Session 4
Green Environment and Sustainable Development for Emerging Economies

GHG, Transportation and Rational Behavior

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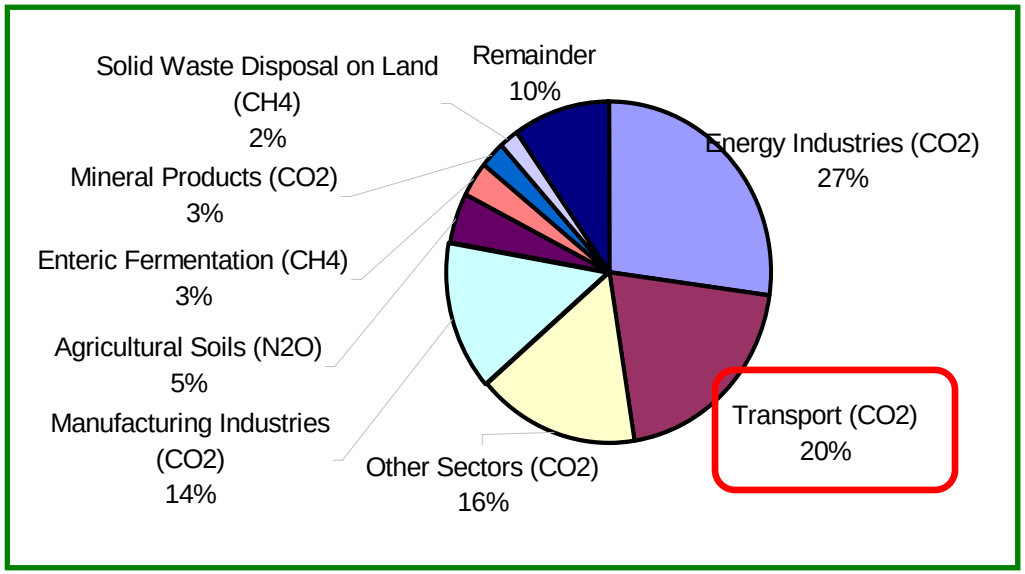
Security of supply and climate change are high on the global energy agenda. And the transport sector is no exception as virtually every means of transport by land, air and sea uses fossil fuels and thus emits CO_2. Energy consumption for transport purposes represents 20% of the world's total energy consumption.

ScienceDaily

(July 27, 2009)

Sources of CO_2 Emissions

Sources of CO_2 contributors in 2007 (kilo tonnes) World



Road transport contributes close to 80 per cent to climate change. Air transport contributes 13 per cent, sea transport 7 per cent and rail contributes just half a per cent of total emissions from the transport sector.

http://www.unep.org/climateneutral/Topics/Transport/tabid/154/Default.aspx

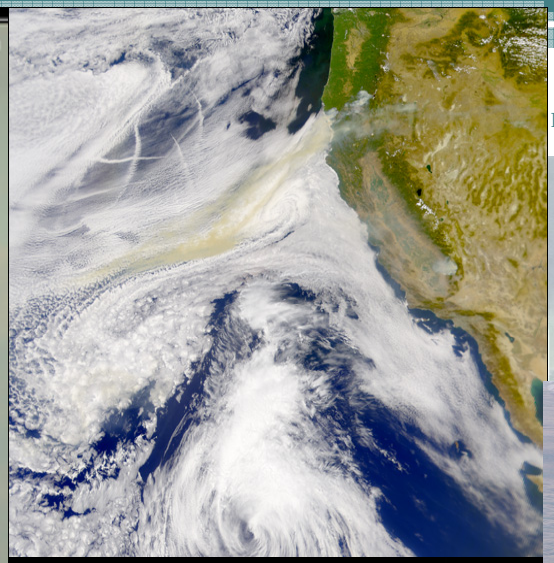
Sources of CO_2 contributors in 2005 (kilo tonnes) Singapore

	Electricity Generation	Industry	Transport	Buildings	Consumers/ Household	Others
Primary Consumption (combust fuel)	19,315 (48%)	13,465 (33%)	7,056 (17%)	325 (1%)	216 (1%)	–
Secondary Consumption (use electricity)	–	8,328 (21%)	930 (2%)	5,910 (15%)	3,415 (8%)	732 (2%)
Overall	–	21,793 (54%)	7,986 (19%)	6,235 (16%)	3,631 (9%)	732 (2%)
Total CO_2 = 40,377 kilo tonnes						

