



Die Wilde Skapies van die Groot Karoo

Big science, human development,
and the law of unintended
consequences

NUCLEUS conference
Hannover, October 2017
Michael Gastrow

The Square Kilometre Array telescope

Aim: build world's largest and most powerful telescope

Tech: 3000 15m dishes in a spiral shape

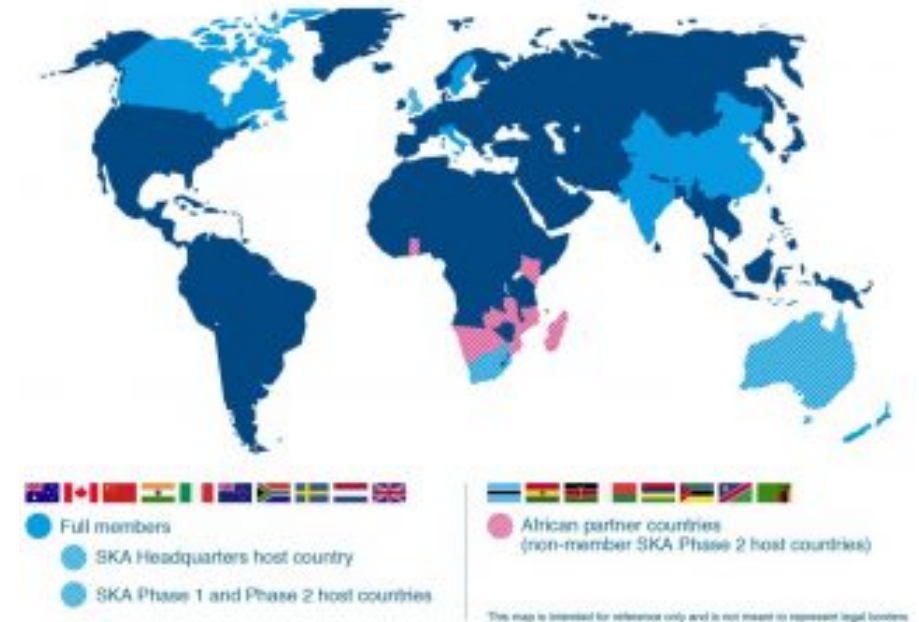
3000km across, with dense core in the Karoo region. > 10 000 antennae in Australia, advance tech for big data, supercomputers, & receiver design

