

COMMENT

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CHEN-MIN CHUNG/IN PICTURES/COREIS



BYD, a Chinese car manufacturer, has joined other firms in committing to increasing the sales of electric vehicles by 30% by 2030.

Track climate pledges of cities and companies

Data transparency is key to accounting for how local governments and the private sector are contributing to global emissions reduction, say **Angel Hsu** and colleagues.

As world leaders agreed to cut global greenhouse-gas emissions at the climate talks in Paris last December, so too did many heads of cities, states, regional governments and companies. More than 400 mayors attended the talks, and Google, Microsoft and Adobe joined scores of large companies committed to getting all of their electricity from renewable sources.

But these pledges are largely not legally binding. What assurance do we have that chief executives and mayors will implement

their initiatives? And how can we gauge whether the sum of these efforts will prevent the global temperature from warming by 2°C above pre-industrial levels?

Tracking and verifying climate actions — commitments made by parties to prevent climate change — requires transparent data reporting. These actions can relate to climate mitigation, adaptation or financing: for instance, Coca-Cola has pledged to set an internal carbon price by 2017; the UK city of Aberdeen has committed to reducing

community carbon dioxide emissions by 42% between 2008 and 2020.

Visible results motivate participants and help independent third parties to track their progress. But much of the story is not being told. Registries for reporting climate initiatives are proliferating — but in a haphazard way. Most have a narrow focus and differ in their criteria for inclusion and reporting.

In 2014, the United Nations Framework Convention on Climate Change (UNFCCC) launched the Non-State Actor Zone for

► Climate Action (NAZCA) to compile the most ambitious and transparent commitments from different data platforms. NAZCA is by far the most comprehensive registry of climate actions made below the national level. Already, its business participants account for one-third of the global economy.

Our analysis of the data posted on NAZCA as of April 2016 shows that the platform lacks pledges from many developing countries and from heavily polluting sectors such as the fossil-fuel industry (see 'Partial view'). Small- and medium-sized enterprises and those with limited resources are deterred from declaring their efforts.

NAZCA offers a solid foundation for building a more complete and accurate platform for collating non-state emissions-reduction efforts. To realize its potential, the UNFCCC must fill the gaps by coordinating data collection and promoting the platform's use. NAZCA should widen and strengthen its criteria to encourage leaders to set universal reporting standards and ensure that local climate actions align with national goals to avoid double counting and omissions.

PATCHY REPORTING

NAZCA currently contains more than 11,300 commitments. Most are from local governments and large businesses in the developed world, especially Europe. The database relies on networks of cities and companies to share their members' data. It captures just a fraction of what is being done.

NAZCA records two types of commitment: individual and cooperative. Each is tagged in one or more sector of climate action, such as 'renewable energy', 'private finance' or 'resilience'.

We analysed only individual commitments and excluded cooperative ones because of concerns about double counting (many commitments are listed twice, once as individual and once as cooperative), which left 7,069 actions. We retained all the tags given to these commitments; actions tagged with both 'emissions reduction' and 'energy efficiency', for example, are counted in both sectors.

Our analysis revealed that NAZCA's biggest blind spots are in developing countries, including China and nations in Africa and southeast Asia. These omissions do not necessarily indicate climate inaction; many cities, states, regions and enterprises are taking actions but lack resources or the motivation to record them.

The costs of recording data vary among sectors. For example, the costs of monitoring transportation and energy use differ, and depend on access to technologies and human resources. Whereas some platforms are free to join, others are not; the Climate Registry, a North American initiative, costs between US\$750 and \$12,000 per year.

Many large companies in the developing

world are overlooked. The sole Chinese bank on NAZCA is the Agricultural Bank of China — one of the world's five largest banks in terms of market capitalization. China's other four top banks disclose climate actions on their websites or in reports, with varying detail. Twenty major Chinese banks are part of an alliance that restricts loans to high-polluting, high-energy-consuming enterprises — by 2014 it had prevented 400 million tonnes of carbon emissions. But these banks are unable to declare 'green credit' initiatives in NAZCA because there is no such category.

