Biodiversity for Food and Agriculture:
Value of Comprehensive Assessments

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based on my experience as:
Chair of the negotiations, and current Vice-chair for the Intergovernmental Panel for Biodiversity and Ecosystem Services
Co-chair of the UK National Ecosystem Assessment
Director of the International Assessment of Agricultural Science and Technology for Development
Board co-chair of the Millennium Ecosystem Assessment
Former Chair Intergovernmental Panel on Climate Change
Chair of the Global Biodiversity Assessment

UN Food and Agriculture Organization
13th April, 2013

Sound Science into Sound Policy and Decision-Making

Good Science is Essential for Informed Public Policy and Decision-making but not sufficient

Comprehensive natural and social scientific programs at the national level are essential - multi-disciplinary science is critical – many developing countries lack capacity

Coordination and integration of international scientific programs is essential, i.e., WCRP, IGBP, IHDP, Diversitas and their joint programs into Future Earth – co-designed, co-delivered and co-communicated with relevant stakeholders

Demand-driven multidisciplinary national regional, and global scientific, technical and economic assessments, involving all relevant stakeholders (governments, UN organizations, private sector, NGOs, media and civil society), are essential – best experts from all stakeholder groups must be involved – lack of data in many countries

Indigenous knowledge needs to be integrated with "modern scientific knowledge"

Recognize that decision-makers need a consensus view in a digestible form of the evidence, including what is known, unknown and uncertainties, and what the policy implications of uncertainties are

Criteria for a Successful Assessment

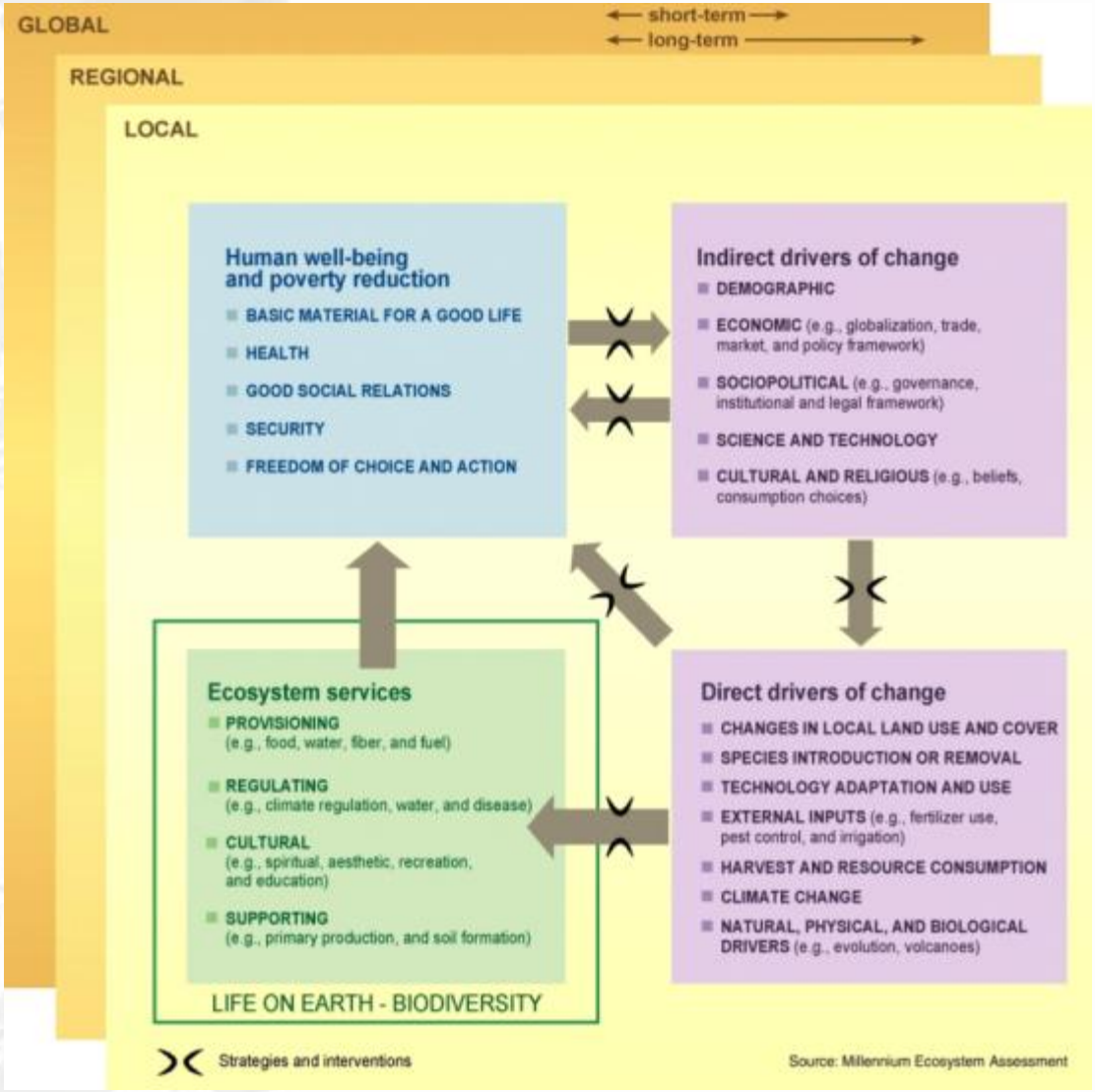
An assessment should provide a critical evaluation of information for purposes of guiding decisions on complex public issues

- Assessments should be co-designed with relevant stakeholders/users
- Conducted using an open, transparent, representative and legitimate process, with well defined principles and procedures
- Assessments should be evidence-based, policy/decision relevant, but not prescriptive – can be an issue with topics such as GMOs, trade, Access and Benefit Sharing
- Assessments should be conducted by credible experts with a broad range of disciplinary and geographical experience.
- Assessments should *reduce* complexity but *add value* by summarisation, synthesis and assessing what is known and widely accepted from what is unknown or controversial

