

SUMMA

Sustainable **M**obility,
policy **M**easures, and **A**ssessment

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Outline

- Background, objectives, and approach
- Policy assessment framework
- Definition of sustainable transport
- Outcome indicators
- Models
- Policy assessment



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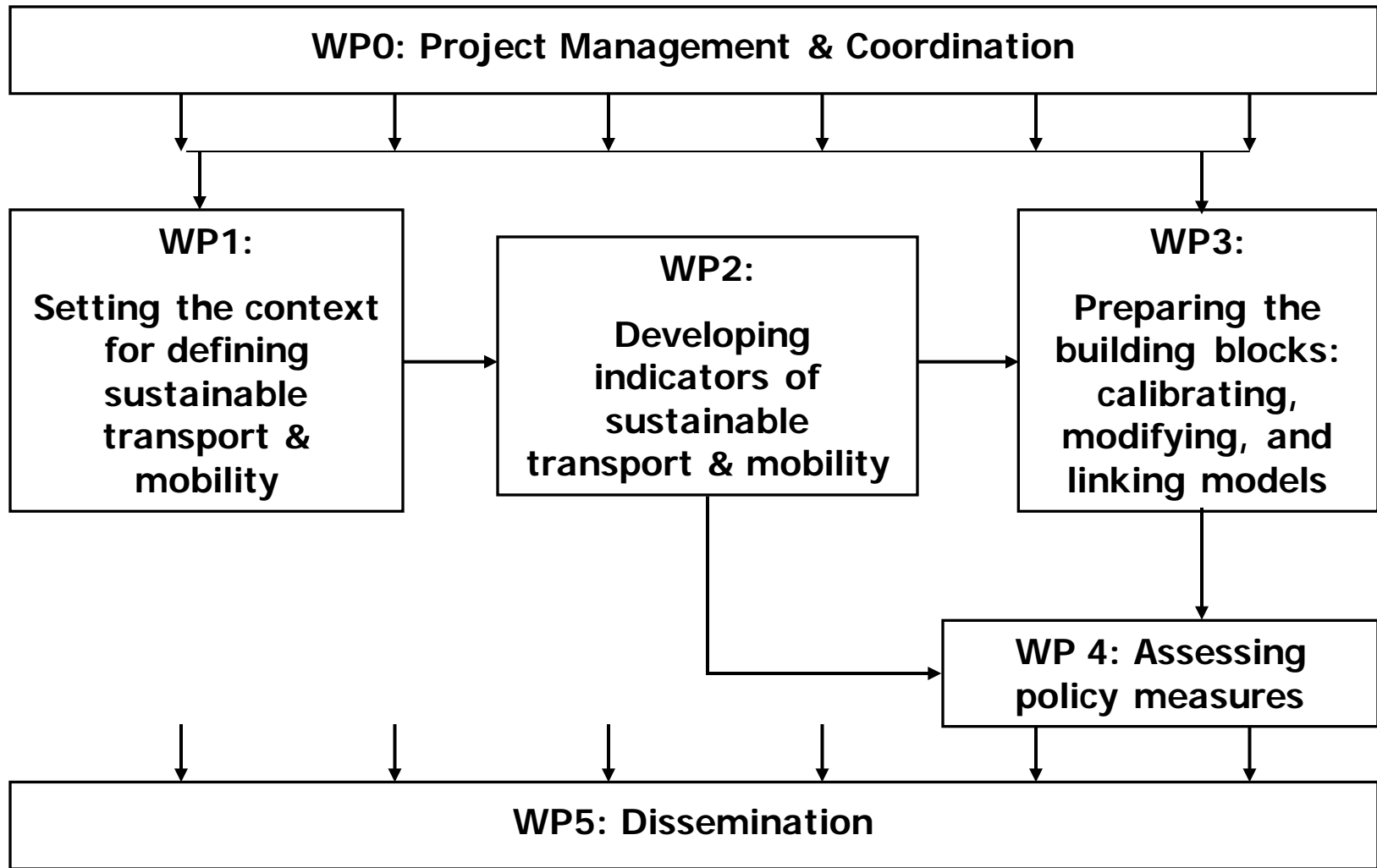
SUMMA

- Funded by the European Commission (DG-TREN) as part of its Fifth Framework research program
- Seven partner organizations; RAND as Coordinator
- November 2002 – April 2005
- Final conference on April 5, 2005
- Fundamental knowledge; still relevant for its operationalization of the concept of sustainable transport

The Objectives of SUMMA

- Define sustainable transport and mobility
- Operationalize this definition by identifying
 - Outcomes of interest (in the language of policymakers)
 - Indicators for use in policy assessment and monitoring developments relevant for sustainable transport and mobility (quantitative; able to be measured by models and tracked in the real world)
- Assess the potential contribution of EC policies to promoting sustainable transport and mobility in regions and cities

