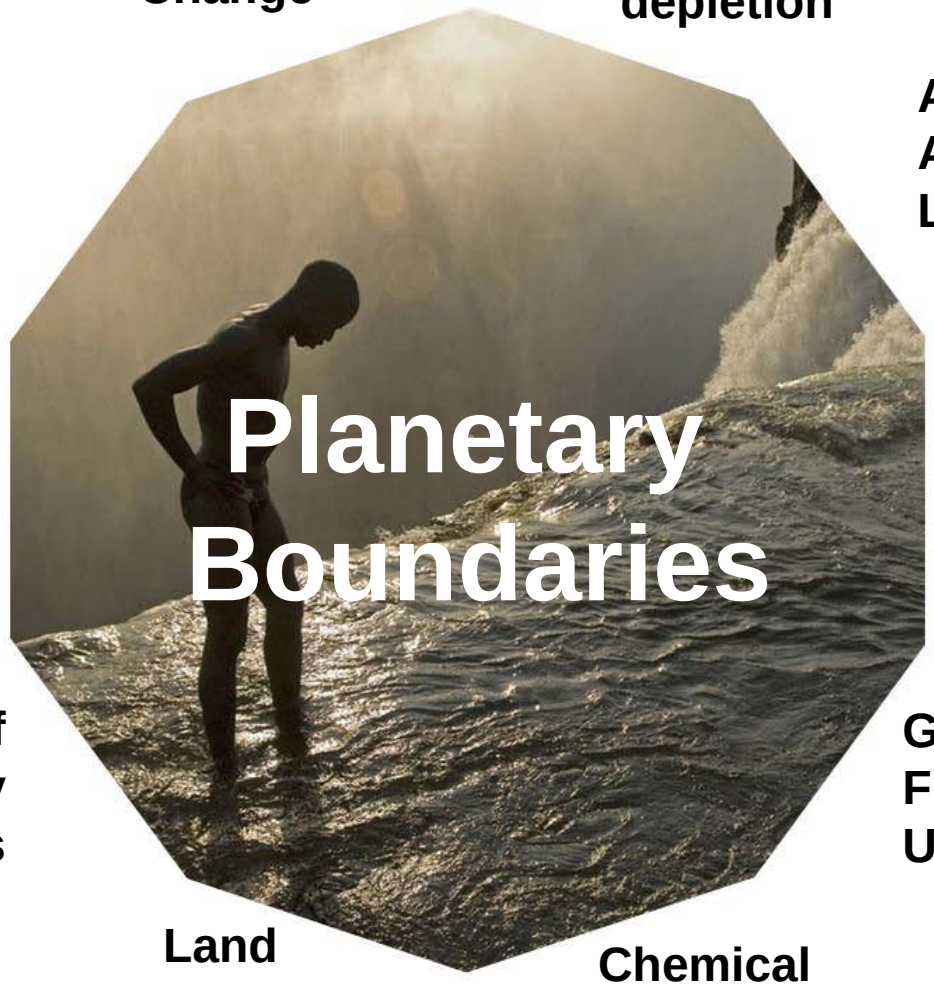
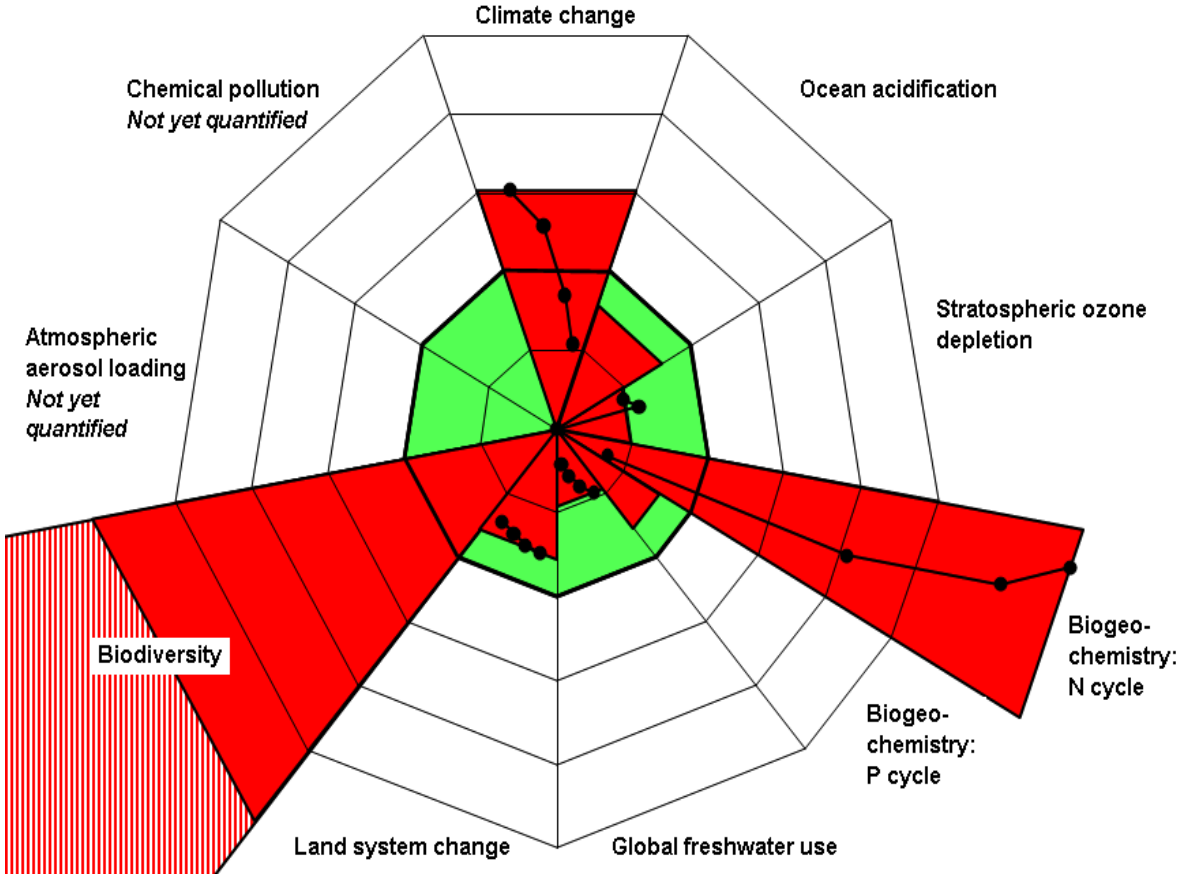
Presented by Dave Griggs
Director, Monash Sustainability Institute