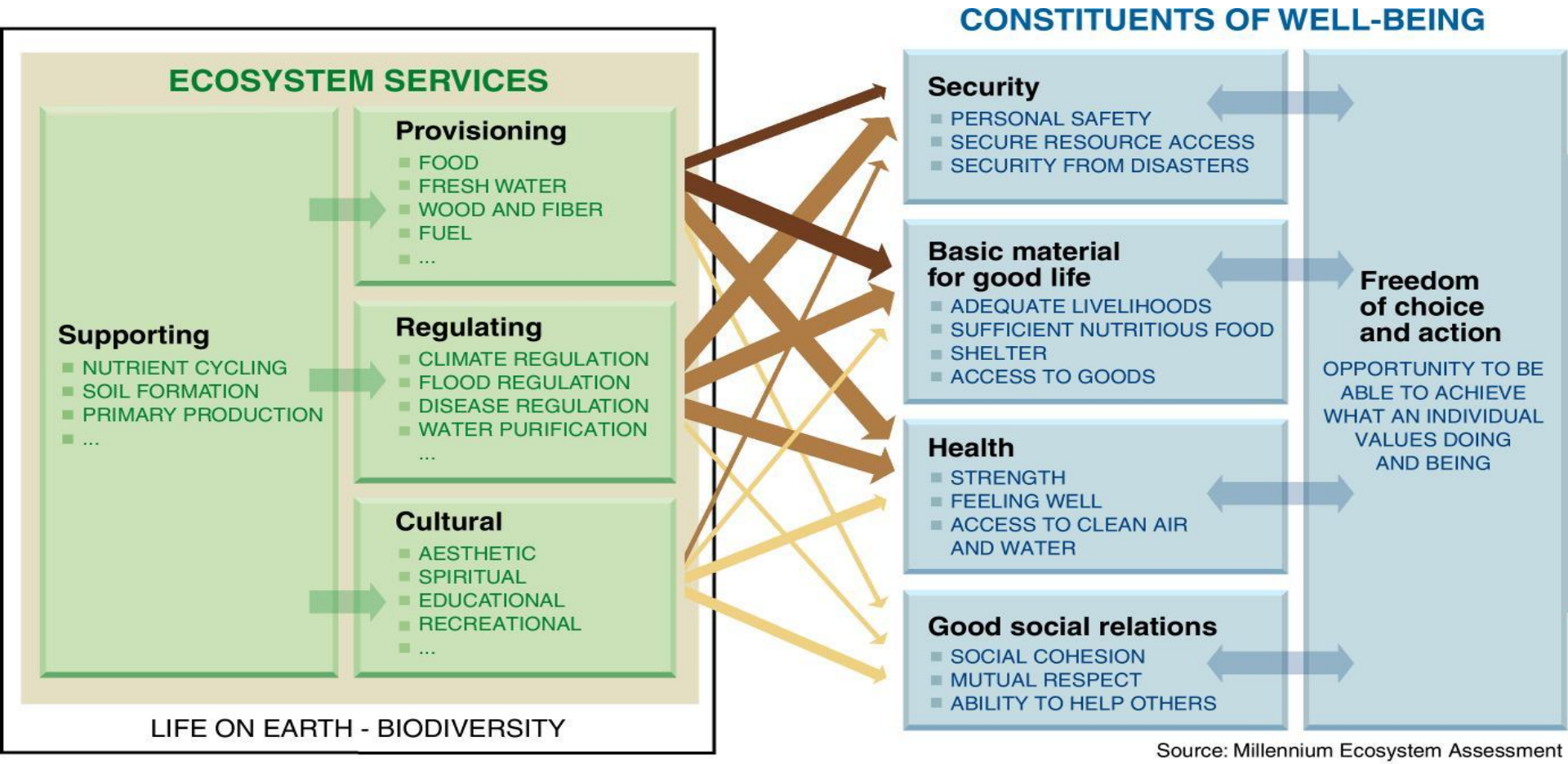
Criteria for a Successful Assessment

- A conceptual framework is required that encompasses spatial and temporal scales (historical and forward-looking using plausible futures), embeds different knowledge systems, and links drivers of change to environmental issues to the different dimensions of human well-being (e.g., linking human activities to biodiversity to ecosystem services to food security)
- Open and transparent selection process for authors and review editors, with geographic, intellectual and gender balance
- Peer-reviewed by all relevant stakeholders
- Acceptance and approval processes must be well-defined, as must procedures to deal with controversial issues and areas of disagreement
- Outreach-communications/engagement strategy - starting at the beginning of the process
- A reader-friendly Summary for Decision-makers and Synthesis

Millennium Ecosystem Assessment (MA) framework



Consequences of Ecosystem Change for Human Well-being and Development



Source: Millennium Ecosystem Assessment

ARROW'S COLOR
Potential for mediation by socioeconomic factors

- Low
- Medium
- High

ARROW'S WIDTH
Intensity of linkages between ecosystem services and human well-being

- Weak
- Medium
- Strong

Conceptual Framework of the UK National Ecosystem Assessment

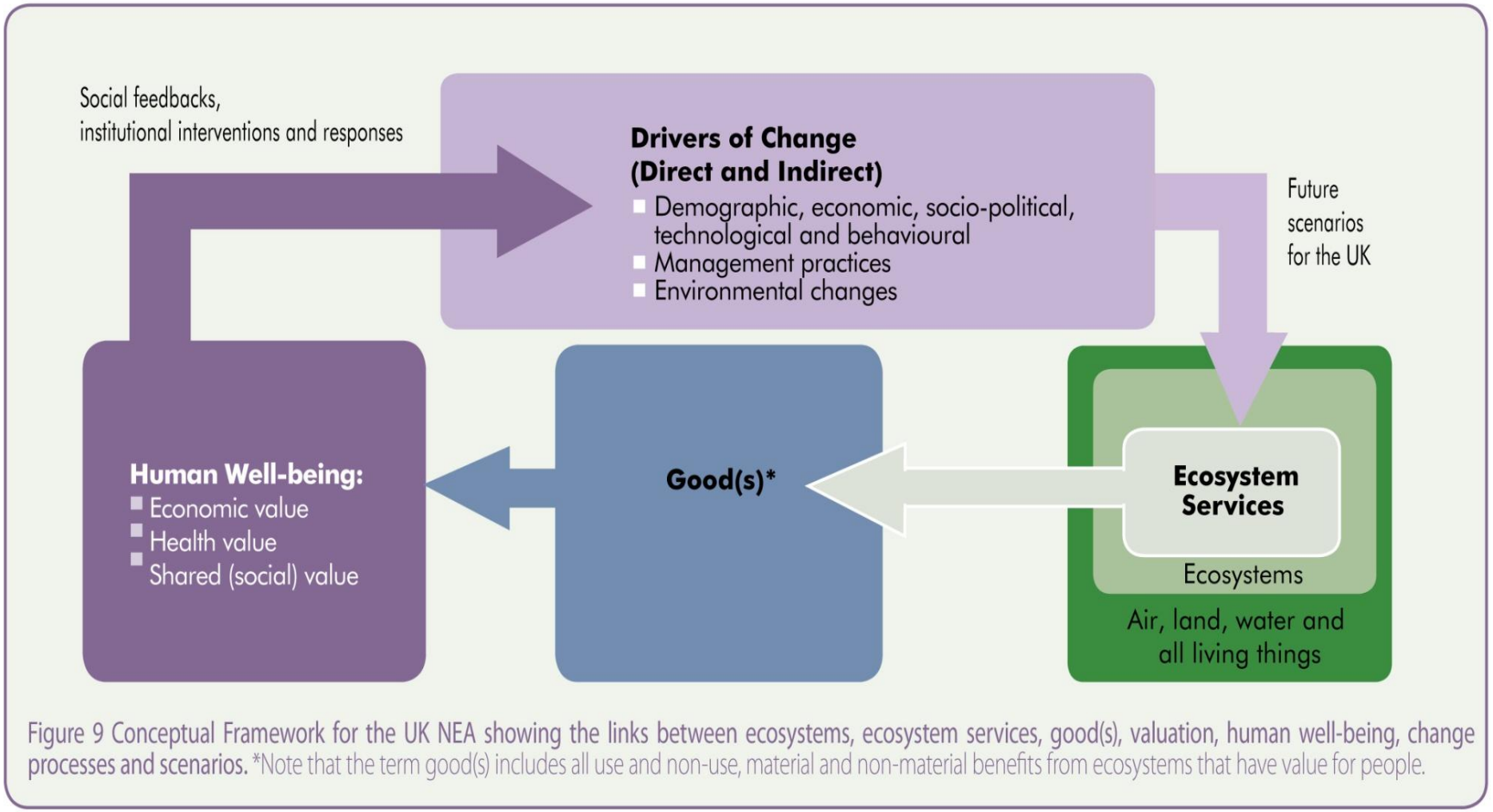


Figure 9 Conceptual Framework for the UK NEA showing the links between ecosystems, ecosystem services, good(s), valuation, human well-being, change processes and scenarios. *Note that the term good(s) includes all use and non-use, material and non-material benefits from ecosystems that have value for people.

