германия
кызматташтыгы
DEUTSCHE ZUSAMMENARBEIT

Аткаруучу:
giz

ELD
THE ECONOMICS OF LAND DEGRADATION
A Global Initiative for Sustainable Land Management

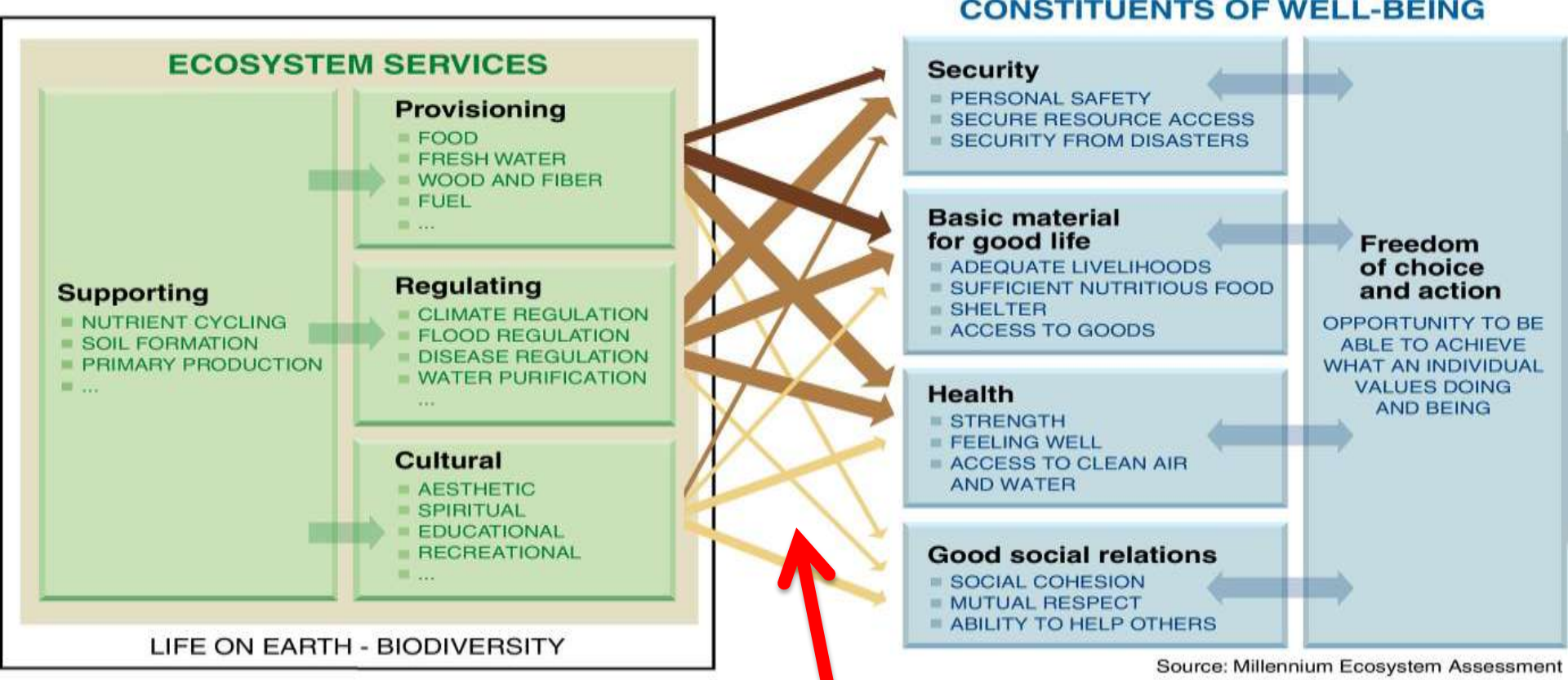
Valuing Natural Capital and Ecosystem Services

Papers mentioned in this presentation can be downloaded from: www.robertcostanza.com

Robert Costanza
VC's Chair in Public Policy
Crawford School of Public Policy
Australian National University
Canberra, Australia

