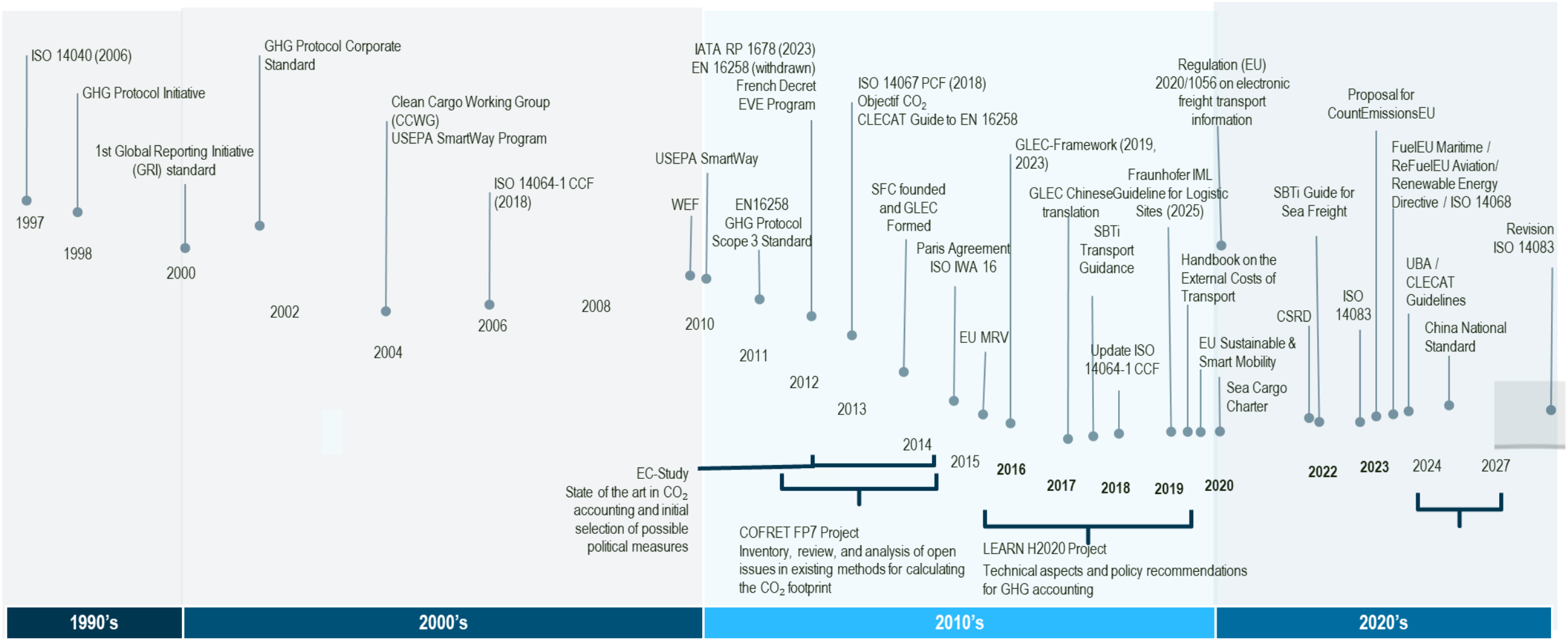
CLEVER

CLEVER-
Creating Legitimate Emission Factors for Verified GHG Emission Reductions in Transport

GHG Emission Calculation Development 1997-2025

CLEVER



Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation program under grant agreement N° 101146908

CLEVER Consortium

CLEVER: Creating Legitimate Emission Factors for Verified GHG Emission Reductions in Transport

Rationale behind CLEVER:

- Emission factors are used in every GHG calculation
- Many emission factor sources available
- Lack of clarity and consistency in methods
- Lots of interested / impacted stakeholders
- International perspective

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Project Objectives

- Define a comprehensive **Emission Factor methodology**
  - Impartial, comprehensive, clear, specified, transferable
- Achieve a **consensus-based** solution via technical dialogue
  - State-of-the-art, gaps and developments
- Provide accompanying **guidance** and ‘validated’ **set of default emission factors**
  - Provide starting point for EC database
- **Market access** to the project outputs

