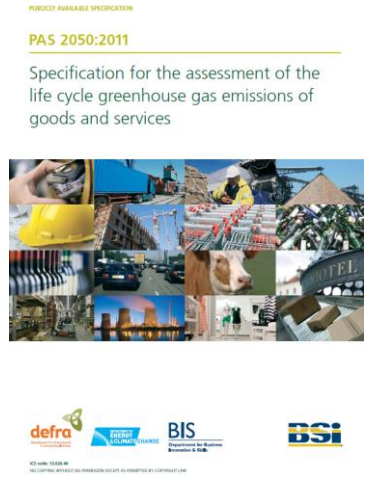
Including changes in forest carbon stocks in LCA for forestry products

Ilkka Leinonen

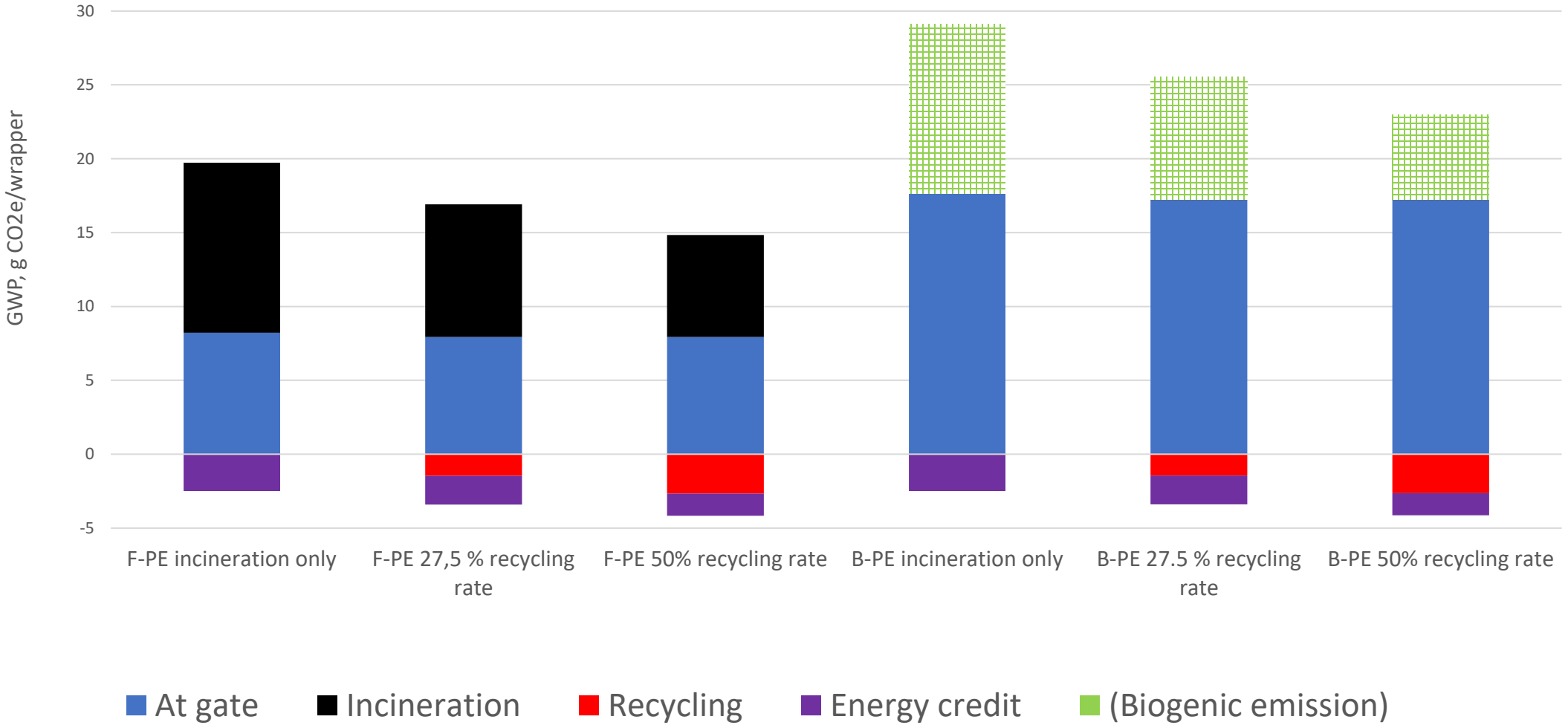
Natural Resources Institute Finland (Luke)

How to quantify the GHG emisisions related to biobased carbon?

