

中外对话 chinadialogue

中国： 国际能源变局者 China and a changing energy landscape

中国的太阳能外交可以绿化一带一路吗？
Can solar diplomacy green the Belt and Road?

外国投资者关注中国可再生能源产业
Foreign investors eye China's renewables sector

中国应该出口“清洁”燃煤电厂吗？
Should China export 'clean' coal power?

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伊莎贝尔·希尔顿
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“中外对话”是一个独立的非营利性组织，以伦敦、北京、德里和圣保罗为中心开展工作。

“中外对话”的主要业务是其独特的完全双语网站，它通过发表精辟、原创的中外文章、评论和分析，促进世界理解中国崛起带来的全球性生态环境影响，进而共同寻求公平可行的全球环境问题解决之道。

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《中外对话》内部交流刊物是“中外对话”网站文章的精华。我们从网站上精心挑选了趣味盎然而极富挑战性的深度报道以及展现科技进步的新闻信息，方便与您的交流。欲阅读更多精彩的文章，请您登陆“中外对话”网站（<http://www.chinadialogue.org.cn>）。

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chinadialogue's primary vehicle is our website (<http://www.chinadialogue.org.cn>), a unique bilingual platform which promotes a global understanding of the environmental impact of China's rise by publishing informed articles, commentaries and analysis by writers from inside and outside of China. We aim to inform, educate, and contribute to building a global consensus on fair and workable solutions.

chinadialogue is now read in 208 countries and regions and in all regions of China.

About our journal

Produced on a bi-monthly basis, our journal brings you the best articles and reports from *chinadialogue*. If you want to contribute to the discussion you can visit our website (<http://www.chinadialogue.org.cn>) to add your comments and thoughts. Join the debate and be part of the solution.

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中国的太阳能外交 可以绿化一带一路吗？

中国的太阳能产业发展经验可助其在一带一路国家实现可持续的转型。

□ 艾·博

中国已经承诺，将通过“一带一路”倡议（BRI）为可持续发展项目提供超过4万亿美元的投資，填補全球基础设施发展资金缺口。但是，如今这个倡议的可信度却遭遇了危机，因为中国似乎并没有兑现其对绿色和低碳基础设施的承诺。

世界资源研究所近期的一份报告显示，中国主要金融机构提供的1450亿美元的贷款中，有大约75%都流向了化石燃料项目，其中包括100亿美元的燃煤火力发电厂。此外，报告还概述了为什么几乎所有化石燃料电厂的投资都是来自国有企业。相比之下，中国私营企业的投资专注于太阳能和风能资源，因而环境足迹相对较小。

下文所列举的例子很多来自东南亚大陆地区。我通过观察这一地区发现，中国“一带一路”倡议在泰国、柬埔寨、越南、缅甸和老挝的能源领域累计投资规模达到了8300万千瓦，其中包括800万千瓦的煤电项目和分布于缅甸、柬埔寨

和老挝的137个总计6500万千瓦的水电大坝项目。

确凿证据显示，煤电对气候和当地空气质量都是有害的。此外也有不少研究证明，过度开发湄公河、萨尔温江和伊洛瓦底江流域的水电资源将对当地生态造成不可逆转的破坏，会让东南亚地区1亿多人口的日常生计和经济基础都陷入了危

险之中。但是，中国并没有停止此类项目建设。类似缅甸克钦邦的密松大坝或者掸邦的塔桑大坝这样的项目有可能增加当地部分生态脆弱地区陷入冲突的风险。

康奈尔大学阿特金森可持续发展中心博士后研究员泰勒·哈伦表示，许多中国企业对老挝和缅甸等国的太阳能与风能投资并不感兴趣。



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泰国在太阳能方面具有巨大潜力，政府对可再生能源的大力推广支持了这些更清洁的技术

他认为，缺少稳定的国家政策框架，可再生能源电力上网困难，以及电力长期采购的相关风险等是造成这一局面的主要原因。

他表示：“水电还将继续成为电力规划的重心所在，一是受到中国国有水电企业的影响，二是因为水电作为一种可靠的基载电力，可以用来出口换汇。”

但是，现有的煤电和水电投资可能会影响东南亚地区的稳定，部分甚至完全抵消中国国内的减排努力，因为不过是将排放从国内转移到了国外而已。

太阳能产业的佼佼者

如今，中国国内的太阳能产业已经发展得非常健全，完全能够胜任向“一带一路”国家提供可持续能源过渡技术的重任。过去十年，中国发展迅速，已经走到了全球太阳能发电领域的前列，太阳能电站和分布式发电量突破 1.65 亿千瓦。

目前，中国电力资源中仍有 60% 来自煤炭火电，不过太阳能电力资源的竞争力正逐渐增强。2018 年 12 月，青海的一座 50 万千瓦的太阳能发电站开始以 0.316 元 / 千瓦时（约合 5 美分 / 千瓦时）的价格对外售电，首次在价格上击败了煤电基准电价。

中国已经超额 50% 完成了 2020 年的太阳能目标。这样的大规模扩张主要得益于过去十年创新灵活的政策指导、大规模政府投资补贴、成功的研发计划以及大幅削减碳排放的政府共识。

中国的政府部门、研究机构和投资者已经积累了大量经验，如此

过去十年，中国发展迅速，已经走到了全球太阳能发电领域的前列，太阳能电站和分布式发电量突破 1.65 亿千瓦。

宝贵的资源应该尽快推广到“一带一路”国家，帮助其完成迫在眉睫的可再生能源转型。世界资源研究所（简称 WRI）的报告发现，31 个“一带一路”倡议参与国要想完成各自在《巴黎协定》中的减排承诺，大约需要 2350 亿美元的投资。

中国特色的“太阳能外交”

中国的太阳能外交能给这些国家带来远比资金支持多得多的好处。太阳能在泰国和越南非常具有商业竞争力，但能源部门官员和公共事业运营机构却经常抱怨，说很难在国家电网系统中管理这种间歇性能源。和中国一样，这些国家也一直鼓励可再生能源投资，但最终却发现资源部署很快就超越了原本规划的目标。例如，泰国曾经计划到 2036 年实现 600 万千瓦太阳能发电目标，而 2015 年，这个目标就已经完成了 50%，这时距离目标设立才刚刚几年。而越南规划中的太阳能投资项目装机为 2000 万千瓦，相当于现有装机的一半左右。然而，由于电网容量和分布限制，当地电网系统只能容纳这其中的很小一部分。

在这个方面，中国的专业知识或许能够提供一些帮助。中国在管理可再生能源扩张所带来的一些棘手问题方面拥有丰富的经验，通常会采取改变补贴结构、减少电力浪

费和逐步灵活地调整目标等多种手段。这也说明，中国完全有能力应对可再生能源转型过程中不可避免的阵痛。

2016 年，中国国家能源局宣布了一项扶贫计划，承诺为中国最贫困地区安装屋顶太阳能系统提供财政奖励和技术指导，并允许参与这一计划的家庭将产生的太阳能电力回售给电网公司。该计划预计通过政府补贴，为 16 个省的 200 万家庭每年增收 3000 元（约合 420 美元）。此外，该计划还将解决和太阳能资源间歇性相关的问题，并推动中国电力产业结构的优化。

如果没有重大干预措施，到 2020 年，柬埔寨和缅甸等“一带一路”国家的电力覆盖水平仍有可能会停留在 50% 左右。这些国家也许可以在国际援助下通过屋顶太阳能系统和小微电网实现脱贫减困。这些项目也会为不少中国太阳能企业走出国门创造商机。比如苏州协鑫光伏科技有限公司就通过中国政府的扶贫计划，在帮扶地区建设了超过 100 万千瓦的小型太阳能发电厂。

威尔逊中心（Wilson Center）中国环境论坛负责人詹妮弗·特纳认为，中国政府应该多多宣传自己的乡村太阳能计划。她指出：“这些项目不仅能为小型社区提供电力，这些小型能源项目的安装与维护还能创造就业。这类扶贫成功经验应该融入到中国‘一

带一路’项目投资中，尤其应该推广到那些因为大型水坝、港口和道路建设而搬迁的社区。”

中国开发商通常会为因基础设施建设而搬迁的社区建立学校、市场和医疗设施，不过结果却是好坏参半。中国投资建设社区太阳能设施的同时，如果能够为运营和维护提供适当的技术能力培训，那么这或许能成为一个更好的选择。

在老挝和柬埔寨，与基础设施项目和经济土地特许权相关的拆搬迁是国内人口流动的主要推动因素。为搬迁人口提供充足的电力可以增加社区青年获得教育资源的机会，并为农村经济发展创造条件。此外，这样做还有助于缩小“一带一路”国家城乡生活差距。

责任与干涉

对许多发展中国家而言，要想建立一个市场竞争环境，让可再生能源发电与煤电实现公平交易，不仅需要创新的政治领导力，同样还需要在国家输配电系统的软（管理）、硬件（物理基础设施）上投入大笔资金。

迄今为止，“一带一路”项目投资主要集中在发电、高速公路、铁路和港口等实物资产领域，这是既是应项目所在国的要求，同时也是消纳其国内过剩产能难度最低的融资方式。鉴于中国不愿意干涉别国事务，所以中国国有企业或政府机构可能也不愿意过多参与别国电力部门的改革规划过程，或者分享太阳能和风能产业转型相关的政策激励良方。

2018年10月发布的国际气候变化委员会（International Panel on Climate Change）报告指出，需要拿出与第二次世界大战期间美国调动国内人力物力时的规模和速度，通过技术转型，防止全球升温超过1.5摄氏度。东南亚大陆的国家最容易受到气候风险的影响。将这些国家的未来绑定在碳密集型产业无疑会让这些国家未来更加脆弱。鉴于这种紧迫性，中国应该承担责任，减少境外碳密集产业带来的结果，并增强这个世界上最脆弱地区的气候弹性。

真正的双赢之策

在“一带一路”的背景下，中国的太阳能外交计划将向世界证明

中国打造生态文明的决心。到目前为止，中国“一带一路”规划优先考虑的要么是那些有重大煤炭扩张计划的国家，要么是这个国家拥有自由流淌、资源条件优异的河流。中国的太阳能外交可以加速太阳能发电的扩张，为搭建融风能、生物质能和其他形式间歇性能源为一体的前瞻性电力系统创造条件。

如今，全球碳排放量再度上升。在这种环境下，如果中国能够有效落实太阳能外交，将极大地提升和巩固其气候领导者地位，并且有可能会刺激其他参与者也加入进来，形成一个良性竞争，共同为了1.5摄氏度的温升目标而努力。亚洲开发银行和世界银行这样的大型银行也可能在这些项目上积极与中国进行合作，一起履行之前的承诺，寻找与中国亚洲基础设施投资银行和其他发展机构共同为项目提供融资的方式。此举将提升全球对“一带一路”作为可持续发展力量的信心，并有助于中国兑现成为负责任全球大国的承诺。☺

艾·博，华盛顿特区史汀生中心东南亚项目主任

Can solar diplomacy green the Belt and Road?

Experience from China's own solar sector could help it deliver a sustainable transition in Belt and Road countries

□ Brian Eyler

China has pledged to fill the global infrastructure development gap with more than US\$4 trillion in “sustainable” projects through its Belt and Road Initiative (BRI). But China is not delivering on its promises of green and low carbon infrastructure so the initiative is facing a crisis of legitimacy.

According to a recent report from the World Resources Institute, about 75% of the US\$145 billion in loans from China’s major financing institutions went to fossil fuel energy projects, including US\$10 billion for coal plants. The report also outlined how almost all investments in the construction of fossil-fuel power were state-owned enterprises. In contrast, private Chinese companies, which have much smaller investment footprints, have focused on solar and wind.

Looking at mainland Southeast Asia, from which many of the examples below are drawn, I observe that China’s BRI power sector investments in Thailand, Cambodia, Vietnam, Myanmar, and Laos total at least 83 gigawatts. This includes over 8 gigawatts of coal projects and a whopping 65 gigawatts of hydropower dams across 137 projects in Myanmar, Cambodia, and Laos.

It’s well established that coal power is bad for the climate and local air quality. There is also no shortage of studies that show how hydropower overdevelopment in the Mekong,

Salween, and Irrawaddy river basins will irreversibly damage their ecology. This is putting the livelihoods and economic base of more than one-hundred million people in Southeast Asia at risk. Yet China continues to build.

Tyler Harlan, a postdoctoral fellow at Cornell University’s Atkinson Center for a Sustainable Future claims that solar and wind are unattractive investments for many Chinese companies in countries such as Laos and Myanmar. He blames the absence of stable policy frameworks, challenges with integrating renewables into the grid, and risks associated with long-term power purchasing.

“Hydropower continues to dominate power planning because of the influence of Chinese hydro state-owned enterprises and because it is perceived as a reliable baseload electricity source that can be exported to accumulate foreign exchange,” he said.

Continued investment in coal and hydro at current levels could destabilise mainland Southeast Asia, and partially or entirely offset China’s efforts to reduce emissions at home by exporting them abroad.

Solar champion

China has developed a robust domestic solar sector that could easily deliver a sustainable transition in Belt and

Road countries. It has moved quickly in the past ten years to lead the world in solar power with at least 165 gigawatts across solar farms and distributed generation.

China still derives 60% of its power from coal but solar is increasingly competitive. In December, a 500 megawatt solar farm in western China started selling power at .316 yuan per kilowatt hour (~5 cents), beating the country's benchmark price for coal power for the first time.

China has already exceeded its 2020 solar target by more than 50%. This massive expansion was helped over the past decade by creative and flexible policy guidance, government subsidies for investment, successful R&D programmes, and a government consensus to significantly curb carbon emissions.

The experiences of government agencies, research institutions, and investors form a valuable toolbox that should be exported to rapidly developing BRI countries where a transition to renewable energy is pressingly required. The WRI report found that 31 Belt and Road countries needed about US\$235 billion in investments to meet their emissions reduction commitments under the Paris Agreement.

Packaging solar diplomacy

Chinese solar diplomacy could help countries with a lot more than project financing. Solar is commercially competitive in Thailand and Vietnam but energy sector officials and utility operators there often complain that intermittent power is difficult to manage on national grids. Like China, these countries have encouraged investment only to find deployment quickly outpace planning targets. For instance, in 2015 Thailand achieved 50% of its intended 2036 solar target of six gigawatts just a few years after setting it. Vietnam has 20 gigawatts of solar investments registered in its pipeline, which is about half its existing capacity. However, only a minor portion can be absorbed into its grid system due to capacity and distribution limitations.

This is an area where Chinese expertise could help. China has a lot of experience managing the unwieldy expansion

China should take responsibility to mitigate carbon intense outcomes outside of its borders.

of renewables whether it's adjusting targets on a gradual and flexible basis, changing subsidy structures or reducing power wastage. This shows an ability to deal with the necessary growing pains of a renewable energy transition.

Further, in 2016, China's National Energy Agency announced a poverty alleviation initiative that provided financial incentives and technical guidance for installing rooftop solar in China's poorest areas. It allows participating households to sell power back to the grid. The programme aims to help two million households in sixteen provinces earn an extra 3000 yuan per year (US\$420) through government subsidies. It will also manage problems related to solar intermittency and structurally optimise the country's power sector.

Electrification rates in BRI countries such as Cambodia and Myanmar are likely to still be around 50% by 2020 without significant intervention. These countries would benefit from foreign assistance to alleviate poverty through solar rooftops and mini-grids in rural areas. Such programmes would also create opportunities abroad for domestic solar champions such as Suzhou Photovoltaic Technology Co. Ltd (协鑫) which has constructed more than one gigawatt of small-scale solar power plants through China's poverty alleviation initiative.

Jennifer Turner, director of the Wilson Center's China Environment Forum argues that the Chinese government should be more vocal about its rural solar schemes. "These projects not only electrify small communities but also create jobs in installation and maintenance of these small-scale energy projects. These kinds of successes should be interwoven into China's BRI investments, especially in communities that are displaced by large dams, ports, or roads," she said.

Chinese developers often build schools, marketplaces, and medical clinics in communities that are resettled due to

infrastructure development, but with mixed results. China's investment in community-level solar could provide a better option if it came with proper technical capacity training for operations and maintenance.

In Laos and Cambodia, resettlement related to infrastructure projects and displacement from economic land concessions are the top driver of internal migration. Providing resettled people with ample access to power will increase access to educational resources for community youth and underpin conditions for rural economic development. It could also help close gaps between rural and urban livelihoods in Belt and Road countries.

Responsibility versus interference

For many developing countries, building a competitive market environment where renewable energy generation reaches price parity with coal requires creative political leadership, physical infrastructure, effective management, and investments in national level transmission and distribution systems.

To date, BRI projects are mostly investments in physical assets such as power generation, highways, railways, and ports. This is what host countries ask for and what China finds easiest to finance given excess domestic capacity. Given China's aversion to interference in the affairs of other countries, state-owned enterprises or government agencies might be reluctant to get too involved in transformative planning processes for another country's power sector or the sharing of best practices related to policy incentives for a transition to solar and wind.

But according to the recent Intergovernmental Panel on Climate Change report, a technological transition, the scale and speed of which is comparable to the US domestic mobilisation for World War II, is required to prevent a 1.5C rise in global temperature. Countries in mainland

Southeast Asia are among the most vulnerable to climate risk. Locking these countries into a carbon intensive future will exacerbate future vulnerability. Given such urgency, China should take responsibility to mitigate carbon intense outcomes outside of its borders and build resiliency within the most vulnerable regions of the world.

A win-win solution

A programme of Chinese solar diplomacy in the context of the BRI would demonstrate to the world China's intentions to become an ecological civilisation. So far, China has prioritised BRI countries with plans for significant coal expansion and those where free-flowing rivers provide critical natural resources. Chinese solar diplomacy could accelerate the expansion of solar capacity and create conditions for forward looking power systems which could integrate wind, biomass, and other forms of intermittent energy.

An effective solar diplomacy, if implemented, would greatly improve China's position as a climate leader at a time when global carbon emissions are ticking upwards again, and potentially spur other actors to create a virtuous race toward a 1.5C future. Big lenders such as the Asian Development Bank and the World Bank would likely be keen to partner with China on such efforts, building on previous pledges to find ways to co-finance projects with China's Asian Infrastructure Investment Bank and other development agencies. Such a move would raise global confidence in the BRI as a force for sustainable development and help make good on China's pledge to be a responsible global power. ☞

*Brian Eyler is Director of the Southeast Asia program at the Stimson Center in Washington, DC and the author of *The Last Days of the Mighty Mekong*.*

中国建拉美最大太阳能电厂

阿根廷的大型光伏电站项目如何反映了中国投资全球太阳能的热情？

□ 费尔明·库普 白莉莉



阿根廷考查里太阳能项目完工后，将拥有120万块太阳能电池板，为电网增加约300兆瓦的电力

在 阿根廷北部胡胡伊省海拔4000米的荒漠中，一间临时办公室外，挂着印有汉字的红色和蓝色横幅在风中啪啪作响。

这里就是拉美最大的太阳能发电厂——考查里电厂的所在地。该项目

是阿根廷发展可再生能源计划的一部分，而中国的技术和资金则是促成该项目的重要因素。过去十年里，阿根廷一直在努力吸引外国投资其基础设施建设，并开始越来越多地倚重中国，考查里项目就是两国密切合作的体现。

中资银行和企业在全球投资建造了很多燃煤电厂。现在他们正进军跨国太阳能开发领域。不过，诸如考查里这样的项目究竟是个例，还是中国转向发展海外清洁能源的普遍标志？

沙漠中的太阳能

考查里是距离胡胡伊首府圣萨尔瓦多 300 公里外的偏远地区。该项目完工后，这里将拥有 120 万块太阳能电池板，为电网增加约 300 兆瓦的电力。该项目最终扩建完成之后发电能力将达到 500 兆瓦，从而成为世界上最大的太阳能发电厂之一。

“考查里是世界上日照资源最优越的地区。这里还具备良好的天气条件，雾霾浓度低，为该项目提供了有利条件，“参与该项目的公司之一考查里太阳能的技术总监吉列尔莫·吉拉尔特说。

该项目总造价 3.9 亿美元，其中 85% 的资金来自中国进出口银行。当地政府将通过发行绿色债券的方式筹集剩余的资金。

这家太阳能电厂由省级能源公司 JEMSE 所有并管辖，由中国电力建设集团子公司上海电力建设公司（上海电建）承建。太阳能电池板由中国江苏腾晖电力科技有限公司提供。

政府已同意向考查里项目所在地的当地社区提供 2% 的利润分成，即每年大约 100 万美元的收益。该项目还为社区成员提供培训，以及从餐饮到交通运输在内的一系列就业机会。

“我们对项目最初的要求是在当地招聘雇员。为了实现这一目标，我们在附近城镇培训并雇用了 600 名工人，

“胡胡伊省的能源部长马里奥·皮萨罗说道。

该项目可能会在 5 月份竣工，项目年限为 25 年。

阿根廷发展清洁能源的驱动力

考查里太阳能发电厂预计会降低能源成本及 32.5 万吨的二氧化碳排放。这是通过 RenovAR 能源推广计划中标的最大的项目之一。该计划共批准了 147 个项目，总装机容量达到 4466 兆瓦。

“考查里项目代表 RenovAR 计划取得了成功，展示了阿根廷发展可再生能源的潜力。我们拥有潜力巨大的绿色资源，这些资源已逐渐为世人所知。”国会议员、绿党领袖胡安·卡洛斯·维拉隆加表示。

政府制定的目标是，到 2025 年可再生能源占比达到 20%，而目前这一比重约为 4%。然而，在推动可再生能源的同时，巴塔哥尼亚南部地区的数十个页岩气、石油等化石能源项目却并没有停滞不前。

阿根廷巴塔哥尼亚地区拥有巨大的风力发电潜力，北部则拥有丰富的太阳能资源。一些大型农业省份则拥有丰富的沼气和生物质资源。尽管如此，阿根廷的可再生能源发展却落后于拉美邻国。

据智利能源监管机构国家电力协

调机构（CEN）估计，今年能源结构中太阳能的占比将达到 10% 左右，而风能则会达到 6% 以上。与此同时，乌拉圭的风能和太阳能占比不断增长，去年几个月中，乌拉圭的风力发电占到总发电量的 44% 以上。

中国在阿根廷的影响力与日俱增

阿根廷与中国建立了“全面战略伙伴关系”，这是中国仅与少数几个国家建立的高级别外交关系。

前总统克里斯蒂娜·费尔南德斯·基什内尔与中国签订了数十项协议。这些协议虽然提升了两国之间的合作，但其中很多却有很大的争议性。

在过去十年中，阿根廷进口的中国产品比重从 5% 上升到 20%。阿根廷的对华出口却没有以同样的速度增长，仅仅从 8% 增加到如今的 12% 左右，导致两国间贸易逆差超过 50 亿美元。

除了投资水坝和铁路等多个基础设施项目外，中国还在 RenovAR 计划中发挥了关键作用。据阿根廷可再生能源商会（CADER）前负责人卡洛斯·圣詹姆斯称，第一轮招标成功的项目中，有一半的风能项目和四分之三的太阳能项目获得了中方的资金和技术支持。

阿根廷能源项目采用中国技

“目前我们还无法判断中国是否会在短期内全面走向国外太阳能市场，但亚投行经济学家汪晓却从正在埃及、阿根廷等国发挥作用的中国太阳能电池板中看到了中国太阳能产业的未来。”

术引起了国内行业协会的担忧，他们担心 RenovAr 等项目针对外国公司的激励措施会阻碍本国技术的应用。

据电力批发市场管理机构 Cammesa 称，在 RenovAr 前两轮招标中中标的所有风能项目中，阿根廷本国的技术仅占 10%。

在核能领域，阿根廷总统毛里西奥·马克里在去年 12 月会见了中国国家主席习近平。当时人们预计

两国领导人会批准建设中国投资的核反应堆。尽管阿根廷拥有先进的核工业，但该反应堆却是由中国制造的。但一群前任环境部长却致函政府质疑该项目的经济合理性。此后，该项目便陷入停滞。

中国银行和企业关注太阳能领域

中国金融机构和企业正在开

辟海外太阳能市场。这一趋势虽然刚刚起步，却展现出越来越强劲的气势。考查里电厂就是其中的一部分。自 2010 年以来，中国进出口银行（Exim）和中国国家开发银行（CDB），以及少数几家公司，开始在全球范围内寻找太阳能项目。

CDB 和 Exim 是国家政策性银行，肩负着支持政府国内外发展议程的重任，其职责包括促进产业升级和为中国企业建立海外市场。

迄今为止，两家银行已经在发达国家和与“一带一路”倡议紧密相关的国家资助了很多大型太阳能项目，包括 2015 年与巴基斯坦签订的太阳能合作项目。

世界资源研究所（WRI）和波士顿大学的一项研究发现，2014 年至 2017 年，太阳能项目贷款仅占中国主要商业和政策性银行发电和输电投资组合的 5.6%。然而，对于上述两家政策性银行来说，相对于 2010 年之前的零投资来说，已经是不小的增长。

中国公司也开始以绿地开发和收、并购的方式投资海外太阳能项目。根据普林斯顿大学和波士顿大学的一项研究，与银行的情况类似，2000 年到 2017 年，太阳能投资仅占中国企业海外投资的 4%。

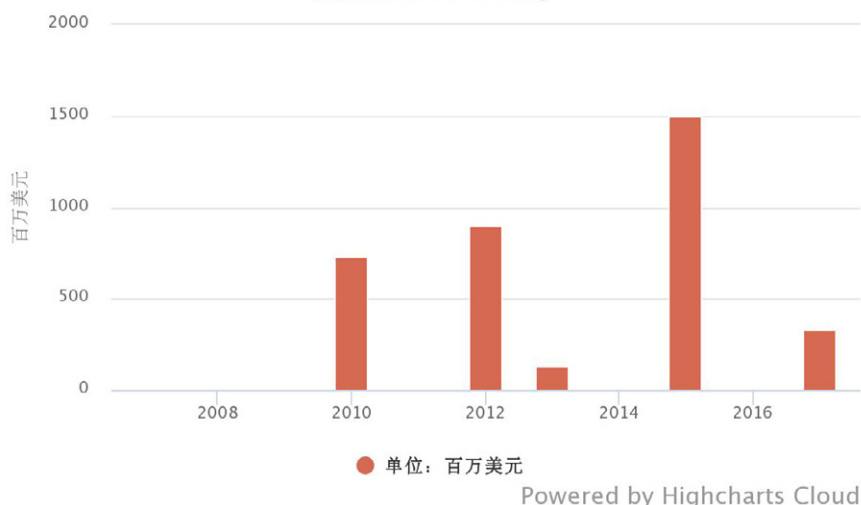
然而，2012 年开始，此类投资开始增加。一些可再生能源公司得到了大型银行的支持，为他们提供了很高的信贷额度。

政策引领

除了阿根廷与中国之间紧密的关系外，RenovAr 计划也是考查里项目吸引中国进出口银行的原因之一。

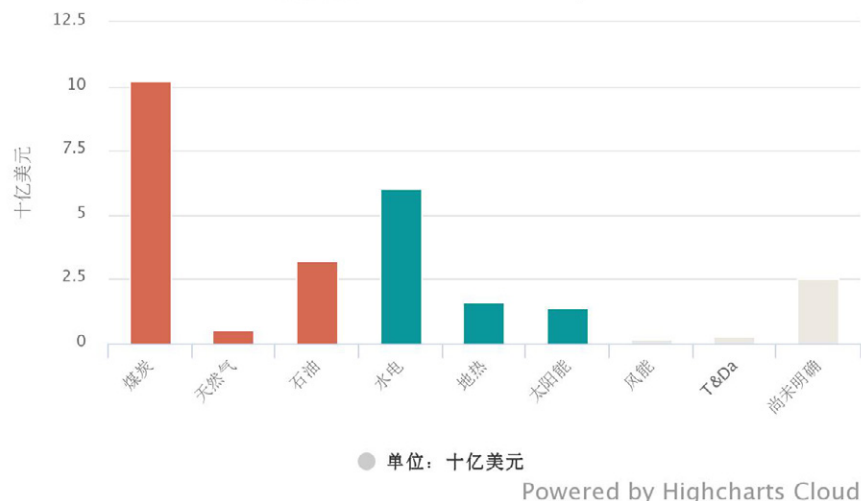
中国进出口银行和中国国家开发银行的海外太阳能投资项目

数据来源: Boston University



部分中资银行的全球能源投资项目(2014-2017)

数据来源: WRI and Boston University





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阿根廷能源项目采用中国技术引起了国内行业协会的担忧

根据普林斯顿大学和波士顿大学的研究，中国公司对可再生能源项目的投资主要集中在具备强大政策支持成熟市场，如英国、澳大利亚、巴西和印度。随着中国国内太阳能产业的蓬勃发展，中资银行和公司有足够的实力为这些市场提供服务。

对于银行而言，政策环境也会对项目的可行性产生重大影响。2017年，由中国领导的亚洲基础设施投资银行首次投资了埃及一大型太阳能园区的光伏项目。高级投资运营专家及该银行埃及项目的团队负责人玛利亚·德尔卡门·德·卡斯特罗·奥维耶罗（Maria del Carmen de Castro Ovejero）表示，国家对可再生能源的政策支持促成了该项目及银行的参与。

“从工程师的角度来看，技术上

一切都能实现。但是如果没有政府的支持，那么什么都不会发生，”她说。

同阿根廷一样，埃及已经建立了上网电价体系，保证了太阳能发电开发商卖给电网的最低电价。《彭博新能源财经》发现，风能和太阳能光伏电站的建设成本已经低于大型天然气和燃煤电厂的建设成本。然而，埃及和阿根廷等国的政策能够帮助新能源行业进入市场并获得资金支持。

发展障碍仍旧存在

随着可再生能源价格越来越低，像考查里这样的项目会成为中国海外能源投资的主流吗？

对于发展中国家来说，大规模发展太阳能仍然面临着技术方面的挑战。根据奥维耶罗的说法，太阳能

电厂技术上很简单，开发速度很快，但将其接入电网却很困难。

“太阳能电厂选址通常是在非常偏远的地方，因此电网接入是这些项目获得资金最重要的因素。电网稳定性又是另一个问题，特别是在发展中国家，”她说。

为了吸引中国投资还需要有明确的可再生能源政策。世界资源研究所和波士顿大学的研究发现，其分析的56个国家中，只有31个国家在其《巴黎协定》国家气候计划中制定了切实可行的可再生能源发展目标。

即使制定了目标，发展中国家也缺乏设计和实施具体政策的能力。AIIB 通信和开发负责人劳雷尔·奥斯特菲尔德表示，该行设有一个专项基金，可以帮助各国填补这一空白。

化石燃料发展惯性

虽然中资银行和企业正大举进军全球太阳能产业，但其整体能源投资仍主要偏重于化石燃料。世界资源研究所和波士顿大学的研究发现，2014年至2017年间，化石燃料投资占其研究的六家大型银行能源贷款组合的91%。

世界资源研究所的研究分析师周李焕表示，中国政府可以就发展可再生能源发出更清晰的信号：

“目前中国政府发布了几个高层文件，例如国务院和生态环境部发布的文件。他们对发展绿色“一带一路”提出了高水平的愿景，但在操作层面上，却缺乏相应的政策或激励措施，鼓励银行发展海外绿色融资。”

与此同时，中国政府同阿根廷一样，也在鼓励化石燃料投资。华北电力大学教授袁家海表示，中国的

政策性贷款等同于对海外煤炭项目的隐形补贴。

“这些项目并没有帮助这些国家实现其气候目标，反而损害了中国的国际形象，增加了投资风险，”他补充说。“为了更多地发挥建设性作用，中国应该放弃隐形补贴，通过明确的发展援助，来帮助“一带一路”沿线国家可再生能源业务的发展，推动全球能源投资转型。”


这也许是国家投资倾斜的结果，引领中国海外太阳能投资的是私营企业，而国有企业仍然专注于化石燃料投资。

太阳能发展预测

当考查里电厂最后一批中国制造的电池板安装完成时，阿根廷将向着该地区可再生能源领导者的地位迈进了一步。这个采用中国技术，由中国最大的一家银行提供资金，

并由中国企业承建的项目展示了中国公司在新产业中占据主导地位的潜力。

目前我们还无法判断中国是否会在短期内全面走向国外太阳能市场，但亚投行经济学家汪晓却从正在埃及、阿根廷等国发挥作用的的中国太阳能电池板中看到了中国太阳能产业的未来。

“时间表可能略有不同，但大约在10年内，可再生能源发电的成本加上每千瓦时的储能成本将与化石燃料发电的成本不相上下，甚至会更低。所以这个发展方向很明确。”

英文原文首发于中外对话网站中拉对话

费尔明·库普，阿根廷记者，致力于环境报道

白莉莉，中外对话研究员，北京能源网络 (Beijing Energy Network) 执行制作

China builds Latin America's largest solar plant

What does an Argentine mega-project say about China's interest in investing in solar globally?

□ Fermín Koop Lili Pike

In the northern Argentine province of Jujuy, at a dizzying 4,000 metres above sea level, red and blue banners inscribed with Chinese characters flap outside a temporary office perched on a barren desert.

This is Cauchari, the site of Latin America's largest solar plant. Chinese technology and finance have enabled the project, which is part of Argentina's plan to boost renewable energy generation.

With Argentina struggling to attract foreign investment for infrastructure over the past decade, it has increasingly turned to China, and Cauchari reflects the two countries' close cooperation.

Chinese banks and companies have developed coal-fired power plants worldwide. Now they are making the foray into cross-border solar energy development. But are projects such as Cauchari exceptional or a sign of a broader shift towards China developing clean energy overseas?



When finished, Cauchari will consist of 1.2 million solar panels, making it one of the largest solar plants in the world.

Cauchari is a remote site 300 kilometres from San Salvador, Jujuy's capital. When finished, it will consist of 1.2 million solar panels and provide the grid with 300 megawatts of power, eventually expanding to produce 500 megawatts, making it one of the largest solar plants in the world.

"Cauchari is in the area with the best solar radiation of the world. We also have good weather conditions and low

smog, both good for the project,” said Guillermo Giralt, technical director of Cauchari Solar, one of the companies involved in the project.

The Export-Import Bank of China (China Exim) is financing 85% of the project’s US\$390 million total cost. The local government will provide the remainder through a green bond.

Provincial energy company JEMSE owns and manages the plant, which is being built by Shanghai Electric Power Construction (SEPC), a subsidiary of the construction group Powerchina. A Chinese firm, Talesun, is also supplying the solar panels.

The government has agreed to provide indigenous communities, who own the land where Cauchari is located, with 2% of its annual profits. This share could equate to up to US\$1 million. Community members have also received training and a range of job opportunities at the site, ranging from catering to transportation.

“Our initial condition for the project was for it to have local workers. In order to achieve that, we trained 600 people from nearby towns and then hired them,” said Mario Pizarro, Jujuy’s energy secretary.

The project will likely be finished by May and have a lifespan of 25 years.

Argentina’s clean energy drive

The Cauchari solar plant is expected to cut both energy costs and carbon dioxide emissions. The latter by some 325,000 tonnes. It is one of the largest projects awarded through the RenovAR energy auction, which approved 147 projects with a combined installed capacity of 4,466 megawatts.

“Cauchari represents the success of the RenovAR scheme and shows the potential of renewables in Argentina. We have great green resources with a lot of potential that are starting to come to light,” said congressman Juan Carlos Villalonga, who is head of the Los Verdes green party.

The government has set a target for renewables to account for 20% of the entire energy matrix by 2025. They now account for about 4%. However, the renewables push runs

in parallel with the promotion of hydrocarbons extraction through dozens of shale gas and oil projects in the southern region of Patagonia.

Argentina has a huge potential to generate wind power in Patagonia and solar in the north. Resources exist for biogas and biomass in provinces with sizeable agricultural industries. Despite this potential, it lags behind its Latin American neighbours.

Chilean energy watchdog the National Electric Coordinator (CEN) estimates that solar will account for nearly 10% of the energy mix this year, while wind could hit just over 6%. Meanwhile Uruguay has been consistently growing its share of wind and solar, which accounted for over 44% of its electricity generation in some months last year.

China’s growing presence in Argentina

Argentina enjoys a “strategic integral alliance” with China, a high diplomatic status that the latter confers on only a handful of countries.

Former president Cristina Fernández de Kirchner elevated the level of cooperation by signing dozens of treaties with China, many of them controversial.

In the last decade, Chinese products rose from 5% to 20% of Argentina’s imports. Argentina’s exports to China did not grow at the same rate, increasing from just 8% to around 12% today. This has led to a record trade deficit of more than US\$5 billion between the two countries.

Alongside investing in several infrastructure projects such as dams and railways, China has played a key role in the RenovAR scheme. In the first round of bidding, half the wind and three quarters of the winning solar projects were linked to Chinese capital and technology, according to Carlos Saint James, former head of Argentina’s Renewable Energies Chamber (CADER).

The use of Chinese technology in Argentine energy projects has generated concerns among national industry associations, which fear the incentives offered to foreign companies through programmes such as RenovAR inhibit the use of their own technology.

According to wholesale power administrator Cammesa, Argentine technology accounted for scarcely 10% of the total used in wind energy projects auctioned through RenovAr's first two rounds.

In the nuclear sector, Argentine president Mauricio Macri met with Chinese counterpart Xi Jinping in December amid expectations the two would approve plants with Chinese finance and reactors. This despite Argentina's advanced nuclear industry. The project stalled after a group of former environment ministers wrote to the government questioning its economic wisdom.

Chinese banks and companies eye solar

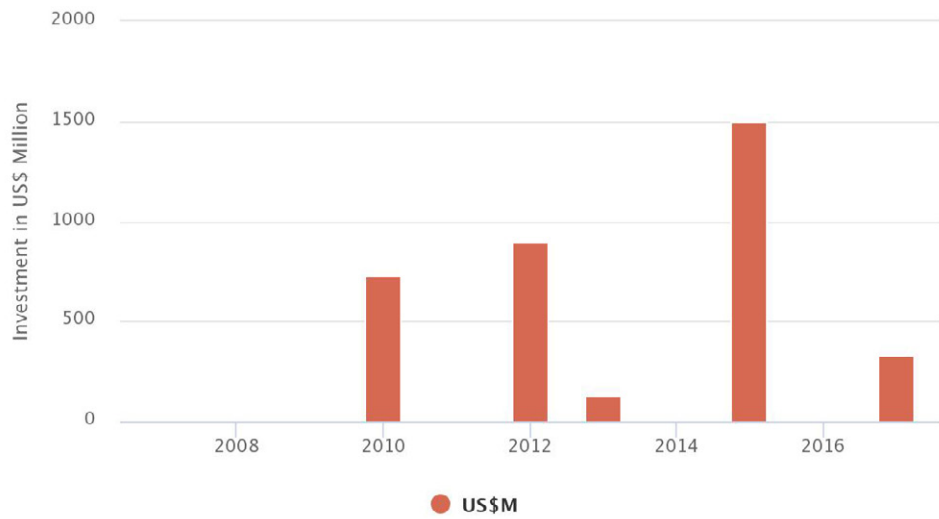
The Cauchari plant is part of a nascent but growing trend of Chinese financiers and companies striking out in the cross-border solar market. Since 2010, China Exim and China Development Bank (CDB), along with a handful of companies, have pursued solar projects globally.

CDB and Exim are state-owned policy banks tasked with supporting the government's domestic and overseas development agenda. This includes promoting industrial upgrading and building an overseas market for Chinese companies.

