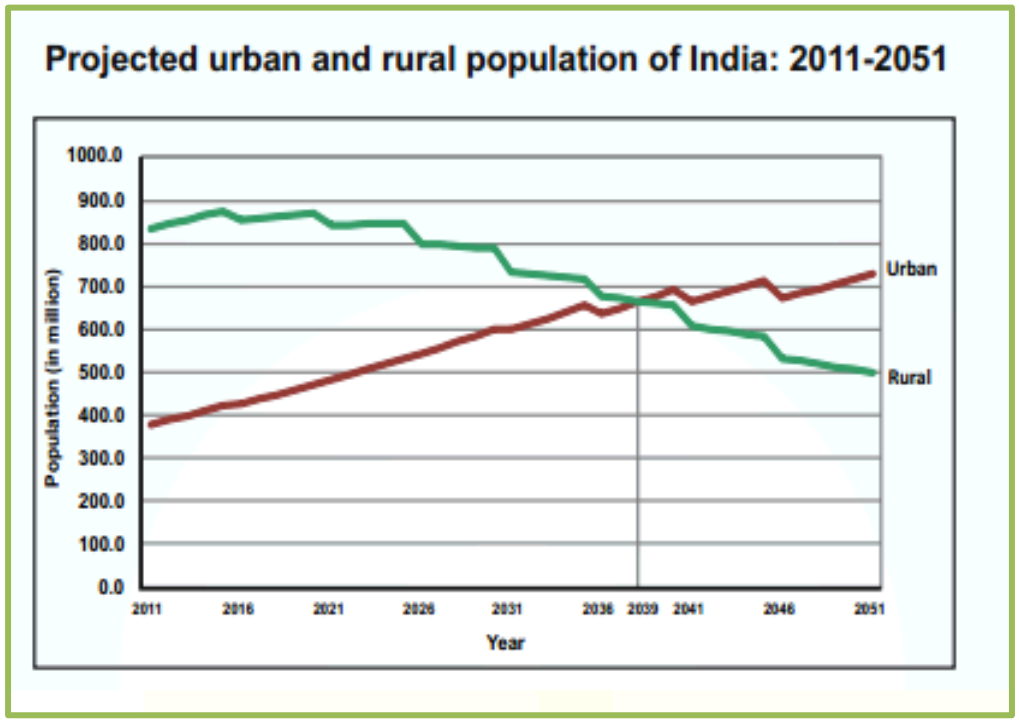
DRIVERS AND STRATEGIES TO SCALE-UP LOW CARBON AND ENERGY EFFICIENT TECHNOLOGY IN THE CONSTRUCTION AND INFRASTRUCTURE SECTORS OF SOUTH ASIA

Development Alternatives

Introduction

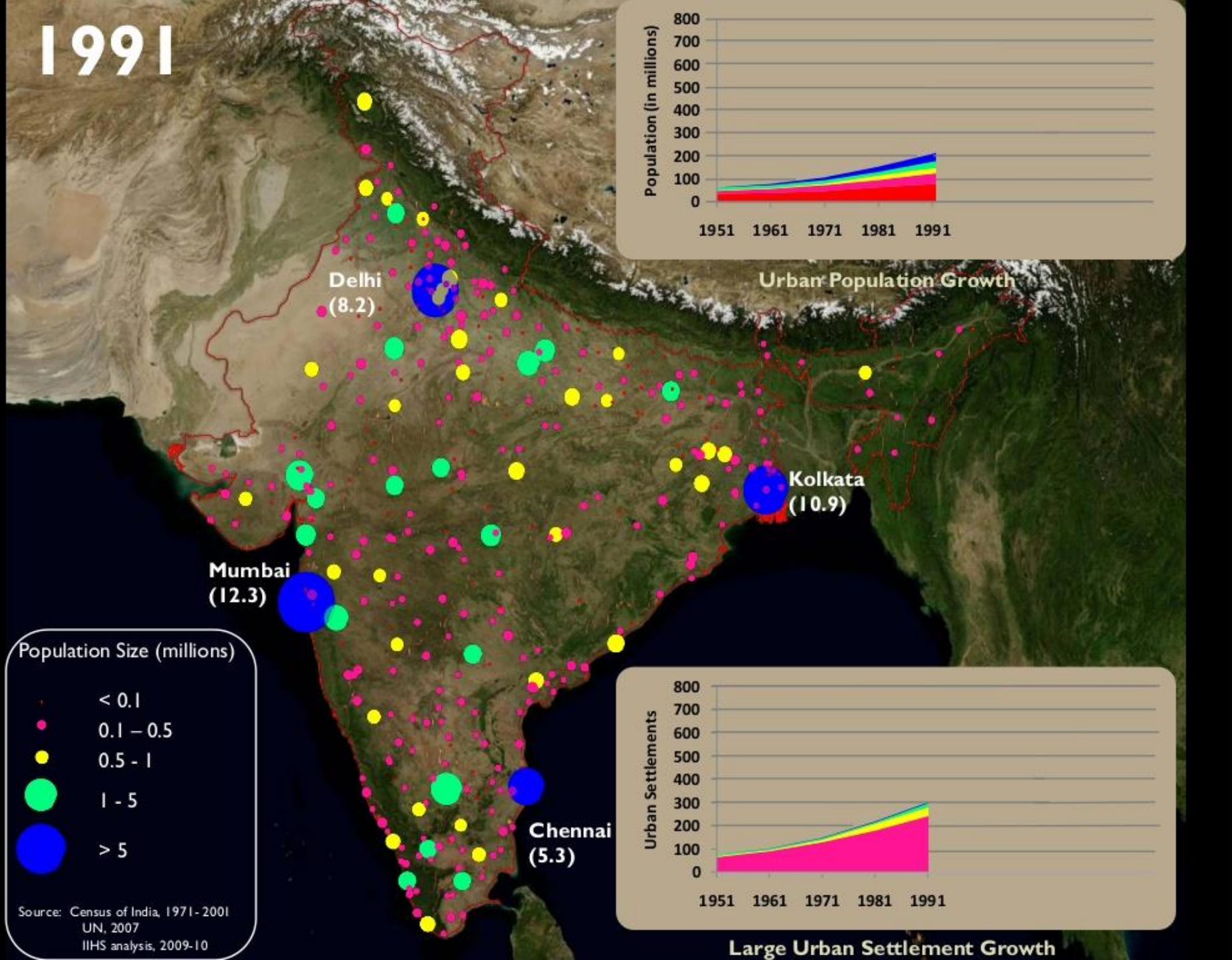


Source: **GoI, Ministry of Housing and Urban Poverty Alleviation, JNNURM Directorate (2011)** ***India's Urban Demographic transition.*** **P.11**

INDIA'S FUTURE WILL BE URBAN

BEYOND 2050, 50% OF INDIAN POPULATION WILL LIVE IN CITIES

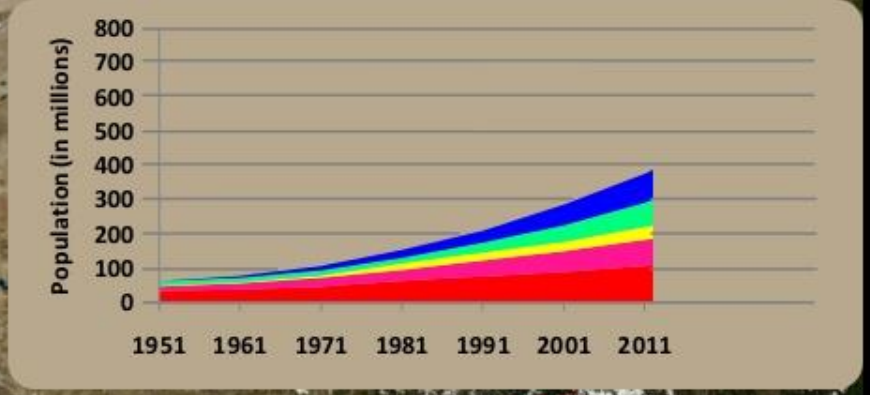
Development Alternatives


1991
Population (in millions)
800
700
600
500
400
300
200
100
0
1951
1961
1971
1981
1991
Urban Population Growth
Delhi
(8.2)
Kolkata
(10.9)
Mumbai
(12.3)
Chennai
(5.3)
Population Size (millions)
< 0.1
0.1 – 0.5
0.5 - 1
1 - 5
> 5
Source: Census of India, 1971-2001
UN, 2007
IIHS analysis, 2009-10
Urban Settlements
800
700
600
500
400
300
200
100
0
1951
1961
1971
1981
1991
Large Urban Settlement Growth

