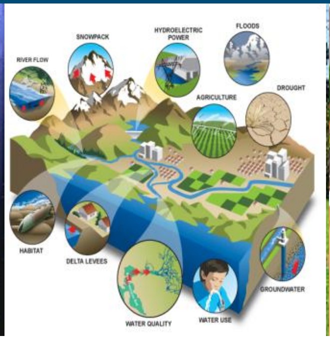
How to write a world-class paper?

Personal experiences

Prof. Dr. Rik Leemans
Environmental System Analysis Group

Editor-in-chief Current Opinion in Environmental sustainability

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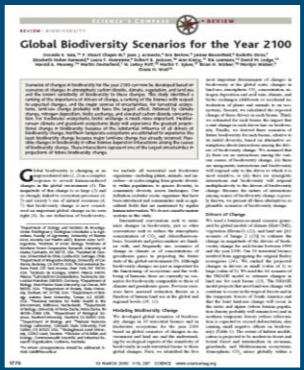
Well-cited papers essential for the science-policy dialogue


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

Nature


Global Biodiversity Scenarios for the Year 2100

Science


New estimates of global emissions of N_2O from rivers and estuaries

Environmental Science


Another reason for concern: regional and global impacts on ecosystems for different levels of climate change

Global Environ-Mental Change


Ecosystem Service Supply and Vulnerability to Global Change in Europe

Science


Global Desertification: Building a Science for Dryland Development

Science

- The Environmental System Analysis Group publishes on innovative approaches and models to understand, predict and assess solutions to large-scale environmental problems. Our research is integrative, interdisciplinary and transdisciplinary. We also contribute to international science-policy assessments.
- **Our results can only be used for policy support if our science is peer-reviewed, published and accepted by the wider scientific community.**

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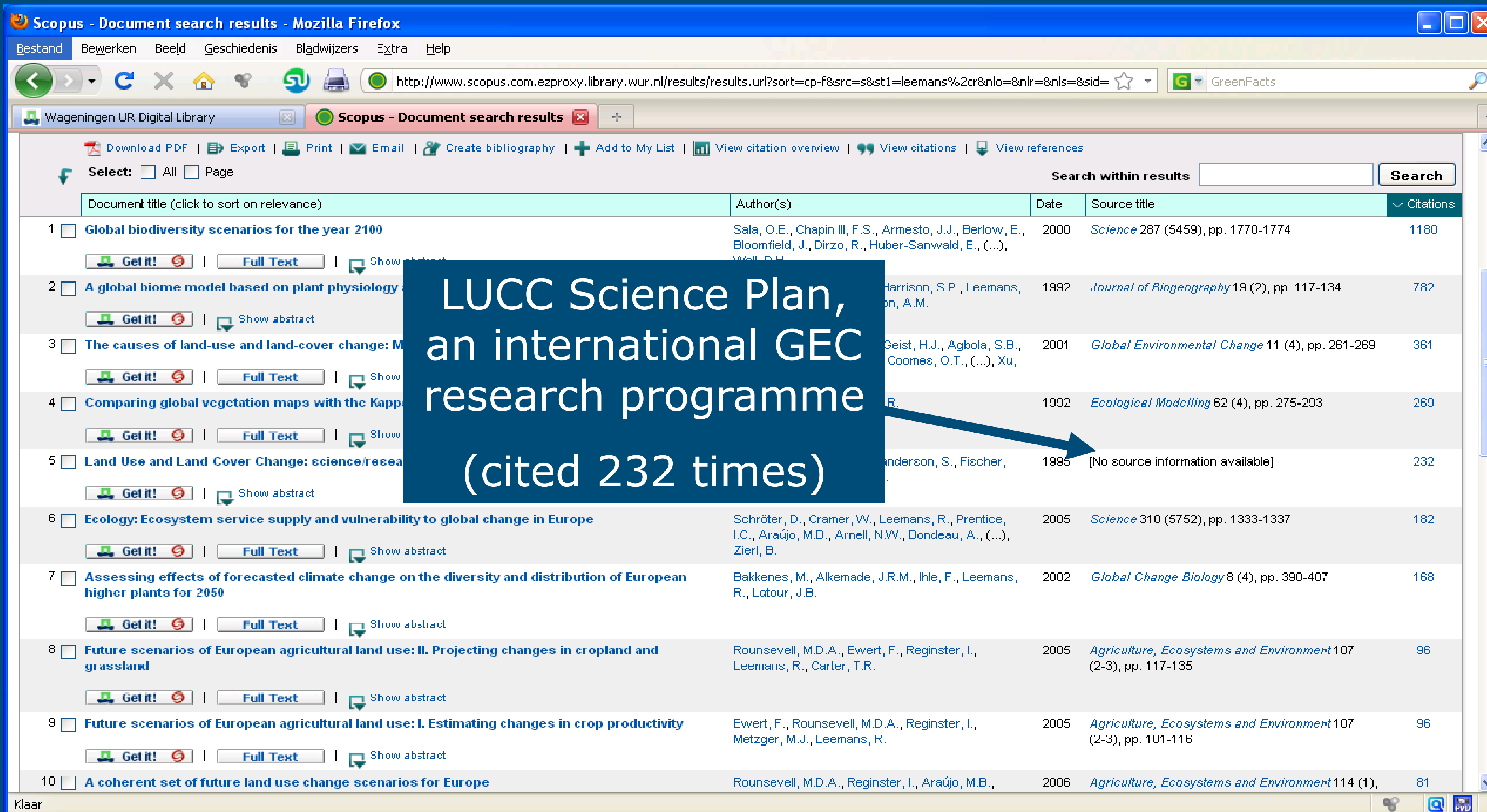
Rik Leemans: Personal records



LUCC Science Plan, an international GEC research programme

(cited 232 times)

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How to write a world-class paper?

- Two-week NCEAS Workshop that resulted in a book and three papers
- I provided scenarios for changes in land use, CO2 and climate from IMAGE-2
- Experts for each biome used these scenarios to assess future trends in biodiversity

Conclusions:

- Biodiversity decline continues
- Different drivers in different regions

Why world-class?

