



**XXIV<sup>th</sup> World  
Road Congress  
Mexico 2011**  
Mexico City 2011.

**“An overview of climate change issues and  
contribution of the road system”**

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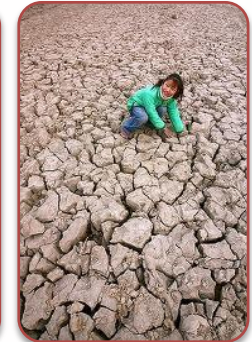
# CLIMATE CHANGE

## UNFCCC DEFINITION:

*'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'.*



# MODELLED OUTCOMES



## SCENARIO 1 (2000 levels)

**0.6°C**  
temperature  
rise

**0.3-0.9m** sea  
level rise

## SCENARIO 2 (B1)

**1.8°C**  
temperature  
rise

**1.1-2.9m** sea  
level rise

## SCENARIO 3 (A1T)

**2.4°C**  
temperature  
rise

**1.4-3.8m** sea  
level rise

## SCENARIO 4 (B2)

**2.4°C**  
temperature  
rise

**1.4-3.8m** sea  
level rise

## SCENARIO 5 (A1B)

**2.8°C**  
temperature  
rise

**1.7-4.4m** sea  
level rise

## SCENARIO 6 (A2)

**3.4°C**  
temperature  
rise

**2.0-5.4m** sea  
level rise

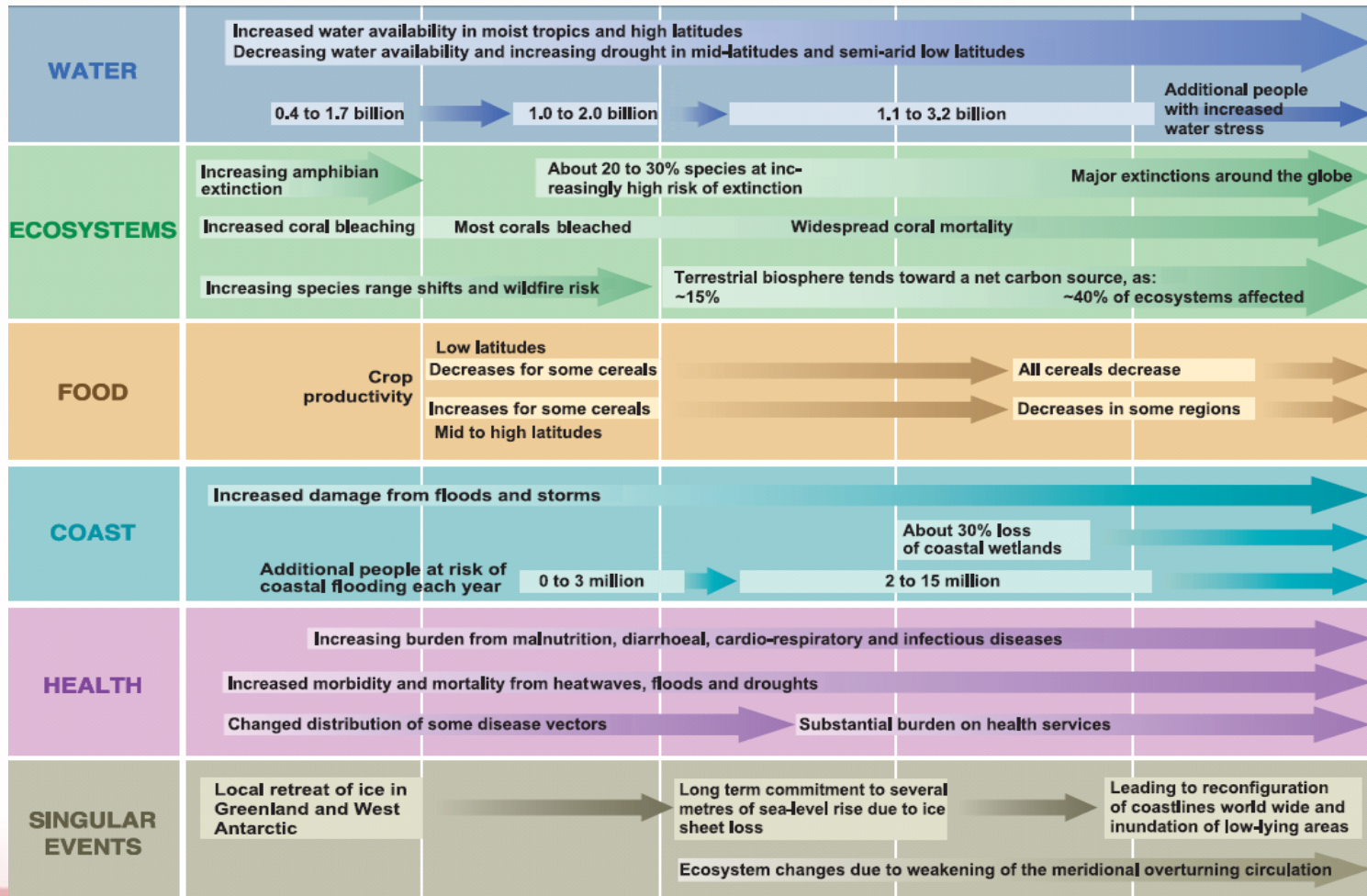
## SCENARIO 7 (A1F1)

