INDIA
Using technology for Urban Sector

vision

Vaibhav Chaturvedi

Prasoon Agarwal

Amir Bashir Bazaz

AIM Training Workshop

NIES, Tsukuba

31/10/2008

Vision !

vision

Discussion points

- City plan/ urban structure
- Change in energy mix
- End use technologies
- Behavioral
- Supply side technologies

Our Analysis

- Sectors of Focus
  - Urban Residential (Slums)
  - Urban Transport

Household Energy Profile

Household Energy Consumption in India (July 1999 – June 2000)

Fuel Type	Physical Units			Mtoe		
	Rural	Urban	Total	Rural	Urban	Total
Fire Wood & Chips (Mt)	158.87	18.08	176.95	71.49	8.13	79.62
Electricity (BkWh)	40.76	57.26	98.02	3.51	4.92	8.43
Dung Cake (Mt)	132.95	8.03	140.98	27.92	1.69	29.61
Kerosene (ML)	7.38	4.51	11.89	6.25	3.82	10.07
Coal (Mt)	1.20	1.54	2.74	0.49	0.63	1.12
L.P.G. (Mt)	1.25	4.43	5.68	1.41	5.00	6.41

Source: Derived from NSS 55th Round, (July 1999-June 2000) data, National Sample Survey Organisation, Ministry of Statistics and Programme Implementation, Government of India

Transport – CO2 Increase

Sectoral CO_2 emissions in Tg-CO_2

Sector	1985	1990	1995	2000	2005	CAGR % (1985–2005)
Power	146	231	392	517	638	7.7
Road	47	70	89	116	143	5.7
Railway	20	14	6	5	6	−5.8
Aviation	2	2.5	3	4	5	4.7
Shipping	0.4	0.5	0.6	0.8	1	4.7
Cement	28	43	62	77	98	6.5
Iron and steel	56	74	86	92	103	3.1
Fertilizer	20	22	23	23	24	1.0
Other industries	62	82	93	100	109	2.9
Other sectors	59	76	94	97	102	2.8
All India	440	615	849	1032	1229	5.3

Note: CAGR (compounded annual growth rate).

Garg (2006)

Action 1

Energy Efficient housing for Urban areas

Financing the need

Lack of skill

Create innovative mechanisms PPP/Microfinance/ Subsidies/cost share

Lack of knowledge about technology

Special skilled People/local people

Lack of professional institutions

Standardization

Build capacity

Implementation

Motivation/Agreement

Data/Information about needs

Resource centers/ aggregate demand Create critical mass

Collaborate/ Participatory approaches design (alternate governance structures)

Research/ Survey

Capacity building/Capability

Create information & Infrastructure – institutions, people, society

vision

vision

Action 2

Penetration of sustainable energy technology - slums

Skill level low

Lack of local/personal needs identification

Lack of professional institutions

High investment

High cost

High cost

Non-internalisation of Energy cost

Create information and marketing infrastructure

Improve load factor

Build capacity

Energy pricing policy

Low demand/basic demand

Data/Information about needs

Create some alternate Structure to support Prices – subisidy on Generation/consumption

