

**Research, research networking, and the role of Africa in the international research community
(with specific reference to civil engineering materials)**

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Outline



- Research landscape and research networking
 - African realities, challenges and opportunities
 - Africa and the share of international research
 - Construction materials research in Africa
 - Research networks
 - Research opportunities and perspectives in Africa
 - Closure
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Research landscapes and research networking

Research landscapes and research networking



Source: <http://www.research-network.org.uk/>

- 'Research landscape' - the array of research activities occurring across different individuals, institutions and entities, geographically and discipline-wise.
 - Hence, a high-level view of broad sum of research efforts in the given field.
- 'Research networking' - arrangements and collaborations, formal and informal, that exist between research individuals and entities.

Research landscapes and research networking

- Internationally, research landscapes and research networking share similarities
- They also exhibit differences across different disciplines and global regions.
 - E.g. medical research - strongly driven by pharmaceutical industry interests;
 - climate change research may be driven by political interest groups (although not exclusively!)
 - Similarities and differences also linked to research support, and to the value placed upon research by society



Source: <https://insiderfinancial.com/owc-pharmaceutical-research-corp-otcmktsowcp-gigantic-move-signals-buy-opportunity>

Research landscapes and research networking

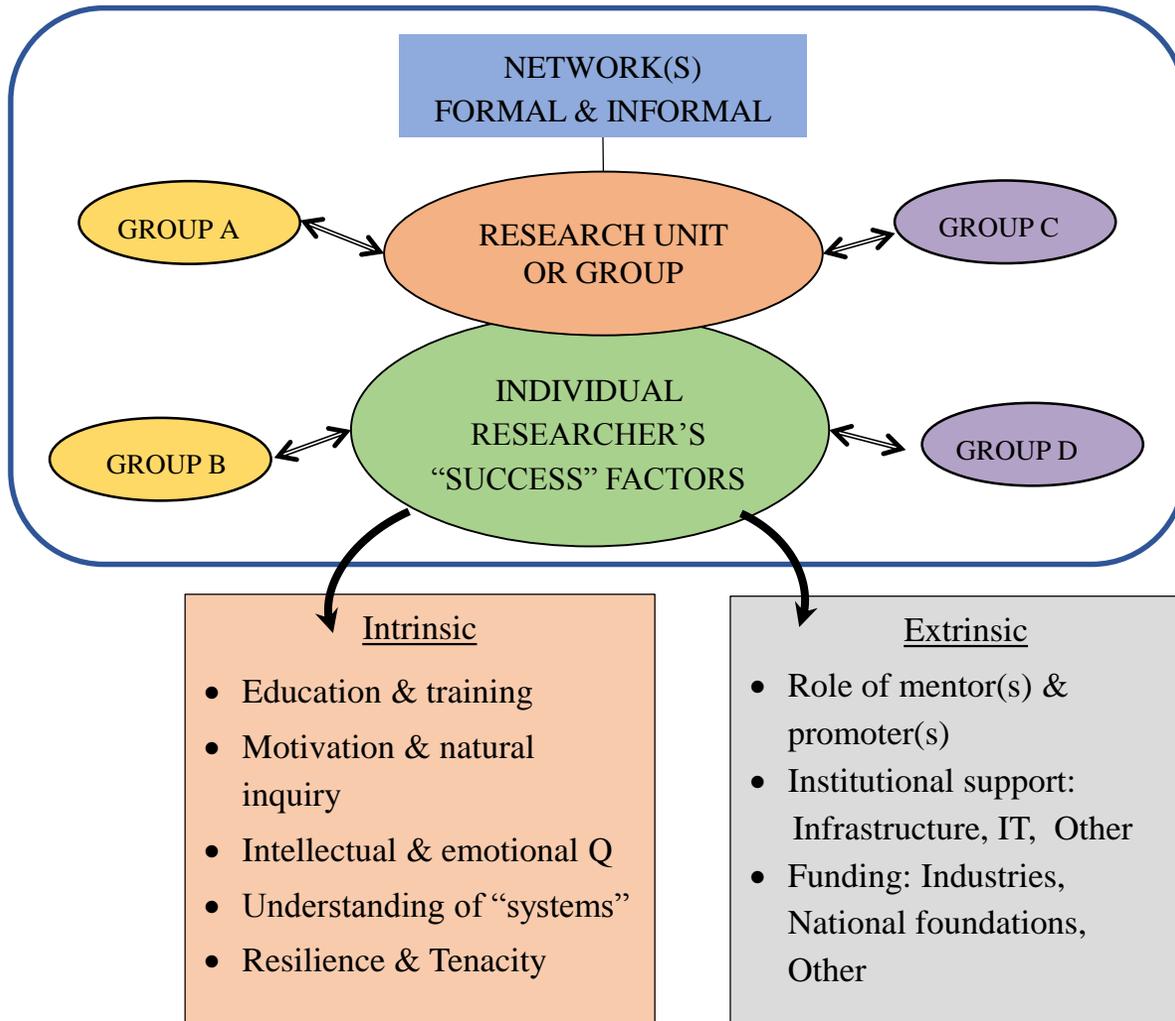


Source: <https://geology.com/world/africa-satellite-image.shtml>

- In 'developed countries', the research landscape is 'richer', more complex and diverse, than in 'developing countries'
- Africa - largely a developing continent - tends to have less developed research networks; sparser research landscape
- However, African science is rising: following 'decades of neglect'
 - small but robust institutions are surviving political changes & economic fluctuations
 - pockets of significant science now found¹.

¹ C. Beaudry, J. Mouton, H. Prozesky, "The Next Generation of Scientists in Africa", African Minds, 2018.

Research landscapes and research networking



Individual researchers

- The ‘success’ of the individual researcher is affected by intrinsic and extrinsic factors – see Figure.
- How the researcher is influenced by, or actively influences, these factors, impacts on ‘success’
- ‘Success’ - a subjective term - difficult to measure objectively, since it will depend on measurement criteria

Research landscapes and research networking

- Research is a dynamic activity - continually uncovering new knowledge or new understanding
> impacts on further research, changing its focus and scope;
 - Ultimate end-point can be very different from original goal.
- Similarly, research groups or units, and research networks, can be very dynamic in that there is constant change, and priorities also change with time.

This is essential to good research.