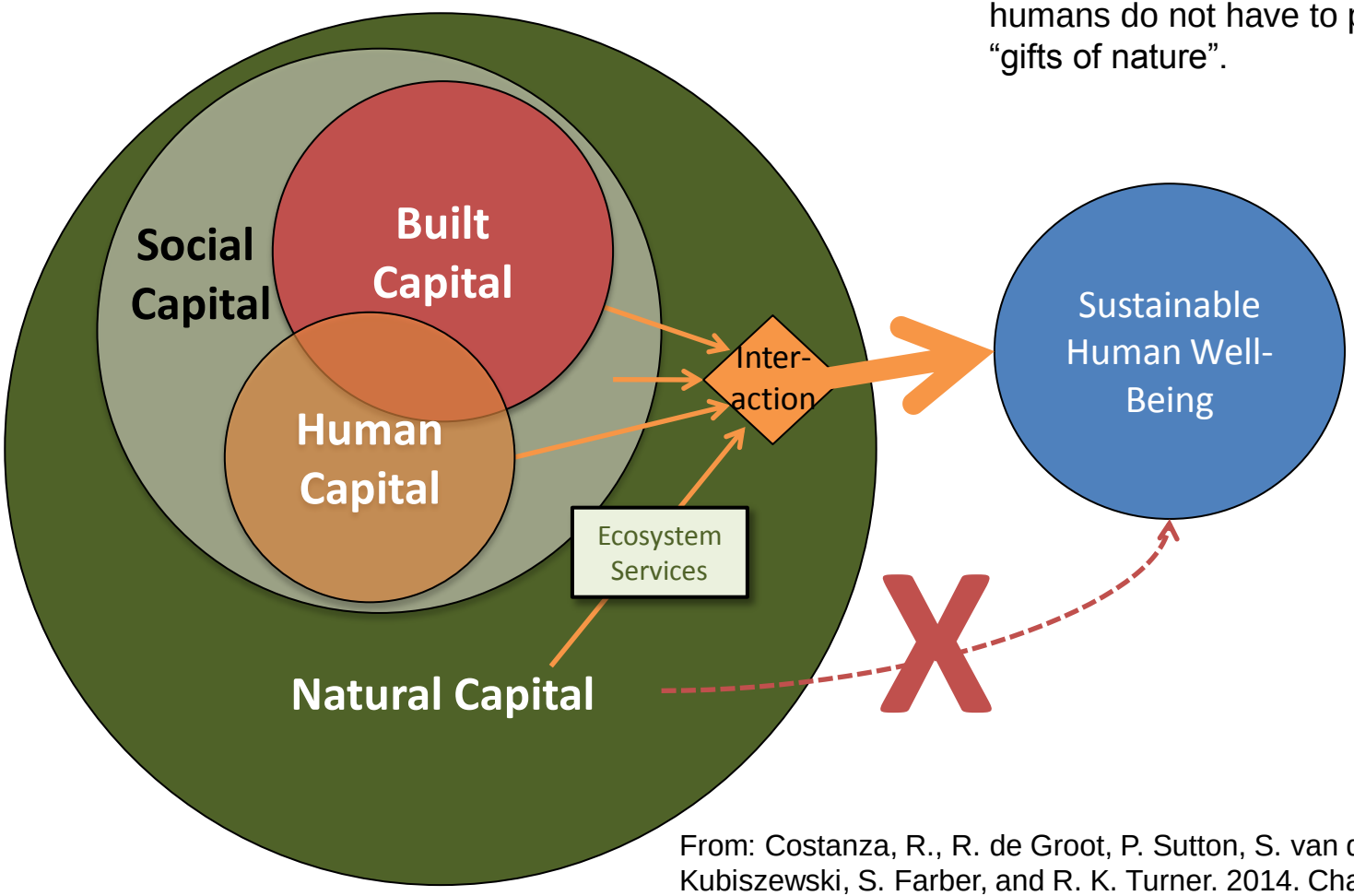
Australian National University

UN Sustainable Development Goals



Missing: Interaction with other forms of capital

Natural Capital is everything in the world that humans do not have to produce or maintain – the "gifts of nature".



From: Costanza, R., R. de Groot, P. Sutton, S. van der Ploeg, S. Anderson, I. Kubiszewski, S. Farber, and R. K. Turner. 2014. Changes in the global value of ecosystem services. *Global Environmental Change* 26:152-158.

Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)

What is IPBES?

The "Intergovernmental Platform on Biodiversity and Ecosystem Services" is a mechanism proposed to further strengthen the science-policy interface on biodiversity and ecosystem services, and add to the contribution of existing processes that aim at ensuring that decisions are made on the basis of the best available scientific information on conservation and sustainable use of biodiversity and ecosystem services. IPBES is proposed as a broadly similar mechanism to the Intergovernmental Panel on Climate Change (IPCC).

What is the science-policy interface?

Science-policy interfaces are social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making at different scales. This includes 2 main requirements:

a) that scientific information is relevant to policy demands and is formulated in a way that is accessible to policy and decision makers; and

b) that policy and decision makers take into account available scientific information in their deliberations and that they formulate their demands or questions in a way that are accessible for scientists to provide the relevant information. Click here for a graphic showing the cycle of

www.es-partnership.org

Ken Henry on advancing Australia's Natural Capital

Share 31 Tweet G+1 0

http://www.thefifthestate.com.au/articles/ken-henry-on-advancing-australias-natural-capital/82531

Ken Henry: natural capital needs to be considered by all stakeholders

"We all know that farmers go through dry and wet times. There will be drought. But when the drought breaks:

- if you have invested in your built capital – your pumps will be working,
- if you've invested in your human capital, you'll have staff to operate your machinery and the know-how to run your business commercially,
- and if you've taken care of your natural capital – managed your weeds, your water retention and your soil health – you will be well positioned to take advantage of future commercial opportunities.

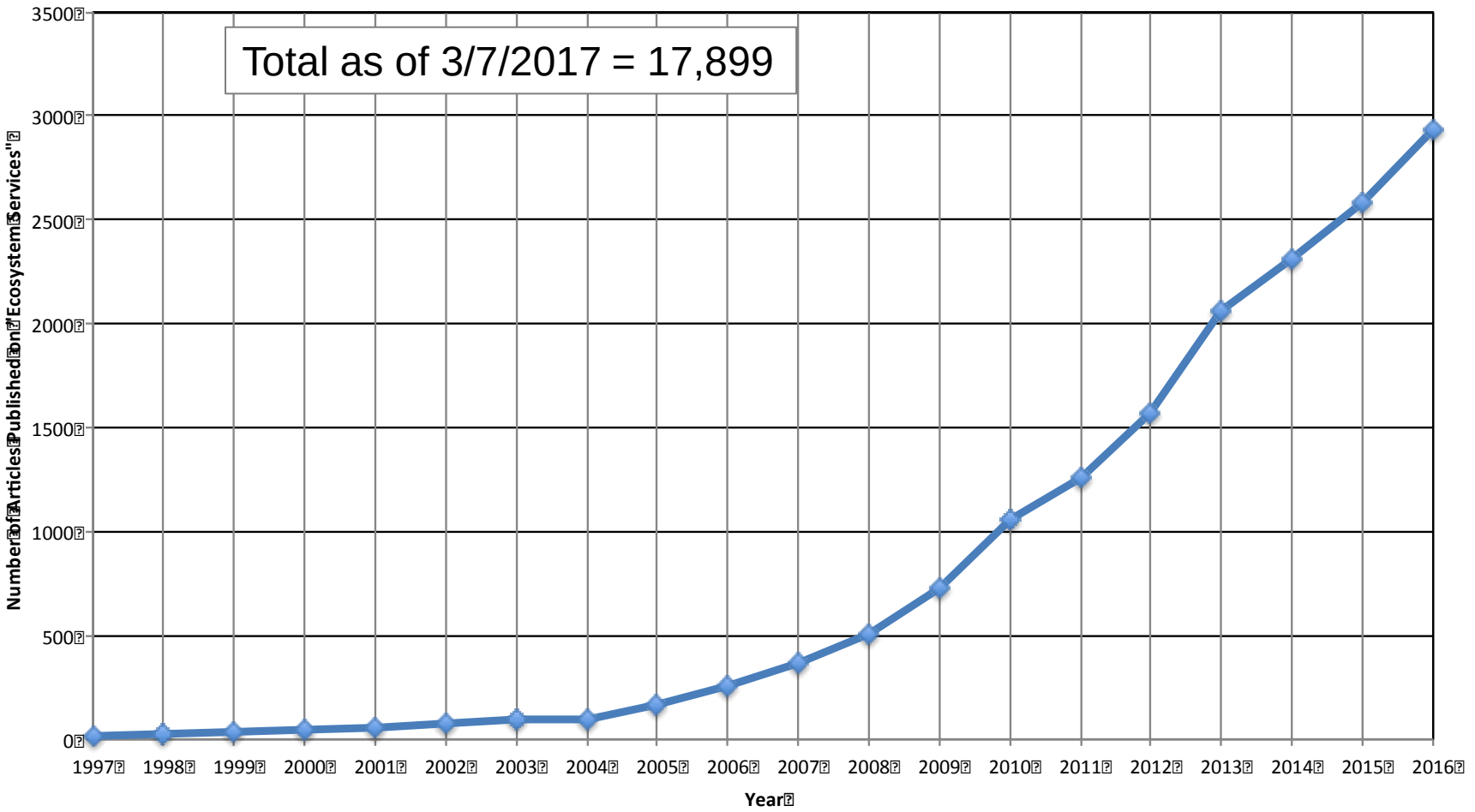
Natural capital is not a footnote in a business plan, it is a core asset on the balance sheet. That's true for an individual business; and it is true also for the nation."

