

Impact of framework scenarios on future traffic emissions and air pollution levels

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Overview

- Risk-Habitat-Megacity
- Scenario description
- Modeling chain
- Results
- Conclusions



Urban settlements - spaces of opportunities



Source: E. Chatterjee

Economic Productivity



Source: Siemens

Nodal Points in Global Networks



Source: A. Künzelmann

Human / Social Resources



Source: Getty Images

Efficient / Innovative Infrastructure

Urban settlements - spaces of risks



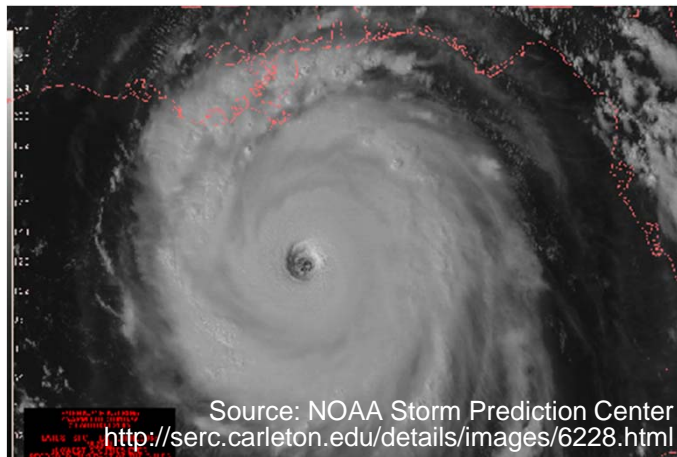
Source: El Mercurio

Single Event



Source: Reuters

Chronically, scope creeping processes



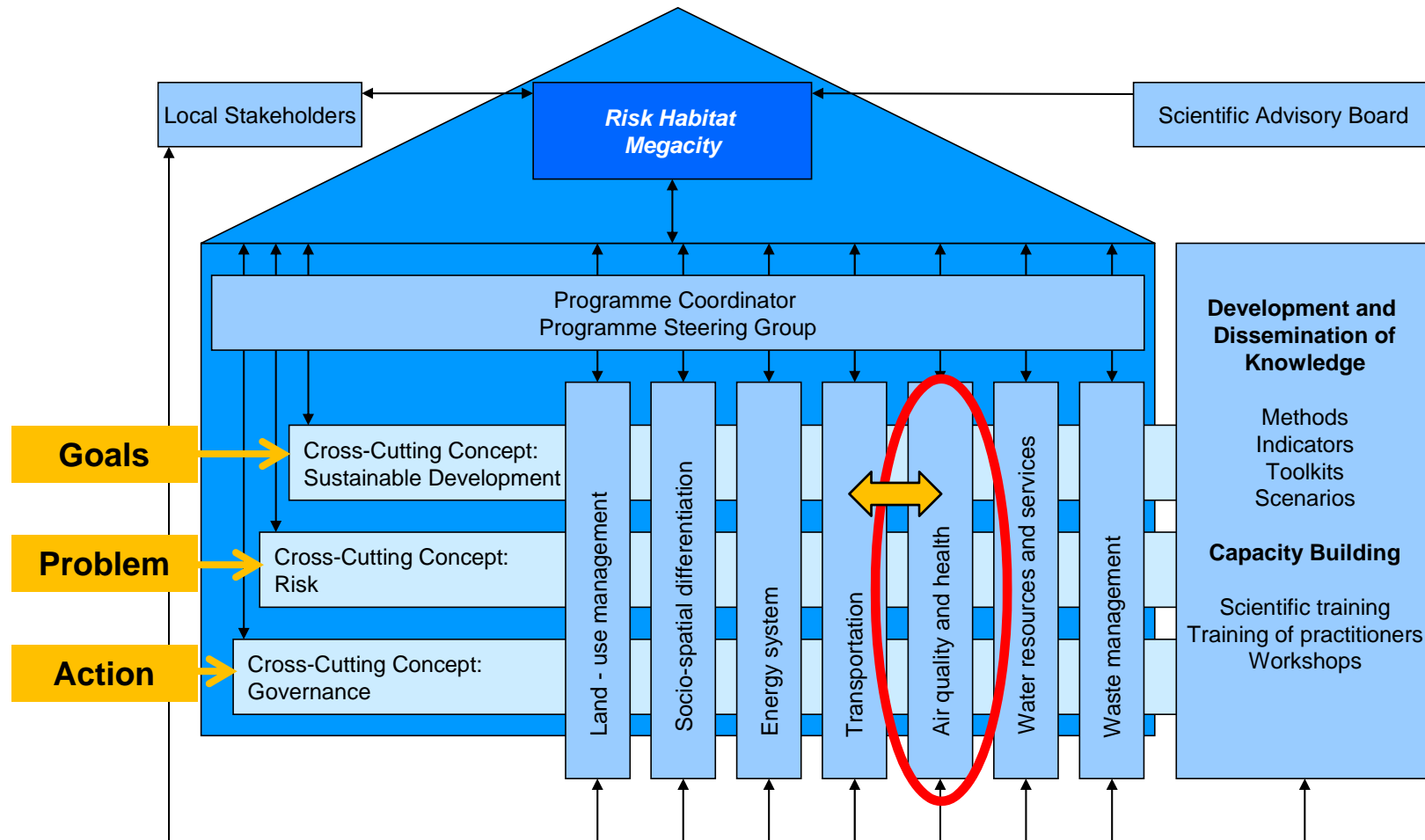
Source: NOAA Storm Prediction Center
<http://serc.carleton.edu/details/images/6228.html>

Global Change

- 'hotspots' for human-environmental interaction
- Responsible for / affected by Global Change
- Extreme actions needed within a increasing insecurity "Governance"

Risk Habitat Megacity

¿sostenibilidad en riesgo?