Conceptual Framework for Valuing Ecosystem Services

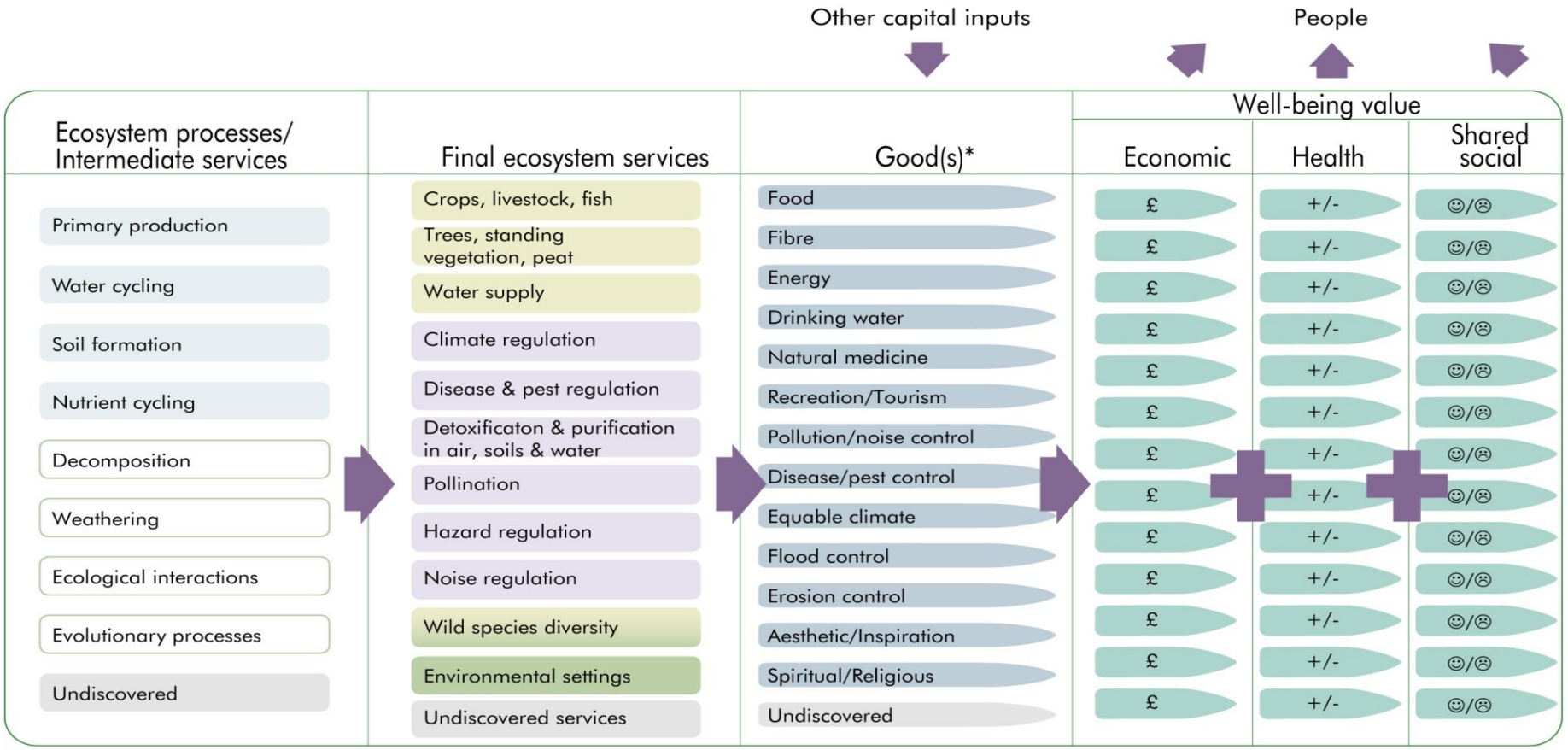


Figure 10 The full set of ecosystem processes, services, goods/benefits and values used in the UK NEA. Note that some ecosystem services can be both intermediate and final services. For simplicity, in this figure, services are shown only in the most final position that they occupy. Services such as pollination and climate regulation that also play important roles further back in the chain are not represented here. Cells with no colour are ecosystem processes/services that were not in the Millennium Ecosystem Assessment classification. *Note that the term good(s) includes all use and non-use, material and non-material outputs from ecosystems that have value for people. Source: adapted from Fisher *et al.* (2008).

