RESEARCH CONCLUDES:

WE ARE DESTROYING EARTH.

Could you kindly rephrase that in unequivocal, inaccurate, vague, self-serving and roundabout terms that we can all understand?
Biodiversität als sozio-ökonomische Herausforderung: (Un)versöhnlichkeit von Wissenschaft und Politik?“

Didier Babin
Biodiversity for Humankind
Biodiversity
Representation
One Earth, how many species?

1 800 000 or 100 000 000 \( (10^8) \) or 10 000 000 000 000 000 000 000 000 000 000 000 \( (10^{31}) \)
About quantity

- $4 \times 10^{24}$ (with *H. sapiens*)
- $1 \times 10^{28}$ (freshwater habitats)
- $2 \times 10^{29}$ (soils)
- $3 \times 10^{30}$ (sea)

---

TOTAL $\approx 5 \times 10^{30}$

Quantity of Bacteria

Biomass

Biosphere = « microbes »!
Symbiosis & Interactions

\[ \approx 10^{14} \text{ cfu vs } \approx 10^{15} \text{ bacteria} \]

\[ 2 \text{ kg !} \]

\[ \approx 400 \text{ species} \]
Carpinteria salt marsh food web – without parasites

Diagram showing the trophic levels and freeliving species interactions.
« French » biodiversity
Life Web
Ecosystem Services

Provisioning Goods produced or provided by ecosystems

Regulating Benefits obtained from regulation of ecosystem processes

Cultural Non-material benefits from ecosystems

Photo credits (left to right, top to bottom): Purdue University, WomenAid.org, LSUP, NASA, unknown, CEH Wallingford, unknown, W. Reid, Staffan Widstrand
Human Well-being and Poverty Reduction
- Basic material for a good life
- Health
- Good Social Relations
- Security
- Freedom of choice and action

Indirect Drivers of Change
- Demographic
- Economic (globalization, trade, market and policy framework)
- Sociopolitical (governance and institutional framework)
- Science and Technology
- Cultural and Religious

Direct Drivers of Change
- Changes in land use
- Species introduction or removal
- Technology adaptation and use
- External inputs (e.g., irrigation)
- Resource consumption
- Climate change
- Natural physical and biological drivers (e.g., volcanoes)

Life on Earth: Biodiversity
<table>
<thead>
<tr>
<th>Trends in Drivers</th>
</tr>
</thead>
</table>

Source: Millennium Ecosystem Assessment
Habitat Loss to 2050 under MA Scenarios

Source: Millennium Ecosystem Assessment
Decline of Animal Populations

Birds in UK

Amphibians (World)

Vertebrates


- All species
- Forest species
- Open field species
- Forest Habitats
- Marine Habitats
- Freshwater Habitats
The 5 main extinction crises?

<table>
<thead>
<tr>
<th>Period</th>
<th>Millions of years ago</th>
<th>Group experiencing mass extinction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quaternary</td>
<td>0.01</td>
<td>Pleistocene: large mammals and birds</td>
</tr>
<tr>
<td>Tertiary</td>
<td>65</td>
<td>Cretaceous: reptiles (dinosaurs); many marine species including foraminifers and mollusks</td>
</tr>
<tr>
<td>Cretaceous</td>
<td>180</td>
<td>Triassic: 35% of animal families, including many reptiles and marine mollusks</td>
</tr>
<tr>
<td>Jurassic</td>
<td>245</td>
<td>Permian: 50% of animal families, including over 95% of marine species, many trees, amphibians, most bryozoans and brachiopods, all trilobites</td>
</tr>
<tr>
<td>Triassic</td>
<td>250</td>
<td>Devonian: 30% of animal families, including agnathan and placoderm fishes and many trilobites</td>
</tr>
<tr>
<td>Permian</td>
<td>500</td>
<td>Ordovician: 50% of animal families, including many trilobites</td>
</tr>
<tr>
<td>Carboniferous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Devonian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silurian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ordovician</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cambrian</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bar width represents relative number of living groups.
A question of speed

Extinctions per thousand species per millennium

- Distant past (fossil record)
- Recent past (known extinctions)
- Future (modeled)

For every thousand mammal species, less than one went extinct every millennium.

Source: Millennium Ecosystem Assessment

Time (years):
- $10^2$ extinction
- $10^4$ speciation
- $10^6$ life
Towards the 6th Crisis!
"HotSpots" - High diversity, many endemics, threatened 25 areas - 1.4% of land

- 44% of vascular plant species
- 35% of birds, mammals, herps, amphibians

Myers et al., 2000
The 5 main extinction crisis?

The main causes
Towards the 6th Crisis!

