Tourism, scarce resources, and sustainable destinations: Energy, Water, Food

Stefan Gössling

Dept. of Service Management and Service Studies, Lund University
School of Business and Economics, Linnaeus University

Why your project will fail.

- Urgency of need to act misunderstood
- Dynamics of tourism system unacknowledged
- Desinterest among tourism stakeholders
- Disconnect business views and science
- Belief in green growth and technology

Decline in critical Earth systems

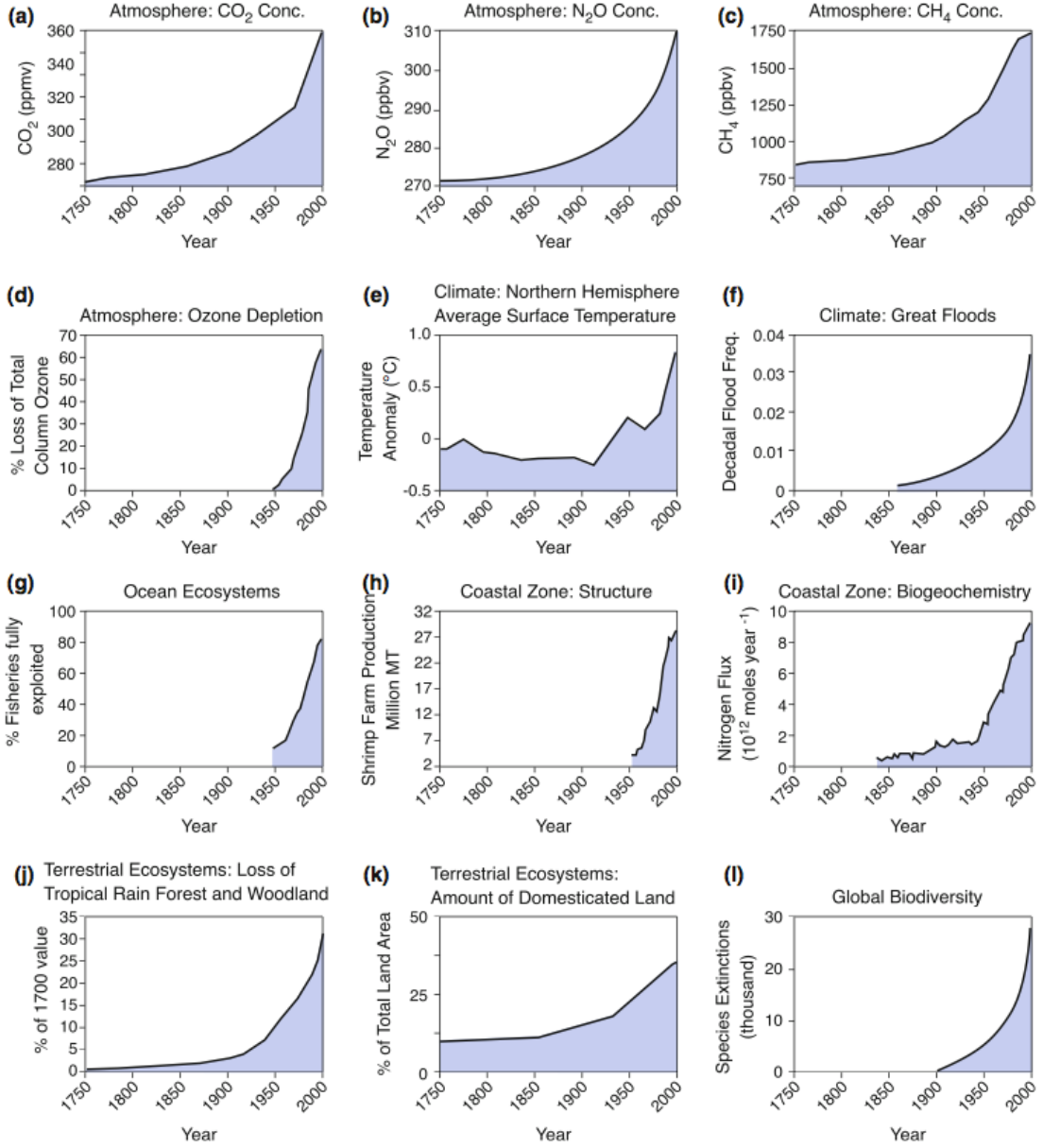
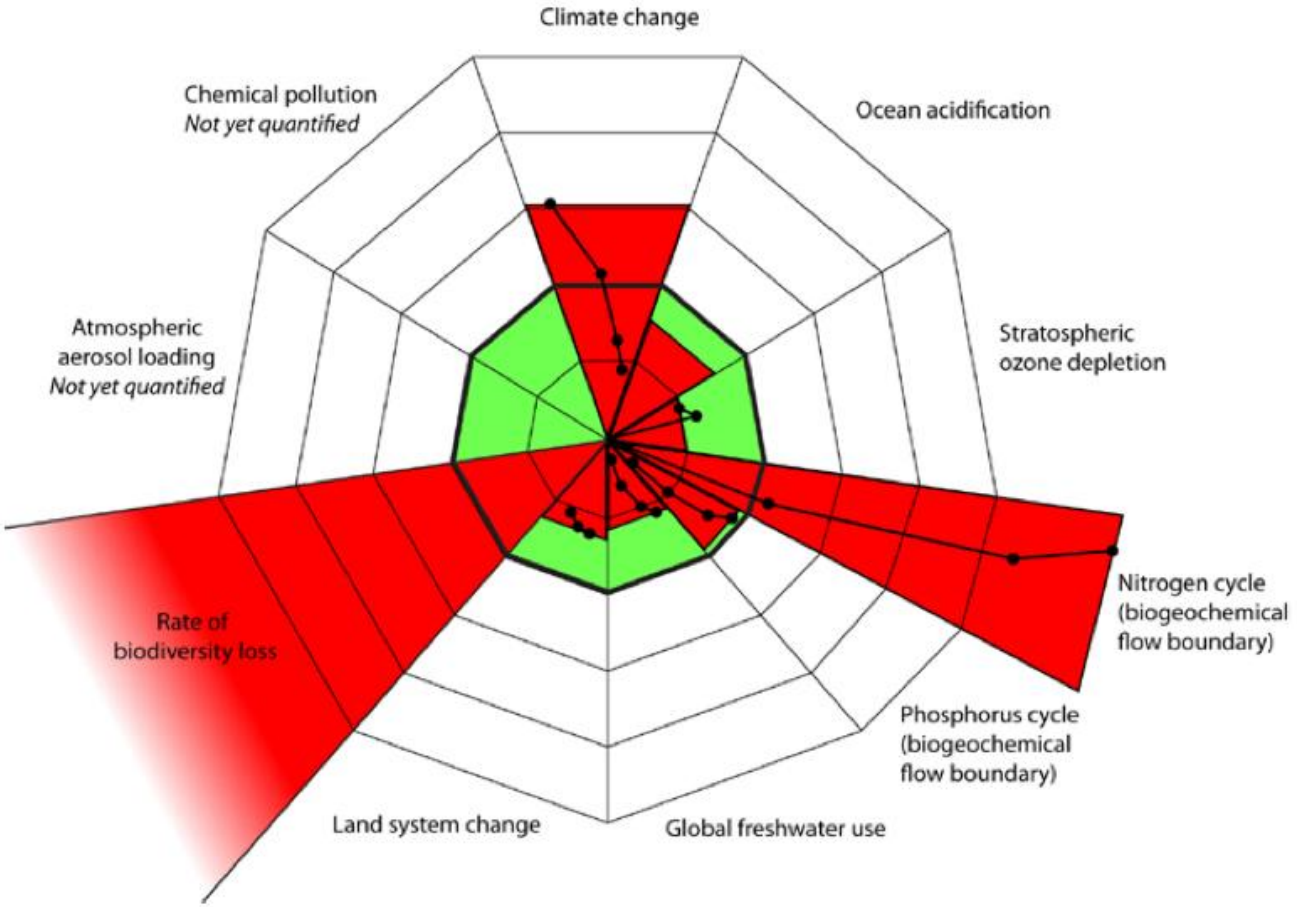


