

The impacts of food loss & waste on the Water-Energy-Food-Ecosystem Nexus

Candidate: Francesco Semeria

Supervisors: Marta Tuninetti, Prof. Francesco Laio, Prof. Luca Ridolfi

Food Loss & Waste (FLW) in the context of the WEF Nexus^[1]

Main challenges

1. Reconstruction of a realistic food trade network.
2. Identify FLW of primary and derived products along complex networks.
3. Estimate multi-dimensional impacts of each FLW stage.

Algorithm by Kastner et al., 2011^[2]

Main assumption

"The products consumed in a given country originate in proportional shares from the country's imports and own domestic production."

Data

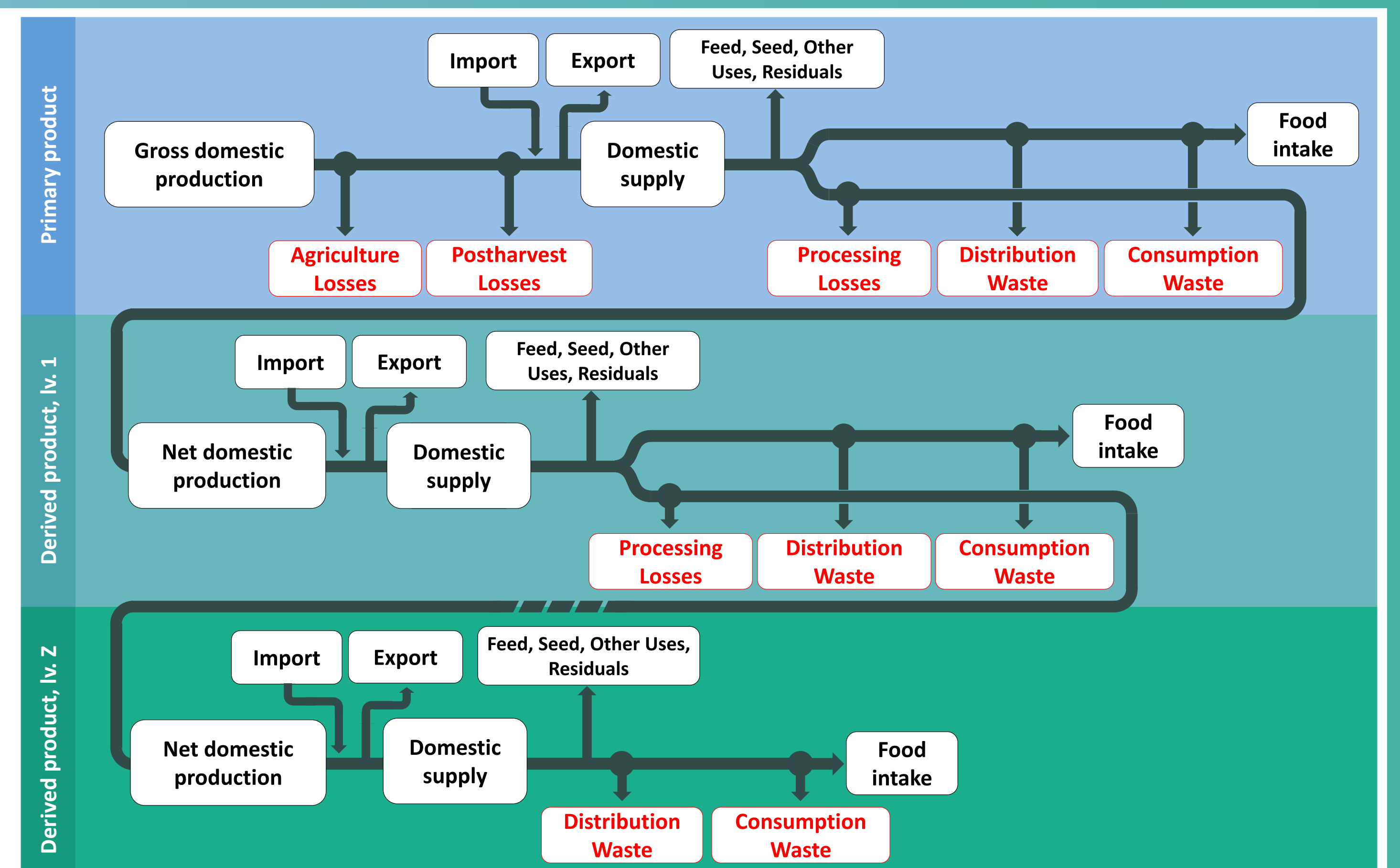
Case of cereals and derived products

- Analysis on 8 *commodity trees* among the most cultivated staple crops, using FAO data for year 2010. A total of 37 food commodities were analysed, considering both primary and derived products.
- Waste percentages at every step of the food chain from Gustavsson et al., 2011^[3].

