Identification and evaluation of errors in the CO$_2$ monitoring database established under art.8 of Regulation (EC) No 443/2009

Service request #5 for Framework Contract on Vehicle Emissions
Framework Contract No ENV.C.3./FRA/2009/0043

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<td>Austria</td>
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<tr>
<td>BE</td>
<td>Belgium</td>
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<tr>
<td>BG</td>
<td>Bulgaria</td>
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<td>CoC</td>
<td>Certificate of Conformity</td>
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<td>CY</td>
<td>Cyprus</td>
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<td>CZ</td>
<td>Czech Republic</td>
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<td>EU</td>
<td>European Union</td>
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<td>EWVTA</td>
<td>European Whole Vehicle Type Approval</td>
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<td>IT</td>
<td>Italy</td>
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<td>IVA</td>
<td>Individually Approved Vehicles</td>
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<td>LU</td>
<td>Luxembourg</td>
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<td>LV</td>
<td>Latvia</td>
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<td>MS</td>
<td>Member State</td>
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<td>MT</td>
<td>Malta</td>
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<td>NL</td>
<td>Netherlands</td>
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<td>NSS</td>
<td>National Small Series Vehicles</td>
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<tr>
<td>OEM</td>
<td>Original Equipment Manufacturer</td>
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<td>PL</td>
<td>Poland</td>
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<td>SK</td>
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<tr>
<td>TVV</td>
<td>Type, Variant and Version</td>
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<td>UK</td>
<td>United Kingdom</td>
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<tr>
<td>VIN</td>
<td>Vehicle Identification Number</td>
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1 INTRODUCTION

The European Union has committed itself to a 20% reduction of its greenhouse gas emissions, and of 30% in case other major economies make comparable efforts. Transport is one of the main emitting sectors, and the only one that continues to grow substantially. Road transport is responsible for the majority of the overall transport emissions, and the EU strategy to reduce CO₂ emissions from light-duty vehicles sets out a number of measures to achieve this objective. Regulation (EC) No 443/2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO₂ emissions from light-duty vehicles adopted in 2009 is the main tool of this strategy and is continuing the CO₂ monitoring as it was implemented in the year 2000 by Decision 1753/2000/EC. Therefore the Commission has 11 years of experience of monitoring CO₂ emissions data and the background system for the data collection as implemented within the Member States. Regulation (EC) No 443/2009 brings in some changes compared to the previous monitoring scheme and gives two years of lead time to verify its correct functioning. Member States have adopted different philosophies while building their registration systems, hence it is relevant to understand all aspects of the monitoring strategy that have not been sufficiently addressed by each Member States and what could be the possible errors that may affect the data delivery for the EU27. Quantification of these issues is relevant in order to estimate the impact the different issues (or errors) might have on manufacturer and EU average CO₂ emissions for different criteria and to identify the responsible entity in charge to implement the monitoring procedures.

Therefore the Commission requires assistance in:

- Collating the knowledge about the MS registration and CO₂ monitoring system in a consistent and structure manner.
- Identifying possible errors within the CO₂ monitoring and its exact location (e.g. registration offices, validation process).
- Description and quantification of occurring errors during data gathering and handling.
- Modifying the monitoring system (e.g. by introducing the VIN number) and evaluating the possible advantages and disadvantages of such changes.
2 TASK 1: SUMMARY OF REGISTRATION PRACTISES IN EU

Following overview is based mainly based on information stemming from Member States gathered during the monitoring activities between 2008 and 2011. DK, UK, RO, LT, AT and HU provided updated information in 2012. Information for CZ and EL were updated based on a Member States visit in 2012. The information for all other MS can be slightly outdated.

2.1 Austria

Short description of the system
The authorized representatives of the car manufacturers compile the CoC-data, send them into the Austrian vehicle approval database and get the national code from EURO TAX. The information is provided in the registration document.

Statistik Austria gets information about registrations from the Austrian Association of Insurances (VVO), which is doing the registrations in Austria.

The data comprise:
- data related to registration (like owner etc)
- technical data from the CoC including CO₂ values
- in case that no CoC is available yet, the individual approval authorities enter the data manually based on type-approval data -

Quality check
The data for every single registration are sent to Statistik Austria. Statistik Austria performs plausibility check (e.g via fuel consumption value or identification of implausible high / implausible low values) and remaining data gaps are mostly filled up by using the national code from EURO TAX (lowest aggregation level: version) and some gaps are also closed also by using internal data, which comprises information about weight, power and engine capacity data. Additionally the data is adapted by adding +75kg for the driver (NB the MRO without driver is stated in the Austrian registration files).
Additional information on specific subjects
IVA and privately imported vehicles are identified by a special field by the VVO. 9 vehicles in 2010. No NSS occurred in 2010.

Summary of data sources
- Predominant source of information for the CO₂ monitoring data according to Regulation (EC) No 443/2009: **mainly COC but also Type approval**
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: **Umweltbundesamt GmbH**
- Existing collaboration with other national institutions: **Austrian Association of Insurances (VVO), Statistik Austria**
- Existing links to databases: **Eurotax**
- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
- Vehicle category (type approved): **not available – AT reports the category of the vehicle registered**
  - Type approval number and its extension
  - manufacturer name: based on the make
  - type:
  - Variant:
Identification and evaluation of errors in the CO₂ monitoring database established under art.8 of Regulation (EC) No 443/2009

- Version:
- no. of registrations: VVO
- mass: Level 1: manufacturer/importer, Level 2: VVO, Level 3: Statistik Austria
- CO₂ value: Level 1: manufacturer, Level 2: VVO, Level 3: Statistik Austria
- Footprint:

Other information
- The manufacturer name is retrieved from its make

2.2 Belgium

2.2.1 Pre 2010

Short description of the system
Data from CoC are transmitted by importers via Febiac (Federation of auto industry) to the ministry. The CoC data is transmitted to the ministry including the VIN (chassis number) before registration (therefore it is called pre-registration). When a car owner wants to register the vehicles he/she shows the insurance papers to the registration office and registers the car. The ministry submits data about the number of registrations back to Febiac.

A number of importers are not part of the preregistration procedure, but still use Febiac's technical database (difference unclear). The new system “automobilis” will be introduced by the ministry between 2010 and 2012.

About 1% of imports are not channelled like described above but private and parallel imports. For those imports the importer has to submit specified data into the ministries system.

Quality check
Until 2009 Febiac processed the data further with its internal “Technicar” database but for 2010 only the pre-registration data send the importers was taken into account.

Summary of data sources
- Predominant source of information for the CO₂ monitoring data according to Regulation (EC) No 443/2009: COC (2010 data submission)
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: Federal Public Service Mobility and Transport
- Existing collaboration with other national institutions: Febiac, customs
Identification and evaluation of errors in the CO₂ monitoring database established under art.8 of Regulation (EC) No 443/2009

- Existing links to databases: Technicar (Febiac owned)

- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
  - Vehicle category (type approved): Importers
  - Type approval number and its extension: Importers
  - manufacturer name: Importers
  - type: Importers
  - Variant: Importers
  - Version: Importers
  - no. of registrations: Ministry
  - mass: Importers
  - CO₂ value: Importers
  - Footprint: Importers

Feedback from the manufacturers on 2010 data
- Chrysler stated that BE data has bad quality regarding mass values.

Other information
- In case that no CoC is not yet available the importer TA data is submitted to Febiac. This may have changed by now.

2.2.2 Post 2010
A new system named “automobilis” will be introduced by the ministry between 2010 and 2012.

2.3 Bulgaria

Short description of the system
Type approving of vehicles lies within the jurisdiction of the ministry of transport. The ministry of interior resp. the traffic police department is responsible for registering M1 vehicles and submitting the CO₂ monitoring data according to Regulation (EC) No 443/2009 to the Commission. Registration is being done in the 31 registrations offices in Bulgaria. The registration offices have access to a database of CoC which is being updated by the traffic police department. The electronic database of the traffic police department is filled in by the electronic CoC send by the dealers as a necessary pre-registration requirement. Ideally all fields of the electronic CoC for M1 have to be filled in, but legally only the following are mandatory:
- category of the vehicle,
Identification and evaluation of errors in the CO₂ monitoring database established under art.8 of Regulation (EC) No 443/2009

- type, variant, version,
- make,
- commercial name,
- name of the manufacturer,
- European Type Approval number,
- VIN,
- all masses,
- wheelbase,
- engine capacity,
- CO₂ value (combined),
- all values relating to the Euro emission classes.

If the above mandatory information from the CoC has not been submitted to the traffic police, this vehicle cannot be registered in Bulgaria.

A citizen who wishes to register a new vehicle receives a CoC from the sales dealer and presents this paper to the registration authority. The registration clerk recalls all technical information of the vehicle from the registration database by typing the European Type Approval number and checks the information on the database with the data contained in the paper CoC. In case of missing, deviating or incorrect data on either the CoC in the registration database or the CoC which has been handed over to the citizen, different approaches are followed. If the information is purely technical and is missing on the database it is simply typed in by the clerk, but if the make or manufacturer name deviate the registration is not performed until further clarification.

**Quality check**

The traffic police has an access point to ETAES which allows for spot checks between type approval and CoC information to be performed.

**Additional information on specific subjects**

**IVA**

Approximately 2% of the new registrations were individually type approved in 2010 in Bulgaria. The ministry of transport is responsible for Individual Vehicle Approval (IVA). So far IVAs have not been reported to Commission but their number will be reported in the future. For registering such vehicle only the paper CoC is used and the information is typed in by the local office clerk as no information is available in the electronic database.

**NSS**

Approval of National small series is the responsibility of the ministry of transport. Such vehicles are currently not present in Bulgaria.
Summary of data sources

- Predominant source of information for the CO₂ monitoring data according to Regulation (EC) No 443/2009: CoC
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: Chief Directorate-Security police
- Existing collaboration with other national institutions: Traffic police department, ministry of transport
- Needed links to more databases: More ETAES access point for the ministry of interior/resp. traffic police department
- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
  - Vehicle category (type approved): Level 1 Importers, Level 2 Traffic police department
  - Type approval number and its extension: Level 1 Importers, Level 2 Traffic police department
  - Manufacturer name: Level 1 Importers/manufacturers, Level 2 Traffic police department
  - Type: Level 1 Importers, Level 2 Traffic police department
  - Variant: Level 1 Importers, Level 2 Traffic police department
  - Version: Level 1 Importers, Level 2 Traffic police department
  - No. of registrations: Level 1: registration offices, Level 2: Traffic police department
  - Mass: Level 1 Importers, Level 2 Traffic police department
  - CO₂ value: Level 1 Importers, Level 2 Traffic police department
  - Footprint: Level 1 Importers, Level 2 Traffic police department

Other information
- The competent authority spotted some forged CoC in BG

2.4 Cyprus

Short description of the system
No information is yet available

Quality check
No information is yet available
Identification and evaluation of errors in the CO₂ monitoring database established under art.8 of Regulation (EC) No 443/2009

Additional information on specific subjects
No IVA and NSS were reported in 2010. It is not clear if these vehicles were registered in Cyprus that year.

Summary of data sources
- Predominant source of information for the CO₂ monitoring data according to Regulation (EC) No 443/2009: CoC

2.5 Czech Republic

Short description of the system
The Czech Ministry of transport is responsible for the type approval of all road vehicles in the Czech Republic and the Ministry of Interior is responsible to the registration of the vehicles.

The representatives of the manufacturers/importers currently submit electronically a basic technical description (named Základní Technický Popis or ZTP) of the M1 vehicles to the ministry of transport. This information is based upon the information provided on the CoC for each type, variant and version. Within the next two years the system will be changed and the representatives of the manufacturers/importers will submit directly the CoC to the ministry.

The ZTP then is approved and equipped with a unique ZTP number and entered into the national database which is made available to the registration authorities. The approval of the ZTP and the ZTP number are being back reported to the representatives of the manufacturers/importers. The ZTP number is made up from 6-8 digits. The first four indicate the type, make and commercial name of the vehicle, the next two digits indicate the version, variant and fuel type. The last two digits indicate whether the ZTP is based on an extended type approval, they are therefore not always available.

When a vehicle is sold, the new owner receives the documentation to be used at registration from the dealer, who imprints the technical information upon the registration document and adds the colour of the vehicle as well as its VIN. This documentation is then presented to the registration authorities for registration by the new owner. The registration authorities match the ZTP number on the documentation with the ZTP number and the respective technical details available within their national registration database. The information of the technical description of the vehicles and their number of registration are being back reported to the ministry of transport inter alia to report the data according to Regulation (EC) No 443/2009 to the European Commission.

This system is being implemented for EWVTA, European small series, National small series and national type approval. For IVA the system is different (see below).

Quality check
The ministry checks the ZTP transmitted by the representatives of the manufacturers/importers on formal requirements, meaning that it is checked whether all fields are available, whether the manufacturer is indicated correctly, whether the mass in running order is smaller than the maximum
mass etc. The content of this file is not checked against the type approval documents\textsuperscript{1}. Furthermore there are some automatic checkups implemented in different stages (e.g. registration).

**Additional information on specific subjects**

**IVA**

If the vehicle does not have a CoC, it has to be checked by a test institute, which performs e.g. the exhaust measurement. The vehicle receives all technical data from the test facility and this information is being entered manually by the registration authority into the system. Since the IVA only have to be reported in the aggregated data of the CO\textsubscript{2} monitoring, only very few missing values can be expected for the 2011 data.

**Incorrect assignment of manufacturers**

Inconclusive match up between manufacturer and makes can happen, if, the registration authority does not match the correct ZTP code to the vehicle\textsuperscript{2}. If the registration officer chooses the most recent and not the ZTP code which is appropriate for the vehicle, there is a mismatch regarding manufacturer/make and also regarding other details on the ZTP can occur (e.g. CO\textsubscript{2} value).

**Version Code**

The version code of the Czech Republic is shorter in comparison to the other EU Member States. This is due to the fact that only 10 digits were reserved for this entry within the system. This was sufficient until recently as the number of version digits got longer than that. In that case the last digits were simply cut off. The issue has been addressed and the monitoring data of 2012 will contain only a very small portion of shorted version numbers. For the 2011 these changes will not yet take into effect.

**Temporary registration**

If a vehicle has been temporarily registered in another MS, those vehicles will not be registered as new vehicle in the Czech Republic. Numerous vehicles (up to 10,000) are being registered for the first time in the CZ Republic and after ~ 10 days deregistered. This may indicate that those vehicles are being exported. These vehicles are being reported by the Czech Republic.

One problem noticed by the Czech authorities is that the COC original and its duplicate look very much alike and that due to that, vehicle owners could register the vehicle more than once for the first time in the EU.

**Conversion (M1/N1, fuel type)**

It is not allowed to convert a vehicle before it has been registered.

\textsuperscript{1} Most large European OEMs for M1 type approve their vehicles in other MS than the CZ Republic.

\textsuperscript{2} This is in particular important for N1 vehicles as here the number of extension amount easily up to 1000 or more.
Summary of data sources

- Predominant source of information for the CO₂ monitoring data according to Regulation (EC) No 443/2009: CoC
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: Ministry of transport
- Existing collaboration with other national institutions: Ministry of interior
- Existing or needed links to more databases: -
- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
  - Vehicle category: CoC, Level 1: Manufacturer/importer representatives, Level 2: Ministry of transport, Level 3: Registration authorities, Level 4: Ministry of transport
  - Type approval number and its extension: CoC, Level 1: Manufacturer/importer representatives, Level 2: Ministry of transport, Level 3: Registration authorities, Level 4: Ministry of transport
  - Manufacturer name: CoC, Level 1: Manufacturer/importer representatives, Level 2: Ministry of transport, Level 3: Registration authorities, Level 4: Ministry of transport
  - Type: CoC, Level 1: Manufacturer/importer representatives, Level 2: Ministry of transport, Level 3: Registration authorities, Level 4: Ministry of transport
  - Variant: CoC, Level 1: Manufacturer/importer representatives, Level 2: Ministry of transport, Level 3: Registration authorities, Level 4: Ministry of transport
  - Version: CoC, Level 1: Manufacturer/importer representatives, Level 2: Ministry of transport, Level 3: Registration authorities, Level 4: Ministry of transport
  - No. of registrations: Level 1: ministry of interior, Level 2: Ministry of transport
  - Mass: CoC, Level 1: Manufacturer/importer representatives, Level 2: Ministry of transport, Level 3: Registration authorities, Level 4: Ministry of transport
  - CO₂ value: CoC, Level 1: Manufacturer/importer representatives, Level 2: Ministry of transport, Level 3: Registration authorities, Level 4: Ministry of transport
  - Footprint: CoC, Level 1: Manufacturer/importer representatives, Level 2: Ministry of transport, Level 3: Registration authorities, Level 4: Ministry of transport
2.6 Denmark

Short description of the system
Denmark has for some time been working on a completely new registration system based on data from CoC documents. However delays in this process meant that in order to fulfil 2009/443 they had to set up a mirror system of the new Digital Motor Registration System (now expected to be implemented in July 2012). This mirror system was used for the first time when we reported the data on the 2010 sale of passenger cars. It collects all CoC data from the car importers through their official organisation - The Danish Car Importers Association. The VIN numbers are then matched to the Central Registration Database, and the CoC data are transferred to The Danish Transport Authority, where the raw CoC data are handled in accordance with the 2009/443 and Commission regulation 1014/2010 to produce the xml files used for reporting.