Scenarios

Background

- Scenario approach have been discussed with civil society stakeholders and political decision-makers of the regional government and national ministries
- Essential precondition for producing relevant and broadly acceptable project results
- Possible inputs for current planning and decision-making processes in the Santiago Metropolitan Region
- Likewise a necessary precondition for considering longer-term perspectives which are essential in the sustainable development context
- Approach represents an important distinctive feature compared to other projects on Megacity issues

Framework Scenarios

Scenarios based on storylines of societal driving factors (→ until 2030)

- Economic development
- Institutional frameworks
- Demographics
- Technical development
- Societal value system

Business-as-usual (BAU)

Continuation of liberalisation and privatisation trends, persistence of strong market forces and weak public regulation activities, continuation of existing social protection measures and subsidy schemes for the poorest

Collective Responsibility (CR)

Characterised by social and environmental justice as principal goals of public regulation, strong regulation of market activities and large public investments, together with the embedding of technologies in society and decoupling of socioeconomic development from resource use

Market Individualism (MI)

Increasing individual freedom and freedom of action, markets as the dominant vehicle for all societal transactions, together with resources and services generation and distribution strongly subject to supply and demand principles.

But also basic socioeconomic variables are estimated:

GDP growth rate, population, household income, persons per household, share of economic branches

Contextualization of Scenarios

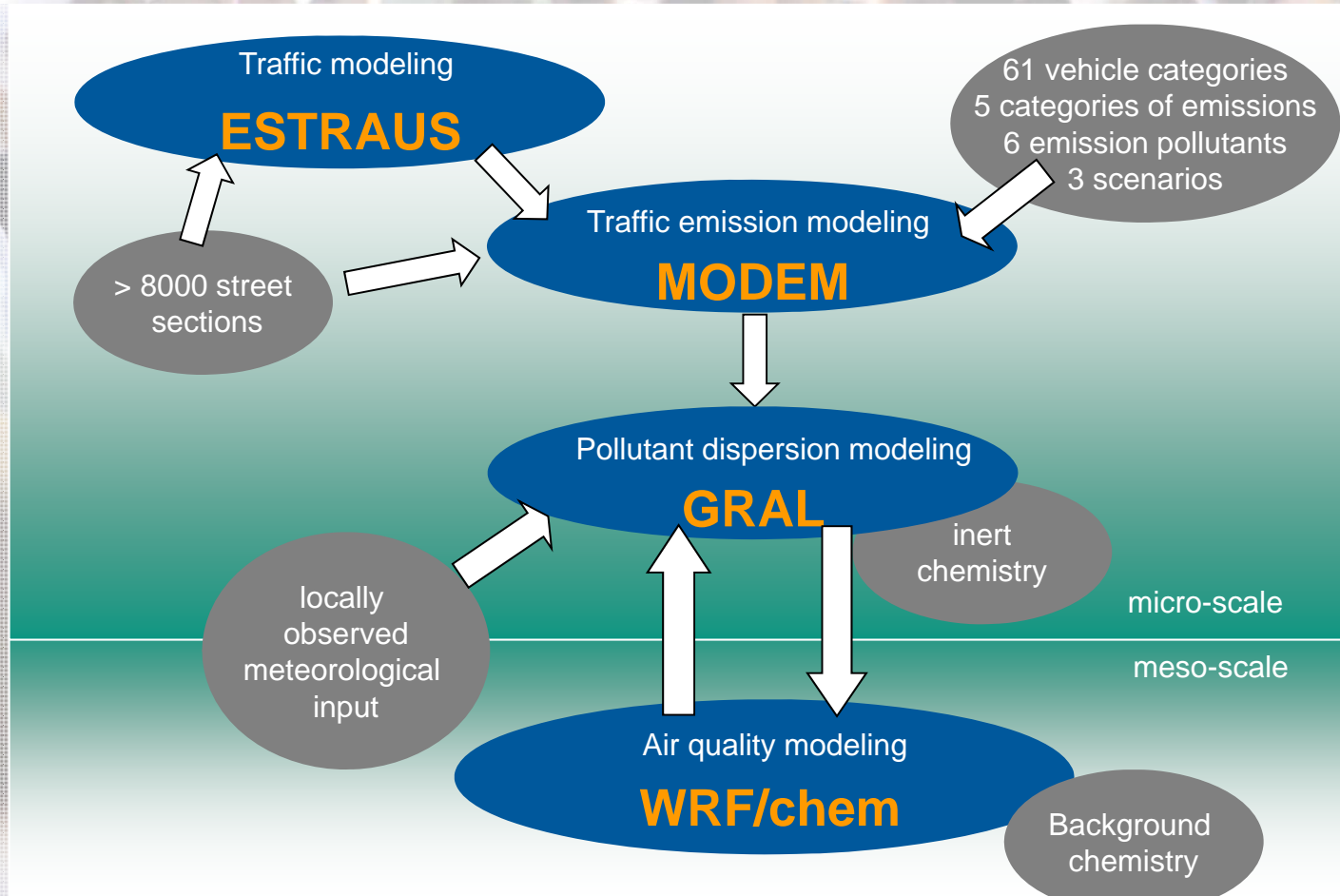
Translation into Transportation / Air Quality & Health

