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RIS
Research and Information System for Developing Countries

Core IV-B, Fourth Floor
India Habitat Centre
Lodhi Road
New Delhi-110 003, India.
Ph. 91-11-2468 2177-80
Fax: 91-11-2468 2173-74-75
Email: dgoffice@ris.org.in
Website: http://www.ris.org.in
Website: http://www.newasiaforum.org

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Nagesh Kumar
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Core IV-B, Fourth Floor, India Habitat Centre
Lodhi Road, New Delhi – 110 003 (India)
Tel: +91-11-2468 2177/2180; Fax: +91-11-2468 2173/74
Email: dgoffice@ris.org.in

East Asian Infrastructure Development in a Comparative Global Perspective: An Analysis of RIS Infrastructure Index

Nagesh Kumar*
Prabir De**

Abstract: Development of infrastructure is one of the key priorities of East Asia Summit (EAS) countries. By constructing an Infrastructure Index for 104 countries comprising all the EAS members, this paper examines the levels of infrastructure attainment of EAS countries in a comparative global perspective over time and space. It makes observations on the gaps between EAS countries in terms of infrastructure development, their overtime performance, and provides some policy recommendations for narrowing the gaps. The Infrastructure Index developed in this paper reveals very wide gaps in terms of infrastructure attainment across the EAS region, which seem to have widened rather than narrowed over time. The findings of this paper suggest that infrastructure development in the lagging EAS region needs to be paid due attention if the regional inequalities are not to widen further. The paper recommends creating a regional mechanism in order to utilize the region's foreign exchange reserves for development of regional cross-border connectivity and other infrastructure services, which, if followed, will not only assist in generation of new demand within the region but also strengthen the regional integration process in EAS.

1. Introduction

Infrastructure is a key factor in driving a country's growth and development. Being public goods, availability of quality infrastructural facilities assists in mobilizing private investments by reducing the magnitude of required investments. Infrastructure development can also help in narrowing development gaps between developed and laggard regions. Infrastructure,

* Director General, RIS, New Delhi. Email: nkumar@ris.org.in
** Fellow, RIS, New Delhi. Email: prabirde@ris.org.in

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especially transport and communication, is crucial for regional cooperation and integration. In the absence of efficient physical connectivity, any initiatives taken towards regional trade liberalization will remain ineffective.

Role of infrastructure in fostering economic development and integration has been supported by the empirical literature. A number of studies have highlighted the importance of physical infrastructure as a determinant of economic growth (e.g. Aschaur 1989; Easterly and Rebelo 1993; and Gramlich 1994; World Bank 1994, for reviews). Favourable role of physical infrastructure in influencing the patterns of foreign direct investment (FDI) inflows has been corroborated by a number of studies (e.g. Loree and Guisinger 1995. Mody and Srinivasan 1996, Kumar 1998, 2000, 2002a, 2002b). Kumar (2002a) argued that quality of physical infrastructure could be a particularly important consideration for locational choices for efficiency-seeking or export-oriented FDI flows, a proposition that was supported by the empirical analysis.

However, the problem faced by empirical studies in a cross-country context while analyzing the role of infrastructure availability is that of measurement of availability of the different components of infrastructure objectively. There are many aspects of infrastructure, for instance, transportation facilities like road network, ports, airports, etc., communication infrastructure covering telecommunication network; information infrastructure; energy availability, etc. (see, World Bank, 1994, for infrastructure indicators of different areas). A country may be strong in road infrastructure but may have poor telecommunication or information infrastructure. Hence, a measure of either road transportation infrastructure or telecommunication infrastructure would not adequately capture the overall quality or availability of infrastructure stock. At the same time, an objectively measured and constructed single comprehensive indicator of infrastructure availability is very important, but not available. The World Economic Forum (WEF) Reports provide country scores and country rankings on infrastructure, among many other indicators. However, these scores suffer from some problems of measurement and construction that limit their usefulness in quantitative analysis. Firstly, the scores are based on subjective perceptions of businessmen in different countries on different aspects of infrastructure availability and quality and not on any objective measurement.

The aspects of infrastructure covered are changed over the years so the rankings of countries are not comparable over time. Finally, different aspects of infrastructure are averaged to obtain a single index of infrastructure. Assigning equal weights to different aspects of infrastructure, although convenient, may not be appropriate conceptually.