Quality check
When the Danish Car Importers Association collects the CoC data for each vehicles, coming from the car importers, they perform a control test of data which ensures that data are not missing or have invalid figures. If they discover invalid or missing data they will return to the importers to have the data corrected. When the data are received by the Danish Transport Authority the data are again systematically ordered and packed in items for the XML transfer. The validity of the OEM data are checked through random samples.

Additional information on specific subjects
IVA and Imports
There are a small number of imported new cars approved individually by the inspection companies on the basis of an EU type approval/COC or a data certificate signed by the manufacturer or an accredited laboratory – and thereby bypass the normal system. This minority of new sold cars enter the Central Vehicle Registry with their fuel efficiency measured as km/l (which is the unit used in the danish tax system) and do not have figures on CO₂ emission.

N1-vehicles
In Denmark many new M1 vehicles are rebuild/converted to and registered as N1 due to advantages in taxation. Some of these receive a national type approval and some are IVA. The Danish data on M1 vehicles only includes vehicles approved and registered as M1.

Summary of data sources
- Predominant source of information for the CO₂ monitoring data according to Regulation (EC) No 443/2009: COC
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: Danish Transport Authority
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- Existing collaboration with other national institutions: **Central Registration for Motor vehicles (Danish Tax and Customs Administration)**

- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
  - Vehicle category (type approved): **Car importers/Danish Car Importers Association**
  - Type approval number and its extension: **Car importers/Danish Car Importers Association**
  - Manufacturer name: **Car importers/Danish Car Importers Association**
  - Type: **Car importers/Danish Car Importers Association**
  - Variant: **Car importers/Danish Car Importers Association**
  - Version: **Car importers/Danish Car Importers Association**
  - No. of registrations: **Danish Car Importers Association / Danish Transport Authority**
  - Mass: **Car importers/Danish Car Importers Association**
  - CO₂ value: **Car importers/Danish Car Importers Association**
  - Footprint: **Danish Transport Authority**

### 2.7 Estonia

**Short description of the system**

The registration procedure for a new car in Estonia is largely carried out by the manufacturer's representative himself. First, using type-approval package Estonian Road Administration creates the necessary database for every type, variant and version of a vehicle, then if representative register a car, he uses CoC to find out the exact type of a vehicle from the database and then this vehicle is attached to the code.

**Quality check**

CoC are sent electronically. The competent authority doublechecks the TAD data contained in the database with the electronic CoCs.

**Summary of data sources**

- Predominant source of information for the CO₂ monitoring data according to Regulation (EC) No 443/2009: **CoC and TAD**
2.8 Germany

2.8.1 Pre 2010

Short description of the system
Based on the WVTA the Kraftfahrt-Bundesamt (KBA) elaborates a Dataset called Typ-Set and provides it to the registration offices. Updates of this database is delivered by the KBA on a daily basis. How often the registration offices update their data with the new KBA files is unclear. The Typdataset is being encoded with technical key numbers (TSN) having three digits and being based upon body work, fuel type, engine power. Further 5 digits are being added based on the Variant/version key. The manufacturer name is also encoded by a four digit number. This represents a new encoding of the key number of the WVTA for facilitating the registration process.

The registration data may differ from the database of the KBA because of manual recording of the data at the registration offices, due to typos or due to changes at the vehicle before registration (e.g. mounting of a trailer coupling). These type of vehicles represents the 0.7% of registrations in 2010. IVA and NSS are not being encoded as explained above.

At registration the respective offices extract the technical data from the either the Typ-dataset, the CoC or the IVA documents. This technical data is being complemented by data about the vehicle owner and national administrative information and represents now the registration data set which is being submitted to the KBA and the to the Commission.

Figure 2: German CO₂ monitoring system
Quality check

No information is yet available.

Summary of data sources

- Predominant source of information for the CO2 monitoring data according to Regulation (EC) No 443/2009: TAD
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: Kraftfahrt-Bundesamt
- Existing collaboration with other national institutions: -
- Existing or needed links to more databases: ETAES https://etaes.eu – MS access only
- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
  - Vehicle category (type approved): TAD; Type approval authority (KBA)
  - Type approval number and its extension: TAD; Type approval authority (KBA)
  - Manufacturer name: TAD; Type approval authority (KBA)
  - Type: TAD; Type approval authority (KBA)
  - Variant: TAD; Type approval authority (KBA)
  - Version: TAD; Type approval authority (KBA)
  - No. of registrations: Registration authority (KBA)
  - Mass: TAD; Type approval authority (KBA)
  - CO2 value: TAD; Type approval authority (KBA)
  - Footprint: TAD; Type approval authority (KBA)

Feedback from the manufacturers on 2010 data

- Some manufacturers mentioned the presence of some special purpose vehicles

2.8.2 Post 2010

- KBA made the decision to build up a CoC database:
  - goal: storing the CoC data for each vehicle (VIN) produced for the German market
  - “open” for vehicles produced for the EU market
- Manufacturers can deliver (voluntary) CoC data to KBA electronically
  - using existing communication infrastructure between KBA and manufacturers for “type data production” and “proof of utilization of registration document Part II”
- KBA will store the CoC data in a central database
Identification and evaluation of errors in the CO₂ monitoring database established under art.8 of Regulation (EC) No 443/2009

- Plan: “Quality check” of CoC data by using
  - “type data” (type, variant, version) ⇒ cross check
  - type approval documentation ⇒ spot check

- KBA will use/provide the CoC data:
  - use them for CO₂-Monitoring
  - provide them to the local registration authorities (online access)
  - provide them to other Member States (via extension of EUCARIS)
    - for CO₂-Monitoring
    - for registration purposes

(Ereg meeting June 2011)

![KBA Vehicle data system - draft](image)

**2.9 Greece**

**Short description of the system**

The Vehicles Technology Directorate of Hellenic Ministry of Infrastructure, Transport and Networks is the type approval authority for Greece. From the importers/manufacturers the ministry gets the type approval document and an excel file which is partly filled with TAD information. The ministry checks the information of the Excel file with the type approval documents and complete the excel file manually. The excel file is the mean to upload the technical information into the national database for
registration purposes. Per European type approval number (ETAN) (and extension), variant and version one row is elaborated containing e.g. for M1 up to 100 columns of technical information and a unique number is assigned to this row. All values needed for Regulation 443/2009 except the axle width are mandatory field to be entered into the system. Every evening new type approval information is uploaded into the (registration system) database.

The procedure is the same for European Whole Vehicle Type Approval, European small series and national small series. For reporting year 2012 the Hellenic Ministry of transport will also include the type approval for the IVA. Until then the regional authorities will perform the type approval and enter the data accordingly.

When a vehicle is registered, the registration officer will enter the type approval number (including the number of the extension), variant and version into the system which is indicated on the CoC provided by the new owner and the information entered by the ministry will be retrieved. As according to Regulation 443/2009 all information should stem from the CoC, the registration officer has the obligation to check all entries and change them in case of differences. At this point the axle width has to be entered into the database, otherwise the registration cannot be completed.

**Quality check**

Electronic information provided by the importer/manufacturer is checked against the type approval information before it is entered into the database. As all fields of the registration database can be changed by the registration officers manually some limitations are being implemented in order to minimise errors. For the mass in running order only four digits can be entered, which could range from 1 kg up to the maximum permissible mass of this specific ETAN, its extension, variant/version.

The taxation system is based on the CO2 value of a car, therefore this value is considered with priority and closely watched also by the Ministry of Finance in order to avoid faulty values.

**Additional information on specific subjects**

*Relation manufacturers/makes*

Mismatch of certain manufacturers and makes was observed in 2010. The relevant procedures were updated, so that this error will not happen anymore for the 2011 data.

*Temporary registration*

Greece has no temporary registration procedures for non SPV M1 vehicles. If temporary registration from other MS are permanently registered in Greece, they will not be counted towards the vehicles reported under Regulation 443/2009 as they are considered to be already registered for the first time in another country, without any more information regarding this country is an EU MS or not.

For Extra-European Registrations Article 2 (2) of the regulation is respected and all others would be counted towards IVA.

*Conversion*

It is not allowed to perform any kind of conversion with the vehicle before first time registration.
Summary on data sources

- Predominant source of information for the CO2 monitoring data according to Regulation (EC) No 443/2009: CoC
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: Hellenic Ministry of Infrastructure, Transport and Networks
- Existing collaboration with other national institutions: Ministry of Finance
- Existing or needed links to more databases: -
- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
  - Type approval number and its extension: CoC, Level 1: Hellenic Ministry of Infrastructure, Transport and Networks, Level 2: Registration authorities
  - Manufacturer name: CoC, Level 1: Hellenic Ministry of Infrastructure, Transport and Networks, Level 2: Registration authorities
  - Type: CoC, Level 1: Hellenic Ministry of Infrastructure, Transport and Networks, Level 2: Registration authorities
  - Variant: CoC, Level 1: Hellenic Ministry of Infrastructure, Transport and Networks, Level 2: Registration authorities
  - Version: CoC, Level 1: Hellenic Ministry of Infrastructure, Transport and Networks, Level 2: Registration authorities
  - No. of registrations: Registration authorities
  - Mass: CoC, Level 1: Hellenic Ministry of Infrastructure, Transport and Networks, Level 2: Registration authorities
  - CO2 value: CoC, Level 1: Hellenic Ministry of Infrastructure, Transport and Networks, Level 2: Registration authorities
  - Footprint: a) Wheelbase: CoC, Level 1: Hellenic Ministry of Infrastructure, Transport and Networks, Level 2: Registration authorities, b) Track width: CoC, Level 1: Registration authorities
2.10 Finland

**Short description of the system**

The data is retrieved from the Vehicular and Driver Data Register kept by the Finnish Vehicle Administration. The register contains all the vehicles registered in Finland.

One of the functions of the Vehicle Administration is the national and EU type approval for all vehicles. Therefore Vehicle Administration receives the type approval data from Nortype which is stored into the Finnish WVTA database. This data including the fuel type, the CO2 value, the mass, the engine power and the engine capacity is used when new M1 vehicles are being registered.

Before the vehicle is registered and taken into use for the first time in Finland its technical and identification data needs to be input into the register. Regarding the new vehicles this can be done either in the prior notification process or in the registration inspection.

**Quality check**

No information is yet available.

**Additional information on specific subjects**

*Imports*

Regarding the vehicles which are imported through prior notification process, the manufacturer or the representative for the manufacturer (importer) provides the data for the prior notified vehicles to be input into the information system. The data set includes e.g. the VIN number and the type approval number, variant, version of a vehicle with which the type approval information can be linked to a vehicle.

Regarding the vehicles which are imported and registration inspected, the inspectors have access to the WVTA-database and can retrieve the adequate data for a vehicle from this database. If there are any problems in this conclusion, the inspectors contact the technical approval unit of Vehicle Administration in order to find out the correct approval data for a vehicle.
Summary of data sources

- Predominant source of information for the CO2 monitoring data according to Regulation (EC) No 443/2009: TAD
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: Finnish Transport Safety Agency TraFi
- Existing collaboration with other national institutions:
- Existing links to more databases: Nortype
- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
  - Vehicle category (type approved):
  - Type approval number and its extension:
  - Manufacturer name:
  - Type:
  - Variant:
  - Version:
  - No. of registrations:
  - Mass:
  - CO2 value:
  - Footprint:

Feedback from the manufacturers
  - Some manufacturers mentioned the presence of some special purpose vehicles.

2.11 France

Short description of the system
No information is yet available.

Quality check
No information is yet available

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3 A mix of information between TAD and CoC was indicated as data source by the MS for the 2010 reporting period
Summary of data sources

- Predominant source of information for the CO2 monitoring data according to Regulation (EC) No 443/2009: TAD
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: Ministère de l'Ecologie, de l'Energie, du Développement Durable et de la Mer
- Existing collaboration with other institutions: UTAC

2.12 Hungary

Short description of the system

No information is yet available

Quality check

No information is yet available

Summary of data sources

- Predominant source of information for the CO2 monitoring data according to Regulation (EC) No 443/2009: CoC
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: National Transport Authority

2.13 Italy

Short description of the system

The documentation (type approval certificate) is sent by the manufacturer and copied into a digital database. The CoC is used to register a vehicle by the registration offices. In order to register a vehicle the following data have to be typed: the OE code (which is a code allowing transposition of EU type approval number in the national system; OE identifies passenger cars and may be printed on the CoC), the Vehicle Identification Number and a secret code to avoid forgeries. By typing the above codes, the type approval data of that vehicle appears and is used to register it.
Identification and evaluation of errors in the CO₂ monitoring database established under art.8 of Regulation (EC) No 443/2009

Table 1: Italian matching of databases

<table>
<thead>
<tr>
<th>A</th>
<th>Type Approval Authority</th>
<th>the registration code</th>
<th>the manufacturers’ name</th>
<th>the CO₂ value</th>
<th>the mass</th>
<th>track width and wheelbase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A+B</td>
</tr>
<tr>
<td>B</td>
<td>Local Registration Offices</td>
<td>the registration code</td>
<td>the number of registrations</td>
<td></td>
<td></td>
<td>certificate of conformity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DATA BASE</td>
</tr>
</tbody>
</table>

Quality check
The data from the CoC are not verified against the type approval data and not used in the monitoring mechanism although it is in the intention of the Italian authority to phase in the data from the CoC.

Additional information on specific subjects
IVA, NSS
The quality of the data related to the IVA vehicles could be lower than the one of EWVTA as data are typed-in manually in the local registration offices. The registration procedure for IVA and NSS follows the same registration procedure as for the volume type approval meaning that the same data are required for registration purposes. Additional information on IVA and NSS is held in the database if needed. Grey imports are part of the individual approvals.

For vehicles retrofitted after type approval but before the registrations, the original certificate of conformity will be substituted with new document containing information on the base vehicle (the manufacturer, the fuel type and the CO₂ value) with a note mentioning the fuel conversion. The CO₂ value is not changed according to the new fuel type and the vehicle is reported by the Italian authorities as an IVA. The Italian registration system holds both first and second stage manufacturer names which appear as a sequence in the same field, so if retrofitting was performed before type approval the 2nd stage manufacturer name can be provided.

Category type
Vehicles approved as passenger cars (M1) and then registered as van (N1) will have a new approval (individual or small series). The same happens if the vehicles has been approved as N1 and then registered as M1. The procedure follows the national requirements for individual approvals or approvals of small series.
Summary of data sources

- Predominant source of information for the CO2 monitoring data according to Regulation (EC) No 443/2009: TAD
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: Ministry of Infrastructure and Transport - Department for Land Transport, Directorate-General Motor Vehicles and Transport Safety
- Existing collaboration with other national institutions:
- Existing or needed links to more databases:
- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
  - Vehicle category (type approved): Level 1 Manufacturer, Level 2:Type approval authority
  - Type approval number and its extension: Level 1 Manufacturer, Level 2:Type approval authority
  - Manufacturer name: based on the make
  - Type: Level 1 Manufacturer, Level 2:Type approval authority
  - Variant: Level 1 Manufacturer, Level 2:Type approval authority
  - Version: Level 1 Manufacturer, Level 2:Type approval authority
  - No. of registrations: Registration offices
  - Mass: Level 1: Manufacturer, Level 2:Type approval authority
  - CO2 value: Level 1 Manufacturer, Level 2:Type approval authority
  - Footprint: Level 1 Manufacturer, Level 2:Type approval authority

2.14 Ireland

Short description of the system
Since 1 January 2011 the distributors/dealer network acts as the legal entity and provides the electronic version of Certificate of Conformity (CoC) and the respective European type approval number for each make, model, version and variant they place on sale in Ireland.

If the CO2 and mass values is not available on a new CoC for new M1 vehicles then the CoC is rejected.
Quality check

Ireland does not check the CoC for plausibility and considers the OEMs data as valid. On the basis of this information, Ireland registers approves the respective vehicles and this process covers 90/95% of the Irish registrations.

The national standard authority (NSAI – www.nsai.ie) is the competent authority for type approving vehicles and it has access to ETAES and could verify the CoC against the Type approval data.