Source: <http://www.exeter.ac.uk/doctorscollege/early-career-researchers/ecr/>

Research landscapes and research networking

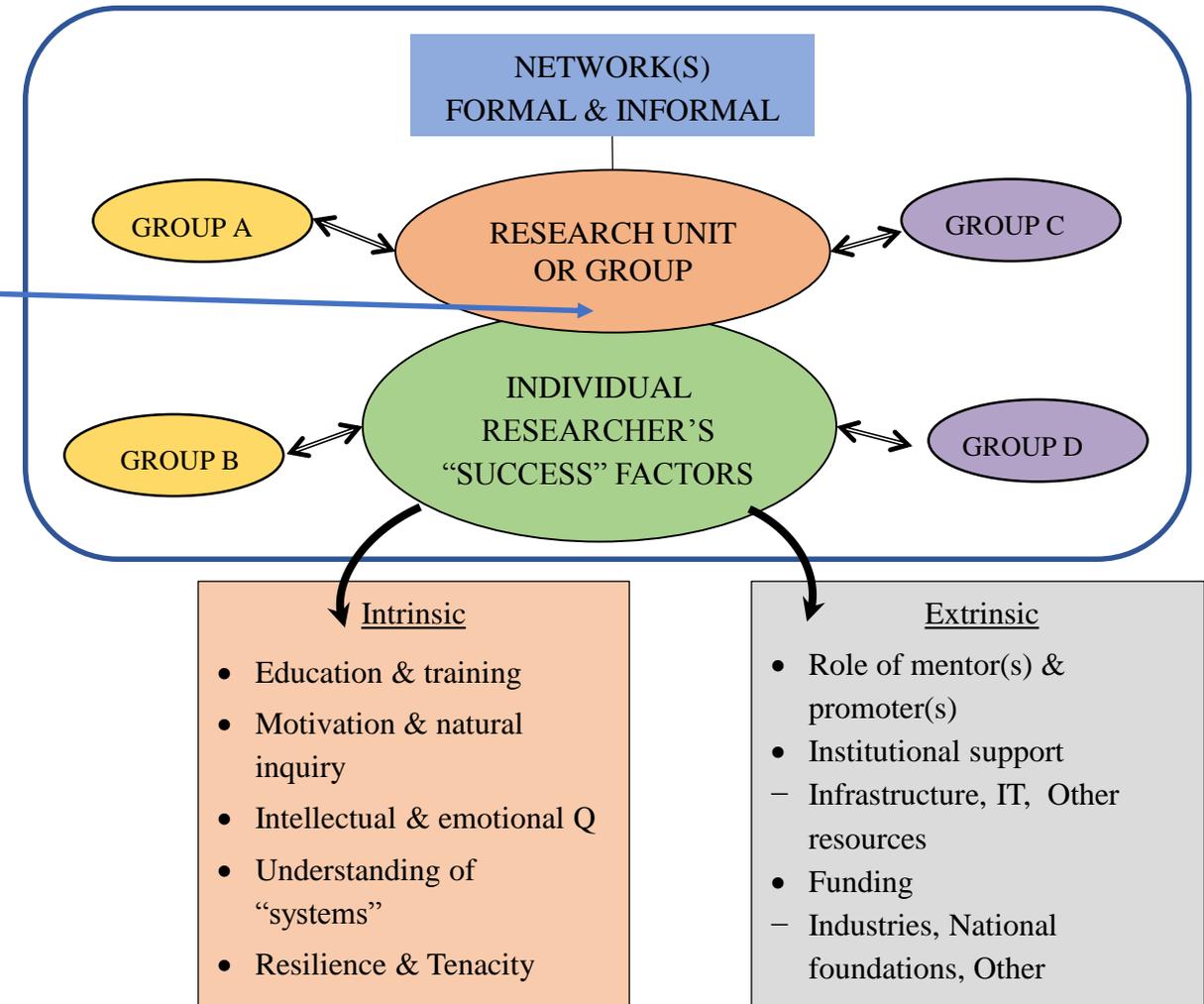


Source: <http://www.exeter.ac.uk/doctorscollege/early-career-researchers/ecr/>

- Researchers by nature tend to be individualistic, pursuing their own ideas and impacting their respective fields.
 - This may be constrained by prescribed research agendas
 - For example industry- or government-directed research
 - In independent academic research institutions, researchers have considerable freedom to pursue their own ideas.
 - This adds to the dynamism of research, but may dilute its impact.
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Research landscapes and research networking

- An individual researcher might be part of a research unit, or work independently
 - Indicated by the overlap in the figure between the entities.
- Research units or groups nowadays strongly encouraged or even required to be multi- or inter-disciplinary.
- Some of this can be achieved by research networking



