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EU Transport GHG: Routes to 2050?

Policy framework for reducing GHG emissions by decarbonising transport fuels and improving vehicle efficiency

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Partners

www.eutransportghg2050.eu



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- Scope
- General considerations on policy instruments
- Transition to sustainable vehicles and energy carriers
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Scope of this presentation

levers

options

volume

economy

organisation of society

spatial planning

structure

mobility system

energy system

efficiency

propulsion system

vehicle design

spatial planning

logistics systems

behaviour

infrastructure

modal shift

new modes

energy infrastructure

alternative propulsion systems

efficient engines

aerodynamics/mass

vehicle size

ITS

traffic management

electricity

hydrogen

biofuels

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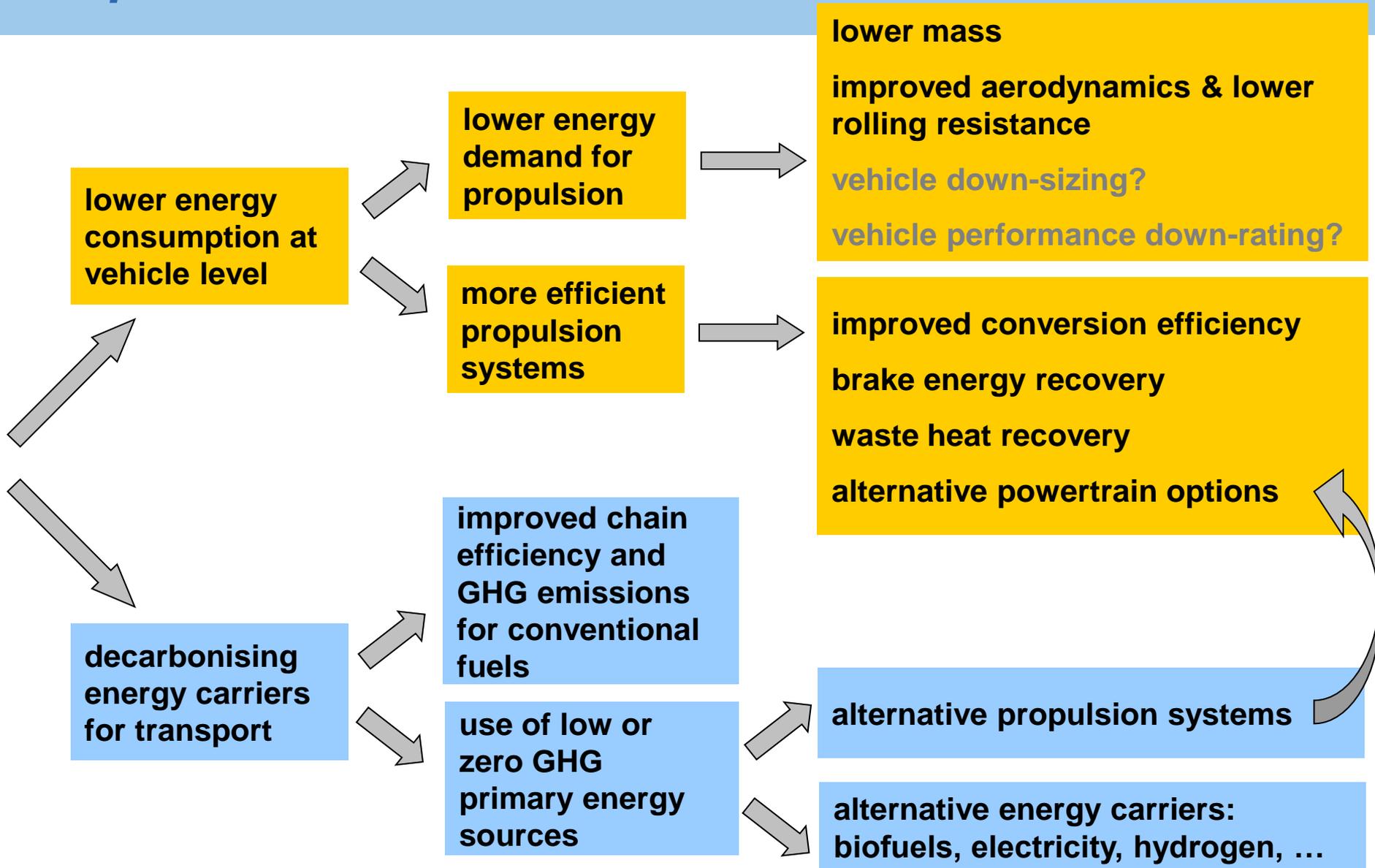
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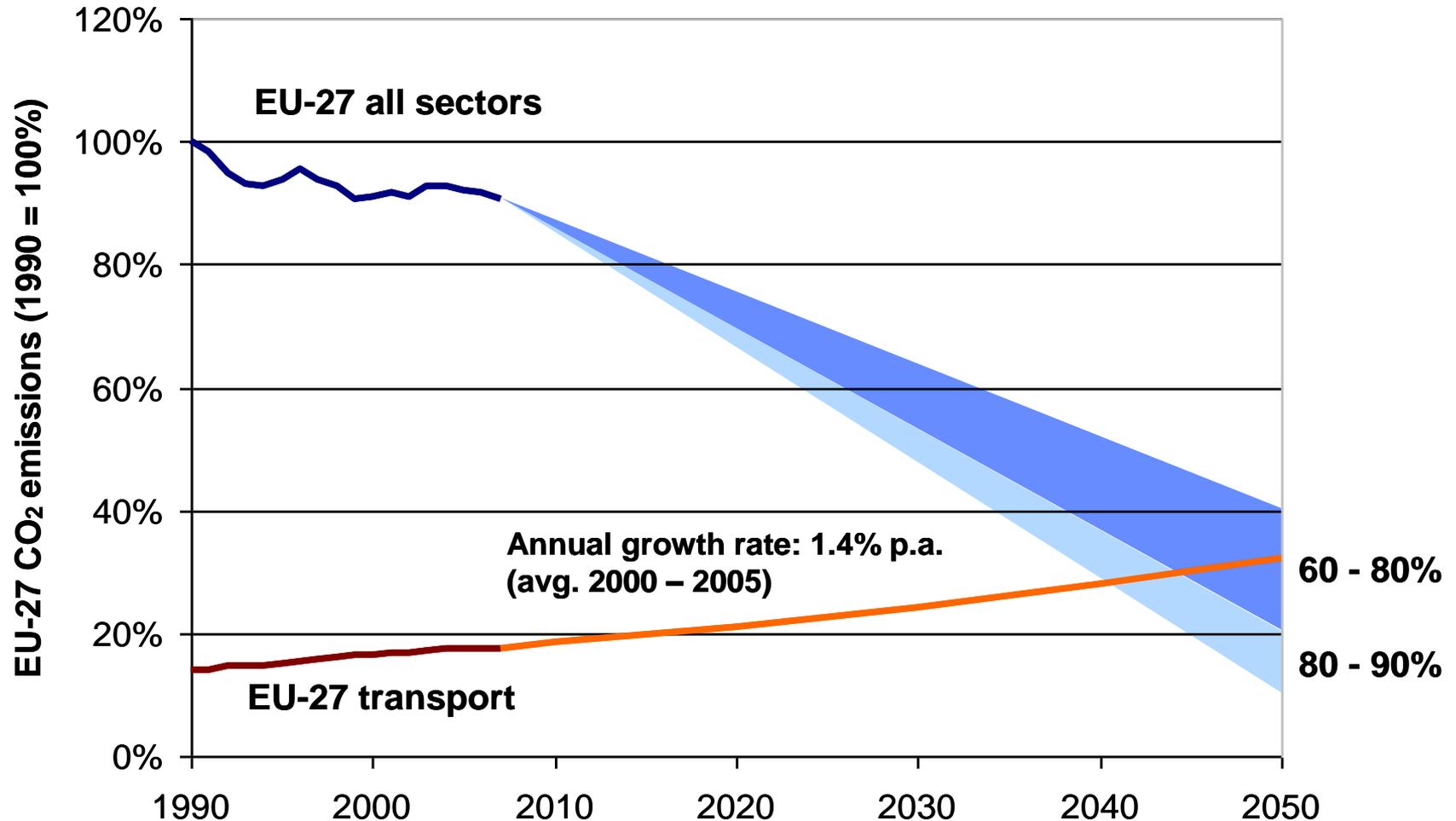
Transition to sustainable transport