2011

3 cities with a population > 10 m and 53 with > 1m

833 m live in 0.64 m villages
377 m live in ~ 8,000 urban centres



Urban Population Growth

Delhi (16.9)

Ahmedabad (5.7)

Kolkata (15.5)

Mumbai (20)

Hyderabad (6.7)

Pune (5.0)

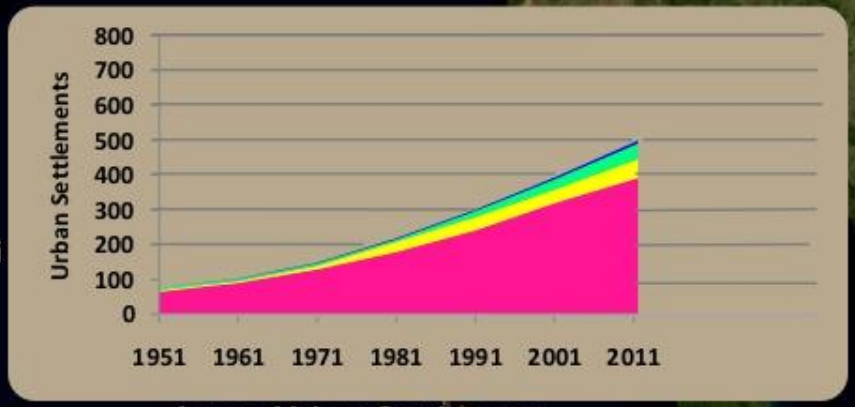
Bangalore (7.2)

Chennai (7.5)

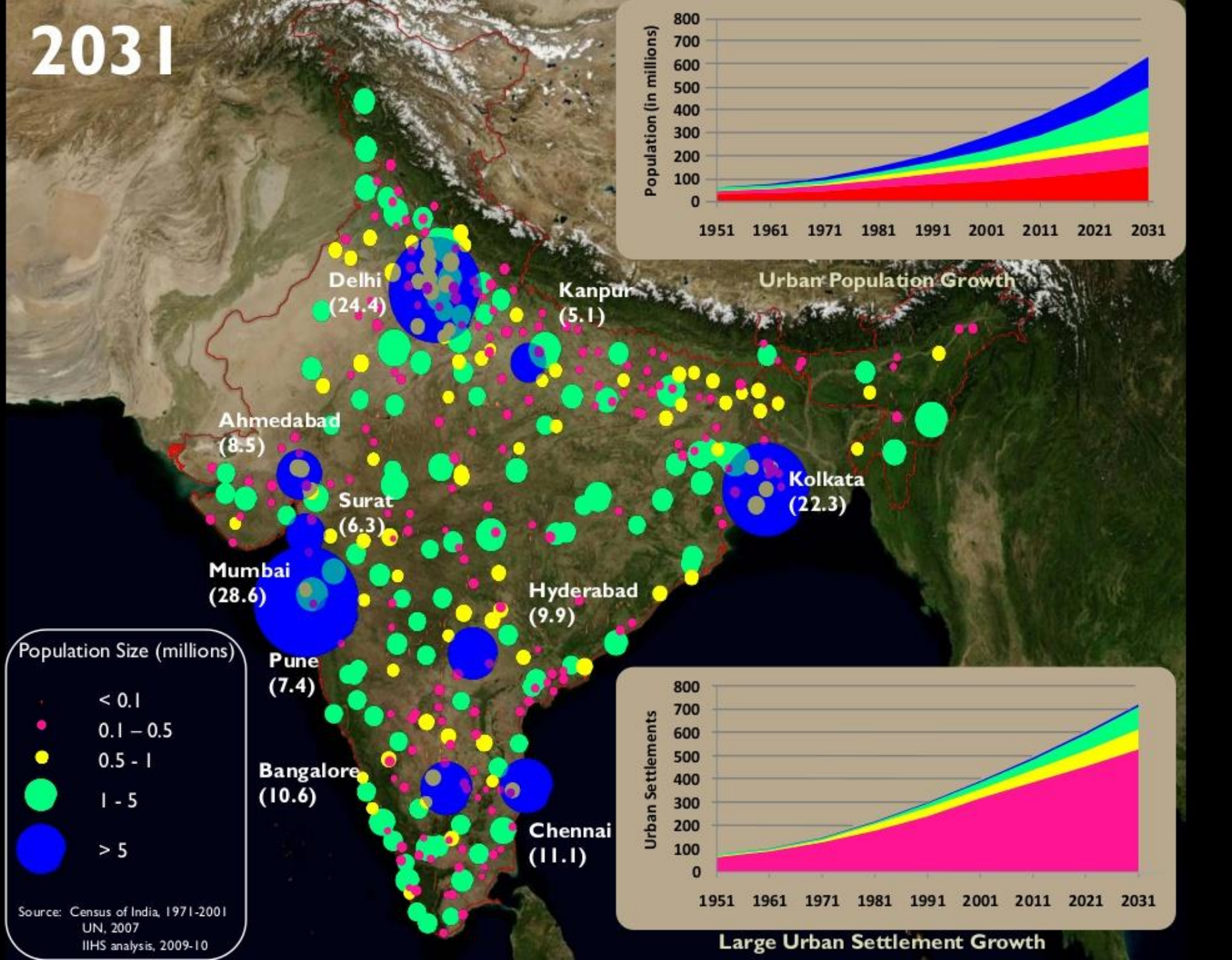
Population Size (millions)

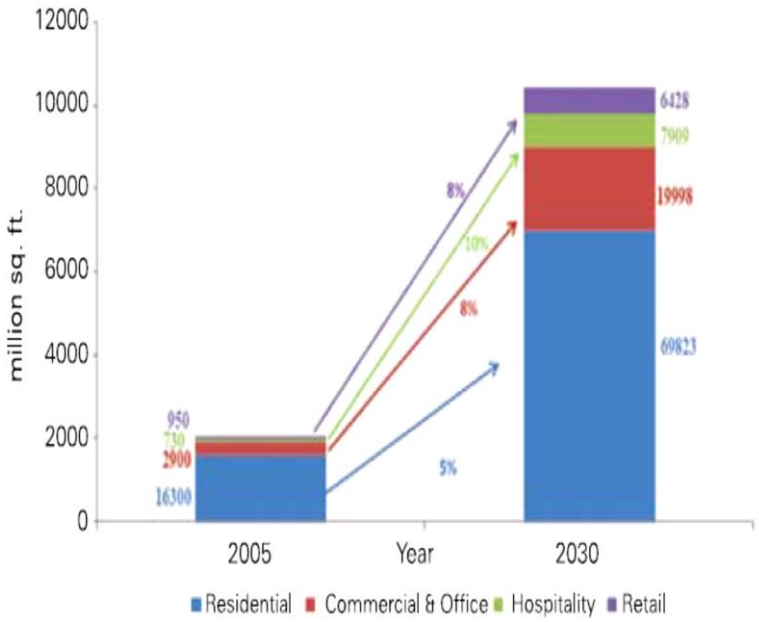
- < 0.1
- 0.1 – 0.5
- 0.5 - 1
- 1 - 5
- > 5

Source: Census of India, 1971-2001
UN, 2007
IIHS analysis, 2009-10



Large Urban Settlement


2031
Population (in millions)
800
700
600
500
400
300
200
100
0
1951 1961 1971 1981 1991 2001 2011 2021 2031
Urban Population Growth
Delhi
(24.4)
Kanpur
(5.1)
Ahmedabad
(8.5)
Surat
(6.3)
Kolkata
(22.3)
Mumbai
(28.6)
Hyderabad
(9.9)
Pune
(7.4)
Bangalore
(10.6)
Chennai
(11.1)
Population Size (millions)
< 0.1
0.1 – 0.5
0.5 - 1
1 - 5
> 5
Source: Census of India, 1971-2001
UN, 2007
IIHS analysis, 2009-10
Urban Settlements
800
700
600
500
400
300
200
100
0
1951 1961 1971 1981 1991 2001 2011 2021 2031
Large Urban Settlement Growth



68 CITIES WITH A POPULATION OF MORE THAN ONE MILLION

13 CITIES WITH MORE THAN 4 MILLION PEOPLE

6 MEGACITIES WITH POPULATIONS OF 10 MILLION OR MORE

38 MILLION UNITS DEMAND FOR LOW COST HOUSING

Development Alternatives

18.78 MILLION URBAN HOUSEHOLDS LACK A DECENT HOUSE TO LIVE IN.

96% OF THEM BELONG TO THE TWO WEAKEST INCOME GROUPS.

