FOODWEB -Baltic environment, food and health: from habits to awareness

Eutrophication impacts of the food chain on the Baltic Sea

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FOODWEB

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Ecological impacts of the food chain

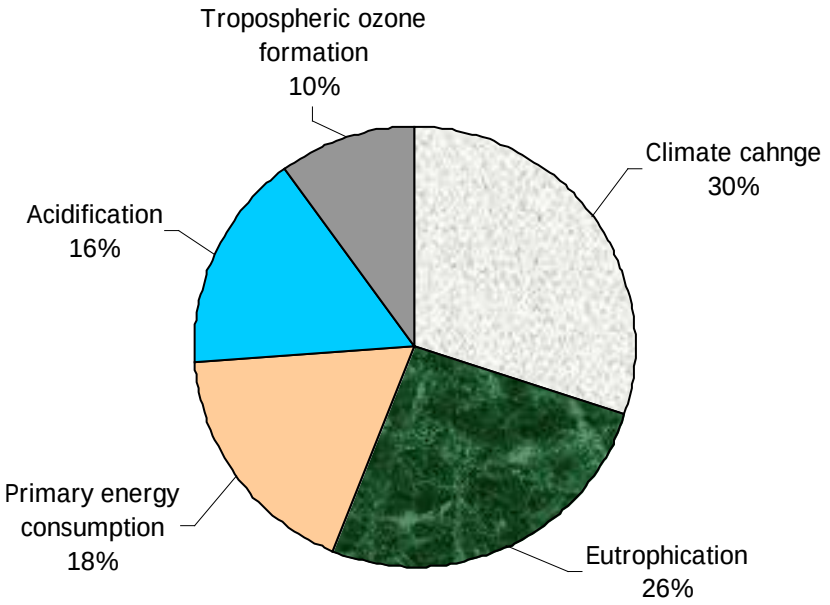
- Resource appropriation (land, abiotic and biotic resources)
- Emissions to air and water, climate change, acidification, tropospheric ozone formation, stratospheric ozone depletion, **eutrophication**, human health impacts, ecotoxic impacts
- Genetic impacts
- **Changes in eco-system balances, biodiversity effects, human health and welfare effects, evolution effects**

Eutrophication impacts of the food chain

- eutrophication

- A major problem in the Baltic Sea – expert evaluation of the relative importance at about the same level as that of the climate change impact (26%/30%) for Finland
- A state where high nutrient concentrations stimulate the growth of algae, which leads to imbalanced functioning of the system.
- Algal blooms, slime formation, increase in water turbidity, accelerated oxygen depletion
- Nitrogen and phosphorus loads are the main cause of the eutrophication in the Baltic Sea
- Atmospheric deposition (NO_x and $NH_{3)}$ contribute about 25%