	2010	2030		
		BAU	MI	CR
Modal Split: Population (Mill.)	6.0	7.3	7.5	6.7
Car trips	36.6 %	38.5 %	48.1 %	41.6 %
Bus & Metro trips	49.0 %	45.9 %	35.7 %	43.1 %
Bicycle trips	---	7.0 %	7.0 %	10.0 %
Increase of highways	---	30 %	130 %	0 %
Additional metro lines	---	Line 6	Line 6	Line 6, 3
Transport tariffs	400 CHP	600 CHP	1000 CHP	400 CHP
Emission Standards	EURO3	EURO5: 2017	EURO5: 2018	EURO5: 2015
		EURO6: 2020	EURO6: 2020	EURO6: 2018
		10 % e-propulsion	15 % e-propulsion	15 % e-propulsion

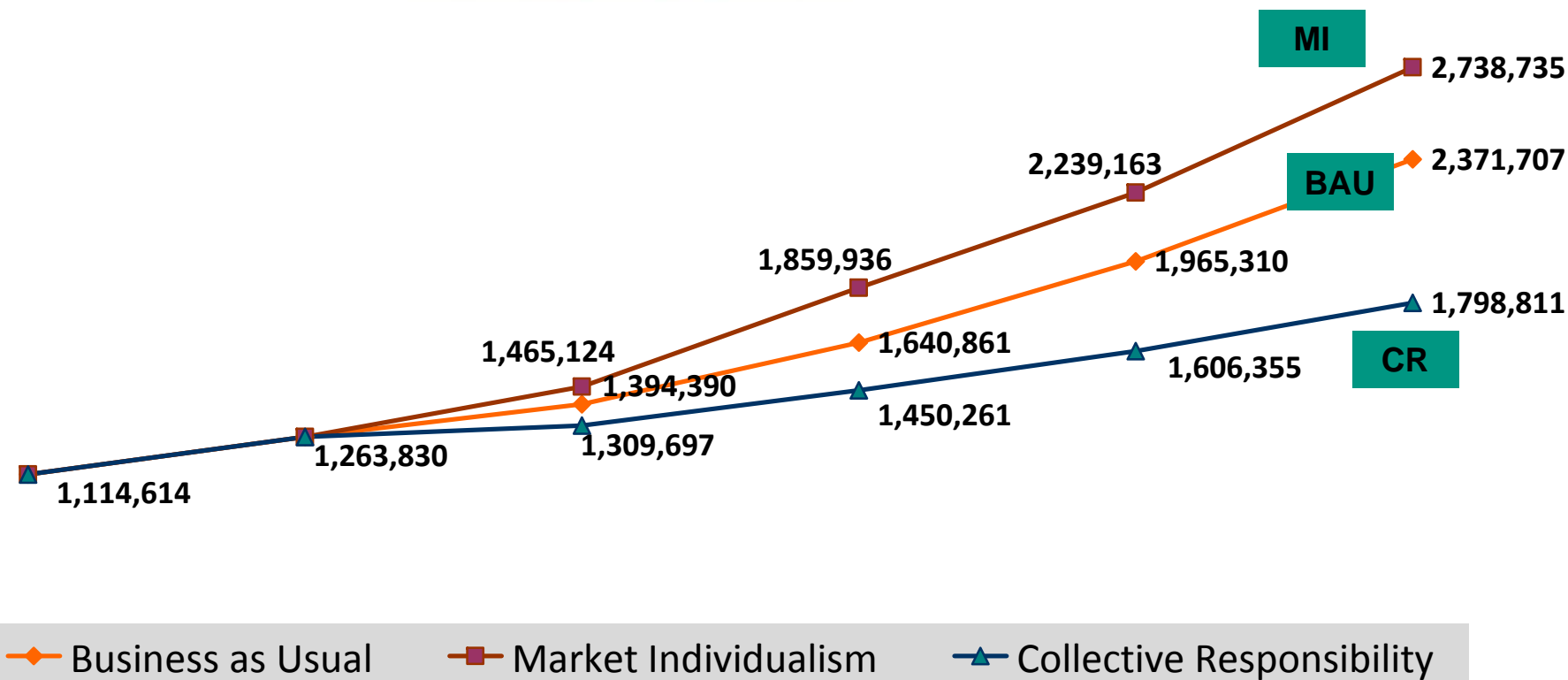


Results

Modeling Chain



Traffic



2007

2010

2015

2020