- Different approaches give contrasting results
  - e.g. the carbon footprint of wood products can show either high positive or high negative values
- This is not tolerable: makes any decision making or communication very difficult
- Common, transparent calculation principles needed
- The basic principles already exist and are widely used (e.g. national GHG inventories, PAS2050 guidelines)
- Practical and consistent applications and guidelines for biobased LCAs developed in the **Bio-LCA** project (funding: Business Finland)



Climate effects of fossil and biobased materials: food packaging as an example



Source: Leinonen et al. (2022) Materials and solutions replacing traditional plastic: final report

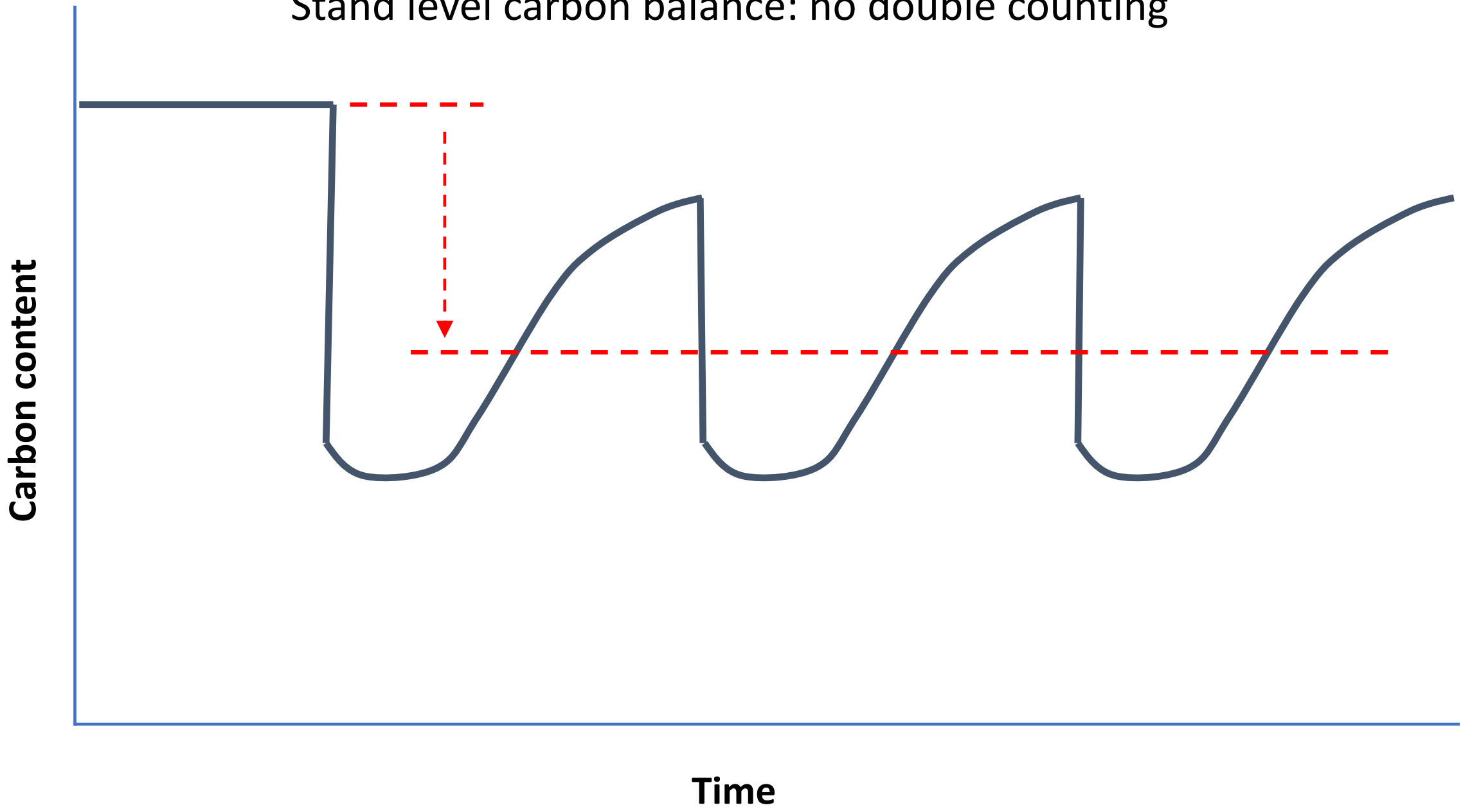
General mass balance principles – basis of all carbon calculations

