



## Development, assessment and costs of Options for Monitoring and Reporting of HDVs

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Main objective: Ensuring a better understanding of the level of and trends in CO<sub>2</sub> emissions from whole HDVs registered in the EU.

➔ By means of Monitoring and Reporting: i.e. the process of data collection, reporting the data and monitoring of trends from the data, of CO<sub>2</sub> emissions from the EU fleet of HDVs.

- Cost-benefit analysis of options for the certification and reporting of Heavy-Duty Vehicle (HDV) fuel consumption and CO<sub>2</sub> emissions" implementing Framework Contract no. CLIMA.C2/FRA/ 2013/0007, service request 1
- Tasks for SR 1: to define and assess the options for Monitoring and Reporting (TNO) and define indicative costs (ICCT).

- Part 1: Definition and assessment of options for monitoring and reporting (TNO)
- Part 2: Costs of monitoring and reporting (ICCT)

- Options were defined in three dimensions on top of a baseline option. This was done using the feedback from the stakeholders and the EC as received during the stakeholder consultation phase.
- The baseline option (M1) sets minimum requirements needed to achieve the general goals of the EC for M+R.
- The three dimensions for which further options have been defined on top of M1:
  - Quantity and subject of the data
  - Responsible entities for data reporting
  - Modernisation of data management

- **M1 Baseline option** (minimum requirements)
  - Based on the current process for M+R of CO<sub>2</sub> of M1 and N1
  - Technical data and CO<sub>2</sub> emissions are collected from TA/certification documents by the MS registration authorities for each vehicle registered in a MS in a CY. This data is annually reported by each MS to the EC/EEA who builds a database (performs checks on the database together with vehicle OEMs) and calculates cross-sections and trends of the data.
  - CO<sub>2</sub> metric that informs about CO<sub>2</sub> per utility (g / ton . km) on top of the standard g/km.
  - Matrix of conditions of usage (mission profiles and payloads)
  - Basic technical data (masses, dimensions, axles, ...), data that defined utility, vehicle identifying number, category, OEM...

- **M2 options**
- Extend on the baseline option regarding the quantity and subject of data to be monitored:

- M2.1 VECTO input data.

CdxA,  $\eta$ , engine map, rr...

- M2.2 Multi-stage vehicles.

Bodybuilders to determine the CO<sub>2</sub> emission of the completed vehicle by means of an optional second stage certification.



- M2.3 Trailers.

Technical data of trailers.



- **M3 options**
- Consider different possibilities to collect and report data, which involves different entities and thus affect responsibilities!:
  - M3.1 Hybrid approach: MS + OEMs
    - MS report VINS of registered vehicles, vehicle OEMs report VINS, CO<sub>2</sub> and technical data to EC/EEA
  - M3.2 Hybrid approach: MS + TAA
    - MS report VINS of registered vehicles, TAA report VINS, CO<sub>2</sub> and technical data to EC/EEA
  - M3.3 OEMs self monitoring
    - OEMS annually report CO<sub>2</sub> and technical data of vehicles sold in the EU

- **M4 options**
- Consider improvements for data management with a main goal to handle the additional data records required to monitor HDVs, to harmonize the process, to reduce errors and in the longer term to reduce effort and costs:
  - M4.1 Digitalization
  - Currently not the case for all TAA, MS. Handwritten documents have lead to errors.
  - M4.2 Database
    - e.g. already under development by EREG



- Qualitative: pro et contra (in the report), accuracy, timeline, comparability, feasibility, stakeholder preference (TNO+ICCT)
- Indicative costs (ICCT)

# Results qualitative assessment

M1 is the baseline option M2 options are additions to M1 regarding data subject and quantity M3 options have differences in responsibilities for data reporting compared to M1 M4 are modernisation options on top of M1		Timeline	Comparability	Feasibility	Accuracy	Stakeholder preference	Notes
<b>M 1</b>	Baseline	Green	Yellow	Green	Yellow	Green	Stakeholders generally positive towards this option regarding monitoring individual HDV and extended technical data
<b>M 2.1</b>	Data: VECTO	Green	Yellow	Green	Yellow	Red	Confidentiality issues mentioned by vehicle OEMs
<b>M 2.2</b>	Data: MSV	Red	Green	Red	Green	Yellow	Complex, time needed to further explore, assess issues
<b>M 2.3</b>	Data: Trailers	Red	Green	Red	Green	Yellow	Lack of harmonization for data collection
<b>M 3.1</b>	MS + vehicle OEM	Yellow	Grey	Yellow	Green		To be further elaborated, explored and discussed with stakeholders
<b>M 3.2</b>	MS + TAA	Yellow	Grey	Yellow	Green		To be further elaborated, explored and discussed with stakeholders
<b>M 3.3</b>	Vehicle OEM self-monitoring	Yellow	Grey	Yellow	Yellow		To be further elaborated, explored and discussed with stakeholders
<b>M 4.1</b>	Digitalization	Red	Grey	Green	Green		Seen by some TAA and the EC as improvement for data transparency and accuracy but time is needed for implementation
<b>M 4.2</b>	Database	Red	Grey	Green	Green		Seen by some TAA and the EC as good solution in the long term for data handling and storage

