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Steering research towards needed impacts

Research portfolios as ex-ante assessment

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Building on collaborations with
SPRU (Science Policy Research Unit), Univ. Sussex (STRINGS project, mapping SDGs)

CWTS
Meaningful metrics

‘MORE’ IMPACT
IS NOT ‘BETTER’ IMPACT

Are we doing the “right” type of research?
Are science and innovation the solution or the problem?

Climate change

Urban development
and unhealthy conditions

Cultural and ethnic suppression
through use of ICT applications

Asbestos

Casino capitalism in
financial innovation

Alignment between research and SDGs

- **Problem: mismatch between research 'priorities' and societal 'needs'**
  - Across many areas: hunger, health, gender, water, energy, climate change, inequality, environment,
  - Lock-in, interests and institutional dynamics may shape research priorities towards "sub-optimal" configurations.
  - Lack of agency of (some, most?) populations on research choices

- **The SDG strategy to reverse misalignment:**

  •Since SDGs address pressing human needs

  •Research should be developed in ways that address SDGs

- **Science policy research perspective:**

  •**Policy tools for monitoring and strategic setting on directions**

Many initiatives “to show” how research addresses SDGs

Impact Rankings 2019 by SDG: climate action

This table on SDG 13: climate action measures universities’ research on climate change, their use of energy and their preparations for dealing with the consequences of climate change.

THE WORLD UNIVERSITY RANKINGS

IN PARTNERSHIP WITH ELSEVIER

- The database Dimensions includes new research category filters for Sustainable Development Goals
- Consultancy SIRIS Acad. Analyses EU-funding with SDG lens
- The Association of Dutch Univ. (VSNU) provides and SDG-Dashboard on SDG-Impact of Dutch universities

vsnu

- UKRI funds project STRINGS at Sussex, with various int’l partners, to map the ‘variety of science, research, technology and innovation pathways that may contribute to SDGs’. http://strings.org.uk/
  - Report for UN Dev. Programme end of 2021

strings
Steering Research and Innovation for Global Goals

However –relationship between research and SDGs is ambiguous

Comparison between Bergen Univ. and Elsevier search mapping

Low degree of overlap
(many SDGs below 30%!!!)

Major disagreements in search strings

Armitage, Lorenz, Mikki (2020) Bergen

Which problems should be prioritised within an SDG?

SDG3 targets

3.1 maternal mortality
3.2 neonatal mortality
3.3 AIDS, tuberculosis, malaria
3.4 prevention of non-communicable diseases and mental health
3.5 substance abuse
3.6 traffic accidents.
3.7 sexual health-care services
3.8 Universal health coverage
3.9 deaths from pollution
3.A tobacco Control
3.B vaccines and medicines for diseases that affect developing countries,
3.C recruitment health workforce
3.D early warning, risk reduction

Elsevier SDG Report (2020)

Which problems should be prioritised within an SDG?

SDG3 targets

3.1 maternal mortality
3.2 neonatal mortality
3.3 AIDS, tuberculosis, malaria

3.4 therapy ~~prevention~~ of cancer (non-communicable diseases) ~~and mental health~~

3.5 substance abuse
3.6 traffic accidents.
3.7 sexual health-care services
3.8 Universal health coverage
3.9 deaths from pollution
3.A tobacco Control
3.B vaccines and medicines for diseases that affect developing countries,
3.C recruitment health workforce
3.D early warning, risk reduction

Elsevier SDG Report (2020)

Comparing health needs and research efforts: alignment with SDGs??

Research efforts focused on diseases of rich countries → cancers & neurology

Ràfols and Yegros (2018)

EXPLORING DESIRABLE ‘IMPACTS’ WITH RESEARCH PORTFOLIOS

Pluralising perspectives in priority-setting

"How do we know if we are doing the right science?"
(Sarewitz and Pielke, 2007)

Develop **methods that help compare**

- research portfolios ("supply") and potential impacts
- societal "demands"/needs

.. so as to help in enriching priority setting processes

… in evaluation or strategy

Opening up S&T appraisal (Stirling et al. 2007)

- Making visible alternative research trajectories & potential impacts
- Making explicit criteria (normative choices) behind choices (not yet dev.)

Comparing health needs and research efforts

Priority Setting Type I: Choosing between different “problems”

Ràfols and Yegros (2018)

Mis-alignment between health priorities and research efforts

Priority Setting Type I: Between different “problems”

- This is amount of research, but not necessarily impact.
- Research is not necessarily the best best to address a problem.
- Impact depends on contextual factors related to ‘innovation systems’

Neonatal conditions require more innovation than natural science research.

