# VERIFY General Assembly

## WP1:GHG MRV user requirement framework

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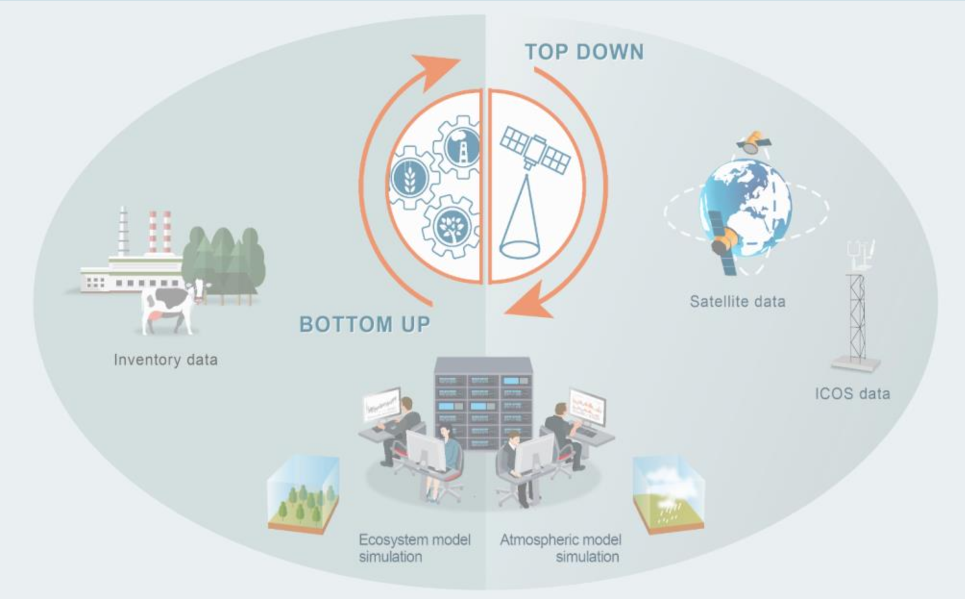
May 9$^{th}$ -11$^{th}$ , 2022





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# WP1:GHG MRV USER REQUIREMENT FRAMEWORK


- MRV policy and inventory **needs assessment in the current** (EU, Kyoto and UNFCCC) and **future** (EU, Paris Agreement) **frameworks**

**WP1 INVENTORY AGENCIES/UNFCCC PROCESSES**

- Identification of tools/methods for the MRV system
- Factsheets
- Report on inputs for IPCC GLs

DATA & TOOLS

**WP2 - ff$CO_2$**

**WP3 - Land**

**WP4 – $N_2O$ $CH_4$**

**WP5 – Synthesis**

**WP6 – System design**

# WP1 Time schedule

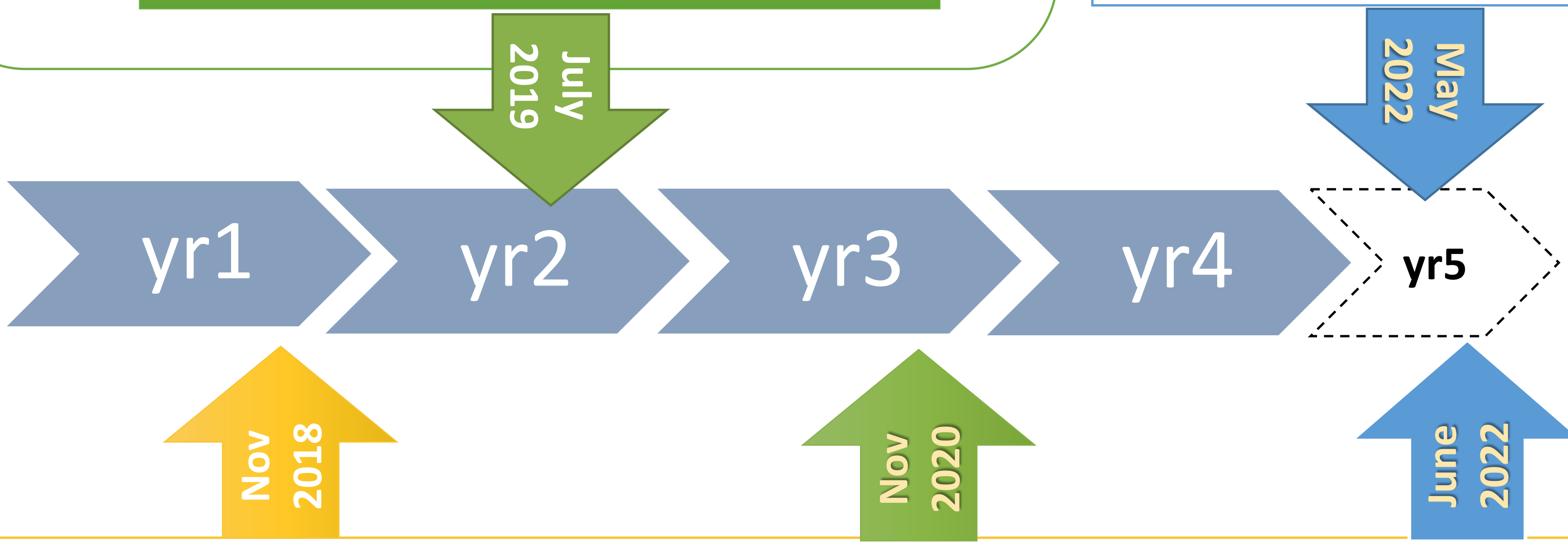
**Terminology analysis (D.1.2** – July 2018**)**
**MR Consolidated reporting requirement assessment (D1.3-** April 2019**)**
**Fact sheets -> per country/sector/gases**

