Revisiting the Project Model for the 'Fast Track'

Exploring alternatives including HSR (Bullet Train)

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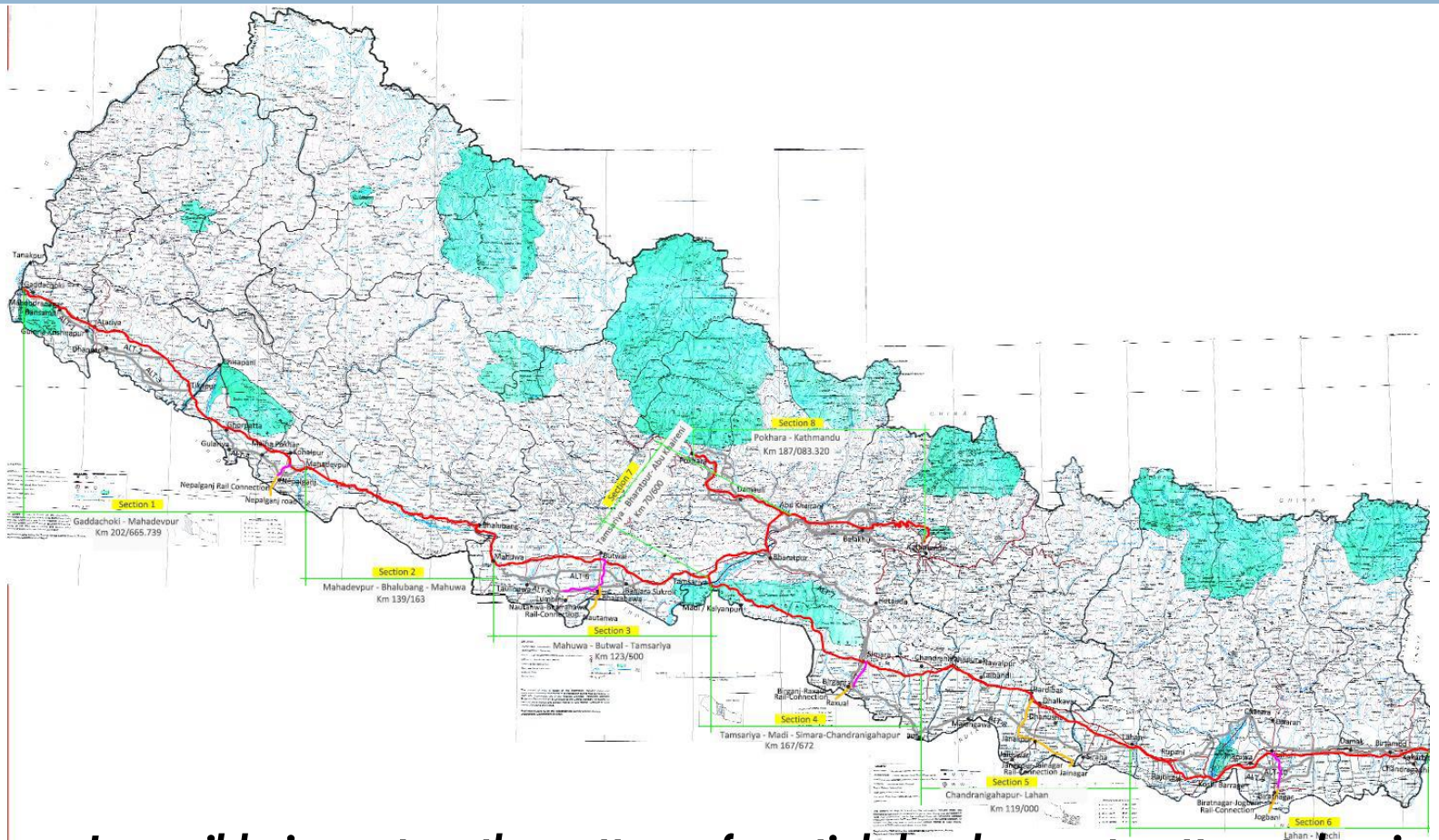
Transport and spatial development

Spatial impacts already visible- more to come

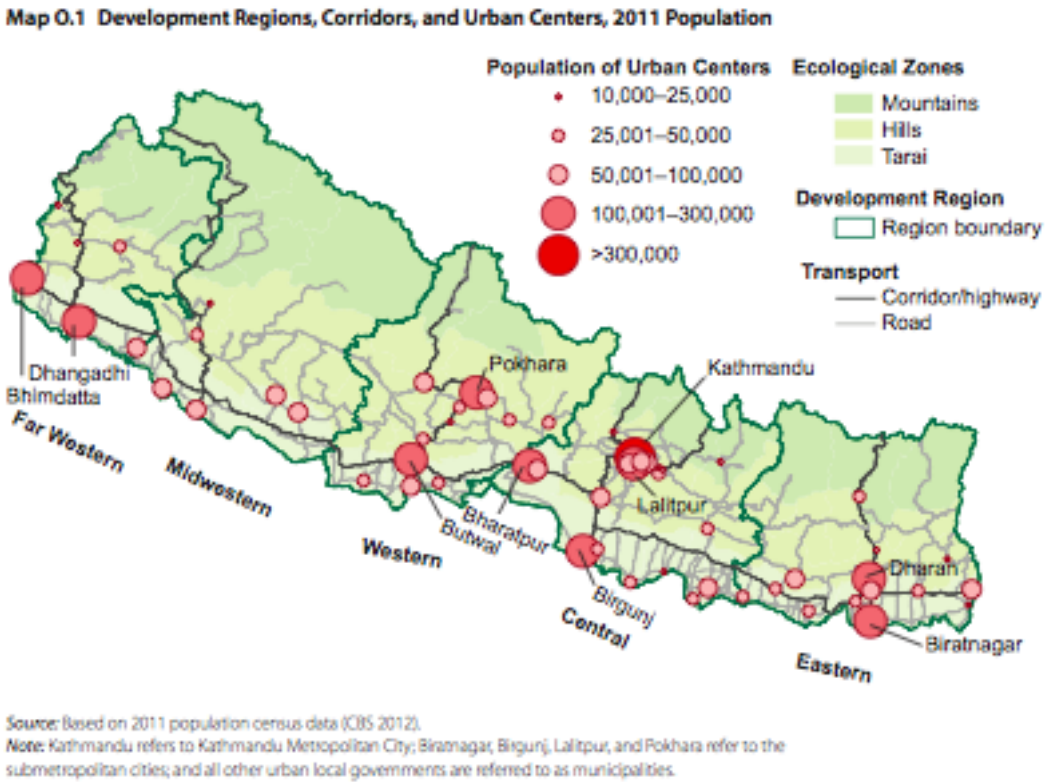


☞ ***Is possible impact on the pattern of spatial development pattern taken in to account while deciding on major transport infrastructure?***

Regional transport connectivity

Level of connectivity

- Basic access
- Mobility (speed)- travel time
- Travel cost
- Level of service (reliability, comfort, safety etc)



Map Source: World Bank (2013) Urban Growth and Spatial Transition in Nepal

Regional transport connectivity

Functional Urban Area is primarily delineated by connectivity indicators, eg

Metropolitan area

•Maximum travel time (to CBD: 60-90 minutes?)

•% of minimum commuting population (of farthest town) to Metro core: 10-20%

•Feasibility of half-day return journey

Regional economic area

Feasibility of single-day return journey

…..importance of transport speed!

Dynamics of transport connectivity

- Dynamics of spatial economics, modal (transport) competition and travellers behavior may have significant influence on factors determining transport connectivity
  - Value of time
  - Door-to-door travel time
  - Passenger fare and cost of different modes
  - Level of transport service
  - Urban or corridor density
- Transport system in Nepal- upgrading to higher speed? May have significant impact on spatial development pattern.

☞ ……

Transport and spatial development

- The interaction works at two level
  - National level- transport and regional development (national land-use)
  - Transport and urban land-use
- Some attempt (with mixed results?) in the past for national level coordination, but current policy lacks strategies for coordination between transport and spatial development
- Different mode/technology may have different impacts; possibility of infrastructure “lock-in”- importance of timing of investing for particular mode!

Strategic importance of Kathmandu-Terai link

- Kathmandu-Nijgadh: 76 km (Nijgadh-Pathlaiya 18 km) (reduce 88 km over the current route)
- Key network link- should be appraised as more than just a "project"
- Provision of high-speed link (road or rail) may bring about unexpected impact in term of generalized transport cost and resulting structural changes in national/regional economics
- Likelihood of shafting part of Kathmandu's function to Terai region
- The link is for 'economic benefits' rather than 'financial profit'

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Kathmandu-Terai-Madhesh Fast Track Project Background

1. Feasibility study : in 2008 by ADB
2. Government Invited private sector under BOOT model→ private companies showed interest but contact was not settled
3. Additional ADB mission to review the Feasibility Report: pointed some shortcoming and suggested further study/analysis
4. World Bank appointed a consultant (CASTELLIA) to review and make suggestion to facilitate PPP process

