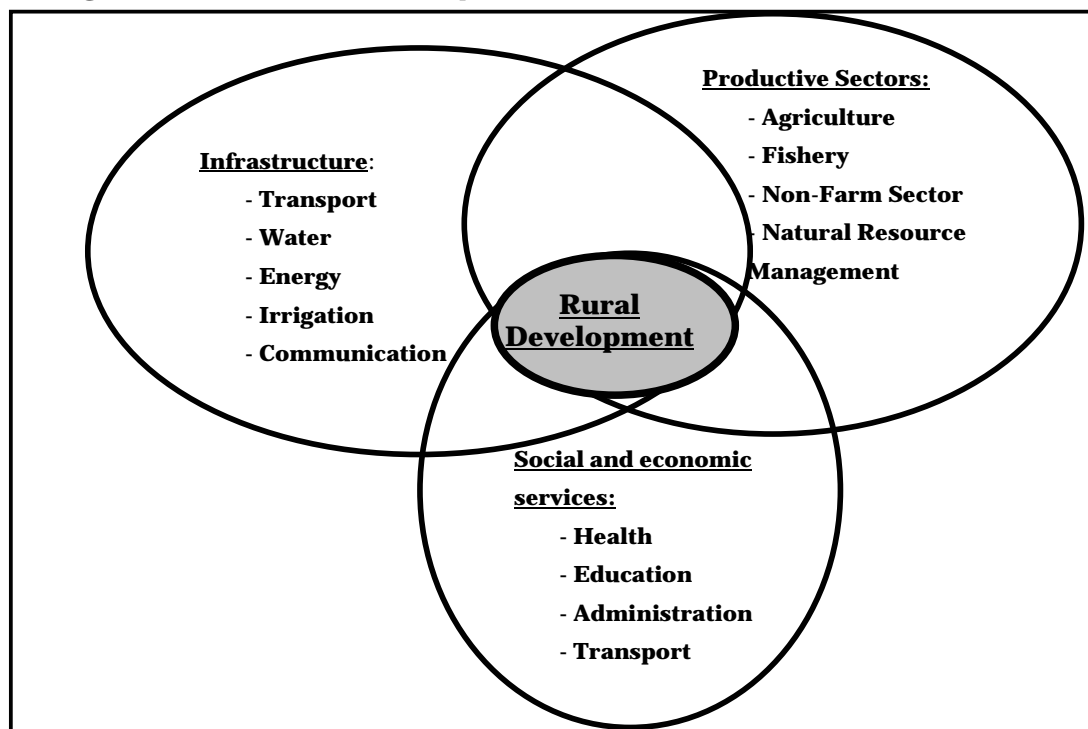
- The manner in which infrastructure is provided, using the resources or assets that rural communities have, physical, financial, institutional (social), human, technical;
- The decentralization is essential for local decision making according to the local needs, which in turn will be a key factor in the efforts to mainstream the poverty alleviation within rural development strategy, since rural poor are the focal point of sustainable approach.

¹ The sustainable livelihood framework presents five categories of assets that are the pillars of a community's livelihood structure. These are natural capital, social capital, human capital, physical capital, and financial capital. Any community, regardless of the level of poverty, will have these livelihood assets, although the combinations and levels of endowment will vary between one community and another. The integrity of a development intervention should be judged in the first instance, on how it complements and reinforces the strength of the existing livelihood assets, while attenuating their weaknesses.

2– Infrastructure and Growth

Along with supportive economic and financial policies, infrastructure (including electricity to power industry, telecommunications to support commerce, and roads to transport goods) has long been recognized as a key element of the enabling environment for economic growth and in turn rural development (figure 1). More recently, the development community has also emphasized that by promoting growth; reliable and affordable infrastructure can reduce poverty and contribute to the achievement of the Millennium Development Goals (MDGs)². It can contribute directly by providing and supporting the delivery of key services, such as those seeking to increase households' access to safe drinking water and basic sanitation. Similarly, the goals related to human development (education and health) rely on services that require supportive infrastructure (water and sanitation) to prevent disease, electricity to serve schools and health clinics, and roads to access them.

Figure 1: Elements of Rural Development



Source: World Bank Technical Paper No. 496³

According to the World Bank, while the needs are increasingly well recognized, in many developing countries key infrastructure services are still in serious short supply and of poor quality. Among sectors, telecommunications is generally well ahead of the reform process; electricity, transportation, and housing are at intermediate stages; and water and sanitation are falling behind.

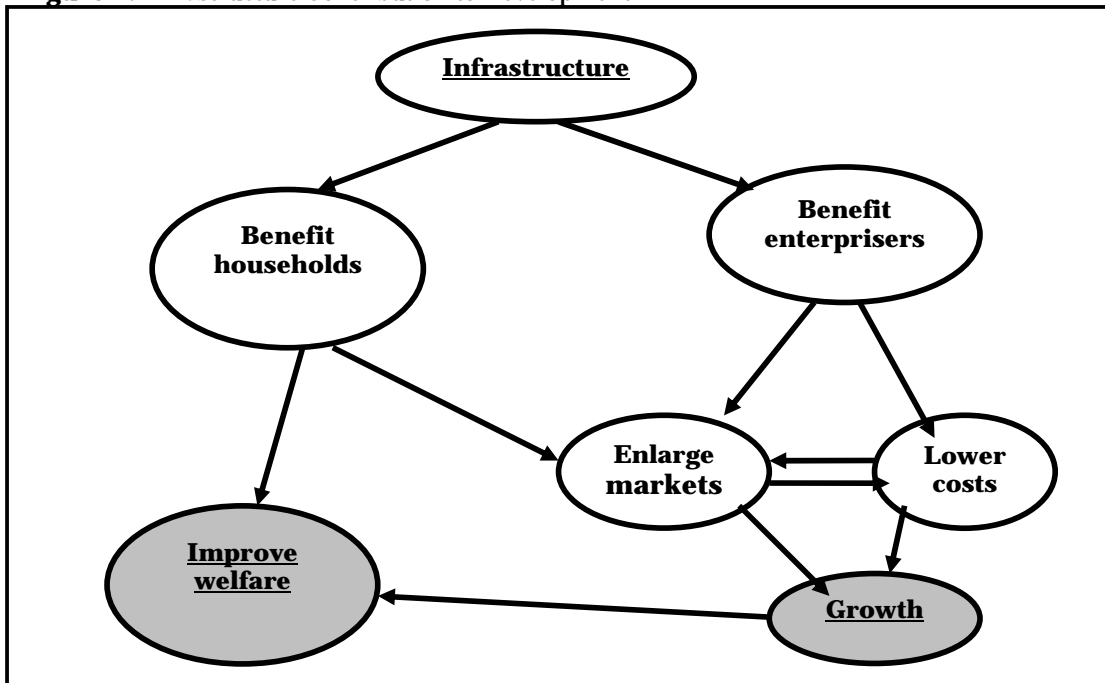
² The Millennium Development Goals are concrete targets endorsed by 189 countries at the September 2000 UN Millennium General Assembly in New York aiming at cutting by half the proportion of people in extreme poverty worldwide by 2015, provide education, improve health, and preserve the environment.

³ Jerry Lebo & Dieter Schelling, *Design and Appraisal of Rural Transport Infrastructure: Ensuring Basic Access for Rural Communities*, World Bank Technical Paper No. 496

2.1. Infrastructure and The Millennium Development Goals

The linkages between infrastructure services, growth and social outcomes like the Millennium Development Goals operate through multiple channels (figure 2). The delivery of services like water, sanitation, transportation and energy directly benefit households and can dramatically improve their welfare. Furthermore, many of the benefits of infrastructure services go to firms, so costs could be lowered and, most importantly, market opportunities could be expanded (especially through telecommunications and transport). The resulting gains in competitiveness and production are what drive the gains in economic growth and ultimately welfare⁴.

Figure 2: Infrastructure Contribution to Development



Source: World Bank Policy Research Working Paper 3468, December 2004

There have been many recent attempts to quantify these linkages between infrastructure and growth, poverty reduction, and achieving related development goals.

2.2. Measuring Infrastructure Impact on Pro-Poor Growth

Infrastructure is taken here to cover all the main common users' services, energy and water supply, transportation and telecommunications, sanitation and waste facilities. As it was put in summarizing the views expressed by the poor in a recent worldwide survey of their opinions (Narayan, 2002), "the lack of basic infrastructure, particularly roads, transportation, and water, is seen as a defining characteristic of poverty".

