The Sustainable Development Goals, science diplomacy and TWAS

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Abstract

To attain the targets of the 17 United Nations Sustainable Development Goals will require not only the input of science, but also the judicious application of science diplomacy. Unfortunately, scientific research, outputs and applications are skewed heavily towards High-income Countries (HICs), whereas many Low- and Middle-income Countries (LMICs) invest much less in training scientists and providing suitable facilities for them to carry out their research. Supporting research in LMICs is critical to reaching the SDGs as not all research outputs from HICs are directly transferrable to lower-resource settings.

Throughout its 40-year history, The World Academy of Sciences (UNESCO-TWAS), headquartered in Trieste, Italy, has been working to build scientific capacity in the Global South, frequently relying on South-South collaboration and exchange to implement its programmes. More recently, since 2014, TWAS has developed activities in the area of science diplomacy – particularly raising awareness among young scientists in LMICs of the necessity to

think of the applications of their research beyond the laboratory, i.e. how their results might be used to tackle the SDGs and how, in turn, they can raise awareness among local policy-makers of the need to engage with scientists within their own countries. Examples based on the actions of alumni from TWAS science diplomacy courses are presented. Also highlighted is the fact that TWAS and other scientific institutions in and around Trieste receive core funding from the Government of Italy, confirming these entities of the so-called Trieste Science System as an instrument of soft power (using science, i.e. science diplomacy) to enhance the credibility and influence of Italy.

In 2015, Member States of the United Nations agreed to a set of 17 development objectives to be achieved by 2030. Known as the Sustainable Development Goals (SDGs, <http://sdgs.un.org/goals>), they cover a range of issues from eliminating poverty, ensuring adequate nutrition, and tackling climate change and biodiversity loss. Many scientific organizations around the world contributed to discussions during the drafting of the SDGs, in what can be regarded as an example of «science in diplomacy» – one of the three pillars of a widely used definition of science diplomacy[1].

Indeed, it is clear that science must also play a key role in reaching the 169 targets of the 17 SDGs by 2030. How can we ensure food and nutrition security, for example, or the provision of safe drinking water and adequate sanitation, without the application of science and technology? Going further, it is clear that many of the SDGs cannot be attained by individual countries acting alone. The SDGs relating to Climate Action (SDG#13) and – as the COVID-19 pandemic has brought to the centre of our attention – Good Health and Wellbeing (SDG#3), among others, also require the application of science diplomacy. In this case, we can

consider the «science for diplomacy» pillar of the tripartite definition referenced above.

Unfortunately, scientific research and outputs are skewed heavily towards High-income Countries (HICs), where investment in necessary personnel and infrastructure is largely adequate. In many Low- and Middle-income Countries (LMICs), however, there is a serious lack of investment in training and retaining scientists and providing those that do remain with suitable facilities for them to carry out their research. Not all research and development carried out in HICs is directly transferrable to LMICs: local context plays a major part in the adaptation and uptake of any technology. To attain the SDGs, therefore, it is imperative that research and development is supported in LMICs. Such support must include sustained efforts in capacity building in science and technology. Only in this way can appropriate local solutions be found for local challenges.

Prior to the 2015-2030 SDGs, the world's nations agreed on another set of targets, the 2000 Millennium Development Goals (MDGs, <http://www.un.org/millenniumgoals/>). It soon became clear that capacity building was an essential requirement. For example, the World Water Development Assessment Programme (2003) noted that: «To fulfil the 2003 requirements of the UN Millennium Development Goals, member countries agreed that Africa would need an estimated 300% increase in the number of trained water professionals, Asia would need a 200% increase, and Latin America and the Caribbean a 50% increase, in all disciplines». And that: «At the 2015 Knowledge Exchange in International Waters conference (Beijing), Asian and African representatives requested capacity building training in international water law and conflict management»[2].

But this is not an issue that arose in 2015 with the introduction of the SDGs, or indeed in 2000 with the intro-

duction of the MDGs. In fact, Abdus Salam, a Pakistani physicist, recognized this issue back in the 1960s. Salam, who went on to win the Nobel Prize for physics in 1979[3], was the driving force behind the establishment of the International Centre for Theoretical Physics (ICTP, <www.ictp.it>) in Trieste, Italy, in 1964. ICTP was created to provide «scientists from developing countries with the continuing education and skills that they need to enjoy long and productive careers. ICTP alumni serve as professors at major universities, chairpersons of academic departments, directors of research centres and ministers of science and technology in nations throughout the developing world. Many of them have been recognized in their own countries and internationally for their contributions to science and science policy» (ICTP - The Abdus Salam International Centre for Theoretical Physics, n.d.)