- Integrative approach with an excellent team of twenty experts
- Never done before!
- Policy relevant results

CITED: 1180 times

SCIENCE'S COMPASS • REVIEW

REVIEW: BIODIVERSITY

Global Biodiversity Scenarios for the Year 2100

Osvaldo E. Sala,[1*] F. Stuart Chapin III,[2] Juan J. Armesto,[4] Eric Berlow,[5] Janine Bloomfield,[6] Rodolfo Dirzo,[7] Elisabeth Huber-Sanwald,[8] Laura F. Huenneke,[9] Robert B. Jackson,[10] Ann Kinzig,[11] Rik Leemans,[12] David M. Lodge,[13] Harold A. Mooney,[14] Martin Oesterheld,[1] N. LeRoy Poff,[15] Martin T. Sykes,[17] Brian H. Walker,[18] Marilyn Walker,[2] Diana H. Wall[16]

Scenarios of changes in biodiversity for the year 2100 can now be developed based on scenarios of changes in atmospheric carbon dioxide, climate, vegetation, and land use and the known sensitivity of biodiversity to these changes. This study identified a ranking of the importance of drivers of change, a ranking of the biomes with respect to expected changes, and the major sources of uncertainties. For terrestrial ecosystems, land-use change probably will have the largest effect, followed by climate change, nitrogen deposition, biotic exchange, and elevated carbon dioxide concentration. For freshwater ecosystems, biotic exchange is much more important. Mediterranean climate and grassland ecosystems likely will experience the greatest proportional change in biodiversity because of the substantial influence of all drivers of biodiversity change. Northern temperate ecosystems are estimated to experience the least biodiversity change because major land-use change has already occurred. Plausible changes in biodiversity in other biomes depend on interactions among the causes of biodiversity change. These interactions represent one of the largest uncertainties in projections of future biodiversity change.

Global biodiversity is changing at an unprecedented rate (*1, 2*) as a complex response to several human-induced changes in the global environment (*3*). The magnitude of this change is so large (*1*) and so strongly linked to ecosystem processes (*4, 5*) and society's use of natural resources (*6, 7*) that biodiversity change is now considered an important global change in its own right (*8*). In our definition of biodiversity, we include all terrestrial and freshwater organisms—including plants, animals, and microbes—at scales ranging from genetic diversity within populations, to species diversity, to community diversity across landscapes. Our definition excludes exotic organisms that have been introduced and communities such as agricultural fields that are maintained by regular human intervention. We do not consider marine systems in this study.

International conventions seek to minimize changes in biodiversity, just as other conventions seek to reduce the atmospheric concentration of CO_2 and chlorofluorocarbons. Scientists and policy-makers are familiar with, and frequently use, scenarios of change in climate or of concentrations of greenhouse gases in projecting the future state of the global environment (*9*). Although biodiversity changes are just as important for the functioning of ecosystems and the well-being of humans, there are currently no scenarios for biodiversity comparable to those of climate and greenhouse gases. Previous exercises have assessed extinction threats as a function of human land use at the global and regional levels (*10, 11*).

Modeling Biodiversity Change

We developed global scenarios of biodiversity change in 10 terrestrial biomes and in freshwater ecosystems for the year 2100 based on global scenarios of changes in environment and land use and the understanding by ecological experts of the sensitivity of biodiversity in each terrestrial biome to these global changes. First, we identified the five most important determinants of changes in biodiversity at the global scale: changes in land use, atmospheric CO_2 concentration, nitrogen deposition and acid rain, climate, and biotic exchanges (deliberate or accidental introduction of plants and animals to an ecosystem). Second, we calculated the expected change of these drivers in each biome. Third, we estimated for each biome the impact that a unit change in each driver has on biodiversity. Finally, we derived three scenarios of future biodiversity for each biome, relative to its initial diversity, based on alternative assumptions about interactions among the drivers of biodiversity change. We assumed that (i) there are no interactions among the various causes of biodiversity change, (ii) there are antagonistic interactions and biodiversity will respond only to the driver to which it is most sensitive, or (iii) there are synergistic interactions and biodiversity will respond multiplicatively to the drivers of biodiversity change. Because the nature of interactions among causes of biodiversity change is poorly known, we present all three alternatives as plausible scenarios of biodiversity change.

Drivers of Change

We used a business-as-usual scenario generated by global models of climate (HadCM2), vegetation (Biome3) (*12*), and land use [A1 scenario of Image 2 (*13*)] to estimate the change in magnitude of the drivers of biodiversity change for each biome between 1990 and the year 2100. Our 10 terrestrial biomes resulted from aggregating the original Bailey ecoregions (*14*). We ranked the projected changes in drivers as small (value of 1) to large (value of 5). We used the A1 scenario of the IMAGE model to estimate changes in land use for each biome (*13*). The IMAGE model projects that most land-use change will continue to occur in the tropical forests and in the temperate forests of South America and that the least land-use change will occur in the arctic and alpine (where human population density probably will remain low) and in northern temperate forests (where reforestation is expected to exceed deforestation, also causing small negative effects on biodiversity) (Table 1). The extent of habitat modification is projected to be modest in desert and boreal forest and intermediate in savannas, grasslands, and Mediterranean ecosystems. Atmospheric CO_2 mixes globally within a

