Greenhouse gases in the post harvest value chain

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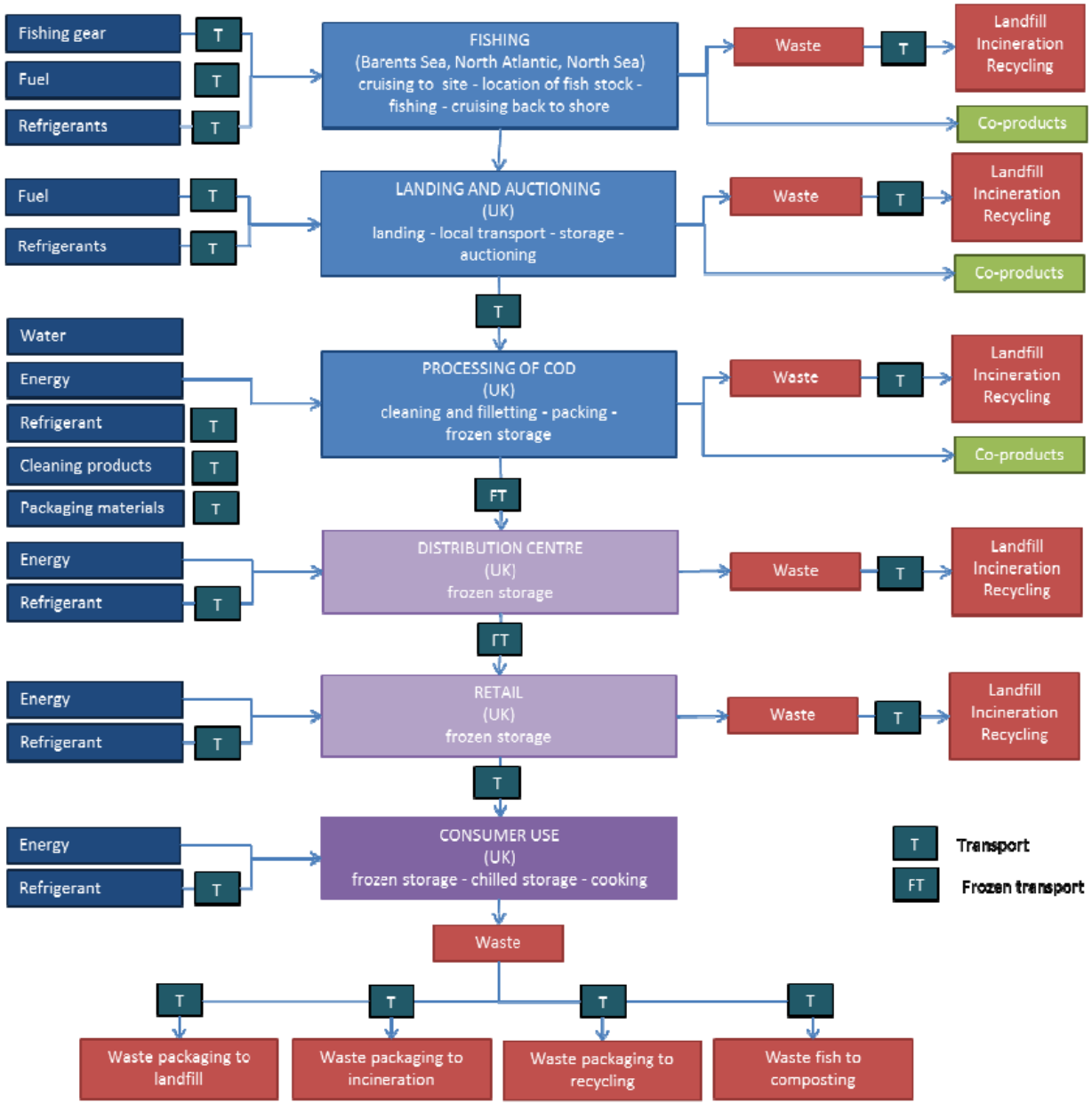
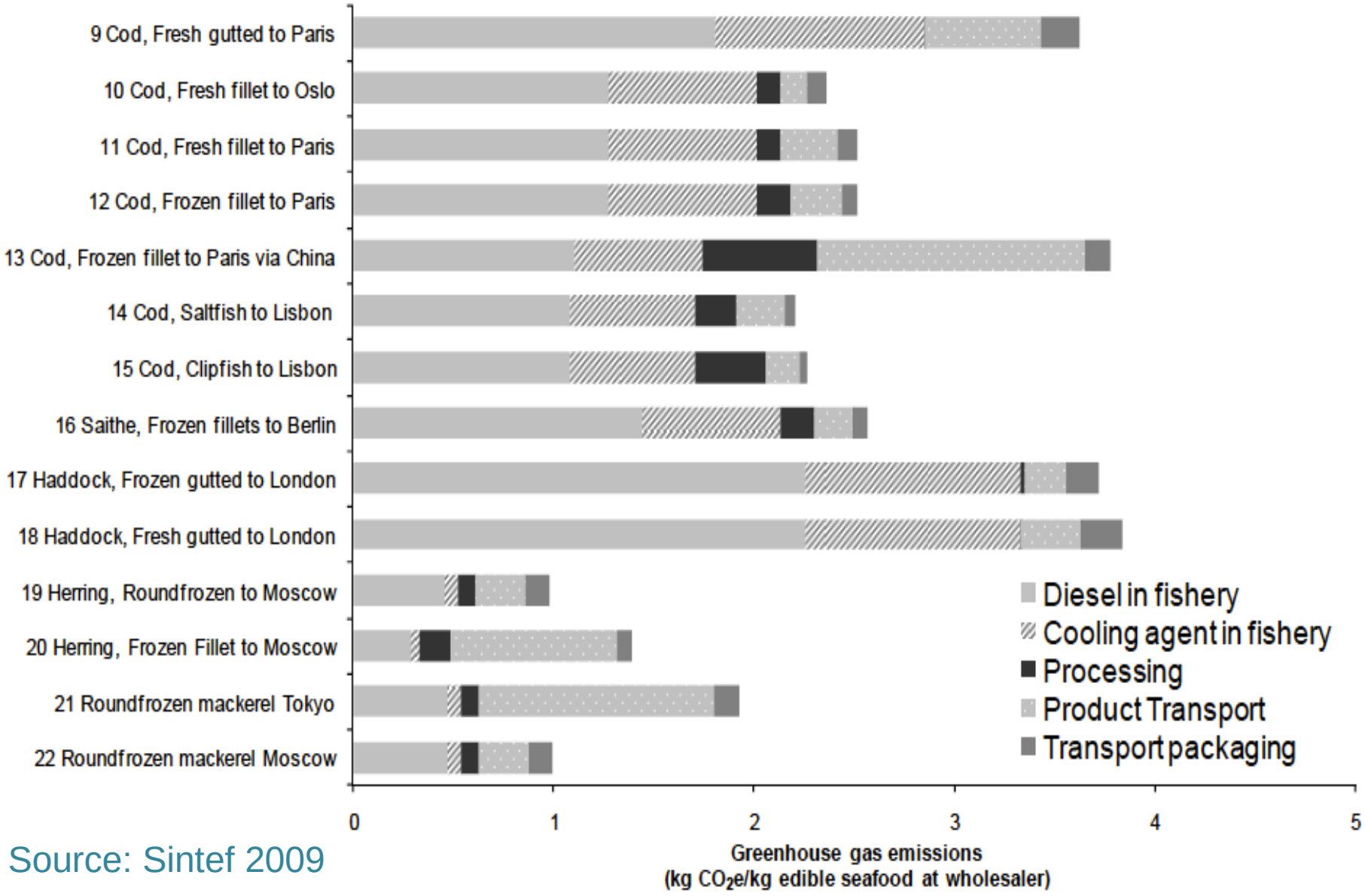

