

1. TUBA VERSION 1.9.5 RELEASE NOTES

1.1 TUBA v1.9 Release (September 2012)

TUBA 1.9 includes changes in TAG Units 3.5.6 and 3.3.5 (May 2012). These include:

1. Changes to economic parameters file:
 - i. Change to base year and present value year from 2002 to 2010
 - ii. Change in maximum number of vehicle types to 20.
 - iii. Increase in fuel types to a maximum of six.
 - iv. Introduction of traded carbon fuel type. The FUEL_TYPE has been expanded to allow the fuel type to specify whether it produces traded or un-traded carbon.
 - v. New values for forecast growth in the working and non-working values of time (VALUE_OF_TIME_GROWTH table).
 - vi. New coefficients for the new fuel consumption equation in TAG (FUEL_CONSUMPTION table).
 - vii. Updated values for the value of carbon (in CARBON_VALUE_CHANGES table).
 - viii. Updated FLEET_CHANGES table (see above).
 - ix. Updated fuel cost forecasts (in FUEL_COST_CHANGES table).
 - x. Updated fuel efficiency forecasts (in FUEL EFFICIENCY table).
2. Changes to TUBA outputs:
 - i. Carbon emissions are broken down between traded and non-traded carbon emissions.

1.2 TUBA v1.9.1 Release (February 2013)

TUBA 1.9.1 includes changes to reflect the latest TAG Unit 3.5.6 (October 2012) and Unit 3.3.5 (August 2012) as well some software 'housekeeping'. These include:

1. General changes:
 - i. Improved reliability in exporting outputs in HTML format.
 - ii. Move from carbon-based emissions to carbon-dioxide emissions (CO₂e) throughout.
 - iii. Improved memory management with the software automatically switching to 'one time period at a time' operation if limited memory is available. (If insufficient memory is available for 'one time period at a time' operation, the software will now terminate with a fatal error).
 - iv. Explicit checks now undertaken on the user-defined growth in fleet proportions (FLEET_CHANGES table) with fuel proportions and growth rates required for all fleet types (FLEET_TYPE table).
 - v. Checks undertaken that all the user-defined input files defined in the INPUT_MATRICES and SECTORS tables of Scheme specific file exist before starting the main TUBA calculations rather than checking immediately prior to processing each file.
 - vi. Improved reliability in running TUBA_ENG.EXE directly from the command line without generating an error that the standard economics file cannot be found.

- vii. Maximum number of input matrices increased from 1,500 to 4,000.
- viii. Updated documentation.
- 2. Changes to economic parameters file:
 - Housekeeping*
 - i. General housekeeping with cross-references to appropriate TAG Units for each data source.
 - Switch to Carbon Dioxide*
 - ii. Switch from carbon to carbon dioxide emissions for Traded and Non-Traded emissions with new parameters T_CARBDXVALUES and NT_CARBDXVALUES respectively and corresponding changes to the base year values in £/tone for Low/High/Central within the PARAMETERS table.
 - iii. Change in the economic cost of Carbon emission (grammes) / unit to equivalent Carbon Dioxide emission (grammes) / unit in the FUEL_COST table.
 - iv. Renaming of the CARBON_VALUE_CHANGES table to CARBDX_VALUE_CHANGES table.
 - Fleet Proportions*
 - v. Fleet proportions now defined for all vehicle types in FLEET table for the base year as well as corresponding growth rates in FLEET_CHANGES table.
 - Fuel Consumption*
 - vi. Minor revisions to the FUEL_CONSUMPTION table and its formatting.
- 3. Changes to TUBA outputs:
 - i. All outputs originally in Carbon are now Carbon dioxide.