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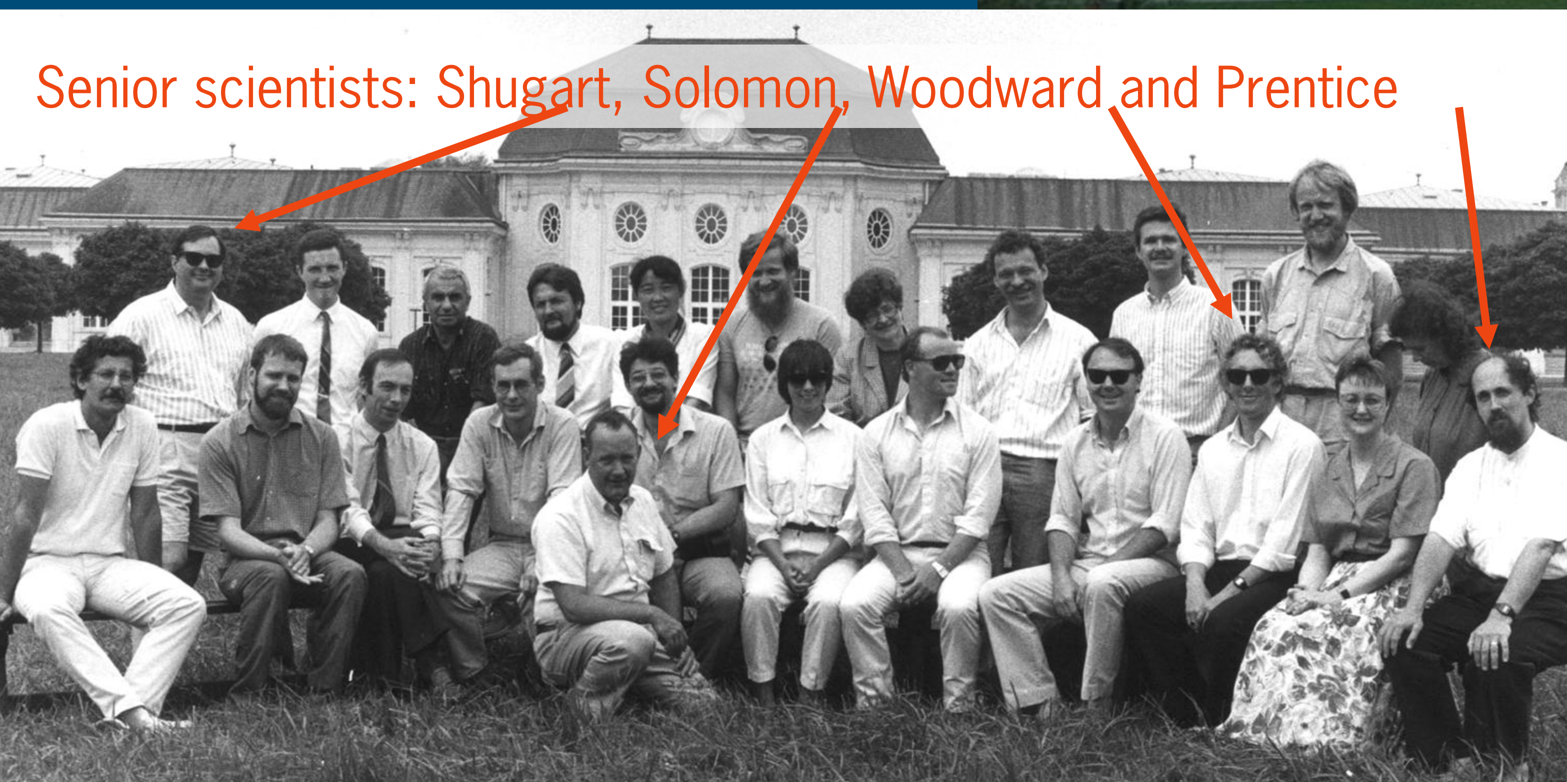
IIASA, Laxenburg

Austria



How to write a world-class paper?

- Result of two summer-schools at IIASA
- I provided the CLIMATE database (**CLIMATE**: **C**ramer-**L**eemans **I**nterpolated **M**eteorology for **A**pplication in **T**errestrial **E**cology), programmed and validated
- Paper was reviewed by three reviewers: **All recommended immediate publication!**

Conclusions:

- A mechanistic model for global vegetation patterns based on theory
- Well validated against independent data

Why world-class?

- New global vegetation model
- Never done before!
- Now used in many global vegetation models (DGVMs)

Journal of Biogeography (1992) 19, 117–134

Cited: 780 times

A global biome model based on plant physiology and dominance, soil properties and climate

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Abstract. A model to predict global patterns in vegetation physiognomy was developed from physiological considerations influencing the distributions of different functional types of plant. Primary driving variables are mean coldest-month temperature, annual accumulated temeprature over 5°C, and a drought index incorporating the seasonality of precipitation and the available water capacity of the soil. The model predicts which plant types can occur in a given environment, and selects the potentially dominant types from among them. Biomes arise as combinations of dominant types. Global environmental data were supplied as monthly means of temperature, precipitation and sunshine (interpolated to a global 0.5° grid, with a lapse-rate correction) and soil texture class. The resulting predictions of global vegetation patterns were in good agreement with the mapped distribution of actual ecosystem complexes (Olson, J.S., Watts, J.A. & Allison, L.J. (1983) *ORNL-5862*, Oak Ridge Nat. Lab., 164 pp.), except where intensive agriculture has obliterated the natural patterns. The model will help in assessing impacts of future climate changes on potential natural vegetation patterns, land-surface characteristics and terrestrial carbon storage, and in analysis of the effects of past climate change on these variables.

Key words. Biome, carbon cycle, climate change, map comparison, plant functional types.

INTRODUCTION

The transcontinental correspondence between geographic patterns of vegetation and climate is one of the oldest observations in plant ecology, and forms the basis for several empirical classification schemes that have been used to predict the broad physiognomic vegetation types known as plant formations, or biomes (Mather & Yoshioka, 1968; Cramer & Leemans, 1992). The best-known schemes are those of Köppen (1936) and Holdridge (1947). Köppen's scheme was intended as a classification of climates, although its boundaries were chosen to coincide approximately with vegetational boundaries and are expressed in terms of aspects of climate (particularly seasonality) that are relevant to plants. Holdridge's scheme on the other hand was meant to relate potential natural vegetation to climate, although its boundaries are merely a regular dissection of a climate space defined by two variables, annual precipitation and growing-season temperatures. The Köppen scheme has recently been improved by Guetter & Kutzbach (1990) and the Holdridge scheme by K.C. Prentice (1990). Such schemes owe their present popularity to their ease of application in assessments of the effects of climate change on potential natural vegetation at a global scale (Emanuel, Shugart & Stevenson, 1985; Shugart *et al.* 1986; Leemans, 1990; Prentice & Solomon, 1991).