SUMMA Tasks

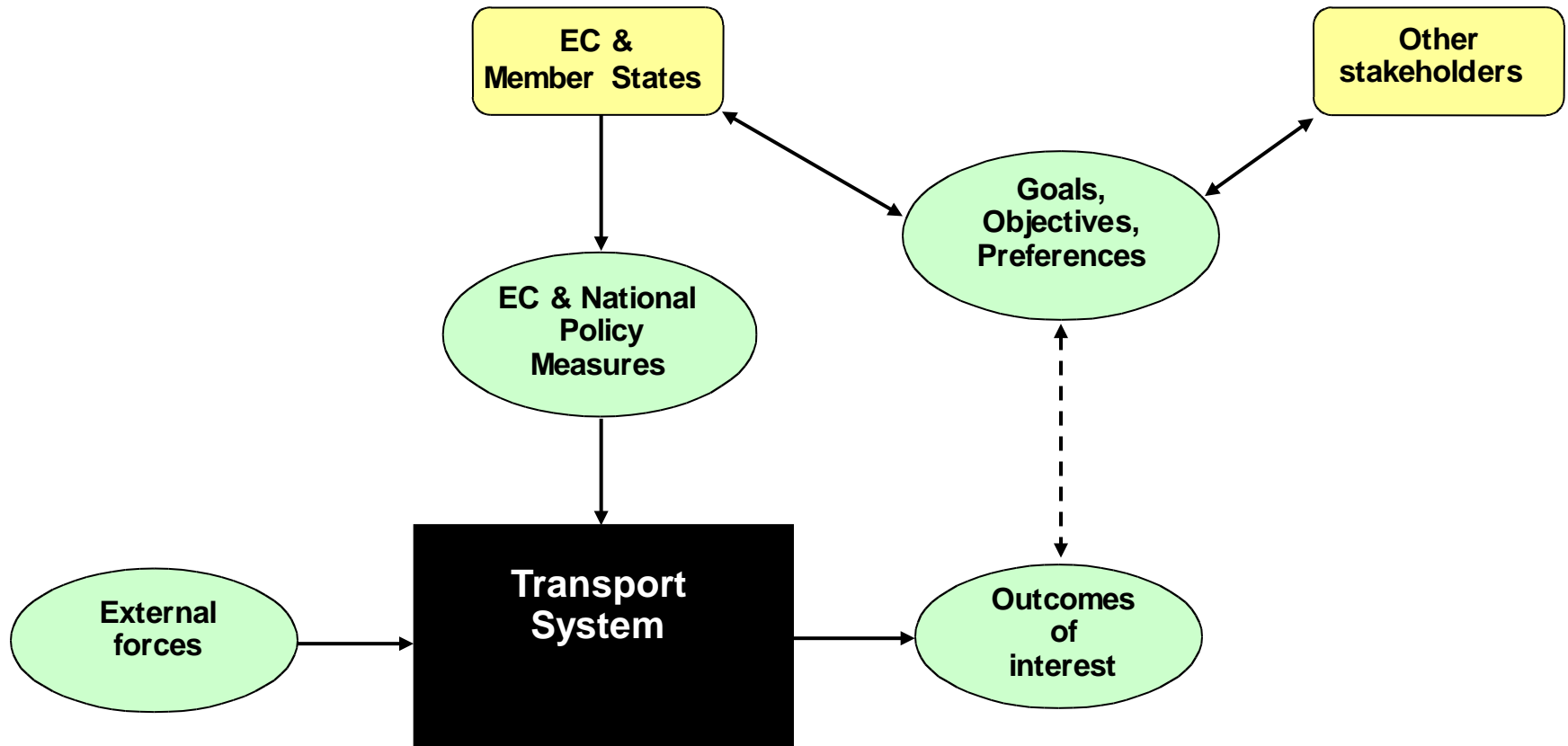




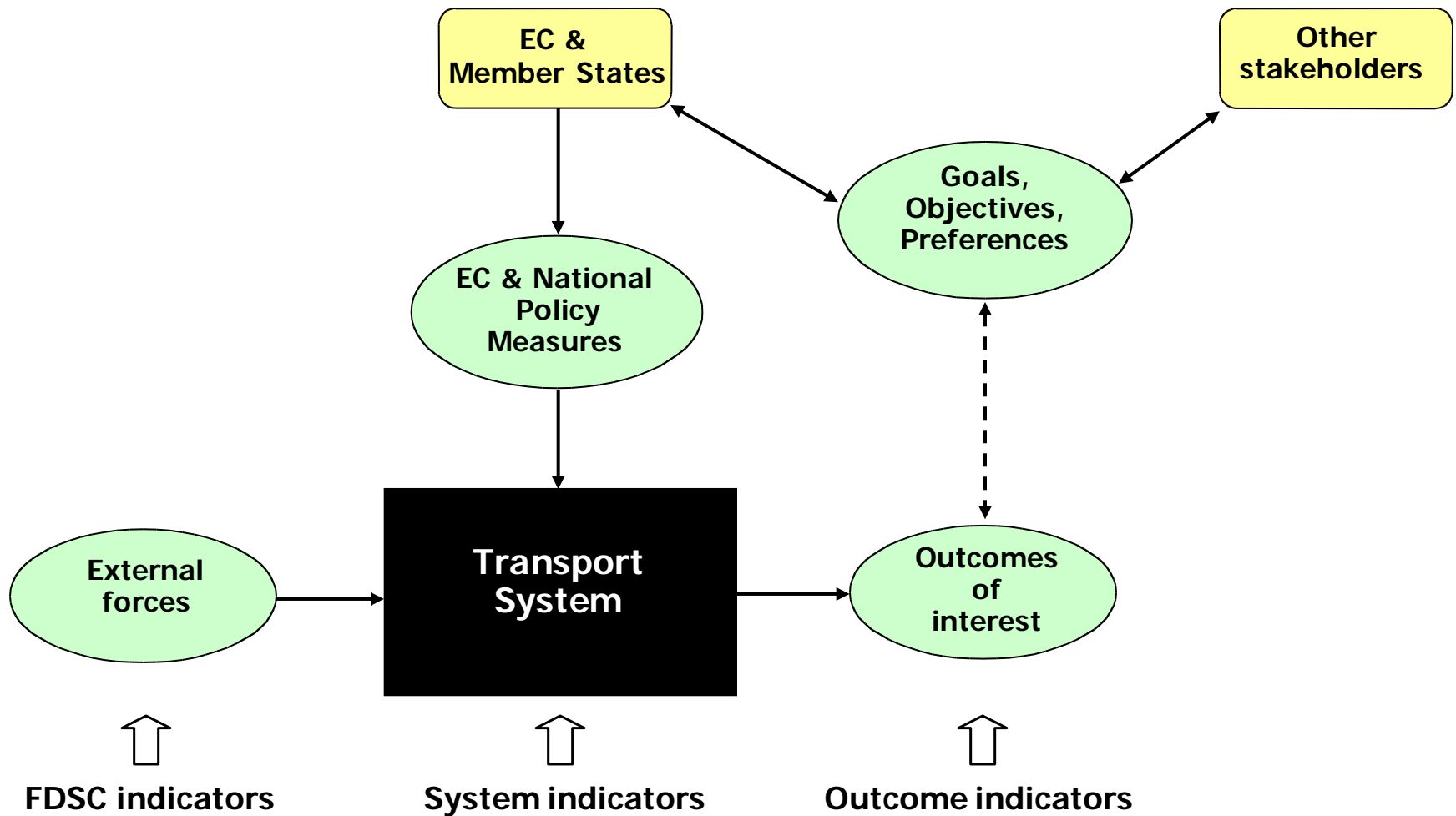
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Generic Policy Assessment Framework



Analytic Policy Assessment Framework





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Defining Sustainability

(Brundtland Commission, October 1987)