Research/ Survey

Aggregate demand

Capacity building/Capability

Data/Information about needs

Create information & Infrastructure – institutions, people, society

City plans- concretize

vision

Action 3

Using technology for Urban mass transportation

High investment

High congestion

High user cost

Create innovative mechanisms PPP/Subsidies

Use ICT for traffic management

Improve occupancy ratio

Lack of institutions

Information about needs/mapping

Low/Improper demand

Create information & Infrastructure – institutions, people, society

Identification of technology

Reduce Private vehicles

Insufficient local public transport infrastructure

Data/Information about needs

Information about transport needs

Research/ Survey

vision

Narrative Story

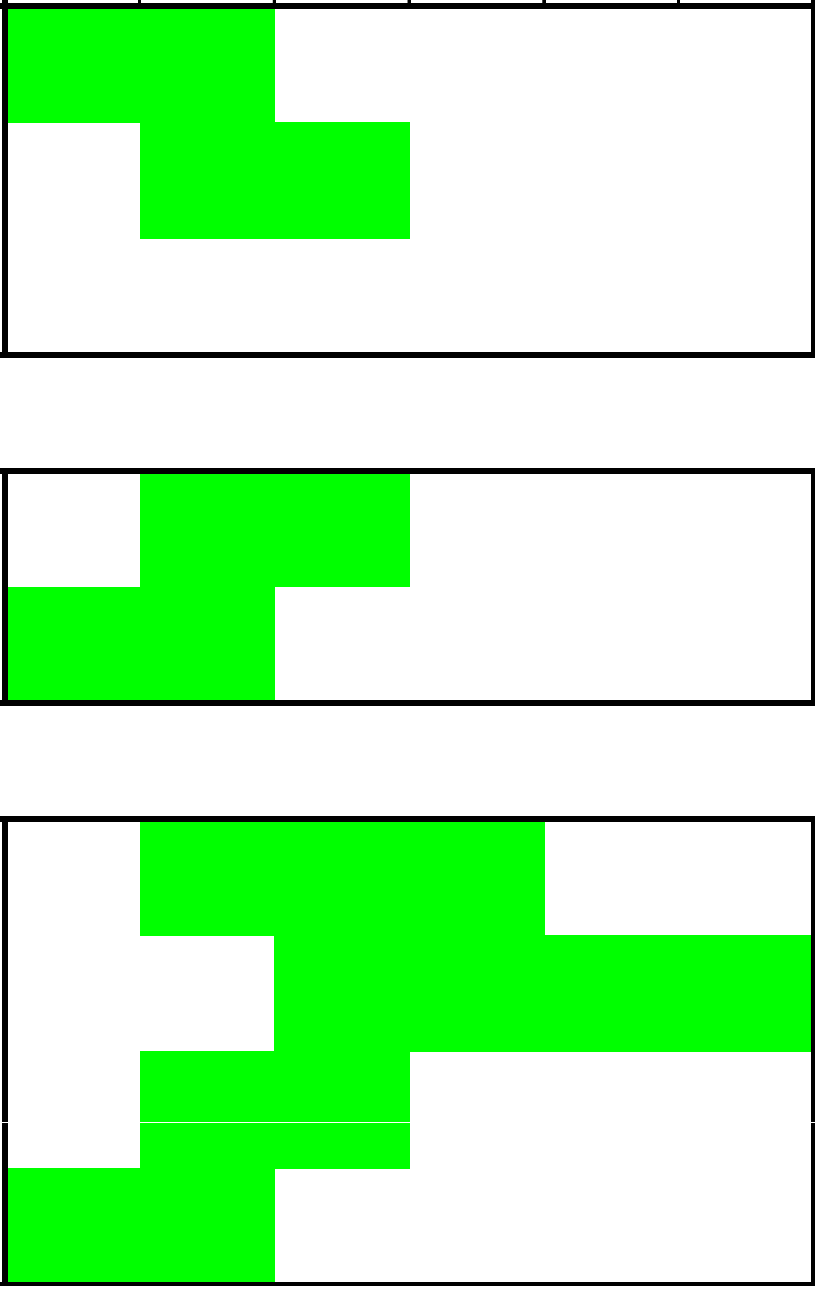
Category	Factor	A	B	Options	Achievement level	2008	2010	2020	2030	2040	2050
Urban Residential/Commercial	Reduction in demand			Increased awareness about consumption - metering	100% dissemnination of information						
				Technology use for reducing energy consumption - like heating needs, other lighting needs	50% in class 1 cities by 2020						
	Reduction in carbon emissions			Better insulation material	100% in class 1 cities by 2050; 50% in class 2 cities						
				Energy efficient design	100% in class 1 cities by 2050; 50% in class 2 cities						
				Increased use of solar power for water heating	100% in class 1 cities by 2050; 50% in class 2 cities						
Urban transportation	Reduction in carbon emissions			Use of ICT in traffic management	100% in all major cities by 2020						
				Introduction of rapid transit systems in Class 1/2 cities	4 metros by 2020						
				Reduction in service demand (pa-km/service)	100% by 2030						
				Private vehicles (increasing % of electric vehicles)	20% by 2050						
				Use of other clean fuels like natural gas	50% by 2020 in all major cities						
	Reduction in demand			Concretizing city plans - appropriate situaton of amenities (schools, markets,..)	100% by 2020 all major cities						
				Mix of mass rapid systems - as per needs & trip requirements	30% by 2030 in all major cities						
				Use of ICT in shifting offices to homes (working from homes)	20% by 2030						
Urban slum development	Aggregating demand (minimise efficiency loss)			Provision of basic in-situ housing amenities	50% slums by 2020						
				Technology suiting a resource efficient design	50% slums by 2020						
				Reduction of floor space occupation (vertical housing)	50% slum occupation by 2030						
	Reduction in carbon emissions			Use of solar or other renewables for lighting and other basic needs	50% slums by 2020						
				Efficient solid waste management system	50% slums by 2020						

Action 1 **Energy Efficient housing for Urban areas**

		Barriers	2008	2010	2020	2030	2040	2050
Option 1	Create information &Infrastructure – institutions,people, society	Capacity building/capacity						
	Resource centers/aggregate demand (Create critical mass)	Implementation issues						
	Create innovative mechanisms PPP/Microfinance/Subsidies/cost share	Finance needs						
Option 2	Research/ Survey	Data/Information about needs						
	Standardization	Lack of knowledge about technology						
Option 3	Collaborate/Participatory approaches design (alternate governance structures)	Motivation/Agreement						
	Special skilled People/local people	Lack of need identification						
	Build capacity	Lack of professional institutions						

Action 2 **Using technology for improving urban mass transportation**

		Barriers	2008	2010	2020	2030	2040	2050
Option 1	Create information & Infrastructure – institutions, people, society							
	Create innovative mechanisms PPP/Subsidies							
Option 2	Use ICT for traffic management							
	Identification of apprpriate technology							
Option 3	Increase occupancy ratio							
	Private vehicles reduction							
	Information about transport needs							
	Research/Survey							