CLEVER main features

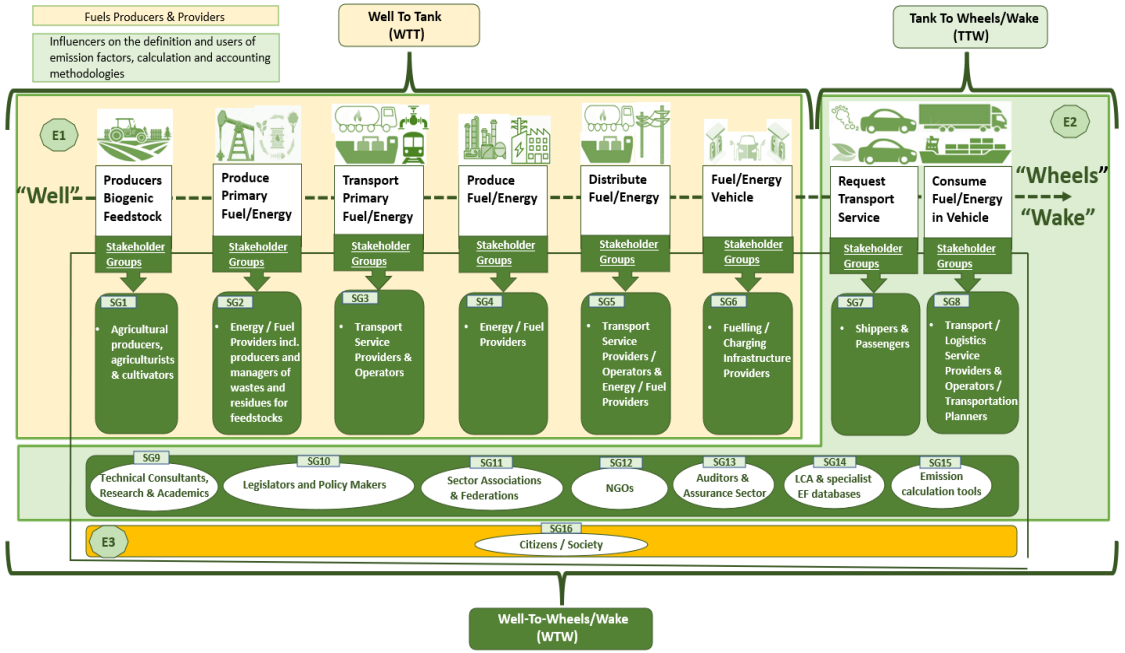
- **Comprehensive transport coverage** includes both passenger and freight across the full transport chain

- **Full energy lifecycle (Well-To-Wheel/ Wake)**: addresses conventional and emerging fuels, including complex low and zero-carbon options like e-fuels and biofuels.