Source: National Environment Agency

World Aircraft Movements


hamperium.com
NO SMOKING

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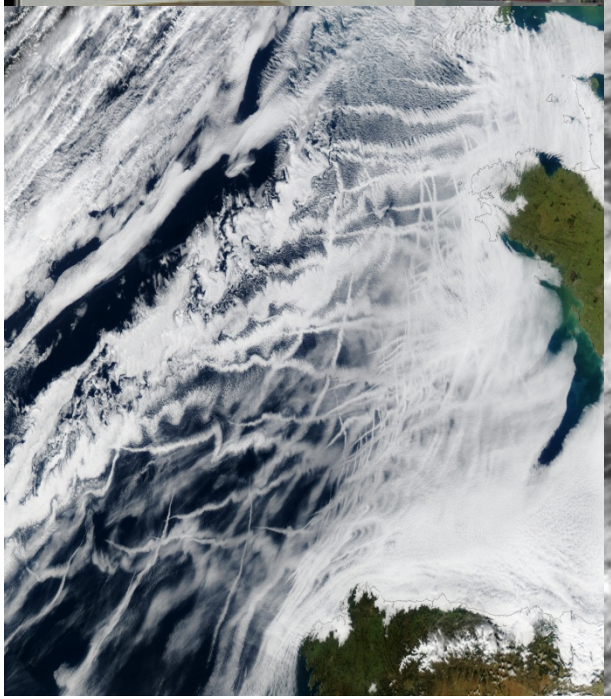
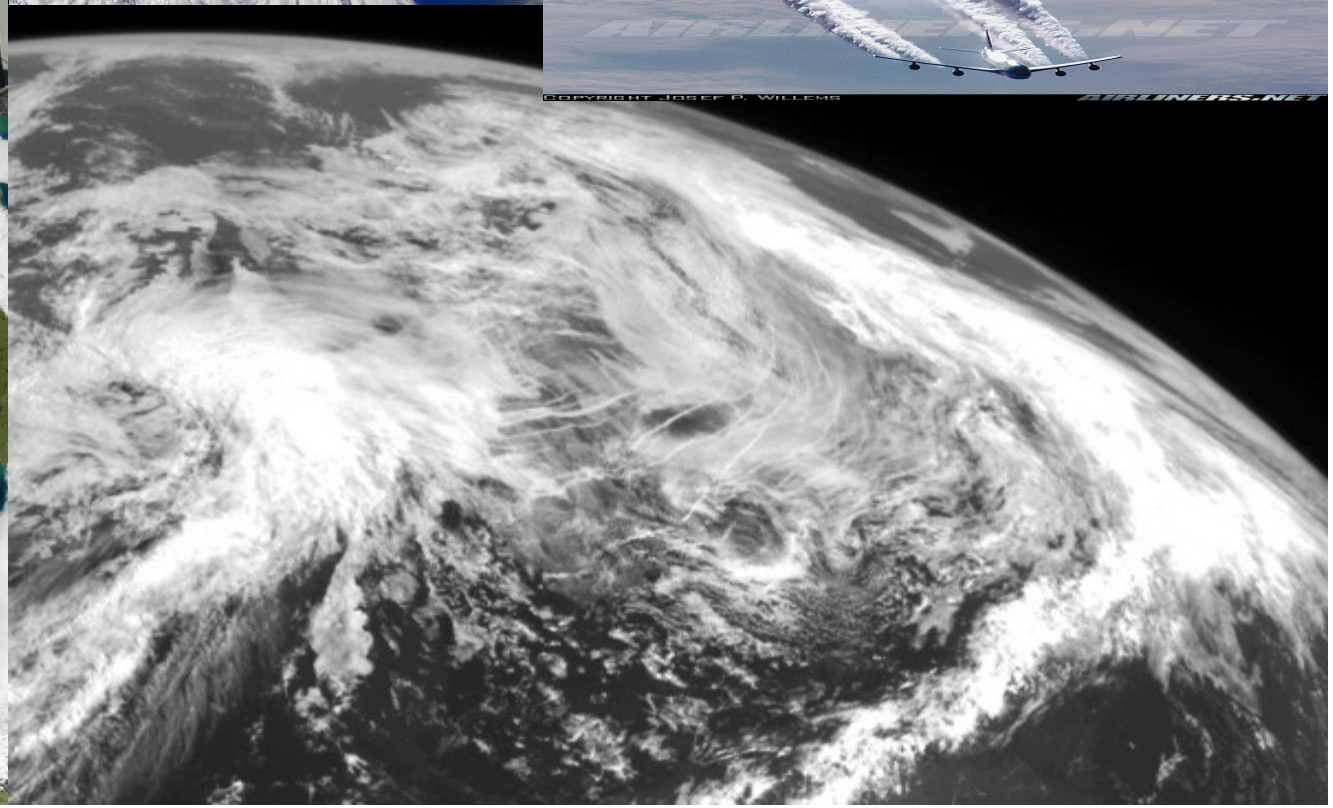
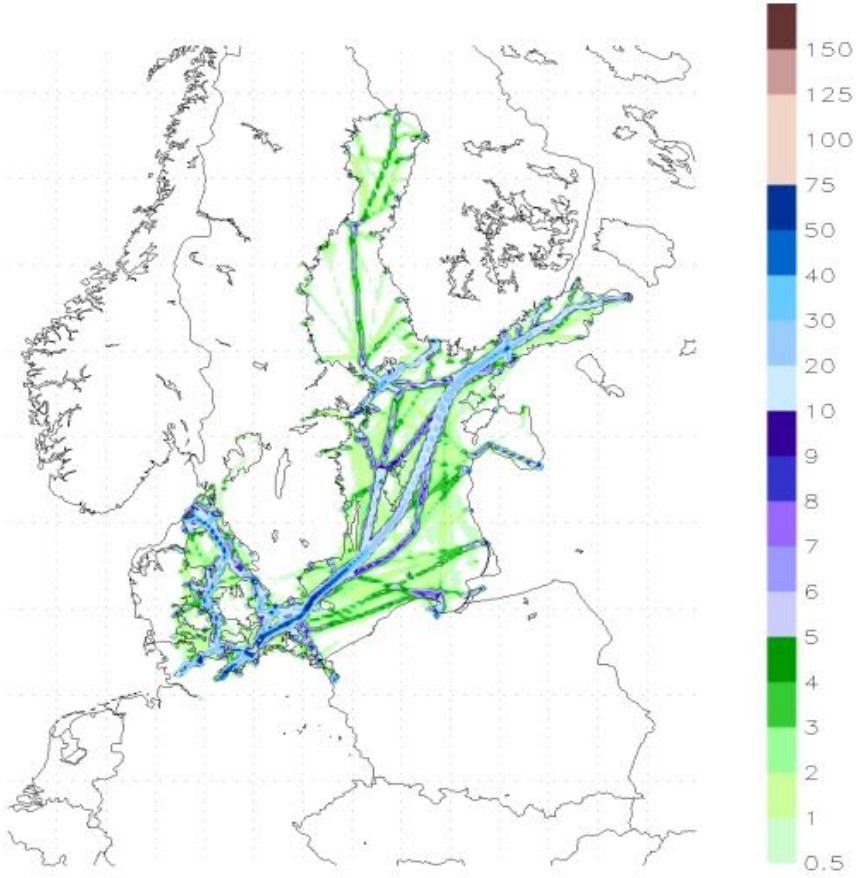
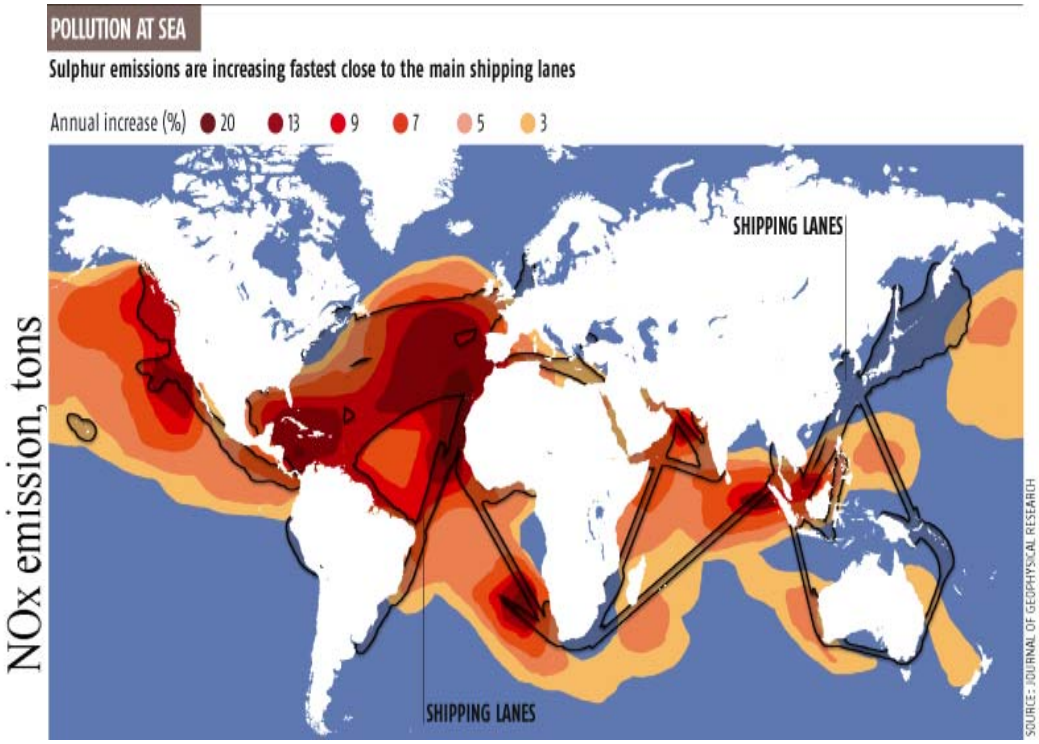