Fishing gear
Fuel
Refrigerants
T
FISHING
(Barents Sea, North Atlantic, North Sea)
cruising to site - location of fish stock - fishing - cruising back to shore
Waste
Landfill
Incineration
Recycling
Co-products
Fuel
Refrigerants
LANDING AND AUCTIONING
(UK)
landing - local transport - storage - auctioning
Water
Energy
Refrigerant
Cleaning products
Packaging materials
PROCESSING OF COD
(UK)
cleaning and filletting - packing - frozen storage
FT
DISTRIBUTION CENTRE
(UK)
frozen storage
RETAIL
(UK)
frozen storage
CONSUMER USE
(UK)
frozen storage - chilled storage - cooking
Transport
Frozen transport
Waste packaging to landfill
Waste packaging to incineration
Waste packaging to recycling
Waste fish to composting

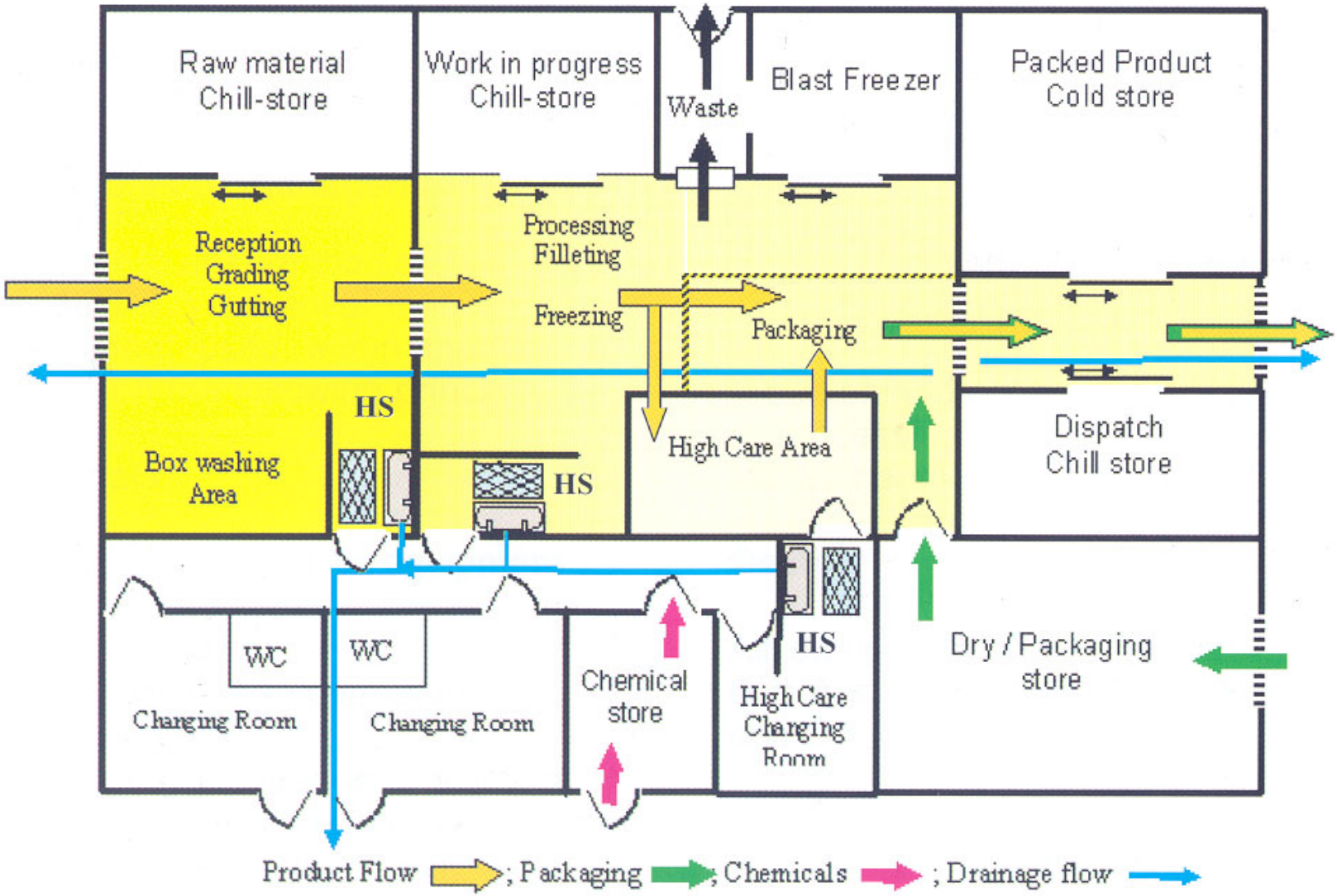
Processing

- **Processing** normally a lot less impact than **production** (capture or farming), but the contribution depends on the processing and product form
- Focus here is processing on land (though many instances of on board processing, even fish meal production)
- Industrial scale or small scale – no real studies
  - Most work in developed countries' seafood systems



Source: Sintef 2009

Processing


Raw material
Chill-store
Work in progress
Chill-store
Waste
Blast Freezer
Packed Product
Cold store
Reception
Grading
Gutting
Processing
Filleting
Freezing
Packaging
HS
Box washing
Area
HS
High Care Area
Dispatch
Chill store
WC
WC
Changing Room
Changing Room
Chemical
store
HS
High Care
Changing
Room
Dry / Packaging
store
Product Flow ; Packaging ; Chemicals ; Drainage flow