Creating an “ecological civilization”

“A good ecological environment is the most universal common good, the most universal aspect of people’s wellbeing”

“We would rather have clear water and green mountains than mountains of silver and gold”

President Xi Jinping


Number of Articles Published on "Ecosytem Services" in SCOPUS
Total as of 3/7/2017 = 17,899
Number of Articles Published on "Ecosystem Services"
3500
3000
2500
2000
1500
1000
500
0
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Year

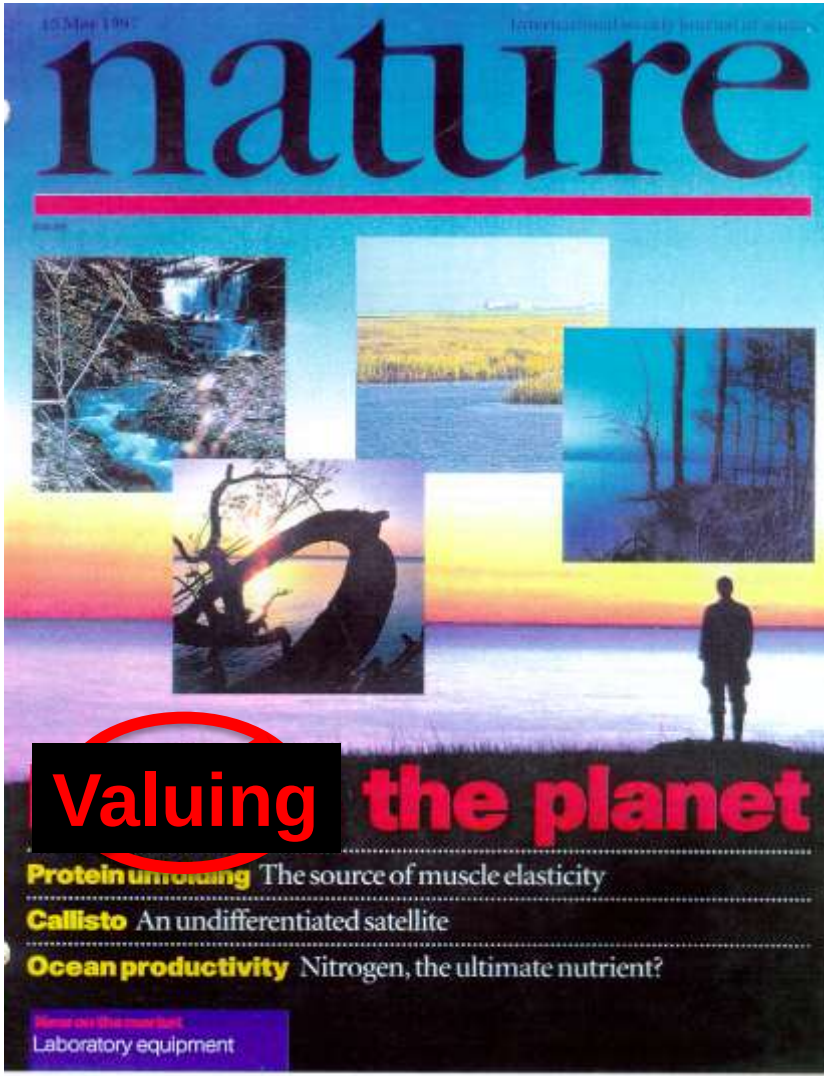
NATURE VOL 387 15 MAY 1997

The value of the world's ecosystem services and natural capital

Robert Costanza, Ralph d'Arge, Rudolf de Groot, Stephen Farber, Monica Grasso, Bruce Hannon, Karin Limburg, Shahid Naeem, Robert V. O'Neill, Jose Paruelo, Robert G. Raskin, Paul Sutton **& Marjan van den Belt**

For the entire biosphere, the value (most of which is outside the market) is estimated to be in the range of US$16–54 trillion per year, with an average of US$33 trillion per year.

2nd most cited article in the Ecology/Environment area according to the ISI Web of Science with more than 7500 citations – which puts it in the top 0.01% of all papers ever published.



Some mistaken identities concerning ecosystem services and valuation

- **Economics ≠ "the Market"**
- **Valuation ≠ Privatization, Commodification, or Trading**
- **Expressing values in monetary units ≠ Market or exchange values**

Also, we cannot avoid valuation:
decisions about ecosystem are implicit valuations

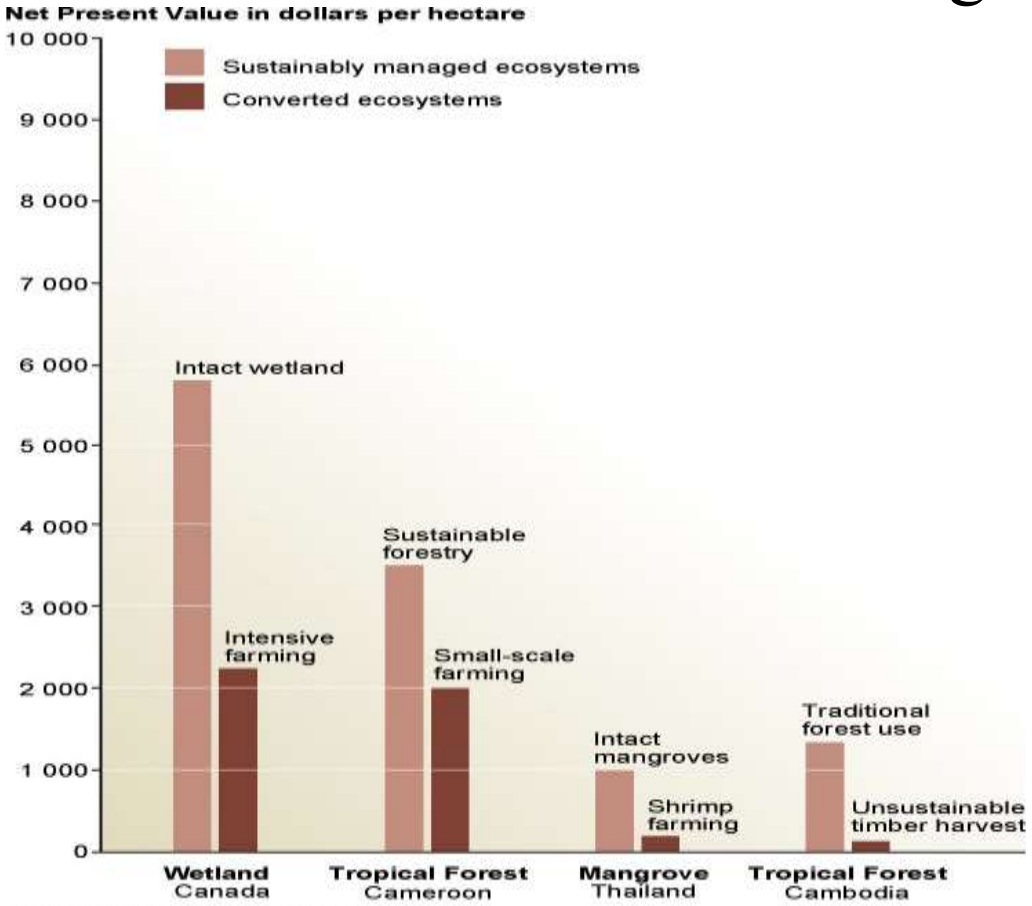
Range of uses for ecosystem services valuation