To date, the banks have financed a number of large-scale solar projects in developed countries and countries

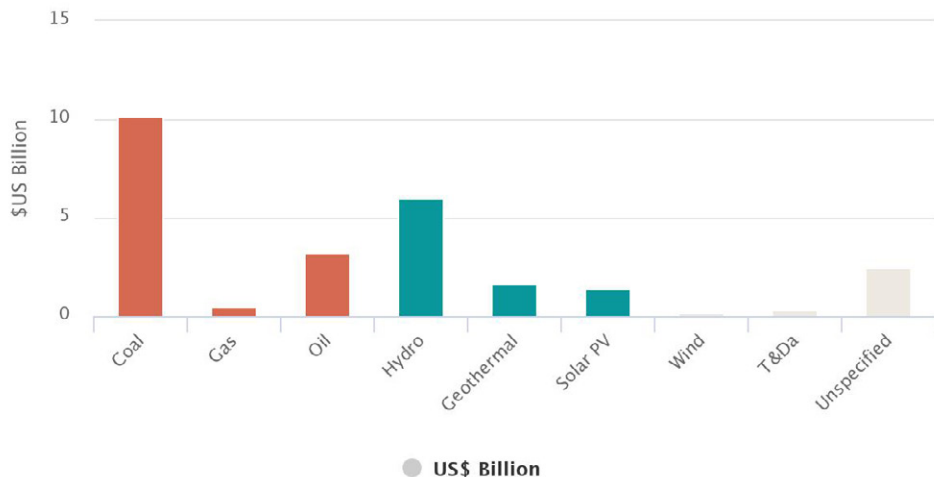
Overseas solar finance from CDB and China Exim.

Source: Boston University



Selected Chinese banks' global energy investment (2014-2017)

Source: WRI and Boston University



closely integrated with the Belt and Road initiative, including Pakistan in 2015.

A World Resources Institute (WRI) and Boston University study found that solar lending made up only 5.6% of China's major commercial and policy banks' power generation and transmission portfolio from 2014 to 2017. However, for the two policy banks, that is up from practically zero investment prior to 2010.

Chinese companies have also started to invest in solar projects abroad, both in greenfield development and through

In roughly 10 years, the cost of renewable generation plus storage will be on par with fossil fuel or even lower.

mergers and acquisitions. Similar to the banks, solar only constituted 4% of companies' overseas investments from 2000 to 2017 according to a Princeton and Boston University study.

However, they started to pick up as of 2012. Some of these renewable energy companies have been supported by the same large banks, which have given them significant lines of credit.

Policies pave the way

Alongside Argentina's strong relationship with China, Cauchari likely appealed to China Exim due to the RenovAr scheme.

According to the Princeton and Boston University study, investment in renewable energy projects by Chinese companies is concentrated in mature markets with strong renewable energy policies, such as the UK, Australia, Brazil and India. Building on China's domestic solar boom, Chinese banks and companies are well equipped to serve these markets.

For banks, the policy environment can also have a strong influence on a project's feasibility. Last year, the China-led Asian Infrastructure Investment Bank made its first solar energy investment in a large solar park in Egypt. Maria del Carmen de Castro Ovejero, a senior investment operations specialist and the bank's team leader for the Egypt project, said that the country's policy support for renewable energy enabled the project and the bank's participation.

"From my point of view as an engineer, technically everything is possible [...] but if you don't have the support of the government, nothing will happen," she said.

Like Argentina, Egypt has established a feed-in-tariff, guaranteeing developers a minimum price for the solar power they sell back to the grid. Bloomberg New Energy Finance found that building wind and solar photovoltaic

plants is already less expensive than building large-scale gas and coal plants. However, policies like Egypt's and Argentina's help the new energy industries break into the market and secure financing.

Barriers remain

As renewable energy gets cheaper, will projects such as Cauchari replace China's conventional energy investments overseas?

In developing countries, technical issues continue to pose challenges for large-scale solar development. According to de Castro Ovejero, solar farms are technically straightforward and quick to develop but integrating them into the grid can be difficult.

"Solar is normally developed in very remote locations, so it is important that the grid connection is available in order to finance these projects. Grid stability is another issue, especially in developing countries," she said.

Clear renewable energy policies are also needed to attract Chinese investment. The WRI and Boston University study found that only 31 out of 56 countries analysed had concrete renewable energy targets in their Paris Agreement national climate plans.

Even with targets, developing countries can lack the capacity to design and implement specific policies. Laurel Ostfield, head of communications and development for the AIIB, said that the bank has a special fund that can help countries fill that gap.

Fossil fuel inertia

While Chinese banks and companies are making inroads in solar development globally, their overall energy investment portfolios remain heavily skewed toward fossil fuels. The WRI and Boston University study found that between 2014 and 2017, fossil fuel investments accounted for 91% of the energy loan portfolios of the six major banks studied.

Lihuan Zhou, a research analyst at WRI who co-authored the study, said that the Chinese government could send clearer signals on renewables:

“Currently there are several high-level Chinese documents, for example issued by the State Council and the Ministry of Ecology and Environment. They have very high-level language on a vision for the green BRI, but on the more operational level there is a lack of policy or incentives for banks to provide green finance overseas.”

Meanwhile, the Chinese government, just like the Argentine, is offering incentives for fossil fuel investment. Yuan Jiahai, a professor at the North China Electricity and Power University, said China’s use of policy loans equates to invisible subsidies for overseas coal projects.

“These projects do not help these countries realise their climate goals and hurt China’s interests in terms of international image and investment risk,” he said, adding, “To be more constructive, China should trade the invisible subsidies for clear development aid to help Belt and Road countries launch renewable energy business development and drive the global energy investment transformation.”

Perhaps a product of the state’s investment priorities, it is privately-owned enterprises that are leading China’s overseas solar investment while state-owned enterprises remain focused on fossil fuel investment.

Solar forecast

When workers lay the final Chinese panels at Cauchari, Argentina will take a leap closer to the renewable energy leaders in the region. Equipped with Chinese technology, developed by a Chinese contractor, and financed by one of China’s largest banks, Cauchari also displays China Inc.’s potential to dominate a new industry.

Whether China will fully embrace foreign solar markets in the near-term remains unclear, but Xiao Wang, an economist at the AIIB, sees the future reflected in the Chinese solar arrays now helping power nations from Egypt to Argentina:

“The timeline might be slightly different, but in roughly 10 years, the cost of renewable generation plus storage per kilowatt hour will be on par with fossil fuel or even lower. So this is a clear direction to move in.” ☞

Fermin Koop is an Argentine journalist, specialising in the environment with experience across diverse publications such as the Buenos Aires Herald, Clarín, Ambito Financiero, Buena Salud and Notio Noticias.

Lili Pike is a researcher for chinadialogue and the executive producer of the Beijing Energy Network’s podcast, Environment China.

外国投资者关注中国可再生能源产业

市场改革和提高透明度重新赋予中国能源项目吸引力。

□ 张柳潼



近来中国电力市场似乎重新受到青睐。这次主要集中在可再生能源领域，如光电、风电、小型水电和电池储能

近几年，中国在光伏和风力发电发展方面一直走在世界前列。截至 2018 年底，中国的光伏发电装机容量为 174 千兆瓦，风力发电装机容量为 184 千兆瓦，分别占全球总量的 36% 和 32%。这些发电设施几乎全是由中国企业开发的，外国投资者的所有权占比不到 1%。

中美贸易战增加了中国电力行

业的投资风险。I Square 资本等美国投资者正试图变卖其中国电力资产。但是，另一些外国投资者（包括独立电力生产商、机构投资者、私人股权公司和石油巨头）则表现出对中国可再生能源项目的强烈兴趣。其背后的部分原因是由于中国的信贷紧缩，促使国内国有电力企业的负债权益比率（杠杆比率）降低。

1 月，中国国家发改委和国家能源局制定计划，推进风电、光伏发电无补贴平价上网。随着风电和光伏发电的成本降低，其价格日益接近政府定价的煤电，将有更多外国投资者试图进入该产业。尽管这些外国投资者仍然保持谨慎，但中国提高市场透明度和将其与国有电力企业同等对待的更大意愿让他们看到了机遇。

轮回的历史

早在上世纪八九十年代，外国投资者就曾经通过与国内企业合资的形式进入中国电力行业。截至 1997 年，至少有 40 家外国企业来华投资，所拥有的电力占中国当时 254 千兆瓦亿千瓦总装机容量的 10%。由于各省级政府都迫切需要通过扩大电力生产来带动经济发展，因此大部分资金被投入了新建燃煤电厂。

但是，九十年代末和本世纪初大多数外国企业退出了中国电力市场。部分原因在于他们感到在 1997-2002 年中国电力过剩期间受到了电力调度的“不公”对待。外国投资者认为，国家电力公司下属的企业比他们企业的更受青睐。而且，固定电价的定价机制无法很好地反映煤价波动，这意味着外国投资者必须承担煤价上涨的风险。

燃气电厂的外国投资者也面临着类似的问题。在气价上涨时，地方政府可能延迟上调付给电力生产者的电价。

重受青睐

近来中国电力市场似乎重新受到青睐。这次主要集中在可再生能

源领域，如光电、风电、小型水电和电池储能。道达尔和 Engie 等国际能源巨头已经建立了小型团队对中国可再生能源产业的发展进行研究和密切跟踪。基础设施投资基金机构（尤其是来自香港、欧洲和加拿大的）也在寻求投资中国大陆可再生能源资产的机会。

中国电力市场监管条件的改善解决了一些曾经令外国投资者踌躇的问题。尽管政府为提高市场透明度公开了月度需求、供应量和价格等数据，但电力调度仍然是不透明的，即便现有投资者要求看到每个电厂的数据，这些数据也不会被提供。

如果得不到这些信息，外国投资者就会担心在电力调度环节，国有电厂会得到比外资电厂更多的优待，尤其是在电力市场供过于求时。

2002 年中国将国家电力公司分成两大电网和五大电力集团，从而部分解决了上述担忧。

2015 年以来，中国电力市场持续深化改革。政府采取了国际公认的“管制资产”原则来制定输配电价格，并决定电网企业对用户所应收的费用。这一改革减少了促使电网公司优先选择煤电而不是光电和风电的动因。此外，广东和浙江等几

个省份正在建立类似美澳的竞争性电力现货市场。实时交易令间歇性、无需燃料的可再生能源比化石燃料电力更具竞争力。

这些改革有希望让市场成为电力调度背后的驱动力量。

新的机遇

投资者也看到了中国电力产业的地区差异。

在华北电网公司（包括内蒙古西部、北京、天津、河北、山西和山东）的范围内，多条特高压输电线路的建设将对各省之间的电力供需进行整合。这样一来，内蒙古西部、山西和河北北部的大量电力就能“出口”到北京、天津和山东这些高需求中心。

而且，多年的严重空气污染让华北有很强大的动力来推动燃煤电厂退役、增加“清洁”能源比例。这为可再生能源投资创造了一个良好的宏观环境。

但是，西北电网（即新疆、甘肃、青海和宁夏）的情况仍然不容乐观，因为这里远离沿海省份的负荷中心，仍然存在巨大的电力剩余。即便可以通过增加特高压线路输出更多的可再生能源电力，开发商们似乎也不得不将电价压得比煤电更低才行。

总的来看，由于光伏和风力发电成本迅速下降，将不再需要补贴来提高竞争力，因此延迟收到补贴对企业来说也就不再是问题。随着技术的改进，无补贴可再生能源的投资机遇将会越来越大。☺

张柳潼，独立能源研究咨询机构水石能源创始人

中国电力发展概览



Foreign investors eye China's renewables sector

Market reform and greater transparency are making energy projects attractive again

□ Zhang Liutong

China has been leading the world in the expansion of solar and wind power capacity in recent years. By the end of 2018, China's solar capacity of 174 gigawatts and wind capacity of 184 gigawatts accounted for 36% and 32% of the global totals for each respective technology. Almost all of the capacity was developed by Chinese companies, with foreign investors owning less than 1% of it.

The US-China trade war has increased the risks of investing in China's power sector. Some US investors like I Squared Capital are trying to divest their Chinese power assets. Nonetheless, other foreign investors (including independent power producers, institutional investors, private equity firms and oil majors) have expressed strong interest in Chinese renewables projects. This is partly driven by credit tightening in China and the push to lower the debt-to-equity ratio (gearing rate) of the domestic state-owned power companies.

In January, the National Development and Reform Commission (NDRC) and the National Energy Administration (NEA) laid out plans to drive the

development of subsidy-free wind and solar farms across China. As the cost of such installations falls, bringing them closer to the price of coal power, which is set by the government, more foreign players will be tempted to enter the sector. While cautious, these investors see opportunities in China's greater willingness to improve market transparency and treat them as equals with state-owned power companies.

A chequered history

Back in the 1980s and 90s, many foreign investors entered the Chinese power sector in joint ventures with domestic companies. By 1997, there were at least 40 foreign companies invested, owning over 10% of the total capacity of about 254 gigawatts. Most of the investment was in greenfield coal plants, driven by provincial governments eager to power rapid economic growth.

However, most foreign companies exited the Chinese market in the late 1990s and 2000s. This was partly because of perceived unfair treatment in the power dispatch process during 1997-2002 when China had a power oversupply. Foreign investors believed that power from the vertically-integrated National Power Corp was favoured over power from their plants. Furthermore, by setting prices for electricity through rigid tariffs, the regime did not respond

The push to retire coal and increase the share of "clean" energy is very strong in northern China.

well to fluctuations in coal prices. This meant that foreign investors had to bear the risk of coal price rises.

Similar challenges exist for foreign investors in gas-fired power plants. Local governments may delay increasing the tariffs paid to power producers when gas prices increase.

Renewed interest

Lately there seems to be a revival of interest in the Chinese electricity market. The focus this time is mainly on the renewables sector – solar, wind, small hydropower and battery storage. Large international energy companies, such as Total and Engie, have set up small teams to understand and closely track the development of the renewables sector. Infrastructure fund houses (especially those from Hong Kong, Europe and Canada) are also looking for opportunities to invest in renewables assets in mainland China.

Improved regulatory conditions in China's electricity market have addressed some of the issues that have made foreign investors hesitate. While data such as monthly demand, supply and prices have been released by the government to improve market transparency, the power dispatch process remains opaque, with no data being released on a plant-by-plant basis even when existing investors ask for it.

Without access to such information, foreign investors will be concerned about state-owned energy assets getting preferential treatment, especially during the dispatch process in an oversupplied market.

China did partially address these concerns in 2002 when it split up National Power Corp into two network companies and five state-owned power companies.

Market reform has continued, with the government adopting an internationally recognised “regulated asset” principle that sets the transmission and distribution tariff, and how much grid companies can charge users. This has reduced the incentive for grid companies to take power from coal plants before solar and wind. Furthermore, several provinces, such as Guangdong and Zhejiang, are in

the process of creating competitive electricity spot markets similar to those in the US or Australia. Trading in real-time gives intermittent, fuel-free renewables an edge over electricity from fossil fuels.

There is hope that these reforms will make the market the driving force behind power dispatch.

New opportunities

Regional variations in China's power sector are also part of the picture being eyed by investors.

Within the North China Grid (Western Inner Mongolia, Beijing, Tianjin, Hebei, Shanxi and Shandong), the construction of multiple ultra-high voltage transmission lines will integrate power supply and demand between provinces. This will enable large amounts of power to be exported from places such as West Inner Mongolia, Shanxi and north Hebei, to the high-demand centres of Beijing, Tianjin and Shandong.

Furthermore, the push to retire coal plants and increase the share of “clean” energy is very strong in northern China, after years of severe air pollution. This has created a good macro environment for renewable energy investment.

However, conditions in north-west China (i.e. Xinjiang, Gansu, Qinghai and Ningxia) remain challenging as it is so far away from the load centres in coastal provinces and there are still large power surpluses in the region. Even if more renewables can be exported by additional ultra-high voltage lines, developers will likely have to sell their energy for less than coal.

Overall, due to the rapid fall in the cost of producing solar and wind power, delayed payment of subsidies will no longer be an issue because solar and wind won't need subsidies to be competitive. As technologies improve, the opportunities to invest in non-subsidised renewables will grow. ☞

Zhang Liutong is director of WaterRock Energy Economics.

中国应该出口“清洁”燃煤电厂吗？

更高效的燃煤技术可能仍然无法帮助“一带一路”国家完成对抗气候变化的宏伟目标。

□ 白莉莉



中国支持建设的煤电项目占中国境外在建煤电项目的四分之一

能源经济与金融分析研究所（简称 IEEFA）的一份最新报告显示，中国计划在海外建设更多的燃煤发电厂，其规模超过了德国现有燃煤发电装机。

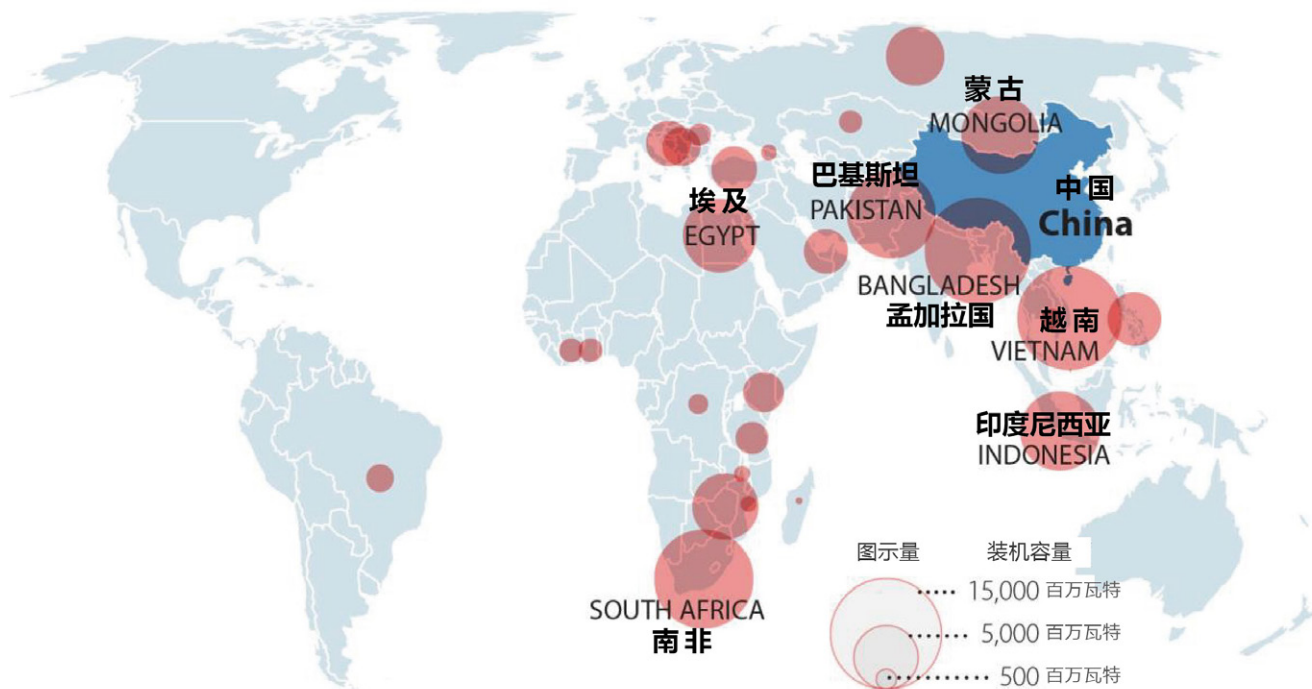
中国国家气候战略中心主任李俊峰在去年的联合国气候大会上接受采

访时说：“不能要求一个比中国更落后的发展中国家现在就开始减少煤炭消费，这是做不到的。”他表示，中国正在利用最清洁、超低排放的技术帮助其他国家满足煤电需求。

IEEFA 报告指出，中方投资的燃煤电厂已经变得更加高效，在建

电厂基本都不属于最高碳的类型。这种煤电建设与清洁化并行的趋势其实恰好反映了中国自身的能源发展轨迹。尽管提高燃煤效率能够带来一些环境和健康效益，但仍然有违全球去碳化的号召。

中国：全球煤电项目的重要资金来源



来源：能源经济与金融分析研究所 (IEEFA)

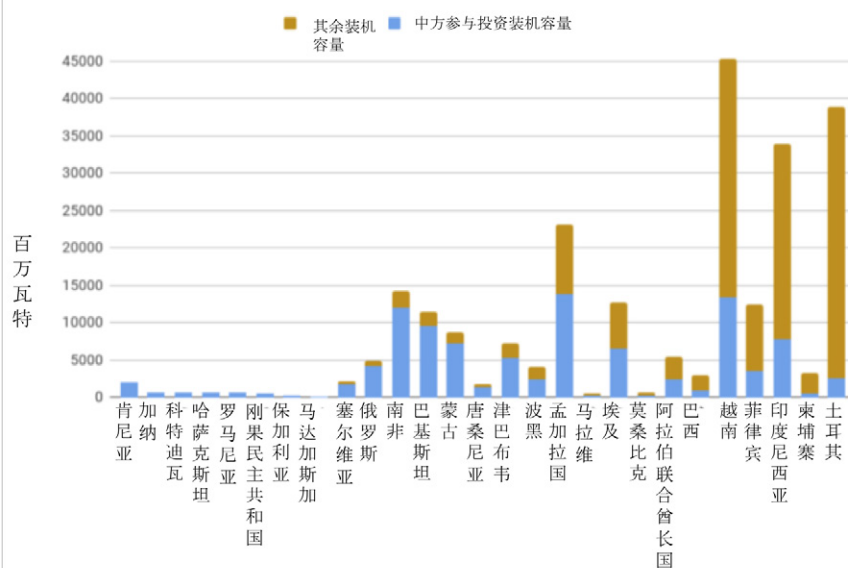
中国海外燃煤电厂发展势头强劲

中国并不是全球煤电发展的新生力量。2017 年的一份研究发现，2001 年到 2016 年，中国企业和银行先后参与了 240 个海外煤电项目的建设，总装机容量达到 2.51 亿千瓦。仅对公共财政的分析就显示，中国已经成为近年来海外煤电行业的最大支持者。

IEEFA 的这份新的报告则是关于中国未来的发展规划。中方参与煤电项目建设的势头似乎并没有趋缓迹象；中方金融机构和企业已经承诺或提议为中国境外四分之一的在建煤电项目提供资金，而这些项目分别分布于 23 个国家，总装机容量约为 10.2 亿千瓦。

中方在某些项目中的资助承诺直接来自高层。比如 2016 年习近平主席

中方参与在建煤电机组的占比分布



来源：能源经济与金融分析研究所 (IEEFA)

对孟加拉国进行国事访问期间，中孟两国就共同签署协议，由中方出资援助建设 4 个煤电项目。在中国政策性银行低息贷款的支持下，不少中国国

有能源公司也享受着高层产业政策的支持，大举进军海外。

华北电力大学袁家海教授表示，发展中国家的能源需求也是推动煤

电发展的重要力量。他对中国在东南亚地区煤电开发的研究表明，煤电对该地区仍然非常具有吸引力。他表示，“对于印尼和越南这样的处于工业化初期的发展中国家而言，煤电依然是其最经济、可靠的选择”，这些国家会优先考虑安全和成本问题，而不是环境因素。

中国并不是唯一一个抓住这个燃煤电厂需求的国家。长期以来，日本和韩国也积极在这些国家投资和开发煤电项目，规模与中国不相上下。如下图所示，获得中方融资最多的几个国家其实也从其他国家获得了投资。

中国投资的绿色化

中国的政府官员和媒体一直宣称，先进的超低排放燃煤发电技术是中国向发展中国家输出的一项关键技术。正如李俊峰所说，中国已经

走在了高效燃煤电厂行业的前列，可以以相对环保的方式满足发展中国家的供电需求。

的确，中国海外煤电投资已经向高效技术模式稳步升级。美国塔夫斯大学凯丽·西蒙斯·盖勒格教授2016年的一份研究发现，2013年到2016年，中国出资建设的燃煤电厂中只有26%属于低效的亚临界电厂，而2000年到2016年间这个比例则高达58%。IEEFA的报告显示，目前中国海外投建的亚临界电厂比例已经下降到23%，而这一下降趋势有望持续下去。

尽管落后了几年，但这个趋势与中国国内能源转型的轨迹是吻合的。过去几年，中国煤电筹建规模持续缩减，因为中国已经意识到了煤电行业的产能过剩问题。但是目前中国国内在建的煤电容量仍然高达2亿千瓦，是其国外投资援建项目的两倍。

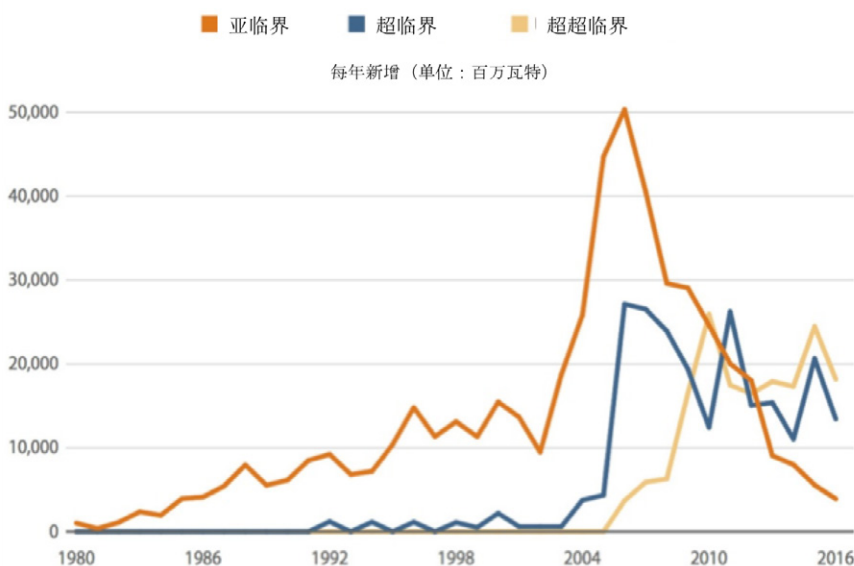
即便中国还在继续煤电建设，但是总体已经走上了追求高效的道路。目前大多数中国煤炭火电厂仍是早期建设的亚临界电厂，而近来中国已经开始逐步转向建设高效的超超临界电厂。《电力发展“十三五”规划》为电厂设立了能效提升目标，同时宣布未来不再建设亚临界电厂。如果旧有电厂无法在2020年达到能效标准，就必须关闭。此外，中国电厂的常规大气污染标准也大多高于美国和欧盟。

而海外的清洁煤电转型则更多是顺应时势的结果。虽然中国不会阻止银行或企业投资低效煤炭项目，但高层对“绿色一带一路”规划的承诺，以及中国能效技术的竞争力或许会推动中国银行和企业的环保高效投资，袁家海表示。中方企业在海外煤电项目中越来越着眼于长期的参与，此前可能只是参与建设或提供设备，现在则会共同持有或者直接参与运营。当然，这样做也会增加更多的长期风险，如果替代能源价格下降或政府政策要求设备升级（就像中国自己所做的那样），那电厂可能会变成“搁浅资产”。所以说，未雨绸缪，投资更加先进的技术可能才是合理的选择。

与此同时，发展中国家可能还是会将煤电视为电力发展最稳定和最具吸引力的能源选择，但是他们同样感受到了清洁转型的压力。各个国家必须按照《巴黎气候协定》提交自己的气候行动计划，其中有不少国家承诺要实现可再生能源目标。抗议活动也阻止了某些低效燃煤电厂的建设，比如中方原计划参与援建的两家孟加拉国电厂就是一个例子。当地民众针对建设新电厂和移民搬迁发起抗议，活动共造成至少4人死亡

中国的清洁燃煤发电技术转型

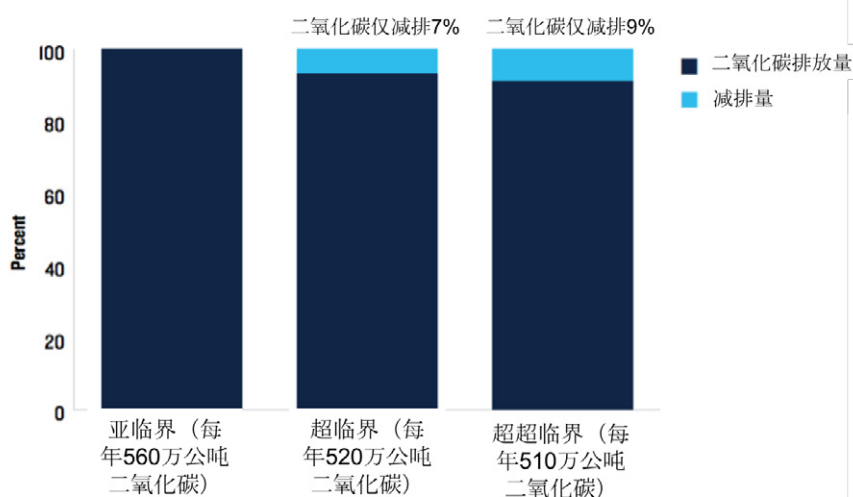
1980年2016年中国燃煤发电装机容量的技术组成



来源：作者测算基础是标准普尔发布2017年3月发布的《全球电厂数据库》。

来源：美国进步中心

图表14：不同燃煤电厂的二氧化碳排放量



来源：自然资源保护委员会 (Natural Resources Defence Council, 简称NRDC)

全球燃煤发电排放与煤炭二氧化碳排放部门 (单位：十亿吨)

燃煤电厂寿命40年，平均容量因子52.5%

深灰=煤炭CO2总预算 (2017-2050)

浅蓝=运营中的燃煤电厂 (2107-)

天蓝=在建项目

深蓝=预建项目 (假设34%落实)



来源：全球煤炭网络 (CoalSwarm) 的全球燃煤电厂追踪系统，2018年1月

清洁燃煤的局限

虽然这波高效电厂建设热潮能够帮助减少污染、降低燃煤消耗，但是它们都还不能算作气候解决方案。中国拟建电厂中有23%是亚临界电厂，未来将生产2300万千瓦能效最低的煤电，而即使是效率最高的燃煤电厂，其碳排放强度仍然很高。

盖勒格表示：“虽然提高燃煤电厂能效总比无所作为要好，但是建设没有碳捕捉和存储设施的新燃煤电厂仍然有违《巴黎气候协定》的能源转

型要求，特别是考虑到这些新建电厂至少会存在30到50年。”全球煤炭网络 (CoalSwarm) 及其他非政府组织去年发表的一份报告显示，到2050年全球现有煤电项目的碳排放仍超出巴黎协定的目标，因此，很多燃煤电厂将不得不提前退役。

地区局部来说，高能效技术只能稍微降低空气污染；此外，要想大幅降低污染排放还需要安装价格昂贵的环保设备。

放眼国际，经济合作与发展组织 (OECD) 出口信贷机构已经同意

逐步淘汰煤炭融资。大多数主要多边借贷机构也限制了煤炭融资。去年，世界银行也从唯一一个计划投资的燃煤电厂项目中撤资，并表示现在可再生能源才是一种更便宜的选择。此外，日本主要电力公司和保险公司也已宣布不再投资或从事煤炭业务。

获得中国资助建设燃煤电厂的很多国家都是最不发达国家。根据共同但有区别的责任原则，这些国家在选择减排路径时应有更大的灵活性。“气候分析”组织2016年的一项研究认为，不同地区的脱碳路径应有所不同，但研究还认为，要想实现《巴黎气候协定》中制定的1.5摄氏度温升目标，全球就不应该再新建任何燃煤电厂。

根据2015年9月在白宫发表的中美联合声明中，中国同意严格控制高污染和高碳排放海外项目的公共投资。《绿色信贷指引》也呼吁中国各银行遵循国际最佳投资实践，但这些指导方针在应对气候变化方面没有法律约束力，也没有对煤炭项目融资作出明确规定。

袁家海表示，随着可再生能源并网发电，中国自身产能过剩的经验说明，抓紧限制煤炭融资势在必行。“中国国内煤电行业当目前面临的结构性风险，15年、20年后一定会在“一带一路”其他发展中国家出现。所以中国必须对海外煤电投资设立严格的能效、环保和排放绩效标准。”^⑤

白莉莉，中外对话研究员，北京能源网络 (Beijing Energy Network) 执行制作

Should China export ‘clean’ coal power?

More efficient coal technology is still incompatible with helping countries meet ambitious climate goals

□ Lili Pike

China is planning on financing more coal-fired power capacity beyond its borders than Germany currently operates, according to a new report from the Institute for Energy Economics and Financial Analysis (IEEFA).

In an interview at last year’s UN climate conference, Li Junfeng, director of China’s National Centre for Climate Change Strategy, said, “We can’t require a developing country that is less developed than China to start decreasing coal consumption now, that is not possible.” China is helping other countries meet their coal power needs with the cleanest ultra-low emissions technology, he said.

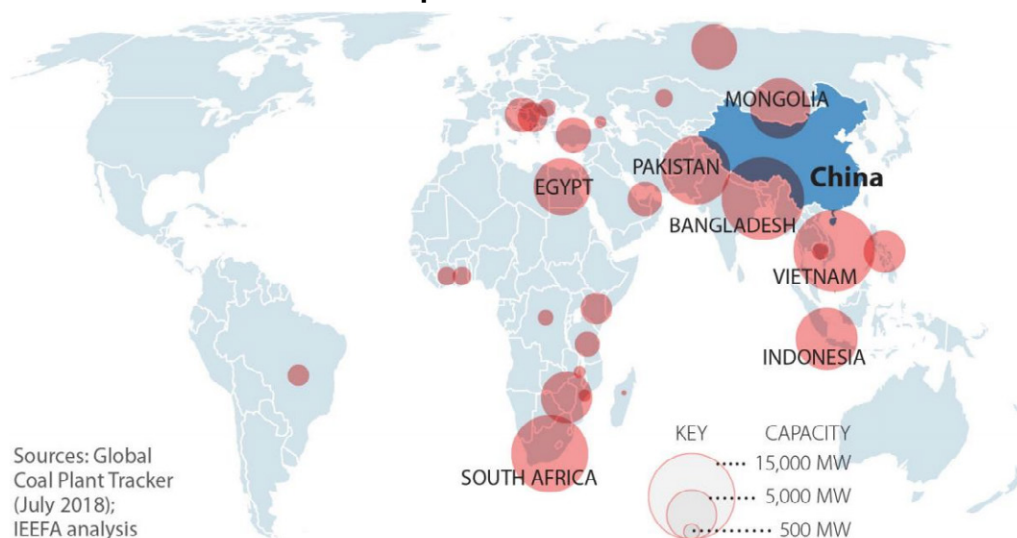
The IEEFA report shows that the Chinese-financed coal plants have become more efficient, with fewer of the most carbon-intensive plants under development. These concurrent trends of continued coal power development, but with more efficient technology, mirror China’s own energy

trajectory. Although the move toward greater efficiency carries some environmental and health benefits, it still defies the call for global decarbonisation.

China’s overseas coal plant development looms large

China is not a new entrant to global coal power development. A study conducted by the Global Environmental Institute in 2017 found that between 2001

Chinese-financed coal power capacity under development outside China



and 2016, Chinese companies and banks were involved in 240 coal projects overseas with a total capacity of 251 gigawatts. Analysing public finance alone, the Natural Resources Defense Council showed that China has been the largest backer of overseas coal power in recent years.

IEEFA's new report pulls back the curtain on China's future plans. Its involvement in coal projects does not appear to be flagging: Chinese financial institutions and companies have committed or proposed to finance one quarter of the coal plants under development outside of China – 102 gigawatts of capacity spread across 23 countries.

In some cases, China's financial pledges come from the very top. Bangladesh and China signed off on four Chinese-financed coal power plants during Xi Jinping's 2016 state visit. State-owned energy companies have also enjoyed high-level support from industrial policies encouraging their overseas expansion, backed by financial support from China's policy banks, which can offer low-interest loans.

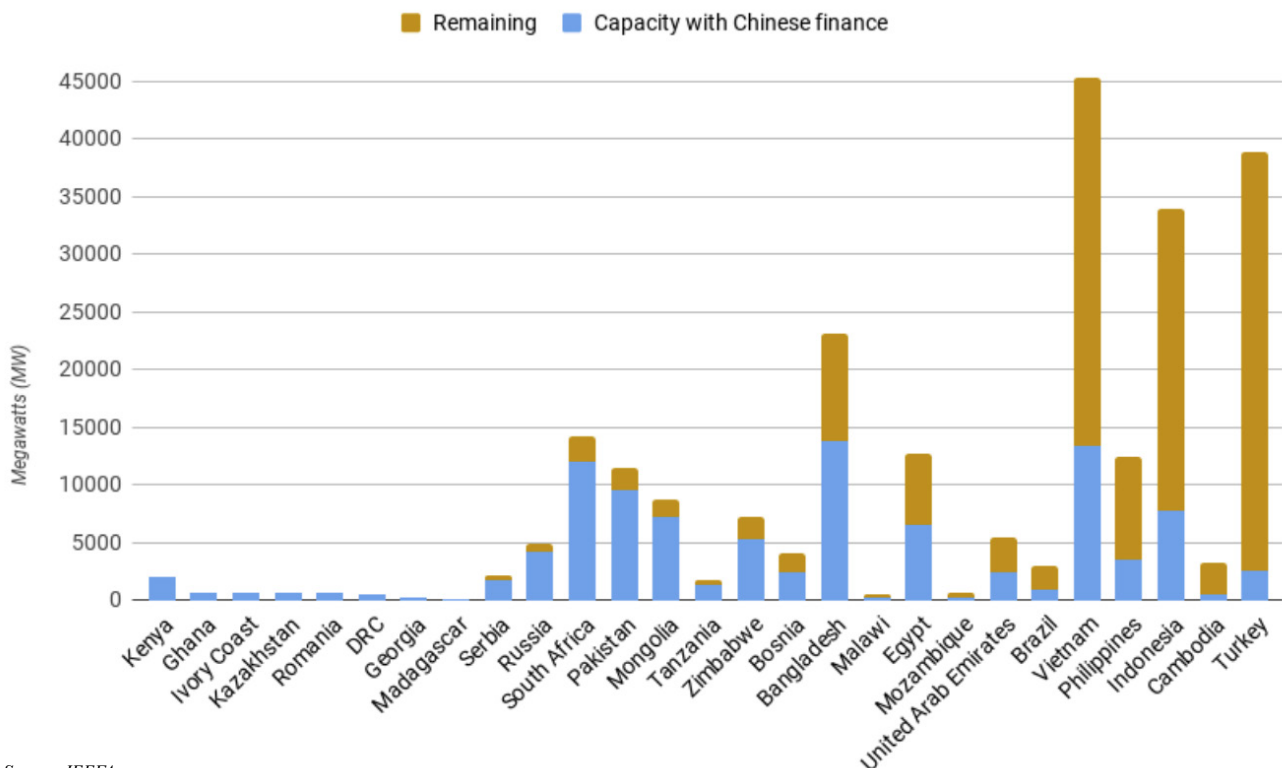
Demand from developing countries is also driving business, said Yuan Jiahai, a professor at the North China Electricity and Power University. His field research on China's coal power development in Southeast Asia showed that coal remains attractive in the region. "For countries like Indonesia and Vietnam that are in the early stages of industrialisation, coal power is still the most economical and reliable choice," Yuan said, adding that these countries prioritise safety and cost over environmental considerations.

China is not alone in capitalising on this demand for coal plants; Japan and South Korea have long been active financiers and developers in these countries as well, rivalling China. As the chart below shows, the countries receiving the most financing from China are also receiving finance from other countries.

Greening in China's image

Chinese officials and media have trumpeted advanced coal technology as a key export to developing countries. As Li

Share of coal power capacity under development with Chinese finance



Source: IEEFA

China and a changing energy landscape

Junfeng expressed, China has pioneered high-efficiency coal power that can supply demand from developing countries in a relatively green way.

Indeed, China's investments in coal power abroad have steadily shifted toward more efficient technology. In a 2016 study, Kelly Sims Gallagher, a professor at Tufts University, found that from 2013 to 2016 only 26% of the Chinese-financed coal plants abroad were inefficient subcritical plants, compared to 58% for the whole of 2000-2016. IEEFA's report shows that this trend is projected to continue: 23% of the plants in China's overseas financing pipeline are subcritical.

The trend follows China's own domestic energy transition, although it lags a few years behind. China's coal plant pipeline has shrunk over the years as the country has acknowledged the excess capacity in the sector, but it still has over 200 gigawatts of capacity in development – twice what it intends to finance abroad.