To overcome the aforesaid problems of infrastructure measurement in inter-country context, Kumar (2002a, 2002b) developed an Infrastructure Index based on six indicators capturing transport infrastructure, communication and information infrastructure and energy availability by using principal component analysis for a sample of 66 countries for three points of time viz. 1982, 1989, and 1994. This Infrastructure Index was able to explain the inter-country variations in the patterns and quality of FDI inflows across sample countries, holding other factors constant. In context of South Asia, De and Ghosh (2003, 2005a) constructed a composite index of infrastructure development across the South Asian countries and found that rising inequality in infrastructure are responsible for widening income gap in the region. While dealing with infrastructure and regional income, De (2005, 2006) developed infrastructure development indices and found that infrastructure facilities positively influence the countries growth in Asia, where quality of transportation infrastructure is an important determinant of Asia's trade and transaction costs. Similar infrastructure indices also constructed by De and Ghosh (2004, 2005b) for Indian states while dealing with infrastructure and development in context of India.

Against the aforesaid background, this paper constructs an Infrastructure Index for 104 countries comprising all the East Asian Summit (EAS) members for three points of time, namely 1991, 2000, 2005 (hereinafter, we call it *RIS Infrastructure Index, RII)*. The global coverage enables us to get a comparative perspective on the infrastructure attainment of EAS countries while three points of time allow us to observe the movement of countries within the sample in terms of development of infrastructure. The paper makes observations on the gaps between EAS countries in terms of infrastructure development, their overtime performance, and provides some policy recommendations for narrowing these gaps.

2. A Comprehensive Measurement of Infrastructure Availability and Country Positions

Here, we briefly summarize the methodology and data sources for constructing an RIS Infrastructure Index (RII) covering 104 countries including all the 16 EAS countries. As observed above, there are several aspects of physical infrastructure which complement each other, such as telecommunication, transport, and financial infrastructure. While these indicators are correlated among themselves in some cases (see Canning 1998), none of them will capture the overall availability of infrastructure adequately. A country may have a very good network of roads but a telecommunication infrastructure that is not so good, for example. Therefore, the statistical technique of principal component analysis (PCA) becomes handy in constructing a unique single index that captures the variance or information contained in different variables capturing different aspects of infrastructure. PCA finds linear combinations of the original variables to construct the principal components or factors with a variance greater than any single original variable.

$$RII_{it} = \Sigma W_{jt} X_{jit} \qquad (1)$$

where RII_{it} = RIS Infrastructure Index of the i-th country (104 countries) in t-th time (namely, 1991, 2000 and 2005), W_{jt} = weight of the j-th aspect of infrastructure in t-th time, and X_{jit} = value of the j-th aspect of infrastructure for the i-th country in t-th time point. Each of the 10 infrastructure variables is normalized for the size of the economy so that it is not affected by the scale. Here, W_{jt} are estimated with the help of PCA.

The aspects of infrastructure covered in the construction of the composite index and their measurements are as follows:

Transport Infrastructure: There could be several aspects of transport infrastructure such as availability of and quality of roads, railways, air transport and ports. In view of the availability of comparable indicators, we have employed following five indicators for capturing the availability and quality of transport infrastructure: (i) Air Transport is captured with the help of passengers carried per 1000 population and air freight million tonnes per kilometres of area, (ii) Road infrastructure is captured by the length of roads network per 10,000 sq. km. of surface area, and percentage share of paved roads, (iii) Railway infrastructure is captured through length of railway lines per 10,000 sq. km. of surface area.

ICT Infrastructure: The availability of ICT infrastructure is captured with the help of teledensity, and density of computers and internet. Total number of telephones (mobiles and fixed line) lines per 1000 inhabitants is a measure of teledensity. Number of personal computers per 1000 inhabitants and internet users per 1000 inhabitants are used to capture IT penetration.

Energy Infrastructure: Energy infrastructure is captured by intensity of energy use viz. energy use (kWh) per inhabitant.

Financial Infrastructure: Domestic credit provided by the banking sector (as percent of GDP) is employed as a measure of availability of financial infrastructure.

The data sources include issues of *World Development Indicators* CD ROM, *CIA Year Fact Book*, country reports (collected as a part of the ERIA/IDE-JETRO project), and other secondary sources. Appendix 1 provides the detailed list of these variables, while Appendix 2 presents the factor loadings, estimated through PCA.

3. East Asian Countries in the World in terms of Infrastructure Attainment

The infrastructure index scores and ranks for the 104 countries for the years 1991, 2000 and 2005 are computed following the methodology outlined in Section 2, and are summarized in Table 1. The countries are listed as per their ascending order of ranking in 2005. Figure 1 presents the rank of countries. The patterns that emerge from the Table 1 are on expected lines, and some important observations are as follows:

First, developed countries occupy the top ten positions in infrastructure development, of which one from North America (USA), two from Asia (Japan and Singapore) and remaining seven countries are from Europe.

