Ricardo
Energy & Environment
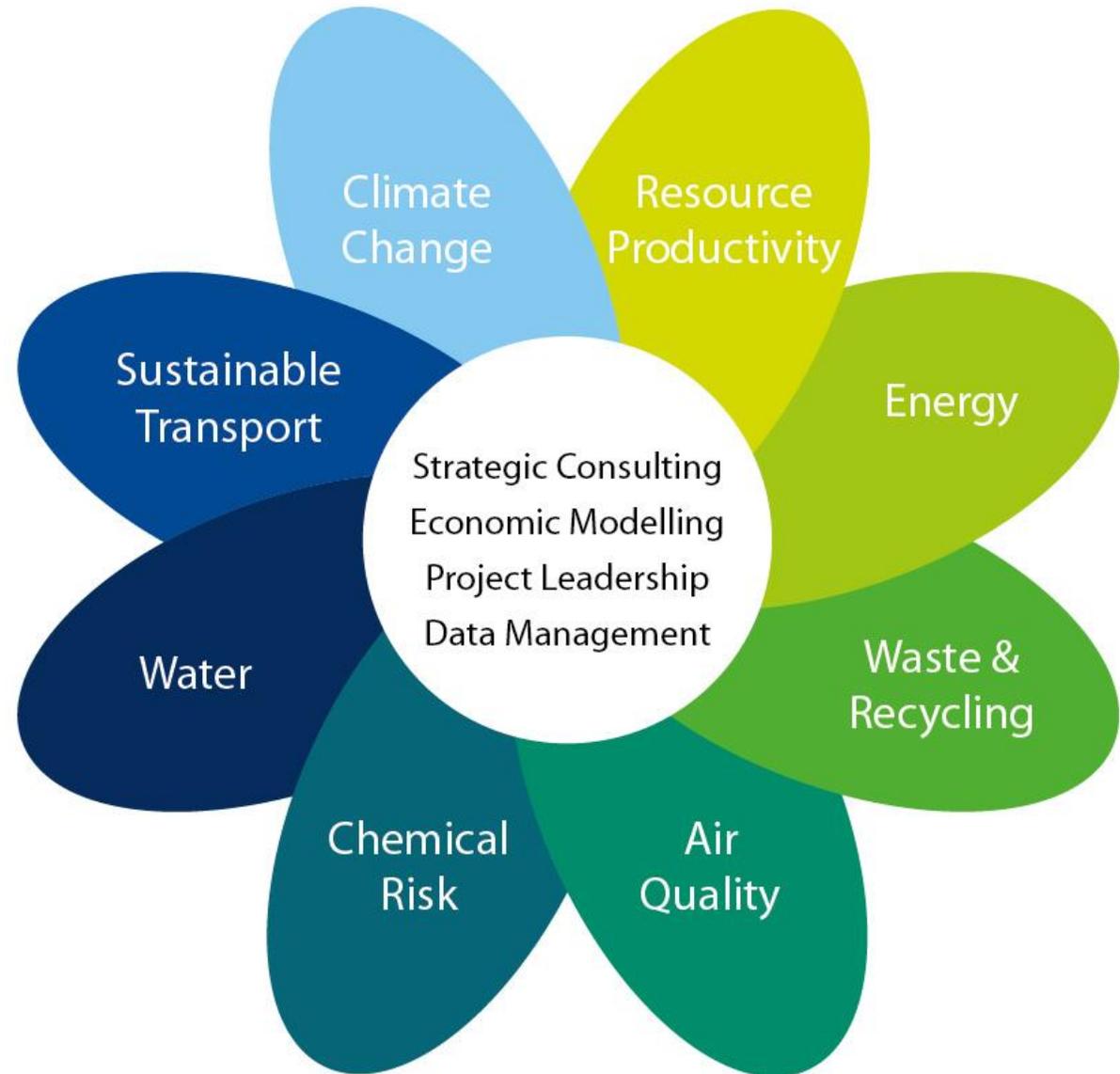
DG MOVE C-ITS deployment study

Presentation for Midlands Intelligent Mobility Conference

24/01/2018

Overview of Ricardo Energy & Environment

- Internationally-renowned consultancy
- Heritage of world-leading scientific/technical capability
- Providing analysis and solutions for major environmental challenges
- Client base of international governments and businesses
- Headquartered at Harwell Science Park, near Oxford
- Over 450 scientists and technical staff
- Part of Ricardo PLC

Climate Change

Resource Productivity

Sustainable Transport

Energy

Strategic Consulting
Economic Modelling
Project Leadership
Data Management

Water

Waste & Recycling

Chemical Risk

Air Quality

Background and purpose of the study

Background

- In recognition of the high potential of C-ITS, the **European Commission has taken the initiative to develop a strategy on the deployment of C-ITS**.