Even as the country continues to build coal plants, its fleet has become much more efficient. The majority of

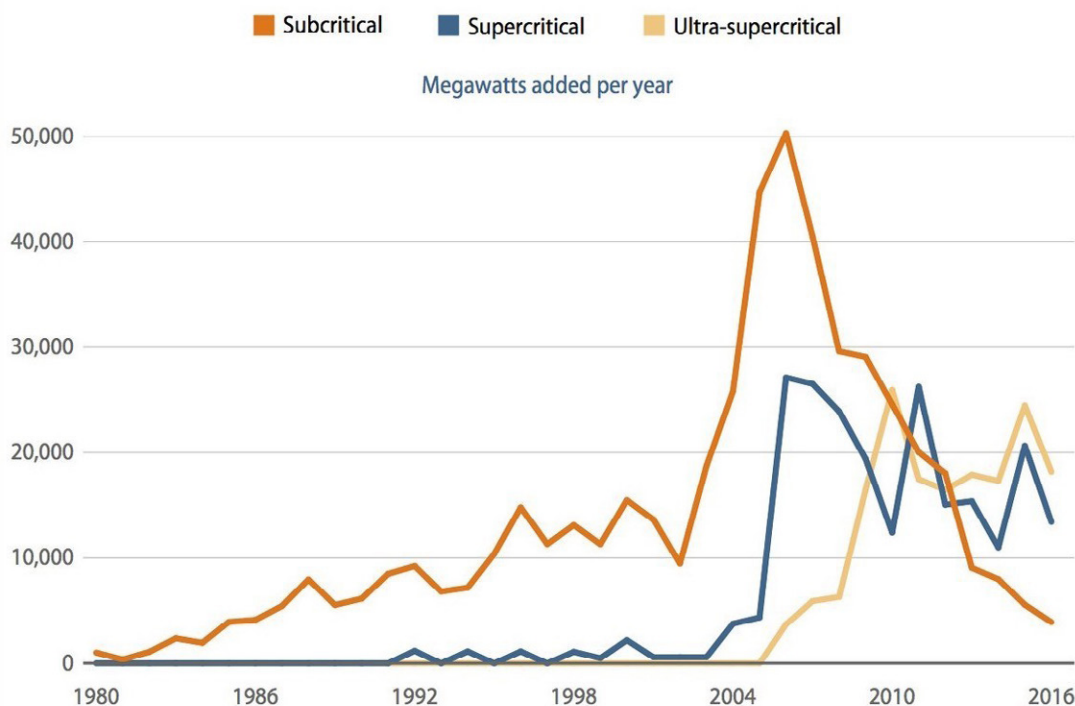
China's plants are still subcritical, leftover from earlier construction, but in recent years the country has shifted toward building high-efficiency ultra-supercritical plants. The 13th Five-Year Plan for the electricity sector sets high efficiency targets for plants to meet, blocking future subcritical plant construction. If an old plant cannot meet this efficiency standard by 2020, it will be shut down. Conventional air pollution standards for Chinese plants are also mostly higher than in the US and EU.

Abroad, the shift to cleaner technology has occurred more organically. China does not block its banks or companies from investing in low-efficiency coal projects. But high-level commitments to a "green Belt and Road" and the competitiveness of China's efficient technology may be pushing Chinese banks and companies forward, Yuan Jiahai said. Chinese companies are increasingly taking long-term positions in coal projects overseas, co-owning or operating plants where they were formerly just involved in construction or equipment provision. In doing so, they have taken on more long-term risks – risks of stranded assets if

alternative energy supplies become cheaper and of government policies requiring retrofits, as China itself has done. Getting ahead of the curve and investing in better technology may be a logical choice.

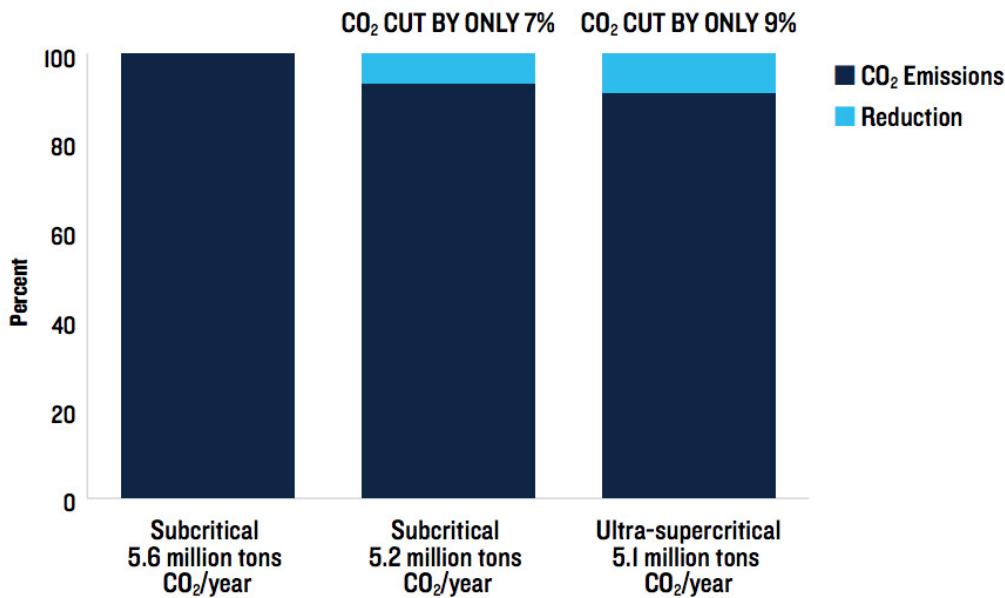
Meanwhile, developing countries may still see coal as the most stable and attractive option for their power sector

Makeup of China's coal power capacity additions, 1980-2016



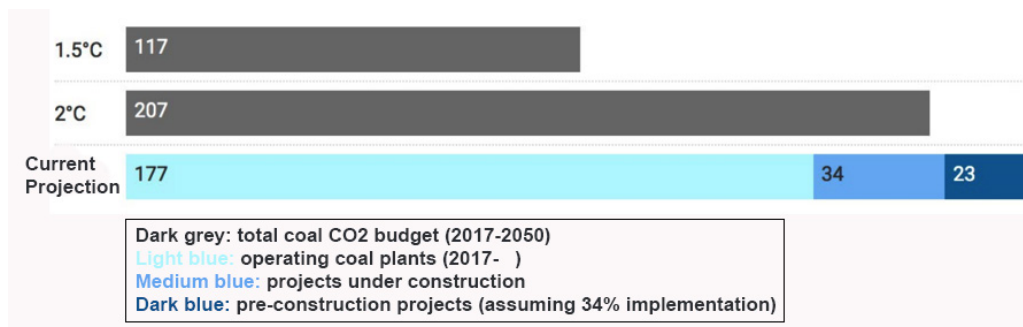
Source: Centre for American Progress

CO₂ emissions by type of coal plant



Source: NRDC

Global coal power CO₂ emissions compared to CO₂ budgets



Source: Coal Swarm and Global Coal Plant Tracker

development, but they are also feeling pressure to move to cleaner alternatives. Countries had to submit climate action plans under the Paris Agreement, with many committing to renewable energy goals. Protests have also stalled the development of dirty coal plants in a few notable cases, including a protest against two proposed plants in Bangladesh, co-sponsored by a Chinese company. At least four people were killed protesting the plants and their displacement of local people.

Agreement, especially because each new coal plant built today will last 30-50 years,” said Gallagher. A report published by Coalswarm and other NGOs last year showed that the existing fleet of operating coal plants worldwide will already exceed the carbon budget for coal plants through 2050, so many plants will have to retire early.

And on a local level, high-efficiency technology only slightly decreases air pollution; additional, costly pollution control equipment is required to make more significant reductions.

Internationally, OECD credit export agencies have agreed

The limits to ‘clean’ coal

Though this new wave of high-efficiency plants can help reduce pollution and coal consumption compared to older technology, it is no climate solution. The 23% of China’s development pipeline that is subcritical is still 23 gigawatts of inefficient coal power, and even the most efficient coal plants are still very carbon-intensive.


“While improving efficiency in coal-fired power plants is better than doing nothing, building new coal plants without carbon capture and storage is incompatible with the energy transition required by the Paris

to phase out coal financing, and most major multilateral lenders have also restricted coal financing. Last year, the World Bank backed out of the only coal plant it had in its investment pipeline, saying that renewables were now a cheaper option. Major Japanese power companies and insurers have announced they will no longer invest in or undertake coal business.

Differentiated responsibilities?

Many of the countries building Chinese-financed coal plants qualify as least developed countries. Under the doctrine of common but differentiated responsibilities, such countries should be granted more flexibility in their path to reducing emissions. A 2016 study by Climate Analytics acknowledges different coal phase out pathways for different regions, but argues that no new coal plants can be built globally in order to meet the Paris Agreement 1.5 degree goal.

In a joint US-China statement at the White House in September 2015, China agreed to strictly control public investment for overseas projects with high pollution and carbon emissions. The Green Credit Guidelines, which regulate China's banks, also call for them to follow international best practices, but these guidelines are neither legally binding nor explicit on coal finance.

Yuan Jiahai said the imperative to restrict coal financing should be clear from China's own experience with overcapacity as renewable energy comes online, "Domestically, China's coal industry is facing structural risks, 15 or 20 years from now these risks will emerge in Belt and Road countries. So [...], China must establish strict energy efficiency, environmental protection, and emissions performance standards for overseas coal financing." 

Lili Pike is a researcher for chinadialogue and the executive producer of the Beijing Energy Network's podcast, Environment China.

最新数据折射中国低碳转型复杂性

2018 年中国煤炭消费再次上涨，能源结构转型的力度和持续性成关注焦点。

□ 冯 颢 白 睿

中 国家统计局 2 月 28 日上午公布的《2018 年国民经济和社会发展统计公报》显示，中国煤炭消费继 2017 年经历小幅反弹后，2018 年再次上涨。

中国煤炭消费总量在 2013 年达到 42.4 亿吨峰值，之后在政府优化能源结构、控制污染排放的努力下，曾实现 2014-2016 年连续三年下降。

专家表示，煤炭消费连续第二年上涨表明中国在经济下行的压力下，可能调低了节能减排目标的相对优先

级。基础建设投资热潮的再度兴起，也使人担忧高耗能产业的增长，以及经济与能源脱钩步伐放慢。

低碳转型步伐放慢？

煤炭消费回升推高了中国的碳排放。根据绿色和平的测算，去年中国的二氧化碳排放量增长了约 3%，这是中国自 2013 年以来最大的二氧化碳排放量增长。

近期，中国国内有不少声音从

保障国家能源安全的角度，提出应该给煤炭消费量一定的增长空间，呼吁通过煤制天然气、煤制油的方式缓解中国的能源供应压力。针对这些声音，发改委能源研究所原所长周大地表示，“再怎么提高技术，煤炭都是低效的、高碳的。从全球减排温室气体和低碳转型出发，回头去依靠煤炭，是在开倒车。”

针对“清洁煤电”的提法，清华大学气候变化与可持续发展研究院学术委员会主任何建坤告诉中外对话，“煤炭可以清洁化利用，但煤炭本身不能叫清洁能源。煤炭发电可实现常规污染物超低排放，但没有解决低碳排放。”

何建坤表示，中国的绿色转型是相当艰难的挑战，在很短的时间内要完成从峰值到零碳，但是同时，绿色转型的行动力度越大、成果越显著，中国对于未来的掌控就越主动。

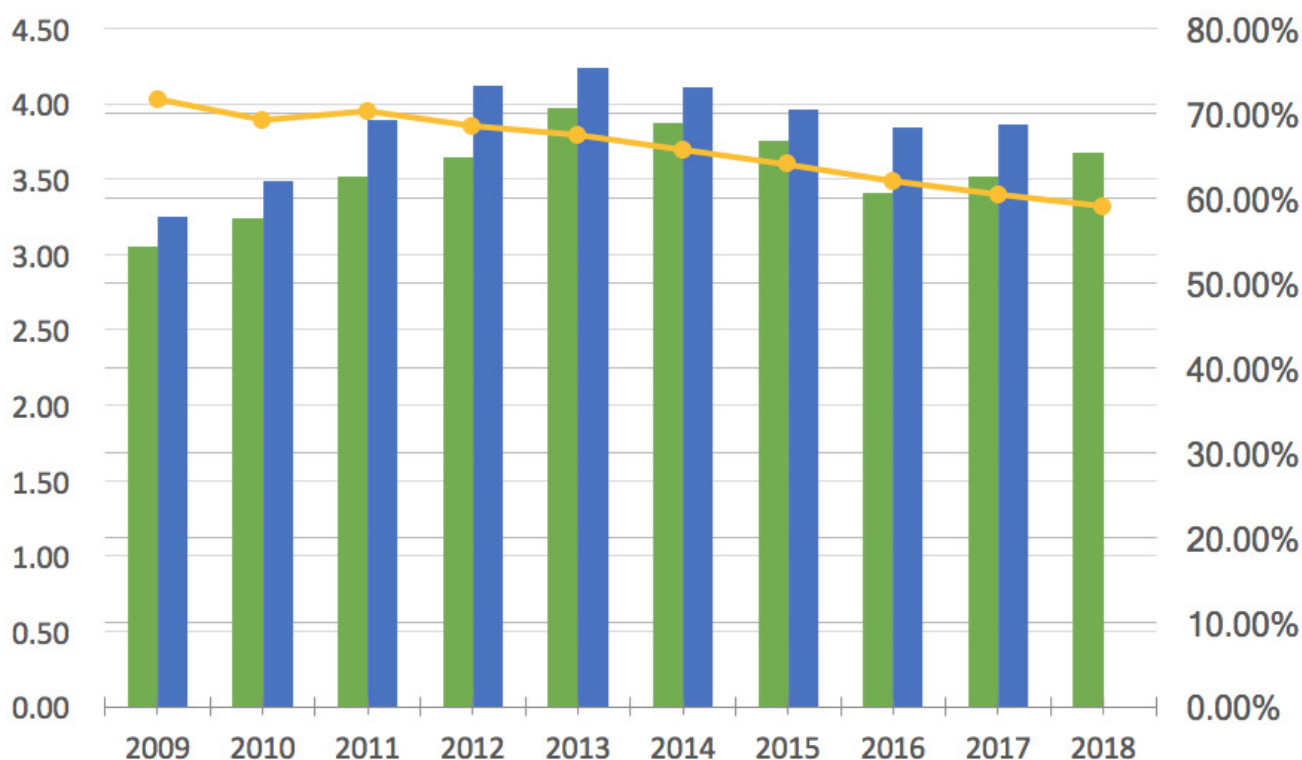
趋势仍在

尽管煤炭消费有所回升，但中国煤炭消费并未回到 2013 年的水平，总体下降趋势未变。



© Qiu Bo / Greenpeace

位于内蒙古的露天煤矿



绿柱：煤炭生产量（单位：十亿吨），蓝柱：煤炭消费量（单位：十亿吨），黄线：煤炭消费占比

从能源结构来看，2018 年中国煤炭消费量占能源消费总量的 59.0%，比上年下降 1.4 个百分点，是中国煤炭占一次能源消费比例首次低于 60%。在中国把天然气归类为“清洁能源”的前提下，2018 年，中国清洁能源消费量(水电、风电、核电、天然气等)占到了能源消费总量的 22.1%，同比上升 1.3 个百分点。

预计到 2020 年，中国可以完成煤炭消费比重降低到 58% 以下“十三五”目标。

周大地表示，2019 年对于达成大气治理攻坚战定下的阶段性目标非常重要。在大规模依赖脱硫、脱销、除尘等末端治理手段之后，下一阶段必须依赖能源结构的调整。

电力消费高速增长

国家统计局公布的数据显示，2018 年中国发电量同比增长 7.7%；全社会用电量同比增长 8.5%，两者的增速创下 2012 年中国经济放缓以来的新高，高于全年国内生产总值 6.6% 的增长速度。

这一方面显示出中国终端能源消费清洁化加快的趋势，以更清洁的电能来替代燃煤和燃油等能源形式；另一方面，在经济下行压力下，基础设施建设的热潮再度兴起，高耗能产业，比如煤炭、钢铁、建材、化工，加速反弹，也大规模的带动了电量增长。这些行业在中国经济发展中依然占据重要引擎作用，因而影响减煤的持续性。

电力消费的快速增长凸显了中国

绿色转型的复杂性。一些行业的污染减排行动表现为更高的电力消费。

华北电力大学经济管理学院教授袁家海以钢铁行业为例分析认为，随着落后产能的淘汰、电炉钢比重的大幅提高以及环保设施投运，钢铁工业用电量大幅增长 9.8%，比上年提高 8.6 个百分点，拉动全社会用电量增长 0.8 个百分点。

基建热潮复苏？

一些分析人士担心，中国政府可能会在经济不确定性增加的情况下再次通过大规模经济刺激计划来促进经济增长。

在中国，经济刺激往往是通过基础设施建设项目来进行。尽管有些基础设施可能是必要的，但短期

内，这些项目将促进对能源密集型建筑材料（如钢铁、水泥）和电力的需求，进而增加煤炭消耗，并推高排放。

作为世界上最大的碳排放国，中国选择的经济发展方向对全球气候努力具有重要意义。绿色和平能源分析师柳力（Lauri Myllyvirta）在去年 12 月的一篇文章中说，“中国新一轮的工业和建筑刺激计划将使得全球排放量再增长几年。”

目前为止，中国政府一直在避免推出全面的刺激计划，而是选择了有针对性的刺激措施，如投资 8600 亿元人民币，专门用于高速铁路和地铁系统的发展。

国际金融服务机构荷兰国际集团

（ING）分析师彭蕊去年 11 月预测，中国今年将向经济注入价值 9 至 10 万亿元人民币的财政刺激方案。根据 2018 年底的固定资产投资数据，她还预测，基础设施将是 2019 年经济增长的主要驱动力，这意味着对金属产品的需求将继续增长。

然而，就在上周，国务院总理李克强重申坚决不搞“大水漫灌”式的大规模刺激。

袁家海表示，2019 年宏观经济增长形势必然会比 2018 年更加艰难，尤其是受到全球经济增长低迷，中美贸易战等因素影响。中国政府把“稳投资”作为稳定经济的重要手段之一，但是本轮稳投资不会对高耗能行业形成显著刺激。

根据国家发改委在其官网上 2 月 26 日公布的文件，2019 年将加大关键技术、高端装备、核心零部件和元器件等领域的“新型基础设施建设”。人本咨询（北京）有限公司研究员刘嘉表示，“从行业的角度来看，中国基础设施建设的质量在提高。这些基础设施建设与碳排放的关系从数据上看还不明确。”

本文中何建坤教授的部分评论于 3 月 5 日经过了更正，特此说明。

冯灏，中外对话研究员

白睿，中外对话气候研究及沟通专员

China's coal consumption on the rise

Use of coal increased again in 2018, raising questions about the green energy transition

□ Feng Hao Tom Baxter

Coal consumption peaked in China in 2013 at 4.24 billion tonnes. Then government efforts to improve the energy structure and tackle pollution saw coal use fall between 2014 and 2016. Following a small increase in 2017 consumption rose again in 2018, according to figures published on February 28 by the National Bureau of Statistics.

Experts say this second consecutive annual increase suggests China may have de-prioritised energy saving and emissions reduction, owing to the pressures of its slowing economy. Another wave of infrastructure investment is also slowing the decoupling of the economy from energy consumption.

A faltering transition?

The rebound in coal consumption has increased China's CO₂ emissions. Greenpeace calculates that they grew by around 3% last year, the largest increase since 2013.

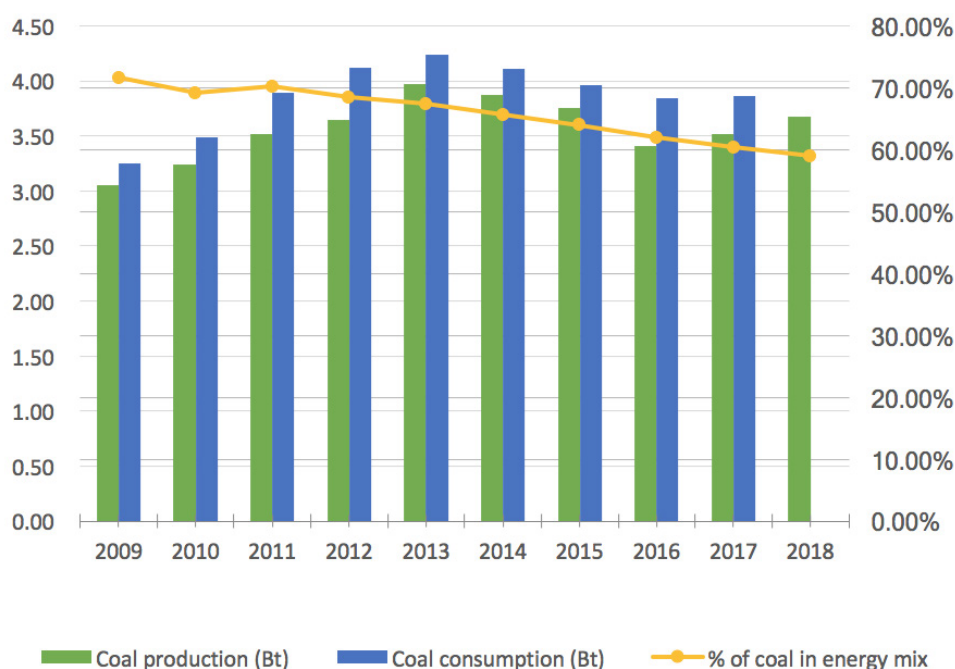
There have been a number of recent proposals for coal

consumption to be allowed to grow in China, so as to reduce pressure on energy supplies, with calls for more coal gasification or liquification. Zhou Dadi, head of the National Development and Reform Commission's Energy Research Institute, said in response that "regardless of how much you improve the technology, coal remains inefficient and carbon-intensive. It would be a step backwards to go from global reductions in greenhouse gas emissions to... a return to reliance on coal."

Commenting on the idea of "clean coal power", He Jiankun, chair of the academic board of Tsinghua University's Institute of Climate Change and Sustainable Development, told chinadialogue that "coal can be used in cleaner ways, but it can never actually be clean and low carbon. Don't get those ideas confused."

He added that China's green transition is a tough challenge: a quick shift from peak carbon to zero carbon. But if China can make it happen, it will have more control over its future.

A new round of industry and construction stimulus would condemn global emissions to grow for another several years.



use. These are new highs since the economic slowdown started in 2012, and outstrip the year's GDP growth of 6.6%.

On one hand, this shows accelerating cleaning up of end-user energy consumption: electricity is replacing gas and oil. But it also reflects greater investment in infrastructure as a response to the economic downturn, with energy-hungry industries such as coal, steel, cement and chemicals recovering

Positive trends

Despite some increase in coal use, consumption has not returned to 2013 levels and the overall trend remains downwards.

In 2018, coal accounted for 59% of China's total energy consumption, 1.4 percentage points down on the previous year and the first time coal has accounted for less than 60% of primary energy. Clean energy, which in China includes natural gas alongside hydro, solar and wind, accounted for 22.1% of total energy consumption, up by 1.3 percentage points.

China is expected to reach its 13th Five Year Plan goal of reducing coal to under 58% of total energy consumption in 2020.

Zhou Dadi said that 2019 will be a crucial year for intermediate targets in the government's "assault on air pollution". With end-of-pipe measures in coal power stations, such as sulphur and nitrate scrubbers and dust collectors, having been installed on a wide scale, the next stage must rely on changes to the energy structure.

Rapidly growing electricity demand

The new 2018 data also showed a 7.7% increase in electricity generation and a 8.5% increase in total electricity

and swelling electricity demand. These industries remain the drivers of economic growth in China, making reductions in coal-use less achievable.

The jump in electricity consumption highlights the complexity of China's green transition. Pollution cuts in some industries mean higher electricity consumption. The steel industry is an example. Yuan Jiahai, professor at North China Electric Power University's Economy and Management College, explained that with inefficient capacity being eliminated, more electric furnaces being used, and environmental-protection equipment coming online, electricity use in the steel industry rose 9.8%. That is 8.6 percentage points more than the previous year, and equates to a contribution of 0.8 percentage points to the increase in total electricity consumption.

An infrastructure revival?

Some analysts worry that increasing economic uncertainty may lead the Chinese government to again promote growth with a major stimulus package.

In China, economic stimulus often means infrastructure construction. Some such construction may be necessary, but it spurs the production of energy-intensive building

materials (like steel and cement) and demand for electricity, and so increases coal consumption and emissions.


As the world's largest carbon emitter, China's choices affect global climate efforts. Lauri Myllyvirta, an energy analyst with Greenpeace, said in an article last November that "a new round of industry and construction stimulus would condemn global emissions to grow for another several years."

So far the government has avoided a comprehensive stimulus package in favour of more targeted measures, such as investing 86 billion yuan (US\$12.8 billion) in high-speed rail and subways.

Iris Pang, an analyst with international financial services group ING, estimated in November that China would inject around 4 trillion yuan (US\$600 billion) into the economy in 2019. Based on data on investment in fixed assets, she also predicted that infrastructure investment would be the main driver of economic growth in 2019. This means demand for metal products will continue to grow.

But as recently as last week, Premier Li Keqiang reiterated that there would be no "flooding" of the economy with stimulus.

Yuan Jiahai indicated that the macroeconomic growth outlook for 2019 is bound to be tougher than 2018, due to a global slowdown and the US–China trade war. He said the government has emphasised "infrastructure investments need to be stable... in sectors such as transportation and power." But he added "I don't expect that economic stimulus will lead to significant incentives for energy-intensive industries."

According to a document published on the National Development and Reform Commission's website on February 26, this year will see increased "new-style infrastructure investment" in crucial technologies, high-end equipment, and key components and parts." Liu Jia, a researcher with Renmu Consulting, said "In industry terms, the quality of China's infrastructure construction is increasing. But it's still not clear from the data how this construction will affect carbon emissions." 

Feng Hao is a researcher at chinadialogue.

Tom Baxter works on climate communications and research at China Dialogue.

中国环境公益诉讼的新力量

检察机关利用法律手段监督政府部门加大治污力度。

□ 王婉琳 龙迪

2019年元旦，中国青海省玉树藏族自治州州政府出台官方通告，禁止向三江源水域（即长江、澜沧江和黄河）随意放生外来鱼种。

此前，当地政府被指对放生活动疏于管理，导致本地鱼群及水域生态系统受到极大威胁。青海省人民检察院代表公众利益，向相关政府部门发出诉前检察建议，要求其加强对本地物种的保护。

该案件很好地体现了中国检察官在提起公益诉讼方面扮演的重要角色。

2017年6月，《行政诉讼法》和《民事诉讼法》正式确立了检察机关提起公益诉讼的制度。此前，中国于2015年7月启动了为期2年的试点工作，13个省市参与试点项目。试点期间，人民检察院共提起1000多起公益诉讼案件，涉及生态环境和资源保护、食品药品安全、国有土地使用权出让等领域。

2018年7月，国家主席习近平对设立检察院公益诉讼检察厅表示支持，意味着公益诉讼案件数量将在未来出现稳步增长。

据悉，2018年1月至11月，全国检察机关共办理公益诉讼案件89000余件，其中55%涉及环保领域（见表1），标志着中国向环境法治迈出的重要一步。

为自然辩护

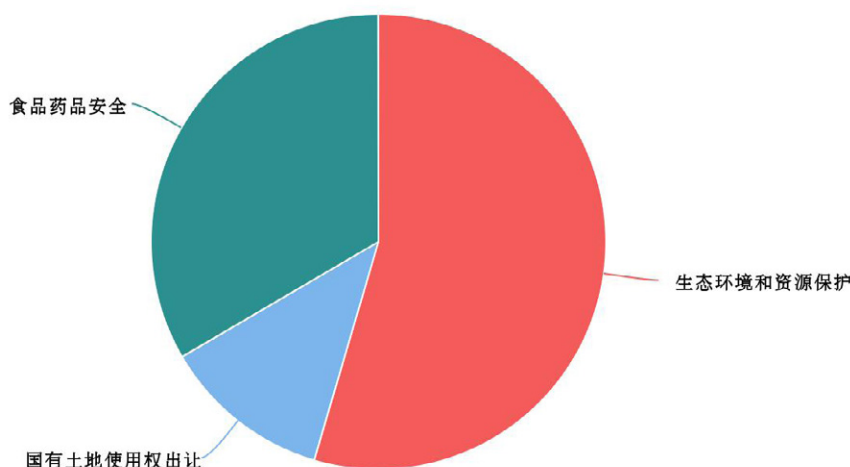
中国2015年新出台的《环保法》明确规定了符合资格的社会组织有权提起环境公益诉讼。

在中国境内注册的500多万家社会组织中，约有700家满足适格主体的法律要求，但仅有不到40家社会组织有财力和人力提起公益诉讼。实际上，2015年仅有9家社会组织提起相关诉讼，2016年也只有13家。

一方面，中国社会组织提起公益诉讼的能力相对有限；另一方面，法律也不允许社会组织针对政府部门提起诉讼。

1. 案件涉及领域

2018年1月至11月



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数据来源：最高人民法院

2017 年，环保组织“自然之友”起诉了云南省地方环保局，但被法院驳回，理由是原告不具备提起行政公益诉讼的资格。根据中国新修订的《行政诉讼法》第 25 条，只有人民检察院有权提起行政公益诉讼。

一支新生的法律力量

随着政府对环保工作的支持力度不断加大，中国正在尝试利用新的政策手段，防止当地政府为了创收，发展污染性行业的做法。

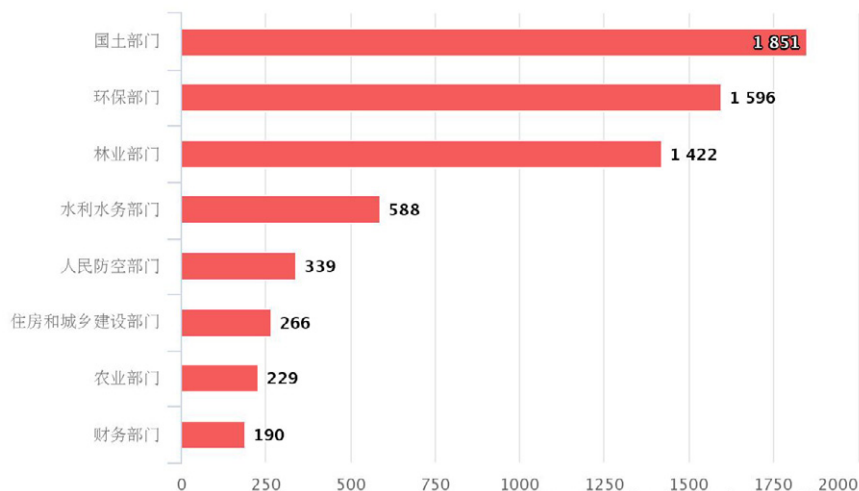
中央政府已经派出了环保督察组走访地方政府，检察机关也参与其中，通过法律手段加强对行政机关的监督。

试点工作

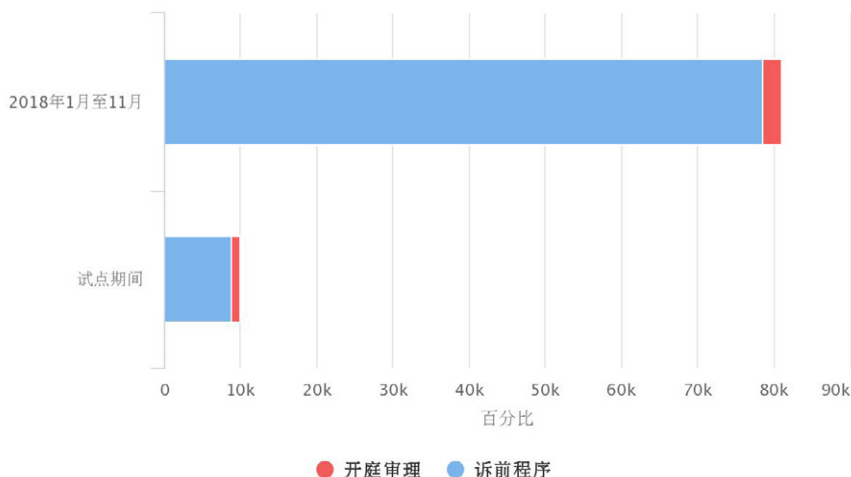
在两年试点期，检察机关共办理公益诉讼案件 9866 件，其中 74% 的案件涉及以下八大部门（见表 2）。另外，全部案件中诉前程序案件 8712 件、提起诉讼案件 1154 件（见表 3），而且几乎所有的案件都是判决检察院胜诉。

在程序上，检察院在提起公益诉讼之前，需首先向违法部门发出“警告”（检察建议），督促其履职并整改。整改期限通常为 2 个月，个别紧急情况缩短为 15 天。试点期间，超过 75% 的政府部门在收到检察建议后进行了整改。以甘肃阿克塞县为例，县人民检察院依法对阿克塞县矿山环境污染问题发出诉前监督检察建议书。阿克塞县政府依据检察机关监督意见，决定对该县石棉矿区有 60 多年环境污染历史的 17 家企业依法予以关停。

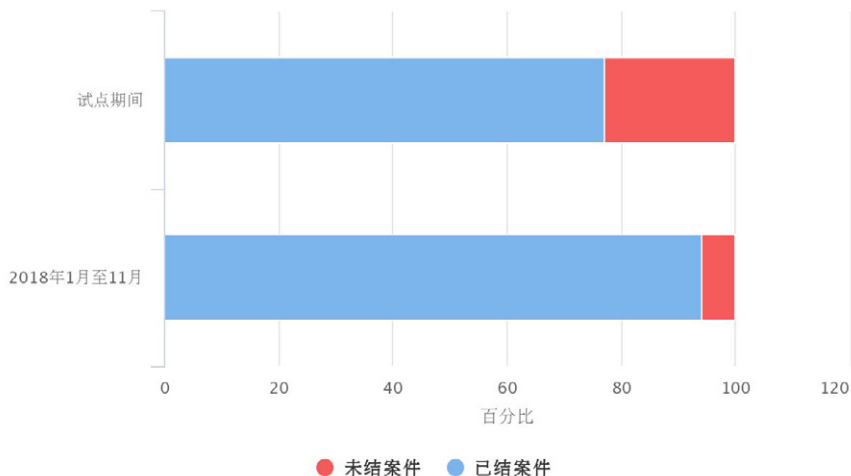
2. 涉案部门



3. 诉前程序结案率



4. 诉前程序结案率



数据来源：最高人民法院

2018 年 1 月到 11 月期间，诉前程序案件占比超过 94%（见表 4），通过诉前程序敦促行政机关整改这一机制极大地提高了系统效率，减少了检察官的起诉工作量，也节省了法官的时间。

90% 的案件都是针对政府部门提起的，剩下的才是公司，这也彰显了检察机关提起公益诉讼案件的独特性。

典型案例

2018 年 3 月最高人民检察院发布了 10 大检察公益诉讼典型案例，详细介绍了案件详情。

湖南省蓝山县环境保护局不依法履行职责案是其中一例。蓝山县环境保护局作为蓝山县环境保护主管部门，对当地选矿厂违法排污污染环境的行为长期不完全履行职责，虽作出行政处罚决定，但一直未采取有力措施执行处罚到位。该选矿厂已被关停并拆除生产设备及厂房等，但厂内的废水未进行无害化处置。

鉴于此，蓝山县人民检察院向蓝山县环境保护局发出检察建议，后者收到检察建议后，立即进行了整改。在公益诉讼案件办理期间，当地的反渎职侵权部门也在调查行政监管部门违法行使职权或者不依法履职的违法情形。最后案件在诉前阶段就得到了解决。

但并不是检察机关提起的所有环境公益诉讼都是针对政府部门的。2018 年 9 月 14 日，南京市鼓楼区人民检察院对南京胜科水务有限公司提起诉讼。

被告企业接受排污企业高浓度废水，私设暗管排入长江。检察机关对涉案公司提起刑事附带民事公益

5. 公益诉讼工作成效

督促恢复受污染土地面积 (Km ²)	林地	2,083
	耕地	100
	草原	168
	湿地	810
督促治理恢复被污染水源面积 (Km ²)		4,917
督促治理恢复被污染土壤面积 (Km ²)		810
挽回直接经济损失 (人民币 亿)	试点期间	2018 年 1 月至 12 月
	8.9	23.9
督促整改和关停的企业		1,700 8,900

数据来源：最高人民检察院

诉讼案，要求被告承担损害赔偿赔偿责任 3.8 亿元（合 5600 万美元），是迄今全国诉请赔偿金额最大的环境污染公益诉讼案件。

面临挑战

虽然公益诉讼制度发展迅速，成效显著，对于检察机关来说，这仍是一项新制度，政府也需要时间进一步探索如何更好地回应检察建议和庭审。诚然，在过去的三年里许多检察官提起公益诉讼的能力得到了增强，但进一步提升整个检察官队伍的专业能力仍是重中之重。

此外，相关判例的梳理和司法解释还需完善。另一方面，是否全国 3500 个检察机关都有能力和资源起诉政府机构也是一个问题，尤其是那些财务上很依赖当地政府的检察机关，承担判决任务的当地法院也面临着同样的问题。

展望未来

两年的试点工作和后续改革成效显著（见表 5），赋予了人民检察院全新的重要职责。

虽然检察机关提起公益诉讼仍然面临着艰巨的挑战，但有中央政府和司法机关的大力支持，相信中国的检察官队伍能够在未来提起更多更有影响力的案件。

2019 年年初，从最高人民检察院至各级人民检察院，全国检察机关纷纷设立了公益诉讼检察厅。

此举意义重大，此前，公益诉讼案件主要是民事行政诉讼厅负责处理，而这三类案件在性质上本是完全不同的。

成立专门的公益诉讼检察厅有助于强化提升队伍办理复杂环境案件的专业化水平和办案能力，专业的环境检察官能够在促进环境合规领域做出重大贡献。^⑤

婉琳，律师，加入欧洲环保协会之前，曾任卡迪夫大学可持续研究中心的研究员。

龙迪，欧洲环境法律组织欧洲环保协会中国项目的首席代表，目前与中国环保部、最高人民法院、最高人民检察院合作，支持中国开展环境治理和环境法治工作，曾任欧盟-中国环境治理项目欧方执行主任。

China's prosecutors are litigating government agencies for being soft on pollution

The rise in public interest legal actions is delivering results for the environment

□ Wanlin Wang Dimitri de Boer



A chemical factory dumps large quantities of foul smelling wastewater into the river in Ningbo

On New Year's Day, the government of Yushu Tibetan Autonomous Prefecture, in north-west China's Qinghai province, issued an official notice banning the release of non-native fish species in the waters of the Sanjiangyuan, the source of the Yangtze, Mekong and Yellow rivers.

The ban came about because the local authorities were accused of failing to stop non-native animals being released

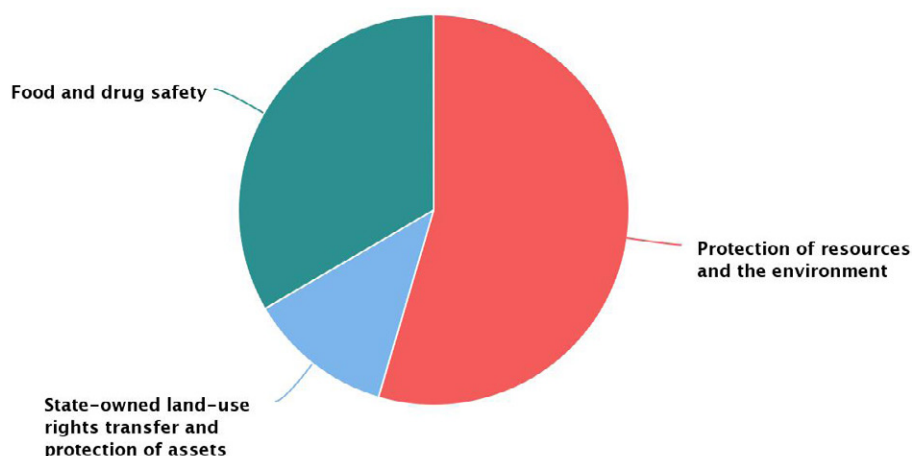
into the aquatic ecosystem and causing harm. Acting in the public interest, the provincial procuratorate – a body of public prosecutors – ordered the authorities to improve protections for the indigenous species.