Green: generally no issues, good with regard to criterion, orange: significant less performance on the criterion and/or issues with regard to the criterion, less preferred. Red: least performance, serious issues with regard to the criterion, not preferred.  
Grey: not a relevant criterion for the option. White: not addressed in the study.

- A number of options has been defined on top of a baseline option. These have an impact on monitoring accuracy, stakeholder responsibility and costs to the stakeholders.
- The baseline option has minimum requirements for monitoring the CO<sub>2</sub> emissions of whole individual HDVs and is designed, taking account of the feedback from the stakeholders and the EC.
- M2 options extend in terms of data type and amount to make the monitoring more accurate and give more detailed insight in trends. In case of MSV and trailers this adds complexity and costs. Further investigation is needed. It could be considered to implement this at a later stage. The VECTO data option is not supported by OEMs due confidentiality issues.

- M3 options have an impact on who is responsible in the reporting process. The hybrid options distribute responsibilities while the OEM self reporting puts it with the vehicle OEM. These options need to be further discussed with SH.
- M4 options can probably not be implemented on a short term but it is advised to consider them for the longer term and start discussions with SH.

- Part 1: definition and assessment of options for monitoring and reporting (TNO)
- Part 2: Costs of monitoring and reporting (ICCT)

## Methodology

1. Determining which cost components are relevant to the baseline (M1), different sub-options.
2. Evaluating the cost associated with each component (limited point estimates, semi-quantitative approach).
3. Aggregating and allocating the costs for selected option combinations and stakeholder types (inclusion of Member States, EC/EEA).

## ■ Generic cost structure for “M” options

Cost component	Sub-component description
<b>Data infrastructure investment costs</b> [Transition costs, in EUR]	<b>Database development costs.</b> The central cost estimate is EUR 420,000 for a large, comprehensive database to cover all the vehicles registered in the European HDV market in one year [estimate from EPA HDV GHG monitoring database]
	<b>Digitalisation costs.</b> These are transition costs required to move from paper records to a fully digital system.
<b>Data management and delivery costs</b> [Annual costs, in EUR/year]	<b>Data management costs.</b> The central cost estimate is EUR 42,000 for a large, comprehensive database to cover all the vehicles registered in the European HDV market in one year.
	<b>Data delivery costs.</b> These are transaction costs derived from transferring data between stakeholders. The costs are assumed to accrue to the provider of the data, not the recipient. They are estimated on the basis of the staff time required to process the data records. <ul style="list-style-type: none"> <li>• The time required to process an individual vehicle record using an automated system (fully digitalised forms, harmonised databases) is negligible (data delivery costs are zero).</li> <li>• The time required to process an individual vehicle record using a semi-manual is estimated as 1/3 of an hour. Hourly staff rates are estimated at 30 EUR/hour.</li> <li>• Data delivery costs do not scale with data complexity (they are not affected by the application of the M2 sub-options).</li> </ul>
	<b>Reporting costs.</b> These are costs incurred by EEA/EC for reporting to the public. These are assumed to be equivalent to 1 full-time equivalent additional staff (or EUR 60,000 per year), as estimated from the requirements of the European LDV monitoring scheme.

- Cost structure for “M” options: assumptions

Option	Assumption
<b>M1</b> <b>Baseline option</b>	This is an adaptation of the scheme already in place for M1 and N1 vehicles with some special requirements for use with HDV. Most of the costs associated to the baseline are incurred regardless of the combination with any of the M2, M3 or M4 sub-options.
<b>M2</b> <b>Quantity of data</b> M2.1: all input data from VECTO M2.2: data of completed vehicles M2.3: data of trailers	These sub-options are not mutually exclusive. Each one of them implies an increased volume of data to be handled has an impact upon the cost of database development, and it also increases transaction and reporting costs.
<b>M3</b> <b>Responsibilities</b> M3.1: MS+OEM M3.2: MS+TAA M3.2: OEM	These sub-options are mutually exclusive. They are assumed to have the effect of shifting transaction costs among stakeholders.
<b>M4</b> <b>Modernisation of IT</b> 4.1 Fully digitalised system 4.2 Centralised database	These sub-options are not mutually exclusive. The expected effect of these sub-options is to lower the transaction costs associated to data handling.



