Sustainability Science in a Global Landscape

Seminar co-organized by
United Nations University, Institute for the Advanced Study of Sustainability (UNU-IAS) and Elsevier

Dignity / People / Prosperity
Planet / Justice / Partnership

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“Meeting fundamental human needs while preserving Earth's life support systems will require an accelerated transition toward sustainability. A new field of sustainability science is emerging that seeks to understand the fundamental character of interactions between nature and society and to encourage those interactions along more sustainable trajectories. Such an integrated, place-based science will require new research strategies and institutional innovations to enable them especially in developing countries still separated by deepening divides from mainstream science. Sustainability science needs to be widely discussed in the scientific community, reconnected to the political agenda for sustainable development, and become a major focus for research.”

*Clark et. al. Science 27 April 2001*
Mapping the 17 SDGs on 6 essential elements

DIGNITY
To end poverty and fight inequalities

PARTNERSHIP
To catalyse global solidarity for sustainable development

JUSTICE
To promote safe and peaceful societies and strong institutions

PEOPLE
To ensure healthy lives, knowledge and the inclusion of women and children

PLANET
To protect our ecosystems for all societies and our children

PROSPERITY
To grow a strong, inclusive and transformative economy

Sustainable Development Goals

Figure I.1 — The six Essential Elements. The figure is reproduced based on Figure 1 in the United Nations' report "The Road to Dignity by 2030: Ending Poverty, Transforming All Lives and Protecting the Planet".
Critical Dimensions of Sustainability Science

- Research Output and Citation Impact
- Research Collaboration
- Interdisciplinary Research
Scopus – the world’s largest abstract & citation database

Over 55M records from 21,912 serial titles and 42,000 books (July 2014)
22M pre 1996 records | 33.0M post 1995 records

- Content from > 5,000 publishers
- “Articles in Press” from > 3,750 titles
- Titles from 105 different countries in all geographical regions
- 40 “local” languages covered
- More than 3,500 Gold Open Access journals Indexed
How can we “data-mine” the science publication landscape
# How to define what type of publications goings into a theme?

## THEME DIGNITY

The publications need to satisfy the following conditions:

1. Contain at least one of the keywords or combinations of keywords in abstract, title or keywords:

   - **agricultural development**
   - **food price**
   - **poverty alleviation**
   - **(agricultural production AND sustainab*)**
   - **(food security AND sustainab*)**
   - **poverty determinant**
   - **child labor**
   - **(hunger AND sustainab*)**
   - **poverty line**
   - **child mortality**
   - **income growth**
   - **poverty reduction**
   - **children’s health**
   - **income inequality**
   - *(reform program* AND sustainab*)
   - **development aid**
   - **income shock**
   - *(rural development AND sustainab*)
   - **distributional effect**
   - **land ownership**
   - **rural finance**
   - **(educational attainment AND sustainab*)**
   - **land reform**
   - **rural poverty**
   - **endowment**
   - **income inequality**
   - *(safety net AND sustainab*)
   - **land right**
   - **small farmer**
   - **(food AND aid)**
   - **land tenure**
   - **smallholder**
   - **(food policy AND sustainab*)**
   - **malnutrition**

2. Belong to one of the following Scopus subject areas:
   - social sciences, economics, econometrics & finance, business, management & accounting, multidisciplinary, and does not belong to medicine.
THEME PEOPLE

The publications need to satisfy at least one of the following two conditions:

1. Satisfy a, b and c below:
   a. Contain at least one of the keywords or combinations of keywords in abstract, title or keywords:

   | AIDS                        | intersex                  | tobacco use                  |
   | cancer                     | lesbian                   | traffic accident             |
   | cardiovascular disease     | malaria                   | transgender                  |
   | child mortality            | maternal mortality        | tropical disease             |
   | chronic respiratory disease| mental health             | tuberculosis                 |
   | diabetes                   | neonatal mortality        | unplanned pregnancy          |
   | drug abuse                 | planned abortion          | vaccine                      |
   | health finance             | post natal depression     | (victim AND crime)           |
   | health risk                | premature mortality       | violence                     |
   | hepatitis                  | reproductive health       | water-borne disease          |
   | HIV Infection              | sexually transmitted disease |                            |
   | household accident         | spontaneous abortion      |                            |

   b. Contain at least one of the following keywords in abstract, title or keywords: development, sustainable, millennium, goal, target, indicator.

   c. Belong to at least one of the Scopus subject areas: obstetrics and gynaecology, health policy, endocrinology, diabetes & metabolism, cardiology & cardiovascular medicine, psychiatry & mental health, public health, environmental & occupational health, infectious diseases,
What are the common keywords for the themes?