- To support the shaping of this strategy the Commission has set up a dedicated C-ITS Platform.

- Aim of the Platform is to build **shared vision of options for overcoming issues which hamper the co-ordinated deployment of C-ITS across the EU**.
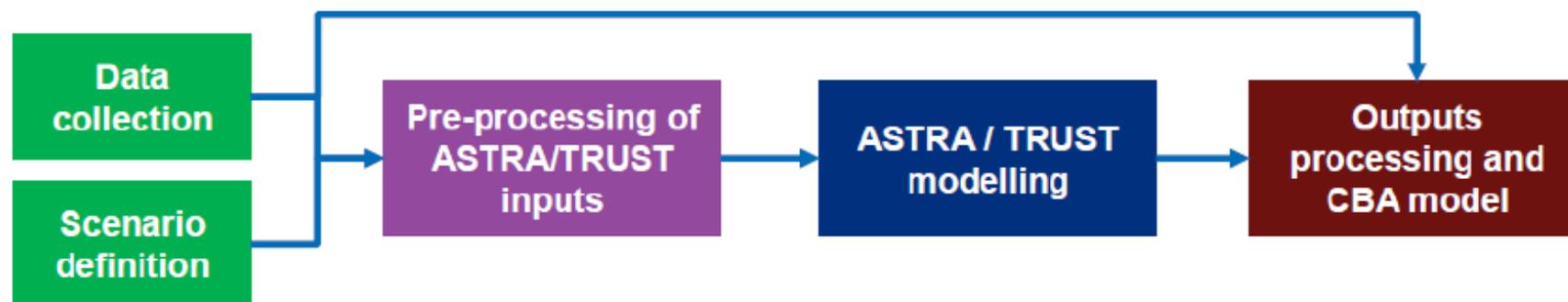
Aims of the study

- **The C-ITS deployment study supports the development of this shared vision** and a common deployment strategy.

- Aim to assess **benefits and costs** from a series **of potential European C-ITS deployment scenarios**.

- Outputs of study provide guidance to DG MOVE on relative impact of different C-ITS services and paces for deployment – for inclusion in a 2016 communication.

- **First major study to evaluate impact of full range of C-ITS services** to Europe.

Methodology overview

Three key elements to the methodology

- **Data collection**:
  - Extensive literature review
  - Close consultation with industry experts
- **Modelling**:
  - European transport system model to estimate overall European-level benefits and costs of C-ITS services under different deployment conditions.
  - Outputs: economic impact, travel time, accidents, AQ, fuel consumption.

- **Case studies**: international case studies to identify best practice and lessons learned elsewhere which may be relevant to the EU