Additional information on specific subjects

IVA and Imports

The number of imported cars is very limited due to a general high vehicle registration tax\(^4\) and the left-hand driving which restricts the possibilities of geographically close countries exporting those vehicles and increases the insurance costs for right-hand driving vehicles. The few imports stem from UK but some also come from Japan and Germany.

Only a small number of new cars are imported into Ireland outside the dealership network, i.e. private import of new cars. The main reason is that apart from the UK, most other EU States have left hand drive cars and these are more expensive to insure, so it would be very unusual that such a car is imported. However, in all such cases the vehicle must have a CoC before it is registered in the State. If such a vehicle is imported from within the EU it should have the standard CoC issued to all vehicles for sale in the EU so this would be processed in the same way (from a CO2 monitoring point of view) as vehicles sold through the dealership network.

If a new vehicle imported from outside the EU is presented for registration, it must also be Type approved and the IVA is issued through the NSAI and will be reported as IVA. There were no IVA and NSS in 2010 and early 2011 in Ireland.

Summary of data sources

- Predominant source of information for the CO2 monitoring data according to Regulation (EC) No 443/2009: COC
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: Department of transport, tourism and sport
- Existing collaboration with other national institutions: National standard authority (Type approval)
- Existing or needed links to more databases:
- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
  - Vehicle category (type approved): distributors/dealer network
  - Type approval number and its extension: distributors/dealer network

\(^4\) For these vehicles, if CO2 is not available, the maximum standard value will be assumed.
Identification and evaluation of errors in the CO2 monitoring database established under art.8 of Regulation (EC) No 443/2009

- Manufacturer name: distributors/dealer network
- Type: distributors/dealer network
- Variant: distributors/dealer network
- Version: distributors/dealer network
- No. of registrations:
- Mass: distributors/dealer network
- CO2 value: distributors/dealer network
- Footprint: distributors/dealer network

2.15 Lithuania

Short description of the system
In Lithuania type approving of vehicles is performed by the State Road Transport Inspectorate under the Ministry of Transport and Communications of the Republic of Lithuania. The vehicle registration is performed by the State Enterprise “Regitra” under the Ministry of the Interior of the Republic of Lithuania. Vehicle technical data of first registered new cars are taken from the CoC (paper form) presented by the vehicle owner at the moment of registration. Registered vehicle data are kept in the Lithuanian Road Vehicle Register. Information about all parameters to be submitted according to Regulation (EC) No 443/2009 is taken from 2 sources: TAD is used as a data source for CO2 emissions, axle width, wheel base, manufacturer name. The remaining data are taken from CoC (The Lithuanian Road Vehicle Register). Starting from 2012 all the data required for the reporting under the Art. 8 of Regulation (EC) No 443/2009 will be taken from CoC (data would be stored in the Lithuanian Road Vehicle Register).

Quality check
The State Road Transport Inspectorate under the Ministry of Transport and Communications of the Republic of Lithuania is responsible for quality check.

Summary of data sources
- Predominant source of information for the CO2 monitoring data according to Regulation (EC) No 443/2009: CoC

- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: Ministry of Environment of the Republic of Lithuania and starting from 2012 – the Ministry of the Interior of the Republic of Lithuania (the State Enterprise “Regitra” – motor vehicle registration authority)

- Existing collaboration with other national institutions: The State Road Transport Inspectorate under the Ministry of Transport and Communications of the Republic of Lithuania
Identification and evaluation of errors in the CO\textsubscript{2} monitoring database established under art.8 of Regulation (EC) No 443/2009

- Existing or needed links to more databases: -
- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
  - Vehicle category (type approved): CoC
  - Type approval number and its extension: CoC
  - Manufacturer name: CoC
  - Type: CoC
  - Variant: CoC
  - Version: CoC
  - No. of registrations: Registration authority
  - Mass: CoC
  - CO2 value: CoC
  - Footprint: CoC

2.16 Luxembourg

**Short description of the system**
The data are provided by a direct access to the national database for vehicle registration and technical inspection. The SNCT has been designed as administrator of the database by the Ministry of Transport.

Registration data and technical information is being matches by using the type approval number, variant and version. Pre-encoding of the type approval data is done and stored under these codes in the database.

**Quality check**
Normally no unknown vehicle will appear, because the vehicle registration will only be accepted with a complete dataset.

**Additional information on specific subjects**

*Temporary registrations*

Vehicles with export license plate have a validity of 3 month and are considered as temporary registrations in Luxembourg. The date of the first ‘putting’ into circulation as fixed by the registration in Luxembourg, is also picked up in the foreign country.

**Summary of data sources**
Identification and evaluation of errors in the CO₂ monitoring database established under art.8 of Regulation (EC) No 443/2009

- Predominant source of information for the CO₂ monitoring data according to Regulation (EC) No 443/2009: **Mix (see below)**

- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: **Ministry of Environment**

- Existing collaboration with other national institutions: **SNCT - Société National de Contrôle technique**

- Existing or needed links to more databases:

- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
  - Vehicle category (type approved): **TAD; SNCT**
  - Type approval number: **TAD; SNCT** (incl. its extension?):
  - Manufacturer name: **TAD; SNCT**
  - Type: **TAD; SNCT**
  - Variant: **TAD / CoC⁵; SNCT**
  - Version: **TAD / CoC; SNCT**
  - No. of registrations: **Registration offices; SNCT**
  - Mass: **TAD / CoC; SNCT**
  - CO₂ value: **CoC, SNCT**
  - Footprint: **CoC; SNCT**

2.17 Latvia

**Short description of the system**
Mainly information is taken from the TAD. Only in cases where particular values are stated in the range, or several values are indicated, data from the CoC are used.

**Quality check**
No information is yet available

**Summary of data sources**
- Predominant source of information for the CO₂ monitoring data according to Regulation (EC) No 443/2009: **TAD**

- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: **Ministry of Transport**

⁵ For the source marked as TAD/COC, the data from COC is considered in the case where the information from TAD and COC differ.
2.18 Malta

Competent authority according to Article 8 (7) of Regulation (EC) 443/2009: Transport Malta

2.19 Netherlands

2.19.1 Pre 2010

Short description of the system
The RDW, the vehicle authority in the Netherlands, monitors the safety and environmental aspects of motor vehicles in the Netherlands. In addition, the RDW registers information about vehicles, their owners and the issued documents, such as registration numbers and driving licences.

The vehicle data from the BKR\(^6\) registration is being linked to the type approval data in the ETR\(^7\) registration. The BKR register holds the vehicle registration details for all vehicles with a Dutch licence plate. The ETR register holds a record of all European type approvals.

They are linked via the European type approval specification system (e.g. e4*01/116*0123*00 - F5P11 – M51AZ1). A specific CO2 monitoring application is designed to generate text files which store the data (CO2 emission, cylinder content, engine capacity, etc.) for the number of licensed passenger vehicles over a given period.

The available information for licensed passenger vehicle within the Dutch system differs depending on the path the vehicles have taken before registration. The different paths of vehicles and the respective available information is explained as follows:

- **A**: a passenger vehicle with a European type approval for which a car importer has applied to RDW for a licence number, which is issued by RDW; this is known as the accelerated procedure.

- **B**: a passenger vehicle with a European type approval that has been imported to the Netherlands by a private individual from another EU country, and for which an application has been made to RDW for a licence number. Following identification by one of the 16 RDW licensing offices, the passenger vehicle is provided with a licence number, subject to a positive result.

- **C**: a passenger vehicle without a European type approval that has been imported to the Netherlands by a private individual from another EU country, and for which an application has been made to RDW for a licence number. The vehicle can be matched up with a national type approval and provided with a licence number.

- **D**: a passenger vehicle without a European type approval that has been imported to the Netherlands by a private individual from another EU country, and for which an application has been made to RDW for a licence number. The vehicle cannot be matched up with a national type approval. The vehicle is provided with a licence number based on the details recorded on the foreign vehicle registration certificate and this is entered in the electronic database.

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\(^6\) Basis Kenteken Registratie - Basic Vehicle License Register

\(^7\) Europese Type approval Registratie- Europese Type approval Registratie
• **E:** a passenger vehicle that has been imported to the Netherlands by a private individual from a non-EU country and for which an application has been made to RDW for a licence number. The vehicle forms part of the vehicle owner’s change of residence to the Netherlands. A licence number is issued for the vehicle and only a limited number of vehicle particulars are entered in the electronic database.

• **F:** a passenger vehicle that has been imported to the Netherlands by a private individual from a non-EU country and for which an application has been made to RDW for a licence number. The vehicle does not form part of the vehicle owner’s change of residence to the Netherlands. This vehicle must be tested at the Test Centre Lelystad. A licence number is subsequently issued for the vehicle and only a limited number of vehicle particulars are entered electronically in the database.

The following table lists the type of data available to RDW having regard to the CO2-monitoring for both the current legislation and the new legislation.

**Table 2: Available information within the Dutch registration system for different passenger vehicles**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Type approval number</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
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<td>-</td>
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<td>-</td>
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<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fuel</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CO₂ emission</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>Cylinder content</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Engine power</td>
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<td>-</td>
<td>-</td>
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<td>-</td>
</tr>
<tr>
<td>Weight</td>
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</tr>
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<td>Wheel base</td>
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<td>Track width</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**Quality check**
No information is yet available

**Additional information on specific subjects**

*IVA, Imports*
Identification and evaluation of errors in the CO₂ monitoring database established under art.8 of Regulation (EC) No 443/2009

Under the arrangements currently in place for issuing licence numbers, RDW has not 100% link-up between the ETR registration and the BKR registration details for vehicles imported from abroad by private individuals (individual import). It would be possible however to provide figures for the number of vehicles recorded in the BKR register, but since there is no 100% linkage between this and the ETR register, a full specification cannot be provided with regard to CO₂ emissions, manufacturer, engine capacity and engine power.

For the time being, no measures are being planned with respect to providing a link between the BKR register and the ETR register for individual import.

Figure 4: Current registration process in the Netherlands

(Ereg meeting June 2011)

Summary of data sources
- Predominant source of information for the CO₂ monitoring data according to Regulation (EC) No 443/2009: TAD
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: RDW Veendam
- Existing collaboration with other national institutions:
- Existing links to more databases: BKR, ETR
- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
  - Vehicle category (type approved): TAD; RDW
  - Type approval number and its extension: TAD; RDW
- Manufacturer name: TAD; RDW
- Type: TAD; RDW
- Variant: TAD; RDW
- Version: TAD; RDW
- No. of registrations: RDW
- Mass: TAD; RDW
- CO2 value: TAD; RDW
- Footprint: TAD; RDW

2.19.2 Post 2010

- Vehicle registration will be based on valid CoC data
- Online provision of CoC data
- Type Approval Database used for check of CoC

![Diagram of Dutch vehicle data system](image)

Figure 5: Dutch vehicle data system (short term solution)

(Ereg meeting June 2011)

As a long term solution the Netherlands are working on a similar system like Germany.
2.20 Poland

**Short description of the system**
Since 2008 technical data of first registered new cars in Poland are taken from the Certificates of Conformity presented by the vehicle owner at the moment of registration at the registration office in local authority responsible for car registration. Next the sets of vehicle data are automatically delivered to the Central Database on Vehicles that is managed by the Ministry of Interior and Administration.

Data needed for calculation are taken from this Central Database on Vehicles. In case of missing data the type approval documentation database is used.

The data are then verified and the necessary calculations are being done by the ministry responsible for Central Database on Vehicles management (Ministry of Interior and Administration).

Finally the report is prepared and delivered to the Polish Ministry responsible for transport (Ministry of Infrastructure), and further submitted to the EC/EEA.
Identification and evaluation of errors in the CO$_2$ monitoring database established under art. 8 of Regulation (EC) No 443/2009

Figure 7: Polish CO$_2$ monitoring

Quality check
The data is verified by the Ministry of Interior and Administration.
Summary of data sources

- Predominant source of information for the CO2 monitoring data according to Regulation (EC) No 443/2009: **CoC**
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: **Department for State Registers and ICT - Ministry of Interior and Administration**
- Existing collaboration with other national institutions: **Motor transport Institute (Type Approval)**
- Existing or needed links to more databases:
- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
  - Vehicle category (type approved): **CoC, Level 1: Registration authority, Level 2: Ministry of interior and administration**
  - Type approval number and its extension: **CoC, Level 1: Registration authority, Level 2: Ministry of interior and administration**
  - Manufacturer name: **CoC, Level 1: Registration authority, Level 2: Ministry of interior and administration**
  - Type: **CoC, Level 1: Registration authority, Level 2: Ministry of interior and administration**
  - Variant: **CoC, Level 1: Registration authority, Level 2: Ministry of interior and administration**
  - Version: **CoC, Level 1: Registration authority, Level 2: Ministry of interior and administration**
  - No. of registrations: **Registration authority**
  - Mass: **CoC, Level 1: Registration authority, Level 2: Ministry of interior and administration**
  - CO2 value: **CoC, Level 1: Registration authority, Level 2: Ministry of interior and administration**
  - Footprint: **CoC, Level 1: Registration authority, Level 2: Ministry of interior and administration**
2.21 Portugal

Short description of the system
The data included in the TAD is registered/uploaded into our type-approval databases and it’s the only vehicle-related data used for registration purposes of new vehicles.

Quality check
There is no verification mechanism in-place to ensure data consistency with the CoC data.

Summary of data sources
- Predominant source of information for the CO2 monitoring data according to Regulation (EC) No 443/2009: TAD
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: IMMT - Istituto de Mobilidade e dos Transportes Terrestres, I.P.

2.22 Romania

Short description of the system
R.A.R is part of the transport ministry is the type approval authority for Romania R.A.R., holds all the data contained in Annex II to Regulation (EC) No 443/2009 both from Type Approval Documentation (TAD) and the Certificate of Conformity (CoC). The only datum missing is the number of registrations that is communicated by the ministry of interior (directorate of driving licence and vehicle registration) to R.A.R. The digital database of R.A.R. contains a mix of TAD and CoC data. R.A.R. issues a vehicle identity card for each individual vehicle reporting the data necessary for the vehicle registration. Data relevant for the CO2 monitoring are: manufacturer name, type and variant, mass, CO2 emissions (one figure only) and additional the type approval number and VIN. Each vehicle identity card receives a 15-character internal code that corresponds to the relevant CoC information of that vehicle. At this stage the vehicle is not yet registered.

To register a vehicle the individual or the dealers will go to the vehicle registration office, part of the ministry of interior, and based on the vehicle identity card receive the registration certificate according to Council Directive 1999/37/EC. Finally the vehicle registration office communicates to R.A.R. the number of the actual vehicles registered for each code number.

The matching between the number of registration certificates issued and the CoC is done via matching the 15-character internal code present both in the vehicle identity card and the registration certificate.
Quality check
The CoC data are used but when the data seems to be not accurate, they are verified against the TAD data. When an individual asks for a vehicle identity card the latter is filled directly with CoC data and not checked against the TAD (due to the very low number of individual registrations performed by individuals).

Additional information on specific subjects

Imports, IVA, NSS
The individual importer goes with the CoC to the type approval authority issuing the Vehicle Identity Card (VIC). The CO₂ emissions are tested if needed although the inspection may be done on paper only. The individual importer received a vehicle identity card with which the importer or the buyer of the respective vehicle can register the vehicle after purchase. The vehicle is currently reported to the Commission stating the name of the manufacturer contained in the documentation. If that name cannot be identified it is retrieved from the WMI code in the VIN, hence the vehicle is attributed to an Original Equipment Manufacturer (OEM). In Romania currently there are applications for Individually Approved Vehicles (IVA) other than imports by individuals (e.g. dealers for special models). 70 IVA were reported in 2010. The RAR started recently the NSS approval procedure according to Directive 2007/46/EC.

Temporary registrations
For temporary registrations (~1%) the Romanian authority issues an export card which is valid for 30 days.

Summary of data sources
- Predominant source of information for the CO₂ monitoring data according to Regulation (EC) No 443/2009: CoC and TAD
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: Registrul Auto Roman - RAR (Romanian Automotive Register)
- Existing collaboration with other national institutions: Ministry of interior (Registrations)
- Existing links to databases: ETAES
- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
  - Vehicle category (type approved): RAR
  - Type approval number and its extension: RAR
  - Manufacturer name: RAR
  - Type: RAR
  - Variant: RAR
  - Version: RAR
Identification and evaluation of errors in the CO$_2$ monitoring database established under art.8 of Regulation (EC) No 443/2009

- No. of registrations: **Registration offices**
- Mass: **RAR**
- CO2 value: **RAR**
- Footprint: **RAR**

**Feedback from the manufacturer on 2010 data**
- Suzuki indicated that the number of registrations in Romania were much lower then expected

2.23 Slovak Republic

**Short description of the system**
Vehicle importers (car dealers, representatives of vehicle manufacturers) are obliged to provide data from type approval (TA) as well as certificate of conformity (COC) into the "registration database". When a vehicle is registered by the Slovak police, the vehicle registration department, data are matched for the specific type in the "registration database" and both the registration document as well as a record are created in the information system of the Slovak police department. Reporting is based on the information contained in such system.