The main cause: our species!
Biomass of fish in Northern Atlantic Sea in 1900

Christensen et al. (Fish & Fisheries, 2003)
And in 2000....

Christensen et al. (Fish & Fisheries, 2003).
<table>
<thead>
<tr>
<th>Region</th>
<th>Number of native species</th>
<th>Number of non-native species</th>
<th>Number of non-native species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>11,000</td>
<td>1,568</td>
<td>12.5%</td>
</tr>
<tr>
<td>New England</td>
<td>1,995</td>
<td>877</td>
<td>30.5%</td>
</tr>
<tr>
<td>New Zealand</td>
<td>1,790</td>
<td>1,570</td>
<td>46.7%</td>
</tr>
<tr>
<td>Hawaii</td>
<td>956</td>
<td>861</td>
<td>47.4%</td>
</tr>
<tr>
<td>Bermuda</td>
<td>165</td>
<td>303</td>
<td>64.7%</td>
</tr>
</tbody>
</table>
Climate change (beech)

In 2000.

In 2100 (scenario)

Not very likely

Virtually certain
Pathogens diversity and climate change

more than 300 times more pathogens
in tropical areas

Guégan 12002

Northern

latitude

Equator

335 species
Footprint and Wealth

Fig. 17: ECOLOGICAL FOOTPRINT BY REGION, 2001

- North America
- Western Europe
- Central and Eastern Europe
- Latin America and the Caribbean
- Middle East and Central Asia
- Asia-Pacific
- Africa

Global hectares per person

Population (millions)

Source: WWF
Biodiversity and Trade

Soybean exportation

Impact on Biodiversity
Landscape Change
Pampa Argentina
The Economics of Ecosystems and Biodiversity (TEEB)
Cost Of Policy Inaction (COPI)

14 000 billion € /year (2050)
TEEB in the press

**Reuters**

Raubbau kostet Menschheit Billionen
UN-Artenschützer: Waldverlust verschlingt jährlich sechs Prozent des Bruttosozialprodukts

U.N. experts warn of economic cost of species loss

Ecosystem destruction costing hundreds of billions a year

The Guardian, 30.05.2008

**Independent.co.uk**

Loss of biodiversity threatens livelihoods of world's poorest

By Emily Dugan
Friday, 30 May 2008

Independent.co.uk

May 30, 2008

Destroying the world’s wildlife costs economy £40bn a year

The Economic Times India, 30.05.2008

**Der Spiegel**

This stock collapse is petty when compared to the nature crunch

The financial crisis at least affords us an opportunity to now rethink our catastrophic ecological trajectory

The Guardian, Tuesday October 14 2008 George Monbiot

**The Economic Times**

Nature loss 'dwarfs bank crisis'

By Richard Black
Environment correspondent, BBC News website, Barcelona

The Economic Times India, 30.05.2008

Umweltzerstörung bedroht Wohlishand

Deutsche-Bank-Manager warnt vor dramatischen Wachstumseinbußen von weltweit sechs Prozent bis zum Jahr 2050

29/05/09

Collection: UFZ
WHAT CAN BE DONE?
Business & Biodiversity

The Corporate Ecosystem Services Review

Integrating biodiversity into business strategies

Biodiversity & Business

CEO briefing

Biodiversity and Ecosystem Services

Biodiversity to a GRI Reporting Resource
Assessing Business’ dependence on living systems
Biodiversity in Product Life Cycle
Ecosystem Accounts, SEEA2003 & SNA

**Core accounts of assets & flows**
- systems: land systems, rivers, soil, sea, atmosphere...
- components: biomass, water, C, N, P, species...

**Counts of ecosystem integrity/health**
(focus on vigor, robustness, resilience, dependance from inputs, healthy populations & stress)

**Ecosystem Rating & Aggregates**

**Sector accounts of flows of ecosystem services**
- Material/energy flows  
  [biomass, water, nutrients, residuals, physical units]
- Functional Ecosystem Services  
  [Marketed & Non-market end use ES, physical units and €]

**Supply & use of ecosystem services by sectors, I-O analysis, NAMEA, Expenditures**

**Natural assets/ ecosystem capital**
- Natural capital stocks, health/resilience, distance to objective (physical units, by sectors)
- Consumption of Ecosystem Capital /restoration costs (€)
- Consumption of Ecosystem Capital concealed in imports/exports (€)
- NPV or market value of selected assets, SNA rules (€)
- Ecosystem assets inclusive wealth (€)

**Sector accounts of ecosystem natural capital**

**Impacts at the ecosystem**

**Feedbacks to the economy**
Fisheries’ future

Worm et al. (Nature) 2006
Management Tools

- Administrators
  - Subsidies
  - Taxes
  - Discounting
  - Property Rights
  - Transf. N-Transf.
  - Permits
  - Transferable Access Rights
  - Norms