INCREASING RECONSTRUCTION DUE TO CLIMATIC EVENTS

BRIDGING THE HOUSING GAP WILL PUT A TREMENDOUS PRESSURE ON NATURAL RESOURCES AND ACCELERATE CLIMATE CHANGE

Development Alternatives

CONSTRUCTION PRACTICES NEED TO BECOME LOW CARBON AND LESS RESOURCE-INTENSIVE

THE CONSTRUCTION SECTOR ACCOUNTS FOR 24% OF GREENHOUSE GAS EMISSIONS IN THE COUNTRY

80% CONTRIBUTION TO EMISSIONS IS BORNE BY BUILDING MATERIALS (CEMENT, STEEL, BRICK & LIME)

THE CONSTRUCTION SECTOR IS HIGHLY RESOURCE INTENSIVE

Development Alternatives

Bricks

INCREASING CONSTRUCTION DEMAND WILL WORSEN THE ENVIRONMENTAL IMPACTS

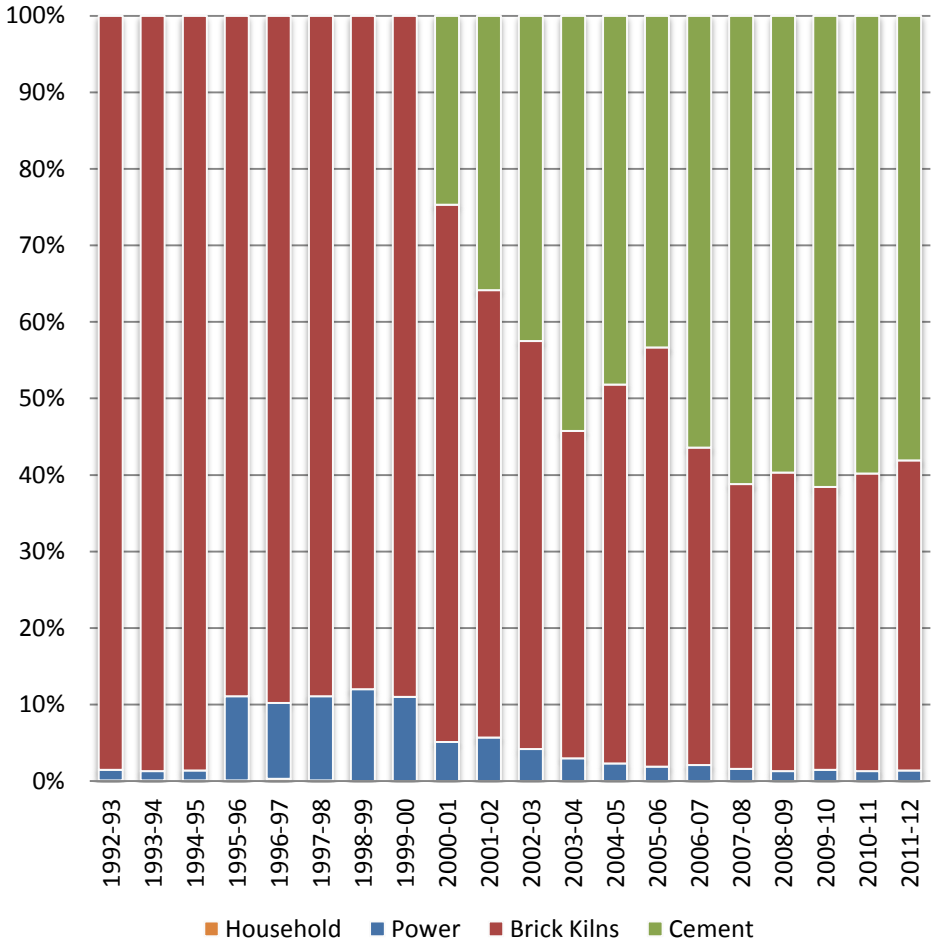
THE BRICK SECTOR ALONE UTILISES 20-30T OF COAL AND 350 MT OF SOIL

OVER 150,000 BRICK KILNS PRODUCES 150-200 BILLION BRICKS ANNUALLY.

DOMINATED BY CONVENTIONAL TECHNOLOGIES LIKE FCKs.

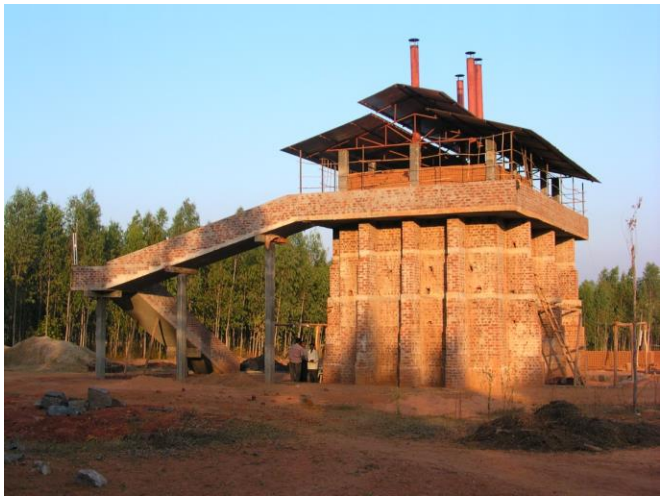
THE TECHNOLOGIES ARE HIGHLY ENERGY & RESOURCE INTENSIVE