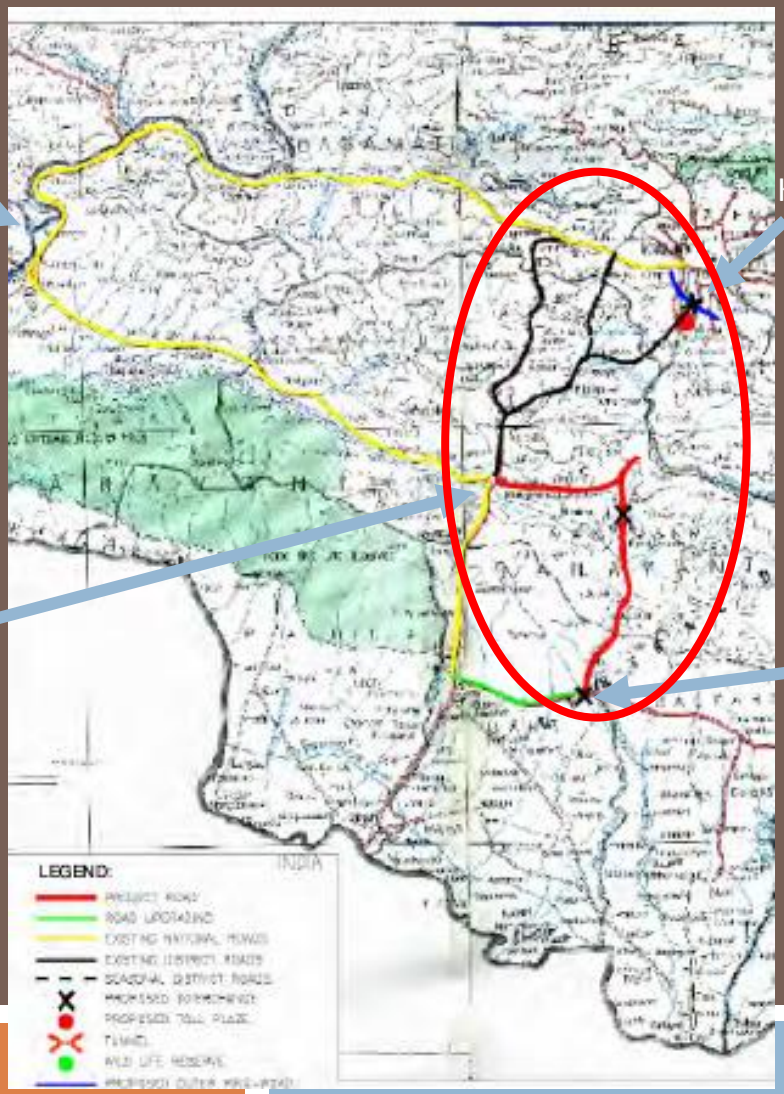
Route in a Map

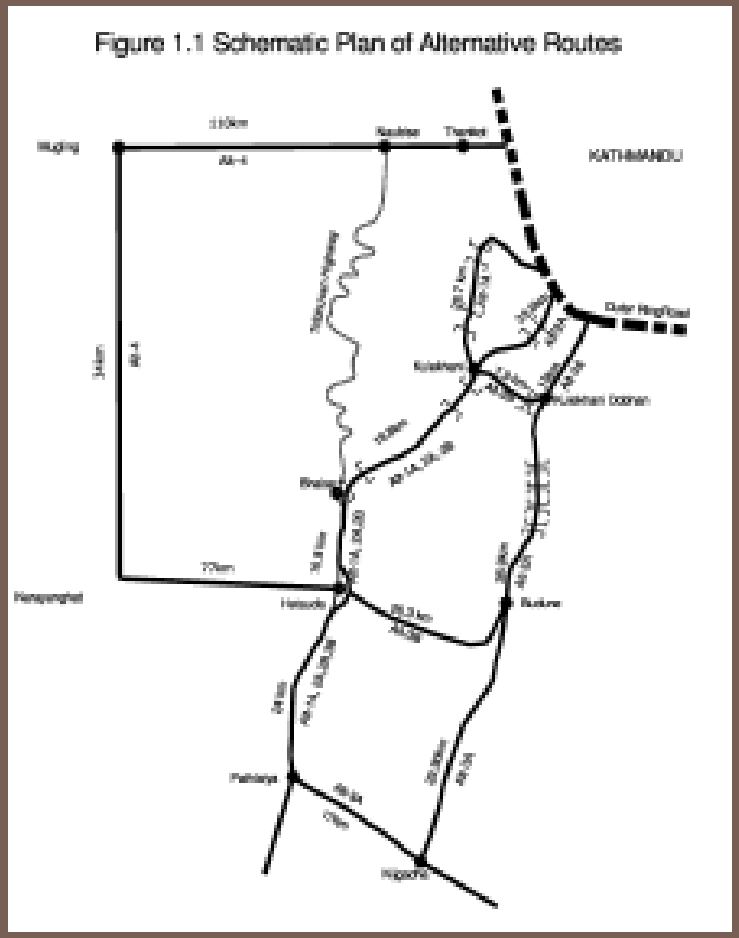
Through Mugling

Kathmandu

Hetauda

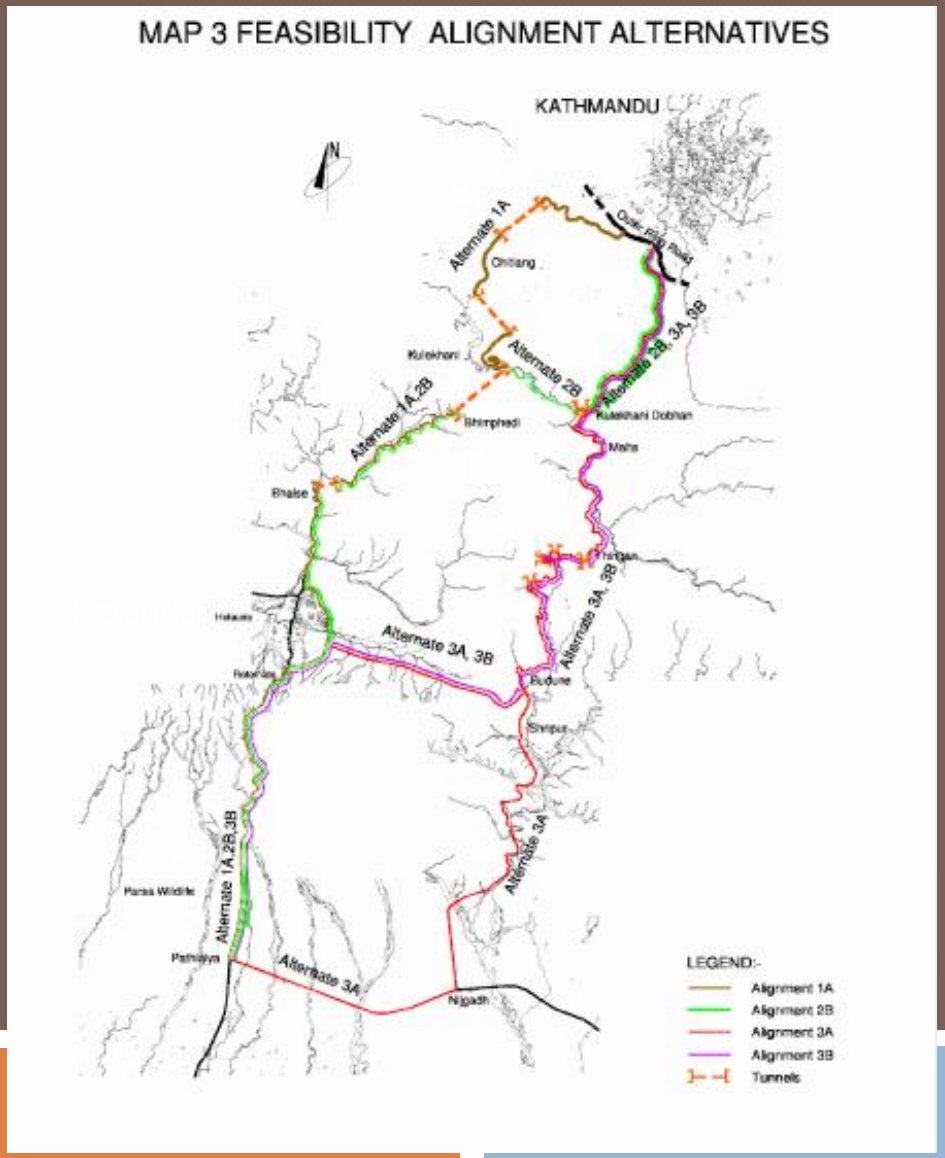
Nijgadh

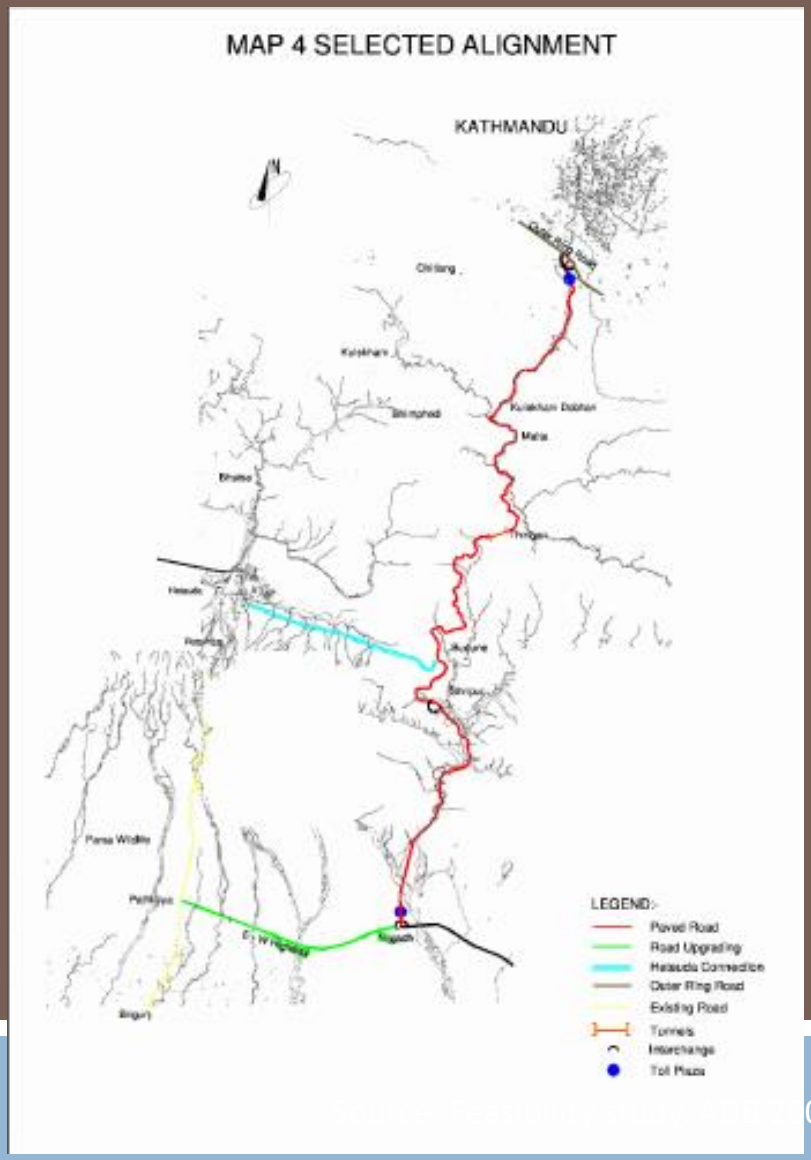




Source: Feasibility study, ADB 2008

Feasibility Studied and Selected route





Traffic Forecast

Table 6.15 Project Road. Airport Opened 2018.

Link		2014		2024		2034	
		Pass	Freight	Pass	Freight	Pass	Freight
Kathmandu	Kulkhani River	2,985	6,479	8,445	12,953	16,550	22,185
River	Malta	2,345	6,449	6,807	12,829	13,352	21,944
Malta	Budne	2,301	6,435	6,693	12,802	13,128	21,875
Budne	Shripur	1,907	4,608	5,888	9,214	11,553	15,823
Shripur	Nijgadh	1,788	4,578	3,873	8,969	7,588	15,187
Nijgadh	Pathlaiya[1]	964	3,538	1,961	7,141	3,949	13,404
Budne	Hetauda	632	1,950	1,420	3,836	2,787	6,605
Kulakhani	Connector	0	0	1,468	85	2,862	139

[1]. Does not include all non network traffic

Maximum road capacity (two lane)
Rolling/Plain: 17000 PCU/Day
Mountainous: 14000 PCU/Day

Source: Feasibility study, ADB 2008

Cost Estimate

Table 2. Project Cost Estimate – 4 Lane Road

$US million (at forecast exchange rate)

Item	Foreign	Local	Total	%Foreign
Civil Works	330.3	373.0	703.3	47.0
Equipment	2.6	0.5	3.0	85.0
Land	0.0	25.6	25.6	0
Consultancy	11.3	37.6	48.9	23.0
Subtotal	344.0	437.3	781.3	44.0
Physical Contingency	17.1	21.5	38.6	44.0
Price Contingency	17.3	84.7	102.0	17.0
Grand Total	**378.4**	**543.5**	**921.9**	**40.5**

Table 3. Project Cost Estimate – 2 Lane Road

$US million (at forecast exchange rate)

Item	Foreign	Local	Total	%Foreign
Civil Works	205.8	238.1	443.9	46.3
Equipment	1.4	0.3	1.7	0.3
Land	0.0	25.6	25.6	0.0
Consultancy	8.1	26.8	34.9	23.2
Subtotal	215.3	290.7	506.0	42.5
Physical Contingency	10.7	14.3	25.0	42.8
Price Contingency	9.9	54.5	64.4	15.4
Grand Total	**235.9**	**359.5**	**595.4**	**39.6**

Includes essential earthworks for upgrading but only single carriageway bridges and tunnels.