Fig. 3 Global-scale changes in the Earth System as a result of the dramatic increase in human activity: **a** atmospheric CO_2 concentration, **b** atmospheric N_2O concentration, **c** atmospheric CH_4 concentration, **d** percentage total column ozone loss over Antarctica, using the average annual total column ozone, 330, as a base, **e** northern hemisphere average surface temperature anomalies, **f** natural disasters after 1900 resulting in more than 10 people killed or more than 100 people affected, **g** percentage of global fisheries either fully exploited, overfished or collapsed, **h** annual shrimp production as a proxy for coastal zone alteration, **i** model-calculated partitioning of the human-induced nitrogen perturbation fluxes in the global coastal margin for the period since 1850, **j** loss of tropical rainforest and woodland, as estimated for tropical Africa, Latin America and South and Southeast Asia, **k** amount of land converted to pasture and cropland, and **l** mathematically calculated rate of extinction (Steffen et al. 2004, and references therein)

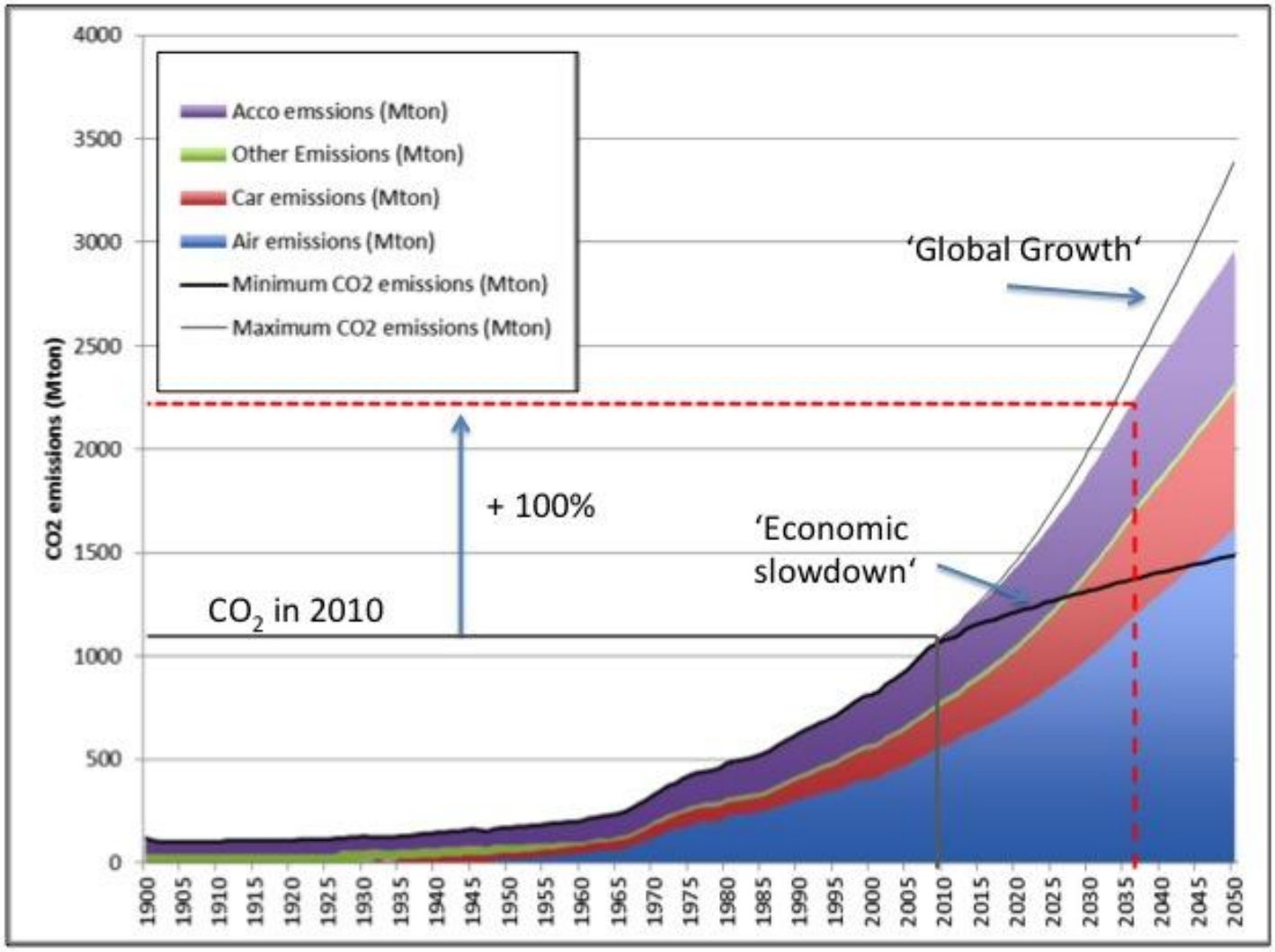
Steffen, W., Persson, Å., Deutsch, L., Zalasiewicz, J., Williams, M., Richardson, K., Crumley, C., Crutzen, P., Folke, C., Gordon, L., Molina, M., Ramanathan, V., Rockström, J., Scheffer, M., Schellnhuber, H.J. and Svedin, U. (2011). The Anthropocene: From Global Change to Planetary Stewardship. Ambio 40: 739-761.