The case highlights the important role played by China's prosecutors in public interest litigation.

In June 2017, procuratorates were empowered to launch

Cases by subject area

(Jan–Nov 2018)



Powered by Highcharts Cloud

Data source: The Supreme People's Procuratorate

such legal actions by the Civil Procedure Law and the Administrative Procedure Law. This followed a successful two-year pilot programme, started in July 2015, when procuratorates in 13 provincial areas were authorised to initiate public interest legal actions. During the pilot, they launched over 1,000 legal challenges in areas such as ecosystem and environment protection, natural resource conservation, food and drug safety, and assignment of the right to use state-owned land.

In July 2018, President Xi Jinping endorsed the establishment of specialised procuratorate departments to handle public interest litigations. This move will likely result in a sustained volume of cases in the coming years.

Between January and November 2018, the public interest litigation handled by Chinese procurators numbered over 89,000, among which about 55% were environmental lawsuits. This marks an important step towards law-based environmental governance.

In defence of nature

China's Environmental Protection Law of 2015 specifically empowers non-governmental organisations (NGOs) to launch environmental public interest lawsuits.

Around 700 NGOs (among over five million believed to be registered in China) meet the legal qualification requirement for bringing such suits. However, less than 40 have the financial and human resources to launch legal actions. Only nine NGOs brought cases in 2015, and about 13 in 2016.

Besides the limited capacity of Chinese NGOs to launch legal action, the law does not allow them to target environmental violations by government departments.

In 2017, a lawsuit brought by Friends of Nature, a Beijing-

based NGO, against a local environmental protection bureau in Yunnan province was dismissed by the court on the grounds that it had no standing to bring administrative public interest litigations. That right is reserved for the People's procuratorates, according to Article 25 of China's modified Administrative Procedure Law.

A new legal armoury

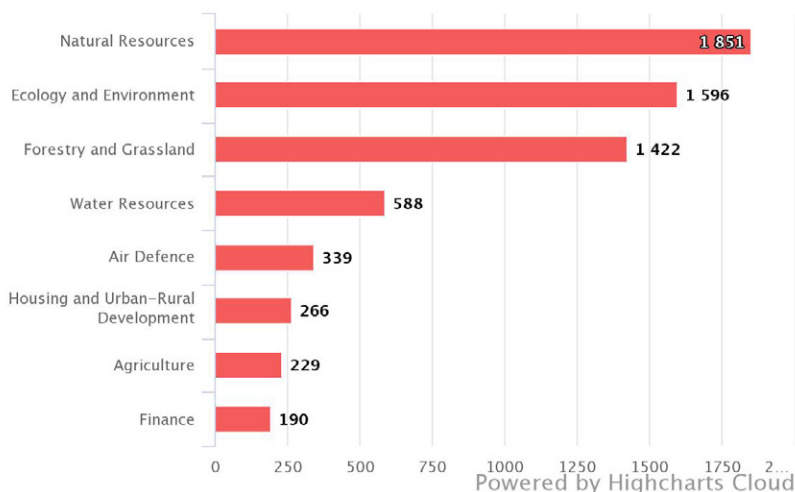
As political support for protecting the environment and addressing pollution grows, China is experimenting with new tools to stop local governments promoting revenue-generating industries that harm the environment.

Central government has dispatched high-profile special inspection squads to check on local governments and prosecutors have been brought in to beef up supervision of government departments through legal means.

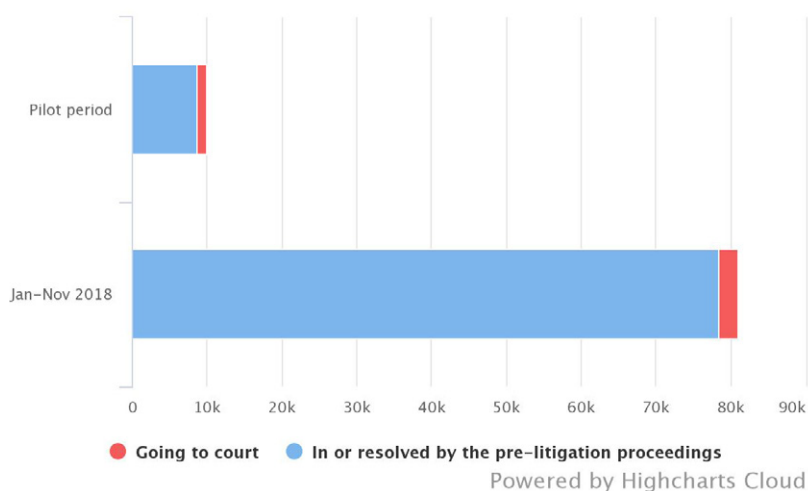
The pilot programme

During the two-year pilot period, 74% of 9,866 public interest cases handled by procuratorates were targeted at eight types of government agencies. Of these, 8,712 were in or resolved by the pre-litigation proceedings, and

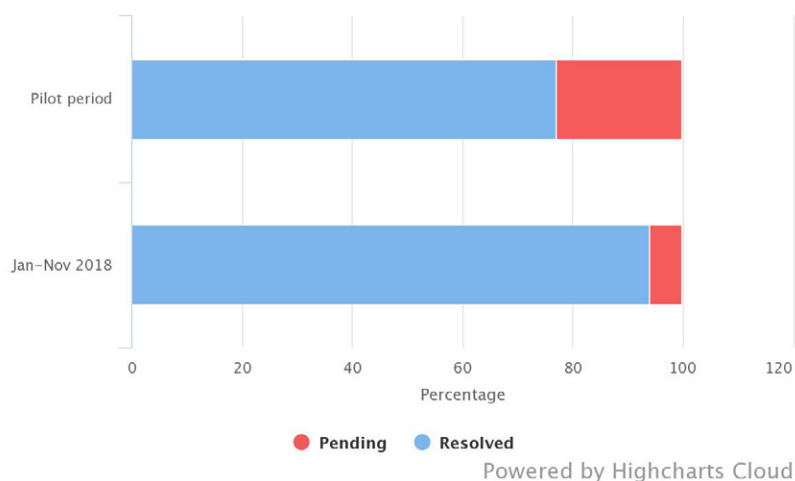
Types of government agency targeted



Result of public interest legal actions



Success rate of pre-litigation proceedings



Data source: The Supreme People's Procuratorate

the remaining 1,154 cases went to court. Among these, nearly all concluded in favour of the prosecutors.

Procedurally, before a procuratorate can file a public interest case in court, they must first send a “warning notice” (pre-litigation recommendation) to the government agency, reminding it to fulfil its legal obligations and rectify the situation. Two months is usually given to make corrections, or 15 days for urgent cases. During the pilot programme, over 75% of government agencies took action following warnings. For instance, in Asake, Gansu province, 17 industrial plants responsible for asbestos pollution over 60 years were shut down by the local environment agency as soon as the procuratorates became involved.

In the period of January to November 2018, over 95% of cases were handled through pre-litigation proceedings with a success rate of 94.42%, up 17.3 percentage points from the pilot period. This testifies to the value of such proceedings, according to a report from the Supreme People's Procuratorate.

Ninety percent of cases were brought against government agencies, with the remainder against companies. This points to the unique role of the procuratorate in holding government agencies to account compared to NGOs.

Typical cases

In 2018, the Supreme People's Procuratorate provided a glimpse of how cases work when it released a set of ten typical public interest litigations initiated by prosecutors around the country.

In the case of Lanshan county, Hunan province, the local environmental protection bureau had ignored the failure of a mineral processing company to comply with an administrative order. The company had left behind environmental waste after it dismantled a facility.

The local procurator issued a pre-litigation warning to the environmental bureau that led to an immediate correction of the wrongdoing. In parallel, the local anti-dereliction body took action against agency staff members for failure to carry out their duties. The case was resolved before going to trial.

Not all legal actions brought by prosecutors were against government agencies. For instance, a case was filed in September 2018 against Nanjing Shengke Water Company by the procuratorate of Gulou district, Nanjing, Jiangsu province.

The company accepted the transfer of high concentration wastewater from other companies but discharged it directly into the Yangtze River through concealed and unauthorised pipelines. A criminal and a civil case were filed, claiming over 380 million yuan (US\$56 million) from Shengke for environmental damage. If successful, it will be the highest payout awarded for environmental damage in a case brought by prosecutors.

Challenges

Despite the rapid progress and impressive results, public interest litigation is still rather new to the procuratorates

and to the government departments receiving legal warnings. Although many prosecutors have enhanced their expertise in the past three years, raising the overall professional capability remains a priority.

Certain precedents and judicial clarifications are still needed, and there is some concern that not all of the country's 3,500 procuratorial bodies may be ready to file lawsuits against peer government agencies, especially when their financial resources are dependent on local governments. The same concern applies to local courts that decide on cases.


What to expect

The two-year pilot programme and resulting reforms have initiated an important new role for procuratorates in China.

Even though the challenges confronting prosecutors can be formidable, with high-level political support from both the central government and top judicial bodies, we can expect prosecutors to bring a growing number of influential public interest lawsuits.

Specialised public interest litigation departments will be established in procuratorates around China, including at the national level (the Supreme People's Procuratorate) at the beginning of 2019.

This is important because prosecutors in the civil and administrative branches were previously responsible for handling cases, despite the work differing from their normal workload.

The establishment of specialised departments will allow entire teams to focus exclusively on public interest cases and develop staff with expertise to pursue complex environmental cases. 

Wang Wanlin is a qualified lawyer in China.

Dimitri de Boer is chief representative in China of ClientEarth, a European environmental law group.

Outcomes		
Damaged Land recovered (Km ²)	Forest	12,647
	Farmland	607
	Grassland	1,020
	Wetland	2,764
Polluted Water Sources recovered (Km ²)		4,917
Polluted Soil recovered (Km ²)		959
Direct economic losses recovered (CNY bn)	Pilot Period	Jan-Dec 2018
	8.9	23.9
Facilities ordered to rectify or closed down	1,700	8,900

Data source: The Supreme People's Procuratorate

冰川融化将给中国和南亚带来挑战

最近一份报告揭示了兴都库什 - 喜马拉雅地区冰川退缩会带来哪些威胁。

□ 奥梅尔·艾哈迈德



爱姆扎湖，尼泊尔境内最大的冰川湖泊之一，因为气候变迁正在扩张

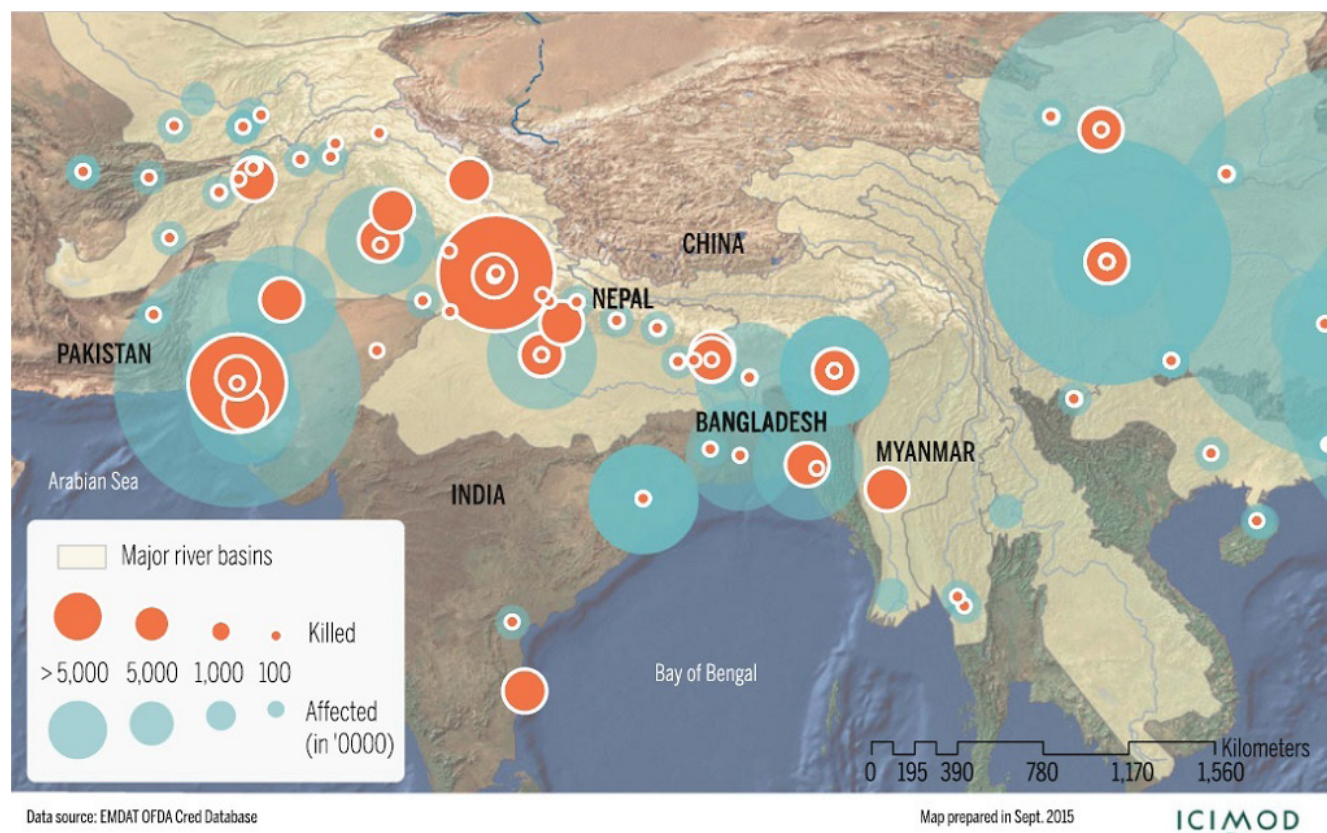
国际山地综合开发中心(ICIMOD)的一份报告显示，到2100年，即便全球温度升高幅度能控制在1.5摄氏度以下，兴都库什 - 喜马拉雅地区的冰川总量仍会减少三分之一。

若全球平均气温升高2摄氏度，则会有49%的冰川消失。

兴都库什 - 喜马拉雅地区监测和评估项目(HIMAP)的这份报告探讨了导致该地区这一变化的16个因素，填补了政府间气候变化专门委

员会(IPCC)在这方面的空白。

众所周知，兴都库什 - 喜马拉雅地区素有亚洲水塔之称。雅鲁藏布江、恒河、印度河、湄公河、黄河、长江等十大河流都发源于此。喜马拉雅山和青藏高原气温升高的速度



2010-2014年间，发源于兴都库什-喜马拉雅地区的河流流域受洪灾影响的范围和程度
资料来源：EM-DAT/CRED

是全球平均值的三倍。上世纪 70 年代以来，这里已经有 15% 的冰川消失了。

冰川后退将给生活在喜马拉雅山区的 2.4 亿人带来直接的影响。对他们中的很多人来说，冰雪融水是不可或缺的。

不仅是他们，下游地区的 19 亿人也将面临种种问题，而最受影响的地区之一就是流经中国、印度、巴基斯坦、以及阿富汗的印度河流域。

汇入印度河的雪融水和冰川融水占其径流量的近 80%。可以说，所有这些发源于喜马拉雅地区的河流当中，最离不开雪融水和冰川融水就要数印度河了。相比之下，恒河和雅鲁藏布江则大部分依靠降雨。随

着冰川后退速度的加快，印度河的径流量虽然会增加，但却变得更加难以预测。

苏黎世大学地理系的托拜厄斯·布鲁赫是上述报告兴都库什-喜马拉雅地区冰雪圈相关章节的主要作者之一。他说道：“印度河冰川覆盖范围很大。虽说喀喇昆仑山脉的冰川处于物质平衡的状态 [即冰川的堆积速度与消融速度相当]，但这种平衡中却既有冰川的融化又有冰川的快速推进。这个过程增加了冰川湖发生溃决洪水 (GLOF) 的风险。而另一方面，[喜马拉雅西麓印度] 拉胡尔和斯皮提县快速退缩的冰川也给其下的土壤结构造成了破坏。”

他还说，冰雪圈中消失的并不只是冰川。随着冰川的退缩而解冻

的冻土层（即冻结多年的地下层）也会导致山体不稳。

据 ICIMOD 流域及冰雪圈区域项目总监阿伦·巴荷塔·什雷斯塔介绍，印度河流域地区也是最关注降雨的地区之一。虽然科学上还无法对影响南亚季风的西部气旋作出解释，但此地降雨模式变得更加不均，极端天气事件增多却是显而易见的。

灾难增加与危险的大坝

印度河流域是兴都库什-喜马拉雅地区受极端天气事件影响最严重的地区之一，1980 年至 2015 年间死于极端天气事件的人数也是最多的。而拟建或在建的大坝和水电项目很有可能会加剧这些风险。这些

项目中就包括中 - 巴经济走廊项目中在中方资助下修建的巴基斯坦水利项目。

既然这些河流的径流量至少到2050年都有可能保持不变或增加，那么要想对拟建的大坝项目重新进行评估就不太可能了。毕竟，径流量变化对大型蓄水项目来说是个利好，因为它们可以起到平稳河流全年流量的作用。

遗憾的是，从南亚以及其他地区既往的水电项目来看，它们最明显的特点就是缺少环境保障措施。而且，单就印度来说，仅占全国人口8%的原住民社区却占到了大坝建设

动迁人口的40%，其中最主要的原因是因为他们都居住在山区。

中国、印度、巴基斯坦、阿富汗这四个印度河流域国家之间复杂的关系也让这一地区面临的问题更加严峻。鉴于其给整个流域以及流域地区群众带来的威胁，制定该地区开发方案时最好能够站在整个区域的角度全面考虑问题，并且同时还要结合制定灾害管理方案。

为了更好地应对这些问题，一些人呼吁将中国和阿富汗也吸纳为《印度河用水条约》的成员国。但是，在《条约》自身都面临压力的情况下，似乎没有太大的余力来推进这一进程。

兴都库什 - 喜马拉雅地区监测和评估项目（HIMAP）的这份报告为印度河流域的居民敲响了警钟，并且推动各方围绕发展规划过程中的关键问题展开了一场对话。遗憾的是，这份报告中也清楚地说明，目前仍然缺少有关山地地区精确的地理信息。这是因为，有关山区的决策在很大程度上仍是由决策者说了算。除非这种情况有所改变，否则印度河仍将是一条多灾之河。^⑤

奥梅尔·艾哈迈德，第三极网站 (thethirdpole.net) 执行编辑，第三极网站关注喜马拉雅地区的跨界水资源问题

Melting glaciers spell more disaster for China and South Asia

A landmark report highlights the threats of glacier retreat in the Hindu Kush Himalayan region

□ Omair Ahmad

Glaciers in the Hindu Kush Himalayan region could lose over a third of their volume by 2100 even if the world manages to keep global warming below 1.5C, according to a report by the International Centre for Integrated Mountain Development (ICIMOD).

If the global average temperature hits 2C then 49% of the volume of these glaciers will be lost.

The findings from the Hindu Kush Himalayan Monitoring and Assessment Programme (HIMAP) report looked at 16 components of change in the region, filling in gaps left by the Intergovernmental Panel on Climate Change (IPCC).

The region, which is known as Asia's water tower, is the source of ten major rivers, including the Brahmaputra, Ganges, Indus, Mekong, Yellow River and Yangtze. The Himalayan



China in focus

and Tibetan Plateau is already warming at three times the global average. Since the 1970s, 15% of the ice has gone.

The retreat of these glaciers will have an immediate impact on the 240 million people that live in the mountains, many of whom are critically dependent on the water from snow and ice melt.

Downstream regions, which are inhabited by 1.9 billion people, will also face problems. One of the most affected basins will be the Indus, which is shared by China, India, Pakistan and Afghanistan.

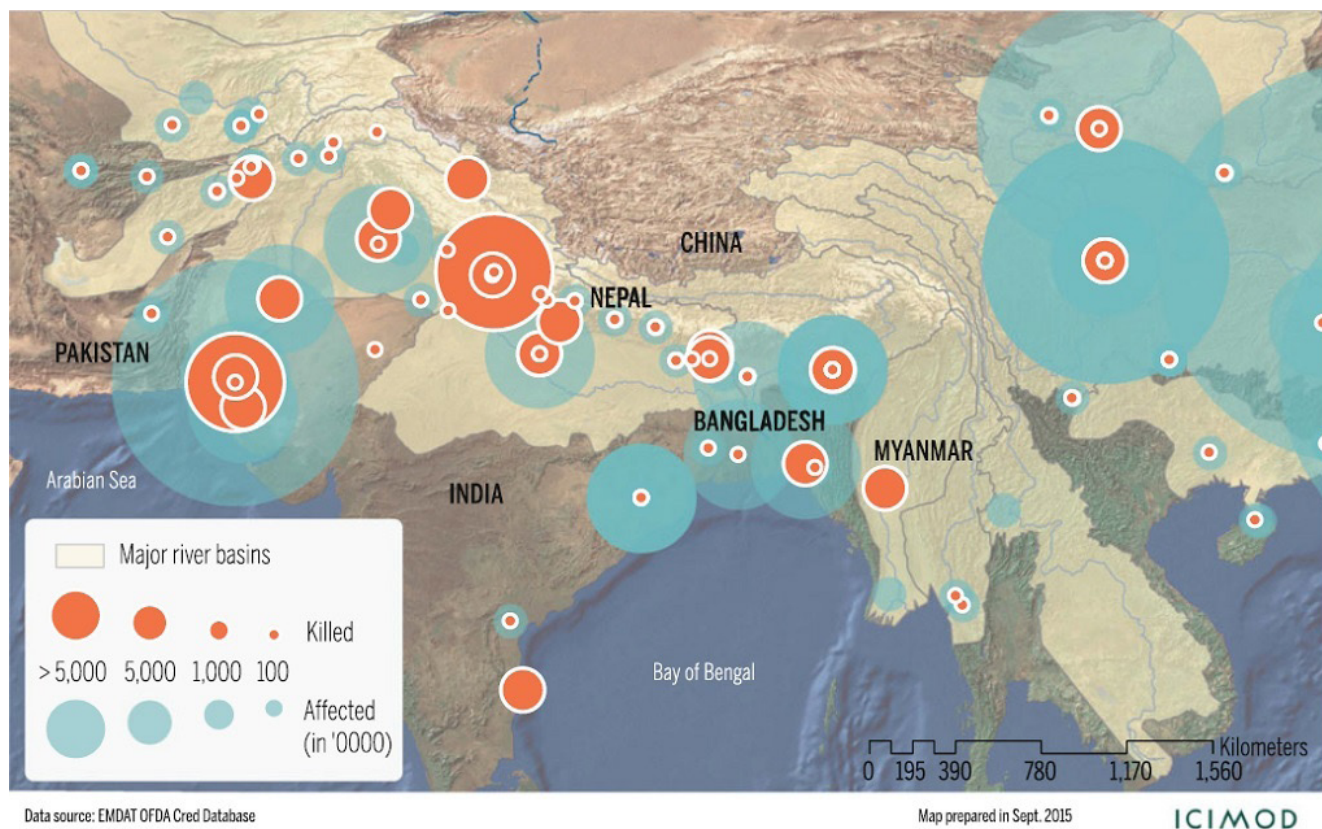
The Indus River is most dependent on snowmelt and glacier melt, which contribute close to 80% of its water. In comparison, the Ganges and Brahmaputra, known as the Yarlung Tsangpo in China, are mostly dependent on runoff from rainfall. As the glaciers retreat at a sharper pace, the Indus basin will have more water flowing in, but it will be less predictable.

Tobias Bolch, from the University of Zurich's geography department and one of the contributing lead authors of the

chapter on the cryosphere in the Hindu Kush Himalayan region said, "The Indus glaciers span a large region. In the Karakoram range there is a mass balance [the glaciers are gaining as much ice as they lose], but that is a mix of melting and rapid advance of some glaciers. This increases the risk of Glacier Lake Overflow Floods. In Lahaul Spiti [in the western Himalayas of India], on the other hand, you have rapid glacier retreat, and this destabilises the land from where the glaciers retreat."

He added that the cryosphere was not just the glaciers. The melting of permafrost – perennially frozen ground beneath the surface – as glaciers retreat will also destabilise the mountains.

According to Arun Bhakta Shrestha, the regional programme manager for river basins and cryosphere at ICIMOD, the Indus region is also one of the areas of most concern for rainfall as well. Although the science on the western disturbance which affects the South Asian monsoon remains unclear, it is already evident that rainfall patterns



Extent and impact of flood disasters in river basins originating in the Hindu Kush Himalayan region from 2010-14 (Source: EM-DAT/CRED)

have become more uneven, with an increase in extreme weather events.

More disasters, dangerous dams


The Indus basin is already one of the most affected by extreme weather events in the Hindu Kush Himalayan region, with the most people killed from 1980 to 2015. These risks are likely to worsen because of dam and hydropower projects that are planned or being built. This includes hydro projects in Pakistan that are supported by China under the China-Pakistan Economic Corridor project.

With sustained or increased water flow expected in the rivers until at least 2050, it is unlikely that planned dam projects will be reassessed. Indeed, the variation of water flows will be a boost to those in favour of large water storage projects to stabilise availability over the year.

Unfortunately the history of hydropower projects in South Asia – and elsewhere – has been marked by a lack of regard for environmental safeguards. Moreover, in India alone, indigenous communities, accounting for only 8% of the population, have accounted for 40% of those displaced by large dams, primarily because they live in mountainous regions.

Compounding the problem for the Indus basin is the difficult relationships between the four countries that share it: China, India, Pakistan and Afghanistan. Given the stark threat to the whole basin and the people that live within it, development plans would ideally incorporate findings for the entire area, with coordination of disaster management plans, too.

Some have called for an expansion of the Indus Waters Treaty to include China and Afghanistan to better deal with these issues. But with the treaty itself under strain, there would seem to be limited scope for this to happen.

The HIMAP report should act as a warning for those living in the Indus basin, and spur a conversation on key issues of development planning. Unfortunately, the report also makes clear that geographically precise information from mountainous regions remains sparse. This is because decision-making for mountain areas is still largely controlled by policymakers in the plains. Until and unless that changes, the Indus will continue to be a river of disasters. 

This article is republished from The Third Pole

Omair Ahmad is the managing editor, South Asia, at The Third Pole (www.thethirdpole.net), which focuses on transboundary water issues in the Himalayan region.

奖还是罚：中国垃圾分类的探索

垃圾分类在中国应该以奖励还是处罚的方式推广？

□ 王晨



北京的垃圾焚烧发电厂里垃圾每天多到烧不过来

北京南城一个寒冷的冬日早上，六十岁的劲松五区居民李敏提着一袋自己在家挑拣好的厨余垃圾走到 300 米外社区另一头的“绿馨小屋”。在那里，工作人员对厨余垃圾称重后，李敏的专门账户里计入了相应的积分。每两天去投放一

次厨余垃圾成了李敏这大半年来必做的一件事。这个习惯也带来了实际的好处，她拿出一个写着“首创智慧绿卡”的小磁卡说，“这个垃圾分类不白做，我已经积了有四五百分了，手纸、洗衣粉，还有抱枕，换了好多东西。”

“绿馨小屋”是劲松街道与北京首创智慧环卫发展有限公司、中环创新科技发展有限公司合作在劲松五区设立了一年多的厨余垃圾投放点，通过积分奖励的方式激励居民对垃圾进行干湿分离。居民可用积分在“绿馨小屋”和工作人员换取生活用品。

2017年发改委、住建部发布《生活垃圾强制分类制度方案》(以下简称“《方案》”)后,中国城市再次开始大力推行垃圾分类。“垃圾分类工作就是新时尚”,2018年11月初习近平主席在上海虹口区考察时的一句话,让垃圾分类重新成为中国城市管理的热点议题。

但新一轮的垃圾分类热潮以“奖励”带动分类的思路也面临来自现实的考验和有效性的质疑。

垃圾分类持久战

中国最早提出垃圾分类概念要追溯到1957年年7月12日在《北京日报》刊登的《垃圾要分类收集》一文,在当年物质极端匮乏的状态下,垃圾分类概念还留存在“勤俭节约”层面。而垃圾分类相关政策制定是从上世纪九十年代开始。1996年北京开始有了多个垃圾分类

试点小区;2000年,原建设部将包括北京、上海、杭州、南京等8个城市确定为首批“生活垃圾分类收集试点城市”。

早期的城市生活垃圾分类尝试,很多都由于忽视培养居民分类习惯养成和后续收集处理不善而不了了之。以北京为例,试点工作开始后的十余年里,已经有3795个小区开展了试点工作,几乎占到北京小区的一半。但由于居民分类投放参与度低、过度依靠二次分拣,试点的垃圾分类整体效果不佳。尽管尝试一直在进行,和废物循环利用率超过50%的德国、日本等国相比,中国生活垃圾分类一直停滞不前。

2015年由中国人民大学国家发展与战略研究院发布的《我国城市生活垃圾管理状况评估》指出,垃圾分类试点多年后,试点城市人均生活垃圾清运量没有显著下降,北京的纸类回收率仅25%,进一步回收空间巨大。

2017年的《方案》中为2020年底生活垃圾回收利用率制定的目标也只有35%。

公益组织北京零废弃联盟的发起人陈立雯与她的团队多年来致力解决城乡垃圾分类减量问题。陈立雯告诉中外对话,占到垃圾总量30%的可回收物会被市场驱动的废品回收业吸收,此外的厨余与其他垃圾的流向路径基本上是“混投混收混运”,一路到终端的填埋场、堆肥厂或焚烧厂。

混合垃圾的不当处理带来的后果触目惊心。中央电视台的系列节目《三问垃圾分类》就向观众展示了这样的景象:120米深的杭州青龙坞山谷10年内就被填满,每天产生近4000吨垃圾污水和渗滤液;北京的垃圾焚烧发电厂里垃圾每天多到烧不过来……

奖品换分类?

《方案》发布后,中国又燃起了一股垃圾分类试点的热情。据环境数据机构“环境司南”统计,截至2018年9月30日,全国已经有104个地级城市和342个区县进行第三方运营的垃圾分类项目,远超方案中提出的46个试点城市范围。

而《方案》中明确将“积分奖励”作为机制创新进行鼓励,也使得“以奖促分”的分类项目遍地开花,尽管目前没有关于奖励型垃圾分类项目的确切数据。

从2017年开始,李敏所在的劲松五区开始实行智慧垃圾分类。据北京晚报报道,小区中1167户居民中的73%参与到了智慧垃圾分类中。一公斤的厨余垃圾积2分,1公斤可回收垃



除了厨余垃圾,劲松五区的其他垃圾都会被混合投放至这些垃圾桶,上面的积分磁卡感应区已经不能使用

圾积 10 分。积累 30 分以上可以兑换类似于卫生纸和洗衣粉的生活用品。

奖励垃圾规范倾倒，尤其是厨余垃圾定点倾倒，使小区干净了不少。四十五岁的废品回收业者郑红梅在劲松五区周边收废品四五年了，她对中外对话说，“这个小区是这附近最干净的小区”。

相比于对公共系统投入和执行成本要求更高的监督处罚的方式，奖励手段靠“甜头”吸引公众参与，也便于统计，成效看得见，因此受到城市欢迎。

除了北京，浙江湖州的吴兴区在一些小区进行“蓝绿积分”试点，投放厨余垃圾为绿积分，可兑换鸡蛋蔬菜或家政服务，可回收物积蓝积分，用以兑换生活用品。杭州一些小区中出现了“(垃圾)桶长制”，被委任为“桶长”的居民督导其他居民正确投放，并且依据投放情况对居民打分，分数能换取生活用品。

但奖励积分政策本身的持续性受到业内人士的怀疑。

罚与奖谁更优

奖励手段能否有助居民垃圾分类习惯培养和责任感建立，中国人民大学研究环境政策管理的宋国君教授对此并不乐观。“分类必须是集体行动，这样才能有规模效益，而奖励是号召性的，必然达不到集体行动全面覆盖的要求，”宋国君说。

陈立雯也认为奖励措施和“谁产生谁负责”的原则相悖。“商业方式鼓励垃圾分类，本身就存在鼓励产生更多垃圾的可能，”陈立雯说，“这本身也和垃圾减量的理念背道而驰。”

中国长期依靠鼓励宣传手段推进垃圾分类。由于不分类的情况太普遍，分类制度太过粗放，处罚难度大，怎么才算分类合格，不合格的怎么罚，罚多少，执法部门也一头雾水。

以处罚和监督的方式推行垃圾分类也在进行。2018 年 7 月 1 日正式实施的《广州市生活垃圾分类管理条例》提出“谁产生谁付费，多产生多付费”的原则，并且规定“个人未按规定将生活垃圾分类投放的，将处二百元以下的罚款。”这是“个人”首次作为垃圾分类责任主体出现在地方性规章中。在深圳，政府为生活垃圾分类推进制定了详细的进程，计划在小区内撤掉垃圾桶并设置一个垃圾投放站点集中分类投放，还要在投放点安装摄像头，监督投放，违规罚款。

但正如一位广州市民在《南方都市报》上撰文指出的：“罚款有没有效果，要考虑执法有没有足够人力，执法标准能否统一。这些后续工作，比立法本身难度更高。”

此外，后端清运过程中的混收也是中国垃圾分类急需解决的问题。社区生活垃圾分类试点的清运系统如果跟不上垃圾分类的创新，还是

会出现“前端分好类，清运又混合”的尴尬局面。

中国的生活垃圾清运量每年还在快速地增长着。生态环境部公布的数据显示，2016 年，中国 214 个大、中城市产生 18850.5 万吨城市生活垃圾。城市垃圾清运量在 30 多年间增加了 5.8 倍。

“现有的收运系统机制与分类方法，远不能够达到承载如此大量并且一直在增长的垃圾量，但越是严峻越要尽快行动，”陈立雯说，“小修小补不能带来本质改变”。

没有强制性的垃圾分类在北京劲松五区也正在面临挑战。因为居民嫌厨余垃圾的异味过重，小区里的厨余回收点由三个减少到一个。李敏说，“回收点在社区一头的角落里，只有每天下午两点到五点收厨余垃圾，别的时间不开放，去的人越来越少。”她觉得很多垃圾分类推广项目要求使用手机客户端，对老年人也并不友好。

负责称重厨余垃圾的工作人员赵茗表示：“居民们众口难调，有的嫌弃有味道要求撤掉，但是撤掉了居民又嫌仅剩的这一个离家太远。而且厨余里面也经常会有塑料纸巾等其他垃圾需要再分拣。”

(文中部分被采访人为化名)

王晨，中外对话编辑助理

Should Chinese citizens be paid to recycle?

Beijingers can swap food waste for household supplies, but critics say the scheme won't scale

□ Wang Chen



A food waste station at Jinsong Apartment Complex No. 5, Beijing.

On a cold winter's morning, 60-year-old Li Min carries a bag of food waste to a station at her apartment complex in Jinsong, Beijing. She has made the trip every two days for the last six months. A worker weighs her bag and rewards her with points. "It's not a waste of time," Lin explains, showing off her points card. "I've earned four or five

hundred points, which I've exchanged for lots of useful stuff: toilet paper, laundry powder, cushions..."

The scheme is a response to a government push on waste sorting in cities. A plan for the compulsory sorting of household waste was published in 2017 by the National Development and Reform Commission (NDRC) and

the Ministry of Housing and Urban-Rural Development (MOHURD) published. In 2018, while visiting the Changhong district of Shanghai, President Xi Jinping spoke of a “new trend” for waste sorting, elevating the issue considerably.

But some industry insiders have questioned the reward schemes, arguing that they’re unsustainable at scale and fail to encourage people to reduce waste.

A messy history

Modern waste management in China can be traced back to 1957 when *Beijing Daily* announced that waste would be sorted for collection. Sorting was viewed as a way to promote the recycling of scarce resources but it didn’t become official policy until the 90s. Beijing launched waste sorting trials in a number of communities in 1996. In 2000, the Ministry of Construction (now MOHURD) announced trials in eight cities including Beijing, Shanghai, Hangzhou and Nanjing.

Those early tests, which reached almost half of Beijing, mostly failed. Despite ongoing experiments, China continues to lag behind countries like Germany and Japan where recycling rates are over 50%.

In 2015, an assessment of China’s management of household waste was published by the National Academy of Development and Strategy at Renmin University. It pointed out that years of trials had not led to reductions in waste sent to landfill or incinerators. The recycling rate for paper in Beijing stood at 25% – meaning there was and is huge room for improvement.

The NDRC and MOHURD’s 2017 plan for compulsory sorting of household waste sets a recycling target of 35% by 2020.

The founder of China Zero Waste Alliance, Chen Liwen and her team have been working for years to encourage

waste sorting and reduction. She told chinadialogue that the most valuable 30% of waste goes to the market-driven informal recycling sector, leaving food and other waste to be collected unsorted and sent to landfill sites, incinerators or fertiliser plants.

The consequences of inappropriate waste management are shocking. A CCTV series on the subject revealed a 120-metre-deep valley in Hangzhou filled with waste over the course of a decade. It now produces almost 4,000 tonnes of polluted water and leachate a day. Meanwhile in Beijing, incinerators are failing to keep up with the quantities of waste sent to them.

Sorting incentives

The plan for compulsory sorting of household waste sparked another round of trials. It proposed 46 local-level cities to carry out trials of third-party-run waste sorting schemes. By October last year, 104 such cities and 342 districts and counties were running trials, according to Environmental Compass.

As the plan explicitly called for “reward points” to encourage sorting, points-based systems have been widely employed. But there is no firm data yet on exactly how many of these trials are running.

Li Min’s community in Jinsong began their waste sorting scheme in 2017. According to the Beijing Evening News, 73% of the 1,167 households in the community are participating. A kilogram of food waste is worth two points, and a kilogram of recyclables 10 points. Once you accumulate 30 or more points you can swap them for household goods.

More orderly disposal of waste, particularly food waste, has made the community cleaner, says Zheng Hongmei, a 45-year-old waste merchant. She says Jinsong is the cleanest place in the neighbourhood.

Sorting systems enforced through monitoring and punishments are more expensive to install and run. By contrast reward-based systems encourage public participation, aid the collection of statistics and have visible impacts. Hence city governments welcome them.

In 2016, China’s 214 medium- and large-sized cities produced 190 million tonnes of waste.

A similar trial is underway in the Wuxing district of Hangzhou, where points acquired for food waste can be swapped for eggs, vegetables and cleaning services. Meanwhile points for recyclables unlock household goods. Some other communities in Hangzhou now have “bin boss” residents who ensure neighbours sort waste properly and award them points.

Industry insiders are dubious about the sustainability of such schemes.

Reward or punishment?

Song Guojun researches environmental policy at Renmin University. He is sceptical that rewards will foster the right habits and sense of responsibility: “Sorting needs to be a mass activity to achieve scale, and these incentives won’t provide the necessary coverage.”

Chen Liwen thinks the rewards go against the principle of “consumer responsibility”, saying that “financial rewards for sorting may encourage the creation of more waste, which won’t help reduce waste quantities.”

China has long relied on publicity to encourage waste sorting. But failure to sort is too widespread, and sorting systems too crude, to allow for punishments for non-compliance. How best to enforce compliance? If by fines, how large should they be?

Trials based on monitoring and punishments are also underway. In Guangzhou, regulations introduced in July last year state that those producing waste must pay for its disposal. Fines of up to 200 yuan will be imposed for failing to sort waste. This is the first set of local regulations placing responsibility for waste sorting on ordinary residents. In Shenzhen, the government has come up with a detailed plan for implementing waste sorting. They will remove bins and replaced them with drop-off points. Cameras will monitor deposits of waste, and people will be fined if they breach waste sorting regulations.

As one Guangzhou local wrote in the Southern Metropolis Daily, “the effectiveness of fines will depend on having adequate personnel for enforcement and consistency in application. That follow-up work will be harder than passing the rules.”

Another problem is keeping waste sorted after it’s been collected. If transportation arrangements don’t keep up and do their job, waste can get mixed up again.

In 2016, China’s 214 medium- and large-sized cities produced 190 million tonnes of waste, according to the Ministry of Ecology and Environment. Transportation of this kind of urban waste has increased almost six fold in the last 30 years.