Source: Feasibility study, ADB 2008

REQUEST FOR PROPOSAL
(RFP)

for

Kathmandu- Terai / Madhes Fast Track Road Project

(Kathmandu-Nijgadh-Pathlaiya Section)

on

Public Private Partnership/BOT

{Minimum Revenue (Traffic) Guarantee Model}

Government of Nepal

Ministry of Physical Infrastructure and Transport

Kathmandu

November, 2014

Toll Fee

Table F - Financial Proposal

Average Amount of NRs. 20.50 per PCU-Km and PCU Factor as stated below in Table 1 shall be taken as base for quoting the Bid in term of Number of PCU per year for 25 years

Table -1

Vehicle Class / Description	Car	Light Bus	Medium Bus	Heavy Bus	Light Truck	Medium Truck	Heavy Truck	Motor Cycle
Passenger Car Unit (PCU) Factor	1.0	1.5	2.0	2.0	1.5	2.0	3.0	0.5
Toll Rate (NRs.) per Km	20.50	30.75	41.00	41.00	30.75	41.00	61.50	10.25
One Way Toll Charges per Vehicle in NRs. For Kathmandu – Nijgadh Section 76 Km	1558.00	2337.00	3116.00	3116.00	2337.00	3116.00	4674.00	779.00
Note:								

RFP: PPP model

1. Minimum revenue (traffic) guarantee and excess profit share
2. Capital subsidy NPR 15 billion
3. Concession period: 25 years (operation)

Current status: Proposal by two parties under evaluation

Contents

Issue: has appropriate alternative been chosen?

1. Project feasibility study identified key attributes: all relevant but not exhaustive
2. In particular, the regional/spatial development impacts have not been discussed/considered
3. ADB/World Bank missions reviewed of FS Report and questioned the evaluation of alternative alignments
4. Has rail option considered?

Multiple Attribute Decision Making Analysis (by ADB Feasibility Study)

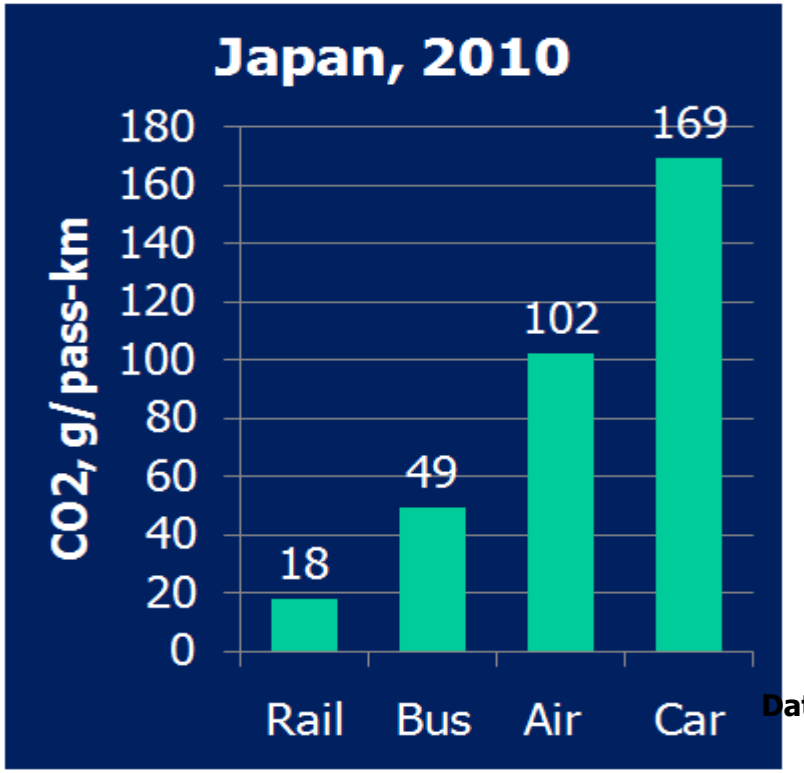
Table 1.5 Results of Prioritization

Criteria	Aims	Cost	Financial	Economic	Technical	Operation Cost	operation Viability	Multi-Modal Transfer	Sustainability	Environment	Resettlement	Social	GAM INDEX	RANK
Weighting	89%	56%	47%	54%	52%	58%	48%	18%	38%	25%	22%	21%		
Two Lane with Passing Lane														
1. Chitlan Valley Route	5.0	7.7	4.1	7.3	5.0	6.7	1.0	9.0	10.0	3.7	10.0	8.0	31.8	8
2B. Kulekhani River Route	6.5	9.4	7.7	10.0	7.0	8.8	2.0	9.0	7.1	6.7	10.0	6.0	39.2	5
3A. Bagmati Valley – EWH Route	5.0	9.9	7.9	9.8	10.0	9.7	10.0	10.0	2.9	7.0	5.0	4.0	**41.3**	1
3B. Bagmati Valley-Hetauda Route	3.0	10.0	8.6	10.0	8.3	10.0	10.0	9.0	2.9	2.6	8.3	7.0	39.3	4
4. Existing Road	1.0	0.0	1.0	1.0	5.0	3.3	10.0	9.0	1.4	2.2	1.0	6.0	15.4	13
Four Lane														
1. Chitlan Valley Route	7.5	2.5	1.0	4.0	3.3	1.0	1.0	9.0	10.0	0.7	6.7	8.0	22.2	12
2B. Kulekhani River Route	10.0	5.8	4.4	5.4	8.3	4.3	2.0	9.0	7.1	4.4	6.7	6.0	33.1	6
3A. Bagmati Valley – EWH Route	7.5	6.8	4.5	5.6	1.0	6.3	10.0	10.0	1.0	4.8	1.7	4.0	29.2	9
3B. Bagmati Valley-Hetauda Route	4.5	6.9	5.2	5.8	3.3	6.8	10.0	9.0	1.0	1.0	5.0	7.0	28.7	10
Two lane + passing but Hetauda-Pathlaiya 4 lane														
1. Chitlan Valley Route	6.5	7.4	4.4	6.7	5.0	6.1	1.0	9.0	10.0	6.3	6.7	8.0	32.4	7
2B. Kulekhani River Route	8.0	9.0	8.3	9.1	7.0	8.2	2.0	9.0	7.1	10.0	6.7	6.0	39.9	3
3B. Bagmati Valley-Hetauda Route	4.0	9.7	10.0	9.6	8.3	8.9	10.0	9.0	2.9	6.3	5.0	7.0	40.1	2
Rail Connection	7.0	7.2	3.0	2.5	2.0	3.0	2.0	8.0	8.0	8.0	2.0	2.0	24.1	11

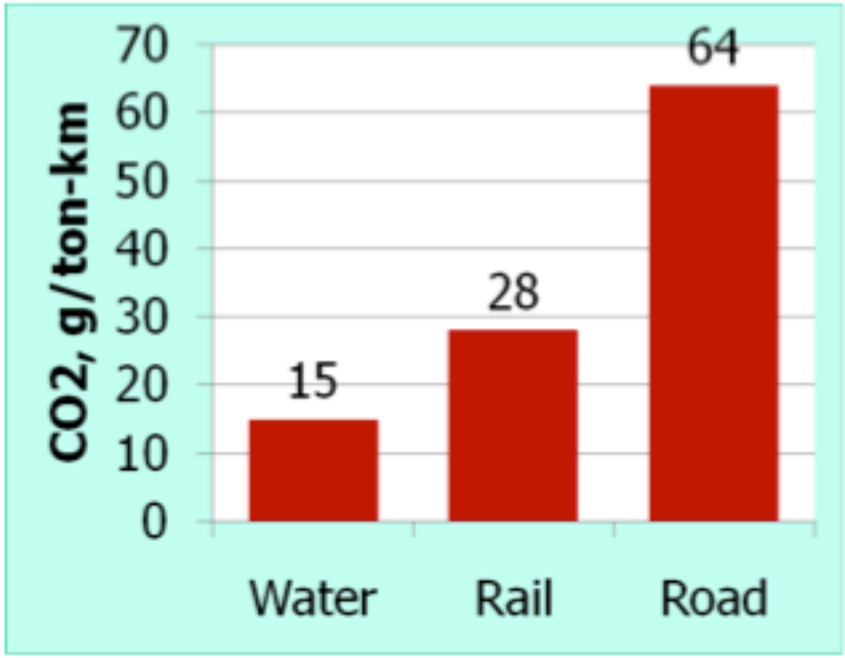
Source: Oriental Consults/ITECO/NDRI (2008): ADB Feasibility Study Report, North-South Fast Track Project, ADB TA 4842-NEP

CO2 emission by different modes

CO2 emission by pass. modes



CO2 emission by freight modes



Data source: McKinsey & Company

मुख्य शहर देखि अन्तरराष्ट्रिय विमानस्थल सम्मको दुरी, यात्रा समय तथा माध्यम

शहर	अन्तरराष्ट्रिय विमानस्थल	दुरी (कि. मि.)	यात्रा गर्न लाग्ने समय (मिनट)	कैफियत
दिल्ली	ईन्दिरा गान्धी	२२.७	१८	द्रुत रेल
बैंकक	सुवर्णभुमि	२५.७	४०-६०	द्रुत बस
टोकियो	नारिता	५२.१४	४५	द्रुत रेल
हङकङ	चेक लाप	३४	२४	द्रुत रेल
सिङ्गापुर	चाङ्गी	१७.२	१७	द्रुत रेल
लन्डन	हिथ्रो	२२	१५	द्रुत रेल
न्युयोर्क	नेवार्क	२१	१६	द्रुत रेल
पेरिस	रोजी	२४.७	१५	द्रुत रेल
सिओल	इन्च्योन/गिम्पो	५२	४३	द्रुत रेल
जाकर्ता	सुकार्नो	२८	४०	द्रुत बस
दुबई	दुबई	४.५	५	द्रुत रेल

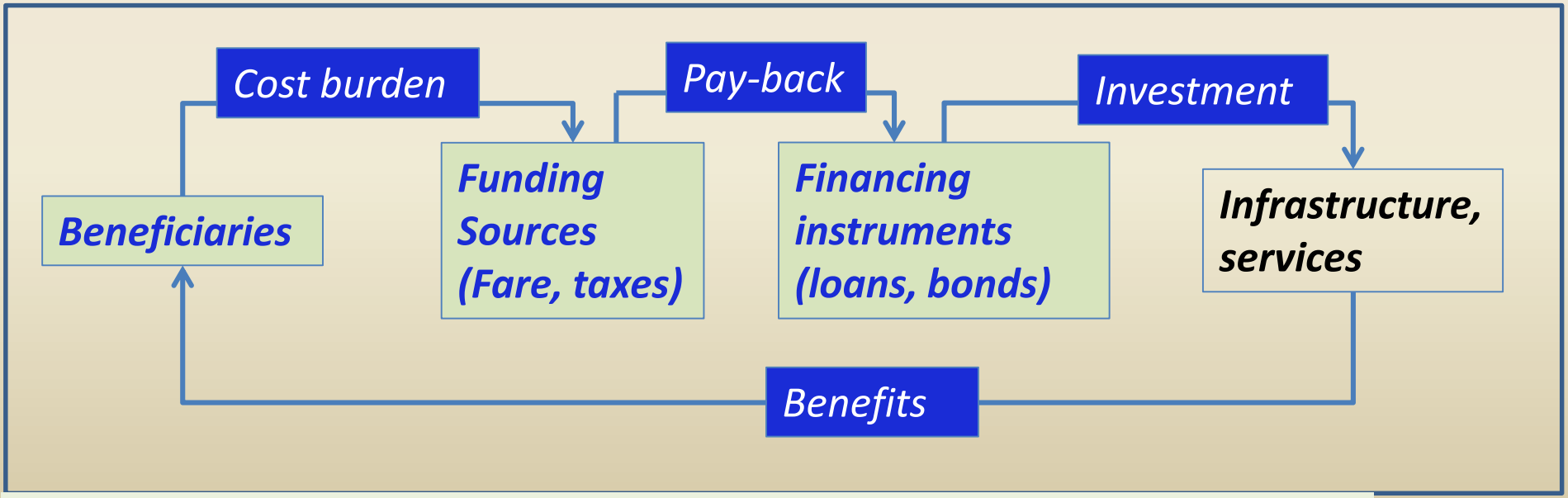
Alternative options

1. Given the importance of the corridor, in future we will need
   - Tolled-Expressway
   - General highway (toll-free)
   - Railway
2. ADB F/S was commissioned before GoN decided on the national railway system. Importance/priority for Ktm-Terai Rail link has significantly increased?
3. Cost of railway (HSR) significantly decreased over past few years; not factored in?
4. Need to clearly identify priority for modes and alignment before implementing any one option
5. Current approach appears to be a “piece meal” kind

