

Generation gap & climate change

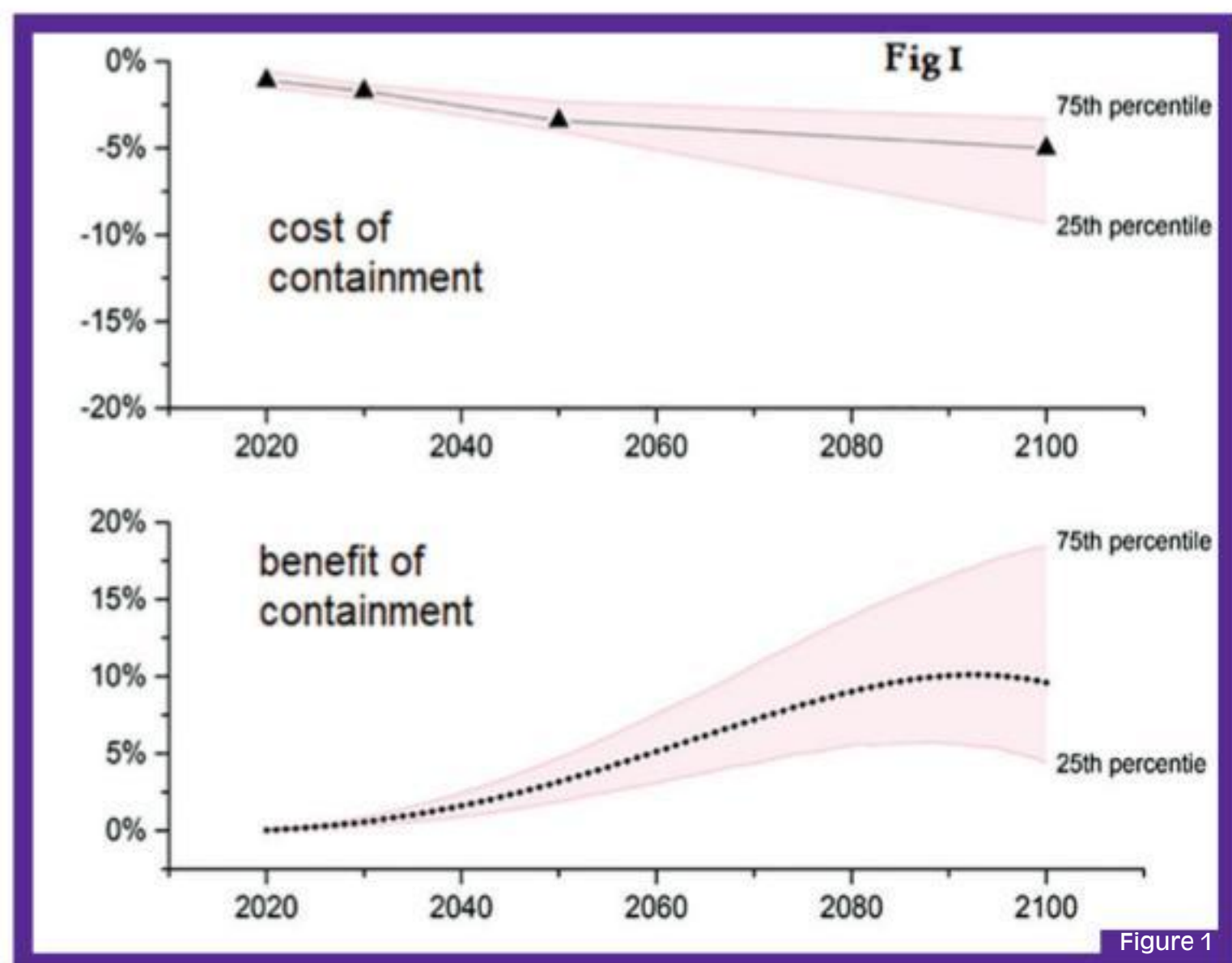


Figure 1

agriculture, housing and services. These changes in economic systems would affect all sectors and lead to the reduction of the gross domestic product of nations. In deriving the overall cost of measures to mitigate global warming, as called for by the 2015 Paris Agreement, the paper relies on Integrated Assessment Models, developed by research groups, and adopted by the 2014 report of the UN's Intergovernmental Panel on Climate Change. And the cost, the paper says, works out to between two per cent and six per cent of the global GDP, on till the year 2100.