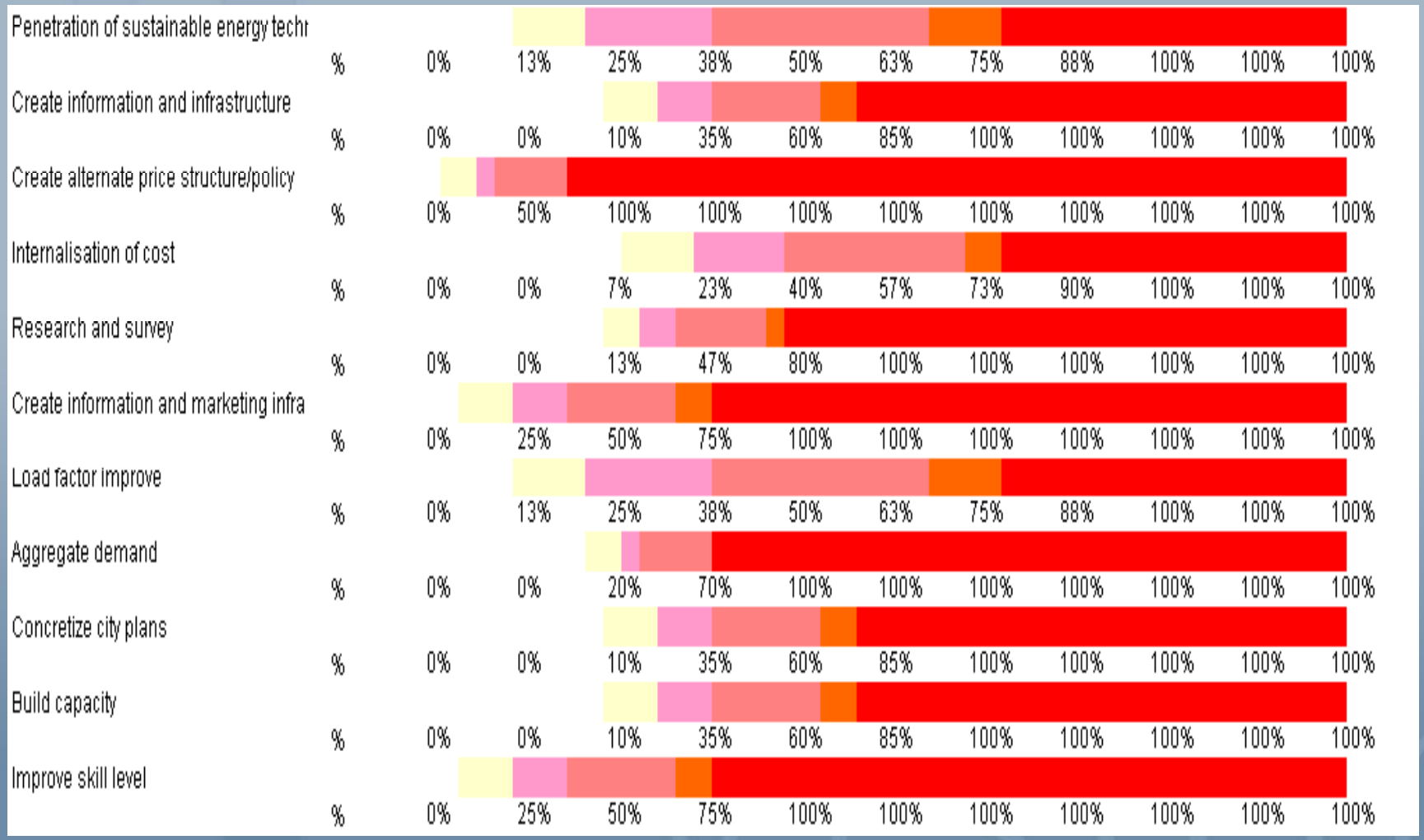
Action 3 **Penetration of sustainable energy technology - slums**

		Barriers	2008	2010	2020	2030	2040	2050
Option 1	Internalisation of Energy cost	High investment cost						
	Structure to support Prices – subisidy on Generation/consumption	Pricing policy						
	Create information & Infrastructure – institutions,people, society	Capacity building/capability						
Option 2	Create information and marketing infrastructure	High cost						
	Research/ Survey	Data/Information about needs						
Option 3	Improve load factor	High cost						
	Aggregate demand	Low demand						
	City plans- concretize	Data/information needs						