The Köppen and Holdridge schemes are however not the only available tools for this purpose, and there are already models that are better in various ways. Box (1981) described a model in which almost 100 plant functional types were assigned climatic tolerances (upper and/or lower bounds) for six climate variables expressing levels and seasonality of temperature and precipitation, and a moisture index expressing the ratio of precipitation and potential evapotranspiration. An 'environmental sieve' based on these climatic limits determined which plant types could occur in a given climate. A dominance hierarchy was then applied to reduce the list of plant types to a set of potential dominants. Global maps based on Box's model are presented by Cramer & Leemans (1992).

Box's model can be considered as a 'Gleasonian' model, in contrast with the Clementsian determinism implicit in the earlier schemes. The biomes are not taken as given, but emerge through the interaction of constituent plants. The

How to write a world-class paper?

- Result of two summer-schools at IIASA
- To compare global vegetation maps, we developed the Kappa statistics

Conclusions:

- A simple statistic to compare global maps and calculate goodness-of-fit
- Well tested for different datasets

Why world-class?

- New urgently needed statistic (in hindsight also developed independently by two other groups)
- Immediately applied in GEC research for global vegetation and land use models

Cited: 278 times

Ecological Modelling, 62 (1992) 275–293
Elsevier Science Publishers B.V., Amsterdam
275

Comparing global vegetation maps with the Kappa statistic

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(Accepted 16 December 1991)

ABSTRACT

Monserud, R.A. and Leemans, R., 1992. Comparing global vegetation maps with the Kappa statistic. *Ecol. Modelling*, 62: 275–293.

The Kappa statistic is presented as an objective tool for comparing global vegetation maps. Such maps can result from either compilations of observed spatial patterns or from simulations from models that are global in scope. The method is illustrated by comparing global maps resulting from applying a modified Holdridge Life Zone Classification to current climate and several climate change scenarios (CO_2 doubling). These scenarios were based on the results of several different general circulation models (GCMs). The direction of change in simulated vegetation patterns between different GCMs was found to be quite similar for all future projections. Although there were differences in magnitude and extent, all simulations indicate potential for enormous ecological change. The Kappa statistic proved to be a useful and straightforward measure of agreement between the different global vegetation maps. Furthermore, Kappa statistics for individual vegetation zones clearly indicated differences and similarities between those maps. The Kappa statistic was found to be most useful for rank ordering of agreement, both across a series of maps and across the various vegetation zones within a map.

INTRODUCTION

Predicting ecosystem response to climate change is currently one of the major issues in ecological research (Walker and Greatz, 1989; Houghton et al., 1990). Current approaches for assessing such response can be charac-

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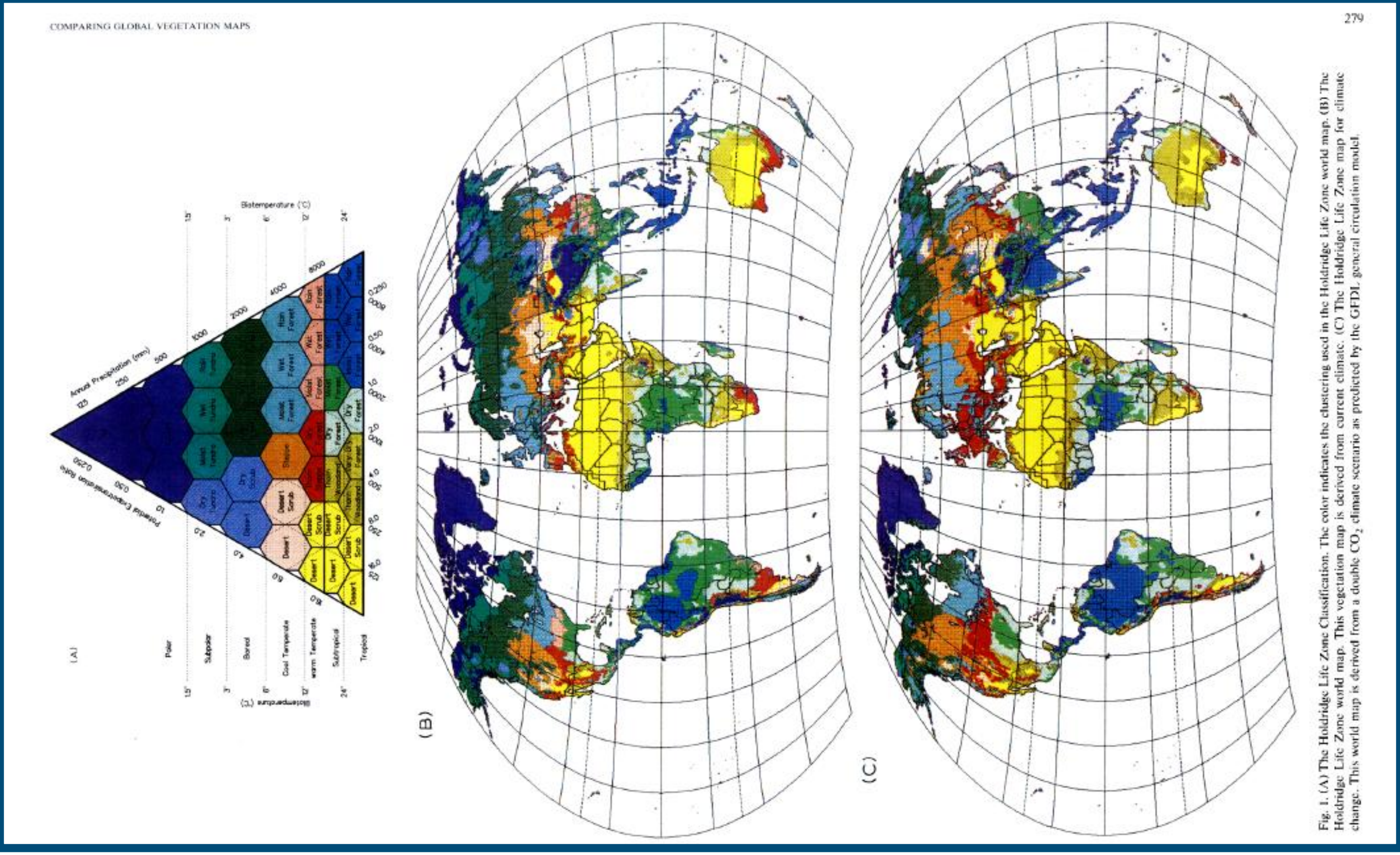
Creating global vegetation maps 25 years ago was a major innovation