The benefit of incurring this cost would be avoiding the economic damage of temperature rise. The paper cites a 2015 study which said productivity of states peaks at an average annual temperature of 15°C, and then there is a pattern of fall in productivity as temperature rises. And on this basis, the study estimated that "keeping the global temperature at the 2010 level could save 23 per cent of global GDP by the year 2100."

What the estimates indicate is that while there would be losses due to the costs of keeping global warming down, and these would dominate the early years, the saving, of the greater economic loss that higher temperature would cause in later years if warming were not contained, would result in a net gain. Figure 1 shows the way it would change, with benefits rising, as the years advance, to compensate costs.

What the study has not considered, the *Nature Communications* paper says, is how these costs and benefits accrue to different age groups in different parts of the world. We can see that older people, at the start of the 2020 to 2100 period, would bear higher costs but reap lower benefits, within their lifetime. In contrast, younger people would benefit from lower temperatures in later years, as compared to the "no mitigation and no loss in earlier years" scenario. There is hence a conflict of interests between the older and younger lot, when valuing current investments to contain global warming.

In order to quantify the relative interest of persons of different age groups, the authors calculated the cumulative cost-to-benefit difference, per capita, with the numbers pertaining to later years discounted to the base year at the rate of three per cent per annum. The cost-benefit of each year over the lifetime of a person was hence reduced to its value at the base year and the lifetime cost or benefit was the total of

each year's discounted figure. And this was done for different age-groups, of persons born between 1920 and 2020, and separately for 169 countries.

Some of the findings are shown in Figure 2. It says that the year 1960 is the cut-off in high income countries — those born before would face a net loss as a result of climate change mitigation, while those born after 1960 would be gainers — and the year is later, till 1980 in lower income countries. The cut-off year itself is variable, according to the form of the model, and circumstances, like in countries in the north, warming would lead to savings in heating costs.

But the message is that younger groups are the ones that would most benefit, in terms of less hardship, as a result of climate change mitigation. "Age cohorts born prior to 1960 generally experience a net reduction in lifetime gross domestic product per capita. Age cohorts born after 1990 will gain net benefits from climate change mitigation in most lower income countries. No age cohorts, however, enjoy net benefits regardless of the birth year in many higher income countries," the paper says.

The editorial in *Nature* is about the Glasgow meeting where countries would report their compliance with commitments made in 2015. While there has been progress in some sectors, like fossil fuel replacement, it is clear that we need policies with a wider reach — "a revolution in how economies are run, and in the choices world leaders must make," the editorial says.

In the 2015 meet, countries agreed to review their targets to match latest assessments, every five years. "Forty-eight countries — including major emitters — are yet to set new targets, and some clearly have no plans to accelerate their climate ambitions," the editorial says. Again, in Copenhagen in 2009, the richer countries agreed to provide \$ (United States) 100 billion per year to less-wealthy nations by 2020, a promise that is far from being kept.

At Glasgow, the new generation of climate researchers and campaigners are expected to "call out climate laggards, and countries that are not fulfilling their funding pledges". For the first time, the editorial says, the "future generation" is more than words in policy statements — the generation is here and insists on being heard. In the context, the study by Haozhe Yang and Sangwon Suh underlines the clash of economic interests that is involved and suggests a way forward.

"Closing the economic disparity among age cohorts may require different climate policies to different age cohorts. The increase in renewable asset price may alleviate the intergenerational disparity under climate change mitigation, given that different age cohorts hold varying amounts of renewable assets. Our study shows that the cost benefit distribution among age cohorts can be an important consideration for policy makers when designing tax and fiscal policies in response to climate change mitigation," the study says.