Science: address fundamental questions in physics & cosmology

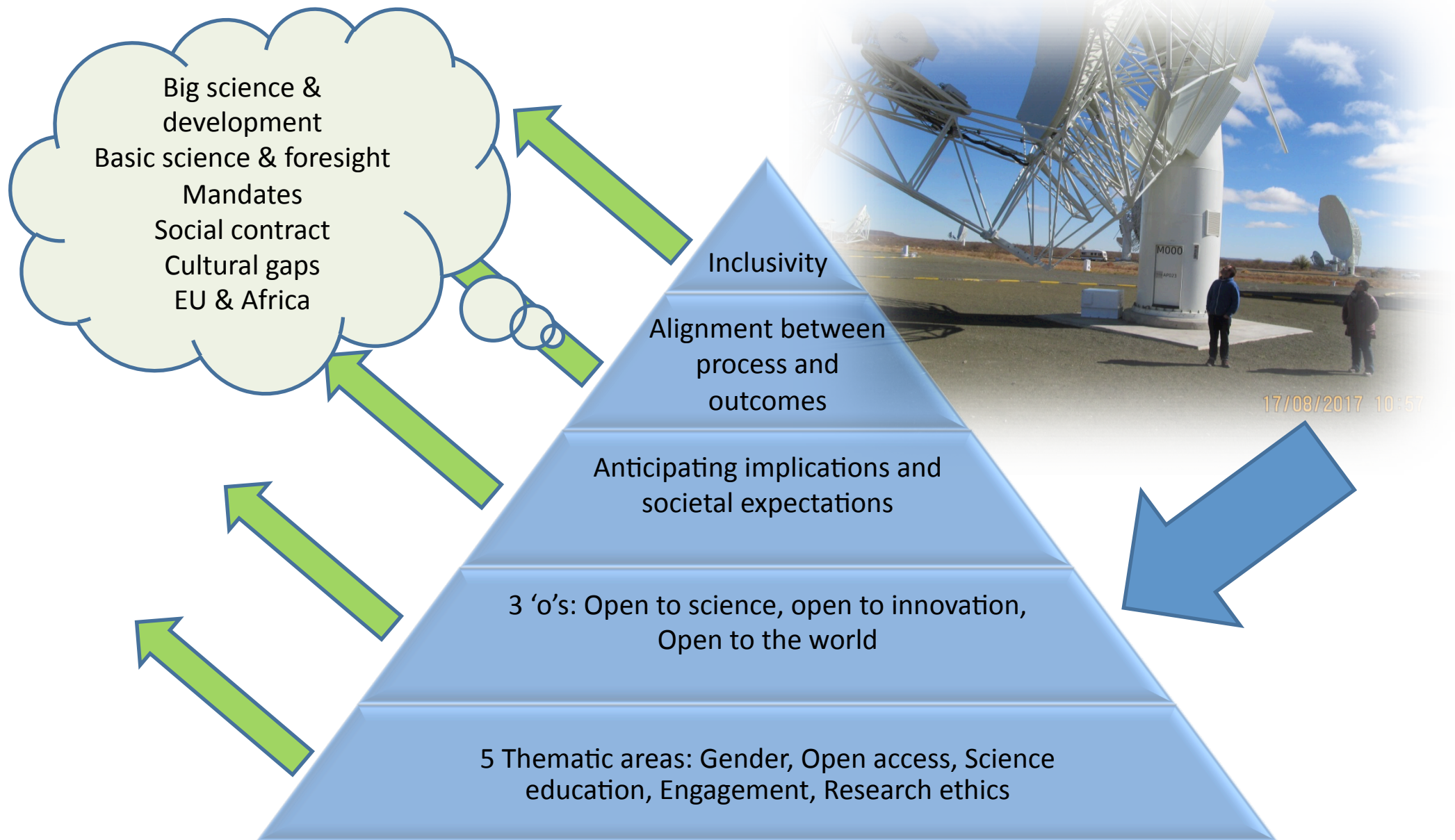
Ownership: global consortium, HQ in UK

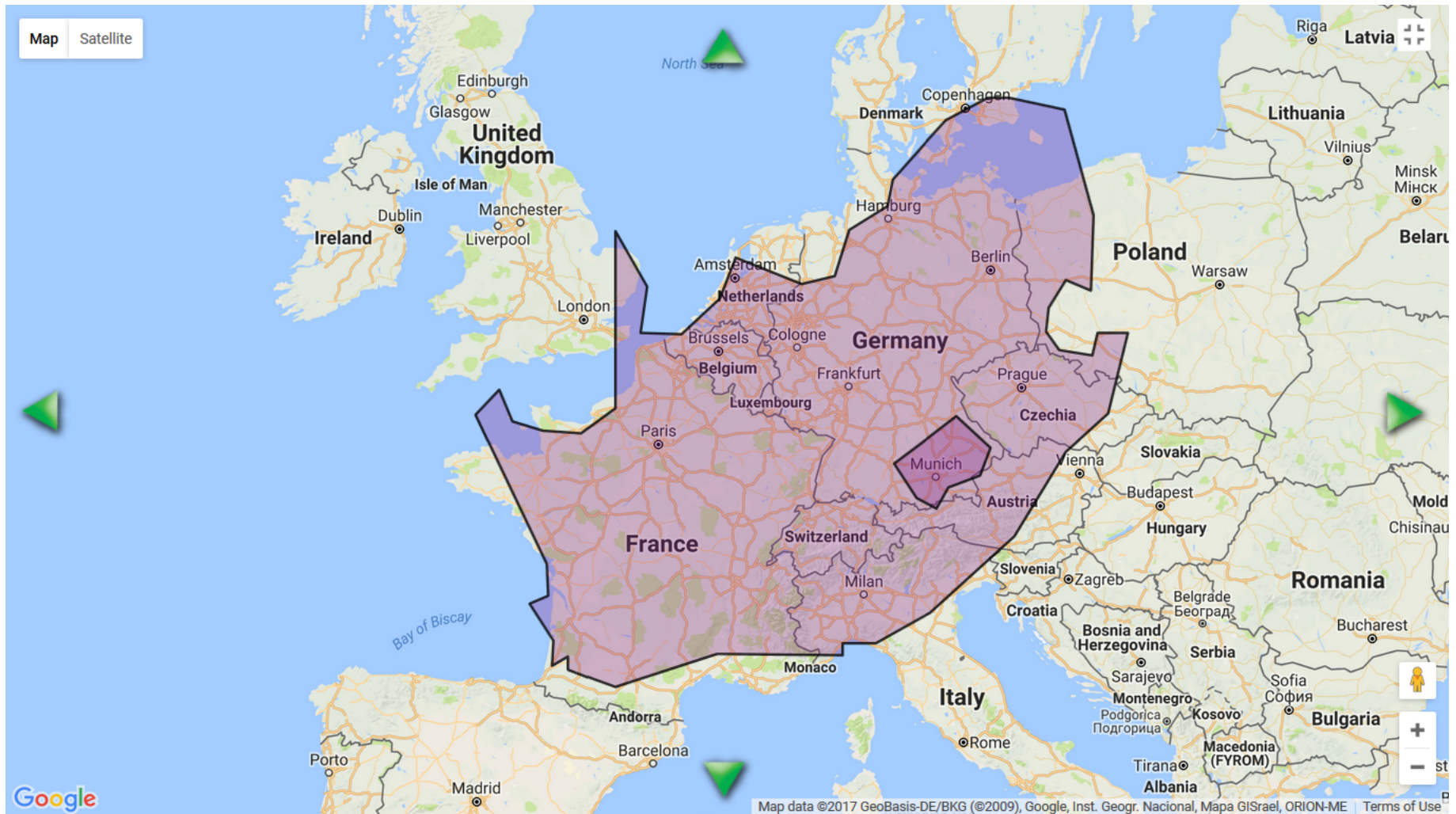
Timeline:

- **2005 – 2012:** *bidding process*. Outcome: Australia awarded the low frequency components and **Africa the mid and high frequency components**. SA site = Karoo
- **2012 onwards:** *construction under way...* **concept collides with reality...**