Total NOx emission, March 2007



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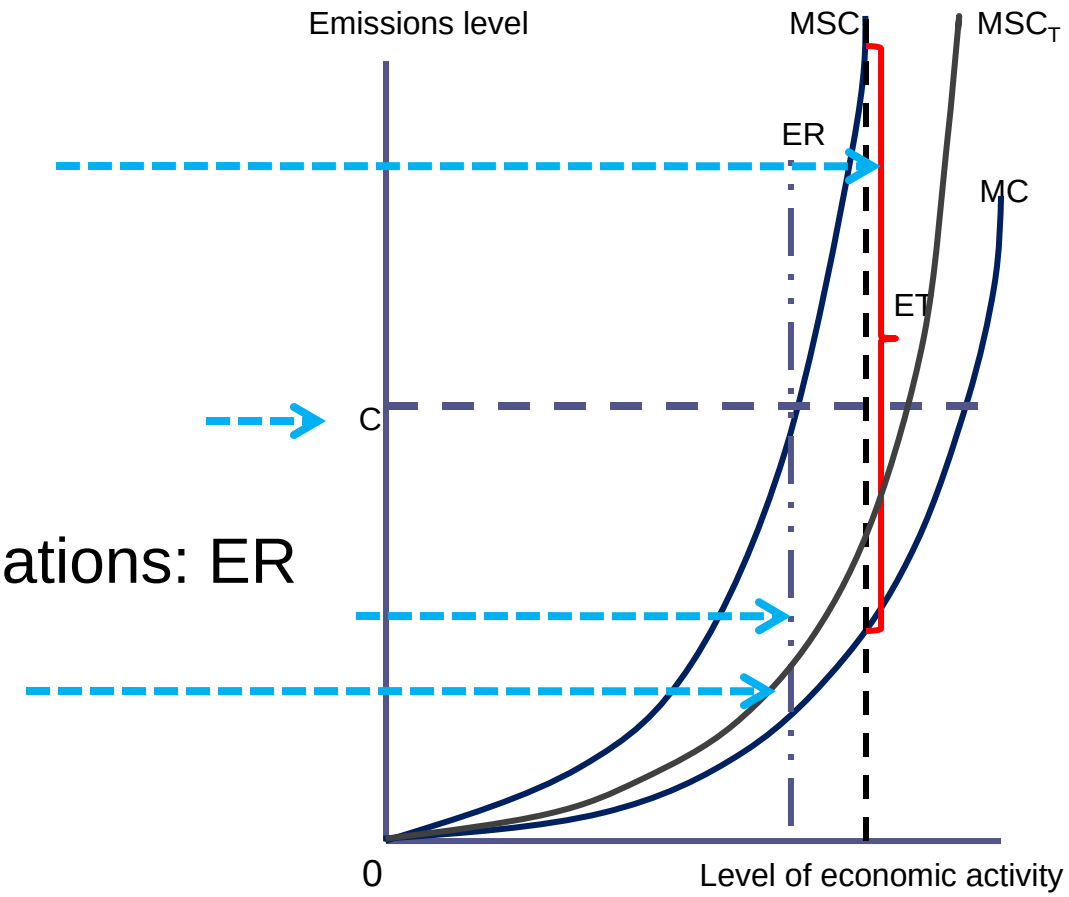
Budget cars rule!