**4.0°C**  
temperature  
rise

**2.4-6.4m** sea  
level rise



# CLIMATE CHANGE CONSEQUENCES



# SCENARIOS

- Future GHG emission rates are not certain due to the complex and dynamic nature of global systems
- Scenarios explore alternative development pathways:
  - Economic variability
  - Population projection
  - Technological advancement
- The outcome of the scenarios are variable depending on the changes we make to the pathways listed above: **this includes the planning, construction management and operation of road transport systems .**



# ROAD SYSTEM EMISSIONS

Two principal components of GHG emissions from road transport:

## OPERATIONAL & EMBODIED CARBON

1. Operational carbon is carbon emissions arising from the use of the road, largely vehicle emissions but also from its maintenance and operation (e.g. lighting)



# ROAD SYSTEM EMISSIONS

2. Embodied Carbon: carbon emissions arising from energy consumption used to manufacture construction materials (e.g. cement, asphalt, etc.), their delivery to the site (transport emissions) and placing them as part of the structure (construction site related emissions)



# OPERATIONAL EMISSIONS: THE SCALE OF CHALLENGE

- Vehicle stock will increase from 700 million in 2002 to over 2 billion units by 2030
- ~23% of all anthropogenic emissions are from transport
- Road transport accounts for 74% of all transport CO<sub>2</sub> emissions



Source: Daily Mail, 2008

Sources: IEA, 2011; Kahn Ribeiro *et al.*, 2007





# CONSTRUCTION EMISSIONS: THE SCALE OF CHALLENGE

- **142 countries** as of **2008** had at least **33, 203,196.87km** of **road** networks  
(World Bank, 2008)

- **Economic development** is bringing more roads of a better quality



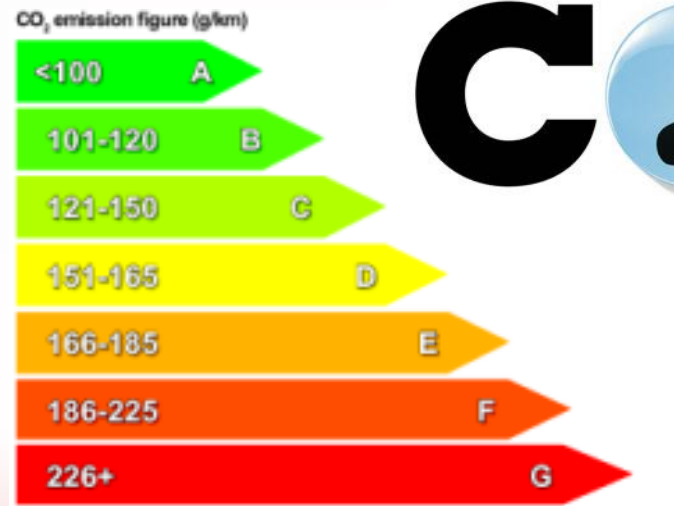
# ADDRESSING THE CHALLENGE: MITIGATION

- Transport planning
- Technological advances
  - Fuels
  - Vehicles
  - Infrastructure