Options at the level of vehicles and fuels

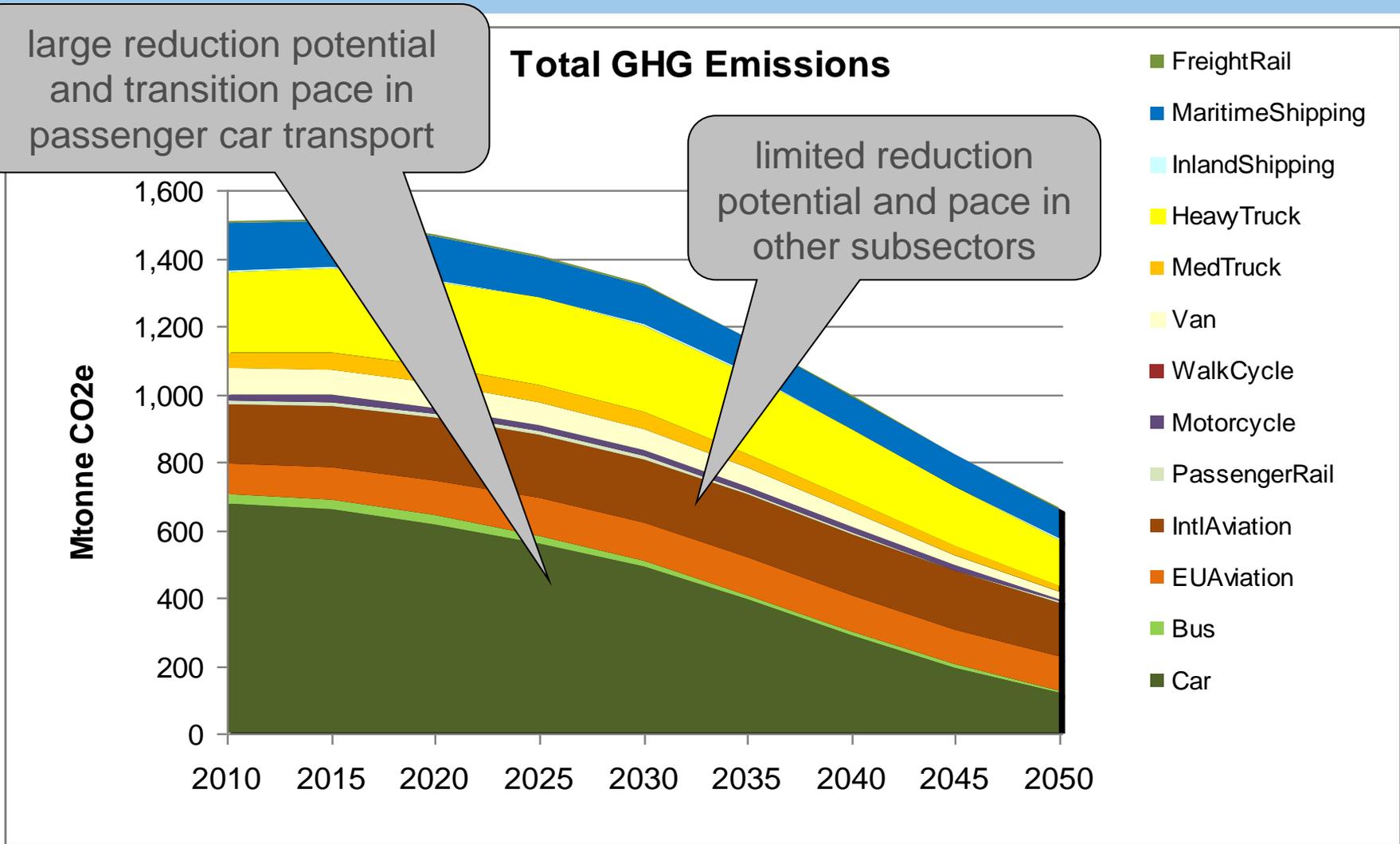


The 2050 target

Keep global warming under 2°C by end of century

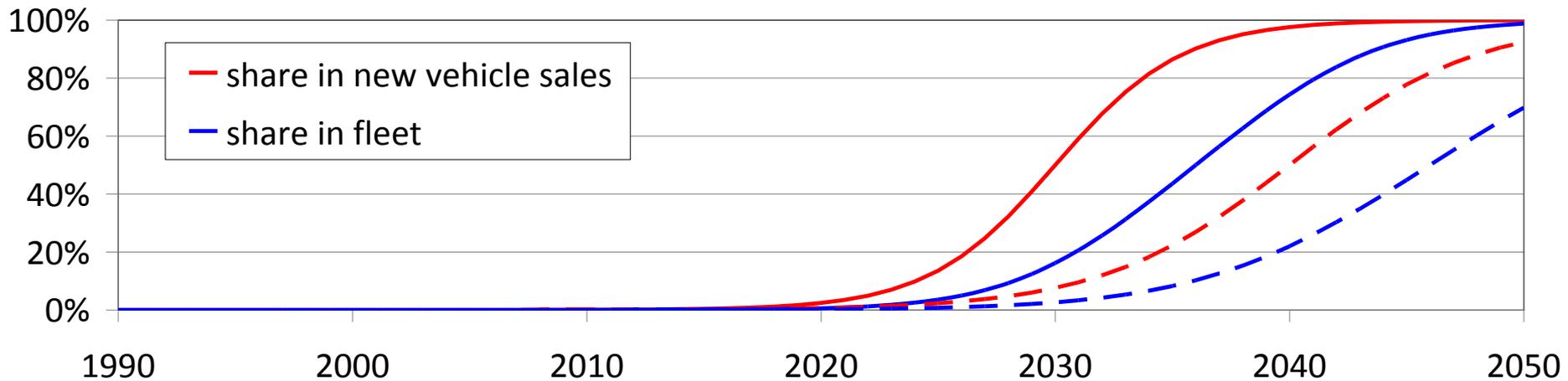


Results from scenario analyses



Timing of transition to sustainable vehicles

Share in sales / fleet of vehicles that are 80 – 100% sustainable



Illustrative example for road transport

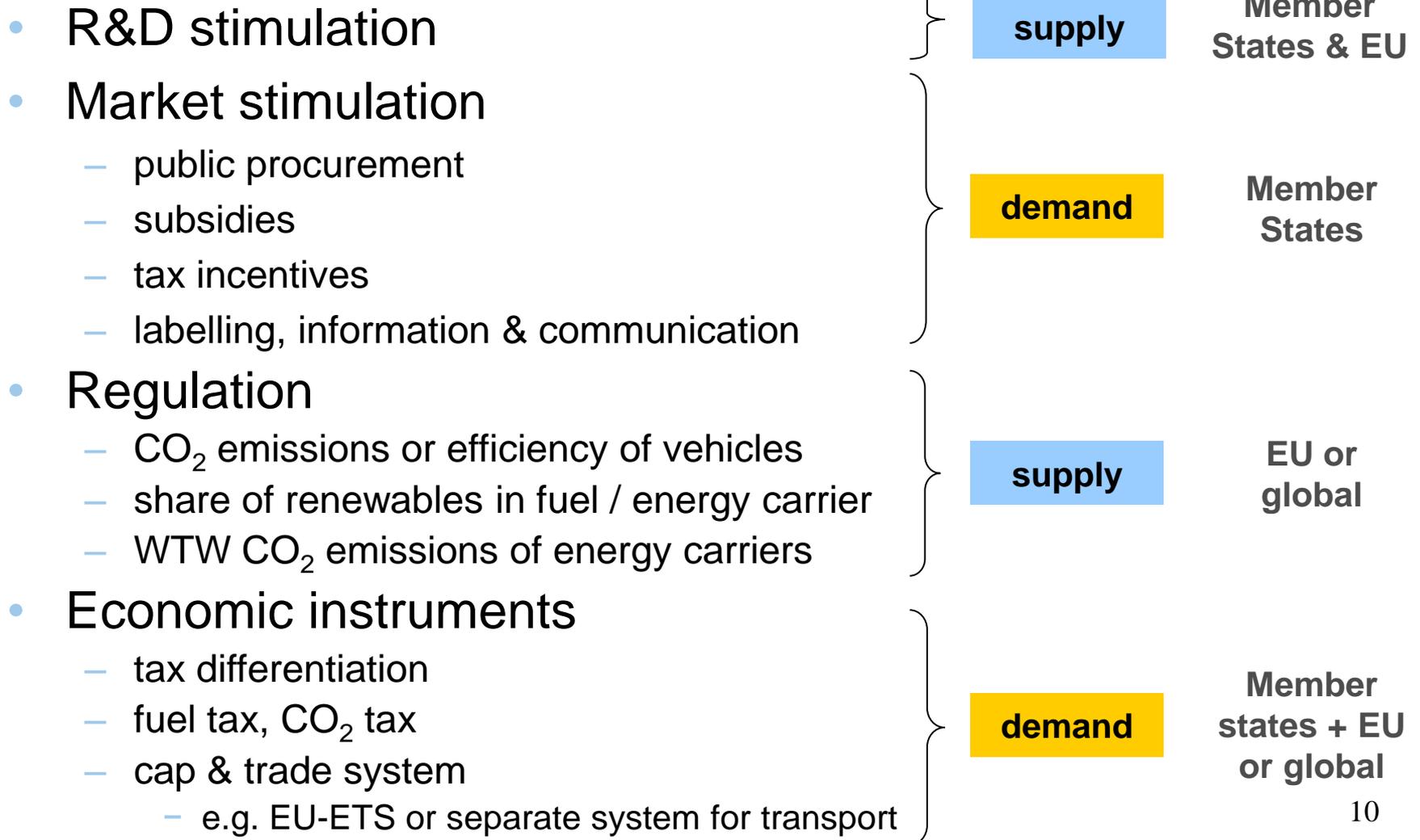
- between 2010 – 2030
 - make conventional vehicles more efficient
 - develop sustainable alternatives to technological and economical maturity
 - create first markets for sustainable alternatives on renewable energy
- by 2030 alternatives must be ready for large scale uptake
- between 2030 – 2050
 - ramp up market share of sustainable alternatives to 100%

Timing of transition to sustainable vehicles

- Possible speed and timing of transition in rail, shipping and aviation slower than in road transport due to:
 - longer vehicle lifetime and thus slower fleet renewal
 - longer lead times for innovation
 - more limited range of reduction options with respect to vehicles and energy carriers
 - need for global harmonisation
- For some of these other modes retrofitting is an option

Policy instruments

Options



Policy instruments

Considerations

- Policy instruments must be:
 - effective
 - ensure that reduction potentials are delivered
 - efficient
 - in theory economic instruments are more cost effective than regulation
 - fair
 - accepted
 - for road transport regulation is easier to realise in EU context than economic instruments
- Strong preference for technology neutral instruments
- Economic instruments OR regulation?
 - or combination of the two?