Implications of UK NEA Storyline on Ecosystem Services

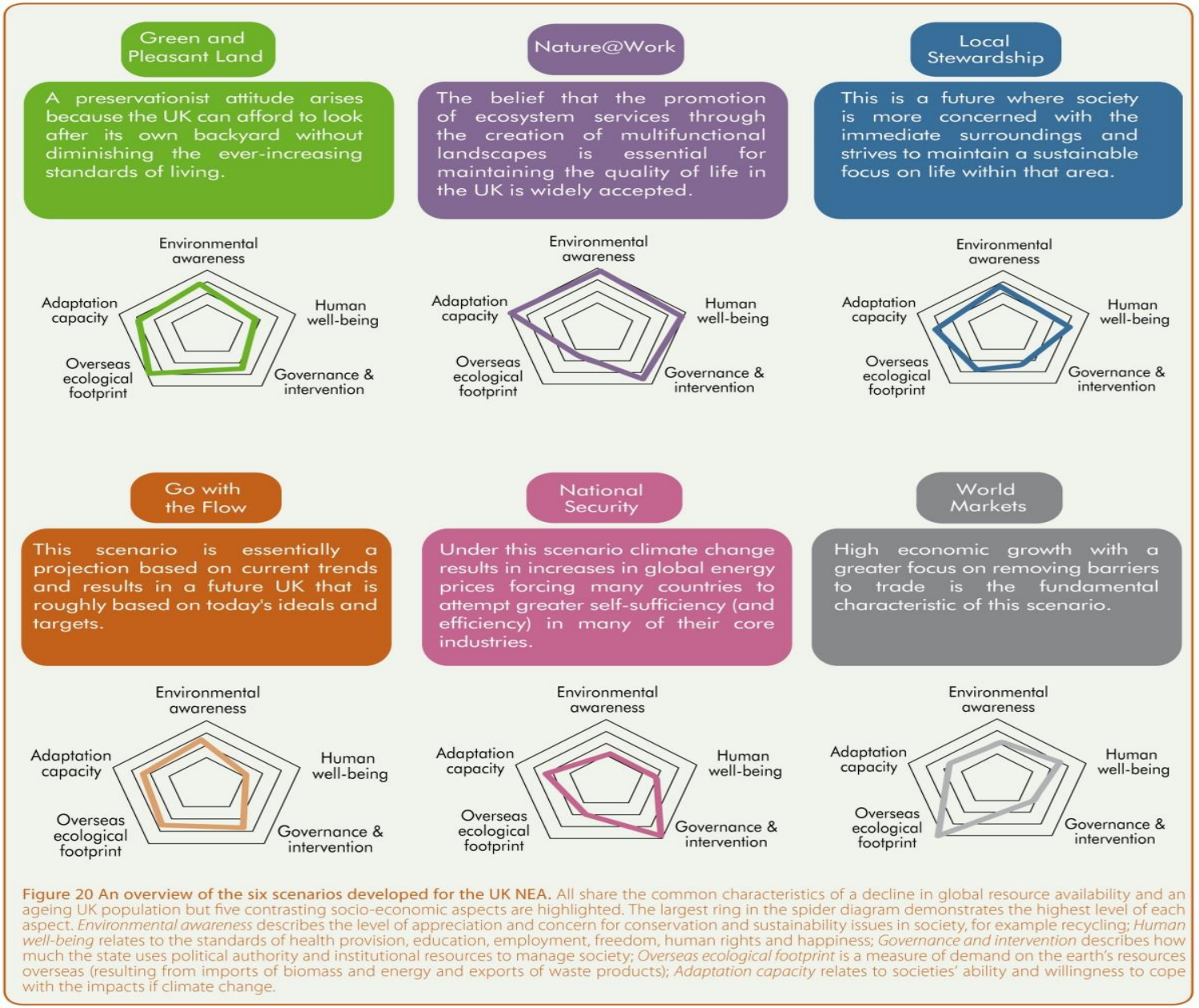


Figure 20 An overview of the six scenarios developed for the UK NEA. All share the common characteristics of a decline in global resource availability and an ageing UK population but five contrasting socio-economic aspects are highlighted. The largest ring in the spider diagram demonstrates the highest level of each aspect. *Environmental awareness* describes the level of appreciation and concern for conservation and sustainability issues in society, for example recycling; *Human well-being* relates to the standards of health provision, education, employment, freedom, human rights and happiness; *Governance and intervention* describes how much the state uses political authority and institutional resources to manage society; *Overseas ecological footprint* is a measure of demand on the earth's resources overseas (resulting from imports of biomass and energy and exports of waste products); *Adaptation capacity* relates to societies' ability and willingness to cope with the impacts if climate change.

International Assessments

- International Ozone Assessments (1981-present)
- Global Biodiversity Assessment (1993-1995)
- UNEP Global Environmental Outlook (1997- present)
- International Panel on Climate Change (1988-present)
- International Assessment of Agricultural Science and Technology for Development (2004-2008)
- Millennium Ecosystem Assessment (2001-2005)
- Global Energy Assessment (2007 – 2012)
- The Economics Ecosystems and Biodiversity
- Intergovernmental Panel on Biodiversity and Ecosystem Services (2013 – present)

International Assessments

- **International Ozone Assessments (1981-present)**
  - inter-governmental - governments approve the broad scope of the assessment
  - expert peer-review
  - **highly influential on national and international policy formulation and implementation– all medium- and long-lived chlorine and bromine chemicals have been banned globally**
- **International Panel on Climate Change (1988-present)**
  - inter-governmental – governments approve the scope of each WG and Synthesis Report - input from NGOs and private sector
  - expert and government peer-review, government approval of the SPM
  - **influential on policy process – Convention and Kyoto Protocol - albeit limited in the US**

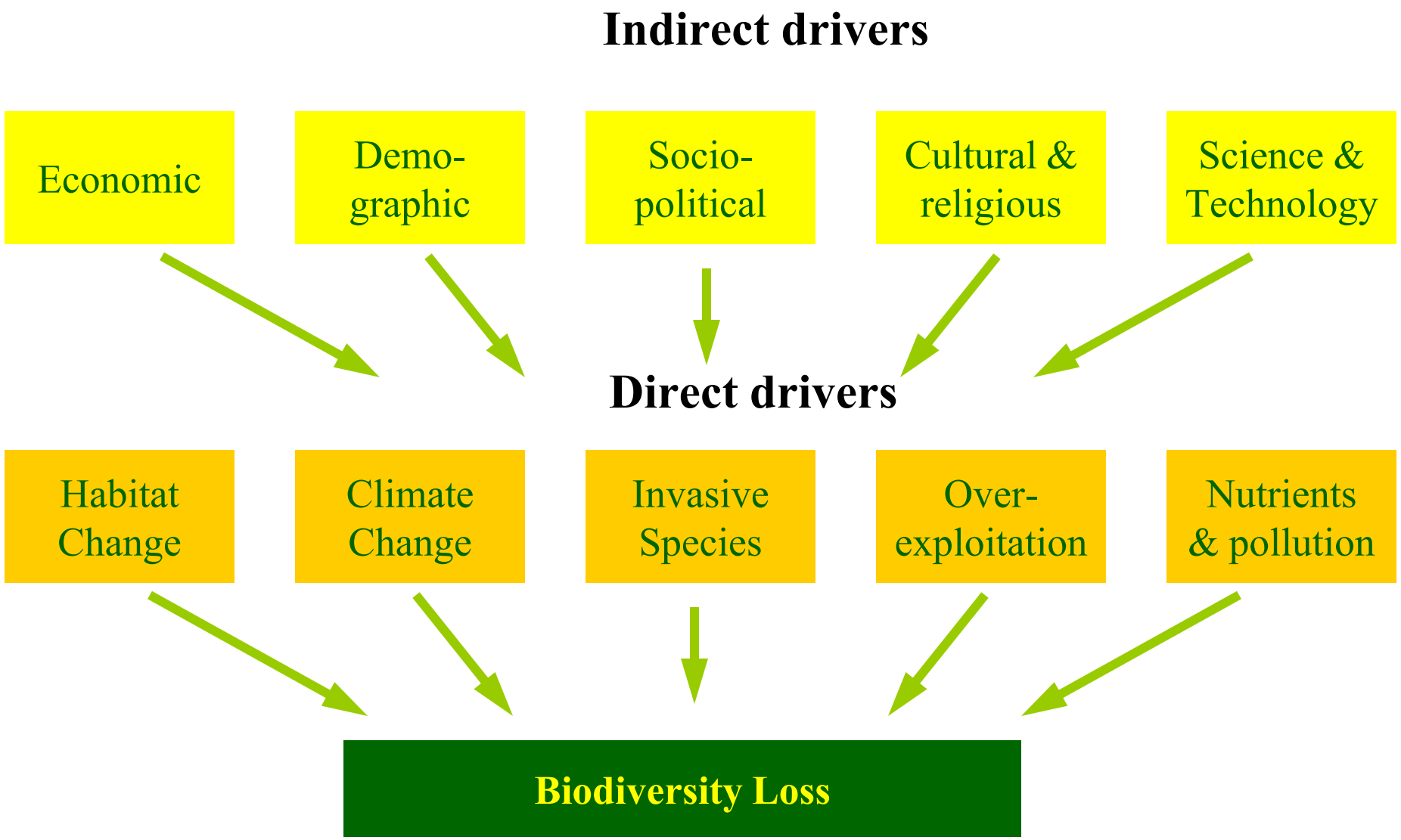
Ecosystem Assessments

- **Global Biodiversity Assessment (1993-1995)**
  - non-governmental
  - expert peer-review
  - **limited impact on international policy formulation – lacked the appropriate mandate -- supply-driven not demand driven**

- **Millennium Ecosystem Assessment (2001-2005)**
  - non-governmental, but tied to intergovernmental processes, e.g., CBD, CCD
  - broad range of stakeholders on the Board of Directors
  - expert and "informal" government rpeer-eview
  - multi-scale assessment: local to global
  - **Impact has been increasing by Conventions and governments (e.g., UK NEA) – IPBES follow-on**