Contents

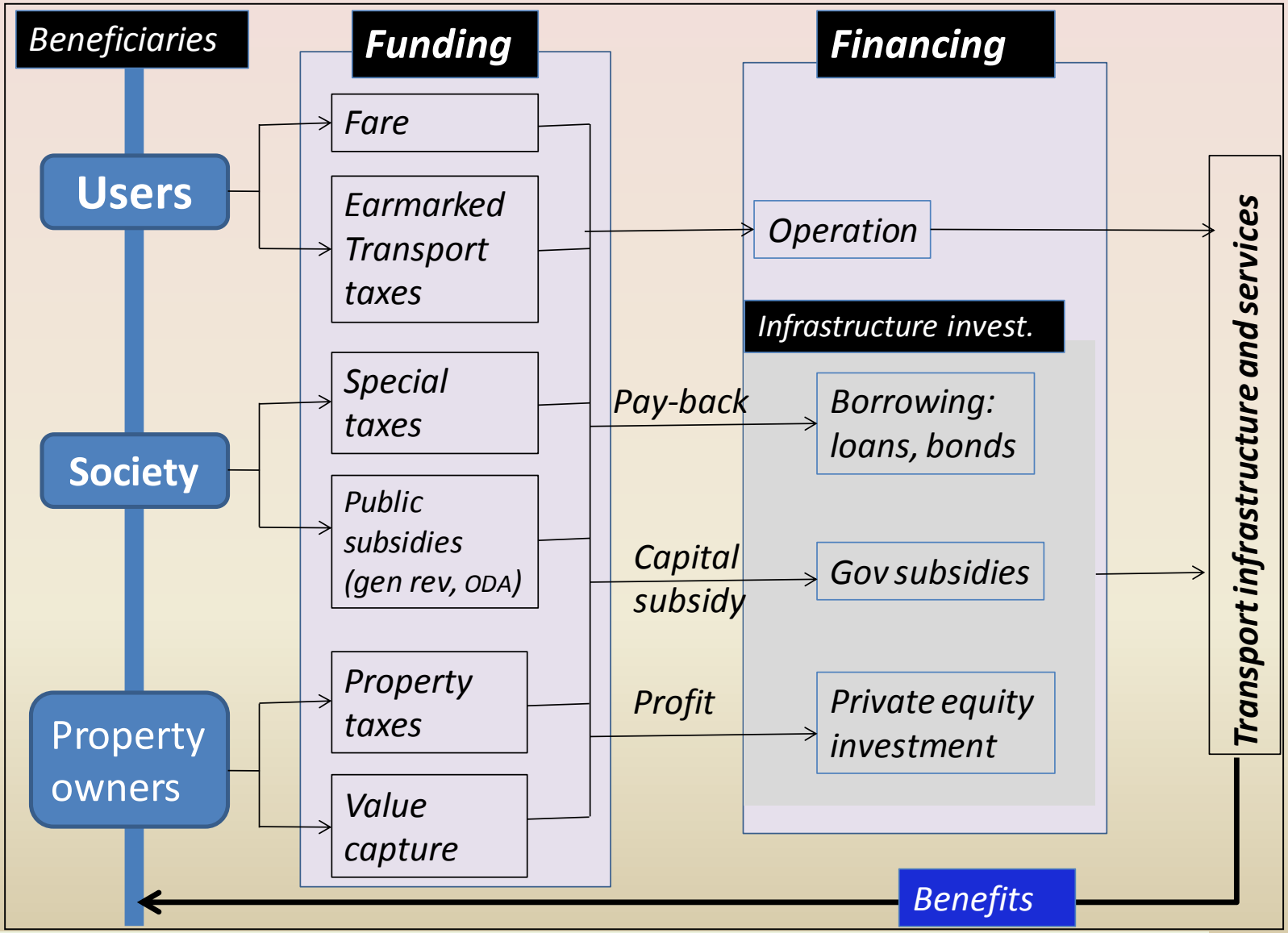
Funding and Financing: different meaning?

- ***Funding*** is the sources that take ultimate burden (paying for benefits) for the cost of infrastructure and services.
- ***Financing*** includes available funds (such as subsidies and grants) and mechanisms to make future stream of revenue available upfront (such as loans, bonds etc)
- There is no such thing as Private Sector Funding!



Morichi and Acharya (2013): Transport Development in Asian Megacities, Springer, Berlin

Funding and Financing



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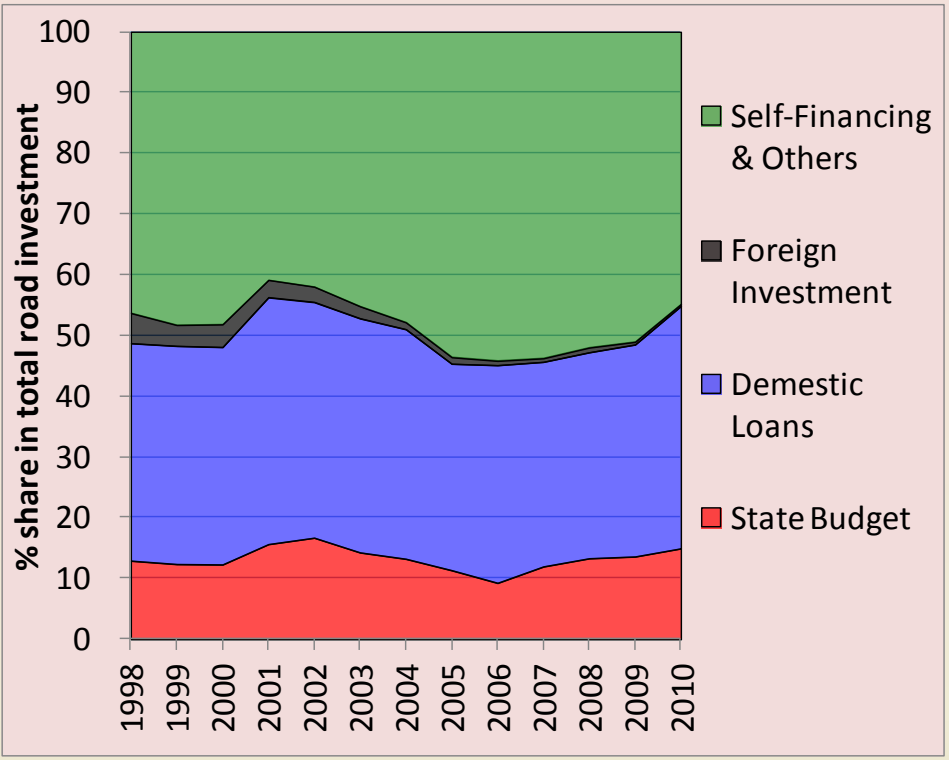
Sources of road financing in China



Data source: China Highway and waterway transport statistical yearbook

Sources of road financing in China (2010)

- National budget (**15%**)
  - Vehicle purchase tax (12%)
  - General revenue (3%)
- Domestic loans **(40%)**
  - National strategic loan (National Dev Bank)
  - Commercial loan (other banks)
- Foreign investment **(0.4%)**
  - Private investors
  - International Financial Institutions (IFI)
- Self Financing and Others **(44.6%)**
  - Road maintenance fee (up to 2009)
  - Fuel tax (since 2009)
  - Additional transport fees by local government
  - Road construction fund
    - Fund raised by local bonds
    - Fund raised by securitization of road assets
  - Local government budget (general revenue)
  - Investment by enterprises, PPP (7%)
  - Toll revenue

Source: Transport Planning and Research Institute, MOC (2006); Country presentation at UN-ESCAP Regional Experiences and Lessons in Financing Highway Infrastructure and Improving Road Safety; World Bank (2010) A review of Institutional arrangements for road asset management

Issue: Is the Funding/Financing model adopted for Fast Track project appropriate?

1. How it should have been funded?
   - General government tax or users' toll?
     - If it is by users' toll
       - By government entity
       - Private sector (PPP)
2. How to Finance?
   - Government capital subsidy?
   - Borrowing/debt, by public or private?

