

The Role of Infrastructure in Development

? *The Lecture Programme 2004*

? *Presented by The Hon. Kingsley Thomas*

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Presentation Structure

- Definition of Development
- Definition of Infrastructure
- Examples of International and Local infrastructure projects
- The impact of infrastructure on Development
- The impact of infrastructure on Development – A Local Example
- The financing of infrastructure projects
- Question and answer session
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Definition of Development



Definition of Development

- Economic development is fundamentally about enhancing the factors of productive capacity - land, labor, capital, and technology of a national, state or local economy.
- By using its resources and powers to reduce the risks and costs which could prohibit investment, the public sector often has been responsible for setting the stage for employment-generating investment by the private sector.
- The public sector's tools and strategies have often been effective in enhancing the following:
 - ? labor force (workforce preparation, accessibility, cost);
 - ? business and community facilities (access, capacity, and service to business incubators, industrial/technology/science parks, schools/community colleges/universities, sports/tourist facilities);
 - ? environment (physical, psychological, cultural, and entrepreneurial);
 - ? economic structure (composition); and
 - ? institutional capacity (leadership, knowledge, skills) to support economic development and growth;
 - ? infrastructure (accessibility, capacity, and service of basic utilities, as well as transportation and telecommunications).



Definition of Infrastructure



Definition of Infrastructure

- We can define physical infrastructure as :
“The basic facilities, services, and installations needed for the functioning of a community or society, such as transportation and communications systems, water and power lines, and public institutions including schools, post offices, and prisons.”
- Modern day thinking suggest that other forms of infrastructure exists, these include Technology and Human infrastructure.
- Technology infrastructure consists of science, engineering, and technical knowledge available to the nation’s industries.
- Human infrastructure contemplates treating education and training as a form of investment that will generate future benefits.
- We will focus on the definition of physical infrastructure for the rest of the presentation.



Examples of International and Local Infrastructure Projects



International and Local Infrastructure Projects

- To gain a better appreciation of the various types of physical infrastructure we can briefly review various infrastructure projects.
- We will look at three International and three Local Physical Infrastructure Projects ¹.

1. See Appendix A for a detailed schedule of government infrastructure projects-2001



International Infrastructure Projects



International Infrastructure Projects

The top 10 construction achievements of the 20th Century are*:

1. Chunnel Tunnel.
2. Golden Gate Bridge
3. Dwight D. Eisenhower System of Interstate and Defense Highways.
4. Empire State Building.
5. Hoover/Boulder Dam.
6. Panama Canal.
7. Sydney Opera House.
8. Aswan High Dam.
9. World Trade Center.
10. Chek Lap Kok Airport in Hong Kong.

Of these projects we have selected the Chunnel, Golden Gate Bridge and the Panama Canal for review.

*CONEXPO-CON/AGG '99



International Infrastructure - The Chunnel



- The opening of the Channel Tunnel in 1994 turned the centuries old dream of a fixed link between the UK and mainland Europe into a reality.
- The average depth of the tunnel is around 150 feet under the seabed.
- There are three different tunnels that make up the Chunnel. It consists of two single-track railway tunnels and a central service tunnel used for safety and services.
- The tunnels are used for both freight and passenger traffic.
- The three tunnels combined make up 95 miles of tunnels dug by nearly 13,000 engineers, technicians, and workers.
- The Chunnel cost US\$15 billion to create and runs a length of 31 miles, 23 of which are underwater.



International Infrastructure - The Panama Canal



- Panama Canal crosses the Isthmus of Panama, in Central America, and allows vessels to travel between the Pacific and Atlantic oceans.
- The waterway measures 64 km (40 miles) and enables vessels to avoid travelling around South America, thereby reducing their voyages by thousands of miles and many days.
- The canal consists of artificial lakes, channels, and a series of water-filled chambers (locks), that raise and lower ships through the mountainous terrain of central Panama.
- It was built by the United States from 1904 to 1914 and posed major engineering challenges, such as damming a major river and digging a channel through a mountain ridge.
- It was the largest and most complex project of this kind ever undertaken at that time, employing tens of thousands of workers.
- Total cost to date has been approximately US\$11.52 Billion in 2003 dollars.



International Infrastructure – Golden Gate Bridge



- The Golden Gate Bridge is a 1.7 mile-long suspension bridge that took over four years to build and links San Francisco with Marin County.
- The Golden Gate Bridge was opened to vehicular traffic on May 28, 1937.
- The Golden Gate Bridge's 4,200 foot long main suspension span was a world record that stood for 27 years.
- The bridge's two towers rise 746 feet and the bridge crosses Golden Gate Strait which is about 400 feet deep.
- The Golden Gate Bridge was completed at a construction cost of US\$438M in 2002 dollars.