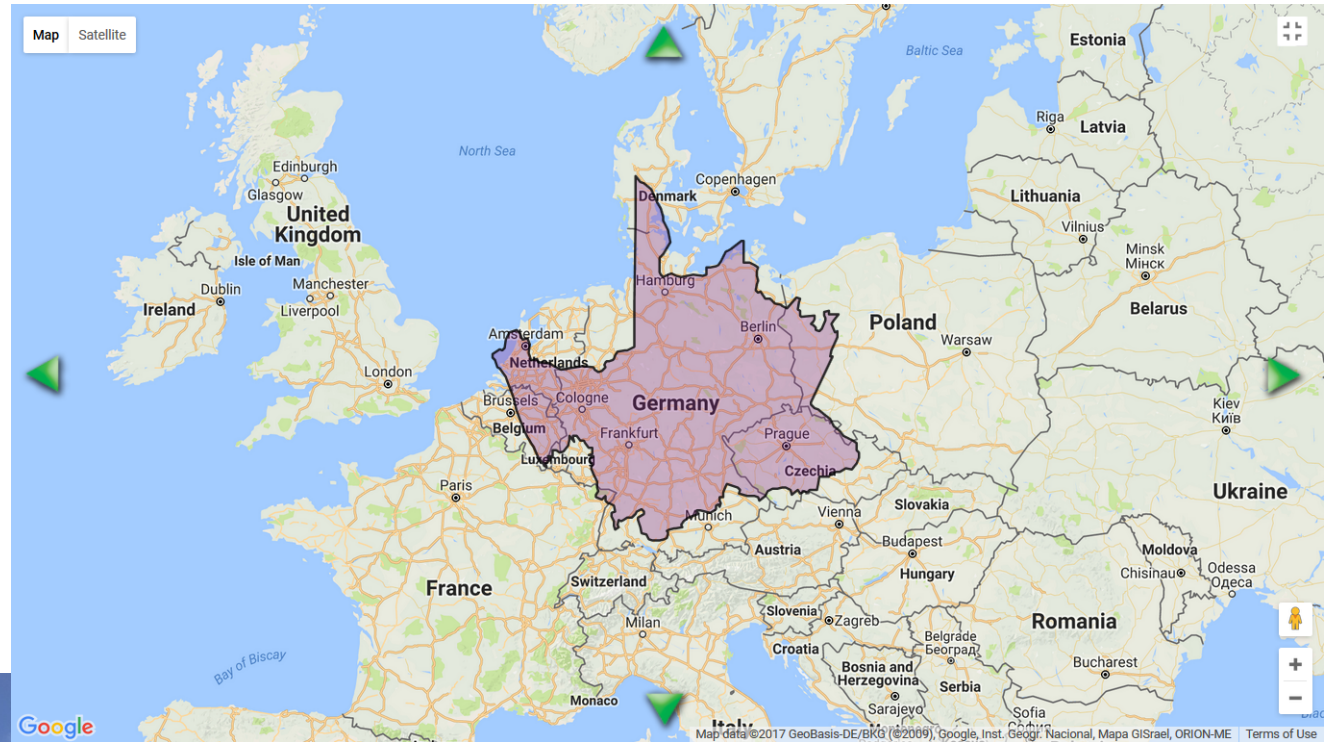
The SKA as RRI case study





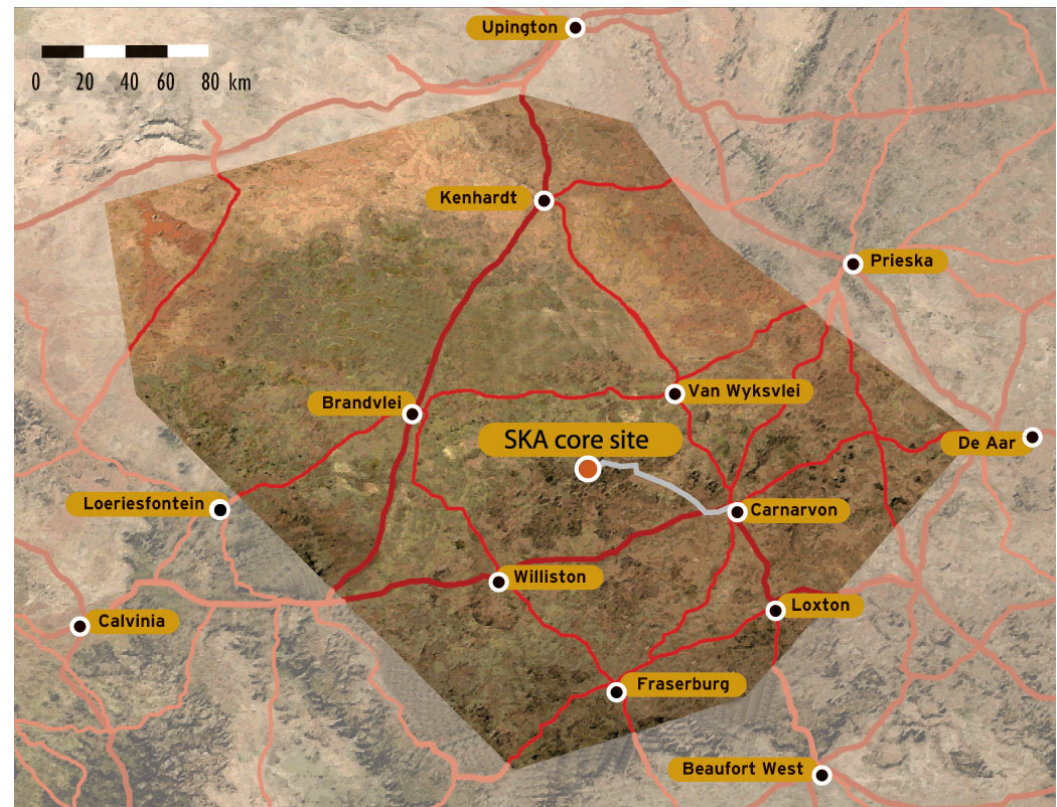
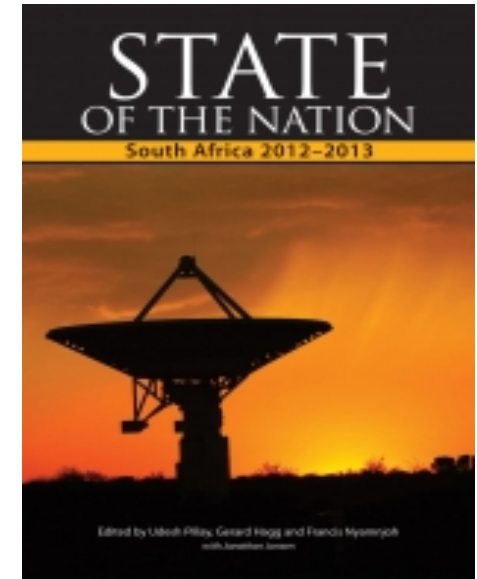
Northern Cape Province, South Africa.

Population:
1,2 million humans.
8 million sheep.