**Verification requirements assessment (D1.4 –** April 2019**)**

**User requirement Document (URD)**

*All WP1 partners actively contributed to the workshops*

**Report on the connection of VERIFY and IPCC process (EMPA)**




**NETWORING: national inventory agencies and the scientific community (RVIM)**

# D1.1 USER REQUIREMENT DOCUMENT

**What? Anthropogenic emissions and removals**

1. Only human induced (i.e. non-natural) emissions/removals
2. *Managed land proxy* for LULUCF sector[‡]

**Which anthropogenic process ? Sectors**

Energy; Industrial Process and Product Use (IPPU); Agriculture, Forestry and Other Land Use (AFOLU); Waste; Others[#]

**Which gasses? GHG not covered by the Montreal Protocol and their "precursors"**

$CO_2$, $CH_4$, $N_2O$, HFCs, PFCs, $SF_6$, $NF_3$, $SF_5CF_3$, halogened ethers, other halocarbons. Precursors: NOx, $NH_3$, NMVOC, CO and $SO_2$

**How? Mass unit**

Generally metric tonnes of GHG (or $CO_2$ eq.) and it multiples. Positive value for emissions and negative value for removals

**Where? National territory**

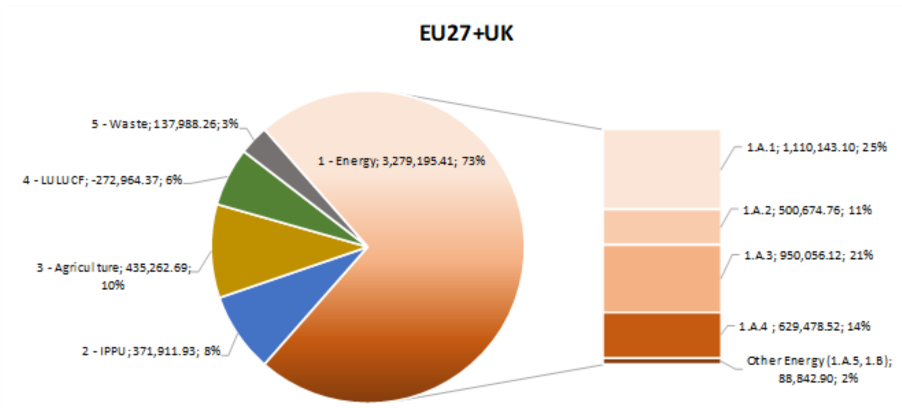
Only GHG emissions/removals taking place within the national territory and offshore areas covered by national jurisdiction