Local Infrastructure Projects



Local Infrastructure – Highway 2000



- Highway 2000 is intended to be a four to six lane controlled-access, tolled motorway with fully grade separated interchanges and intersections built according to modern international standards.
- Highway 2000, consisting of two phases, will connect the capital Kingston with Montego Bay and Ocho Rios passing through St. Catherine, Manchester, St. Elizabeth, Westmoreland, Hanover and St. Ann.
- Phase 1 of the Project is being developed on a design, build, operate and transfer basis by Bouygues Travaux Publics. This phase will connect Kingston to Williamsfield passing through Bushy Park.
- The Developer/Concessionaire is also part of a private-public partnership (PPP) with the Government of Jamaica in raising US\$ 390M which is the expected cost of Phase 1 of the project.



Local Infrastructure – Ports



- The Port of Kingston is situated on Kingston Harbour (top left picture), which is the world's seventh largest natural Harbour. The port is strategically located on the north/south east/west axis through the Caribbean, approximately 32 miles from the trade routes passing through the Panama Canal. It is recognised as the largest shipping port in the region.
- After a port expansion program that was completed in early 2002 the port can now do 30 movements/hr per crane compared to 19 before the upgrade and can also now accommodate larger vessels.
- The port expansion cost US\$78M.
- ❖ The Port Antonio Marina (bottom left picture) was officially opened in September 2002.
- ❖ The marina consists of: a reconstructed Ken Wright Cruise Pier and terminal building; a two-storey multi-functional building; 32 berths; a promenade and access road with multiple shops and several restaurants; a freezone boat yard; on-land storage for 50 boats; a multi-skilled repair facility, and facilities
- ❖ The Marina was constructed at a cost of US\$15 million



Local Infrastructure – Emancipation Park



Emancipation Park
New Kingston - August 1, 2002
Observer Newspaper

- **Emancipation Park was opened on 1 August 2002. The two hectare Park has a 500-metre jogging track, three water fountains, a large bandstand, restrooms and a variety of flora.**
- **The Park also has an Emancipation sculpture, which is a bronzed male and female figure placed on a dome-shaped fountain.**
- **The Park was constructed at a cost of J\$100 million.**



The Impact of Infrastructure on Development



The Impact of Infrastructure on Development

Note that the examples of infrastructure that have been presented thus far only represent a small subset of the possible types of infrastructure projects. Infrastructure as noted in our earlier definition includes:

- Transportation systems
- Communications systems
- Water supply
- Power supply
- Public institutions:
 - ? Schools
 - ? Post Offices
 - ? Prisons
 - ? Fire Stations
 - ? Parks etc.



The Impact of Infrastructure on Development

- Research on the impact of infrastructure on growth has concluded that the the role of infrastructure in growth is substantial, significant and frequently greater than that of investment in other forms of capital projects.
- Infrastructure services, such as power, transport, telecommunications, provision of water and sanitation are central to the activities of households and to economic production.
- Infrastructure represents the wheels of economic activity and is used in the production process of nearly every sector. Transport, for example, is an input for every commodity, while our very lives, let alone economic activity, would be impossible without water.
- Users demand infrastructure services not only for direct consumption but also for raising their productivity.
- Infrastructure is an important tool for ensuring that growth is consistent with poverty eradication – squatter communities tend to lack facilities; people spend more time dealing with basic amenities which otherwise should be taken for granted eg. fetching of water and carrying fire wood etc. instead of using their time to generate an income.



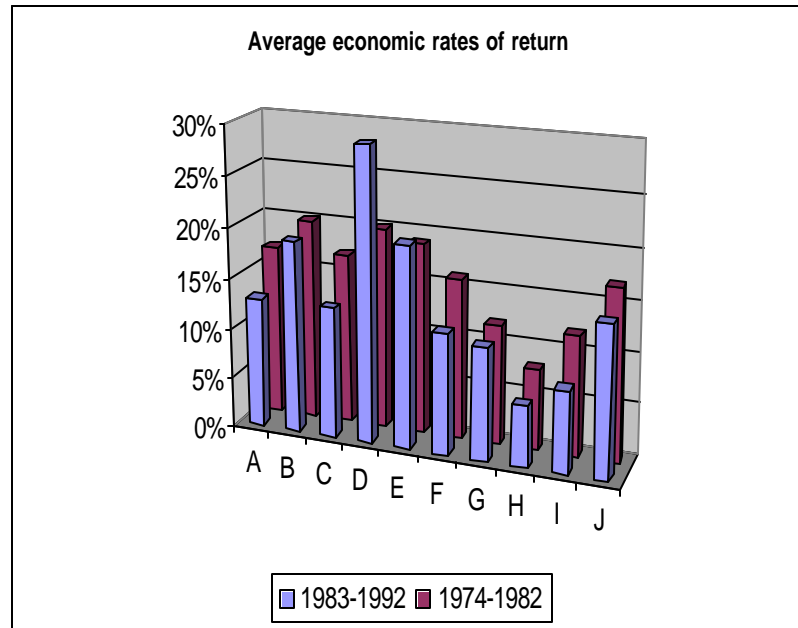
The Impact of Infrastructure on Development