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

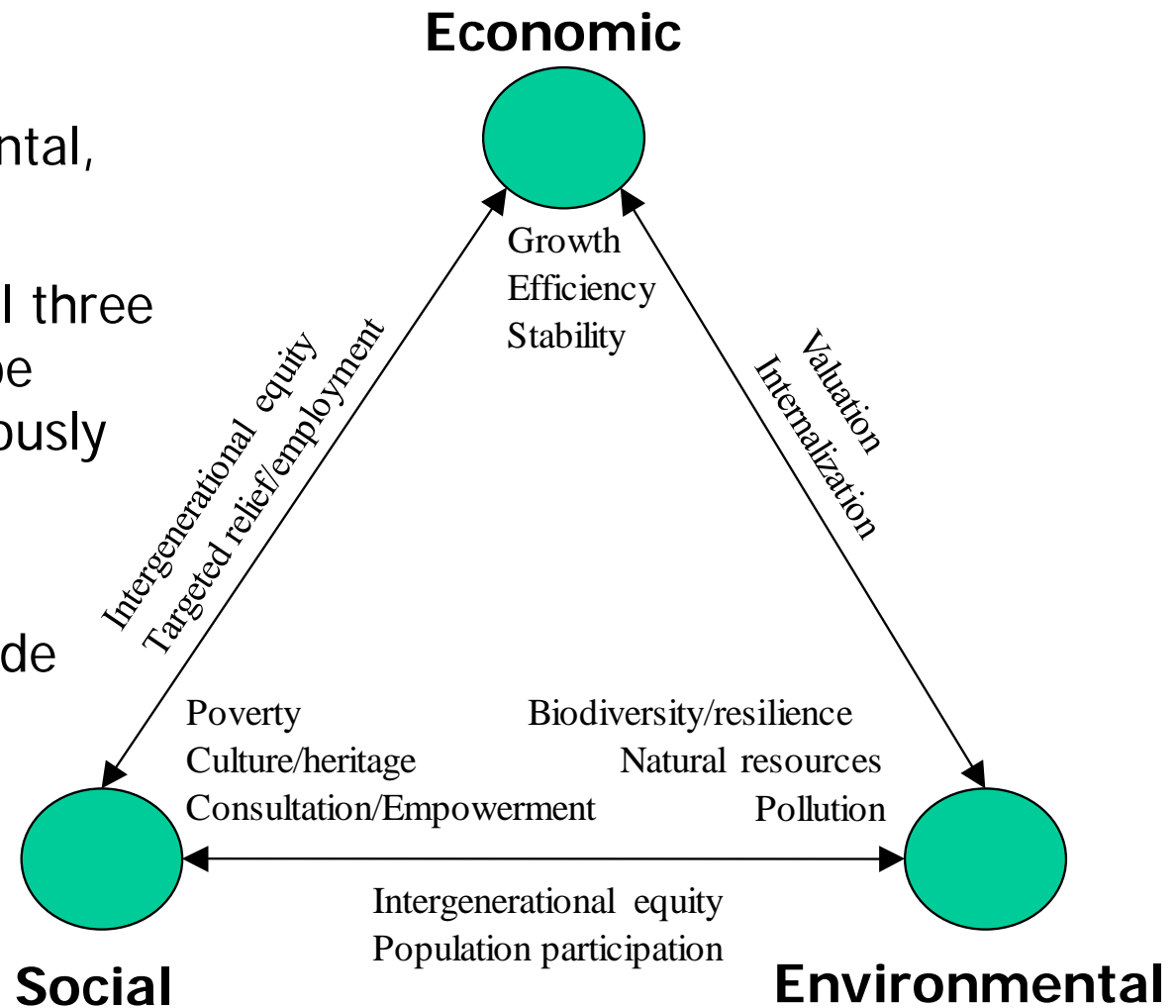
Defining Sustainable Transport

(Council of the EU, 2001)

- A sustainable transport system is defined as one that:
 - Allows the basic access and development needs of individuals, companies and societies to be met safely and in a manner consistent with human and ecosystem health, and promises equity within and between successive generations.
 - Is affordable, operates fairly and efficiently, offers choice of transport mode, and supports a competitive economy, as well as balanced regional development.
 - Limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and, uses non-renewable resources at or below the rates of development of renewable substitutes while minimizing the impact on land and the generation of noise.

The Three Dimensions of Sustainability

- Economic, environmental, and social
- Policy outcomes for all three dimensions have to be considered simultaneously (not sequentially or independently)
- Tradeoffs must be made among them



Goals / Outcomes of Interest

Economic	Environmental	Social
<ul style="list-style-type: none">■ Accessibility■ Transport operation cost■ Productivity / Efficiency■ Costs to economy■ Benefits to economy	<ul style="list-style-type: none">■ Resource use■ Direct ecological intrusion■ Emissions to air■ Emissions to soil and water■ Noise■ Waste	<ul style="list-style-type: none">■ Accessibility and affordability■ Safety and security■ Fitness and health■ Liveability and amenity■ Equity■ Social cohesion■ Working conditions in transport



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Principles of Outcome Indicator Development

- The set of indicators should cover all of the outcomes of interest
- Each indicator should have a clear relationship to the goals/outcomes of interest of sustainable transport
- Each indicator should be a measurable outcome of the transport system
- Existing data availability not critical (“wish list”)

The Process of Indicator Development

- Identified several possible indicators for each outcome of interest (based on existing work, whenever available)
- Screened and revised the indicators at expert and policymaker workshops
- Ended with detailed descriptions of 60 indicators in a common format

Links Between Sustainability Goals and SUMMA Outcomes of Interest

Element from the definition of sustainability	Related Outcome of Interest (OoI)	Dimension
Basic access	<ul style="list-style-type: none"> • Accessibility 	Economic, social
Development needs	<ul style="list-style-type: none"> • Accessibility • Cost / benefits to economy • Productivity / Efficiency • Transport operation costs • Social cohesion 	Economic, social
Safety	<ul style="list-style-type: none"> • Safety and security 	Social
Human health	<ul style="list-style-type: none"> • Safety and security • Fitness and health • Liveability, amenity • Emissions to air, soil and water 	Social, environmental
Ecosystem health	<ul style="list-style-type: none"> • Direct ecological intrusion • Emissions to air, soil and water • Waste 	Environmental
Equity	<ul style="list-style-type: none"> • Equity 	Social
Affordable	<ul style="list-style-type: none"> • Accessibility (incl. affordability) 	Social
Fairness	<ul style="list-style-type: none"> • Accessibility (by mode) • Equity • Transport operation costs 	Economic, social
Efficiency	<ul style="list-style-type: none"> • Productivity / efficiency • Transport operation costs 	Economic
Transport modes	<ul style="list-style-type: none"> • Accessibility 	Economic, social
Competitive economy	<ul style="list-style-type: none"> • Accessibility • Transport operation costs • Costs and benefits to the economy • Productivity / efficiency 	Economic
Emissions	<ul style="list-style-type: none"> • Emissions to air, soil, water • Emissions of noise 	Environmental
Waste	<ul style="list-style-type: none"> • Waste 	Environmental
Renewable and non-renewable resource use	<ul style="list-style-type: none"> • Resource use 	Economic, environmental
Impacts on land	<ul style="list-style-type: none"> • Resource use (incl. land take) • Direct ecological intrusion (incl. fragmentation) 	Environmental
Noise	<ul style="list-style-type: none"> • Emission of noise 	Environmental

Some Environmental Outcome Indicators

- Resource use
 - Energy consumption
 - Consumption of solid raw materials
 - Land take
- Emissions to air
 - Transport emissions of greenhouse gases (GHG)
 - GHG emissions from manufacture and maintenance
 - Transport emissions of air pollutants
 - Air pollutant emissions from manufacture and maintenance

Some Economic Outcome Indicators

- Benefits to economy
 - Gross value added
 - Public revenues from taxes and traffic charging
 - External benefits of transport (e.g., reliability)
- Transport operation costs
 - Supplier operating costs
 - Transport-related expenditures of households
 - Transport prices
- Costs to economy
 - Infrastructure costs
 - Public subsidies
 - External transport costs

Difficulties in Specifying Social Outcome Indicators

- Literature only recently being developed
- No agreement on what social sustainability means
 - Not only stability and balance
 - Also change and development
- Equity is a fundamental aspect
 - Horizontal (within current generation)
 - Vertical (across generations)