## Expected qualitative impacts of M options

Options	Data infrastructure investment costs					Data management and delivery costs				
	EEA/ EC	MS	OEM (vehicle)	OEM (component)	OEM (trailer & body)	EEA/ EC	MS	OEM (vehicle)	OEM (componen t)	OEM (trailer & body)
<b>M1 (baseline)</b>	-	-	-	-	-	-	-	-	-	-
<b>M2.1 (all input data from VECTO)</b>	↑	↑	↑	↑	-	↑	↑	↑	↑	-
<b>M2.2 (data of completed vehicles)</b>	-	-	-	-	↑	-	-	-	-	↑
<b>M2.3 (data of trailers)</b>	↑	↑	-	-	↑	↓	↓	-	-	↑
<b>M3.1 (responsibilities: MS + OEM)</b>	-	-	-	-	-	-	↓	↑	-	-
<b>M3.2 (responsibilities: MS + TAA)</b>	-	-	-	-	-	-	↑	↓↓	-	-
<b>M3.3 (responsibilities: OEM)</b>	-	↓	↑	↑	-	-	↓	↑	-	-
<b>M4.1 (fully digitalised system)</b>	↑	↑	↑	↑	↑	↓	↓	↓↓	↓	↓
<b>M4.2 (centralised database)</b>	↑↑	↓	↑	↑	↑	↓	↓↓	↓↓	↓	↓

- Estimated costs for selected M options: vehicle OEMs

	Transition costs		Annual costs	
	Large OEM	Medium OEM	Large OEM	Medium OEM
<b>M1</b>	€ 52 162	€ 24 475	€ 443 053	€ 207 885
<b>M2.1</b>	€ 59 986	€ 28 146	€ 473 053	€ 221 961
<b>M3.1</b>	€ 52 162	€ 24 475	€ 473 053	€ 221 961
<b>M3.2</b>	€ 52 162	€ 24 475	€ 30 000	€ 14 076
<b>M3.3</b>	€ 78 243	€ 36 712	€ 503 053	€ 236 038
<b>M4.1</b>	€ 104 323	€ 48 950	€ 30 000	€ 14 076
<b>M4.1+4.2</b>	€ 104 323	€ 48 950	€ 30 000	€ 14 076

Total costs

	Transition costs		Annual costs	
	Large OEM	Medium OEM	Large OEM	Medium OEM
<b>M1</b>	€ 1.36	€ 1.36	€ 11.57	€ 11.57
<b>M2.1</b>	€ 1.57	€ 1.57	€ 12.35	€ 12.35
<b>M3.1</b>	€ 1.36	€ 1.36	€ 12.35	€ 12.35
<b>M3.2</b>	€ 1.36	€ 1.36	€ 0.78	€ 0.78
<b>M3.3</b>	€ 2.04	€ 2.04	€ 13.13	€ 13.13
<b>M4.1</b>	€ 2.72	€ 2.72	€ 0.78	€ 0.78
<b>M4.1+4.2</b>	€ 2.72	€ 2.72	€ 0.78	€ 0.78