For showing the benefits of delivering elements of infrastructure to poor people, there are some figures. According to a recent study in Guatemala; those un-served by electricity are paying per unit much more than those served (about 50 times as much per kwh for lighting by candles, kerosene, and butteries). Another study in Port-au-Prince, Haiti highlights that un-served inhabitants by drinking water facilities pays 5-16 times per cubic meter much more than who served (World Bank 2001). Alternative to utility services involve high time costs for collection of water, and frequently health costs from poor water quality. Regarding transportation, the poor have to spend 25 % of their income on the journey to work (World Bank 2001).

⁴ World Bank Policy Research Working Paper 3468, December 2004

The conditions described above pose notably heavy burdens on rural poor people and constitute serious obstacles to use of public health and educational facilities (constrain accessing human capital) and participation in social activities (obstacle accessing social capital).

Among the more robust findings from growth researches, there is a significant impact of infrastructure investment and of human resource development on growth. For example, public investment in transportation and communication identified high impact on GDP: elasticity of 0.16 (Esterly and Repelo, 1993).

The relationship between infrastructure and economic growth might well have been stronger if it was possible to represent infrastructure with indicators of the quality and quantity of services actually provided.

The rural non-farm growth, in different parts of the world, is effective poverty reducing, which can be significantly increased by assuring the availability of both infrastructure and education to the poor and by improving smallholder in agriculture (Reardon et al, 2000).

2.3.Private Provision of infrastructure Services

Market-oriented reforms of infrastructure in developing countries tend to focus primarily on commercially viable services in urban areas. Nevertheless, an increasing number of countries are beginning to experiment with extending the market paradigm to infrastructure services in rural areas that are often less attractive in commercial terms. In these cases, subsidies are used to close the gap between market requirements and development needs, and are increasingly determined and allocated on a competitive basis. Many researchers discuss the conditions under which competition among firms for such subsidies, successfully used in the telecommunications sector in a number of middle-income countries, could also be applied to electricity, water and sanitation and transportation services in lower-income countries.

3-Transportation

Rural transport networks in most developing countries are underdeveloped and of poor quality. It is estimated that about 900 million rural dwellers in developing countries do not have reliable all-season access to main road networks, and about 300 million do not have motorized access at all. At the same time, resources are being spent on upgrading roads to higher than economically justified standards for populations that already have a reasonable level of access.

Poor access to transport in the rural areas of developing countries constrains economic and social development and contributes to poverty. Alternatively, improving rural people's access to essential services requires improving mobility, through better transport infrastructure and services and drawing attention to the location, quality, and price of facilities. Better mobility gives people better access to services (education, health, and finance), markets, income-earning opportunities, and social, political, and community activities.

3.1.Rural Transport and Poverty Reduction

Rural poverty is pervasive and difficult to address. However, improving mobility can reduce rural poverty by facilitating women, men, and children to more readily access services (education, health, finance, markets), obtain goods and income, and participate in social, political and community activities. Furthermore, Mobility requires a combination of appropriate transport infrastructure, improved transport services, and affordable means of transport, both motorized and non-motorized.

Various studies have provided evidence that poverty is more pervasive in areas with no or unreliable (motorized) access, what are referred to as unconnected areas. For example, in Nepal, where the percentage of people below the poverty line is 42 percent, the incidence of poverty in unconnected areas is 70 percent. In Bhutan, the enrollment of girls in primary schools is three

times as high in connected villages compared to unconnected ones. In Andhra Pradesh, India, the female literacy rate is 60 percent higher in villages with all-season road access compared to those with unreliable access.

There is a clear evidence that rural transport infrastructure is an essential, but not sufficient, component of sustainable rural development and poverty reduction. Consequently, poverty reduction strategies require a comprehensive framework for implementation: The simultaneous development of adequate rural infrastructure, productive sectors, social and economic services, an appropriate macroeconomic framework, and good governance and local ownership, is required for rural poverty alleviation as illustrated in (Figure 1 before).

3.2.The Concept of Basic Access in terms of transportation

Basic access is the minimum level of rural transport infrastructure network service required to sustain socioeconomic activity. Accordingly, the provision of basic access is often viewed as a basic human right, similar to the provision of basic health and basic education. Consistent with a basic needs focus, the basic access approach gives priority to the provision of reliable, all-season access, to as many villages as possible, over the upgrading of individual links to higher than basic access standard.

A basic access intervention, in this context, can be defined as the least-cost (in terms of total lifecycle cost) intervention for ensuring reliable, all-season passability for the locally using means of transport.

Affordability therefore will primarily be determined by a population's capacity to maintain their basic access infrastructure over the long term. In cases where motorized basic access is not affordable, improvements to the existing path network and the provision of footbridges may be the only affordable alternative.

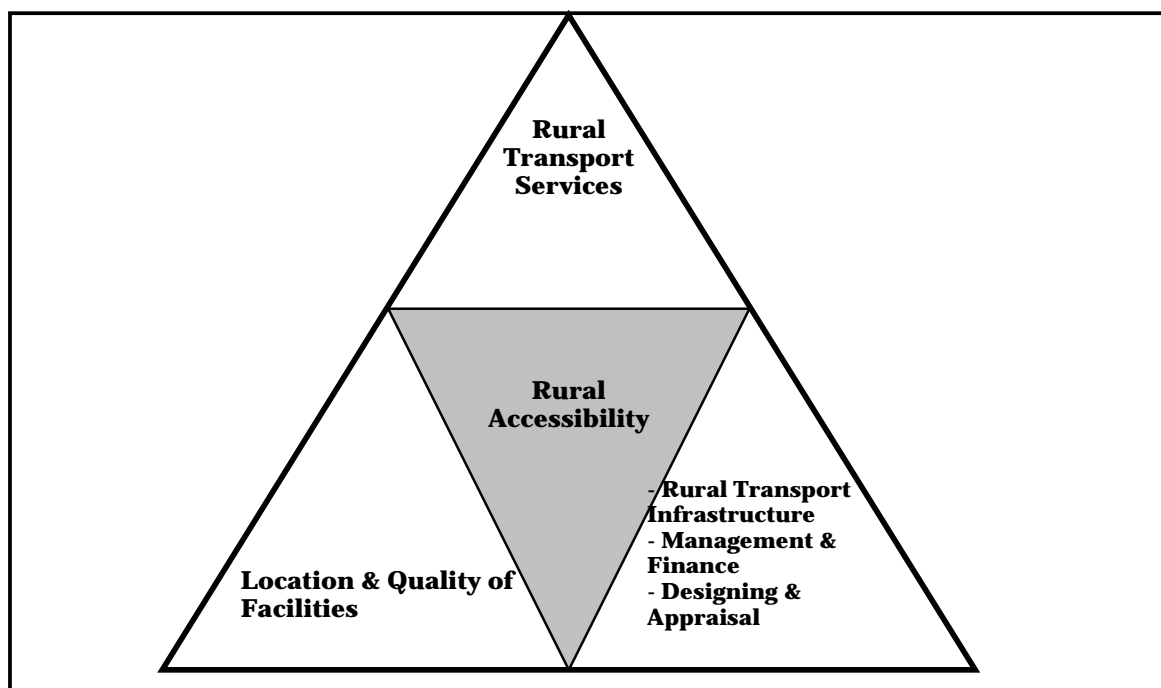
3.3.A Holistic Approach to Rural Development

A new emerging approach to rural transport interventions requires a more holistic understanding of the mobility and access needs of the rural communities than has traditionally been the case in rural road sub-sector investments. It is a demand-led, or people-centered, approach with an emphasis on the needs expressed by affected communities. In this context, rural transport is more broadly seen as an input into successful rural livelihood strategies, within which access consists of three complementary elements: (Figure 3)

- Transport services,
- Location and quality of facilities,
- Transport infrastructure.

This approach acknowledges that intervention may be required in all three categories, not simply the latter. To effectively utilize and target available resources, country specific rural transport policies and strategies are required.

Figure 3: Elements of Rural Transport



Source: Source: World Bank Technical Paper No. 496

3.4. Transportation in Syria

3.4.1 Main Roads

Syria has witnessed an expansion of the road network, which grew from 19,819 kilometers in 1980 to 49,977 kilometers in 2005, at an average annual growth rate of 4%. Moreover, road networks continued to grow rapidly, both main and rural road networks as in (table 1 and 2).