Processing (cont'd)

- Assuming climate neutral refrigerants, main impacts are:
  - Yields
  - Processing waste use and management
  - Energy
    - Product type and processing method - Cooking, canning, fishmeal and oil, filleting, H&G, freezing, drying, salting, etc
    - Storage methods – chilled, frozen

Brussels Seafood Show 2012

Distribution

- Mode most important, not distance
- Ship < rail < road < long haul flight < short haul flight
  - but not always that simple. Small less efficient vans, sub-optimal loading ….as an example (SINTEF study)
- But also what roads (tarmac??), how efficient the truck, etc. Big differences in developing countries
- Ice versus frozen versus canned, for instance
- Reducing PHL, reduced spoilage (more developing country issues)

Retail and consumption

- Distribution systems to stores → efficient systems
- Better market information and communication
- Energy use in stores/homes, mostly refrigeration
- Large waste of food products (past sell by dates…) at retail and consumer – 30% is a common figure used
- Disposal of packaging

Mitigation?

- From a technology point of view:
  - Energy efficiency: good management, correct sizing and use of equipment, use only when necessary; cleanest transport option practicable.
  - Cleaner and renewable fuels: biomass, solar, wind, purchased green energy, combined heat and power.
  - Resource efficiency: reducing unnecessary use of products and equipment; recycling and reuse where environmentally appropriate. Reduced losses.
  - Product development ? Frozen/superchilled – allows non airfeight travel
- Changing consumption away from GHG intensive products
  - Part of sustainable consumption and move to sustainable diets

Changing behaviour ?

- Information needed for informed choice is complex
  - Capture – what method, how long at sea, engine efficiency
  - Farmed – intensive, semi-intensive, extensive, carnivorous or not,
  - Distribution method – air, road, rail, ship – and temperature – frozen, iced, ambient
  - Processing – refrigerant used, cooking times, temperatures and duration, storage temp and time, packaging type and amount, energy for drying (mechanical/sun),
  - Energy production method – coal, nuclear, wind, etc. Cleaner and renewable fuels: biomass, solar, wind, purchased green energy, combined heat and power.
  - Packaging – cardboard, polystyrene, plastics

Issues to change?

- Part of long term sustainability issues and CSR - for businesses
- Impending legislation/taxes – focuses the mind.
- Carbon footprint awareness is increasing amongst consumers
  - With Tesco and M&S launching air-freight labels on fresh produce?
  - Tesco ditches carbon labels in Jan 2012 – had done 1100 products with 500 labelled products but no-one else doing it
- Unintentional consequences
  - As countries develop wealth → more high value products (GHG intensive?? More cold chain products are consumed. Is this sustainable?
  - Impact on developing countries? New barrier? Reduced air freight? Lack of data?
- Are we tweaking or changing our systems

Hopes ?

- *"From a business perspective, food companies that act early to identify and minimize supply chain greenhouse gas emissions will likely be at a competitive advantage, and may also be rewarded in the marketplace for environmentally responsible behavior" (Pelletier and Tyedmers 2008).*

How are we going to do it?

- To quote Clive Woodward, coach of Rugby World Champions in 2003, as to why England won
  - We were 100% better – we didn't do one thing 100% better, we did 100 things 1% better…."

Step	GHG characteristics	Issues
Post harvest processes	Wider range of GHG associations depending on process, mainly fuel/electricity, water supply/treatment, cleaning, waste disposal, packaging, labour; capital items including buildings, process equipment, vessels/vehicles based on category-based ratios, mass/process conversion factors, use and disposal	Boundaries in supply chain, yield variations, allocation to products, byproducts, value added product mixes; usage/disposal of wastes; values associated with water use; role of refrigerants

Step	GHG characteristics	Issues
Distribution	Primarily depend on mode of transport, temperature, pack options, distance – fuel use; capital items include storage/distribution depots, air transport, vessels, trucks, handling and IT systems; GHG estimates based on allocated use rates, category-based ratios	Effects of loading levels, handling/ storage stages, route efficiency, infrastructure investment, fuel pricing, product losses, refrigerants

Step	GHG characteristics	Issues
Retail and consumption	Range of GHG associations depending on products, on retail, food service conditions and consumption characteristics – power for lighting/cooling, home storage, cooking; wastes, packaging disposal	Variations across systems, food cultures, energy sources for storage, food preparation, refrigerants, regulatory impact on losses, wastes, infrastructure