Some Social Outcome Indicators

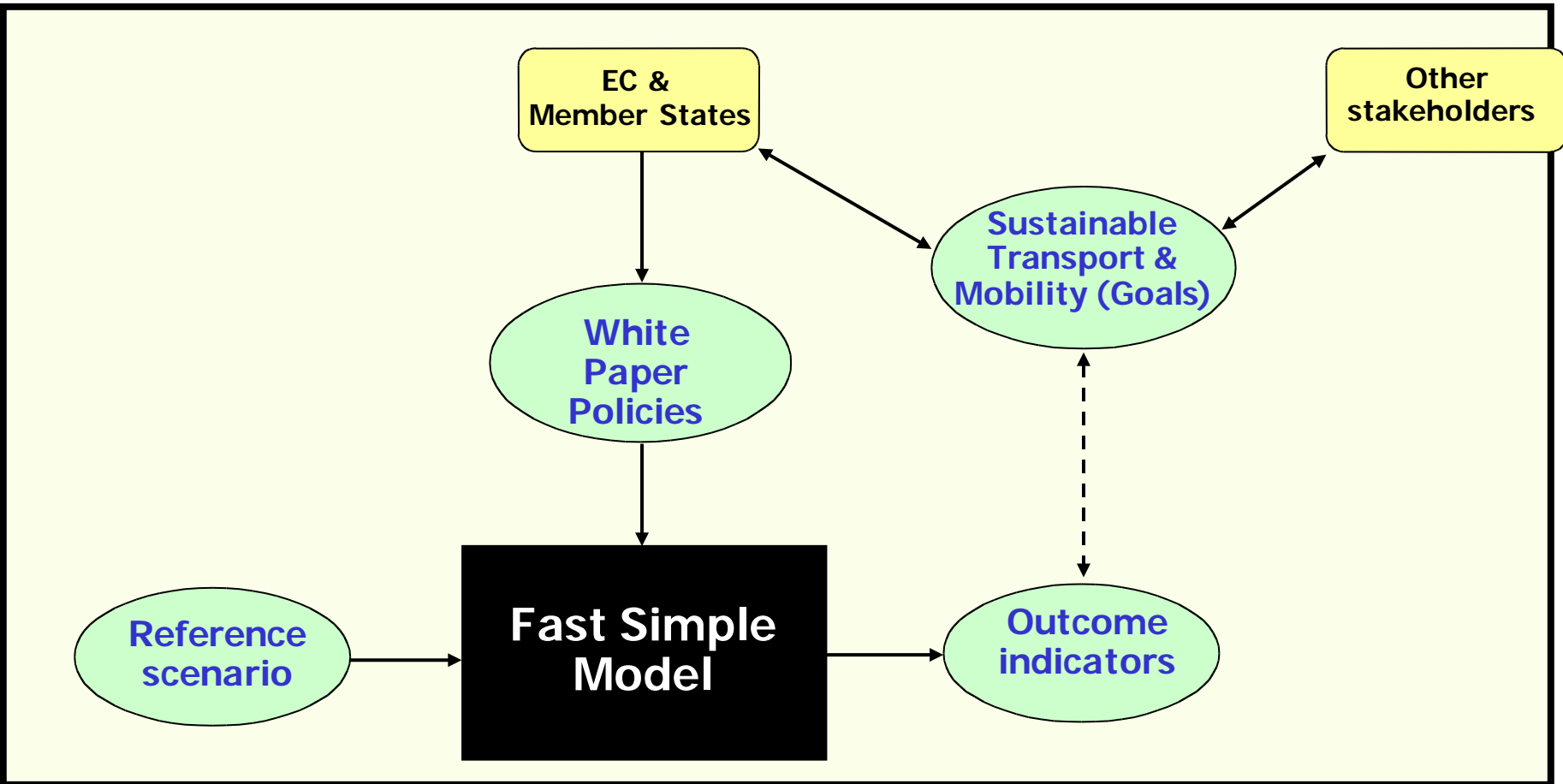
- Accessibility and Affordability
 - Access to basic services
 - Access to public transport
 - Affordability
- Safety and Security
 - Accident-related fatalities and serious injuries
 - Vehicle thefts and other crimes
 - Security on public transport
- Fitness and Health
 - Walking and cycling as transport means for short-distance trips



Outline

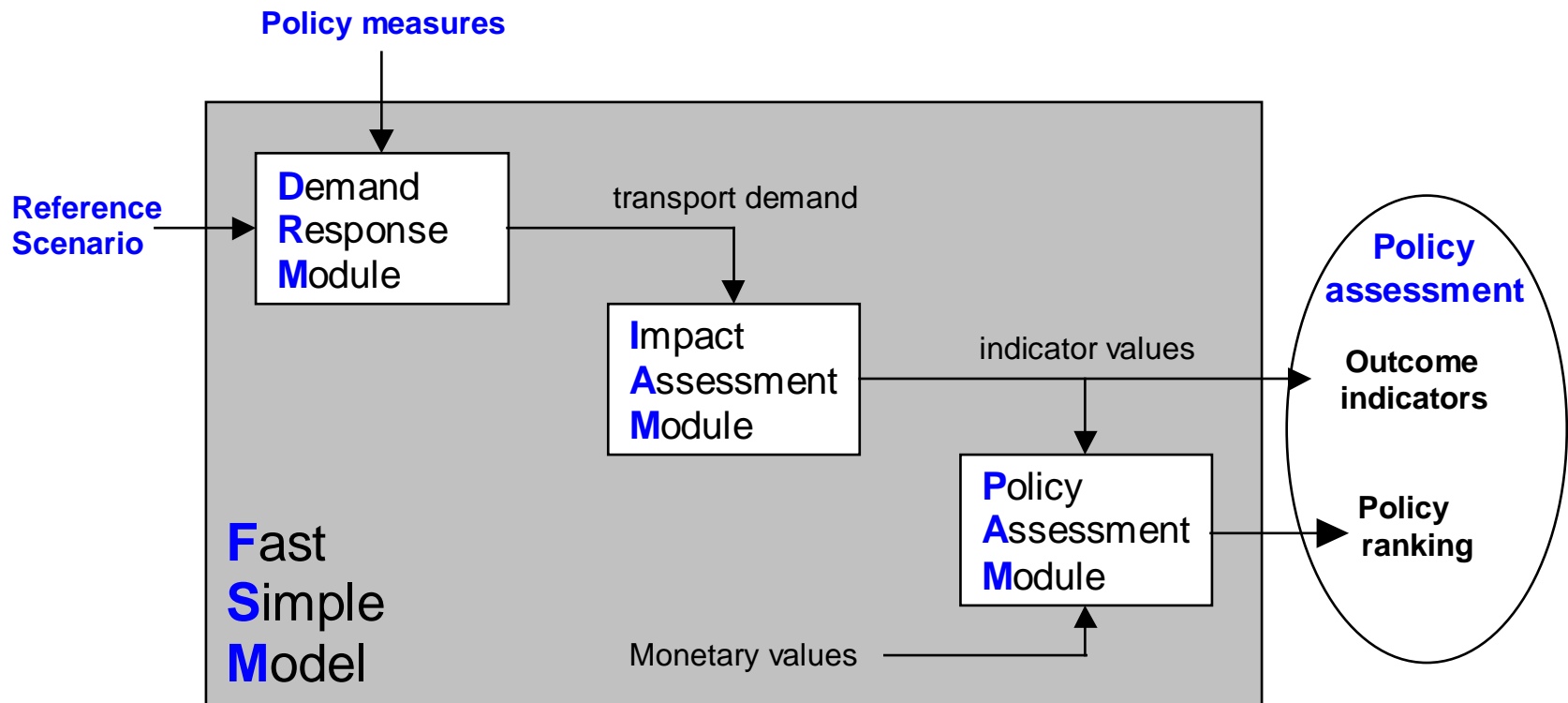
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The SUMMA Policy Assessment Framework