→ But here SSH research could help

Directionality in problems:
What type of problems receive attention?
Who benefits from the solution of these problems?

Rafols and Yegros (2017)

Comparing health needs and research efforts

Priority setting Type II: Choosing between 'approaches' towards "solutions"

Cassi et al. (2017)

Topic modelling based on titles and abstracts of publications on obesity in WoS (2002-2013)

Potential misalignments between health needs and research efforts

Priority setting Type II: Research on Obesity

Directionality in approaches:

- What type of approaches are used to address a given problem?

Diversity in approaches:

- How is research spread across approaches and framings?

Diversity in the face of uncertainty and ambiguity

Different choices yield different type of solutions with different social implications.

Not only an issue of preferences, e.g. prevention over treatment.
Who benefits (equity)? On appropriability (molecule or process?)

Key point: There are <u>many valid and legitimate ways of addressing problems</u>
Political economy favour trajectories of incumbents (gov., ind., experts)

4. PLURALISTIC AND CONDITIONAL SELECTION OF TOPIC FOR SDGS

STRINGS approach to SDGs mapping: plural and conditional appraisal of relation of topics to SDGs

- Since SDGs are policy concepts
  - Mapping SDGs entails an interpretation of the policy into scientific terms
  - This interpretative (irrespective if conductive algorithmically or not) should be transparent, open to scrutiny and contestable

- Provide a battery of potential relevant clusters
  - For each SDG show clusters potentially related

  → Visualisation interface

- Let stakeholders decide which clusters are relevant for SDGs
  - According to their understanding and values
  - According to their contexts

The structure (landscape) of science

4,000 areas based on direct citation clustering

Visualisation interface of STRINGS

SDG 7 - Ensure access to affordable, reliable, sustainable and modern energy for all

map

SDG
7

seeds >=
20

AND

Share seeds >=
0.05

Cluster
- SSH
- Biomed & health
- Physical science & engineer
- Life & earth
- Maths & Computer science

Community pubs

pubid	
35813684	418
34710316	406
36215834	346
34964280	333
35904829	319
34675033	309
34631797	293
34367917	292

SeedPublications

Pub Id	
27062495	1,964
31828341	1,833
32961518	818
26907242	817
28056714	815
28332663	791

Selected communities

Cluster Id1	Community labels	N Seeds	Shar..
825	sustainability transition; solar home system; feed; social accept..	4,239	0.62
733	biomass; biofuel; switchgrass; life cycle assessment; energy	3,336	0.58
1738	compressed air energy storage; caes; thermodynamic analysis; e..	2,437	0.55
3049	life cycle assessment; energy return; eroi; energy payback time; ..	538	0.53

Summary – judging the valueS of impactS

- **Re-framing the impact agenda**
  - Not (only) about MORE impact → about the types of impactS

- **'Research portfolio' as a method to facilitate deliberations** on priority setting – on 'impactS' that are most needed.
  - Also in SDGs: aoptions in choosing problems and approaches

- **In spite of lack of accuracy of estimates of research effort** (via #pubs or funding), the data could be helpful to get debate started.

- **Quantitative estimates of societal needs very difficult**

- **Need to develop social decision-making processes**
  - Multi-Criteria Analysis, and/or deliberative processes, or other methods of discussing demand.

NOT MORE IMPACT → IMPACT WHERE IT IS NEEDED

2. DIFFICULTIES WITH EX-POST IMPACT ASSESSMENT

The argument

1) Values and impact: not all impact is 'good'

Not all innovation is good. Research can lead to harmful innovation.

2) Summative ex-post impact assessment —problematic (skip here)

i) impact comes too late

ii) attribution — too many influences.

iii) favours incumbents in political economy

iv) often too narrow in scope: project, lab.