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My lessons learned for writing a world-class paper

- Work with world-class research teams (e.g. IIASA ,NCEAS, IPCC & MA)
- Create innovative tools (e.g. Kappa statistics, BIOME & IMAGE model)
- Create large databases that are needed by the research community (e.g. CLIMATE, IMAGE-scenarios) and distribute them freely
- Contribute to review workshops (e.g. 'The Myth of Deforestation' and 'Sustainability or Collapse' papers)
- Contribute to new innovative concepts and theories (e.g. climate-change impacts, biodiversity scenarios, ecosystem services, quantifying vulnerability)
- Help to define and initiate new science agendas (active in international GEC programmes and ESSP)
- Create press releases and distribute your papers widely

Publishing a paper: understanding the process





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Why publish?

Publishing is one of the necessary steps **embedded in the** scientific **research process**.

- **We should publish:**
  - To present **new and original results or methods**
  - To rationalize **(refine or reinterpret) published results**
  - To **review the field** or to summarize a particular subject
  - To **publish that advance**, not repeats, **knowledge** and understanding in a certain, scientific field

We should **not publish:**

- Reports of no scientific interest
- Work out of date
- **Duplications** of previously published work
- Incorrect/not acceptable conclusions

You need a GOOD manuscript to present your contributions to the scientific community

A research study is meaningful only if…

- it is clearly described, so
- someone else can use it in his/her studies
- it arouses other scientists' interest
- allows others to reproduce the results.

By submitting a manuscript you are basically trying to sell your work to your community…

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What makes a good manuscript?

A good manuscript **makes** readers (especially reviewers and editors) **grasp the scientific significance as EASILY as possible.**

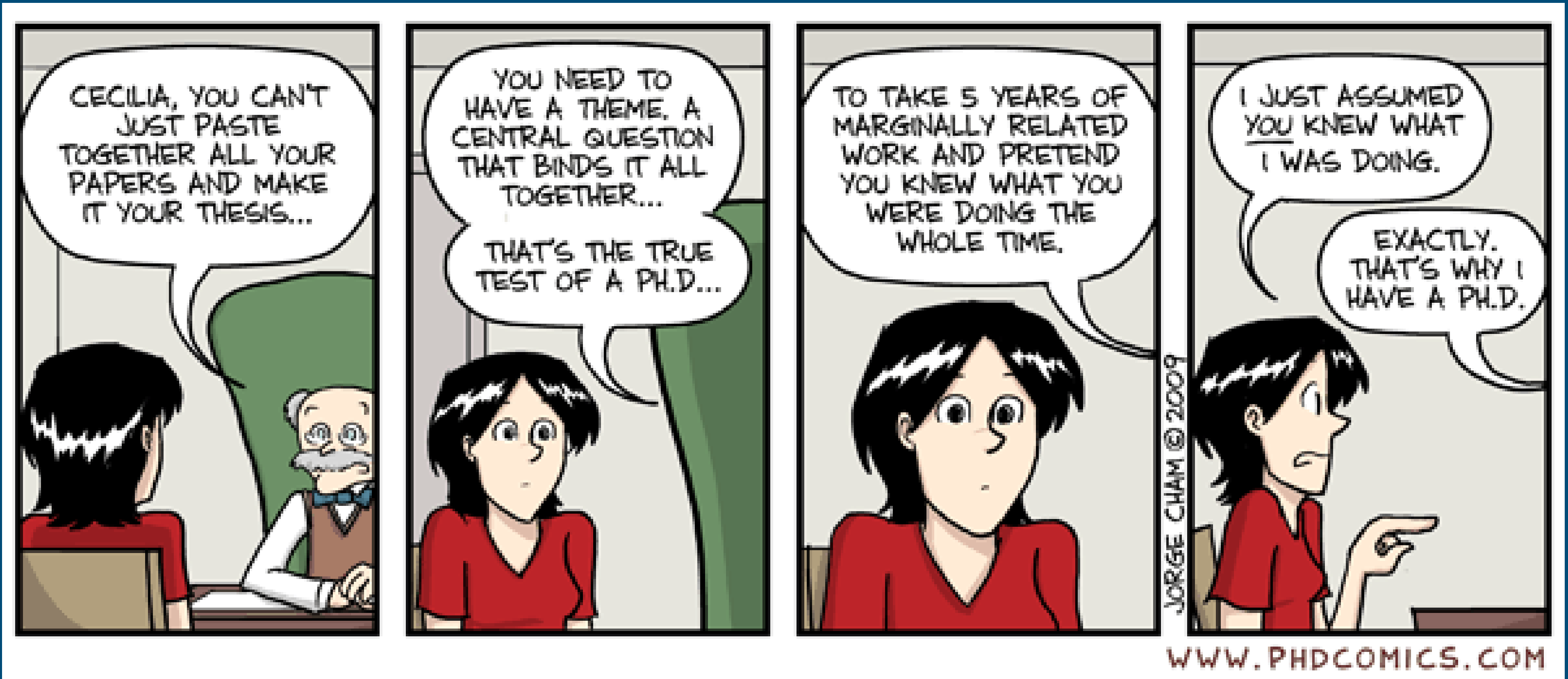
- **Writing** a good manuscript **is NOT easy**. Be prepared to work hard on it.
- **What makes a good manuscript?**
  - **Cherish your own work** – if you do not take care, why should the journal?
  - There is **no secret recipe for success** – just some simple rules, dedication and hard work.
  - **Editors and reviewers** are all busy scientists, just like you – make things easy to **save their time!**

Presentation is critical!

