



**Innovation Center
Iceland**

LightTrawl

Fishing with photons

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Why do we fish with photons ?

In the beginning there was a study

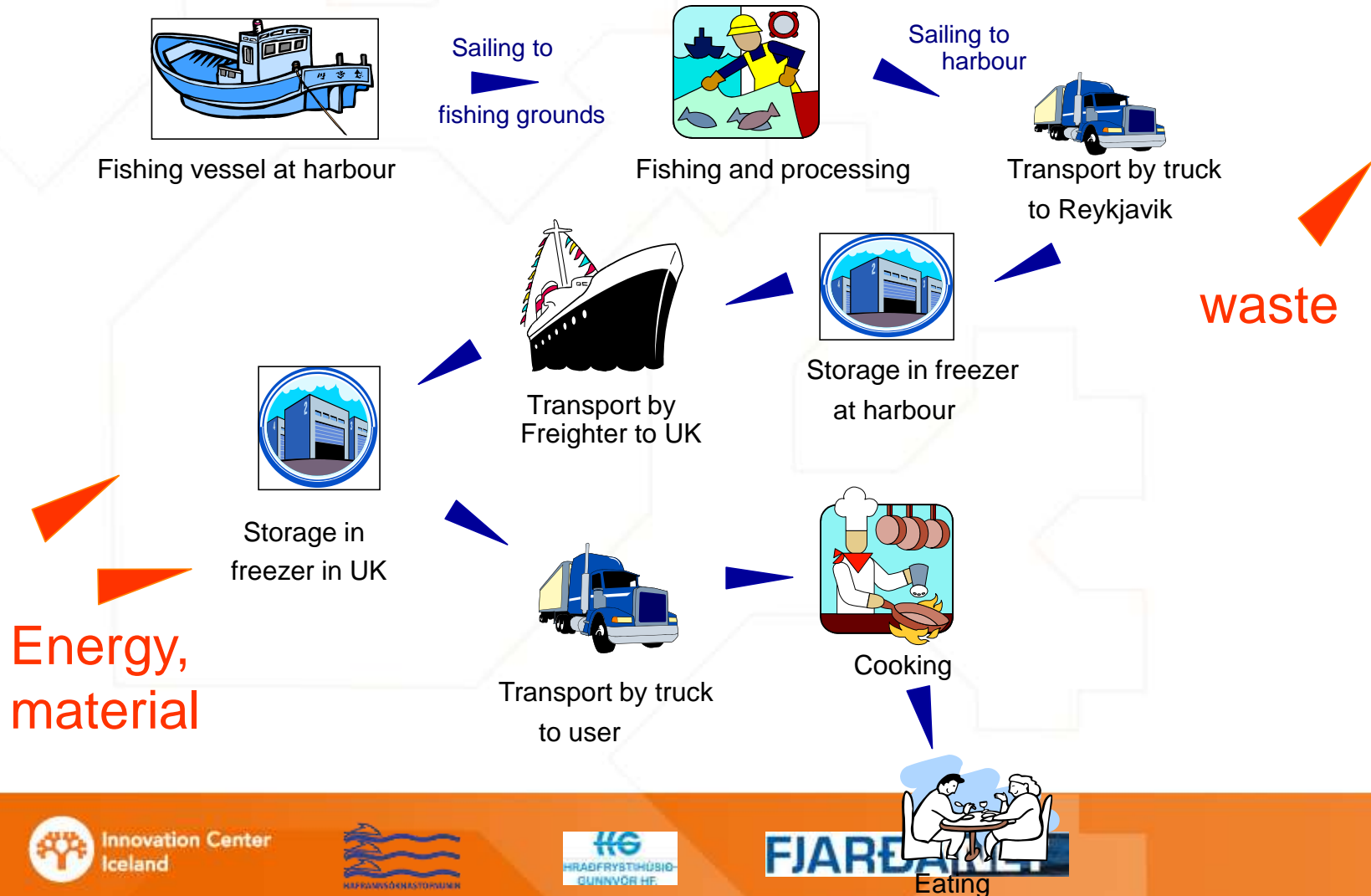
Life Cycle Analysis (LCA) of cod fishing.

The greatest environmental impact was traced to oil consumption during fishing.