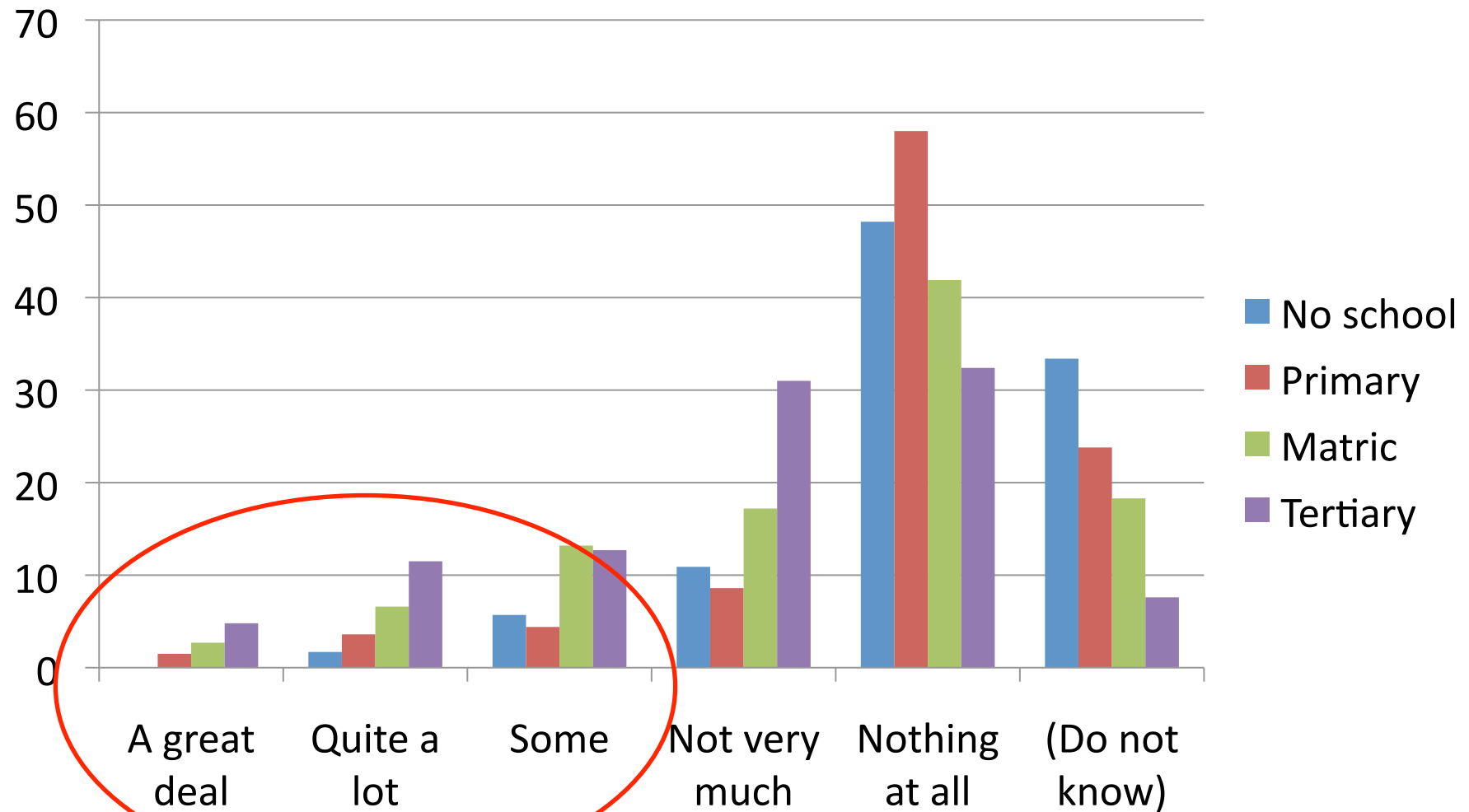


Early stages (2005-2012): national policy & regulation: *top down support*

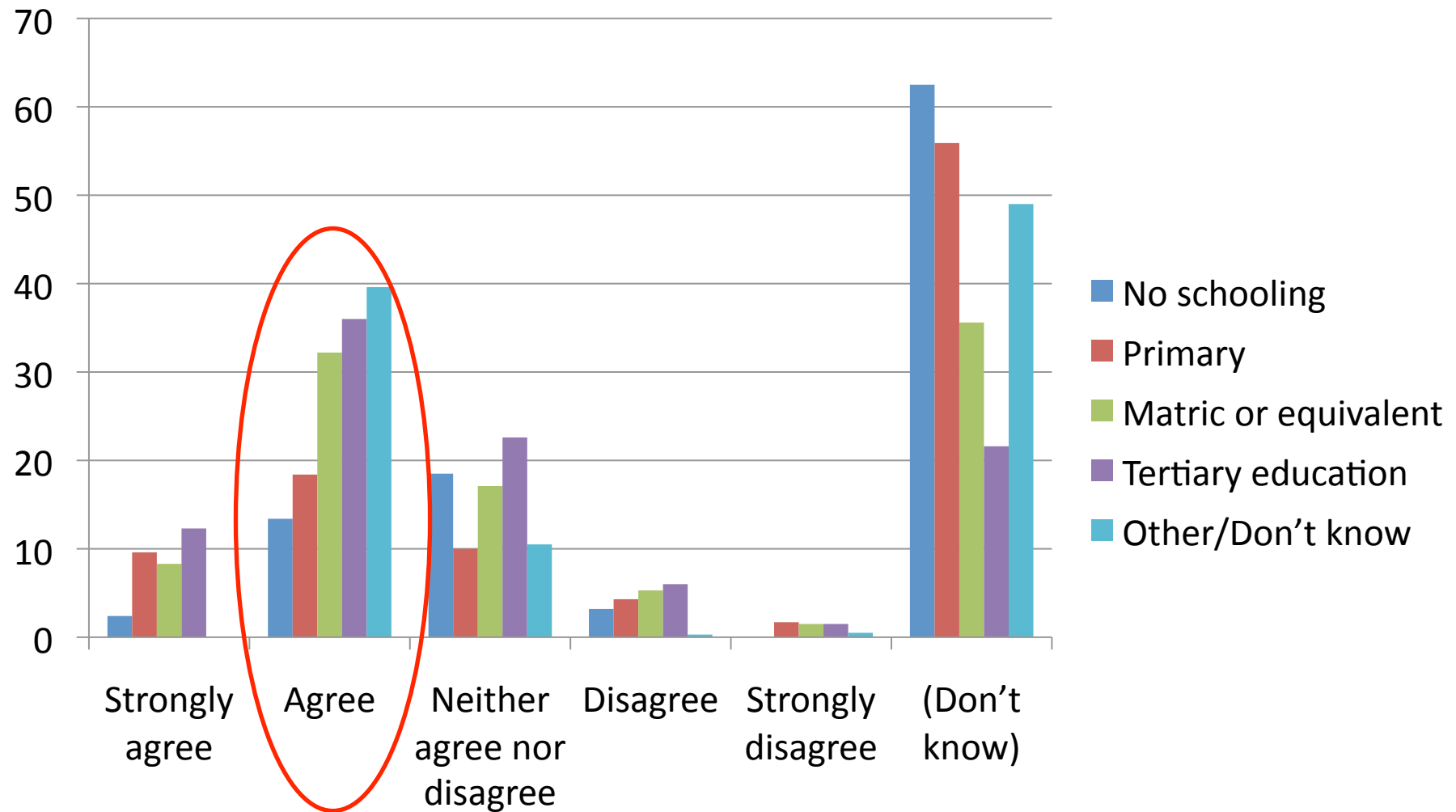
- African Geographic Advantage Act **2007**
- VAT exemption **2005**
- Institutional support (**2005 >**) :
- Rhetorical support
- Political support
- Funding support
- ***Why so much support?***
 - ***Scientific value***
 - ***Economic value***
 - ***Knowledge & skills***
 - ***Innovation***
 - ***Politico-symbolic value***