What is a good paper?

- Target to your intended audience
- Clear message, which is easy to understand (abstract & title)
- Introduction should put research into the broader context and provide a well defined objective
- The innovation must be made explicit
- Well structured and easy to read
- Focused and logical reasoning
- Well referenced
- Clear Figures and Tables
- Clear explanations of symbols and legends

Writing experience helps: ask advice!



What is the main bottleneck?

Every journal has its own intended audience and interests with a specific interest. **Always Check that!**
You should also write for that audience (*i.e. use their jargon and explain jargon of other communities*).
Otherwise paper could well be judged "*out of scope*".

Do research, analyze results, draw conclusions and try to structure your paper

Select journal (scope, audience and format) and finalize paper

Paper reviewed and accepted of rejected

Improve and respond to reviews

Paper accepted and published

Submitting a paper

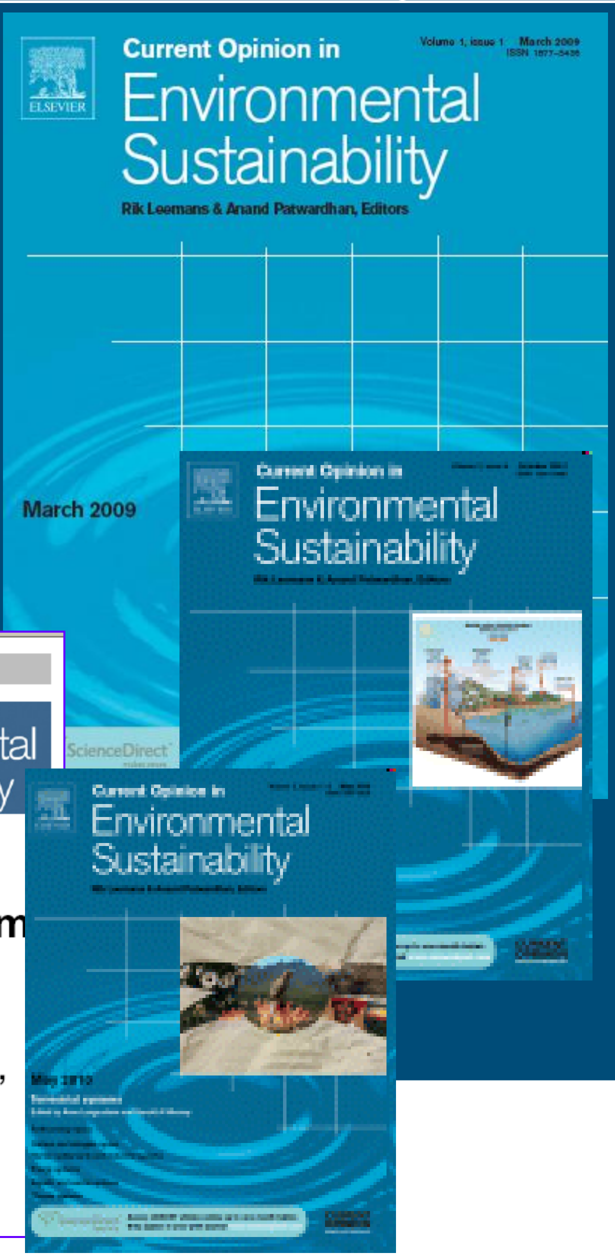
- Read and follow journal instructions
- If you are not sure that your paper is within the scope. (when you are not sure, contact editor and show her an abstract)
- Write a clear cover letter (provide objective and innovation, you can also suggest reviewers)

What does the Editor-in-chief do?

- Checks if the paper fits in within the scope of the journal (10-30')
- Sends the paper to an editorial board member for the actual review process
- Makes the final decision to accept on basis of advice of the editorial board member.
- Contacts the publisher

Current Opinion in Environmental Sustainability

- Focuses on review and synthesis papers from the Earth System Science Partnership (ESSP)
- Possibilities to publish international science and strategy plans
- Themes: Terrestrials systems; Aquatic systems; Climate systems; Energy systems; Carbon and Nitrogen cycles; Human systems