Various modelling steps required to process scenario uptake levels

Data collection

Scenario definition

Pre-processing of ASTRA/TRUST inputs

ASTRA / TRUST modelling

Outputs processing and CBA model

Scenario development

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Bundles of services defined

| Service bundle	C-ITS Services	Rationale
Bundle 1 Day 1, V2V, ITS-G5	• Emergency brake light • Emergency vehicle approaching • Slow or stationary vehicle(s) • Traffic jam ahead warning • Hazardous location notification	• Day 1 safety-based V2V services based on ITS-G5 communication, likely to be deployed to vehicles supported by US legislation
Bundle 2 Day 1, V2I, mainly applicable to motorways	• In-vehicle signage • In-vehicle speed limits • Probe vehicle data • Shockwave damping • Road works warning • Weather conditions	• Day 1 V2I, services that deliver most benefit to motorways. Some services listed here may also be applicable to other road types
Bundle 3 Day 1, V2I, mainly applicable to urban areas	• Green Light Optimal Speed Advisory (GLOSA) / Time To Green (TTG) • Signal violation/Intersection safety • Traffic signal priority request by designated vehicles	• Day 1 V2I, services expected to only be applicable in urban areas. Therefore, these services are in a separate bundle to those in Bundle 2
Bundle 4 Day 1.5, V2I, Parking Information	• Off street parking information • On street parking management and information • Park & Ride information • Information on AFV fuelling & charging stations	• C-ITS services intended to provide information regarding parking (and refuelling) to drivers
Bundle 5 Day 1.5, V2I, Traffic and other information	• Traffic information and smart routing	• C-ITS services intended to provide traffic information to drivers
Bundle 6 Day 1.5, Freight specific services	• Loading zone management • Zone access control management	• Zone management services
Bundle 7 Day 1.5, V2X (mainly applicable to urban areas), likely to be ITS-G5	• Vulnerable road user protection (pedestrians and cyclists)	• V2X service expected to be post day 1. Communication method is likely to be ITS-G5. Main benefits are likely to be seen in urban areas.
Bundle 8 Day 1.5, V2V, likely to be ITS-G5	• Cooperative collision risk warning • Motorcycle approaching indication	• Post day 1 V2V services based on ITS-G5
Bundle 9 Day 1.5, V2I	• Wrong way driving	• Post day 1 V2I service. As for Day 1 services

Scenarios defined with increasing ambition

		TEN-T Corridors	TEN-T Core	TEN-T Comprehensive	Non m-way non urban	Urban	Services
V	Personal transport	A	A	A	A	A	Emergency brake light Emergency vehicle approaching Slow or stationary vehicle(s) Traffic jam ahead warning Hazardous location notification
	Public transport	C	C	C	C	C	
	Freight	A	A	A	A	A	
I	Personal transport	B	B	C	C/D	C	Road works warning Weather conditions In-vehicle signage In-vehicle speed limits Probe vehicle data Shockwave damping
	Public transport						
	Freight	B	B	C	C/D	C	
I	Personal transport				C/D	C	GLOSA/TTG Signal violation/Intersection safety Traffic signal priority request by designated vehicles
	Public transport				C/D	C	
	Freight				C/D	C	
I	Personal transport	D	D	E	E	C	Off street parking information On street parking management and information Park & Ride information Information on fuelling & charging stations for AFVs
	Public transport						
	Freight	E	E	E	E	C	
I	Personal transport	A	A	B	C/D	C	Traffic information & smart routing
	Public transport						
	Freight	B	B	B	C/D	C	
I	Personal transport					D	Loading zone management Urban zone access control
	Public transport						
	Freight	D	D			D	
X	Personal transport				E	E	Vulnerable road user protection
	Public transport				E	E	
	Freight				E	E	
V	Personal transport	E	E	E	E	E	Motorcycle approaching indication Cooperative collision risk warning
	Public transport	E	E	E	E	E	
	Freight	E	E	E	E	E	
I	Personal transport	E	E	E		E	Wrong way driving
	Public transport						
	Freight	E	E	E		E	