Relative importances of different environmental impact categories for Finland



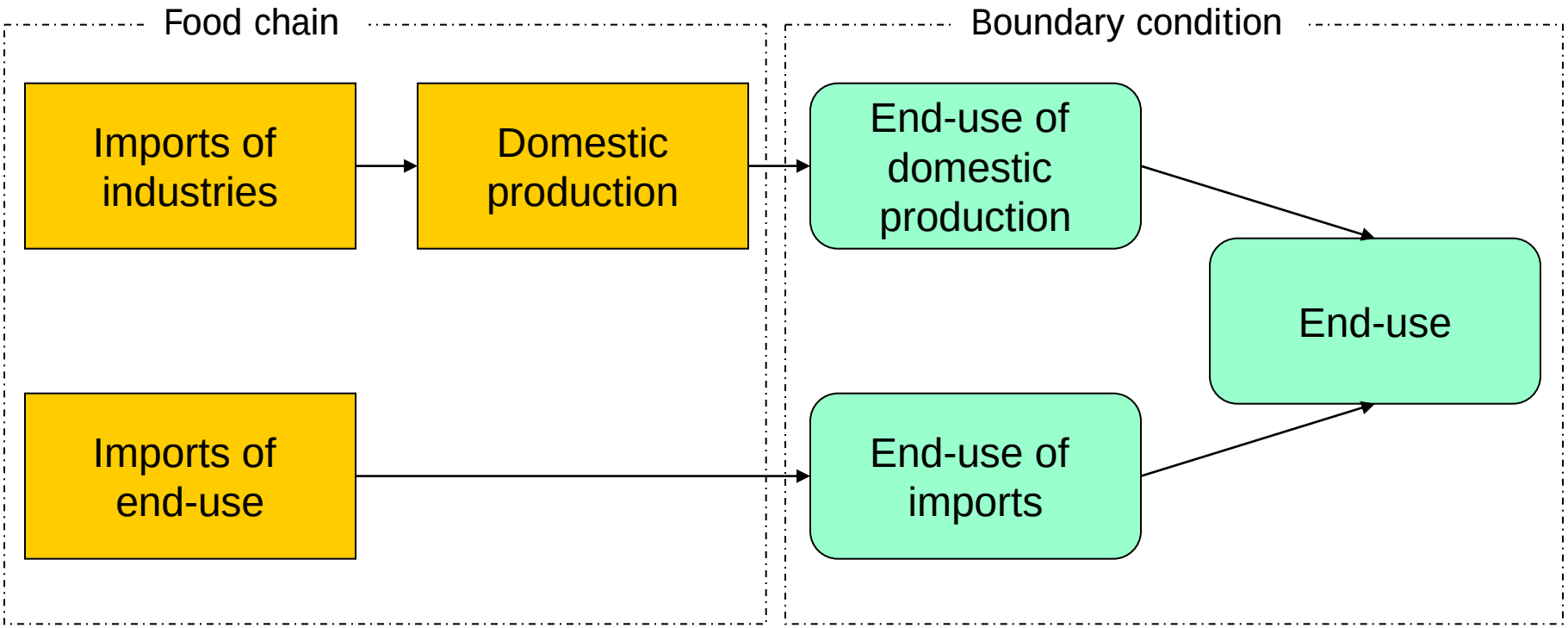
Source: Nissinen, A., Grönroos, J., Heiskanen, E., Honkanen, A., Katajajuuri, J.-M., Kettunen, J., Kurppa, S., Mäkinen, T., Seppälä, J., Silvenius, F., Timonen, P., Virtanen, Y., Voutilainen, P. 2005. Development of benchmarking for the environmental impacts of different products, services and consumption patterns. In: Sustainable Consumption: The Contribution of Research, Workshop 10-12 February 2005, Gabels Hus, Oslo, p. 98-114. Norwegian University for Science and Technology (NTNU), Industrial Ecology program, Report 1/2005, Trondheim, Norway. ISBN 82-7948-046-3.

Eutrophication impacts of the food chain –
Economic Input-Output Life Cycle Assessment (EIOLCA) model