Policy instruments

Regulation

- Regulation of vehicles & components
 - potentially very effective, as targets all new vehicles
 - potentially applicable for all modes
 - aimed directly at tank-to-wheel emissions – important as these are the emissions that can be influenced by a vehicle's manufacturer
 - needs test procedures that correlate to real-world emissions
 - can be successively tightened to stimulate innovation

Policy instruments

Options for regulation of vehicles

- further tightening of the emission targets within the present approach for cars and light commercial vehicles
 - sales averaged
 - utility-based limit function
- emission limits per vehicle:
 - setting an absolute emission maximum, either on its own (individual vehicle emission limits) or in combination with fleet averaging (as an upper limit)
- using utility-based limit curves that penalise high emitters (flattening out for high values of the utility parameter)
- using bin-based systems requiring increasing shares of vehicles over time to meet more stringent emission limits
- regulation of the energy efficiency of components
- development of appropriate regulation for other modes
 - HD vehicles
 - trains, ships, aircraft

Policy instruments

Options for regulation of vehicles

- regulation of CO₂ emissions per unit of transport function
 - g/pass-km or g/tonkm, especially relevant for other modes than road transport;
- setting absolute restrictions on vehicle parameters
 - e.g. size, weight, power, power/mass ratio
- limitation of maximum speed or other performance indicators
 - offers some room for creativity in combination with flanking measures such as steep tax differentiation between speed limited / unlimited vehicles
- mandatory application of technologies
 - e.g. retrofitting existing vehicles with low rolling resistance tyres
 - promoting application of technologies that do not yield (large) benefits on the type approval test but that do significantly improve real world CO₂ emissions
 - tyre pressure monitoring systems, gear shift indicators and low rolling resistance tyres
 - solar roofs and efficient LED lights.
 - may have to be combined with regulation setting minimum performance requirements at the component level
- mandatory externally controlled limitation of speed and acceleration, dependent on location and condition of driving
 - also possibly beneficial for reasons of air quality, noise and safety.

Aspects of new policy instruments

From tank-to-wheel to well-to-wheel

- How to deal with vehicles that are zero emission under vehicle-based regulation?
 - creates leverage
 - include WTT in vehicle regulation?
- Advent of alternative energy carriers and developments in conventional fuels requires regulation to take account of WTT and TTW GHG emissions
 - electricity, hydrogen
 - biofuels
 - conventional fuels from unconventional oil
- Options:
 - combine TTW vehicle regulation with WTT regulation for energy carrier
 - possibly combined with renewable energy target
 - existing EU policy: Article 7a of the Fuel Quality Directive
 - include WTT emissions in vehicle GHG regulation
 - e.g. using default WTT factors

Policy instruments

Regulation of energy carriers

- Regulation of CO₂ emissions from well to wheel
 - e.g. Renewable Energy Directive and Fuel Quality Directive
 - targeting well-to-wheel emissions
 - well-to-tank emissions from energy production chain
 - TTW emissions through fossil carbon content of fuels
 - separate from regulation of vehicles, as energy producers/suppliers responsible for this, but need to be linked to ensure compatibility
 - could be expanded to cover other modes – bunkering an issue
 - global approach is preferred
- Sustainability criteria
 - share of renewables (ref. RED)
 - especially for biofuels
 - Indirect Land-Use Change (ILUC) effects
 - competition with food
 - biodiversity

Policy instruments

Regulation of energy carriers

- Electric transport
 - interaction with policies for the electricity sector
 - EU-ETS, renewable energy directive
 - identify & monitor electricity used for electric vehicles
 - part of article 7a of FQD, but practical approach not yet defined
 - does this requires smart metering to know electricity used by EVs?
 - how to identify carbon intensity of that electricity?
 - how to deal with household connections?
- Regulation to stimulate market introduction of alternative fuels
 - E.g. mandatory targets
- Fuel quality standards and compatibility
 - safety regulations need to be developed for new fuels/applications

Policy instruments

Economic instruments

- Main options
 - tax differentiation
 - fuel tax, CO₂ tax
 - cap & trade systems
 - “smaller” options
 - differentiation of parking fees
 - company car taxation
 - fiscal treatment of commuting and business travel
 - subsidies
- Distinction between temporary measures and structural instruments
 - subsidies are generally temporary