Many big emitters are also absent. Only 17 of the 90 fossil-fuel and cement companies responsible for about two-thirds of global historical greenhouse-gas emissions¹ report climate commitments in NAZCA. None of the oil giants from OPEC, the Organization of the Petroleum Exporting Countries, is on the roster; also missing are energy titans Coal India and Lukoil, Russia's second largest oil producer. Some omissions stem from differing corporate cultures — a US oil company may experience greater domestic pressure to include a climate-change pillar in its corporate strategies than, say, a Saudi Arabian one. Other companies may simply be unaware of NAZCA.

Several US fossil-fuel companies, including Peabody Energy, Arch Coal and Massey Energy, are not listed on NAZCA. Their vulnerability to the risks of a changing economic and regulatory climate might be their greatest incentive to participate. Faced with competition from natural gas and tighter regulation, Peabody Energy, the world's largest private coal producer and distributor — and number 16 out of the top 90 fossil-fuel and cement historical carbon emitters¹ — filed for bankruptcy in April. And Arch Coal joined several other large US coal companies in filing for bankruptcy this year.

Registering entire sectors in one go would broaden the representation of heavy-polluting industries, including those from developing countries. This approach has proved successful in the cement sector, which accounts for 5% of global carbon emissions. Companies responsible for 30% of the world's cement production participate in the Cement Sustainability Initiative, a 17-year-old programme that reports to NAZCA. The initiative's members collectively aim to reduce 2020 carbon emissions by 50 million to 100 million tonnes², equivalent to removing 10.5 million cars from the road for a year.

INCONSISTENT METRICS

Incomplete and incompatible data-collection methods thwart attempts to measure and compare mitigation efforts. Without

clear requirements, participants report data unevenly or idiosyncratically, often leaving out information on the sources and sectors targeted and the scope of particular initiatives. For instance, less than one-sixth of NAZCA's commitments related to carbon pricing include a specific carbon price, and the amounts listed range from \$0.01 to \$357.37 to emit 1 tonne of CO₂ equivalent.

Fifteen of the banks that have recorded climate actions on NAZCA, including investments in renewables and emissions reductions in their own operations, are also among the world's 20 biggest financial backers of coal mining and coal-fired electricity generation — the most carbon-intensive way to produce power³.

Essential contextual information is often absent. Urban and regional boundaries are frequently defined by local governments in contradictory ways. Political language obfuscates: distinctions between emissions from the 'government' (typically a municipality's building and transport emissions) and the 'community' (an entire community's emissions, stemming from any sources that a municipal government would exercise influence over) shift from place to place.

Sectors often lack definition. Many municipal action plans focus on sectors such as waste, transport, buildings and energy efficiency that generate high emissions and come under local control. The Covenant of Mayors for Climate and Energy, for example, is a network of 6,600 mainly European cities committed to emissions reduction. It requires its members to address at least two of four key sectors, such as emissions from residential buildings and transport. When such details are unavailable, analysts (ourselves included) must search for the information elsewhere — in published studies or in interviews — or use approximations and proxy variables. This makes analyses slow to perform, hindering the capacity of third parties to act as watchdogs.

NAZCA does not enable analysts to assess the quality of commitment data to evaluate progress. Problems arise in data collection, information deposition and in the structure of the system. For example, few data providers collect information on how or whether projects are being implemented; NAZCA does not track such data; and there is no harmonized definition of what should be tracked.

When different bodies post data, double counting of emissions reductions — in local reports and again in national ones — can be a problem for analysts trying to add everything up. For example, the United States' second biennial report⁴ to the UNFCCC includes a 'high abatement scenario' that recognizes that state-level policies may exceed federal requirements. The solution is to ensure that sub-national efforts are accounted for, or tracked separately within national climate