1. All reductions in carbon storage, fossil or biogenic (LULUC) counted as emissions
2. All increases in carbons storage counted as negative emissions (sink)
3. All changes counted only once (no double counting)

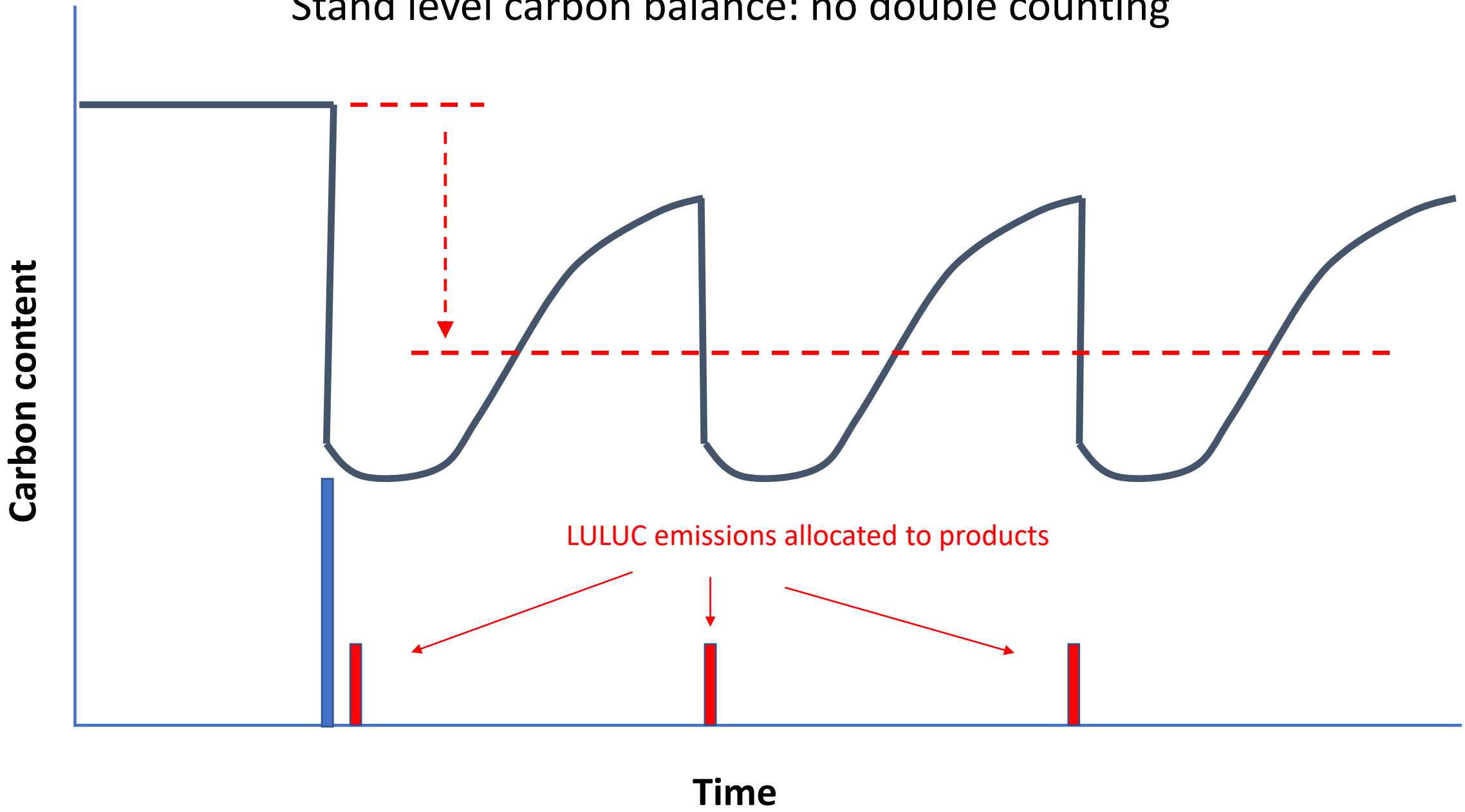
-> Produces correct estimates of the carbon flows between the storage and atmosphere