Development Alternatives



COAL CONSUMPTION COAL BY DIFFERENT SECTORS IN PAKISTAN

Development Alternatives



VERTICAL SHAFT BRICK KILN

FLY ASH BRICK

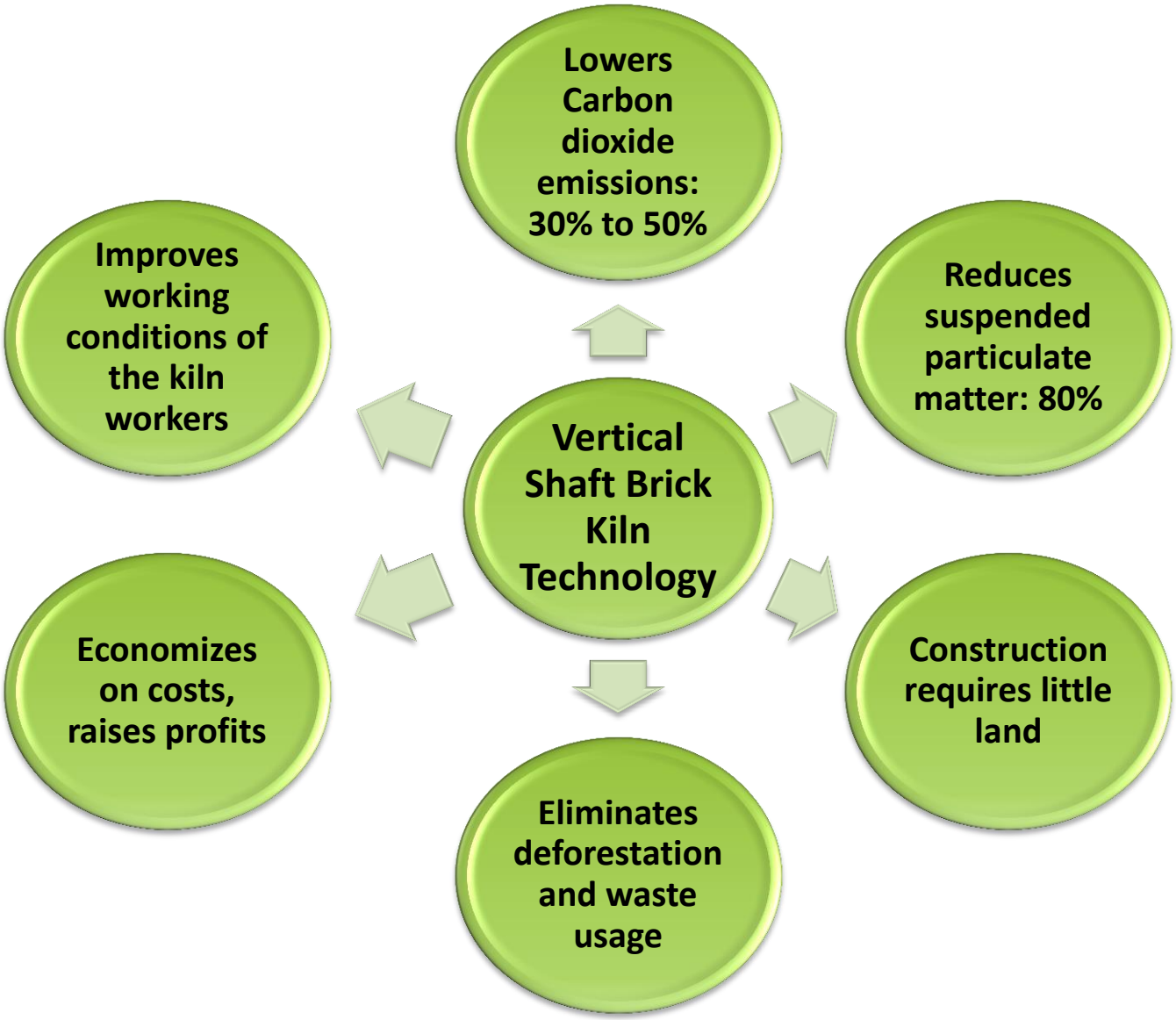
ZIG-ZAG BRICK TECHNOLOGY

HYBRID HOFFMAN KILN

THE BRICK INDUSTRY NEEDS TO ADOPT LOW CARBON AND RESOURCE EFFICIENT TECHNOLOGIES

Development Alternatives

Vertical Shaft Brick Kiln



Development Alternatives

NEED FOR ACTION & ENGAGEMENT WITH STAKEHOLDERS

CARBON EMISSIONS NOT TAKEN SERIOUSLY

GENERATE AWARENESS

ENDORSEMENT OF AGENCY

NO GOOD BUSINESS CASE- HIGH INITIAL INVESTMENT

HIGHLIGHT COST EFFECTIVENESS

PARTNER WITH GOVERNMENT AGENCIES AND BANKS

LACK OF OWNERSHIP AND ACCEPTABILITY

WIDER DISSEMINATION AND AWARENESS

MORE PILOT VSBKS

Development Alternatives

Hollow Concrete Block

POTENTIAL TO CONTRIBUTE TO AFFORDABLE HOUSING

EMBODIED ENERGY is 100~170% LOWER THAN BRICKS

DOES NOT USE TOP FERTILE SOIL FOR PRODUCTION

COST-EFFECTIVE, EASIER AND FASTER BUILDING CONSTRUCTION

30-40% CHEAPER COMPARED TO RCC FRAME BUILDING

Development Alternatives

"The main reason I bought this house was due to its cost which was about 4.5 million rupees including land that was almost half of the price to buy RCC house of the same size and other reason was assurance of quality of house. My neighbors and relatives generally perceive this house made of HCB to be weak but it is not so."

"The main reason I bought the house was due to its low cost and trust in the quality of house."

"I am keen in building HCB house in near future."

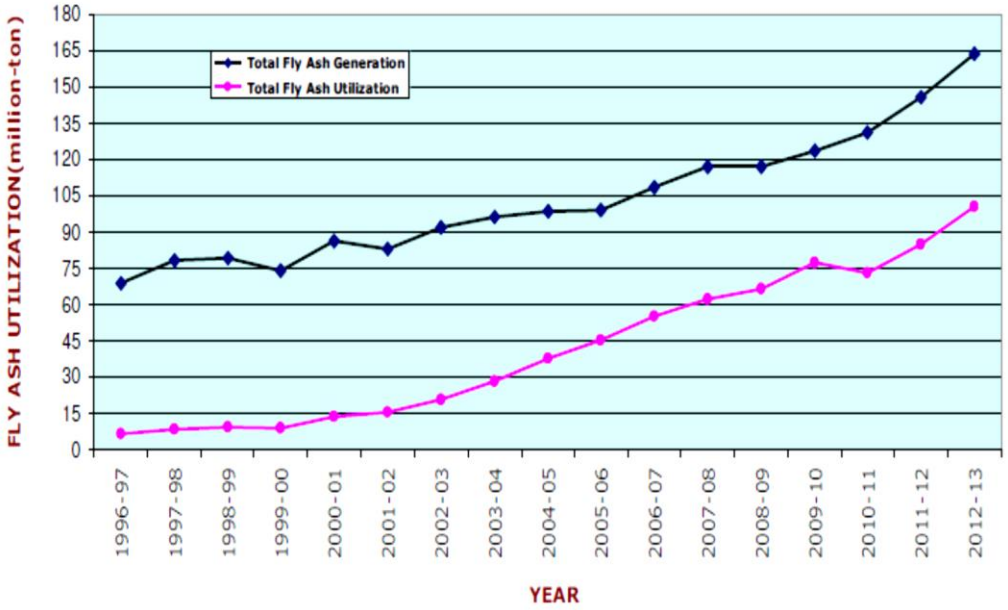
Unaware while buying house that this house was low cost only of NRs 0.5 million made of HCB which has made her perception that the house she owns is of very low quality.

New owner bought HCB house for NRs 2 million from the owner who bought this house for NRs 0.5 million within a year; feels cheated knowing that this house is made of HCB and cost was only NRs 0.5 million.

"Many people are interested and ask about HCB housing, but most people hesitate to go for HCB house as people perceive RCC are safe compared to HCB house which are built under load bearing system."