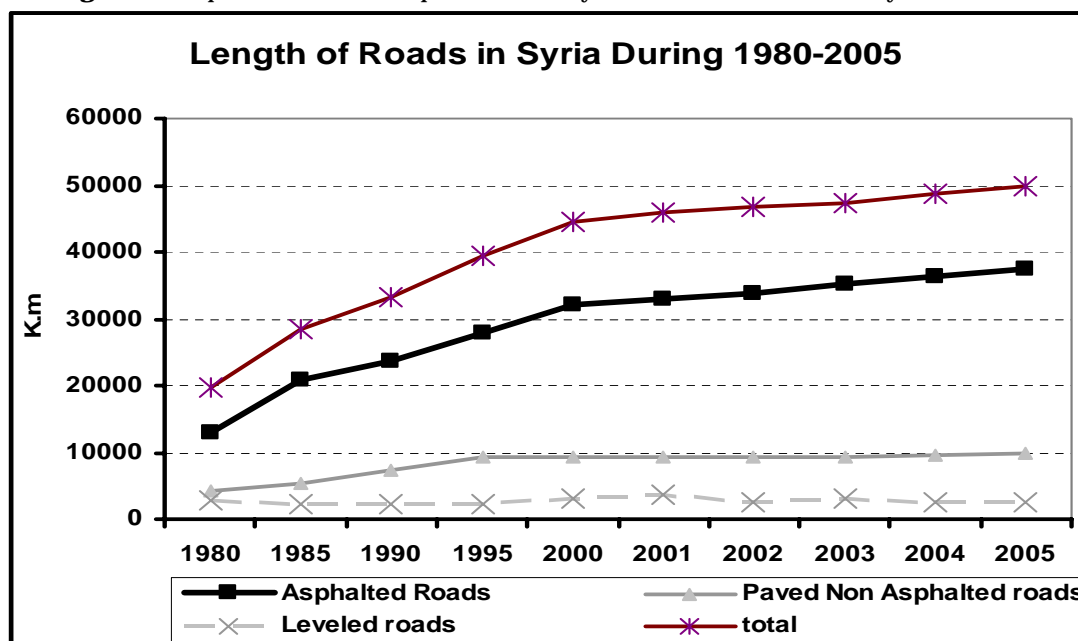
Table 1: Length of Roads in Syria (K.M)

Year	Asphalted Roads	Paved Non Asphalted roads	Leveled roads	total
1980	12969	4172	2678	19819
1985	20732	5467	2197	28396
1990	23779	7305	2129	33213
1995	27769	9327	2237	39333
2000	32028	9405	3142	44575
2001	32914	9335	3611	45860
2002	33880	9165	2652	46697
2003	35092	9289	3033	47414
2004	36412	9711	2644	48767
2005	37554	9999	2424	49977

Source: Central Bureau of Statistics

In 2005, the length of total asphalted roads amounted 37554 km, divided into local 30496 km and central 7058 km, achieving an annual average growth rate of 4.5% in the period 1980-2005. In the same year, non-asphalted roads accounted 9999 km. As for leveled roads stood at 2424 km; therefore; total length of roads in Syria amounted 49977 km in the same year.

Figure 4: Represents the development of the Syrian road network over 25 years



3.4.2 Agricultural roads

In addition to the growth in major roads and highways, The 1990s and first half of 2000s witnessed an expansion of the rural road network, which grew from 530 kilometers executed by the Ministry of Agriculture and Agrarian Reform (MAAR) in 1991 to 7,788 kilometers executed in 2005 (accumulation number). Moreover, MAAR is no more responsible of rural road networks. However, by 2004 the ministry of real estate became responsible of executing the agricultural roads.

Table 2: Planed and executed agricultural ways during 1980-2005

	Planed length (K.m)	Executed length (K.m)	Served area (000 hec)
1991	528	530	69.7
1995	450	614	45.5
2000	942	1741	147.7
2001	1302	1196	81
2002	1302	1196	80.9
2003	1304	1578	167
2004	400	933	95
2005	Continuing executing the roads, which have been started		
Total	6228	7788	686.8

Source: Agricultural Statistical Abstract

The previous table contains a time series data about the planned and executed roads in rural areas as agricultural roads to serve cultivable land, which accounts 686.8 thousands hectare in 2005.

3.4.3 Private investments in transport sector

One of the most significant direct consequences of the landmark Law N. 10, passed in 1991 to provide a more friendly environment to private sector investment, was the complete overhaul of the national transport sector.

The law provides a number of incentives, including income tax exemptions, capital repatriation facilities and customs duty exemptions for all capital investments. Private investors in the transport industry used that latest article of the law, which exempted them from paying standard import duties on motor vehicles that can rise up to 250%, to set-up transport ventures, either in the form of private rental companies or in the form of public transport schemes. Since the launch of the Law, more than two-third of the projects put forward for licensing were in the transport sector. The minibuses present these days in every single Syrian city and village and the air-conditioned luxury Pullman buses now linking the major cities between them, are all owned by companies set-up under this law. Reduced investment opportunities in other sectors of the economy has led to a certain saturation in the market, in particular in the inter-city luxury bus transport segment. Companies, there, have sought to diversify their services by offering money transfer operations and through the transport of goods but over capacity has led, lately, to a number of consolidation and restructuring operations.

The following table indicates the number of transport projects licensed according to investment law number 10 at governorates level up to 2006.

Table 3: Transport projects according to Investment Law no.10 by governorates

Governorate	Included	Executed
Damascus	319	198
Rural Damascus	269	192
Aleppo	432	342
Hama	265	219
Homs	246	178
Lattakia	142	96
Tartous	177	116
Idleb	82	51
Al-Rakka	22	10
Dair-Ezour	40	27
Al-Hassaka	24	13
Dar'a	25	20
Al-Swaida	11	2
Qunaitra	10	2
Total	2064	1466

Source: Ministry of Transport, 2006

Largest portion of transport projects was in Aleppo governorate, 342 projects, followed by Hama governorate, 219 projects.

According to the Ministry of Transport, the numbers of vehicles registered according investment law number 10 are as follows: 1294 cars, most of it were in the 1990s; 1516 buses; 146 tanks; 3029 mini-buses, all of it were before 2002; and 7728 lorries.

Table 4: Vehicles included and executed according to Investment Law no. 10

	cars		buses		Tanks		Mini-buses		lorries	
	Included	Executed	Incl	Exec	Incl	Exec	Incl	Exec	Incl	Exec
Till 1999	1572	1259	1430	1099	306	121	3570	2940	2746	2183
2000			114	91	15	7	61	59	169	125
2001	8	8	320	212	72	1	51	12	1583	1257
2002	27	27	80	34	61	17	18	18	3418	2332
2003			75	27	5				1153	638
2004			139	18	52				4894	1016
2005			2002	35	1				2187	152
2006			368						1266	25
Total	1607	1294	4528	1516	512	146	3700	3029	17416	7728

Source: Ministry of Transport, 2006

4.-Energy

Energy service is essential to rural economic development efforts. Our focus will be mainly on the infrastructure of electricity sector because it is more important than another energy sectors in an economic sense. In addition, it has environment-friendly usages. Some evidence suggests that electricity supply quality is a critical element of infrastructure as countries' income levels increase.

Providing reliable, affordable electricity is essential to the economic well-being and quality of life for all of the nation's rural residents. Furthermore, electricity is important for a mix of domestic uses (e.g. lighting, television, and radio), productive uses (e.g. water pumping, refrigeration, mills, and sewing machines) and public uses (e.g. schools, health centers, etc). The programs of rural electrification typically aim at making electricity available to individual households, farms, and businesses, not only for community uses.

4.1.Ways of Delivering Electricity Services

There are important tradeoffs between service quality and cost for delivery of rural electricity. Although power grid standards are finally required, in the absence of well-developed networks alternative off-grid solutions are often faster and more flexible to arrange and require lower initial investment, although in some cases they may be more expensive to run. Off-grid solutions can meet typical rural demand patterns in a more flexible way than traditional solutions, especially to dispersed users in remote areas, at a cost that is comparable to what rural users already spend in inferior energy sources (e.g. candles, kerosene, battery charging, and disposable dry cell batteries). Off-grid systems, however, typically provide only limited service duration (e.g. electricity available only a few hours each day in many rural diesel systems), lower voltage stability, or limited power and energy

A growing variety of business models are used to deliver rural electricity. For example, a cluster of consumers may be supplied by a local electricity services company or cooperative using a mini-grid powered by renewable resources and backed up by diesel generation where needed; if demand grows a connection to the main grid may become more cost-effective so that local generation may be discontinued or combined with grid power. Solar home systems may be sold by equipment dealers to households, usually as installed systems, sometimes on credit or with service contracts or guarantees, or may be owned by an energy services company that charges the household a monthly fee and is responsible for the service. Some of these delivery mechanisms are well suited for open competition among firms (e.g. sale of solar home systems) while others typically involve licensing, franchising, and regulation (e.g. village mini-grids and electricity service companies).

4.2.Electricity Sector in Syria

The total electricity production amounted according to 2005 estimation, 36,048 Million Kilo Watt per Hour (M.K.W.H.) of which 34,779 Million K.W.H. that was generated under the supervision of Ministry of Electricity, and 1,296 Million K.W.H. which was produced by Industrial Establishments. The following table 5 represents the electricity produced and consumed, for lighting or for industrial usages; in addition to the sold electricity outside the country, and the loses in the networks, over the period (1980-2005) in Syria.

