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Science: an undervalued asset in governance for development

Introduction

Done well, governance is almost invisible; done badly, its impacts can be disastrous. Science and scientific advice are vital, but poorly understood, assets in governance. At a national level, science can strengthen the basis for robust policy. At an international level, scientific understanding will be critical if countries are to engage with the defining economic, social and environmental challenges of the 21st century.

The quality of governance varies globally, as does the prominence given to science within it. Developing countries may be limited in their capacity to produce policies underpinned by sound scientific evidence because the mechanisms to integrate this information into policy are weak. In more developed countries, these mechanisms may be stronger but systems for scientific advice are still not without problems.[1]

This policy brief explores the role of science in governance for development. It concentrates on Africa, highlighting recent successes and failures from the continent, and drawing on the Royal Society's programmes and networks.[2] The paper argues that strengthening the mechanisms for science to feed into governance will be crucial for sustainable social and economic development, and it highlights some examples of this in practice.

What is good governance?

According to the UK's Department for International Development, governance is about much more than simply government: "*it is also about political parties, parliament, the judiciary, the media, and civil society. It is about how citizens, leaders and public institutions relate to each other.*"[3]

A wide array of public policy decisions rely on some form of scientific and technological input. Any country (developing or developed) seeking to create robust policies needs access to accurate scientific information, the desire to use it and the skills to analyse it. However, the use of evidence in policy is not straightforward, and the importance attached to it varies considerably by country and issue. The timescales involved in producing robust research are often long in comparison with the pace of policy debates; research may inconveniently open up more questions than it answers; and research can be too narrow in relation to the broad issues of concern to policy makers.[4]

This is not to say that public policy decisions should be based *only* on scientific evidence. Nor that governance is a purely managerial process, where decision makers, presented with the same evidence, should all reach the same conclusion. Decision makers need to consider multiple, scientific and non-scientific, sources of evidence amongst many factors. A policy based purely on the relevant science might be impractical, overly technocratic or expensive to implement. The challenge is to ensure science advice is readily available, and carries appropriate weight in decision making.

Good governance can sometimes seem counter to the scientific advice. The key thing is that decisions are taken in full recognition of what is known about a given topic, even if this evidence does not appear to have determined the final outcome. It is also important for decision makers to understand what is uncertain, or not known, and ensure that policies are flexible enough to adapt if new evidence becomes available.

Scrutiny of policy and its implementation should also draw on scientific evidence and principles. Parliamentarians, civil servants and all those who seek to influence policy, need to be able to access and understand the importance of impartial scientific evidence, its use in shaping and challenging policies, and its potential in building more accountable governance structures.

The principles underlying scientific inquiry – rational inquiry, objectivity, impartiality, transparency and peer review – complement broader approaches to good governance and decision making. In complex or contested areas of policy, the use of evidence based scientific advice can increase public confidence and participation, especially when people are engaged early on in the process. Opening up new avenues for dialogue between scientists, policy-makers and the wider public has the potential to strengthen the bonds between the state and its citizens.

At the international level, increasing attention is being directed to the role of science in foreign policy and diplomacy.[5] Science must underpin responses to the most

pressing global problems – climate change, food and energy security, and public health – to which many developing countries are most vulnerable. No one country will be able to solve these challenges on its own. The tools, techniques and tactics of foreign policy need to be informed with scientific advice. Without this understanding, countries cannot make their voices heard, influence agendas or effectively contribute to international debates. The role of science in diplomacy was at the foreground of the Copenhagen COP-15 climate change talks in December 2009, when leaders such as Ethiopia's Prime Minister, Meles Zenawi, played a prominent negotiating role.

The African context

The quality of African governance is neither uniform, nor universally weak.[6] It is difficult to compare well-run Tanzania with chronically mismanaged Zimbabwe, or post-conflict Côte D'Ivoire with democratic and stable Ghana.[7] Whilst there is increasing acknowledgement of the role of science in poverty alleviation and economic growth, the commitment of African leaders and the international community to science as a core part of the development agenda ebbs and flows. At a meeting of the Organisation of African Unity in 1980, African leaders agreed to commit 1 per cent of GDP to R&D. Thirty years later, South Africa has come close, but no African country has achieved this target. A significant number of countries are yet to reach 0.1% of GDP. Policy commitments to science and innovation range from passing nods in some African countries to full-scale blueprints for development in countries like Rwanda and Mozambique.[8]

The role of science in governance also varies. In countries where the education system is weak, the critical skills associated with information literacy[9] – "the ability to recognize when information is needed and the ability to locate, evaluate, and use effectively the needed information"[10] – can be difficult to foster. There may be limited institutionalised channels for policymakers to interact with the academic community, such as scientific advisory councils, national academies of science, or dedicated science advisers.