Development Alternatives

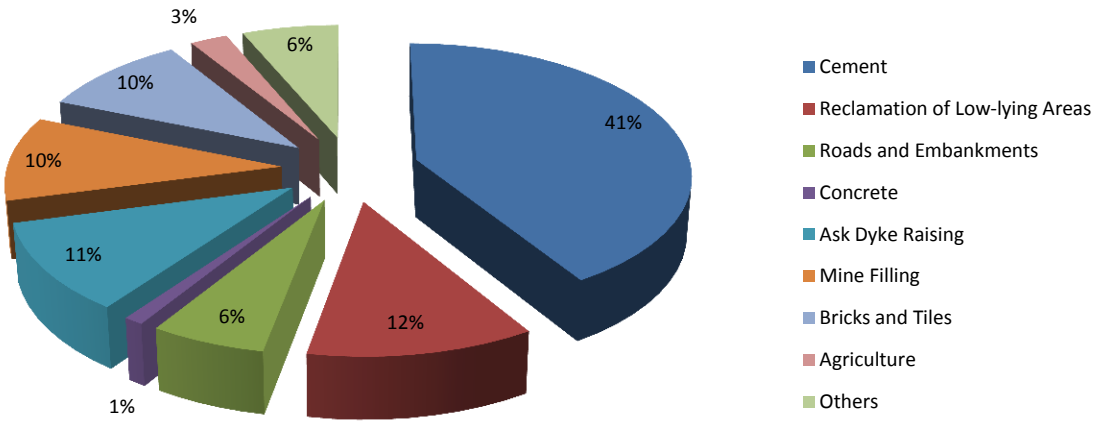
Fly Ash



INCREASING FLY ASH GENERATION

61% UTILISATION TILL DATE

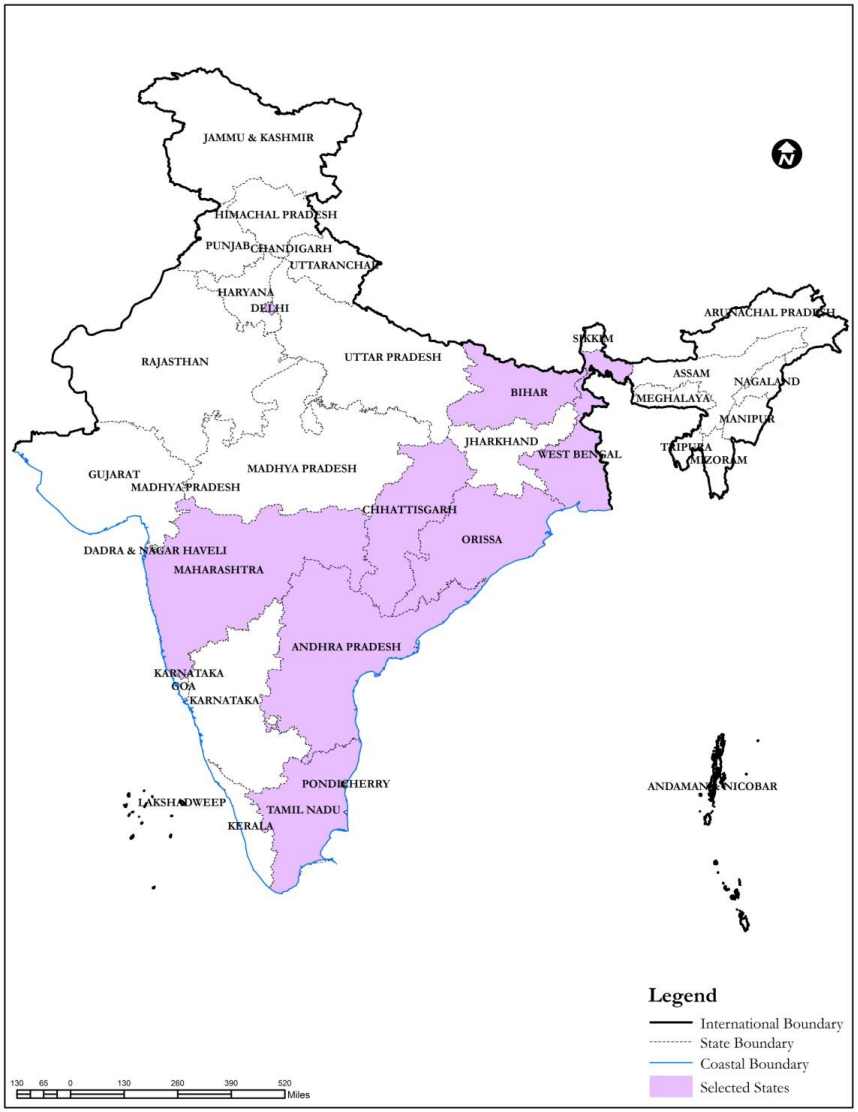
Source: **Central Electricity Authority (2013)**



USE OF FLY ASH IN BUILDING MATERIALS

9.94% UTILISATION IN THE PRODUCTION OF BUILDING MATERIALS

Development Alternatives

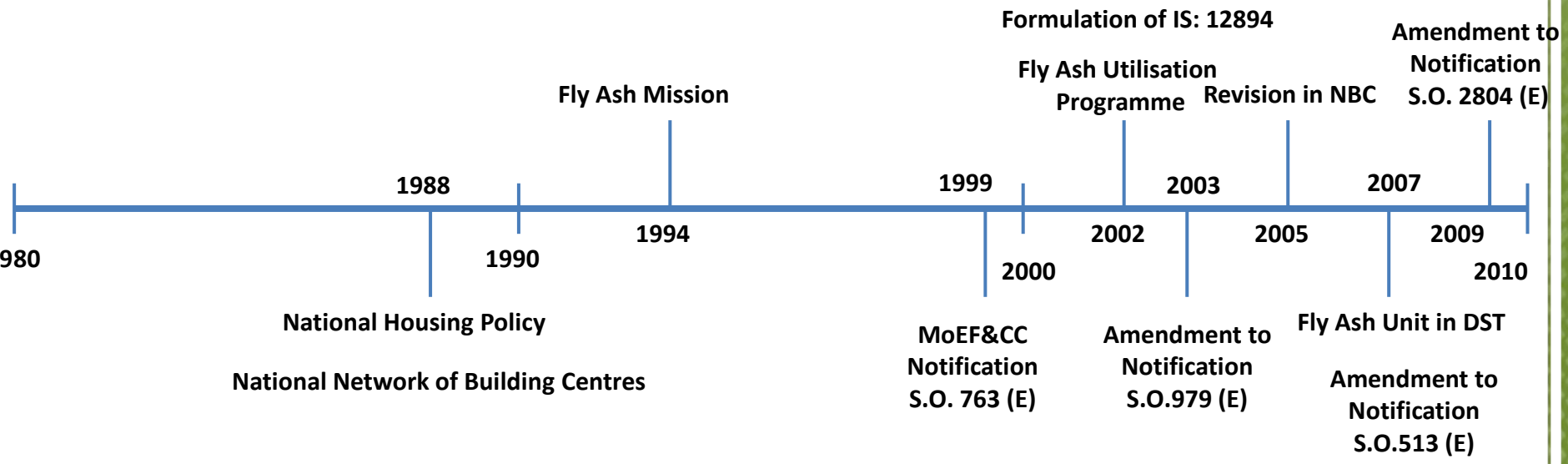


93% INCREASE IN UTILISATION OF FLY ASH IN BUILDING MATERIALS SINCE 1996-97

2800 FLY ASH UNITS IN THE COUNTRY

3% MARKET SHARE AS COMPARED TO RED BRICKS

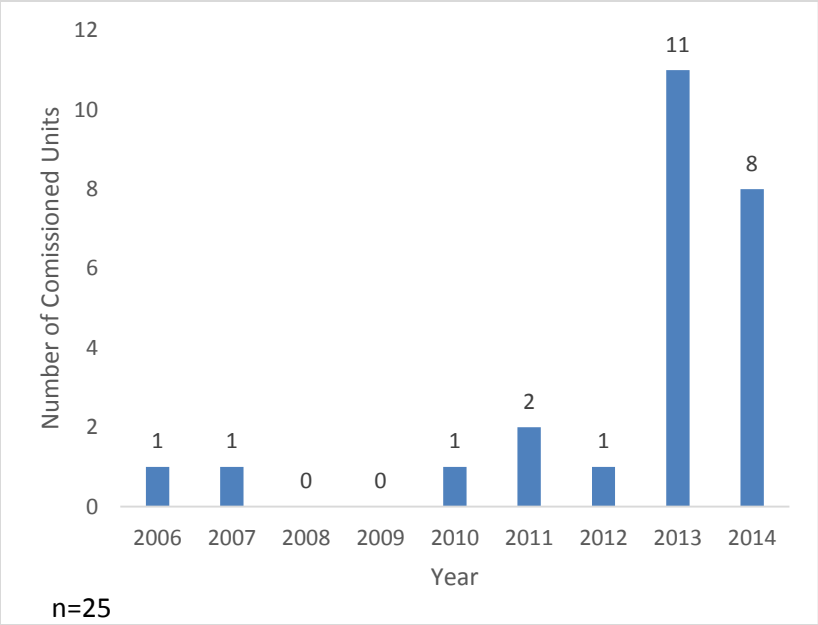
Development Alternatives



POLICY PUSH TO ACCELERATE FLY ASH UTILIZATION

Development Alternatives

S.No	Policy Heads	Initiatives of Various States		
		Tamil Nadu	Odisha	Chhattisgarh
1.	Year (last revision/validity)	2007-2014	2007	2009-2014
2.	Priority Sector (wrt bricks)	Cost effective building materials	Fly ash brick industry	Fly ash product (except cement)
4.	Infrastructural Support		• Promote industrial parks for priority sector • Exemption from payment of premium on production of eligibility certificate: Priority sector: 50% Thrust sector: 100%	
5.	Financial and Other Support			
6d.	Stamp Duty		• No stamp duty for Govt. allocated land. In case of transfer of land by Govt/ IDCO/private industrial estates to new units: Priority: 50% Thrust: 100%	
6e.	VAT and taxes		• 50% VAT reimbursement for 5 years and 75% for priority sectors. • 75% VAT reimbursement for thrust sectors for 10 years. • 2% CST for fly ash for a period of 10 years in thrust sector	
6f.	Interest Subsidy	• Capital subsidy of 15% on plant and machinery • 15% capital subsidy to priority sectors upto 30 lakhs	• 5% per annum on term loan for 5 years to SMEs and thrust sector	• 50 % of the total interest paid upto 6 years for priority industries; • 30 % of the fixed capital investment upto 60 lakhs for priority sectors in SMEs in economically developing areas.
6g.	Power		• 100% exemption of electricity duty up to a contract demand of Five Megawatt for thrust sector.	• 100% exemption of electricity duty for 7 years for priority industries in economically developing areas. • 100% exemption of electricity duty for 10 years for priority industries in economically backward areas.