The bottom ten positions are occupied by LDCs from Africa and Asia. For example, Myanmar and Cambodia are from Asia, and rest eight countries are from Africa. Developing countries occupy the middle portion of the ladder. Given the estimated ranks, LDCs and land-locked countries across the world suffer more due to infrastructure inadequacy.

Second, the East Asian countries (ASEAN+6) comprise a heterogeneous group and is characterized by wide gaps in infrastructure attainment. As

Table 1: RIS Infrastructure Index Scores and Ranks of Countries

	1991		2000		2005	
	Index	Rank	Index	Rank	Index	Rank
United States	25.96	1	22.95	1	20.66	1
Japan	16.28	5	18.65	4	18.58	2
Singapore	15.73	6	20.11	2	17.66	3
Switzerland	19.07	4	19.43	3	17.19	4
Netherlands	14.22	11	17.20	7	17.18	5
Denmark	14.81	9	17.74	6	16.95	6
Sweden	19.39	3	16.89	8	16.70	7
Ireland	10.43	18	14.41	14	16.12	8
United Kingdom	14.87	8	15.59	9	15.93	9
Norway	21.28	2	17.94	5	15.56	10
Germany	13.25	12	15.56	10	15.20	11
Austria	11.96	16	15.14	11	14.67	12
Canada	14.55	10	14.69	13	14.37	13
New Zealand	12.92	13	14.88	12	14.11	14
Korea	7.78	26	13.97	15	13.68	15
Australia	14.92	7	13.00	16	13.67	16
France	12.87	14	12.69	17	13.59	17
Israel	9.72	19	11.37	20	13.28	18
Bahrain	11.99	15	11.41	19	13.09	19
Italy	9.38	21	11.93	18	12.93	20
Slovenia	7.56	28	10.32	24	12.68	21
Qatar	9.70	20	10.83	22	12.11	22
Spain	8.98	22	10.98	21	11.98	23
United Arab Emirates	8.06	23	10.74	23	11.06	24
Kuwait	10.46	17	8.71	26	10.55	25
Slovak Republic	6.63	31	7.77	30	10.38	26
Portugal	6.96	29	9.86	25	10.19	27

Table 1 continued

Table 1 continued

	1991		2000		2005	
	Index	Rank	Index	Rank	Index	Rank
Czech Republic	7.96	24	8.19	29	9.64	28
Malaysia	5.10	37	8.65	27	9.21	29
Greece	7.85	25	8.60	28	8.84	30
Croatia	6.20	32	6.47	33	8.48	31
Poland	5.02	38	6.26	36	8.15	32
Hungary	4.95	39	6.34	35	7.99	33
Mauritius	5.15	36	6.40	34	7.41	34
Lebanon	3.90	47	6.86	32	7.35	35
Brunei	7.76	27	7.27	31	7.34	36
Bulgaria	6.77	30	5.19	42	7.18	37
South Africa	3.62	48	5.46	39	6.42	38
China	3.51	49	4.83	43	6.33	39
Jordan	5.28	35	5.28	41	6.19	40
Russia	5.86	33	4.00	48	6.01	41
Thailand	4.17	43	5.48	38	5.89	42
Saudi Arabia	4.48	40	4.09	45	5.88	43
Romania	4.21	42	3.92	50	5.76	44
Uruguay	4.07	44	5.69	37	5.62	45
Ukraine	5.59	34	4.09	46	5.25	46
Turkey	2.59	61	4.00	47	5.21	47
Chile	2.96	57	5.45	40	5.20	48
Egypt	3.98	46	4.18	44	5.09	49
Tunisia	3.18	52	3.49	53	4.58	50
India	3.48	50	3.95	49	4.49	51
Mexico	2.54	63	3.07	58	4.44	52
Sri Lanka	2.57	62	3.18	56	4.35	53
Argentina	2.37	65	3.70	52	4.33	54
Brazil	3.08	54	3.31	54	4.24	55
Oman	2.31	66	3.26	55	4.05	56
Iran	2.73	60	3.07	57	4.03	57
Kazakhstan	4.24	41	2.85	59	3.68	58
Venezuela	3.07	55	2.78	62	3.39	59
Georgia	4.05	45	3.83	51	3.31	60
Vietnam	0.91	92	1.85	75	3.27	61
Indonesia	2.23	69	2.74	63	3.21	62
Philippines	1.53	76	2.58	65	2.95	63
Kyrgyz	3.28	51	2.60	64	2.95	64
Colombia	2.24	68	2.11	73	2.92	65
Pakistan	2.39	64	2.26	68	2.89	66