In a parliamentary context, many legislatures have limited access to scientific knowledge and expertise. While countries like Uganda now have a dedicated Science and Technology Parliamentary Committee to advise and scrutinise policy, such examples remain rare. At a more fundamental level, a culture of open exchange and dialogue between policy makers, parliamentarians, academia and other sectors may not be in place.

Exacerbating this, universities and governments may be unaware of discounted or free opportunities to access peer reviewed journals, and lack sufficient internet speed or bandwidth to download articles. Scientists and policy makers may not be able to afford to travel to international meetings to access the latest information, listen to debates and join networks that allow access to pre-publication information.

As a result, it can be difficult for decision makers to draw on the expertise of their own scientific communities, or the wider international community. This can lead to ill-informed debate and sub-optimal production and scrutiny of policy; which in turn undermines the whole governance process.

The following case studies are drawn from sub-Saharan Africa, and demonstrate the significant role of science within governance, particularly in health policy.

South Africa and the crisis of the Duesberg Hypothesis

The turn of the century saw a catastrophic failure of scientific evidence informing policy in South Africa. Thabo Mbeki, the then President, supported the Duesberg Hypothesis – the belief that various non-infectious factors such as recreational and pharmaceutical drug use are the cause of AIDS, and that HIV is a harmless passenger virus.[11] His adherence to this point of view is estimated to have caused an additional 300,000 deaths in South Africa over the eight years to 2007 through the delayed provision of anti-retroviral drugs.[12] Yet many in the scientific community knew that the Duesberg Hypothesis was the result of cherry-picking predominantly outdated scientific data[13] and selectively ignoring evidence in favour of HIV's role in AIDS.[14] This example highlights the importance of political leadership in determining the extent to which evidence is used to formulate and implement policy in countries with limited transparency.

Civil society in South Africa steps up to provide sound scientific advice

In 2007, the Academy of Science of South Africa released an influential report on HIV/AIDS, nutrition and TB.[15] This report recognised the fact that "the issues concerning nutritional influences on human immunity....have been among the most controversial in South Africa in the last decade"[16] with the national health ministry having "supported the use of beetroot, lemons and garlic to treat HIV."[17] This report gained international recognition and helped to reshape South Africa's HIV public policy. It also demonstrates the value of a national science academy in providing advice on policy with immediate social benefit.

Nigeria and the avoidable resurgence of polio

In 2003, the political and religious leaders of three states in northern Nigeria stopped immunisation against polio claiming the vaccine could be contaminated with anti-fertility agents, HIV and cancerous agents. This case highlights the complexity of competing influences in decision making. Utilization rates of orthodox health-care in Northern Nigeria have always been low, with little trust in modern medicine and a history of perceived betrayal by the federal government.[18] In addition, there was cynicism about the well funded, door-to-door campaigns promoting polio vaccines. Nigerians were also suspicious about Western health interventions in the wake of Pfizer's 1996 'Trovan trial'.[19]

After an eleven month pause, vaccination restarted in these states, with a vaccine sourced from Indonesia. During this period, however, new polio outbreaks occurred in fourteen countries across three continents, all with strains traceable to Nigeria.[20]

A self sufficient Malawi

In 2005, Malawi suffered a terrible drought. Over a third of the population needed food aid and many villages reported people dying of starvation.[21] The government launched fertilizer and seed subsidies, and within three years, Malawi was self sufficient, selling more corn to the World Food Programme than any other country in southern Africa.[22] Similar schemes in neighbouring countries have led to macroeconomic instability, fiscal crises and hyperinflation.[23] However, the decisions taken in 2005 were based on sound evidence and highly effective. The challenge is now for Malawi to forge a smooth transition to a more financially sustainable future, without such reliance on subsidies.

Zambia and the confusion over GM maize

In 2002, the Zambian Government rejected US food aid that was genetically modified despite 2.3 million Zambians facing severe food shortages.[24] A number of southern African countries had expressed concerns about receiving GM food aid because of its potential health impacts on humans, on domestic agricultural biodiversity; and because cultivation of GM crops could endanger future exports to GM-free markets in Europe.[25] At the time, there was no regulatory system in place in Zambia to evaluate, accept or reject the GM maize.[26] Eventually, Malawi, Mozambique and Zimbabwe accepted GM maize after South Africa agreed to mill the shipments before distribution. Zambia, however, continually refused to accept any GM food aid, even after sending a team of scientists to the US, South Africa and Europe to assess the situation. Science was only one part of this complex crisis – economics and foreign policy were also central to the decision process. But the Zambian governance framework was not well set up to access the necessary scientific information, regardless of the weighting this would have carried in the final decision.