Sustainability boundaries



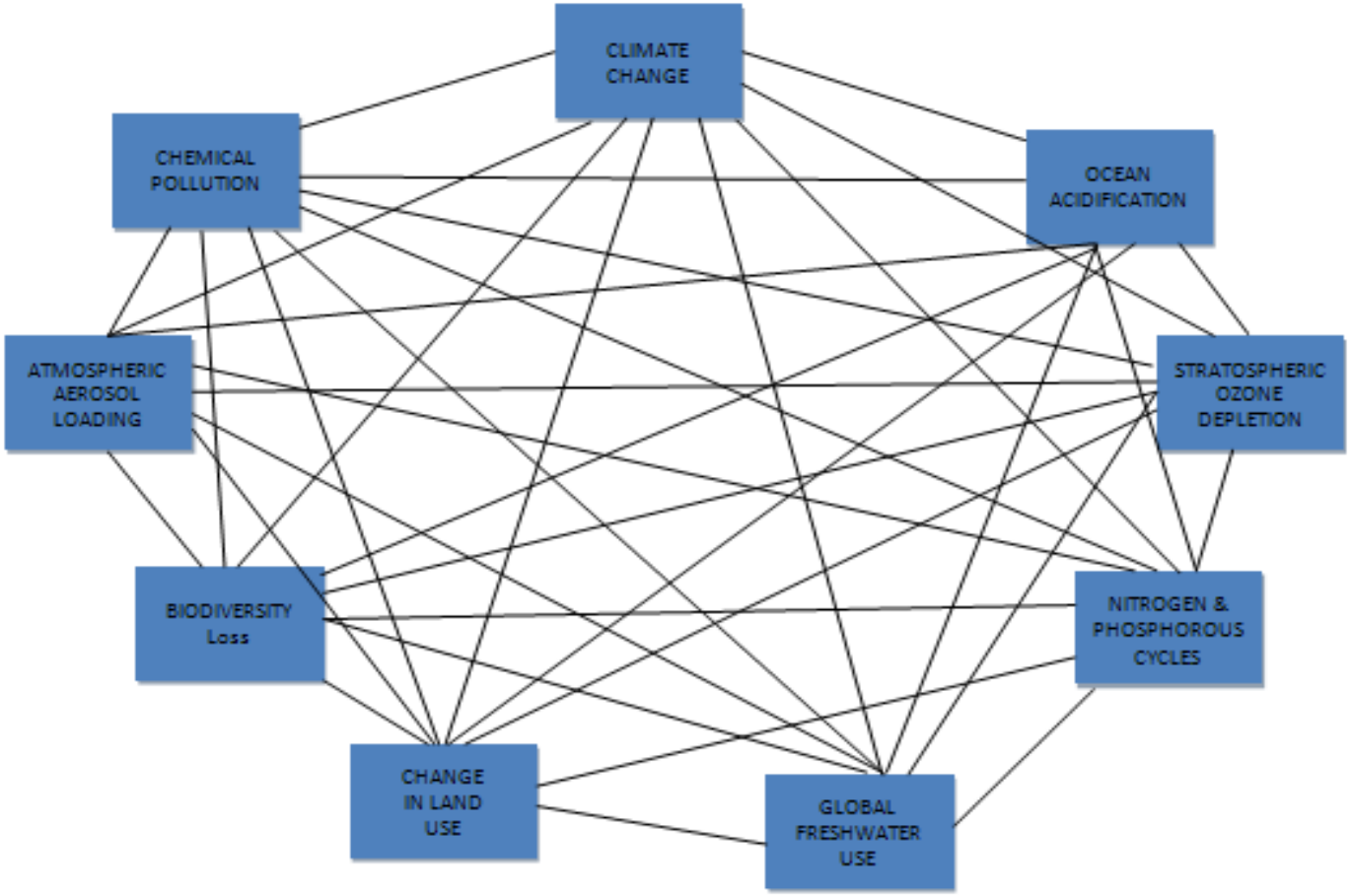
Rockström et al. 2009

Planetary Boundaries: Defining the safe operating space

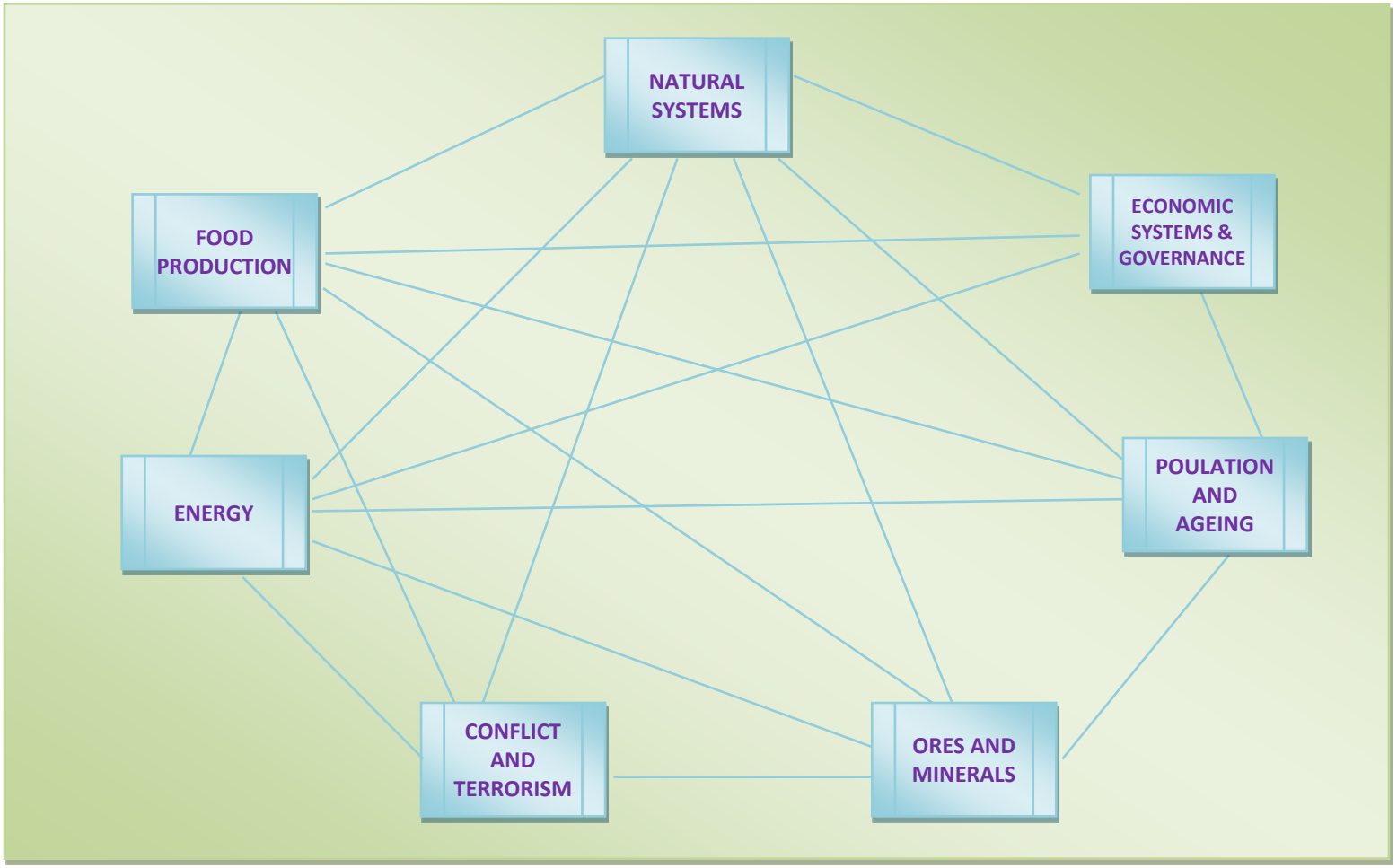


Rockström et al. 2009

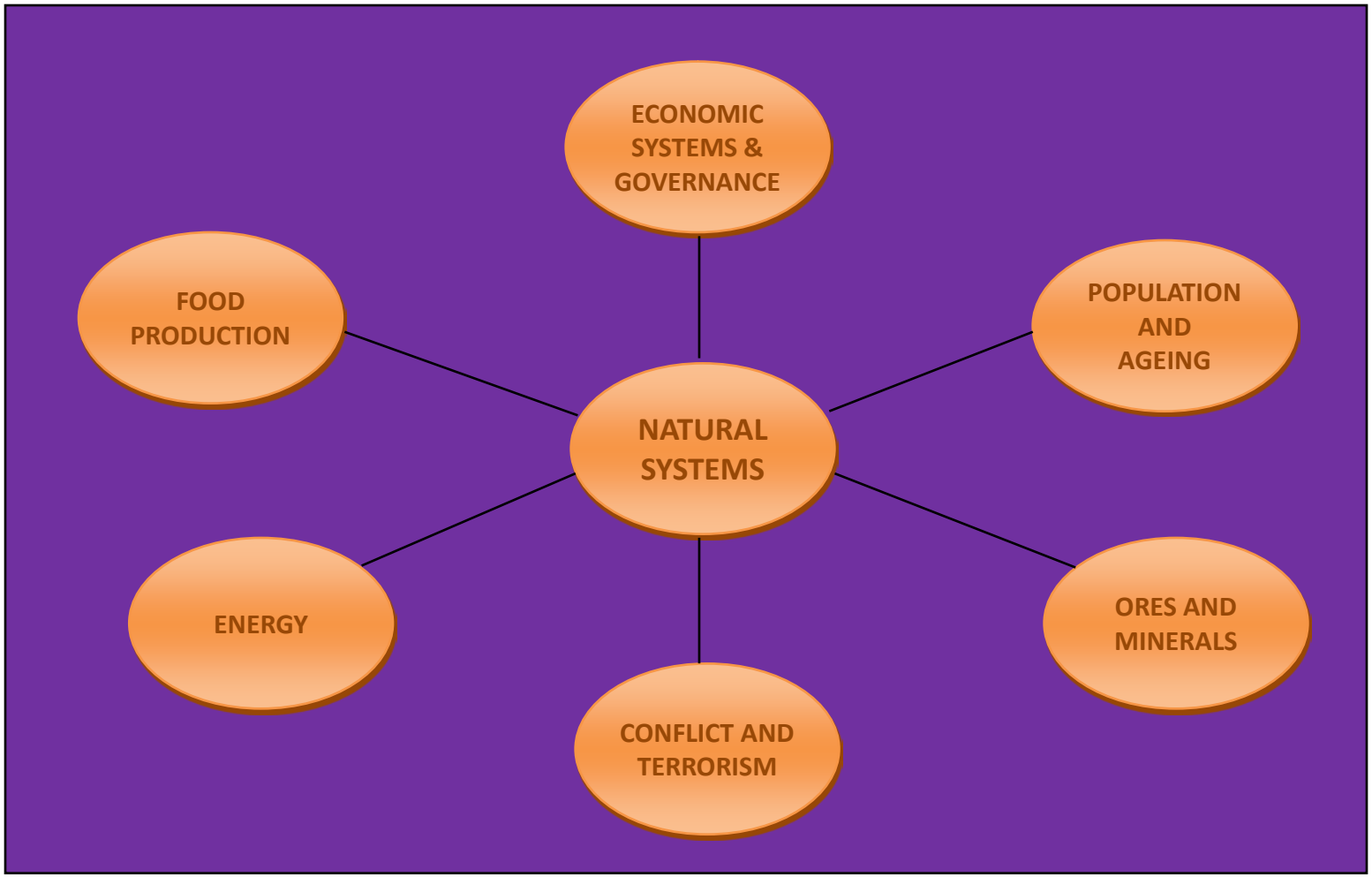
Planetary Boundaries Interaction



Sustainability Boundaries



Natural Systems Linkages



Natural systems and terrorism

"You have destroyed nature with your industrial waste and gases, more than any other nation in its history. Despite this, you refuse to sign the Kyoto agreement so that you can secure the profit of your greedy companies and industries."

Natural systems – Terrorism links

Use of the environment to conduct terror

- **e.g., Lighting of bushfires, ….**

Social resentment caused by environmental factors leading to terrorist recruitment

- **e.g., Long term refugee camps as a result of drought and floods are recruitment grounds for terrorists "Refugee camps are a hotbed of discontent producing a large, disaffected population open to criminal activities and terrorist recruitment" – A Rumphy (2008)**

A 4C warmer world will increase the need for and therefore the likelihood of direct action to protect the environment. It will increase the vulnerability of the environment to acts of terror and increasing frequency and magnitude of extreme events will lead to greater numbers of environmental refugees.

Natural systems – Terrorism links

To date no assessment has been made of the level of terrorism that would threaten global sustainability

At its present level it clearly has major local, regional and global impacts on society and economy.

- For example, looking at the direct economic costs of military operations in the US alone, the US Congress has approved a total of $1.283 trillion for military operations, base security, reconstruction, foreign aid, embassy costs, and veterans health care for the three operations initiated since the 9/11 attacks (Belasco, 2011).

Changes in natural systems as a result of climate change will both increase the potential for the use of natural systems to carry out acts of terrorism and will increase the likelihood of conditions that have been demonstrated to lead to recruitment of terrorists

Overall terrorism and conflict have not reached the point of threatening sustainability

Natural systems – Economy links

- For at least the last 50 years striving for economic growth has been the dominant policy goal worldwide.

- However, this economic growth has come through an unsustainable use of natural resources.

- Not only is the paradigm flawed due to the unsustainable use of natural resources but also in the basic premise that:

economic growth = prosperity = personal wellbeing

Natural systems – Economy links

The impact of the economy on natural systems comes primarily as a result of increasing exploitation of the world's natural resources.

Economic growth based on excessive consumption is the prime driver of all the threats to all the Planetary Boundaries namely climate change, ocean acidification, stratospheric ozone, global phosphorus and nitrogen cycles, atmospheric aerosol loading, freshwater use, land-use change, biodiversity loss and chemical pollution.