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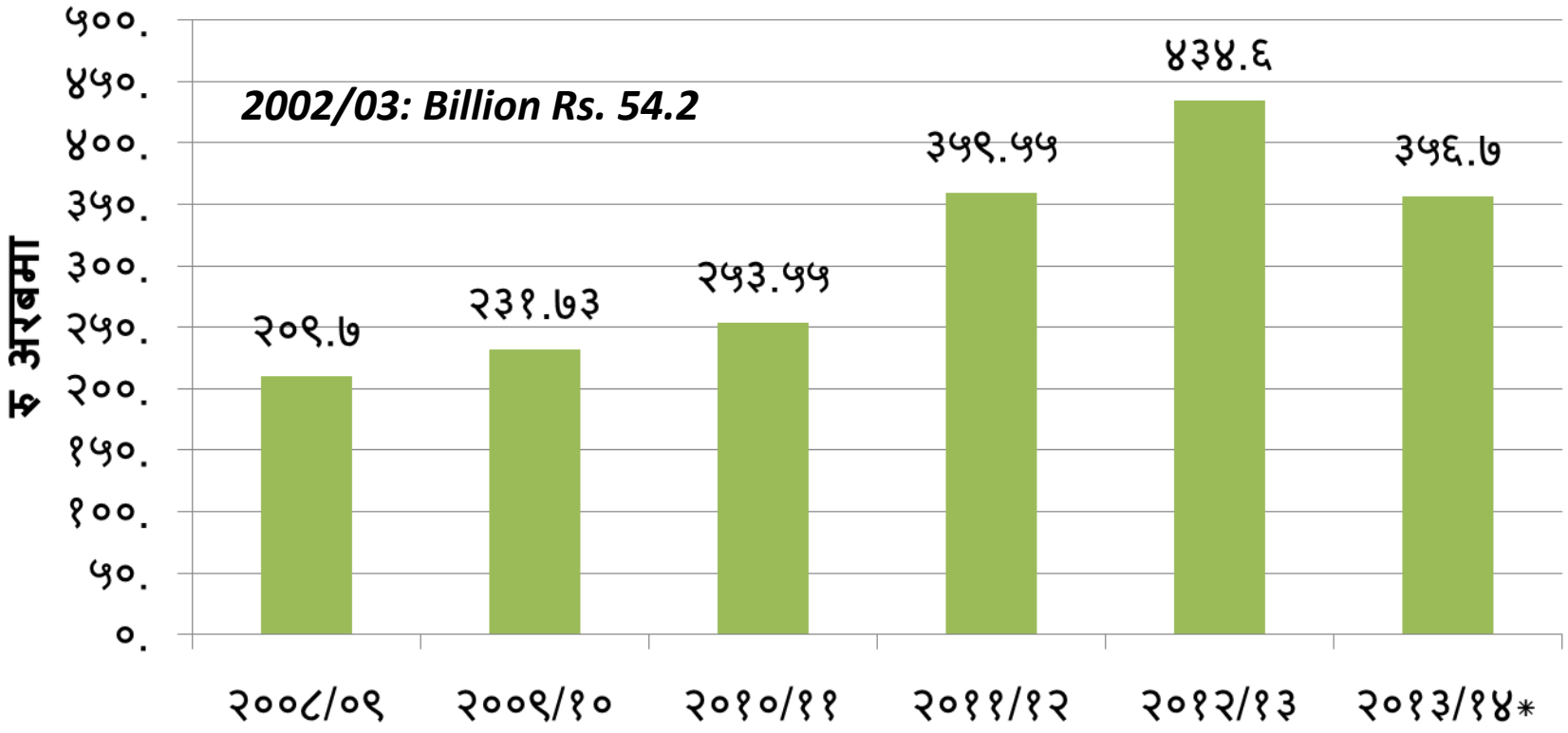
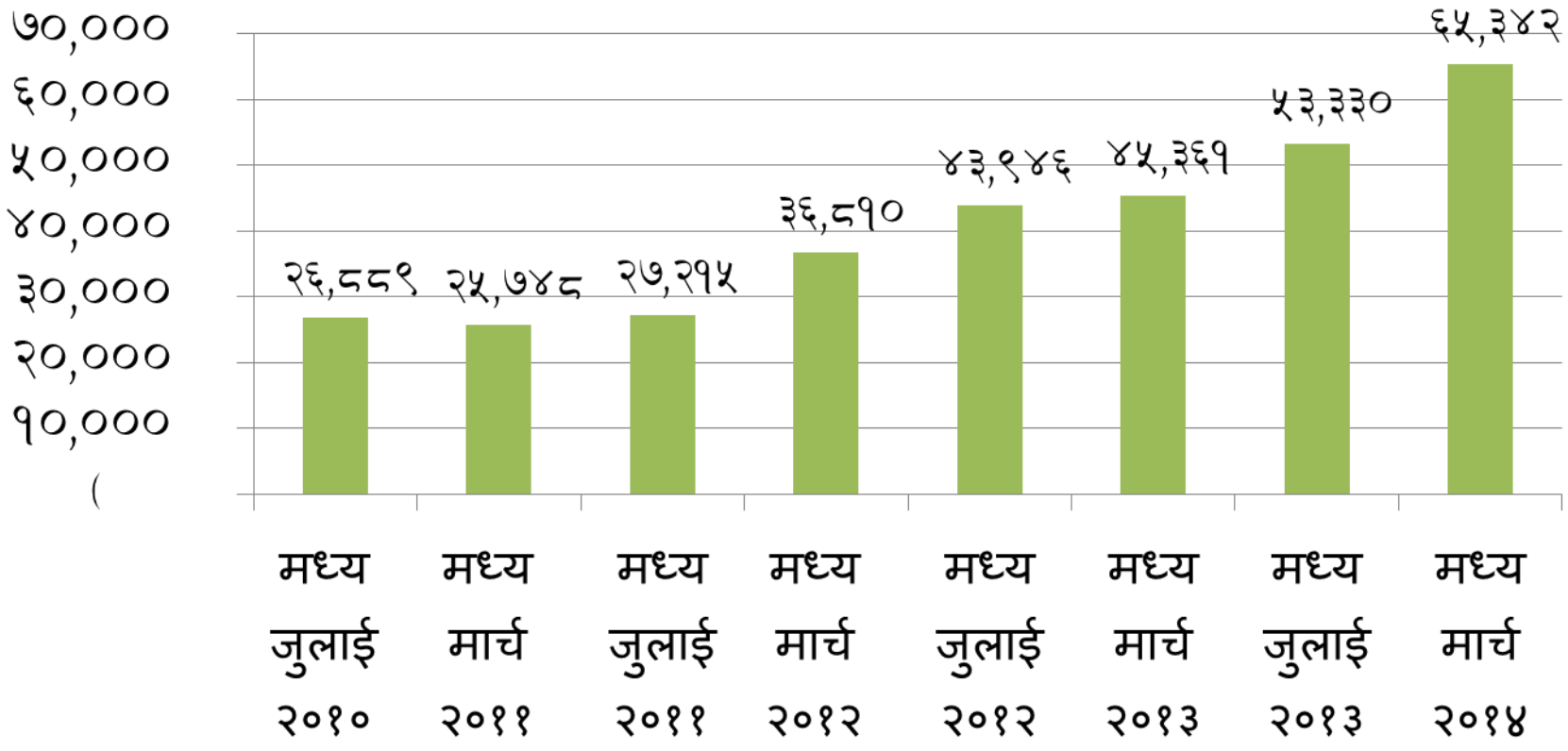
रेमिटान्स रु अरब मा



नोट: २०१३/१४ को पहिलो ५ महिनाको मात्र

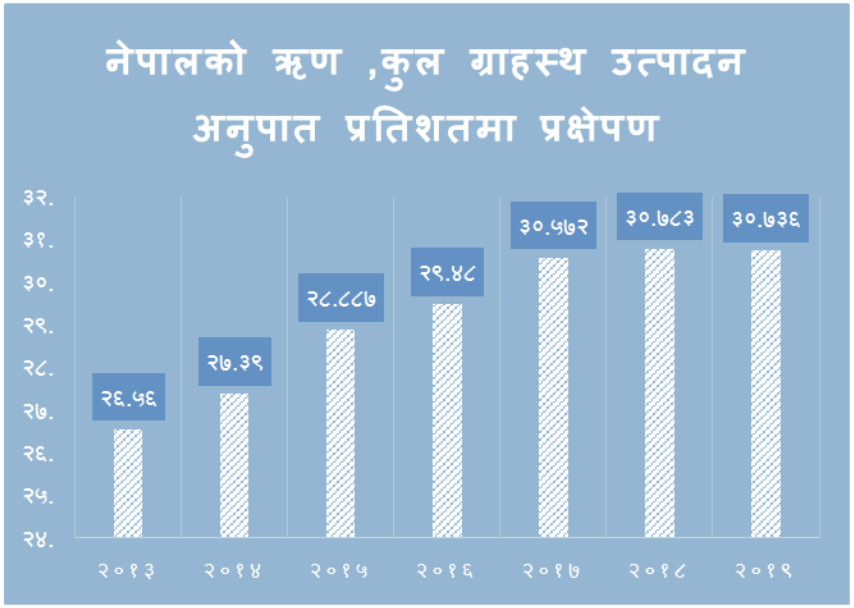
Source: Economic Survey 2014

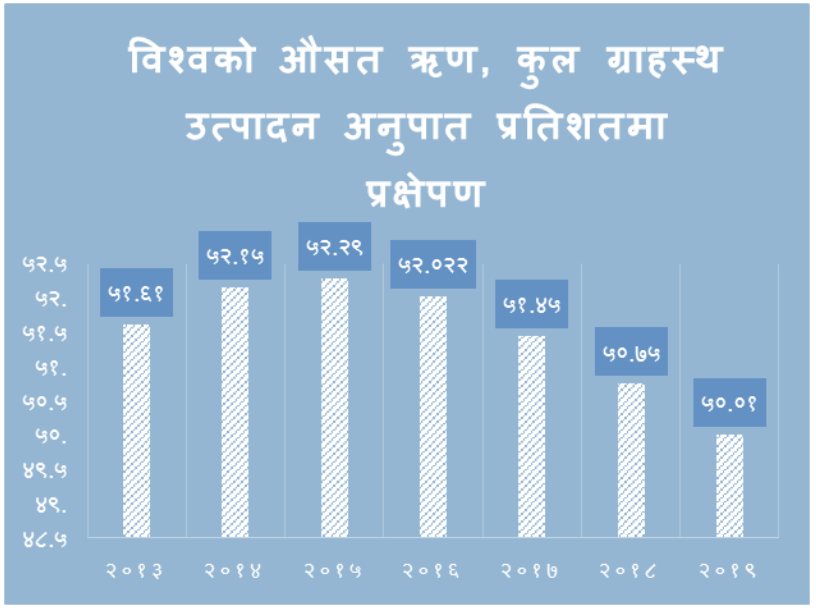
हामीलाई सडक आयोजना मा प्रत्यक्ष बैदेशिक लगानी आबश्यक छ ?

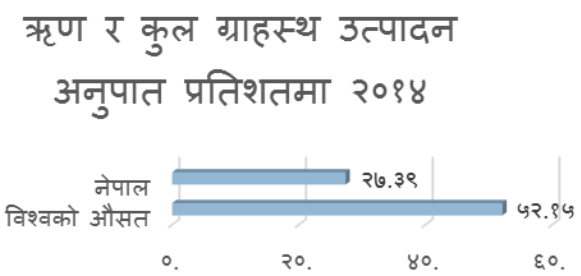


Source: Economic Survey 2014

सरकारको स्रोत नभएर नै हो?







स्रोतः- अन्तरराष्ट्रिय मुद्रा कोष

Funding/Financing

1. Appears that public sector funding/financing is possible
   - Unused domestic capital and manpower
   - Project should be used for learning-by-doing

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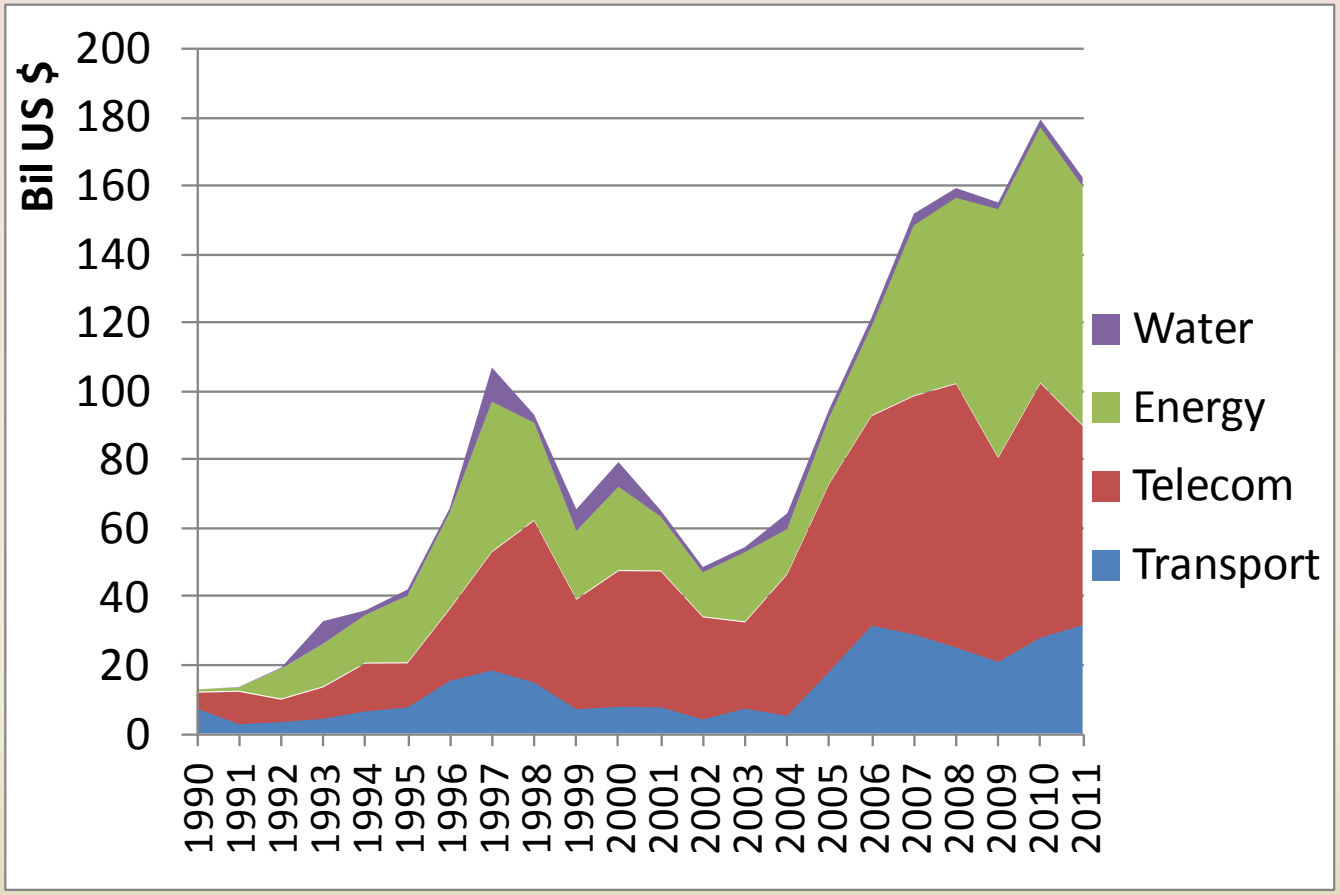
Issue: is the PPP model adopted for the project efficient?