Fast Simple Model

(Three Modules: DRM, IAM, and PAM)

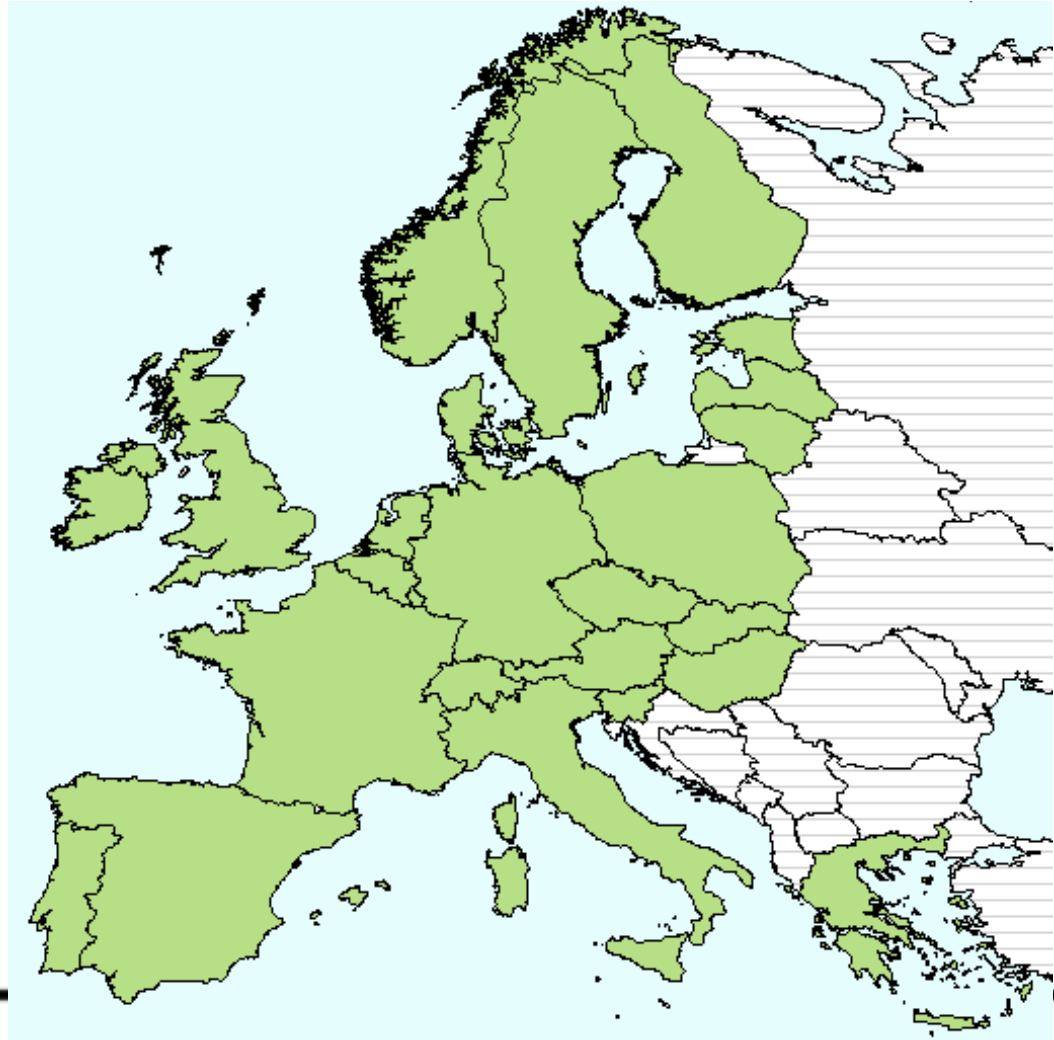


DRM – Spatial Disaggregation

25 countries

EU-25 less Malta
and Cyprus, but
including Norway
and Switzerland

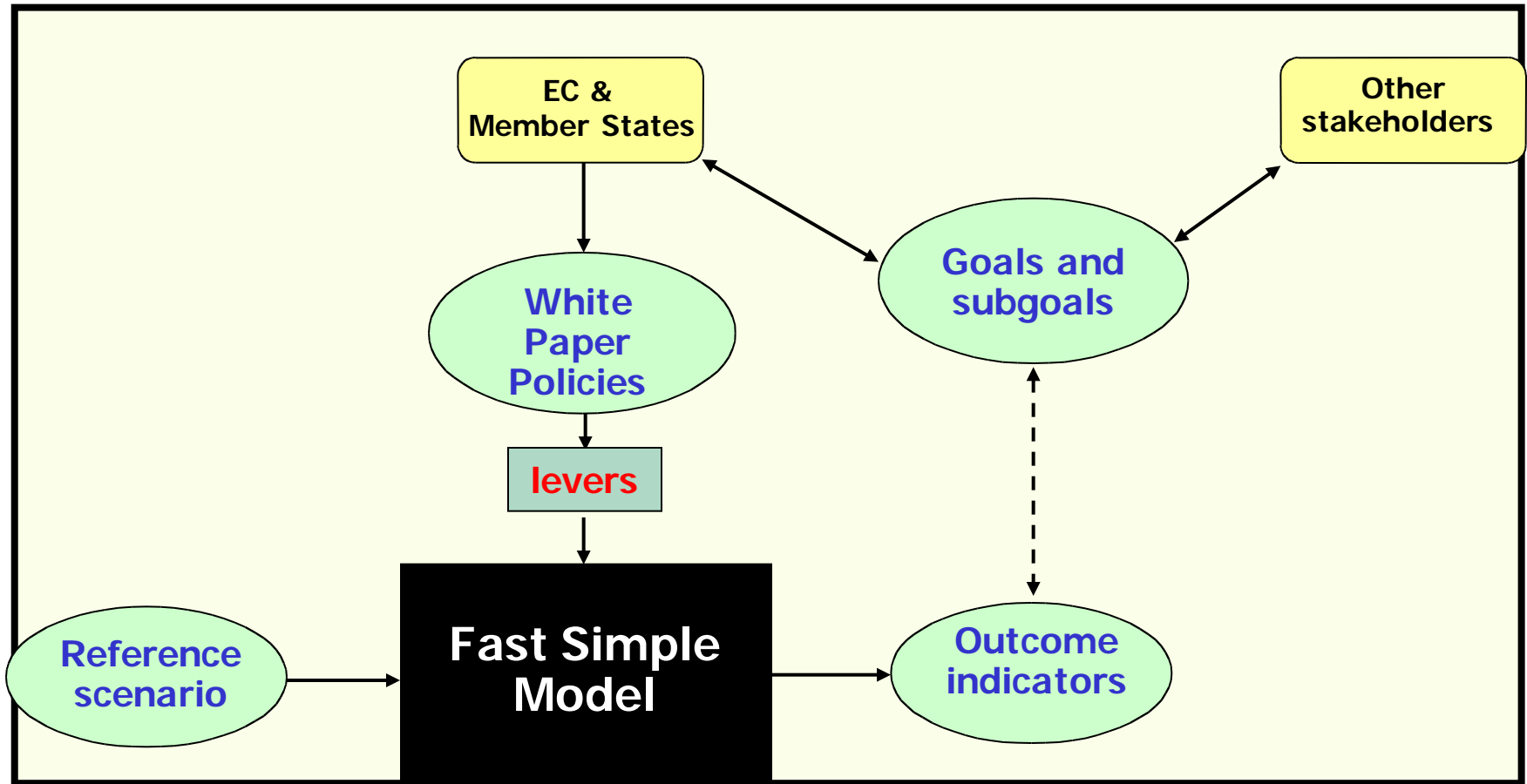
Demand is
generated at
NUTS-2 level
(e.g., provinces in
the Netherlands)