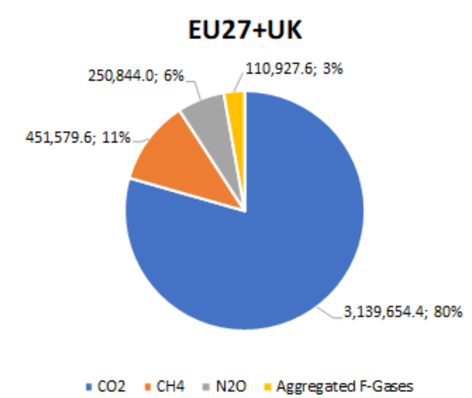
**When? Yearly based estimations for the entire time series**

1. Consider only the estimates for the calendar year which emissions/removals occur
2. Sequence of annual estimates from the base year and the submission year minus 2

# OTHER ACTIVITIES

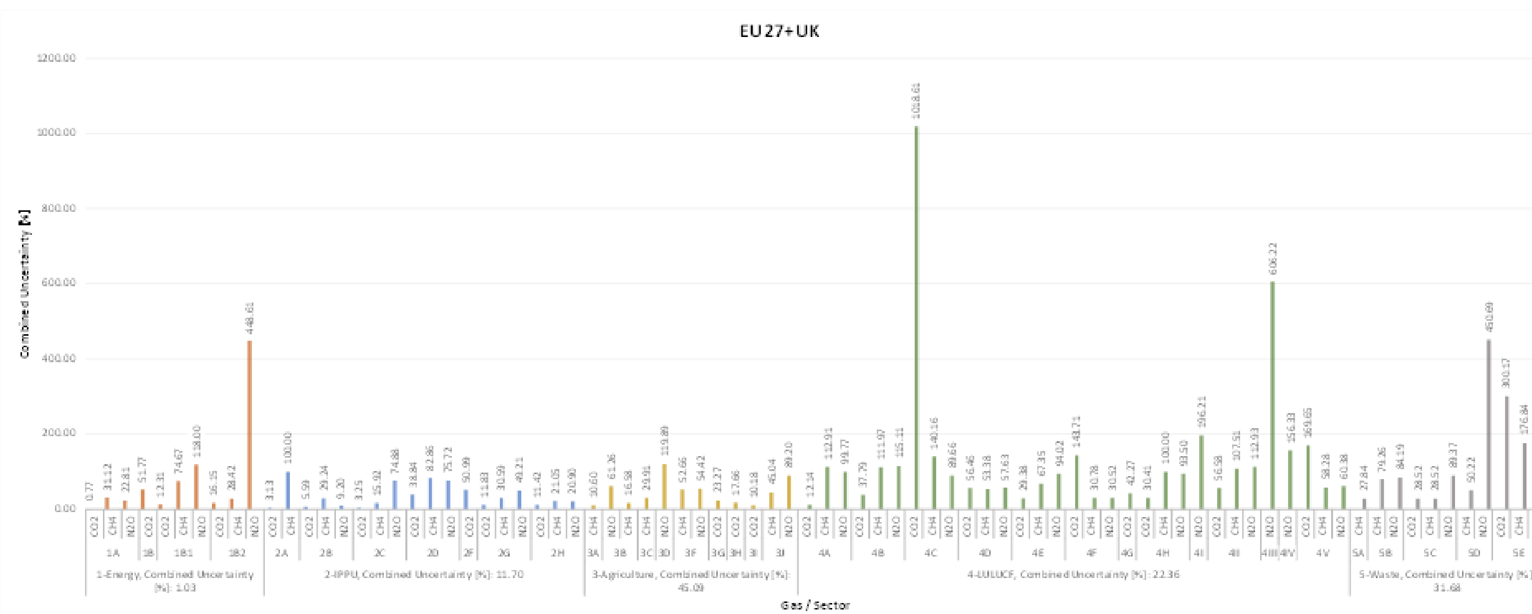
- Update of EU and MS Inventory Fact Sheets (UBA)
  - Display GHG Emission data with 2021 inventory submission
  - Fact sheets for all 27 MS + EU, Iceland, Norway, Switzerland and UK



# MAIN ACHIEVEMENTS TO DATE

- Update of EU and MS Uncertainty Assessment
  - Based on GHG Emission data according to 2021 inventory submission
  - IPCC Approach 1 (Error propagation)
  - Results in line with previous uncertainty assessment



# SCIENTIFIC FINDINGS

- Collaboration with WP3 on the assessment of needs for spatial explicit reporting under LULUCF regulation (841/2018) – Survey (CMCC, WU, IPRA, CITEPA)

- Publications:

Environmental Science and Policy 122 (2021) 116–126

Contents lists available at ScienceDirect

Environmental Science and Policy

journal homepage: www.elsevier.com/locate/envsci

Emerging reporting and verification needs under the Paris Agreement: How can the research community effectively contribute?