- Infrastructure covers many sectors and can collectively represent a large share of a country's economy.
- Infrastructure typically represents about 20% of total investment and 40-60% of public investment in most developing countries.
- Public infrastructure investments range from 2-8% of GDP (average of 4%). This was 5.5% for Jamaica in 2001¹

1. See Appendix A for further details



The Impact of Infrastructure on Development



Infrastructure	1983-1992	1974-1982
A Irrigation./drainage	13%	17%
B Telecommunications	19%	20%
C Airports	13%	17%
D Highways	29%	20%
E Ports	20%	19%
F Railway	12%	16%
G Power	11%	12%
H Water Supply	6%	8%
I Sewerage	8%	12%
J All Infrastructure	16%	18%

Table shows the average economic rates of return on World Bank-supported projects 1974 -1992

- As can be seen from the above graph and table the empirical data is quite compelling regarding the economic rationale for investing in infrastructure.
- Generally infrastructure gives an above average rate of return. This can be seen from figures for the two decades shown where the average rate of return on overall infrastructure projects was between 16-18% with highways generating the highest returns during the 20 year period.
- Economic returns on infrastructure projects will also vary depending on factors such as design, location and timeliness of completion and whether the project is demand driven (ie. whether the project is responding to effective demand)



The Impact of Infrastructure on Development

Investment in infrastructure can be expected to produce results
In the following areas:

- Increased output as a result of the utilisation of infrastructure to generate higher productivity
- Structural and comparative cost changes through improved technology
- Productive amenities attract firms for investment
- Induced private investment through lower costs and higher returns
- Higher wages through improved productivity
- Direct and multiplier effects of infrastructure construction wages
- Access to markets: cheaper inputs, higher output prices, and alternative employment raise incomes
- Improved health, education, and social services due o better mobility and access
- Environmental improvement and personal and household use of infrastructure services



Planning the Highway 2000 Corridor

- To ensure that maximum benefits are derived from Highway 2000 it is necessary that a structured approach is taken to manage the use and allocation of lands along the Highway 2000 corridor, particularly in the face of competing demands to ensure that the nation's limited land resources are allocated in a sustainable and orderly manner.
- To this end a Planning Committee has been established under the auspices of the Ministry of Land and Environment and the Ministry of Development to undertake this the project. The project approach will be fully consultative and the committee will be drawn from a wide cross-section of stakeholders such as the Parish Councils, Commissioner of lands, private land owners, community groups, farmers and government agencies supported by a technical working group.
- The primary objective of the project will be the preparation of a Development Plan for lands along the corridor of Highway 2000, to facilitate the promulgation of zoning regulations, definition of growth centres and the development of strategies /guidelines for allocation and the development of the lands along the corridor.
- Key areas of focus will be the preservation of arable, pasture and other agricultural lands, promotion of economic activities at prescribed locations, establishment of green belts between existing settlements, e planning for future development and availability of land , preservation of heritage monument and sites, drainage, flood mitigation and facilitation of irrigation works, conservation and environmental considerations.



The Impact of Infrastructure on Development – A Local Example



The Impact of Infrastructure on Development - Local

An econometric model analysis of the Highway 2000 Project, that was supported by the Planning Institute of Jamaica, produced the following results.

- Employment

The employment impact of the project should be significant particularly in the construction sector. In the medium term, it is estimated that 54,172 jobs will be created rising to 119,736 in the long term. Approximately 14% of the employment will be generated in the construction sector in the medium term and this is expected to rise to 17% in the long term

- Output

Over the medium term, it is estimated that the H2K project would generate a J\$26.16 billion positive in nominal GDP. In the absence of any additional inflationary impulses from the project, this translates to an additional 3.0 percentage points of real GDP growth. Under the same assumption about inflation, the long-term impact of H2K is estimated at J\$34.5 billion or 3.7% real growth.