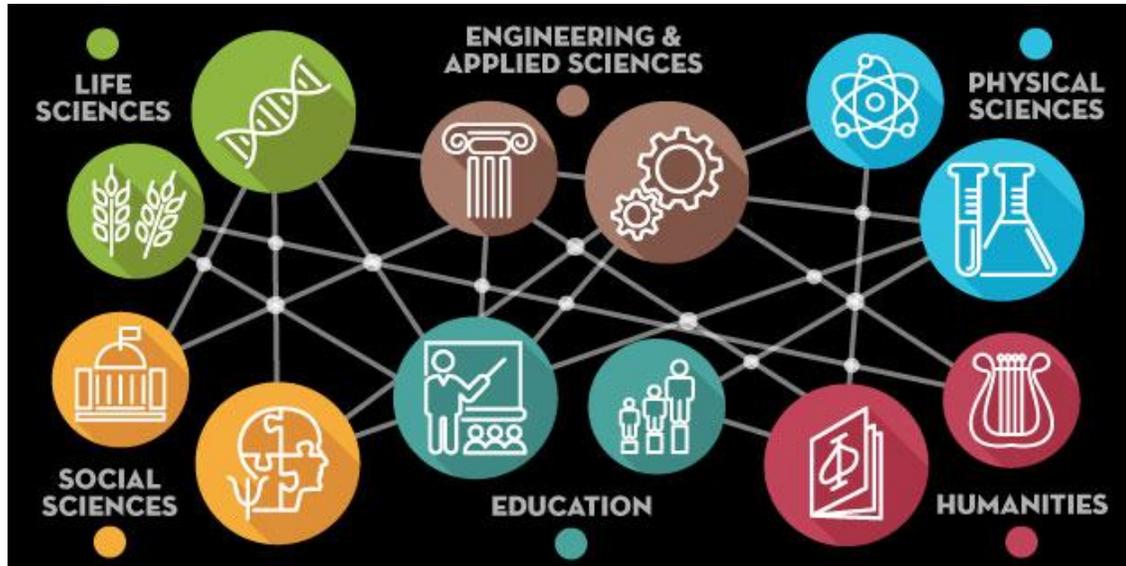
Research landscapes and research networking

- ‘Networking’ between the research unit (or individual researchers) and other similar groups or units, local or international, is also **strongly encouraged** (by research authorities).
 - Assumption: benefits of networking or collaboration are obvious(?)
- Preferable for researchers/research units to interact in networks.
 - Collaborations may be formal or informal
 - Research agendas may be clearly articulated or relatively diffuse.



Research landscapes and research networking

- However, shared intellectual values and respectful relationships are a vital prerequisite for successful networks and collaboration!



Source: <https://news.vanderbilt.edu/2016/11/07/new-interdisciplinary-university-research-council-created/>

- Thus, the challenge for Africa is how to:
 - develop strong research units and research networks
 - foster greater inter-disciplinarity in research units.
 - (in context of civil engineering materials research)
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African realities, challenges and opportunities (and threats?)

African realities, challenges and opportunities (and threats?)

Africa and the share of international research

- The general view from outside the African continent may be that research activity is relatively sparse, with limited impact.
 - However, from the UNESCO Report (2015), there is growth in research, both in quantity and impact.
 - Research articles published in the continent have risen by 60% between 2008 and 2014.
 - In 2016, African scholars contributed 3.2% of world share of scientific publications
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African realities, challenges and opportunities (and threats?)

Africa and the share of international research

- From a study (Onyancha, 2018) - there is knowledge specialization as well as research diversity in several sub-Saharan African countries.



- Also, knowledge production in sub-Saharan Africa addresses areas that are considered key to economic development
 - Mainly agriculture and health.
 - Increasingly, also in the mathematical and physical sciences, including materials science
 - And astronomy – SKA and ‘big data’ investments

African realities, challenges and opportunities (and threats?)

Africa and the share of international research

- One of the main challenges to research in Africa is funding – **presently only 0.8% of global R&D expenditure in Africa.**
- There are cases of researchers working unpaid, sometimes for years (Makoni, 2018).
- International funders may provide funds, but have a set agenda which often fails to address the societal challenges that African countries face (Onyancha, 2018).
- Properly funded national research agencies are needed.

UNPAID RESEARCH IN AFRICA

Some 85% of 412 academics and students from six countries reported having been in research position with no pay at some point in their career. The practice seems to be common and is said to be partly due to lack of funds for research.