Table 1 continued

Table 1 continued

	1991		2000		2005	
	Index	Rank	Index	Rank	Index	Rank
Zimbabwe	1.51	77	2.11	72	2.84	67
Ghana	2.31	67	2.84	60	2.76	68
Tajikistan	3.10	53	2.48	67	2.73	69
Uzbekistan	2.92	58	2.54	66	2.70	70
Turkmenistan	2.97	56	2.79	61	2.65	71
Syria	2.88	59	1.64	77	2.60	72
Paraguay	1.48	78	2.13	70	2.51	73
Bangladesh	1.83	73	2.12	71	2.50	74
Namibia	1.75	75	1.98	74	2.46	75
Peru	1.05	87	1.57	79	2.39	76
Nicaragua	1.79	74	2.23	69	2.35	77
Mongolia	2.05	70	0.95	88	2.29	78
Botswana	0.56	98	1.25	83	2.25	79
Bolivia	1.27	82	1.79	76	1.91	80
Swaziland	1.85	72	1.48	80	1.89	81
Sudan	0.93	91	0.91	89	1.76	82
Senegal	1.25	83	1.27	82	1.62	83
Kenya	1.31	79	1.07	86	1.43	84
Malawi	0.77	95	0.69	92	1.42	85
Nepal	1.29	81	1.37	81	1.38	86
Ethiopia	0.99	89	1.06	87	1.25	87
Zambia	1.93	71	1.60	78	1.24	88
Nigeria	0.75	96	0.52	97	1.24	89
Madagascar	1.30	80	1.14	85	1.19	90
Uganda	0.79	94	0.82	90	1.06	91
Lao PDR	0.55	99	1.19	84	0.87	92
Cameroon	1.00	88	0.64	94	0.79	93
Yemen, Rep.	1.23	85	0.59	96	0.77	94
Myanmar	0.97	90	0.79	91	0.76	95
Mozambique	0.62	97	0.63	95	0.73	96
Tanzania	1.25	84	0.41	99	0.63	97
Cambodia	0.45	100	0.66	93	0.55	98
Angola	1.20	86	0.13	104	0.52	99
Somalia	0.28	103	0.34	100	0.48	100
Congo, Rep.	0.89	93	0.49	98	0.47	101
Central African Republic	0.42	101	0.31	101	0.42	102
Congo, Dem. Rep.	0.40	102	0.14	103	0.26	103
Chad	0.27	104	0.25	102	0.21	104

Note: Arranged according to the ranks in 2005. EAS countries have been put in bold.
Source: Calculated by authors following the methodology described in the text.

Table 2: Evolving Global Ranks of East Asian Countries in Terms of Infrastructure Development

	1991	2000	2005
Japan	5	4	2
Singapore	6	2	3
New Zealand	13	12	14
Korea	26	15	15
Australia	7	16	16
Malaysia	37	27	29
Brunei	27	31	36
China	49	43	39
Thailand	43	38	42
India	50	49	51
Vietnam	92	75	61
Indonesia	69	63	62
Philippines	76	65	63
Lao PDR	99	84	92
Myanmar	90	91	95
Cambodia	100	93	98

Source: Authors, based on Table 1.

shown in Table 2 and Figure 2, Japan, Singapore, New Zealand, South Korea and Australia find themselves among the first 16 countries in the world. The next group comprises developing countries including Malaysia, China, Thailand, and India within 55 countries in the world. Vietnam, Indonesia, Philippines, Lao PDR, Myanmar, and Cambodia occupy the bottom six positions in East Asia. In general, the rankings in infrastructure attainment seem to relate to their levels of development.

Third, among the 16 East Asian countries, 10 countries successfully improved their global ranks between 1991 and 2005, while the same of rest six countries decelerated (Table 2). Among those climbing the ladder in terms of attainment of infrastructure development, most impressive stride has been made by Vietnam that has jumped 31 places (from 92 to 61) over the period 1991 to 2005. Philippines, South Korea, China, Malaysia, and Lao PDR are the countries which have improved their ranks. Among those that have come down the ladder in terms of infrastructure development