Table 5: Electrical energy produced and consumed, 1980-2005, (M.K.W H)

	Produced Energy	Consumed Energy			Energy sold outside the country	Loss & self consumption
		For Lighting	For Industry	Total Consumption		
1980	3,837	1,331	1,564	2,895	67	875
1985	8,038	2,914	3,278	6,192	73	1,773
1990	11,611	4,072	4,201	8,273	-	3,338
1995	16,186	4,346	6,243	10,985	292	5,305
2000	25,286	10,378	6,829	17,207	1,418	6,661
2001	26,845	10,800	7,302	18,102	1,271	7,472
2002	26,896	10,864	7,052	17,916	692	8,288
2003	28,264	11,651	5,616	17,267	249	10,748
2004	30,922	13,096	6,223	19,319	539	11,064
2005	36,048	15,109	7,164	22,273	844	12,931

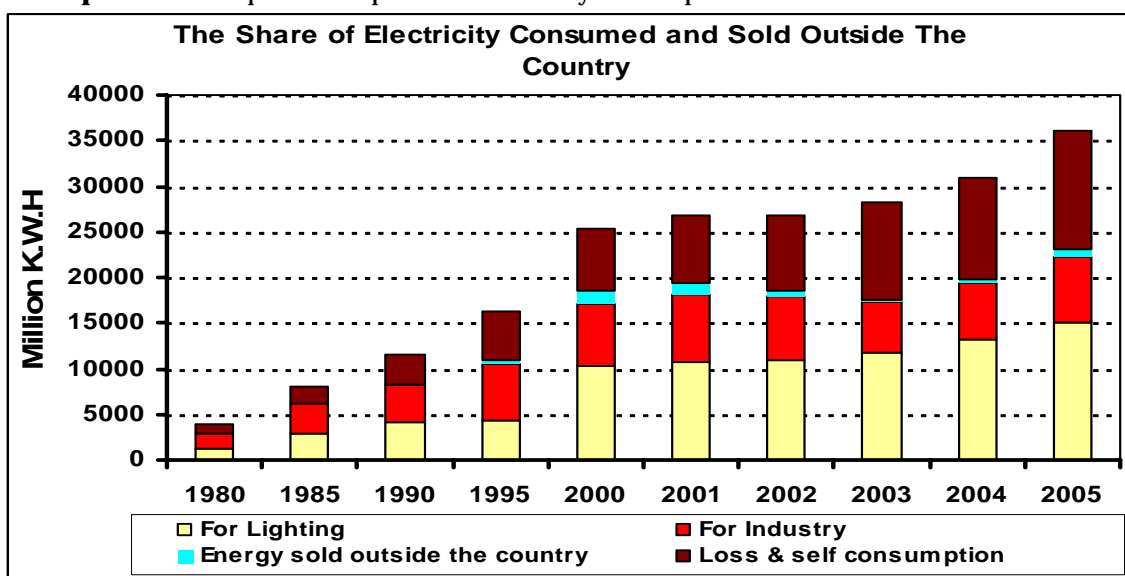
Source: Central Bureau of Statistics

Electricity production increased from 3,837 (M.K.W.H) in 1980 to 36,048 in 2005 at an average annual growth rate of 9.8%. During the same period, electricity consumption for lighting increased from 1,331 to 15,109 (M.K.W.H) achieving an average annual growth rate of 10.7%; moreover, the industrial electricity consumption increased from 1,564 to 7,164 (M.K.W.H) in 1980 and 2005 respectively, at an average growth rate of only 6.5%.

The volume of electricity sold outside the country varied over years, it increased from 67 (M.K.W.H) in 1980 to 1,418 in 2000 achieving its pike, then it decreased to 249 in 2003 and increased after that to be 844 (M.K.W.H) in 2005.

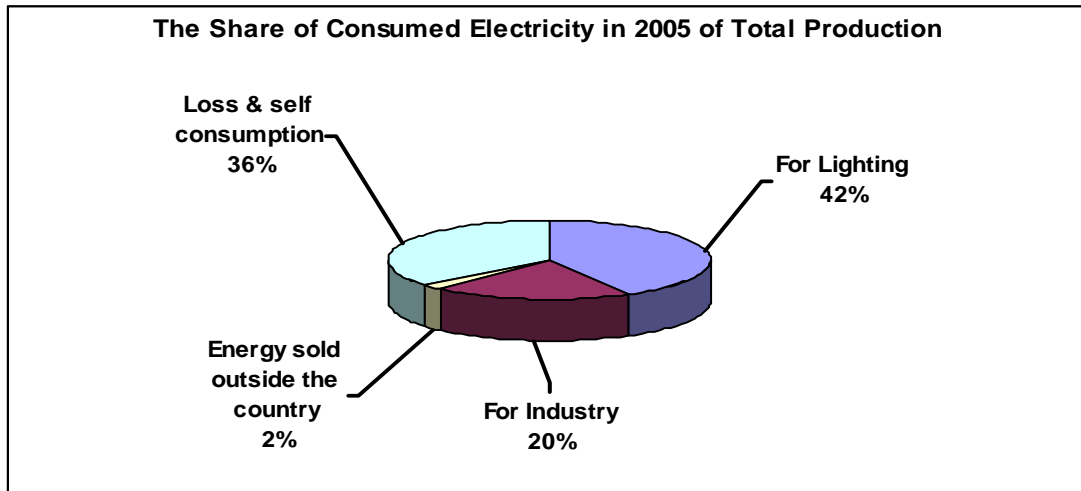
The coming graph shows the share of electricity consumption of total produced electricity, according to consumption type, electricity sold outside the country, and the loss and self consumption.

Graph 5: The composition of produced electricity consumption



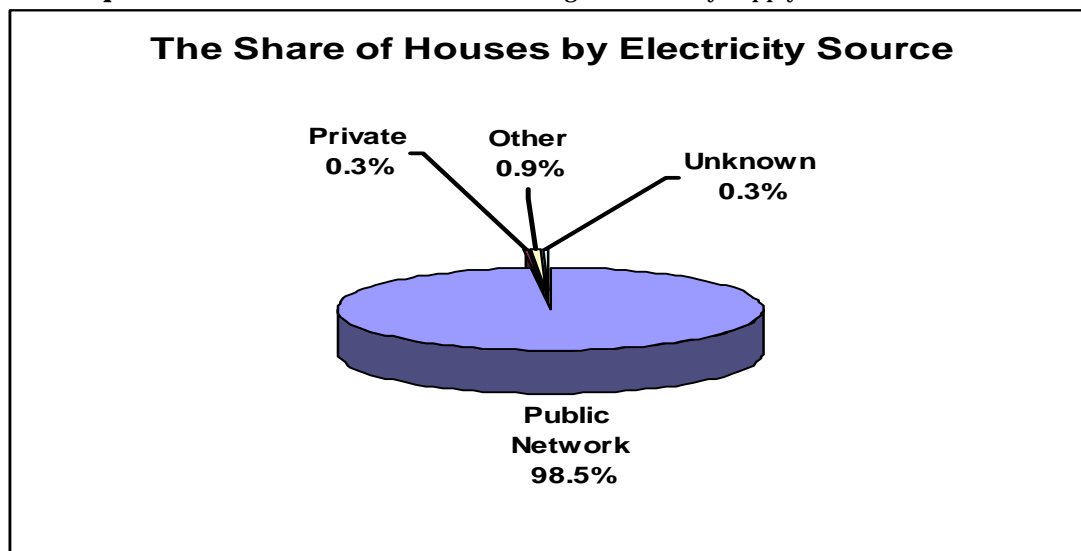
In 2005, the share of losses and self consumption estimated at 36 percent of total electricity production through the distribution network, either because of theft of electricity or of the poor condition of the network (the Ministry of Electricity, 2006).

Graph 6: Electricity consumption, sold outside, and losses



Furthermore, the available data represents that the distribution percentage of houses according to electricity supply means applied in the whole country in 2004 was as follows: public network 98.5%, private 0.3%, other sources 0.9%, and unknown sources 0.3% (CBS, 2006) as in the following graph.

Graph 7: The distribution of houses according to electricity supply means



The Syrian electricity demand is growing at an average of 8-10 percent annually. The demand rose from 31.9 billion KWH in 2004 to 34.8 KWH in 2005. According to the projections of the Ministry of Electricity the figure is expected to reach 49 billion KWH in 2010 and 94 billion KWH in 2020. To meet these figures the Ministry is investing heavily to increase capacity through new power plants and renewable energy.