Source: Makoni, M. (2018). Research is often unpaid in sub-Saharan Africa. Nature. doi: 10.1038/d41586-018-07244-w

Construction materials research in Africa

Research networks

- In Africa, there is a need to develop research clusters and networks in construction materials, that are viable and sustainable.
 - Sound and reliable national infrastructure is essential for:
 - economic development (and is notoriously and dangerously under-valued!)
 - areas such as human health (think of clean water and proper wastewater treatment!)
 - Formal research networks in construction materials are not strongly evident, but are likely in embryo.
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Construction materials research in Africa

Research networks

- One network model that might be studied and emulated has existed in South Africa for the last 25 – 30 years (Ballim,2018)
 - Summary of the progress which the SA concrete materials research network has made:
 - Significant progress in structural design and specification approaches to ensure improved durability and more efficient material usage for RC structures
 - A supportive relationship has evolved over past 25 - 30 years between university-based researchers in cement and concrete technology and the broad concrete industry
 - The South African relationship might be a model that other research collaborators would wish to emulate in their home countries (Ballim, 2018)
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Research opportunities and perspectives in Africa

Research opportunities and perspectives in Africa

- Firstly: researchers and research units / networks must ensure that research credibility is established and internationally benchmarked - to attract industry and external links.
 - This speaks to the 'quality' of research, which is not entirely linked to resources,
 - It is closely linked to a strong research culture and a thirst for knowledge.
- Secondly: individual capacity-building is essential, but should be embedded in a framework of building the institutions of science in Africa.
- There is every incentive for the current generation of researchers authoritatively to prove African intelligence and research perspective.



Research opportunities and perspectives in Africa



Source: <https://avatars.com/knowledge-skills/>

- Regarding research opportunities, we expect these are enormous and very exciting.
- The importance of generating and developing local indigenous knowledge and skills must be stressed, rather than importing them.
- Research plays an indispensable role – the generation of high-level human resources that are truly a national and continental resource.

Beaudry et al: "Research performed in the higher education system generates knowledge, stimulates international cooperation and increases competitiveness in the global knowledge economy".

Research opportunities and perspectives in Africa

Some ideas and perspectives:

- Investigation and use of African natural materials for construction e.g.
 - natural pozzolans, calcined clays, natural fibres, limestones, organic materials for admixtures and additives (RILEM TC-AMC, 2018), and the like;
 - ‘traditional’ African building materials, clay, mud, etc.
- Developing materials that support energy efficient architecture
 - dome structures
 - improved tensile stress materials,
 - low carbon materials,
 - natural resins with natural fibre as reinforcement, etc.
- Development of African design codes and specifications, strongly informed by local materials, expertise and practice.



Research opportunities and perspectives in Africa

- From a philosophical perspective,
 - African researchers can bring a different worldview to their work;
 - a 'communal' approach, looking for ways to maximise cooperation and leverage progress for the greater benefit of all,
 - in contrast to a strongly individualistic worldview.
 - This could mean that, suitably networked and resourced, African researchers could make major and qualitatively different types of research contributions in the future.
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Research opportunities and perspectives in Africa

- Thus, a specific African challenge is to develop an approach where research questions are posed against the backdrop of a shared developmental framework or philosophical approach that can guide on-going work.
- Following on, collaboration between international researchers and African scholars can offer advantages to other continents;
- Intra-African collaboration can make a substantial contribution to the development needs of the continent.



Research opportunities and perspectives in Africa

- We must create African research networks – drawing on key people and key institutions on the continent.
 - We must put plans in place to:
 - find such people
 - create the networks
 - make them sustainable
 - start to work on African problems relevant to the continent.
 - Greater research mobility would help in this.
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Closure

- Firstly, the role of mentors and promoters for aspiring researchers.
 - Fortunate is the young researcher who can locate or be provided with such mentors and promoters, assuming they take genuine interest in the person concerned.
 - My own journey would probably never have got off the ground without such people, local and international, who got behind me and 'pushed' me forward.
- Secondly, RILEM, as an international 'research network', is actively expanding into Africa: first 'African Technical Committee' in 2018 (RILEM, 2018). More will follow.
 - RILEM offers great incentives to African researchers (e.g. free student memberships), and can be one sure way for budding researchers to break into the broader international arena.
- Such was my experience!



Asante!