USD 3,900

0.8 l

Economic solutions

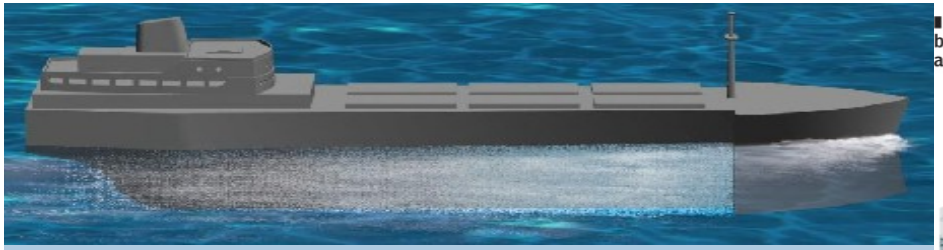
- Emission taxes: ET
- Cap AND Trade: C
- Cap on trade: C
- Environmental regulations: ER
- Technology: MSC_T

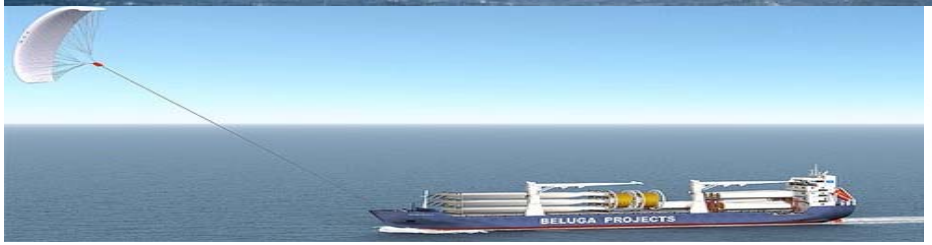


Holistic approach

- Technology: Information and Vehicle
- Psychology
- Marketing
- Economic instruments
- Traffic Engineering & Management
- Alternative efficient and 'green modes'