- Economists
  - Free Access
  - Forbiddance
  - Quotas

- Naturalists
  - Selectivity
  - Subsidies
  - Transf.
Adaptive co-management
Pour une gestion durable de la pêche

• 1. Rétablir le dialogue entre les pêcheurs, les scientifiques et les décideurs politiques

• 2. Construire les outils de la décision politique pour une véritable Approche Ecosystémiques des pêches

• 3. Faire des pêcheurs les premiers acteurs d’une pêche responsable

• 4. Des pouvoirs publics qui exercent leurs prérogatives

• 5. Des citoyens mieux informés et plus responsables

(rapport du Sénat par P.M. Le Cléach 2009)
Biodiversité : quelle est la situation ?

• **Connaissance** : la disparition de la biodiversité pose et posera de sérieuses menaces sur le bien-être de l’espèce humaine

• **Opinion publique** : la biodiversité est considérée comme une question secondaire

• **Action** : les efforts pour inverser les tendances à la perte de biodiversité restent trop faibles

• **Gouvernance scientifique** : la communauté scientifique reste éparpillée et faiblement impliquée dans les processus de décision

• **Enjeux** : Liens avec éradication de la pauvreté, sécurité alimentaire, approvisionnement en eau de qualité, croissance économique, conflits d’usage et d’appropriation, santé, énergie, climat
Orientations de la recherche française sur la biodiversité
Biodiversity: scientific and technological challenges
« la biodiversité : support potentiel d’une nouvelle économie, source de nouvelles technologies et objet d’une gouvernance à renouveler »
Long term: from manufactured to natural capital

(Millenium ecosystem Assessment)
Taxation of the consumption of nature

• From taxing labour and capital to taxing the consumption of nature;

• Energy: a Tax on Energy Added?

• Renewable resources: taxation of extraction - directly - or using tradable rights.
IMoSEB 2006-2007:
a worldwide consultation towards an
International Mechanism of Scientific Expertise on Biodiversity

Supported by an International Steering Committee

> Scientists
Gaston Achoudong, Mary Kalin Arroyo, Carlo Heip,
Leonard Hirsch, Yvon Le Maho, Michel Loreau, Keping Ma,
Georgina Mace, Harold A. Mooney, Alfred Oteng-yeboah,
Charles Perrings, Peter Raven, José Sarukhan,
Robert J. Scholes, Arkady Tishkov, Jacques Weber

> Representatives of governments
Algeria, Austria, Canada, China, Costa-Rica,
Denmark, France, Gabon, Germany, India, Italy, Iran,
Jamaica, Madagascar, Malawi, Malaysia, Morocco, Namibia,
New-Zealand, Papua-New-Guinea, Poland, Saudi Arabia,
Senegal, Slovenia, South Korea, Spain, Sweden, Switzerland,
Thailand, UK, USA

> Inter-Governmental or international Organizations, UN and Specialized Agencies,
NGO’s, Research initiatives and others
> BIODIVERSITY INTERNATIONAL
> CI
> CCITES
> CMS
> DIVERSITAS
> EC–DG research
> EEA
> EPBRS
> FAO
> GBIF
> GREENPEACE
> ICES – CIEM
> ICSU
> IFB
> IIFB
> IUCN
> MA
> RAIPON
> RAMSAR CONVENTION
> SBF
> SCB
> SSCBD
> SSCOBDB
> TNC
> UNcbd
> UNCCD
> UNEP – DEWA
> UNEP – WCMC
> UNESCO
> UNU – IAS
> WORLD BANK
> WWF

Led by an Executive Committee

> 15 members appointed by the ISC
to implement ISC’s recommendations for action
Co chairs: Prof. Michel Loreau (Canada)
& Prof. Alfred Oteng-Yeboah (Ghana)

Members:
Ivar Baste, Martha Chouchena-Rojas, Christine Dawson,
Horst Korn, Keping Ma, Georgina Mace, Marthe Mapangou,
Charles Perrings, Peter Raven, José Sarukhan, Stephan Schnierer,
Robert Watson, Jacques Weber

http://www.imoseb.net
An original, open and inclusive exploratory process

**North American Consultation**
“Science-Policy interface is of critical importance. More science is better but translating information into action is more important”

**European Consultation**
“A flexible, light and hybrid model, based on existing structures ... exploring the potentiality of a network of networks”

**Asian Consultation**
“Be an Intergovernmental Panel with guiding principles: scientific credibility, political legitimacy and relevance”

**South American Consultation**
“All forms of knowledge should be taken into account. Need to strengthen the interface between technical/scientific expertise and decision making”