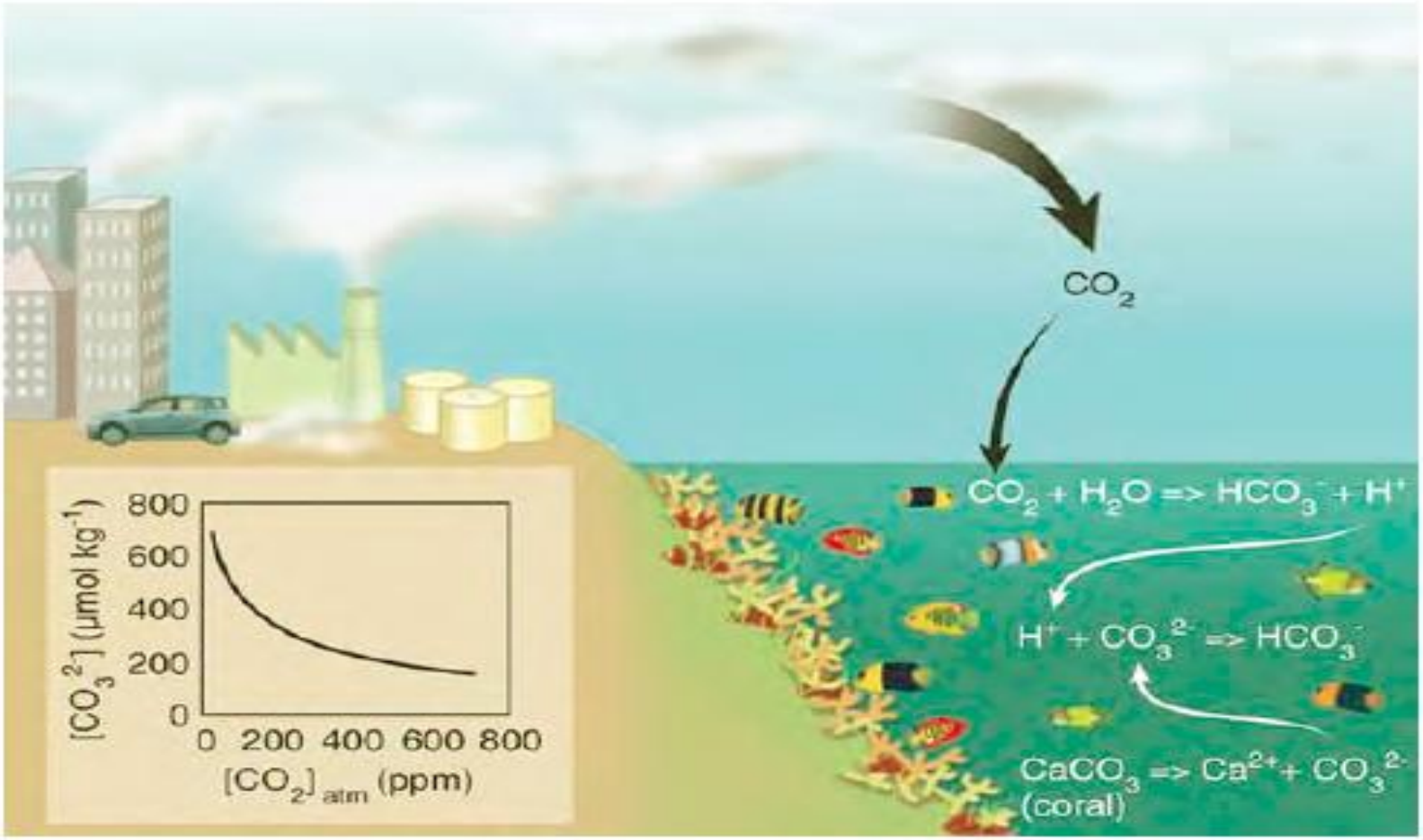
- **UK National Ecosystem Assessment (2009-2011)**
  - non-governmental
  - broad range of stakeholders on the Board
  - expert and government peer-review
  - multi-scale assessment: local to national
  - **Immediate impact on policy – the Natural Environment White Paper for England**

Drivers of Biodiversity Loss



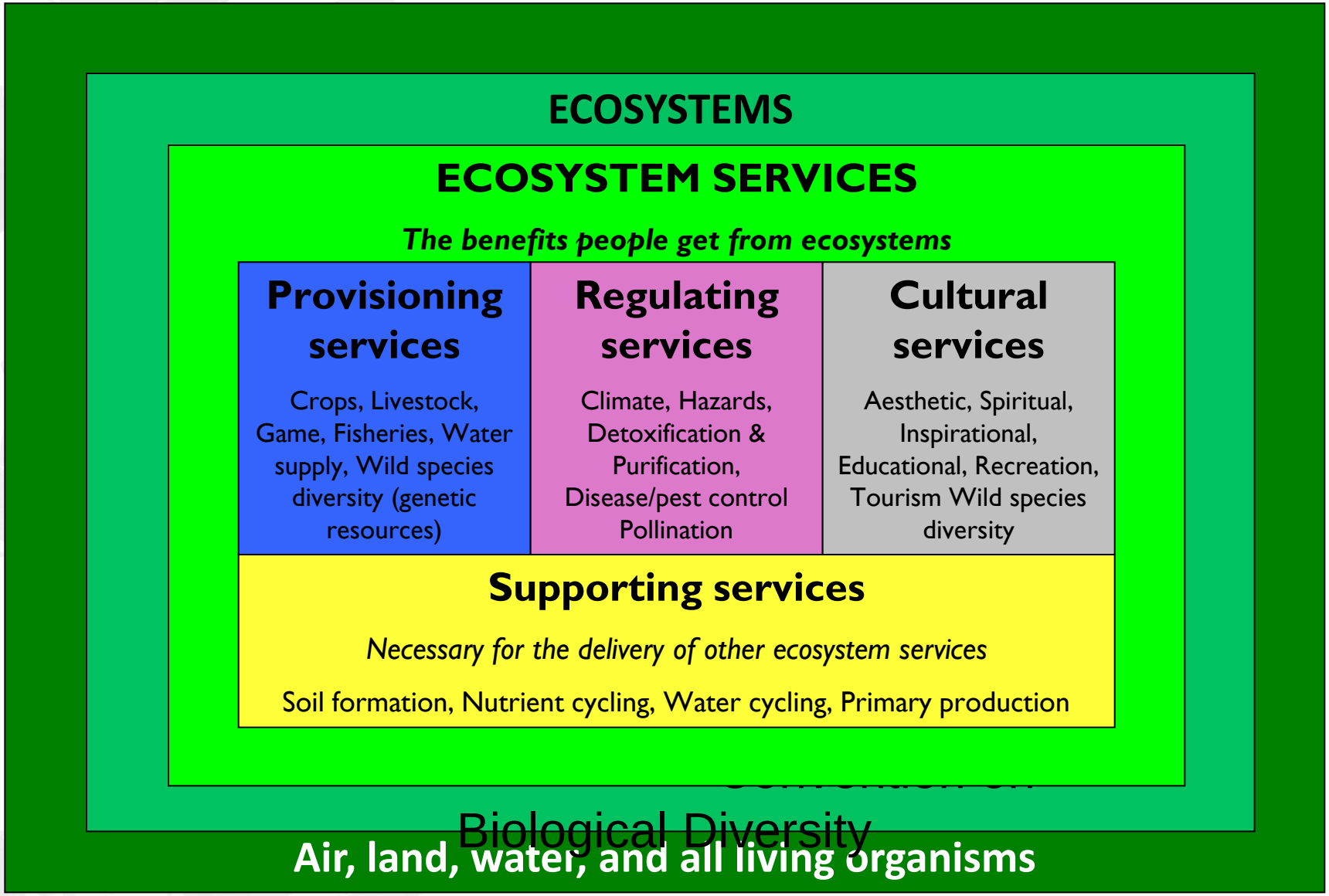
Ocean acidification

Figure 18. Linkages between the buildup of atmopsheric CO_2, the increase in ocean acidity and the decrease in carbonate ion concentration.