**Quality check**
No information is yet available

**Summary of data sources**
- Predominant source of information for the CO2 monitoring data according to Regulation (EC) No 443/2009: CoC
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: Documents and Registers Unit of the Presidium of the Police Force Ministry of Interior
- Existing collaboration with other national institutions:
- Existing or needed links to more databases:
- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
  - Vehicle category (type approved):
  - Type approval number and its extension:
  - Manufacturer name:
  - Type:
  - Variant:
Identification and evaluation of errors in the CO₂ monitoring database established under art.8 of Regulation (EC) No 443/2009

- Version:
- No. of registrations:
- Mass:
- CO₂ value:
- Footprint:

**Other information**
- It is not clear if SK reported temporary registrations in 2010.
- Apparently IVA and NSS cannot be distinguished and they may have been attributed to a manufacturer in the 2010 delivery.

2.24 Slovenia

**Short description of the system**
No information is yet available

**Quality check**
No information is yet available

**Summary of data sources**
- Predominant source of information for the CO₂ monitoring data according to Regulation (EC) No 443/2009: CoC
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: JAVNA AGENCIJA ZA VARNOST PROMETA
2.25 Spain

2.25.1 Pre 2010

**Short description of the system**

*Organization and scope of the DGT*

The DGT belongs to the Ministry of Interior and it is the body responsible to several aspects of vehicle data and traffic management. DGT shares jurisdiction with other ministries depending on the matter (e.g. the ministry of transport, industry for vehicles, environment for bicycles, health for driving licences) and has numerous linkages with other administrations. From an administrative view it is the central governmental administration responsible inter alia for vehicle registrations. In this function it decides about the minimum requirements applicable in Spain. The DGT has to cooperate with the 17 national autonomous communities and the Spanish municipalities who have jurisdiction on build up areas at local level. DGT's main functions are related to road safety, traffic quality and fluency, traffic-related administrative services.

The DGT is the only authority that can register vehicles in Spain. In addition it holds the national registry for drivers and traffic offenses.

The DGT is an administrative authority and not a technical authority although DGT is gaining more and more technical competences by increasingly collecting information about vehicles. For example the ministry of industry is carrying out the technical inspection for vehicle roadworthiness and submits the result of the inspection (passed/failed) to the DGT. Also under a new project DGT is gathering information about the insurance status of a vehicle from insurance associations.

The technical competence to evaluate the plausibility of the data lies within the Ministry of Industry which is also the type approval authority.

*The current Spanish monitoring system*

Spain is using the information on the CoC and on the type approval for the CO₂ monitoring but stored in a national document called the ITV card. The ITV card must, by law, take data from the CoC and the type approval they are used as reference document not only for the purpose of registering a vehicle but also for other purposes (e.g. taxation, roadworthiness inspections).

OEMs issue the ITV and send a copy to the DGT (blue), to the owner of the vehicle (green) and to autonomous community (pink for technical inspection and to create duplicates of the green ITV should the owner ask for it).

The current ITV card does not contain: the name of the manufacturer, the version, the fuel mode and electric energy consumption. Although the ITV card contains the wheelbase and the track widths but this information is not yet stored in the registry. The collection of these data will be ensured in 2012.

The ITV card also contains the EC type approval number and the VIN which are available in the DGT database.

**Quality check**

The CoC is not compared to the type approval information.
The ITV card comes only in paper format and all technical information it contains is being inserted manually in the local registration offices therefore different spellings for make and commercial name can happen as well as some typos on technical data. Prior to 2010 there was no mandatory requirement to include CO2 in the ITV card which explains the high number of unknown vehicles in Spain. From January 2010 the reporting of CO2 emission was voluntary for registration but mandatory as of September 2010.

The technical competence to evaluate the plausibility of the data lies within the Ministry of Industry which is also the type approval authority. The latter confines in the information given to the government by the manufacturers.

**Additional information on specific subjects**

**Imports IVA NSS**

In case of Individual Vehicle Approval (IVA) the type approval authority will verify the requirements of the vehicle and issues the ITV card to the car owner. For National approval of Small Series (NSS) the type approval authority will verify the requirements of the vehicle, so manufactures will issue the ITV card. IVA and NSS can be distinguished and separately reported. The national type approval number includes the characters HIB for IVA and SKN for NSS. In case of need, more information on these vehicles is available to DGT for further investigation.

Import for private individuals can be distinguished in the database (entry procedencia in the ITV has three possible values – national, EU, and outside) and they should be reported under the IVAs. The technical inspection will produce the ITV and put the OEM name as manufacturer and it risks to be reported unless the procedencia is used to find the personal imports. The Spanish authorities are aware of the issue. 53 IVA were reported in 2010.

**Vehicle category**

Currently the category of the vehicle registered is reported to the Commission which explain the appearance of one ISUZU vehicle registered before April 2010. On the 14 January 2011 the law with regard to conversion of vehicles will change. From that date it is not allowed anymore for an M1 to be modified before registration.

**Summary of data sources**

- Predominant source of information for the CO2 monitoring data according to Regulation (EC) No 443/2009: **CoC and TAD**
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: **Ministry of Interior - DGT**
- Existing collaboration with other national institutions: **Ministry of Industry (type approval authority)**
- Existing or needed links to more databases:
- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:

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8 ISUZU has claimed not to be producing M1 vehicles. No M1 type approval documentation was found in ETAES (https://etaes.eu) for this manufacturer.
Identification and evaluation of errors in the CO$_2$ monitoring database established under art. 8 of Regulation (EC) No 443/2009

- Vehicle category (type approved): Level 1: Manufacturers/Importers, Level 2: DGT, Level 3: registration authorities
- Type approval number and its extension: Level 1: Manufacturers/Importers, Level 2: DGT, Level 3: registration authorities
- Manufacturer name: Level 1: Manufacturers/Importers, Level 2: DGT, Level 3: registration authorities
- Type: Level 1: Manufacturers/Importers, Level 2: DGT, Level 3: registration authorities
- Variant: Level 1: Manufacturers/Importers, Level 2: DGT, Level 3: registration authorities
- Version: Level 1: Manufacturers/Importers, Level 2: DGT, Level 3: registration authorities
- No. of registrations: Level 1: registrations authorities, Level 2: DGT
- Mass: Level 1: Manufacturers/Importers, Level 2: DGT, Level 3: registration authorities
- CO2 value: Level 1: Manufacturers/Importers, Level 2: DGT, Level 3: registration authorities
- Footprint: Level 1: Manufacturers/Importers, Level 2: DGT, Level 3: registration authorities

2.25.2 Post 2010

In June 2010 a new format of the ITV was approved by Spanish law and it will be compulsory as of June 2012. The ITV card resembles the certificate of registration to a much larger extent and contains a considerable number of entries from the CoC. This new ITV card does include the name of the manufacturer both for the base vehicle and the completed vehicle as well as wheelbase and numerous other features either needed for the CO$_2$ monitoring or for national purposes. The mandatory fields in the new ITV card depend on the category of the vehicle (M1 requirements may differ from N1).

All the mandatory fields of the new ITV card needs to be filled in during this pre-registration step otherwise the whole file will be rejected and the registration cannot happen at a later stage. Furthermore under the Spanish law, the OEMs are responsible for stating the correct information, i.e. the information also contained in the CoC. The national law RD 750/2010 explains that the OEMs is responsible for stating the correct information.

The new ITV card will be sent electronically from the manufacturers to the DGT server that will forward them to registration authorities in the autonomous communities, replacing the need for a blue and pink ITV card. The OEM will still issue one paper copy of the new ITV for the vehicle owner. If a citizen then intends to register a vehicle at one of the 70 registration authorities of the DGT she/he present the ITV card and the registration authority will extract all technical data from the database by matching the VIN of the DGT database with the VIN of the paper ITV card.
Identification and evaluation of errors in the CO\textsubscript{2} monitoring database established under art.8 of Regulation (EC) No 443/2009

**Quality check**

The data of the new ITV card will not be checked against the type approval values.

If the mass and CO\textsubscript{2} emission value additionally to other parameters are not indicated within the ITV card the vehicle will not be registered. The version is not included in the present ITV card format, but it is included in the new one. By June 2012 the version will be a mandatory entry and it will be recorded in the DGT registry.

As of 2012 manual data entry will not be possible for volume registration as electronic data delivery will replace it.

**Additional information on specific subjects**

**IVA, NSS**

IVA will use the new ITV card format but only paper-based and it will follow the same process as in the current system. NSS will follow the same procedure than a normal type approval car.

**Conversion**

On the 14 January 2011 the law with regard to conversion of vehicles will change. From that date it is not allowed anymore for an M1 to be modified before registration. Before this date such modifications are possible.

If a vehicle is being converted after registration the DGT the vehicle has to be presented to the technical inspection stations and the changes are being approved on the printed ITV card but the changes will not be reflected in the database of the DGT.

Therefore in Spain the category of the vehicle type approved has always to coincide with the category of the vehicle registered. In the same way LPG retrofitting will have to be done before type approval. There cannot be LPG retrofitting after type approval but before registration.
2.26 Sweden

**Short description of the system**

The electronic CoC is sent from manufacturer to the Swedish authority. SE has access to NorType (see below), a digital type approval database containing more than 100 technical parameter for each version. The vehicle is registered only if the CoC coincides with the TA information.

![Figure 8: Swedish registration data flow (Overview)](image-url)
Quality check

Before registration the vehicles are compared with the information provided within the NorType database. Even the information from the “manual registrations” (not electronic files but dispatch CoC document for manual process) of M1-vehicles is compared against the NorType database. If the information is not correct the vehicle is not registered.

The NorType database project is a cooperation between Sweden, Finland, Norway and Iceland. The NorType database is a central database for European whole vehicle type approvals issued by the type approval authorities of the EU and the EEA countries. The type approval collects from www.etaes.eu and the information from the type approval is registered in a structured and harmonized manner in the NorType database. The NorType database is administrated by Iceland’s authorities of type approval. The information is registered by two independent handling officer and if the information from this two handling officer isn’t matching each other, the information will not be registered in the NorType database. In Sweden the needed information from the NorType database is downloaded to a local database in Sweden and use the information from the local database (called SweType).

Summary of data sources

- Predominant source of information for the CO2 monitoring data according to Regulation (EC) No 443/2009: CoC
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009: Swedish Transport Agency
• Existing collaboration with other national institutions: **Swedish Road Administration-Division Society and Traffic**

• Existing links to databases: **ETAES, NorType**

• Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
  - Vehicle category (type approved): **CoC; Manufacturer/Importer and European Type approval authorities**
  - Type approval number and its extension: **CoC; Manufacturer/Importer and European Type approval authorities**
  - Manufacturer name: **TAD; Manufacturer/Importer and European Type approval authorities**
  - Type: **CoC; Manufacturer/Importer and European Type approval authorities**
  - Variant: **CoC; Manufacturer/Importer and European Type approval authorities**
  - Version: **CoC; Manufacturer/Importer and European Type approval authorities**
  - No. of registrations: **Central registration authority**
  - Mass: **CoC; Manufacturer/Importer and European Type approval authorities**
  - CO2 value: **CoC; Manufacturer/Importer and European Type approval authorities**
  - Footprint: **CoC; Manufacturer/Importer and European Type approval authorities**

**2.27 United Kingdom**

**Short description of the system**

The Driver and Vehicle Licensing Agency (DVLA) is the registration authority; the VCA is the type approval authority while the Department for Transport (DfT) is the designated national authority for the purpose of the monitoring CO2 from passenger cars for Regulation (EC) No 443/2009. The latter receives data from DVLA on all registrations of European type approvals and national approval of small series (NSS). VCA also provides DfT with figure on individual approvals (IVA). There are three ways for registering a vehicle in the system managed by the DVLA:

- online for several vehicles at once by the manufacturer/dealer by uploading a datasheet and in DVLA system via an website;
- online for single vehicles: same as method 1 available for manufacturer/dealer only;
- on paper for single vehicles at the local registration offices. This option is available to individuals only and not to manufacturer/dealers.

The large majority (about 89%) of registration happen via method 1 and about an additional 6% with method 2. In case of missing data the manufacturers/dealers are contacted.

Part of the information comes from the CoC while other data are required by the DVLA mainly for taxation purposes. Additional entries, as the bodywork and the fuel type, are not taken from the CoC.
**Quality check**

Data coming from manufacturers and dealers are not checked against the type approval documentation nor are plausibility checks performed.

The UK monitoring system has a shared-facility with the manufacturer/dealer in the sense that the system relies on a software package manager by manufacturer for generating the data to be delivered and a software package managed by the DVLA for accepting those data.

**Additional information on specific subjects**

**Vehicle category**

The category of the vehicle is always reported by the manufacturer/dealers but not when no CO2 figure is required (mainly for IVAs). The category of the vehicle however is the one assigned at registration and is taken from the type approval certificate.

\[N1\]

In the large majority of the cases the category of the vehicle at type approval and at registration coincides. Yet in some instances a car could be converted after type approval and be registered as a van. The vice versa is also true, i.e. a van can be registered as a car. The former vehicles will not be reported to the Commission while the latter will. DfT confirms that presently only a small number of vehicles are converted after type approval and before registration. An individual or manufacturer/dealer may decide to register as vans some large vehicles (e.g. SUVs) for tax reasons or simply to escape the CO2 monitoring. These conversions will necessarily go under the NSS and IVA process therefore abuses will be spotted by verifying the number of NSS and IVA every year.

**Summary of data sources**

- Predominant source of information for the CO2 monitoring data according to Regulation (EC) No 443/2009: CoC
- Competent authority according to Article 8 (7) of Regulation (EC) No 443/2009:
- Existing collaboration with other national institutions: DVLA
- Existing or needed links to more databases:
- Identification of all sources for the different parameters according to Regulation (EC) No 443/2009/EC and the authority responsible for it:
  - Vehicle category (type approved): **not available** — UK reports the category of the vehicle registered as declared by the dealer, manufacturer or registering organisation
  - Type approval number and its extension: **Level 1: Manufacturer/retailer, Level 2: DVLA, Level 3: DFT**
  - Manufacturer name: **DFT based on a code completed by the manufacturer/retailer indicating the manufacturer responsible for type approving the vehicle. This is checked against the original Make and corrected by DfT where necessary.**
  - Type: **Level 1 Manufacturer/retailer, Level 2: DVLA, Level 3: DFT**
Identification and evaluation of errors in the CO₂ monitoring database established under art.8 of Regulation (EC) No 443/2009

- Variant: Level 1 Manufacturer/retailer, Level 2: DVLA, Level 3: DFT
- Version: Level 1 Manufacturer/retailer, Level 2: DVLA, Level 3: DFT
- No. of registrations: Level 1 Manufacturer/retailer, Level 2: DVLA, Level 3: DFT
- Mass: Level 1 Manufacturer/retailer, Level 2: DVLA, Level 3: DFT
- CO₂ value: Level 1 Manufacturer/retailer, Level 2: DVLA, Level 3: DFT
- Footprint: Level 1 Manufacturer/retailer, Level 2: DVLA, Level 3: DFT
3 DESCRIPTION OF ERRORS AND ERROR SOURCES

3.1 Error types

Most errors which may occur within Member States CO₂ monitoring data are caused by:

1) The monitoring system has not been designed to properly follow the requirements of Regulation (EC) No 443/2009.
   This may lead to a constant flow of vehicles/data either incorrectly incorporated or left out of the monitoring and therefore to systematic errors. They impact on the averages depends on the number of vehicles concerned.
   Such system-inherent errors can only be quantified when having basic information about:
   a. the Member States having deficiencies within their monitoring system,
   b. the specific issues which cannot be addressed within the monitoring,
   c. the manufacturers which are most likely affected by this error source and
   d. the technical specifications of those vehicles being incorrectly incorporated or left out of the monitoring.
   With this information the data could be assessed and the average CO₂ and mass values could be corrected accordingly. As this requires numerous in depth assessment per Member States and/or per manufacturer, it is crucial to estimate whether the number of vehicles associated with this error is high or low. The sources of these systematic errors can be reduced or even eliminated by implementing quality assurance and quality control procedures and improvements in data collection and/or methodologies (IPPC 2006). Until these quality assurance and quality control procedures are not established to a sufficient degree, this error type can be quantified by applying a correction factor (see chapter 5).