In 2005, The Pubic Establishment for Electricity Generation and Transmission supplied 88 percent of the electricity, the Al-Furat dam, which is affiliated to the Ministry of Irrigation, supplied 10 percent while 2 percent came from plants affiliated to the Ministry of Oil.

Investment by the government in this sector is on the rise. It reached SYP 8.5 billion in 2005 and is expected to stand at SYP 9.4 billion in 2006. Syria received strong support from international financial institutions to develop its distribution network, and to install an automatic management and control center for the whole electricity network.

Finally, the regional power network linking Syria, Lebanon, Iraq, Jordan and Turkey, has been completed and has allowed the set-up of a common pool of electricity reserve. The network aims at reducing costs and allowing trade and exchange of electricity between the different countries.

4.3 Private investments in electricity sector

The government is seeking the involvement of the private sector to meet growing electricity demand.

A German company is expected to be the first private sector operator in the Syrian electricity field after four decades of state monopoly. And to build a wind power plant with a total capacity of 300 megawatts, near the city of Homs.

5.-Communication

Information and Communication Technology (ICT) plays a major role in global economic growth and forms its main component. This sector was the main factor in the economic growth of developed and some developing countries during the last decade. ICT has tremendously impacted the structure of society and created a new mechanism of interpersonal and societal relations.

ICT, including telephones, contribute significantly to development, because it provides an important and potentially economical way for people to access information (especially for markets).

5.1 ICT and Development

ICTs are an essential and supporting component of socio-economic development; they provide developing countries with opportunities, never offered before, to achieve sustainable development. Nonetheless, ICTs have almost never presented, by themselves, a developmental goal. They remain; however, excellent developmental mechanisms that help increase productivity, stimulate growth, increase job opportunities, advance the welfare of society, and keep businesses abreast of developments in world markets. ICTs are also the major means to move towards the information society and knowledge-based economy. ICTs are a driving force in economy, and thus activating ICT application, production and utilization will undoubtedly boost socio-economic growth and leave a positive impact on all those involved in the information and knowledge society.

5.2 The Information Society

The information society is a society in which information, knowledge and related technologies are used in a way that constitutes a positive impact on productivity, teaching methods, social relations, and policies in all walks of life. It is also the society in which access, search, communication, production and use of information are key processes that shape the lives of individuals and institutions. ICT is the basic instrument in the information society in which availability and adaptability of infrastructures are a necessity. ICT infrastructure should provide: Equal opportunities for accessibility and universal service to all individuals, thus enabling them to effectively acquire and use the information they need. The Internet and its applications are the driving force in the information society, as they provide information in all

fields of inquiry, whether scientific, academic, cultural, economic, financial, political or related to health and education.

5.3 ICT Infrastructure and Access

One of the most important dynamics in developing ICT and building the Information Society in Syria is providing an advanced ICT network infrastructure that is characterized by a high performance and extensive penetration that covers all areas in Syria without exception. If the availability of this advanced infrastructure is accompanied by innovative technologies on the largest possible scale and in all socio-economic domains, there will be a remarkable boost in the growth of economic and social development and a progress in the welfare of individuals. This, however, should go hand in hand with advancement in postal services, which will have a positive impact on various senses like e-commerce.

Infrastructure accessibility should be of a reasonable cost that corresponds to the purchasing power of individuals, in a way that enhances public accessibility in remote areas where the means of access to infrastructure and services are lacking. This can be achieved by establishing public access centers, such as telecommunications centers, post-offices, schools, libraries and archives.

The expansion of ICT infrastructure in Syria should improve its status according to international indicators of e-readiness, as Syria's status in this regard is still far below regional and international standards. The government has to take drastic measures and make crucial decisions to improve Syria's position according to these indicators. The fast-evolving nature of ICT makes it important for Syria to take rapid changes into account be able to keep up with the global development in the coming years.

The importance of a rapid expansion of accessibility to infrastructure lies in that it increases the ability of individuals to access, process, and exchange information on the national and international levels, for the purpose of promoting socio-economic, political, educational, cultural, scientific, academic and health activities. Facilitating information access and the richness of cyber-space are necessary elements for the growth of the information society and the achievement of countless advantages, such as educating the public, providing new job and trade opportunities, developing innovation, and advancing scientific research. To achieve this, there should be a constant cooperation among various educational, cultural, and non-governmental organizations and institutions. Access to information, however, should also be protected from abuse and misuse according to clear and transparent regulations and codes. In addition to that, local public institutions, such as libraries, archives, museums, gallery, should be supported for the purpose of open accessibility for academic research and publishing and for the preservation of valuable documents and manuscript.

To reach the information society, there should be a diligent encouragement of collecting, disseminating and processing of information, as well as using information for research and decision-making. Also of importance is building a digital Arabic content that corresponds to native, national and societal needs, as this will have a clear positive impact on economy and development.

5.4. Telecommunication sector in Syria

In its ambitious plans for economic and administrative reforms, Syria highlighted the essential role of the ICT sector and its potential in opening new opportunities for the Syrian market. This trend was confirmed by the income growth in this sector during the past several years. Syria considers the development of the ICT sector as a developmental challenge and has created for that purpose a dedicated ministry in 2004, the Ministry of Communication and Technology (MOCT). The main mission of this ministry is to formulate policies and strategies formulation to empower rapid development in this sector.

5.4.1 Infrastructure of ICT

The Syrian Telecommunications Establishment (STE) is the only authority in telecommunications and related infrastructures. Yet there is a tendency today towards multiplicity in the provision of telecommunications services, and towards the participation of the private sector in added-value services (e.g. public payphones). STE also requires sub-contractors to provide various other telecommunications services.

There is currently a good fixed telephone network available with an acceptable penetration rate of 13% at the end of 2003. But there is still a need to increase this rate towards reaching a better capacity of providing new subscriptions, shorter waiting periods (weeks) and improved customer services (Ministry of Communication and Technology, 2004). In 2005, the telephone's numbers, main lines in use amounted 2.91 million, and the number of fax subscribers reached 27245 subscribers (CBS).

Mobile telephone services were introduced in Syria three years ago, and since that time mobile telephony has grown rapidly, especially during 2003, as the number of subscriptions reached almost 1,200,000 (up from 400,000 at the end of 2002). This service is provided via two firms that have signed build-operate-transfer (BOT) contracts with STE (Ministry of Communication and Technology, 2004). In 2005, mobile cellular telephone subscribers amounted 2.77 million (CBS).

Rates charged for mobile telephony have dropped remarkably, but they are still high compared to neighboring countries, especially in relation to per-capita income.

The Internet had a limited penetration four years ago, but between 2002 and 2003 it has grown rapidly, with the number of subscribers reaching 110,000. This, however, is a very low rate compared to those of neighboring countries. Internet service is provided via two operators: STE and the Syrian Computer Society (SCS). The diffusion of advanced services, such as leased circuits, Integrated Services Digital Network (ISDN), Broad-bands is still very limited (Ministry of Communication and Technology, 2004). In 2005, the e-mail and internet subscribers are 216000 subscribers, and the number of subscribers in integrated digital network was 6961 subscribers. (CBS).

The high-tech restriction imposed on Syria is having a very negative impact on the number of ICT projects that can be planned and implemented (Ministry of Communication and Technology, 2004).

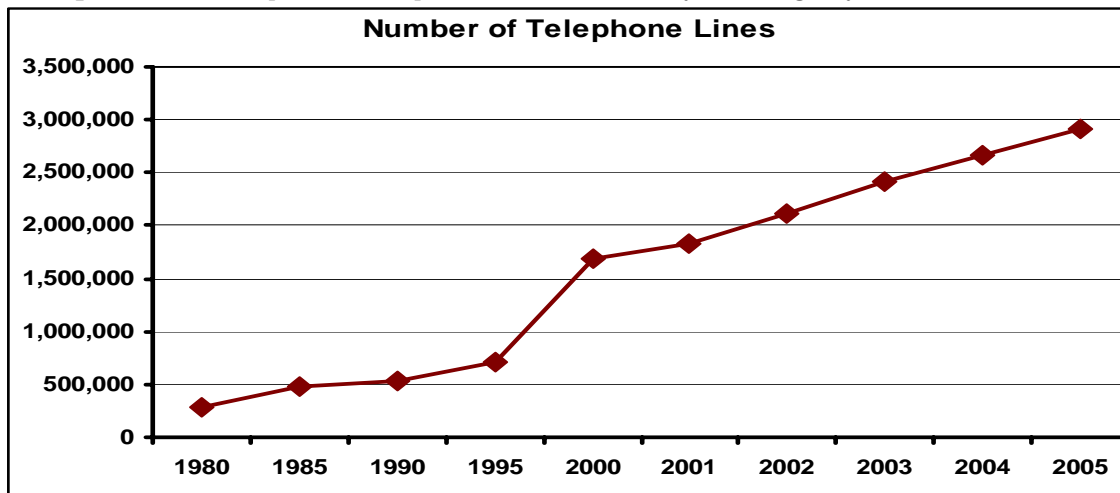
The following table represents the development of telephone line numbers in Syria during the past 25 years. Where the total number of telephone lines increased from 286517 lines in 1980 to 2906563 in the year of 2005 achieving an annual growth rate of 10.1% by year. The figure of total telephone lines consists of two kinds, the automatic and manual lines. the number of automatic lines increased from 247275 lines in 1980 to 2904552 in 2005 with an annual growth rate of 10.8% yearly, while the number of manual lines increased from 39242 in 1980 to 122581 lines in 1990 then it decreased to 2011 lines in 2005.