Use of Valuation	Appropriate values	Appropriate spatial scales	Precision Needed
Rising awareness and interest	Total values, macro aggregates	Regional to global	Low
National income and well-being accounts	Total values by sector and macro aggregate	National	Medium
Specific policy analysis	Changes by policy	Multiple depending on policy	Medium to high
Urban and regional land use planning	Changes by land use scenario	Regional	Low to medium
Payment for ecosystem services	Changes by actions due payment	Multiple depending on system	Medium to high
Full cost accounting	Total values by business, product, or activity and changes by business, product, or activity	Regional to global, given the scale of international corporations	Medium to high
Common asset trusts	Totals to assess capital and changes to assess income and loss	Regional to global	Medium

From: Costanza, R., R. de Groot, P. Sutton, S. van der Ploeg, S. Anderson, I. Kubiszewski, S. Farber, and R. K. Turner. 2014. Changes in the global value of ecosystem services. *Global Environmental Change* 26:152-158.

Degradation of ecosystem services often causes significant harm to human well-being

- The total economic value associated with managing ecosystems more sustainably is often higher than the value associated with conversion
  - Conversion may still occur because private economic benefits are often greater for the converted system



Source: Millennium Ecosystem Assessment

Economic Reasons for Conserving Wild Nature

Costs of expanding and maintaining the current global reserve network to one covering 15% of the terrestrial biosphere and 30% of the marine biosphere = $US 45 Billion/yr

Benefits (Net value* of ecosystem services from the global reserve network) = $US 4,400-5,200 Billion/yr

*Net value is the difference between the value of services in a "wild" state and the value in the most likely human-dominated alternative

Benefit/Cost Ratio = 100:1

(From: Balmford, A., A. Bruner, P. Cooper, R. Costanza, S. Farber, R. E. Green, M. Jenkins, P. Jefferiss, V. Jessamy, J. Madden, K. Munro, N. Myers, S. Naeem, J. Paavola, M. Rayment, S. Rosendo, J. Roughgarden, K. Trumper, and R. K. Turner 2002. Economic reasons for conserving wild nature. *Science* 297: 950-953)

Ecosystem Services 1 (2012) 50–61

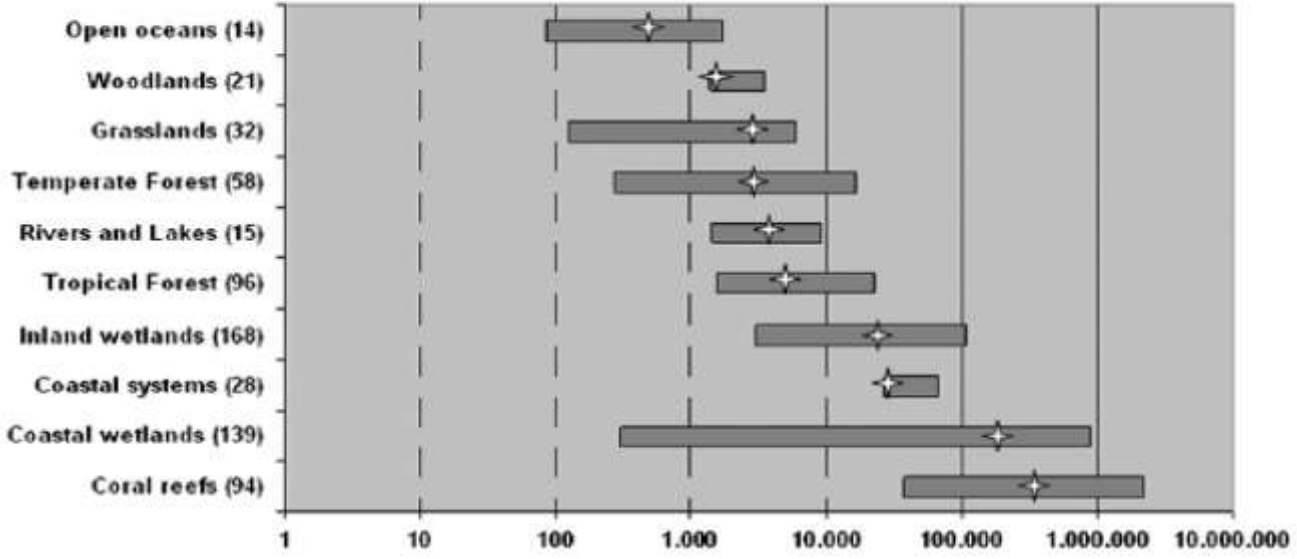
Contents lists available at SciVerse ScienceDirect

Ecosystem Services

journal homepage: www.elsevier.com/locate/ecoser

Global estimates of the value of ecosystems and their services in monetary units

Rudolf de Groot [a,*], Luke Brander [b,1], Sander van der Ploeg [a], Robert Costanza [c], Florence Bernard [d], Leon Braat [e], Mike Christie [f], Neville Crossman [g,h], Andrea Ghermandi [i], Lars Hein [a], Salman Hussain [j], Pushpam Kumar [k], Alistair McVittie [j], Rosimeiry Portela [l], Luis C. Rodriguez [g,h], Patrick ten Brink [m], Pieter van Beukering [b]



Global Environmental Change 26 (2014) 152–158

Contents lists available at ScienceDirect

Global Environmental Change

journal homepage: www.elsevier.com/locate/gloenvcha

Changes in the global value of ecosystem services

Robert Costanza [a,*], Rudolf de Groot [b], Paul Sutton [c,d], Sander van der Ploeg [b], Sharolyn J. Anderson [d], Ida Kubiszewski [a], Stephen Farber [e], R. Kerry Turner [f]

[a] Crawford School of Public Policy, Australian National University, Canberra, Australia
[b] Environmental Systems Analysis Group, Wageningen University, Wageningen, The Netherlands
[c] Department of Geography, University of Denver, United States
[d] Barbara Hardy Institute and School of the Natural and Built Environments, University of South Australia, Australia
[e] University of Pittsburgh, United States
[f] University of East Anglia, Norwich, UK

Global Environmental Change 26 (2014) 152–158

Contents lists available at ScienceDirect

…we estimated the loss of ecosystem services from 1997 to 2011 due to land use change at **$4.3–20.2 trillion/yr.**

EU Biodiversity Strategy to 2020

Our life insurance, our natural capital

The protection, conservation and enhancement of the Union's natural capital is one of the 9 priority objectives of the **7th General Union Environment Action Programme to 2020** 'Living well, within the limits of our planet'.