Exceeding critical thresholds



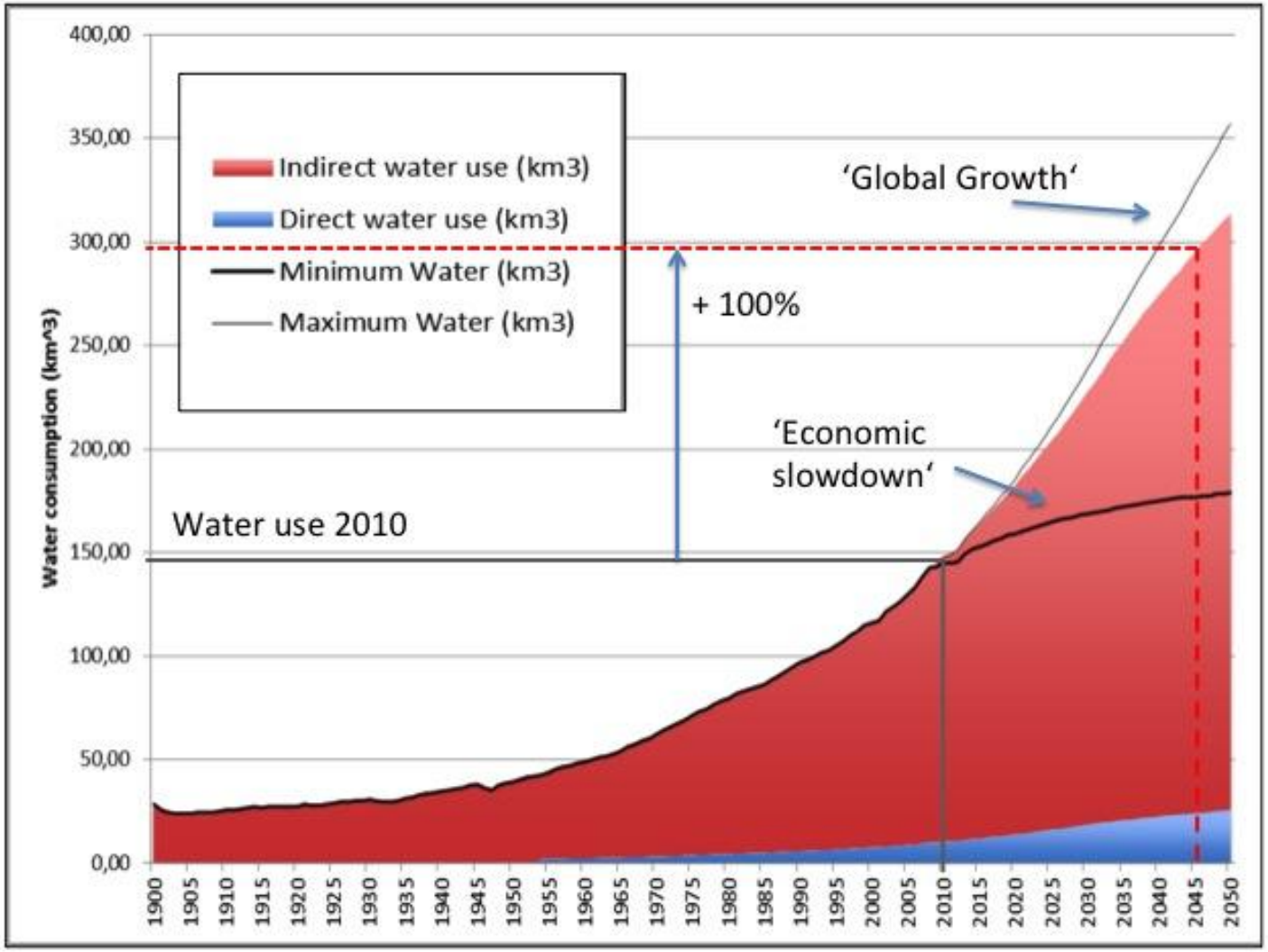
Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin III, F.S., Lambin, E., Lenton, T.M., Scheffer, M., Folke, C., Schellnhuber, H., Nykvist, B., De Wit, C.A., Hughes, T., van der Leeuw, S., Rodhe, H., Sörlin, S., Snyder, P.K., Costanza, R., Svedin, U., Falkenmark, M., Karlberg, L., Corell, R.W., Fabry, V.J., Hansen, J., Walker, B., Liverman, D., Richardson, K., Crutzen, P., and Foley, J. (2009). A safe operating space for humanity. Nature 46: 472-475.

CO_2 emissions 1900-2050



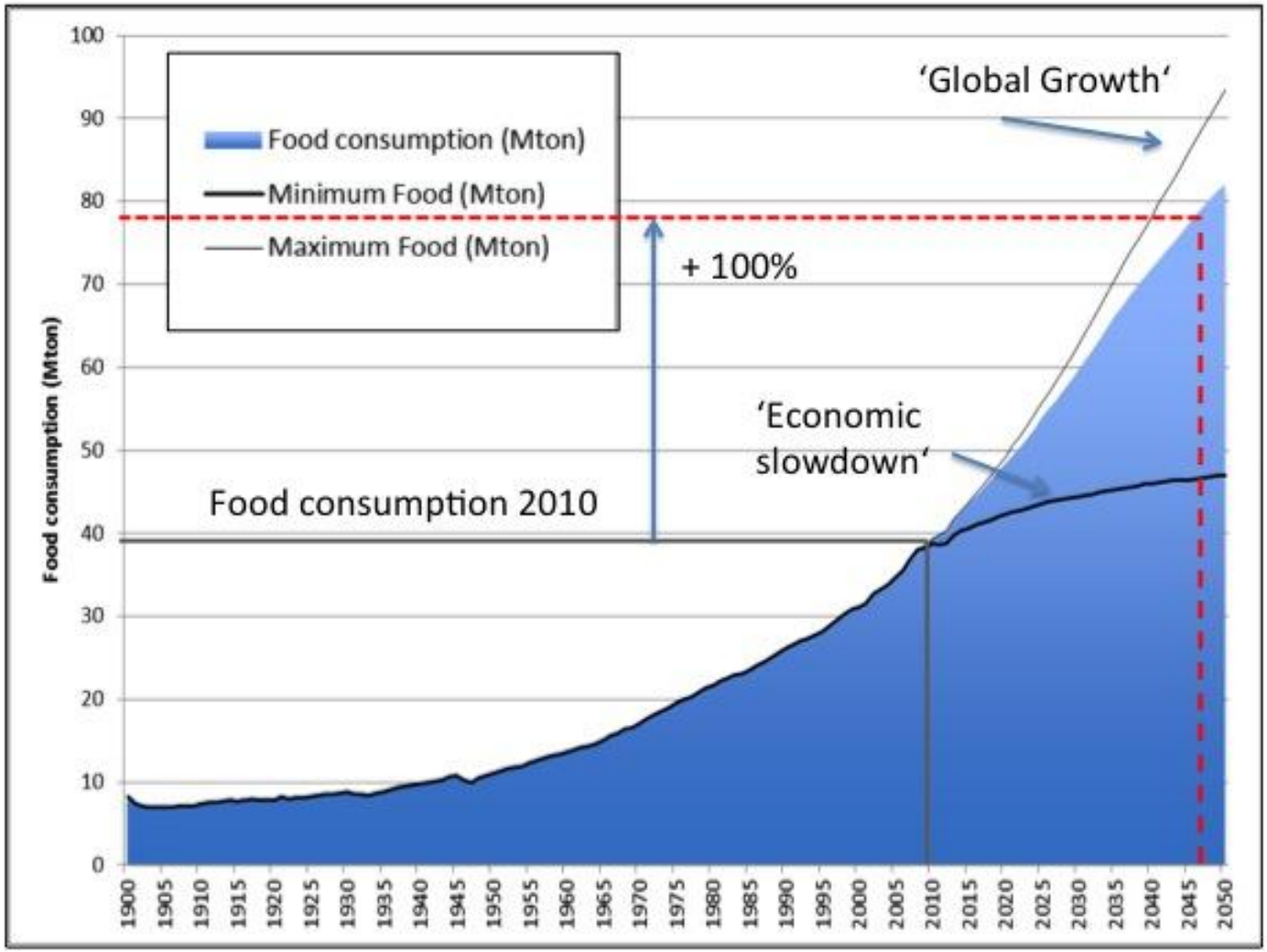
Gössling, S. and Peeters, P. 2015. Assessing tourism's global environmental impact 1900-2050. Journal of Sustainable Tourism, 23(5): 639-659.