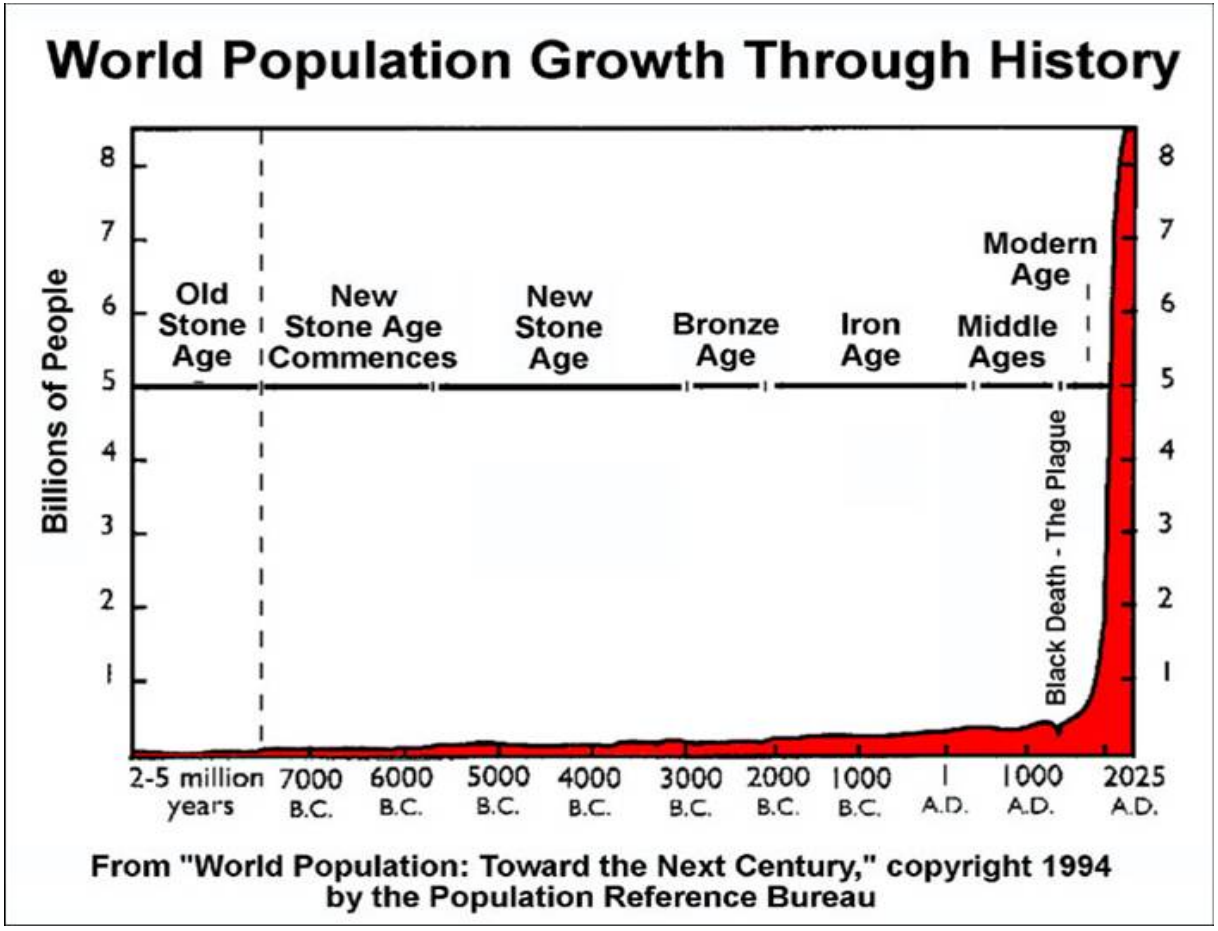
Increasing climate change thus presents an increasing threat to the sustainability of the global economy

Natural systems – Economy links

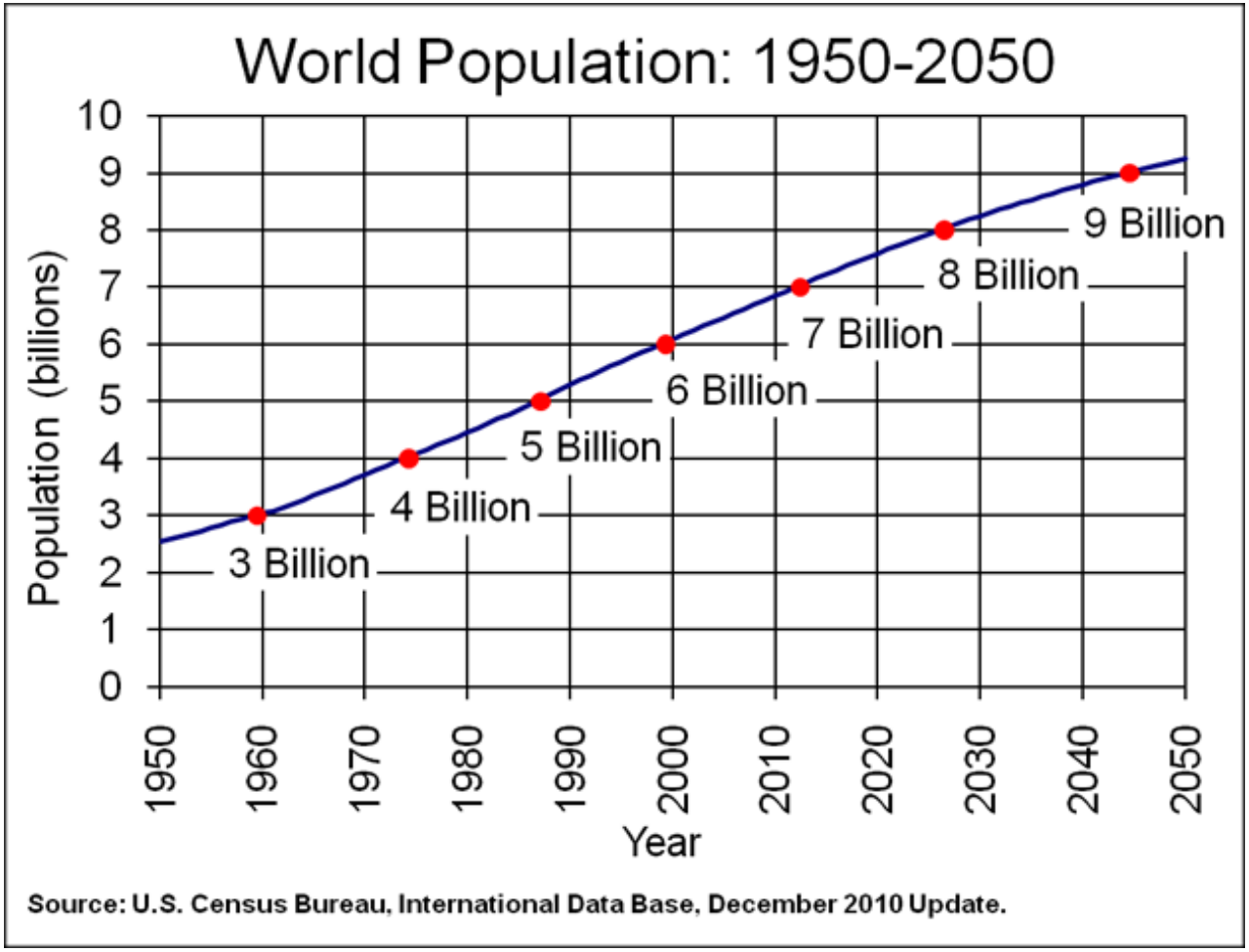
- The Global Financial Crisis showed how vulnerable to global financial system is to shocks
- The global debt crisis has reached the point where countries such as Greece are in danger of defaulting
- By the end of 2011 US total government debt is budgeted to reach $18.094 trillion
- Climate change will place an increasing additional stress on the global economy

While the world is gradually recovering from the GFC there are a number of indicators that the global financial system is very near to crossing a boundary and becoming unsustainable.