Policy instruments

Economic instruments

- Tax differentiation based on CO₂
 - vehicle tax
 - direct impact on purchasing behaviour
 - circulation tax
 - road pricing
 - more indirect impact through TCO
 - effective instruments in a policy that aims at both congestion reduction and GHG reduction
 - can reduce traffic congestion without generating additional traffic
 - infrastructure charging
 - e.g. port charging
 - on regional or EU scale for inland shipping
 - on global or regional scale for maritime
 - airport tax for aviation
 - on basis of TTW or WTW?
 - requires appropriate type approval procedures

Policy instruments

Economic instruments

- Fuel tax / CO₂ tax
 - how to determine CO₂ price?
 - by external cost estimate
 - with current values not very effective relative to EU tax levels
 - how to value external costs of uncertain but radical effects in > 2 C scenario
 - or set at level that achieves desired level of reduction
 - incentivises all technical and non-technical reduction options
 - EU harmonisation strongly preferred
- Tax harmonisation at EU level difficult to achieve
 - requires unanimity

Policy instruments

Economic instruments

- “Smaller” options
 - differentiation of parking fees
 - company car taxation
 - remove hidden subsidies
 - fiscal treatment of commuting and business travel
 - remove hidden subsidies
- Subsidies
 - should be temporary
 - for the long term a structural fiscal framework is necessary to create a stable market

Policy instruments

Cap & trade systems

- Inclusion of all transport modes in the EU ETS
 - If abatement costs in transport are high, the transition to sustainable transport is postponed
 - Effect on CO₂ price may increase “carbon leakage”

OR

- Separate trading system for transport based on:
 - Cap & trade - limiting the total emissions of all system participants
 - May include various modes
 - Promotes all technical and non-technical options for CO₂ emission reduction
 - Baseline & credit - limiting the specific emissions per vehicle, train or ship
 - Similar to regulation at level of sales averaged CO₂ emissions per vehicle with option of trading credits among manufacturers
 - To be applied per mode
 - No impact on volume and behaviour