Recognizing that ICTP dealt with only a limited area of science and that sustainable economic development required the input of all scientific disciplines, Salam followed up the establishment of ICTP with the creation of what was then known as the Third World Academy of Sciences (TWAS). Beginning with just 42 Founding Fellows in 1983, TWAS (now The World Academy of Sciences and acting as a programme unit of UNESCO, <www.twas.org>) recognizes more than 1,200 eminent scientists from around the world as Fellows, with more than 80% from LMICs.

Through four decades, TWAS' mission has remained consistent:

- Recognize, support and promote excellence in scientific research in the developing world;
- Respond to the needs of young scientists in countries that are still developing in science and technology;

- Promote South-South and South-North cooperation in science, technology and innovation; and
- Encourage scientific research and sharing of experiences in solving major challenges facing developing countries.

TWAS uses the credibility of its eminent Fellows from around the world to provide capacity-building programmes aimed largely at young scientists in LMICS, and particularly a sub-set identified as Science and Technology-lagging Countries (STLCs). For example, TWAS and its partners offer over 300 fellowships per year to scientists in the developing world who want to pursue a doctoral degree or post-doctoral research, and also allocates well over USD1 million in research grants every year to individual scientists and research groups in STLCs.

Partners in the TWAS fellowships schemes are typically government agencies in those LMICs that have excellent scientific facilities. These include the Chinese Academy of Sciences (CAS), the Council for Scientific and Industrial Research (CSIR) and the Department of Biotechnology (DBT) of the Ministry of Science and Technology, both in India, the National Research Foundation (NRF) and the Department of Science and Technology (DST) of South Africa, and the Scientific and Technological Research Council of Turkey (TÜBİTAK). Thus, negotiations between TWAS and these partner agencies can be considered as examples of the third pillar in the science diplomacy definition, i.e. «diplomacy for science».

Such fellowship and other exchange schemes were designed to encourage South-South collaboration – one of TWAS' key missions that also has relevance to the SDGs. As mentioned above, research carried out in HICs cannot

always be easily transferred to LMICs. In contrast, research performed in a developing country – leading to innovation in a resource-constrained environment – is often more directly applicable in other developing countries. As well as helping to directly build scientific capacity, therefore, such exchange schemes also lay the foundations for technology transfer and the attainment of the SDGs.

The investment contributed to the various TWAS fellowship programmes by the partner governments is not trivial – all costs for hosting the visiting scientists are borne by them. So what do these countries gain from their philanthropy? The answer can be found in the concept of «soft power», defined as «the ability of a country to persuade others to do what it wants without force or coercion» (Nye, 1990). Soft power is often expressed through culture (e.g. art, cuisine), but also sport, political values – and scientific collaboration.

TWAS receives core financial support from the Government of Italy via the Ministry of Foreign Affairs and International Cooperation (MAECI). Indeed, other international scientific institutions in Trieste, including ICTP and the International Centre for Genetic Engineering and Biotechnology (ICGEB, <www.icgeb.org>), also receive such support. Likewise, other institutions in the region, such as the National Institute of Oceanography and Applied Geophysics (OGS, <www.ogs.it/en>) and the Central European Initiative (CEI, <www.cei.int>), are also directly active in science diplomacy activities. These examples amply demonstrate that, through its political and financial support, the Italian government is using its soft power to promote science diplomacy and to build lasting relations with scientists from around the world.

It is fair to say that science diplomacy activities in Trieste began with TWAS. Since 2014, TWAS (in partnership with the American Association for the Advancement of Sci-

ence (AAAS, <www.aaas.org>), has trained more than 400 young scientists, largely from LMICs, in science diplomacy. These efforts ensure that the scientists carrying out research in their laboratories or through field studies are aware of the wider implications of their work and how it can contribute to informing policy and contributing to the SDGs.