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PLUS POINTS

Why black & white?



The secret of precisely why giant pandas are coloured black and white has been uncovered by a team of scientists from the United Kingdom, China and Finland, a question that has puzzled experts for generations.

While the bears' distinctive high-contrast colouring means they stand out in the unnatural surroundings of a city zoo, where most humans encounter them, the opposing shades of their fur actually plays a counterintuitive but crucial defensive role in the mountain forests where they would normally reside, the new study found.

"The giant panda uses black-and-white pelage as a form of crypsis to avoid detection in its natural habitat," the scientists from the University of Bristol, the Chinese Academy of Sciences and the University of Jyväskylä wrote in the academic journal *Scientific Reports*, concluding that the combined extremes allow them to camouflage themselves more effectively against different aspects of a given backdrop, helping them evade intrepid predators like leopards, tigers and dholes (Asiatic wild dogs).

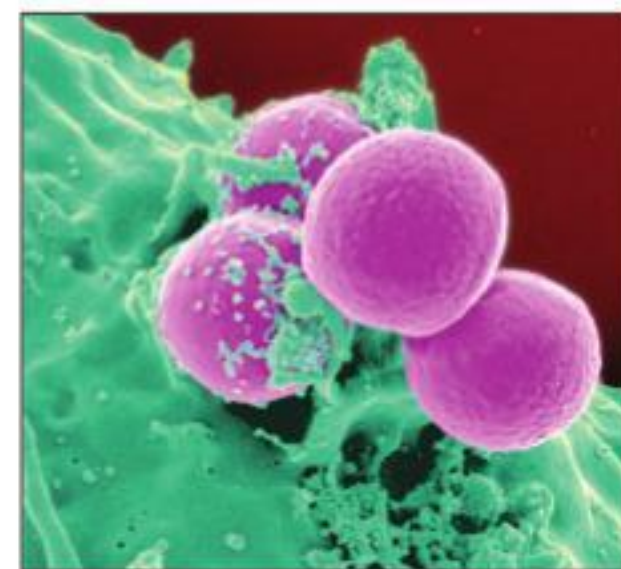
"The black fur blends into dark shades and tree trunks, whereas white fur matches foliage and snow when present, and intermediate pelage tones match rocks and ground," the team wrote.

The patchiness of their fur's colouring also appears to confuse perceptions of their outline, making their exact shape more difficult for would-be antagonists to determine and perhaps discouraging an attack.

The team's findings were based on examining photographs of 15 different pandas taken between 2007 and 2014 in Sichuan, Shaanxi and Gansu provinces in the humid and remote wilds of South-central China, which were analysed against the forest, rocks and rivers that comprise the fragmented background of those locations.

— The Independent

How penicillin works



An international team of researchers has discovered that beta-lactam antibiotics kill methicillin resistant *Staphylococcus aureus*, or MRSA, by creating holes in the cell wall which enlarge as the cell grows, eventually killing the bacteria.

The growth of these holes leads to failure of the cell wall and death of the bacteria, something which the scientists now plan to exploit in order to create new therapeutics for antibiotic resistant superbugs.

It was previously known that beta-lactam antibiotics work by preventing cell wall growth, but exactly how they kill has remained a mystery until now. Professor Simon Foster, from the University of Sheffield's School of Biosciences, said, "Penicillin and other antibiotics in its class have been a centrepiece of human healthcare for over 80 years and have saved over 200 million lives. Their use, however, is severely threatened by the global spread of antimicrobial resistance.

"Our findings get to the heart of understanding how existing antibiotics work and give us new avenues for further treatment developments in the face of the global pandemic of antimicrobial resistance."

Using this knowledge and an understanding of how the enzymes are controlled, the scientists also showed the efficacy of a novel combination therapy against *S. aureus*. The team worked with a simple model for how the bacterial cell wall expands during growth and division and established a hypothesis for what happens when this is inhibited by antibiotics like penicillin. The predictions of this model were tested using a combination of molecular approaches, including high resolution atomic force microscopy.