Lucia Perugini[a], Guido Pellis[a,*], Giacomo Grassi[b], Philippe Ciais[c], Han Dolman[d], Joanna I. House[e], Glen P. Peters[f], Pete Smith[g], Dirk Günther[h], Philippe Peylin[c]

Earth Syst. Sci. Data, 14, 1639–1675, 2022
https://doi.org/10.5194/essd-14-1639-2022


Comparing national greenhouse gas budgets reported in UNFCCC inventories against atmospheric inversions

Zhu Deng[1,★], Philippe Ciais[2,★], Zitely A. Tzompa-Sosa[2], Marielle Saunois[2], Chunjing Qiu[2], Chang Tan[1], Taochun Sun[1], Piyu Ke[1], Yanan Cui[3], Katsumasa Tanaka[2,4], Xin Lin[2], Rona L. Thompson[5], Hanqin Tian[6], Yuanzhi Yao[6], Yuanyuan Huang[7], Ronny Lauerwald[8], Atul K. Jain[9], Xiaoming Xu[9], Ana Bastos[10], Stephen Sitch[11], Paul I. Palmer[12,13], Thomas Lauvaux[2], Alexandre d'Aspremont[14,15], Clément Giron[14], Antoine Benoit[14], Benjamin Poulter[16], Jinfeng Chang[17], Ana Maria Roxana Petrescu[18], Steven J. Davis[19], Zhu Liu[1], Giacomo Grassi[20], Clément Albergel[21], Francesco N. Tubiello[22], Lucia Perugini[23], Wouter Peters[24,25], and Frédéric Chevallier[2]

Earth Syst. Sci. Data, 13, 2363–2406, 2021
https://doi.org/10.5194/essd-13-2363-2021


The consolidated European synthesis of $CO_2$ emissions and removals for the European Union and United Kingdom: 1990–2018

Ana Maria Roxana Petrescu[1], Matthew J. McGrath[2], Robbie M. Andrew[3], Philippe Peylin[2], Glen P. Peters[3], Philippe Ciais[2], Gregoire Broquet[2], Francesco N. Tubiello[4], Christoph Gerbig[5], Julia Pongratz[6,7], Greet Janssens-Maenhout[8], Giacomo Grassi[8], Gert-Jan Nabuurs[9], Pierre Regnier[10], Ronny Lauerwald[10,11], Matthias Kuhnert[12], Juraj Balkovič[13,14], Mart-Jan Schelhaas[9], Hugo A. C. Denier van der Gon[15], Efisio Solazzo[8], Chunjing Qiu[2], Roberto Pilli[8], Igor B. Konovalov[16], Richard A. Houghton[17], Dirk Günther[18], Lucia Perugini[19], Monica Crippa[9], Raphael Ganzenmüller[6], Ingrid T. Luijkx[9], Pete Smith[12], Saqr Munassar[5], Rona L. Thompson[20], Giulia Conchedda[4], Guillaume Monteil[21], Marko Scholze[21], Ute Karstens[22], Patrick Brockmann[2], and Albertus Johannes Dolman[1]

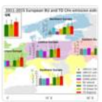
Earth Syst. Sci. Data, 13, 2307–2362, 2021
https://doi.org/10.5194/essd-13-2307-2021


Article | Assets | Peer review | Metrics | Related articles

Review article

28 May 2021

The consolidated European synthesis of $CH_4$ and $N_2O$ emissions for the European Union and United Kingdom: 1990–2017