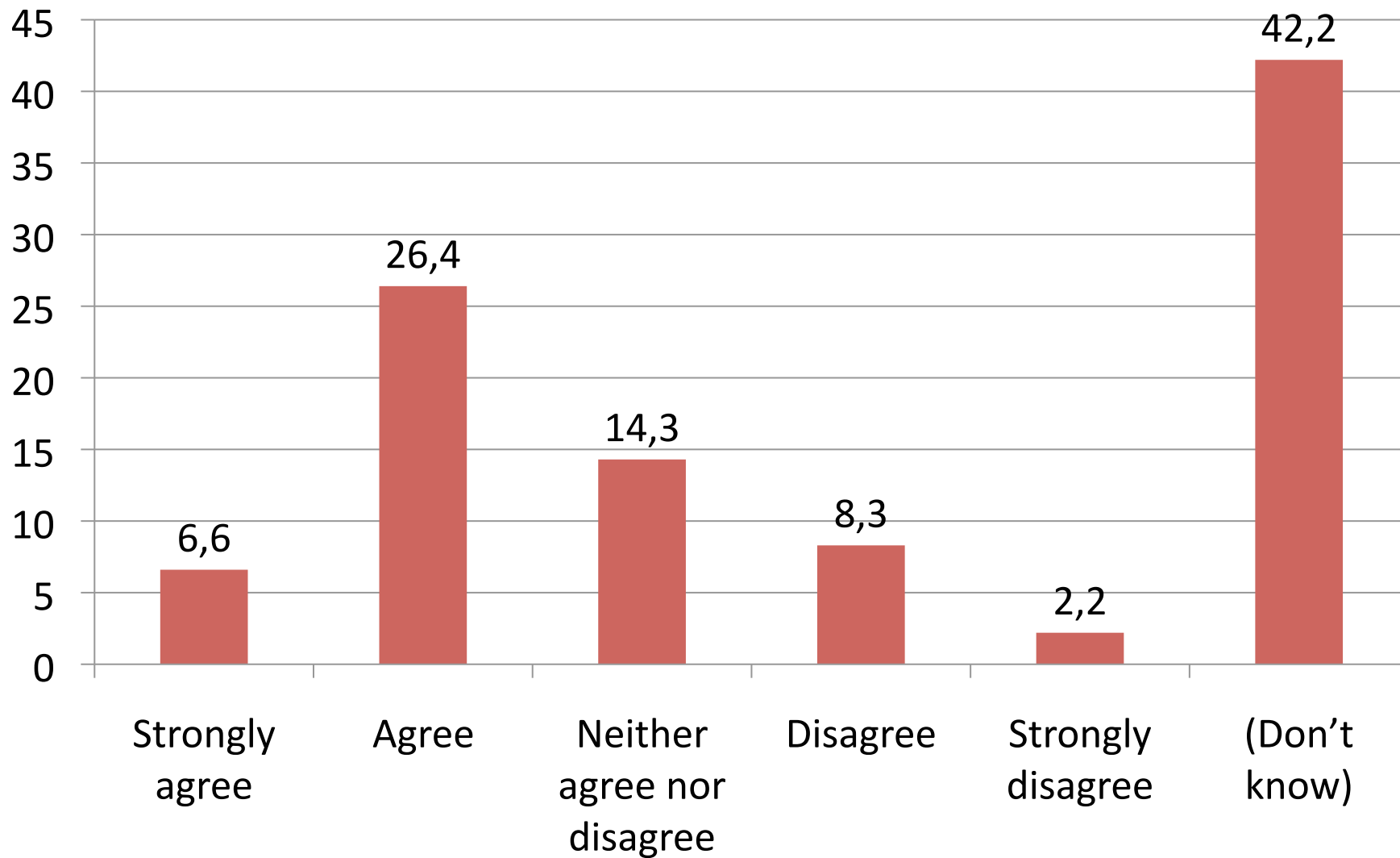
How much have you heard about the Square Kilometre Array (SKA) telescope?