Water use 1900-2050



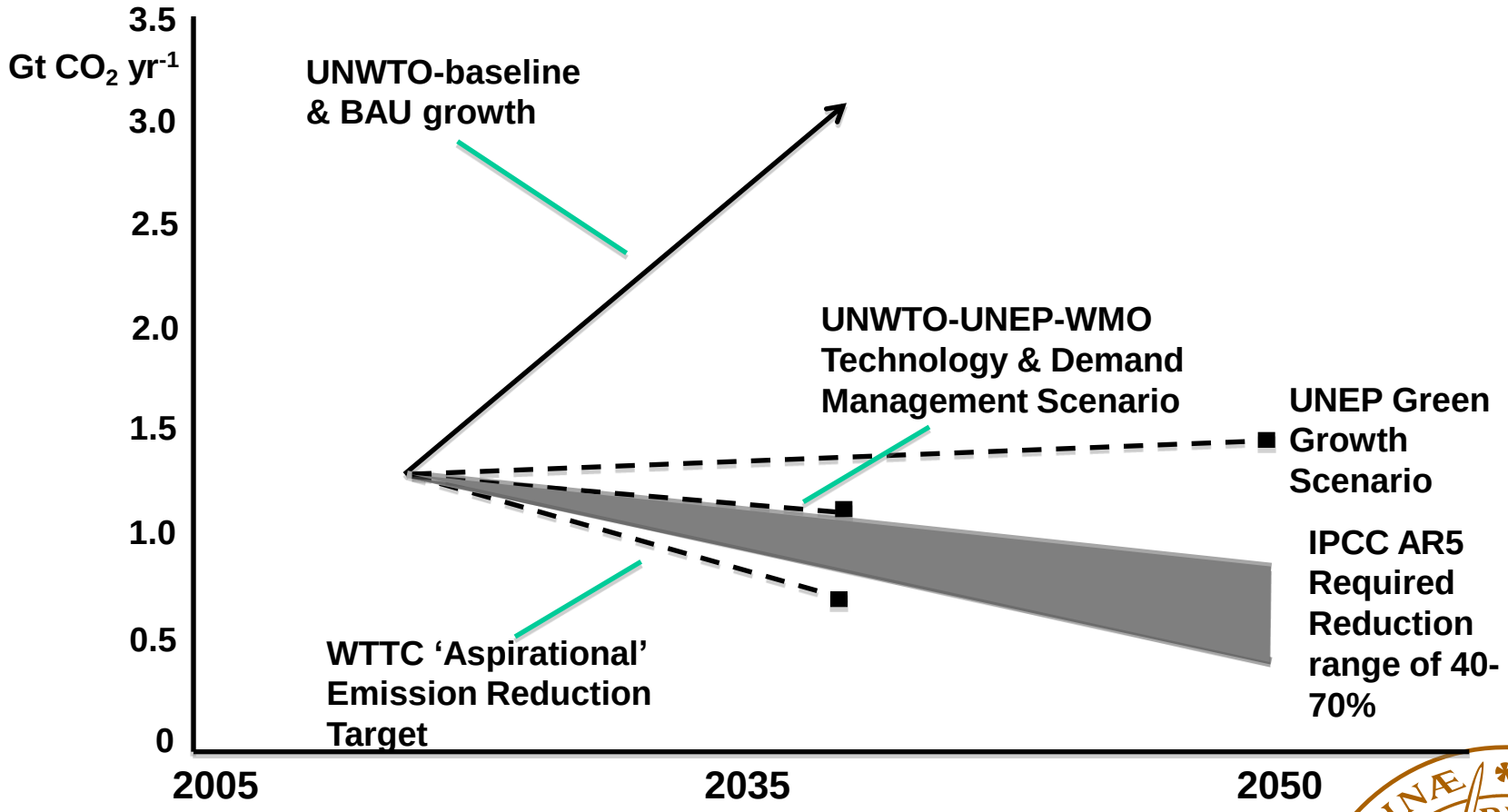
Gössling, S. and Peeters, P. 2015. Assessing tourism's global environmental impact 1900-2050. Journal of Sustainable Tourism, 23(5): 639-659.

Food consumption 1900-2050



27% of total „tourism additional“

Gössling, S. and Peeters, P. 2015. Assessing tourism's global environmental impact 1900-2050. Journal of Sustainable Tourism, 23(5): 639-659.



Scott, D., Hall, C.M. and Gössling, S. 2015. A review of the IPCC Fifth Assessment and implications for tourism sector climate resilience and decarbonisation. Journal of Sustainable Tourism, http://dx.doi.org/10.1080/09669582.2015.1062021

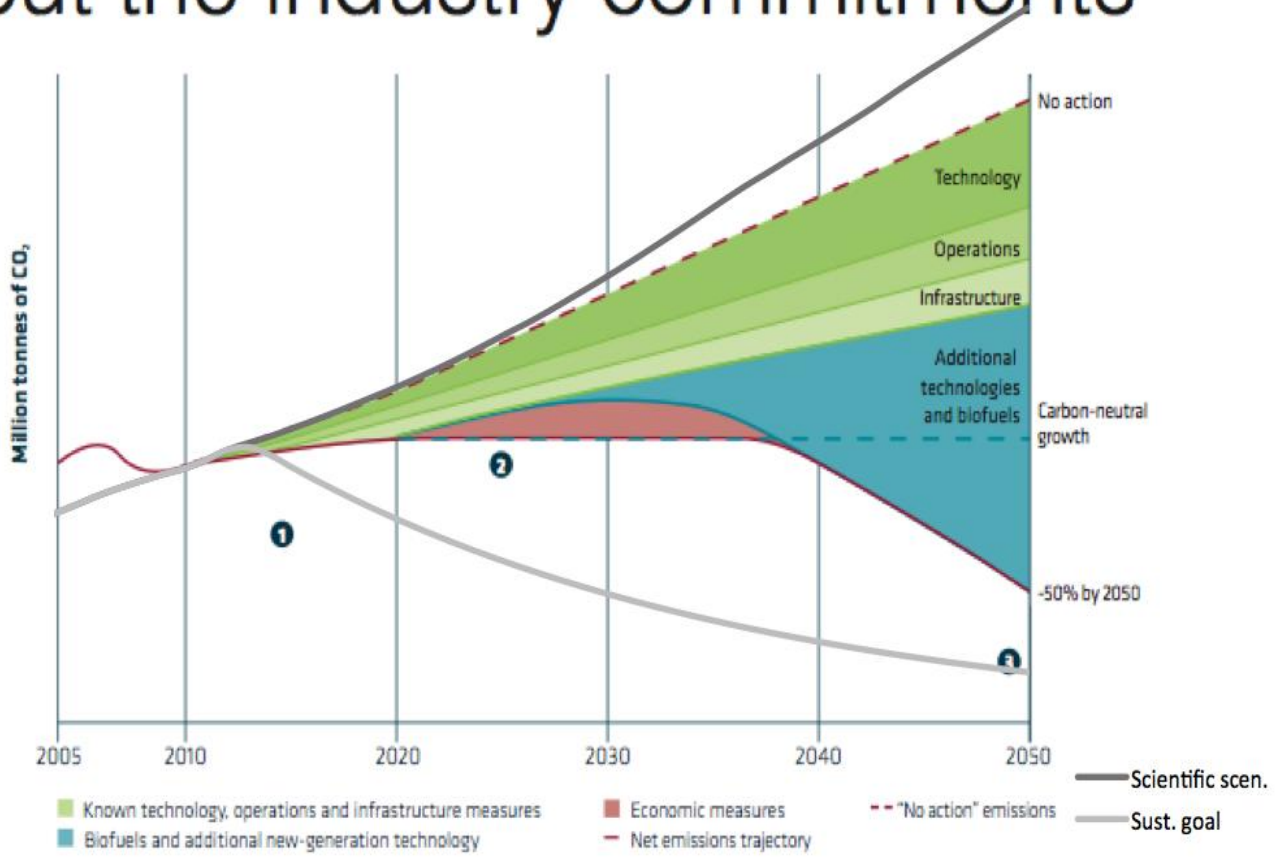
IATA‘s view on aviation and climate change