The project was led by the University of Sheffield as an international, interdisciplinary effort, involving groups at Xiamen University in China, Masaryk University in the Czech Republic and McMaster University in Canada.

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ANANTHANARAYANAN

Steps to contain global warming and moving to greener lifestyles are not without their costs. But the payback is a more habitable world. Does the cost-benefit ratio, however, differ according to the age-bracket of individuals?

Haozhe Yang and Sangwon Suh, from the Bren School of Environmental Science and Management, University of California, Santa Barbara, look into the question in a paper in the journal, *Nature Communications*. The costs and benefits of climate change mitigation, of course, are not the same for all countries. But are they higher for younger people than for older ones? And does the ratio differ in different parts of the world?

And two weeks later, an editorial in the journal *Nature* reports that "young people will be key" at the 26th Conference of Parties

(COP26) to the United Nations Climate Convention, which started in Glasgow, Scotland on Sunday. "The world's youth movements are following the science of climate change... and COP26 would be wise to involve them in decisions", the editorial says.

The *Nature Communications* paper seeks to substantiate the belief that younger people have a larger stake. "A prevailing narrative," the paper says, "is that younger and future generations are the greatest victims of climate change driven by the actions and inactions of older generations." While younger people should then benefit most by mitigating climate change, there is "no peer-reviewed literature that quantifies the costs and benefits of climate change mitigation by age cohorts at a country level," the paper says.

Containment of global warming calls for several measures. One is less use of fossil fuels and energy, and others are changes in land use,

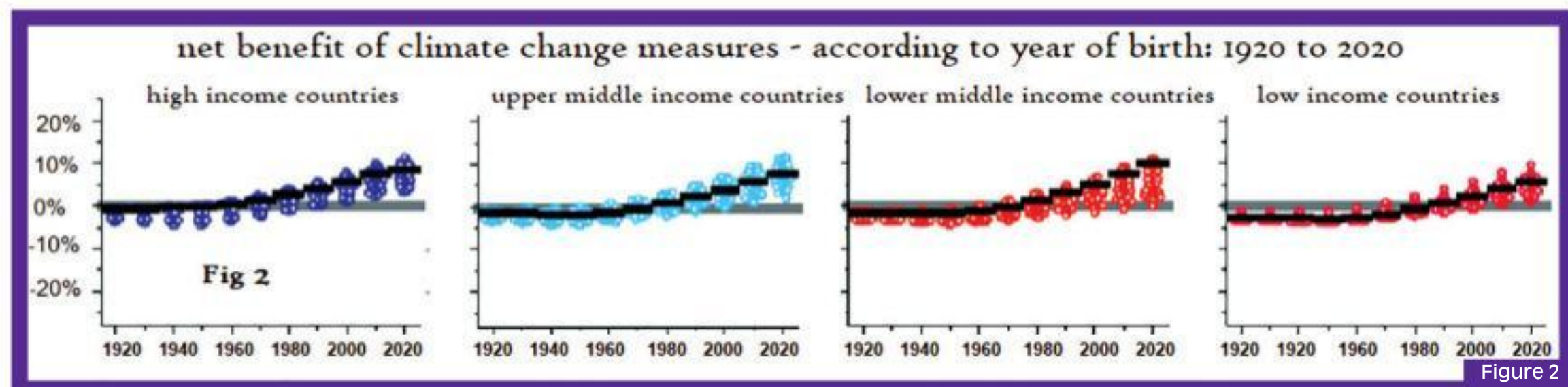


Figure 2

TAKING SCIENCE TO THE PEOPLE

Vigyan Prasar has been relentlessly propagating scientific and technological knowledge for more than three decades

BIJU DHARMAPALAN & KAPIL K TRIPATHI

Science is the foundation on which any nation exists, and the development of a nation can well be assessed by its developments in science and technology.