1.3 TUBA v1.9.2 Release (November 2013)

TUBA 1.9.2 is an incremental update to TUBA v1.9.1 with the following revisions:

- 1. General changes:
 - i. The PARAMETERS table in the Scheme file must now state the "TUBA_version" as "1.9.2" otherwise a fatal error will be generated;
 - ii. Minor correction to the process to export the Scheme file from the TUBA GUI application with the correct TUBA version ID (TUBA v1.9.1 only);
 - iii. If the no path is provided in the Scheme file's INPUT_MATRICES table, the path is assumed to be the same as folder location of the Scheme file (i.e. reverting back to the original TUBA v1.9 method);
 - iv. The memory checks previously introduced with TUBA v1.9.1 to determine if sufficient memory is available at the start of the TUBA run are now **also** applied a second time when the memory is to be used (and, therefore, to reduce the occurrence of the program 'crashing' without warning).
 - v. Central Government revenues are now (correctly) included within the NET Impact sub-section of the output TEE Table (all formats) (TUBA v1.8 onwards);
 - vi. If more than three vehicle types in the FLEET table are specified in the Economics Parameter file, the default TUBA warnings thresholds are correctly applied rather than assumed to be zero (TUBA v1.9 onwards);

- vii. When the 'One User Class at a Time' option is selected, the traded and non-traded carbon calculations are summarized in the TEE table for **all** user classes rather than only the first user class (with the values for the subsequent user classes set to zero) (TUBA v1.9.1 only);
 - viii. Improved memory operation with 64-bit Operating Systems (also included in the final TUBA v1.9.1 release);
 - ix. The changes in the monetary value of traded and non-traded carbon dioxide emissions through time are now based on the relevant scenario specific growth rates for the low and high growth scenarios (as specified in TAG Unit 3.3.5) rather than assuming central growth rates apply to all scenarios (as in TUBA v1.9.1 or earlier);
 - x. Updated documentation including:
 - i. Re-inclusion of General Guidance and Advice document (omitted from TUBA v1.9.1 release)
 - ii. More advice on memory management, reducing memory requirements and resolving memory errors (see section 3.9 of the User Manual);
 - iii. Additional information for running TUBA from the command line for advanced users (see section 3.5 of the User Manual).
2. Changes to the economics parameter file:
- i. Minor correction to the default growth rates in the value of the carbon dioxide emissions over time (in the CARBDX_VALUE_CHANGES Table) as defined in TAG Unit 3.3.5 (August 2012) (TUBA v1.9.1 only);
 - ii. The changes in the fleet composition by vehicle and fuel types from the base year (in the FLEET_CHANGES table) are now specified on an annual basis rather than five-yearly intervals as previously stated;
 - iii. Expansion of the CARBDX_VALUE_CHANGES table to specify the changes in the monetary value of traded and non-traded carbon dioxide emissions through time for low, central and high growth scenarios rather than central scenario only (see 1.ix above).

1.4 TUBA v1.9.3 Release (January 2014)

TUBA 1.9.3 is an incremental update to TUBA v1.9.2 principally to include changes introduced in WebTAG2 Units A3 'Environmental Impacts' (specifically Units A3.3 & A3.4) and A1 'User and Provider Impacts' (A1.3) published in January 2014. These new WebTAG2 units have replaced the previous TAG Units 3.3.5 and 3.5.6. The specific changes are as follows:

1. General changes:
- i. The PARAMETERS table in the Scheme file must now state the "TUBA_version" as "1.9.3" otherwise a fatal error will be generated;
 - ii. Removal of the adjustment to modify the VOT growth rate for a given year if the discount rate for that year is different from the rate for the current year;
 - iii. Minor update to TUBA_G to remove erroneous warnings relating to FUEL_CONSUMPTION cut-off speed;
 - iv. Correction to a (long-standing) problem resulting in the under valuation of the CO₂e benefits when using absolute changes in monetary values rather than the relative (default) values specified in the Economics Parameter file.

- v. Updated documentation including references to WebTAG2 published in January 2014.
2. Changes to the economics parameter file:
- i. Tables updated to ensure consistency with the new WebTAG2 Units (January 2014) and, specifically, the new 'WebTAG Databook' (Autumn 2013 release) available at <https://www.gov.uk/transport-analysis-guidance-webtag#webtag-data-book>.