“The existing transportation systems and sorting methods are nowhere near adequate to deal with such huge and increasing quantities of waste, but that just means we need to act sooner,” said Chen Liwen. “Minor fixes won’t bring the real change we need.”

The non-compulsory sorting in Jinsong is facing its own challenges. The number of food waste stations has been cut from three to one after complaints about the smell. “The recycling point is in a corner and only takes food waste from 2pm to 5pm... Fewer and fewer people are using it,” says Li Min. She adds that elderly people don’t like the mobile phone apps that many waste sorting schemes use.

Zhao Ming’s job is to weigh the food waste when it’s dropped off: “It’s hard to please everyone. Some people complain about the smell and want the drop-off points removed. Others complain the drop-off point is too far away. And we often find plastic or paper in the food waste and have to pick it out.” ☺

Some names have been changed.

Chen is one of our junior researchers on our Beijing editorial team.

新时代的中拉关系

随着中国通过基础设施建设和媒体合作带来日益增长的影响力，新版的“中拉对话”已经成为了解中拉关系的一份必备读物。

□ 伊莎贝尔·希尔顿

2018年，中国与拉丁美洲和加勒比地区的关系取得了显著成就。先是5月份特立尼达和多巴哥与中国签署了共建“一带一路”谅解备忘录。截至2018年年底，包括玻利维亚、安提瓜和巴布达、圭亚那、乌拉圭、哥斯达黎加、委内瑞拉、智利和厄瓜多尔在内的多个拉美国家都积极加入了“一带一路”倡议（BRI）这个中国倡导的全球商贸与基建项目中。除此之

外，萨尔瓦多也首次改变外交策略，与中华人民共和国建交。新加入“一带一路”的国家，无论大小，都受到了热烈欢迎。中国政府认为这个项目带来的投资和发展将会改变拉丁美洲的未来。

中拉关系的这一转变之所以令人瞩目是因为在中华人民共和国成立后的50年里，中国对拉丁美洲这个美国门罗主义所定义为美国专属的权益地区毫无兴趣。而拉丁美洲

对中国也兴趣不大。除了1960年古巴新革命政府与中国建立了外交关系，以及1970年智利与中国建交之外，大多数拉美国家都是直到1972年美国总统尼克松访华——这一意味着世界政治格局发生变化的标志性事件之后才正式承认了中华人民共和国。阿根廷与墨西哥在1972年与中国建交，而巴西和玻利维亚也相继于1974和1985年与中国建交。

但是，即便是这样，双方之间的关系仍不密切。20世纪90年代初，邓小平提出的新的改革与开放政策让中国搭上了一波全球化浪潮，赶上了世界上规模最大、发展最快的一场工业化革命。百业待兴的中国迫切需要拉丁美洲的能源和原材料。但是，一直到2000年初，中国国家领导人才开始访问拉丁美洲国家。

正是从那一年开始，中拉关系发生了变化。2010年，中国已经超越美国成为南美最大的贸易伙伴，同时也是该地区最大的投资方。如今，一系列引人注目的大型基建项目公告让拉美成为了中国未来全球



© Shealah Craighead

习近平主席与特朗普总统的会面

化愿景的一部分，虽然很多项目目前还处于停滞状态，甚至实现起来困难。

双方的合作并不仅限于贸易和发展领域。为了在该地区树立良好形象，中国还花重资打造中国媒体的西班牙语和葡萄牙语版面，同时积极培育地方合作伙伴。用中国的话来说，就是建立一种双赢和互惠互利的双边关系。

然而，现实总是更为复杂，这一点无可避免。虽然很多政府都对允诺的投资非常感兴趣，但却并不一定都愿意参与“一带一路”。尽管2018年11月在布宜诺斯艾利斯举行的G20峰会期间习近平主席与阿根廷总统马克里进行了双边会谈，但是阿根廷依然没有正式签约加入“一带一路”。其邻国巴西，新任总统博尔索纳罗更是曾多次发表反华言论。委内瑞拉的重重危机也让美国官员的一些有关中国影响威胁论和“债务陷阱外交”的说法有了更大市场。越来越多的证据显示，华盛顿方面未来很可能会强迫其合作伙伴在美之间做出一个选择。

与此同时，中国也在积极展开自己的外交努力。2018年1月，中国-拉美和加勒比国家共同体(CELAC)论坛第二次部长级会议在智利首都圣地亚哥召开。拉美和加勒比国家共

越来越多的证据显示，华盛顿方面未来很可能会强迫其合作伙伴在美之间做出一个选择。



墨西哥总统安德烈斯·曼努埃尔·洛佩斯·奥夫拉多尔

同体(CELAC)2011年在委内瑞拉成立，是一个拉丁美洲区域集团，成员不包括美国和加拿大。来自31个拉丁美洲和加勒比国家的部长以及包括联合国拉丁美洲和加勒比经济委员会在内的四个区域组织和多边机构的负责人，一同聆听了中国外交部长王毅关于“一带一路”积极效益的陈述。与特朗普总统对美墨边境以南的公开敌意和“美国优先”的保护主义论调形成鲜明对比的是，王毅部长承诺，中国将始终致力于和平发展的道路和改革开放双赢战略，并随时准备与所有国家分享发展红利。

无论这一承诺能否兑现，对华关系的转变对拉美地区，以及其人民、资源、减缓气候变化的角色、未来发展和增长红利的分配来说都有着深远影响。关于中国和拉美地区的交往的性质和影响还有很多关键问题有待解决：比如中方投资是否会推动可持续发展，是否会使当地陷入“再初级化”的境地，导致经济困顿，当地工业被扼杀，加剧现

有环境、社会 and 气候危机？中国的贷款结构是否是可持续的，其雄心勃勃的基建出口是否会给当地带来另外一场债务危机？国内债务问题和中美贸易战等中国面临的自身经济问题是否会影响其在拉美兑现承诺的能力？中国对大豆的需求是否会破坏南美森林，而中国鱼类产品消费需求是否会耗尽当地的海洋资源？拉美民间社会如何跨越现有的语言与文化障碍，以及两个地区间遥远的地理距离，找到与中方互动的途径？

随着拉美地区新一轮不确定性的出现，中国在该地区的影响力受到了考验，一些关系中提及的利益也受到了质疑。中美贸易战已经对南美农业综合企业产生了连锁反应。在墨西哥，新任总统、资源民族主义者安德烈斯·曼努埃尔·洛佩斯·奥夫拉多尔(Andrés Manuel López Obrador, 简称 AMLO)就对墨西哥革命制度党(PRI)的腐败统治发起了挑战；而在尼加拉瓜，农村反运河

抗议者则全力支持全国的反政府抗议。于此同时，在同样深陷危机的阿根廷，当地批评人士也对农业出口模式提出了质疑。

2018年5月，由中方部分出资建设的哥伦比亚伊图安格（Hidroituango）大坝出现垮塌。由此引发的环境危机不仅成为了新闻头条，也让一个月后举行的哥伦比亚总统大选首次将环境问题纳入竞选话题。秘鲁是拉美地区与中国建交时间最长的国家之一，然而近年来也在矿业管理问题上与中国出现了越来越多的冲突。

在这样一个富有多样性的地区，对华关系也是复杂而多面的。但最重要的是，要让那些处在这场巨变中的人们能够讲出他们的故事，要对官方宣传和权利人士的声明进行质询，要让公众听到那些受影响民众的声音。中拉对话（Diálogo

Chino）致力于通过自己充满活力的网站，对这些关键事件用三种语言（英语、西班牙语和葡萄牙语）进行报道和分析。

未来一年，我们将追踪《埃斯卡苏协定》（Acuerdo de Escazú）的进展，该协定旨在保护环保人士，但是目前必须争取得到国会的认可。我们还会评估中-萨两国新建外交关系对2019年萨尔瓦多总统选举的影响，以及是否会使该国改变2017年出台的全面禁止金属采矿禁令。2018年年底，阿根廷民众对现任总统表现进行了评判，认定其政策制定受到了前任政府签署的中国贷款条件的限制。我们将从拉美地区的雨林和海洋给您带来报道，探讨中国和此地区关系对全球生态环境意味着什么，并分析这些快速发展的合作伙伴关系中被低估的气候、社会和经济影响。

改革开放让中国从政治和经济上与世界紧密地结合在了一起。在近日召开的庆祝改革开放40周年大会上，习近平主席发表重要讲话，高度赞扬了中国在提升文化软实力和国际影响力方面取得的成功。如今，全球媒体面临着一个共同挑战——如何客观公正地理解和讲述中国崛起的故事。我们的报道是独立、无党派意识和不含政治宣传意味的。随着拉美与中国关系的不断加深，拉丁美洲乃至全球的读者需要，而且应该得到有关这一方面准确可信的信息。而中拉对话（Diálogo Chino）能够做到这一点。📞

英文原文首发于中外对话网站中拉对话

伊莎贝尔·希尔顿，中外对话的首席执行官及总编

China and Latin America: A relationship transformed

As China's influence grows through infrastructure and media deals, the new-look *Diálogo Chino* is essential reading

□ Isabel Hilton



Chinese President Xi Jinping with Salvadorean counterpart Salvador Sánchez Cerén. The two countries established diplomatic relations in 2018

China scored some notable triumphs in its relations with Latin America and the Caribbean in 2018. First signalled by Trinidad and Tobago in May, countries throughout the region embraced China's flagship global trade and

infrastructure programme, the Belt and Road Initiative (BRI). By the end of the year, Bolivia, Antigua and Barbuda, Guyana, Uruguay, Costa Rica, Venezuela, Chile and Ecuador had been added to the tally of those signing

BRI agreements, along with El Salvador, which was first obliged to shift its diplomatic recognition from Taiwan to the People's Republic. Each new subscriber to the initiative, large or small, was warmly welcomed aboard what Beijing presented as the investment and development project that would define Latin America's future.

It is a transformation of relations the more remarkable for the fact that, for the first fifty years of its existence, the People's Republic of China (PRC) took little interest in Latin America, a region the US had defined in the Monroe Doctrine as its exclusive area of interest. The indifference was mutual. In 1960, the new revolutionary government in Cuba established diplomatic relations with China, but with the exception of Chile (1970), most other Latin American governments did not recognise the PRC until after President Nixon's 1972 visit to Beijing signalled that the world's alliances were changing. Argentina and Mexico recognised the PRC that year, followed by Brazil in 1974 and Bolivia in 1985.

Even then, engagement remained sparse, despite Deng Xiaoping's new policy of reform and opening, launched in earnest in the early 1990s, which helped China to ride a wave of globalisation that triggered the world's biggest and fastest industrial revolution. China's expanding industries were hungry for Latin America's energy and raw materials, but it was not until 2001 that a Chinese head of state – the then president Hu Jintao – came to the region, visiting Brazil, Argentina, Chile and Cuba.

Since that year, relations between Latin America and China have been transformed. By 2010, China had displaced the US to become South America's largest trade partner, as well as the region's biggest investor. Today, a series of eye-catching announcements on infrastructure mega-projects has embedded Latin America in China's vision of the global future, even if many have stalled and seem unlikely to come to fruition.

Nor has the effort been confined to trade and development: keen to build a positive image in the region, China has also invested heavily both in Spanish and Portuguese language versions of its own state and Party media, and in cultivating local partners. The story that

China tells is about win-win deals and mutual benefit.

Reality, inevitably, is more complex. Whilst many governments are enthusiastic about the promised investment, not all have committed to the BRI. Argentina neglected to formally sign up, despite a bilateral meeting between President Xi and President Macri on the sidelines of November's G20 summit in Buenos Aires. In neighbouring Brazil, the newly elected president Bolsonaro has a track record of anti-Chinese rhetoric, and the continuing crisis in Venezuela has lent weight to warnings from a series of US officials about the dangers of China's influence and what they call 'debt-trap diplomacy'. There is growing evidence in Washington that the US will increasingly aim to force a choice on its partners, between the US and China.

China, meanwhile, pursues its own diplomatic efforts: the Second Ministerial Meeting of the Forum of China and the Community of Latin American and Caribbean States (CELAC) was held in Santiago, Chile, in January. CELAC, the regional bloc formed in Venezuela in 2011, does not include the US or Canada. Ministers from 31 Latin American and Caribbean countries and the heads of four regional organisations and multilateral institutions, including the United Nations Economic Commission for Latin America and the Caribbean, heard Chinese foreign minister Wang Yi insist on the benefits that BRI would bring. In an implicit contrast to President Trump's overt hostility to everything south of the US-Mexico border, and his "America First" protectionism, Wang Yi promised that, "China will always stay committed to the path of peaceful development and the win-win strategy of opening up and stands ready to share development dividends with all countries."

Whether that promise is fulfilled or not, the transformation of relations with China has far-reaching implications for the region, its people, its resources, its role in climate mitigation, its future growth and the distribution of the

It is critical that the stories of those caught up in this grand transformation are told.

benefits of that growth. Many critical questions remain about the nature and impact of that engagement: are China's investments contributing to sustainable development, or will they lead to 're-primarisation' of struggling economies, killing local industries and accelerating the environmental, social and climate crises now underway? Are China's loans structured sustainably, or will its ambitious infrastructure exports trigger another debt crisis in the region? How will China's own economic troubles – its internal debt levels and the impacts of US trade hostility – affect its capacity to pursue its ambitions in Latin America? Will China's appetite for soy continue to drive the destruction of South America's forests, and its appetite for fish empty the region's seas? And how will Latin American civil society find a way to engage with Chinese actors, given the barriers of language and custom, and the distance that divides them?

China's reach is already being tested and the benefits of some of the relationships questioned as the region faces a new round of uncertainties. The US-China trade war has had knock-on effects on South America's agribusiness; in Mexico, newly-inaugurated resource nationalist Andrés Manuel López Obrador, or AMLO, has challenged the Institutional Revolutionary Party (PRI)'s kleptocracy and in Nicaragua, rural anti-canal protesters threw their weight behind the national anti-government uprising. In Argentina, meanwhile, critics called into question its agro-export model as it, too, faced an economic crisis.

In Colombia, an environmental crisis in May caught the headlines as the part-Chinese financed Hidroituango dam collapsed, putting environmental concerns on the agenda for the first time in a generation as the country prepared for a June presidential election. In Peru, one of the countries in the region with the longest history of engagement with China, there are continuing conflicts over Chinese management in the mining sector.

This is a complex and multifaceted set of relationships in a region rich in diversity. It is critical that the stories

of those caught up in this grand transformation are told, that official propaganda and the claims of powerful actors are interrogated, and the voices of those affected are heard. *Diálogo Chino* is dedicated to reporting, analysing and covering these vital issues on its dynamic, trilingual (English, Spanish and Portuguese) website.

In the coming year, we shall track the progress of the *Acuerdo de Escazú*, which seeks to protect environmental defenders, but which must now be endorsed by national congresses. We'll assess the impact of the new relationship with China on the presidential elections in El Salvador in February 2019 and if there will be pressure to lift the country's 2017 blanket ban on metal mining. At the end of the year, Argentinians pass judgement on a presidency that has found its policy choices limited by tough conditions imposed by Chinese loans agreed under a previous administration. We shall report from the rainforests and the oceans on the ecological impacts of the China relationship and will analyse the underreported climate, social and economic impacts of these rapidly evolving partnerships.

In a recent speech marking the 40th anniversary of the tentative introduction of reforms that enabled China's political and economic integration with the rest of world, President Xi praised his country's success in increasing its cultural soft power and international influence. Media worldwide now face a challenge in understanding and telling the story of China's rise objectively. Our reporting remains independent, non-partisan and free of propaganda. Audiences in Latin America and around the world demand, and deserve, reliable and accurate information on the impacts of the region's deepening engagement with China. *Diálogo Chino* is uniquely placed to serve them. ☺

*This article is republished from *Diálogo Chino*.*

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中国投资激活“失落之城”

伊塔博拉伊曾经是巴西崛起的象征，如今它期待靠一个炼油厂创造很多就业。

□ 曼努埃拉·安德列奥尼



2015年，里约石化园的工人在巴西国家石油公司总部外抗议

经历了三年的蹉跎后，约苏埃·里贝罗终于又满怀希望了。

他曾经在里约热内卢石油化工园区（Comperj，以下简称里约石化园），也就是里约热内卢伊塔博拉伊的一座炼油厂的建筑工地从事建筑工作。但2015年巴西检方揭发的一桩大腐败丑闻将该项目

背后的国企——巴西国家石油公司（petrobras，以下简称巴西石油）牵涉在内，建设中止了。成千上万的工人被解雇，其中也包括里贝罗。

但去年3月事情开始有了转机。巴西石油雇用了由中国企业科瑞石油牵头的联合企业集团在该址修建一座天然气处理设施。慢慢地工人

们都回来了。接着，10月份巴西石油与中国石油（CNPC）签署了一份重启炼油厂建设的合同。根据这一合同，中国石油将持有该新建设施20%的股份。

尽管很多人都为这一项目能在数年危机后重启而庆幸，但并非所有人都感到高兴。环保人士们担心



空气和瓜纳巴拉湾的水道遭受污染，这一区域的污染可能造成海豚灭绝，而海豚正是里约州州旗上的象征。炼油厂面临的另一个质疑是：它能给一个本就高度依赖石油的地区带来长期效益吗？

据某些估算，里约石化园将创造 8000 到 10000 个工作岗位。大约 800 人已经开始工作了，里贝罗希望自己也能尽快成为他们中的一员。

他说：“我确信今年就能回到那里。我想他们（中国人）来到这里会干得很棒。我甚至觉给他们 20% 的股份太少了。因为巴西人……很不幸，腐败太厉害了。”

没落的象征

巴西石油 2008 年开始修建里约石化园，这给该地区的发展和就业带来了希望。里约石化园建设顶峰时期，雇用的工人超过 3 万名。当时，政府曾承诺该项目完成后将带来超过 20 万直接和间接工作机会。

里贝罗记得很清楚：“我曾经有稳定的生活，结了婚、建了房、买了车。”

这个城市的爆发式增长轨迹与巴西全国是一致的，当年巴西的经济增长率超过 5%。

接下来的 2014 年，大规模的反腐调查——“洗车行动”开始了，100 多名顶尖政治家和商人遭到起诉。巴西石油就处在这场风暴的核心，根据其自身计算，该公司用于贿赂的金额至少有 30 亿美元。

调查让很多实权人物锒铛入狱，包括前总统路易斯·伊纳西奥·卢拉·达席尔瓦。卢拉去年 4 月被捕，但至今仍然坚决否认对他的指控。所有涉及腐败行为的项目都被中止。一项研究估计，这项调查对巴西的 GDP 产生了约 350 亿美元的影响。

伊塔博拉伊是受“洗车行动”打击最大的城市之一。

“在大约两个月里，我们单是在里约石化园就丢掉了 1.5 万个工作。”里约石化园的一个当地工人工会的主席保罗·凯撒·昆塔尼哈如是说。

该工会估计，如今伊塔博拉伊的失业者多达 1.7 万人。巴西新闻网站 G1 的一篇报道称，有当地有 700 家商店关门，房地产价格下跌 45%，暴力犯罪水平激增。

昆塔尼哈说：“伊塔博拉伊成了一座鬼城。”

目前，昆塔尼哈只是谨慎地抱着希望。就业开始缓慢回升，主要受雇于科瑞石油与巴西工程企业 Método Engenharia 组建的联合体。该公司如今已经雇用了 500 人，而且说到 2019 年下半年还将再招 2000 人。

每天早晨，数百位像里贝罗这样的男女都会聚集在国家就业系统的当地机构外等候好消息。

就在几条街外的科瑞大楼门前，年轻男子们手里拿着文书进进出出。他们已经被录用。因为担心丢掉宝贵的工作，没有一个人想接受采访。有一位说：“我不知道如果接受采访公司会怎么想，”然后就去参加体检了。



曾经提供了数千工作机会的里约石化园正在重新施工

强化纽带

对于像里约石化园这样因“洗车行动”而暂停的诸多项目，中国投资者都表现出了兴趣。

在巴中工商总会会长唐凯千看来，新的投资表明中国支持巴西的意愿非常强烈。2018年第一季度，中国对巴西投资比2017年同期增加了三倍多，达到13亿美元。

他说：“这么多的大项目都被叫停，只能放在那里生锈。然后中国再次表现出对巴西的信心并进行投资。这就是里约石化园的经历。”

中国石油对巴西石油的投资并非首次。这两家企业已经在位于巴西沿海超深海域的Libras大型油田项目上有过合作。但是，里约石化园将是中国在美洲的第一家炼油厂。

里约热内卢联邦大学的经济学教授、能源领域专家爱德华·阿尔梅达说：“几乎没人关注这个部门，这一（投资）举动表明它能吸引其他企业。我们在炼油行业需要更多的投资。”

阿尔梅达说，大多数外国企业投资的都是巴西的石油勘探和开采行业，而非炼制。炼油厂的风险更大，因为它们对起伏不定的燃料市场需求和价格等内在因素的依赖度很高，这些因素常常受到政府管制。但巴西需要炼油厂，尽管该国石油可以自给，柴油和汽油却仍然需要进口。

据阿尔梅达说，在里约石化园项目上“下注”使中国石油大大赢得了巴西石油的信任。他说，这个合作有利于中国继续开发巴西的石油

资源，这里的条件要比中东国家和美国都好，中东政治更加动荡，而美国则竞争过于激烈。

巨大的环境成本

尽管很多人对里约石化园重新开始招工感到高兴，环保人士们却很担忧。里约石化园坐落在里约热内卢的瓜纳巴拉湾旁，这使其变得尤为危险。

几十年来，这个海湾一直遭受另一座炼油厂——卡希亚斯公爵城炼油厂（简称公爵城炼油厂）的污染。2010年，一家当地环境机构的负责人告诉媒体他确认公爵炼油厂是里约热内卢州最大的污染单位。繁重的航运和附近城镇不正规的下水系统也破坏着海湾的环境。

里约石化园坐落在一个相对干净的地点，人们将密切关注环境风险的管理。

研究者们将附近的瓜皮米林环境保护区昵称为“诺亚方舟”，是因为这里庇护着很多濒临灭绝的物种。

“如果有一天我们能减少排入海湾的生活废水和工业残渣，它就有望得到恢复，”瓜皮米林保护区的前负责人布雷诺·埃雷拉如是说，他的博士论文就是关于里约石化园的。他还说，瓜皮米林可以为很多物种提供一个关键的繁殖区域，其中就包括由于污染而数量剧减的濒危圭亚那海豚。

埃雷拉说巴西石油未能恢复当地的原生植被来减少里约石化园的

影响，但巴西石油予以否认。他希望中国石油对于来自环保人士的压力能做出更积极的回应。

埃雷拉承认当地需要就业。但他说，除了建筑工作，重栽树木、净化河流也能给这座城市带来机会。

而且，世界很多国家可再生能源项目相关就业的增加速度要比传统化石燃料行业更快。根据美国能源部的数据，2016年该国太阳能行业就业人数增加了25%，而风能行业则增加了32%。

中国在全世界进行可再生能源技术的建设和融资是这一增长背后的主要动力。其中就包括巴西，中国企业在这里拥有水电站，在风能和太阳能产业的份额也与日俱增。

根据国际可再生能源机构2018年的一份报告，巴西是可再生能源转型六个受惠最大的国家之一，从这一转型中获得89.3万个新的工作岗位。巴西是生物燃料产业就业人数最多的国家。

但是，经济学家阿尔梅达说，眼下伊塔博拉伊需要里约石化园来将其拉出火烧眉毛的经济和社会危机。

他说：“理想中我们要建立高科技企业，每个人都在空调房里工作，申请专利、赢得诺贝尔奖。但我们必须首先面对现实。”

英文原文首发于中外对话子网站中拉对话

曼努埃拉·安德列奥尼，中拉对话巴西板块编辑

Chinese investment brings hope to a fallen city

Once a symbol of Brazil's rise, Itaboraí expects a controversial oil refinery to create many jobs

□ Manuela Andreoni

After three years of struggle, Josué Ribeiro is finally hopeful again.

He used to have a construction job on the Comperj project, the site of an oil refinery in Itaboraí, Rio de Janeiro. But in 2015, as Brazilian prosecutors untangled a massive corruption scandal involving Petrobras, the state-owned company behind the project, construction ground to a halt. Thousands were fired, including Josué.

But in March last year things started to look up. Petrobras hired a consortium led by Chinese company Kerui Petroleum to build a natural gas processing unit at the site. Slowly, workers returned. Then, in October, Petrobras signed a contract with China National Petroleum Corporation (CNPC) to resume construction of the refinery. Under the deal, CNPC would control 20% of the new facility.

Though many celebrate the revival of economic activity after years of crisis, not all share the enthusiasm. Environmentalists are concerned about the pollution of air and waterways in Guanabara bay, an area where contamination threatens the extinction of dolphins, a symbol on Rio's state flag. The refinery also raises questions about the long-term benefits to a region already highly dependent on oil.

According to some estimates, Comperj will create between 8,000 to 10,000 jobs. Around 800 are already working. Josué hopes he will soon be one of them.

"This year, I'm confident I'll get back in there," Ribeiro said. "I think them [the Chinese] coming here will work out really well. I even think 20% is too little for them. Because Brazilians... Unfortunately, there is a lot of corruption."



A symbol of the downfall

Petrobras started building Comperj in 2008, bringing hope of development and employment to the region. Over 30,000 were employed at Comperj at the peak of construction. Back then, the government promised the project would bring over 200,000 direct and indirect jobs by its completion.

“I had a stable life,” Ribeiro remembers. “I got married, I built my house, I bought a car.”

The city’s explosive upward trajectory paralleled Brazil’s. The economy grew by over 5% that year.

Then, in 2014, came Operation Carwash, a widespread corruption investigation that indicted over 100 top politicians and business executives. Petrobras was at its centre. By its own calculations, the company had paid at least US\$3 billion in bribes.

The investigation jailed many powerful men, including former president Luiz Inácio Lula da Silva, who was arrested last April under charges he still fiercely contests. Projects suspected of harbouring corrupt activities halted. One study estimates the investigation’s impact on Brazil’s GDP to be around US\$35 billion.

Itaboraí was among the cities hit hardest by Operation Carwash.

“In a period of two months or so we lost 15,000 jobs in Comperj alone,” says Paulo César Quintanilha, president of a local union for Comperj workers.

The union estimates there are 17,000 people without jobs in Itaboraí today. According to a report by news website G1, 700 shops have closed, real estate prices fell 45% and levels of violence have shot up.

“Itaboraí became a ghost town,” says Quintanilha.

Now, Quintanilha is only cautiously hopeful. Hiring has restarted slowly, mainly in Kerui Petroleum’s consortium with Método Engenharia, a Brazilian engineering company. The company now employs 500 people but says it should hire 2,000 more by the second half of 2019.

Every morning, hundreds of men and women like Josué wait for good news outside the local unit of the National Jobs System.

A few streets up, at the entrance of Kerui’s building,

young men come and go with paperwork in hand. They are being hired. None wanted to talk to Diálogo Chino. They fear losing their cherished jobs. “I don’t know how the company will feel about me giving interviews,” one said, as he left for a medical exam.

Strengthening bonds

Chinese investors have shown interest in a number of projects like Comperj that stalled because of Operation Carwash.

For Charles Tang, president of the Brazil-China Chamber of Commerce, the new investments show just how much China is willing to back Brazil. In the first quarter of 2018, Chinese investment in the country more than quadrupled compared to the same period of 2017, reaching US\$1.3 billion.

“There are so many big projects halted, basically getting rusty,” he said. “Then comes China once more willing to believe in Brazil and invest. That’s the story of Comperj.”

CNPC’s investment in Petrobras isn’t its first. The two companies are already partners in the massive Libras oil field, located in ultra-deep waters off the Brazilian coast. However, Comperj would be China’s first refinery in the Americas.

“This is a sector that receives very little attention and this movement shows it could attract new companies,” says Edmar de Almeida, an economics professor at the Federal University of Rio de Janeiro who studies the energy sector. “We need more investment in refineries.”

Almeida says most foreign companies invest in oil exploration and extraction in Brazil, not refining. Refineries are a riskier because they rely on internal factors such as uncertain market demand for fuel and prices, which are often regulated by the government. But Brazil needs them.

Ideally everyone would be working in air-conditioned rooms and winning Nobel prizes. But this is what we have.

Though the country is self-sufficient in oil, it still imports diesel and gasoline.

The bet on Comperj will buy CNPC a lot of credit with Petrobras, according to Almeida. The partnership could be good for China to keep exploring oil reserves in Brazil, where, he says, conditions are better than in countries in the Middle East, where politics can be even more volatile, and the US, where competition is too fierce.

Big environmental costs

While many celebrate the return of jobs to Comperj, environmentalists are worried. Comperj's location aside Rio de Janeiro's Guanabara Bay makes it especially risky.

For decades, the bay has suffered from contamination by another refinery, the Duque de Caxias Refinery, or Reduc. In 2010, the head of a local environmental agency told the press he had identified Reduc as the biggest polluting agent

in the state of Rio de Janeiro. Heavy shipping traffic and nearby towns' informal sewage systems also plague the bay's environment.

Comperj sits on a relatively clean spot and the management of environmental risks will be closely watched.

Researchers nicknamed the nearby Environmental Protection Area of Guapimirim "Noah's Arc" since it safeguards many species facing ecological oblivion.

"If one day, we can reduce the sewage spillage and industrial residues in the bay, it's expected that it will recover," says Breno Herrera, a former head of the Guapirim protection area who wrote his doctoral thesis about Comperj. He says Guapimirim could provide a vital arena for the regeneration of species including the endangered Guiana dolphin, whose numbers have depleted as a result of pollution.

Herrera says Petrobras failed to recover native vegetation



The Environmental Protection Area of Guapimirim, in the Guanabara Bay

in the region that would mitigate Comperj's impact. Petrobras denies this. He hopes CNPC will be more responsive to pressure from environmental campaigners.


Herrera admits the region needs jobs. However, aside from construction work, he says there are opportunities for the town in replanting trees and cleaning rivers.

Furthermore, in many countries around the world, job creation linked to renewable energy projects is growing faster than in traditional fossil fuels. In the US, the solar workforce increased by 25% in 2016, while employment in wind power increased by 32%, according to the US energy ministry.

China is the main motor behind this growth, building and financing renewable energy technology across the world – including in Brazil, where Chinese companies own hydropower plants and are increasing their stake in the wind and solar sectors.

According to a 2018 report by the International Renewable Energy Agency, Brazil is one of the six countries that benefits most from the transition to renewable energy, with 893,000 jobs created. Brazil is the leading employer in the biofuels industry.

Right now, however, economist Almeida says Itaboraí needs Comperj to lift it out of an urgent economic and social crisis.

“Ideally we would have high-tech companies, and everyone would be working in air-conditioned rooms, filing patents and winning Nobel prizes,” he said. “But this is what we have.” 

This article was originally published in Diálogo Chino.

Manuela Andreoni is Diálogo Chino's Brazil editor

走出国门， 中国电动公交车进军拉美市场

今年拉丁美洲的四个主要城市都将开辟电动公交车线路，更多试点计划也将陆续启动。

□ 列瓦诺·安德烈斯·贝穆德斯



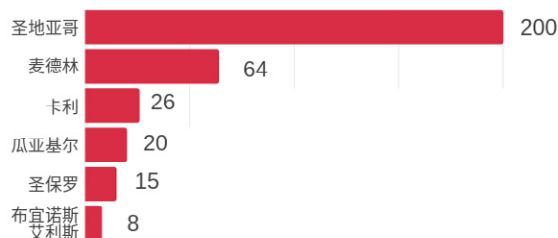
在智利圣地亚，200辆电动公交车整装待发

今年，中国电动公交车终于要走上拉丁美洲的街头了。其实，多年前各大电动公交车厂商已经锁定了这个市场，但是却一直很难改变该地区各国对这种新兴技术的怀疑态度。

目前，大多数国家都已经将清洁公共交通转型作为减少碳足迹的首选策略，特别是在在人口规模较大的城市。如今，电动公交车已经在中国实现了批量生产，但是却在进军拉美市场时遭遇了不小阻碍。

据“中拉对话”此前报道，哥伦比亚首都波哥大市在2018年更换了1160辆公交车，但是却拒绝使用中国的电动公交车。整个招标过程也说明了中国车企进军拉美市场的主要障碍：电动公交车比柴油或天然气公交车价

2019年中国电动公交车亮相拉美市场



格更高，但是当地并没有国家资金用于支持购进公交车的计划，而且当地充电桩总量也不足。此外，专业人员匮乏以及当地对中国产品了解不足也是造成这一困境的原因。

目前，拉美地区能源领域的温室气体排放量增速位居全球前列，然而上述因素却导致电动公交车无法进入这个本该潜力巨大的地区市场。

卡洛斯·莫吉卡、莉莎·温斯蒂和盖伊·爱德华兹三名研究人员共同撰写了一份全面分析拉丁美洲电动汽车市场现状的报告。他们表示：“如果能立即将22个拉美城市的公交汽车和出租车全部替换为电动汽车，那么到2030年该地区将节约近640亿美元的燃料，减少二氧化碳碳排放3亿吨。”

但是实际上，情形可能会有所发展。2019年上半年，中国电动大巴将首次亮相4个拉美主要城市，上述四个城市的总人口达1400万。此外，还有4个城市计划开展电动公交车试点计划。那么到底是哪四个城市呢？

圣地亚哥（智利）

自2018年12月中旬以来，100辆由中国比亚迪集团生产的电动公

交车已经亮相圣地亚哥街头，这让圣地亚哥成为拉丁美洲拥有电动公交车数量最多的城市，同时也是除中国以外，全球电动公交车保有量排名第二的城市。

2019年1月中旬，圣地亚哥快速公交系统（BRT）Transantiago还将新增100辆来自中国宇通公司的电动公交车。如今，圣地亚哥的空气污染和空气质量已经引发了公众的高度关注，而这些公交车将成为实现该市公共交通绿色化的重要推动力。此外，圣地亚哥还将新增490辆柴油公交车，不过这些车辆都将达到环保要求更高的欧VI排放标准。

Transantiago担负着圣地亚哥60%人口的出行需求，而且也已经解决了其他国家尝试引进电动公交车时面临的一些问题。本次交易由塞巴斯蒂安·皮涅拉政府提供资助，他本人曾在2018年12月亲自为首批电动公交车揭幕，并将“电动交通”列为其2018-2022年能源路线图的重要支柱政策之一。除了一些其他承诺之外，该规划还计划在3年内将电动汽车总量增加到现在的10倍。

此外，意大利电力巨头意大利国家电力公司（Enel）也正在与公

运营方进行合作，计划在圣地亚哥安装100个充电桩。

迭戈波塔莱斯大学交通与物流创新中心主任佛朗哥·巴索解释称：“购买电动公交车主要是受交通与电信部购买意向的影响。与以往不同，这次是交通与电信部直接购进了这批车辆，而没有进行招标。加上意大利国家电力公司（Enel）的支持，尤其是充电基础设施方面的支持，从而加快了整个流程。”

世界资源研究所罗斯可持续城市中心研究员达里奥·伊达尔戈表示：“圣地亚哥的情况很有意思，因为私人运营商、汽车制造商和配电机构组成了联盟。”

麦德林和卡利（哥伦比亚）

去年年底，麦德林宣布中国汽车厂商比亚迪公司赢得了一项向哥伦比亚出口64辆电动公交车的合同。

今年8月，这批电动汽车将加入当地的Metroplús公交系统，麦德林这个哥伦比亚第二大城市将成为继圣地亚哥之后拉美地区电动汽车保有量第二的城市。本次采购完全由当地政府提供资金。经过招标，比亚迪打败了另外两个竞争者，从而拿下了这笔订单。而那两个竞争者计划提供同样产自中国的，由宇通和中通汽车生产电动公交车。

紧随麦德林的脚步，哥伦比亚第三大城市卡利也在几周前宣布，将在MIO交通系统中新增125辆电动公交车。首批26辆将由中国申沃客车有限公司制造，预计今年5月交付使用。

根据《巴黎气候协定》，哥伦比亚承诺到2040年将7个城市中75%

的公交车替换为零排放汽车。而麦德林和卡利也成为哥伦比亚为兑现其承诺而迈出的第一步。

电动汽车技术对哥伦比亚来说有着额外的吸引力，因为该国 70% 的电力供应都来自水力发电，也就是说哥伦比亚的能源组合比大多数国家都要清洁环保。

为什么这两个城市能够先于首都波哥大引入电动公交车呢？原因就在于波哥大的 Transmilenio 公交系统主要使用的是铰接式和双铰接式公交车。中国厂商虽然已经在普通电动公交车市场上站稳了脚跟，但铰接式和双铰接式公交车却是他们的短板。

瓜亚基尔（厄瓜多尔）

厄瓜多尔人口最多的城市瓜亚基尔也将在今年迎来 20 辆比亚迪生产的电动公交车。

但是与圣地亚哥和麦德林不同，瓜亚基尔的这项计划是由当地的一家私人公交运营商 Saucinc 牵头的。这家只经营一条公交线路的小公司为了用电动公交车替换现有的柴油车辆而不得不向厄瓜多尔政府求助。

与智利的圣地亚哥一样，瓜亚基尔通过国家金融公司（National Finance Corporation，简称 CFN）获得了国家特别信贷支持，总额覆盖了购置款的一半。此外，根据当地法律规定，购置电动公交车的企业还将免缴进口关税和增值税。

而厄瓜多尔首都基多可能也会因此受益，因为基多的一家交通运营方目前正在中国考察，而且正考虑进口 20 到 60 辆与波哥大模式类似的双铰接式电动公交车。

其他试点项目

目前，至少还有 4 个拉美城市宣布将在今年进行电动公交车试点，所用车辆基本都是中国制造的。

巴西首都圣保罗共有 1.4 万辆公交汽车。去年 10 月该市已经宣布将先投放 15 辆电动公交车进行试点。这些车辆均来自比亚迪公司在圣保罗附近坎皮纳斯市的工厂，并已于 1 个月前交付，预计今年 3 月份投入使用。

今年 1 月，阿根廷首都布宜诺斯艾利斯也宣布将从 5 月起投放 8 辆电

动公交车进行试点。本次试点将与意大利国家电力公司（Enel）合作。与其他城市不同的是，试点车辆将同时来自宇通、中通汽车、海格客车和金龙这 4 家中国制造厂商。

得益于德国和一家当地可持续发展基金会的捐款，哥斯达黎加的圣何塞也将有 3 辆电动公交车首次上路。此外，这个中美洲国家还通过了一项法律，利用经济奖励措施推动电动交通行业的发展，此举也使其成为该地区低碳交通的先驱。

绿色气候基金（GCF）是《巴黎气候协定》创建的一个为减少温室气体排放提供帮助的金融机制。而乌拉圭政府就向该基金申请了一笔贷款，从而将首都蒙得维的亚的 120 辆公交车更换成电动车，占其公交车总数的 10%。^⑤

英文原文首发于中外对话网站中拉对话

安德烈斯·贝穆德斯·列瓦诺，中拉对话拉丁美洲安第斯区域（哥伦比亚、厄瓜多尔、秘鲁、玻利维亚和委内瑞拉）记者及编辑

Chinese electric buses make headway in Latin America

This year will see electric buses operate in four major cities, with plenty more introducing pilot schemes

□ Andres Bermudez Lievano

Chinese electric buses look set to finally arrive on Latin American roads this year. Manufacturers identified the market as a priority years ago but have struggled to convince the region's sceptical countries to back the new technology.

Most countries have prioritised the shift toward cleaner public transport to reduce their carbon footprint, especially in the most populated cities. Yet electric buses – a technology that China is already manufacturing at scale – have faced entry barriers.