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The SUMMA Policy Assessment Framework



The SUMMA policy assessment process: Goals → Policies → Levers → Indicators

Goals of the EC's (2001) White Paper

- 1 Shifting the balance between modes of transport**
 - 1.1 Improving quality in the road sector*
 - 1.2 Revitalising the railways*
 - 1.3 Controlling the growth in air transport*
 - 1.4 Adapting the maritime and inland waterway transport system*
 - 1.5 Linking up the modes of transport*
- 2 Eliminating bottlenecks**
- 3 Placing users at the heart of transport policy**
 - 3.1 Unsafe roads*
 - 3.2 The facts behind the costs to the user*
- 4 Managing the globalisation of transport**
- 5 Rationalising urban transport**
- 6 Achieving a sustainable transport system**

White Paper Category 3.2 Goals Specified in Detail

-
- 1 Shifting the balance between modes of transport
 - 2 Eliminating bottlenecks
 - 3 Placing users at the heart of transport policy
 - 3.1 *Unsafe roads*
 - 3.2 *The facts behind the costs to the user*
 - 3.2.1 **Guarantee the interoperability of means of payment on the trans-European road network**
 - 3.2.2 **Establish an infrastructure charging system**
 - 3.2.3 **Propose uniform taxation for commercial road transport fuel**
 - 4 Managing the globalisation of transport
-
- 5 Rationalising urban transport
 - 6 Achieving a sustainable transport system
-

Assigning Policy Lever Values

Policy No.	Policy	Lever value/ implementation	Justification of policy levers
The facts behind the costs to the user			
	Guarantee the		
3.2.1P	Guarantee the interoperability of means of payment on the trans-European road network		Car time decrease of 2%
3.2.2P	Establish an infrastructure charging system		Variable car cost increase of 15%
5.11P	Implement road pricing (for passenger transport)	Car cost increase of 13% on inner city roads	Referring to operationalisation of Scenario C of Hamburg 2010 Transport Planning Concept 2010
5.11F	Implement road pricing (for freight transport)	Lorry cost increase of 3% on inner city roads	
3.2.3P	Establish uniform taxation for commercial road transport fuel (for passenger transport)	Hybrid cars variable cost increase of 9% and other cars variable cost increase of 12%	Referring to internal cost model structure (share of cost component)
3.2.3F	Establish uniform taxation for commercial road transport fuel (for freight transport)	Lorry cost increase of 10%	

Scorecard

(Relative changes in outcome indicators)

	O1	O2	O3
P1	104	101	110
P2	94	100	118
P3	105	99	90

(Values shown are percentage changes in the outcome indicators between the Reference Case and the policy run)