Figure 1: Rank of Countries in Ascending Order in 2005

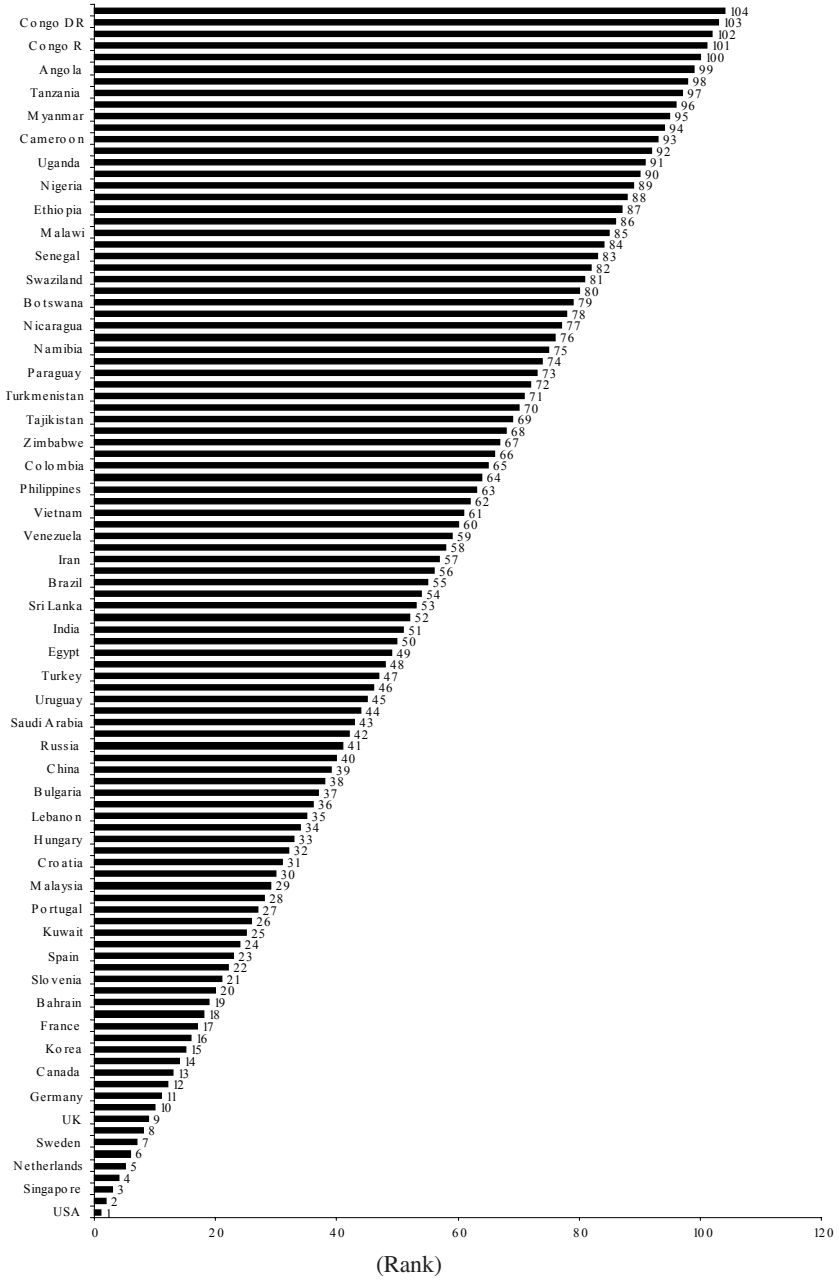
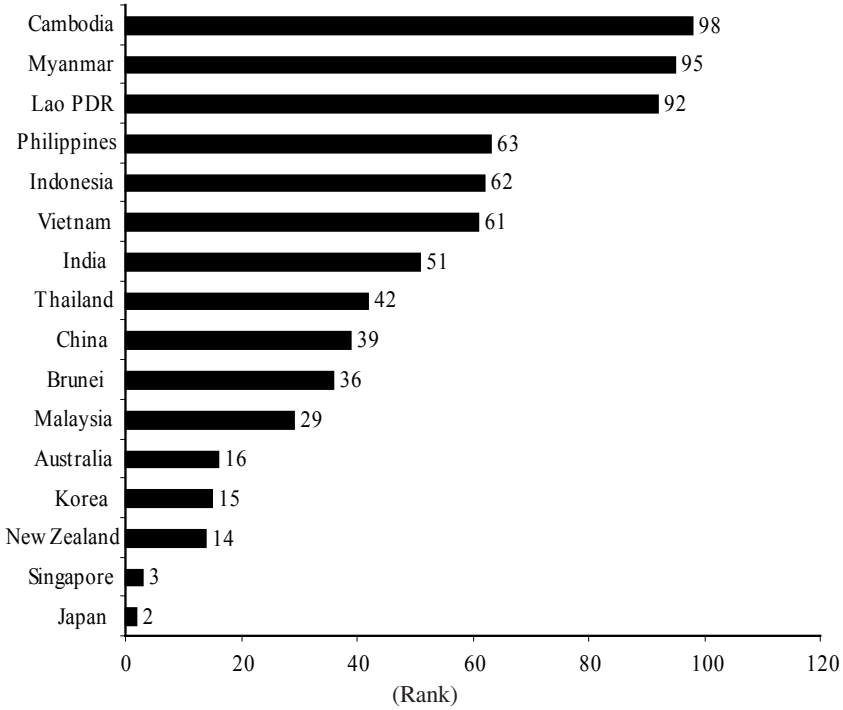