**African Consultation**
“A simple, decentralised, adaptable, flexible, non-bureaucratic structure, close to and accessible by the actors, capable of sharing knowledge and responding quickly”

**Oceanian Consultation**
“This mechanism should be civil society driven, and both reactive and pro-active. Representatives of local and indigenous communities and business sector should be included”
Final recommendations

“Recommended to strengthen the science-policy interface in ways that respect a number of principles:

- be scientifically independent, credible, inclusive,
- be policy legitimate through inter-governmental and multi-stakeholder involvement,
- be policy relevant without being policy prescriptive,
- be based on a robust and relevant conceptual framework,
- address decision-makers from governments and other sectors of society at global, regional and national scales,
- be responsive to decision-makers needs,
- be communicated in an appropriate form for consideration and possible action,
- be supported by networking efforts of scientific and knowledge holders,
- promote dialogue between international agencies and decision-makers”
AD HOC INTERGOVERNMENTAL AND MULTI-STAKEHOLDER MEETING ON AN INTERGOVERNMENTAL SCIENCE-POLICY PLATFORM ON BIODIVERSITY AND ECOSYSTEM SERVICES

10th - 12th November 2008
Putrajaya International Convention Centre (PICC)

**Key operating principles**
- Inclusive of intergovernmental, governmental and non-governmental stakeholders and building upon existing networks
- Scientifically independent, credible
- Responsive to policy needs
- Underpinned by experiences of relevant assessment processes
- Continuous monitoring from the outset

**Science-Policy Interface**
- The World Climate Research Program, the International Geosphere-Biosphere Program, the International Human Dimensions Program have provided important International Coordinating Mechanisms for research – now is the time to consider reinvigorating the defunct World Climate Research Impacts Program
- International independent policy-relevant, but not policy prescriptive, expert assessments that have encompassed risk assessment and risk management have proven to be a critical component of the science – policy interface, e.g.,
  - The International Stratospheric Ozone Assessments
  - The Intergovernmental Panel on Climate Change
  - The Millennium Ecosystem Assessment
  - The International Agricultural Assessment of Science and Technology for Development
  - The Global Environmental Outlook

The proposed Intergovernmental Platform for Biodiversity and Ecosystem Services could be a mechanism to provide information to all ecosystem conventions and even more important to individual countries through sub-global assessments
Next steps

- Nairobi (Feb 2009) : 25th Gov Council UNEP
- Paris meeting (April 2009) : MeA meeting
- Brussels (May 2009) : EU IpBES
- Nairobi (Oct 2009) : 2nd Intergov meeting
- ...

- Aichi-Nagoya (Oct 2010) : CoP 10 and UN International Year of Biodiversity
vielen Dank!

• Thanks to:
  

Contact: didier.babin@cirad.fr
RESEARCH CONCLUDES:

WE ARE DESTROYING EARTH.

COULD YOU KINDLY REPRESS THAT IN EQUIVOCAL, INACCURATE, VAGUE, SELF-SERVING AND ROUNDABOUT TERMS THAT WE CAN ALL UNDERSTAND?
Enjeux et questionnements

• Economiques et sociaux
• De durabilité et de synergie
• De décision et de contrôle
• Politiques de souveraineté, de coopération et de gouvernance internationale
• De représentation et d’évaluation
• De recherche-développement : innovation technologique
• De démocratie et d’innovation sociale
• De recherche ...
Anthropocentric value of biota

**Direct-use values**
- Consumptive use
  - Foods
  - Fibres
  - Fuels
  - Genes
  - Biochemicals
  - Amenity

**Indirect-use values**
- Non-consumptive use
  - Habitat
  - Water
  - Nutrients
  - Soils
  - Climate
  - Disease

**Non-use/passive use values**
- Resilience
- Resistance
- Pollination
- Seed dispersal
- Erosion
- Buffering
- Education
- Spirituality
- Amenity
4. Changes in Economic value due to loss of Biodiversity

<table>
<thead>
<tr>
<th>Land based ecosystems only Excl. Polar &amp; Desert Biome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>World Total (Land-based ecosystems*)</td>
</tr>
<tr>
<td>Natural areas</td>
</tr>
<tr>
<td>Forest managed</td>
</tr>
<tr>
<td>Extensive Agriculture</td>
</tr>
<tr>
<td>Intensive Agriculture</td>
</tr>
<tr>
<td>Woody biofuels</td>
</tr>
<tr>
<td>Cultivated grazing</td>
</tr>
</tbody>
</table>

➤ This loss is equivalent to 7% of projected global GDP for 2050.

➤ The loss grows with each year of biodiversity loss.