POLICY PUSH HAS BEEN INSTRUMENTAL IN THE UPTAKE OF FLY ASH BRICK TECHNOLOGY IN BIHAR

INTER-DEPARTMENTAL TASK FORCE ON CLEAN BUILDING MATERIALS WAS SET UP IN 2012

DECISION MAKING VENUE

ENGAGED IN POLICY INTERVENTIONS AND AWARENESS GENERATION ACTIVITIES

THRUST ON USE OF FLY ASH BRICKS IN PUBLIC CONSTRUCTION

25 UNITS SET UP SINCE 2012

Development Alternatives

75% INCREASE IN USE OF FLY ASH BETWEEN 2000-01 AND 2004-05

DECREASED PROFITBAILITY OF RED BRICKS

THE SELLING PRICE OF RED BRICKS INCREASED TO Rs. 3000/1000 BRICKS FROM Rs. 2000

THE SELLING PRICE OF FLY ASH BRICKS WAS Rs. 2200/1000 BRICKS

MARKET MECHANISMS HAVE PLAYED A CRUCIAL ROLE IN THE ADOPTION OF FLY ASH BRICK TECHNOLOGY

Development Alternatives

BUT STILL…

Lack of access to finance

Low Credit Worthiness of Entrepreneurs

Cumbersome Procedures cause delays

Weak enforcement of policies

Poor Political Will

Incentives & Procurement

Perception of poor quality & quantity

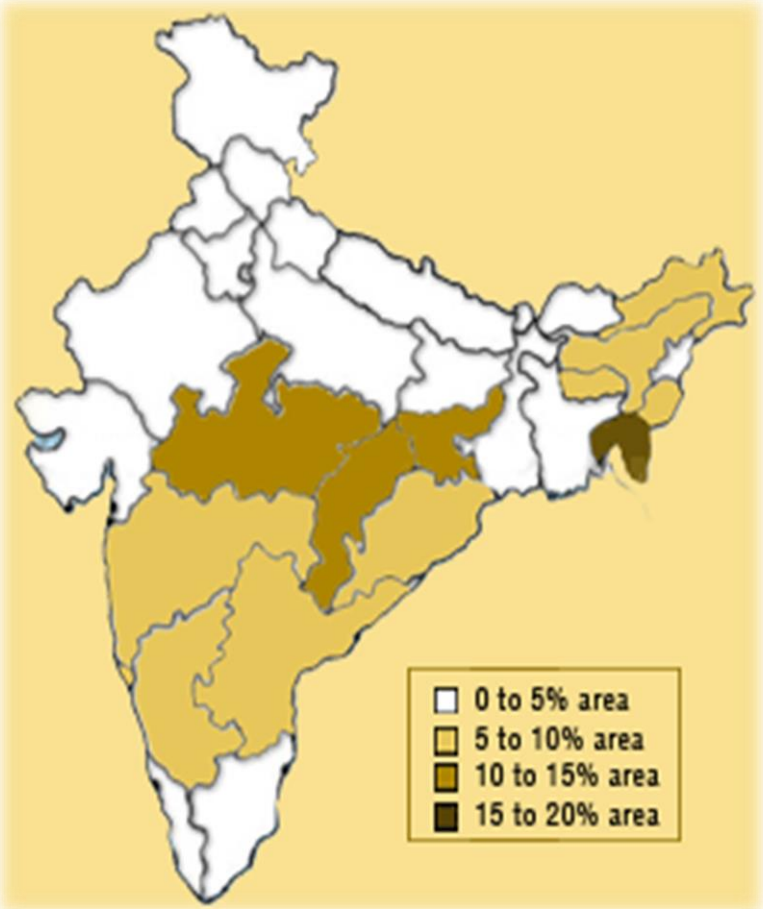
Lack of quality control

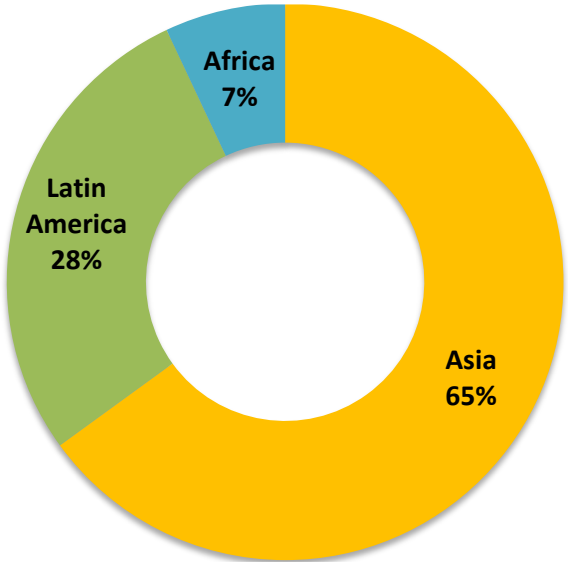
Impact on market

Development Alternatives

Bamboo

Development Alternatives





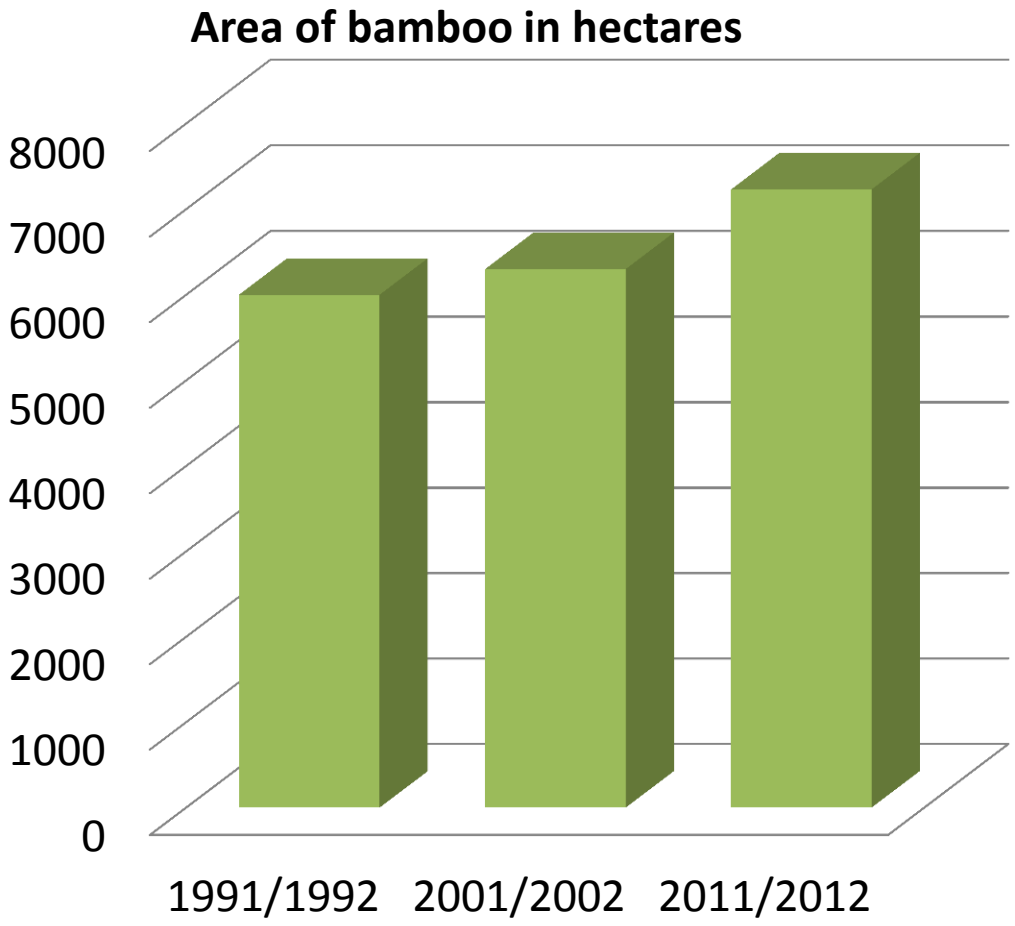
ASIA IS THE RICHEST BAMBOO PRODUCER WITH 24 MHa OF WORLDWIDE RESOURCES