3) Assessment: from value-free & individual to value-laden & system thinking: Are we doing the type of science that would lead to desirable type of impacts?

i) From focus on impact of S&T → focus on societal problems

ii) Examine science 'supply' via R&D portfolios: what are corrent *de facto* priorities?

iii) Examine 'demands' or 'needs' for impact: look for data and stakeholders' views on societal needs.

iv) Use this information to inform decisions in evaluation and strategy

– through open deliberative processes with diverse stakeholders

Problems with ex-post impact assessment

- Increasing # of evaluation studies aiming at capturing “impact” of individual projects.
- Often problematic:
  - linear assumptions
  - attribution problem
  - unclear that peer reviewers can judge

An alternative approach:

- Methods for a more systemic (research portfolio) approach
- Research programme or institutional level
- Look if/how a set research activities relates to a given societal need → what type of science is done (Hess, 2007)
- Builds on Sarewitz (aligment) and Stirling (uncertainty/diversity)

Take away insights – the Impact Agenda

1. **Impact agenda**
   - mainly a research assessment issue
   - need to define goal of assessment
   - from attribution to contribution
   - from impact to value
   - uncertainty and value laden

   → **Impacts can be positive, negative or both**

2. **Ex-post models of research assessment**
   - based on impacts – problems of timing and attribution
   - based on processes: researchers-stakeholders interaction
   - no general indicators of research impact -- only indicators useful for supporting impact assessment in certain contexts

3. **Resarch portfolio analysis can help in ex-ante RIA**

Unspoken assumptions in S&T policy

S&T policy (enlightenment):

- Knowledge from S&T leads to well-being
- State (e.g. univ. admin) is benevolent
- Expertise (e.g. scientometrics) serves the public good

However – instances of assumptions breaking down

- no agreement on benefits of research (highly contested)
  - Focus of health research in pharma therapeutics
- the state/admin can favour particular interests
  - Nuclear energy?
  - Pharma?
- experts' views can be aligned with state/particular interests
  - Impact indicators (e.g. pats) favour therapeutics over prevention

Tentative methodology of research portfolios

<u>Building the porfolio</u>

1. Gather data (pubs, grants, news…) on relevant cognitive space (e.g. obesity)
2. Classify data into areas – generate the **research landscape**
   - Top down (Classifications) or Bottom up (clustering, topic modelling, …)
3. Find portfolio (distribution over topics) of an organisation, institution or territory

<u>Exploring the porfolio</u>

1. Seek data of societal needs/demands (exploring in health)
2. Try to **relate science supply** and **societal needs/demands**

<u>Priority setting in policy (to be developed)</u>

1. Develop deliberative processes of evaluation using this information to re-assess priorities.
2. Prioritisation according to stakeholders' values on options.

COMPARING TOPICS

THE CASE OF DISEASES

DIFFERENCES BY COUNTRY

Work with Alfredo Yegros at CWTS

Health priorities vs. research efforts

WHO 2012 Disease data – WoS pubs (2009-13)

Ràfols and Yegros (2018)

Health priorities vs. research efforts

WHO 2012 Disease data – WoS pubs (2009-13)

Ràfols and Yegros (2018)

Comparing academic publications and pharma publications

Yegros, Tijssen, Garcia-Abad and Rafols (2018)

Comparing academic publications and pharma publications

No perfect alignment should be expected.

Prioritisation is influenced by:
-- dominant production in Global North
-- pharma priorities
-- cultural norms
-- expectations of progress via research
-- perceptions solution availability (problem is healthcare system or 'implementation').

Yegros, Tijssen, Garcia-Abad and Rafols (2018)

SCIENCE SUPPLY OF A RESEARCH TOPIC

THE CASE OF RICE

DIFFERENCES BY COUNTRY

Work with Tommaso Ciarli at SPRU

What are the “options” in rice research?

Research landscape

Not a fined-grain perspective

SViewer

How research priorities differ by country

US, 2000-12

How research priorities differ by country

India 2000-12

How research priorities differ by country

Thailand 2000-12

SCIENCE SUPPLY OF A RESEARCH TOPIC:

THE CASE OF AVIAN FLU

SHAPING BY INSTITUTIONS

Work with Matthew Wallace at Ingenio &IDRC

Institutions and the research agenda

Avian Flu Basemap

Institutions and the research agenda

Private-sector funding

Institutions and the research agenda

Basemap, 2003-2014

Institutions and the research agenda

Academic reward -- Top “multidisciplinary” journals overlay

Institutions and the research agenda

Research by mission-oriented governmental organisations

EXPLORING DEMAND:

THE CASE OF OBESITY

MAPPING BOTH SUPPLY AND DEMAND

Work with Cassi, Du Turkheim et al. at OST (Paris)

Science supply map using topic modelling

EU parliament themes (experiment)

Topic modelling of parliamentary questions (about 200 in about 2003-2013)

Not obvious how to relate policy themes with research themes

Semantic relation between supply (left) and demand (right)