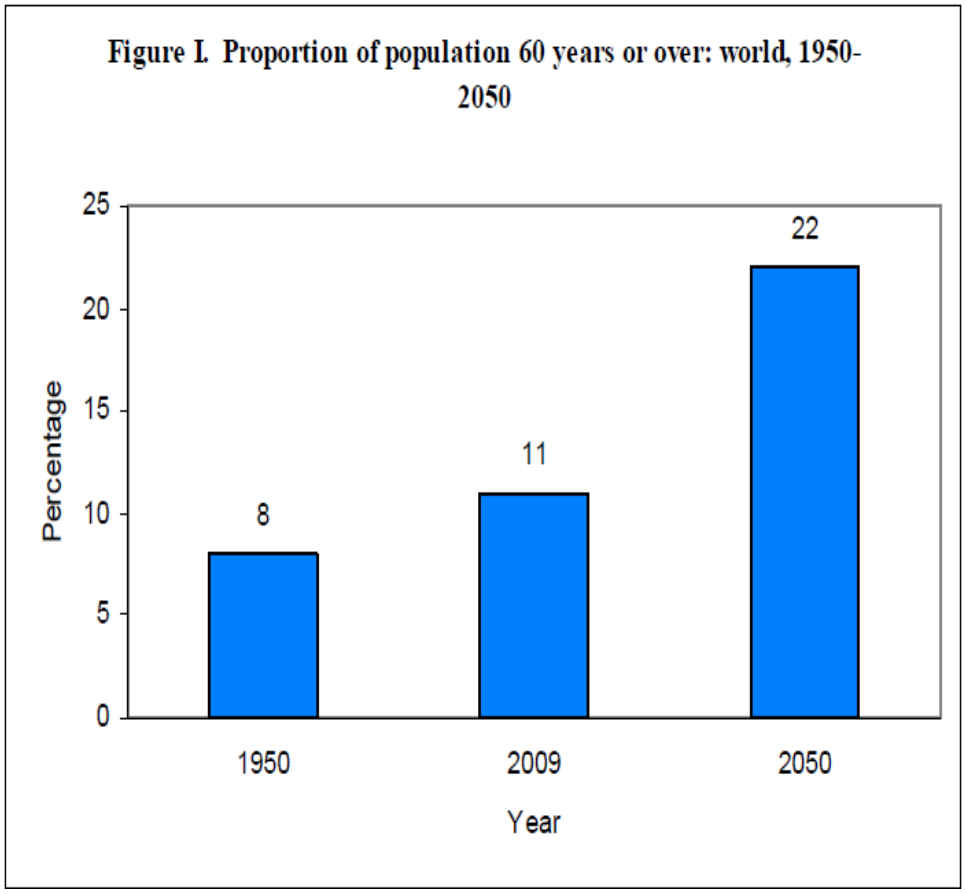
Natural system – population links

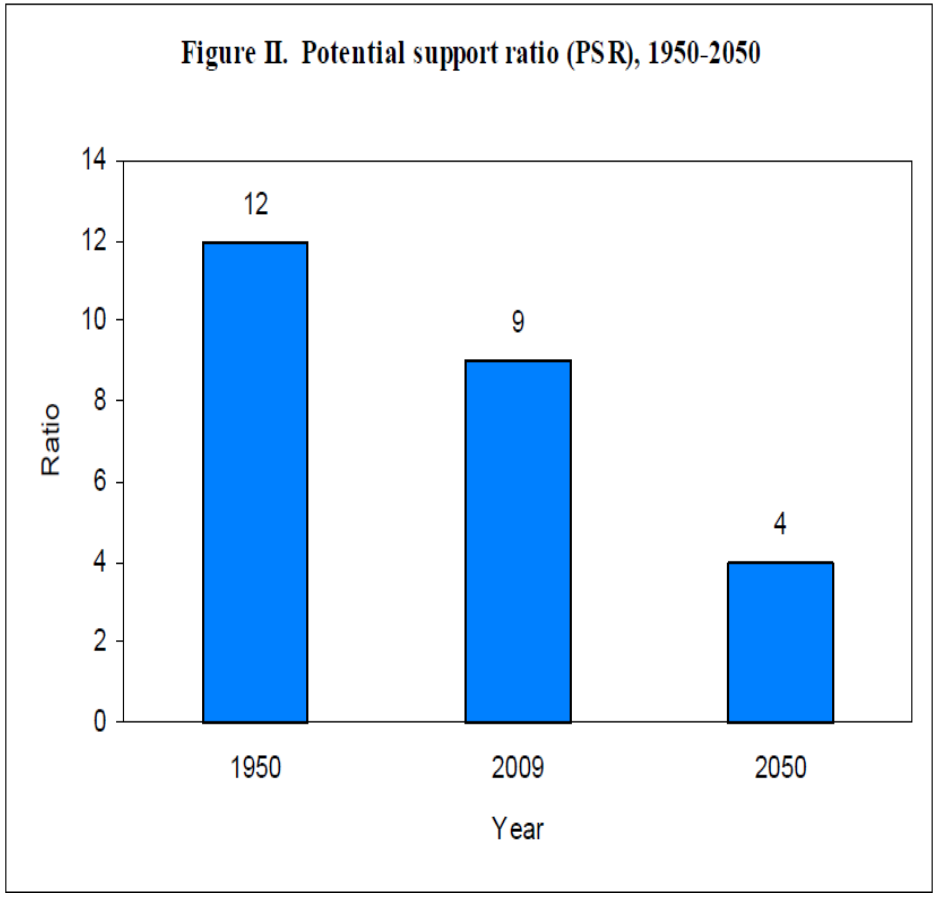


Natural system – population links



Natural system – population links



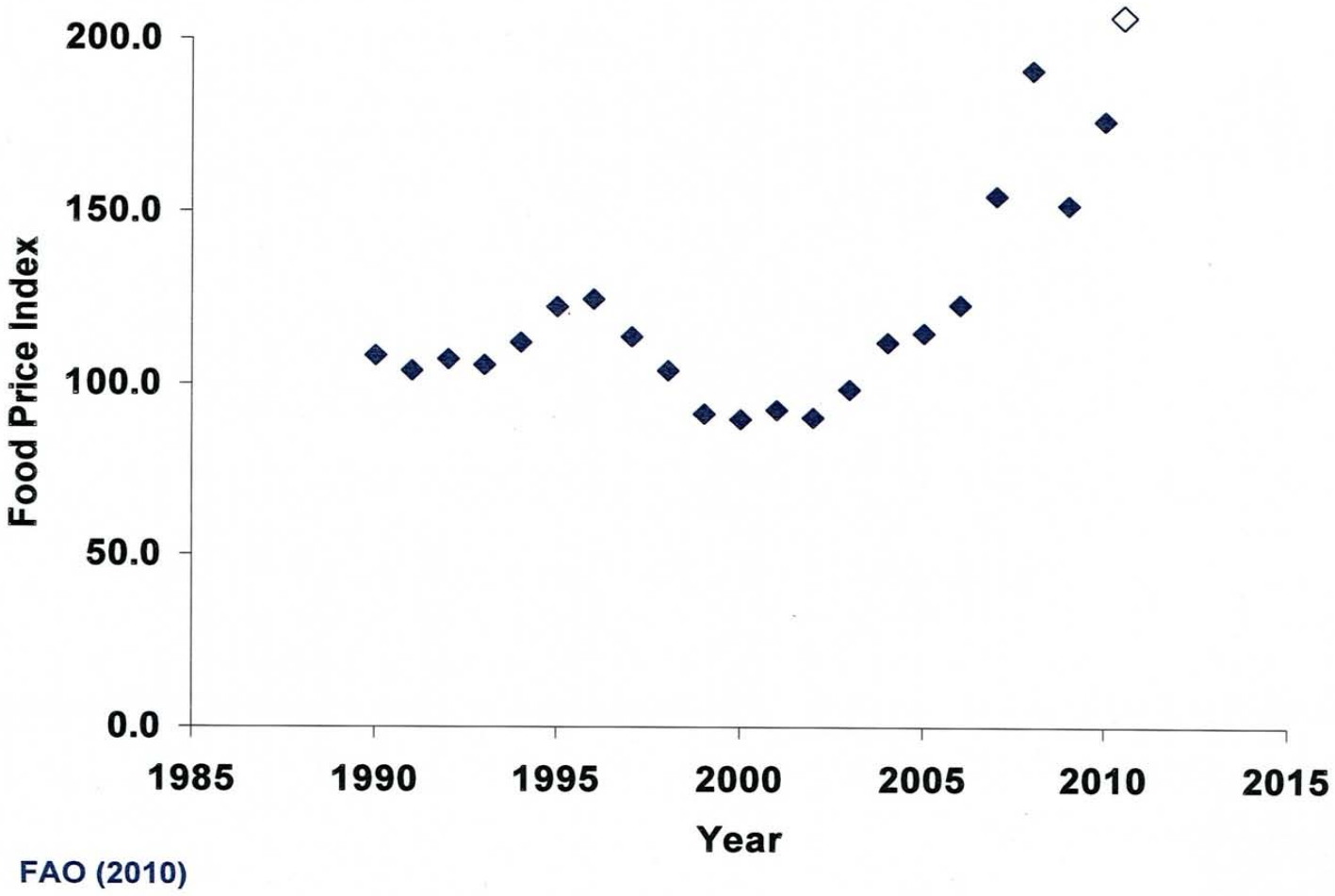


Natural systems – population links

- Population is projected to continue to grow
- Direct link between population and natural systems through individual consumption
- Also pressures on natural system due to building on natural land to accommodate increased population
- Increasing population, e.g., near coasts, increases vulnerability to climate extremes
- Many studies believe we are already beyond a sustainable population (WWF Living Planet Report)
- Others believe that improvements in farming mean that we have not yet reached that point.

While we may not be beyond a technically maintainable population we are probably beyond a sustainable population

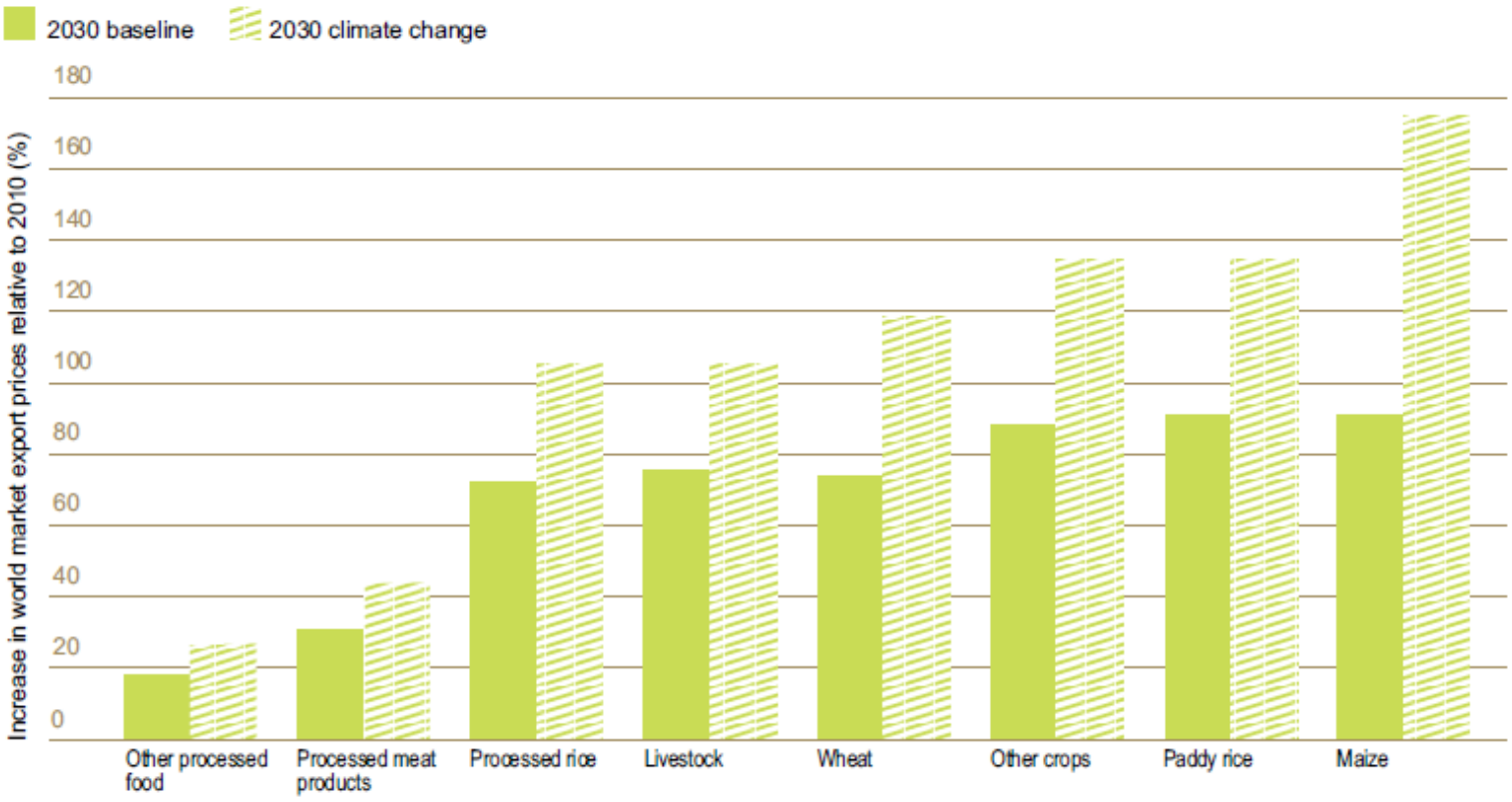
Food price increases impact disproportionately on the poor



FAO (2010)