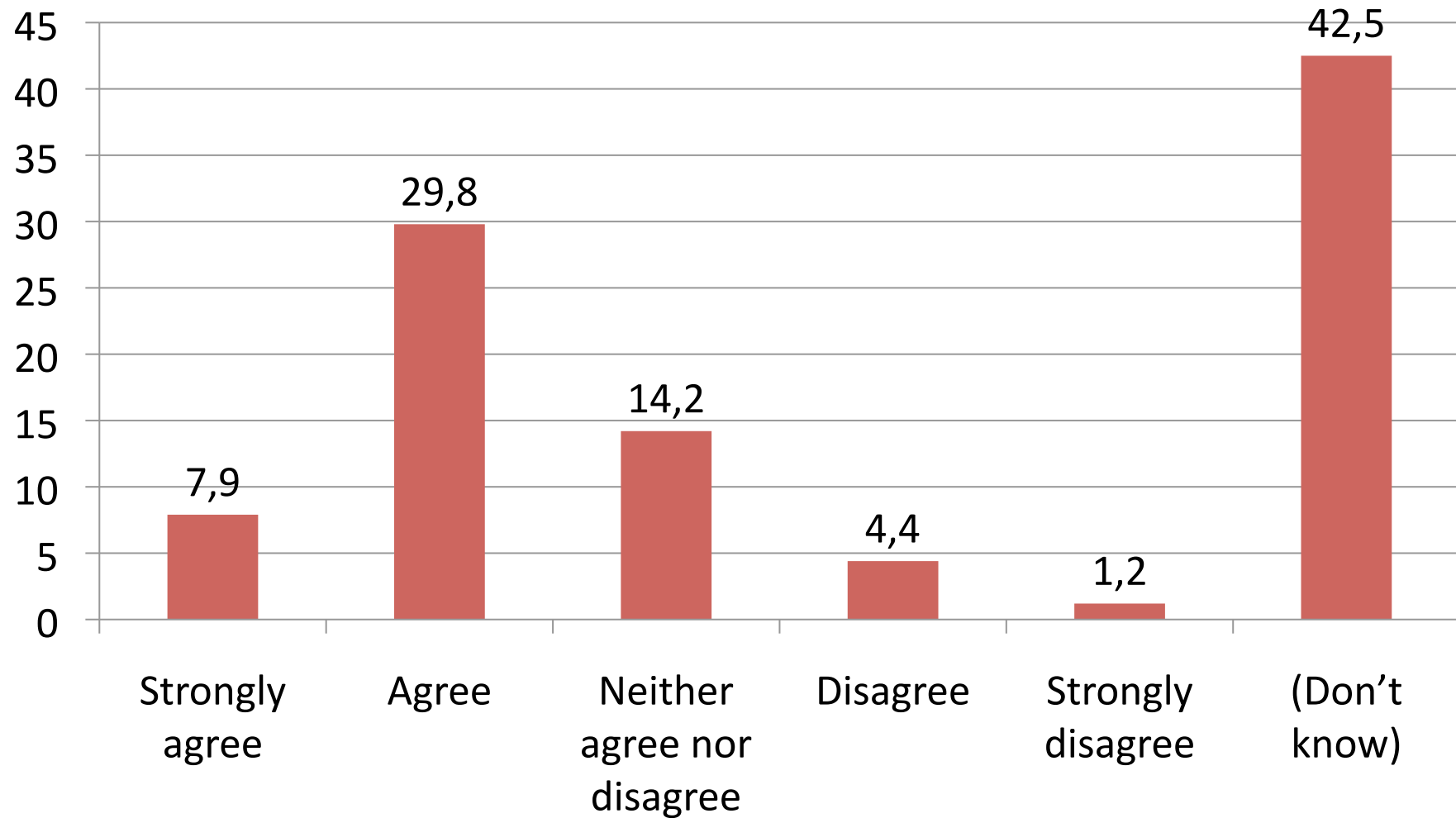
The SKA research will contribute to improve the quality of life



The money spent on this research is worthwhile



The SKA will inspire South Africans to become more interested in science



Organisational components of the SKA as a % of news media coverage

African partner countries	33
Global partner countries	22
UK HQ	6

Organisational components of the SKA as a % of Twitter coverage

Global partner countries	27
African partner countries	23
UK HQ	3

The SKA as a symbol of African science and technology in the news media	%
SKA framed as an African project (other than organisational references)	21
Affirmation of African S&T capabilities	10
Affirmation of South African S&T capabilities	9
External views of South African S&T capabilities	8
Africa as part of global S&T	7
Comparison to World Cup 2010	6
External views of African S&T capabilities	5
Africa Day	4
African growth in astronomy	2
Refutation of Afro-pessimism	2
TOTAL references to the SKA as a symbol of African science & technology	35

Politico-symbolic value as driver for national support



- The SKA is framed in the public sphere :
 - *Implicitly through a proxy discourse on site allocation*
 - *Through explicit framing as an African symbol*
 - As an African project + validation of science & tech capabilities
 - As a refutation of Afro-pessimism
 - As evidence of African membership of the global scientific and technological community.
- **Politico-symbolic value** > political support > financial + institutional support > winning site bid > manifestation of the project
- **RRI: at national level implicitly (assumed) to be meeting development needs of SA**
- **But were development needs a priority – for policy makers, for the SKA, in the media?**

Development context in the media?