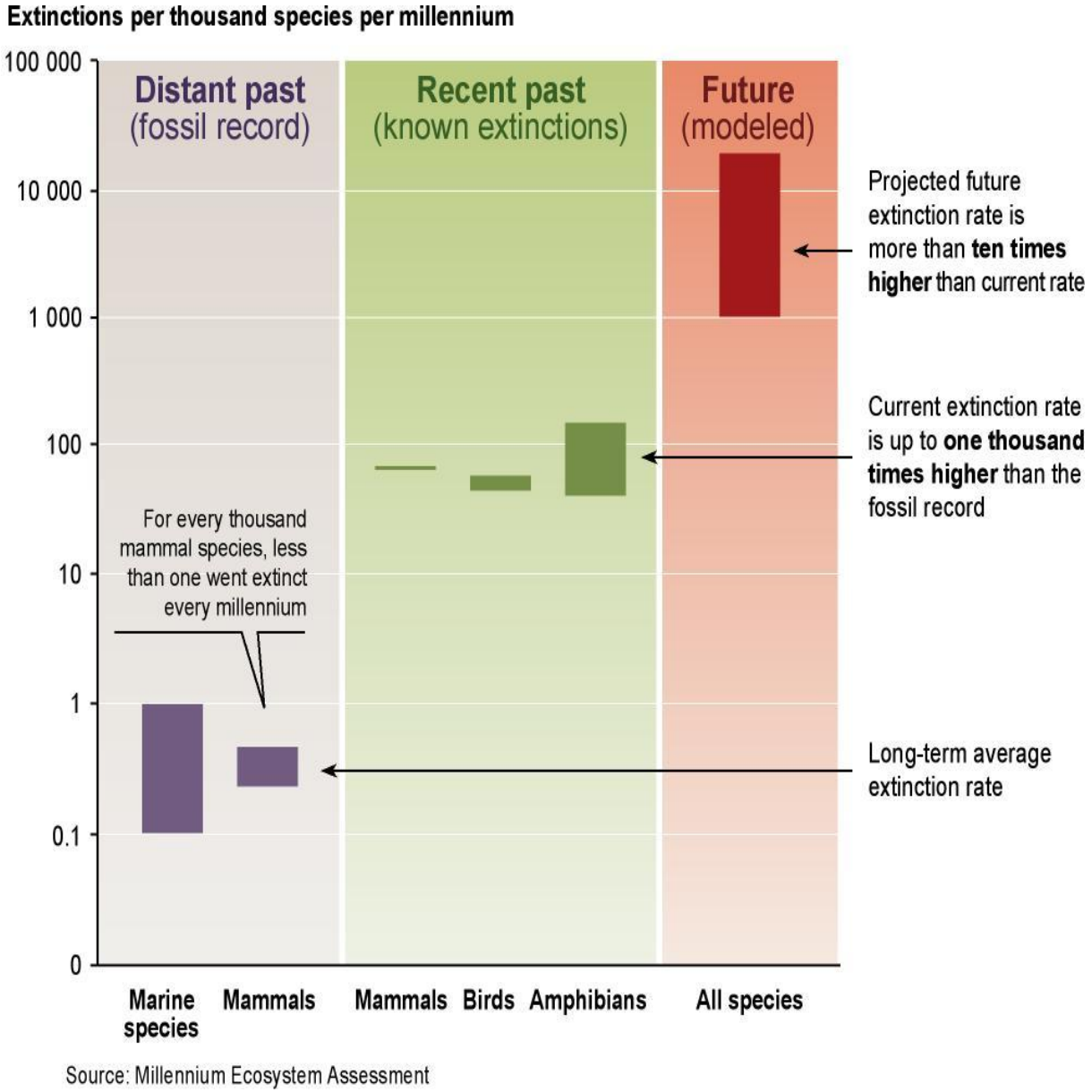
Approximately 25% of the CO_2 emitted by humans in the period 2000 to 2006 was taken up by the ocean where it combined with water to produce carbonic acid, which releases a proton that combines with a carbonate ion. This decreases the concentration of carbonate, making it unavailable to marine organisms that form calcium carbonate shells. (Source: Hoegh-Guldberg et al. 2007)

Ecosystem Services



Species extinctions

Human activities have taken the planet to the edge of a massive wave of species extinctions, further threatening our own well-being



Recent Major Agriculture Assessments

- **World Bank Development Report 2008: Agriculture for Development**
- **International Assessment of Agricultural Science and Technology for Development –** Agriculture at a Cross-Roads (2008)
- **Royal Society –** Reaping the Benefits (2009)
- **UK Go-Science /Foresight Report –** The Future of Food and Farming (2011)
- **Commission on Sustainable Agriculture and Climate Change –** Achieving Food Security in the Face of Climate Change (2011)

International Assessment of Agricultural Science and Technology for Development

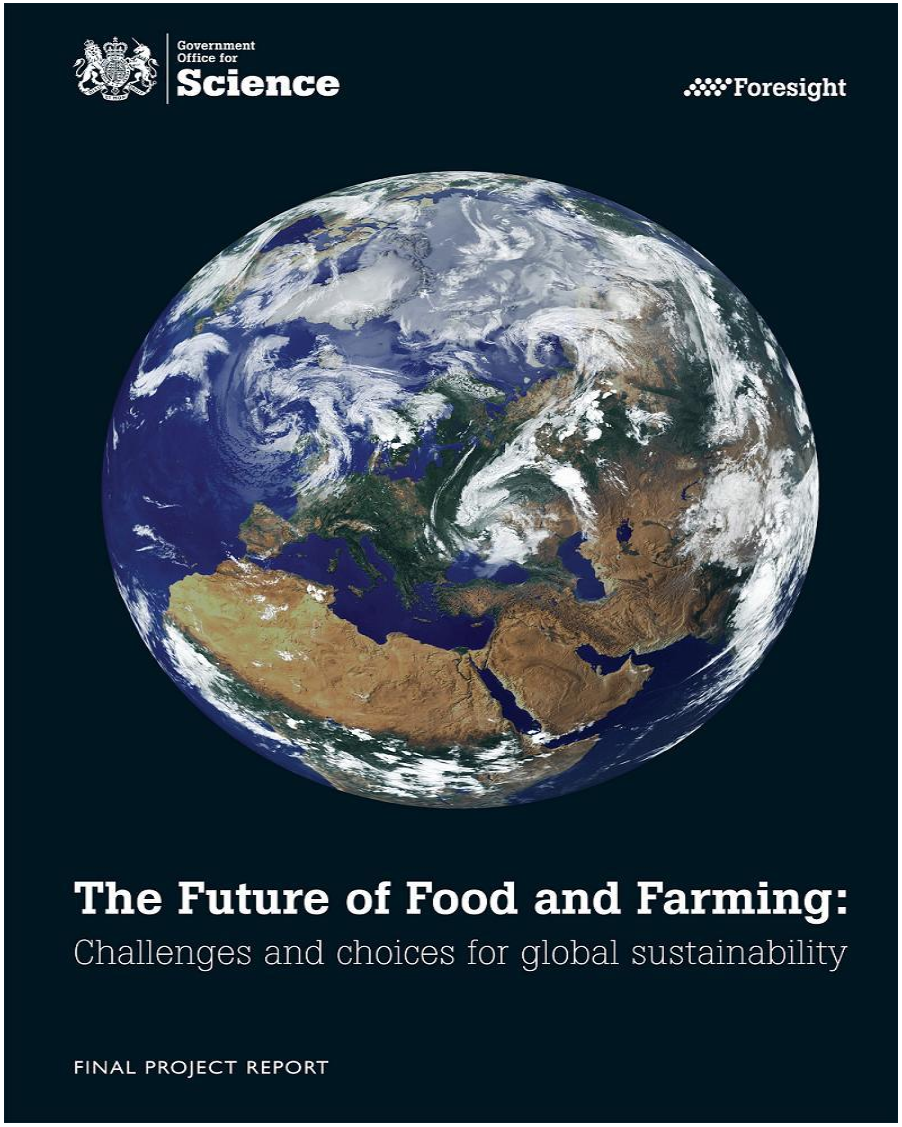
- Inter-governmental, but with a multi-stakeholder Bureau (governments, private sector, NGOs, producers, consumers and international organizations) – a unique governance structure
- Sponsored by 7 international agencies (WB, FAO, UNEP, UNDP, UNESCO, WHO and GEF), plus governments and private sector
- Expert and government review
- Plenary approved the scope, the Summaries for decision-Makers and the Synthesis Report
- Multi-thematic, multi-temporal, multi-scale (global and five sub-global assessments)