To provide one example, Patrick Ssebugere, an environmental toxicologist at Makerere University, Uganda, attended an AAAS-TWAS science diplomacy course in 2018. He learnt new communication skills, which he is now putting to good use acting as an advisor for policymakers and the Government of Uganda. He has begun to monitor the western Uganda region, where deep oil fields are luring the interest of international oil companies. Drilling, which may start in a near future, could release pollutants such as heavy metals and polycyclic aromatic hydrocarbons into the soil that may eventually leach into lake basins. Ssebugere and his team are carrying out preliminary tests, collecting baseline data to advise the Government when the drilling starts. Another of his projects involves devising new methods to quantify the levels of microplastics in surface waters, sediments, fish and other organisms in Lake Victoria, the shores of which are shared by three nations (Serra, 2022).

It is also clear that policy-makers, diplomats and government officials are often unaware of the importance of science diplomacy and especially the contributions that scientists can provide towards policy options. Indeed, as one expert speaker at an AAAS-TWAS science diplomacy course succinctly put it: «Policy-making without science is just guessing» (Copeland, 2009). For these reasons, science diplomacy training provided by TWAS is targeted not only towards young scientists, but so-called «science diplomacy ambassadors» (including young government officials, perhaps

working in a ministry of science or department of energy) are also invited to attend. Testimonials received from such course participants confirm that they are actively using the science diplomacy training they received in their daily work. Recently, ministry officials in Brazil, India and South Africa, for example, have confirmed to TWAS that they are using what they learnt during their science diplomacy training «on a daily basis».

The numbers of individual young scientists who are able to take forward their science diplomacy training and have a positive impact in policy circles are, however, limited. A more effective outcome is the example provided by Grace Abakpa of the National Biotechnology Development Agency (NABDA) and Etim Offiong, African Regional Centre for Space Science and Technology Education – both from Nigeria and who met for the first time in Trieste at a AAAS-TWAS train-the-trainers' science diplomacy course in 2019. On their return to Nigeria, they connected with their Federal Ministry of Science and Technology and provided a 3-day course in science diplomacy to some 35 staff members, officials and policy-makers.

«The Federal Ministry of Science and Technology really welcomed our feedback [from the TWAS course attended], and in 2020 this culminated in an agreement which aims to set up trainings for early career scientists in the Ministry on science diplomacy», informed Abakpa. «It further aims to work in collaboration with other ministries – especially the Ministry of Foreign Affairs – for further work on science diplomacy and broader inclusion and engagement of policy makers. The TWAS training contributed greatly to this outcome».

In summary, it can be said that societies face three kinds of problems that can be classed as simple, complicated or com-

plex. An example of a simple problem would be how to irrigate a field. Introduced from Egypt to Greece by Archimedes, the origins of the so-called Archimedes Screw are said to date back to the third century BCE. A more complicated problem is providing water and sanitation to every household in a city. This requires a combination of facilities and technologies – from reservoirs to pumping stations, to purification and sewage treatment plants. However, it can be done with available technologies. These can also be classed as «tame» problems. In contrast, complex – or «wicked» – challenges require solutions that go beyond the competencies of science and technology. Continuing the above example of providing water to a city – what happens when multiple actors with multiple demands are concerned.

Perhaps the water resource is shared by more than one nation, or the available water must be shared with other sectors such as agriculture and industry, while not forgetting our duty to protect the natural environment (enshrined, for example in SDG#14 – Life Below Water).

«The search for scientific bases for confronting problems of social policy is bound to fail, because of the nature of these problems. They are "wicked" problems, whereas science has developed to deal with "tame" problems» (Rittel and Webber, 1973: 155).

The SDGs – while requiring the input of science to reach the targets – are «wicked»/complex problems. That is, more than just science and technology is required to deal with them. What is required is science diplomacy – a concerted effort to build bridges and understanding between the scientific and the policymaking communities. In many LMICs (and elsewhere!) critical first steps in this process include capacity building in research and development, and capacity building in science diplomacy.

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Endnotes

1 From the definition of science diplomacy provided by the Royal Society and by the American Association for the Advancement of Science, in *New Frontiers in science diplomacy* (Royal Society and AAAS, 2010).
2 Both quotes from Marshall et al. (2017).
3 See <http://en.wikipedia.org/wiki/Abdus_Salam>.