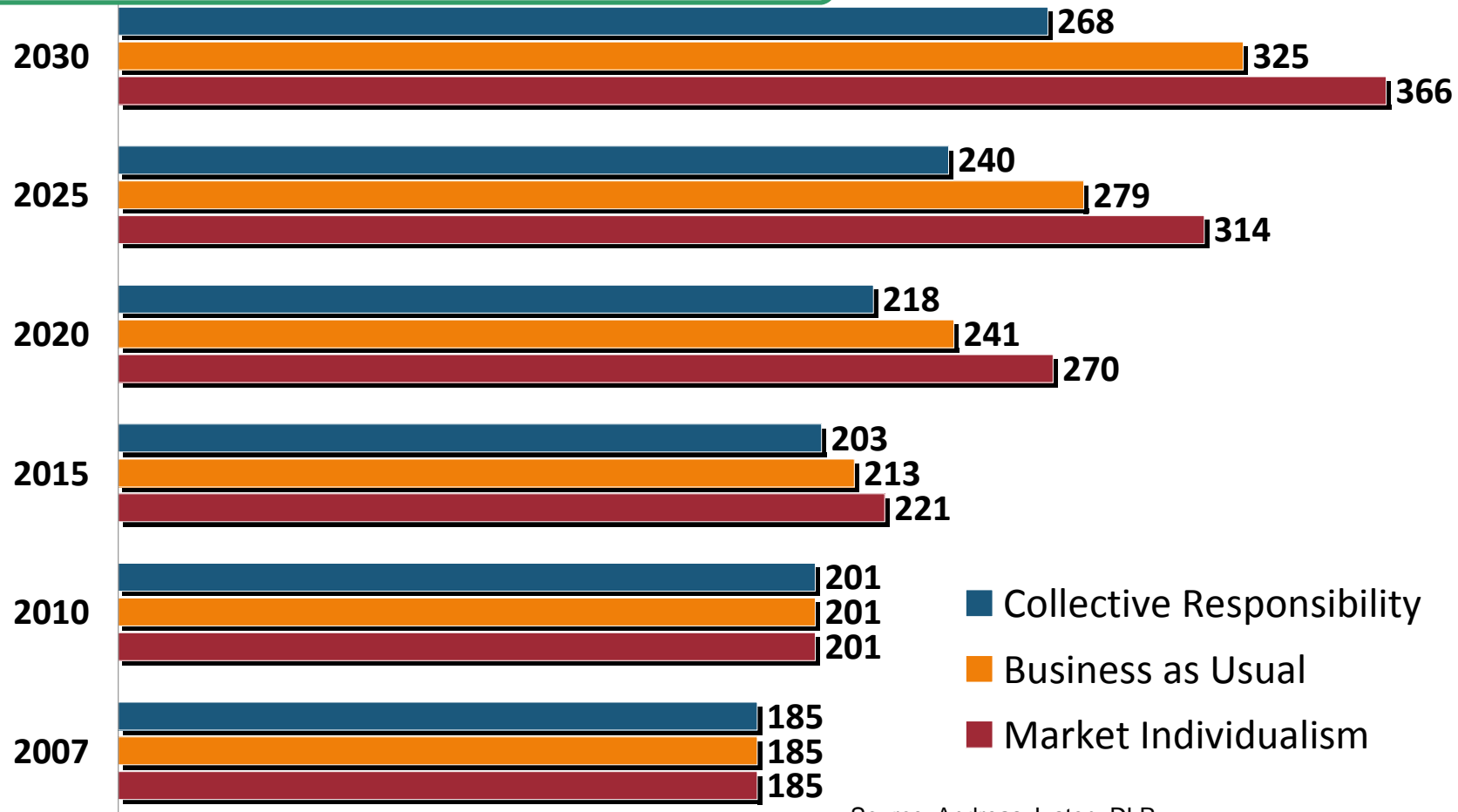
2025

2030

Source: Andreas Justen, DLR

Motorization

Number of cars per 1.000 inhabitants

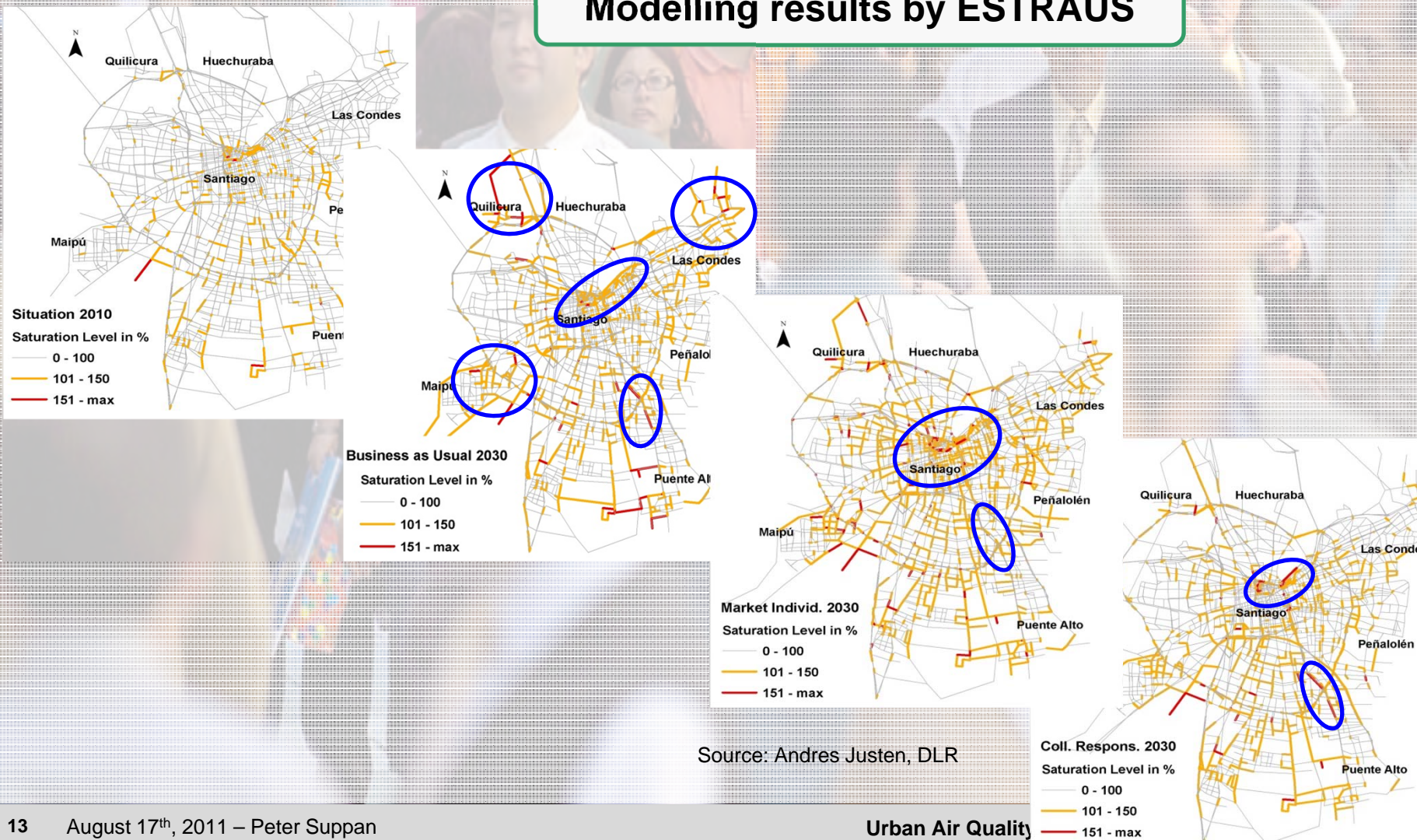


Source: Andreas Justen, DLR

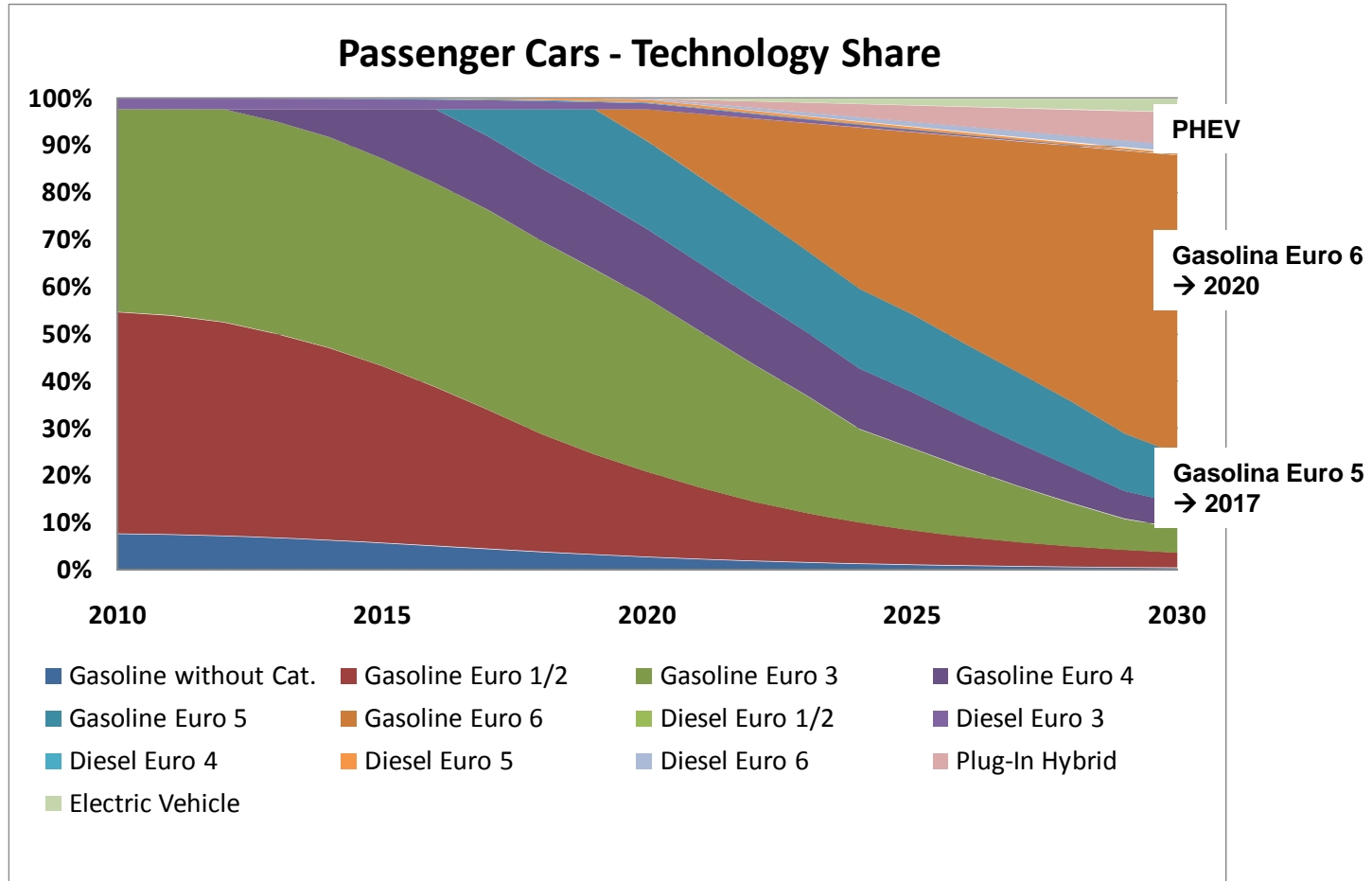
EU-27: 464 / USA: 783 / Japan: 539 / China: 29 / Russia: 188 (all 2007)