Natural system – food production links

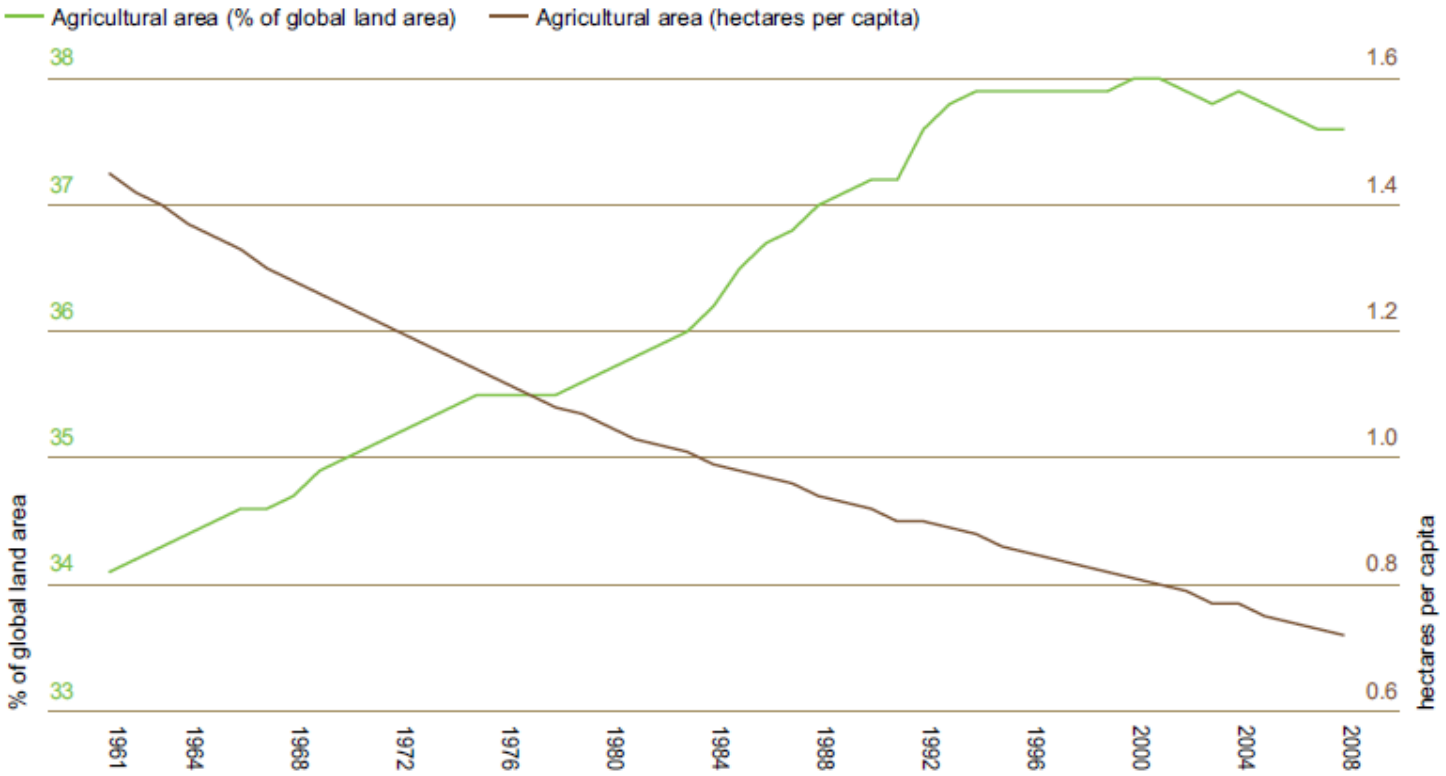
Figure 1: Real food price changes predicted over the next 20 years



Source: D. Willenbockel (2011) 'Exploring Food Price Scenarios Towards 2030', Oxfam and IDS

Natural system – food production links

Figure 4: The share of land devoted to agriculture has peaked



Source: Calculated from FAO, http://faostat.fao.org/site/377/default.aspx

Natural system – food production links

Figure 11: The predicted impact of climate change on maize productivity to 2030

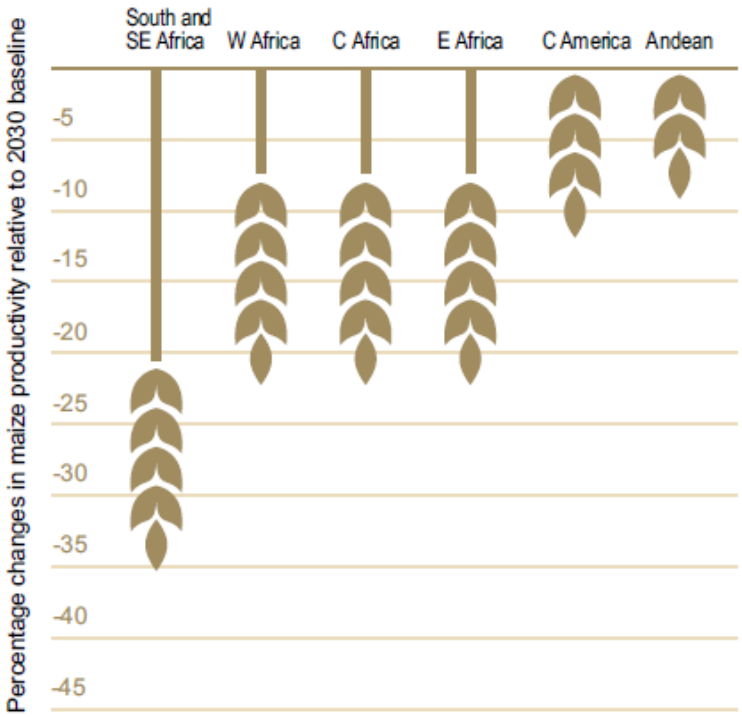
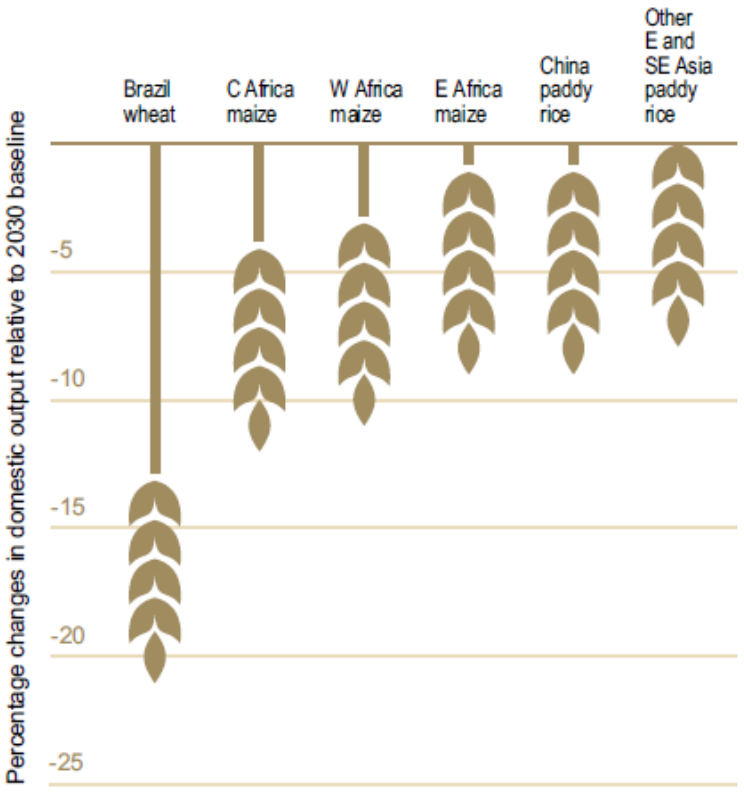


Figure 12: The predicted impact of climate change on regional staple food production to 2030