Costs per  
vehicle sold

## Estimated costs for selected M options: Member States

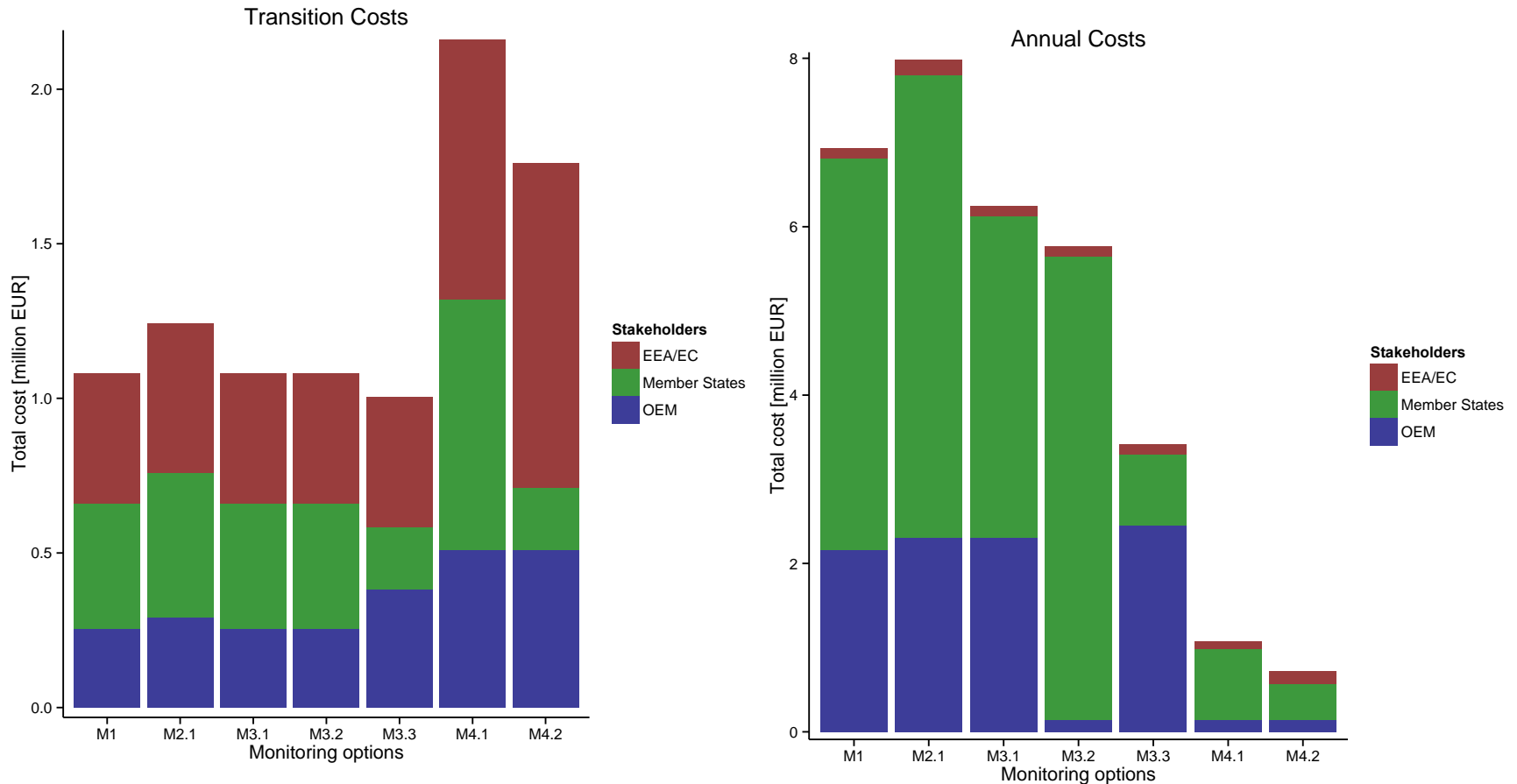
	Transition costs		Annual costs	
	Large MS	Small MS	Large MS	Small MS
<b>M1</b>	€ 68 087	€ 6 809	€ 560 000	€ 110 000
<b>M2.1</b>	€ 78 300	€ 7 830	€ 590 000	€ 140 000
<b>M3.1</b>	€ 68 087	€ 6 809	€ 530 000	€ 80 000
<b>M3.2</b>	€ 68 087	€ 6 809	€ 590 000	€ 140 000
<b>M3.3</b>	€ 34 043	€ 3 404	€ 30 000	€ 30 000
<b>M4.1</b>	€ 136 174	€ 13 617	€ 30 000	€ 30 000
<b>M4.1+4.2</b>	€ 34 043	€ 3 404	€ 15 000	€ 15 000

Total costs

	Transition costs		Annual costs	
	Large MS	Small MS	Large MS	Small MS
<b>M1</b>	€ 1.36	€ 1.36	€ 11.20	€ 22.00
<b>M2.1</b>	€ 1.57	€ 1.57	€ 11.80	€ 28.00
<b>M3.1</b>	€ 1.36	€ 1.36	€ 10.60	€ 16.00
<b>M3.2</b>	€ 1.36	€ 1.36	€ 11.80	€ 28.00
<b>M3.3</b>	€ 0.68	€ 0.68	€ 0.60	€ 6.00
<b>M4.1</b>	€ 2.72	€ 2.72	€ 0.60	€ 6.00
<b>M4.1+4.2</b>	€ 0.68	€ 0.68	€ 0.30	€ 3.00

Costs per monitored vehicle

## Estimated costs for selected monitoring and reporting options: all stakeholders



Assumptions for comprehensive cost calculations: 3.5 large MS, 24.5 small; 3 large vehicle OEMs, 4 medium OEMs

### Monitoring “M” options

1. The final formulation of “M” options have not been fully assessed with the stakeholders and therefore additional consultation may be required.
2. Cost estimates for “M” were derived from a very limited consultation with US EPA and EEA, complemented with a semi-quantitative analysis.
3. Investments to improve data exchange operations (M4 sub-options) benefit all stakeholders in the long run.
4. Annual costs for all stakeholders together are in the range of 0.5 million to 8 million EUR. In addition there are transition costs in the range of 1 to 2 million.

**Thank you for your attention!**