The EU Biodiversity Strategy stipulates in Target 2, Action 5 that the member states must map and assess the state of the ecosystems and their services and promote the integration into the reporting systems at the EU and national level by 2020.

Target 2 – Maintain and Restore Ecosystems and their Services

By 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15 % of degraded ecosystems.

Action 5) Member States, with the assistance of the Commission, will map and assess the state of ecosystems and their services in their national territory by 2014, assess the economic value of such services, and promote the integration of these values into accounting and reporting systems at EU and national level by 2020.

From: Bateman et al. 2013. Bringing Ecosystem Services into Economic Decision-Making: Land Use in the United Kingdom. *Science* 341:45-50

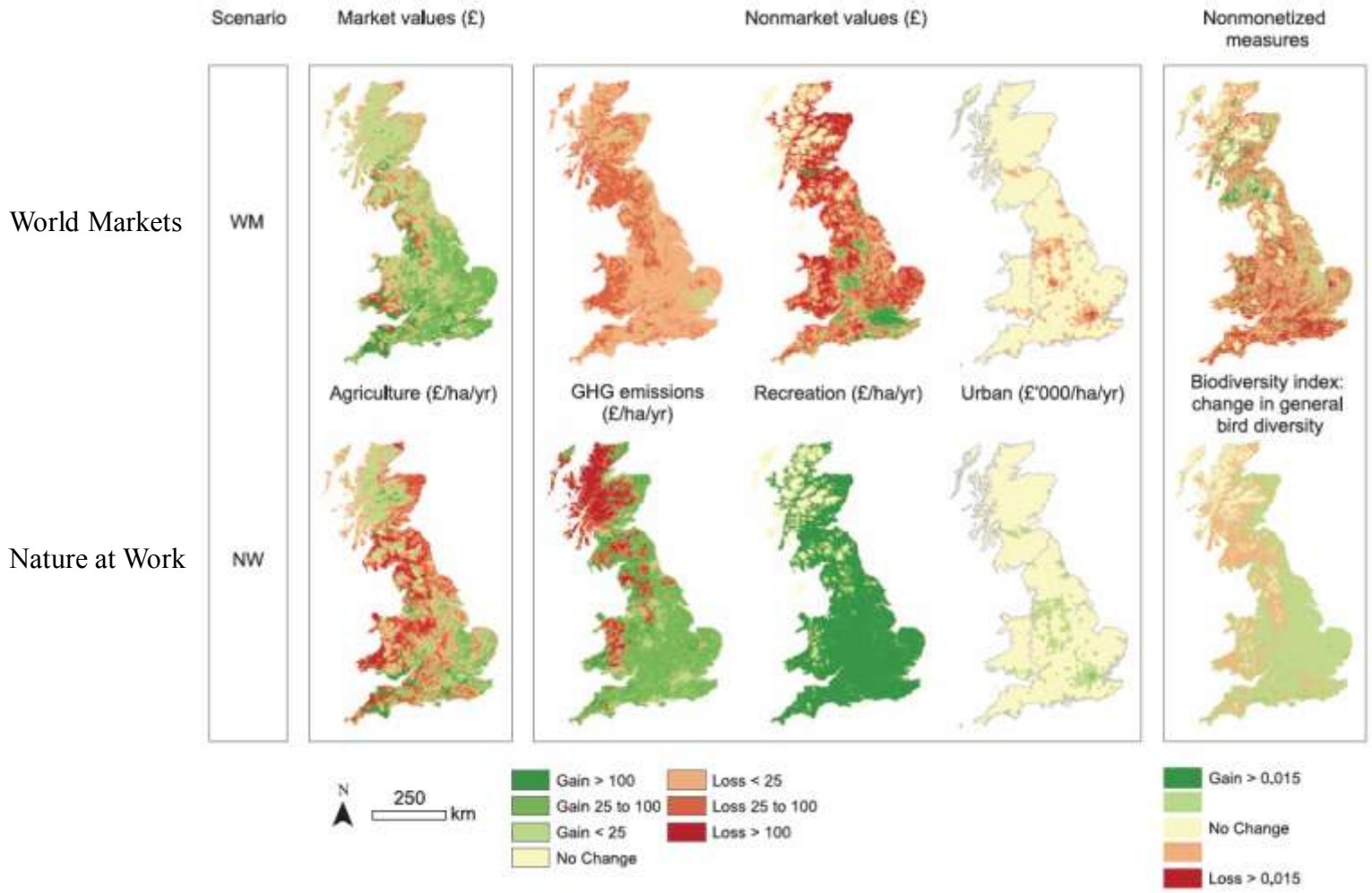
Table 2. Summary of land-use change scenarios. [Details in (*13*).]

Scenario	Environmental regulation and planning policy relative to current	Spatial focusing of changes
Go with the flow (GF)	**Similar:** Policy and regulatory regime as today. Existing patterns of countryside protection relaxed only where economic priorities dominate.	**Unfocused:** Similar spatial constraints on land-use change as today. No expansion of the protected area network.
Nature at work (NW)	**Stronger:** Policy and planning emphasize multifunctional landscapes and the need to maintain ecosystem function.	**Focused:** Greening of urban and peri-urban areas to enhance recreation values.
Green and pleasant land (GPL)	**Stronger:** Agri-environmental schemes strengthened with expansion of stewardship and conservation areas.	**Focused:** Increased extent of existing conservation areas. Creation of functional ecological networks where possible.
Local stewardship (LS)	**Stronger:** Agri-environmental schemes strengthened with expansion of stewardship and conservation areas.	**Unfocused:** No strong spatial component to changes but protection of areas of national significance continues.
National security (NS)	**Weaker:** Emphasis on increasing UK agricultural production. Environmental regulation and policy is weakened.	**Unfocused:** Some land-use conversion into woodland occurs in areas of lower agricultural values
World markets (WM)	**Weaker:** Environmental regulation and policy are weakened unless they coincide with improved agricultural production.	**Focused:** Losses of greenbelt to urban development, which results in loss of recreational values. Weaker protection of designated sites and habitats.

Table 1. Summary of the ecosystem service related goods considered in the analysis. [Metrics, data, modeling and valuation are fully documented in (*13*).]