Congestions

Modelling results by ESTRAS



Development of Technology Share

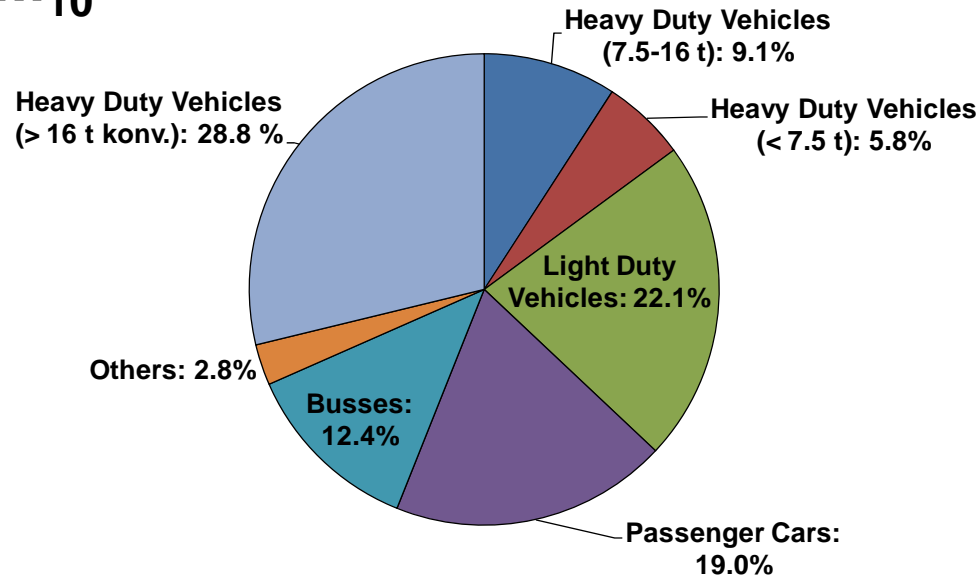


Passenger cars technology share in Santiago de Chile based on the **Business As Usual** scenario