Once India became independent, political leaders of the time deemed science and technology as a high priority area. The country's first Prime Minister Jawaharlal Nehru had said, "The future belongs to science and those who make friends with science." His words have expressed the sentiment of political leaders and policymakers in Independent India. Prime Minister Narendra Modi also said recently, "The 21st century is the century of knowledge. Knowledge, science and education will have the power and strength to embrace the entire universe."

But to achieve this goal, every citizen should be scientifically literate and embrace science in their daily lives. It's a challenging task for a culturally and geographically diverse country like ours. Moreover, even though our scientists had commendable achievements in post-Independence India, scientific knowledge remained elusive to the common citizen. Even after enjoying the fruits of science, most Indians were unable to understand the science behind their everyday problems.

After Independence, the country had a couple of Council of Scientific and Industrial Research institutes like the National Institute of Science Communication, and Indian National Scientific Documentation Centre, which were later merged to form the National Institute of Science Communication and Information Resources. It has been recently renamed the

National Institute of Science Communication and Policy Research.

But the CSIR institutes largely focused on academic communication, through journals and magazines. A vacuum, however, remained in communicating science to people across the country. It was eventually filled by the establishment of Vigyan Prasar on 11 October 1989 with the objective "to undertake, aid, promote, guide and coordinate efforts in the popularisation of science and inculcation of scientific temper among the people, and to increase the knowledge, awareness, and interest about science and technology among all segments of the society." Noted scientist and doyen of Indian science communication, Narendar Kumar Sehgal, was its first director and the baton is now held by Nakul Parashar.

Let's take a look at the main activities of Vigyan Prasar that include,

- Large-scale science popularisation tasks,
- Developing knowledge products in many Indian languages, including publications, news features, films, radio programmes, compendia, portals and a variety of new media, exhibitions and kits,
- Building capacities to communicate, filmmaking and ham radio being specific examples,
- Servicing the dissemination needs of institutions,
- Networking with institutions, experts and knowledge platforms,
- Developing strategies for bilateral and multilateral initiatives, and
- Assisting national missions to strengthen outreach/engagement interventions.

Vigyan Prasar strives to adapt, utilise and employ new and emerging technologies for science and technology communication and popularisa-

tion. The publication programme of Vigyan Prasar delivers popular science books and newsletters aligned with its science popularisation goals. It has consistently published books by renowned scientists and science communicators from across the country on various themes of topical relevance. The publications are also used by several grassroots institutions including state science and technology councils, room to read and science centres. Almost all titles of Vigyan Prasar are available in the digital library on the website, *vigyan-prasar.gov.in*.

Vigyan Prasar also brings out the bi-lingual popular science magazine *Dream 2047* every month. During the Covid-19 pandemic, it has been relentlessly involved in disseminating scientific information through its publications. It has published the world's first "scintoon" book *Bye Bye Corona* to make people aware of Covid-19 in an engaging way.

Vigyan Prasar has launched a unique initiative called "India Science Wire" — a science news service dedicated to developments in Indian research institutions, universities and academia in January 2017. Its programme "Science on Television", in association with Doordarshan, has received wide acceptance across the country.

Science can belong to the people only when they find involvement and appreciation in science communication. The science serials/films/documentaries produced by Vigyan Prasar has helped to bridge the gap between labs and people. "Science is everywhere and for everyone" is the guiding principle of its activities.

In this digital age, most people in the world are receiving science and technology knowledge through new electronic media. Vigyan Prasar has



launched the Internet-based over-the-top television channel, India Science, supported by the National Council of Science and Technology Communication, department of science and technology, Government of India.

That said, science and technology broadcasts on radio have been an integral part of Vigyan Prasar's efforts for large-scale outreach. Dedicated listener groups comprise unique engagement processes, which are designed to enhance the impact of outreach. It has produced several programmes in association with All Indian Radio.

The gender and technology communication programme of Vigyan Prasar has also been established with the objective to empower women through effective science and technology communication with active programmes and resource material for women of all age groups and from different socio-economic strata. It is focused on enabling women to make informed choices and take appropriate decisions for improving the quality of their lives.

Vipnet, an acronym for Vigyan Prasar Network, was added as a new