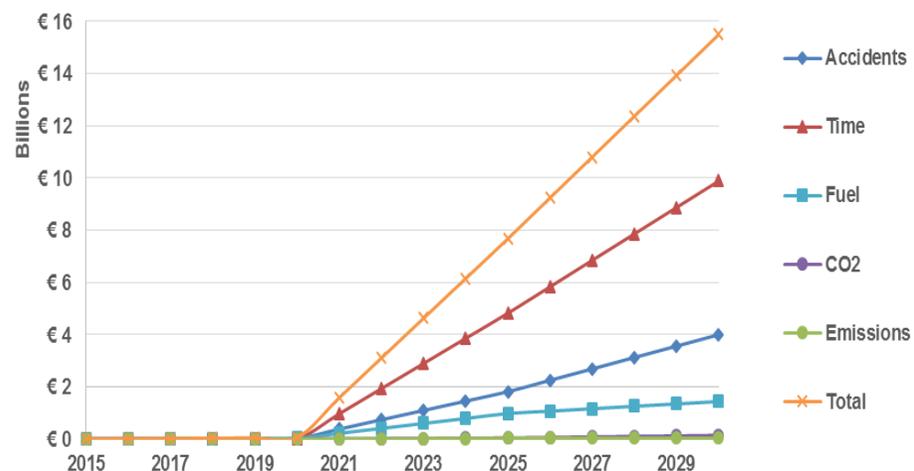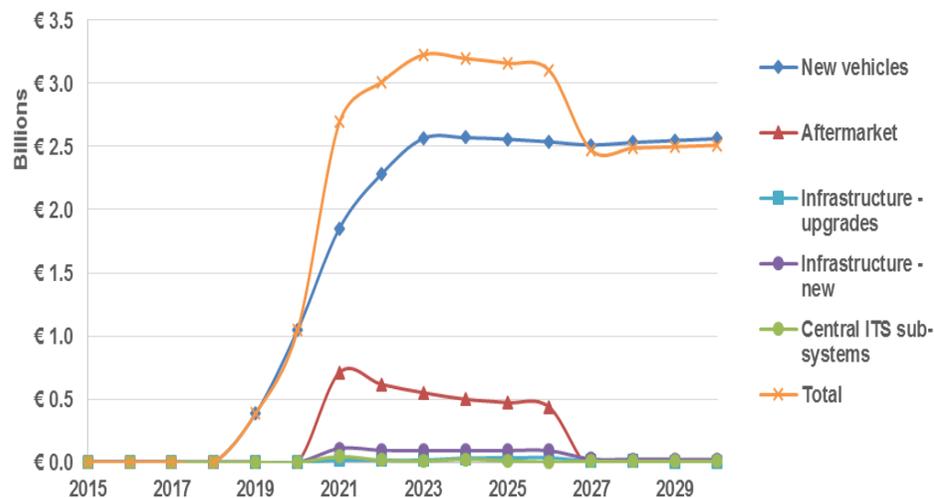# Reasonably aggressive 'central' scenario defined in consultation with stakeholders

Deployment levels from 'central' scenario
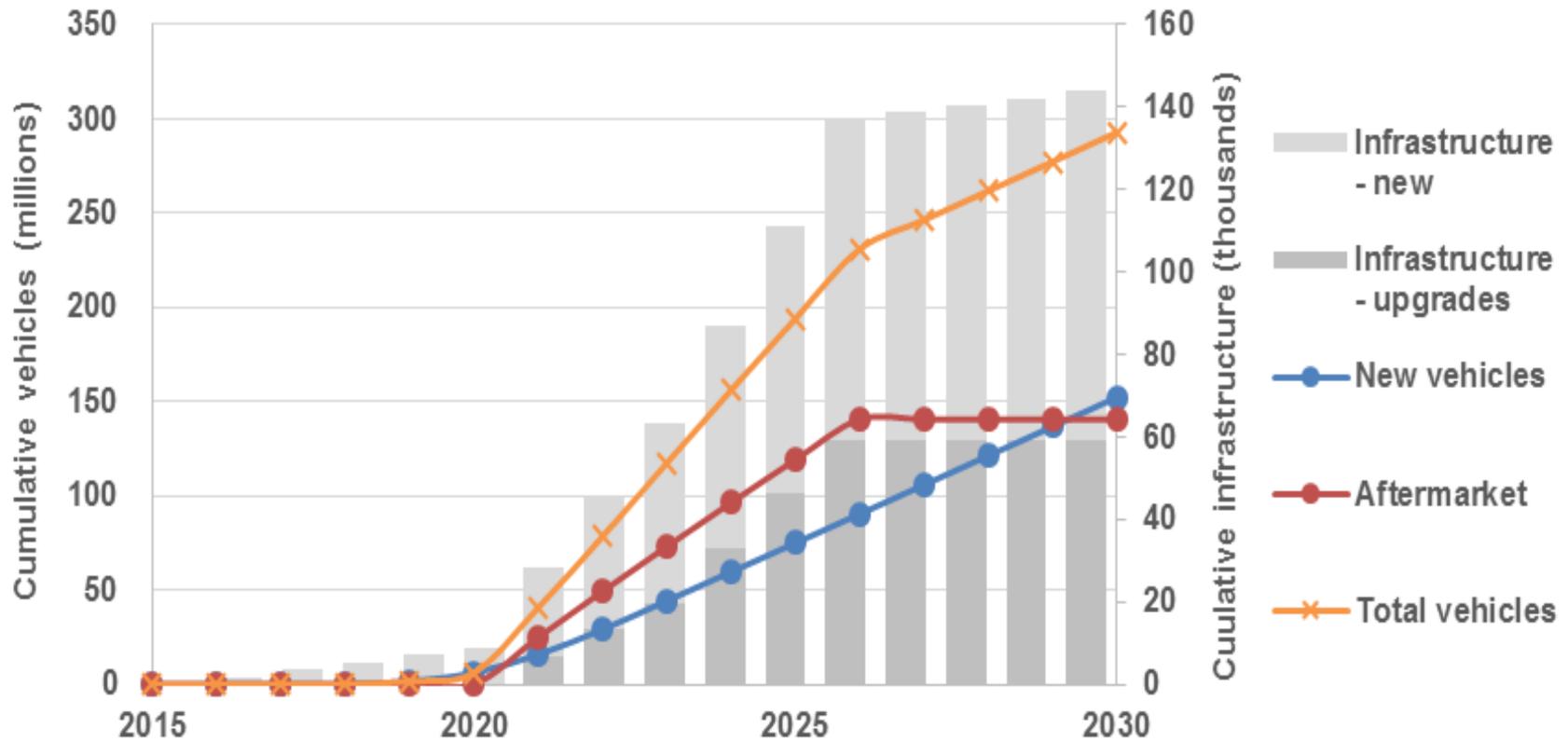
Overview of some of the key CBA outputs (1 of 2)