Mapping out the industry commitments

❶ improve fleet fuel efficiency by 1.5% per year from now until 2020

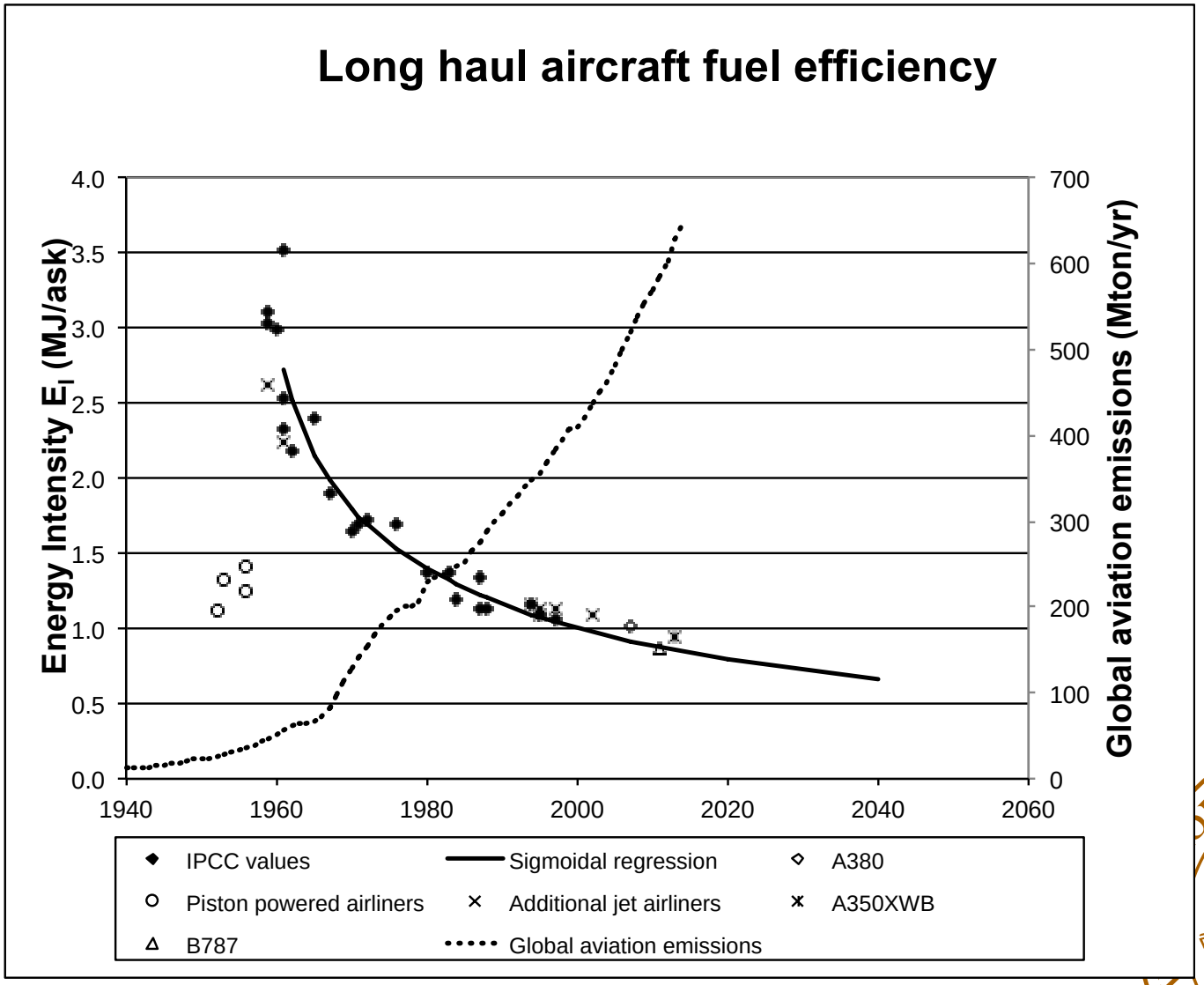
❷ cap net emissions from 2020 through carbon neutral growth

❸ by 2050, net aviation carbon emissions will be half of what they were in 2005.



(Schematic, indicative diagram only)

Energy efficiency gains and absolute emission growth



The destination dilemma

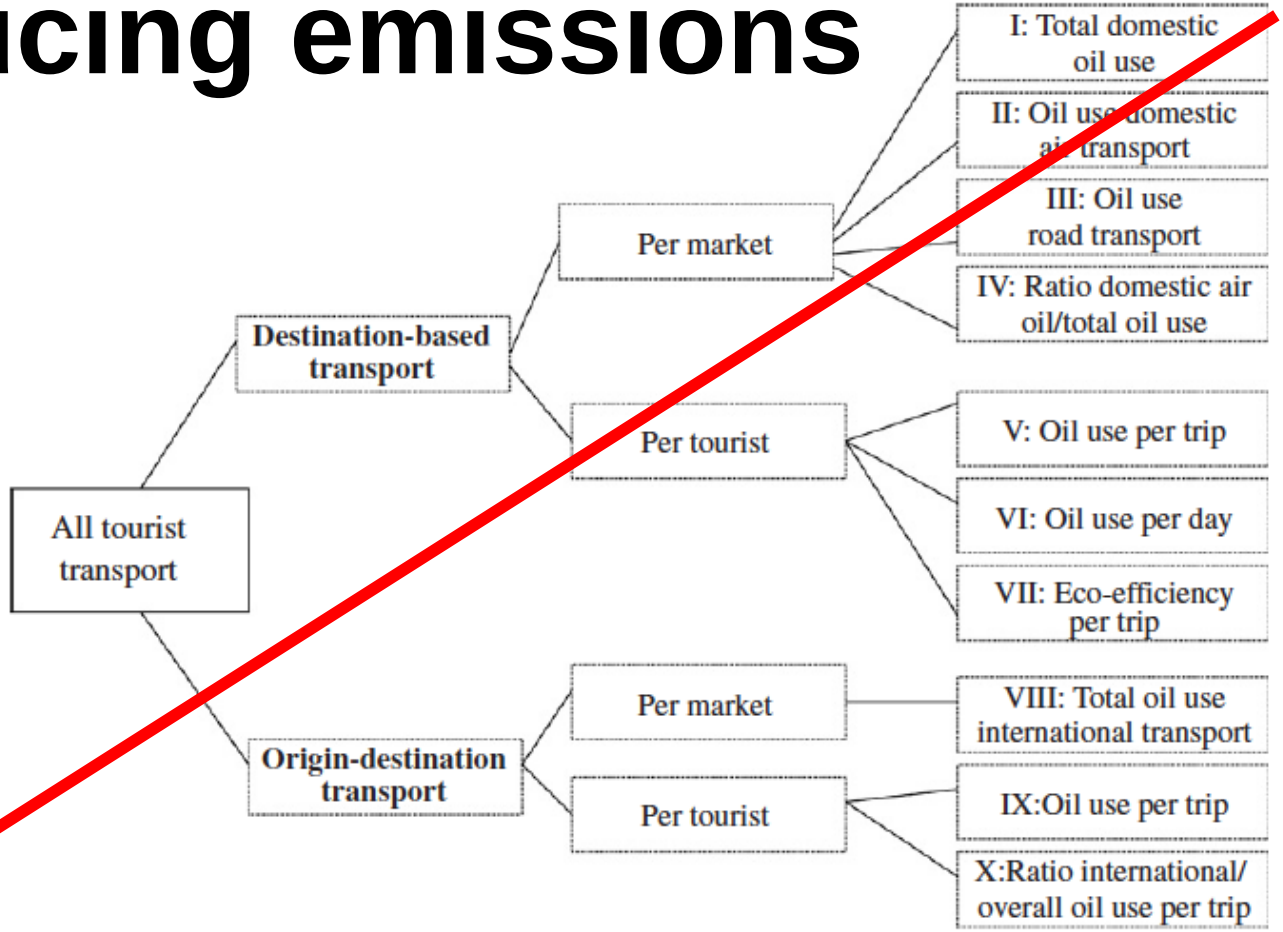
- **Success is measured in growth (arrivals, spending, jobs)**
- **With declining ALS, arrival growth is a necessity**
- **Environmental management can only be incremental in this situation**

⇒ **If you are serious about "saving the planet", then this will require a fundamental rethinking in destination management.**

Monitoring resource use in destinations

1. What is relevant?
2. Assessment methods: choice of system boundaries, value chain, lifecycle?
3. Reduction potential – where to reduce at what cost?
4. Monitoring progress and assessing implications?
5. Desirable future to stakeholders?