- Policies
  - Legal
  - Fiscal

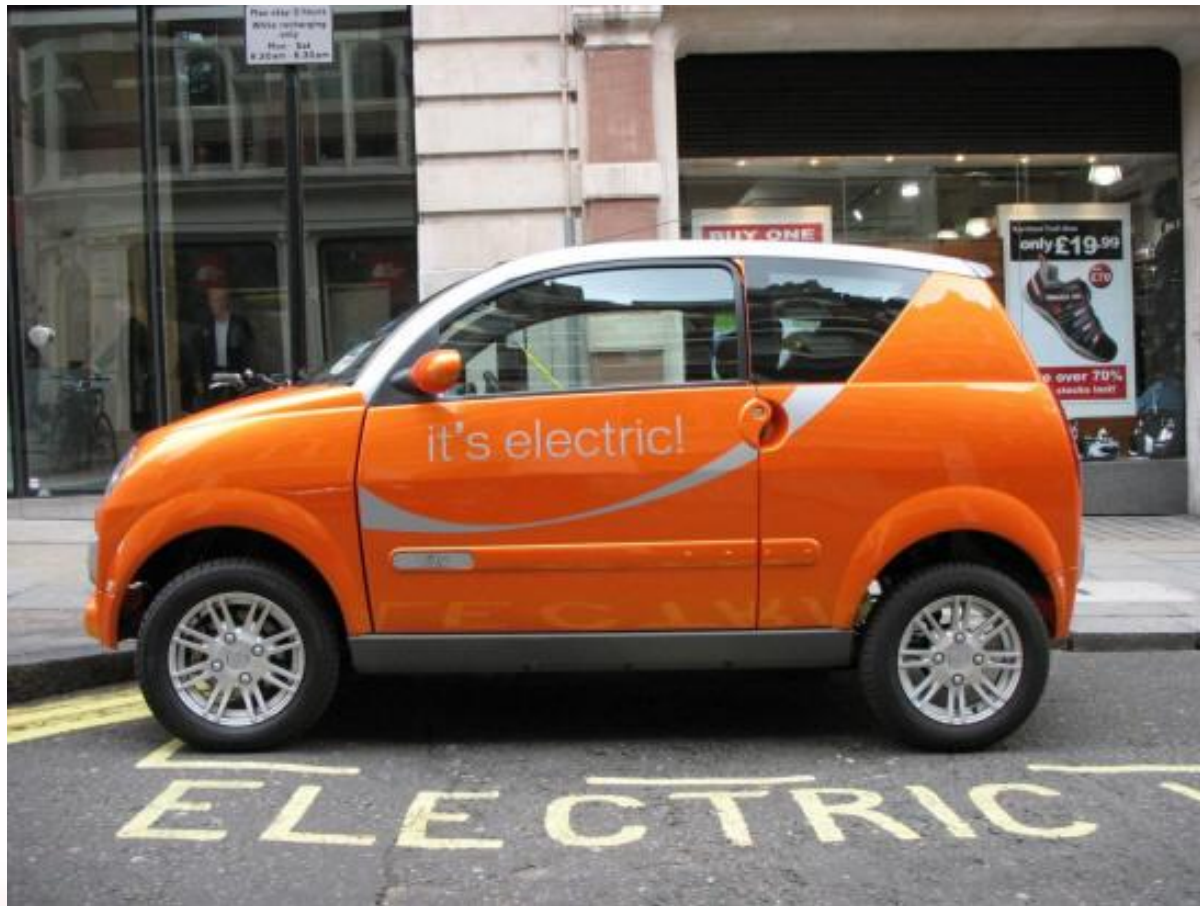
- Change in attitudes



# ADDRESSING THE CHALLENGE: TRANSPORT PLANNING



# ADDRESSING THE CHALLENGE: VEHICLE DESIGN



# ADDRESSING THE CHALLENGE: CONSTRUCTION MATERIALS



# ADDRESSING THE CHALLENGE: BEHAVIOUR AND ATTITUDES

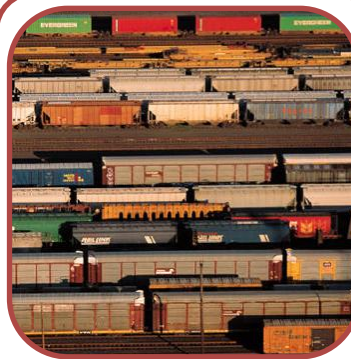
## Behaviour/Attitude Change



**Other**  
modes of  
**transport** –  
walking/  
cycling



**Car/Ride**  
**Sharing**  
schemes



**Freight** –  
rail or  
maritime



**Education**



# ADDRESSING THE CHALLENGE: ADAPTATION



## *The Gulf Coast Study*





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**Thank You**

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