Ecosystem service–related good	Metrics (in year specified)	Main data and sources	Model	Valuation
Agricultural production	Proportion and output of land use in each 2-km grid square	Land use, soils and physical environment, climate, digital mapping, etc. (*31–33*)	Environmental-econometric regression analysis of land-use decisions as a function of the local physical environment, prices, costs and policies, based on (*34*)	Market values (*35*)
Greenhouse gases	Net metric tons of CO_2, CH_4, and N_2O per 2-km grid square	Land-use predictions, GHG responses (*36–38*)	Process models for CO_2, CH_4, and N_2O; conversion to metric tons of CO_2 equivalent ($MTCO_2Eq$) based on insulation factors	Official UK values per $MTCO_2Eq$ (*39*)
Recreation	Visitors per 2-km grid square	National survey of >40,000 households, census (*40*, *41*)	Regression model of visit count from outset to destination as a function of characteristics of both locations, population socioeconomics, etc.	Meta-analysis of 300 ecosystem-specific valuation estimates
Urban green-space amenity	Distance to green space from each 2-km grid square	Digital mapping census (*32*, *41*)	Regression model linking distance from households to green-space sites, their size and quality	Meta-analysis of prior literature examining changes in value with respect to distance
Wild bird–species diversity	Wild bird diversity (*20*) per 2-km grid square	*Breeding Bird Survey* (*42*)	Regression model linking wild bird diversity to land use and location.	Not valued; analysis uses the opportunity cost of avoiding declines

From: Bateman et al. 2013. Bringing Ecosystem Services into Economic Decision-Making: Land Use in the United Kingdom. *Science* 341:45-50



Example scenario analyses including non-market ecosystem services values

From: Bateman et al. 2013. Bringing Ecosystem Services into Economic Decision-Making: Land Use in the United Kingdom. *Science* 341:45-50

Table 3. Change in values across Great Britain from the present day (2010) to 2060 achieved by the targeting of policy options under three decision rules. (Millions of £s per annum; real values in £2010; UK Climate Impacts Programme low-emission scenario throughout.)

Decision component	Maximize market (agricultural) values only (Fig. 3, A and B)	Maximize all monetary values (Fig. 3, C and D)	Maximize all monetary values with biodiversity constraint (Fig. 3, E and F)
Market agricultural value	971	–448	–455
Nonmarket GHG emissions	–109	1,517	1,510
Nonmarket recreation	2,550	13,854	12,685
Nonmarket urban green space	–2,520	4,683	4,352
All monetary values	892	19,606	18,092

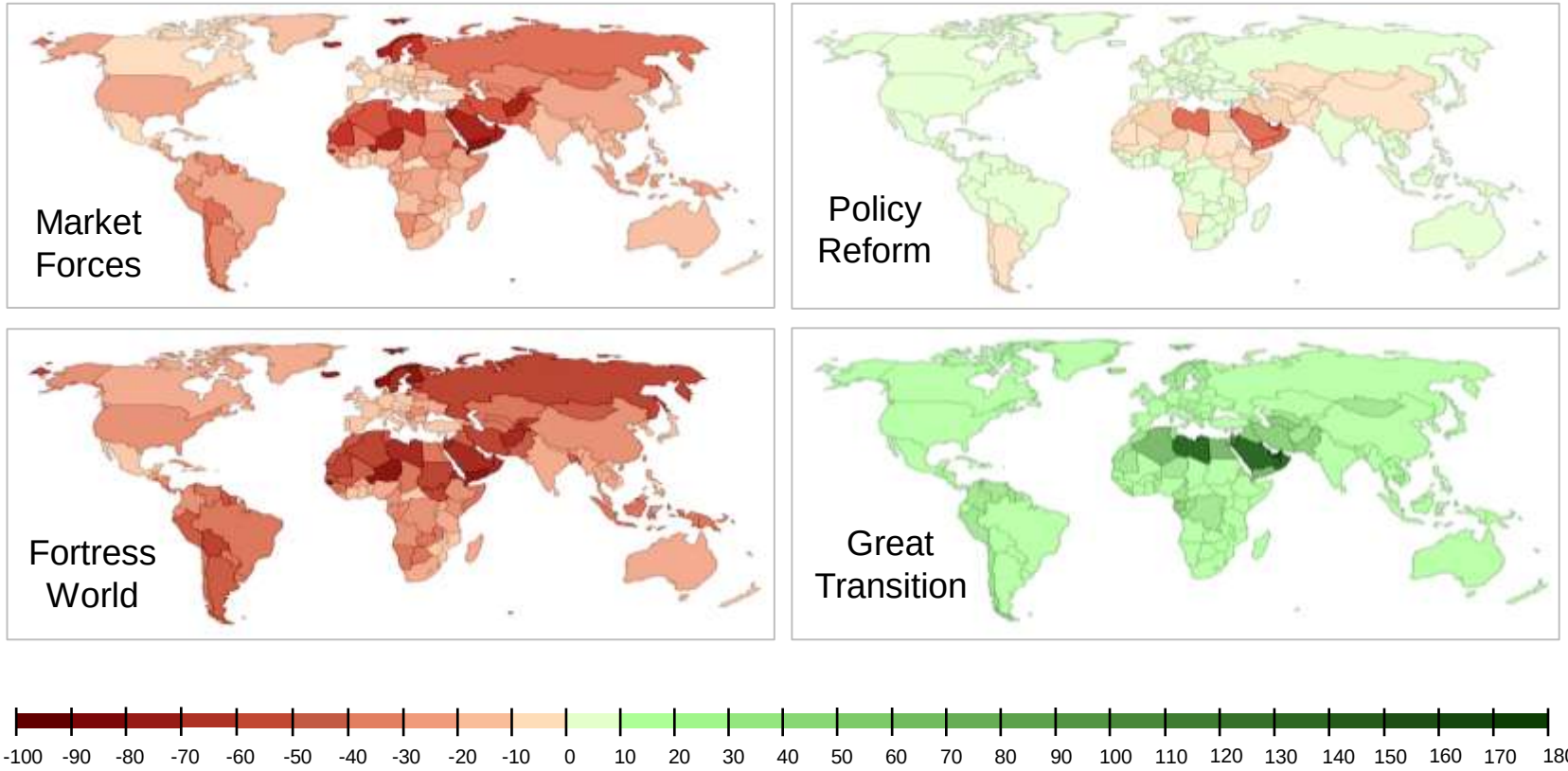
From: Bateman et al. 2013. Bringing Ecosystem Services into Economic Decision-Making: Land Use in the United Kingdom. *Science* 341:45-50

Table 3. Change in values across Great Britain from the present day (2010) to 2060 achieved by the targeting of policy options under three decision rules. (Millions of £s per annum; real values in £2010; UK Climate Impacts Programme low-emission scenario throughout.)