1. Under the current arrangement, government will provide capital subsidy of NRS 15 billion, and also guarantee projected traffic demand (expected revenue).
2. In case, we have to go for PPP, is this the most optimal arrangement in Nepal's context?

Role of PPP for transport investment in developing Asia

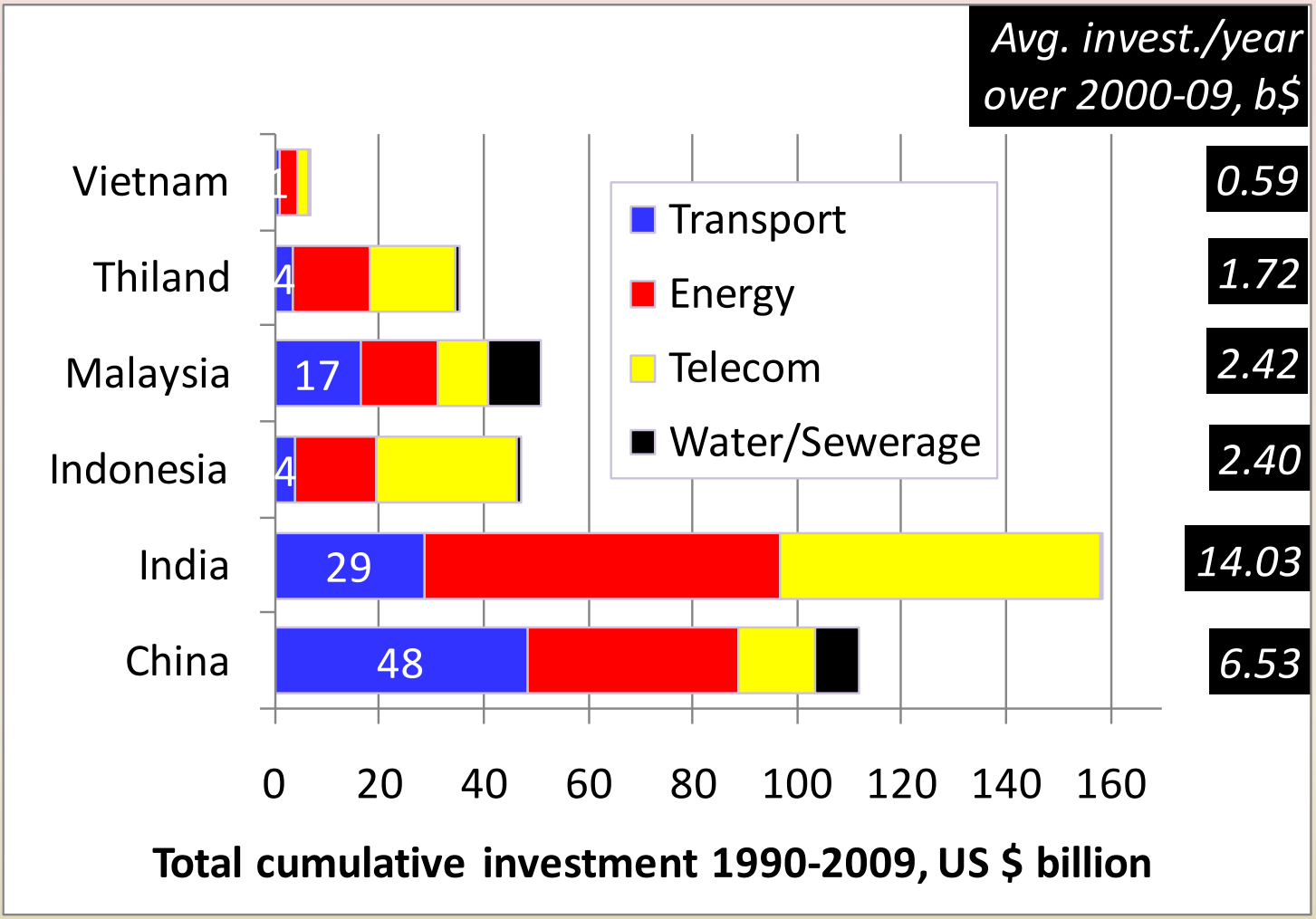
Global trend of private sector investment in infrastructure



Data source: World Bank PPI database

- Private sector financing increased in recent year, but more so for energy and telecom than for transport

Private sector financing in selected Asian countries



Transport figure varies widely by countries- but not significant to the extent of expectation!

Evolution of PPP institutions and key issues in Asian countries, 1/2

	Evolution of PPP Institutions	Key Issues
Korea	• Umbrella PPP Law in 1999 • Updated in 2005- BTO/BTL model • PPP unit (PIMAC) • MRGs (60-90 %) phased out in 2005 • PPP revitalization programs 2009- NRSS • Amendment in PPP law in 2011 • Allows asset-based securitization	• Many PPP-based transport projects had demand less than forecasted • Financial burden to government- bad image of PPP among people • Phasing out of MRG- adverse impact on PPP's attractiveness • NRSS effectiveness yet to be proven
India	• No PPP laws; only regulation/guidelines • Central PPP unit (DEA) • Guidelines- 2008; Sector specific guidelines • Viability Gap Funding (VGF) –upto 40% • State level PPP Laws • National PPP policy 2012 (draft)	• Value-for-Money (VFM) of PPP project increasingly questioned (expected return in PPP project 18-25 %) • Concern for transparency and corruption • Lack of width/depth of financial market • Increasing burden on budget (of VGF)
China	• Piecemeal PPP regulation since 90s • BOT circular in 1995 • Asset-based securitization	• Smaller role of private sector • Concerns for transparency/corruption • Rethinking on appropriateness of PPP

BTO/BTL: Built transfer operate; Built transfer lease
PIMAC: Public and Private Infrastructure Investment Management Center; MRG: Minimum Revenue Guarantee
NRSS: New Risk Sharing Scheme: enable concessionaire to achieve certain rate of return as opposed to MRGs
DEA: Department of economic affairs

Source: compiled on the basis of information from country reports; Allen and Overry (2012) Asia-Pacific Guide to PPP; ADB/EIU (2011) Evaluating Environment for PPP in Asia Pacific

PPP trend in Korea

Unit: Trill. KRW, %

	'95-00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11*
PPP Investment** (A)	2.7	0.6	1.2	1.0	1.7	2.9	2.9	3.1	3.8	3.9	2.7	2.2
Gov't Investment (B)	69.7	16.0	16.0	18.4	17.4	18.3	18.4	18.4	20.5	24.7	24.5	24.4
A / B (%)	3.9	3.8	7.5	5.4	9.8	15.8	15.8	16.8	18.5	15.8	11.0	9.0

* : Based on 2011 government budget forecast.

** : Private investment on PPP projects covering central government BTO projects, local government BTO projects more than 200B KRW or with 30B more national fund and BTL rail projects

Source: Park, Hyeon (2012). Government support for PPP projects in Korea, Presentation at High-level Expert Group Meeting on Infrastructure Public-Private Partnerships for Sustainable Development, 11 and 13 November 2012, Tehran, Islamic Republic of Iran organized by UNESCAP

Evolution of PPP institutions and key issues in Asian countries, 2/2

Thailand	No specific PPP law PPP activities governed by PPSU Act 1992 New PPP law- comprehensive (expected in 2013)	• Concern for transparency and corruption • Contractual disputes • Width/depth of financial market • Issue of public subsidies
Indonesia	PPP framework- decree 67/2005 2010 rev- risk allocation, subsidies 2012 Land acquisition law enacted PPP unit (Bappenas)	• Under-developed financial market • Risk allocation- complex process • Lack of government resource for capital subsidy
Vietnam	BOT Law in 2006 PPP decree in 2011 PPP task force (no PPP unit)	• PPP institutions not yet matured • Financial market not developed • Not all project commercially viable- needs capital subsidy

PPSU: Private participation in State Undertaking

Source: compiled on the basis of information from country reports; Allen and Overry (2012) Asia-Pacific Guide to PPP; ADB/EIU (2011) Evaluating Environment for PPP in Asia Pacific

Public–Private Partnership Financing in Korea

Chronological Changes in PPP Policies (Act/Regulation)

Abolition of minimum revenue guarantee (MRG) and introduction of government compensation of base (raw) cost …..

	Period	Characteristics
Phase I	1968–1994	• Sporadic promotion of public–private partnership (PPP) projects based on individual laws (Road Act, Port Act, etc.)
Phase II	1994–1998	• The Republic of Korea began to induce private capital to build infrastructure facilities through systematic procedures with enactment of the Act on Promotion of Private Capital Investment in Social Overhead Capital • Implementation remained sluggish due to immature PPP conditions, government's failure to play the proper roles, and excessive regulations due to fear of controversies over preferential treatment • Formulation of policy package for inducing private participation, across-the-board legal revision through the Act on Private Participation in Infrastructure
Phase III	1999–2004	• Positive government support and division of role for revitalizing private investment • Reinvigoration of private sector's investment and project participation
Phase IV	2005–present	• Revision of the Act on Private Participation in Infrastructure • Inclusion of nine residential infrastructure facilities in the scope of PPP projects and the introduction of the build–transfer–lease formula as a new method • Introduction of mandatory feasibility study for unsolicited projects (costing W200 billion or more) • Revitalization of infrastructure fund through public subscription • Abolition of minimum revenue guarantee and introduction of government compensation of base (raw) cost

Source: Ministry of Strategy and Finance. Act on Promotion of Private Capital Investment in Social Overhead Capital and Act on Private Participation in Infrastructure (PPP Act). Seoul.

Source: KDI/ADB 2011

Role of PPP for transport investment in developing Asia

- PPP emerged as major instrument for financing transport investment- but past experience is mixed
- Countries are making effort to improve the system
- PPP remain as a major policy agenda in the coming years
- PPP is not so much for relieving budgetary pressure but more about efficiency in management
- Most important contribution of PPP is perhaps to introduce system of user charge since it is more acceptable in case of PPP project than in conventionally managed by government agencies
- Most challenging issues in transport PPP is risk allocation and provision of capital subsidy for project financially not viable.

Current PPP model for Fast Track?