Table 6: Number of telephone lines in Syria during the period 1980-2005

Years	Automatic	Manual	Total
1980	247275	39242	286517
1985	409853	69529	479382
1990	407494	122581	530075
1995	914667	86820	709903
2000	1676100	8500	1684600
2001	1819356	6235	1825591
2002	2103245	3802	2107047
2003	2412691	2418	2415109
2004	2659449	2127	2661576
2005	2904552	2011	2906563

Source: Central Bureau of Statistics

Graph 8: The development of telephone line numbers in Syria during 25 years



5.4.2 The National ICT Strategy

The decision to formulate a strategy for ICTs in Syria comes from a commitment by the government to utilize the potential of these technologies to achieve the objectives of socio-economic development, i.e. alleviating poverty, raising educational standards, boosting individual capabilities, improving health standards, replenishing environmental resources, as well as building the information society in Syria where every individual is able to access, process and utilize information and knowledge to improve her/his living standards.

The strategy is based on the equal distribution of the benefits of technology among all citizens in urban, rural and remote areas. It is vital to pay special attention to youth in order to empower them to be active participants in the Information Society, and to help them benefit from the opportunities offered by ICT, whether they are contributors, project leaders, entrepreneurs, or decision makers. Attention should also be paid to citizens with special needs who may benefit from ICT in overcoming the difficulties they face in their work and daily life.

Considering the fast-evolving nature of ICTs, they cannot be subject to the same rules as other technologies and conventional economic industries. ICTs require an unleashing of the full potential of the Syrian economy, in the public and private sectors, allowing a new role for the

State to promote and organize this potential, in addition to establishing domestic and international strategic partnerships that go beyond the conventional ones. The development of ICT and its application requires promoting these technologies by establishing technology parks and business incubators.

5.4.3 *Infrastructure in the strategy*

Developing ICT infrastructures is a key prerequisite to the overall development process. In this respect, international indicators were identified to compare between countries and to help set concrete and well documented targets. It is according to these indicators that the strategic targets Syria is seeking to reach by 2013 (i.e: after ten years) have been set. These strategic targets are:

- Fixed telephone line penetration ratio of 30 lines per 100 people (i.e. at least one fixed telephone line per family): reaching this target tele-density means an addition of approximately 4 million fixed telephone lines (i.e. an increase of 125% to the number of fixed lines at the end of 2003), and an approximate investment of 500 to 600 million dollars.
- Mobile telephone lines penetration ratio of 30 lines per 100 people: This target mobile tele-density means an addition of approximately 6 million cellular lines (6 times the current recorded number of lines), and an investment that could reach up to 2 billion dollars, and possibly 4 billion dollars, if the cost of mobile phone set for subscribers is included.
- Internet penetration ratio of 20 sub-scribers per 100 people, i.e. reaching 4 million subscribers: This requires an investment of about 150 to 200 million dollars.
- Computer penetration ratio of 30 computers per 100 people, i.e. reaching an overall target of approximately 6 million computers: This means an investment (by institutions and citizens alike) estimated at 3 billion dollars (including the cost of the basic software needed.).

6.-Water Supply and Sanitation

The most challenging factors, for the sustainable development at global level, are providing energy, reduce poverty, and dealing with water shortage, according to the Human Development Report of UN, 2006. The report highlighted the relative importance of drinking water and sanitation facilities in the development plans of developing countries. In general drinking water has the priority although 2.6 billion people live without treated sanitation facilities while 1.2 billion don't have access to safe drinking water.

6.1.Importance of water supply and sanitation

Potable water and, to a lesser extent, sanitation services, are often a priority for rural communities. Willingness to pay for improved services depends on the distance to, and quality of, existing sources of water and sanitation facilities, as well as the consumers' perceptions of the health threats of unimproved services.

Solutions to improved water supplies in rural areas are almost always localized, the water supply (be it ground or surface water) and its treatment and distribution being provided in each community as a stand-alone system. Network solutions only make economic sense in areas where water sources are scarce or expensive, or where communities are close to one another. For each water technology there are also service level options, which can range from shared facilities (public stand posts or community hand pumps) to house connections (individual hand pump, yard tap, or in-house plumbing).

For sanitation services, the choice of technology and service level depends on population size and concentration, water service level and consumption rates, and soil permeability. For most rural areas in developing countries, the appropriate solution will be an on-site sanitation system (latrine or septic tank). Piped sewer and wastewater treatment systems are sometimes installed in larger communities, but costs are high.

After years of struggling to achieve sustainable rural water systems scattered in communities across the rural landscape, most countries have now shifted from centralized supply-driven service provision models to decentralized demand-responsive ones. Countries are now looking for new models of sustainable rural water systems, increasingly turning to the private sector to help run existing services through management contracts, leases, and concessions.

water and sanitation sector in Syria

6.2.1 Drinking water

Syria is considered as dry or semi arid country, characterized by scarcity of its water resources and inequality of distribution with regional distribution of people, which impose qualitative and quantitative pressure on these resources. The total volume of available water resources for use in Syria is estimated at 15.9 billion m³ annually. The average per capita is 1000 m³ yearly, which is being decreasing because of population growth. The report prepared for tenth-five year plan about water resources indicates that there is water shortage estimated, in average, by 1727 m³ by year during the period 1990-2003. In 2005, water shortage reached 3125 m³.

According to official statistics of Central Bureau of Statistics concerning production and consumption of drinking water in whole Syria (table 7). In 2005, the actual production of water in Syria reached 1,297,785 m³ increasing from 301,432 m³ in 1980, achieving an average annual growth rate of 6.3%. Furthermore, the consumption of water was divided into three categories, priced consumption, free consumption, and lost in the network. The volume of priced water consumption increased from 155,534 m³ in 1980 to 781,154 m³ in the year 2005 achieving an average growth rate of 7% annually. Moreover, during the same period, the consumed amount of drinking water increased from 62303 m³ in 1980 to 105,132 m³ in 2005.

The volume of water lost in the network also increased from 83595 m³ in 1980 to 411,499 m³ in 2005 at an annual average growth rate of 69%.

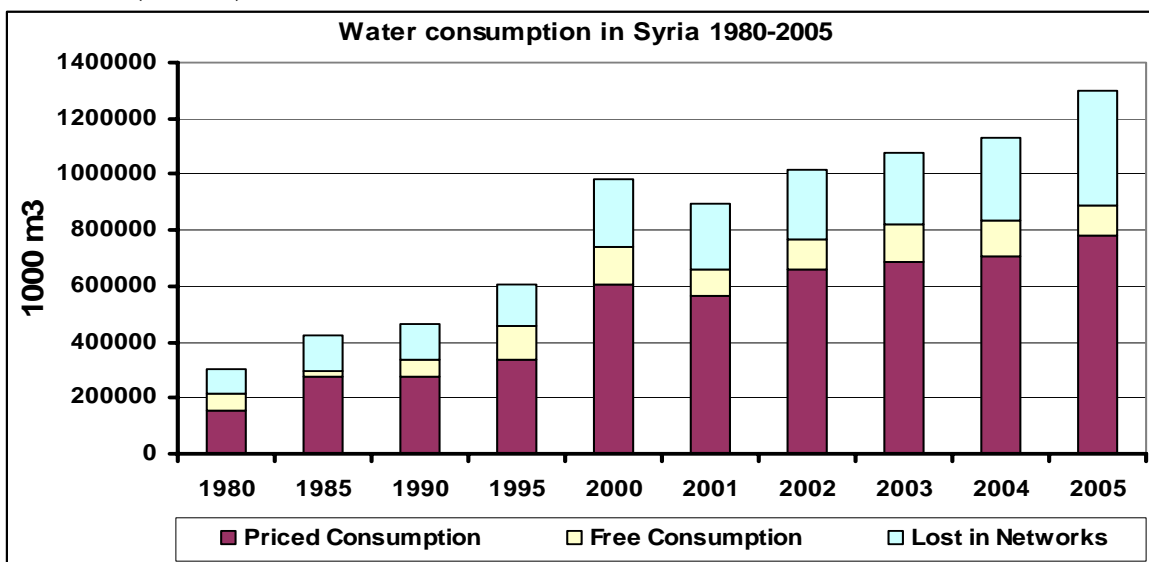
The number of subscribers stood at 2,808,515 subscribers in 2005 increasing from 469818 subscribers in 1980 achieving an average growth rate of 7.7% yearly, reflecting the growth rate and diffusion of drinking water supply services in the country (CBS).