Dignity
- farmer
- research community
- strategy
- production system
- child
- land
- income
- population
- poverty
- data
- impact
- economics
- food system
- health
- international
- problem
- program
- government
- survey
- poverty alleviation

People
- gender identity
- residence characteristics
- development
- young adult
- treatment outcomes
- mental health
- HIV
- antiretroviral therapy
- incidence
- mortality
- data
- research
- population
- interview
- questionnaires
- cross-sectional studies
- data collection

Prosperity
- global warming
- urban area
- air
- development pollution
- air pollution
- technology
- energy efficiency
- transportation
- applications
- economics
- sustainable development
- public policy
- planning
- energy utilization
- design
- greenhouse gases

Planet
- greenhouse gases
- carbon dioxide
- climate
- climate change
- data
- region
- models
- climate
- simulation
- economics
- costs
- surfaces
- global warming

Justice
- United States of America
- politics
- development
- effect
- research
- power
- analysis
- democracy
- practice
- society
- security
- education
- economics
- sustainable development

Partnership
- industry
- stakeholder
- capacity building
- public policy
- corporate social responsibility
- management
- sustainable economics
- process
- people
- communities
- societies and institutions
RESEARCH OUTPUT AND CITATION IMPACT
SUSTAINABILITY SCIENCE IS A FIELD WITH A HIGH GROWTH RATE IN RESEARCH OUTPUT

7.6%

Double the Scopus average growth rate (2009-13)
Figure 1.1 — Total number of publications; per country for top 15 most prolific countries in sustainability science; per year for the period 2009-2013.

a. Top 15 most prolific countries
Figure 1.2 — CAGR of publications in sustainability science; per country for the top 15 most prolific countries in sustainability science; for the period 2009-2013.
Figure 1.3 — Total number of publications; for the world; per theme for sustainability science; per year for the period 2009-2013.
RESEARCH OUTPUT IN SUSTAINABILITY SCIENCE ATTRACTS

30%

MORE CITATIONS THAN AN AVERAGE RESEARCH PAPER
RESEARCH COLLABORATION
RESEARCH IN SUSTAINABILITY SCIENCE IS HIGHLY COLLABORATIVE

EXAMPLE:

US proportion of international collaboration in its research output

26.5% (2009) to 32.9% (2013)

HOWEVER:

Collaboration between high-income and low-income nations remains low
Figure 2.1 — Share of internationally collaborative publications out of the country’s total publications and FWCI of international collaboration; per country for the top 15 most prolific countries in sustainability science; for sustainability science; per year for the period 2009-2013.
Figure 2.3 — Network map of countries; for the world; for sustainability science; for the period 2009-2013. The size of the nodes denotes the number of the publications of the country. The color of the nodes and edges denotes the continent (dark blue: Asia, blue: Africa, pink: Europe, purple: North America, green blue: South America, green: Oceania). The length of the edges denotes Salton’s index. Nodes with less than 10 connections and edges with a Salton’s index less than 0.026 are not shown. Force Atlas 2 algorithm is used for the layout.
Disparities in Contributions to Sustainability Science

HIGH-INCOME COUNTRIES

76% (254,629) of all publications in sustainability science (2009-13)

LOW-INCOME COUNTRIES

2% of all publications in sustainability science (2009-13)
Figure 2.5 — The number of collaborative publications across income classes, for the world, for sustainability science, for the period 2009-2013. The numbers in the bracket are the share of collaborative publications out of all publications of the countries in the income class.
Figure 2.9 — Network map of top institutions in each sector, for the world, for sustainability science, for 2009-2013. The size of the nodes denotes the number of the publications of the institution. The color of the nodes denotes the sector of the institution (blue: academic; green: medical; dark blue: government; pink: corporate). The length of the edges denotes Salton’s index. Nodes with less than 39 connections and edges with a Salton’s index less than 0.025 are not shown. Force Atlas 2 algorithm is used for the layout.
Interdisciplinary Research

Monodisciplinary: apple

Multidisciplinary: fruit salad

Interdisciplinary: smoothie

Transdisciplinary: multi-fruit ice cream
How can we define interdisciplinary?
SUSTAINABILITY SCIENCE IS LESS INTERDISCIPLINARY THAN THE WORLD AVERAGE
What is the share of a country’s sustainability science publications among the top 10% most interdisciplinary?

Figure 3.1 — Share of the top 10% most IDR, per country for the top 15 most prolific countries in sustainability science; for sustainability science; 2009 and 2013.
Figure 3.3 — Co-occurrence map of key phrases in the top 10% IDR publications, for the world for sustainability science, for the period of 2009-2013. The size of the nodes denotes the number of occurrences of the key phrase. The color of the nodes denotes the clusters. The length of the edges denotes the intensity of co-occurrences of key phrases in the top 10% IDR in sustainability science. Nodes with no connection and edges with the intensity less than 0.076 are not shown. Force Atlas 2 algorithm is used for the layout.
Conclusions

- Baseline
- Growth
- Disparities
- Strengths
- Gaps
- Dialogue
How editors can contribute to sustainable development

When the UN established the Sustainable Development Goals at its headquarters in New York last month, it set the agenda for Sustainable Development for the next 15 years.

As an editor, you can collectively draw more attention to sustainability science in a number of ways, including:
“There is a natural value chain of knowledge. I think mapping how this range of activities connect and could contribute to problem solving within the SDG framework would be extremely valuable.”

Jeffrey Sachs
The Earth Institute
Thank you!