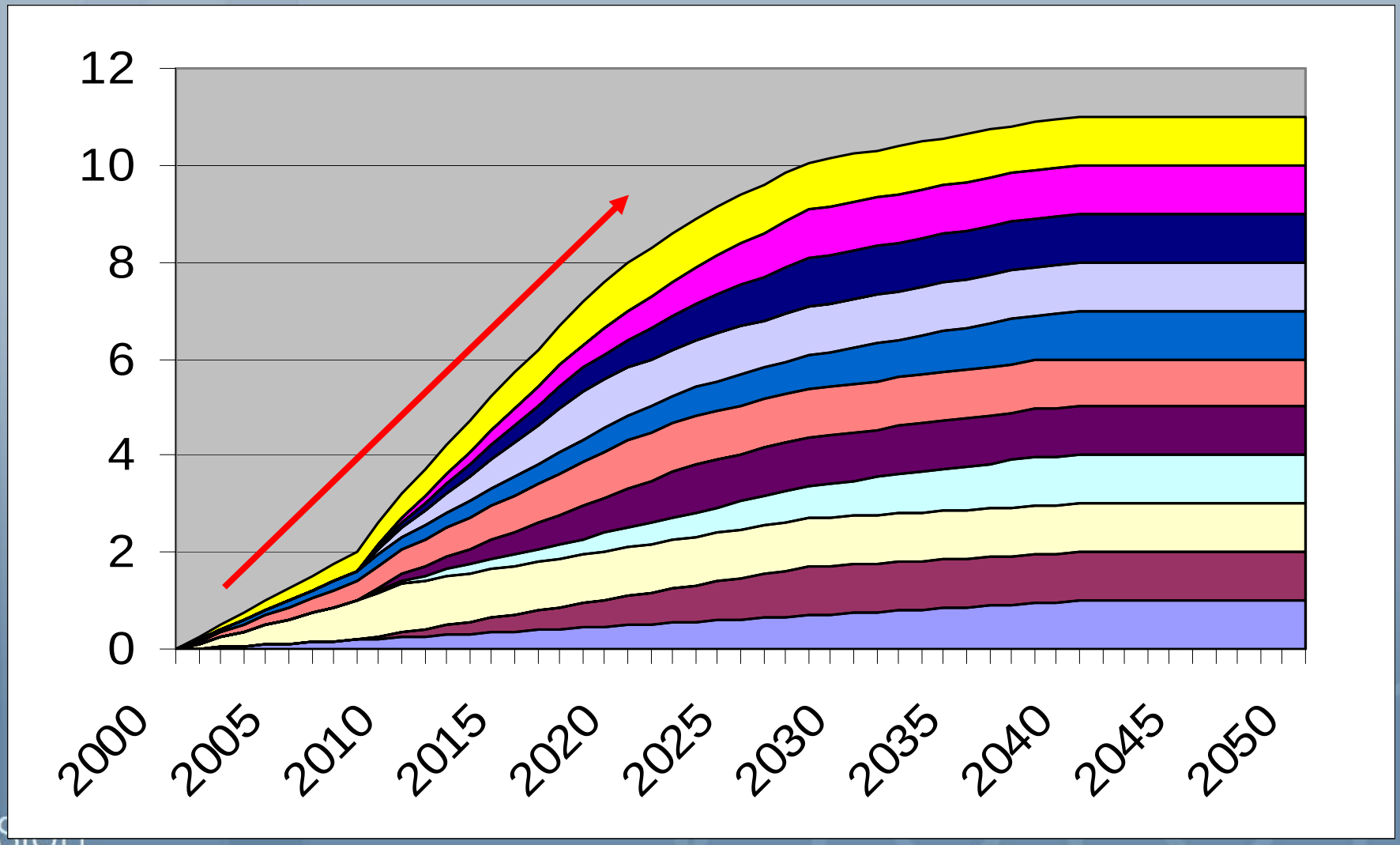
Technology Scenarios
for urban development

Scenarios	**A**	**B**
Action 1 (Urban slums)	Accelerated penetration of solar	Penetration of solar + energy efficiency
Action 2 (Urban tpt)	Modal shift to mass transport	Modal shift + energy efficient vehicles