Policy instruments

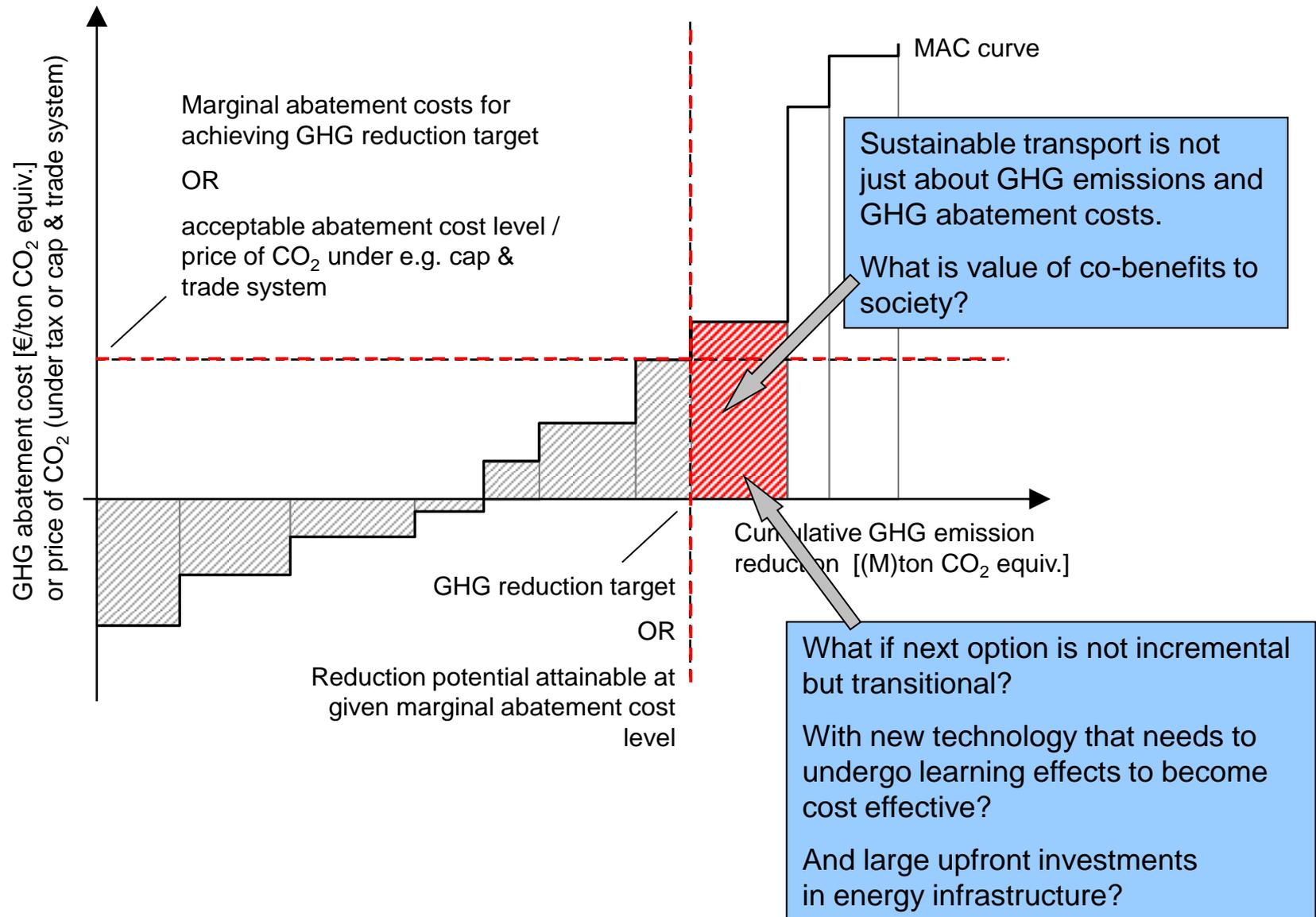
Cap & trade systems

- Upstream trading:
 - Cap is put on companies that sell transport fuels
 - CO₂ price may become volatile due to very indirect impact of energy companies on behaviour of consumers

OR

- Downstream trading
 - Fuel consumers, that actually use the fuels and thus emit the CO₂, are the trading parties
 - Complex and costly due to large number of trading entities