Methods

Input-output analysis

1. Model food loss and waste within each country.
2. Trace FLW associated with food intake for every food commodity.
3. Estimate impacts of FLW on water, land and energy.

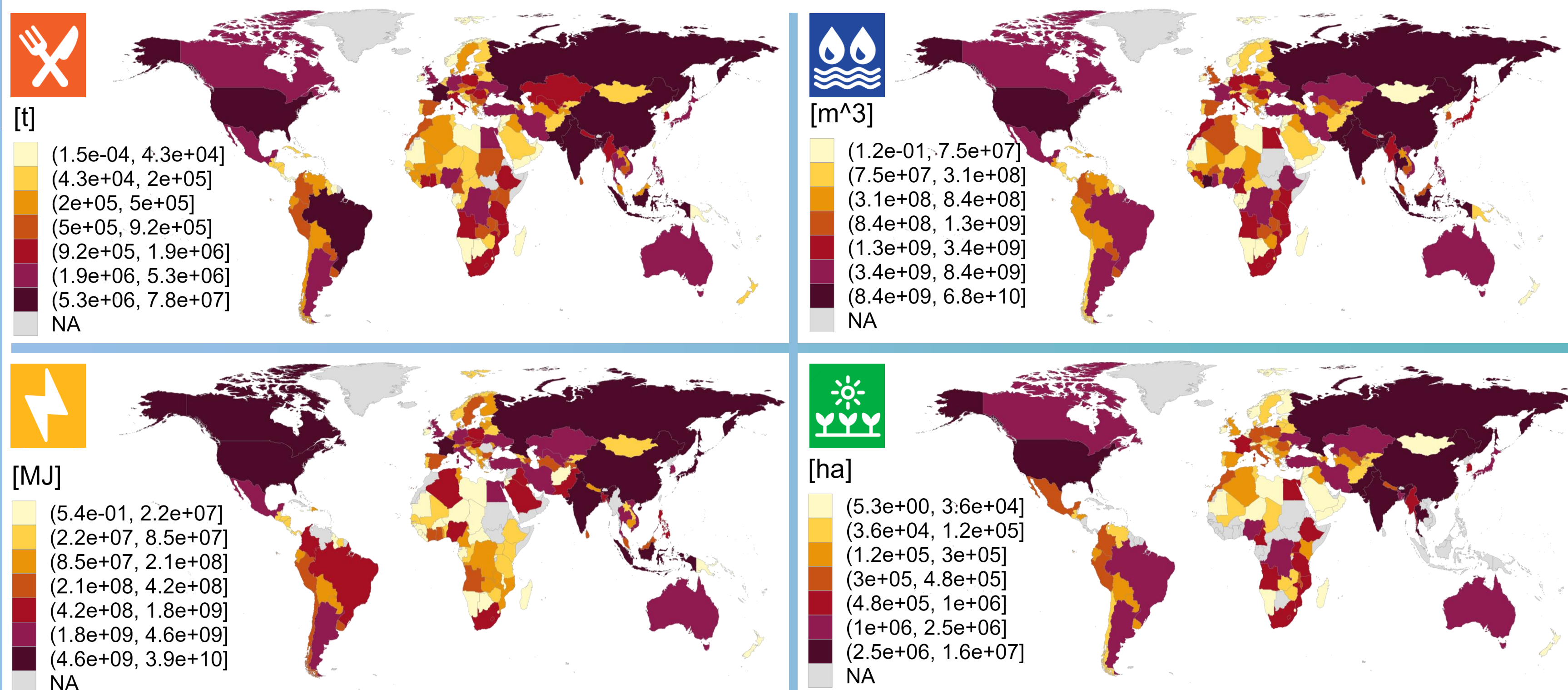
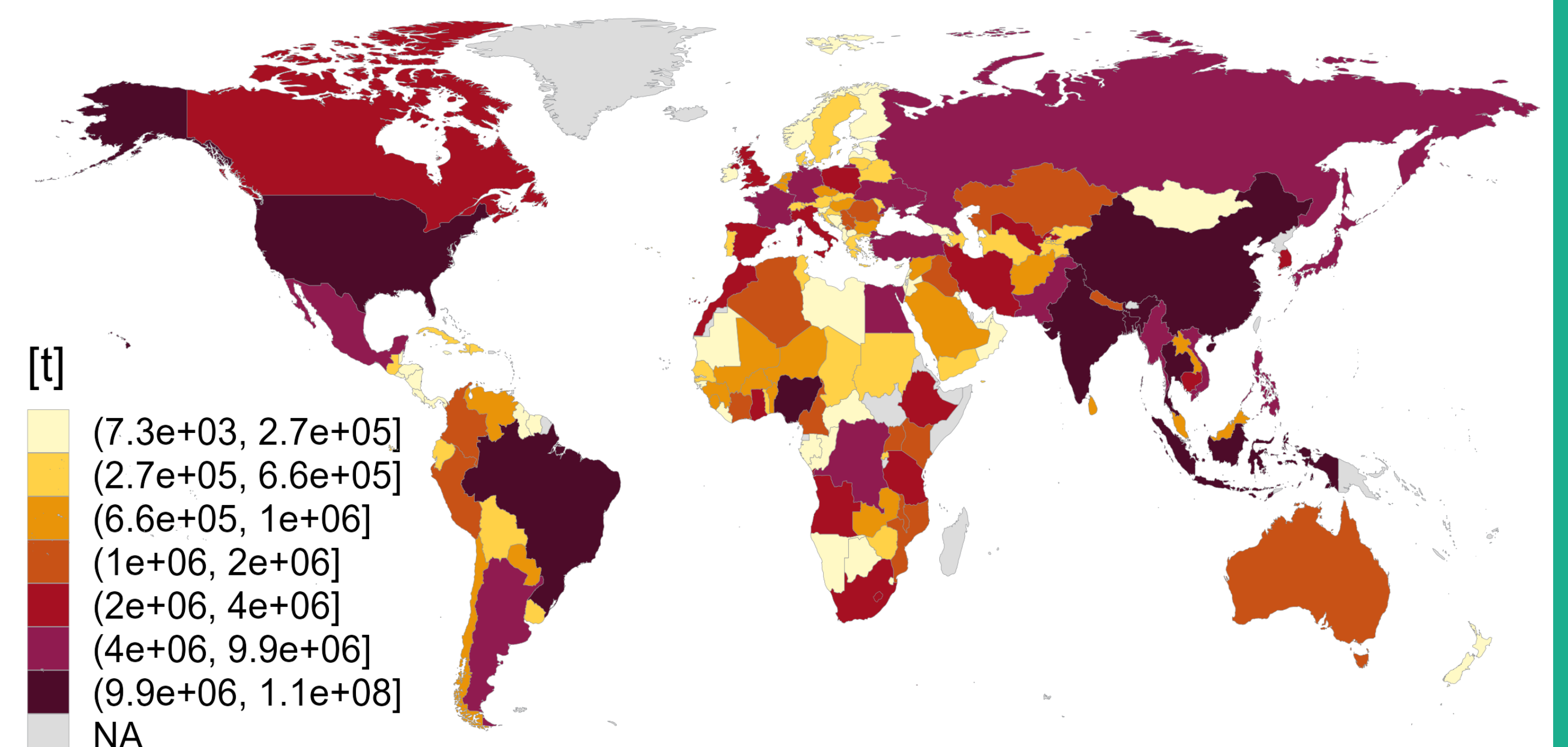
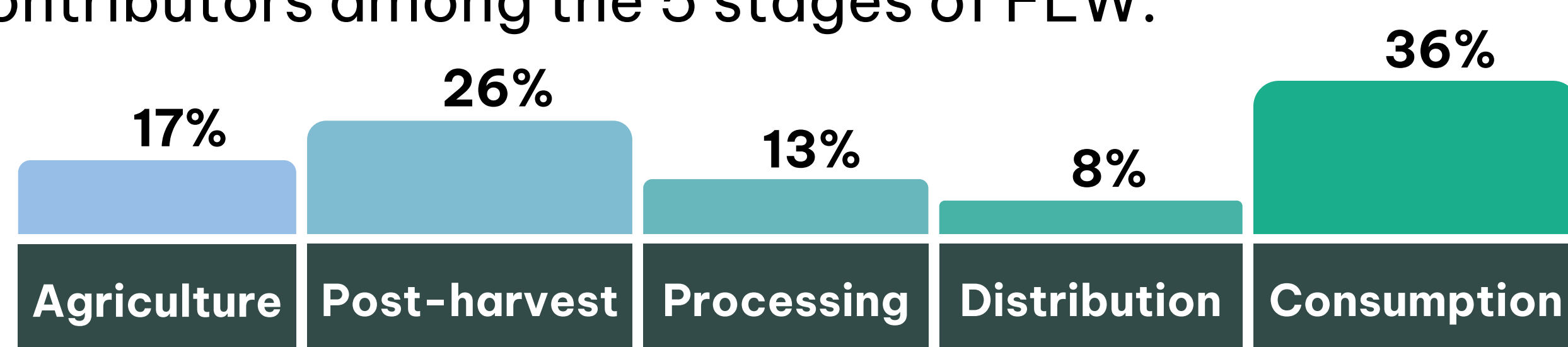


