Environmental implications of bioeconomy

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What is the bioeconomy ?

Knowledge-based production and use of natural or biological resources. Providing economy goods and services in an **environmentally-friendly way**.

European Commission: Bioeconomy comprises those parts of the economy that use renewable biological resources from land and sea to produce food, materials and energy, such as

- crops,
- **forests**
- fish and animals
- **micro-organisms: algae**

Forests

- Environment for recreation, nature tourism, and hunting
- Provide wood and non-wood materials
- Wildlife live in forests

Forest products

- Forest products to **replace fossil raw materials**

  => **mitigate climate change**

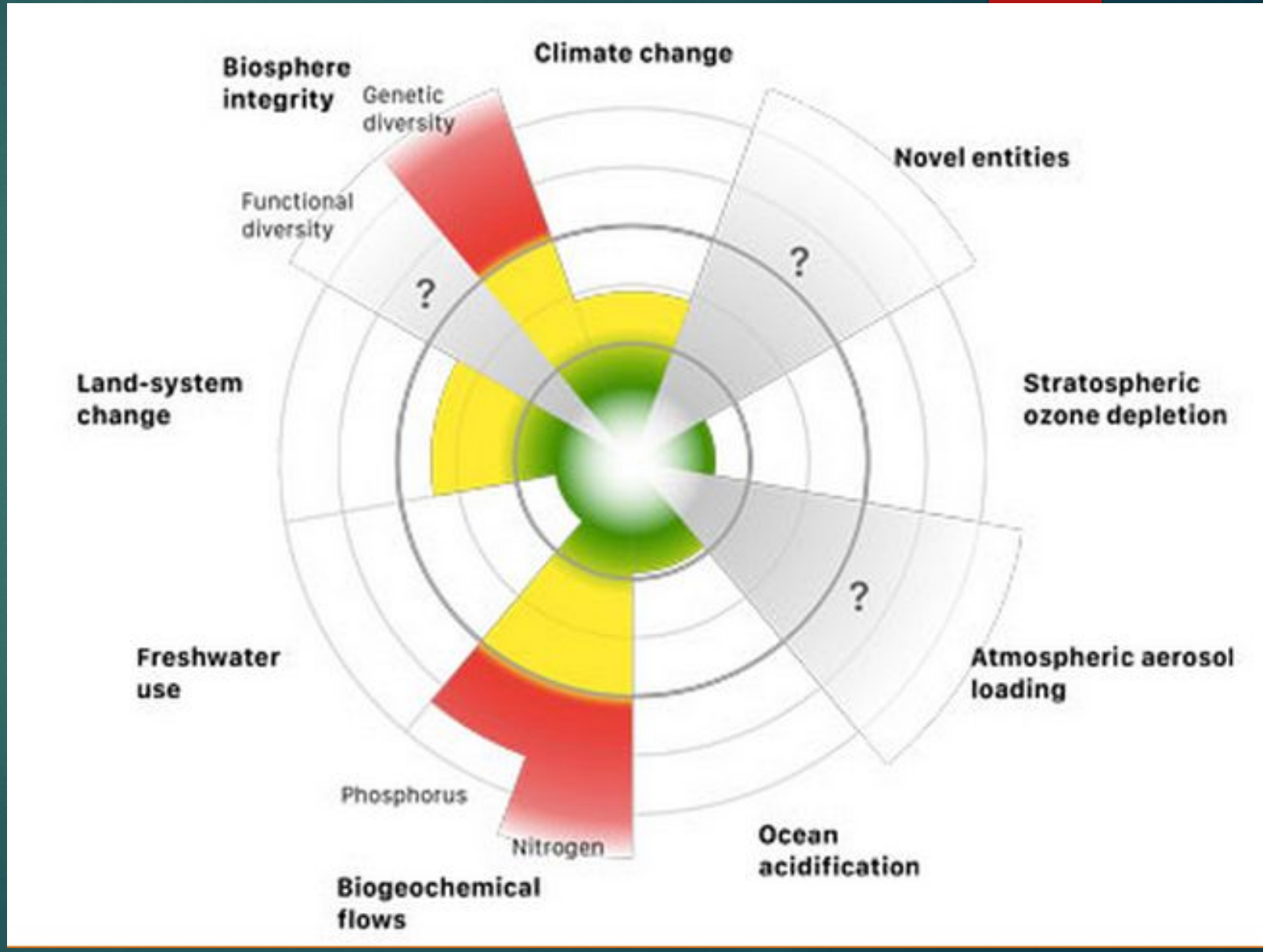
- Forests and forest products (e.g. wood in buildings) are **carbon sinks**

  => **mitigate climate change**

Major global threats

- The loss of biodiversity
- The loss of phosphorus and nitrogen

https://unfccc.int/news/scientists-say-planetary-boundaries-crossed
(United nations climate change)