1.5 TUBA v1.9.4 Release (May 2014)

TUBA 1.9.4 is an incremental update to TUBA v1.9.3 principally to include changes introduced in WebTAG2 Units A3 'Environmental Impacts' (specifically Units A3.3 & A3.4) and A1 'User and Provider Impacts' (A1.3) published in May 2014. These new WebTAG units have updated those previously published in January 2014. The specific changes are as follows:

1. General changes:
 - i. The PARAMETERS table in the Scheme file must now state the "TUBA_version" as "1.9.4" otherwise a fatal error will be generated;
 - ii. Switch to GDP-based price deflator rather than previous RPI-deflator in both the scheme file and economics files;
 - iii. A clarification note has been added to the output file confirming that the estimated benefits for Traded CO2e benefits are not included within the TEE table but remain to provide additional information.
 - iv. Updated documentation including references to WebTAG published in May 2014.
2. Changes to the economics parameter file:
 - i. Tables updated to ensure consistency with the new WebTAG2 Units (May 2014) and, specifically, the new 'WebTAG Databook' (Spring 2014 release) available at <https://www.gov.uk/transport-analysis-guidance-webtag#webtag-data-book>.
 - ii. Switch to GDP-based price deflator rather than previous RPI-based deflator.
3. Changes to the scheme file:
 - i. Switch to GDP-based price deflator rather than previous RPI-based deflator.
4. Software changes
 - i. A new 64-bit version of TUBA available to all users alongside the existing 32-bit version. Both versions are available to users with separate installers for each version. The versions will install to different locations and may be used together.
 - ii. The software for the TUBA engine (TUBA_ENG.EXE) has migrated from the previous Salford FORTRAN language to Intel Virtual FORTRAN (IVF). The benefits are:
 - i. the same source code will generate both 32-bit and 64-bit versions;
 - ii. enable it access more memory as a 64-bit application;
 - iii. use more efficient standard internal memory management routines; and
 - iv. run quicker (with model runtimes reduced by up to 30%).

- iii. The existing TUBA GUI (TUBA_G.EXE) has been updated to access the new IVF-based binary files. The TUBA v1.9.4 binary files are not compatible with earlier versions (and vice versa).

Further information available in Section 3.11 of the User Manual.

- iv. The location of the temporary TUBA scratch files has been moved from the default Windows Application area to the folder containing the scheme files. The scratch files use the numbering format TUBA_XXXX_X.TMP (e.g. TUBA_1234_1.TMP) and may now need to be manually deleted if a TUBA run fails. The files have been moved to accommodate larger schemes which may require more than 25Gb of temporary storage space.

1.6 TUBA v1.9.5 Release (November 2014)

TUBA 1.9.5 is an incremental update to TUBA v1.9.4 principally to include changes introduced in WebTAG Units A3 'Environmental Impacts' (specifically Units A3.3 & A3.4) and A1 'User and Provider Impacts' (A1.3) published in November 2014. These new WebTAG units have updated those previously published in May 2014. The specific changes are as follows:

1. General changes:
 - i. The PARAMETERS table in the Scheme file must now state the "TUBA_version" as "1.9.5" otherwise a fatal error will be generated;
 - ii. Updated documentation including references to WebTAG published in November 2014.
2. Changes to the economics parameter file:
 - i. Tables updated to ensure consistency with the new WebTAG2 Units (November 2014) and, specifically, the new 'WebTAG Databook' (Autumn 2014 release) available at <https://www.gov.uk/government/publications/webtag-tag-data-book-november-2014>.

3. Software changes

TUBA GUI

- i. Enhancements to the export routine to enable the (user-edited) economics parameter file to retain the same number of decimal places as the original.

TUBA ENGINE

- i. Correction to enable non-sequential numbering to be used in the USER_CLASSES table within the scheme file (see section 5.5 of the User Manual). (*Affected TUBA v1.9.4 only.*)
- ii. Correction to permit unused zones to be included within the Zone to Sector correspondence file (see section 5.7 of the User Manual). (*Affected TUBA v1.9.4 only.*)
- iii. Updated release for both 32-bit and 64-bit versions.

All TUBA users should migrate to TUBA v1.9.5 at the earliest opportunity.