Reducing emissions



Becken, S. (2008). Developing indicators for managing tourism in the face of peak oil. *Tourism Management*, *29*(4), 695-705.

- **75% of overall emissions are from transport**
- **Aviation most important (40% of total)**

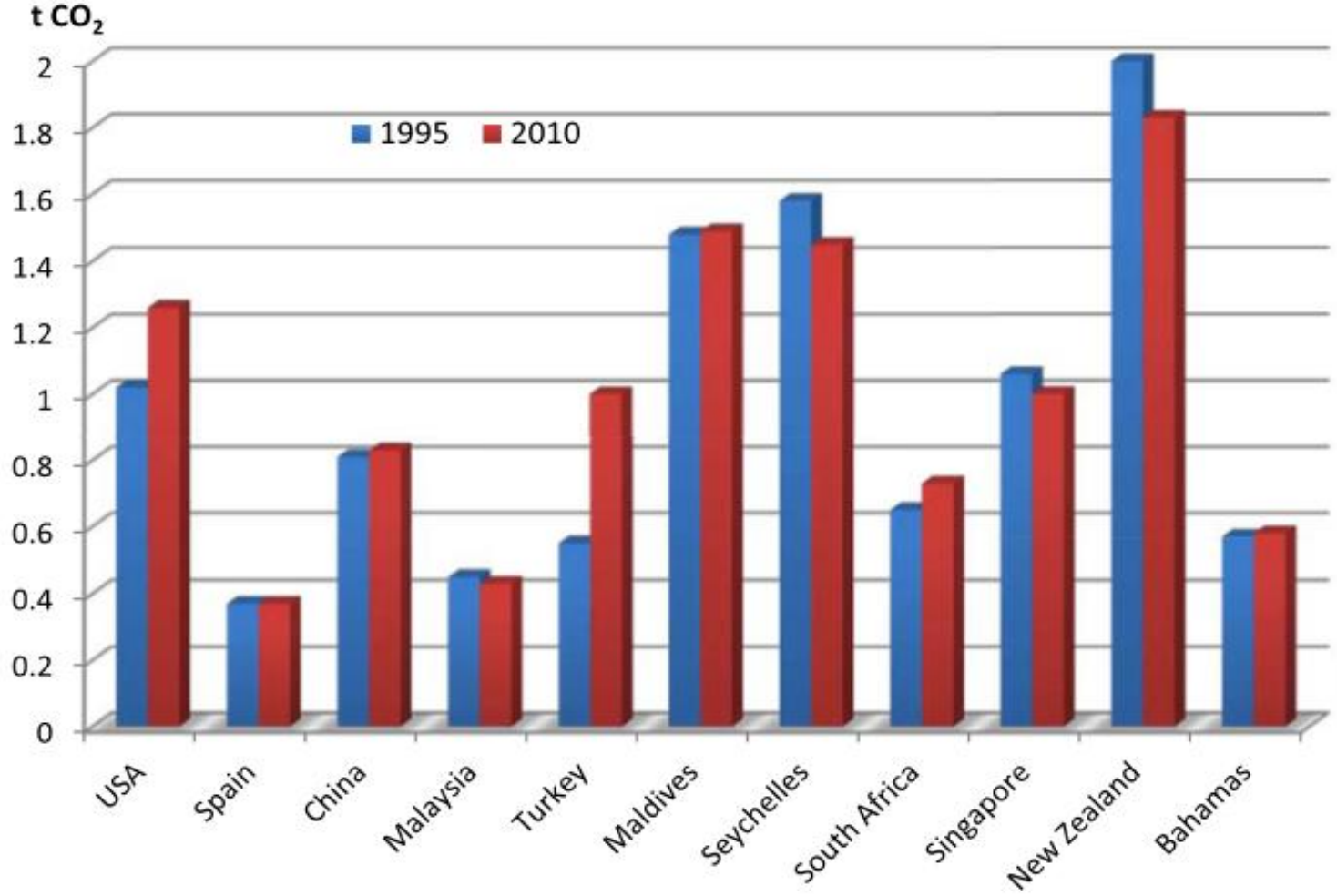
⇒ ***Arrivals by air focus crucial!***

Emission intensities and distances

Country	Average emissions per international tourist		Average distance flown per international tourist	
	1995	2010	1995	2010
USA	1.02	1.57	4831	7394
Spain	0.37	0.37	1619	1602
China	0.83	0.81	3960	3845
Malaysia	0.45	0.43	1858	1765
Turkey	0.55	0.60	2522	2776
Maldives	2.00	1.49	9490	7065
Seychelles	1.58	1.45	7534	6898
South Africa	0.65	0.73	2890	3290
Singapore	1.06	1.00	4982	4681
New Zealand	2.00	1.83	9547	8712
Bahamas	0.57	0.58	2714	2756

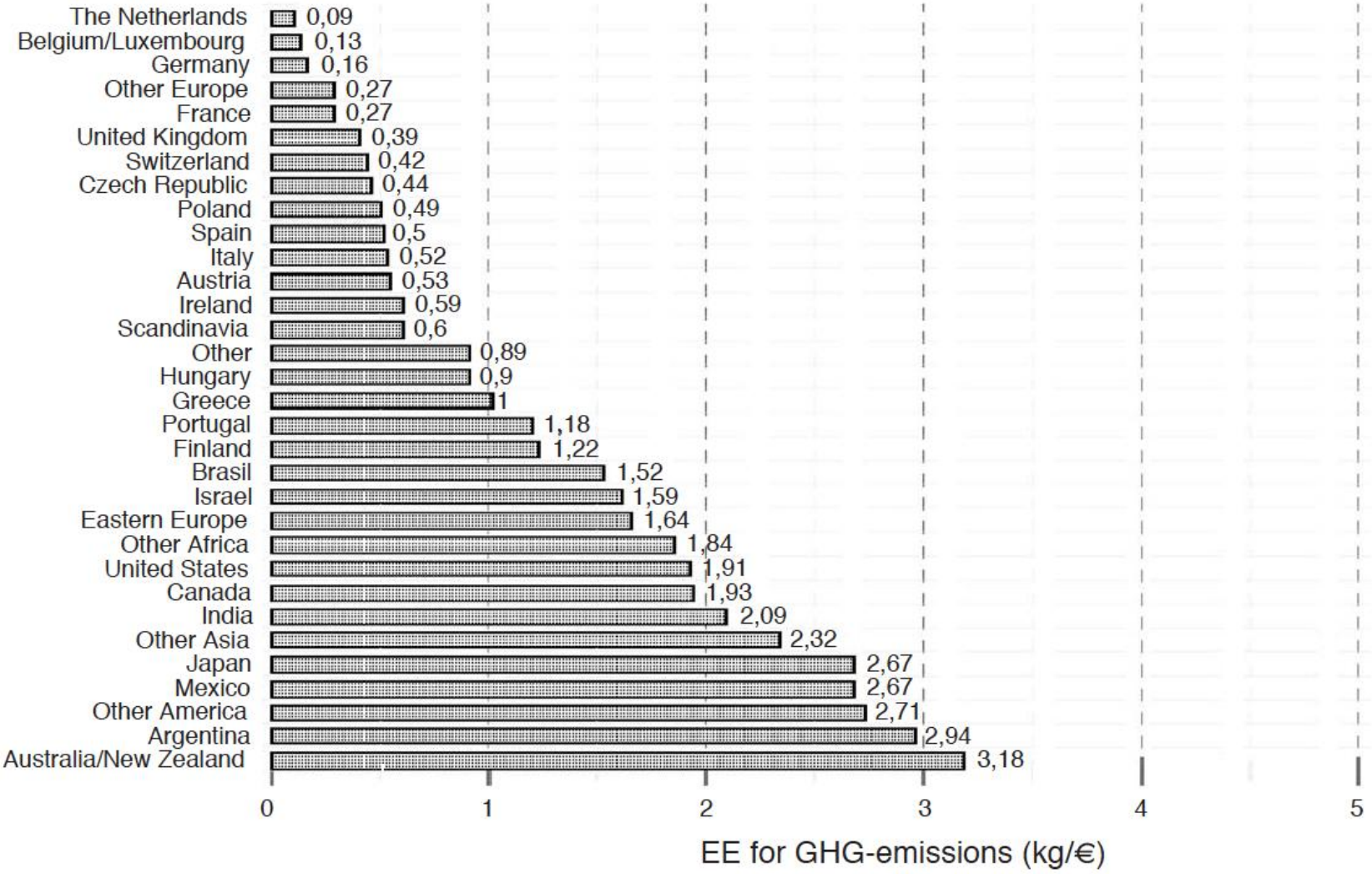
Gössling, S., Scott, D., and Hall, C.M. 2015. Inter-market variability in CO2 emission-intensities in tourism: Implications for destination marketing and carbon management. Tourism Management 46: 203-212.