Insecticide treated nets and the reduction of malaria

Malaria is a major health problem in Africa, with 212 million cases a year causing 800,000 deaths.[27] Research in the 1980s and 1990s showed that use of insecticide treated nets caused significant reductions in mortality, particularly in infants. Since then the efficacy of the nets has been demonstrated repeatedly.[28] This weight of evidence, combined with the low cost of nets and their relative ease of use, has led to them becoming a key component of public health policy, vigorously supported by donors and governments alike. Over 100 million were distributed across the continent between 2006 and 2008, and 23 countries have implemented programmes to provide them for all age groups at risk.[29] Though malaria is still a significant problem, this evidence based approach is reaping rewards. Decreases in malaria cases and deaths have been consistent for more than five years in Botswana, Eritrea, South Africa, Sao Tome and Principe, Swaziland, Zambia and Zanzibar, United Republic of Tanzania[30] with other countries also making good progress. With artemisinin-based combination therapies offering renewed promise for the treatment of malaria, we may be entering a new era of malaria control.

Fostering good governance in science

These case studies are no more than snapshots, but they highlight how the use of science in African governance can vary widely. There are some exciting success stories, with scientists helping to make policy, or holding decision makers to account. But other countries still face overwhelming barriers in promoting scientific evidence in governance, in the face of competing priorities.

As science and innovation become increasingly mainstream within the global development agenda,[31] the importance of using scientific knowledge and methods to support governance is often overshadowed by more 'eye-catching' capacity building initiatives. Whilst appreciating the constraints and complexities of the African policy context, there are a number of ways in which the role of science in governance could be strengthened:

1. Improving access to credible scientific information and trusted networks

Globalisation has dramatically altered the organisation and delivery of scientific research, with international collaboration in science growing rapidly.[32] Through novel partnerships, developing countries can strengthen their own capacity, not only to do research, but also to manage the interpretation and application of its outputs in national policies. As the New Partnership for African Development (NEPAD) states: "*It is not the mere accumulation of physical capital and natural endowment that transform economies and stimulate human development but the ability of countries to produce, harness and wisely use scientific knowledge and related technological innovations.*"[33]

Global debates on shared policy challenges also require, and are enriched by developing country participation. This may require subsidised participation at international meetings; subsidised subscriptions to international organisations and publications; free access to journals and other information sources for developing country scientists, parliamentarians and policy researchers. There are already considerable efforts in this area – such as AGORA (the Access of Global Online Research in Agriculture) and PERii (the Programme for the Enhancement of Research Information).[34] However, more could be done to raise awareness of what initiatives exist and how to benefit from them.

2. Building capacity in scientific literacy

The effective use of scientific advice in governance requires policymakers and other actors to have a minimum level of scientific literacy, or at least access to others who have it. It also requires scientists to communicate their work in an accessible and intelligible way, which is sensitive to its wider policy context. Training policymakers, diplomats and negotiators in science and technology can increase their capacity to handle technological issues in international forums.

In recent years, there has been a strong growth in the number of higher education institutes across Africa. Ethiopia is a good example, with an expansion in its number of universities from seven to twenty, with a focus on science and engineering training. In the long term, such investments will provide an important boost to overall scientific capacity, strengthening the likelihood that policy makers will be able to access a cadre of trained scientific experts and analysts.

In the short to medium term, more initiatives to build scientific capacity within African schools and universities are critical. There are already many education, training and exchange programmes in place, but the scale of the task remains daunting. More effort could also be directed to specific training for policymakers and scientists. Civil society organisations such as the the African Capacity Building Foundation, some national academies of science, and the Association of European Parliamentarians with Africa (AWEPA) already provide some training to policy makers to build scientific literary. This could be complemented by more courses or scholarships to enable African policymakers or parliamentarians to understand the role of science in governance elsewhere. For example, the UK Parliamentary Office for Science and Technology (POST) offer secondments to Ugandan Parliamentary staff to further their appreciation of parliamentary processes overseas.

3. Better links between scientists and policy-makers at all levels

Where policy is not underpinned by scientific evidence, this is often due to systemic weaknesses rather than deliberate avoidance or neglect by decision makers. Safeguarding against this may require more profound adjustments to the structure and functions of government, parliament and other organisations.

