Sustainability as a topic at a technical university: A bibliometric analysis

Work in progress – Preliminary results

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18th Nordic Workshop on Bibliometrics and Research Policy
Presentation outline

• Background: sustainability policy

• Research themes

• Methods and data

• Results: sustainability research and research areas

• Discussion: conclusions and implications
Background: sustainability policy

Brundtland report (UN 1987) solving the conflict between socioeconomic development and protection of the natural resource base by defining sustainable development as:

‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’.

Now: sustainable development as an **essentially contested concept**? Agree on ‘first level’ political meanings; under this apparent unity there is deeper disagreement. Makes it easy to modify to fit changing circumstances and vulnerable to hijacking and re-definition.
Research themes

UNIVERSITY POLICY

- specialization in areas of environmental engineering
- cross-disciplinary involvement in natural sciences
- show current examples of domains of sustainability research in areas of social sciences and humanities

NATIONAL AND EU POLICY

- Policy on research investments in Sweden and EU: Grand Challenges and Horizon 2020
Methods and data

- Local publication database (DiVA). (Web of Science to be used in further work)

- Two-step method: sustainability and wider search of terms to expand analysis of research publications not explicit mention sustainability/hållbar

Step 1 search: Sustainability Hållbar

Step 2 search: expansion of terms (beyond sustainability)
Methodological concerns

- Step 1 – High precision, low recall
- Step 2 – Balance between recall and precision
- Example – Environmental (Environmental humanities, environmental management, environmental assessment...)

Sustainability

- waste, LCA, eco-design
- wind power
- solar cells
- energy, electricity
Data and type of publications

- **Data:** Local publication database (DiVA) and Web of Science
- **Time period:** 2004-2013
- **Fields searched in:** Title, abstract, keywords

- **Step 1** – search for "sustainab*" and "hållbar*"
  - 772 records

- **Step 2** – Extended search from retrieved keywords (119 words)
  - 2171 records

Work in progress – Preliminary results
## Step 2 – Publication types

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Work in progress – Preliminary results
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Work in progress – Preliminary results
### Step 2 - Languages

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Visualizations of word clusters

- VOSviewer
- Clusters from co-occurring words
- Words in title, abstract and keywords
- Stop lists
- Delimitation
  - Most frequent words (occurring at least 7 times)
  - Most relevant words in clusters

Eck, N.J. van, Waltman, L., 2010. Software survey: VOSviewer, a computer program for bibliometric mapping. Scientometrics 84, 523–538
Step 1 – Word cluster

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Red: Urban planning, ICT, Sustainability
Pink: Water research
Turquoise: Production systems
Yellow: Materials research/engineering
Blue: Fuel systems research
Green: Electricity and heating
Step 1 Themes

- Red: Urban planning, sustainability assessment
- Yellow: material research, properties of environmentally friendly
- Green: energy systems, solar
- Blue: GHG green house gas, transport, biofuel
- Pink: water (Arsenic, Bangladesh/India) and participation, gender
- Turquoise: technical production systems, mobility
Step 2 – Word cluster

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Yellow: Traffic, wireless, communication
Turquoise: Systems (adaptation)
Red: Environmental performance/assessment
Light blue: fuel cells, solar cell systems
Blue: Materials (nano, wood, fibre, plastic)
Green: Power system, turbine, heat pump
Pink: Groundwater; contamination
Step 2

- Turquoise: fuel cells, solar cell systems (dsc, electrolyte)
- Blue: material sciences, polymer, cellulose, renewable resource
- Pink: Agriculture, arsenic, Baltic sea
- Green: hydropower, electricity production, wind power, solar-thermal
- Red: Strategic environmental, environmental history
- Yellow: wireless networks, traffic, communication
- Light blue: production system, university
Results: co-publication analysis of KTH-organizational units (step2)

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Discussion: conclusions and implications

• Two-step method to capture ‘sustainability turn’

• Engineering sciences: areas of waste management, materials (solar cells), energy use and electricity networks (production, distribution and use)

• Social sciences: planning, environment and sustainability

• Not much interdisciplinarity (social-natural sciences)
Contributions and Further work

• Analysis of research in the ‘sustainability turn’ NOT defining sustainability research

• DiVA: expanded analysis including both Web of Science of KTH’s own publication database

• Methodological analysis of a topic in two steps to examine areas of specialization in environmental research including natural as well as social sciences and humanities

• Further analysis of citation data in research areas, journal areas where research is published, doctoral thesis – step 2 over 400!