The Impact of Infrastructure on Development - Local

Highway 2000 is expected to stimulate economic and social development by improving access to areas of the island and to facilitate the development of several “Millennium Projects”.

Highway 2000 will:

- Facilitate the growth of economic activity between Kingston and the main tourism centres and other areas of the island with development potential;
- Provide a safer means of travel between population centres along its routes;
- Lower vehicle operation costs;
- Reduce travel time between major cities and urban centres.
- Stimulate the construction of manufacturing complexes, rest areas and gas stations and an Economic Re-Processing Zone (ERZ);
- Reduce population pressure on major urban areas;
- Improve access to tourist centres/attractions such as Y.S. Falls and the Milk River Spa;
- Stimulate agricultural activity by opening up tracts of land for agricultural development;
- Improve the transportation of agricultural produce in the country.
- Facilitate the development of housing along the highway corridor;
- Be a catalyst for similar financed infrastructure projects;
- Attract different and innovative financing sources.



The Financing of Infrastructure Projects



The Financing of Infrastructure Projects

With the global trading environment being largely unfavourable and most developing countries having a high level of debt relative to their GDP, the financing of infrastructure has become more challenging. These constraints have led to innovative methods of financing infrastructure projects.

Methods of financing infrastructure projects include:

- Public finance obtained from general taxation and public borrowing
- Private finance
- Public-private partnership (PPP) financing

Public finance has been the traditional source of funds for investment in Infrastructure projects in both developed and developing countries.

Governments traditionally own, operate and finance nearly all infrastructure, primarily because its production characteristics and public interest involved were thought to require a monopoly, and hence government provision.



The Financing of Infrastructure Projects

Private finance

- Under this method infrastructure is solely financed by the private sector using various types of funding from different sources (equity, loan, subordinated loans). Typically these projects are structured around the BOOT –Build Own Operate and Transfer concept where ownership of the infrastructure will revert to the government after an agreed period.

Public-private partnership (PPP) financing

- Increasingly infrastructure projects which are necessary are not financially robust to be financed totally by private funding. It is only some form of public sector involvement that can close the gap between commercial financial analysis and social cost benefit analysis. Under this approach, whereby the private sector is encouraged to take the project risk, the public sector will inject sufficient funds to reduce the investment risks to levels acceptable to the private sector.



Question & Answer Session



Appendix A

GOVERNMENT INFRASTRUCTURE PROJECTS 2001		
EXECUTING AGENCY	PROJECT	J\$Mn
Ministry of Education and Culture	1) Government Schools Maintenance Programme	135.0
	2) Schools Project	606.9
	3) Reform of Secondary Education (ROSE)	206.4
Urban Development Corporation	1) East Coast Road Phase III	331.0
	2) Independence Park external fence	426.6
	3) National Stadium renovation	194.3
	4) Mandeville Hospital	735.0
	5) Hellshire Sewerage Pongs	78.0
Ministry of Transport & Works	1) Montego Bay Drainage & Flood Control Sub-project	459.8
	2) Northern Coastal Highway Improvement Sub-Project - Segment 1 (Negril to Montego Bay)	286.2
- National Works Agency	3) Northern Coastal Highway Improvement Sub-Project - Segment 2 (Montego Bay to Ocho Rios)	2,718.0
	4) Road Rehabilitation and Institution Strengthening	585.0
	5) Mount Diablo	153.0
	6) Old Harbour By-Pass Road	1,800.0
	7) Washington Boulevard	329.0
	8) Trafalgar Road	93.0
	9) October - November 2001, Disaster Rehabilitation	1,492.5
Jamaica Social Investment Fund (JSIF)	Construction of social and economic infrastructure such as schools, community and civic buildings, roads and minor water supply systems	325.8
National Irrigation Commission	Installation of irrigation water systems in Pedro Plains, St. Elizabeth and Sevens River, St. James	5,000.0
	Canal Lining - Clarendon and St. Catherine	5.0
National Water Commission	CDB/GOJ Cathment Tank Rehabilitation Programme	140.0
	Rural Water Supply	189.6
	Kingston Metropolitan Area (KMA) Water Supply Sub-Project	3.1
Port Authority	Trans-shipment Port Expansion, Kingston Harbour, Hunts Bay and Fort Augusta	1,758.5
	Port Antonio Marina Project	n/r
Jamaica Public Service Co. Ltd.	Rural Electrification	209.9
Total Infrastructure Projects		18,261.6
Jamaica GDP		334,700.0
Infrastructure/GDP		5.46%