Modelling outputs highlights

- **Costs:**
  - Total annual costs peak at c. €3.2bn per year in mid-2020s,
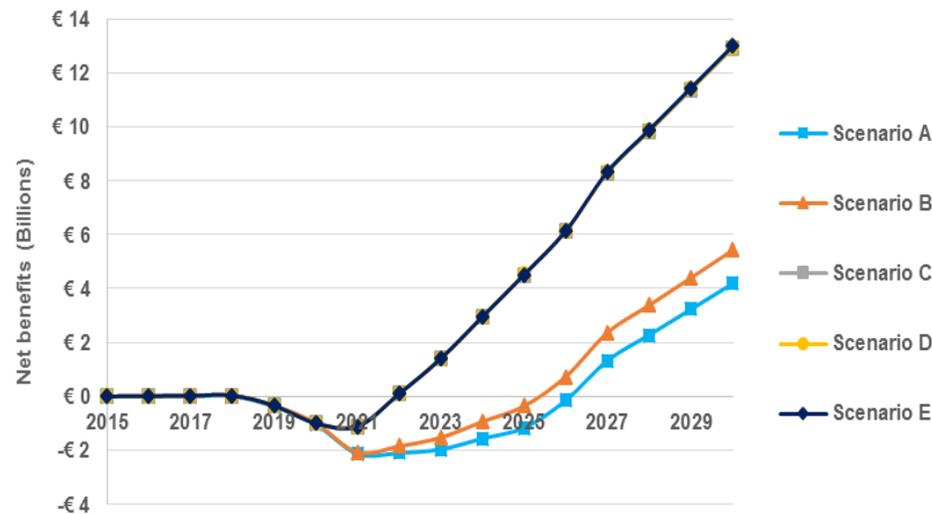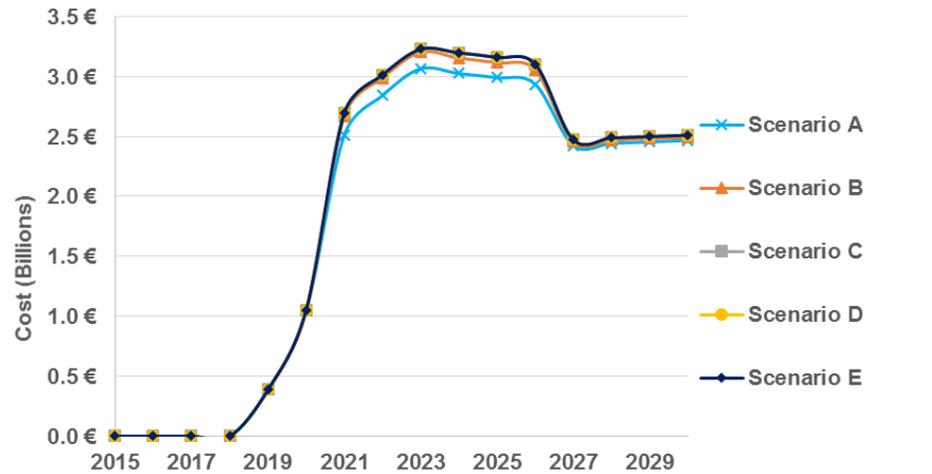 - Dominated by in-vehicle and aftermarket equipment costs