Figure 2: Global Ranks of East Asian Countries in 2005



between 1991 and 2005 are countries like Australia and Brunei (rankings of both fallen by 9 places). Therefore, a regional integration process among the EAS countries should attempt to reduce the infrastructure gaps.

Finally, the infrastructure gap between the most developed and the least developed in East Asia seems to have widened than narrowed from 5-100 in 1991 to 2-98 in 2005. The resource requirements for bridging these gaps are therefore substantial. The process of regional economic integration has to contribute to narrowing these gaps by providing resources for development of infrastructure.

4. Narrowing the Infrastructure Gaps in East Asia

As observed above, the gap between the most developed and the least developed in East Asia in terms of the index has widened than narrowed during the period 1991 and 2005. The gaps existing between the EAS

countries in terms of level of infrastructure attainment need to be addressed as a part of the programme of regional economic cooperation and integration for promoting balanced regional development. Otherwise, the programmes of regional cooperation could work to further widen the development gaps. In particular, enabling infrastructure needs to be created in the laggard regions and countries so that they can enjoy the opportunities created by regional trade liberalization and integration. Therefore, Asia's growth potential will be realized only if we can narrow the infrastructure gap.

The resource requirement for bridging or narrowing these gaps is substantial. RIS (2007) estimated that developing Asia including LDCs will need to spend an estimated total of US$ 412 billion per annum between 2007 and 2012 (or about 7.3% of the combined GDP of developing Asia and LDCs) on infrastructure development such as roads, railways, airways, ports and electricity (see, Table 3). This figure does not include cross-border infrastructure. RIS also estimated that India alone has to spend an investment of about US$ 410 billion in six infrastructure sectors, namely, road, railways, ports, power, aviation, and urban infrastructure during the period 2007 to 2012 as against the estimated US$ 384 billion during 2007-2011 by the Planning Commission (Government of India, 2007). These estimates are also in tune with others, as summarized in Table 4.

Table 3: Annual Infrastructure Investment Needs in Developing Asia

Countries	Investment (2007-2012)	
	Amount (US$ billion)	Share in GDP (%)
China	208.33	10.78
India	68.33	9.89
Indonesia	26.67	6.46
Malaysia	13.33	7.87
Philippines	8.33	7.85
Thailand	11.67	7.22
Vietnam	6.67	5.80
Asian LDCs	74.67	4.60
Total	412.06	7.30

Source: RIS (2007)

Table 4: Estimates of Annual Infrastructure Investment Needs in Asia, 2007-2011

	ADB-JBIC-WB East Asia excluding South Asia[1]	UNESCAP East Asia and South Asia[2]	RIS South and East Asia[3]
Infrastructure investment (US$ billion)	165	228	412
Infrastructure investment (percent of GDP)	6.2	6.8	7.3

Notes: 1. Includes East Asia excluding South and Central Asia for the period 2006-2010. 2. Includes East Asia and Pacific, and South Asia for the period 2006-2010. 3. Includes Developing and LDCs of South, Southeast and East Asian countries for the period 2007 to 2011.
Source: RIS based on the respective studies.

It is clear that additional resource requirements for meeting infrastructure needs of Asia are at least US$ 200 billion per year. RIS study also goes on to demonstrate that mobilization of resources on that scale is feasible in the current conditions of Asia with large surplus savings (over US$ 300 billion in 2004) but they cannot be delivered in full because of a lack of an appropriate regional framework for their mobilization. Hence, these savings and excess foreign exchange reserves of Asia have to be deployed outside the region such as US treasury bonds often earning very poor if not negative real return. Asian countries are now setting up sovereign wealth funds to enhance their returns on these foreign exchange reserves. However, it has been argued by an RIS study that this can be done in a much more effective manner by a regional framework. In a study, RIS has also proposed a regional mechanism that can borrow from Asian central banks for infrastructure development in a very creative manner to supplement and complement other existing facilities and resources (see, RIS 2007 for further details).