Forest final felling disturbs natural forest ecosystem

- Natural forest biodiversity is lost for years after final felling
- Soil nutrients are released with water runoff, when the soil structure is disturbed

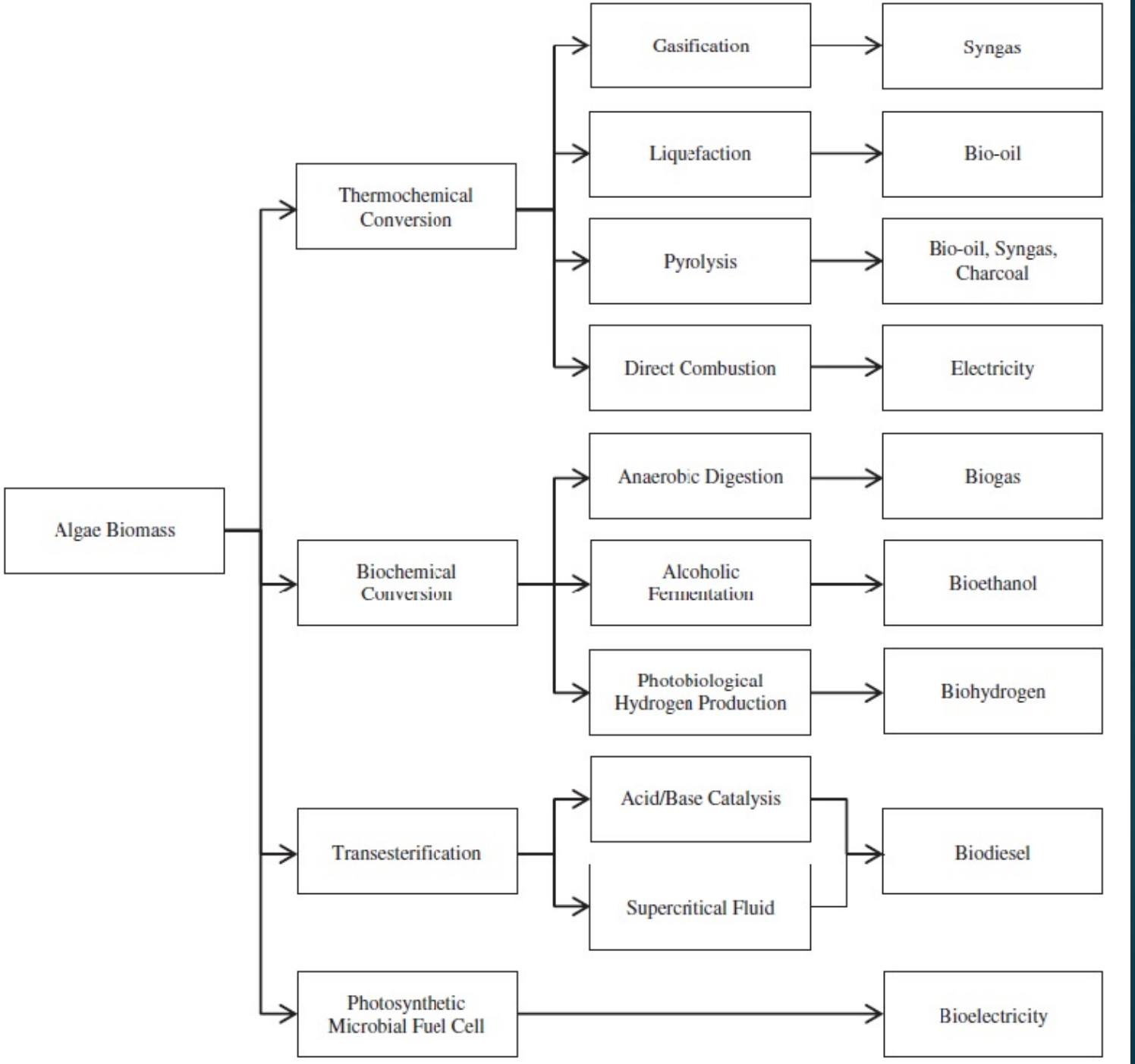
What has been done?

- Reforestration immediately after final felling
- Alternative: Continuous forestry without final felling
  - Trees of different ages occur in the forest
  - Oldest trees are removed
- Monitoring system to prevent forest fires
- National and natural parks have been established
- Unique forest ecosystems are protected
  - streams, peatlands not forested, etc.
- Evaluation: the direction of forest protection is right but not yet sufficient
- Research ongoing to develop sustainable forestry

Alternative sources for biomass:

- Wastewater sludge
- Agricutural organic waste (straw, plant residues, etc)
- **Algae biomass**

Energy production from biomass (Tan et al 2015 Biotechnology Advances 33, 1219)



Why algae cultivation ?