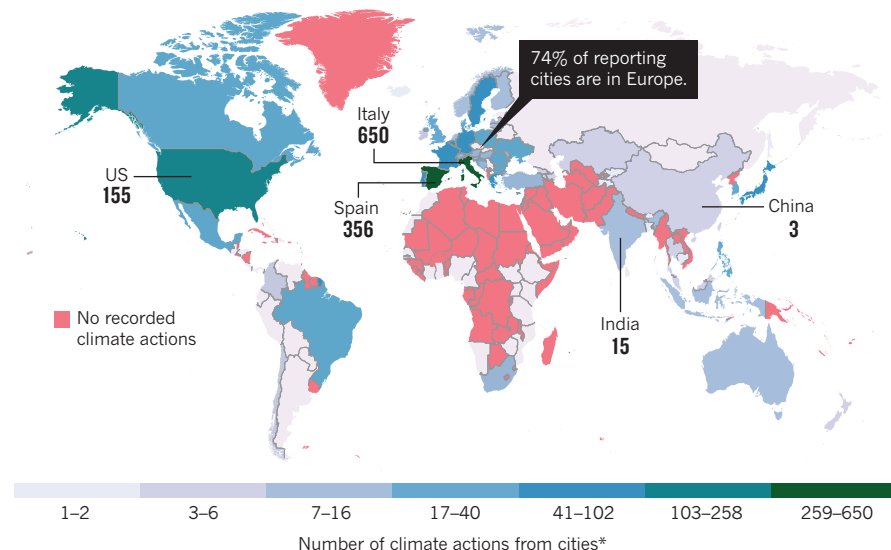
"Essential contextual information is often absent."

PARTIAL VIEW

Cities, regions, investors and civil-society organizations, mostly in the developed world (1), have so far listed more than 7,000 individual climate commitments spanning many sectors (2) in the United Nations' Non-State Actor Zone for Climate Action (NAZCA) database. Analysis of these actions highlights gaps and trends, and the need to firm up reporting of climate pledges made below the national level.

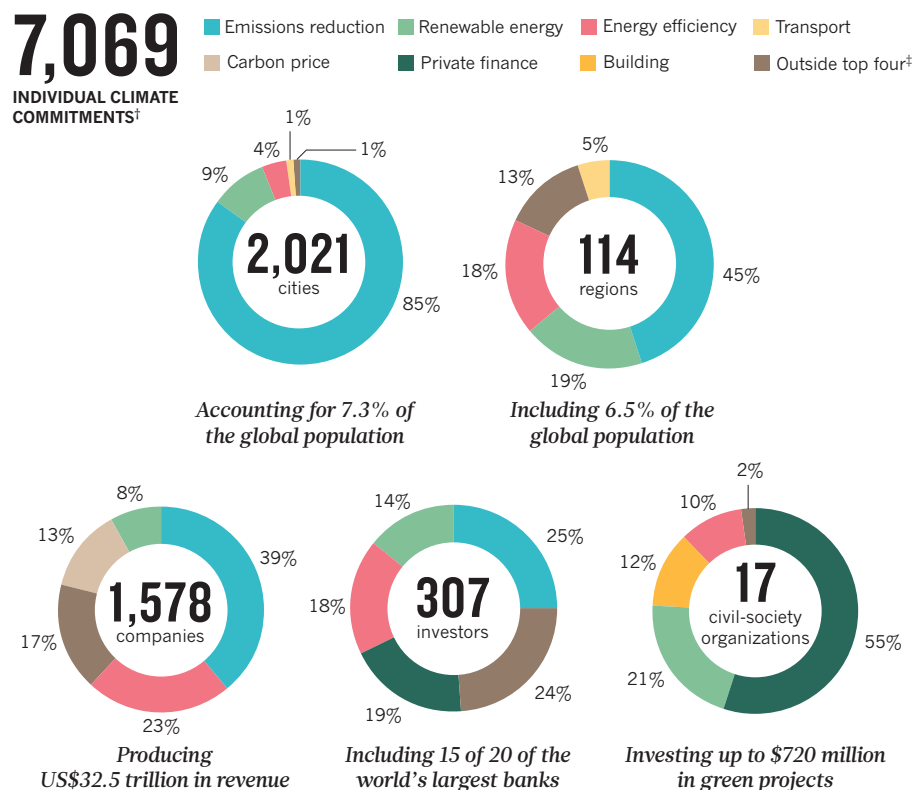
1 City initiatives

Few cities in the developing world report their climate projects in NAZCA.



2 Differing approaches

Long-term emissions reductions are the main focus of individual cities and regions; private investors target many different short-term projects across sectors. For each, the top four sectors of climate action are shown.



*Includes both individual and cooperative actions registered in NAZCA. †Number removes double-counted or repeated actions, and excludes cooperative actions. ‡All NAZCA categories: energy access and efficiency, renewable energy, private finance, resilience, transport, building, forest, short-term pollutants, innovation, agriculture, emissions reduction, use of carbon price, other. See go.nature.com/hmzg26.