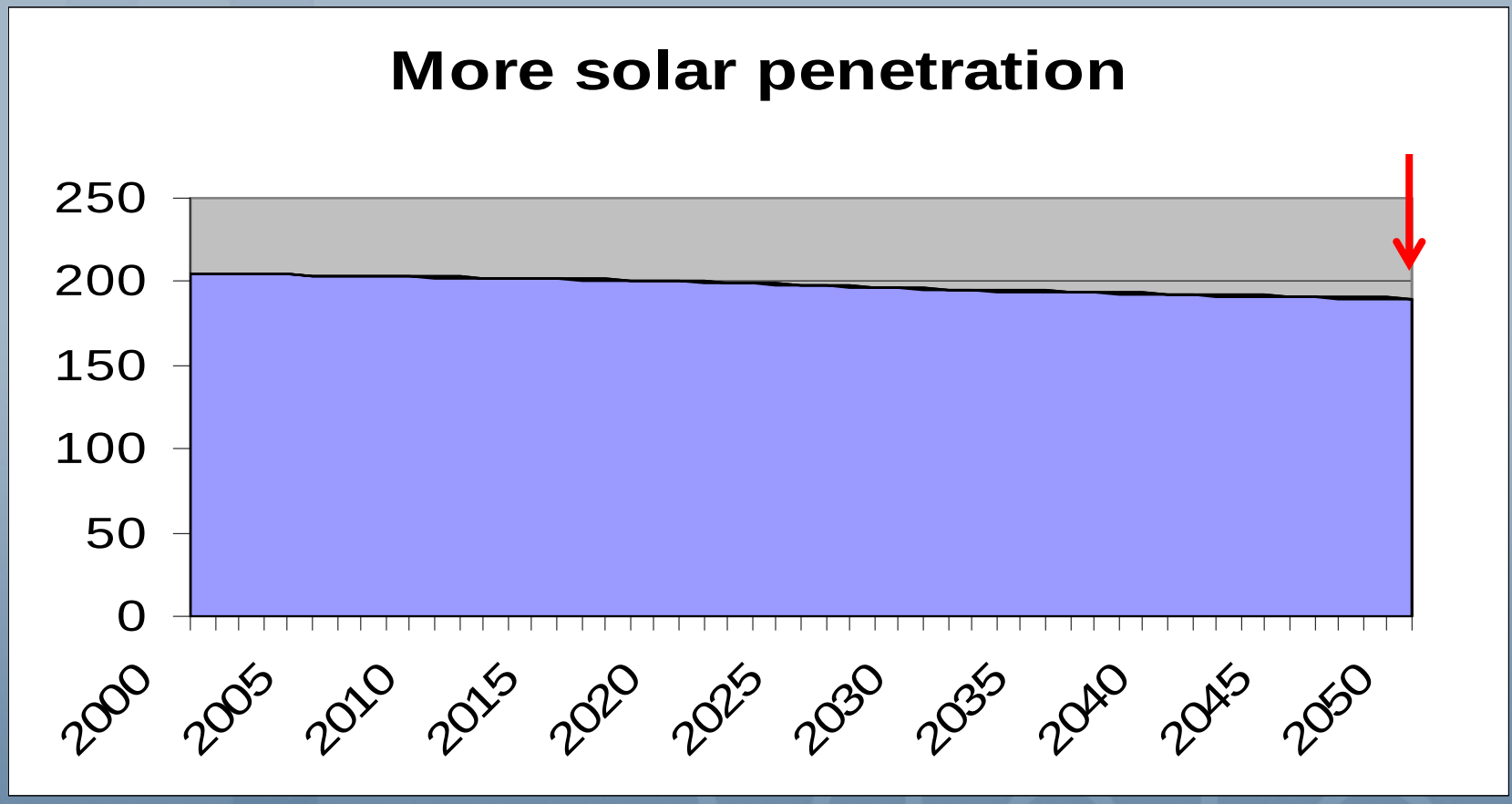
Penetration – Action 1 Urban Slums



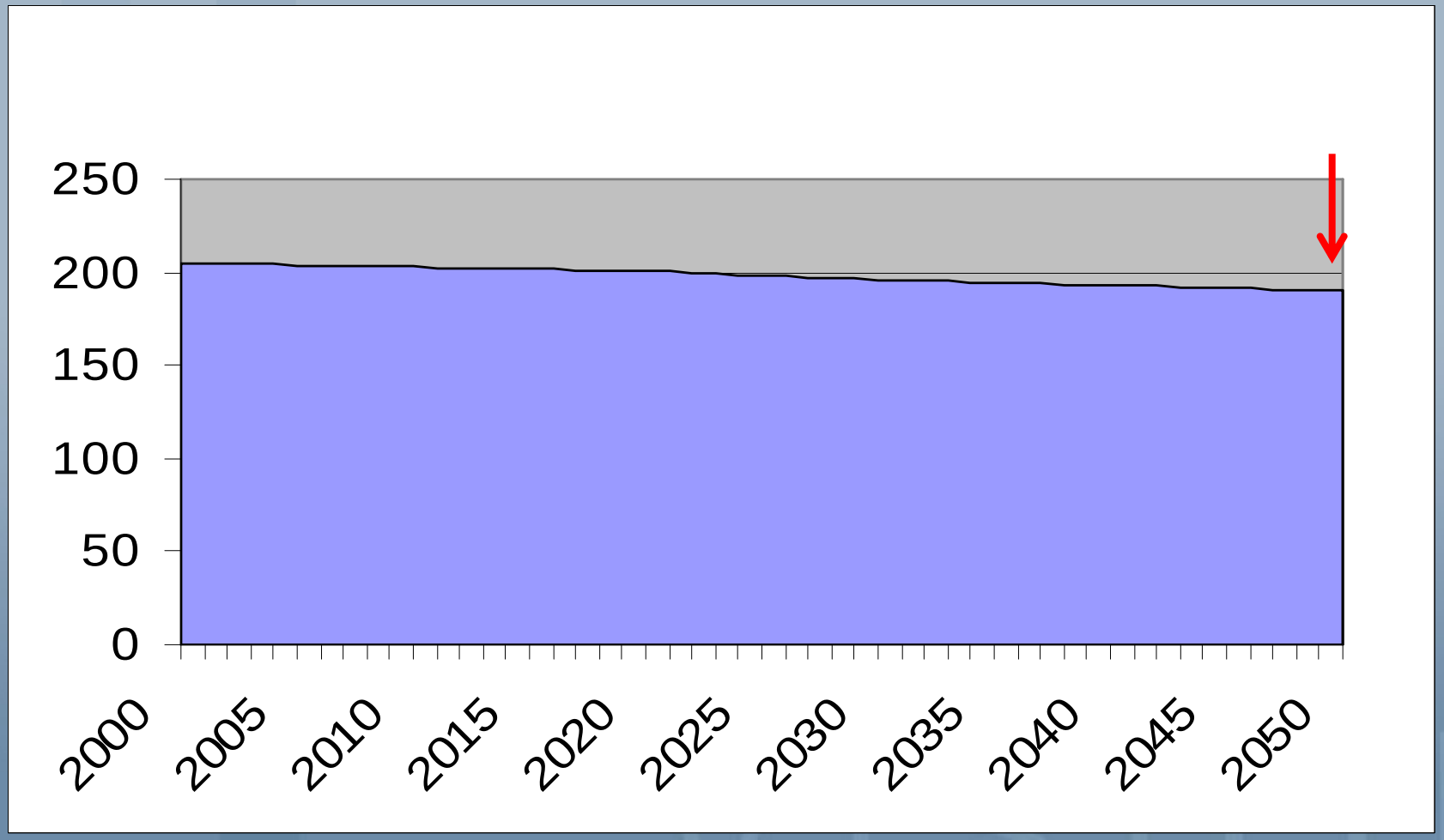
Penetration – Action 1
Urban Slums



