



Institute of Transport Economics
Norwegian Centre for Transport Research



Coping with Climate: Assessing Policies for Climate Change Adaption and Transport Sector Mitigation in Indian Cities

Financed by:



Indian Institute of
Science, Bangalore

Farideh Ramjerdi
Institute of Transport Economics



Climate Adaptation in the Transport Sector: Accelerating Global Efforts
Transport Events at COP21

December 9, 5-7, 2015, Paris



Indian Institute of
Technology Bombay



School of Planning and
Architecture Delhi

The objectives of the project

- To examine how the transport sector can contribute to the visions, goals at national and urban level
 - Economic development
 - Environmental sustainability (global and local)
 - Adaptation/resilience to adverse climate change
 - Social inclusion
 - Urban livability
 - Safety & health concerns related to the emissions of pollutants
- To develop alternative scenarios that meets the visions/goals
- The scenarios integrate “climate change scenarios”
- Examine the barriers to the implementation, in particular related to finance and governance
- Provide support for political decision making at local and national levels

Transport sector as an *open complex system*, a *socio-technical system*

Transport plays a fundamental role in the economy and Society

Open complex system: There are multiple interacting markets, with many types of increasing returns and many positive feedback mechanisms between these markets, with many non-linear relationships and time lags and institutional settings as well as interactions with its surrounding markets and environments.

The term socio-technical system is a conceptual reminder that technologies affect and are an effect of their broader infrastructural, organisational, regulatory, and symbolic environments.

Governing the transport system also means mediating between various conflicting interests and objectives such as economic development, environmental protection, human health and social equality. Further, it must take into consideration technical innovation, quality standards, habits, standards of living and ideological visions.

A characteristic of such systems is path-dependency and lock-in effects.

The need for change in transport planning paradigm to meet challenges of climate change

- Complexity of the transport system makes it inherently subject to significant **risks and uncertainties**, along with compounding risks and uncertainties concerning technology, markets, political context, socio-demographics and changes in values and preferences.

Climate change amplifies these risks and uncertainties. There is a need to:

- improve risk assessment, risk valuation and risk management, issues weakly understood by public officials and policy makers
- change the planning framework and to embrace flexibility as part of the planning process.
- move away from a ‘static thinking’, associated with the traditional planning methods, towards methods of dynamic planning where decisions are made continuously and based on steady flow of new information.

These issues of great relevance in the context of climate change adaptation and mitigation policies

Challenges faced by urban transport: Population and urbanization

- Population in 2015: 1.27 billion
- Population in 2028 : 1.45 billion, world's most populous country
- Urbanization in India is taking place at a fast pace.
- Urban population
 - In 1990: 222 million
 - In 2014: 410 million
 - In 2050: 800 million



Advantages of urban India (McKinsey Global Institute)

- Cities could generate 70% of net new jobs created in 2030,
- Cities produce 70% of GDP, and increase the per capita incomes by fourfold nationally
- Cost of delivering basic services is 30 to 40% lower than rural areas
- To meet the urban demand, India needs to build
 - 700-900 million sqm of residential and commercial space a year.
 - 350 to 400 kilometers of metros and subways every year
 - 19,000 -25,000 kilometers of road lanes would need to be built every year (including lanes for bus-based rapid transit systems), nearly equal to the road lanes constructed over the past decade.
- Cities can also deliver a higher quality of life
- India needs thriving cities
- Among challenges: finding sources of funding the capital investment in cities in India

Problems with urbanization

Lopsided urbanization & faulty urban planning, resulting in India's urbanization to follow by some basic problem in the area of:

- Unemployment, and income disparities
- Housing
- Slums & urban sprawl
- Growing congestion
- Inadequate and unreliable urban infrastructure, including transport

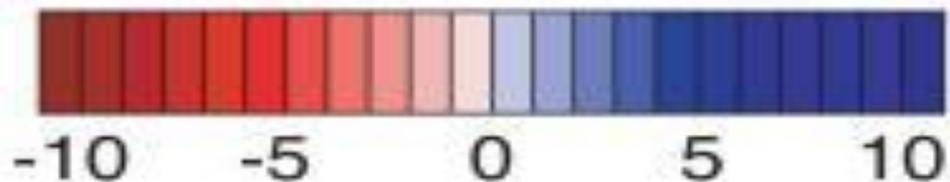
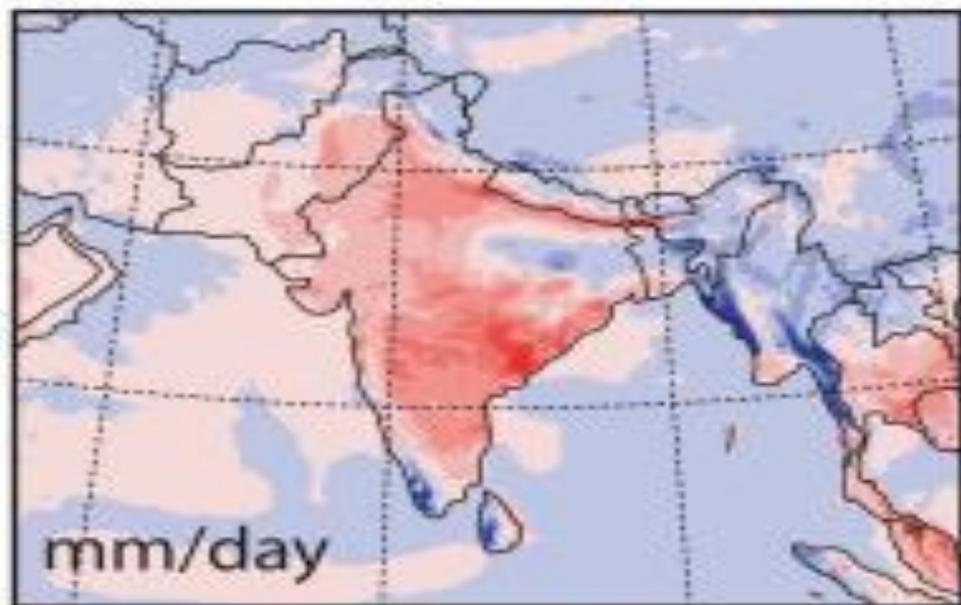
WHO: air pollution is single biggest environmental health risk