Martin Nogalski (IMK-IFU) - Master-Thesis

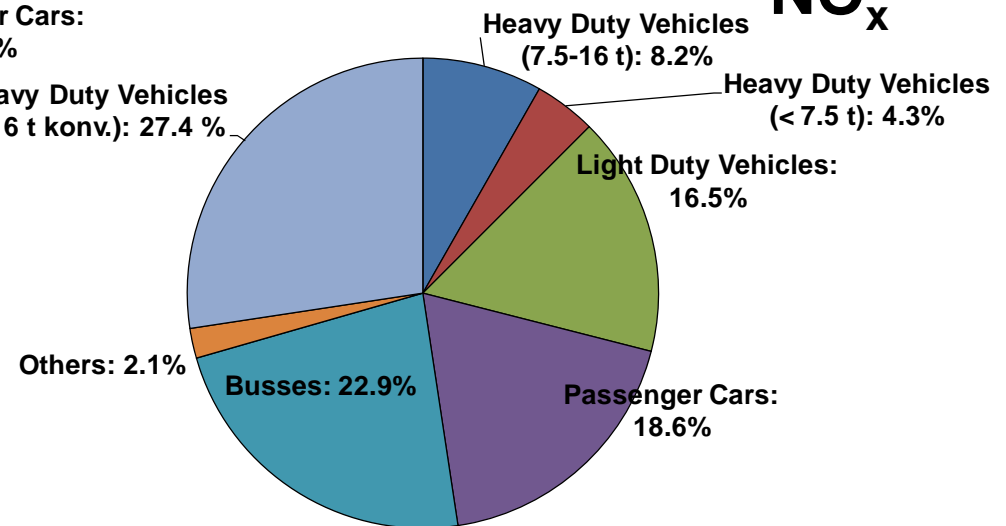
Traffic Emissions

PM₁₀

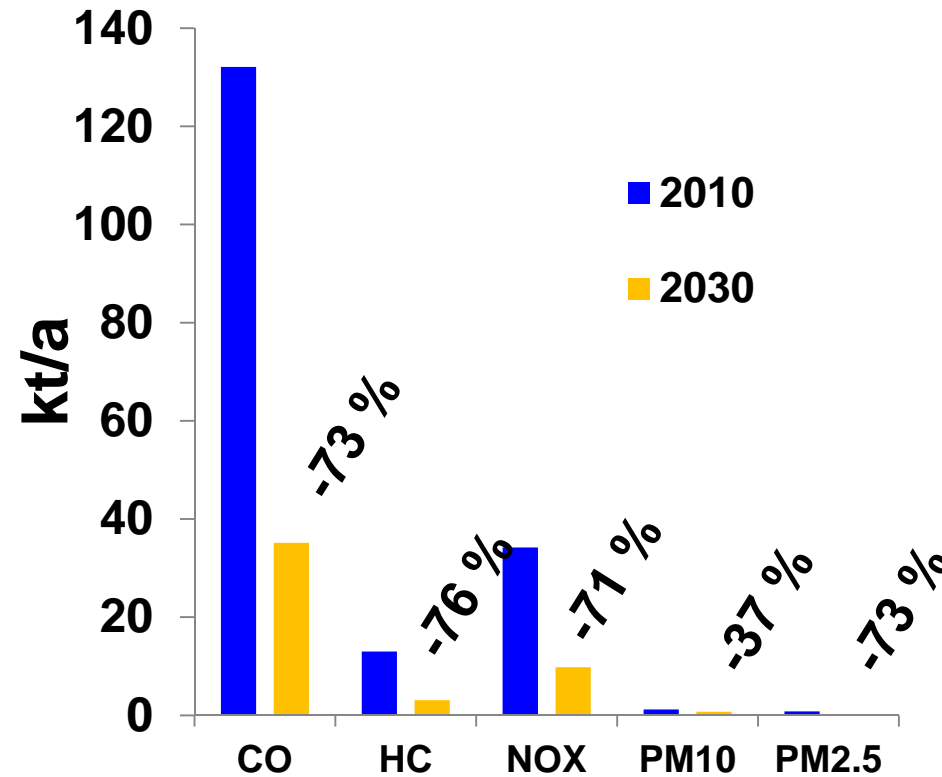


Traffic emission distribution for PM₁₀ and NO_x in the Greater Region of Santiago de Chile in 2010

NO_x



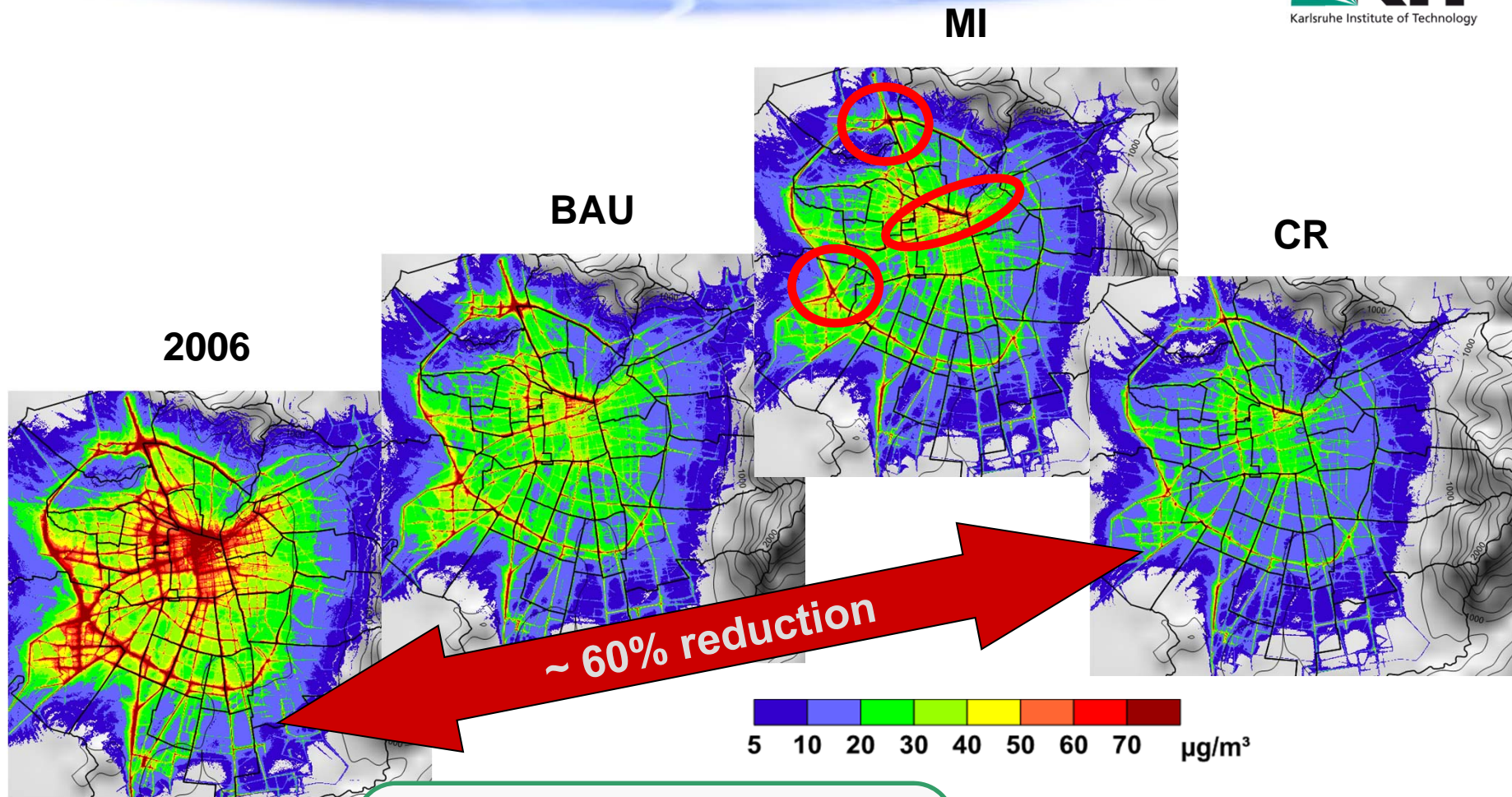
Traffic Emission Reduction



Emission reduction based on passenger cars technology share in Santiago de Chile →
Business As Usual scenario