- Problem with split incentives
 - manufacturers have to invest in (initially expensive) technology
 - users have benefits of reduced fuel consumption but have limited incentive to invest in (initially expensive) technology
 - myopia & risk aversion

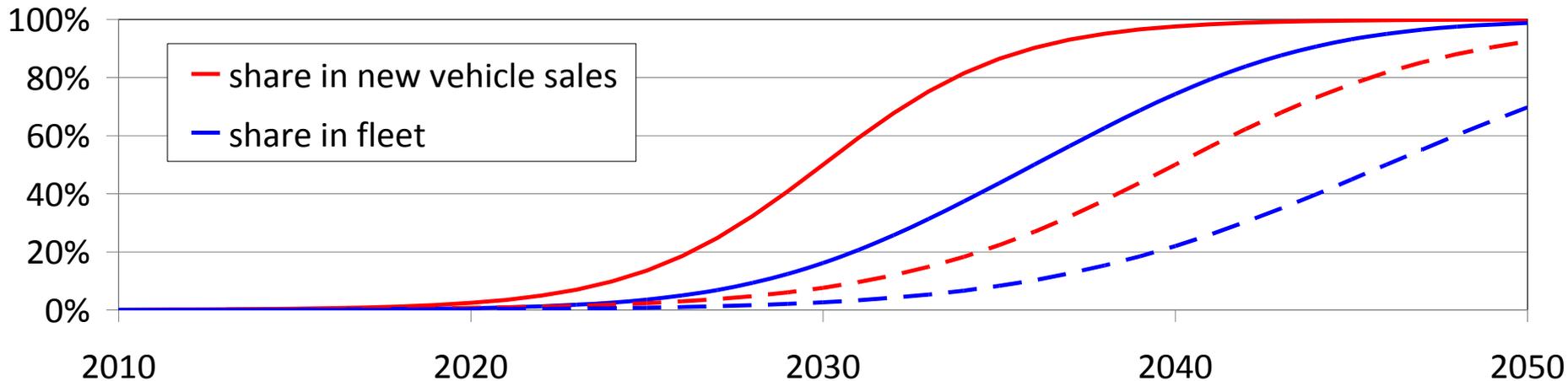
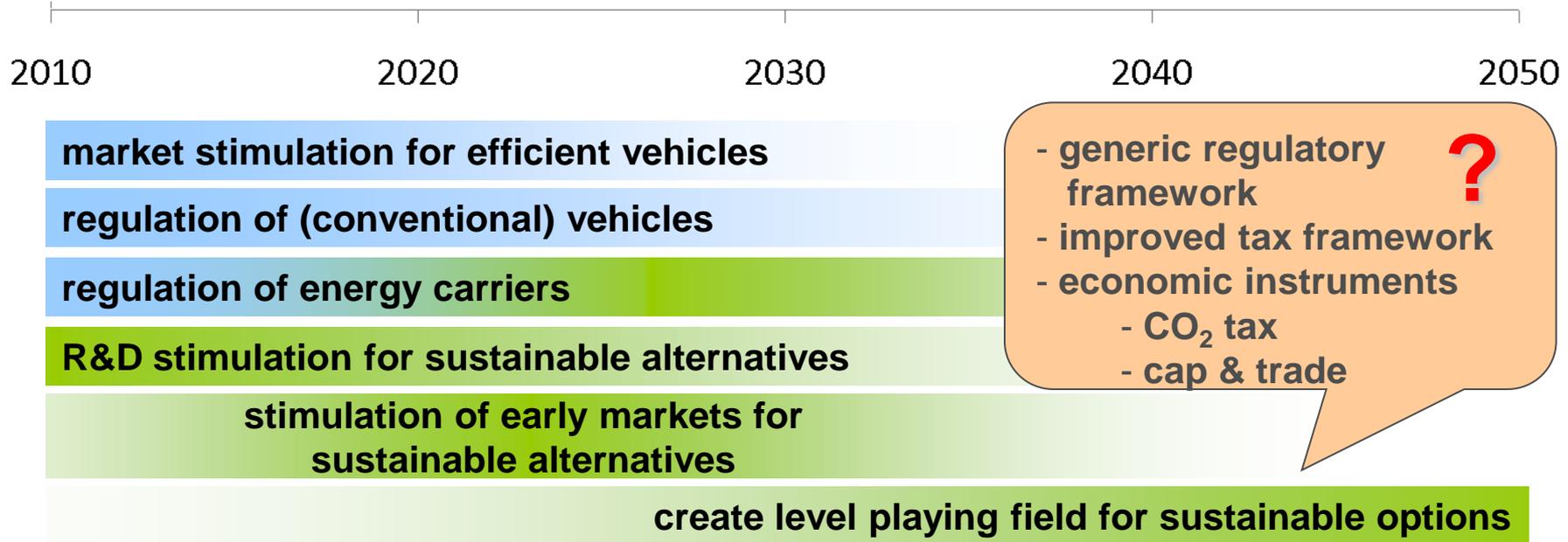
Economic instruments vs. dynamics of transitional GHG reduction options