- The whole system needs to be taken into account, no partial optimization

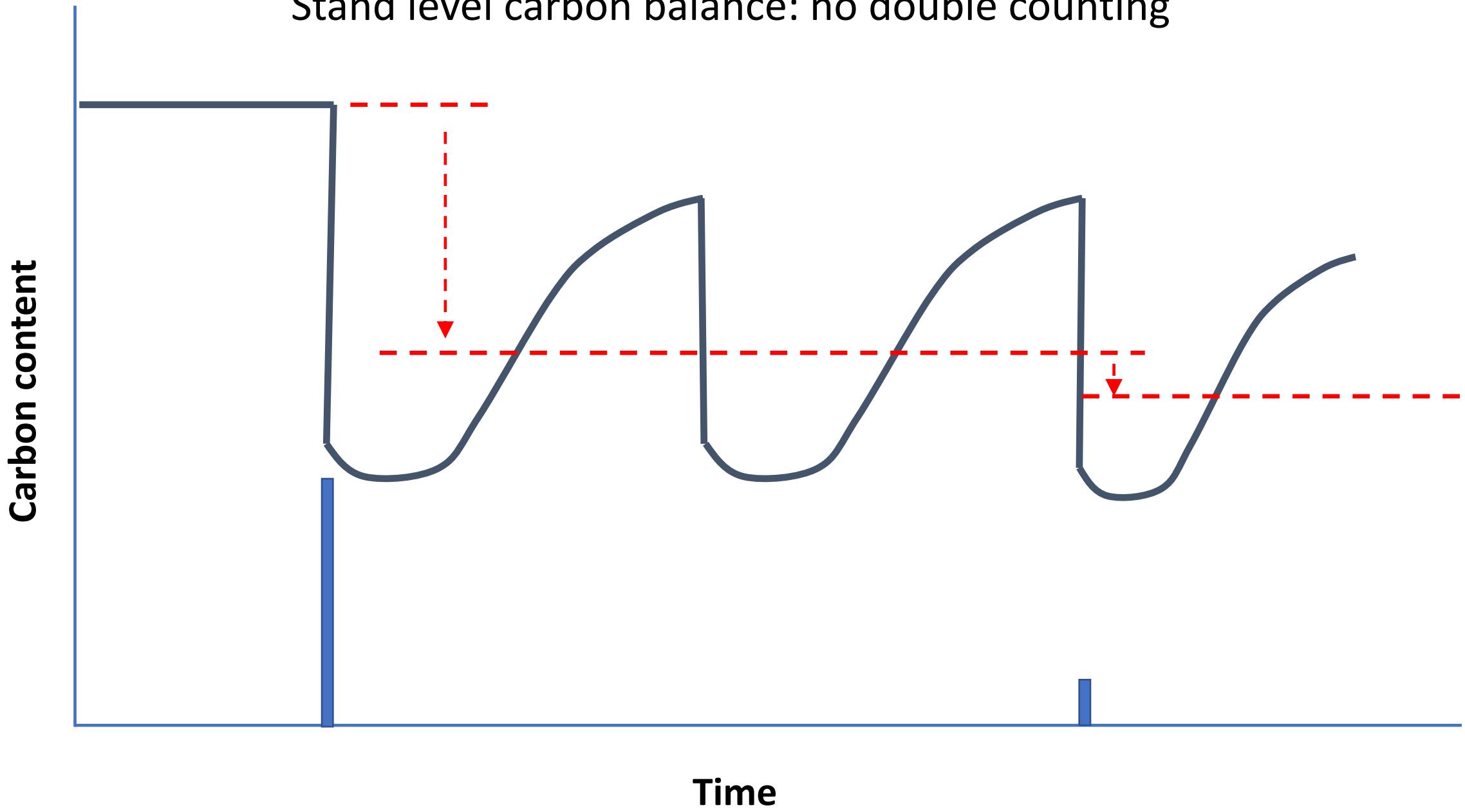
Stand level carbon balance: no double counting