Influenced thinking on sustainable agriculture and the role of small-holder farmers, BUT no single body demanded the report

IAASTD Key Messages

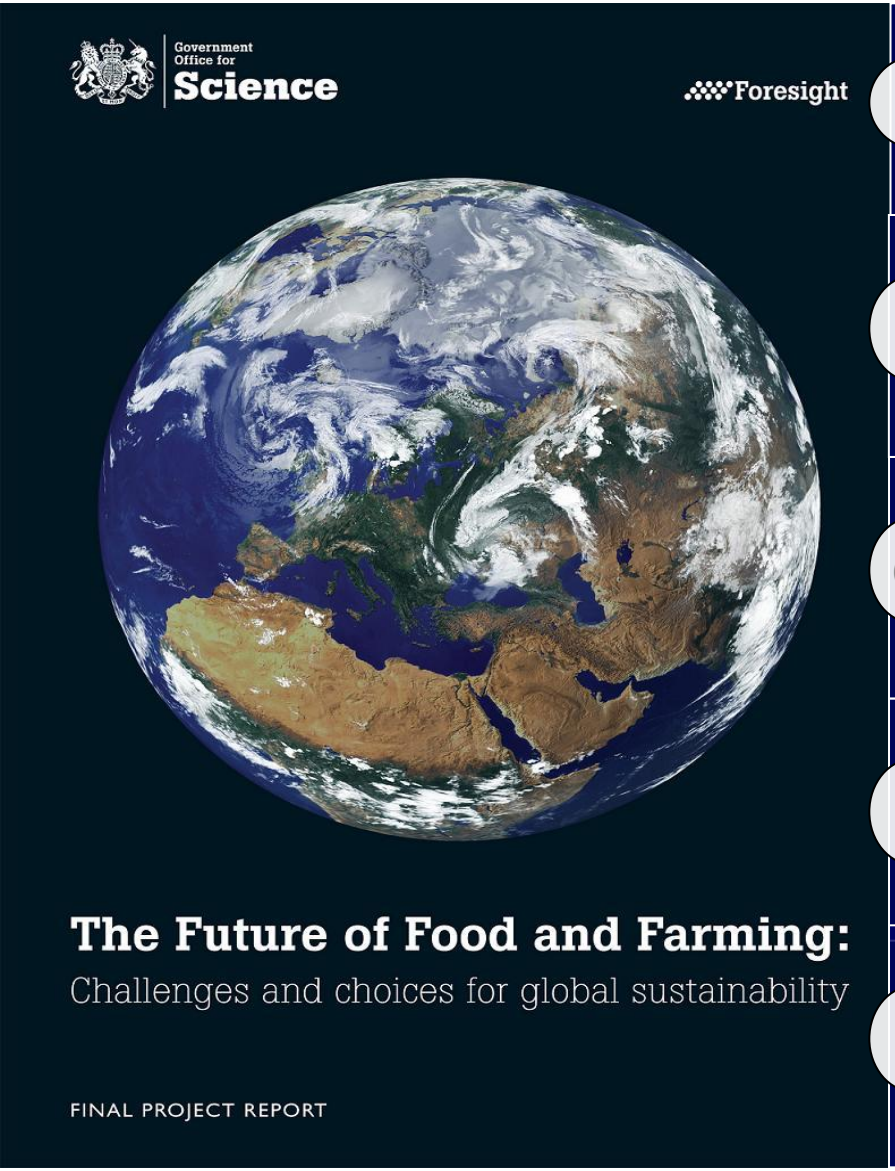
- Embed economic, environmental and social sustainability into agricultural policies, practices and technologies
- Address today's hunger problems with appropriate use of current technologies, emphasizing agro-ecological practices (e.g., no/low till, IPM and INRM), coupled with decreased post-harvest losses
- Advanced biotechnologies may be needed to address future demands for increased productivity and emerging issues such as climate change and new plant and animal pests – but the risks and benefits must be fully understood
- Provide payments to the farmer for maintaining and enhancing ecosystem services
- Reform international trade, e.g., eliminate OECD production subsidies, eliminate tariff escalation on processed products, recognize the special needs of the least developed countries through non-reciprocal market access
- Increase public and private sector investment in research and development, extension services, and weather and market information

UK Go-Science: Future of Food and Farming



- Radical redesign of the global food system
- "No action/change" is not an option
- Policies and decisions <u>outside</u> of the food system also critical, e.g., climate policies and biodiversity