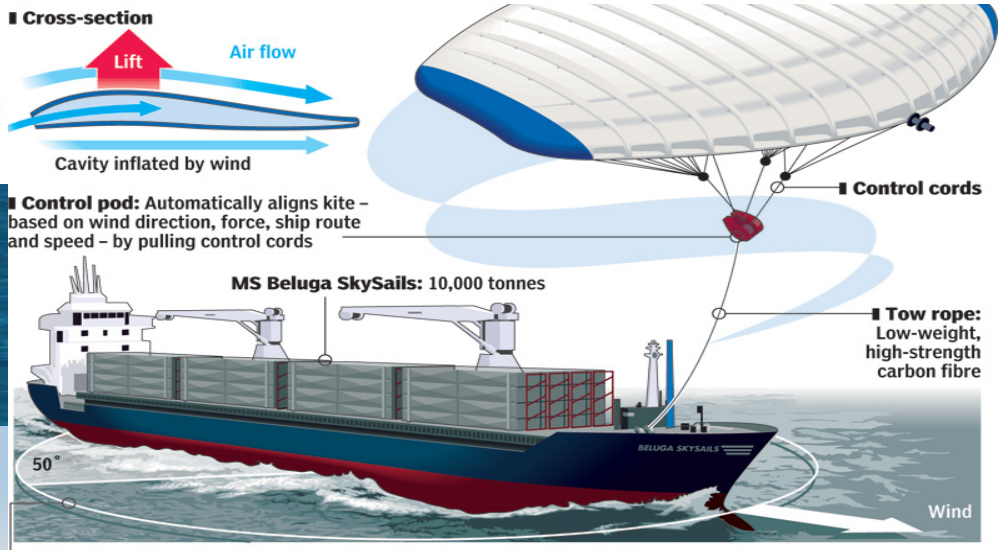
Green Technology





787 Dreamliner and A380 generate about 20% less carbon dioxide than their predecessors.

An Airbus A380 being loaded with synthetic GTL aviation fuel

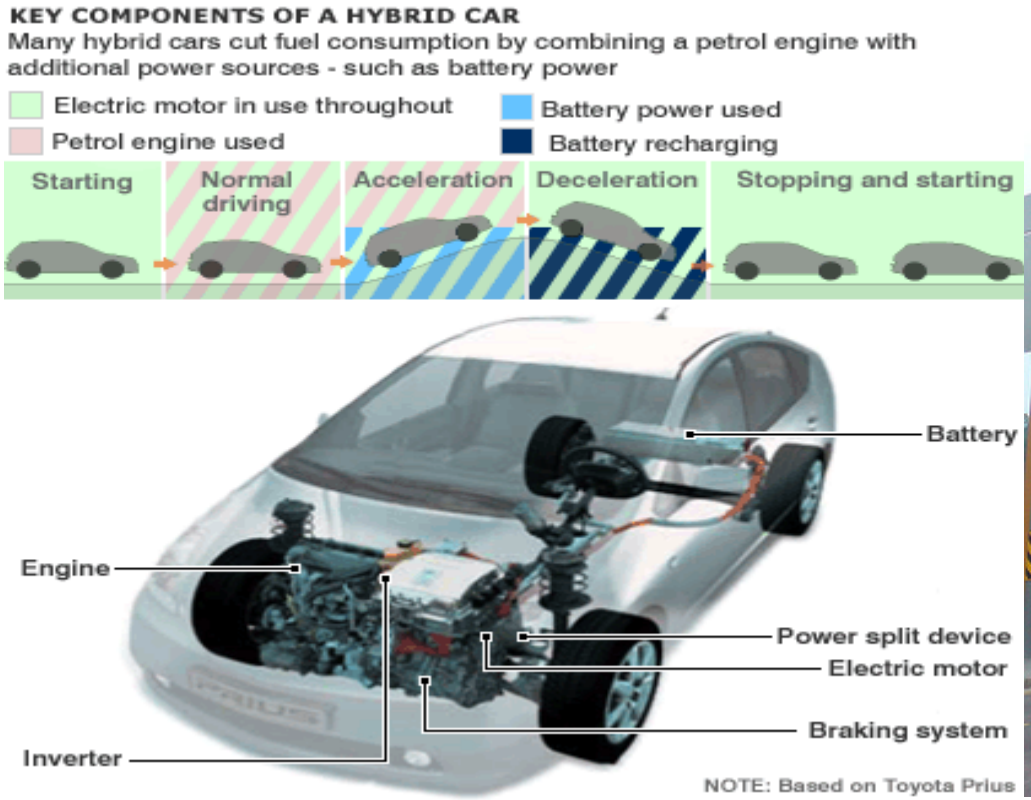


SOURCES: SKYSAILS, BELUGA GROUP, WINTECC PROJECT

GRAPHIC NEWS / NATIONAL POST

Latest Updated Quota Premium (March 2009 2nd Open Bidding)

Price is in Singapore Dollar (SGD)



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Category	Current Quota Premium	Previous Quota Premium	▲/▼	Difference
A (1600cc and below, taxi)	S$5,116	S$4,890	▲	S$226
B (1601cc and above)	S$5,001	S$5,101	▼	S$100
C (Goods Vehicle and Bus)	S$5,600	S$5,300	▲	S$300
D (Motorcycles)	S$912	S$958	▼	S$46
E (Open)	S$5,982	S$5,700	▼	S$282

Quota Premium (March 2009 2nd Open Bidding)

Key mitigation technologies and practices by sector IPCC Fourth Assessment Report, 2007

Sector	Key mitigation technologies and practices currently commercially available	Key mitigation technologies and practices projected to be commercialized before 2030
Energy Supply	Improved supply and distribution efficiency; fuel switching from coal to gas; nuclear power; renewable heat and power (hydropower, solar, wind, geothermal and bioenergy); combined heat and power; early applications of CCS (e.g. storage of removed CO2 from natural gas)	Carbon Capture and Storage (CCS) for gas, biomass and coal-fired electricity generating facilities; advanced nuclear power; advanced renewable energy, including tidal and waves energy, concentrating solar, and solar PV.
Transport	More fuel efficient vehicles; hybrid vehicles; cleaner diesel vehicles; biofuels; modal shifts from road transport to rail and public transport systems; non-motorized transport (cycling, walking); land-use and transport planning	Second generation biofuels; higher efficiency aircraft; advanced electric and hybrid vehicles with more powerful and reliable batteries
Buildings	Efficient lighting and day light; more efficient electrical appliances and heating and cooling devices; improved cook stoves, improved insulation; passive and active solar design for heating and cooling; alternative refrigeration fluids, recovery and recycle of fluorinated gases	Integrated design of commercial buildings including technologies, such as intelligent meters that provide feedback and control; solar PV integrated in buildings
Industry	More efficient end-use electrical equipment; heat and power recovery; material recycling and substitution; control of non-CO2 gas emissions; and a wide array of process-specific technologies	Advanced energy efficiency; CCS for cement, ammonia, and iron manufacture; inert electrodes for aluminum manufacture

What lies at the heart of making green choice?

- The dilemma is, not that opposition to reducing Green House Gas emissions is too high but that support is too low;
- Decisions are more often governed by emotions than by analysis; more by its meaning than by its monetary value.

Decarbonise road transport!

- Ultra low carbon vehicles increasing the efficiency of existing engines and systems
- Market reality: Rechargeable electric or hybrid electric vehicle.
- Traffic congestion: Speedier maintenance, better information systems, and promoting the use of in-car technology i.e. intelligent speed adaptation.
- "If everyone switched to diesel vehicles, CO2 emissions would drop by 30 per cent overnight," Andrew Didlick, Peugeot, Director Public Affairs, UK.
- Longer- term: Network expansion, which could cut carbon emissions by improving traffic flow, and also improve urban air quality by moving through traffic onto bypasses.

Human Behavior

- Human beings bear little more than a passing resemblance to the "economic man" of classic economics textbooks. **We're messy creatures, not altogether skilled at maximizing value, or efficiency, or all those other things our self-interest is supposed to drive us to attain**.