As *Diálogo Chino* reported recently, Colombian capital Bogotá renewed its fleet of 1160 buses in 2018, rejecting Chinese electric options. The tendering process highlighted

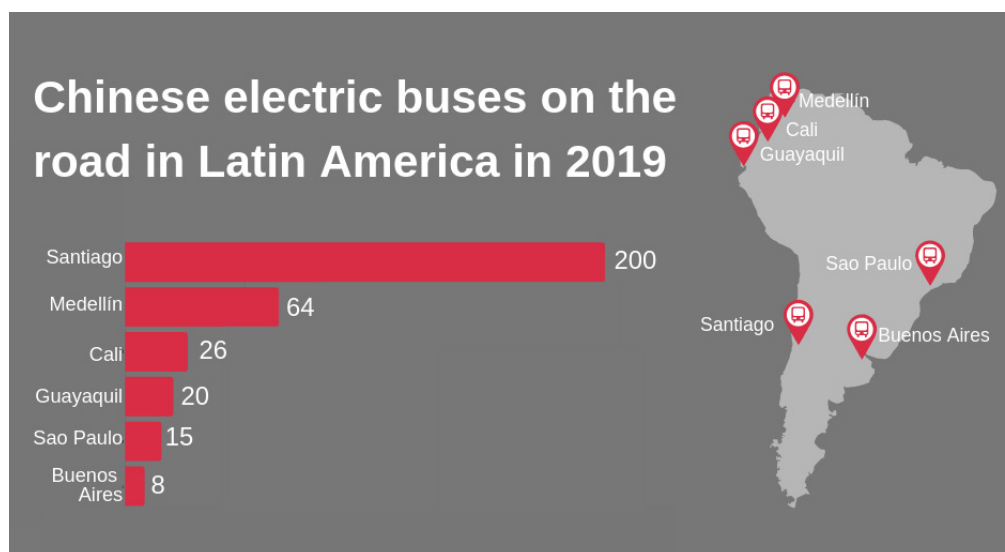
several obstacles: the absence of national financing models for the purchase of buses, which are more expensive than diesel or natural gas, and charging points. Other problems include a lack of trained personnel and the poor perception many countries have of Chinese products.

This has prevented electric buses from reaching their potential in a region where greenhouse gas emissions in the energy sector are growing faster than in any other.

“If the current fleet of buses and taxis in 22 Latin American cities were immediately replaced with electric vehicles, the region could save almost US\$64 billion in fuel by 2030 and prevent the emission of 300 million tonnes

of carbon dioxide,” according to researchers Carlos Mojica, Lisa Viscidi and Guy Edwards, who wrote a comprehensive report on the current state of the electric car market in Latin America.

However, the picture could change. Four large cities with a combined 14 million inhabitants will debut fleets of



Chinese electric buses over the first half of 2019. Another four will introduce pilot schemes. Which are they?

Santiago, Chile

Since mid-December, 100 electric buses manufactured by China's BYD have been deployed in Santiago, making the Chilean capital the owner of the largest electric fleet in Latin America and the second largest of any city in the world outside China.

Transantiago, Santiago's Bus Rapid Transport system (BRT), will add a further 100 made by Yutong, which arrived in Chile in mid-January. They are the driving force behind Santiago's quest to make public transport greener in a city where pollution and air quality have become issues of high public concern. The city will also add another 490 buses powered by diesel engines, although they will meet the higher Euro VI performance standard.

Transantiago, which transports 60% of the city's population, has solved some of the problems faced by other countries trying to introduce electric buses. The deal was financed by the government of Sebastián Piñera, who personally presented the first buses in December and who made "electromobility" into one of the central pillars of his 2018-2022 Energy Roadmap. Among other commitments, the plan promised to multiply the number of electric vehicles operating by ten within three years.



BYD will unveil 20 electric buses in Guayaquil this year.

Italian electricity giant Enel is working closely with bus operators to install 100 charging points in the city.

"The purchase of electric buses was very much influenced by the willingness of the Ministry of Transport and Telecommunications to have this fleet. Unlike previous cases, it was the Ministry itself that bought the buses through direct deals, without bidding. This, coupled with Enel's support, especially in terms of providing charging infrastructure, made the process much faster," explains Franco Basso, director of the Center for Innovation in Transport and Logistics at Diego Portales University.

"The case of Santiago is also very interesting because there is an alliance between private operators, manufacturers and energy distributors," says Darío Hidalgo, a researcher at the World Resources Institute's Ross Center for Sustainable Cities.

Medellín and Cali, Colombia

Late last year, Medellín announced that Chinese company BYD had won the contract to bring 64 electric buses to Colombia.

With the incorporation of these vehicles to the Metroplús system in August, Colombia's second city will also become the owner of the second-largest electric fleet in the Latin America region after Santiago. The purchase, 100% funded by the local government, was decided after a tender in

which two other bidders also offered to supply Chinese-made Yutong and Zhongtong buses.

Medellín will be followed closely by Cali, which announced a few weeks previously its eventual goal is to have 125 electric buses in the MIO transport system. The first batch of 26 vehicles, manufactured by the Chinese company Sunwin Bus Corporation, will arrive in May to the third-largest Colombian city.

Medellín and Cali will

therefore become the first cities to advance in the goal set by Colombia in commitments under the Paris Agreement to replace 75% of public buses in seven cities with zero emission vehicles by 2040.

Electric technology has an additional attraction for Colombia where 70% of electricity comes from hydroelectric plants, meaning the country has a much cleaner energy mix than most others.

One reason why both cities managed to introduce electric buses before Bogotá is that China already has a solid market for ordinary electric buses but has so far failed to produce reliable articulated and double-articulated buses, as Bogotá's Transmilenio system requires.

Guayaquil, Ecuador

The port of Guayaquil, the most populous city in Ecuador, will also debut 20 buses manufactured by BYD this year.

However, unlike Santiago and Medellín, this initiative was led by one of the city's private transport operators. Saucinc, a small company which operates one specific route, turned to the national government for help in replacing its fleet of diesel-powered buses with electric ones.

Like Chile, Guayaquil garnered state support through a special credit from the National Finance Corporation (CFN), which financed half of the purchase. There is also a law that exempts electric buses from paying import tariffs and value-added tax (VAT).

These efforts could benefit the capital Quito too, since one of its transport operators was also in China exploring the possibility of buying between 20 and 60 electric buses which, like in Bogotá, would have to be bi-articulated.

New pilots

At least four other cities in Latin America announced they will start pilots with electric buses this year, most of them manufactured in China.

Sao Paulo (Brazil), which has a fleet of 14,000 public buses, announced in October that it will start a pilot with 15 electric buses. The vehicles produced by BYD, which has a factory in the nearby city of Campinas, were delivered a month ago and will hit the roads in March.

Buenos Aires (Argentina) announced in January that it will carry out a pilot with eight buses starting in May. Unlike the other cities, there will be four different Chinese manufacturers (Yutong, Zhongtong Bus, Higer Bus and King Long), working in partnership with Enel.

San José (Costa Rica) will debut three buses, thanks to a donation from Germany and another from a local foundation for sustainable development. The Central American country was a pioneer in the region for low-carbon transport, passing a law to provide economic incentives for electric transport.

In Montevideo (Uruguay), the national government requested a loan from the Green Climate Fund (GCF), one of the financial mechanisms created by the Paris Agreement to facilitate initiatives that reduce greenhouse gas emissions. This would allow the Uruguayan capital to replace 120 buses, some 10% of its fleet. ↻

This article is republished from Diálogo Chino

Andres Bermudez Lievano is Diálogo Chino's regional editor for the Andean region (Colombia, Ecuador, Peru, Bolivia and Venezuela).

亚投行的新考验

人们很快就能对亚投行的项目提出申诉，
这家多边银行会如何处理此类投诉？

□ 白莉莉

缅甸金山水泥厂的办公室位于附近河边的一个小村子里，办公室的墙上钉着一只白色的意见箱。村民若是认为工厂存在问题，如导致水质或空气质量下降，就可以往意见箱里塞纸条进行投诉。但水泥厂工作人员和当地人都不清楚这些投诉将如何解决，或者能否得到解决。

金山水泥厂是亚洲基础设施投资银行（以下简称“亚投行”）自2015年成立以来首批投资的项目之一。2018年12月，亚投行建立了一个新的机制，作为研究人员口中常见的基础意见箱申诉制度的补充。该机制让社区能够直接向银行总部反映他们的问题。

被称为“中国的世界银行”的亚投行是一家多边开发银行，目前拥有93个成员国，中国目前仍持有31%的股份，是所有成员国中占股最多的。该行被视为对中国多边领导力的考验，其宗旨是“精简、廉洁、绿色”，即摆脱同类机构中常见的官僚主义，坚持环境和社会高标准。而后一点，中国本国的开发银行都尚未做到。亚投行新的申诉机制是朝着国际最佳实践迈



缅甸金山水泥厂的“项目申诉补救机制”

出的一步，但其缺陷也再次引起了外界一直存在的批评：精简、绿色，说起来容易做起来难。

让开发银行承担责任

上世纪80年代末，印度西部拟修建一座160米的大坝。这一提案

引发了一场争论：多边银行是否应该对那些受其投资影响的偏远社区负责。世界银行打算投资建设世界上最大的灌溉系统，而这个大坝就是该项目的一部分。外界对该项目的社会 and 环境影响（包括14万居民被迫搬迁）一片哗然，导致世界银行首次不得不对其投资的项目启动独

立审查。审查表明，尽管有保障措施，项目仍可能导致严重损害，尤其是对缺乏强有力的法律制度和民间社会的国家，因此需要更多监督。

这场争论以及其他类似事件推动创建了首个针对多边开发银行的问责制度——现在这个制度得到了广泛采用。这些政策允许民众直接，而不是通过项目建设公司向银行提出投诉。通过建设公司投诉既有风险，又没有用，金山水泥厂就是个例子。

欧洲银行信息中心联合主任凯特·盖瑞认为，尽管银行不是当地活动的直接参与者，但他们的投资让可能造成损害的项目得以开展，这就是申诉机制存在的道义基础。“投资了就应该负责任。”她说。多年来，多边开发银行收到的投诉数量有所增加，表明这些渠道对缺乏其他申诉方法的地方社区而言十分重要。

让亚投行负责

亚投行已经仿照主要开发银行的政策制定了一系列环境和社会政策，其中最重要的就是该行的《环境与社会框架》。该框架要求其遵循同行的做法，建立问责制度。

执行方面，亚投行新的问责政策允许两人及以上人员就银行对该框架的执行不力提出投诉。一旦确认投诉属实，就可以启动合规审查，进而制定管理行动计划，解决已经确定的问题，或者是进入争端解决

程序。后者往往是在社区已经遭受土地掠夺等损失，并希望就具体赔偿进行谈判时启用的。

盖瑞说，强有力的问责机制有两个关键职能：为受影响社区提供补救，以及为银行提供改进自身实践的机会，后者与新近成立的亚投行关系尤为密切。其他银行被成功索赔的案例改变了制度实践，造成大量赔款。2004年，有社区就国际金融公司（世界银行集团下的私营部门贷款机构）投资当地棕榈油带来的环境和社会影响提出投诉，导致该公司下令暂停清拆土地，世界银行集团实施了为期18个月的棕榈油融资禁令，同时重新评估项目风险。

今年3月下旬，受亚投行项目影响的社区可以开始申诉，届时该行的新政策将接受考验。

亚投行能否做到绿色精简？

批评人士对亚投行先于制定社区问责政策就着手投资一事表示震惊。虽然最后的政策照顾到了他们关切的很多方面，但仍有人对结果持保留态度，尤其是当地社区与银行的沟通渠道方面。包容性发展国际（Inclusive Development International）的法律总监娜塔莉·布加勒斯基说，“亚投行的政策虽然包含了一些创新元素……但在几个重要方面没有达到国际最佳实践。”

她指出了该政策的一个最根本的问题。社区投诉必须以项目未能遵守银行自身的环境和社会框架为基础。布加勒斯基说：“由于这些标准的范围比国际金融公司的绩效标准等国际公认的标准要狭窄很多，也更加模糊，所以社区遭受的严重损害可能不属于该机制的受理范围。”例如，商业和人权资源中心（Business and Human Rights Resource Centre）研究员周龙炜指出，框架要求银行在其项目中“征求”原住民社区的意见，但并没有要求获得他们的“同意”，这一点与其他银行不同。

民间社会组织人士看到的另一个问题是，该机制不适用于亚投行与其他机构联合投资的项目。联合投资项目占亚投行投资组合的65%。亚投行在这些项目上将尊重其他银行的问责机制，但会保持在过程中获悉并关注争端解决过程。但是，其他银行的政策虽然更强有力，但缺少亚投行的某些关键特征。例如，世界银行监察小组就不具备解决争端的职能，无法作为中间人直接参与银行客户和受影响社区之间争端的解决过程。“我们认为，受影响的人应该能自由选择最符合其自身情况、最能促成其想要的结果的机制。”布加勒斯基说。

随着亚投行日趋成熟，越来越多地开始独立投资，这一问题将随着时间的推移而消失。但目前社区

“亚投行新的申诉机制是朝着国际最佳实践迈出的一步，但其缺陷也再次引起了外界一直存在的批评：精简、绿色，说起来容易做起来难。”

成员们不得不依靠其他银行或者当地公司来解决他们的问题。这是亚投行追求的精简与社区利益相违背的一个例子，凯特·盖瑞说。

针对该行35%的独立投资项目，社区能够通过银行自身的申诉机制提出申诉。但政策规定，投诉人必须先诉诸银行管理层或当地申诉补救机制，如金山水泥厂的意见箱。

跨国公司研究中心(Centre for Research on Multinational Corporations)高级研究员克里斯托·吉诺维斯说，根据她与社区合作的丰富经验，这些由公司运营的机制从来都是没用的。她说，亚投行在这方面是个特例。“其他银行不会要求你先诉诸项目层面的申诉机制。”

首先在当地提出投诉可能会导致投诉者遭到当地政府或公司的报复。然而，亚投行通过了一项引申条款。该条款认识到了这一风险并指出，投诉者如果面临此类威胁，可直接联系银行，无需先在当地申诉。

亚投行拒绝就新政策发表评论。行长金立群在一篇新闻稿中说：“确

保亚投行投资的项目不会对环境与当地民众造成伤害，是我们“精简、廉洁、绿色”价值观的基石。这一机制将会让我们能够对受影响民众的担忧快速做出反应，以便我们能够与客户合作，及时解决这些问题。”

中资银行的榜样？

环境律师、马里兰大学法学院讲师张兢兢认为，尽管外界有批评，但与中国其他一些海外开发实践和机构相比，亚投行及其政策堪称典范。

张兢兢帮助发展中国家的社区通过司法渠道解决与中国开发有关的一些问题。从塞拉利昂到几内亚，她处理过的中资银行投资的项目都没有为当地民众提供投诉渠道。她承认亚投行的申诉机制有其局限性，但也认为该政策为这些机构提供了一个具有启发性的范例。“我希望中资银行能够从中吸取教训，效仿亚投行，建立自己的社会保障框架和申诉机制，”她说。

近来一项分析显示，中国帮助建立的亚投行和新开发银行在环境

和社会标准方面的表现都优于中国本国的政策银行。然而，中国国内的政策银行在规模和全球影响力上仍远超亚投行。2016年，亚投行的贷款不足中国对“一带一路”国家总投资的1%。

美国大学副教授塔马尔·古特纳近来警告称，亚投行可能会分散对大型中资银行的注意力：“中国在亚投行以外的行动与该行的政策目标之间存在明显的矛盾和张力，这可能导致亚投行变成一个万绿丛中一点红的‘形象工程’。”

目前而言，亚投行对国际最佳实践的追求将在3月新政策生效时受到考验。吉诺维斯认为，政策语言十分重要，但执行才能真正展示其在问责制方面的努力。如果执行得好，“这将是一项虽不令人惊艳，但却非常有效的政策，”她说。

白莉莉，中外对话研究员，北京能源网络(Beijing Energy Network)执行制作

‘China’s World Bank’ is making it easier to complain

People can soon start filing grievances with AIIB projects, but the new policy still falls short

□ Lili Pike

In a riverside village near the Shwe Taung cement plant in Myanmar, a white suggestion box is nailed to the wall of the company’s office. Villagers can slip paper into the box to lodge complaints about problems they attribute to the plant, such as the diminishing water or air quality. But company staff and locals are unclear about how or if their queries would be addressed.

The Shwe Taung plant is among the first batch of projects that the Asian Infrastructure Investment Bank (AIIB) has financed since its inception in 2015. In December 2018, the bank established a new mechanism to supplement the rudimentary suggestion-box grievance systems that researchers say are commonplace. This will allow communities to communicate their problems directly to the bank’s headquarters.

Referred to as China’s World Bank, the AIIB is a multilateral development bank that now boasts 93 member countries, with China still holding a dominant 31% stake. The bank has been viewed as a test of China’s claim to multilateral leadership. Its founding maxim is to be “lean, clean and green”. This translates to shedding the bureaucracy of its peers while upholding high environmental and social standards – ones that China’s own development banks have yet to adopt. The bank’s new grievance mechanism is a step toward international

best practice, but its shortcomings also renew a familiar criticism: that being lean and green is easier said than done.

Holding development banks to account

In the late 1980s, a proposed 160-metre dam in western India sparked debate about the responsibility of multilateral banks to distant communities affected by their investments. The dam was part of a project financed by the World Bank to create the world’s largest irrigation system. Outcry over the social and environmental impacts of the project, including the displacement of 140,000 people, led the bank to commission the first independent review of one of its projects. Despite safeguards, the review showed that projects could lead to serious damage, particularly in countries without strong legal systems and civil society. Additional oversight was needed.

This controversy and others like it led to the creation of the first accountability systems for multilateral development banks – mechanisms that are now ubiquitous. These policies allow people to file complaints directly with a bank rather than through the companies that build projects. Going through companies can be risky or futile, as in the case of the Shwe Taung cement factory.

The premise, according to Kate Geary, co-director of

The bank's new grievance mechanism is a step toward international best practice, but its shortcomings also renew a familiar criticism: that being lean and green is easier said than done.

Bank Information Center Europe, is that even though banks are not actors on the ground, their financing enables projects that can cause damage. “If you invest, you should be accountable,” she said. The number of complaints filed with multilateral development banks has increased over the years, showing the importance of these channels to local communities that often lack alternatives.

Making the AIIB accountable

The AIIB has established a series of environmental and social policies modelled on those of leading development banks. One of the most important was the bank’s Environmental and Social Framework, which required it to follow its peers in creating an accountability mechanism.

Delivering on that commitment, the bank’s new accountability policy allows two or more people to file complaints about the bank’s failure to implement the framework. If the submission is deemed eligible, it can trigger a compliance review that results in a management action plan to resolve any issues identified, or it can lead to a dispute-resolution process. The latter is often used when communities have already incurred losses, such as land grabs, and want to negotiate for concrete reparations.

Strong accountability mechanisms serve two key functions, says Geary: providing redress to affected communities and giving banks an opportunity to improve their own practices, the latter being particularly relevant to the AIIB as a new bank. Successful claims at other banks have altered institutional practices and resulted in major reparations. In 2004, communities brought a complaint against the International Finance Corporation (IFC), the private-sector lender in the World Bank Group, about the environmental and social impacts of an investment in palm oil. This led the company to issue a moratorium on land clearance and the World Bank Group to implement an

18-month ban on financing palm oil, while it re-evaluated the risks.

In late March this year, communities affected by AIIB projects can begin filing complaints, at which point the bank’s new policy will be put to the test.

Can the AIIB be lean and green?

Critics of the bank expressed consternation that the bank had begun investing before it established an accountability policy for communities. Although the final policy took many of their concerns into account, some still have reservations about the outcome, particularly regarding the accessibility of the bank to local communities. Natalie Bugalski, legal director of Inclusive Development International, said, “While the policy contains some innovative elements [...] it falls short of international best practices in several important respects.”

She pointed to an issue at the very foundation of the policy. Community complaints have to be anchored in the project’s failure to comply with the bank’s own environment and social framework. Bugalski said, “Because these standards are far narrower in scope and much vaguer than internationally accepted standards, such as the IFC’s performance standards, serious harms suffered by communities may fall outside the purview of the mechanism.” For instance, Lowell Chow, a researcher at the Business and Human Rights Resource Centre, noted that the framework requires the bank to “consult” indigenous communities in their projects but does not require it to obtain their “consent”, unlike other banks.

Another issue civil society advocates see is that the mechanism does not apply to projects that the bank finances with other institutions. These co-financed projects constitute 65% of its portfolio. For these, the bank will defer to the accountability mechanisms of other banks but remain

involved in the process, according to the policy. Other banks have stronger policies, but some lack key features of the AIIB's. For instance, the World Bank Inspection Panel does not include a dispute-resolution function for brokering settlements directly between a bank client and affected communities. "We believe that affected people should have the freedom to choose the mechanism that makes most sense to their particular situation and the outcomes they are seeking," Bugalski said.

This issue will fade over time as the bank matures and moves toward more independent financing, but for the time being community members will have to look to other banks or the local company to address their issues. This is an example of how the bank's leanness can work against community interests, said Kate Geary.

For the 35% of the bank's projects that are standalone, communities will be able to file complaints through the AIIB's own grievance mechanism. However, the policy states that complainants must first seek redress from bank management or local grievance redress mechanisms, like the suggestion box in Shwe Taung.

Kristen Genovese, senior researcher at the Centre for Research on Multinational Corporations, said that in her extensive experience working with communities, these company-run mechanisms have never proved useful. She said the AIIB is a complete outlier on this front. "There are no other banks that require you to use the project-level grievance mechanism first."

Having to file complaints locally first may expose complainants to the risk of retaliation from the local government or company. However, the AIIB has adopted a progressive clause that acknowledges this risk and states that if locals face such threats, they do not have to file locally before reaching out to the bank.

The AIIB declined to comment on the new policy. In a press release, bank president Jin Liqun said, "Ensuring that the environment and local people are not harmed by AIIB-financed projects is a cornerstone of our lean, clean and green values. This mechanism will enable us to respond quickly to concerns from project-affected people so we can work with our clients to address those issues in a timely manner."

An example for Chinese banks?

Despite criticism, Zhang Jingjing, an environmental lawyer and lecturer at the University of Maryland Law School, sees the policy and the bank as exemplary compared to some of China's overseas development practices and institutions.

Zhang helps communities in developing countries sue over issues related to Chinese development. From Sierra Leone to Guinea, the Chinese banks financing projects she has worked on offer no channels for locals to complain. Although she acknowledges the limitations of grievance mechanisms, she sees the AIIB's policy as an edifying example for these institutions. "I hope Chinese banks can learn from this and follow AIIB to set up their own social safeguard framework as well as this mechanism," she said.

China has helped establish the AIIB and the New Development Bank (NDB), and both outperform the country's own development banks on environmental and social standards, according to a recent analysis. However, China's domestic policy banks still dwarf the AIIB in scale and global reach. In 2016, AIIB lending was less than 1% of China's total investment into Belt and Road countries.

American University associate professor Tamar Gutner recently cautioned that the AIIB may be a distraction from the larger Chinese banks: "A clear or growing contradiction between China's actions outside the AIIB and the bank's policies and goals could still risk turning the AIIB into the Potemkin village of international organisations – a showcase of good intentions in a larger sea of hypocrisy."

For now, the AIIB's own commitment to international best practices will be tested when its new policy goes into effect in March. Genovese said that the policy language is important, but implementation is where its true commitment to accountability will be made clear. If properly implemented "you can have a policy that isn't spectacular but is still very effective," she said. ☺

Lili Pike is a researcher for chinadialogue and the executive producer of the Beijing Energy Network's podcast, Environment China.

世界屋脊难逃生物多样性丧失厄运

到 2100 年，兴都库什 - 喜马拉雅地区大约 87% 的原始栖息地都会消失，并带来全球性影响。

□ 贝丝·沃尔克



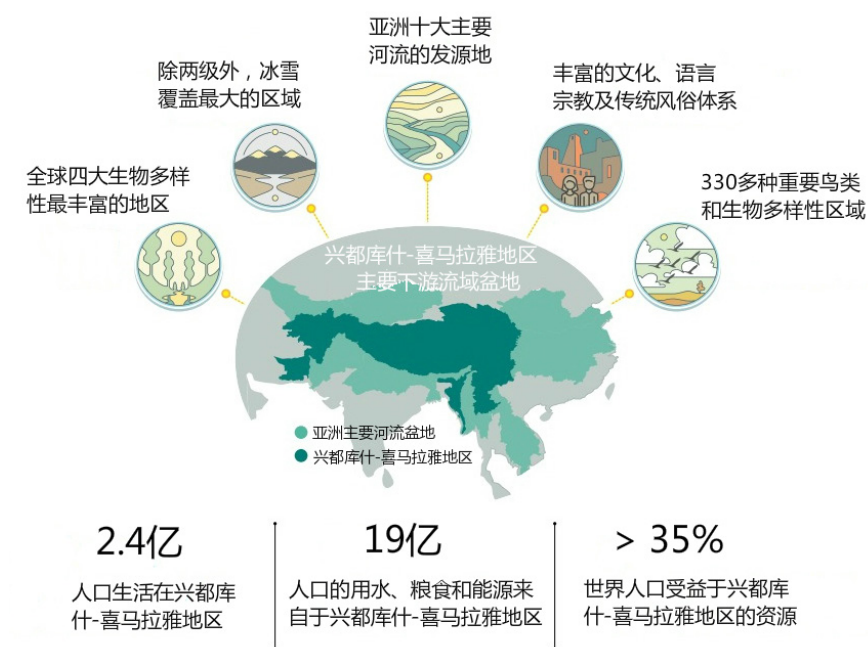
小熊猫

世界屋脊作为这个世界上生物多样性最丰富的热点地区之一，正在失去的不仅仅是冰雪，动植物物种、作物多样性和生态系统多样性也一样走上了下坡路。国际山

地综合发展中心（ICMOD）最近出版的一份具有里程碑意义的评估报告中提供了该地区上述生态现状的证据。

兴都库什 - 喜马拉雅地区是亚

洲 10 大主要河流的发源地，为大约 20 亿人提供着生活所需的水资源、食物、能源和碳存储。但是这份报告却为世人描述了一幅前景黯淡的画面。该报告中由昆明世界农作林



来源: HIMAP



来源: HIMAP

业中心徐建初等人撰写的章节显示，受人类发展、环境污染、资源过度开采和气候变化等因素影响，兴都库什-喜马拉雅地区的生物多样性已经开始急剧下滑。

报告援引数据显示，该地区70%到80%的原始栖息地已经消失，而到2100年，这个比例可能会上升到80%到87%。届时，仅喜马

拉雅山脉印度一侧就有四分之一的特有物种可能会消失。基础设施开发、贸易线路开拓、水电大坝建设等都会给该地区脆弱的环境造成重击，而气候变化更是让这一切“雪上加霜”。

这意味着，该地区向亚洲其他地区提供的水和碳储存等重要环境服务也将面临终结。

全球生物多样性热点地区

兴都库什-喜马拉雅山脉拥有不少全球生物多样性最丰富的地区，许多甚至还未被发现。1998年到2008年，每年都会在喜马拉雅东部地区发现大约35种新物种。

该地区西起阿富汗，东至中国，横跨了大片地区，不仅覆盖着大片的冰雪，还有郁郁葱葱的热带山谷、山地森林、高山牧场、高原草原、湿地和荒漠草原。

这些自然环境为老虎、大象、麝香鹿、大熊猫和雪豹等不少珍稀濒危动物提供了栖息之地。然而，除过去十年藏羚羊和大熊猫的数量出现回升之外，其他濒危物种都几近灭绝。此外，杜鹃花、兰花、珍稀草药和多种野生可食用植物也都开始面临威胁。

国际山地综合发展中心(ICMOD)的报告证实了之前的一些研究成果：随着气候变化和气温不断上升，到2050年，青藏高原上大面积的草原、高山草甸、湿地和永久冻土都将消失。最近的^⑤些报告显示，青藏高原的变暖速度可能是全球平均水平的3倍。

新报告还强调称，兴都库什-喜马拉雅地区的遗传多样性也同样具有全球意义。目前在尼泊尔发现的稻米有2500多种，而喜马拉雅西部地区发现的香米也有100多类。当地农民种植的这些作物可以作为提高产量和对抗病虫害的一种遗传基因资源。这一点对于保护全球粮食安全至关重要，因为粮食多样性锐减导致人类越来越容易受到气候变化的影响。报告指出，目前针对该地区遗传多样性的研究还很少。

人类的影响

如今，生态系统的抗压能力越来越差，导致野生生物总量和植物生产力下降，动植物生长期发生变化，整个生态系统开始向高海拔地区转移。与此同时，由于气候变化和传统管理系统的崩溃，该地区面临的自然灾害也越来越严重。

这一切都会产生巨大的影响，特别是对当地山区的 2.4 亿人口来说尤其如此。这些人仍然生活在贫困之中，他们的日常饮食和生计都离不开当地的自然资源。报告指出，喜马拉雅地区生态多样性在人类健康方面的作用完全被忽视了。众所周知，几千年来这里都生长了不少的药用植物，而这也会对大型医药集团产生一些影响，因为药物的发现和研究都与了解草药对人体的影响有着密不可分的关系。遗憾的是，很多草药在得到利用前可能就消失了。生物多样性消失会使病原体“迁徙”到新栖息地，从而导致生物媒介性传染病的扩散。而随着水资源可利用量的变化，新的疾病也会涌现出来。

此外，兴都库什 - 喜马拉雅地区也是全球文化多样性最丰富的地区之一。大约有 1000 多个民族居住在这片人口密集的山谷耕地地区，每一个民族都有着自己的传统习俗、农作物以及深厚的地方常识。

几个世纪以来，古老的山区丝绸之路逐步发展成了广阔而充满活力的贸易网络，促进了当地文化、知识和生物多样性交流，带动了不同物种、农业系统和植物的大规模迁徙。上世纪 60 年代，随着中国逐步封锁国界和边界冲突爆发，很多贸易线路被关闭，但是目前大部分的线路已经被重新开放，虽然由于印巴和中印关系紧张，一些边界贸易通道仍处于封闭状态。

积极转变，探索社群保护新模式

报告指出，过去几十年，环境保护方式已经出现了积极转变——以往都是将人类排除在保护区范围之外，而如今则更多地是以当地社区为中心开展保护行动。这种参与式的方法当然也带来了不少积极变化，比如退化森林和湿地得到有效恢复和再生。而在神圣树林等宗教场所附近，生态多样性也变得更加丰富。

但是，更大的威胁其实已经迫在眉睫。

社群行动仍然不足以遏制生物多样性大规模丧失的趋势。水电就是一个巨大的威胁，目前这个区域投入运营或在建的大型水电项目有 550 多个。中国“一带一路”倡议下开辟了多条贸易通道，包括在环境脆弱地区新建铁路和公路，这些线

路虽然会给偏远地区带来发展机遇，但同时也可能会给资源过度开采和非法野生动物贸易带来便利。

受气候变化的影响，生态系统正在发生巨大的变化，而主要河流发源地——青藏高原的变化更是格外明显。那里的永久冻土和大规模荒漠化已经使大片珍贵的草原和湿地逐渐变为沙漠。

生物多样性保护还需更大决心

兴都库什 - 喜马拉雅地区大约 40% 的区域被列为保护区，但是保护措施的落实却是不尽人意。这些地区大多地处偏远，有时甚至受到边境冲突困扰，当地政府很难对其进行掌控。以横跨印缅两国边界的印缅生物多样性热点区为例，这里有着大量的地方特有物种，但是保护措施却远远落后于其他地区。

该报告作者呼吁该地区各国、援助国政府以及私人部门加大对保护工作的财政支持。这份报告并未过多罗列各国政府、投资者和民间社团应该采取的具体措施，但强调了强化地区合作的必要性。

英文原文首发于中外对话网站第三极。

贝丝·沃尔克，中外对话文化频道编辑，同时也是第三极项目编辑

Hindu Kush Himalayas set for massive biodiversity loss

World's most biodiverse region will lose up to 87% of original habitat by 2100, with global repercussions

□ Beth Walker

It is not just the snow and ice that's disappearing from the roof of the world. Animals and plant species, crop diversity and ecosystem diversity are also being lost in one of the earth's richest biodiversity hotspots. This is the evidence presented recently in the landmark ICIMOD assessment report on the state of the region.

The report paints a bleak picture for the region that is the source of Asia's 10 major rivers and which provides water, food, energy and carbon storage for almost two billion

people. Biodiversity is in steep decline, driven by human development, pollution, overexploitation of resources and climate change, according to the report chapter authored by Xu Jianchu from the World Agroforestry Centre in Kunming, China, among others.

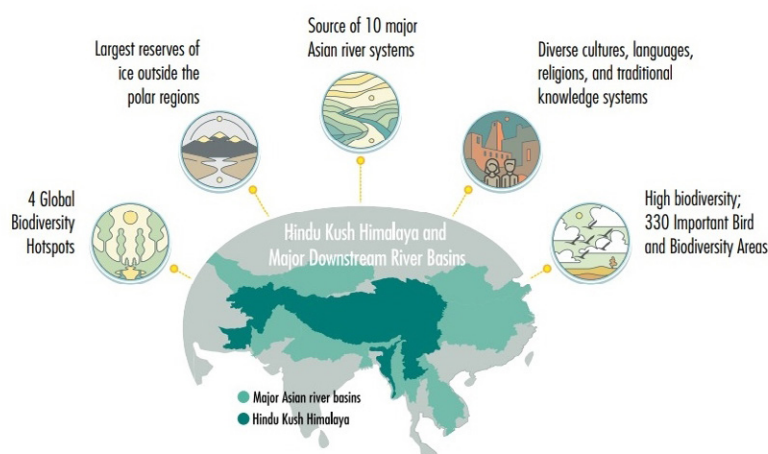
According to data cited in the report, 70-80% of the region's original habitat has been lost and that may increase to 80-87% by 2100. A quarter of endemic species in the Indian Himalayas alone could be wiped out by 2100. Climate

change is set to worsen this, along with new infrastructure development, trade routes and hydropower dams planned for the fragile region.

This will mean the loss of key environmental services the region provides, such as water and carbon storage, to the rest of Asia.

Global biodiversity hotspot

The mountains of the Hindu Kush Himalaya contain the most biodiverse regions in the world – some of it still undiscovered. About 35 new species were found every year in the Eastern Himalayas between 1998 and 2008.



240 million

people depend directly on the HKH for their lives and livelihoods

1.9 billion

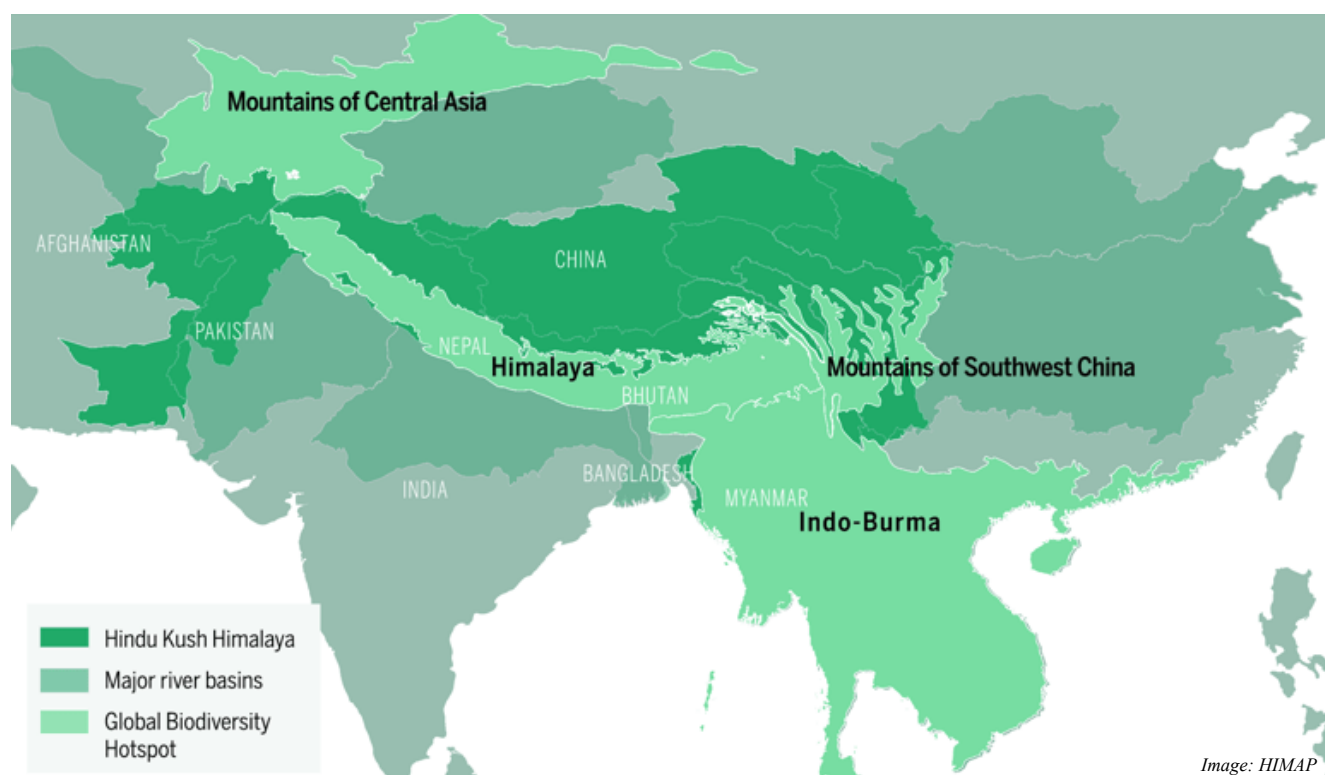
people depend on the HKH for water, food, and energy

> 35%

of the world population benefits indirectly from HKH resources and ecosystem services

Image: HIMAP

Summary of the HKH Assessment Report



Spanning a vast distance from Afghanistan in the west to China in the east, the region is not only vast tracts of snow and ice. It encompasses lush tropical valleys, mountain forests, alpine meadows, high altitude grasslands and wetlands, as well as arid steppes.

These provide habitat to a diversity of rare endangered animals including tigers, elephants, musk deer, red panda and snow leopards. Most of these species – apart from the Tibetan antelope and giant panda of which numbers have rebounded in the past decade – are being driven to extinction. Rhododendrons, orchids, rare medicinal and wild edible plants are also under threat.

The ICIMOD findings corroborate earlier studies showing that as temperatures rise with climate change, large areas of grasslands, alpine meadows, wetlands and permafrost will disappear on the Tibetan plateau by 2050. The Tibetan plateau is warming at up to three times the global average, according to recent reports.

The genetic diversity of the Hindu Kush Himalaya also has global significance, the new report highlights. There have been 2,500 species of rice identified in Nepal alone, and 100 types of basmati in the Western Himalayas. The

variety of crops grown by farmers could serve as a genetic resource for improving crop yields and pest resistance. This will be essential to support global food security in a world where shrinking crop diversity has left us vulnerable to climate change. There has been little research so far on the genetic diversity of the region, the report points out.



+35

new species discovered

each year in the eastern Himalaya between 1998 and 2008



1/4

of endemic species in the Indian Himalaya could be wiped out by 2100



70–80%

of habitat lost in biodiversity hotspots in the HKH (relative to 1500 A.D.)

Human impacts

Ecosystems are becoming less resilient to stress. This has led to a loss of wildlife populations, and plant productivity, and changes in growing seasons, with entire ecosystems



A Tibetan guide talks about climate change at Everest

shifting to higher altitudes. At the same time the region is facing an increase in the severity of natural disasters due to climate change and a breakdown of traditional systems of management.

This will have huge impacts, particularly for the 240 million people in mountain regions who still live in poverty and depend on natural resources for their daily food and livelihood. The role of Himalayan biodiversity in health has been overlooked, the report points out. The area has been known for millennia as the home of numerous medicinal plants. This will also have an effect on large pharmaceutical corporations, since the discovery and development of medicines is linked to understanding the effects of plants and herbs on the human body. Many of these may be lost before they're utilised. Biodiversity loss will see the expansion of vector-borne diseases as pathogens move to new habitats, and new diseases due to changes in water availability.

The Hindu Kush Himalaya is also one of the world's

most culturally diverse regions. Its densely populated and cultivated valleys are home to over 1,000 different ethnic groups, each with their own traditional practices, agriculture crops and deep local knowledge.