Table 7: Production and consumption of drinking water in Syria (1000 m³)

	Production	Priced consumption	Free Cons.	Network Loss	No. of Subscribers
1980	301432	155534	62303	83595	469818
1985	425077	273661	23716	127700	688944
1990	466280	279072	56111	131097	859376
1995	608856	339759	115456	153641	1036083
2000	984483	608035	134470	241978	2310923
2001	895613	566922	90075	238616	2487641
2002	1013398	662436	102193	248769	2406467
2003	1080154	688643	135734	255777	2244953
2004	1129324	709146	128142	292036	2416827
2005	1297785	781154	105132	411499	2808515

Source: Central Bureau of Statistics

Graph 9: Drinking water consumption in Syria by consumption categories of production in 25 years (1000 m³)

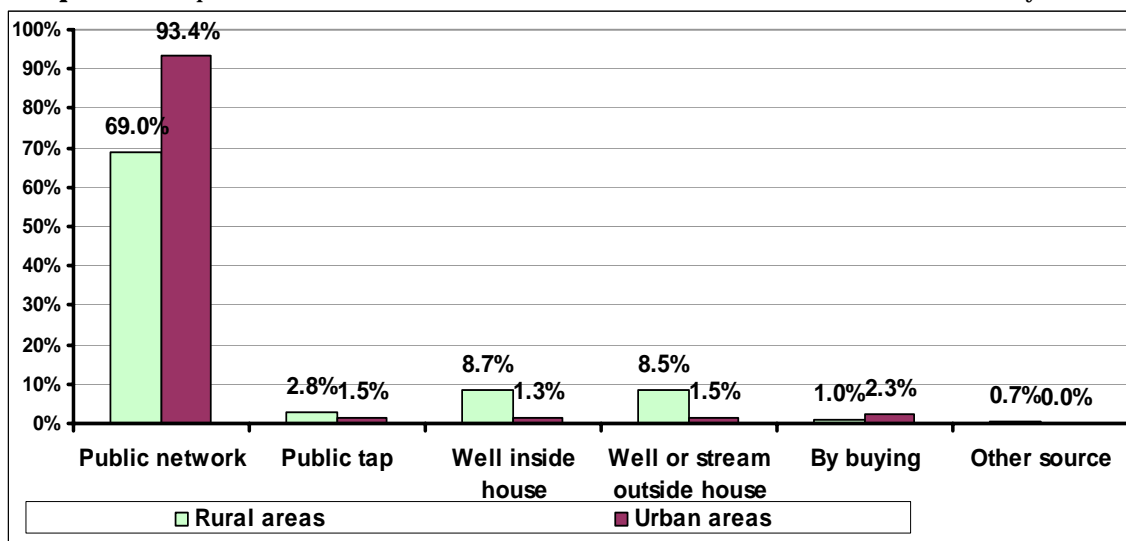


According to "The Multi-indicators Survey about Health, Social and Rearing the Child in Syria, CBS, 2000"⁵, The relative percentage of population benefited from safe drinking water in rural areas is 89%, and 97.5% in urban areas. By comparing rural and urban areas in terms of

⁵ For more details about relative distribution of population who benefited from safe drinking water services geographic regions and residential areas, the reader can refer to "The main report of multi indicators survey about health, social and rearing the child in SAR, 2000", CBS & UN Organization for Children.

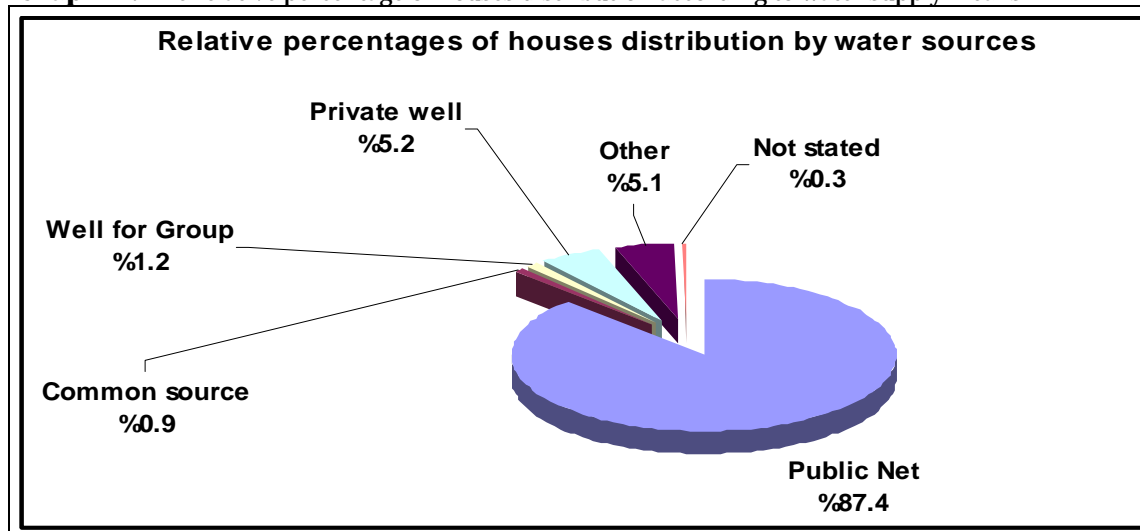
drinking water facilities, we find that 93.4% of urban populations get water from public network and only 69% of rural population gets water from public network. The following graph represents the difference between rural and urban areas by water supply means.

Graph 10: Comparison between water-related infrastructures in rural and urban areas of Syria, 2000



As for drinking water supply, the distribution percentage of houses according to type of drinking water connection means in the country⁶ in 2004 was as follows: Public network 87.4%, common source 0.9%, collective well 1.2%, well owned by the household 5.2%, other sources 5.1%, and unknown sources 0.3% (CBS, 2004).

Graph 11: The relative percentage of houses distribution according to water supply means



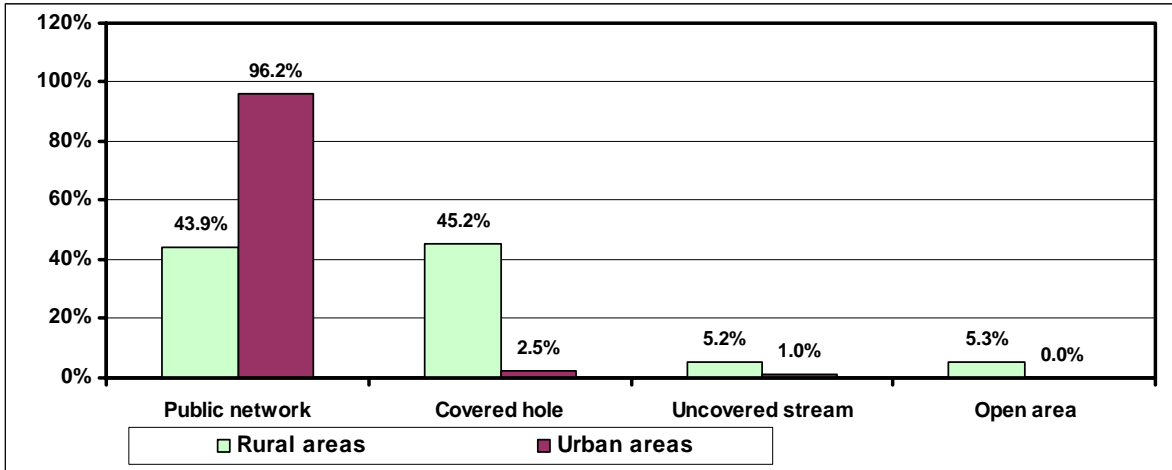
6.2.2. Sanitation facilities

The main findings of “the multi-indicators survey about health, social, and rearing the child in SAR, by CBS in 2000 highlights that about 71.6% of population are served by public sanitation network, this figure increases to 96.2% in urban areas and decreases to 43.9% in rural areas. Furthermore, the relative percentage of houses using closed hole is 22.6% at country level, this

⁶ The report of basic findings of population and houses survey for 2004” published by CBS includes more details at governorate level.