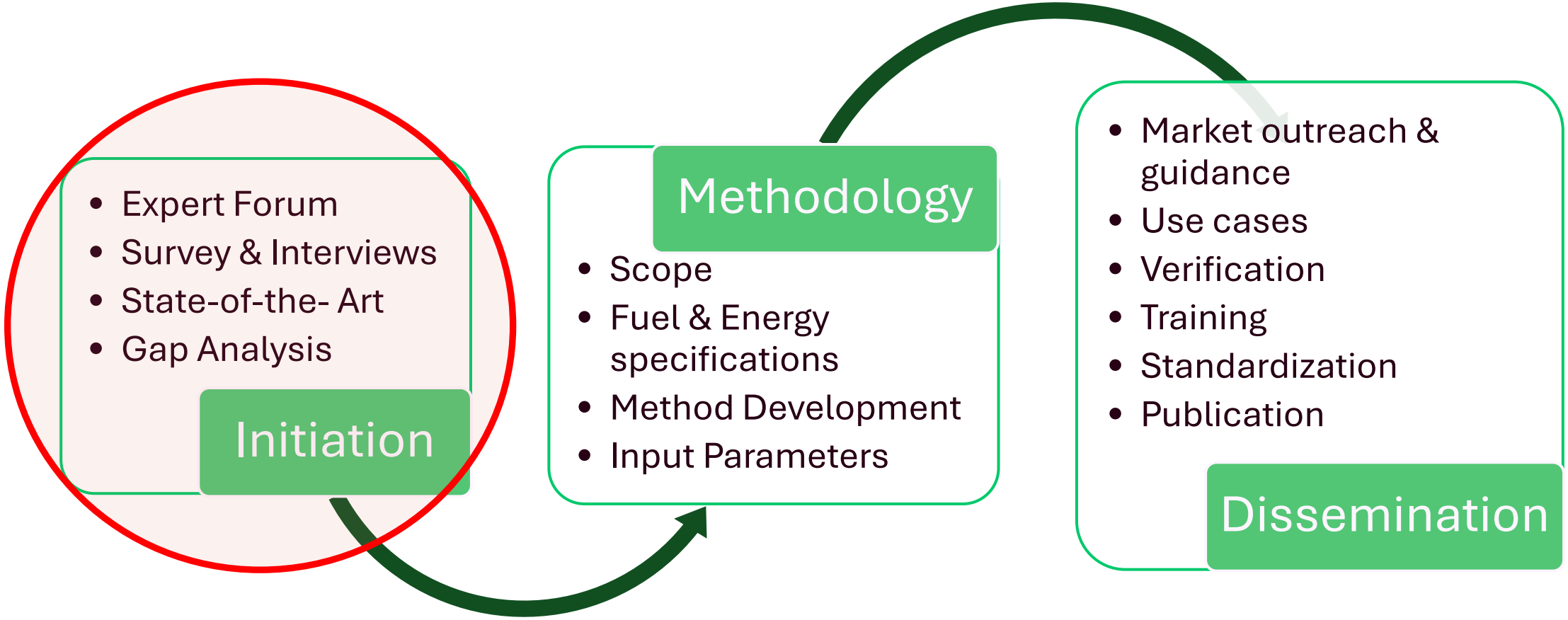
- **Multi-stakeholder collaboration**: Expert Forum with representatives from the entire CLEVER value chain.

- **Dynamic emission factors**: adaptable by fuel type, region, and technology.

- **Global relevance and alignment:** consistent with EU and international frameworks (CountEmissions EU, ISO standard 14083, GLEC framework, etc.).



Initial Stages



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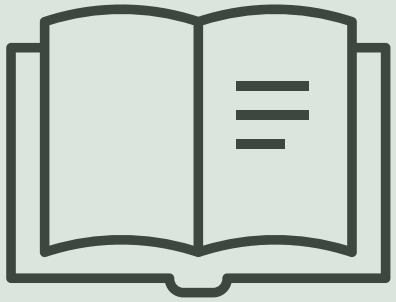
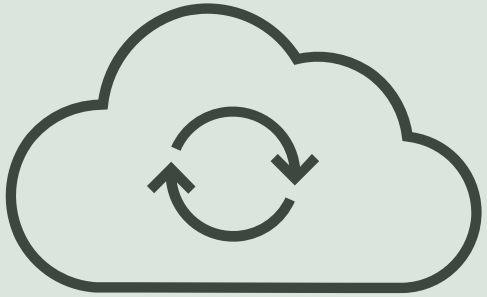
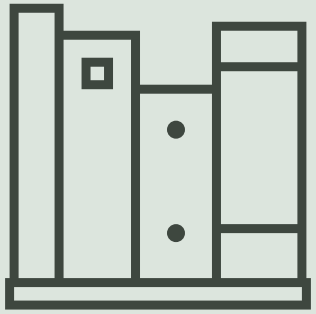
Emission Factors Gap Analysis

- **Emission Factors Gap Analysis**
  - Identifies key challenges in emission factor (EF) development and use:
    - **Fragmentation and inconsistencies** due to multiple institutions developing EFs independently.
    - **Data accuracy and availability concerns**, particularly for emerging energy carriers.
    - **Lack of centralized, harmonized databases.**
    - **Regional and sectoral data gaps**, including land use and black carbon.
    - **Regulatory inconsistencies**, causing challenges in cross-comparison and application.
    - **Transparency issues**, affecting trust in EF methodologies.
  - **Deliverable on Emission Factors Gap Analysis submitted in January**