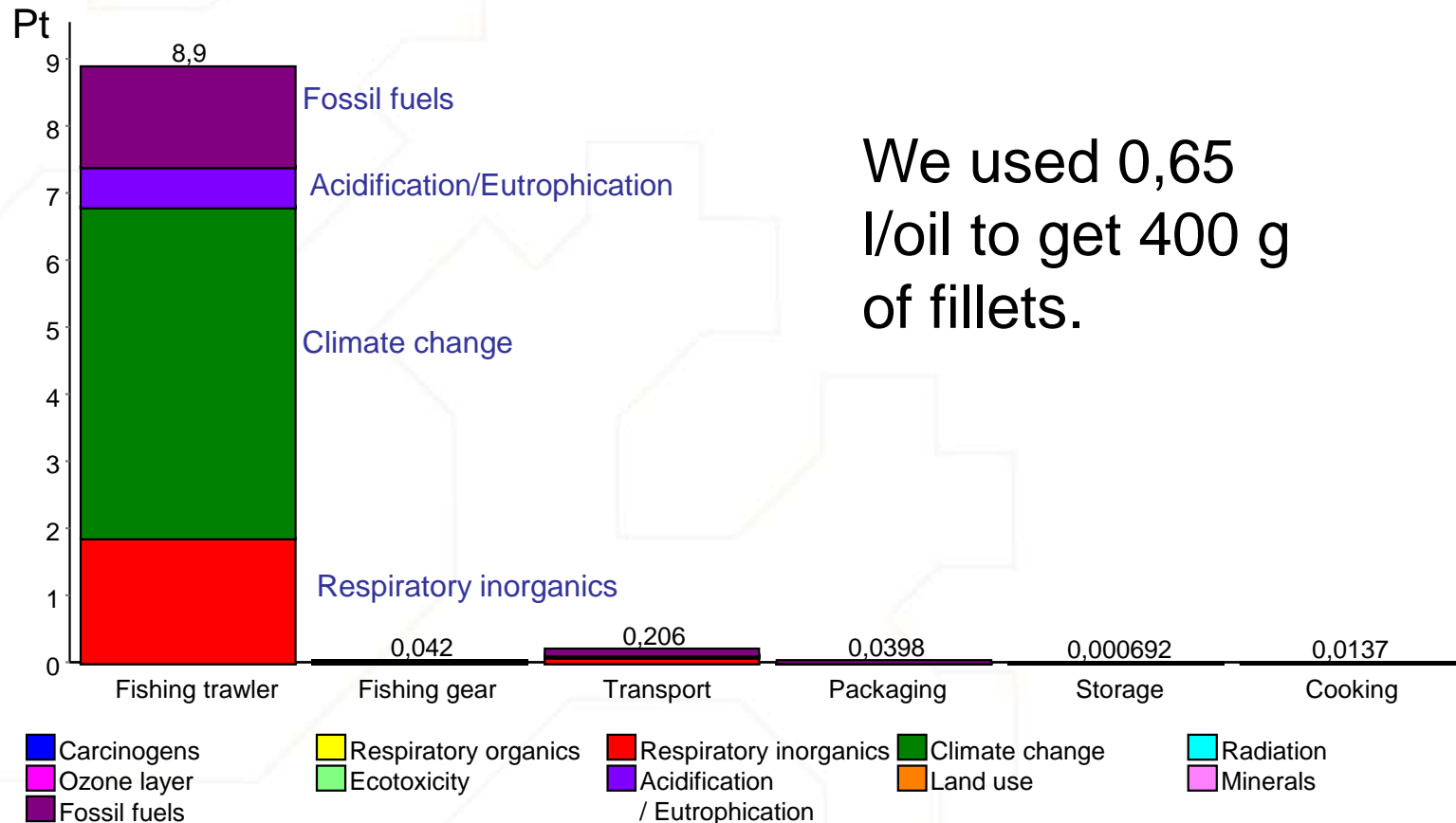
Oil consumption was considered unacceptable