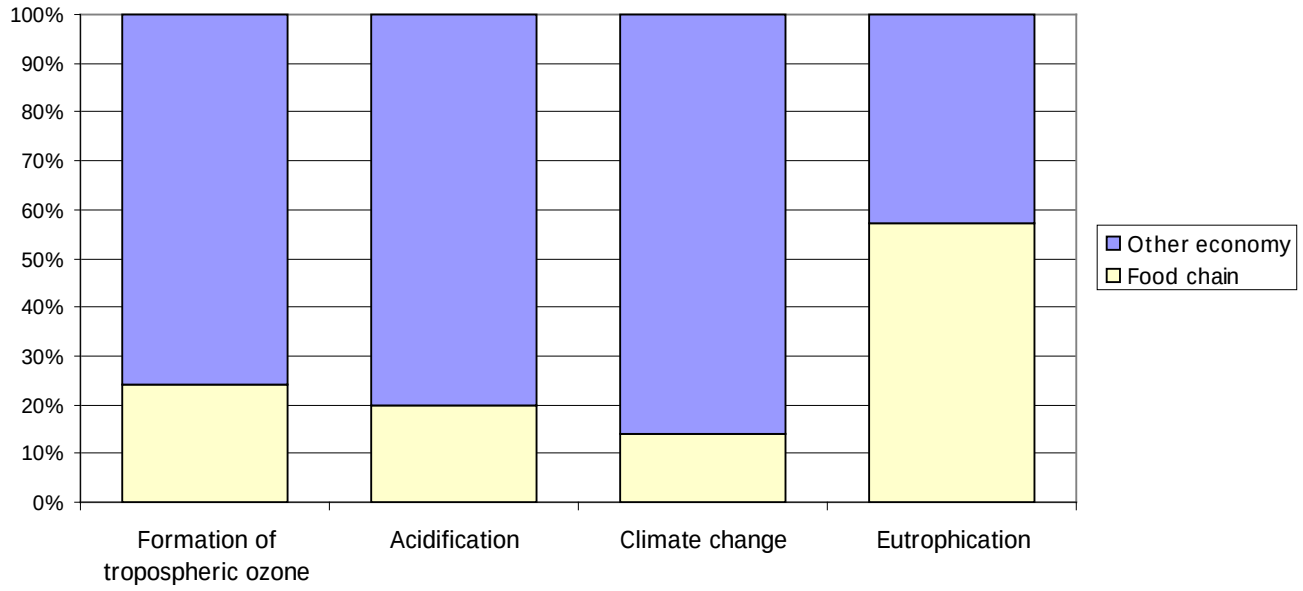
- Belongs to the family of Materials Flow Analysis (MFA) models
- Is a systematic approach used to explore how materials appear in economic systems, and how they affect the environment
- Constitutes of the internal relationships of the economic system and its interrelations with the environment

Eutrophication impacts of the food chain

– Flow chart of the food chain model



Eutrophication impacts of the food chain – Of the domestic total of the national economy (Finland)



Impact	Food chain	Other economy
Formation of troposhrecic ozone	24%	76%
Acidification	20%	80%
Climate cahnge	14%	86%
Eutrophication	57%	43%

Eutrophication impacts of the food chain

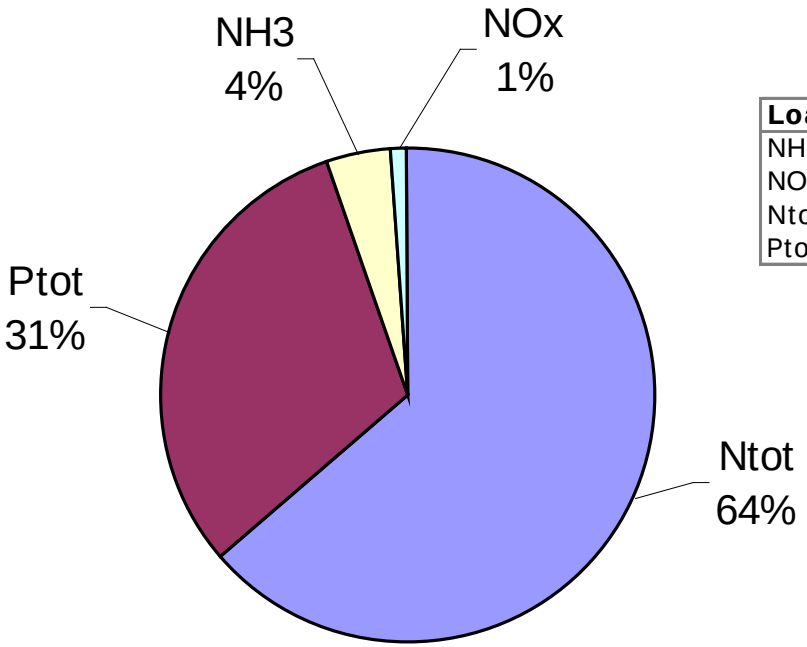
– Total, domestic and imported (Finland)

Environmental impacts of the food chain (Finland)