For more information on the Gap Analysis

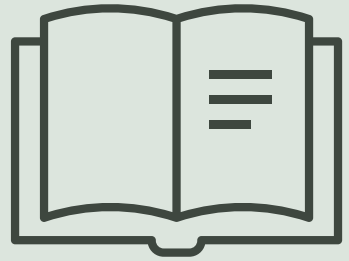
High-level Findings

Development of emission factors = LCA

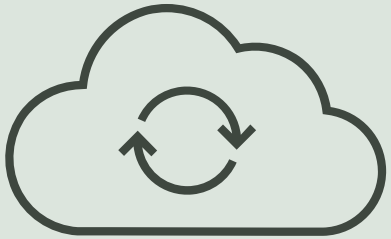
- Match the approach and boundary to the defined purpose
  - Apply it consistently and comprehensively
- Gaps occur due to:
  - Processes omitted
    - Fully or partially
    - Intentionally or accidentally
  - Data missing
- For users, inconsistency in application is as influential as gaps
- → consensus over rules is critical to meaningful result(s)

High-level Findings



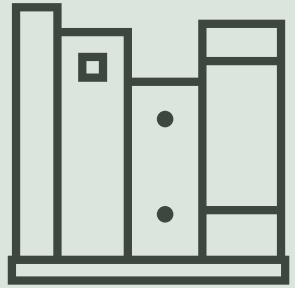
Consensus over ‘rules’ is critical to meaningful result(s)

- Balance detail vs applicability (e.g. by geography or timing) – where to draw the line?
  - Global values in a truly global market vs national values in a localized market
  - Market-based values linked to commercial choices

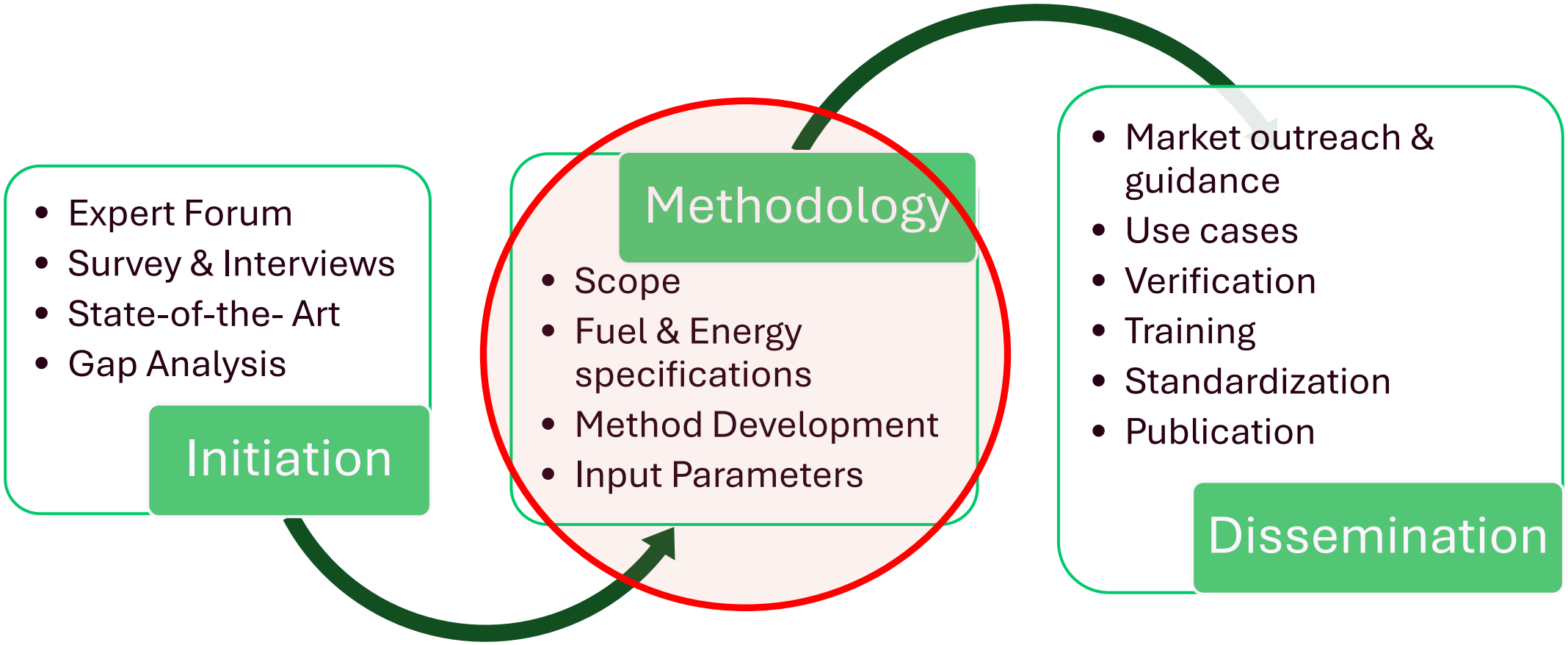


Interviews told us:

- Increasing lack of trust
- More transparency
- True harmonization and transparency/explanation
- Greater awareness and willingness of stakeholders to engage…



Current Status



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Task 3.1: Goal and scope definition

Milestone D3.1

Goal of CLEVER GHG Emission Factors and Methodology

CLEVER supplies:

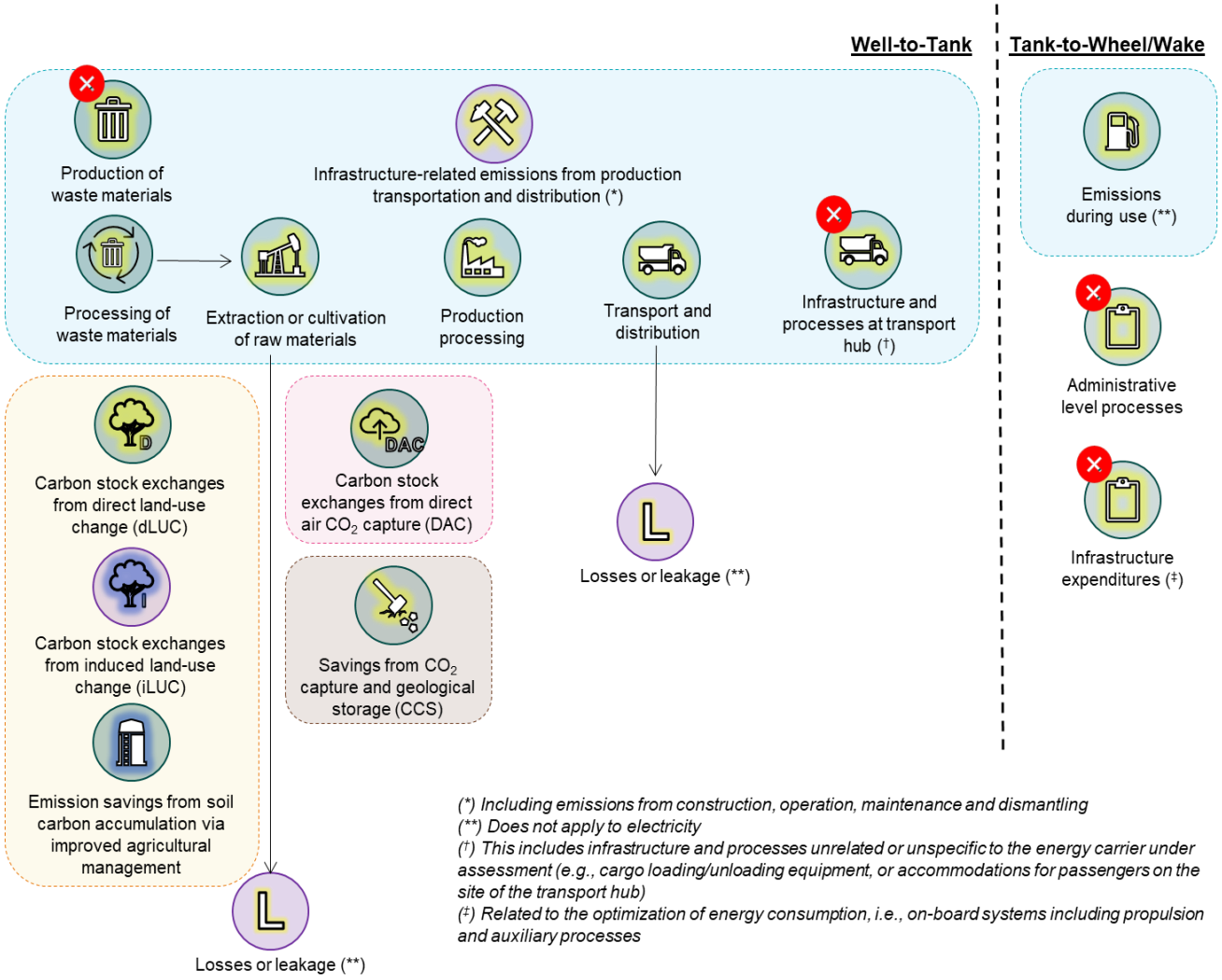
- A universal methodology on how to derive GHG emission factors for different energy carriers and pathways
- A set of ready-to use GHG emission factors for the most commonly used energy carriers today and in the near-future following this methodology