2) A system is properly designed to follow the requirements of the CO₂ monitoring but the procedures are not followed correctly. The number of vehicles/data affected is presumably low and the associated error is most likely random. As a rule random errors have no relevant impact on the average, if the number of correctly collected data is much larger than the data missing due to this error. Nevertheless, “good practice requires the use of a 95 percent confidence interval for quantification of random errors. This may also be expressed as a percentage of the central estimate. [...] The confidence interval can be conveniently expressed

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9 Systematic errors or bias are defined as “the lack of accuracy. Bias can occur because of failure to capture all relevant processes involved or because the available data are not representative of all real-world situations, or because of instrument error” [IPPC 2006]. They may be reduced or even eliminated by implementing quality assurance and quality control procedures and improvements in data collection and/or methodologies [IPPC 2006].

10 Random errors are defined a “random variation above or below a mean value. […] Usually, the random error is quantified with respect to a mean value, but the mean could be biased or unbiased.” [IPPC 2006].
Identification and evaluation of errors in the CO$_2$ monitoring database established under art. 8 of Regulation (EC) No 443/2009

as plus or minus half the confidence interval width divided by the estimated value of the variable (e.g., ± 10%)” (IPPC 2006).

Generally statistical methods are being applied if the available data set presents only a random sample from the whole population.

Once systematic errors are corrected to the extent possible, the uncertainty analysis can then focus on quantification of the random errors with respect to the mean estimate (IPPC 2006). So there is a clear hierarchy in removing the different error types, first removal or correction of systematic errors and then quantification of the random errors by using the confidence interval.

In the following chapter all errors which have been identified to be possible under the current CO$_2$-Monitoring according to Regulation (EC) No 443/2009 will be addressed in detail.

3.2 Data verification procedure of the Commission

According to Article 8 (1) of Regulation (EC) No 443/2009 MS “shall record information for each new passenger car registered in its territory in accordance with Part A of Annex II. They shall furthermore "ensure the maintenance, collection, control, verification and transmission of the […] monitoring data” (Article 4 Regulation (EU) 1014/2010).

The Member State data is checked by the Commission (i.e. the EEA) when it is submitted. If the dataset is incomplete or manifestly incorrect, the MS is requested to re-submit the data or to agree to corrections. The Commission keeps the data reported by Member States in a central register, shall provisionally calculate inter alia the average CO$_2$ value for each manufacturer (Article 8 (4) Regulation (EC) No 443/2009) and inform manufacturers thereof. Manufacturers may notify to the Commission if there are errors in the provisional data and calculations. Paramount for the efficient verification of the provisional calculation is access to accurate TVV codes as this enables the automatic comparison between different databases.

The Commission shall consider any notifications of errors from manufacturers and shall either confirm or amend the provisional calculations which are based on the MS records (Article 8 (5) Regulation (EC) No 443/2009). The Commission does not change or correct the data unless this has been agreed with MS or OEMs (EU COM pers. comm. 2012). Due to this it is possible that systematic and random errors remain within the data which are submitted to the OEM, although these errors have been identified by the Commission, but could not be changed as MS did not agree to the changes or could not provide an alternative data set.
3.3 Responsibility for the errors

It is important to note that the different MS base their monitoring data to a different extent on information directly provided by the manufacturers or vehicles importers. In some systems the technical data is introduced directly by the manufacturers/importers and the MS assign only the respective registration numbers per vehicle version to the technical information, while in other MS the technical information is entered by the MS and then matched with registration data. A relation between these different input flows of technical data and the established data verification procedures cannot in all cases be drawn. There are, however, MS which consider the input data of the manufacturer as correct and do not verify it using their own technical data. This does add another level of potential error sources as it is possible that the manufacturers/importers introduce incorrect or incomplete data into the system.

Due to this, the responsibility for delivering missing, incorrect or unidentifiable data usually has to be shared between stakeholders. In many cases the manufacturers, retailers and/or importers are responsible for submitting the respective data to the Member States authorities, so that registration of a vehicle can be performed. If they fail to deliver complete, correct or identifiable data, it is the MS responsibility to implement measures ensuring the manufacturers, importers and or retailers do so. The further data treatment on MS side is the MS responsibility. If the system of the Member States does not gather all relevant parameters, the responsibility for the error source lies on Member States side. The same is true when registration with outdated type approval values is possible. In order to assess how the errors evolve around the average CO2 and mass values within the CO2 monitoring, the possible sources of errors have to be identified first and further described. Based on the annual data collections according to Decision 1753/2000/EC and Regulation (EC) No 443/2009 as well as the feedback stemming from the manufacturers, the following list of error sources could be elaborated.

1. Missing parameters
   (a) CO2 value
   (b) Mass
   (c) Footprint
   (d) Fuel type
   (e) Type, variant and version (TVV)
   (f) manufacturer name
2. Incorrect indication of data
3. Incorrect assignment of manufacturers
4. Delay in updating the type approval database
5. Missing registrations
6. Temporary registrations
7. Incorporation of vehicles being out of scope of Reg. 443/2009
   (a) L-class and N-class
   (b) Special purpose vehicles
   (c) 2nd hand cars
8. Heterogeneous incorporation of Individual type approved vehicles (IVA)/National small series (NSS)
Missing or incorrectly incorporated geographical areas

3.4 Missing parameters

Missing parameters can occur for each entry. They occur either because the MS monitoring system systematically does not gather the required parameter or it has not been gathered due to a random mistake during registration.

Nevertheless the statistical study carried out by [Agilis/Eurostat 2011] for DG Climate did conclude that the missing TVV, mass and CO₂ values per manufacturer of the database published in July 2011 (before OEM corrections) were of random nature.

Below example shows missing values for axle track (front and rear), wheelbase, for mass and for the CO₂ value in the orange cells.

### Table 3: Example of missing parameters

<table>
<thead>
<tr>
<th>Man</th>
<th>Ct</th>
<th>T</th>
<th>Va</th>
<th>Ve</th>
<th>Mk</th>
<th>Cn</th>
<th>R</th>
<th>E</th>
<th>M</th>
<th>At1</th>
<th>At2</th>
<th>W</th>
<th>Ft</th>
<th>Fm</th>
</tr>
</thead>
<tbody>
<tr>
<td>XXX</td>
<td>M1</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>XX</td>
<td>X</td>
<td>1231</td>
<td>125</td>
<td>915</td>
<td>915</td>
<td>2490</td>
<td>petrol</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>XXX</td>
<td>M1</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>XX</td>
<td>X</td>
<td>2643</td>
<td>125</td>
<td>915</td>
<td>1465</td>
<td>1475</td>
<td>2490</td>
<td>petrol</td>
<td>M</td>
</tr>
<tr>
<td>XXX</td>
<td>M1</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>XX</td>
<td>X</td>
<td>149</td>
<td>125</td>
<td>1470</td>
<td>1460</td>
<td>2490</td>
<td>petrol</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>XXX</td>
<td>M1</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>XX</td>
<td>X</td>
<td>2</td>
<td>915</td>
<td>1475</td>
<td>1460</td>
<td>2490</td>
<td>petrol</td>
<td>M</td>
<td></td>
</tr>
</tbody>
</table>

Unknown and missing parameters can be easily quantified. The table below shows the number of missing parameters in relation to the total registrations in 2010 (only for those manufacturer which submitted corrections).
Table 4: Missing values of selected manufacturer for EU 27

<table>
<thead>
<tr>
<th>Manufacturer (mh)</th>
<th>Total Registrations</th>
<th>Missing CO₂</th>
<th>Missing Mass</th>
<th>Missing Footprint</th>
<th>Missing Type</th>
<th>Missing Variant</th>
<th>Missing Version</th>
<th>Missing TVV</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTON MARTIN LAGONDA LTD</td>
<td>1416</td>
<td>1</td>
<td>0</td>
<td>177</td>
<td>320</td>
<td>16</td>
<td>231</td>
<td>14</td>
</tr>
<tr>
<td>AUDI AG</td>
<td>591305</td>
<td>706</td>
<td>1090</td>
<td>72453</td>
<td>86440</td>
<td>36361</td>
<td>84566</td>
<td>36081</td>
</tr>
<tr>
<td>BAYERISCHE MOTOREN WERKE AG</td>
<td>640525</td>
<td>335</td>
<td>427</td>
<td>37278</td>
<td>40620</td>
<td>11841</td>
<td>38070</td>
<td>11788</td>
</tr>
<tr>
<td>CNG-TECHNIK</td>
<td>583</td>
<td>0</td>
<td>0</td>
<td>172</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>DACIA</td>
<td>251990</td>
<td>52</td>
<td>40</td>
<td>56</td>
<td>49</td>
<td>65</td>
<td>9820</td>
<td>49</td>
</tr>
<tr>
<td>DAIHATSU MOTOR CO</td>
<td>18990</td>
<td>7</td>
<td>13</td>
<td>5725</td>
<td>6838</td>
<td>5366</td>
<td>6535</td>
<td>5366</td>
</tr>
<tr>
<td>DAIMLER AG</td>
<td>647351</td>
<td>1082</td>
<td>521</td>
<td>94488</td>
<td>5584</td>
<td>673</td>
<td>1631</td>
<td>427</td>
</tr>
<tr>
<td>FIAT GROUP AUTOMOBILES SPA</td>
<td>977789</td>
<td>545</td>
<td>1665</td>
<td>556682</td>
<td>603254</td>
<td>519304</td>
<td>602119</td>
<td>519253</td>
</tr>
<tr>
<td>FORD-WERKE GMBH</td>
<td>1077900</td>
<td>509</td>
<td>830</td>
<td>211145</td>
<td>14765</td>
<td>12100</td>
<td>103625</td>
<td>11871</td>
</tr>
<tr>
<td>FUJI HEAVY INDUSTRIES LTD</td>
<td>30747</td>
<td>79</td>
<td>22</td>
<td>5533</td>
<td>5374</td>
<td>4217</td>
<td>5158</td>
<td>4215</td>
</tr>
<tr>
<td>GENERAL MOTORS COMPANY</td>
<td>1590</td>
<td>99</td>
<td>53</td>
<td>327</td>
<td>255</td>
<td>128</td>
<td>274</td>
<td>110</td>
</tr>
<tr>
<td>GM DAEWOO AUTO U TECH COMP</td>
<td>147072</td>
<td>564</td>
<td>411</td>
<td>23156</td>
<td>29949</td>
<td>19862</td>
<td>28222</td>
<td>18561</td>
</tr>
<tr>
<td>GM ITALIA</td>
<td>37671</td>
<td>1</td>
<td>0</td>
<td>28422</td>
<td>36849</td>
<td>28422</td>
<td>36849</td>
<td>28422</td>
</tr>
<tr>
<td>HONDA AUTOMOBILE CHINA CO</td>
<td>20879</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>186</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>HONDA AUTOMOBILE THAILAND CO</td>
<td>1444</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>HONDA MOTOR CO</td>
<td>102973</td>
<td>55</td>
<td>83</td>
<td>146</td>
<td>2072</td>
<td>31</td>
<td>36</td>
<td>20</td>
</tr>
<tr>
<td>HONDA OF THE UK MANUFACTURING</td>
<td>47881</td>
<td>41</td>
<td>41</td>
<td>48</td>
<td>1081</td>
<td>22</td>
<td>35</td>
<td>13</td>
</tr>
<tr>
<td>HONDA TURKIYE AS</td>
<td>1591</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MAGYAR SUZUKI CORPORATION LTD</td>
<td>87229</td>
<td>25</td>
<td>22</td>
<td>24054</td>
<td>31178</td>
<td>17689</td>
<td>31419</td>
<td>17683</td>
</tr>
<tr>
<td>MARUTI SUZUKI INDIA LTD</td>
<td>19610</td>
<td>33</td>
<td>32</td>
<td>3469</td>
<td>7415</td>
<td>3115</td>
<td>7415</td>
<td>3115</td>
</tr>
<tr>
<td>MAZDA MOTOR CORPORATION</td>
<td>170102</td>
<td>63</td>
<td>60</td>
<td>18607</td>
<td>15086</td>
<td>7814</td>
<td>20138</td>
<td>7780</td>
</tr>
</tbody>
</table>
Identification and evaluation of errors in the CO₂ monitoring database established under art.8 of Regulation (EC) No 443/2009

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>EU 27 Level</th>
<th>TVV</th>
<th>TVV</th>
<th>TVV</th>
<th>TVV</th>
<th>TVV</th>
<th>TVV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercedes-AMG GmbH</td>
<td>1504</td>
<td>1</td>
<td>0</td>
<td>181</td>
<td>68</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>MITSUBISHI MOTORS CORPORATION MMC</td>
<td>74030</td>
<td>93</td>
<td>1389</td>
<td>14374</td>
<td>7781</td>
<td>5453</td>
<td>7275</td>
</tr>
<tr>
<td>MITSUBISHI MOTORS EUROPE BV MME</td>
<td>16555</td>
<td>22</td>
<td>24</td>
<td>718</td>
<td>394</td>
<td>23</td>
<td>397</td>
</tr>
<tr>
<td>OPEL</td>
<td>935967</td>
<td>401</td>
<td>167</td>
<td>117938</td>
<td>146200</td>
<td>77118</td>
<td>172109</td>
</tr>
<tr>
<td>QUATTRO</td>
<td>2608</td>
<td>12</td>
<td>12</td>
<td>248</td>
<td>518</td>
<td>218</td>
<td>531</td>
</tr>
<tr>
<td>RENAUET</td>
<td>1125788</td>
<td>585</td>
<td>286</td>
<td>386</td>
<td>282</td>
<td>371</td>
<td>39438</td>
</tr>
<tr>
<td>SEAT</td>
<td>291330</td>
<td>242</td>
<td>2511</td>
<td>34595</td>
<td>40835</td>
<td>9718</td>
<td>40194</td>
</tr>
<tr>
<td>SKODA</td>
<td>423958</td>
<td>144</td>
<td>3106</td>
<td>50818</td>
<td>27734</td>
<td>10406</td>
<td>27682</td>
</tr>
<tr>
<td>SUZUKI MOTOR CORPORATION</td>
<td>85274</td>
<td>94</td>
<td>71</td>
<td>17131</td>
<td>17036</td>
<td>13717</td>
<td>16718</td>
</tr>
<tr>
<td>TOYOTA MOTOR EUROPE</td>
<td>565867</td>
<td>732</td>
<td>848</td>
<td>96716</td>
<td>129859</td>
<td>63619</td>
<td>136608</td>
</tr>
<tr>
<td>VAUXHALL</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>VOLKSWAGEN</td>
<td>1470906</td>
<td>694</td>
<td>965</td>
<td>165206</td>
<td>238715</td>
<td>90797</td>
<td>241081</td>
</tr>
</tbody>
</table>

**ALL**

<table>
<thead>
<tr>
<th>EU 27 Level</th>
<th>TVV</th>
<th>TVV</th>
<th>TVV</th>
<th>TVV</th>
<th>TVV</th>
<th>TVV</th>
<th>TVV</th>
</tr>
</thead>
<tbody>
<tr>
<td>9870426</td>
<td>7224</td>
<td>14697</td>
<td>1580256</td>
<td>1496737</td>
<td>938469</td>
<td>1658180</td>
<td>935281</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentage</th>
<th>0,07%</th>
<th>0,15%</th>
<th>16,01%</th>
<th>15,16%</th>
<th>9,51%</th>
<th>16,80%</th>
<th>9,48%</th>
</tr>
</thead>
</table>

The table shows that little information is missing for the CO₂ and mass values (0,07% and 0,15%) on EU 27 level for the manufacturers concerned, while the number of missing TVV is considerably higher (from 10% to 17%). Those are the missing values which remained after the corrective actions by some manufacturers, indicating that only part of the data can actually be identified and corrected by them. Data fields which are missing the required information and cannot be filled by either the MS or by the manufacturers behave like incorrect data which was identified, but could no be corrected and therefore had to be suppressed.
The relation between these errors is shown in below figure. The colours indicate combinations which are favourable for the data verification or correction (green) and combinations which are not (red).

![Diagram](image)

Figure 10: Verification and correction possibilities of missing and corrupted data

Due to the close connection of missing and incorrect data, identification and evaluation possibilities are being discussed for both cases in following chapter.

### 3.5 Incorrect indication of data

Incorrect data can appear for each parameter which is asked by the CO₂ monitoring. This chapter is divided by incorrect data having
- an indirect effect onto the CO₂ and mass values (see chapter 3.5.1) and
- a direct effect upon the averages (see chapter 3.5.2).
3.5.1 Incorrect or conflicting information regarding the TVV

The incorrect indication of TVV may lead to the situation that numerous physical parameters cannot be identified or verified properly. Such highly corrupted data could be for example the indication of only a few letters from the variant or the CO₂ value. If e.g. the variant BSDAFP has been indicated as BSDAF (missing the last letter) this information is too short in order to decide upon the correct variant (it could be BSDAFP or BSDAFF). Such highly corrupted TVV data can be considered a missing data as no correction is possible (see also chapter 3.4).

