

Some Remarks for the SAM Workshop

“Closing the Gap between LDV Real World CO₂ Emissions and Laboratory Testing”

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My Remarks

- Is our basic goal to provide to the consumer the best available information on vehicle fuel economy so that he/she may select the product that suits him best OR is our basic goal to make a reliable estimation of CO₂ emissions in the EU?
- CO₂ vs pollutant emissions – Not the same problem, so probably not judged from the same testing procedure.
- Are the basic assumptions behind the development of “representative” tests of reality (test cycles, analysis methods, etc) supported by a solid scientific knowledge base?
 - ✓ Gaussian statistics? Extreme events not accounted.
 - ✓ Absence of interactions (ie non-linearity/complexity)?
 - ✓ Identification of “outliers”?
 - ✓ Use of models. OK but at what level? It seems that we fit reality to the models and not the opposite.

The Gap Grows Like a Natural Species...

icct.org

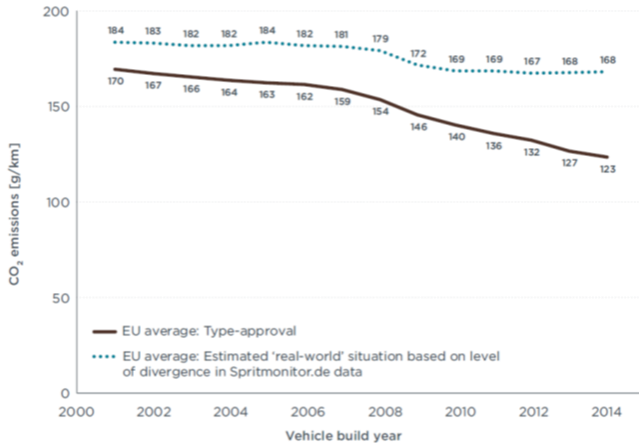
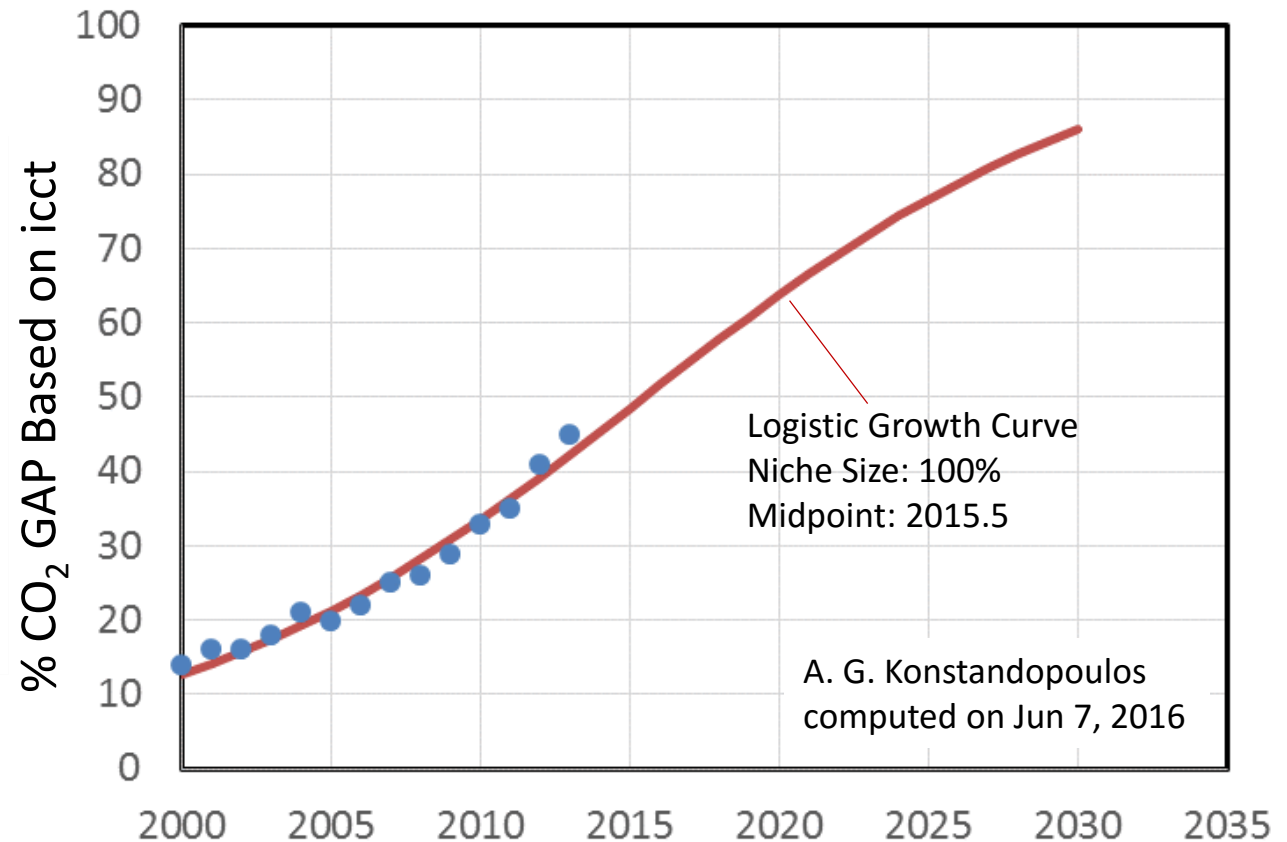


Figure 30. 2001-2014 real-world vs. type-approval CO₂ emissions based on Spritmonitor.de estimates and type-approval data from the European Environment Agency (European Environment Agency, 2014; European Environment Agency, 2015)⁴².



- This points to the Industrial Ecology origin of the GAP. It is similar to biological species growth, population dynamics, disease spreading, etc. The presence of a known challenge (NEDC) has led to the adaptive optimization of vehicles to pass the challenge.
- Based on the observed kinetics of adaptation, a rational time frame for the revision of the testing procedure is about 5 years.

Towards Policies...



- **WLTP vs NEDC:** If correlation of WLTP to NEDC is required for any reason why not keep both testing cycles in use? WLTP for certification and NEDC for “backward compatibility”. EPA is running more than 1 cycle (i.e. 5).
- **A NEED:** Analyze existing real driving data using the tools of complex systems dynamics, e.g.
 - ✓ define appropriate phase space and trajectories
 - ✓ statistical probability density functions consistent with all the data
 - ✓ check for correlations, persistence/anti-persistence
 - ✓ derive rules/models for the convolution (not superposition!) of driver, vehicle, road network and the interaction with the population of the other driver-vehicle pairs on the road
- **A PROPHECY:** Detailed multi-scale modeling (exploiting big data analytics/real time wirelessly relayed information and non-linear dynamic simulations) can support policy developments, allowing for a localized/personalized approach in addition to the global certification level.
- **A SUGGESTION:** Launch a pilot study under the SAM auspices to further support the design of post-2020 policies based on a holistic approach

Dedicated Journal

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Examples of topics that may appear in the journal include:

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Testing, durability and compliance such as cycles, certification, aging, in-field (on-vehicle) performance and analysis, and in-use compliance. Analysis of current and future emission regulations.