- Why are we doing this?
  - Different methodologies and databases for GHG emission factors exist leading to the need for a harmonised approach

- For whom are we doing this, who will use this and how?
  - CLEVER GHG emission factors will be included into the CountEmissionsEU database and be usable for everyone doing GHG calculations of transports
  - Calculation of own/ additional GHG emission factors will be possible following the methodology
  - Adaptation of existing GHG emission factors will also be possible due to a modular approach

CLEVER GHG emission factors cannot directly be used to compare the climate impacts of transportation without further information on the transport!

System boundary



- System boundary: Inclusion of all (relevant) life cycle stages (including energy provision infrastructure) → 3% cut- off criteria based on overall climate impact can be applied
- Waste is available burden-free for fuel production, but any upgrading is included

Scope of CLEVER GHG Emission Factors

- Geographical scope: average fuels used in Europe and country-specific values for electricity
- Temporal scope: current and emerging energy carriers (base year: 2025)
- Technological scope:
  - broad range of energy carriers and their pathways for usage in different vehicle types used in transportation covering all modes of transport (air, water, ocean, rail, road)
- Energy carrier pathways:
  - Fossil fuels and electricity
  - Biogenic fuels and electricity
  - Renewable fuels of non-biological origin (RFNBOs)
  - Recycled carbon fuels
  - Renewable (non biogenic) electricity
  - Other low carbon fuels
- Impact assessment:
  - "Climate change" as GWP100 (from latest IPCC report) but with the addition of hydrogen
- Inclusion of direct land use change (following IPCC guidelines with 20-years perspective)
- Approach to biogenic carbon: -1/+1 (only permanent storage of biogenic carbon can lead to negative WTW emissions)
- Coverage of additional climate impacts from high altitude emissions of airplanes, black carbon emissions and indirect land use change (iLUC)

Result presentation of CLEVER GHG Emission Factors

CLEVER results are given as:

$$EF_{Total} = EF_{Core} + EF_{iLUC} + EF_{ACI}$$

- with EF_{Total} constituting the total CLEVER GHG emission factor
- with EF_{Core} including all GHG emissions and processes inside of the system boundary (apart from iLUC and additional climate impacts)
- with EF_{iLUC} representing contributions from iLUC (indirect land use change)
- with EF_{ACI} representing additional climate impacts (divided into impacts of hydrogen, high altitude emissions and black carbon)

- Division into:
  - Well-to-tank and tank-to-wheel
  - Main GHGs (CO2, N2O, CH4, H2)
  - Biogenic CO2
- Additional information on:
  - Energy carrier pathway and usage
  - Lower heating values
  - Densities (for liquid fuels)
  - Data quality rating
  - GWP100 of the main GHGs

