

bb The Amazon urgently needs a Fourth Industrial RevolutionCarlos Nobre and Juan Carlos Castilla-Rubio [Author alerts](#) Sep 30 15:18 [Comment](#)

The Amazon rainforest harbours about 10-15 per cent of all the world's biodiversity on land and stores an estimated 150-200bn tons of carbon. Its rainfall generates approximately 15 per cent of the fresh water that flows into the Earth's oceans. The people who live in the Amazon or on its borders include so many ethnic groups and speak so many languages that the region is one of the most culturally diverse places on the planet.

It is the last place you would expect an industrial revolution to take place.

For the past 50 years, this region has seen drastic changes in how the land is used, with massive tracts of forests cleared. Climate models predict that up to 60 per cent of the Amazon forests could be lost by 2050, with most of the land replaced by degraded cerrado — dry grasslands with far fewer species and much less carbon stored.

But tapping the Amazon's current biodiversity — countless living organisms, plants, animals and insects — using the latest technological advances may be the only way to impede the tragic fate facing the world's largest tropical forest.

Over the past few years, the world economy has been quietly undergoing a high-speed transformation driven by the fusion of digital, material and biological innovations of the Fourth Industrial Revolution. Artificial intelligence, robotics, blockchain, 3D printing, nanotechnology, synthetic biology, DNA editing, biomimicry, energy storage and quantum computing, to name but a few, create tremendous opportunities and risks.

We already have the technologies to develop rainforest-based consumer and pharmaceutical products capable of serving global markets. The jambu, a bush common in Amazonian backyards, contains an alkaloid known as spilanthol in its leaves, branches and flowers. Used in regional cuisine, this substance lightly numbs the mouth and tongue — and has already been patented for use as an anaesthetic, antiseptic, anti-wrinkle agent and anti-inflammatory.

The recent reduction of Amazon deforestation — a remarkable 80 per cent decrease in Brazilian Amazon forest loss in the last 10 years — allows for a radical rethink of the current economic model of development there. The old development paradigm — attempting to reconcile maximising conservation with intensifying large-scale agriculture and expanding hydropower capacity — has seen its moment come and go. The new model sees all of the biological and biomimetic assets in the Amazon that can be leveraged through the Fourth Industrial Revolution in progress. There is a species of Tungara frog for example that creates a long-lasting foam. It has inspired new energy generation technologies and new technologies for carbon dioxide capture.

But the catastrophic risks of forest dieback remain, and we must embrace ambitious innovation. This paradigm would respect the traditional knowledge of indigenous populations and help them secure their livelihoods along with their forested lands.

There is a vast potential in this rainforest, but its survival is not guaranteed. The still-too-high deforestation rates and more frequent forest fires are already causing longer dry periods and an increasing number of climate extremes. If warming in the region exceeds 4° C or more than 40 per cent of the total forest area is lost to deforestation, a tipping point will likely be reached and forest dieback may become irreversible.

Development policy in the Amazon has historically taken two pathways. The first embraces nature conservation and protects large swathes of territory from any human activity. The second approach has focused on conversion or degradation of forests for the production of agricultural commodities like meat and soya or tropical timber at the forest frontier, and also mineral commodities and

the build-out of massive hydropower generation capacity. These uses together have been historically responsible for the massive deforestation of the Amazon.

There is, however, a third way within reach in which we aggressively embrace high-tech innovation and look at the Amazon as a tremendous source of biological assets and ecosystem services that can provide new, innovative products and services for current and new markets.

System-level change in the Amazon as proposed cannot be executed single-handedly. On the contrary, we are proposing a collaboration with leading public, private, academic and philanthropic actors for the journey ahead, engaging Indigenous peoples in Brazil and other Amazonian countries, uniting the best capabilities of R&D centres, universities, technology startups and visionary companies all over the world. Government participation is also vital to improve the educational infrastructure and scientific capacity in the Amazon.

If successful, this new development model can be applied to all tropical regions helping to preserve the Earth's great biological diversity. We have an important choice to make. The future of the Amazon and its impact on the planet lie so clearly in the balance. Time is not on our side, but we can still choose the third way.

Carlos Nobre is a member of the UN Scientific Advisory Board for Global Sustainability and a foreign member of the US National Academies of Science. Juan Carlos Castilla-Rubio is the chairman of Space Time Ventures. They are co-authors of a recently published article on "Land-use and climate change risks in the Amazon and the need of a novel sustainable development paradigm" in the Proceedings of the National Academies of Science.

Posted in [Global](#) | [Permalink](#)