Average per tourist emission intensities for various countries



Gössling, S., Scott, D., and Hall, C.M. 2015. Inter-market variability in CO2 emission-intensities in tourism: Implications for destination marketing and carbon management. Tourism Management 46: 203-212.

Integrating environment and economy



Gössling, S., Peeters, P., Ceron, J.-P., Dubois, G., Patterssson, T., and Richardson, R. 2005. The eco-efficiency of tourism. *Ecological Economics 54(4): 417-434.*

Water management

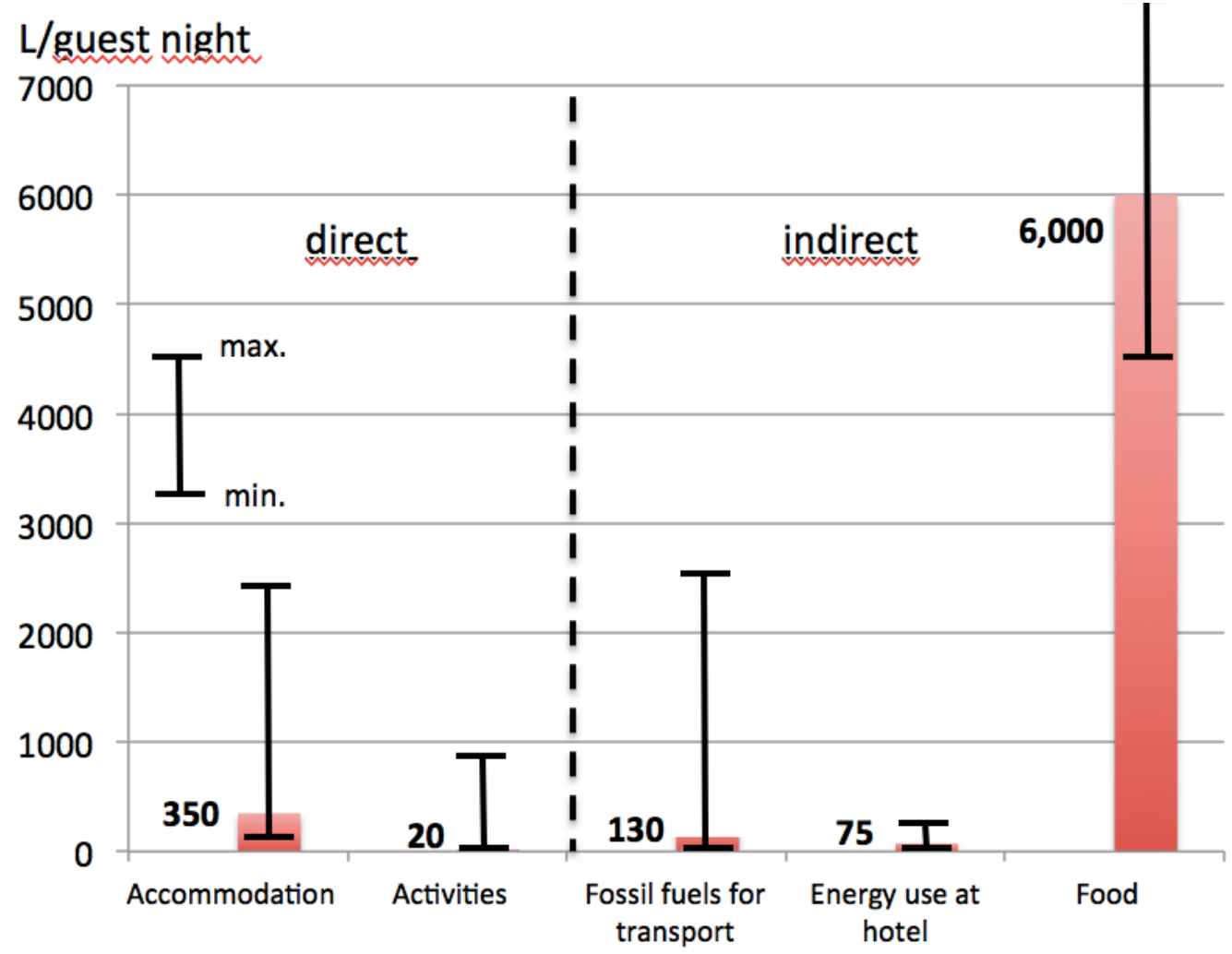
- **Wide range of indicators used in the past**
- **Few relevant**

Gössling, S. 2015. New key performance indicators for water management in tourism. *Tourism Management* 46: 233-244.

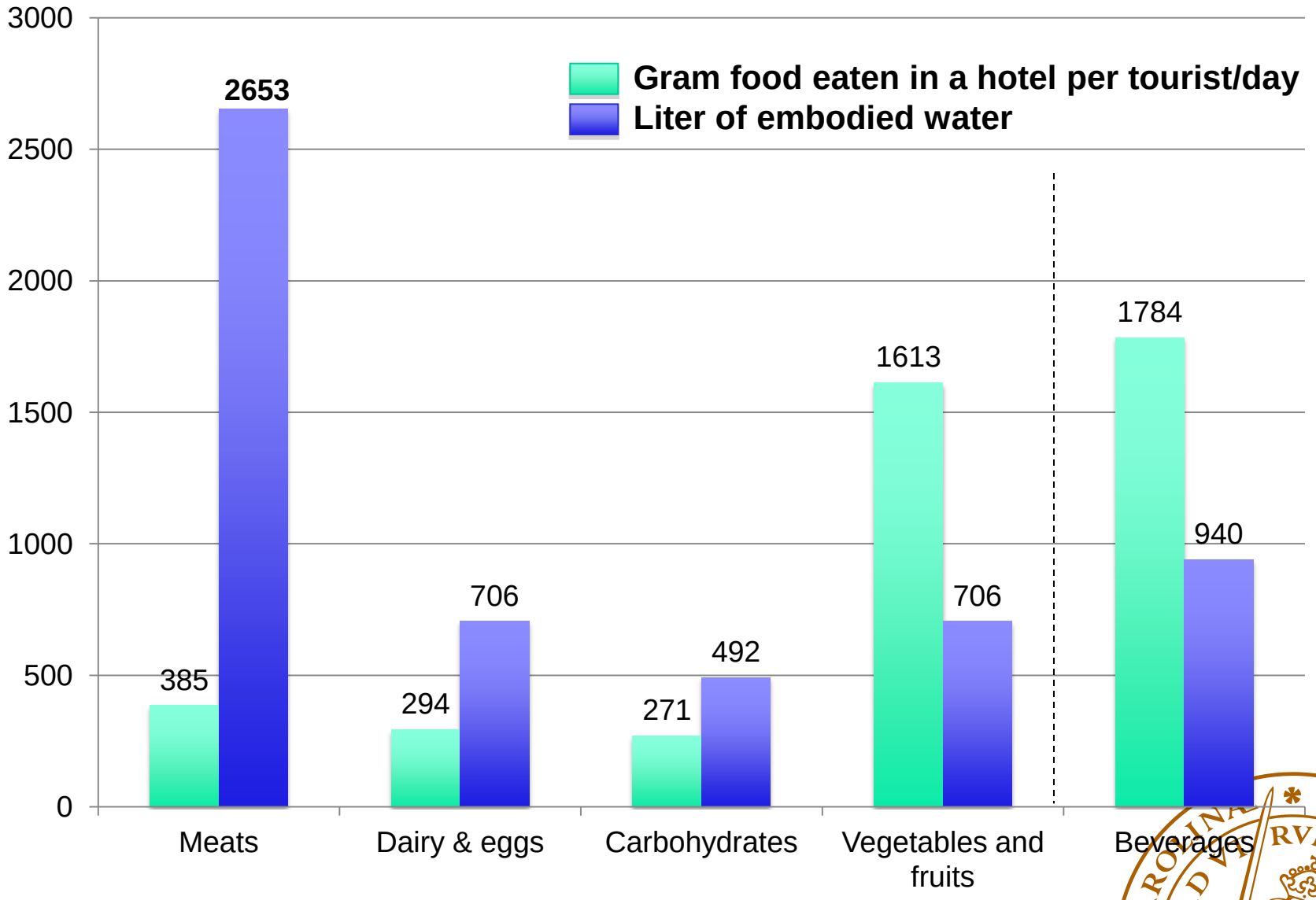
Comparison of water use indicators.[a]