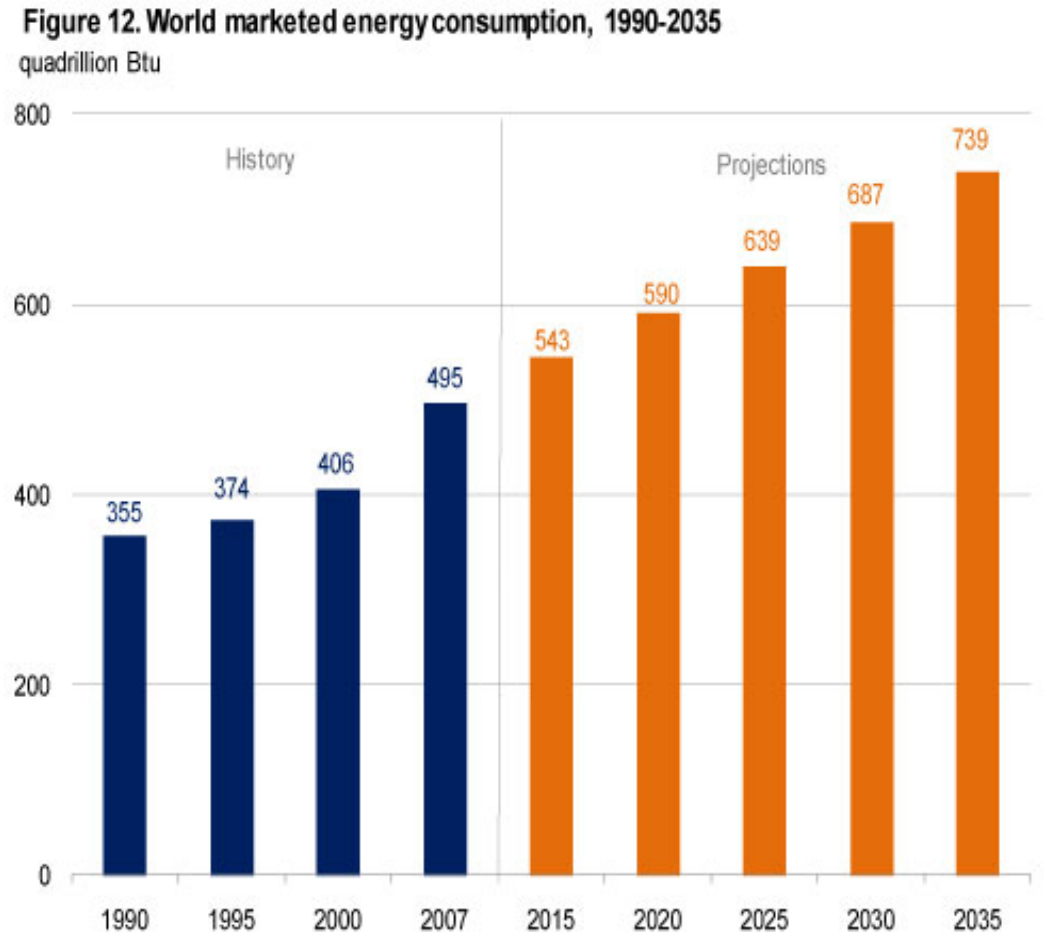


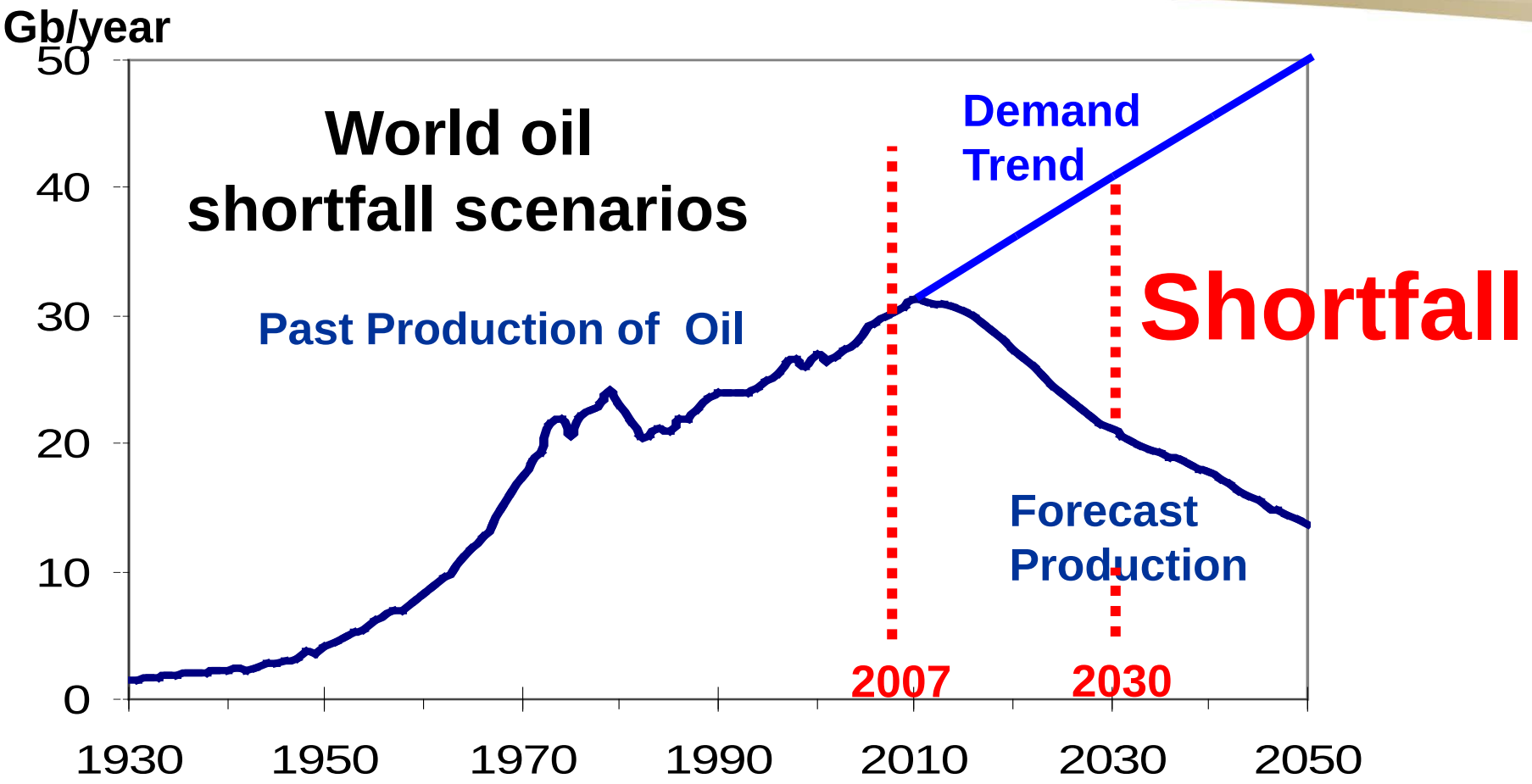
Natural systems – food production links

- Food prices are projected to continue to grow in real terms
- Climate change will have a negative impact on staple food crops
- Pressures on agricultural land to accommodate increased population
- Some believe that improvements in farming, e.g., GM crops mean that we can continue to increase food production.
- However, even if technologically possible to feed a larger population there are other dangers in turning the world “into a giant feedlot” (Erlich & Erlich)

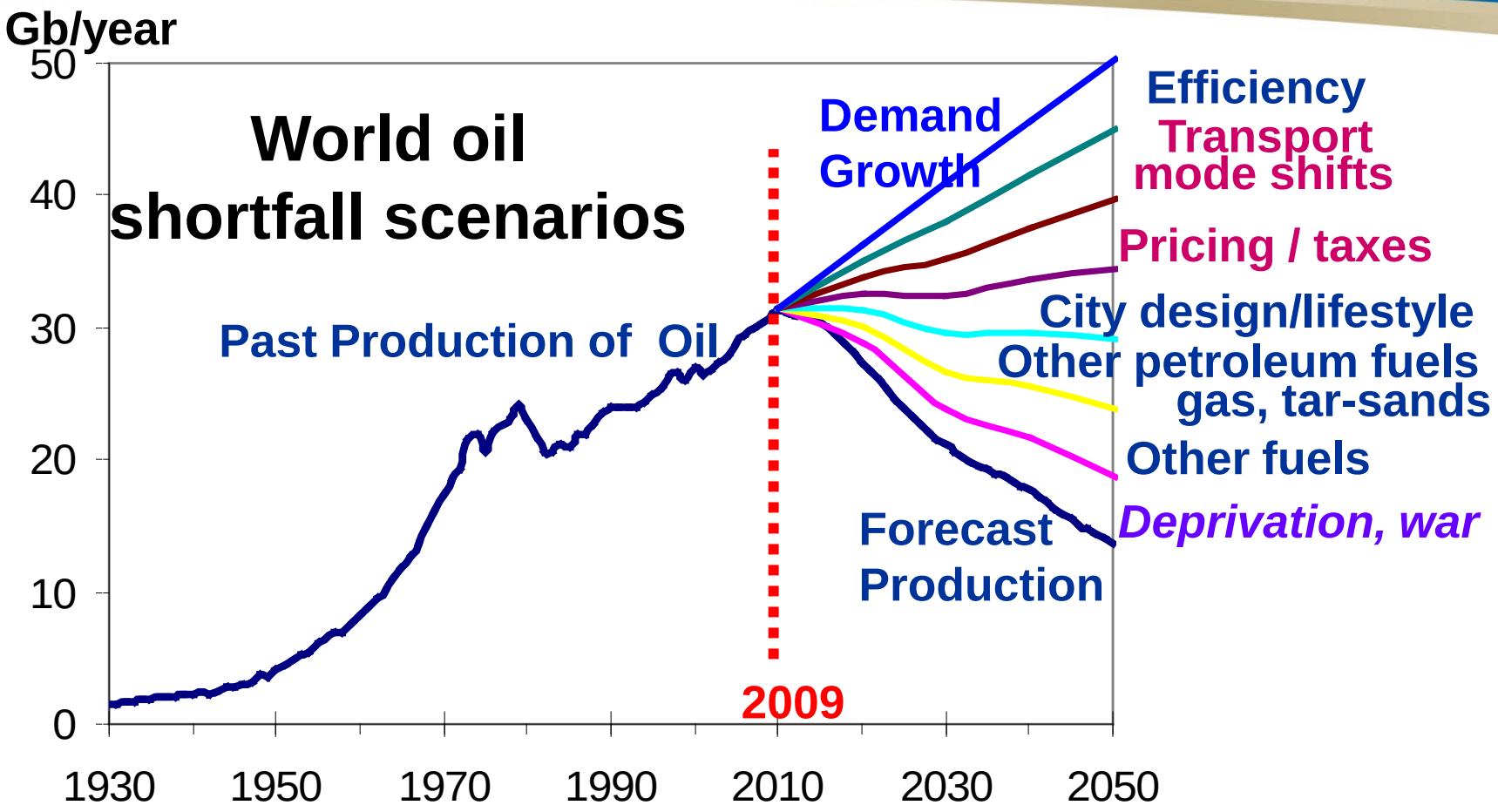
Overall conclusion is that we are probably not beyond a sustainable food production limit but there will be increasing consequences.

Natural system – energy links



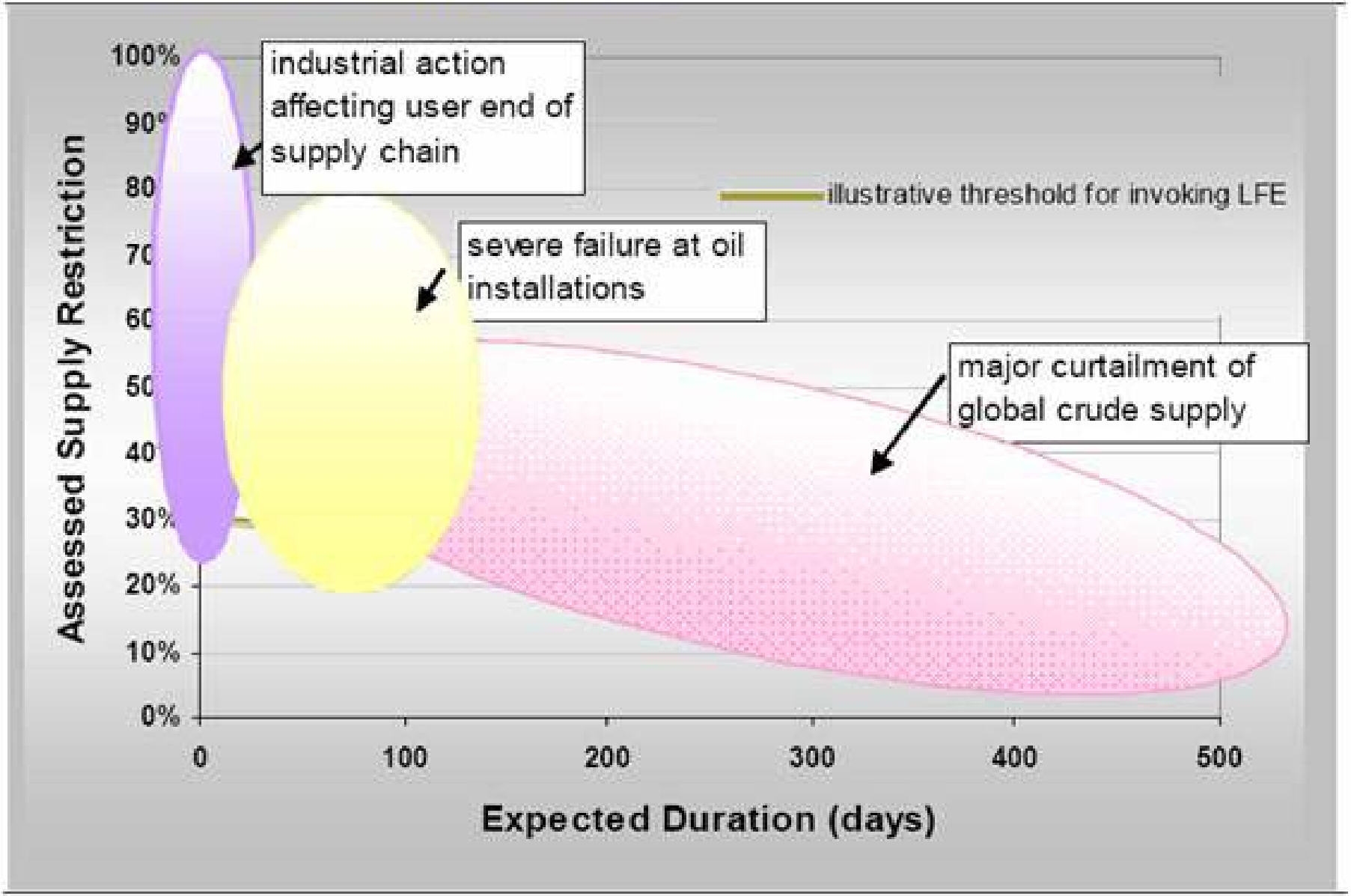


By 2030, the gap is equivalent to 6,000 nuclear reactors



- no single "Magic Bullet" solution,
- probably no replacement ever for cheap plentiful oil
- Urgent preparation and adjustment are vital

Figure 10 **Disruption scenarios — circumstances in which government intervention may be called for**



Note: see text for explanation.