Regulation vs. economic instruments

- It will be necessary to apply both push (supply side) AND pull (demand side) instruments
- Especially for transitional technologies early market formation is necessary to
 - stimulate investment in infrastructure
 - to push option down the learning curve (cost reduction and product innovation)
 - requires specific actions
- In short to medium term for road transport regulation seems most appropriate
 - supported by demand measures such as subsidies, labelling and tax differentiation
- When target gets tougher economic instruments may be necessary
 - CO₂ tax or cap & trade system?
 - general or sector-specific instrument?
 - Can be combined with regulation to ensure availability of efficient technologies

Possible timing of policy instruments for transition to sustainable vehicles & fuels



Conclusions

Main issues

- What is the target for GHG emissions from transport in 2050?
 - 80 – 90% reduction rel. to 1990 can not be reached with efficient vehicles and low GHG energy alone
 - maximum reduction identified in scenario tool: < 60%
 - combination of limited potentials and lead times for market introduction and fleet renewal
 - target level partly determines type(s) of policy instruments to be used
- Policy instruments to be implemented at national, EU or global level?
 - main instruments at least at EU level
 - EU measures need to be augmented by member state actions
 - global instruments especially relevant for aviation and maritime transport
 - with exception of (air)port charges
 - global instruments or harmonisation not always appropriate
 - different GHG reduction target levels for industrialised and developing economies
 - require different (sets of) instruments
 - may slow down regulatory process in EU

Conclusions

Main issues

- Regulation vs. economic instruments?
 - theoretical discussion about optimal instruments should not slow down process of innovation and transition
 - transport sector suffers from split incentives which make effect of economic instruments indirect and possibly slow
 - regulation targets parties that need to invest (OEMs) and creates level playing field
 - CO₂ tax requires harmonisation at EU level
 - cap & trade system complex for road transport and with small impact in short – medium term
- Policy framework should foster co-evolution of transport and energy system
 - production of GHG-neutral energy should match growth in sustainable vehicles
 - possible synergies should be harvested
 - e.g. role of electric vehicles in facilitating large scale uptake of intermittent renewables (wind / sun)

Conclusions

Main issues

- Many instruments require appropriate metrics for defining GHG emissions of vehicle or activity
 - relation between TTW and WTW emissions of vehicles
 - relation with real world impacts
 - incl. or excl. direct relation with behaviour
 - WTW emissions of energy carriers
- Choice for policy instruments is not about “one or the other” but about defining an evolution of packages of complementary policy instruments that:
 - over time effectively stimulate the transition towards sustainable vehicles and energy carriers
 - combine demand and supply oriented instruments
 - to take care of split incentives problem
 - stimulate innovation and early market formation in the short to medium term
 - create a level playing field and stable market for sustainable options in the longer term