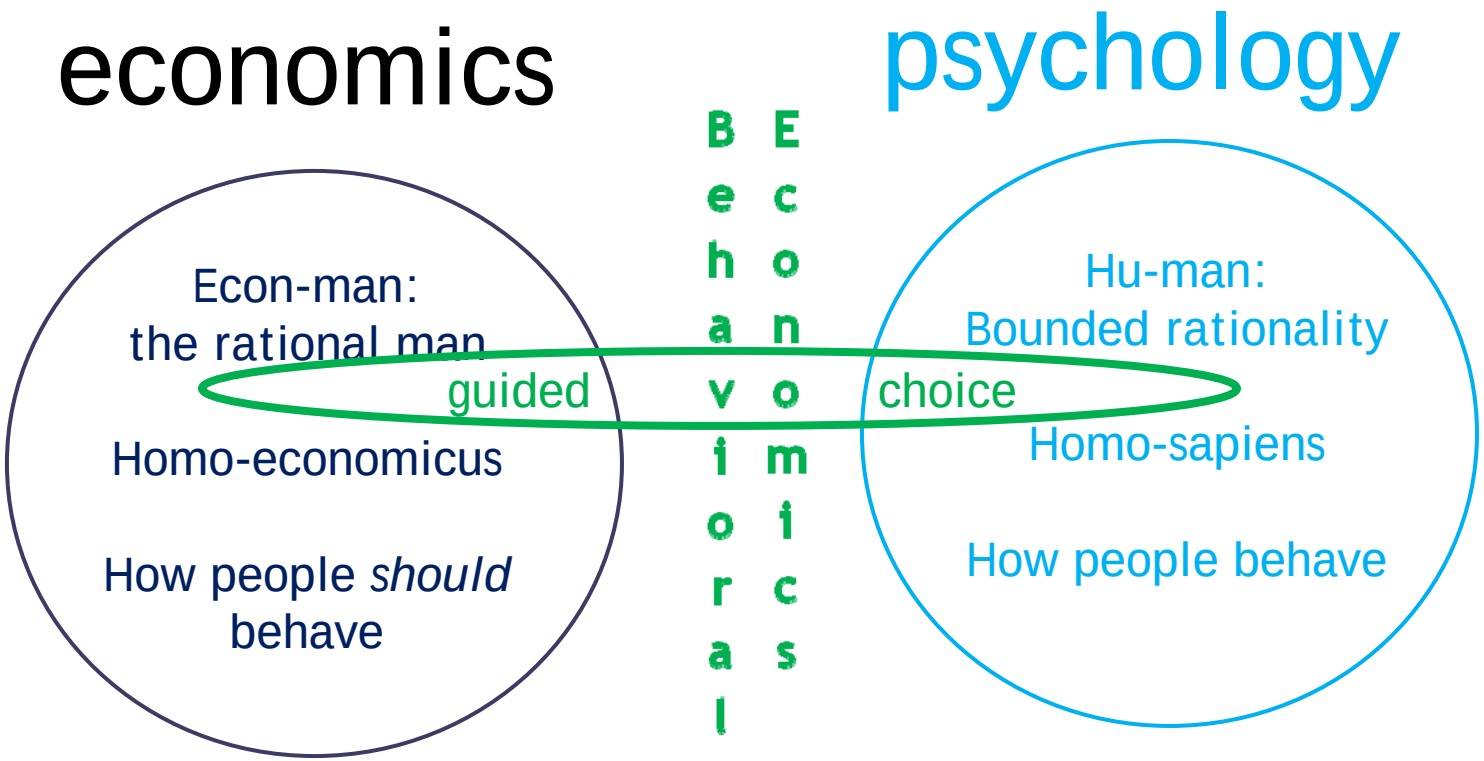
  Cass Sunstein & Richard Thaler, *Nudge*; Dan Ariely, *Predictably Irrational;* George Akerlof & Robert Shiller, *Animal Spirits*

- "**People make bad choices!**"

  Barry Schwartz, The Paradox of Choice

- "**choice architecture**": framing how decision makers can gently scoot people towards better choices
- "**information architecture** or **interaction design**": understand today's information-rich world is confusing, and give focus attention to crafting the environment in which people make choices gives us, "a fighting chance of knowing what we're doing."