The vast and vibrant trade networks along the old mountain silk roads facilitated the exchange of culture, knowledge and biodiversity over centuries. This resulted in a rich migration of species, and different farming systems and plants. Many of these routes were shut down in the 1960s as China turned inwards and border disputes broke out – but are now being revived. Many more remain closed, largely due to political tensions between India and Pakistan as well as India and China.

Community conservation

The report notes a positive shift over the past decades in conservation approaches – from focusing on species by excluding people from protected areas, to a more

community-centred approach. Participatory approaches have brought positive change – regenerating degraded forests and restoring wetlands for example. And biodiversity is much richer around religious sites such as sacred groves.

But bigger threats loom

Community action can't do enough to stem the tide of wide-scale biodiversity loss. Hydropower is a big threat, with over 550 large projects operational or under construction. New trade routes under China's Belt and Road Initiative, such as new rail and roads cutting through fragile landscapes, will bring opportunities to remote regions, but could facilitate greater resource extraction and illegal wildlife trade.

Climate change is driving massive ecosystem changes, particularly on the permafrost and widespread desertification at the source areas of major rivers on the Tibetan plateau in China, turning vast swathes of precious grasslands and wetlands into desert.

More ambition needed

About 40% of the Hindu Kush Himalaya region is designated as protected areas but implementation of conservation measures is patchy. Many of these areas are remote and authorities have little control over border regions sometimes plagued by conflict. The Indo-Burma hotspot is one example. Straddling India and Myanmar, it has one of the highest levels of endemic species but lags far behind other regions in conservation.

The report's authors call for countries in the region and donor governments and the private sector to step up financial commitments for conservation. The report is a bit thin on concrete measures national governments, investors and civil society should take but it emphasises that greater regional cooperation is a necessity. ↻

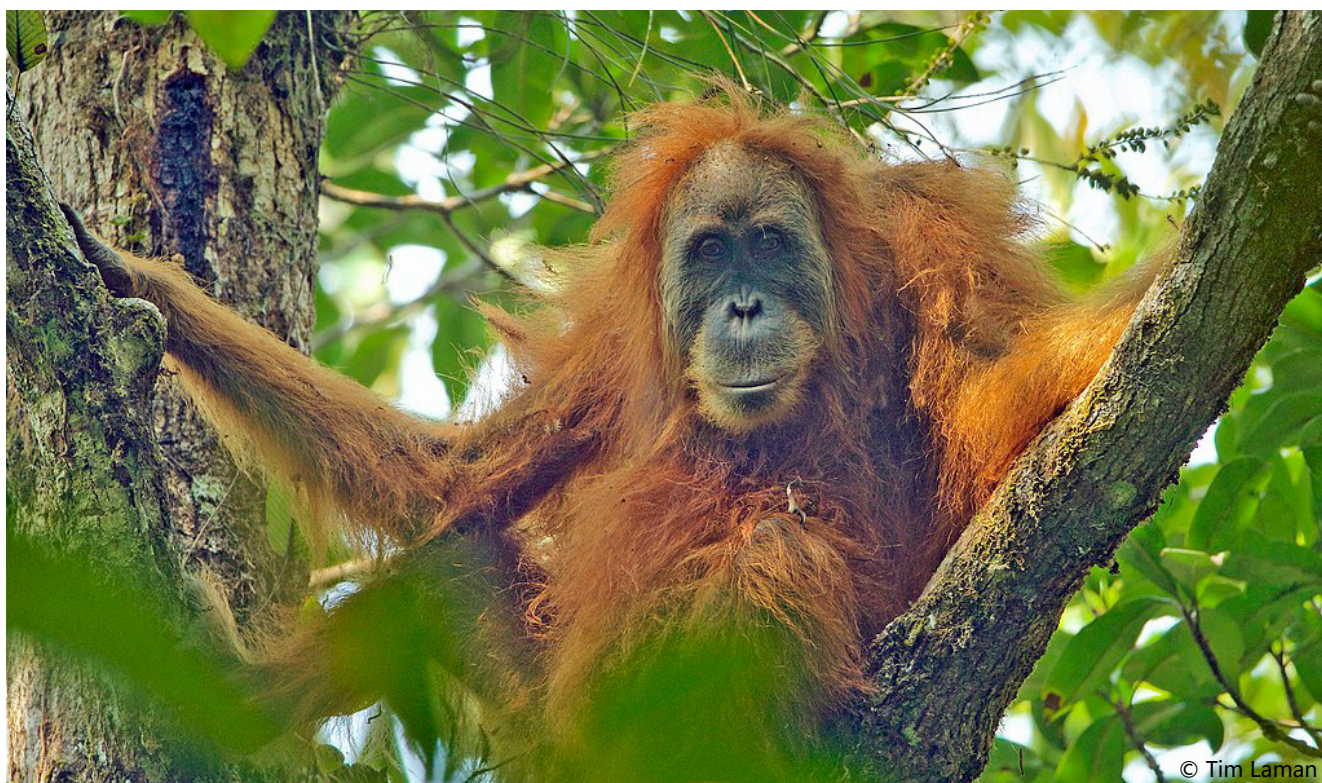
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印尼达巴奴里猩猩前途未卜

科学家呼吁保护热带雨林栖息地，并停止在苏门答腊岛建设水电大坝。

□ 汤米·阿普利亚诺



成年的达巴奴里母猩猩

印度尼西亚的巴丹托鲁热带雨林栖息着很多罕见物种。马来熊、穿山甲、豹以及老虎等动物已经在北苏门答腊岛上生存了数千年。而作为地球上最稀有的类人猿物种，达巴奴里猩猩也一直安静地生活在这片树林中。

但是，这里仅存的约 800 只达巴奴里猩猩目前因为一个部分由中国银

行出资的森林水电项目而面临严重威胁。3月4日，北苏门答腊地区法院驳回了非政府组织印度尼西亚环境论坛(WALHI)试图阻止该项目的诉讼请求。同一天，中国银行发布了一个声明称已“注意到”环保组织对该水电项目的担忧，并且“会非常仔细地评审项目”。3月13日，WALHI为进一步申诉又迈出一步。

2017年，灵长类学家才认定达巴奴里猩猩与爪哇和苏门答腊地区的猩猩属于不同物种。达巴奴里猩猩的毛格外卷曲，呈肉桂色，雄性头领猩猩有明显的唇上小胡子，而雌性猩猩则下巴上长有胡须。

达巴奴里猩猩对人类很警惕。但是由于水电站建设砍伐了大量树木，不少达巴奴里猩猩开始逐渐

进入人类居住的森林地区。印度尼西亚环境与林业部自然资源与生态系统保护总干事维拉特诺表示，农民们已经在村庄附近森林的树冠中发现了猩猩专门搭建的用来睡觉的巢窝。

种群分散可能会造成达巴奴里猩猩灭绝。目前这个物种已经被分成了3个族群，其中只有一个族群的规模足够大，有500多个个体，能够保持遗传多样性并维持族群繁衍。而繁殖速度过慢也让这个物种变得尤其脆弱。雌性达巴奴里猩猩15岁才能开始生育，每8到9年只能生育1到2只（极少数情况）后代。研究人员从2005年开始研究这些大猩猩并试图在这3个族群间建立联系，但是并没有成功。

水电站建设需要架设高压电线，修建道路网络。对一个完全生活在树上的物种来说，道路就好像一堵难以穿透的墙。而对印尼的猎人和居民来说，这简直就是一份天降礼物。

大坝

印尼PT北苏门答腊水力资源公司（PT North Sumatra Hydro Energy）将与中国水电集团（Sinohydro）共同建设这座水电大坝。而中国银行和中国出口信用保险公司（Sinosure）则为该项目提供资金支持，累计规模达16亿美元。

这座大坝也是中国“一带一路”倡议中有关公路、铁路、港口和能源基础设施建设规划的一部分。有专家担心一些项目将会影响到全球生物多样性最丰富的一些地区。詹姆斯库克大学热带环境与可持续科学中心主任威廉·劳伦斯教授认为，这个倡议是“史上环境风险最高的项目”。

由于担心这个大坝的环境后果，世界银行拒绝为其提供资金支持。但是，中国企业和他们的印尼合作伙伴仍在紧锣密鼓地推进这个项目，并将于2022年全面投入运营。届时，4台涡轮机组的总发电量将达到510兆瓦。

印度尼西亚环境论坛（Walhi）正在试图阻止这个项目。Walhi对PT北苏门答腊水力资源公司提起了诉讼，认为其项目环评没有考虑下游濒危物种和居民，以及潜在的生态灾难风险。但是，北苏门答腊岛的一个法院却在3月初裁定大坝项目可以继续进行。

Walhi北苏门答腊执行董事达纳·普利玛·塔里干表示，他们已经开始继续提出上诉。他指责地方法院法官在上一次的诉讼中并没有采纳他们的论点或证据。

“我们向法官提交了53份文件证据，有13名独立证人出庭作证，但是法官小组在判决时并没有考虑我们的证据。”

洪水肆虐的下游地区

2018年12月，“中外对话”采访了祖菲特里·西雷加尔，大家经常叫他加亚尼。他当时正坐在哈普桑



大片森林因项目建设被砍伐

巴鲁村自家的小房子门前。外面正下着雨，他很担心巴丹托鲁河会因此决堤，淹没他的家和鱼塘。

就在一个月以前，洪水淹没了他的房子，积水高达一米。加亚尼怀疑，水电站建设过程中的森林砍伐导致了洪水爆发。他亲眼看到原木在距离他家 200 米的河中漂浮。

他说：“除非有人事先把它们砍倒了，否则这么大的木头不会被河水冲走的。”

2018 年 11 月，加亚尼在 Walhi 对 PT 北苏门答腊水力资源公司的诉讼中出庭作证。他认为，水电公司进行项目影响评估的过程中缺少公众意见征询的环节，当地社区根本不了解这个项目的潜在影响，有些甚至都不知道这座大坝正在建设中。

大坝的设计思路是每天截流储水 18 个小时，并在晚上 6 点到午夜的用电高峰时段放水发电。每日流量的这种巨大变化可能会淹没下游地区，包括 12 平方公里的农田。这条河流也是当地农业和渔业的重要支柱。因此，大坝很有可能会令 10 万名依靠河流为生的居民受到影响。

加亚尼担心说：“未来，我们每天都会面临一场巨大灾难的威胁。”

地震风险

该大坝所在地区还属于地震多发区。一旦溃坝，水坝内 350 万立方米的水就会涌出，从而给下游地区造成严重破坏。但是，该项目的评估中却并没有考虑这个风险。

北苏门答腊大学环境研究员贾亚·阿诸那指出：“这个影响评估研

究是不完整的，如何避免地震带来的风险是这类研究不可缺少的部分。项目所在地及周边地区经常发生地震。这里的地壳环境不稳定。”

爪哇岛国家发展大学研究员埃科·缇加·帕里普诺主要研究减灾问题，他也认同贾亚的看法。“这个影响评估未能考虑可能影响大坝和受大坝影响的地质因素。”

他认为，这个水电大坝将为采矿企业 PT Agincourt Resources 供电，而后者则有可能将废料沉积物直接排入河中，进一步影响河流生态环境。

埃科表示：“这个项目完全没有讨论制定一个环境管理和监督方案。”

来自印尼环境与林业部的维拉特诺曾致信 PT 北苏门答腊水力资源公司。他在信中指责这家公司没有考虑项目对达巴奴里猩猩的影响。他要求该公司组织一个团队，确保项目建设期间周边没有猩猩出没，并且专门开辟一个野生动物迁徙的走廊并加以保护，从而确保大猩猩能够安全地在东西两个栖息地间穿行，同时还要种植果树满足大猩猩觅食需求。

但是贾亚·阿诸那认为，这些措施还不够。由于稻田和鱼塘被淹没，当地人肯定会进入森林找寻更多生存资源，而这又会进一步侵占猩猩的栖息地。

专家建议

科学家呼吁印尼政府立即停止这个水电项目的建设，保护并合理界定达巴奴里猩猩的主要森林栖息地，雇佣警卫人员防止伐木和偷猎。

阿尔法·纳苏蒂安是北苏门答腊大学的一位专门研究达巴奴里猩

猩的灵长类动物学家。他希望将这片森林的土地性质从“其他用途区域”重新划定为森林保护区，防止对其进行开发。他说：“达巴奴里猩猩的活动、觅食和繁殖需要大片的森林。”和维拉特诺一样，他也建议开辟野生动物走廊和缓冲林区。

北苏门答腊大学林业研究员昂里扎认为，该水电项目并不是必不可少的，人们完全可以找到可持续的替代方式。

他指责帮助 PT 北苏门答腊水力资源公司进行环境影响评估的 PT Global Inter Sistem 公司在提交给当局的文件上伪造了他的签名。昂里扎的确针对这片森林地区进行了生物多样性研究，但是他提及的有关达巴奴里猩猩、苏门答腊虎和其他保护物种的内容随后都被从报告中删除了。

印度尼西亚大学灵长类动物专家贾塔纳·苏普里阿纳认为，国家有责任保护达巴奴里猩猩和苏门答腊虎等多种濒危物种栖息的森林。目前，达巴奴里猩猩总数不足 800 只，损失任何一只对中印尼两国来说都是悲剧性的。

PT 北苏门答腊水力资源公司在回复“中外对话”的电子邮件中表示，该公司已于 2016 年和 2018 年年底对大坝下游地区进行了研究，并将结果提交给了当局。此外，该公司还回顾了该项目对达巴奴里猩猩的影响，并与自然资源保护中心合作，针对相关影响采取了监测和减轻影响措施。^⑤

汤米·阿普利亚诺，印度尼西亚记者

Orangutan species at risk of extinction after legal challenge fails

Scientists call for rainforest habitat to be protected and dam construction to cease in Sumatra

□ Tommy Apriando

The Batang Toru rainforest in Indonesia teems with rare life. Sun bears, pangolins, tapirs and tigers have roamed this wild patch of North Sumatra for millennia. Meanwhile the rarest great ape on Earth, the Tapanuli orangutan, has lived quietly in the trees above them.

A hydropower project in the forest, part funded by the Bank of China, is now putting the roughly 800 surviving Tapanuli orangutans at serious risk. Activists made their opposition heard on March 1 outside branches of the bank in cities including Jakarta, New York, Hong Kong, Manila and Johannesburg. On March 4, a court in North Sumatra rejected a legal challenge by the Indonesian Forum for the Environment (WALHI) that would have stopped the project. That day the Bank of China released a statement saying it “took note” of the concerns expressed by environmental organisations and “will evaluate the project very carefully.” On March 13, WALHI made its first steps towards appealing the court’s decision.

Primatologists only recognised the Tapanuli orangutan as distinct from the Bornean and

Sumatran varieties in 2017. They had noticed that their fur was particularly frizzy and cinnamon-coloured, that the dominant males had prominent moustaches, and the females were bearded.

The Tapanuli orangutans are wary of people. Yet tree-felling for the hydropower plant has already pushed some into parts of the forest inhabited by humans. In the canopies above their villages, farmers have spotted the distinctive nests orangutans build for sleeping, said Wiratno, director general of natural resources and ecosystems conservation at the Ministry of Environment and Forestry.



Fallen trees in Batang Toru

Fragmentation may be the undoing of the Tapanuli orangutan. Already split into three populations, only one of these – at 500 strong – is thought to be sufficiently large and genetically diverse to sustain itself. A very slow reproduction rate makes the species particularly vulnerable. Females start breeding at the age of 15 and then give birth to one or (more rarely) two offspring only every eight or nine years. Researchers, who started studying these great apes in 2005, have tried to link up the three groups but without success.

The hydropower plant will require the installation of high-voltage electricity lines and a network of access roads. To an exclusively tree-dwelling species a road is an impenetrable wall. To Indonesian hunters and settlers, it is an invitation.

The dam

Indonesian firm PT North Sumatra Hydro Energy is building the hydropower plant with Chinese state-owned enterprise Sinohydro, architect of the enormous Three Gorges Dam. The Bank of China and Sinosure, a Chinese state-owned insurer, are backing the project, which is set to cost US\$1.6 billion.

The dam is part of China's Belt and Road Initiative to build roads, railways and ports, as well as energy infrastructure. This will affect some of the most biodiverse parts of the planet. Professor William Laurance, director of the Centre for Tropical Environmental and Sustainability Science at James Cook University has called the initiative "the riskiest environmental project in history".

The World Bank declined to offer funding because of concerns about the environmental consequences. But the two Chinese corporations and their Indonesian partners are pushing hard for its completion. It is set to be fully operational by 2022, when its four turbines will generate 510 megawatts.

The legal challenge from the Indonesian Forum for the Environment (WALHI) to PT North Sumatra Hydro Energy claims its environmental impact assessment failed to consider endangered species or communities downstream

and the potential for ecological disasters. However, a court in North Sumatra ruled in early March that the dam could go ahead.

Dana Prima Tarigan, executive director of the North Sumatra branch of WALHI, has begun the process of appealing the ruling. He believes the judges have not considered their arguments or evidence.

"We submitted 53 pieces of documentary evidence to the judges and 13 independent witnesses at the trial, but none of these were taken into consideration by the panel of judges in giving a decision."

Flooding downstream

When chinadialogue interviewed Zulfritri Siregar, better known as Ghayani, in December, he was sitting outside his small house in the village of Hapesong Baru. It was raining and he was nervous that the Batang Toru River would burst its banks and inundate his home and fish farm.

Just a month earlier, flooding had filled his house a metre deep. Ghayani suspected that forest clearing for the hydropower plant had contributed to the flash flood. He had seen timber floating down the river that runs just 200 metres from his house.

"Such large logs cannot be carried away by the river unless someone cuts them down first," he said.

Ghayani gave testimony in the Walhi lawsuit against PT North Sumatra Hydro Energy in November. He argued that the company had failed to consult the public as part of its impact assessment. Local communities had not been informed about the potential effects of the project. Some did not even know a dam was being constructed.

The dam is being designed to block water for 18 hours a day and release it when electricity demand peaks, between 6pm and midnight. This daily surge will flood areas

Scientists have called on the Indonesian government to put an immediate halt to construction.

downstream, including 12 square kilometres of farmland. One hundred thousand people who rely on the river for fishing and agriculture are likely to be affected.

“A big disaster will threaten us every day,” fears Ghayani.

Seismic risks

The dam will also be situated in an area prone to earthquakes. A collapse would risk the release of 3.5 million cubic metres of water, causing severe damage downstream. The impact assessment does not consider this risk.

“The impact study is incomplete. There must be studies on how to avoid the risks that might arise from an earthquake,” said Jaya Arjuna, an environmental researcher at the University of North Sumatra. “Earthquakes regularly hit the site of the project and its surroundings. The land in the region is unstable.”

Eko Teguh Paripurno, who researches disaster mitigation at the University of National Development in Java, echoed Arjuna’s view. “The impact assessment fails to consider the geological characteristics that might influence and be influenced by the dam.”

He believes that the hydropower plant is going to supply electricity to the mining company PT Agincourt Resources, which will deposit waste sediment in the river, further impacting the riverine ecosystem.

“There is no discussion of a plan for environmental management and monitoring of the project,” claimed Eko.

Wiratno, of the Ministry of Environment and Forestry, wrote a letter to PT North Sumatra Hydro Energy complaining that the company had failed to consider the effects of the project on the Tapanuli orangutan. He asked the company to form a team to ensure that no orangutans are nearby during construction, to designate and protect a wildlife corridor along which the great apes can safely travel between the eastern block of their habitat and the western block, and to plant fruit trees to nourish them.

But Jaya Arjuna does not believe that such measures would be enough. As their rice fields and fish farms are submerged, locals will penetrate the forest in search of resources, encroaching further on the orangutan habitat.

Expert recommendations

Scientists have called on the Indonesian government to put an immediate halt to construction, to protect and properly demarcate the primary forest inhabited by the Tapanuli orangutan, and to employ guards to prevent logging and poaching.

Arfah Nasution, a primatologist specialising in the Tapanuli orangutan at the University of North Sumatra wants the forest to be reclassified from “other use area” to a conservation forest, which would protect it from development. He said, “This species requires extensive forest blocks to explore, forage and reproduce.” Like Wiratno he suggested that wildlife corridors are needed, as well as areas of buffer forest.

Onrizal, a forestry researcher from the University of North Sumatra, argues that the hydropower project is not essential and that sustainable alternatives could be found.

He has accused PT Global Inter Sistem, which carried out the environmental impact assessment on behalf of PT North Sumatra Hydro Energy, of forging his signature on a document that was submitted to the authorities. Onrizal conducted biodiversity research on the forest but references he made to the Tapanuli orangutan, Sumatran tiger and other protected species were later removed.

Jatna Supriatna, a primatologist at the University of Indonesia, suggested that the country has a responsibility to protect the forest home of the Tapanuli orangutan and other endangered species, like the Sumatran tiger. With fewer than 800 individuals, the loss of the species would be tragic and hugely embarrassing to Indonesia and China.

Responding to an email from chinadialogue, PT North Sumatra Hydro Energy said it had conducted studies in the downstream region in 2016 and at the end of 2018, and had sent the results to the authorities. It had reviewed the impact of the project on orangutans, and collaborated with the Natural Resources Conservation Center to carry out monitoring and mitigation measures, it added. ☞

Tommy Apriando is a journalist in Indonesia

消失中的高原虫草带来的生态之忧

过度采挖和气候变化威胁着一种被称为“喜马拉雅伟哥”的稀有真菌，它曾给印度偏远地区带来繁荣。

□ 帕拉·k·亚达夫



人们在喜马拉雅山西部北阿坎德邦阿斯果德地区采挖虫草

过去十年中，一种价值极高的壮阳药和药用植物——冬虫夏草，为喜马拉雅山脉西部的印度陶利根加 (Dhauliganga) 山谷地区带来了繁荣。这里的社区经济过度依赖于这种稀有真菌(藏语称虫草为 Yartsagunbu)所带来的收入。但过

度采挖导致这一物种近乎枯竭，脆弱的高原草原环境也受到了破坏。

这些是我们近期在 2018 年 12 月发布的研究报告——“冬虫夏草：转变喜马拉雅西部地区人民生活方式”中所得到的研究结论。我们对北阿坎德邦楠达德维生物圈保护区中 32 个

村庄的虫草采挖和贸易进行了分析，结果发现，虫草占采挖家庭现金年收入的 74% 左右，并在过去 10 年中改变了当地的社会和经济状况。

“现在，这笔收入支撑着我们全年的孩子教育、家庭医疗和日常生活支出。另外，现在我不完全靠种

地来维持生计了。种地得靠天吃饭，而且还要提防野生动物的破坏，“36岁的普雷姆·辛格·拉纳说道。他每年都会采挖虫草并且参与了我们的研究。

虫草的繁荣将偏远地区的农户与国内、国际市场联系了起来。当地冬虫夏草的平均价格从2006年的每公斤4700美元上涨到2015年每公斤1.3万美元以上，涨幅达三倍之多。而卖到遥远的中国消费者手上时，价格比黄金还高。

然而，重金诱惑给虫草和喜马拉雅山地带来了巨大的生态压力，导致虫草数量急剧减少。

短暂的历史

历史上，生活在喜马拉雅西部楠达德维生物圈和阿斯果德地区的人们往来于西藏和印度低矮的山地之间，从事着羊毛、小米和盐的买卖。1962年中印发生冲突后，当地人与中国的贸易往来便停止了。这里的人们不得不依靠自给农业、放牧和收集药草来维生。

20世纪90年代，他们在这地区发现了虫草。

冬虫夏草真菌(学名为 *Ophiocordyceps sinensis*)通过感染寄生在蝠蛾幼虫体内，将其杀死后

再从其头部抽生而出。该物种生长于西藏高海拔地区的喜马拉雅草甸，以及不丹、印度和尼泊尔等地。中药里通常用做壮阳药，并逐渐成为一种日常保健品。

这种真菌大约在1500年前被藏族牧民发现，他们观察到牲畜吃了一种蘑菇后变得精力充沛。因此，明朝时的御医用它来研制强效壮阳药。通常的做法是将其与老鸭同煮，来治疗性欲减退和男性阳痿；也可与猪肉、麻雀和甲鱼配伍来增强体力和抗疲劳。尼泊尔的一些地方将虫草磨成粉，与牛奶同食，作为滋补品和壮阳药。人们还认为它可以治疗哮喘、肾脏疾病、月经不调和炎症等一系列疾病。

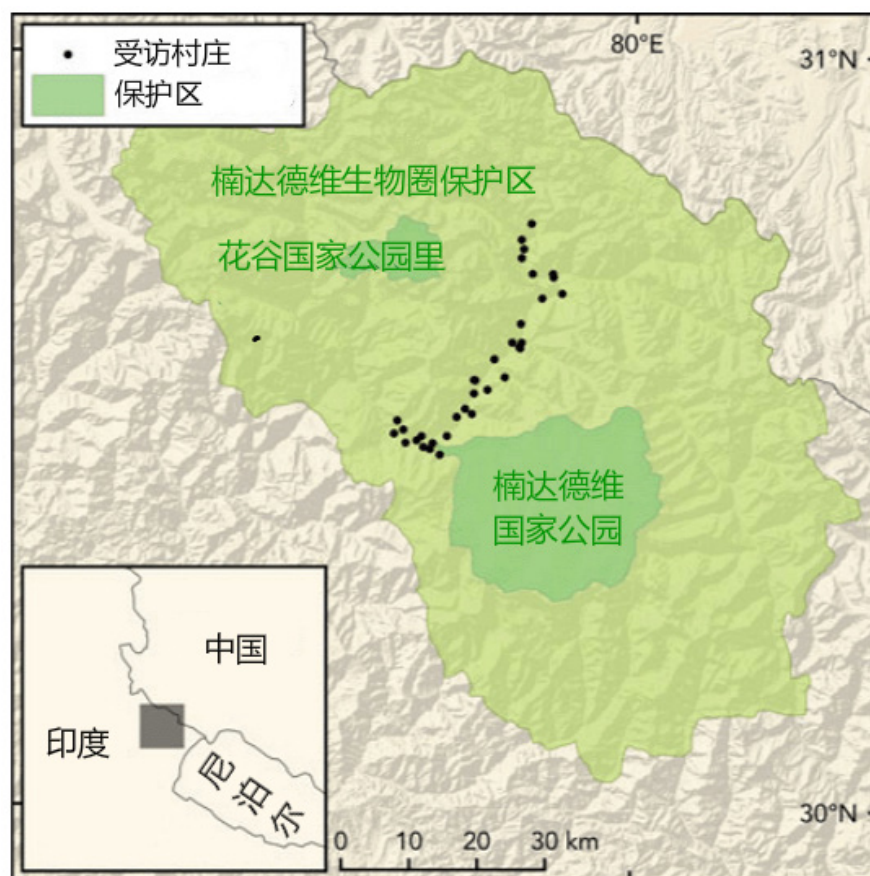
在北阿坎德邦的阿斯果德地区，1996年当地人从尼泊尔来的工人那里了解到虫草的经济价值后，开始采挖虫草。这种商品利润丰厚的消息在南达德维生物圈保护区谷地如野火般迅速传播开来。现如今，人们从高山草甸采挖冬虫夏草，卖给中间商获得丰厚的回报，然后这些中间商再将其卖到中国。

如今，虫草在亚洲和西方国家的城市里都有售。楠达德维生物圈保护区和阿斯果德附近的家庭中，至少每户都有一人在外面寻找虫草的踪迹。

濒危物种

虫草采挖季节从6月初持续到7月底。人们趴在地上，竭力寻找苹果把儿大小的虫草。挖草人必须勇敢地面对恶劣的气候条件，而且他们不一定会有所收获。一些村民在高海拔牧场经历了数周的煎熬后仍旧空手而归。

印度北阿坎德邦楠达德维
生物圈保护区内受访村庄位置图



资料来源: P.K. Yadav et al., Flora & Fauna 2018



虫草采挖季结束后挖草人废弃的营帐

大多数挖草人认为，由于竞争激烈和物种丰度下降，近年来采挖冬虫夏草变得更加困难。这一说法与我们得到的人均采挖数据相符。

过度放牧以及人类活动使得高山牧场承受的压力越来越大，对虫草及其栖息地产生了负面影响。研究期间，在保育领袖计划和鲁福德基金会的支持下，我们记录了成千上万的村民每年带着他们的帐篷、食物和家畜来采挖虫草的过程。

这些活动必将破坏偏远地区的牧场，并给濒临灭绝的喜马拉雅物种带来威胁，如雪豹、蓝羊和高山植被等。挖草人营帐周围遍地垃圾，但却没有相应的垃圾清理机制。

冬虫夏草生长在高山草甸。这里不仅是包括北阿坎德邦的恒河在内许多亚洲主要河流的发源地，也是下游人们重要的水源地。对早就

因气候变化而脆弱不堪的河流来说，这里的污染和栖息地破坏将给它们的水质和水量供应带来深远影响。

过度采挖终究是虫草数量急剧下降的重要原因之一。斯坦福大学的一项新研究也表明气候变化导致了虫草数量的下降，该区域的一些地方自 1979 年以来，冬季平均温度上升了 4℃ 左右。

所有这些威胁都可能导致该物种在当地灭绝。中国青藏高原地区的冬虫夏草也在逐渐消失，由于气温升高，虫草在此地的分布区海拔正在逐渐上升。

在印度的许多地方，采挖虫草是合法的，但虫草买卖却是违法的。这导致虫草被走私到尼泊尔和中国，并在黑市上出售。北阿坎德邦政府已经通过地方森林委员会发布了虫草采挖和贸易准则，由地方森林委员会为此

类活动颁发许可证。但是，在这些偏远地区政府法规没有得到落实。

毫无监管的猖獗采挖行为让人同时也为尼泊尔和中国地区虫草灭绝和山区自然景观受到的威胁感到担忧，促使人们呼吁建立可持续化的管理模式。

鉴于印度以及中国、不丹和尼泊尔的虫草采挖造成的影响，我们迫切需要展开更大范围的公开讨论和研究。这些偏远地区监管不足，而且缺少相应的政策支持资源的可持续管理，以及帮助当地群众转变谋生方式。^⑤

本文最初发表于第三极网站

帕拉·k·亚达夫,从事保护相关的研究和倡议工作,以打击野生动植物犯罪,促进野生资源的可持续和合法贸易

Vanishing caterpillar fungus leaves Himalayan communities vulnerable

Overharvesting and climate change threaten a rare fungus that has brought prosperity to a remote part of India

□ Pramod K. Yadav

In the Dhauliganga valley of India's Western Himalayas, caterpillar fungus – a highly valued aphrodisiac and medicinal plant – has brought prosperity over the past decade. Communities have become overwhelmingly dependent on the rare fungus, known as yartsagunbu in Tibet, for their income. But overharvesting has led to depletion of the species and environmental damage in the fragile alpine grasslands.

These were the findings of our recent research study “Yartsagunbu: transforming people's livelihoods in the Western Himalaya” published in December 2018. We analysed the harvesting and trade of caterpillar fungus in 32 villages in the Nanda Devi Biosphere Reserve in Uttarakhand state. We found that caterpillar fungus contributes about 74% of a harvester's household annual cash income, and has transformed local social and economic conditions in the last 10 years.

“Now I spend this money for my children's education, family healthcare and daily needs for a whole year. Furthermore, now I do not have to rely completely on agriculture, which is subject to rainfall and destruction by wildlife,” said 36-year-old Prem Sing Rana, who harvests caterpillar fungus every year and took part in the study.

The caterpillar fungus boom has helped integrate remote rural households into national and international markets. The average local price for caterpillar fungus has tripled



Harvested caterpillar fungus

from USD\$4,700 per kg in 2006 to more than \$13,000 per kg in 2015. When sold to Chinese consumers further afield, the price is higher than gold.

But the lure of easy money has put enormous ecological pressure on the caterpillar fungus and the Himalayan landscape, leading to a sharp decline of the species.

A short history

Historically, people who lived in the Nanda Devi Biosphere and Askot landscape of the Western Himalaya traded wool, millet and salt between Tibet and the lowlands of India. After the Indo-China conflicts in 1962, trade with Tibet stopped. And people in the area – largely from the Tibetan

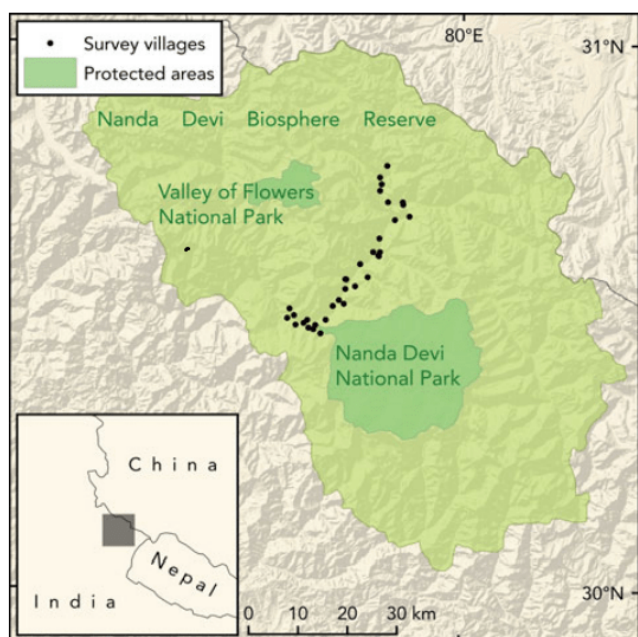


FIG. 1 Location of the study villages in Nanda Devi Biosphere Reserve, Uttarakhand, India.

Source: P. K. Yadav et al., *Flora & Fauna* 2018

ethnic Bhotia group – had to rely on subsistence agriculture, herding and collecting medicinal herbs.

In the 1990s, the community discovered caterpillar fungus in the area.

The fungus (*Ophiocordyceps sinensis*) infects and eats the inside of ghost moth caterpillars, kills them and emerges out of their head. The species is found among the high-altitude Himalayan meadows of Tibet, as well as in Bhutan, India and Nepal. It is a popular aphrodisiac in Chinese medicine and is increasingly used as a dietary supplement.

The fungus was discovered about 1,500 years ago by Tibetan herdsman, who observed their livestock become energetic after eating a kind of mushroom. Consequently, royal physicians during the Ming Empire used it to develop powerful and potent medicines. The fungus is usually consumed by cooking it with aged duck to treat hypo-sexuality and male impotence. It is also cooked with pork, sparrow and turtle to treat fatigue. In some parts of Nepal, caterpillar fungus is powdered and drunk with cow's milk as a tonic and aphrodisiac. It is also believed to treat a range of ailments, including asthma, renal complaints, irregular menstruation and inflammation.

In Askot, Uttarakhand state, harvesting of caterpillar fungus began in 1996, after locals learnt of its economic value from migrant Nepali workers. News of this lucrative commodity spread like wildfire around different valleys of the Nanda Devi Biosphere Reserve. People now harvest caterpillar fungus from alpine meadows and get a handsome return by selling it to brokers, who then take it to China.

Today, at least one person in every household around the Nanda Devi Biosphere Reserve and Askot landscape has left in pursuit of caterpillar fungus, which is now traded across cities in Asia and in western countries.

Species under threat

The harvesting season for caterpillar fungus lasts from the beginning of July until the end of June. People lie on the ground, trying to spot the tiny caterpillar fungus, as small as an apple stalk. Collectors have to brave harsh climates and there are no guarantees they will find anything at all. Some villagers return with nothing to show after weeks of hardship in high altitude pastures.

The majority of collectors believe that harvesting caterpillar fungus has become more difficult in recent years because of fierce competition and a decline in the abundance of the species. This is supported by our data on per capita harvest.

Overgrazing and growing human pressures on the alpine pastures has had a negative impact on caterpillar fungus and its habitat. During the study, supported by the Conservation Leadership Programme and Rufford Foundation, we documented how thousands of villagers go to collect the fungus each year, taking their tents, food and domestic animals.

These activities are bound to destroy remote pastures and threaten the endangered Himalayan species, such as snow leopards, blue sheep and alpine plants. Rubbish surrounds the camps of harvesters and there is no system in place to clean it up.

Since many major Asian rivers – including the Ganga in Uttarakhand – originate in the high altitude meadows, the habitat of caterpillar fungus is also a vital source of



Blue sheep or Bharal in caterpillar fungus habitat

water for people living downstream. Pollution and habitat destruction here will have profound effects on the quality and availability of water in those rivers, already vulnerable to climate change.


Ultimately, over-harvesting is almost certainly responsible for a sharp decline in caterpillar fungus population. New research from Stanford University has also shown climate change is responsible for this decline, in a region where average winter temperatures have increased by 4C since 1979 in some places.

All these threats could lead to the local extinction of the species. On the Tibetan plateau in China, caterpillar fungus is also disappearing, and its distribution area is creeping further up the mountains because of warming temperatures.

In many parts of India, the collection of caterpillar fungus is legal but the trade is illegal. This has led to smuggling of the fungus into Nepal and China and selling on the black market. The Uttarakhand government has issued guidelines for the collection and trade of the fungus through local level

forest councils, which issue permits for these activities. However, government regulations are not enforced in these remote regions.

The rampant and unregulated harvesting of caterpillar fungus has raised concerns about the extinction of the species and threats to the alpine landscape in Nepal and China as well, prompting calls for sustainable management.

There is an urgent need for greater public debate and research on the impact of caterpillar fungus harvesting in India, as well as in China, Bhutan and Nepal. In these remote regions there is inadequate regulation and a lack of government policies to support sustainable resource management and alternative local livelihoods. 

This article was originally published on The Third Pole.

Pramod K. Yadav carries out research and advocacy on conservation to combat wildlife crime and promote sustainable and legal trade of wild resources.