Impact	Domestic		Imports		Total	
Tropospheric ozone formation	37	(68%)	17	(32%)	55	Milj. person ppm hour
Acidification	18	(61%)	12	(39%)	30	Milj. AEeq
Climate change	9108	(61%)	5814	(39%)	14922	Milj. kg CO2 eq
Eutrophication	**23**	**(61%)**	**14**	**(39%)**	**37**	**Milj. kg PO4- eq**
Per person and day						
Tropospheric ozone formation	0.019		0.009		0.028	person ppm hour
Acidification	0.009		0.006		0.015	AEeq
Climate change	4.7		3.0		7.7	kg CO2 eq
Eutrophication	**0.012**		**0.007**		**0.019**	**kg PO4- eq**

Eutrophication impacts of the food chain

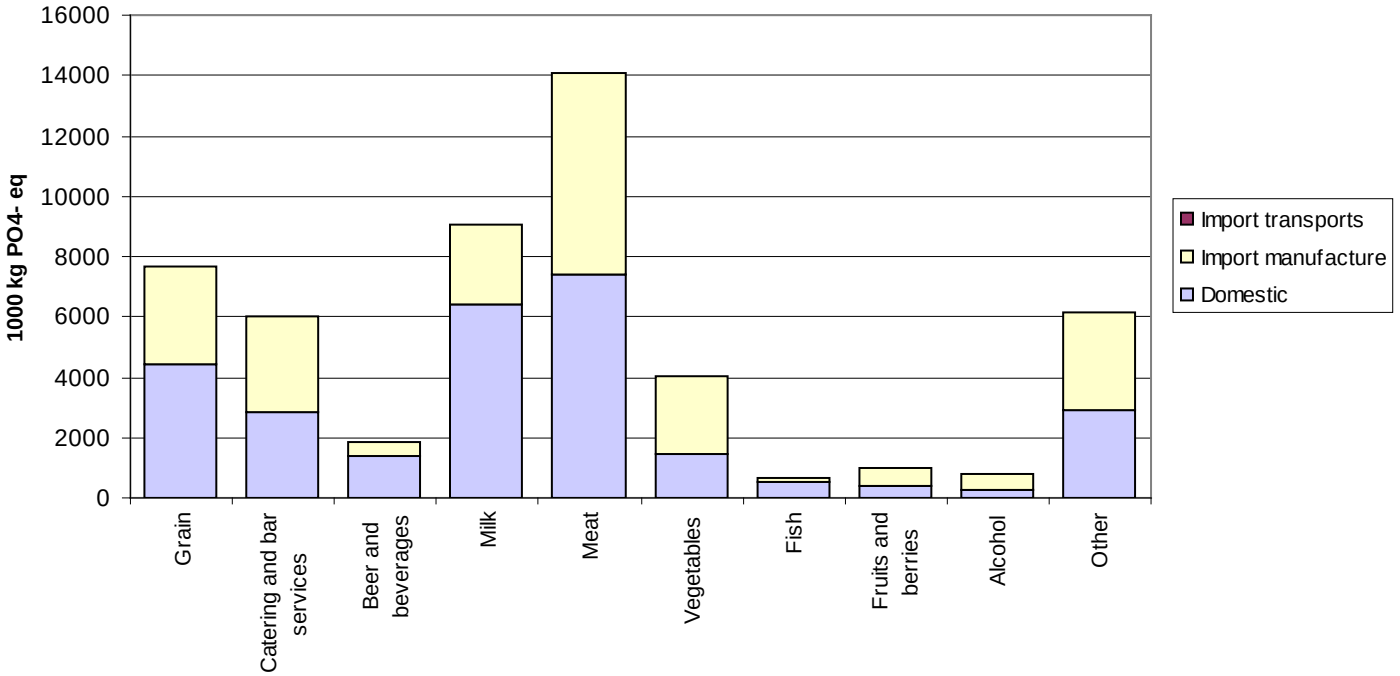
– By loads (Finland)



Load	1000 kg/year
NH3	23548
NOx	17912
Ntot	34679
Ptot	2321

Eutrophication impacts of the food chain

– By product groups (Finland)



Eutrophication impacts of the food chain

– Per kg of raw material (Finland, Estonia, Latvia)

	Finland	Estonia	Latvia
Beef	51.5	61.9	60.5
Pork	15.4	17.5	12.7
Poultry	7.1	8.0	6.0
Eggs	16.1	18.3	13.3
Milk	3.3	3.9	3.9
Cereals	5.0	5.7	4.0
Potato	0.7	0.7	0.8

NOTE: Values are computed with the Finnish food chain model (KETJUVASTUU). Estonian and Latvian values are thus rough estimates.