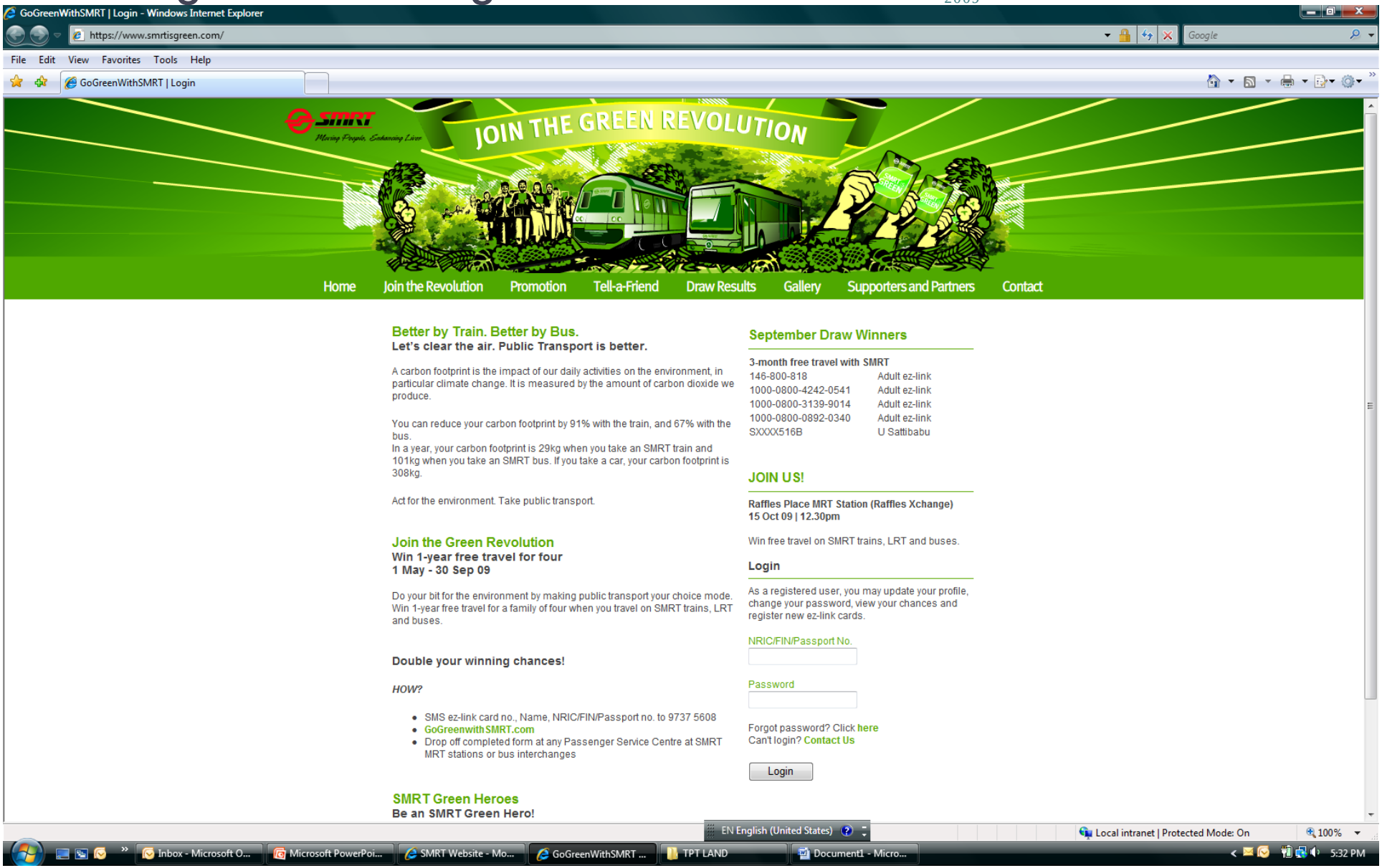
Paradigms in human behavior



Guiding behavior 1

- Designing Advanced Traveller Information Services (ATIS) that benefit individuals and transport systems;
- Recent evidence showed that even when provided with explicit information on their travel choices, travellers turn out to interpret and value this information in a way that systematically violates the assumptions of rational behaviour.
- Travellers are heavily influenced by context, i.e. the manner in which travel information is being presented.
- Salience: It is difficult to the driver to easily imagine the air pollution and climate change caused by carbon emissions.

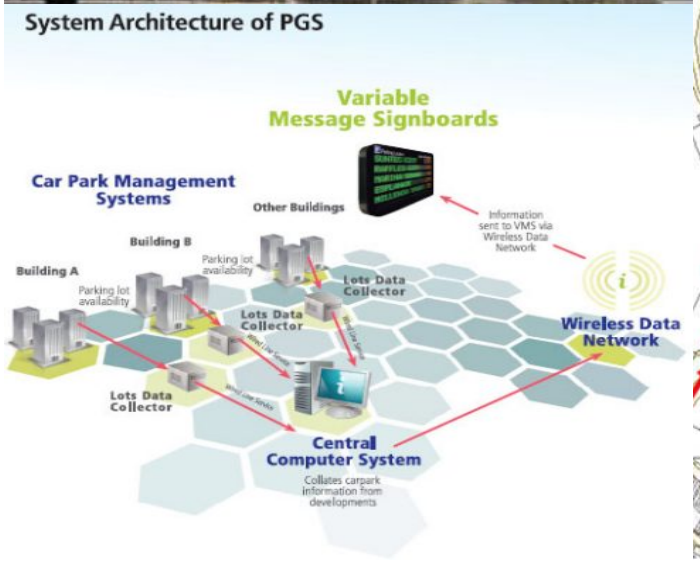
Getting the message across!