LCA: Environmental effects of fish on the consumers dish



Results: Environmental effects



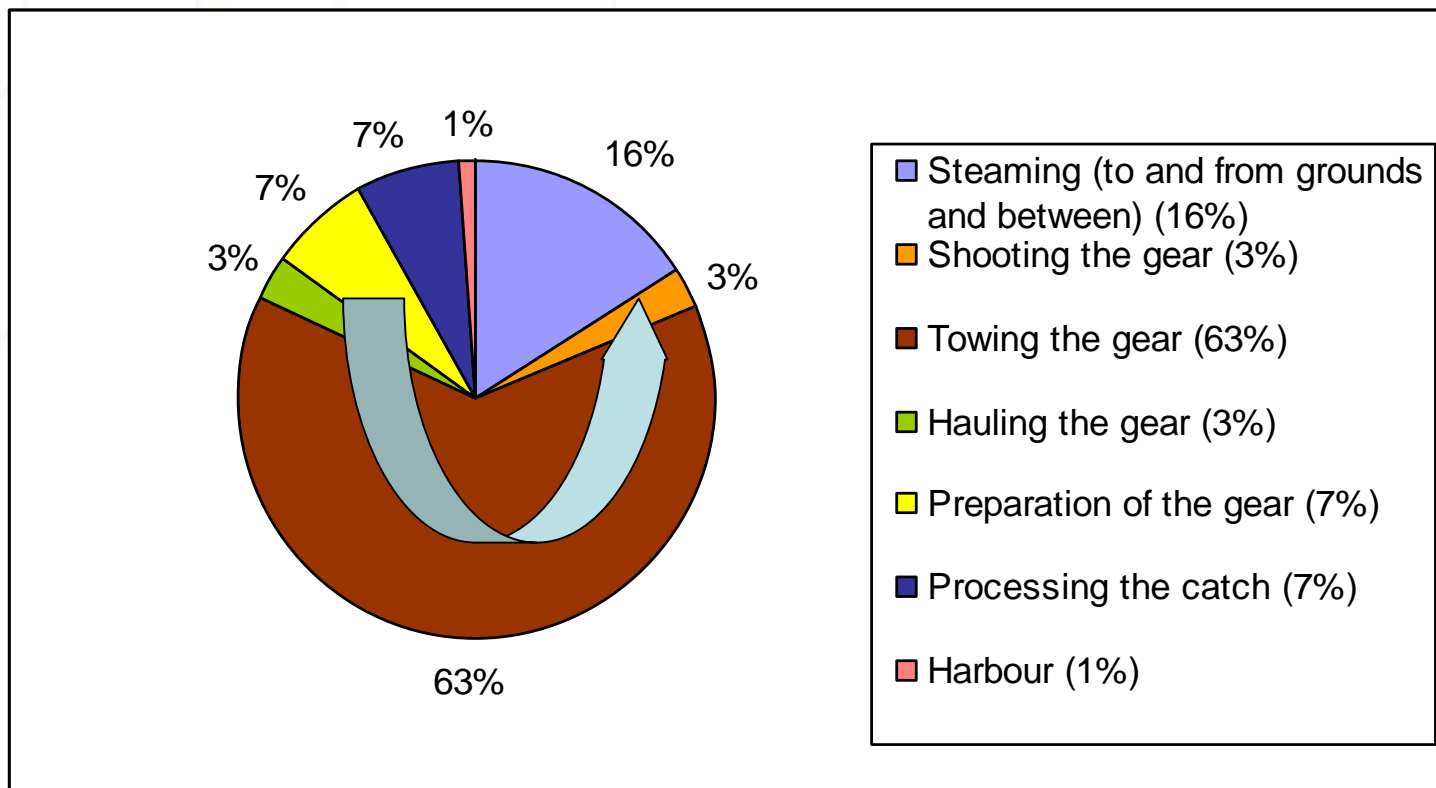
We used 0,65 l/oil to get 400 g of fillets.