Scenario 1A (Slums- Solar) Accelerated Solar penetration



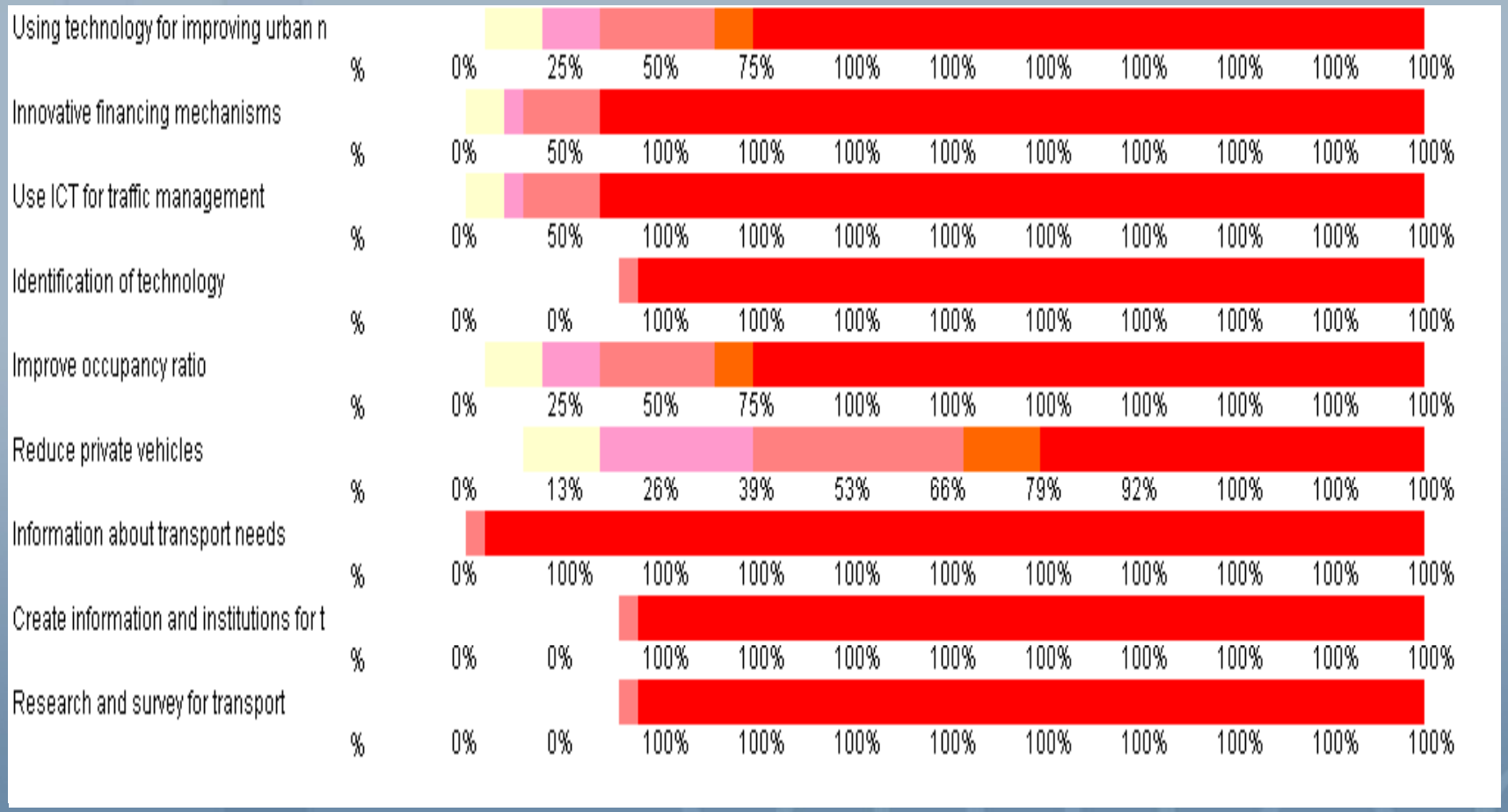
Scenario 1B (Slums- Solar + ṅ) Accelerated Solar penetration