Analysis of data present in NAZCA database on 12 April 2016. To explore the data further, see visuals.data-driven.yale.edu/climateaction.

action plans. Different levels of government must share their goals and harmonize their reporting. The efforts of mayors and governors who deliver mitigation results beyond national requirements need to be recognized to encourage others.

Cities and sub-national governments are limited in their jurisdiction and often short of resources. National governments can help to support local initiatives. The German government, for instance, gave the state of Saxony-Anhalt subsidies to build its renewable-energy sector⁵. Sub-national governments have more flexibility to experiment with potentially risky policy tools. Seven Chinese cities and provinces are piloting emissions-trading schemes ahead of a national programme rollout planned for 2017.

TRACK OUTCOMES

NAZCA is a good first step in understanding the global extent of climate actions by regional and municipal governments and the corporate sector. The next step is to track the outcomes of these initiatives. NAZCA and its data providers should identify common benchmarks for tracking performance and implementation. These should determine the impact and benefits (such as lower health-care costs from reduced air pollution) of climate actions, as well as the gaps in them.

Data collection is expensive. Monitoring the implementation of the UN's Sustainable Development Goals, a broad set of development targets, will require \$1 billion in annual aid to support data collection in developing countries alone⁶. Increased financial support and knowledge sharing between governments and organizations, as well as research to find cheaper ways to monitor data (avoiding overlaps and inefficiencies), would help developing countries to join in. Adding a finance 'matchmaking' function — linking funders with those who need funds — to NAZCA would attract new initiatives and ensure that existing ones receive enough backing. The Covenant of Mayors, for example, links its members to European Union public funds.

A common set of standards that embrace open-data principles needs to be developed by third-party organizations and adopted by climate-action networks. For example, a partnership of think tanks and business associations (the World Resources Institute, the C40 cities network and ICLEI—Local Governments for Sustainability) produced the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories.

Cities, states, companies, investors and civil-society organizations need to use comparable reference points, time frames, levels of emissions coverage, planning processes, methodological assumptions and

approaches. They should report a comprehensive range of emissions sources and sinks. The Paris agreement asks nations to provide this information. Ideally, carbon balance sheets should address consumption-based emissions and account for the leakage or export of emissions (when entities transfer production of emissions to other locations through trade, for example), estimated at the national level to be three times the physical quantity of traded goods⁷. Some local governments, such as that of King County in Washington state, which includes Seattle, are starting to incorporate these considerations into their commitments.

Adding a function to NAZCA that evaluates the degree of implementation for each climate action would help to compare and identify actions that are being carried out and those that exist only on paper. (This could use the ranking system of the Climate Action Tracker, which rates national climate pledges as 'inadequate', 'medium', 'sufficient' or 'role model'.) Data sets on countries' populations, gross domestic products and land areas, for instance from the World Bank, could be linked with NAZCA data to provide visualizations and metrics to understand the breadth and scope of global climate actions.

By promoting meaningful and accurate record keeping, NAZCA could become the gold standard for climate-action reporting networks. ■

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William Whewell, peer-review pioneer.

PAUL D. STEWART/SPL

Troubled from the start

Pivotal moments in the history of academic refereeing have occurred at times when the public status of science was being renegotiated, explains **Alex Csiszar**.

Referees are overworked. The problem of bias is intractable. The referee system has broken down and become an obstacle to scientific progress. Traditional refereeing is an antiquated form that might have been good for science in the past but it's high time to put it out of its misery.

What is this familiar litany? It is a list of grievances aired by scientists a century ago. If complaining about the faults of referee systems is nothing new, such systems are not as old as historical accounts often claim. Investigators of nature communicated their findings without scientific referees for centuries. Deciding whom and what to trust usually depended on personal knowledge among close-knit groups of researchers. (Many might argue it still does.)

The first referee systems that we would recognize as such were set in place by English scientific societies in the early nineteenth century. But these referees were never intended to play the part of supreme scientific gatekeepers. That notion emerged in around 1900 (see 'Past notes'). It was exactly then that some began to wonder whether referee systems might be fundamentally flawed. In this sense, peer review has always been broken.

Today, with the debate about the future of peer review more fraught than ever, it is crucial to understand the youth of this institution. What's more, its workings and its imagined goals have evolved continually, and its current tensions bear the marks of this. The referee system has become a mishmash of practices, functions and values. But one thing