Eutrophication impacts of the food chain

– Options to reduce them?

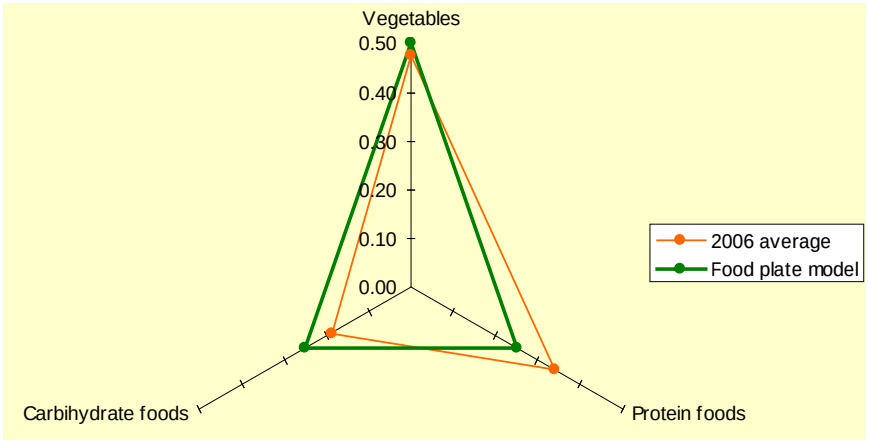
1) **Change the diet, choose foodstuffs of lower eutrophication intensity**

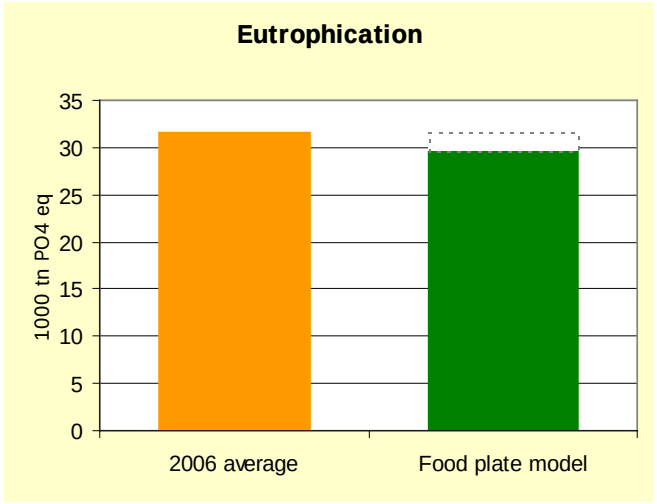
2) **Reduce the eutrophication intensity of the food raw materials**

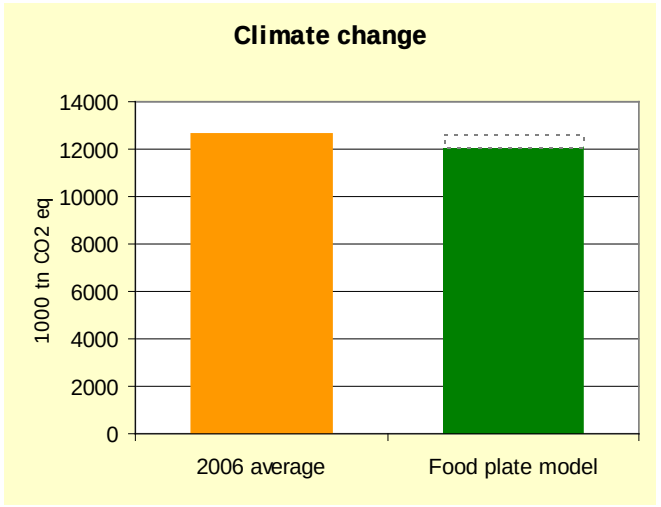
3) **Increase the consumption of the imported foodstuff**