- Given the capacity of government agencies to manage PPP (in the context of many uncertainties associated with the project), current model of PPP may not deliver expected results
- Room for revisiting many provisions in the draft contact (in particular traffic/revenue guarantee)- other alternatives might be more appropriate (EPC, annuity pay etc)
- Good possibility of not arriving at the agreeable terms between government and private parties

Contents

Common Railway Systems

1. Conventional rail (speed up to 160 km/hr)

2. (Conventional) High Speed Rail: 200-350 km/hr

3. Maglev (550 km/hr)

Railway as a transport mode

1. Economically efficient, environmentally/socially sustainable
2. Despite the adv of the system, railway faced declining market share after 2nd world war
   - Popularity of automobile/roads
   - Inefficiency of railway operators
3. Recent re-emergence of railway (in particular HSR)

International patterns of travel demand

- Excessive per capita travel demand in US & EU countries
- Mode share by travel distance- unbalanced pattern

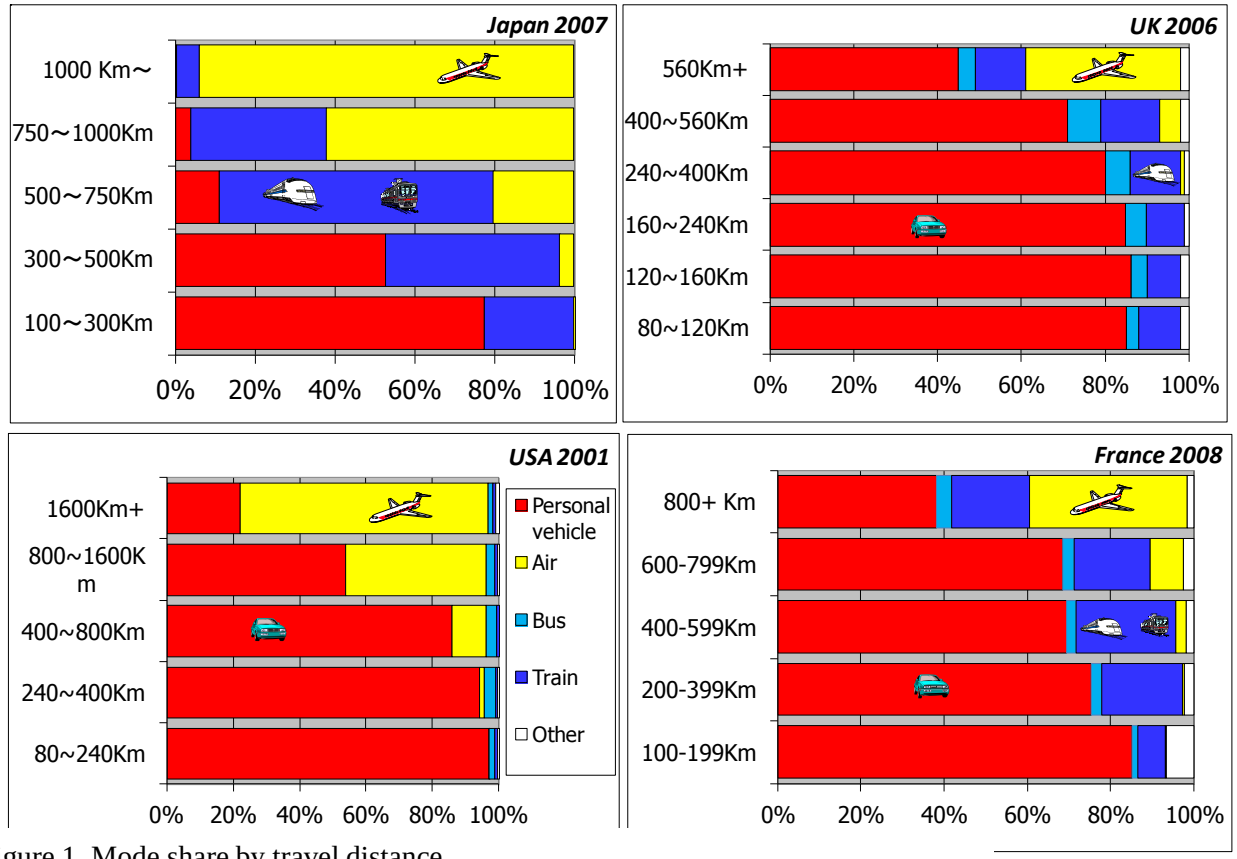
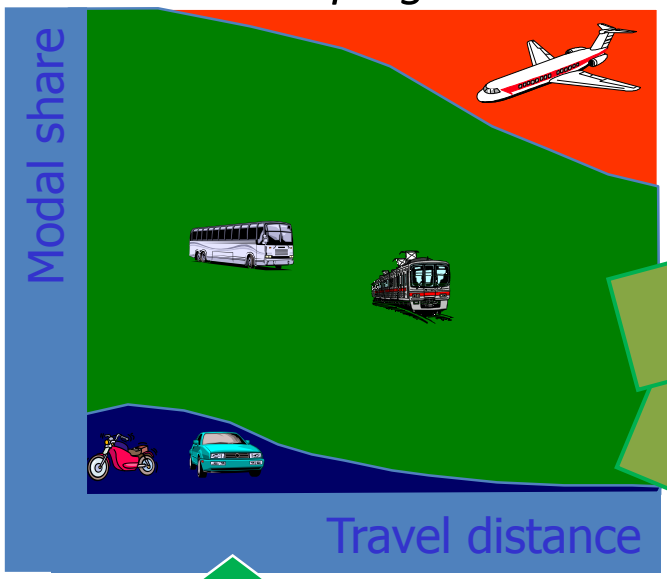


Figure 1. Mode share by travel distance

Data sources: MLIT (2009), Department for Transport (2006), BTS (2007)

Intercity transport scenario for Developing Asia

Developing countries

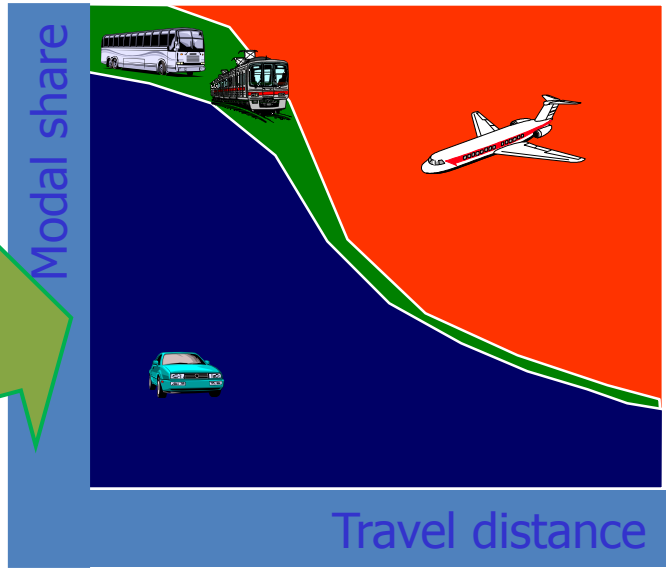


- *Growing travel demand*
- *Rapid motorization*
- *Increasing value of time*
- *Priority for highways*

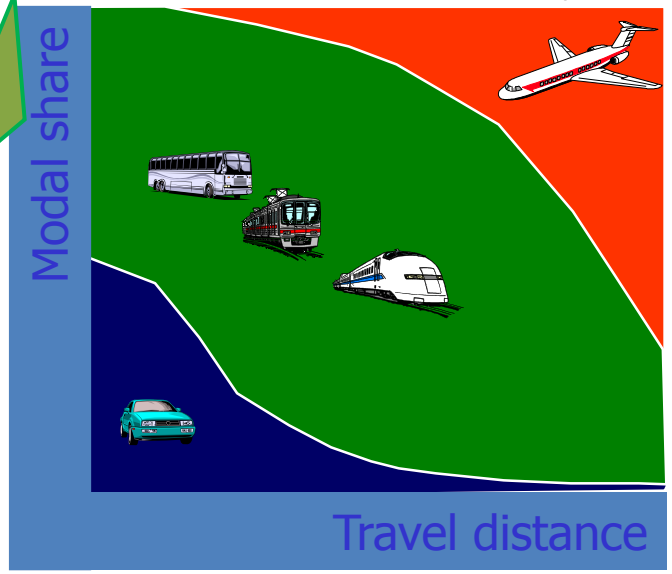
Policy Options

- *Road investment*
- *Rail investment and timing*
- *Improvement in railway services*
- *HSR investment*
- *Tax/subsidy for externalities*

Europe and the US

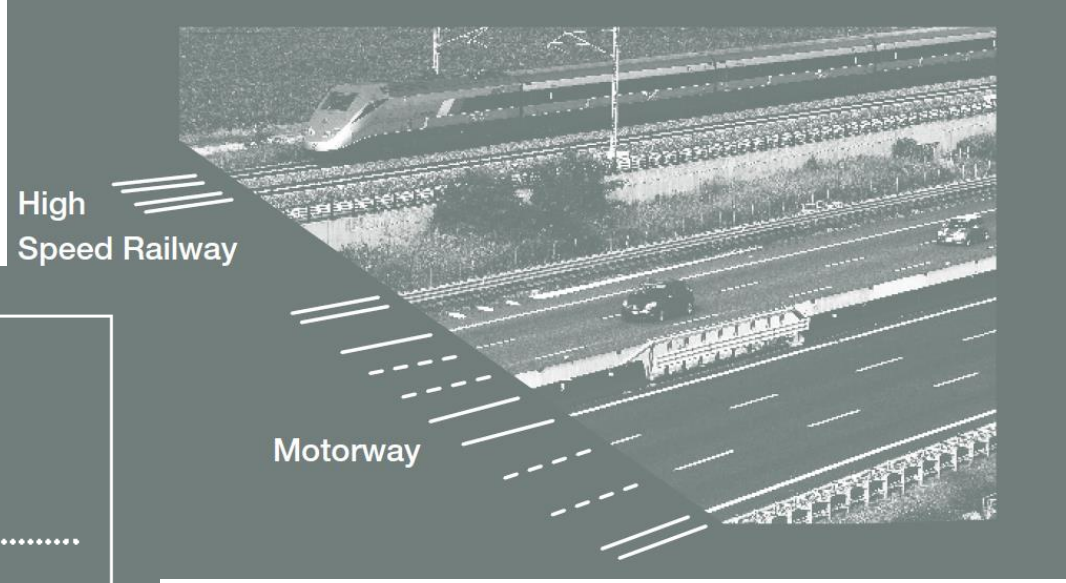


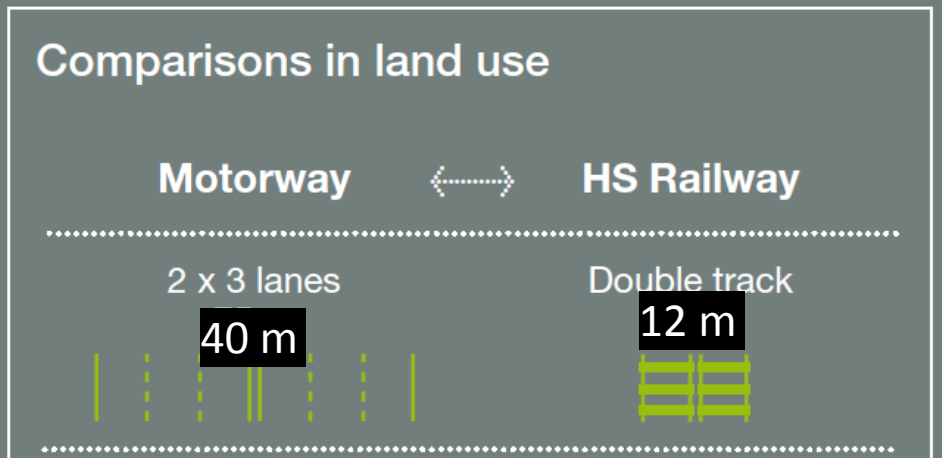
Japan



☞ ***Potential role of HSR to make mode share pattern more balanced and sustainable***