Decision component	Maximize market (agricultural) values only (Fig. 3, A and B)	Maximize all monetary values (Fig. 3, C and D)	Maximize all monetary values with biodiversity constraint (Fig. 3, E and F)
Market agricultural value	971	–448	–455
Nonmarket GHG emissions	–109	1,517	1,510
Nonmarket recreation	2,550	13,854	12,685
Nonmarket urban green space	–2,520	4,683	4,352
All monetary values	892	19,606	18,092

From: Bateman et al. 2013. Bringing Ecosystem Services into Economic Decision-Making: Land Use in the United Kingdom. *Science* 341:45-50

From: Kubiszewski, Costanza, Anderson, and Sutton. (2017). The Future of Ecosystem Services: Global Scenarios and National Implications. *Ecosystem Services.* 26:289-301.



From: Kubiszewski, Costanza, Anderson, and Sutton. (2017). The Future of Ecosystem Services: Global Scenarios and National Implications. *Ecosystem Services.* 26:289-301.

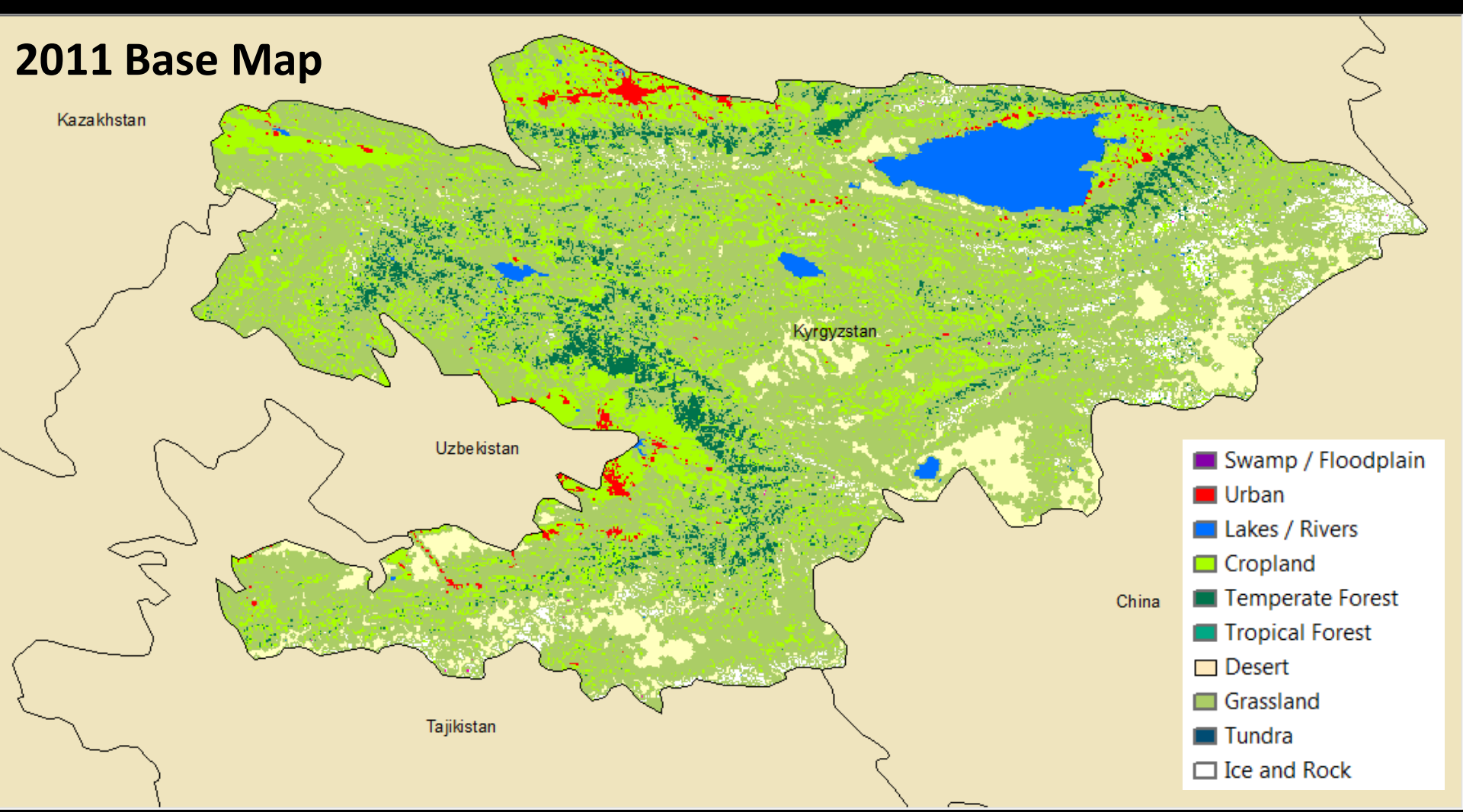
german cooperation
DEUTSCHE ZUSAMMENARBEIT