INDIA IS THE SECOND LARGEST COUNTRY IN TERMS OF BAMBOO RESOURCES

Source: National Bamboo Mission

Development Alternatives

Market	Annual Trade of Bamboo
Local Market	1.9 million culms
Domestic Market	0.6 – 0.7 million culms
India	0.5 million culms



NEPAL

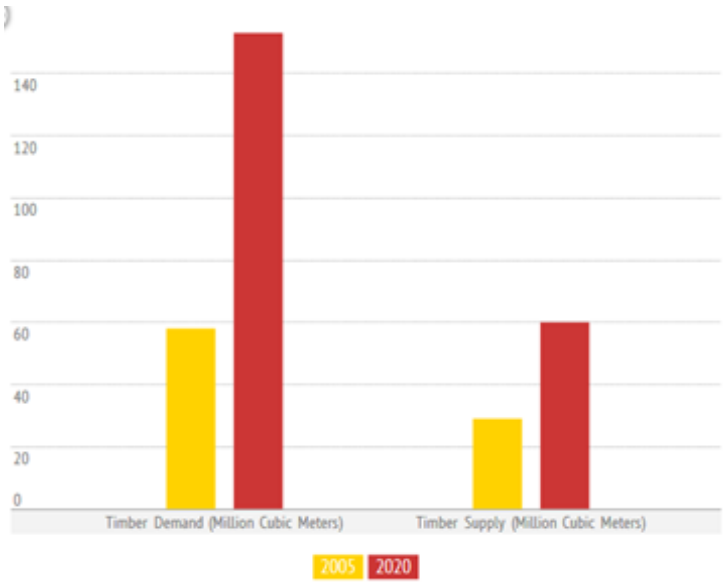
12 GENERA , >50 SPECIES OF BAMBOO

TOTAL BAMBOO COVERAGE ~63,000 HA; 60 % IN NATURAL FORESTS

TOTAL GROWING STOCK ~15 MILLION CUBIC METRE, BIOMASS VALUE OF 1060 MT

CONTRIBUTES 1-2% TO THE NATIONAL GDP

Development Alternatives



DEMAND FOR BAMBOO IS 26.69 MILLION TONNES WITH 13.47 MILLION TONNES SUPPLY

MAXIMUM BAMBOO IS USED FOR SCAFFOLDING

EXPECTED MATKET DEMAND OF INR 20,000 CRORES

INCREASING COST AND REDUCED SUPPLY OF TIMBER

LESS ENERGY COMPARED TO OTHER BUILDING MATERIALS 30 MJ/M3 AS COMPARED TO @ REQUIRE 240, 500 AND 80 MJ/M3

Development Alternatives

Traditional Bamboo Roof

Modern Bamboo Roof

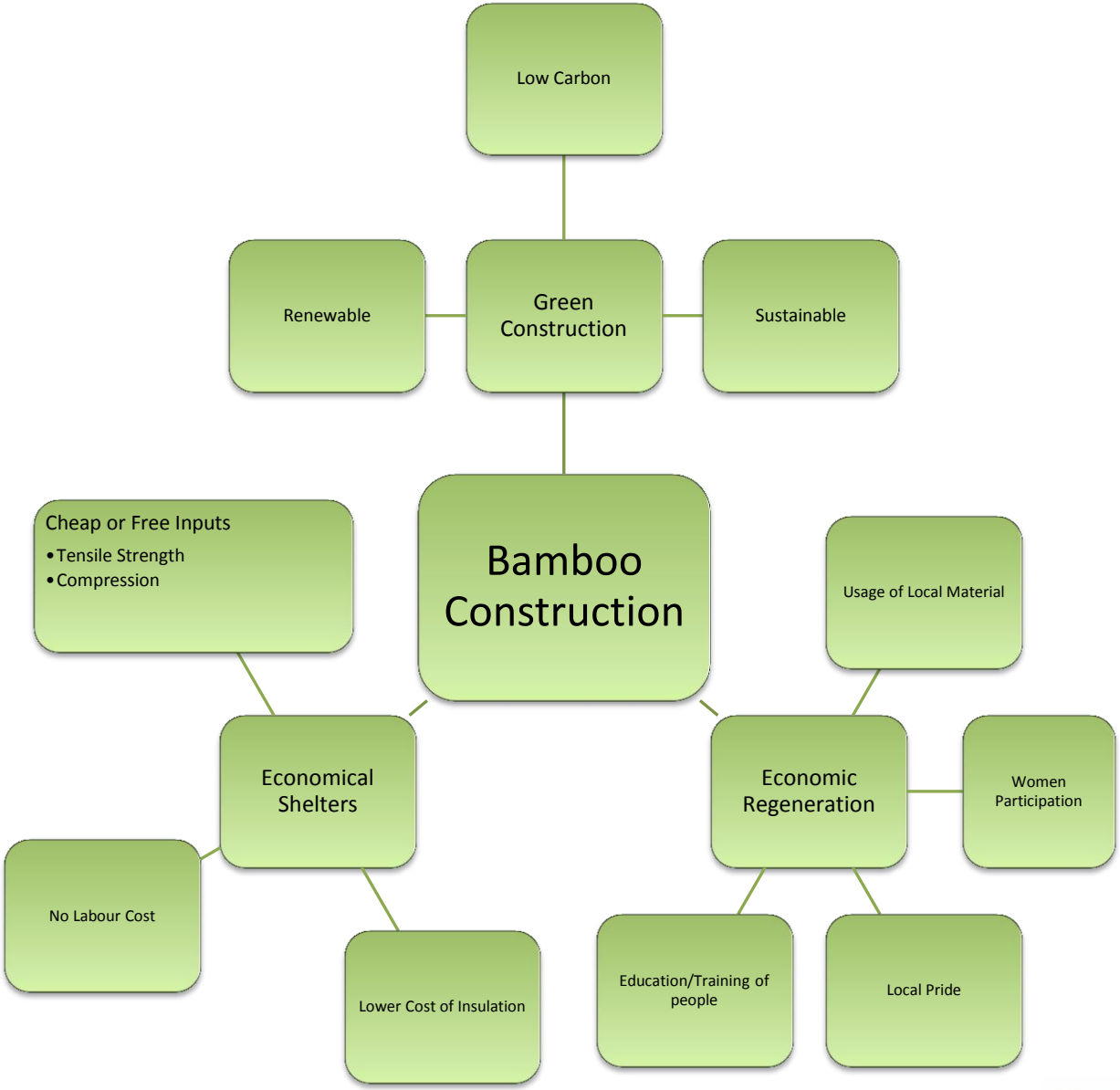
Traditional Bamboo Window

Modern Bamboo Window

Traditional Wall

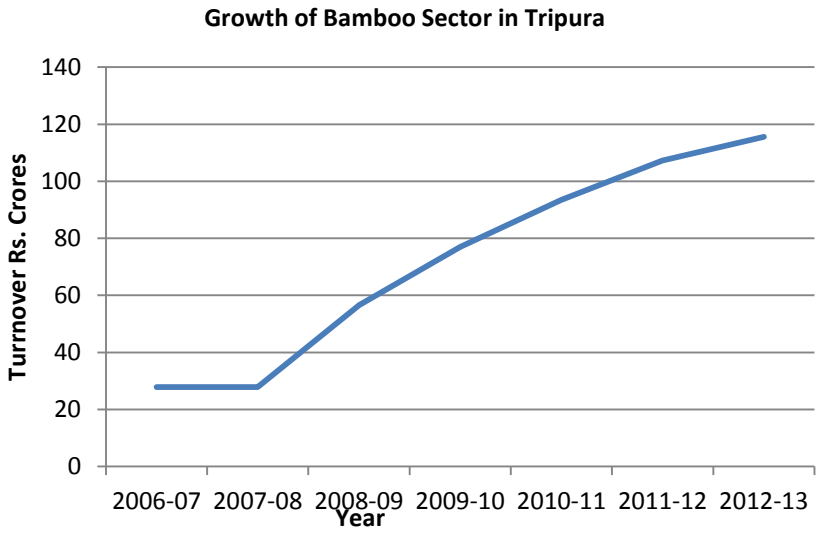
Modern Wall

Development Alternatives



Development Alternatives

Name of the Policy	Objectives	Approach	Achievements
Tripura Bamboo Policy, 2001	To develop bamboo sector in the State. Provide an impetus to conservation; Develop the resource, both in forest and farm areas Improve the utilization of bamboo and Develop effective marketing for the bamboo-based products.	Adopting scientific means (tissue culture) Practicing improved cultivation and management using community based initiatives Establishing small and large enterprises	Inauguration of bamboo tiles factory Increase in turnover to Rs. 115 crores Setting up of bamboo park Online B2B & B2C marketing through Indiamart.com and eBay.com 40,591 persons trained
Tripura Bamboo Mission, 2007	Sustain growth in bamboo sector Increase turnover from Rs. 95 crores to 200 crores Provide production and commercial infrastructure, technology, marketing support, capacity building and product diversification Provide livelihood and employment opportunities	Develop institutional structure Building enterprises on commercially sustainable models Mobilization of private investment in bamboo sector Promoting Plantation	
Kerala Bamboo Policy	Protect and conserve biodiversity Enhance resources Improve bamboo productivity Improve and promote traditional bamboo houses and establishment of modern bamboo houses Promote bamboo sector development	Database Development Protection and Conservation of Biodiversity Sustainable Management of Resources Resource Enhancement Development of bamboo based industries Livelihood Security of the Bamboo Dependents Enactment of Grower Friendly Rules and Regulation Environmental protection Skill development Scientific Input and Research Activities Publication and Awareness	Approval to conduct Kerala bamboo fest every year. Treatment facilities being inducted Preparation of a data base in the form of an annotated bibliography of bamboo literature.