Eutrophication impacts of the food chain

– Change the diet

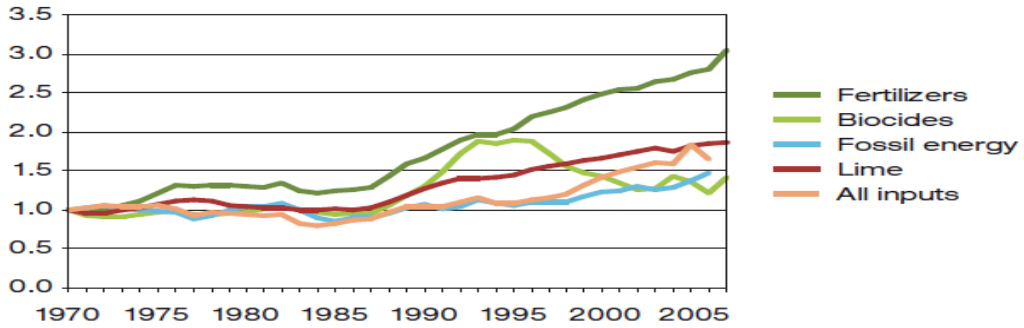


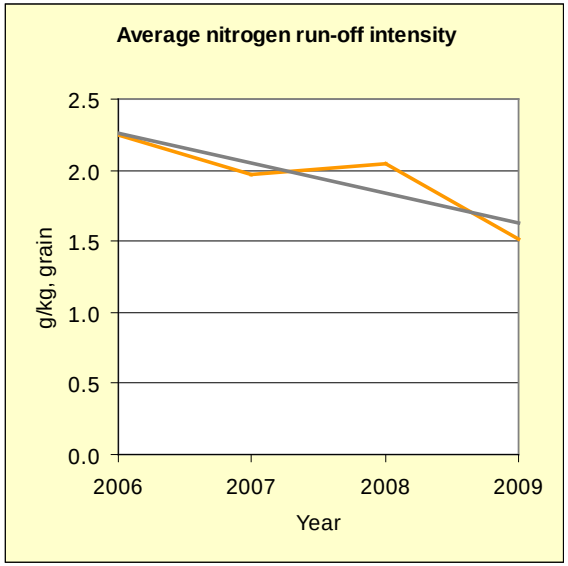


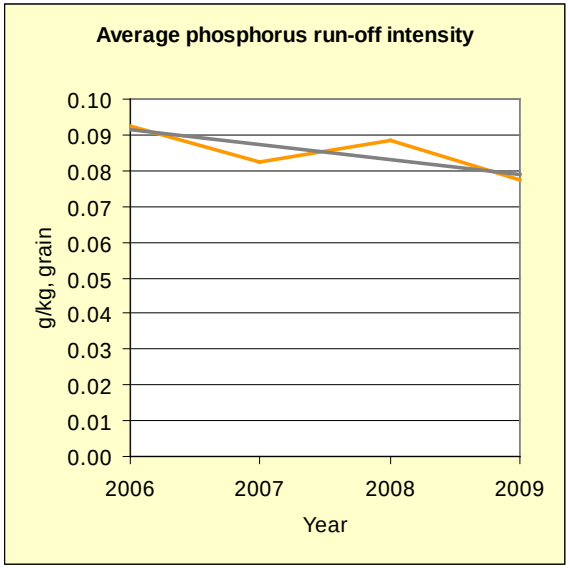


Eutrophication impacts of the food chain –

Reduce the eutrophication intensity of the raw materials







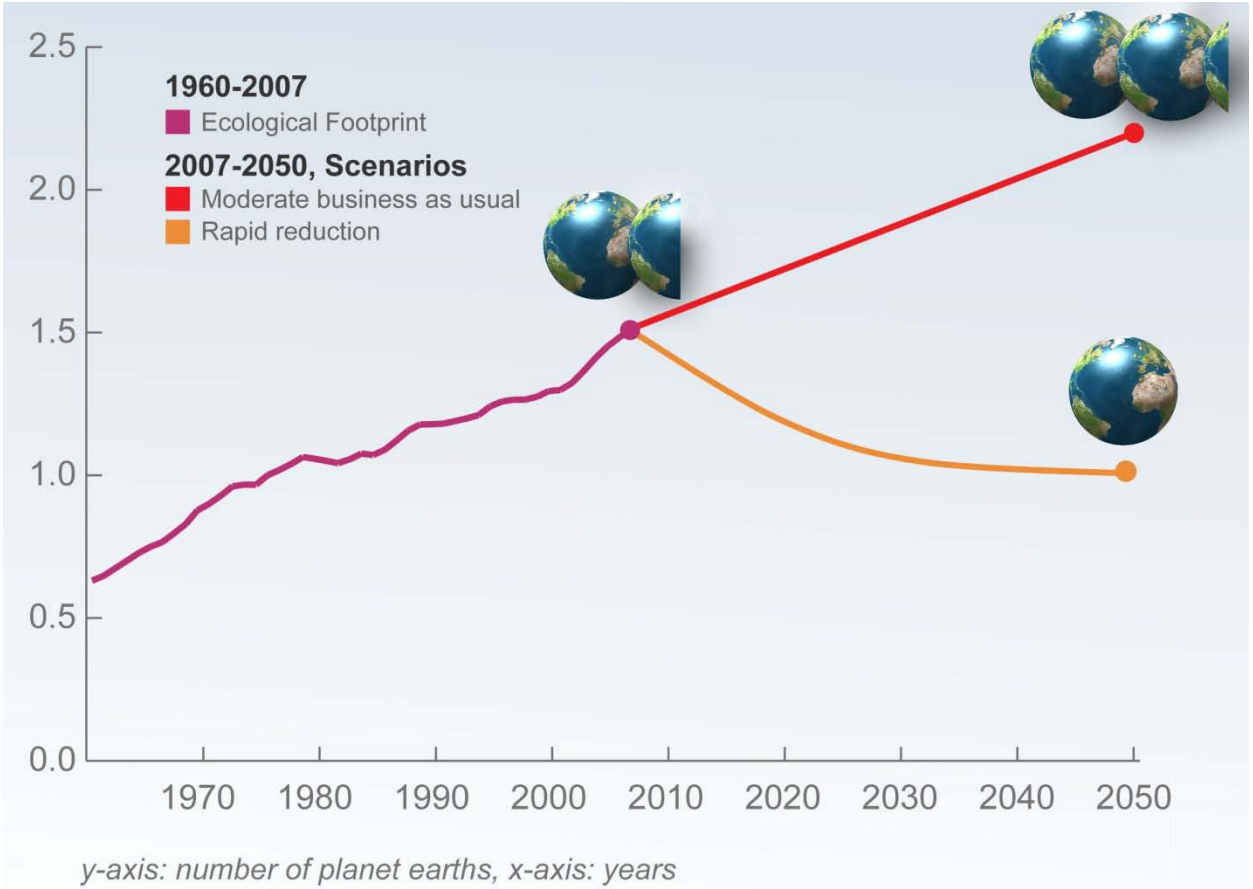
Eutrophication impacts of the food chain

– Increase the consumption of the imported foodstuff

- Would be an effective reduction measure for the food production based eutrophication impacts on the Baltic Sea
- Imports should come from outside the Baltic Sea catchment region
- Would not reduce the impacts of food consumption
- Could introduce new sustainability risks in the long run through the trade-off effects, for example those related to global food availability

Eutrophication impacts of the food chain

– Global ecological footprint 1967-2010



Source: GLOBAL FOOTPRINT NETWORK. ECOLOGICAL FOOTPRINT ATLAS 2010