Ana Maria Roxana Petrescu[1], Chunjing Qiu[2], Philippe Ciais[2], Rona L. Thompson[3], Philippe Peylin[2], Matthew J. McGrath[2], Efisio Solazzo[4], Greet Janssens-Maenhout[4], Francesco N. Tubiello[5], Peter Bergamaschi[4], Dominik Brunner[6], Glen P. Peters[7], Lena Höglund-Isaksson[8], Pierre Regnier[9], Ronny Lauerwald[9,23], David Bastviken[10], Aki Tsuruta[11], Wilfried Winiwarter[8,12], Prabir K. Patra[13], Matthias Kuhnert[14], Gabriel D. Oreggioni[4], Monica Crippa[4], Marielle Saunois[2], Lucia Perugini[15], Tiina Markkanen[11], Tuula Aalto[11], Christine D. Groot Zwaaftink[3], Hanqin Tian[16], Yuanzhi Yao[16], Chris Wilson[17,18], Giulia Conchedda[5], Dirk Günther[19], Adrian Leip[4], Pete Smith[14], Jean-Matthieu Haussaire[6], Antti Leppänen[20], Alistair J. Manning[21], Joe McNorton[22], Patrick Brockmann[2],

# NEXT STEPS

**D1.7 Report of last networking meeting**


**D1.8 Report on the connection of VERIFY and IPCC process**

Scientific outcomes of the project in line with IPCC inventory methods are communicated **to IPCC via EF database**

***Lead: EMPA***

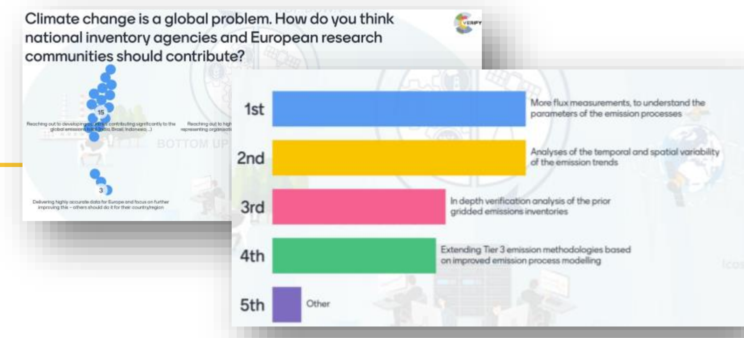
# Thank you for your attention.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776810

# OVERALL CONCLUSIONS

| | GHG NATIONAL INVENTORIES | TD-MODELS |
|---|---|---|
| ***Temporal scale*** | Low resolution:<br>Yearly, until t-2 (t-1) | High resolution:<br>Monthly, hourly |
| ***Spatial scale*** | Low resolution:<br>Territorial, country specific (per Member State) | High resolution of spatially disaggregated data, applicable for<br>- regional/global coverage without political border<br>- local scale for verification of e.g. large point sources |
| ***Activity link*** | Fine granularity:<br>Disaggregated by source, subsector, human activity specific | Course granularity:<br>Larger groups of activities for which spatial and temporal data are available, of interest for near real time emission assessment |
| ***Challenges*** | Direct/indirect emissions, uncertainties, increased complexity | Modeling of processes, biofuel/biomass, Carbon Capture and Storage. |

# DISCUSSION POINTS




- **For which emissions sources would new atmospheric and/or flux measurements significantly help revising the emission factors most?**
  - The most important sectors were judged to be **crop production**, then **livestock**, and **then waste**.
- **Which task would you tackle first for further improvement?**
  - First the **spatial distribution**,
  - **top down evaluation** with inverse modeling
  - seasonal distribution
- **What are the challenges for improving CH4/N2O Inventories?**
  - Measurements are considered to be most crucial for improving implied emission factors and for assessing the spatial and seasonal distribution of the emissions.
- **Where do you see the largest assets of top down inventories using observations and inverse modeling?**
  - This is most useful for reducing the uncertainties and for increasing our understanding of the emission processes into the atmosphere.

# CONCLUSIONS
# SECOND NETWORKING MEETING
# NOV 2020

- The **bottom-up** mean agrees generally well with the UNFCCC estimates, but show larger (climate) variability (i.e. ORCHIDEE) →More disaggregated data are important to understand the agreement is for good reason or by chance, and also to understand better the drivers.
- The **top-down ensemble estimates show large variability and uncertainty**
- For CO2 and LULUCF sector, there is the need to reduce the gap between inventories and models by **defining common definitions** in land use reporting
- **The uncertainty is a fundamental parameter**. It is essential to correctly compare emission/removal estimates.
- **The spatial resolution** of current top-down models could be a limiting factor for the application of these instruments for verification purposes
- **Categories and sectors** need to be identified
- **Dissemination** of new tools is important (low awareness of availability of new tools)