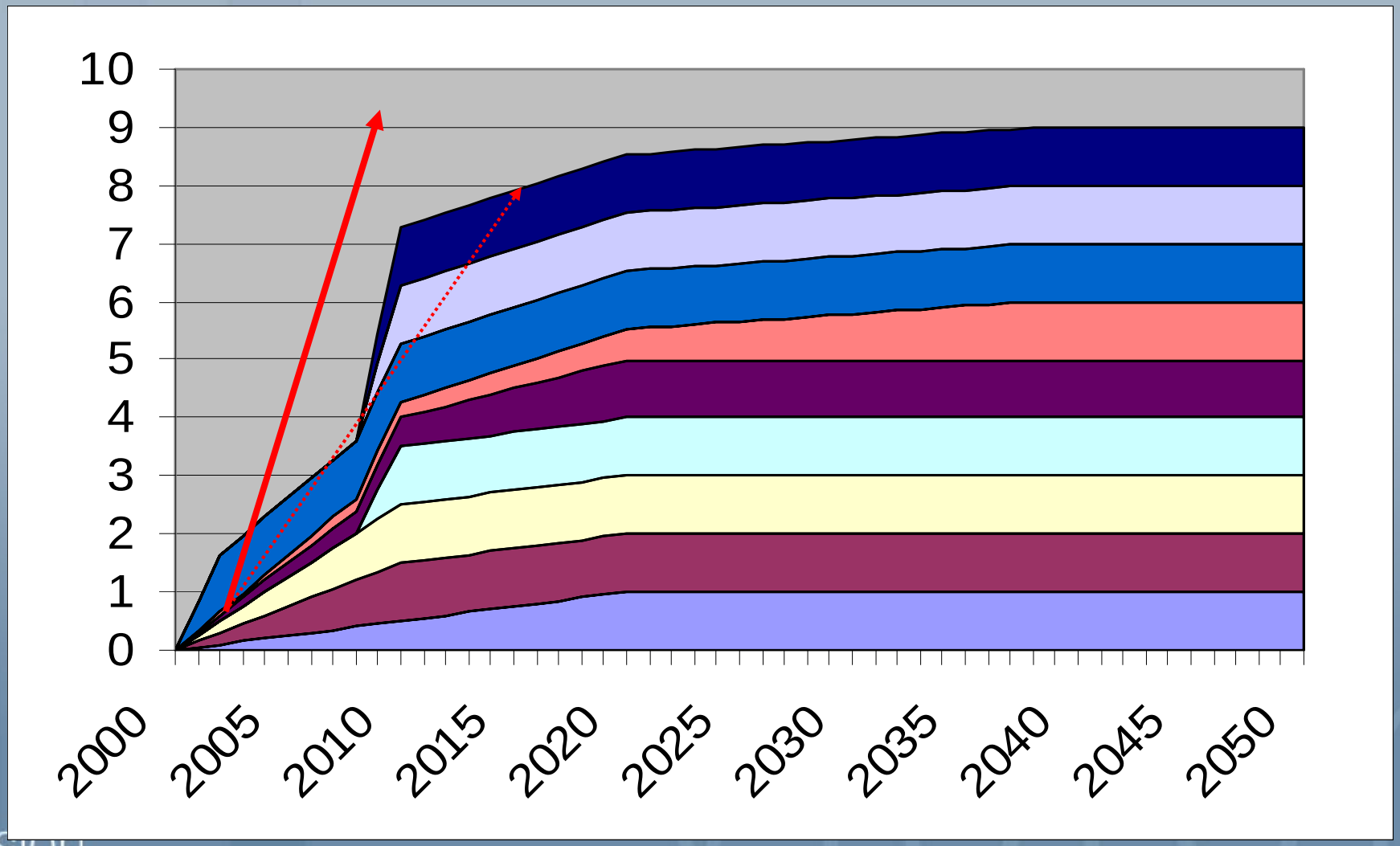
vision

Efficiency improvement lead to a higher CO2 reduction

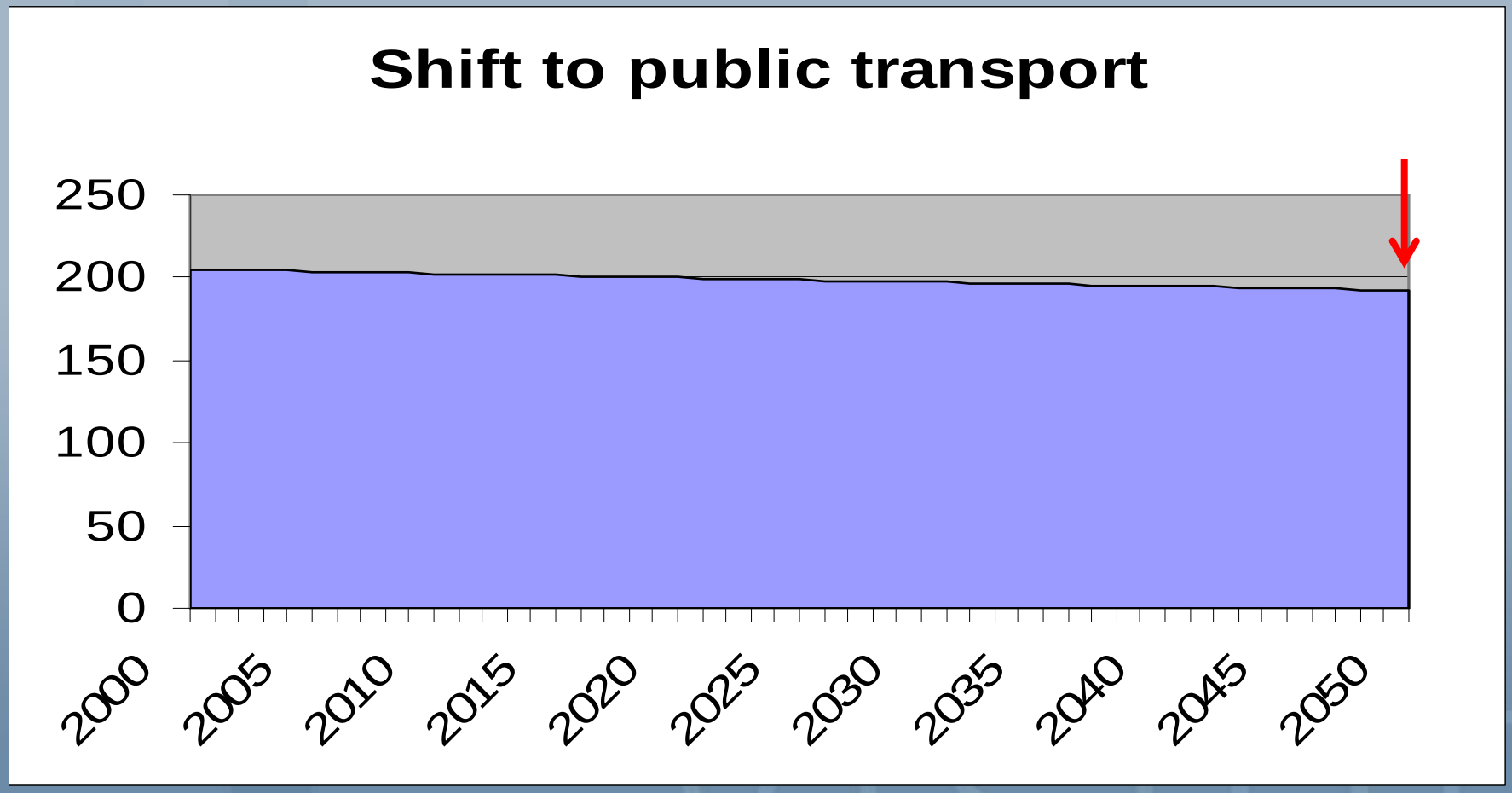
Penetration – Action 2 Urban Transport



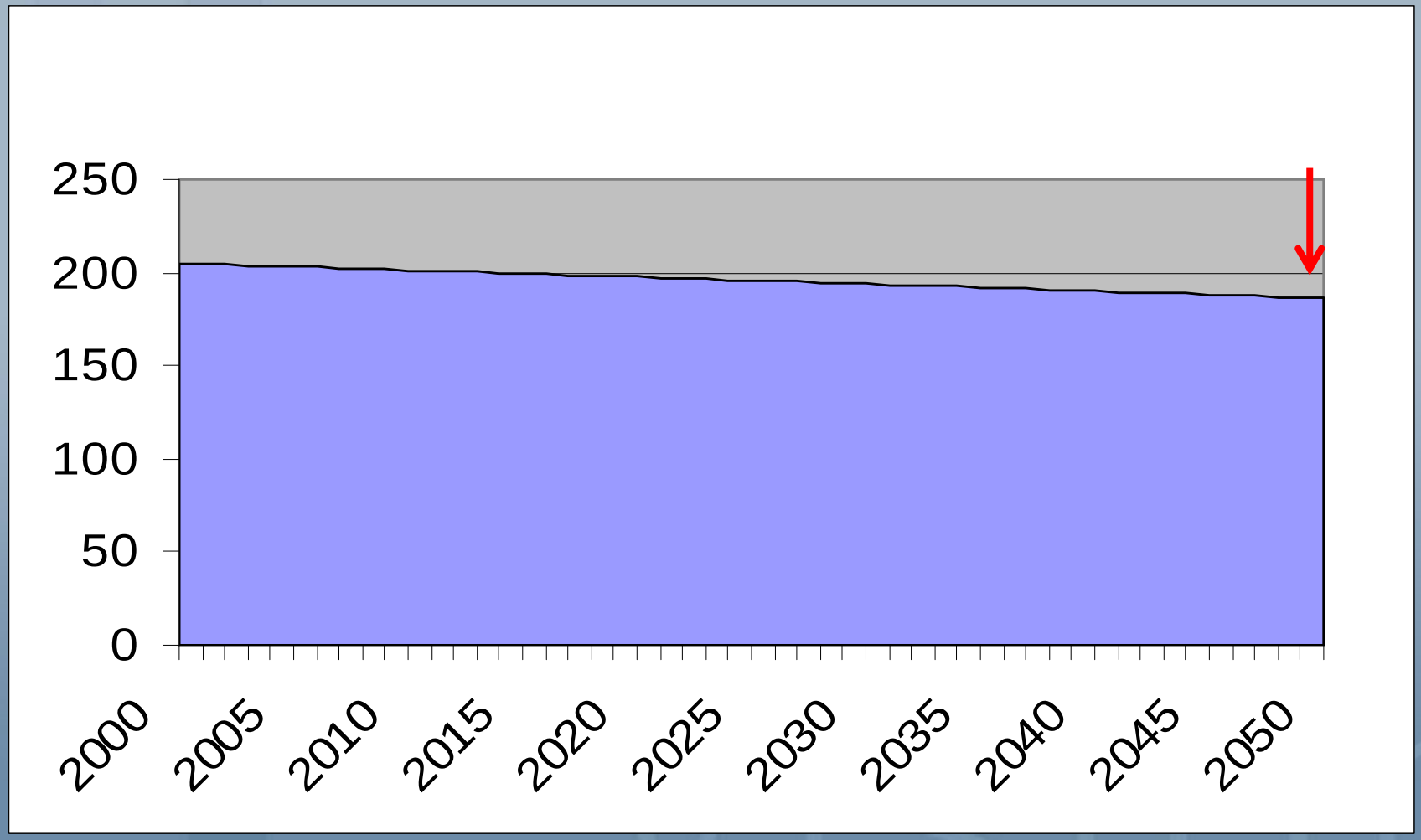
Penetration – Action 2 Urban Transport



Scenario 2A (Urban – Mass) CO2 reduction



Scenario 2B (Urban – Mass + ṁ) CO2 reduction



vision

Efficiency improvement lead to a higher CO2 reduction

Comments

- Synergies: SD with LCS
- Sensitizing policy makers and public
- Decision making and Implementation
  - centralized v/s decentralized
- Developing Country Context – Biomass??

vision

Thank You !