Nevertheless some incorrect TVV can be corrected by the OEM, see example below. The red letters were indicated by manufacturers to be incorrect, green letters show the corrected entry.

Table 5: Example of notified version code

| BSD1AEFF | BSD1AFF |
| BSD1FF   | BSDAFF  |
| BFDAFP   | BSDAFP  |

The reason for the flawed indication of TVV is due to incorrect entry of CoC or type approval data upon registration. Very often in case of TVV the letter "o" and the number zero are used incorrectly or symbols, blanks and additional letters are introduced.

In both cases (highly and minor corruption of the TVV) these more formal flaws hinder the automatic comparison of datasets and therefore complicate the correction of incorrect or the verification of plausible data and have therefore an indirect effect on the average CO₂ and mass values.

Method to identify the error

Generally the OEMs have the possibility to verify this monitoring data, provided that the TVV is not too corrupted. If the TVV cannot be corrected and the true TVV remains unclear the confidence interval as explained in chapter 5.4 has to be calculated since [Agilis/Eurostat 2011] found that at least for 2010 the missing TVV per manufacturer were of random nature.

If it is found in future that the missing TVV is systematically missing and they TVV cannot be corrected, a correction of the associated error has to be performed.

Two possibilities to correct the associated error are explained in chapter 5.

Comparative work can be done also on MS and EU COM level in order to identify incorrect resp. suspicious data entries.
3.5.2 Incorrect data of physical parameters

As mentioned before a statistical study carried out by [Agilis/Eurostat 2011] for DG Climate did conclude that the missing mass and CO₂ values per manufacturer of the database published in July 2011 (before OEM corrections) were of random nature. Nevertheless it has happened in the past that physical parameters were systematically incorrectly incorporated. Therefore both cases are being discussed here.

3.5.2.1 Random

During the transfer from paper version into some kind of database the incorrect incorporation of values can occur, either by switching numbers (189 instead of 198), hitting the wrong number (123 instead of 124), missing a number (23 instead of 235) or adding numbers (1900 instead of 190). These typos can happen at every stage of the process, if data has to be treated manually. Depending on the specific MS system, the error can therefore be introduced by the manufacturer/importer or the MS authorities.

An example for incorrect mass values is presented below.

<table>
<thead>
<tr>
<th>Make</th>
<th>Commercial name</th>
<th>Registrations</th>
<th>Mass (in kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RENAULT</td>
<td>TWINGO</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>RENAULT</td>
<td>TWINGO</td>
<td>1</td>
<td>23</td>
</tr>
<tr>
<td>SUZUKI</td>
<td>SPLASH</td>
<td>1</td>
<td>65</td>
</tr>
<tr>
<td>VOLKSWAGEN</td>
<td>POLO</td>
<td>1</td>
<td>67</td>
</tr>
</tbody>
</table>

Many of these typos can be identified easily as they are typical outliers, usually having a very low number of registrations and having therefore also a low impact on the averages.

Method to identify the error

Generally the OEMs have the possibility to verify this monitoring data, provided that the TVV and the manufacturer name are accurately indicated as it enables automatic data comparison. Only in those cases where one TVV has more than one CO₂ or mass values (in case of type approval extensions) it is not in all cases possible for the OEM to identify the correct value (see also chapter 3.5.1). Since it is expected that for the 2011 data the type approval number and its extension is going to be reported by the MS, identification and removal of the error is not necessary.

11 When the TVV is correct.
3.5.2.2 Systematic

Update of TA database

Vehicles can receive a type approval extension which cites different CO₂ and/or mass values than the initial type approval. Depending on the system, it is possible that the type approval based registration information is updated with the extension with a certain lag of time. Germany verified several ranges occurring within CO₂ values data and from their analysis it is clear that the CO₂ value for the same TVV can fluctuate up to 20 %\(^\text{12}\) due to type approval extensions. It cannot be completely ruled out that such systematic data flaws occur in some MS and for some manufacturers.

Method to identify the error

The error can only be identified if the type approval number including its extension or the VIN are being submitted by the MS and then compared with information from the OEM.

3.6 Incorrect assignment of manufacturers

This error is in particular important for those registration systems which are completely or partly based on makes as this could lead to mismatches between manufacturers. For most OEMs this is not relevant as manufacturer and make usually coincide. But in particular for the make Chevrolet the manufacturer is important as Chevrolets are being produced by two different manufacturers namely General Motors and GM Daewoo (now GM Korea). For some Fiats and Suzuki the distinction is also relevant as the manufacturer Suzuki Magyar produces both as makes. Also tuning or retrofitting companies which are manufacturers in their own right but are specialised on certain makes/manufacturers like e.g. Mercedes or BMW could have their CO₂ values affected, if those makes/manufacturers were incorrectly assigned. This error source can clearly shift the average values of certain manufacturers towards higher or lower CO₂ and/or mass values, in particular if vehicles from specialised tuning companies cannot be differentiated from the OEM. Therefore this error source will most likely produce a systematic error for specific manufacturers. As pointed out before, the implementation of quality assurance and quality control procedures and improvements in data collection and/or methodologies may reduce or even eliminate systematic error. So this should be the primary goal in order to avoid the error altogether.

\(^\text{12}\) It could be even more, but further data was missing in order to assess the maximum effect.
Method to identify the error
Generally the OEMs have the possibility to verify this monitoring data, provided that the TVV and the manufacturer name are accurately indicated as it enables automatic data comparison. If this data is not submitted to such an extent that this verification can be performed and the OEM has to verify each entry manually, a comparison of the registrations over time for the different manufacturers could be used to compare MS and OEM information and perform correct assignments. This can be done also on MS and EU level. But for this analysis the correct indication of the manufacturer name is crucial.

3.7 Missing registrations

According to one manufacturer, some registrations would be expected to happen in one monitoring year or within the subsequent monitoring year, but they do not appear at all. According to them this can be observed particularly for vehicles having e.g. a rather rare fuel type, and therefore it is possible that missing registrations are limited to certain types of vehicles.

This error is closely connected to:

- Missing parameters
- Incorrect indication of data
- Incorrect assignment of manufacturers

The reasons for these missing data might be that data sets are not transmitted to the CO₂ monitoring of the European Commission or that the parameters which would identify the “missing” registrations have been changed for the respective vehicles disturbing their identification.

This error source can produce systematic and random errors. In case of missing harmonisation which results in not reporting of specific vehicles (like e.g. hybrids), this error source has the potential to systematically shift the average values of certain manufacturers. But if the associated CO₂/mass value is reported correctly missing only the relevant information identifying them properly (e.g. the fuel type) then the error has no impact onto the CO₂ and mass values.

In case of actually missing registrations there is no evidence that a systematic error is associated with this. The manufacturer who mentioned this error source should be asked for more details as this error could not be identified during the data comparison activities between 2003 and 2004.
Method to evaluate the error

This error source has not been addressed before, and therefore information from MS on this issue would also be needed. The information required from the MS should comprise whether the system might systematically not report registrations and the reasons for that. In order to assess the error a comparison between OEM and MS data based on VIN would be required.

3.8 Temporary registrations

Article 2 of Regulation (EC) No 443/2009 specifies that “This Regulation shall apply to motor vehicles of category M1 [...] which are registered in the Community for the first time and which have not previously been registered outside the Community (‘new passenger cars’).”

Vehicles are being registered temporarily if they are bought within one Member State and are to be driven to another MS for permanent registration. For this case the respective vehicle needs temporary plates and therefore a (temporary) registration until the transport into the final MS is completed and the vehicle has been registered permanently. A temporary registration is therefore the first time registration in the EU and should be reported according to Regulation (EC) No 443/2009. If Member States in- or exclude these vehicles differently into the CO2 monitoring, vehicles could be double counted or not counted at all.

LU pointed out that in their case “Vehicles with export license plate have a validity of 3 month and are considered as temporary registrations in Luxembourg. The date of the first ‘putting’ into circulation as fixed by the registration in Luxembourg, is also picked up in the foreign country. [...] these vehicles should not be considered as new vehicles by the countries to which they are exported”.

This would mean that all new vehicles which have been temporarily registered in LU are being reported by LU and not by the MS to which they are exported.

Germany reported that they had temporarily registered 19770 new vehicles (~0,7% of Germanys total registrations) in 2010. They specified further that in their case: “temporary registrations” mean, that these vehicles are part of the normal traffic for a while. In some cases they stay in Germany [...] although they were meant to be exported.”

In the case of Ireland and the Slovak Republic it could not be clarified whether their data submission contained temporary registrations or not. The Commission did not advise the MS for the 2010 data collection how to report temporary registrations, leading to a potential error as MS dealt differently with those vehicles. The procedure for reporting year 2011 and onwards has now been harmonised (see EU guidelines) so that in future this error source should not be an issue.
Method to evaluate the error

In order to assess the error for 2010 associated with this issue on EU level one would need to know the VIN number of the vehicles which were registered temporarily and permanently for each MS and their CO2 and mass values.

Like this the vehicles which were double counted or not counted at all could be identified and the associated error per Member State and manufacturers could be calculated.

3.9 Incorporation of vehicles being out of scope of Regulation (EC) No 443/2009

Regulation (EC) No 443/2009 excludes numerous vehicle types from its scope. Those are e.g. special purpose vehicles (like caravans and wheelchair accessible vehicles) as defined in the type approval directive 2007/46/EC. Furthermore vehicles which have been registered within the EU before and vehicles not destined for the carriage of passengers are not to be reported within the CO2 monitoring for passenger cars. 921 vehicles were indicated by the OEMs to be out of scope in the CO2 database of reporting year 2010. 292 of them had a CO2 value (163 g/km) and 352 had a mass value (1419 kg). Six manufacturers were affected, but mostly Renault and Ford. 18 Member States were affected, but mostly Germany and Spain. Additionally 5 vehicles in Spain were labelled by the OEM as being out of production. These numbers cannot be considered to be representative as not all OEMs gave feedback. Furthermore the missing values for TVV prevented the checking of all vehicles. This error source has the potential to systematically shift the average values of certain manufacturers toward higher or lower CO2 and/or mass values. The number of registrations of out of scope vehicles is however very low (< 1000 vehicles or < 0.01%) so that the error associated with this error source is estimated to be very small and is most likely random. Even if the number of out of scope vehicles would be three times higher the share of registrations would only amount to 0.02%.

The implementation of quality assurance and quality control procedures and improvements in data collection and/or methodologies may reduce or even eliminate this error. So this should be the primary goal in order to avoid the error altogether.

Most large OEMs produce special purpose vehicles or vehicles which are not destined for the carriage of passengers. It is therefore important that the MS monitoring system is designed so that those vehicles cannot be incorporated in the CO2 monitoring data.
Method to identify the error

Generally the OEMs have the possibility to verify the monitoring data provided that the TVV is indicated.

For the Commission it is fairly difficult to identify out of scope vehicles without additional information since they are usually closely related to vehicles within the scope of the CO2 monitoring. If these vehicles cannot be identified by their technical parameters (e.g. if their mass is above 5000 kg classifying them automatically as M2), only the name of the manufacturers or the commercial name can identify out of scope vehicles in the current data set. This requires either manual checks or a list comprising the nominations of all manufacturers resp. manufacturers and model names of special purpose vehicles.

3.10 Heterogeneous incorporation of Individual type approved vehicles (IVA)/National small series (NSS)

3.10.1 NSS

National small series vehicles are defined as “The number of units of one type to be registered, sold or put into service per year in one Member State [...] shall be determined by that Member State but shall not exceed 75 Units (see Article 23 and Annex XII of Directive 2007/46/EC). According to Annex VII of the European Type Approval Directive 2007/46/EC the Type Approval Number will indicate the letters NKS for national small series. So instead of e11*2007/2046*0004*02 counting for vehicles type approved according to Directive 2007/46, the type approval number for national small series would look as follows e11*NKS*0004*02.

Those vehicles should be reported within the aggregated data as NSS. Not all Member States indicated these vehicles. This can be due to the fact that no such vehicles were registered in the given year or the MS system is not able to distinguish these vehicles from those vehicles being EU type approved. SK indicated that the latter is the case and BG and NL specified that the indication of those vehicles was not possible for the 2010 data. For 14 Member States the indication of those vehicles has not been indicated and six MS indicated 674 NSS vehicles.

---

13 FR, UK, ES, AT, PL, EL, DK, FI, RO, IE, SI, CY, LV, MT, NL.

ES, RO and IE gave indications during the Member States visits that they are able to distinguish NSS. Although they have not confirmed that their number of registrations is zero for 2010, this is highly probable.

14 EE, LU, CZ, PT, BE, IT
Identification and evaluation of errors in the CO₂ monitoring database established under art.8 of Regulation (EC) No 443/2009

**Method to identify the error**

This error is only relevant for very small volume manufacturers, but for them it is crucial if they have been attributed to a manufacturer and they will be counted towards a manufacturer's target. Generally the OEMs have the possibility to verify the monitoring data, provided that the TVVs are indicated. If the TVV is not submitted to such an extent that this automatic verification can be performed and the OEMs have to verify each entry manually, this should still be possible as the number of vehicles is relatively low and could still be verified with moderate effort.

Verification on EU/MS level is also possible, as it is expected that for the 2011 data the type approval number is going to be reported by the MS. Due to this the national small series vehicles can be identified quite easily by searching for the entry NKS.

For those MS not indicating the type approval number the following approach is possible on EU level\(^{15}\).

- Those MS which are not able to distinguish NSS vehicles should be identified.
- Those manufacturers which have, in the given year, registered \(\leq 75\) vehicle per MS and type should be identified.
- A matrix table of low volume manufacturers and Member States should be elaborated.
- Those manufacturers should be identified which where only registered within those MS which are not able to distinguish NSS.
- All those manufacturers should be removed from the detailed data.

In general a clarification between the OEM and the respective MS would verify the status of the low volume manufacturers.

**3.10.2 IVA**

Individual type approval or 'individual approval' is defined in Directive 2007/46/EC as *"the procedure whereby a Member State certifies that a particular vehicle, whether unique or not, satisfies the relevant administrative provisions and technical requirements."* Those vehicles should only be reported within the aggregated data as IVA.

Mostly these vehicles are privately imported vehicles from outside the European Union usually having no European type approval. Custom made vehicles or kit cars could also fall under this category if they are not reported under the NSS category or have a European small series approval (which allows them to be part of the CO₂ monitoring data). Most MS indicated the IVA which amounted to

\(^{15}\) This error is best addressed on EU level as here comparisons of low volume manufacturers between the MS are possible.
The Slovak Republic indicated that their system is not able to distinguish these vehicles from those vehicles being EC type approved. The Netherlands stated that the information is not available within their system or in the submitted data. BG specified that the indication of IVA was not possible for the 2010 data but will be from 2011 onwards. For six MS\(^{17}\) it remains unclear why IVA vehicles have not been indicated. DK showed a very high number of IVA (about 18000), which was due to the changes they made according to the requirements of Regulation (EC) No 443/2009. It is expected that their number will decrease significantly in 2011. This error source has the potential to systematically shift the average values of certain manufacturers toward higher or lower CO\(_2\) and/or mass values.

**Method to identify the error**

Generally the OEMs have the possibility to verify the monitoring data, provided that the TVVs are indicated.

Verification on EU/MS level is also possible, as it is expected that for the 2011 data the type approval number is going to be reported by the MS. Due to this the IVA might be easier to spot within the detailed data as they approval number will either be missing or be structured according to the national requirements rather than the EU format of the type approval number.

### 3.11 Missing or incorrectly incorporated geographical areas

The EU has territories also outside the European continent. Some of these territories are part of the European Union, but not part of the customs union and vice versa (see table below).

<table>
<thead>
<tr>
<th>Territories of EU Member States</th>
<th>Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akrotiri and Dhekelia</td>
<td>Europe</td>
</tr>
<tr>
<td>Åland</td>
<td>Europe</td>
</tr>
<tr>
<td>Azores</td>
<td>Europe</td>
</tr>
<tr>
<td>Basel / Mulhouse airport</td>
<td>Europe</td>
</tr>
<tr>
<td>Büsingen am Hochrhein</td>
<td>Europe</td>
</tr>
<tr>
<td>Campione d’Italia</td>
<td>Europe</td>
</tr>
<tr>
<td>Canary Islands</td>
<td>Europe</td>
</tr>
</tbody>
</table>

\(^{16}\) Excluding DK.