- The losses from environmental pollution are equivalent to about 4% of GDP
- Climate change and air pollution in India has become so severe that yields of crops are being cut by almost half (further pressure on urbanization)

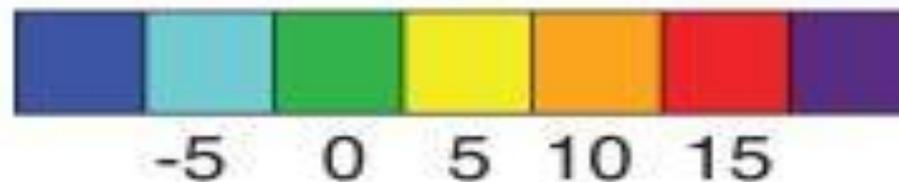
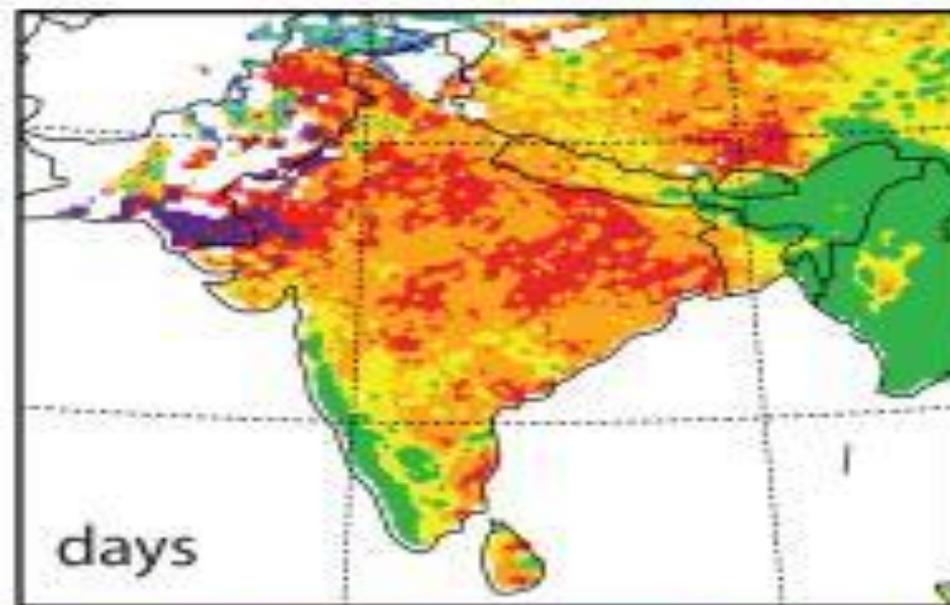


Changing Climate: Monsoon patterns will change both in the timing of the advent of rains and in the amount of precipitation..
Lack of uniform trends but increasing spatial variability in observed Indian rainfall extremes