Analyzing 1 p life cycle 'COD'; Method: Eco-indicator 99 (E) / Europe EI 99 E/E / single score

Interesting values

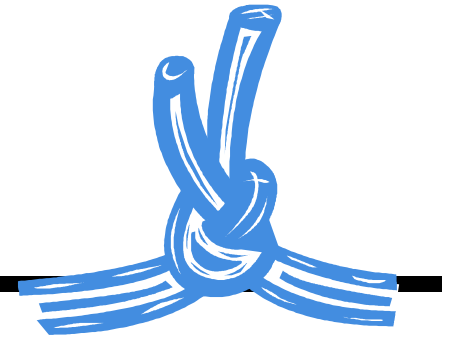
- To catch 1 kg of ungutted mixed catch - on average 0,65 L oil was needed which gives approximately 400 g of fish fillets.
- The emission of CO₂ was around 1800 g for 1 kg of mixed catch
- The area swept per 1 kg of mixed catch is estimated to be 1000 m²

Oil usage during fishing



More than 70% of the total oil consumption in a fishing trip is used to operate the fishing gear

The problem to focus on



Is the present fishing gear

- based on towing a rope through water
= high drag = **high energy consumption**
- The trawls are
 - Energy consuming
 - More than a century old technology
 - Criticized for damaging sea bed

Our vision is !

- To reduce environmental effects
- To reduce energy per unit catch
- To produce a bottom trawl that will not damage the bottom

Our questions?

- Can we catch fish without touching it ?
- Can we release unwanted fish, for example desired brood stock or fish we do not have quota for ?

The way forward

Is to replace present drag causing gear with a structure that does not produce drag

Can we play on the sensory organs of fish ?

- Eyes - vision
- Chemoreceptors - taste and smell
- Lateral line system - currents and vibrations
- Electric currents

The research question

How can we play on fish senses ?



Light in sea water

- Light beam produces visible virtual structure in sea water.
- The fish perceives the light beam as a solid rope.

We know that we can attract fish with light

But our Question is

Can we herd fish with drag-free light beams ?

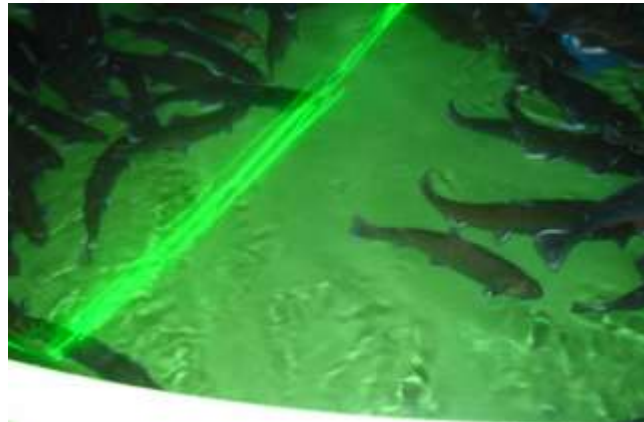
We can herd fish with light



Arctic charr in a tank



Fish avoid the light



Can we do this in real situation in the actual fishing ground ?

?? !!!

Does it work ? – Prototype 1

During a fishing trip. You see lights, the trawl structure and fish being herded

BUT !!!



Prototype II

- Is in development
- Will be water tested this year



The goal is



A valuable innovative product

- That uses only half of the energy
- That meets the demands of sustainable fisheries

Technical progress

Ability expected

- To be positioned at an exactly defined place in the sea column (>40 cm above sea bottom)
- To herd fish with light

Specially designed

- Trawl winch
- Towing cable
 - High speed Ethernet connection
 - Power supply
- Lights
 - Beams move x/y -axes
 - Patterns can be made

Who are members of the crew ?

Innovation Center Iceland; Halla Jónsdóttir, Geir Guðmundsson, Torfi Þórhallsson, Jón Matthíasson, Ingólfur Örn Þorbjörnsson, Þorsteinn Ingi Sigfússon, Nils Gíslason, etc.

Icelandic Marine Research Institute; Einar Hreinsson, Hjalti Karlsson etc.

Hraðfrystihúsið Gunnvör; Einar Valur Kristjánsson

Fjarðanet; Jón Einar Marteinnsson, Magni Guðmundsson

Various subcontractors

Supported by, TÞS, AVS, Átak til Atvinnusköpunar, V.V.
Several companies etc.



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Technical challenges

We are solving technical problems in the depths
-pressure, water and rough conditions

- Pressure vessels
- Electricity
- Data transfer
- Effects of light
- Keeping a given distance off the seabed