Join our public consultation

CLEVER Open Consultation

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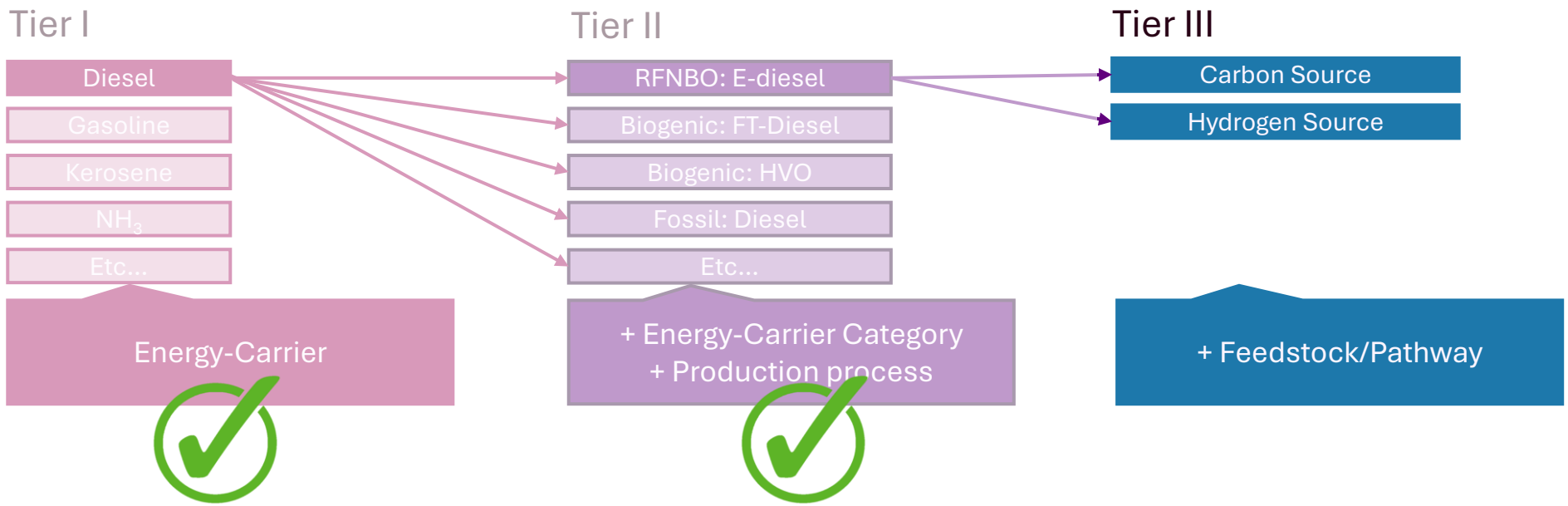
Task 3.2: Common set of fuel and energy specifications

Energy carrier selections

Approach to selecting emission factors for development

- T3.2 will select a limited number of pathways to produce default emission factors for the CLEVER database. The purpose of these will primarily serve to test the developed CLEVER methodology.
- The final selection will consider:
    1. Weighting choices towards the most prevalent transport modes (covering freight & passenger road, marine, inland waterway, rail and air transport)
    2. Selecting energy-carriers which are most common now and in the near future
    3. Ensuring all categories (fossil, biogenic, RFNBO, etc.) have been covered
    4. Ensuring that unique LCA method complexities are covered by the selections e.g., iLUC
- CLEVER has broken this selection task into 3 'Tiers'.
- Having consulted with stakeholders on Tier I and Tier II choices, the consortium is now discussing Tier III (feedstocks).



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WP5: Increasing industrial understanding of benefits and operational application

WP5 INTRODUCTION

WP5 will focus on

i. provide practical, hands-on coaching to ensure that the industry can apply the theoretical knowledge in real-world scenarios

ii. provide training and capacity building tools and courses focused on the enhancement of skills and knowledge within the CLEVER industrial ecosystems and increase the understanding about the need for adopting the CLEVER outputs

EXAMPLE OF USE CASE

A carrier wants to know the impacts of biofuels in its business to evaluate strategic investments. Therefore, CLEVER EFs will be used to compare different fuels considering the same number of shipments and routes (real data from the involved organisation).
The outcome will be a formal report including a brief introduction about the company, the topic and the purpose of the use case with final description of CO_2e impact comparison + any other relevant results.

JOIN THE OPEN CALL

EXPECTED TIMELINE

Open Call launch
Application window opens

Autumn 2025

Evaluation process
Review and selection of the applicants

Use cases coaching start
Real-world applications

1st quarter of 2026

The Open Call will be open to:

- **Transport operators of passenger and/or freight applications** e.g. logistics providers, tourism companies, ...
- **Shippers**
- **Energy/fuel producers or suppliers**
- **Auditors**
- **Policy makers**
- ...

Open Call close
Application window closes

Result announcement
Winners notified

End of 2025/Beginning of 2026

OUR VISION

The harmonized framework of emission factors will support quantification of baselines and tracking of emission reductions.

CLEVER outputs are designed to support EU directives and potentially inform international standards like CountEmissions EU.

Join our journey!

CLEVER Newsletter

& Repository

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www.emissionfactors.eu

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