Results

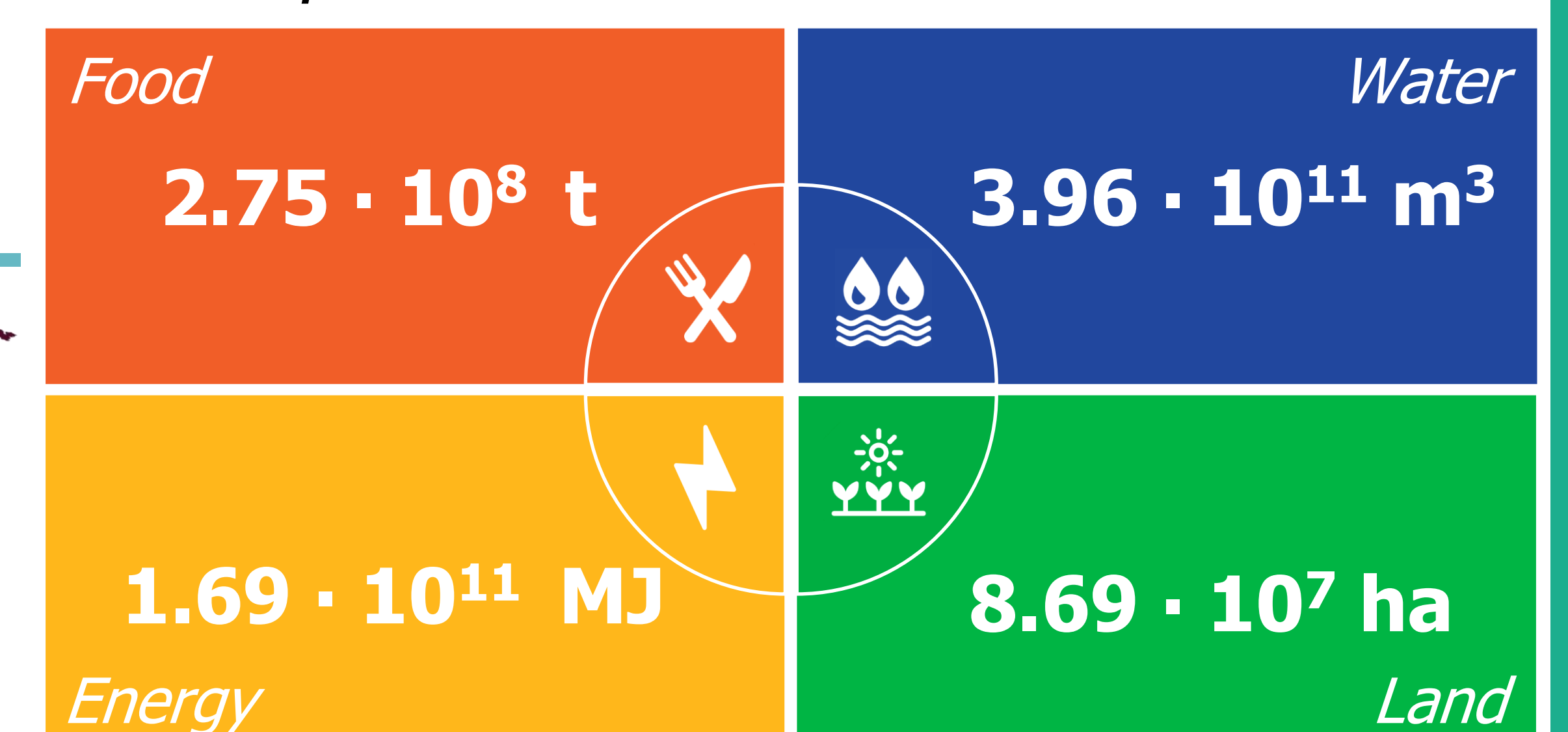
Mapping where FLW occurs

We estimate that, globally, a total of $4.59 \cdot 10^8$ t of food was either lost or wasted along the value chain.

Consumption waste and post-harvest losses were the largest contributors among the 5 stages of FLW.



Impacts associated to direct human food consumption



Corporate partner



Bibliography

1. Kummu, M. et al., 2012, *Lost food, wasted resources: Global food supply chain losses and their impacts on freshwater, cropland, and fertiliser use*. Science of the Total Environment. Vol. 438, pp. 477-489.
2. Kastner, T. et al., 2011, *Tracing distant environmental impacts of agricultural products from a consumer perspective*, Ecological Economics, Vol. 70, no. 6.
3. Gustavsson et al., 2011, *Global food losses and food waste – Extent, causes and prevention*. FAO. Rome.