COSUST-15; NO OF PAGES 10 ARTICLE IN PRESS

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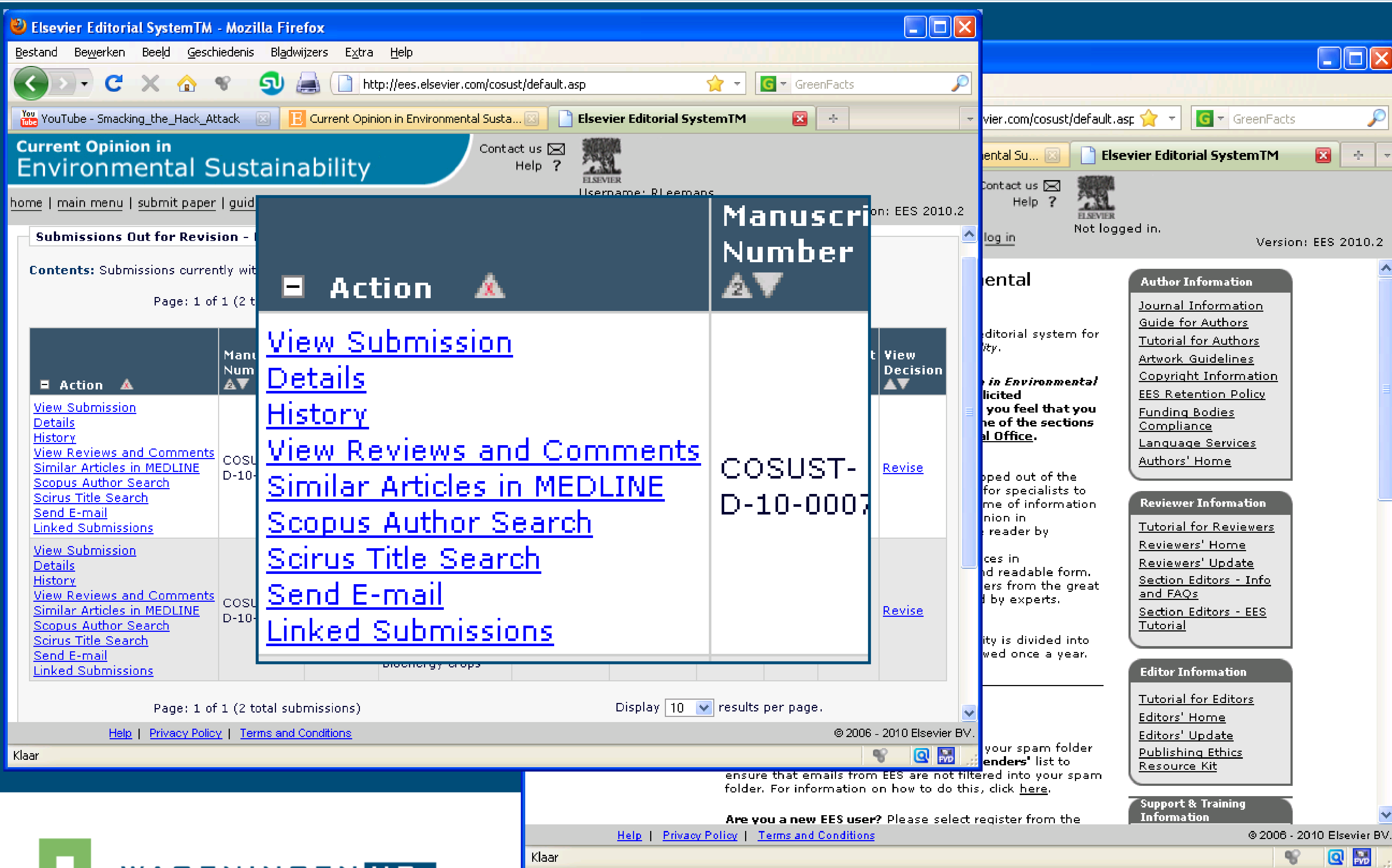
Current Opinion in Environmental Sustainability

Developing a common strategy for integrative global environmental change research and outreach: the Earth System Science Partnership (ESSP)

Strategy paper

Rik Leemans[1], Ghassem Asrar[2], Antonio Busalacchi[3], Josep Canadell[4], John Ingram[5], Anne Larigauderie[6], Harold Mooney[7], Carlos Nobre[8], Anand Patwardhan[9], Martin Rice[10], Falk Schmidt[11], Sybil Seitzinger[12], Hassan Virji[13], Charles Vörösmarty[14] and Oran Young[15]

The Editorial system



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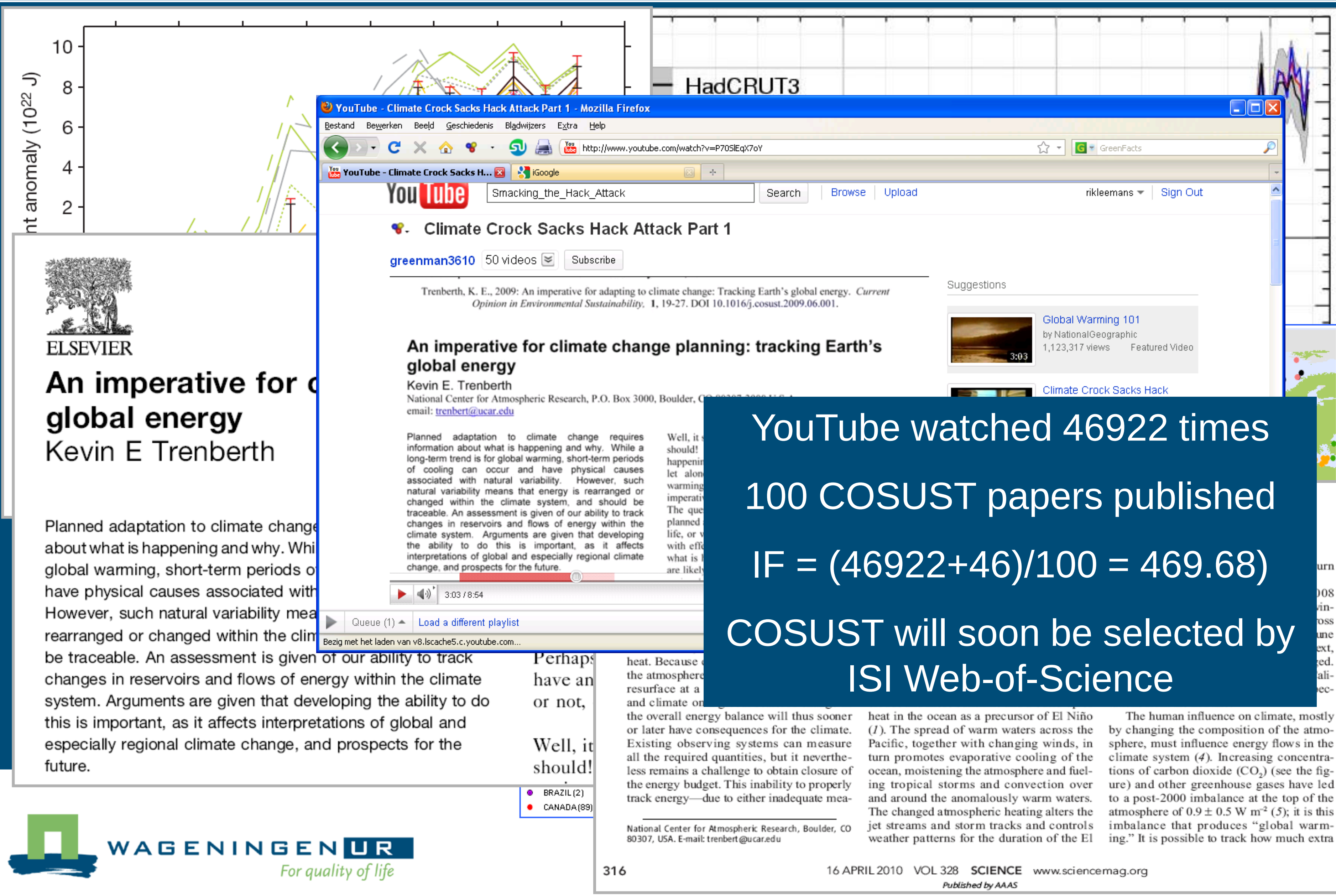
Observed changes in temperature