It would therefore appear that the EAS region has resources for meeting the growing resource requirements for infrastructure development and narrowing the development gaps to produce win-win outcomes. Needless to mention, the demand impulses generated from financing of additional

infrastructure development in poorer countries in the EAS region will add to the dynamism of the region. By generating additional demand impulses within the region such a mechanism might also assist in adjustment with the global imbalances by reducing the dependence of Asia on the West.

5. Concluding Remarks

In the foregoing an attempt has been made to examine the infrastructure attainment of EAS countries in a comparative global perspective with the help of an Infrastructure Index following a methodology developed in earlier RIS studies. In terms of relative ranks, some EAS countries, like Japan, Singapore, New Zealand and Australia find themselves ranked along with the industrialized western countries, others like Thailand, Philippines, China, India, Vietnam occupy middle space and the least developed countries like Myanmar, Lao PDR and Cambodia ranked towards the end of the sample. Some countries have improved their ranks over time while others have slipped down the ranks because of inadequate attention paid to infrastructure development. This RIS Infrastructure Index reveals very wide gaps in terms of infrastructure attainment across the EAS region, which seems to have widened rather than narrowed over time. Hence, infrastructure development in the lagging regions needs to be paid due attention if the regional inequalities are not to widen further. In order to bridge the infrastructure deficits across the region, huge magnitude of resources would be needed which are estimated to be between US$ 200 to 500 billion per year. On the other hand, the region's foreign exchange reserves now add up to more than US$ 3 trillion, far in excess of their Balance of Payment liquidity needs and that remain invested in western securities earning negative rates of return in the absence of a regional framework for their fruitful deployment. In that context, an RIS proposal of a regional mechanism to mobilize a very small proportion of these reserves for development of regional cross-border connectivity and other infrastructure could be highly productive. It might also assist in generation of new demand within the region and help in adjustment with global imbalances. This proposal needs to be examined further by the EAS policy makers including the modalities for operationalizing the regional mechanism through exiting regional institutions or by creating a new one.

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Appendix 1

List of Indicators

Indicator	Data Sources
Air transport, freight (million tons per km)	WDI
Air transport, passengers carried, (per 1000 population)	WDI
Roads, total network (per 10000 km)	WDI, IDE-JETRO, CIAFY
Roads, paved (% of total roads)	WDI, IDE-JETRO, CIAFY
Rail lines (per 10000 km)	WDI, IDE-JETRO, CIAFY
Electric power consumption (kWh per capita)	WDI
Fixed line and mobile phone subscribers (per 1,000 people)	WDI
Internet users (per 1,000 people)	WDI
Personal computers (per 1,000 people)	WDI
Domestic credit provided by banking sector (% of GDP)	WDI

Appendix 2

Unrotated Factor Loadings (PCA)

Year: 1991
Factor Loadings (Unrotated) (eria.sta)
Extraction: Principal components
(Marked loadings are > .700000)

	Factor 1	Factor 2
Air transport, freight (million tons per km)	0.591	-0.126
Air transport, passengers carried (PER 1000 POP)	0.793	-0.281
Roads, total network (km) PER 10000 KM	0.586	0.354
Roads, paved (% of total roads)	0.611	0.486
Rail lines (total route-km) (PER 10000 KM)	0.313	0.723
Electric power consumption (kWh per capita)	0.858	-0.231
Fixed line and mobile phone subscribers (per 1,000 people)	0.946	0.036
Internet users (per 1,000 people)	0.767	-0.412
Personal computers (per 1,000 people)	0.922	-0.176
Domestic credit provided by banking sector (% of GDP)	0.681	0.306
Expl.Var	5.327	1.328
Prp.Totl	0.533	0.133

Annexure 2 continued

Annexure 2 continued

Communalities (eria.sta)
Extraction: Principal components
Rotation: Unrotated

	From 1 Factor	From 2 Factors	Multiple R-Square
Air transport, freight (million tons per km)	0.349	0.365	0.588
Air transport, passengers carried (PER 1000 POP)	0.630	0.708	0.705
Roads, total network (km) PER 10000 KM	0.343	0.468	0.484
Roads, paved (% of total roads)	0.374	0.610	0.500
Rail lines (total route-km) (PER 10000 KM)	0.098	0.621	0.280
Electric power consumption (kWh per capita)	0.736	0.790	0.811
Fixed line and mobile phone subscribers (per 1,000 people)	0.895	0.896	0.917
Internet users (per 1,000 people)	0.588	0.758	0.688
Personal computers (per 1,000 people)	0.850	0.881	0.916
Domestic credit provided by banking sector (% of GDP)	0.464	0.558	0.538