Martin Nogalski (IMK-IFU) -
Master-Thesis

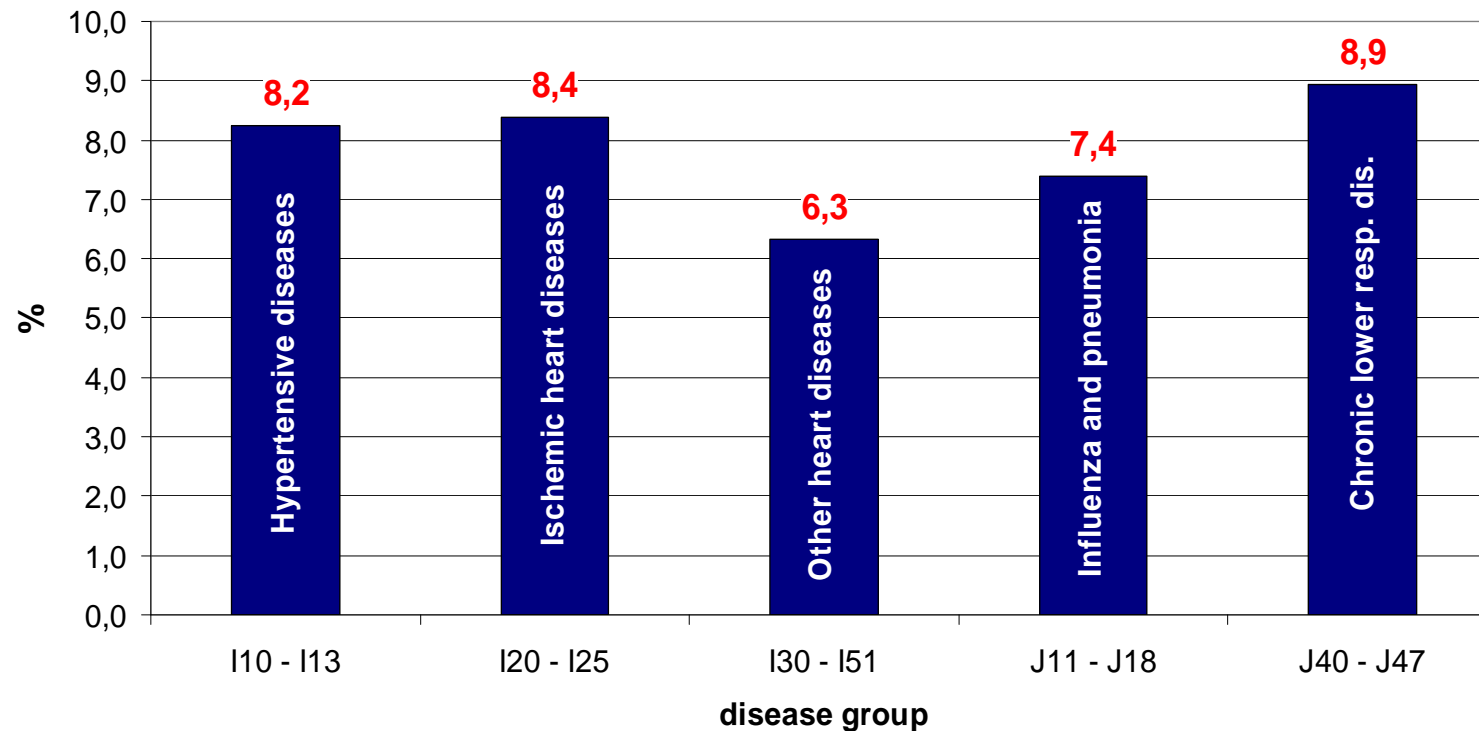
Air Pollution Distribution



Annual mean NOx distribution
for 2006 (only traffic emissions)
in the Greater Region of
Santiago de Chile

BAU - business as usual
MI - market individualism
CR - collective responsibility

Adverse Health Effects: Santiago



Mortality Risks
per 10 µg/m³ PM₁₀

Source: Ulrich Franck, UFZ

Conclusions

- Scenario development needs multidisciplinary views and approaches
- Assessment of traffic emissions is a straight forward process
- Coupled micro-mesoscale modeling is needed to describe the air pollution levels for further analysis

„It is now understood that the battle against climate change will likely be won - or lost - in cities. However, research thus far has concentrated mostly at the sector (e.g. agriculture, water, energy) and national levels. Targeted research at the city level is needed to enable policy makers to understand the magnitude of the impacts and the alternatives to improve resilience of the cities (World Bank 2008)

Thank you very much for your attention