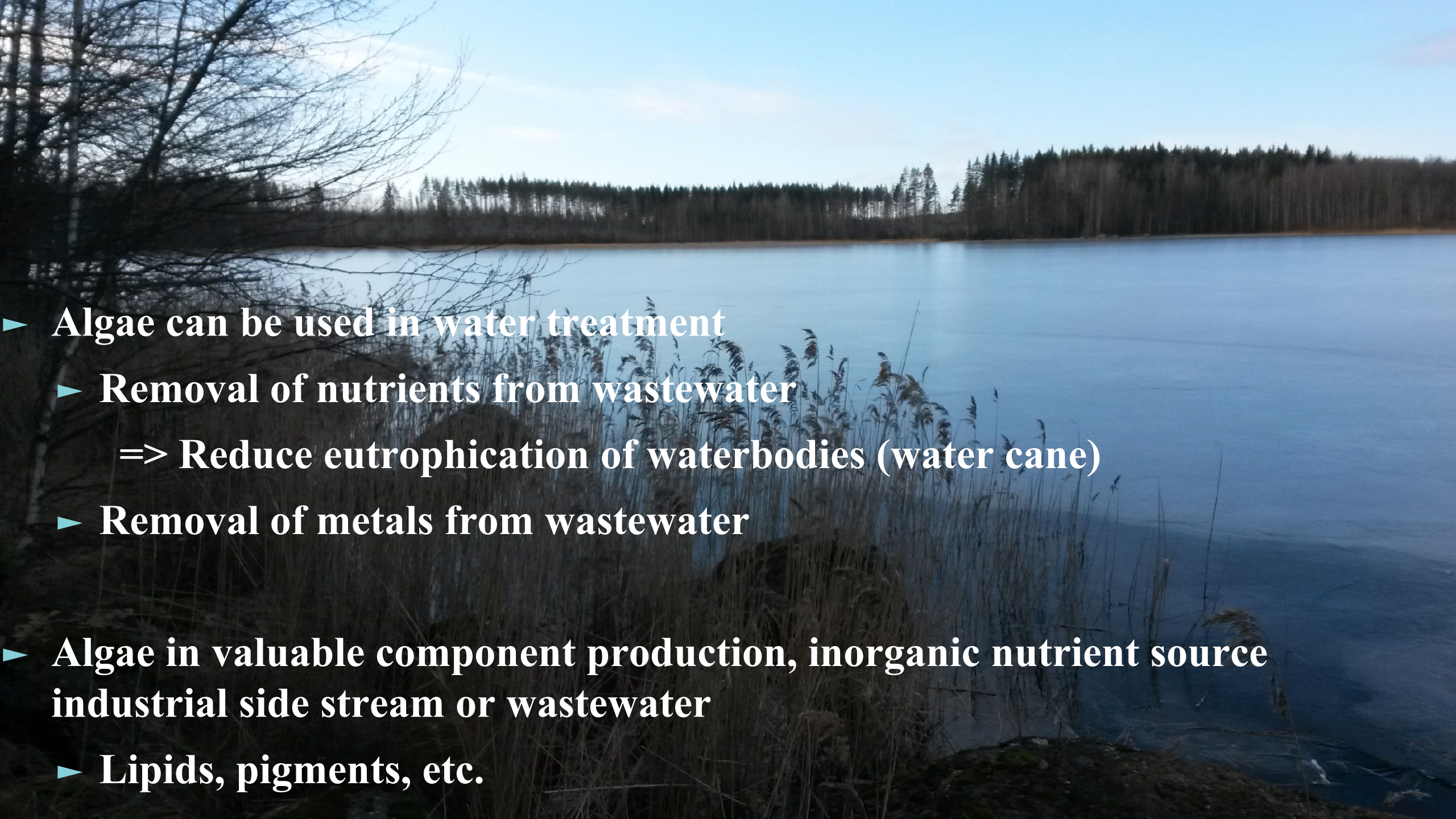
- Algae cultivation for biomass production can be implemented in **three dimension**
- Algal biomass may also be possible to use as **food** for humans and animals

  => **Land requirement is reduced**

- **Energy source** requirement

  limiting algae use in Finland

https://newatlas.com/algae-powered-building/27118/



- Algae can be used in water treatment
  - Removal of nutrients from wastewater

    => Reduce eutrophication of waterbodies (water cane)
  - Removal of metals from wastewater

- Algae in valuable component production, inorganic nutrient source industrial side stream or wastewater
  - Lipids, pigments, etc.

In recognition of active work for sustainable development for the environment, the town Lahti has been granted the status of European Green Capital 2021


Thank you for your attention