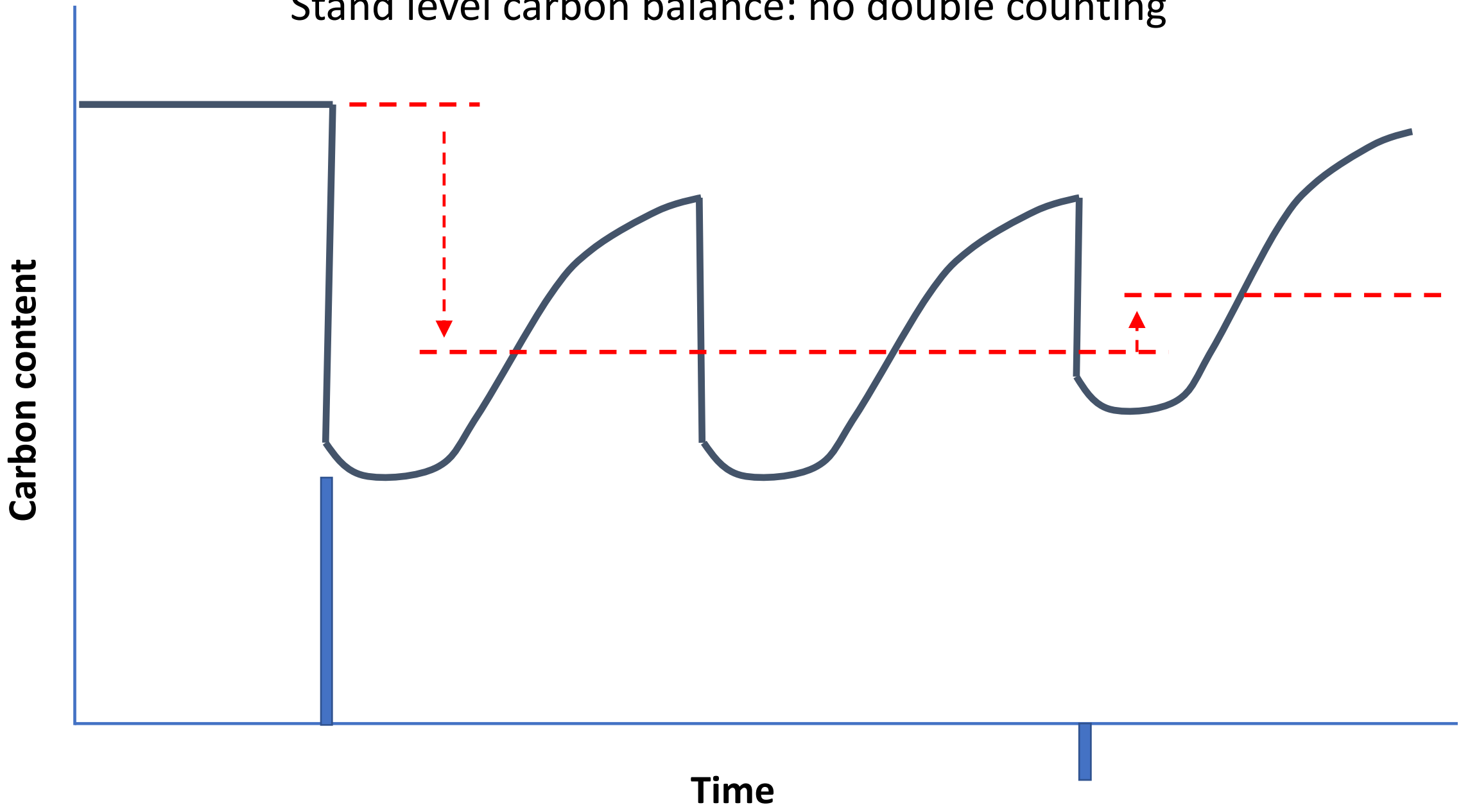
Stand level carbon balance: no double counting