Indicator	Reference/Organization
• Water use per guest night	Antakyali, Krampe, and Stei (2008); Bohdanowicz and M (2007); Eurostat (2009); Gös (2001a); Lamei, von Münch, der Zaag, & Imam (2009b); Tilmant, van der Zaag, and I (2009a); Langumier and Ric (1995); Rico-Amoros, Olcina and Sauri (2009); WWF (20
• Water use per room	Alexander (2002); Deng and Burnett (2002) Cooley, Hutchins-Cabibi, Col Gleick, & Heberger (2007); Siegelbaum and The RICE Gr (2002)
• m^3 per room and year • Laundry in kg per guest night • Total volume consumed per day • Volume of reused water • The % of annual supply in use • The number of days shortage per year • Cost of new water	Bohdanowicz and Martinac Blancas et al. (2011) UNWTO (2004)
• Fresh water consumption per guest night compared to general population water consumption per person night; • Percentage of tourism enterprises with low-flow shower heads and taps and/or dual flush toilets/ waterless urinals; • Percentage of tourism enterprises using recycled water; • Percentage of water use derived from recycled water in the destination	European Commission (EC 2

Direct and indirect water use



Gössling, S. 2015. New key performance indicators for water management in tourism. *Tourism Management* 46: 233-244.



Gössling, S. 2015. New key performance indicators for water management in tourism. *Tourism Management* 46: 233-244.

Water indicators for destinations

Vulnerability

- **Renewable water resources per guest night in high season**

Planning

- **Area of irrigated land per bed**
- **Area of pool per bed**

Managing

- **Area of solar thermal and PV installed per bed**
- **Amount of meats and dairy products per guest night**
- **Energy use per guest night**
- **Share of rooms fitted with low-flow devices**
- **Kg of laundry used per guest night**

Gössling, S. 2015. New key performance indicators for water management in tourism. *Tourism Management* 46: 233-244.
Gössling, S., C.M. Hall, and Scott, D. 2015. Tourism and Water. Channel View Publications: Bristol, UK.

3Ps for food management

Purchases	RED – buy as little as possible policy • Buy as little as possible vegetables grown in heated greenhouses • Buy as little as possible foods involving air transport • Buy as little as possible specific species, such as giant, king and tiger prawns, lobster • Buy as little as possible imported beef • Buy as little as possible aluminium foil AMBER – buy less policy • Buy less beef • Buy less deep-sea fish (e.g. cod) • Buy less farmed carnivorous fish (e.g. salmon) • Buy less rice • Buy less seasonal foods out of their season/storage time- GREEN – buy more policy • Buy more locally produced foods, if transported over short distances using CO_2-efficient modes • Buy more potatoes • Buy more grains (including pasta) • Buy more pelagic fish • Buy more pork • Buy more chicken • Buy more foodstuffs with longer shelf lives

Gössling, S., Garrod, B., Aall, C., Hille, J., and Peeters, P. 2011. Food management in tourism. Reducing tourism's carbon 'foodprint'. *Tourism Management* 32(3): 534-543.

Preparation

Preparation	• Purchase energy from renewable sources • Use more energy-efficient cooking routines • Do not prepare energy-intensive foods in-house • Put dishes on the menu that use less meat and more vegetables • Prepare meals only after orders have been placed • Plan purchases to avoid waste • Separate food waste from general waste

Gössling, S., Garrod, B., Aall, C., Hille, J., and Peeters, P. 2011. Food management in tourism. Reducing tourism's carbon 'foodprint'. *Tourism Management* 32(3): 534-543.

Presentation

Presentation	• Always present at least one attractive vegetarian alternative • Reduce portion sizes at buffets, with more regular replenishment • Reduce plate size at buffets • Arrange buffets so that less carbon-intensive foods are at the centre • Train staff to recommend less carbon-intensive dishes • Avoid single-use packaging

Overall, an estimated 50-80% of emissions avoidable.
Possibly as much in water use.

Gössling, S., Garrod, B., Aall, C., Hille, J., and Peeters, P. 2011. Food management in tourism. Reducing tourism's carbon 'foodprint'. *Tourism Management* 32(3): 534-543.

Resource Use Intensities

Aspect	*Range of estimates*	*Global average*	*Global total (year)*
Energy			
- per guest night	3.6-3,717 MJ	272 MJ	
- per trip (domestic & internat. average)	50-135,815 MJ	3.575 MJ	17,500 PJ (2005)
Emissions			
- per night (accommodation)	0.1 – 260 kg CO_2	13.8 kg CO_2	
- per trip (domestic and internat. average)	<0.1 – 9.30 t CO_2	250 kg CO_2	1,304 Mt CO_2 (2005)
Fresh water, L per tourist per day			
- direct (accommodation)	84-2,425	350	
- indirect (fuels, food)	4,500-8,000	6,425	
- combined	2,000-10,575	6,795	92.4 km^3 (2000)
Land use, m^2			
- direct, per bed	30-4,580 m^2/bed	40 m^2	
- direct and indirect, per tourist		21.8 m^2	70,000 km^2 (1999)
Food use, grams per day			
- per tourist per day	2,200-3,100g	1,800g	24.5 Mt (2000)

Gössling, S. and Peeters, P. 2015. Assessing tourism's global environmental impact 1900-2050. Journal of Sustainable Tourism, 23(5): 639-659.

Conclusions

- **Significant changes needed in global tourism system to reduce resource consumption;**
- **Can only be achieved by fundamentally different destination management approaches that emphasize optimization, not maximization*;**
- **High energy prices will be key in any endeavour to save resources;**
- **Stakeholders will have to be involved in measuring and monitoring resource consumption, and the identification of reduction goals.**

*Gössling, S., Ring, A., Dwyer, L., Andersson, A.-C. and C.M. Hall. 2015. Optimizing or maximizing? A challenge to sustainable tourism. *Journal of Sustainable Tourism*, *in press.*