UK-Go-Science: Five Challenges



A. **Balancing future demand and supply sustainably**

B. **Addressing the threat of future volatility in the food system**

C. **Ending Hunger**

D. **Meeting the challenges of a low emissions world**

E. **Maintaining biodiversity and ecosystem services while feeding the world**

Commission on Sustainable Agriculture and Climate Change

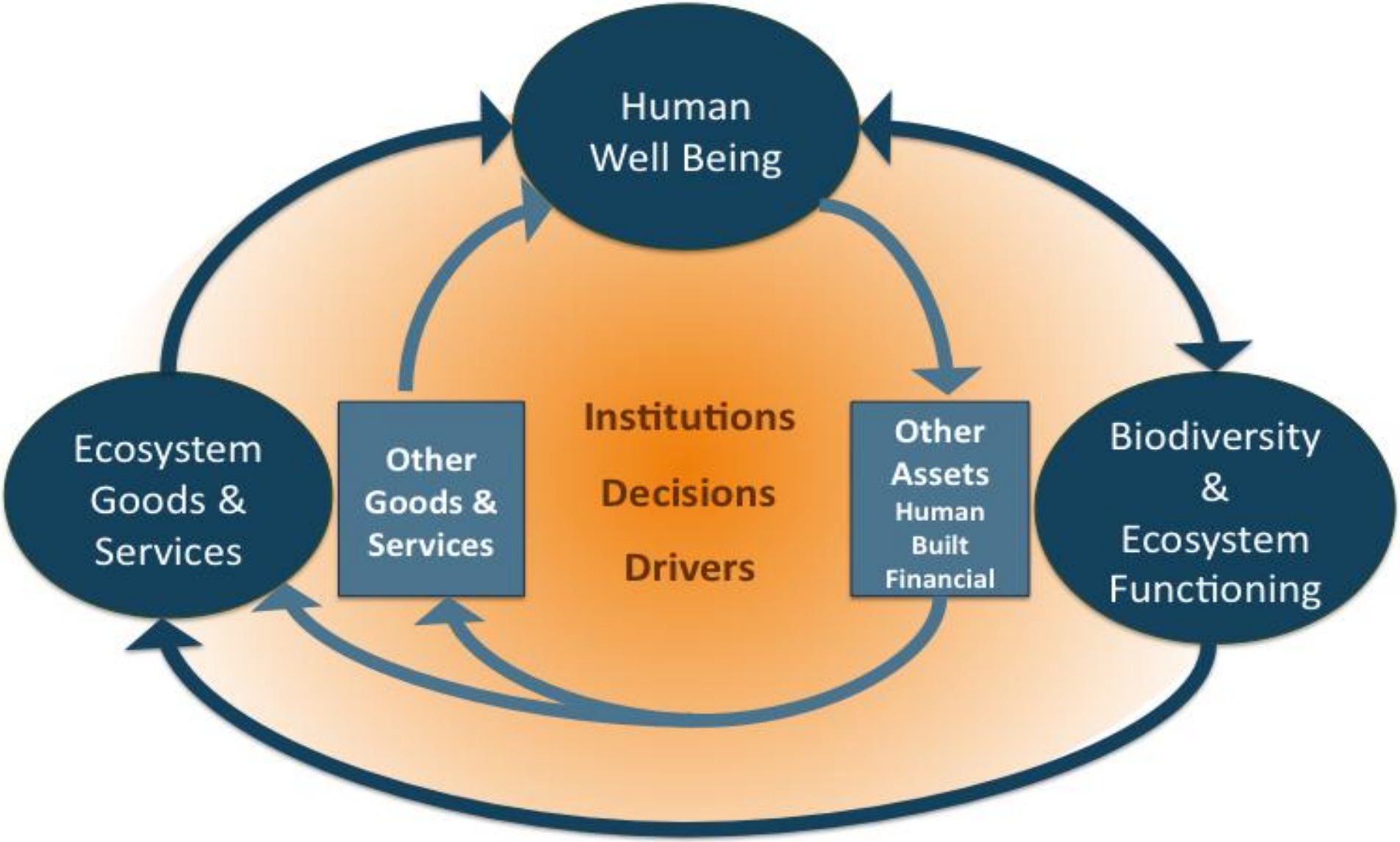
- Integrate food security and sustainable agriculture into global and national policies
- Significantly raise the level of global investment in sustainable agriculture and food systems in the next decade
- Sustainably intensify agricultural production while reducing GHG emissions and other negative environmental impacts of agriculture
- Develop specific programs and policies to assist populations and sectors that are most vulnerable to climate changes and food insecurity
- Reshape food access and consumption patterns to ensure basic nutritional needs are met and to foster healthy and sustainable eating patterns worldwide
- Reduce loss and waste in food systems, targeting infrastructure, farming practices, processing, distribution and household habits
- Create comprehensive, shared, integrated information systems that encompass human and ecological dimensions

Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES)

- An intergovernmental process
- Four main functions
  - Assessments (global, regional, sub-regional and thematic)
  - Research (stimulate not fund)
  - Capacity-building
  - Policy-relevant tools
- Governance and management structures largely established
- Co-sponsored by UNEP, UNDP, UNESCO and FAO
- Endorsed by UN General Assembly in December 2010
- Established in Panama in April 2012

- Issues remaining include:
  - Detailed work program has yet to be established
  - EU membership
  - Rules of Procedure to be completed
  - UN-Body or Non-UN Body

Potential IPBES Conceptual Framework



IPBES Inter-sessional Work Program

- Work programme 2014-2018
- Receiving and prioritizing requests put to the platform
- Knowledge systems
- Conceptual framework
- Scoping process
- Procedures relating to reports and deliverables
- Potential future regional structure and composition of the Multidisciplinary Expert Panel
- Stakeholder engagement strategy
- Possible strategic partnerships

Potential IPBES Assessment Activities

- Regular multidisciplinary assessments at regional (including sub-regional) and global scales.
- Thematic assessments on policy relevant issues, including emerging issues
- Technical support and capacity building for national assessment activities
- Developing common frameworks and tools for assessment
- Catalogue of assessments
- Produce and disseminate reports – but the assessment process also important!

An Electronic Web-based Assessment Process

- There is a need for a web-based multi-disciplinary knowledge assessment system, which critically reviews and synthesizes new knowledge with previous information in as close to real time as possible, to produce information needed to strengthen the science-policy interface and implement sustainable development, nationally, regionally and globally

- The system should be an integrated web-based assessment process that is spatially explicit (global, regional and sub-regional level and, where possible, national level), recognizing and assessing the inter-linkages among the development issues (e.g., food and water security) and regional and global environmental issues

- The concept of a web-based electronic assessment process would for the first time truly integrate and assess the implications of climate change, loss of biodiversity/ecosystem services, land degradation, and air quality on issues such as poverty eradication, food, water, energy and human security

An Electronic Web-based Assessment Process

- It should an inter-disciplinary assessment, embracing, *inter-alia,* the range of issues covered by the IPCC, MA, IPBES, IAASTD, TEEB, the Global energy assessment, and UNEP's GEO focussing on the inter-linkages - the proposed system would not duplicate established assessment processes, but would complement and assist them in being more efficient, effective and synthetic.

- Peer reviewed and grey literature on all aspects of poverty alleviation, human well-being, food, water, energy, materials and human security, climate change, biodiversity loss and ecosystem degradation, land and water degradation, and air quality would be up-loaded into a web-based system, critically reviewed and synthesized with previous information in as close to real time as possible.

- New information would be up-loaded in near real time, and critically assessed and synthesized in the context of previous information every 12-18 months, which is much more frequent than other assessment processes which have a cycle time of between 5 and 10 years.

An Electronic Web-based Assessment Process

- Users would need to be engaged in co-designing a user-friendly system, including decision-makers in government, private sector, non-governmental organizations and civil society.

- The proposed system could also provide the basis for developing the science priorities for the multi-disciplinary international research program: Future Earth.

- The proposed system would provide decision-makers with easy access to a “one-stop shop” of crucial relevant peer-reviewed and synthesized information in all UN languages and will address the fundamental disconnect between the scientists, Governments, the private sector and public.

- The assessment and synthesis could use a conceptual framework comparable to that suggested for Future Earth, which inter-links the drivers of change (direct and indirect), with environmental issues and human well-being.

- The system would need to operate under a credible and legitimate authorizing environment.

Conclusions

- Biodiversity (genetic, species and landscape level) and ecosystem services (provisioning, regulating, cultural and supporting) are being lost due to human activities, i.e., habitat conversion, over-exploitation, pollution, introductions and climate change

- Agricultural production and hence food security are being undermined due to the loss of biodiversity (loss of genetic diversity and wild relatives) and ecosystem services (food production, pollination, and water resources)

- Loss of biodiversity and climate change are highly inter-linked and both undermine agricultural productivity and should be addressed together

- Fisheries are being affected by climate change and ocean acidification, in addition to over-fishing,

- IPBES could address the implications of the loss of biodiversity and degradation of ecosystem services on agricultural productivity, but unlikely to address the broader issues of food security, which encompasses issues of trade, rural development, gender, education, and risks and benefits of advances in S&T (genomics and GM technologies)