UNESCO, OECD or World Bank reviews can provide a stimulus to action through external, independent, authoritative assessments of a country's science and innovation system, including the role of science in governance. But regular analysis at a national level is also vital. There are numerous ways to strengthen links between scientists and policy makers, including:

- Dedicated scientific advisers for governments, or specific government departments;
- Scientific advisory boards/councils, including parliamentary science committees which can call on national scientists for advice;
- Greater avenues for discussion and exchange between independent bodies such as national science academies and NGOs; and governments and parliaments;
- International (possibly informal) networks of advisers to government – perhaps comprising diaspora scientists. [35]

At the same time, there are no one-size-fits-all solutions: models that have been applied in one country will not be applicable elsewhere. Sharing best practice on approaches to governance is valuable, and there are a number of fora that could play this role such the Network of African Science Academies, the African Union, NEPAD and the African Parliamentary Knowledge Network.

In some developing countries, communication and coordination between different government ministries and intergovernmental bodies remains limited. Good governance requires the coordination of many stakeholders – scientific and non-scientific – located in different organisations and departments. Improving communication between these different bodies, at low cost – such as through cross-departmental advisory groups – could pay dividends, with positive implications for the quality of policy produced.

Developing the capacity within African parliaments to source, objectively analyse and critically consume new knowledge is essential to providing more rigorous checks and balances in policy making. The Uganda National Academy of Sciences (UNAS) is currently trialling an MP-scientist pairing scheme (with the support of the Royal Society and POST). The aim of the scheme is to improve the quality of scientific advice within Uganda's Parliament, and it has recently resulted in the appointment of a dedicated Parliamentary liaison officer within UNAS.

Creative partnerships can also add value here. Recently the InterAcademy Panel (with a membership comprised of 104 of the world's science academies) and the European Climate Foundation worked together to convene workshops in Africa, Asia and Latin America where leading local scientists in these regions met with their national climate policy experts and negotiators to appraise them of the most up-to-date science around climate change and help to prepare them for the COP-15 Copenhagen conference.

4. Stronger public institutions to provide sound scientific advice

Funding partners and policy agencies could usefully work in partnership with science academies, NGOs and think tanks to support evidence-based policy and strengthen national and regional governance frameworks. Internal reforms and institutional strengthening are important if the key organisations within national innovation systems are to effectively engage in the dialogue that produces good governance.

Initiatives led by the US National Academy of Sciences, the Royal Society and the Network of African Science Academies are working to improve the capacity of African science academies to provide independent, evidence-based scientific advice to their governments.[36] As illustrated by the earlier South African case study, national science academies can perform a vital independent challenge function for policy-makers. Think tanks are also increasingly seen as an influential player in shaping development policy and practice. The Bill and Melinda Gates Foundation, the William and Flora Hewlett Foundation and the IDRC of Canada recently announced US$30 million in grants to 24 think tanks in East and West Africa.[37]

5. Broader metrics for scientific capacity

There is a need for better metrics for scientific governance. Conventional STI metrics – spending, patents, and peer reviewed publications – do not reflect the *use* of science, particular in non-academic arenas such as policy and governance. Alternative metrics, that capture the local application of science and innovation, could become a useful mechanism for comparing and sharing good practice. Measures could include the presence (or number) of government scientific advisors, the number of independent think tanks, cross-departmental or stakeholder policy fora. Efforts in this area include the UNESCO Institute for Statistics' global perspective on science and technology statistics[38] and the NEPAD African Science, Technology & Innovation Indicators Initiative.[39] The Ibrahim Index of African Governance could also be expanded to include a better reflection of the role of science in governance.

List of acronyms

AGORA	Access of Global Online Research in Agriculture
AIDS	Acquired Immune Deficiency Syndrome
AWEPA	Association of European Parliamentarians with Africa
COP 15	Fifteenth Session of the Conference of the Parties to the Climate Change Convention
EU	European Union
GDP	Gross Domestic Product
GM	Genetically Modified
IDRC	International Development Research Centre
HIV	Human Immunodeficiency Virus
NEPAD	New Partnership for African Development
NGO	Non-Governmental Organisation
OECD	Organisation for Economic Co-operation and Development
PERii	Programme for the Enhancement of Research Information
POST	UK Parliamentary Office for Science and Technology
R&D	Research and development
STI	Science, technology and Innovation
TB	Tuberculosis
UNAS	Uganda National Academy of Sciences
UNESCO	United Nations Educational, Scientific and Cultural Organization

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