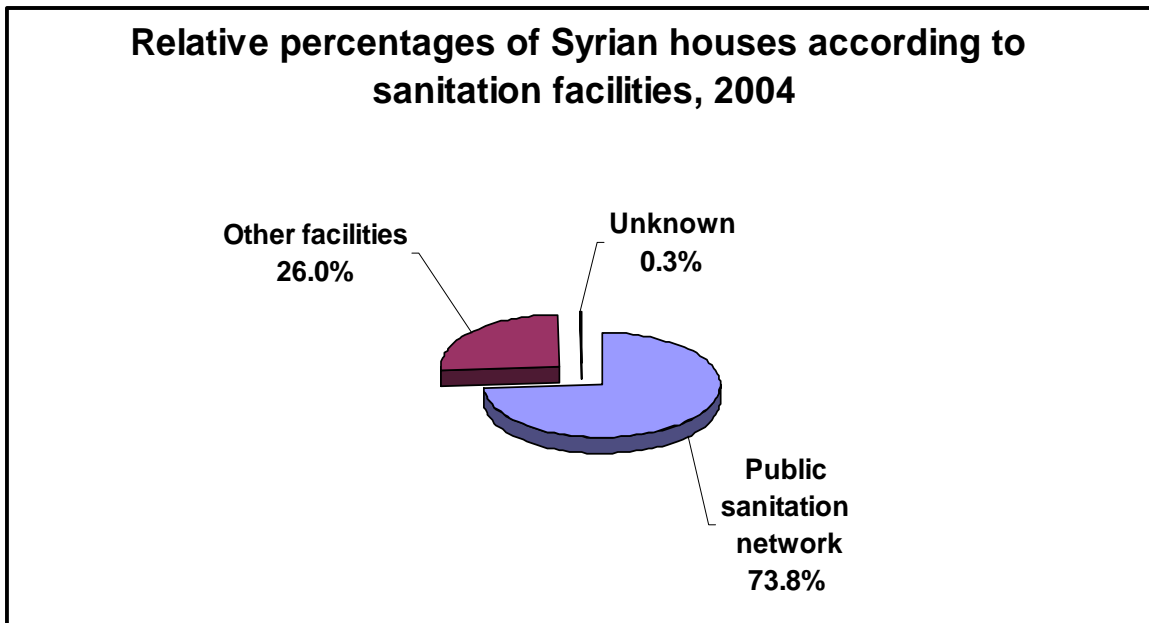
figure increases in rural areas to reach 45.2% but in urban areas is 2.5% only. The other 5.3% of total Syrian houses use uncovered streams or in the open area, 10.5% in rural and 1% in urban areas.⁷

Graph 12: Comparison of sanitation facilities between rural and urban areas of Syria in 2000



The “report of basic findings of population and houses survey for 2004” published by CBS indicates that the relative distribution of houses according to sanitation means in Syria⁸ were as the following: 78.8% of houses are connected to public network, 26% of houses use covered holes, 3% are unknown.

Graph 13: The relative distribution of houses by sanitation means in Syria, 2004



⁷ For more details about relative distribution of houses according to sanitation means and geographic regions and residential place, refer to “The main report of multi indicators survey about health, social and rearing the child in SAR, 2000”, CBS

⁸ The report includes more details at governorates level

6.3. Investments in the sector of drinking water and sanitation facilities

The budget allocated to sewage projects is rising 600 percent in the current five year plan, where a total budget of SYP 37 billion had been allocated to develop sewage and sanitation projects across the country in the period 2006-2010.

Syria and Malaysia inked an accord to build 20 stations to treat sewage water at a cost of USD 31 million in Damascus countryside. Furthermore, the two countries also signed a memo of understanding to execute 34 stations to treat sewage water and to deal with 50 wells for potable water in Daraa region southern Syria.

"The first project will serve housing compounds joining from 5,000 to 25,000 inhabitants and will treat 120 wells for potable water to desalinate nitrates in Damascus surrounding," the two sides noted.

The project will cost USD 60 million of which the Syrian government will pay half in Syrian pounds and the other half in a soft loan issued by the Malaysian government.

7. Other Investments in Infrastructure

The development of industrial cities (IC) has been a top priority for Syrian decision makers, who want to attract investments in the country and lessen the pressure on the cities of Damascus, Aleppo and Homs. In 2004 the Syrian President issued a decree establishing three ICs in Damascus (Adra), Aleppo (Sheikh Najjar) and Homs (Hessia). The three ICs are built in the outskirts of the cities and hold the names of the areas they are built on. The construction works have moved at an unusually high speed and are already hosting several factories even though infrastructure works started only in 2004.

- **Adra**, which is located 35 km north east of Damascus, is the largest and spreads over an area of 70 million m². The total estimated cost of its infrastructure should reach SYP 21 billion (USD 420 million). Close to 400 factories are either operating or under construction.
- **Sheikh Najjar**, to the north east of Aleppo, has a total area of 44.1 million m² and building its infrastructure should cost SYP 13.7bn (USD 274 million). It is close to Aleppo International Airport. Building works there moved faster than in the other two ICs. At the end of August 2006, 37 plants were already operating and 527 other were under construction.
- **Hessia**, has a cost of SYP 7.5 billion (USD 150 million) and a total area of 25 million m². The master plan for the city includes a residential area that could host 66,000 people. The city includes a dry port. 200 factories are operating or under construction.

The cities include all type of industrial sectors and have dedicated areas for each specific sector (textile, agro-food, chemicals, etc). The plots are either sold or rented to investors.

The infrastructure works are financed by the government and by soft loans from international financing institutions. The Kuwaiti-based Arab Fund for Economic and Social Development (AFESD) has, for instance, offered the Syrian government a loan of KWD 9m to finance the building of power transmission stations in the three cities. The Islamic Development Bank has offered a loan of USD 5m to finance the establishment of a treatment station for tanning water in Adra. Also, the government is holding talks with the European Investment Bank for a loan to finance the building of Adra's and Hessia's water treatment stations.

The Syrian authorities bank a lot on the development of these cities. Syria is supposedly a competitive place to attract industries due to its relatively cheap labour and energy costs as well as its strategic geographic location. A new IC in the eastern area of Deir-ez-Zor is also under consideration.

Table 8: Key statistics on Syria's industrial cities

	Adra	Sheikh Najjar	Hessia
Total area (million square metres)	70	44.1	25
Total estimated cost of infrastructure (SYP, billion)	21	13.7	7.5
Government's expenditures (SYP, billion)	1.776	2.99	1.49
Number of operating factories*	26	37	23
Number of factories under construction*	376	527	190
Number of licenses awarded to new factories*	800	697	202

Source: The Ministry of Local Administration and Environment

*As at 31 August 2006

Conclusion and Recommendation

In addition to macro-economic policies, infrastructure is considered one of the main components that provide communities by the appropriate environment for sustainable social and economic development. Infrastructure is not developmental goals by itself but excellent developmental mechanisms, which help to increase productivity, promote growth, increase work opportunities, and improve social welfare.

The road network in Syria achieved an annual average growth rate of 4% during the period 1980-2005. Moreover, a special attention should be devoted to this sector aiming at improving its services and motivate private sector to play its role in costly construction works and improved transport facilities.

During the same period, the electricity sector grew by average rate 9.8% yearly for production. The relative distribution of houses supplied by public network amounted 98.5%. However, the demand for electricity increased also by 10% annually. Consequently, there are needs to improve the quality of grid networks, rationalize energy consumption, and use the renewable resources, such as water and wind power, in addition to involve private sector in the development process of this sector for both production and distribution of electricity.

Regarding the development of communication sector during the past 25 years, the number of fixed lines increased annually by 10.1% growth rate in average, but the coverage rate still low compared to neighboring countries. Furthermore, the number of mobile phones increased remarkably to be 2.77 Million lines in 2005, but the fees for calls still high relatively with the income per capita. due to the main role plaid by this sector in business world and achieving the information society, there should be a devoted attention to achieve the goals of the National Strategy for Information and Communication Technologies of diffusion rate 30 fixed and mobile lines and computers (internet services) by 2013, in addition to reduce cost for using these facilities according to the income per capita to help people achieve the information society.

The sector of drinking water and sanitation has improved during 1980-2005. Water production by the General Institution for Drinking Water has achieved an annual growth rate of 6.3% and the consumption grew by 7% yearly in average during the same period. In general, Syria is suffering from the scarcity of its water resources, so it is important to rationalize water consumption and treat sanitation water and polluted wells, and support the role of private sector in this field.

In conclusion, providing infrastructure services to areas where it not exists, and improve it where there are some of these services, is a basic instrument to improve economic status in general and consequently social welfare.

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