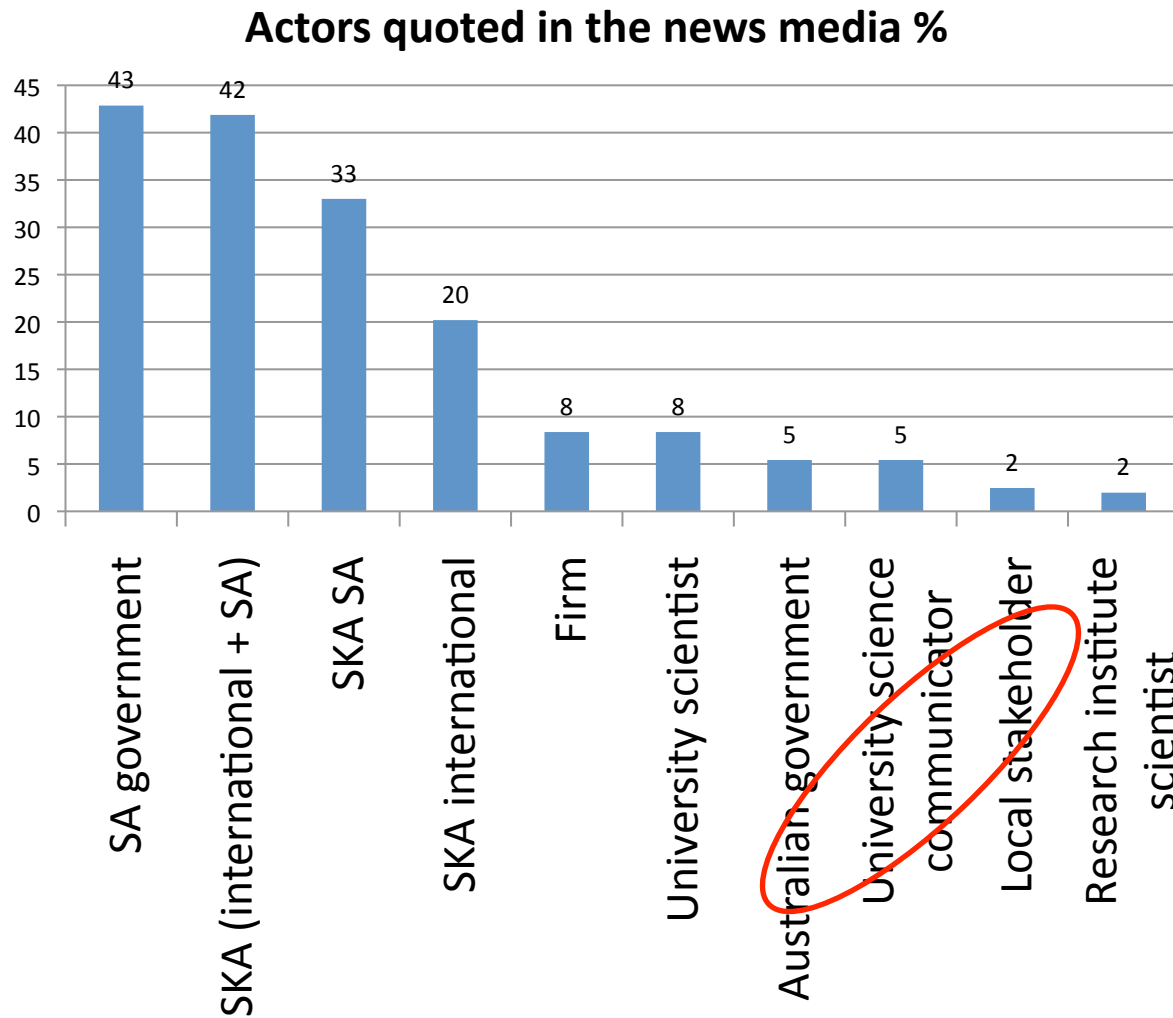
Development context only mentioned in **1 Tweet** and 14 re-Tweets



And what about representations of local stakeholders...?

% of news mentioning development context	%
Local economic development	3
Astronomy in developing countries	2
Carnarvon local skills development	2
Carnarvon property prices	2
Carnarvon economic growth	1
Limitations to development impact	1
Negative impact on local communities	1
TOTAL	9

Who is seen? Who is heard?



And in the social media? **Zero** mention of local stakeholders on Twitter...

Actors mentioned in news media (cumulative index)	Total
SA Gov	211
SKA	121
University	53
Firm	51
Aus Gov	19
EU Gov	18
US Gov	16
Science facility	14
Research institute	11
Local stakeholders	6



Implementation and local *development* (2012-2017):

Development initiatives:

- HCDP: primary school, high school
- Construction + supplier development programme
- Collateral benefits: astro-tourism, hospitality...
- **Nothing related to:**
 - Alcoholism, FAS, health, street children, ECD
 - Arts, culture, public facilities
 - Offsetting economic losses

Contested **mandates** and the prism of local interests:

- Different positions, no real consensus: conceptual confusion leading to practical problems
- What is the development mandate of big science, in principle?
- How would this differ between SA and EU?



Local stakeholder & public *engagement*



- **Interface structures:**
 - Public forums
 - Stakeholder forums
 - SEA (2012-2015)
 - **Organised opposition:** LAG, churches, farmers, social networks...
- **Controversies:**
 - Land acquisition
 - RFI mitigation
 - Economic impact
 - Inclusiveness of benefits
 - Public participation
- **Micro-politics:** race, class, history, party-politics (and science)
- Early assumptions juxtaposed against current situation: **unintended consequences**
- Globalised natural **science confronting social complexity:** the return of CP Snow

The normative challenge of big science and development: a SA perspective

- The normative equation for the development ethics of big science is impossible to fully solve. The benefits are so different from the risks and costs that it is hard to reconcile them.
- How can we compare the possibility of fundamental breakthroughs, such as understanding dark matter or gravity waves, with data describing human development indicators in South Africa's Karoo?
- Even if it were possible to establish a way to measure and assess such a comparison, we would still be left with normative questions...
- Must inferred relationships between costs and benefits in this case remain hypothetical?
- Should we focus on trade-offs within comparable time frames?



Questions for NUCLEUS

- What is the role of **context**? Does a mega-telescope in Africa have a different development mandate and social contract to one in Europe? If so, why, and in what way?
- How do we reconcile big science with an environment of **poverty and exclusion**?
- How does NUCLEUS conceive of the deliberative process of determining the social responsibility of science in the context of **developing countries**?
- How does this fit into the NUCLEUS conception of the **social contract** between science & society?
- If we look beyond the normative uncertainty,
how do we **assess social impact**?
Do we need M&E for (big) science?
(Simmonds et al, 2013)
- +...?





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