\(^{17}\) FR, IE, SI, CY, LV, MT. IE gave indications during the Member State visit that they are able to distinguish IVA. Although they have not confirmed that their number of registrations is zero for 2010, this is highly probable.
Identification and evaluation of errors in the CO2 monitoring database established under art.8 of Regulation (EC) No 443/2009

<table>
<thead>
<tr>
<th>Territories of EU Member States</th>
<th>Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceuta</td>
<td>North Africa</td>
</tr>
<tr>
<td>French Guiana</td>
<td>South America</td>
</tr>
<tr>
<td>Gibraltar</td>
<td>Europe</td>
</tr>
<tr>
<td>Guadeloupe(^{18})</td>
<td>Caribbean</td>
</tr>
<tr>
<td>Heligoland</td>
<td>Europe</td>
</tr>
<tr>
<td>Kleinwalsertal</td>
<td>Europe</td>
</tr>
<tr>
<td>Livigno</td>
<td>Europe</td>
</tr>
<tr>
<td>Madeira</td>
<td>Europe</td>
</tr>
<tr>
<td>Martinique</td>
<td>Caribbean</td>
</tr>
<tr>
<td>Mayotte(^{19})</td>
<td>Africa</td>
</tr>
<tr>
<td>Melilla</td>
<td>North Africa</td>
</tr>
<tr>
<td>Mount Athos</td>
<td>Europe</td>
</tr>
<tr>
<td>Réunion</td>
<td>Africa</td>
</tr>
<tr>
<td>Saint Barthelemy</td>
<td>Caribbean</td>
</tr>
<tr>
<td>Saint Martin(^{20})</td>
<td>Caribbean</td>
</tr>
</tbody>
</table>

[EU pers. comm 2012]

The registration data of those territories should be part of the data delivery as all territories which are part of the EU are also subject to the CO2 regulation [European Commission pers comm. 2011].

This error source has the potential to systematically shift the average values of certain manufacturers toward higher or lower CO2 and/or mass values. Nevertheless the distribution of those vehicles being registered in territories which are geographically close to the EU 27 zone will most likely not be very much different and have therefore not a large associated systematic error if they are not reported.

The territories outside mainland Europe could very well have a different composition of the new M1 vehicle fleet than the associated EU country in mainland Europe. In particular the fleet of the Caribbean territories might import their new M1 vehicles rather from American countries than from European.

Since all territories are fairly small, their total number of registrations would also be very small resulting in a very low impact on the average values per Member State.

\(^{18}\) Excluding Saint Barthelemy and Saint Martin

\(^{19}\) The status of Mayotte is expected to change in near future or has even changed by now. http://www.france.fr/en/knowing/geography/overseas-departments-and-territories/article/mayotte-becomes-101st-french-department

\(^{20}\) Excluding Sint Maarten
**Method to evaluate the error**

Basic information about the manufacturer, number of registrations, CO2 and mass values are necessary in order to evaluate the error. It might be helpful to use also the VIN when performing a comparison between OEM and MS data, as it could be that this error is associated with the error source of missing registrations (see chapter 3.7).

**3.12 Other considerations**

According to one manufacturer registrations of vehicles which would have been expected to occur in a certain monitoring year due to their early sale, appear not until the next monitoring year. Generally a time lag will always occur between selling of a car and registering a car. Particularly in December and January which mark the two months between two monitoring years, it is likely that numerous vehicles will be registered in a different year than they were bought. A delay of several months cannot be explained but is not relevant for the CO2 monitoring as long as the vehicles are registered. Due to this, delayed registrations cannot be considered to be an error if the vehicles are being registered. If they are not registered, the error would be missing registration (see chapter 3.7).

**3.13 Summary**

Following table shows the different error types their categorization and possible statistical counter measures (for further explanations, please see chapter 3.1).

<table>
<thead>
<tr>
<th>Error type</th>
<th>Error category</th>
<th>Statistical counter measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing/Incorrect information but TVV</td>
<td>Random (2010), Random and/or systematic &gt; 2010</td>
<td>Calculation of the confidence interval/Correction</td>
</tr>
<tr>
<td>Missing/ Incorrect TVV</td>
<td>Random (2010), Random and/or systematic &gt; 2010</td>
<td>Calculation of the confidence interval/Correction</td>
</tr>
<tr>
<td>Incorrect assignment of manufacturers</td>
<td>Systematic</td>
<td>Correction</td>
</tr>
<tr>
<td>Missing registrations</td>
<td>Random and/or systematic</td>
<td>Calculation of the confidence interval/Correction</td>
</tr>
<tr>
<td>Temporary registrations</td>
<td>Systematic (in 2010) expected random &gt; 2010</td>
<td>Correction/Calculation of the confidence interval/Correction</td>
</tr>
<tr>
<td>Out of scope vehicles</td>
<td>Random and/or systematic</td>
<td>Calculation of the confidence interval/Correction</td>
</tr>
<tr>
<td>NSS</td>
<td>Systematic</td>
<td>Correction</td>
</tr>
<tr>
<td>IVA</td>
<td>Systematic</td>
<td>Correction</td>
</tr>
<tr>
<td>Geographical areas</td>
<td>Systematic</td>
<td>Correction</td>
</tr>
</tbody>
</table>

As the error category defines the counter measure to be taken, below table shows the different error sources and summarizes the current possibilities to eliminate or quantify them. Except for the error source of missing registrations for which the associated error cannot be estimated, the impact of each
error on the EU 27 averages can be consider as being low since the number of involved registrations is de facto or presumed to be low. Nevertheless the impact of each error per manufacturer can be higher if the error systematically appears for selected manufacturers. In particular the incorrect assignment of manufacturers has a very high impact on the averages per manufacturer. The impacts increase for those manufacturers having only few registrations.

The rationale to read Table 9 is as follows: If an error cannot or only partly be identified/removed from the dataset from one of the involved institutions, the evaluation of the error is required.

Table 9: Summary of possibilities to identify, remove or assess the errors

<table>
<thead>
<tr>
<th>Target institution</th>
<th>EU COM/EEA</th>
<th>EU COM/EEA</th>
<th>OEM</th>
<th>Evaluation of error necessary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issue</td>
<td>Error Identification possible in the current monitoring system</td>
<td>Error removal possible</td>
<td>2010</td>
<td></td>
</tr>
<tr>
<td>Reporting period</td>
<td>for all years</td>
<td>for all years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing information but TVV*</td>
<td>Yes</td>
<td>Partly</td>
<td>Partly</td>
<td>Yes</td>
</tr>
<tr>
<td>Missing TVV</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Incorrect TVV – high data corruption</td>
<td>Partly</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Incorrect TVV- low data corruption</td>
<td>Partly</td>
<td>Partly</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Incorrect information but TVV*</td>
<td>Partly</td>
<td>Partly</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Incorrect assignment of manufacturers*</td>
<td>Partly</td>
<td>Partly</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Update of TA database*</td>
<td>No</td>
<td>No</td>
<td>Partly</td>
<td>Yes</td>
</tr>
<tr>
<td>Missing registrations</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Temporary registrations*</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Out of scope vehicles*</td>
<td>Partly</td>
<td>Partly</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>NSS*</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>IVA*</td>
<td>Partly</td>
<td>Partly</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Geographical areas*</td>
<td>No</td>
<td>No</td>
<td>Unclear</td>
<td>Yes</td>
</tr>
</tbody>
</table>

* Assumption TVV is present and correct

Following table shows the methods to identify or remove errors or the means which are currently missing in order to do so. The column “missing information for error estimation” refers to above table and is only relevant for those errors which require such an evaluation.
Table 10: Summary of methods to identify, remove or assess the errors

<table>
<thead>
<tr>
<th>Target institution</th>
<th>EU COM/EEA</th>
<th>EU COM/EEA/MS</th>
<th>Missing information for error removal</th>
<th>Missing information for error estimation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reporting period</td>
<td>for all years</td>
<td>for all years</td>
<td>for all years</td>
<td>2010</td>
</tr>
<tr>
<td>Missing information but TVV*</td>
<td>Counting of missing parameters</td>
<td>Plausibility checks</td>
<td>Type approval number incl. its extension</td>
<td>Type approval number incl. its extension</td>
</tr>
<tr>
<td>Missing TVV</td>
<td>Counting of missing parameters</td>
<td>Implementation of changes within the registration system (MS)</td>
<td>100% of TVV</td>
<td></td>
</tr>
<tr>
<td>Incorrect TVV – high data corruption</td>
<td>Comparison between MS data</td>
<td>Implementation of changes within the registration system (MS)</td>
<td>100% of correct TVV data</td>
<td></td>
</tr>
<tr>
<td>Incorrect TVV – low data corruption</td>
<td>Comparison between MS data</td>
<td>Implementation of changes within the registration system (MS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incorrect information but TVV*</td>
<td>Comparison between MS data</td>
<td>Plausibility checks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incorrect assignment of manufacturers*</td>
<td>Comparison of time series</td>
<td>Plausibility checks</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Update of TA database</strong></td>
<td>Comparison of MS TVV information</td>
<td>Implementation of changes within the registration system (MS)</td>
<td>Type Approval Number incl. extension or VIN</td>
<td>Type Approval Number incl. extension or VIN</td>
</tr>
<tr>
<td><strong>Missing registrations</strong></td>
<td>Comparison of VIN between OEM and MS data</td>
<td>Implementation of changes within the registration system (MS)</td>
<td>VIN</td>
<td>VIN</td>
</tr>
<tr>
<td><strong>Temporary registrations</strong></td>
<td>Comparison of VIN between OEM and MS data</td>
<td>Implementation of an EU harmonised approach</td>
<td>VIN</td>
<td>VIN</td>
</tr>
<tr>
<td>Out of scope vehicles*</td>
<td>Elaboration of a negative list</td>
<td>Implementation of changes within the registration system (MS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NSS*</td>
<td>Type Approval Number</td>
<td>Type Approval Number</td>
<td>Type Approval Number</td>
<td></td>
</tr>
<tr>
<td>IVA*</td>
<td>Elaboration of a negative list</td>
<td>Implementation of changes within the registration system (MS)</td>
<td>Information on manufacturer name, CO2, mass, registrations or Type Approval number or VIN</td>
<td></td>
</tr>
<tr>
<td>Geographical areas*</td>
<td>not available</td>
<td>Implementation of changes within the registration system (MS)</td>
<td>Information on manufacturer name, CO2, mass, registrations</td>
<td></td>
</tr>
</tbody>
</table>

* Assumption TVV is present and correct
Identification and evaluation of errors in the CO₂ monitoring database established under art.8 of Regulation (EC) No 443/2009

The error sources geographical areas, missing information but TVV, update of TA database, temporary and missing registrations cannot be identified and removed by the EU Commission or the OEM. There are, however, means to remove these error sources by introducing new or different information (like the VIN or the type approval number) than currently foreseen by Regulation (EC) No 443/2009 (see also chapter 4).

If those means are not chosen in the future an error estimation should be carried out (see chapter 3.14).

For numerous vehicles the information on TVV is missing to a large extent. This is due to the fact that some Member States are still in the transition of the monitoring systems. Therefore this error source is likely to vanish in the future. Until the implementation has not been completed, the Commission requires a method to assess the error associated with missing TVV. Chapter 5 describes several methods for this purpose.

3.14 Selection of MS for in-depth assessment of errors not identifiable in the EU CO₂ database

In case that the means necessary for removing the errors sources of geographical areas, update of TA database, temporary and missing registrations are not being introduced into the revision of Regulation (EC) No 443/2009 (see Table 9), an estimation of the error related to the respective error source and based on reporting year 2010 would have to be calculated.

Member States having geographical areas which should/should not be part of the data delivery are mainly FR, DE, EL, ES, IT, PT, SE, UK. A systematic check of those MS could provide insight whether there is indeed an error to be expected for those MS. Details on the nature of the incorrect data would have to be provided as well.

Within all MS which use exclusively or partly the type approval documents for registering a car a delay in updating of the TA database with new information could occur in theory. A systematic check of those MS (EE, DE, FI, FR, IT, LV, PT, RO and ES) could provide insight whether there is an error to be expected for those MS or not.

For the temporary registrations a few neighbouring countries have to be selected for which a VIN based comparison should be carried out. Sensible combinations are in particular FR-ES-PT, UK-IE, FR-BENELUX, DE-BENELUX, DE-PL-CZ, IT-FR-AT, DE-FR, AT-SK-SI-HU, EL-BG-RO, DK-SE-FI, FI-EE-LT-LV.
Regarding the **missing registrations** initial information of the manufacturer is required in order to choose the MS most likely affected by the error source. Furthermore details like the VIN about the missing vehicles must be submitted in order to perform data comparisons with MS VIN based data.

## 4 TASK 3: POSSIBILITIES TO USE THE VIN

Numerous manufacturers cited the lack of the Vehicle Identification Number (VIN) as one reason for not being able to verify the 2010 CO₂ Monitoring data completely. The VIN has to be indicated within the CoC under entry 0.10 and is uniquely assigned to each vehicle by the manufacturer. Some Member States have already started to working on a VIN based registration procedure (see Ereg activities) as such a system has advantages also regarding other vehicle related fields like the technical inspections.

As mentioned in chapter 3 the error source of missing registrations and temporary registrations is best identified if MS and manufacturers would provide equally formatted VIN-numbers within the frame of Regulation (EC) No 443/2009 as automated comparisons between the two data sets (initial monitoring data and OEM corrected data) would be possible on the basis of individual vehicles. For most other error sources the use of the VIN is not crucial as other means exist to identify or assess them. These are clear advantages when using the VIN. Nevertheless, a VIN based system has also some drawbacks which are discussed in the following paragraph²¹.

1) **Inflated database**

Submitting the VIN instead of the TVV would increase the amount of data to be transferred and handled significantly. In 2010, fewer than 300.000 records were necessary to provide information for ~13 million newly registered M1 vehicles in EU 27. If the VIN would be used each vehicle would require one record augmenting the number of datasets by ~13 million. Nevertheless this disadvantage can be reduced when a separate file for the VIN would be used. Such an approach would require two separate files which contain an ID allowing the matching of the data. One file would contain data based on TVV plus the ID number and one file would contain the VIN which are associated with the respective ID numbers (see graph below). Although this procedure has some technical benefits with regard to data upload times and data handling, the effort for analysing the data might be higher as several VINs will be associated to one TVV combination requiring the disaggregation of data at one point. In addition the effort for MS might increase if they have to provide

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²¹ An additional small excursus on the VIN and the mass used according to Regulation (EC) No 443/2009 can be found in the Annex.
two files instead of one disaggregated file. Whether this is a valid disadvantage would have to be verified by the MS.

The data comparison activities could be performed as indicated in following graphs:

![Diagram](image.png)

**Figure 11**: CO2 monitoring system with separate VIN file- variation 1

In this example the OEM receives only the VIN number and matches them with his internal VIN based data and generates a new database taking only those VIN into account which were registered in the MS. This file is then shared with the EU Commission who shares on her part the combined dataset.
In this example the OEM receives the completed data set right from the beginning and has to match it with their internal data.

Which of the above data comparison procedures should be implemented in detail depends on the likes of the involved stakeholder and cannot be assessed here. As this is mainly a technical issue which could be overcome in one way or another, it will not be discussed further.

2) Typos

Also within the VIN typos or transposed digits can occur, which could hinder the identification of the vehicle, therefore some additional information about the variant and version would still be required, in case that the VIN has not been entered correctly.

3) Privacy rules

Several Member States mentioned during the WG4 meeting that the VIN is or could be subject to privacy rules and that sharing the VIN with the public or the manufacturers could violate national but also European data protection rules. This could be a knock-out criterion for sharing the VIN openly with the manufacturers and/or the public. The only option to overcome this obstacle would be to use the VIN only for internal analysis on national and/or European level. This would nevertheless require the manufacturers to submit lists of sold vehicles including its VIN to the national authorities and/or to the Commission in order to match the MS and OEM data. Further analysis is required of the legal framework for data protection.
4) Administrative burden

MS have currently overhauled their monitoring systems according to the requirements Regulation (EC) No 443/2009 or are still in the process to do so. The introduction of the VIN would most likely increase their administrative burden (at least for those MS which did so far not gather or base their registration system upon the VIN).

Conclusions

There are currently no objective criteria available in order to decide which of the advantages or disadvantages weighs more than others. Following table summarises the points which count for or against using the VIN and identifies the actions to be taken in the future in case that the advantages and disadvantages shall be assessed further.