Eigenvalues (eria.sta)
Extraction: Principal components

Factor	Eigenval	% total Variance	Cumul. Eigenval	Cumul. %
1	5.327	53.272	5.327	53.272
2	1.328	13.279	6.655	66.550

Annexure 2 continued

Annexure 2 continued

Year: 2000
Factor Loadings (Unrotated) (eria.sta)
Extraction: Principal components
(Marked loadings are > .700000)

	Factor 1	Factor 2
Air transport, freight (million tons per km)	0.547	-0.331
Air transport, passengers carried (PER 1000 POP)	0.749	-0.342
Roads, total network (km) PER 10000 KM	0.640	0.231
Roads, paved (% of total roads)	0.659	0.394
Rail lines (total route-km) (PER 10000 KM)	0.358	0.795
Electric power consumption (kWh per capita)	0.809	-0.278
Fixed line and mobile phone subscribers (per 1,000 people)	0.938	0.064
Internet users (per 1,000 people)	0.920	-0.091
Personal computers (per 1,000 people)	0.941	-0.092
Domestic credit provided by banking sector (% of GDP)	0.732	0.110
Expl.Var	5.633	1.178
Prp.Totl	0.563	0.118

Annexure 2 continued

Annexure 2 continued

Communalities (eria.sta)
Extraction: Principal components
Rotation: Unrotated

	From 1 Factor	From 2 Factors	Multiple R-Square
Air transport, freight (million tons per km)	0.299	0.409	0.430
Air transport, passengers carried (PER 1000 POP)	0.561	0.678	0.678
Roads, total network (km) PER 10000 KM	0.409	0.463	0.463
Roads, paved (% of total roads)	0.434	0.589	0.521
Rail lines (total route-km) (PER 10000 KM)	0.128	0.760	0.301
Electric power consumption (kWh per capita)	0.654	0.731	0.740
Fixed line and mobile phone subscribers (per 1,000 people)	0.879	0.883	0.899
Internet users (per 1,000 people)	0.846	0.855	0.899
Personal computers (per 1,000 people)	0.886	0.894	0.919
Domestic credit provided by banking sector (% of GDP)	0.536	0.548	0.537

Eigenvalues (eria.sta)
Extraction: Principal components

Factor	Eigenval	% total Variance	Cumul. Eigenval	Cumul. %
1	5.633	56.333	5.633	56.333
2	1.178	11.776	6.811	68.108

Annexure 2 continued

Annexure 2 continued

Year: 2005
Factor Loadings (Unrotated) (eria.sta)
Extraction: Principal components
(Marked loadings are > .700000)

	Factor 1	Factor 2
Air transport, freight (million tons per km)	0.483	0.269
Air transport, passengers carried (PER 1000 POP)	0.584	0.484
Roads, total network (km) PER 10000 KM	0.645	-0.183
Roads, paved (% of total roads)	0.707	-0.180
Rail lines (total route-km) (PER 10000 KM)	0.385	-0.804
Electric power consumption (kWh per capita)	0.811	0.304
Fixed line and mobile phone subscribers (per 1,000 people)	0.919	-0.017
Internet users (per 1,000 people)	0.927	0.003
Personal computers (per 1,000 people)	0.911	0.021
Domestic credit provided by banking sector (% of GDP)	0.751	-0.149
Expl.Var	5.393	1.134
Prp.Totl	0.539	0.113

Annexure 2 continued

Annexure 2 continued

Communalities (eria.sta)
Extraction: Principal components
Rotation: Unrotated

	From 1 Factor	From 2 Factors	Multiple R-Square
Air transport, freight (million tons per km)	0.233	0.305	0.327
Air transport, passengers carried (PER 1000 POP)	0.341	0.576	0.407
Roads, total network (km) PER 10000 KM	0.416	0.450	0.399
Roads, paved (% of total roads)	0.499	0.532	0.504
Rail lines (total route-km) (PER 10000 KM)	0.148	0.794	0.255
Electric power consumption (kWh per capita)	0.658	0.750	0.734
Fixed line and mobile phone subscribers (per 1,000 people)	0.845	0.845	0.838
Internet users (per 1,000 people)	0.859	0.859	0.890
Personal computers (per 1,000 people)	0.830	0.831	0.851
Domestic credit provided by banking sector (% of GDP)	0.564	0.586	0.554

Eigenvalues (eria.sta)
Extraction: Principal components

Factor	Eigenval	% total Variance	Cumul. Eigenval	Cumul. %
1	5.393	53.931	5.393	53.931
2	1.134	11.344	6.527	65.275

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