Future Change in Summer Convective Precipitation



Future Change in Monsoon Onset Date

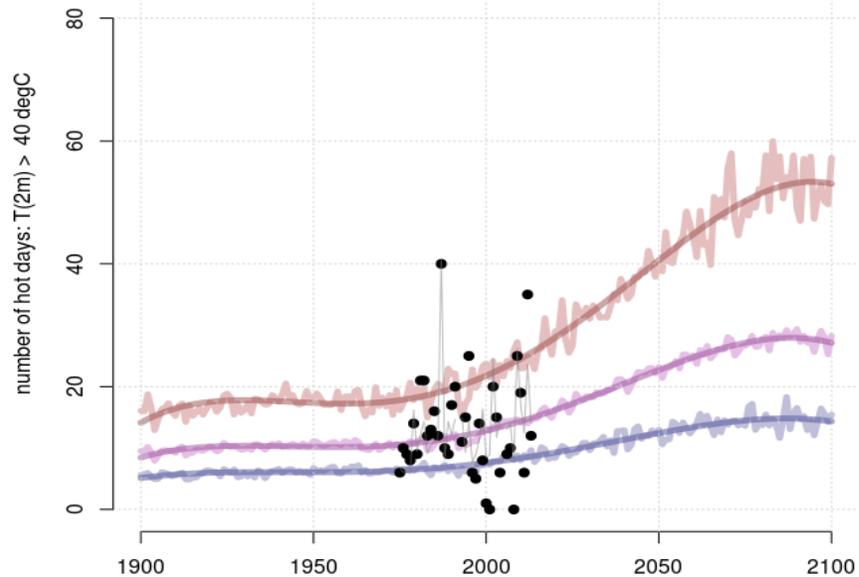


Analysis of “hot days” under scenario RCP4.5

Close match between the mean temperature and number of days above a certain threshold (“hot days”). The upper and lower curves represent typically hot and cold seasons (mostly inter-annual spread), whereas the middle curve is the ensemble mean.

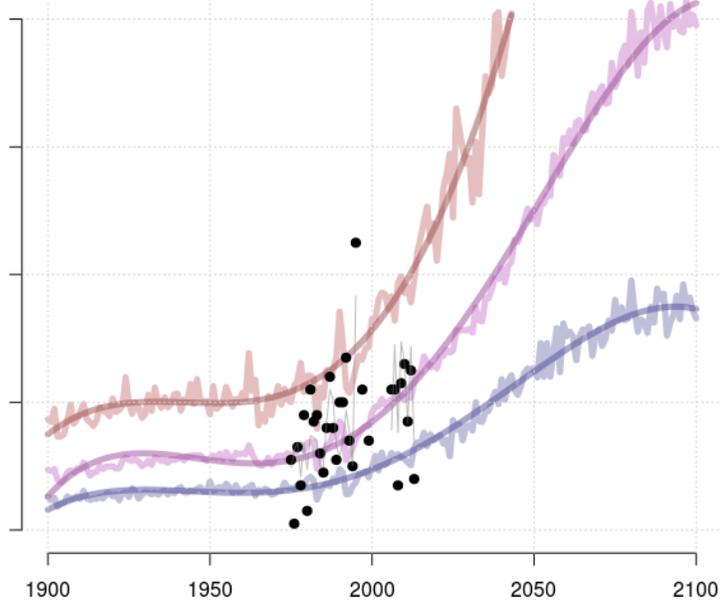
NEW DELHI/S

>40 degC



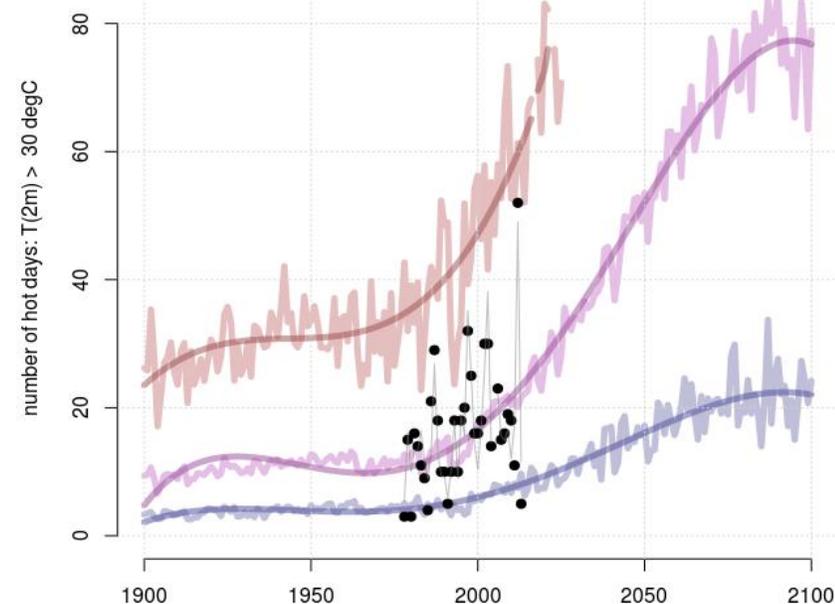
BOMBAY/SANTACRUZ

>32 degC



BANGALORE

>30 degC



Visions for future:

- Environmental sustainability (local and global)
- Adaptation to climate change and resilience
- Economic viability
- Social inclusion
- Livability

We need to change course

Is leapfrogging possible for India and for the developing economies?

Some thoughts on the scenarios for urban transport

- Integration of adaptation and mitigation scenarios/policies. This is particularly important with rapid urbanization, growth in income and car ownership.
- Urban planning/land use policies to promote public transport, walking and cycling, to address social cohesion and economic growth associated with agglomeration
- Coordination with other urban infrastructure provisions
- Coordination with other sectors, in particular energy sector
- Addressing risks and uncertainties in the scenario development
- Institutional reforms to strengthen urban and local government
- Addressing financial barriers
- Involving stakeholders (public and private sector actors, service providers,...) in the development of the scenarios
- Need for data for the development of scenarios and implementation & monitoring

We hope that CLIMATRANS would/could contribute to the change of course



Thank you