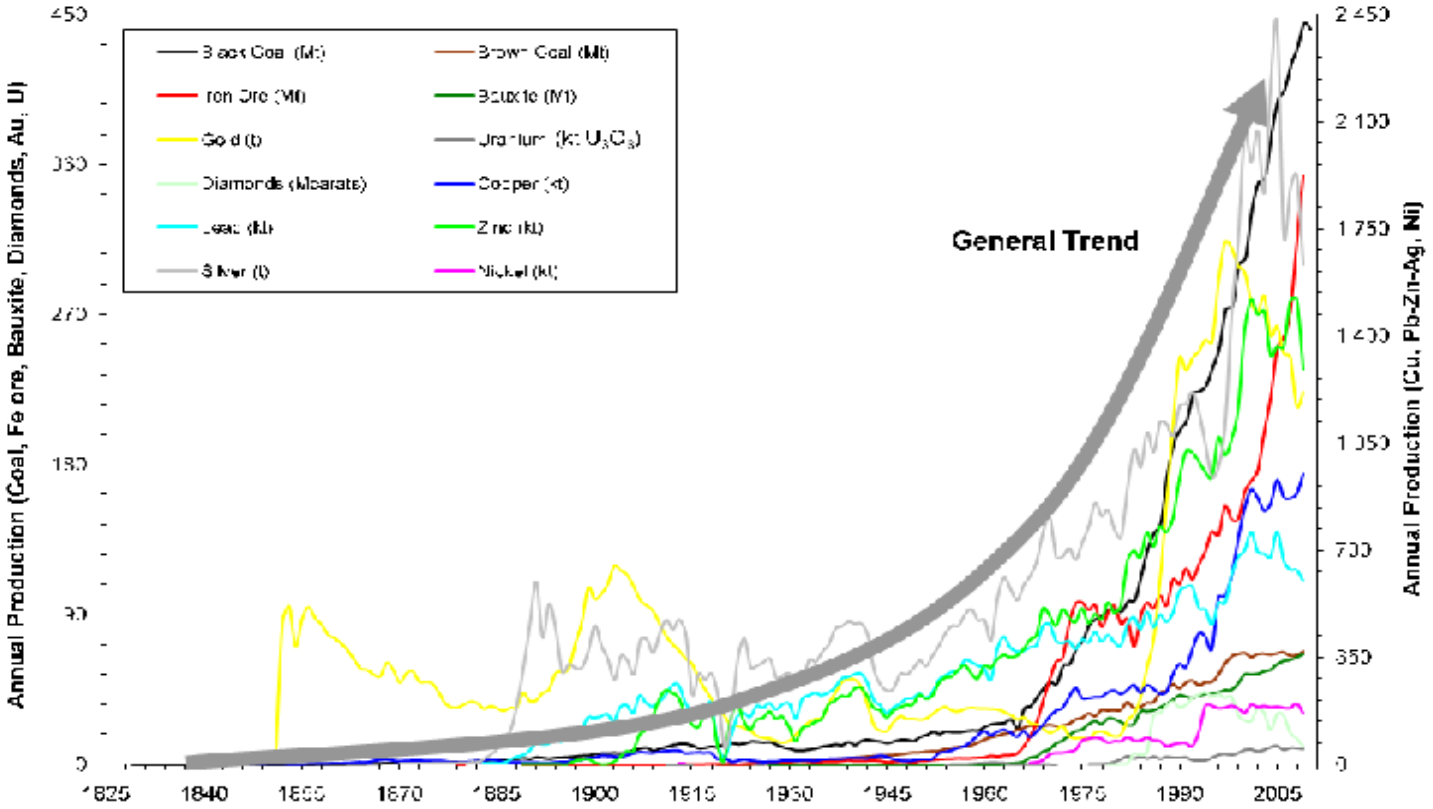
Data source: ACIL Tasman

Natural systems – energy links

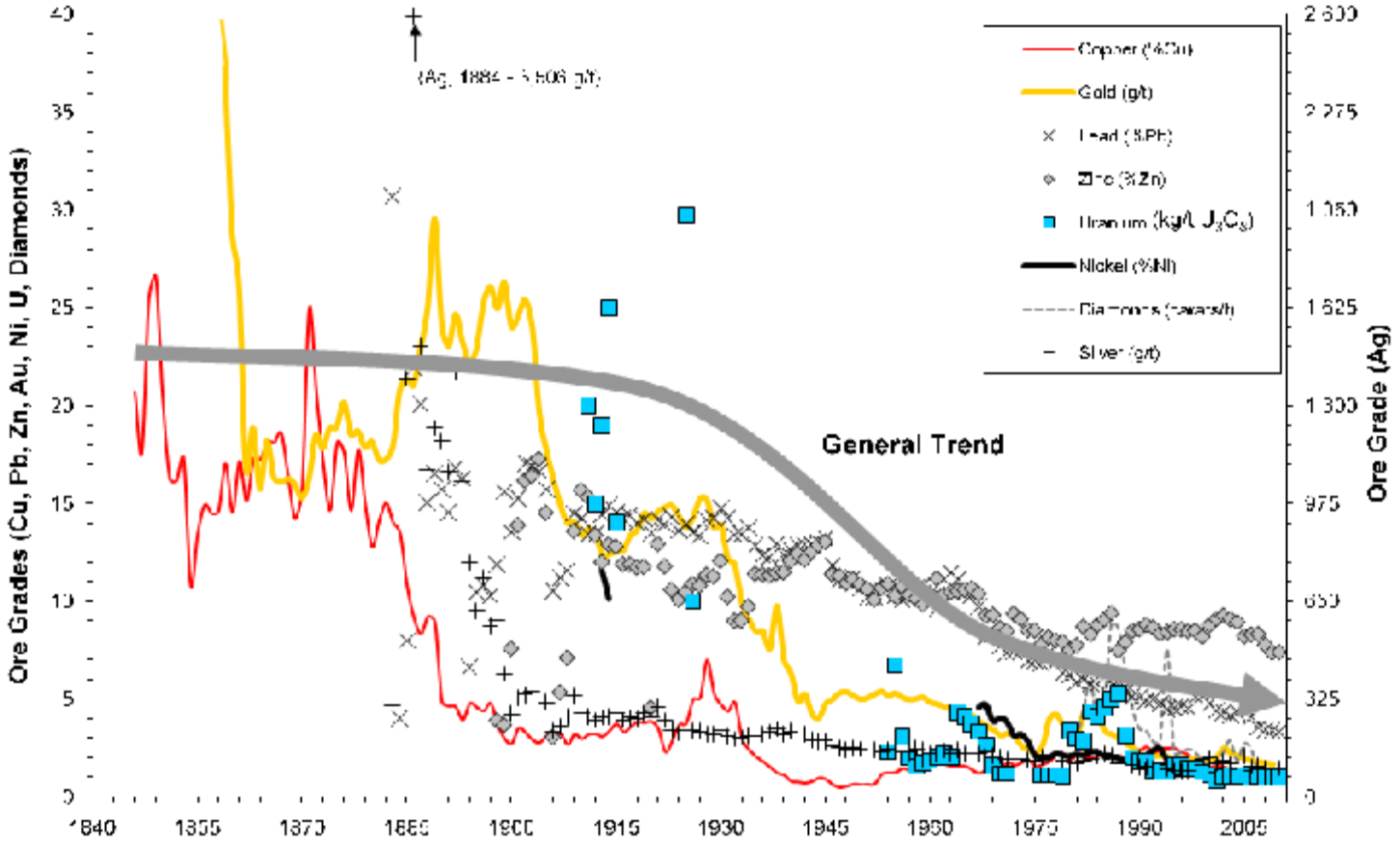
- Global energy demand is predicted to continue to increase strongly
- Some conventional resources, e.g., oil, are predicted to decline rapidly over coming decades
- Technologies already exist to replace declining resources
- Some of these replacements come with their own environmental hazards, e.g., tar sands, shale oil
- Risk of interruption of supply is probably a greater risk

The availability of technology to replace depleting conventional energy sources probably means we are not in immediate danger of exceeding sustainable global energy demand