Kerala Bamboo Mission,2003	Promote cultivation of bamboo Promote development of new products and innovative designs and usages Promote research in the bamboo sector	livelihood and economic security through broad-based association linking Government, NGOs, SHGs, and Local bodies	
Madhya Pradesh Bamboo Mission, 2013	develop a new line of bamboo products by bamboo artisans for national and international marketing (market) promote and facilitate traditional and non -traditional bamboo based artisans	Skill development Increasing supply of quality bamboo Availability of advanced tools and equipments	Road map has been made Organized bamboo fest Organized bamboo workshop Organized Bamboo Utsav
Nagaland Bamboo Policy, 2004	Protect & conserve rich bio-diversity Sustainable development and utilization of bamboo resources Promote bamboo plantation Promote bamboo as an essential wood substitute Promote awareness and understanding of bamboo	Development of bamboo as resource: Development of bamboo forest area. Bamboo Plantation Development Development of Bamboo as an Enterprise: Promote bamboo based Industries Create awareness of the uses and value of Bamboo Promote and Develop traditional usage of Bamboo	Marketing channels established for bamboo products Demonstrated high end and architecturally complex structures involving use of bamboo and bamboo composite material at village Kisama



POLICY PUSH HAS BEEN INSTRUMENTAL IN THE UPTAKE BAMBOO TECHNOLOGY IN TRIPURA

240% ABSOLUTE GROWTH RATE AND 35.8% CAGR FOR BAMBOO-BASED PRODUCTS

2017 TARGET OF RS. 200 CRORES ACHIEVEMENT IN 2012-13 IS RS.115.56 CRORES

500 TRAINING PROGRAMMES , 22,000 BENEFICIARIES PARTICIPATED 10,000 INCREMENTAL LIVELIHOODS

BAMBOO PARK FOR VALUE ADDING TECHNOLOGY

Development Alternatives

2005 Emergency shelters (Karavan Ghar) designed by Yasmeen Lari for affected in 2005 Earthquake

2005-2006 Stone and wood from the debris of collapsed houses, lime mortars, with provision for bond stones, galvanized iron sheets in corners and horizontal bracing in stone masonry walls

2007 *Dhijii* (cross bracing) as an effective seismic resistant structural technique-

lime-mud roofs instead of iron sheets

Weather resistant, high insulation value

2009 Reduced use of wood in construction, replaced by mud mortars and mixes

2010 All bamboo structure

HERITAGE FOUNDATION, GREEN KARAVAN GHAR: STEP BY STEP REDUCTION AND REPLACEMENT OF HIGH CARBON EMITTING MATERIAL WITH GREENER MATERIAL

Development Alternatives

BUT STILL…

Volatility in market prices

Stiff competition for bamboo from other products

Resource availability

Trade and transit restrictions

Lack of quality control

Lack of prioritisation

Lack of promotional schemes and support

Technical Concerns

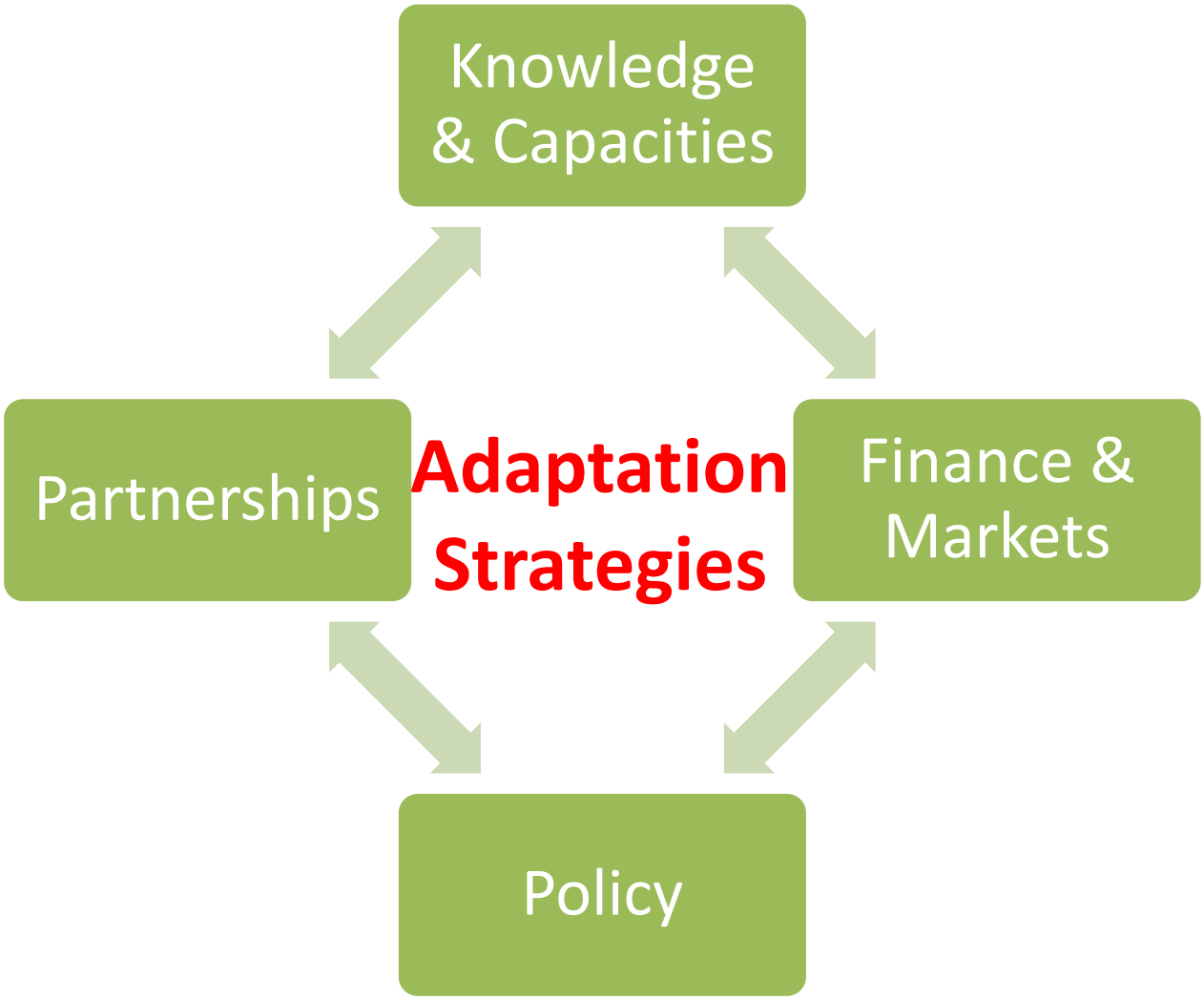
Perception of poor quality – poor man's timber

Lack of quality control

Lack of inputs and information

Development Alternatives

In Conclusion



Development Alternatives

Action Matrix

Awareness Generation	Quality Control – Rating & Grading
Incentives for Entrepreneurs	Procurement Policies
Institutional Partnerships	Innovation & Research

Development Alternatives

THANKS

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