Table 11: Advantages and disadvantage for using the VIN

<table>
<thead>
<tr>
<th>Advantage</th>
<th>Required actions to assess advantage</th>
<th>Disadvantage</th>
<th>Required actions to assess disadvantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presumed positive effect onto most error sources</td>
<td>Data comparison activities</td>
<td>Incorrect VIN/implausible vehicles are still possible</td>
<td>Maybe data comparison activities</td>
</tr>
<tr>
<td>Only mean to identify missing and temporary registrations</td>
<td>Data comparison activities</td>
<td>Contradicting privacy rules</td>
<td>Legal assessment</td>
</tr>
<tr>
<td>Lower administrative burden for the OEM</td>
<td>Information from the OEM</td>
<td>Presumed higher administrative burden for the MS</td>
<td>Information from the MS</td>
</tr>
</tbody>
</table>
5 TASK 4: EVALUATION OF THE ERRORS

In particular for missing/incorrect values the Commission has sought a solution for addressing this issue and already implemented a method for the 2010 data (see Commission Implementing Decision 2011/878/EU).

This contract should evaluate the possibilities of an alternative method to correct the data than the one implemented though Commission Implementing Decision 2011/878/EU.

The basic ideas for alternative methods to assess the associated errors with the missing TVV data came from one Member State and the Commission.

The method employed upon the 2010 data will also be described in a form so that a comparison of the methods will be possible.

5.1 Basic considerations

In order to be able to compare the different methods the data is being categorised as explained below. Although only the CO₂ values is mentioned here, the same method can also be applied upon the mass and footprint values.

The data where the CO₂ is known/unknown can be summarised in the following graph and tables (the exact values depends on the specific manufacturer).

Figure 13: Overview of the different relations between CO₂ values and TVV
Identification and evaluation of errors in the CO₂ monitoring database established under art.8 of Regulation (EC) No 443/2009

Table 12: Number of vehicles (CO₂ known)

<table>
<thead>
<tr>
<th>number of vehicles</th>
<th>TVV known</th>
<th>TVV unknown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changed</td>
<td>n11</td>
<td>n12</td>
<td>n11+n12</td>
</tr>
<tr>
<td>Unchanged</td>
<td>n21</td>
<td>n22</td>
<td>n21+n22</td>
</tr>
<tr>
<td>Total</td>
<td>n11+n21</td>
<td>n12+n22</td>
<td>Σn=n11+n21+n12+n22</td>
</tr>
</tbody>
</table>

Table 13: Sum of CO₂ values before corrections made by OEM

<table>
<thead>
<tr>
<th>sum CO₂ before correction by OEM</th>
<th>TVV known</th>
<th>TVV unknown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changed</td>
<td>E₁₁</td>
<td>E₁₂</td>
<td>E₁₁+E₁₂</td>
</tr>
<tr>
<td>Unchanged</td>
<td>E₂₁</td>
<td>E₂₂</td>
<td>E₂₁+E₂₂</td>
</tr>
<tr>
<td>Total</td>
<td>E₁₁+E₂₁</td>
<td>E₁₂+E₂₂</td>
<td>ΣE=E₁₁+E₂₁+E₁₂+E₂₂</td>
</tr>
</tbody>
</table>

Average CO₂ value before corrections \( = \frac{\sum E}{\sum n} \)

Table 14: Sum of CO₂ values after corrections made by OEM

<table>
<thead>
<tr>
<th>sum CO₂ after correction by OEM</th>
<th>TVV known</th>
<th>TVV unknown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changed</td>
<td>E*₁₁</td>
<td>E₁₂</td>
<td>E*₁₁+E₁₂</td>
</tr>
<tr>
<td>Unchanged</td>
<td>E₂₁</td>
<td>E₂₂</td>
<td>E₂₁+E₂₂</td>
</tr>
<tr>
<td>Total</td>
<td>E*₁₁+E₂₁</td>
<td>E₁₂+E₂₂</td>
<td>ΣE*=E*₁₁+E₂₁+E₁₂+E₂₂</td>
</tr>
</tbody>
</table>

Average CO₂ value after corrections \( = \frac{\sum E^*}{\sum n} \)

It must be realised that
- the symbol * indicates the CO₂ values after correction from the OEM.
- in reality the cells X₁₂ and X₂₂ are unknown because the TVV is unknown. Only the sums of these cells are known.
- the tables Table 13 and Table 14 are almost the same, only cell E₁₁ is changed.
5.2 Approach 1: Calculation used for 2010 data

The calculation of the average CO₂ and mass values was based only on those datasets which had an available CO₂ AND mass value. So in case that a data row only contained a CO₂ value but no mass value this data row was not used for the calculation of the average CO₂ values. The same principle was pursued with the mass data.

<table>
<thead>
<tr>
<th>number of vehicles</th>
<th>Mass</th>
<th>TVV known</th>
<th>TVV unknown</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>changed known</td>
<td>n₁₁₁</td>
<td>n₁₂₁</td>
<td>n₁₁₁+n₁₂₁</td>
<td></td>
</tr>
<tr>
<td>changed unknown</td>
<td>n₁₁₂</td>
<td>n₁₂₂</td>
<td>n₁₁₁+n₁₂₁</td>
<td></td>
</tr>
<tr>
<td>unchanged known</td>
<td>n₂₁₁</td>
<td>n₂₂₁</td>
<td>n₁₁₁+n₂₂₁</td>
<td></td>
</tr>
<tr>
<td>unchanged unknown</td>
<td>n₂₁₂</td>
<td>n₂₂₂</td>
<td>n₁₁₁+n₂₂₁</td>
<td></td>
</tr>
<tr>
<td>total</td>
<td>n₁₁+n₂₁</td>
<td>n₁₂+n₂₂</td>
<td>Σn₁₁+n₂₁+n₁₂+n₂₂</td>
<td></td>
</tr>
</tbody>
</table>

\[
\text{average CO₂ value} = \frac{E^{*}₁₁₁₁ + E₂₁₁₁}{n₁₁₁ + n₂₁₁₁}
\]

5.3 Approach 2: Correcting unidentifiable vehicles

Within the 2010 data the manufacturers were able to identify numerous vehicles with incorrect CO₂ and/or mass value. As this was not possible for the unidentifiable vehicles, the correction applied upon the identifiable vehicles could be used to the same extent for the unidentifiable vehicles. In other words – method 2 tries to estimate values for the cells E₁₂ and E₂₂ based on the assumption that correcting is needed to prevent a bias in the estimated mean. The symbol \( ^* \) indicates that the CO₂ emissions are an estimate.

The following is assumed:

- That the ratio between the sum of CO₂ values is equal to the ratio of the number of vehicles in the group TVV known.
  \[
  \hat{E}₁₂ = \frac{n₁₁₁}{n₁₁₁+n₂₁₁} \times (E₁₂ + E₂₂) \\
  \hat{E}₂₂ = \frac{n₂₁₁}{n₁₁₁+n₂₁₁} \times (E₁₂ + E₂₂) \\
  \hat{E}₁₂ + \hat{E}₂₂ = (E₁₂ + E₂₂)
  \]

- That the effect of correcting by OEM follows the multiplicative model:
  \[
  E^{*}₁₁₁₁ = f\ E₁₁₁₁ \text{ or } f = \frac{E^{*}₁₁₁₁}{E₁₁₁₁}
  \]

- The multiplicative correcting model holds also for the cell E₁₂
Identification and evaluation of errors in the CO2 monitoring database established under art.8 of Regulation (EC) No 443/2009

Table 15: Sum of CO2 values after correction by OEM and applying correction effect at estimated CO2 values for vehicles with TVV unknown

<table>
<thead>
<tr>
<th>sum CO2 after correction by OEM</th>
<th>TVV known</th>
<th>TVV unknown</th>
<th>Total</th>
</tr>
</thead>
</table>

The additional effect on the average CO2 value of correcting the vehicles with TVV unknown to the effect of correcting the vehicles with TVV known is

\[
\text{additional effect} = \frac{\sum E^{**}}{\sum n} - \frac{\sum E^{*}}{\sum n} = \frac{f E11 + E21 + f \hat{E}12 + \hat{E}22}{\sum n} - \frac{f E11 + E21 + E12 + E22}{\sum n} \\
= \frac{f \hat{E}12 + \hat{E}22 - (E12 + E22)}{\sum n}
\]

Define next \( \Delta = f - 1 = \frac{E^{**} - E11}{E11} \) so

\[
\text{additional effect} = \frac{\Delta \times \hat{E}12 + (\hat{E}12 + \hat{E}22) - (E12 + E22)}{\sum n} = \frac{\Delta \times \hat{E}12}{\sum n}
\]

Or

\[
\text{additional effect} = \frac{(E^{**} - E11)(n11 + n21)}{\sum n} \times \frac{E12 + E22}{E11}
\]

5.4 Approach 3: Application of a confidence interval

In theory the information about the whole population for vehicles registered in a given year is available. Yet in practise there are some values of CO2 and mass that cannot be verified or incorporated given the corrupted TVV codes. The mean value in a distribution is an estimate of the true value of the whole population. The true value is not known unless the whole population is also known. The confidence interval on the mean value of a distribution is the interval around the mean value in which the confidence is high to find the true value. The greater/higher the confidence interval is, the larger is the uncertainty about the mean. This is somewhat counterintuitive since one would normally think that the more confidence assigned to a data set, the smaller the error should be. The confidence interval is a combination of variation in the dataset and the confidence level. One way to understand this confidence level is the following: 100%
confidence prevails that the CO2 emissions of a manufacturer are between 0 and 1000 g CO2/km. The confidence diminishes though if the range is narrowed down to e.g. 50 and 300 g CO2/km or even 115 and 120 g CO2/km etc.

Besides the desired level of confidence, the interval depends on the distribution of the registrations, CO2 and mass values. It is therefore unique for each manufacturer and it takes into account all values having a CO2 or mass value regardless whether they could be verified by their TVV or not. This is sensible as the TVV is only a means to confirm or reject data, but its absence does not relate to the quality of the indicated CO2 or mass values - meaning that a missing TVV does not automatically imply that the assigned CO2 or mass values are incorrect.

Nevertheless since the missing TVV hinder the verification of the data, this can lead to the incorporation of more incorrect CO2 and mass values in comparison to a situation where the TVV would be complete. In order to reflect this, the confidence interval could be adapted according to the proportion of the missing TVV by using a finite population correction. Due to this, the confidence interval is adapted according to the number of vehicles with missing or highly corrupted TVV.\textsuperscript{22}

The data used in this method are the data with both CO2 and TVV known corrected and not corrected by the manufacturer, or in other words the cells \( X_{11} \) and \( X_{21} \).

Assume:

- The missing of TVV is random, it is not related to errors in the given CO2 values. The average of the data, inclusive the corrected data with TVV is an unbiased estimator for the mean.

The estimate for the average is

\[
\bar{E} = \frac{E_{11} + E_{21}}{n_{11} + n_{21}}
\]

The standard error of this mean is

\[
sem = \frac{\text{standard deviation}}{\sqrt{n_{11} + n_{21}}}
\]

However this a random sample from a population with finite size \( n_{11} + n_{12} + n_{21} + n_{22} \), so this standard error should be multiplied with the finite population correction

\[
\sqrt{\frac{n_{21} + n_{22}}{n_{11} + n_{12} + n_{21} + n_{22}}}
\]

So the standard error of the mean becomes

\[
sem = \frac{\text{standard deviation}}{\sqrt{n_{11} + n_{21}}} \times \sqrt{\frac{n_{21} + n_{22}}{n_{11} + n_{12} + n_{21} + n_{22}}}
\]

\textsuperscript{22} Background information about the confidence interval and sampling techniques can be found inter alia in:

- ISO-Standard 2601-1980 on the statistical interpretation of test results – Estimation of the mean – confidence interval, Cochran,
- W., G. 1977, Sampling techniques, Third Edition John Wiley & Sons,
This results in a (1-\( \alpha \)) confidence interval which looks like \( \bar{E} \pm t_{\alpha} \text{sem} \). For a 95% confidence interval is \( \alpha = 0.025 \). If \( n_1 + n_2 = 0 \) (all TVV are known) the sem becomes 0.

### 5.5 Test run

All methods were exemplary tested upon one manufacturer from the 2010 dataset in order to see the different results (see table below).

#### Table 16: Sum of CO\(_2\) values after correction by OEM and applying correction effect at estimated CO\(_2\) values for vehicles with TVV unknown

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Average emissions after OEM correction</th>
<th>Correction method 1</th>
<th>Correction method 2</th>
<th>Correction method 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>g/km</td>
<td>resulting CO(_2) value</td>
<td>resulting CO(_2) value</td>
<td>resulting CO(_2) values</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>144,109</td>
<td>0.001</td>
<td>-0.031</td>
<td>144,080</td>
</tr>
</tbody>
</table>

Ideally the methods should have been applied upon all manufacturer but time and budgetary restraints did not allow to implement repeatable IT procedures for all three methods. In addition it could not safely decided which of the three methods would be the most appropriate to be used upon the CO\(_2\) monitoring data. Such a decision would require an in-depth statistical assessment of the underlying data and assumptions of the methods as well as different statistical methods.
6 LITERATURE

IPPC 2006, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, 2006 IPCC GUIDELINES FOR NATIONAL GREENHOUSE GAS INVENTORIES VOLUME 1, GENERAL GUIDANCE AND REPORTING, CHAPTER 3 UNCERTAINTIES


7 ANNEX

In order to discuss the advantages and disadvantages of using the VIN, firstly an excursus on the mass to be used according to the Regulation (EC) No 443/2009 has been undertaken as the mass value to be used is closely connected to the CoC which also bears the VIN.

According to Regulation 443/2009 ANNEX II PART A 1 and 2 inter alia the mass value has to be taken from the Certificate of conformity (CoC) and the mass is defined in Article 2 (1) d of Regulation (EC) No 443/2009 as “the mass of the car with bodywork in running order as stated in the certificate of conformity and defined in section 2.6 of Annex I to Directive 2007/46/EC”;

According to information from the TAAM23 and EReg24 the mass stated in the CoC and in the type approval documentation in section 2.6 of Annex I to Directive 2007/46/EC do not describe the same mass value. The rational of this statement is explained as follows. Entry 13 of the CoC states the mass in running order and footnote 13 specifies that “With respect to vehicles belonging to category M 1 […] under 3,5 tonnes, the actual mass may vary by 5 % with respect to the mass stated in this entry.” The actual mass is therefore the mass which is being actually weighted (e.g. during a road control or similar25) comprising optional equipment like e.g. coupling devices, while the mass indicated in section 2.626 of Annex I to Directive 2007/46/EC does not. This opinion is shared by the TAAM (2009) which states that “there is no direct link between the actual mass of a specific vehicle when it leaves the production line and the mass in running order as specified in section 2.6” of the CoC.

As a consequence section 2.6 of Annex I to Directive 2007/46/EC does not define the mass in running order indicated within the CoC, but it defines the mass indicated within the type approval documents.

Furthermore this means that the mass to be used according to Regulation (EC) No 443/2009 can be unique to the vehicle and that it can only be found on the CoC, just like the VIN27. All other parameters like the combination of Type, Variant and Version or the European Type Approval Number together with Variant and Version do not uniquely identify a vehicle. If for example the European Type Approval Number (including its extension number and date) together with the Variant and Version would be used for identifying vehicles this could lead to the situation that the same European Type Approval Number, Variant and Version do have numerous different mass values. Thus, the situation would be similar regarding mass as it is now, when using the type, variant and version.

By clarifying the definition of mass in running order, actual mass and mass of the optional equipments, e. g. by amending either the type approval directive or the Directive 1992/21/EC on

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23 Type-Approval Authorities Meetings
24 European Vehicle and Driver Registration Authorities
25 Although the TAAM defined the actual mass as follows “The actual mass is the mass of a specific vehicle when it arrives at the end of the production line, calculated to a fuel tank filled with 90% fuel, liquids, tools, spare wheel, if fitted, and driver”, the phrasing the actual mass may vary by 5 % with respect to the mass stated in the CoC suggests that the mass indicated within the CoC describes the mass at the end of the production line, while the actual mass is the mass weighted during road control or similar. Both values are actual masses values just during different life stages (one directly after the production line and one after putting the vehicle into circulation). These two values can coincide but must not (due to filling differences of the tank and other liquids).
26 The mass in running order is defined as follows in Section 2.6 of Annex I of Directive 2007/46/EC: “Mass of the vehicle with bodywork and, in the case of a towing vehicle of a category other than M1, with coupling device, if fitted by the manufacturer, in running order, or mass of the chassis or chassis with cab, without bodywork and/or coupling if the manufacturer does not fit the body work and/or coupling device (including liquids, tools, spare wheel, if fitted, and driver and, for buses and coaches, a crew member if there is a crew seat in the vehicles)”
27 Excluding the cars body work, which also bear the VIN.
Identification and evaluation of errors in the CO₂ monitoring database established under art.8 of Regulation (EC) No 443/2009

masses and dimension these ambiguity should be eliminated is such a way that only one mass in running order is attributed to one version, i.e. the mass of the vehicle tested at type approval.