Transport Systems Modelled

- Passenger non-urban
- Freight non-urban
- Passenger urban
- Freight urban

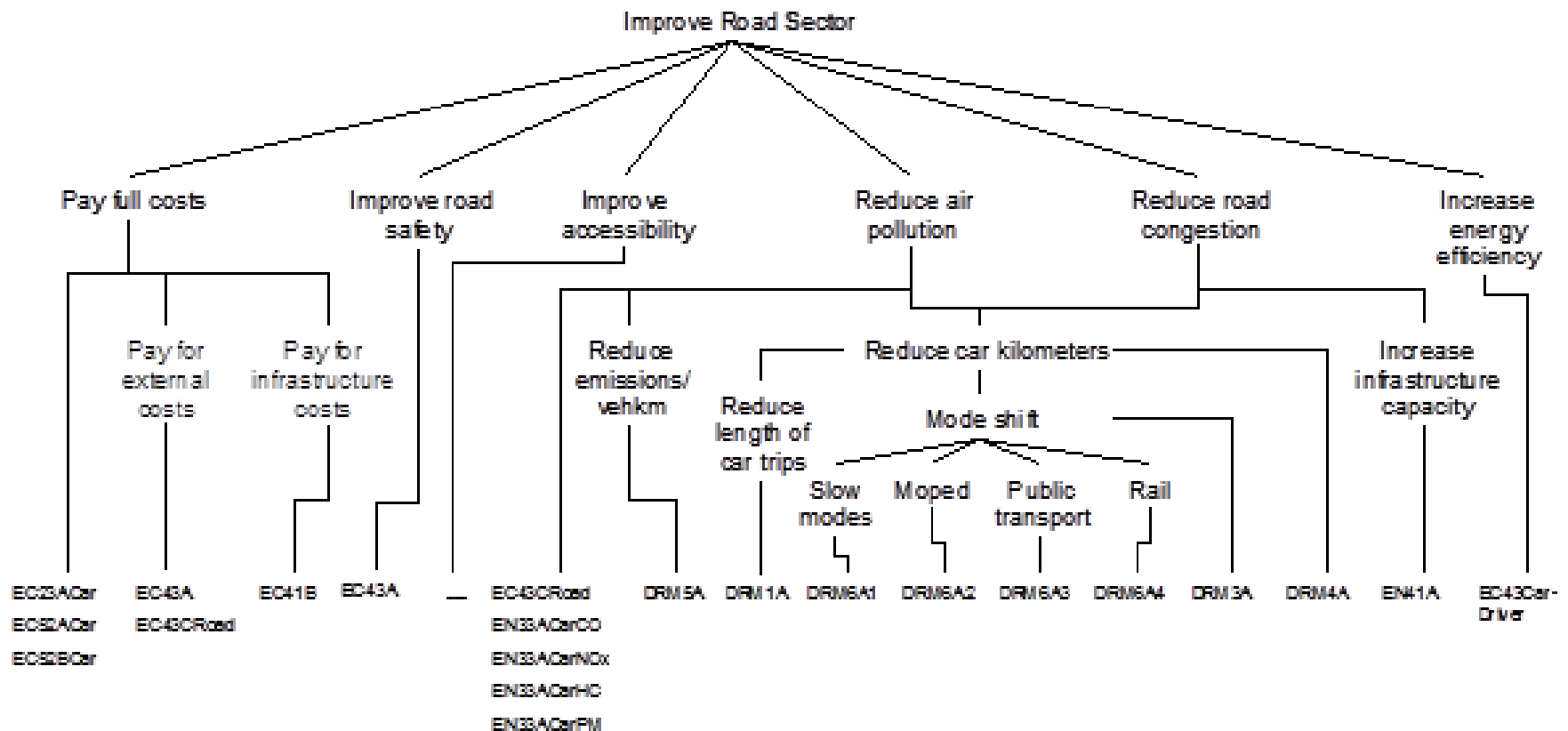
Transport Systems Modelled

- Passenger non-urban
- Freight non-urban
- Passenger urban
- Freight urban

Passenger Non-Urban Goal Hierarchy

IMPROVE ROAD SECTOR							REVITALIZE RAILWAYS		
Pay full costs		Improve road safety	Improve accessibility	Reduce air pollution		Reduce road congestion		Increase energy efficiency	Increase use of rail (Reduce use of roads)
Pay for external costs	Pay for infrastructure costs			Reduce emissions /vehkm	Reduce car kilometers				
		Reduce length of car trips	Reduce car trips						
			Mode shift						
			Slow modes	Moped	Public transport	Rail			

Goal Tree for the Goal "Improve Road Sector" (Passenger Non-Urban)



Passenger Non-Urban Policies (17)

Passenger policies	
1.1.1P	Harmonise inspections and penalties (for passenger transport)
1.2.1.2P	Ensure a high level of safety for the railway network (for passenger transport)
1.2.1.3P	Update the interoperability directives for all components of the network (for passenger transport)
1.5.1P	Build and promote multi-modal transport networks and terminals (for passenger transport)
3.2.1P	Guarantee the interoperability of means of payment on the trans-European road network (for passenger transport)
3.2.2P	Establish an infrastructure charging system (for passenger transport)
3.2.3P	Establish uniform taxation for commercial road transport fuel (for passenger transport)
4.1P	Mobilise private sector finance to link the Accession countries to the trans-European railway network (for passenger transport)
4.5P	Develop an EU satellite navigation system (Galileo) (for passenger transport)
5.4P	Introduce low-price tickets for employees to use on public transport in cities ('job ticket' for passenger transport)
5.5P	Improve the performance and service quality of public transport (for passenger transport)
5.12P	Increase parking fees (for passenger transport)
5.22P	Add road infrastructure (for passenger transport)
6.1.1P	Subsidise energy efficient car purchase (for passenger transport)
6.1.2P	Subsidise energy efficient car technologies (for passenger transport)
6.4P	Make PM filter mandatory (for passenger transport)
6.5P	Change fixed price of car ownership (for passenger transport)

Results From Passenger Non-Urban Policy Runs (2nd Level Goals, European Level)

	IMPROVE ROAD SECTOR					REVITALIZE RAILWAYS
	<i>Reduce road congestion</i>	<i>Reduce air pollution</i>	<i>Pay full costs</i>	<i>Improve road safety</i>	<i>Increase energy efficiency</i>	<i>Increase use of rail (Reduce use of roads)</i>
1.1.1P	102	102	99	103	101	104
1.2.1.2P	101	101	100	101	100	103
1.2.1.3P	101	101	100	101	100	103
1.5.1P	101	101	100	102	101	110
5.22P	98	94	103	91	102	100
3.2.1P	100	100	100	100	100	99
3.2.2P	102	103	167	105	100	103
3.2.3P	102	103	102	104	99	102
4.1P	101	101	100	101	100	107
4.5P	100	100	100	100	99	98
5.4P	101	101	99	102	101	118
5.5P	101	101	100	102	100	102
5.12P	100	100	105	100	100	100
6.1.1P	100	101	100	100	99	100
6.1.2P	100	101	100	100	99	100
6.4P	100	152	104	100	100	100
6.5P	101	102	99	103	99	104

Best and Runner-Up Passenger Non-Urban Policies

Second-Level Goal	Best Policy	Runner-up Policies
Reduce road congestion		3.2.2P 3.2.3P
Reduce air pollution	6.4P	3.2.2P 3.2.3P
Pay full costs	3.2.2P	5.1.2P
Improve road safety		3.2.2P 3.2.3P
Increase energy efficiency		5.2.2P
Revitalise railways	5.4P	1.5.1P

Best Policies: Passenger Non-Urban Policies

Second-Level Goal	Best Policy	Runner-up Policies
Reduce road congestion		3.2.2P 3.2.3P
Reduce air pollution	6.4P	3.2.2P 3.2.3P
Pay full costs	3.2.2P	5.1.2P
Improve road safety		3.2.2P 3.2.3P
Increase energy efficiency		5.2.2P
Revitalise railways	5.4P	1.5.1P

Reduce air pollution, 6.4P: Make particulate matter filters mandatory (152)

Pay full costs, 3.22P: Establish an infrastructure charging system (for pax transport) (167)

Revitalise railroads, 5.4P: Introduce low-price tickets for employees to use on public transport in cities ('job ticket' for pax transport) (118)

Passenger Non-Urban Policies: Reduce Road Congestion

- 5.22P: Add road infrastructure (98)
- 3.22P: Establish an infrastructure charging system (102)
- 3.23P: Establish uniform taxation for road transport fuel (102)

Note: shift to rail under 3.2.2P and 3.23P is small, since they induce a mode shift to other modes (e.g., bus-tram-metro and slow modes)

Freight Non-Urban Goal Hierarchy

IMPROVE ROAD SECTOR										REVITALIZE RAILWAYS	ADAPT MARITIME IWW
Pay full costs		Improve road safety	Improve accessibility	Reduce air pollution			Reduce road congestion		Increase energy efficiency	Increase use of rail (Reduce use of roads)	Increase use of IWW (Reduce use of roads)
Pay for external costs	Pay for infrastructure costs			Reduce emissions /vehkm	Reduce truck kilometers			increase infrastructure capacity			
		Reduce length of truck	Reduce truck trips								
			Make trip intermodal		Mode shift						
					Rail	Sea	IWW		Reduce rail congestion		