- **Benefits:**
  - Total annual benefits rise to c. €15bn per year by 2030,
  - Dominated by value of time and accident-related health benefits

- **Benefit-cost ratio**: High overall BCRs achieved = 6 for Scenario 'E' central
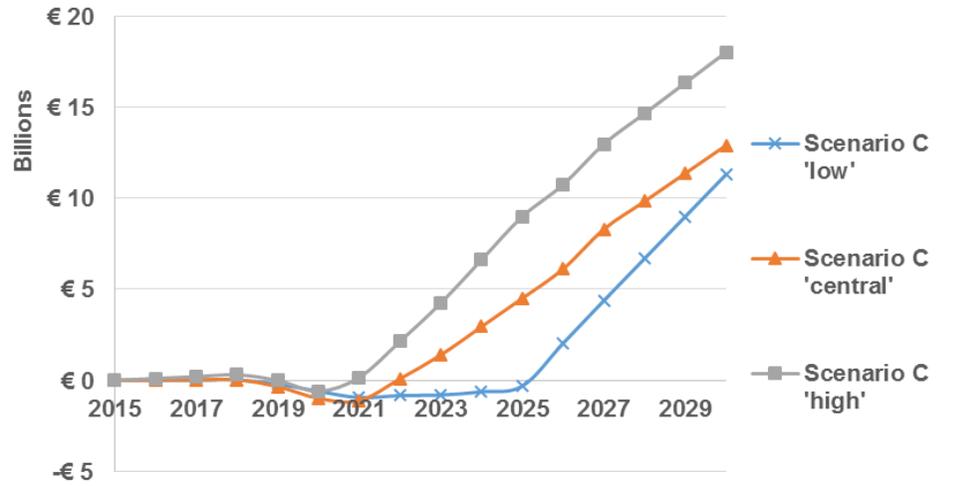
Overview of some of the key CBA outputs (2 of 2)

Modelling outputs highlights

- Significant improvement in BCRs between scenarios:
  - Minimal variation in costs
  - Large variation in benefits
- Very strong benefit of deploying via cellular networks in 'high' scenario:
  - Network effects sufficient to offset additional data costs

Key conclusions from the cost-benefit-analysis

Conclusion 1

- **Small number of cost and benefit categories dominate overall BCR:**
  - Costs: in-vehicle hardware costs dominate, limited infrastructure costs
  - Benefits: travel time and accident-related benefits dominate

Conclusion 2

- **Significant benefit from deploying more services** due to initial investment costs:
  - Additional services enable additional benefits with minimal costs

Conclusion 3

- **Faster deployment results in faster break-even** due to 'network' effects:
  - Clear benefits of targeting more rapid rollout for vehicles and supporting high levels of infrastructure coverage
  - This will enable quicker payback periods and higher overall benefits

Conclusion 4

- **Using cellular networks** to provide V2I services **can have immediate benefits**
  - Very high infrastructure coverage achieved from day 1
  - Faster ramp-up of benefits in early years of deployment
  - Earlier cashflow break-even

Recommendations for continued work to support C-ITS deployment

Recommendation 1: coordinated action

- C-ITS deployment highly beneficial at EU level, but **coordinated action required** to support successful deployment.

- Key stakeholders include:
  - **Standards bodies**: ensuring interoperability between regions
  - **Industry**: strong coordination to overcome 'chicken and egg'
  - **Consumers**: engage to promote benefits, encourage adoption
  - **Highways agencies/urban transport authorities**: local business cases
  - **Governments**: highlight benefits to decision makers, support deployment

Recommendation 2: additional research

- **Additional evidence is required in a number of fields** to support the deployment of C-ITS:

  - **Hybrid cellular / DSRC comms.**

  - **Urban-focused services**

  - **Personal and central ITS sub-systems,** performance, associated costs and the business case

  - **Local/regional benefits and business cases** for deploying C-ITS

  - Further research into costs and impacts for **non-passenger cars**

  - **Overlapping services**: further evaluate impact of similar services

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