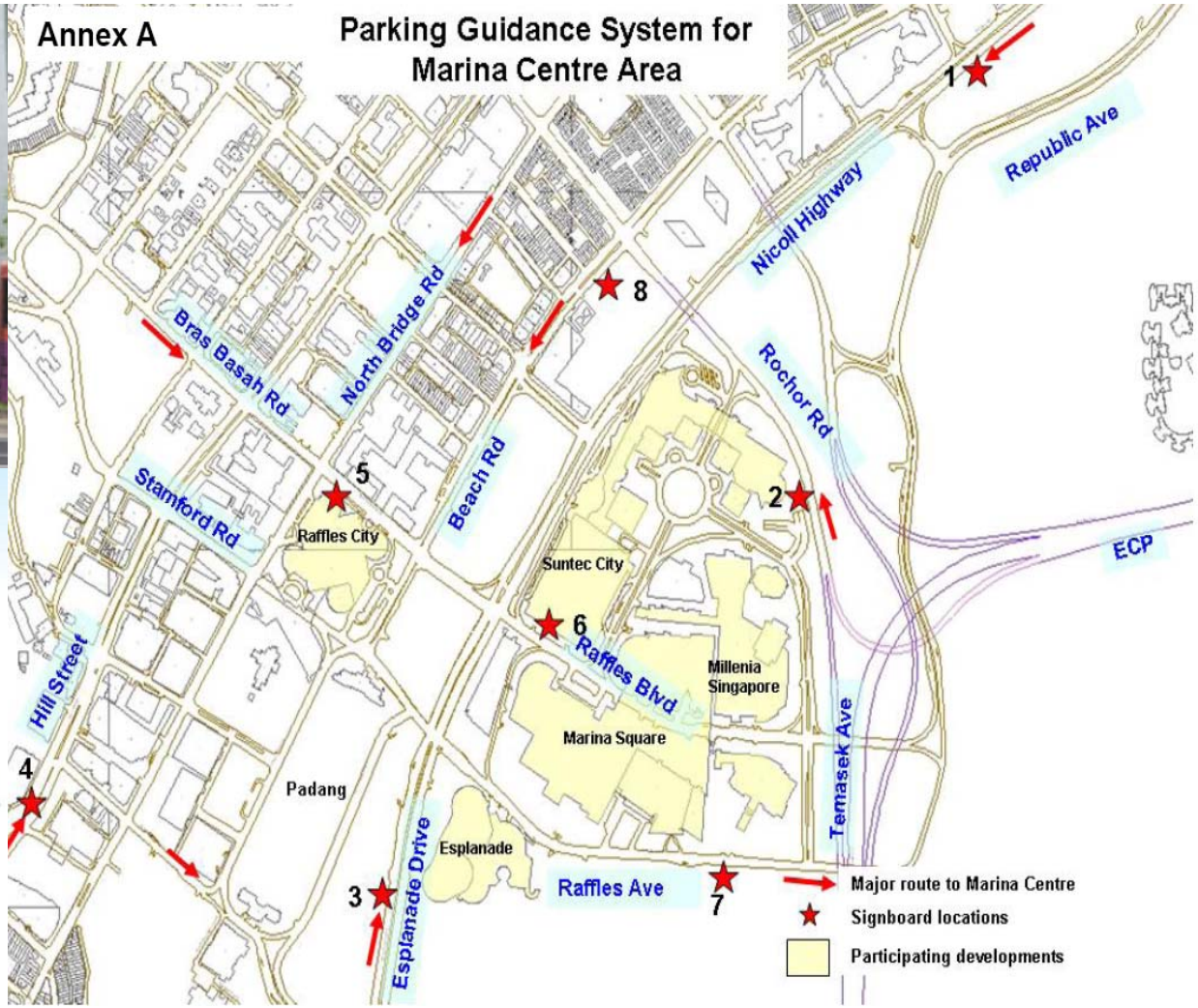


Guiding behavior 2

- In-vehicle data recorders on drivers' behaviour: Visibility and doing the right thing
- Provide drivers with environmental costs, against some targets or against previous performance, could provide them with a psychological incentive to change their behaviour.
- Choice architecture + measures to influence choice

Parking Guiding System

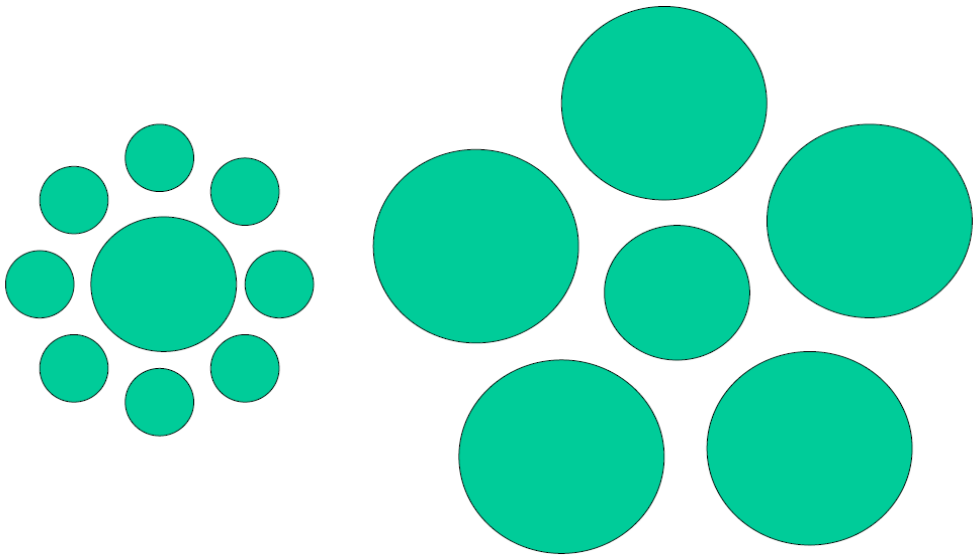




Guiding behavior 3 Road-pricing

- Get prices right through taxes / subsidies;
- Recognize bounded rationality :
- Travelers do not always associate their behaviour with the relevant costs;
- Guided choice helps individuals overcome cognitive biases, highlight the better choices, and increase the size and the speed of behavioural change – without restricting choices or limiting travellers' freedom of choice.

It's the context!



A nudge is any small feature in the environment that attracts our attention and alter our behaviour

Urinal at Schiphol, Amsterdam

Smart Meter & Light synchronization

A traffic light synchronization program in Texas **reduced delays by 24.6 percent and fuel consumption by 14.2 percent**.
A similar program in Austin Texas saved commuters **2.3 million hours of their time and 1.2 million gallons of fuel usage**.

U.S. Department of Transportation Report

Nudging through the design of information
Loss Aversion

Commuting Choices:

By car: 35 minutes

By MRT: 25 minutes

By Car : 35 minutes

By MRT : You SAVE 10 minutes

By MRT : 25 minutes

By Car : You take 10 minutes LONGER

In conclusion

"The challenge we have now is to shape how we navigate that information in meaningful ways. The people who truly figure that out, are going to be the ones to run the world."

Barry Schwartz, Professor of Social Theory and Social Action, Swarthmore College

"Climate change is shaping global markets and global consumer attitudes. There will be winners and losers. Companies who seize the opportunities, who adopt environmental, social and governance policies and who evolve, innovate and respond to these challenges are likely to be the pioneers and industry leaders of the 21st century."

Achim Steiner, UNEP Executive Director