

QnAs with Wolfgang Lutz

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In 2015, 193 nations came together to define 17 sustainable development goals. However, the large number of specific development targets renders prioritizing the use of development resources a challenging endeavor. Demographer Wolfgang Lutz, of the International Institute for Applied Systems Analysis in Vienna, Austria, and a recently elected member of the National Academy of Sciences, writes in his Inaugural Article (1) that the concept of *sola schola et sanitate* (only education and health) should serve as the guiding principle for development efforts, echoing Martin Luther's principles of *sola scriptura*, *sola fide*, and *sola gratia* (only scripture, only faith, and only grace) that guided the Reformation 500 years ago. Lutz recently spoke to PNAS about his work on education and health.

PNAS: What is the focus of the discipline of demography?

Lutz: Demography deals with the changing size and composition of human populations. When people talk about demographic change, what most people mean is the changing age composition. But this definition goes beyond the age composition; it can include many other characteristics whose changing distributions are relevant for social and economic change.

Over the last 20 years, we have analyzed populations by age, sex, and educational attainment. It also lends itself to forecasting: Once you know how many 20-year-old women have completed high school, this is a very good predictor of how many 60-year-old women in 40 years will have completed high school, because it's a sticky characteristic. Once you've achieved it, you maintain it for the rest of your life.

PNAS: In your Inaugural Article (1), you recount the development of the island nation of Mauritius. What role did health and education play in that nation's economic transformation?

Lutz: I was just coming from graduate school back to Austria into this interdisciplinary research institute. I was looking for a country to study that was compact, so the island of Mauritius came across as a nice microcosmos. We had good statistical data going back to the 19th century. Mauritius in the 1960s had served as a textbook case of a population trapped in the vicious circle of high population growth, poverty,

and environmental degradation. Because people are poor, they have more children; because they have more children they are still poor, and they deforest the island and run out of natural resources. The British economist James Meade was sent to Mauritius by the British government to assess the situation and make proposals. He came up with the proposal [to] bring all girls to school and introduce family planning. Even the influential Catholic Church at that time agreed to support the government efforts in family planning.

When I came to the island in the early 1980s for the first time, it had already made incredible progress. At that time, the textile industry was booming, and the fertility rate had declined very rapidly from more than six children per woman to [fewer] than three children per woman in about a decade. People were still poor, but everybody had a job. Then tourism kicked in. Now Mauritius has moved on beyond tourism to be an IT [information technology] hub. They are now one of the most developed societies and economies in the whole African region.

We built a quantitative model of population–development–environment interactions and played with alternative histories. We looked for the key drivers of positive development and found education, particularly female education, and a basic health standard.

PNAS: How do you think governments could implement a focus on health and education?

Lutz: In most European countries as well as in the [United States], basic education has long been compulsory. The resulting human capital was one of the main drivers, I found, of the [United States] and Europe leading the world technologically. If you look where international development assistance today is putting the emphasis, basic education receives only 2–3% of the entire bilateral and multilateral development assistance. That's a very tiny proportion. This is not reflective of the very important long-term benefits



Wolfgang Lutz. Image courtesy of the Austrian Academy of Sciences.

This QnAs is with a recently elected member of the National Academy of Sciences to accompany the member's Inaugural Article on page 6904.

that education has. Health recently has received much bigger funding because there have been major health initiatives. If you go to developing countries, they want to open new power plants or new highways, big infrastructure projects: that's where the money goes and not into basic education in the villages.

PNAS: Can you elaborate on your statement in the Inaugural Article (1) that "brain power is the potentially unlimited zero emissions energy for a sustainable future"?

Lutz: Studies of future energy systems come to the conclusion that technological innovation makes the difference. We need new inventions to be able to fully move to renewables. And then we need populations that are ready to give up harmful practices and switch to a new technology and a new behavior that is more benign for the environment. Both are cognitive processes. They say you cannot have energy for free. Brain energy is one of the few resources that is not exhausted by being used; it's strengthened by being used.

PNAS: Where have you seen this focus on health and education being implemented particularly well?

Lutz: Finland is the country I wrote my dissertation about. It was the poorest, least-developed corner of Europe in the late 19th century. They were in a terrible state. Then the Lutheran church, together with the state officials, invested heavily in literacy. Between 1870 and 1900 the number of elementary school

teachers increased by a factor of 10. The Lutheran church did not allow young people to marry unless they read one page from Luther's small catechism. Literacy was the permission to reproduce. It was successful. In the early 20th century, the young population in Finland was one of the best educated in the world. It's no wonder that Finland was the first country in Europe that introduced the female right to vote because women had an equal standing with men. Today, Finland is one of the high-tech leaders in the world. Singapore, South Korea, and Taiwan all followed the same pattern. In all of these successful countries, investments in basic health and basic education preceded success. You only find a few economies where oil has triggered an increase in income without the social development of health and education. That's highly artificial. As soon as the oil price drops, the economy fails.

PNAS: What hurdles lie ahead in implementing your proposal?

Lutz: Changing the mindset of decision makers who fund development or who are behind the development policies of the countries. Showing that this fundamental role of basic education and health is not just a belief, but that there is statistical, scientific evidence. It needs to be recognized as a basic prerequisite for many other sustainable development outcomes we are hoping for.

1 Lutz W (2017) Global Sustainable Development priorities 500 y after Luther: *Sola schola et sanitate*. *Proc Natl Acad Sci USA* 114:6904–6913.