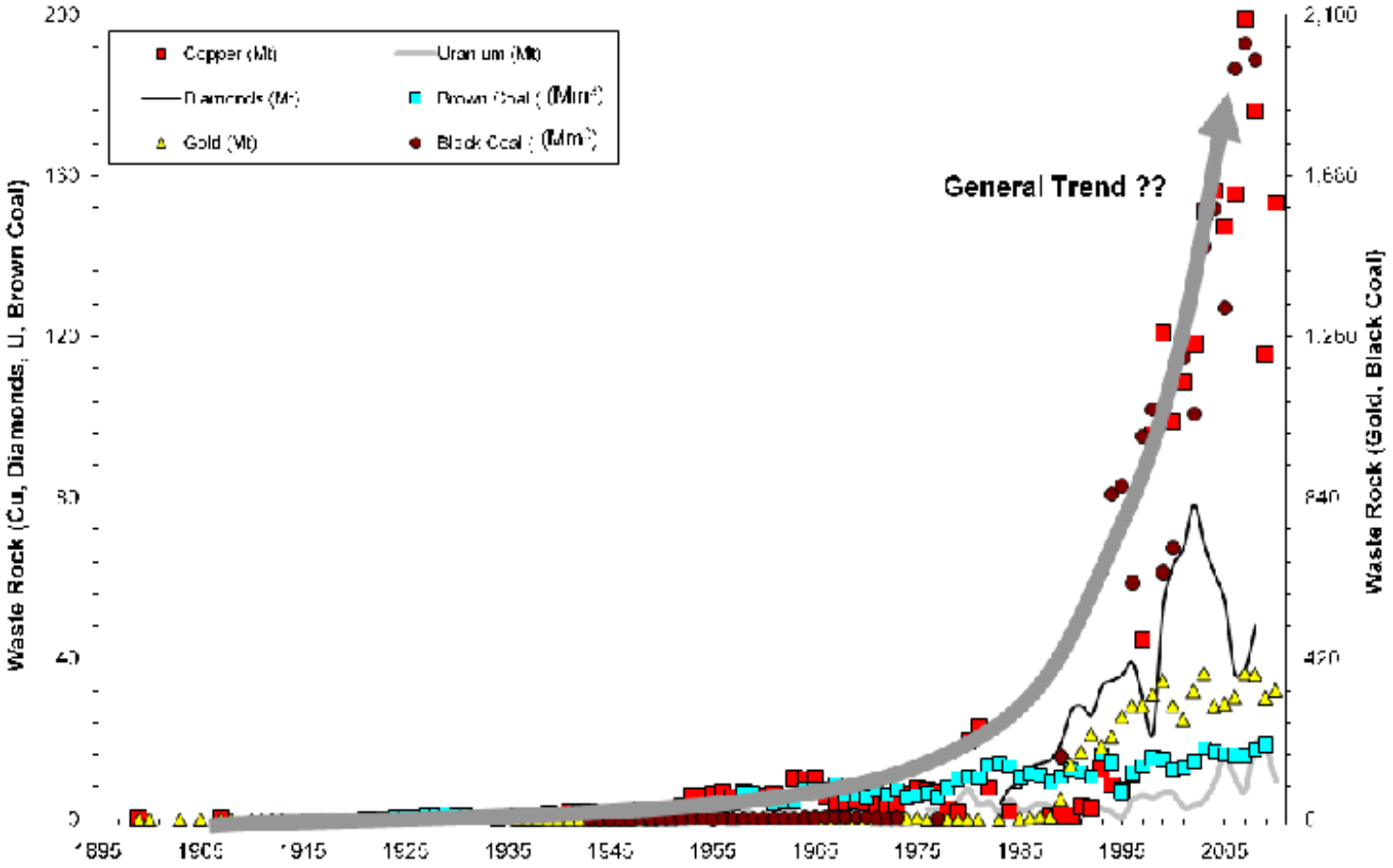
Natural systems – ore and mineral grades links



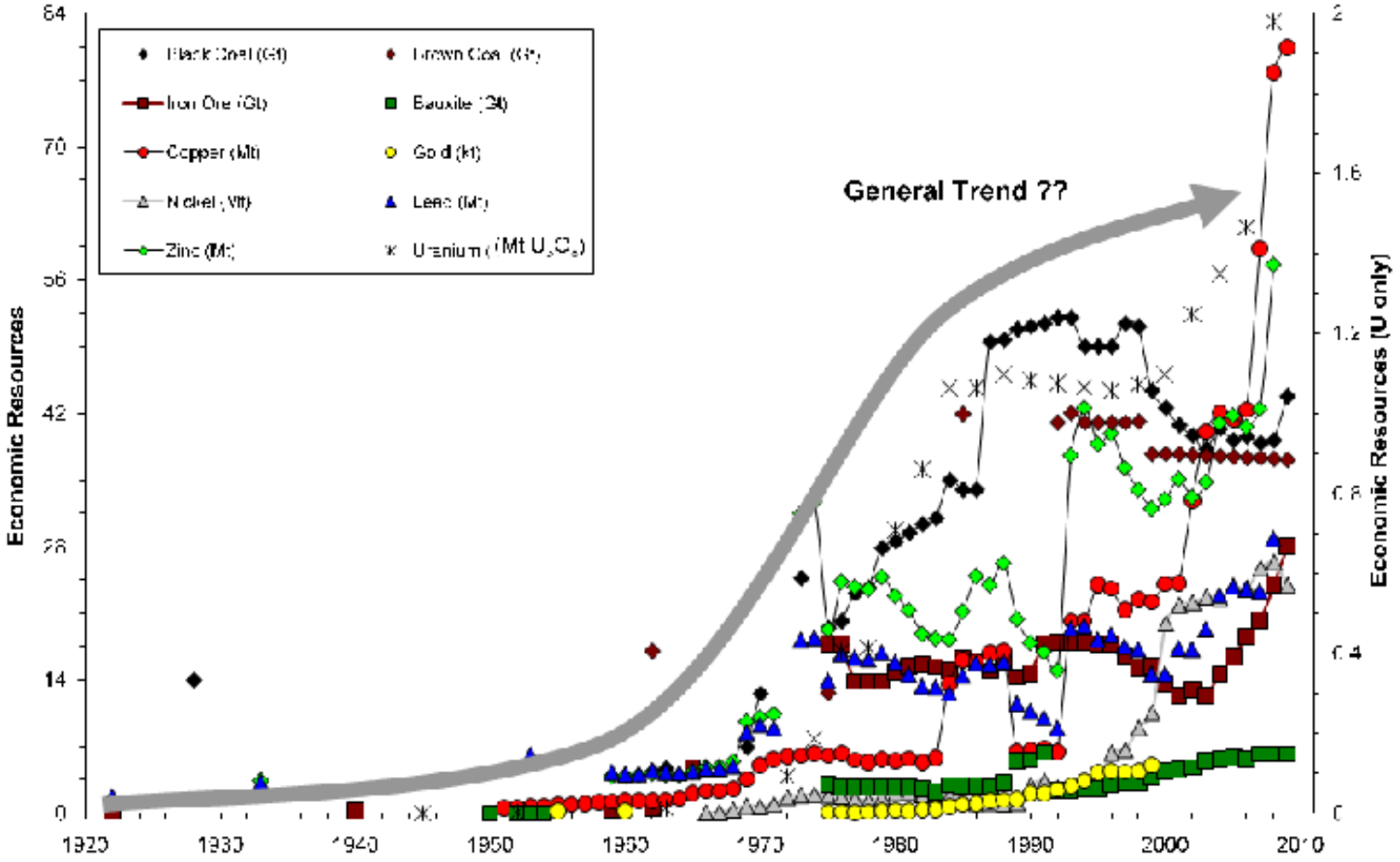
Natural systems – ore and mineral grades links



Natural systems – ore and mineral grades links



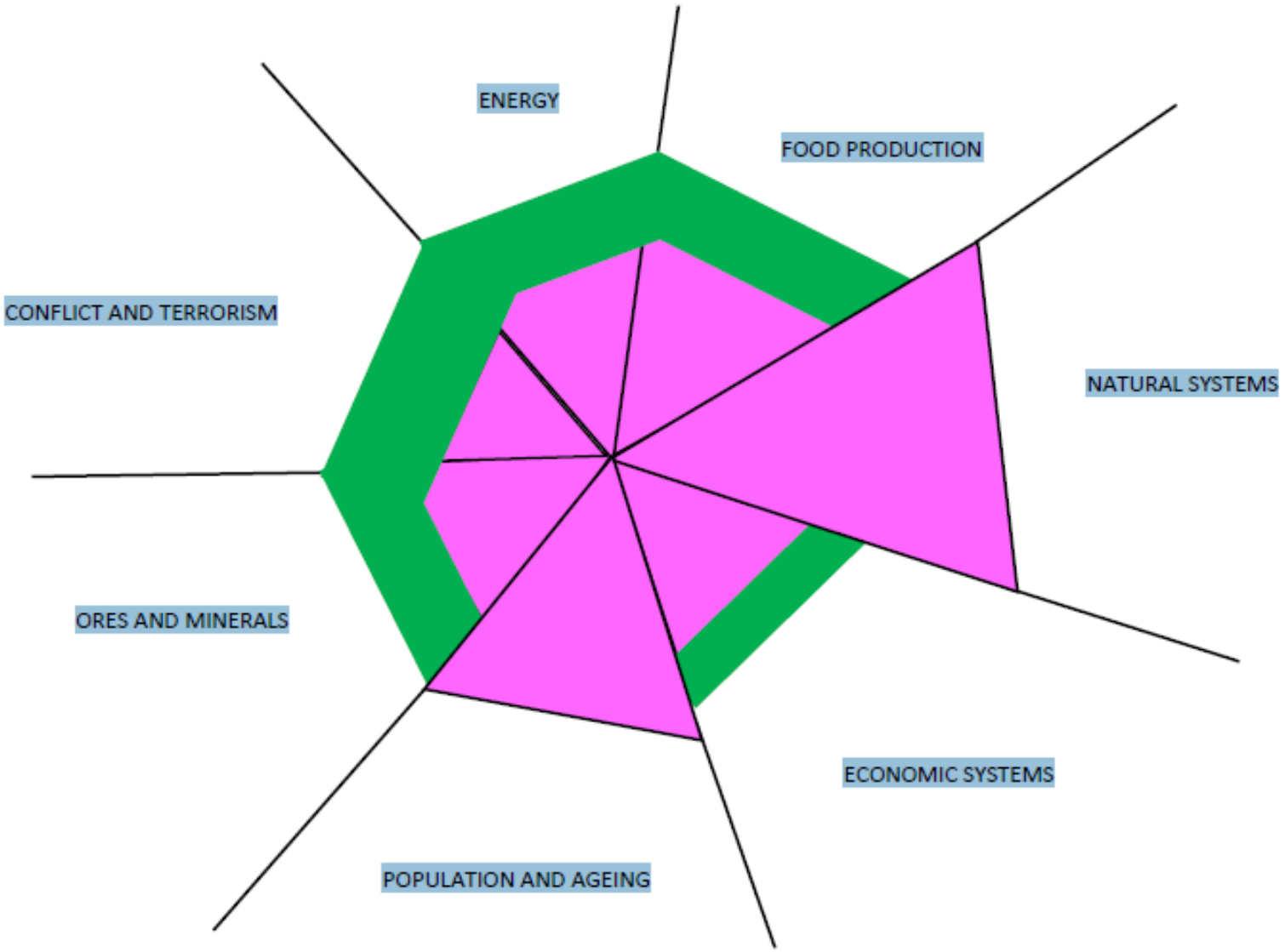
Natural systems – ore and mineral grades links



Natural systems – ore and mineral grades links

- The quantity of ores and minerals required by the global economy is increasing rapidly
- The costs of obtaining ores and minerals is also increasing rapidly
- The quality or grade of ores and minerals being extracted is decreasing rapidly as stock are depleted
- The increasing mining of ores and minerals is causing increasing levels of environmental degradation
- Increasing frequency of extreme weather and climate events will impact on the mining industry

Increasing costs and levels of waste generated will probably curtail mining activity before actual shortages, but to date sustainability boundary has not been reached.


ENERGY
FOOD PRODUCTION
NATURAL SYSTEMS
ECONOMIC SYSTEMS
POPULATION AND AGEING
ORES AND MINERALS
CONFLICT AND TERRORISM

The end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