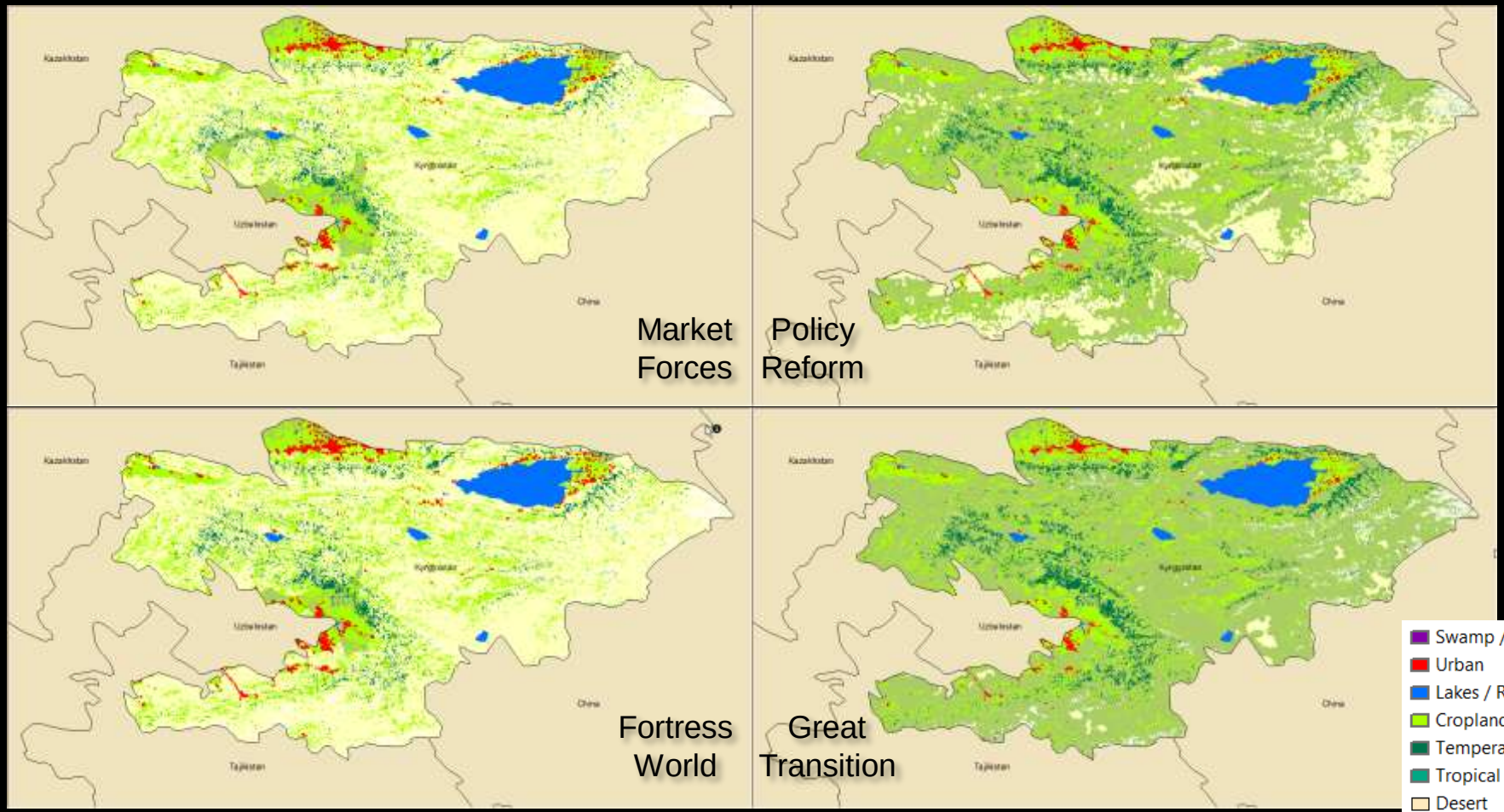
Implemented by

Regional Programme for Sustainable and Climate Sensitive Land Use for Economic Development in Central Asia

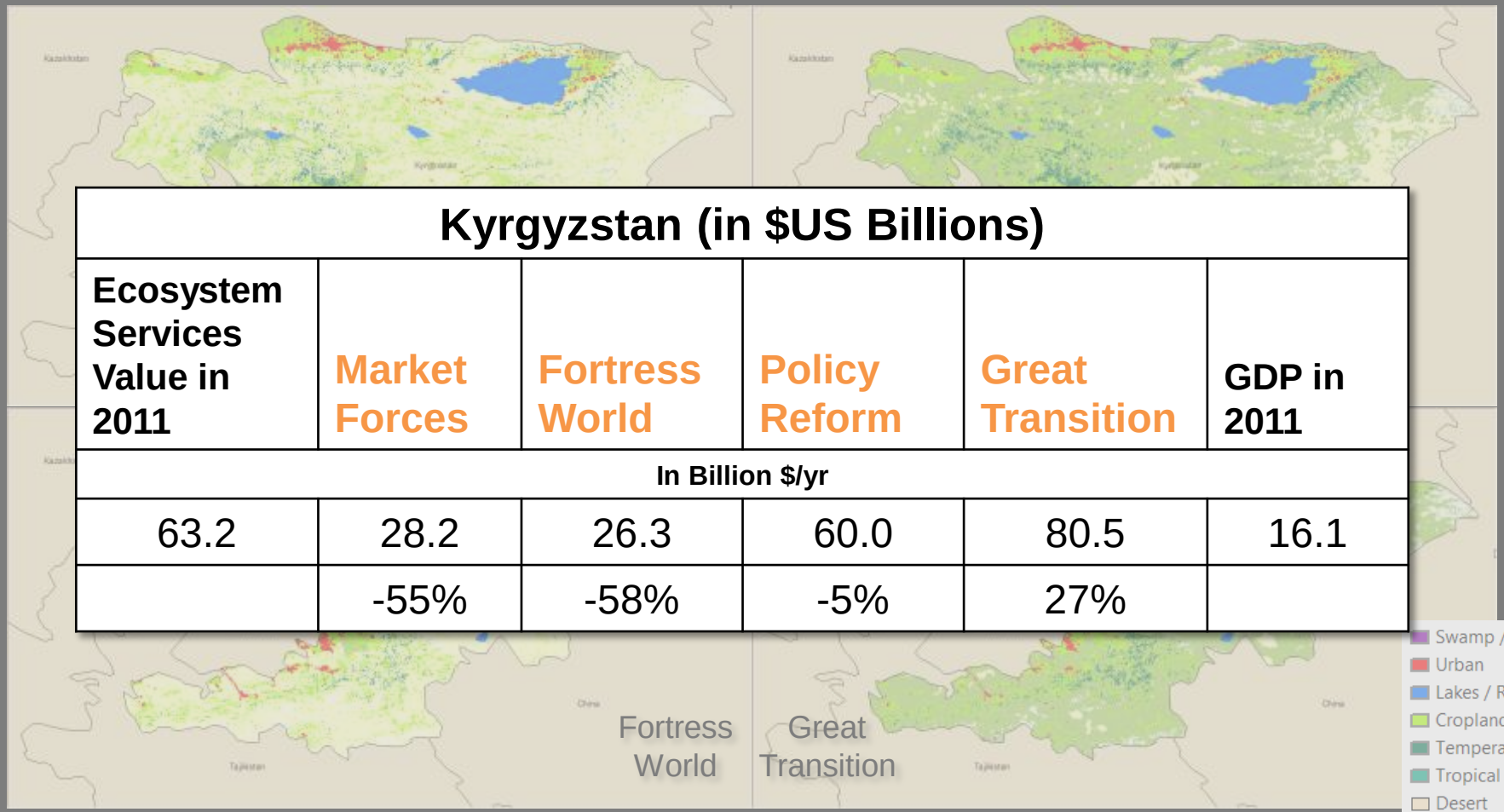
- Climate change – domain of operations
- Pastures – 85% and Forests – 6% of total area
- Increasing rate of degradation and deforestation
- Opportunities – unproductive lands for fast growing trees and horticulture
- Integration of unproductive lands to economy through restoration of landscape
- Accounting forest goods and services and finding the true value

2011 Base Map




Market Forces
Policy Reform
Fortress World
Great Transition
Swamp / Floodplain
Urban
Lakes / Rivers
Cropland
Temperate Forest
Tropical Forest
Desert
Grassland
Tundra
Ice and Rock

Kyrgyzstan (in $US Billions)					
Ecosystem Services Value in 2011	**Market Forces**	**Fortress World**	**Policy Reform**	**Great Transition**	**GDP in 2011**
In Billion $/yr					
63.2	28.2	26.3	60.0	80.5	16.1
	-55%	-58%	-5%	27%	



Wellbeing Economies Alliance (WE All)

At a meeting in Glasgow, Scotland, in Oct. 2017, a group of five governments (Scotland, Sweden, Costa Rica, Slovenia, and New Zealand) committed to creating the inter-government group of the global Wellbeing Economies Alliance.

Thank You

Papers mentioned in this presentation can be downloaded from:
www.robertcostanza.com