Freight Non-Urban Policies

Freight policies	
1.1.1F	Harmonise inspections and penalties (for freight transport)
1.1.2F	Increase the number of checks that Member States are required to carry out on compliance with driving times and drivers' rest periods (for freight transport)
5.21F	Allow bigger trucks for long-haul transport (for freight transport)
1.2.1.1F	Open up the national freight markets to cabotage (for freight transport)
1.2.1.2F	Ensure a high level of safety for the railway network (for freight transport)
1.2.1.3F	Update the interoperability directives for all components of the network (for freight transport)
1.4.6F	Improve inland waterway transport (for freight transport)
1.4.7F	Develop a European maritime traffic management system (for freight transport)
1.5.1F	Build and promote multi-modal transport networks and terminals (for freight transport)
1.5.4F	Standardise transport units and freight loading techniques (for freight transport)
6.7F	Increase service frequency for non-road modes (for freight transport)
3.1.2F	Harmonise rules governing checks and penalties concerning speeding in international commercial transport on the trans-European road network (for freight transport)
3.2.2F	Establish an infrastructure charging system (for freight transport)
3.2.3F	Establish uniform taxation for commercial road transport fuel (for freight transport)
4.5F	Develop an EU satellite navigation system (Galileo) (for freight transport)
6.2F	Increase / make uniform time windows (for freight transport)
6.3F	Subsidise environmentally friendly transport modes (for freight transport)
6.6F	Subsidise rail transport (for freight transport)

Results From Freight Non-Urban Policy Runs (2nd Level Goals, European Level)

	IMPROVE ROAD SECTOR			REVITALIZE RAILWAYS	ADAPT MARITIME IWW	
	Pay full costs	Reduce air pollution	Reduce road congestion	Increase energy efficiency	Increase use of rail (Reduce use of roads)	Increase use of IWW (Reduce use of roads)
1.1.1F	102	101	101	100	107	102
1.1.2F	99	101	101	100	108	102
5.21F	101	99	99	100	93	98
1.2.1.1F	100	100	100	100	103	99
1.2.1.2F	100	100	100	100	103	99
1.2.1.3F	100	101	100	100	106	99
1.4.6F	100	100	100	100	100	101
1.4.7F	100	100	100	100	99	100
1.5.1F	98	102	102	100	109	101
1.5.4F	98	102	102	100	118	98
6.7F	100	100	100	100	101	100
3.1.2F	100	100	100	100	101	100
3.2.2F	153	105	105	100	126	109
3.2.3F	107	105	105	100	126	109
4.5F	101	99	99	100	95	99
6.2F	101	99	99	100	93	98
6.3F	90	115	113	100	179	85
6.6F	93	111	110	100	200	74

Best and Runner-Up Freight Non-Urban Policies

Second-Level Goal	Best Policy	Runner-up Policies
Pay full costs	3.2.2F	3.2.3F
Reduce air pollution	6.3F 6.6F	3.2.2F 3.2.3F
Reduce road congestion	6.3F 6.6F	3.2.2F 3.2.3F
Increase energy efficiency		
Increase use of railways	6.6F 6.3F	3.2.2F 3.2.3F 1.5.4F 1.5.1F 1.1.2F 1.1.1F 1.2.1.3F
Increase use of inland waterways	3.2.2F 3.2.3F	

Best and Runner-Up Freight Non-Urban Policies

Second-Level Goal	Best Policy	Runner-up Policies
Pay full costs	3.2.2F	3.2.3F
Reduce air pollution	6.3F	3.2.2F
	6.6F	3.2.3F
Reduce road congestion	6.3F	3.2.2F
	6.6F	3.2.3F
Increase energy efficiency		
Increase use of railways	6.6F	3.2.2F
	6.3F	3.2.3F
		1.5.4F
		1.5.1F
		1.1.2F
		1.1.1F
		1.2.1.3F
Increase use of inland waterways	3.2.2F	
	3.2.3F	

- Charging (3.22F or 3.23F) increase lorry costs by 18% (infrastructure or taxation)
- Subsidization of environmentally friendly modes (6.3F) or rail (6.6F)

Results From Freight Non-Urban Policy Runs

	IMPROVE ROAD SECTOR				REVITALIZE RAILWAYS	ADAPT MARITIME IWW
	<i>Pay full costs</i>	<i>Reduce air pollution</i>	<i>Reduce road congestion</i>	<i>Increase energy efficiency</i>	<i>Increase use of rail (Reduce use of roads)</i>	<i>Increase use of IWW (Reduce use of roads)</i>
1.1.1F	102	101	101	100	107	102
1.1.2F	99	101	101	100	108	102
5.21F	101	99	99	100	93	98
1.2.1.1F	100	100	100	100	103	99
1.2.1.2F	100	100	100	100	103	99
1.2.1.3F	100	101	100	100	106	99
1.4.6F	100	100	100	100	100	101
1.4.7F	100	100	100	100	99	100
1.5.1F	98	102	102	100	109	101
1.5.4F	98	102	102	100	118	98
6.7F	100	100	100	100	101	100
3.1.2F	100	100	100	100	101	100
3.2.2F	153	105	105	100	126	109
3.2.3F	107	105	105	100	126	109
4.5F	101	99	99	100	95	99
6.2F	101	99	99	100	93	98
6.3F	90	115	113	100	179	85
6.6F	93	111	110	100	200	74

Infrastructure charging system

Taxation for commercial road transport fuel

Results From Freight Non-Urban Policy Runs

Bigger trucks for long-haul transport

	IMPROVE ROAD SECTOR				REVITALIZE RAILWAYS	ADAPT MARITIME IWW
	<i>Pay full costs</i>	<i>Reduce air pollution</i>	<i>Reduce road congestion</i>	<i>Increase energy efficiency</i>	<i>Increase use of rail (Reduce use of roads)</i>	<i>Increase use of IWW (Reduce use of roads)</i>
1.1.1F	102	101	101	100	107	102
1.1.2F	99	101	101	100	108	102
5.21F	101	99	99	100	93	98
1.2.1.1F	100	100	100	100	103	99
1.2.1.2F	100	100	100	100	103	99
1.2.1.3F	100	101	100	100	106	99
1.4.6F	100	100	100	100	100	101
1.4.7F	100	100	100	100	99	100
1.5.1F	98	102	102	100	109	101
1.5.4F	98	102	102	100	118	98
6.7F	100	100	100	100	101	100
3.1.2F	100	100	100	100	101	100
3.2.2F	153	105	105	100	126	109
3.2.3F	107	105	105	100	126	109
4.5F	101	99	99	100	95	99
6.2F	101	99	99	100	93	98
6.3F	90	115	113	100	179	85
6.6F	93	111	110	100	200	74

A Few Policy Conclusions (European Level)

- An effective policy for realizing the goals for both passenger and freight transport, is to increase the price for using the road infrastructure.
- A policy based on charges appears to perform better than a policy of providing subsidies.
- Improving the level of service for road freight transport is not a good way to achieve the goals. It attracts transport from rail and inland waterways, and therefore leads to more truck kilometers.
- There appear to be only small variations in the size of the policy effects across the various countries and regions of Europe, which suggests that the EC could implement these policies Europe wide.

Further Information

- [SUMMA Final Report:](http://www.tmlleuven.be/project/summa/summa-d5.pdf)
<http://www.tmlleuven.be/project/summa/summa-d5.pdf>
- Warren E. Walker, S. Adnan Rahman, Rik van Grol, and Lisa Klautzer, "Operationalizing the Concept of Sustainable Transport and Mobility", *Environmental Practice*, Vol. 8, Issue 1 (March 2006), pp. 24-48. [doi 10.1017/S1466046606060029]
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