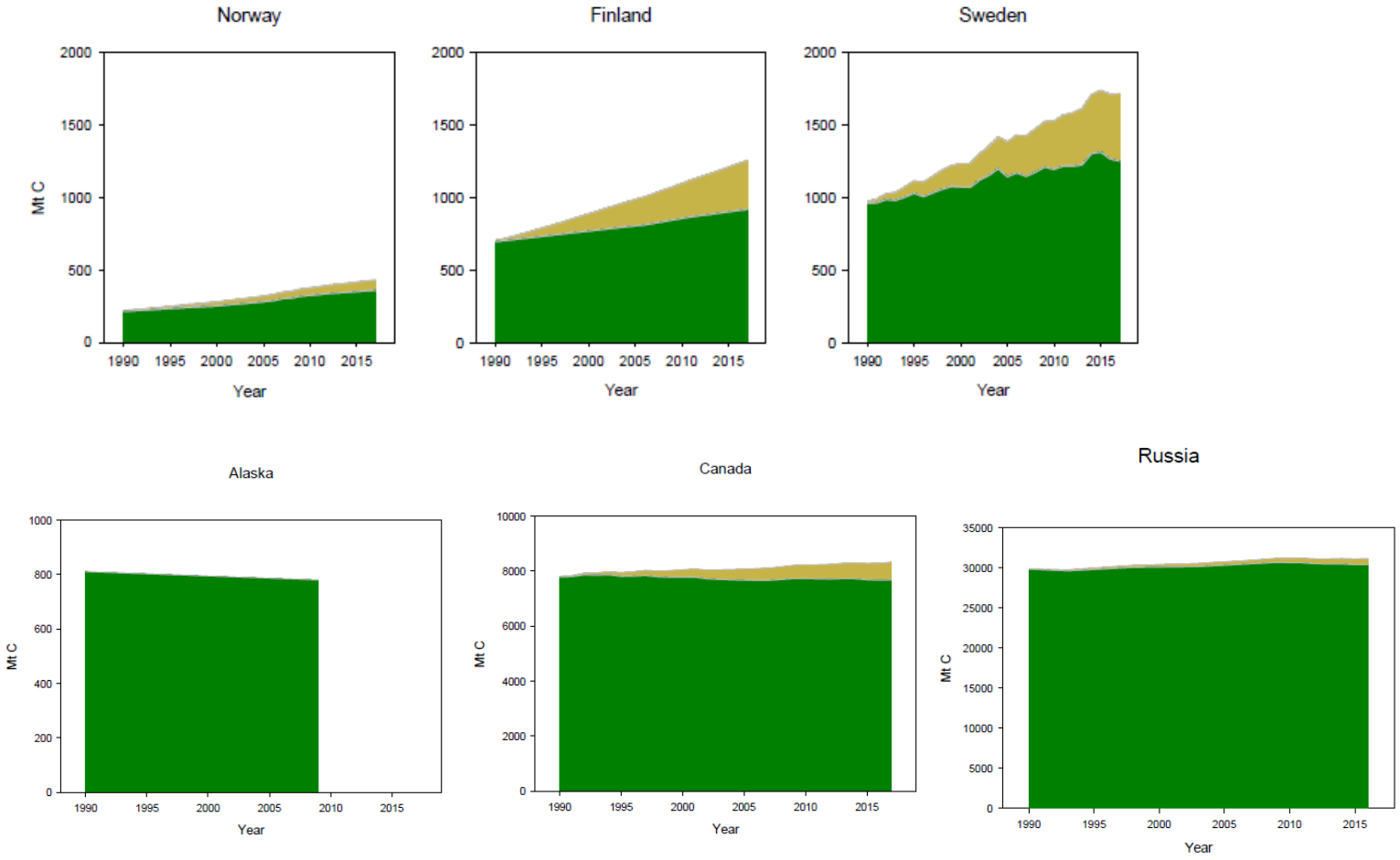
Stand level carbon balance: no double counting



Stand level carbon balance: no double counting



Carbon sinks and sources at a national level



- In Finland, the forest carbon storage has increased by **0.67 tC** per 1 t carbon removed in loggings during 1990-2020 -> strong net sink
  - Source: NIR results and LUKE statistics

Source: Report from an Insight Process conducted by a team appointed by the International Boreal Forest Research Association (IBFRA), REPORT 2021/11

Conclusions

- Correct, mass balance-based carbon counting needed in all climate change assessments (not only in LCA)
- Efficient communication and decision making possible only if such counting principles are applied, and in a transparent way
- Correct counting methods can demonstrate the special features of biobased materials, e.g. carbon neutrality in cases where the carbon storage does not decrease (and LULUC emissions in cases where the storage does decrease)

Further steps

- Development of LCA methodologies for biobased production continues in the **Bio-LCA** project
- Scientists invited to join the Scientific Advisory Board of the project
- Expert workshop to be organized in autumn 2022
- For further details, please contact Prof. Ilkka Leinonen, Natural Resources Institute Finland
  - ilkka.Leinonen@luke.fi