Capacity per width of land
HSR vs Expressways





1500 car/lane/h
1.7 Pass/car

13 Trains/track/h
926 Pass/train (70% of 1323)

2x7,650 Pass/h

2x12,038 Pass/h

Per land-width
High-speed Rail capacity (pass/h) = 5.2 x Expressways (cars)

Characteristics and role of HSR

- Higher speed: 300-350 km per hour
- Higher capacity: about 12,000 passengers per direction per hour (5 times the capacity of expressway for the same right-of-way width)
- Potential role for the development of secondary and tertiary cities
- Higher safety and lower CO2 emission

Competitive travel distance for HSR

- One of the key considerations for policy makers
- Distance range for different modes- computed *conceptually* and *empirically*

Equations for competitive distance for difference mode are derived conceptually

$$D_{CR} = \{(E_R + M_R) - (E_C + M_C)\}\frac{V_C V_R}{V_R - V_C}$$

$$D_{RA} = \{(E_A + M_A) - (E_R + M_R)\}\frac{V_R V_A}{V_A - V_R}$$

Assumed parameter values and competitive OD distance for each modes

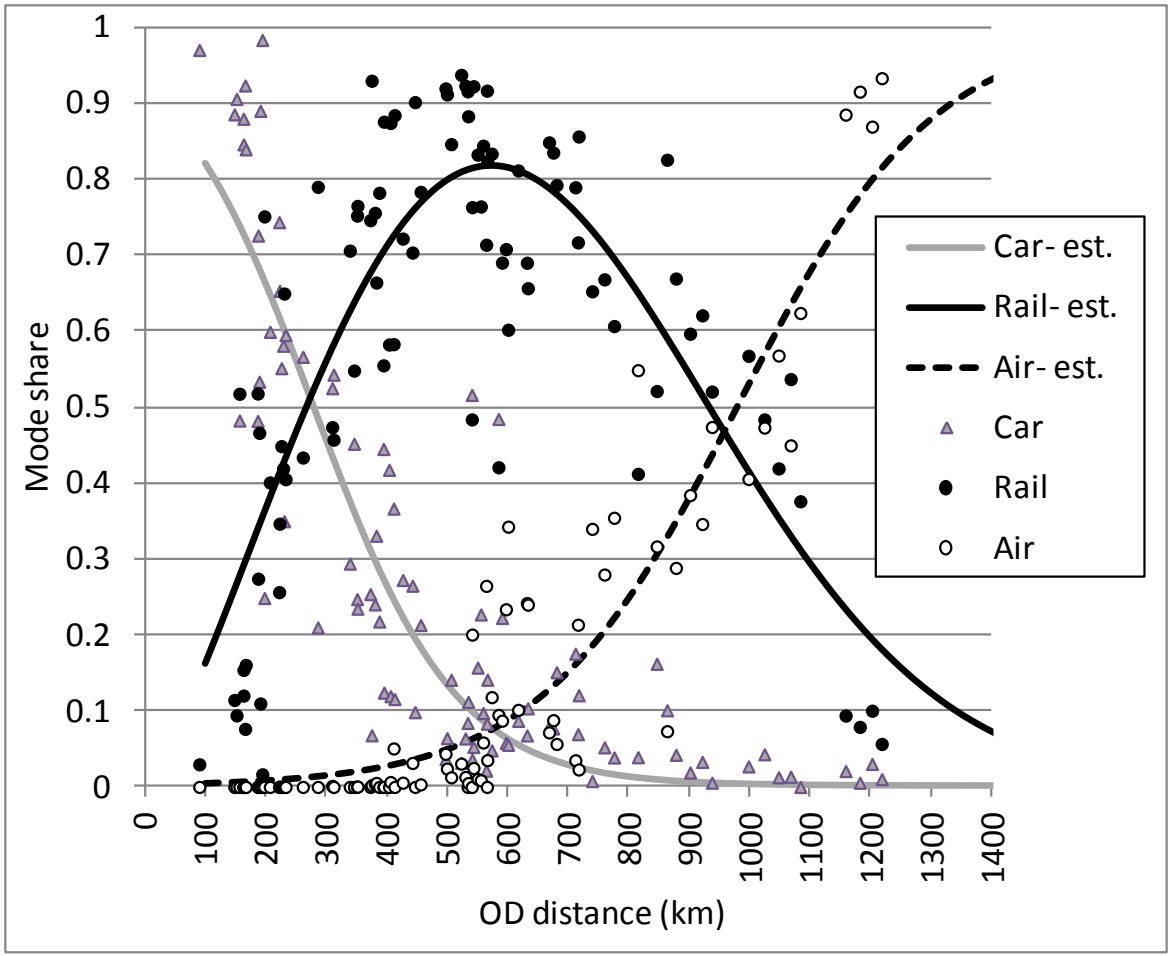
	Car	Rail	Air
Access/Egress time (Ei), min	15	60	120
Terminal time (Mi), min	0	10	70
Average speed (Vi), km/h	90	240	840
Competitive OD distance niche, km	**<132**	**132-672**	**> 672**

Acharya and Morichi (2013)

Competitive travel distance for HSR

- Competitive distance for different modes- computed also empirically using intercity OD travel data (along Tokyo-Osaka-Fukuoka corridor) from Japan-through parameter estimation

Car: < 270 km
Rail: 270-960 km
Air: >960 km



Acharya and Morichi (2013)

HSR: Typical design specification

Item	Design Specification
Gauge	1435mm
Number of line	Double track
Maximum design speed	350km/h
Maximum operation speed	320km/h
Distance between track centerline	4.3m
Width of formation level	11.3m

Vertical Grade for HSR

California High-Speed line, (planned project)

- Desirable Grades < 1.25%
- Maximum Grades: up to 2.50%
- Exceptional Grades: up to 3.50%
- Average grade of 3.5 % (max section length 6 km)

System under operation (Max gradient)

Cologne-Frankfurt HSR: 4 % (Germany)

LGV Sud-Est: 3.6 % (France)

Kathmandu-Terai Link: max gradient

- For railway, vertical gradient might pose a technical constraint
- Average gradient (over the whole length): around 1.5 %
- Given the exceptional gradient (allowable) is 3.5-4.0 % for EMU, the issue can possibly resolved by adopting appropriate structure(tunnel, viaducts)
- ADB study (FT/FS) refers a study by a private company, which suggests max gradient of 3 %

HSR Cost (per km) in China

US$ 1= RMB 6.2

Table 1. Railway Projects Supported by the World Bank in China

Project	Max. Speed kph/Type	Length Km	Total Estimated Cost RMB b	Unit Cost RMB m/km	Bridges+ Viaduct+ Tunnels (% of route km)	Period of Construction
Shijiazhuang - Zhengzhou	350 PDL	355	43.9	123	69	2008-2012
Guiyang - Guangzhou	250 PDL	857	94.6	110	80	2008-2014
Jilin- Hunchun	250 PDL	360	39.6	110	66	2010-2014
Zhangjiakou – Hohhot	250 PDL	286	34.6	121	67	2013-2017
Nanning – Guangzhou	200 Mixed	463	41.0	89	53	2008-2014
Harbin – Jiamusi	200 Mixed	343	33.9	99	48	2014-2017

Notes: 1. Total project cost includes the cost of project preparation, land acquisition, construction of the railway and regular stations, contingencies, rolling stock and interest during construction. The cost of railway excluding cost of project preparation, rolling stock and interest during construction is estimated at about 82 percent of the total cost.
2. Cost References: GG-Revised FSR Dec. 2010, NG- PAD May 2009, Shi-Zheng PAD May 2008, Jituhun-PAD 2011, Zhang-Hu-FSR, HaJia-Revised Feasibility Study Oct.2012/PAD.

Source: World Bank (2014): High-Speed Railways in China: A Look at Construction Costs

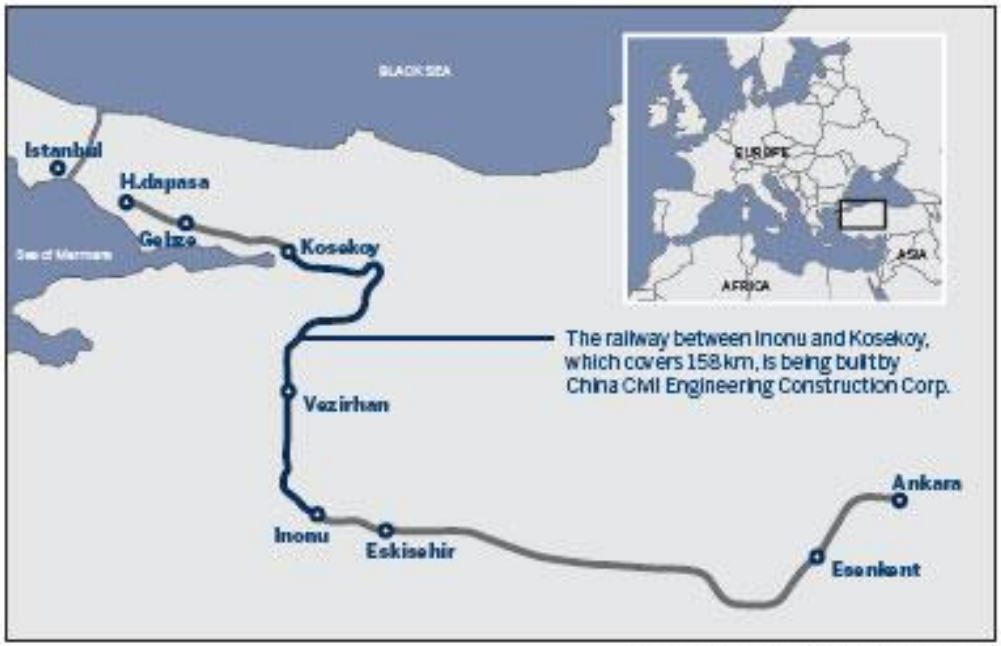
Ankara-Istanbul HSR (Turkey)

Service opened: 25 July 2014

Phase I: 251 km US$ 747 mil *($ 3 mil/km)*

Phase II: 214 km US $ 2,270 mil *($ 11 mil/km)*

Source: Wikipedia



158-km HSR: between Inonu and Kosekoy by China

Project cost: 1,27 bil $ (720 million, Loan from China)

50 km Tunnels/10 km Bridges

Source: China Daily (2011 July 13)

How relevant is rail option?

- Rail option for Ktm-Terai Link should be appraised from the view point of long-term transport strategy (in context with E/W Railway)
- Electric rail's rail's contribution to reducing fuel dependency, zero-accident, and electricity by regenerating braking system
- In case, conventional railway is adopted on technical ground, infrastructure should be designed for HSR (for future upgrading)
- Despite the strategic importance, rail options also have challenges
  - Technical constraints and know-how
  - Institution design (possible locked-in by inefficient institution)
  - Lower passenger demand (short-run)

Sum-ups

- Critical issues to address in the current format of PPP model- in particular traffic guarantee (scope of fine tuning)
  - Traffic guarantee or revenue guarantee?
  - Investment guarantee or profit guarantee?
- In case, the PPP process terminates without contract, study should start from “ground zero”- examine all options in a coordinated way
- Government funding option should be examined with broader strategic objectives (including capacity building)
- Railway option should evaluated in the context of E/W railway and access time/comvenience to international airport

Thank you!

"An approximate answer to the right question is worth a great deal more than a precise answer to the wrong question."

- John Tukey