YouTube watched 46922 times

100 COSUST papers published

IF = (46922+46)/100 = 469.68)

COSUST will soon be selected by ISI Web-of-Science

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What does the topic editor do?

- Set up a timely and confidential review process (anonymous, constructive, etc.)
- Selects reviewers
  - his expertise, reference list, your suggestions, SCOPUS, scholar.google or ISI on basis of your title and keywords
- Oversees the timeline (send reminders to the reviewers)
- Judges if reviews are appropriate
- Determines is the response of the authors is adequate
- Suggest publication, revisions or rejection
- Advices the editor-in-chief on final decision

Results of a review

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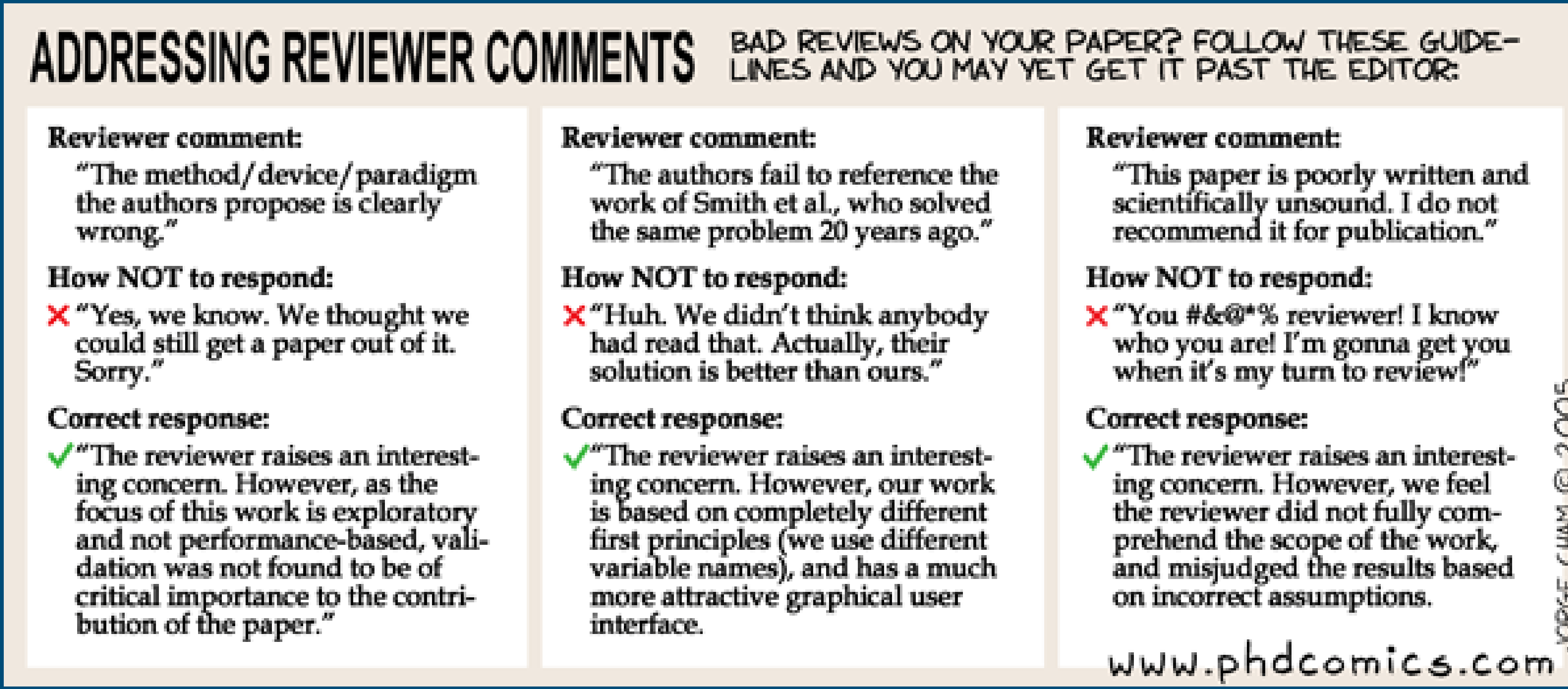
Decisions

- Accepted with no change (happened only once to me)
- Accepted with minor changes (normally, you can quickly deal with it. It is OK to disagree with reviewers)
- Accepted with major changes (normally, you need time to deal with it. It is OK to disagree with reviewers)
- Rejected (outside scope; results do not support conclusions; doesn't add new knowledge; sloppy writing, ……).
  You can complain to editor-in-chief when results seem unfair, but…….

How to respond to a review



Some final thoughts and tips

- Publication with high scientific and societal impact is important
- Understanding the publication process helps
- Collaboration in excellent research teams helps

But you have to make the excellent contributions!