西非国家在沿海捕捞问题上做了笔好生意吗？

不发达国家将捕捞权作为收入来源的做法是否是一种好的经济发展策略？

□ 约翰·维丁

在充满不确定的全球经济中，沿海和岛屿国家指望海洋为不断增长的人口提供食物和工作，经验表明管理良好的海洋渔业可以为可持续发展带来显著的经济效益。由于全世界约三分之一的已知渔业资源被认为存在过度捕捞，世界银行估计，如果改善管理，每年海洋渔业能增加 830 亿美元收益。

很多收入较低的沿海和岛屿国家都试着通过外国捕捞合同获得这些经济回报，一般都是收入较高国家的捕捞企业付钱在其水域捕鱼。沿海国家有渔业资源但没有大型捕捞船队，因此就把渔场准入权卖给有能力的国家，将带来的收益用于国家发展。

类似的操作在全世界的海域非常常见。比如，最近《科学进步》（Science Advances）杂志发表的一篇文章对工业化捕捞船只进行了跟踪研究，发现在收入较低国家海域从事大规模捕捞的船只中有 78% 都注册在收入较高的国家。

如果措施得当，这些合同可以对低收入国家的发展做出巨大贡献。例如，2009 年以来一些太平洋岛国已经



中国渔船 Yi Feng 08 号因涉嫌标记不明被几内亚比绍渔业部门扣押

谈成多项金枪鱼捕捞合同（至少一部分在其管辖之下），外国捕捞企业向其支付的准入费用每年 多达数亿美元（至少比原来增长了五倍）。

如果我们把这种操作看成生意（就是一个拥有渔业资源管辖权的国家与其他有捕捞船队的国家做交易），那我们可以从经济角度来评价它们对各方或双方来说是“好生意”还是“坏生意”。当然，这些渔业资源还有远超经济意义的巨大价值，但站在生意的角度至少能为各国政府（尤其是其财

政部门）提供一个评估与外国签订捕捞合同的参考标准。

我和同事们一直从这个角度观察西非海岸此类外国捕捞合同中一个存在已久的例子，外国拖网船几十年来一直在那里捕鱼。我们希望帮助西非各国政府回答一个基本问题：从经济角度看，允许外国拖网船在其沿海进行捕捞作业究竟是不是一笔好生意？

这个问题很重要，因为外国渔船打到的沿海鱼类对西非国家来说

是一个富有经济价值的资源，也是当地小户渔民几百年来生计所在。过去多次有报道称外国工业化渔船侵犯了西非国家和当地渔村的权益，比如2017年《纽约时报》的报道。

关于这种交易的信息很少。一开始，我们为几内亚比绍、几内亚、塞拉利昂和利比里亚四个西非国家2005-2016年发放给外国渔船的捕捞许可证建立了一个数据库。

在此期间获得许可的外国渔船按照比例依次是中国（47%）、西班牙（13%）、韩国（12%）、塞内加尔（7%），其余是很多份额较小的国家。

我们利用许可证数据库和从政府及其他公开资源获取的数据，将2015年作为考察对象。这本质上就是一个会计操作，估算一下外国渔船从西非

海域获得的总收入和利润，看看有多少通过准入费进入当地政府手中，又有多少留在外国企业手里。

我们并没有将西非当地从靠港和鱼类加工中获得的收入计算在内，因为大多数（如果不是全部）这种和外国公司签订捕捞合同的操作都是完全离岸的：这些渔船在西非海域捕鱼，然后将其运往海外加工和消费。

2015年，利比里亚和塞拉利昂政府所获得的收入分别占捕捞活动估计总收入（不包括当地的鱼类加工和消费）的5%和8%，但外国企业在那一年赔了钱。

几内亚的捕捞利润很高，但该国政府只通过准入费获得估计总收入的2%。只有几内亚比绍政府与欧盟（代表其船队）达成了一项协议，因而获得了较高的份额，占估计总收入的17%。

分别来看，太平洋岛国政府2014年获得总捕捞收入中的12%，远高于几内亚（2%）、利比里亚（5%）和塞拉利昂（8%）等国2015年的收入占比。在采矿和石油产业，东道国政府从总收入中获得的比例通常要高得多（超过40%）。

我们的估算可能并未反映西非沿海捕捞业的经济全貌。在某些案例中，2015年外国捕捞企业似乎在赔钱的情况下仍然申请更多的捕捞许可。这种情形，或者是因为捕捞企业得到了补贴，或者数据不准确，因为渔获量的报告并不充分。两种情况可能都是存在的，但由于数据过粗略无法判断。

我们的研究对象中至少有三个国家在这笔生意里的年回报率较低。当然，对西非国家来说除了经济回报还有很多其他考虑，比如外国捕捞业带来的潜在负面社会和环境的影响（像与当地小户渔民的冲突，或者致使鱼类数量下降从而难以长期维持某些种类的捕捞）。如果产生此类影响而且从这笔生意中获得的经济回报较低，那么重新谈判或终止外国捕捞合同对西非国家来说可能才是合算的。

总的来说，西非国家似乎没有掌握充足的鱼类资源和捕捞收益率信息，因此无法与外国捕捞企业达成一笔信息对称的交易，甚至无法对资源获取进行准确定价。如果不能获得更多信息，这些国家就不可能知道允许外国渔船在其沿海活动是不是一笔好生意。因此，我们准备进行第二轮研究，希望做出更加清晰的概括。^⑤

约翰·维丁，杜克大学尼古拉斯环境政策解决方案研究所海洋与沿海政策项目主任



Is foreign trawling benefiting West Africa?

Some governments capture as little as 2% of the revenue generated by foreign fleets fishing in their waters

□ John Virdin

Coastal and island countries are increasingly looking to the sea to provide food and jobs for their growing populations in an uncertain global economy. Roughly one third of the world's assessed fish stocks are considered overfished. Experience shows that well-managed ocean fisheries can provide large economic benefits. In fact, the World Bank estimates that ocean fisheries could provide US\$83 billion more each year if better managed.

Many poorer coastal and island countries try to make money by selling access to their fish-abundant waters to

companies from richer countries with large fishing fleets.

Such arrangements are widespread. An effort to track industrial fishing vessels, reported in the *Science Advances* journal in August, found that 78% of large-scale fishing in the waters of lower-income countries was carried out by vessels registered in higher-income nations.

Done well, these arrangements can contribute significantly to the development of lower-income countries. Since 2009, some Pacific Island countries have negotiated contracts for access to tuna stocks at least partially under their jurisdiction. The fees paid by foreign fishing companies increased public revenues in these nations by several hundred million dollars – at least a five-fold increase.

Arrangements where one country with jurisdiction over fish resources enters into trade with others that have fleets to harvest them can be “good” or “bad” deals for one or both of the parties, in economic terms. Of course, fish stocks have greater value than economics can measure, but using a trade lens allows governments, particularly finance agencies, to assess foreign fishing arrangements.

The West African situation

My colleagues (at Duke University, the World Bank and independent consulting firms) and I have examined foreign



fishing arrangements off the coast of West Africa, where foreign trawlers have fished for decades. We wanted to help West African governments answer a basic question: in economic terms, is foreign trawling along their coasts a good or bad deal for them?

Coastal fish stocks in West Africa are economically valuable, and have been targeted for centuries by local small-scale fishers. It has been reported that foreign industrial fleets benefit from fisheries at the expense of West African countries and their local communities.

Information on this trade is sparse. As a starting point we built a database of fishing licenses issued to foreign trawlers from four West African countries for the period of 2005-2016: Guinea-Bissau, Guinea, Sierra Leone and Liberia.

Over this period, the foreign trawl fleet operating in the national waters of all four countries was dominated by vessels registered to China (47%), Spain (13%), South Korea (12%), Senegal (7%) and many countries with small percentages of the remainder.

We looked at government and public sources to estimate the total revenues and profits generated by foreign vessels from fishing in West African waters. Then we calculated how much went to governments in the

Governments do not appear to have sufficient information to price access to resources accurately.

region, via access fees, compared to how much stayed with foreign companies.

The data excluded the economic benefits from landing and processing fish in West Africa, because that is largely done abroad. Vessels typically catch fish in West African waters then transport them overseas for processing and consumption.

In 2015, the governments of Liberia and Sierra Leone received 5 and 8%, respectively, of the estimated total revenues generated by fishing activities (not including processing and consumption of fish). Meanwhile foreign companies reported losing money.

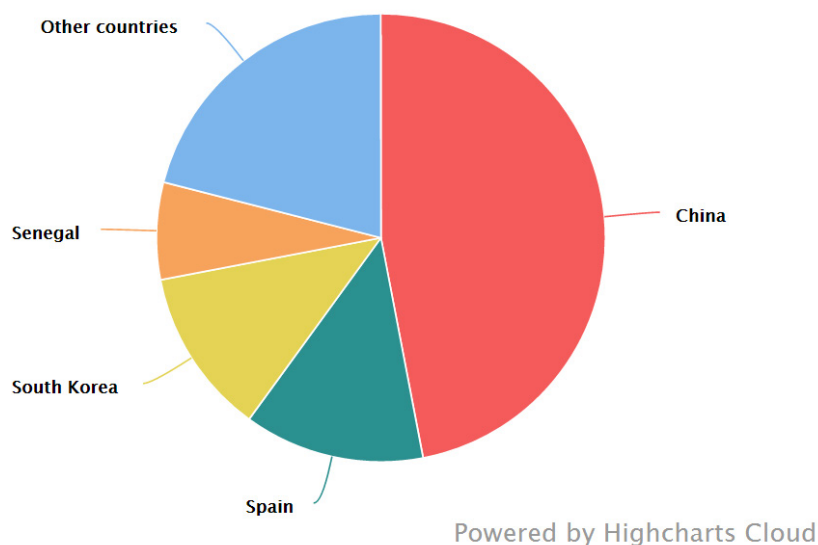
In Guinea, significant profits were likely generated but the government only captured 2% of the estimated total revenues from fishing via access fees. Only in Guinea-Bissau, which has its agreement with the EU, did the government capture a larger share of the estimated revenues – some 17%.

To put these results in perspective, in 2015 Pacific Island governments captured 12% of the equivalent value in 2014 – as opposed to an estimated 2, 5 and 8% in Guinea, Liberia and Sierra Leone, respectively. In the mining and petroleum sectors, governments often collect a much higher percentages of revenues, more than 40% in most cases.

The bigger picture

These findings do not capture the full economic picture of the trade in West Africa's coastal fishery. The fact that some foreign fishing companies are


Foreign fishing fleets in Guinea-Bissau and Sierra Leone



applying for new licenses despite appearing to lose money is curious. It suggests they are receiving subsidies or under-reporting their catches. Both may be occurring but the data is too coarse to tell.

For at least three of the four countries surveyed, the annual returns from this trade seem relatively modest. Of course, considerations for West African countries go far beyond the merely economic. Social and environmental impacts include conflicts between small-scale fishers or draw-downs of fish stocks below sustainable levels. In these cases, and where economic returns from the trade are relatively low, re-negotiating or discontinuing the trades may be a gain for West African countries.

These governments do not appear to have sufficient information about the stocks and profitability of fishing them to make well-informed decisions about trade with Chinese and other foreign fishing companies, including pricing access to resources accurately.

Without more information, it will be impossible for these countries to know if foreign trawling along their coasts is a good or bad economic deal. So we are starting round two of the research now, hoping to gain a much fuller and clearer picture. 

John Virdin is director of the Ocean and Coastal Policy Program at the Nicholas Institute for Environmental Policy Solutions, Duke University.

废弃的盐水：生态问题还是经济机遇？

新研究引发了对全球日渐增多的海水淡化厂排出的有毒盐水的重重担心。

□ 凯瑟琳·厄尔利

全球 97% 的水资源是海水，淡水只有 1%。由于气候变化和人口增长导致淡水资源承受的压力逐步攀升，越来越多的国家开始建造海水淡化厂，将海水变成饮用水，供工业和农业使用。

然而，最近一份来自联合国大学水资源、环境与健康研究所(UNU-INWEH)、荷兰瓦赫宁根大学和韩国光州科技研究院的研究报告却显示，海水淡化过程中产生的富含化学物质的盐水可能会带来不小的环境影响。

研究人员表示，海水淡化厂每生产一升淡水，平均就要产出 1.5 升

盐水。尽管由于原料海水的盐度、淡化方法和当地条件不同，这个数据可能有所差异，但据研究人员估计，全球所有海水淡化厂每天会产出 1.42 亿立方米的盐水。这个数字比上一次评估增长了 50%。

报告指出，由于目前大约 80% 淡化产生的浓盐水都是在距离海岸 10 公里的范围内产生的，所以通常的做法是将它们直接排进海洋或者地表水、下水道和水井中。

报告警告称，这种浓盐水会给海洋生物和海洋生态系统带来巨大风险，因为它会大幅增加流入海域

的海水盐度，并且生产过程中使用的含有铜、氯等有毒化学物质的防垢剂和防污剂也会造成海洋污染。

本报告首席作者、瓦赫宁根大学的爱德华·琼斯表示：“浓盐水排入水体后沉降在底部，会消耗接受水体中的溶解氧。高盐度和溶解氧水平下降会对底栖生物(如生活在海底的蠕虫、蛤蜊、螃蟹、龙虾和海绵动物等)产生深远的影响，进而通过整个食物链的产生传导效应。

研究人员表示，在全球海水淡化厂数量大幅增长的今天，应该对其产生的浓盐水进行更好地处理。上世纪 60 年代海水淡化厂刚开始出现的时候数量并不多，主要集中在中东国家，而如今全球 177 个国家有 16000 多座海水淡化厂已经投入使用。

行业趋势

然而，莫特·麦克唐纳工程咨询公司的海水淡化专家乔纳森·毕肖普却认为，联合国的这份文件将两种海水淡化的方式混为一谈，误解了目前的行业走向。



距离以色列沿岸300公尺，盐水在地中海排出

他解释道，目前主要有两种不同的海水淡化技术。较为传统的蒸馏法将海水反复加热沸腾和冷凝，其除盐效果显著，而且不需要其他太多的操作环节。

但是，这个过程非常耗电，大约有 75% 的水最终都会以盐度稍高的温水排出。中东地区大多使用的是蒸馏法，因为那里历来能源成本较低，而且海水淡化厂通常都是与发电厂联产。

第二种方法是反渗透法。这种 20 世纪 90 年代开始广泛采用的方法利用机械加压通过半透膜除去水中的盐分，大大提高了淡化效率，电力消耗仅为蒸馏法的四分之一。这个过程使用的是冷水，所以排出的盐水也不是温热的，但是其中的盐分要比原料海水多 50%。

毕肖普说道：“我认为，当然是更现代的反渗透海水淡化厂产出的盐水更容易管理。我们观察过这类工厂排水口附近的水流和构造，你很容易就会发现，排水口附近的扰流很快就与海水融为一体。而从热处理淡化厂排出的大量温盐水则会产生巨大的影响，这与电厂排出的热水是一个道理。”

因此，新建海水淡化厂排入海洋的温盐水总量不一定会升高。蒸馏法工艺每生产一立方米淡水产生的盐水是反渗透技术的 4 倍。

毕肖普指出，中东以外已经没有国家建设新的蒸馏法海水淡化厂了。而即便是中东地区也开始逐步告别热处理技术，比如阿曼和阿拉伯联合酋长国就已表示将停止新建此类工厂。

IDTechEX 咨询公司董事长彼得·哈罗普博士认为，盐水破坏野生

动物生存环境目前并不是一个特别严重的问题。不过他也补充说：“未来我们确实应该关注这个问题，应该出台更严格的法规，遏止不负责任的盐水排放。”

他指出，盐水与海水并不能很快融合在一起，但是我们可以通过创新方法来解决这个问题，例如在波浪或潮汐发电厂旁建造海水淡化厂，这样就可以加速水流搅动，加快盐水混合速度。

其他的利用方式

联合国研究人员没有指出的是，对于水产养殖和农业来说，废盐水带来的环境问题反而意味着经济机遇。

联合国大学水资源、环境与健康研究所助理院长曼苏尔·卡迪尔博士表示：“淡化厂排出的废盐水用于水产养殖可使鱼类生物量提高 3 倍。此外，人们还利用这种水培育膳食补充剂螺旋藻，灌溉牧草灌木和作物（虽然后者可能会导致土地盐碱化）。

位于迪拜的国际生物碱农业中心（ICBA）目前正在对上述盐水利用模式进行研究。ICBA 中心专门研究耐盐物种的农学家狄俄尼索斯·阿格里克·莱拉博士解释说，像罗非鱼和海鲷鱼这些鱼类可以在盐水中“茁壮成长”。鱼类排泄物能够丰富水质，而这些水又可以用来浇灌海甜菜和海蓬子等耐盐植物。海蓬子是一种用途广泛的盐生植物（耐盐植物），可作为蔬菜、动物饲料和生物燃料原料。

她说，水产养殖与农业相结合的机制可以提升食物产量，改善营养含量，并且保障民生。

然而，莱拉补充说，盐水副产品的质量取决于海水淡化技术和原料海水的质量。在用来饲养和种植将用于人类消费和作为动物饲料的鱼类和作物之前，应该检查废盐水中的重金属和其他化学品含量。

联合国报告建议，还可以将盐水中含有的盐和金属（包括镁、石膏、氯化钠、钙、钾、氯、溴和锂）提取出来用于商业用途。现在回收这些资源成本很高，但技术进步可能会改变这种情况。卡迪尔称，生产大量盐水的国家可能会因此而受益。

哈罗普乐观地认为，随着太阳能成本降低，将矿物成分从盐水中分离出来将变得具有经济可行性。他说：“技术正在大跨步向前发展，廉价电力可以让提取盐水中的成分变得具有可行性。”

毕晓普指出，与盐水排放相比，电力使用对环境的影响要大得多。如果社会能够提高用水效率，如减少初级消耗，在可行的情况下重复利用（例如工业用水），以及通过先进的废水处理工艺回收来制造饮用水和非饮用水，那么这两种情况的环境影响都可以大大减少。他补充说，用最高的标准处理再生水仍然比海水淡化能耗更低。

他说：“大家通常会提到的一点是，或许可以对废水善加利用。但我的观点是，我们应该首先集中精力降低能耗，然后努力充分利用循环水，鼓励提高饮用水的使用效率。”

凯瑟琳·厄尔利，自由撰稿记者，《环境学家》前主编

Waste brine – ecological problem or economic opportunity?

New research raises concerns about toxic salt water from the world's growing fleet of desalination plants

□ Catherine Early

About 97% of the world's water is saline and just 1% is fresh. As this fresh water comes under increasing pressure from climate change and population growth, more countries are building desalination plants to make salt water drinkable, and to supply industry and agriculture.

A recent paper by researchers at three universities, including the UN University Institute for Water, Environment and Health (UNU-INWEH), paints a worrying picture of the environmental impact of the chemical-laden brine that results from this process.

For every litre of fresh water output, the researchers say, desalination plants produce on average 1.5 litres of brine. Though the exact amount varies according to the salinity of the feed water, the desalination method and local conditions, the researchers estimate that globally, plants now discharge 142 million cubic metres of brine a day – a 50% increase on previous assessments.

Since almost 80% of brine from desalination is produced within 10km of the coast, it is typically discharged directly into oceans or emitted into surface water, sewers, or wells, according to the paper.

The brine poses major risks to ocean life and marine ecosystems by greatly raising the salinity of the seawater it flows into, and by polluting oceans with toxic chemicals used as anti-scalants and anti-foulants, including copper and chlorine.

“Brine underflows deplete dissolved oxygen in the receiving waters,” says lead author Edward Jones, from Wageningen University in the Netherlands. “High salinity and reduced dissolved oxygen levels can have profound impacts on benthic organisms (such as worms, clams, crabs, lobsters and sponges that live in the seabed), which can translate into ecological effects throughout the food chain.”

Brine needs to be better managed to deal with a dramatic rise in the number of desalination plants worldwide, the researchers said. Starting from a few, mostly Middle Eastern facilities in the 1960s, today nearly 16,000 desalination plants are operational in 177 countries.

Sector trends

However, Jonathan Bishop, desalination specialist at engineering consultancy Mott MacDonald, says that the UN

Today nearly 16,000 desalination plants are operational in 177 countries.



© Alan Harper
Brine flowing from a desalination plant at San Ramón, Baja California, Mexico

paper conflated two desalination methods and misread the industry's direction of travel.

There are essentially two different types of desalination technology, he explains. Under the more traditional thermal processes, salty water is repeatedly boiled and condensed. Thermal treatment is very successful in removing salt, and does not suffer too many operational issues.

However, it uses a lot of power, and around 75% of the water imported into the system is discharged as warm, slightly saltier water. The thermal technique has mostly been used in the Middle East, where energy has historically been cheap, and has typically been co-developed with power stations, Bishop notes.

The second method, established in the 1990s, is reverse osmosis. This removes salt from water by applying mechanical pressure through a semi-permeable membrane. This has rapidly improved in efficiency, and now uses around a quarter of the power of the thermal desalination process. Moreover the brine it produces is not heated, though it is around 50% saltier than feed water, he says.

"I certainly see the brine disposal from the more modern reverse osmosis plants as a much more manageable solution. We've looked at currents and modelling of these outfalls,

and you can easily demonstrate that the impact of the plume of seawater around them very quickly drops off to the same as the sea. Whereas, a large amount of warm brine going into the sea from a thermal plant can have quite a significant impact, as with warm water from power stations," he says.

Thermal desalination processes produce four times as much brine per cubic metre of fresh water as those using reverse osmosis.

Bishop points out that no countries outside the Middle East are building new thermal desalination plants. Even this region is turning away from thermal technology, with Oman and the United Arab Emirates both stating they will not build any more.

Dr Peter Harrop, chair of consultancy IDTechEX, does not believe that brine damaging wildlife is a particularly serious problem at the moment. "But it's a legitimate concern for the future and there should be tighter regulations to prevent irresponsible output of salt water in one area."

Though brine does not mix very quickly with seawater, he suggests that innovative solutions could be found, such as building desalination plants alongside wave or tidal power plants that would churn the water up and disperse the brine.

Alternative uses

The UN researchers did point out that the environmental problem of excess brine could instead present economic opportunities in fish farming and agriculture.

"Reject brine has been used for aquaculture, with increases in fish biomass of 300% achieved. It has also been successfully used to cultivate the dietary supplement spirulina, and to irrigate forage shrubs and crops (although this latter use can cause progressive land salinisation)," adds Dr Manzoor Qadir, assistant director of UNU-INWEH.

Such uses are being researched at the International Center for Biosaline Agriculture in Dubai. Dr Dionysia Aggeliki Lyra, an agronomist specialising in salt-tolerant species at the centre, explains that certain types of fish such as tilapia and sea bream thrive in the brine. The waste they produce enriches the water, which can in turn be used to irrigate

salt-tolerant plant species, such as sea beet and *salicornia bigelovii* – a multi-purpose halophyte (saline-tolerant plant) that can be used as a vegetable, in animal feed and for biofuel production.

Schemes that combine aquaculture and agriculture can increase food, improve nutrition and secure livelihoods, she says.

However, Lyra adds that the quality of the brine produced depends on the desalination technology and the quality of feed water. “The reject brine should be checked for heavy metals and other chemicals before use in growing fish and crops for human consumption and animal feed,” she says.

Salt and metals contained in brine, which include magnesium, gypsum, sodium chloride, calcium, potassium, chlorine, bromine and lithium, could also be extracted for commercial uses, the UN paper suggests. Recovering these resources is very expensive now but technological improvements could change that. Countries producing large volumes of brine could benefit, according to Qadir.

Harrop is optimistic that it will become economically viable to separate brine into its component minerals as solar

power falls in cost. “Technology is moving at breakneck speed and very cheap electricity can provide viability for getting those salts out,” he says.

Bishop points out that power-use has a far bigger environmental impact than brine discharges. Both problems could be drastically reduced if society was more efficient in its use of water. Primary consumption needs to be reduced. Water can be reused where practical, such as for industry, and recycled through advanced wastewater treatment processes that produce both drinking and non-drinking water. Treating recycled water to the highest standard is still less energy-intensive than desalination, he adds.

“The point is often made that perhaps there’s a beneficial use for the waste water, but my view is that we should concentrate on driving down energy consumption in the first place, and try and take advantage of secondary uses and encourage more efficient potable water use,” he says. ☞

Catherine Early is a freelance journalist and the former deputy editor of the environmentalist.

深海海底采矿的未来将于年内决定

国际海底管理局本周的会议能否找到一条既能开发矿藏，又能保护生物多样性的道路？

□ 杰西卡·奥尔德雷德

这是地球上最寒冷、最黑暗的地方之一，充满了海洋生物（其中很多还有待发现），还有矿藏丰富的海底。

过去十年，人们对不属于任何国家管辖的深海进行了越来越多的探索。经过多方评估，海底矿藏可以为从电池和喷气发动机到风力发电机和手机的各种商品提供原材料。

一些深海海底采矿活动业已在国家主权海域展开：2017 年日本开始进行海底矿产资源开采，而巴布亚新几内亚备受争议的索尔瓦拉 1 项目则已经中止。深度超过 200 米的公海占全球面积的近三分之二，今年各国将围绕如何管理这一“区域”蕴藏的资源展开一场全球性的重要讨论。

由谁来开采以及如何开采的问题，将被正式纳入国际海底管理局（联合国任命的机构，专门负责管理作为“人类共同遗产”的深海海底资源）正在草拟的一份“行为准则”之中。

有人认为在促进深海海底开发的同时确保这些活动不伤害海洋环境是不可能的，肩负这一艰巨使命



鸚鵡螺矿业生产的深海海底采矿机

的国际海底管理局 168 个成员必须就一系列关键问题达成一致，包括：如何保护脆弱而独特的海洋生态系统、如何管理这个潜在价值数十上百亿美元的产业、如何公正合理地分配收益，以及可问责性和透明度如何体现等。

时间紧迫。迄今，国际海底管理局已经批准了 29 个为期 15 年的勘探合同，涉及 3 种矿藏，面积覆盖太平洋、印度洋和大西洋的 130 多万平方公里海域。其中好几份合同将于 2021 年到期，因此国际海底管理局将在今年 2 月和 7 月在牙买加的

金斯敦举行两次重要会议，以便在 2020 年最后期限前完成行为准则的制订。

那些为行为准则提供咨询的人士说，管理机构及其成员有机会在采掘业起步前为其制订规则，这在历史上或许还是首次。但民间团体和科学家们则认为，全世界的海洋已经面临着气候影响和过度捕捞的严重压力，而且此次的准则制定将是建立在缺乏对风险充分认识的情况下开始的。

深海矿物包括多种价值很高的金属，如铜、锌、锰、钴和稀土元素。

多金属(锰)结核是一种凸凹不平、土豆大小的球体,悬浮在极深海底的淤泥里。它们在东太平洋一个名为克拉里昂-克利珀顿的勘探区带被发现。这个区域具有极高的商业价值。据估计,其蕴藏的镍、钴和锰超过已知所有陆地储量的总和。麻省理工学院最近进行的一份成本效益分析发现,开采这些多金属结核有利可图,每年能够带来高达22亿美元的收入。

多金属硫化物是通过热液活动形成的,即地壳中排出的热水与冷水相激,形成含有铁、银和金等金

属的热液堆积体。这些喷口看起来就像烟囱,几乎都位于太平洋和大西洋深海陡峭的半活跃火山顶部。

钴结壳在水下火山被发现,大多数在太平洋400-7000米的深海,含有稀土。

获得上述29份合同的是由各国政府发起的多家私营实体,这些国家包括中国、法国、德国、印度、日本、韩国、俄罗斯和“海洋金属联合组织”(由保加利亚、古巴、捷克共和国、波兰、俄罗斯和斯洛伐克组成的集团),以及库克群岛、基里巴斯、瑙鲁、新加坡和汤加等小岛国。

皮尤慈善信托基金会深海采矿项目正在施压以求达成一项“预防性”行为准则。据该项目负责人科恩·钮金特说,中国作为世界最大的矿物和金属消费国及进口国,是颇具影响力的一方。他说:“这关系到(中国的)国际声望。习近平主席提出了‘三深’战略——深空、深地、深海。我感到中国准备对深海海底采矿投入大量资源。”

行为准则达成后,采矿也不一定会马上开始。根据国际海底管理局的规则草案,合同方必须进行一个环境影响评估并展示其财力和技术能力。比利时企业全球海洋矿产资源股份有限公司已经表示其准备好2023年就开始采矿活动。观察家们预计从2025年到2027年可能会有所动作,但另一些人则质疑“地质学家们的幻想”根本无法顺利起步。

国际海底管理局秘书长迈克·洛奇说,商业性深海海底采矿要依靠三件事:“一是我们希望在2020年

深海矿床及其所含金属



多金属结核

镍、钴、铜、锰等金属来源



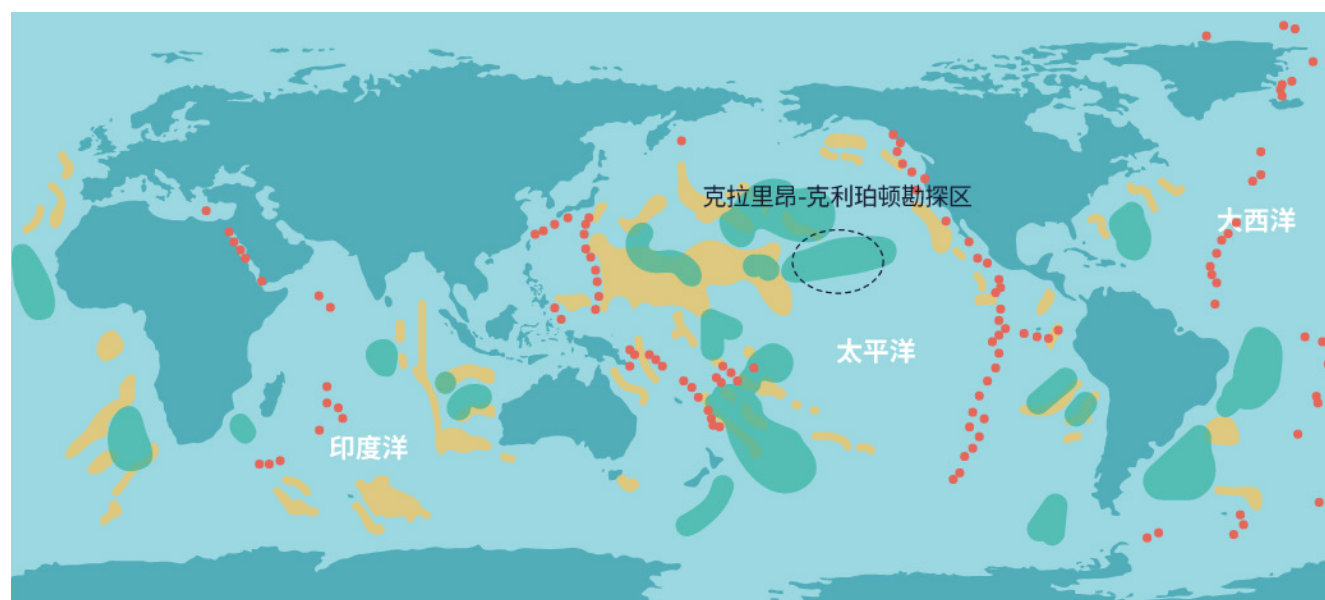
多金属硫化物

铜、铅、锌、金、银



富钴结壳

钴、钒、钼、铂、碲



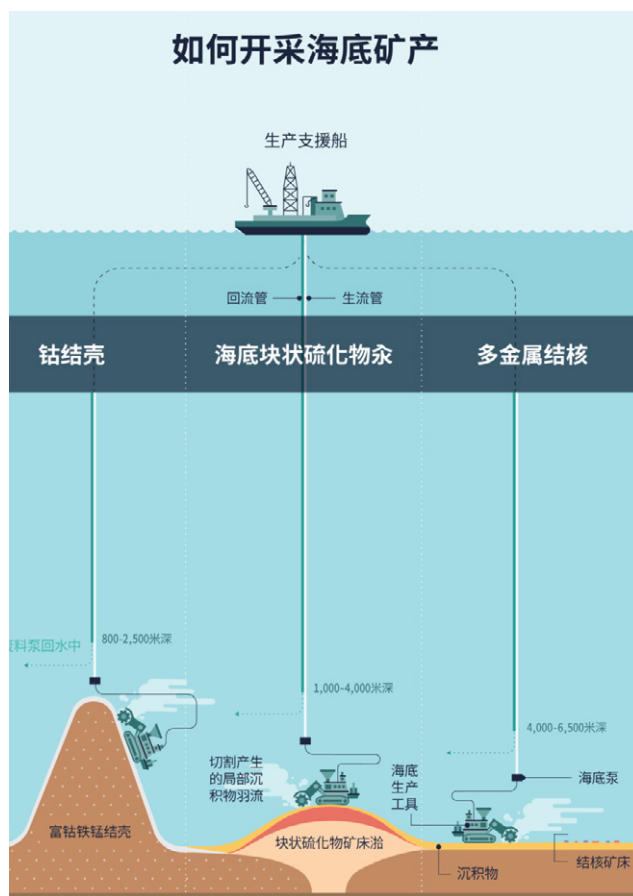
多金属结核

富钴结壳

多金属硫化物/喷口

●

出资国	承包方
中国	中国五矿集团公司
库克群岛	库克群岛投资公司
英国及北爱尔兰	英国海底资源有限公司
新加坡	新加坡海洋矿产私人有限公司
比利时	全球海洋矿产资源股份有限公司
基里巴斯	马拉瓦研究与勘探有限公司
汤加	汤加近海采矿有限公司
瑙鲁	瑙鲁海洋资源股份有限公司
德国	德国联邦地球科学与自然资源研究院
印度	印度政府
法国	法国海洋开发研究院
日本	深海资源开发株式会社



之前定稿的法规；二是近年来投入不断增加的技术开发；三是商业方面，即金属市场价格。”

主共和国(刚果(金))开采的，这是世界上最贫困、最暴力、也是最腐败的国家之一。支持深海采矿的人们认为，

满足需求

尽管开采这些矿物的尝试已经多次失败，但最近这个阶段的勘探有可能取得成功，这背后是有原因的。鹦鹉螺矿业的首席地质学家约翰·帕里亚诺斯说，最根本的原因是由于人口日益增加而带来的资源需求的增加。“由于工业化的扩大直接减少了世界的贫困，我们如今面对着一个更大的市场。”

尽管预测多种多样，但如果矿产需求以1%的预计年均增长率增加的话，到2050年就会提高60%。对于铜等特定商品来说，需求增加可能高达341%。国际海底管理局说全球铜和镍需求量的15%可以从深海海底获得。

与此同时，陆上金属储量的开采难度增加、利润降低。比如钴几乎都是在刚果民

海底储量远比陆地更为集中，能够提供可靠、清洁且符合伦理的原材料来源，这些材料对于高技术和可再生能源技术至关重要。

然而，一份2016年的供求评估的结论认为即便在最富雄心的情境（到2050年实现100%的可再生能源）下，现有的陆上采矿、金属回收利用技术的提高和其他来源就能满足预期需求。“深海采矿增强了你可以继续空前增长的信心，不过是以不同的方式。”“深海采矿运动”（DSMC）组织的安迪·惠特莫尔如是说。DSMC是一个由一些反对采矿的非政府组织，以及太平洋、美国 and 加拿大当地人组成的联盟。

看不见的毁灭

尽管围绕需求的争论仍然分歧巨大，采矿业在公海恶劣环境下的矿物开采和处理技术取得了巨大进展。4月，一家比利时公司将把世界首台25吨重的机器人拖拉机放到了4500米深的太平洋海底。

基于现有设计，海底矿藏将通过好几公里长的管子被压到海面的船上。结核的采集则是通过一台在洋底滚动的巨大履带车将水注入淤泥以扰动沉积物，再将其吸起并将淤泥向后喷出。硫化物的采集需要一个巨大的机器人在海底滚动前行，并使用机械齿把上层数米厚的沉积物粉碎。这些巨大机械的重量几乎是蓝鲸的两倍，将在海底留下深刻且长久的足迹。

这些作业过程将给海底、其上层水体以及所有周边环境造成影响。为了开采结核而进行的洋底刮擦会破坏章鱼、海绵和其他物种的深海

深海采矿机

总高度 (单位:英尺)

22

大型切割机

6

人

总重量 (单位:吨)



小型汽车

1



蓝鲸

170



海底工具

310

栖息地。大量的动物群落集中在热液喷口附近。这些海洋动物组成了地球上最富活力的生态系统之一，而在喷口采矿会扰动沉积物，造成某些动物窒息。其他已经对缺少阳光和深海高压具有独特适应力的物种也会被采矿产生的噪音和污染所影响。

“深海采矿运动”联合创始人马修·吉安尼说：“这些矿区将要覆盖的面积很大，有1万平方公里。沉积物羽流将达到采矿点之外数十公里。即便羽流只波及几公里，受到影响的区域也将达到实际采矿面积的二至三倍，会导致那里的生态系统退化和物种灭绝。”

他还说，克拉里昂-克利珀顿的勘探区经过三四十年的勘探和扰动后，几乎没有得到任何恢复。“恐怕在人类存续期间是看不到什么恢复了。”

去年，《海洋科学前沿》杂志上的一篇文章得出结论说，深海环境的脆弱属性、减少伤害的技术有限，对于生态的认知不足，以及恢复的不确定性意味着采矿业“无法实现零生态多样性损失的结果”。

尽管采矿区域看上去只是大片的淤泥和石头，2016年对克拉里昂-克利珀顿勘探区进行的一项调查发现，发现了多样性惊人的生物。在一个矿区大小的区域采集到的12种动物中，有7种是科学上的新发现。

世界自然保护联盟全球海洋与极地项目负责人卡尔·古斯塔夫说：“我们目前对深海的认识不足以保护那里独特的物种不受采矿活动伤害。批准那些在基本未经勘探且十分脆弱的区域进行勘探的合同也让人警惕。我们需要为海底采矿开发设立一个10年暂停期。”

“深海采矿运动”的吉安尼说：“对采矿采取限制的最重要原因是我们对深海的了解并不充分这一事实。我们在甚至不知道下面有什么的情况下就进行开发，只会毁了那里。”

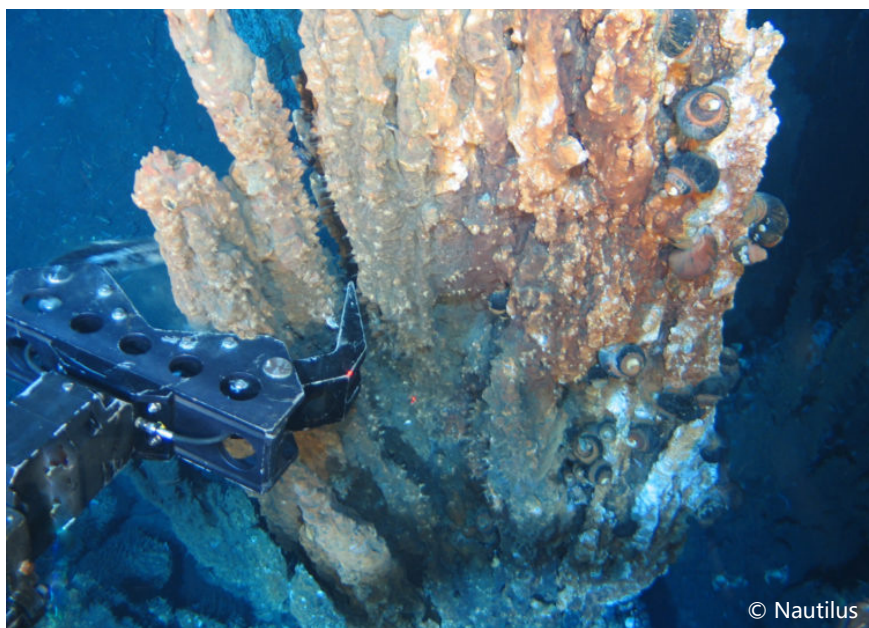
但帕里亚诺斯认为，深海采矿的环境和社会影响比陆地活动还要小。他说：“如果你觉得需要从某个地方得到金属，那么深海与陆地相比就全是优势了。这里不会有植被破坏，也没有淡水污染。我认为这对环境是有利的，只要我们操作得当。”

一些人认为几十年来管理陆上采矿的法规也未能遏止生态灾难。惠特莫尔说：“即使我们进行深海采矿，你也仍然需要陆上采矿，没有哪个能完全替代另一个。我们深为忧虑的是，即便你制定了法规，企业就会保护环境吗？何况还是在一个大众都无法看到的地方。”

国际海底管理局的法规草案将海洋环境保护列为一项“基本原则”，但迄今还没有就如何确保这项保护落到实处达成任何协议。行为准则需要界定出一个可以接受的环境损害程度，为企业进行环境评估制定指导原则，并就监控其落实的制度或机构达成一致。

在众多保护提议中，有一项是在生态重要性地区设立禁采区，即区域环境管理计划（REMP）。禁采区可能占整个“区域”面积的32%。尽管设立禁采区可能对锰结核矿区的生态保护有效，但专家们质疑其对热液喷口区是否同样适用。

洛奇说：“很多人会有一种本能反应，认为采矿是破坏性和危险的（基于人们对陆上采矿的认知）。但更重要的是我们要把深海海底采矿放在一个更大的语境下来思考。它



热液喷口

是现有的管理最严格的海洋开发之一，也是全球公域中唯一受到国际体制管理的区域。”

“没有任何国家或实体能对海底进行勘探或开发，除非与国际海底管理局签署合同、得到所有 168 个成员国的同意。我们已经为深海海底采矿准备了很多年，我们确切地知道如何对其进行管理并确保将环境影响降到最低。深海矿物带来的收益也会带动

深海科学经费的大幅增加，从而帮助我们更好地认识海洋环境。”

利益冲突

最终开采获得的任何收益都受到收益分享制度的管理，并在考虑发展中国家需求的前提下分配给所有成员国。这个支付制度仍在考虑之中，国际海底管理局已经与麻省

理工学院签约，委托其对多个经济模式进行比较。

吉安尼说：“各国开始认识到，即便让几十甚至更多个采矿项目上马，167 个成员国再加上欧盟所分到的特许费也寥寥无几。但它们可以通过充当所谓的发起国获得大笔收益，因为可以直接对采矿企业征税。”

这个利益冲突引发批评。惠特莫尔说：“国际海底管理局在制订规则的同时还通过其制订的规则挣钱，这让人深感忧虑。从透明度和可问责性的角度来看，企业与国家之间的特殊关系造成了不健康的状况。”

吉安尼说：“即便制定了最好的法规，如果其中涉及到的利益大到足以推动这个产业的向前进行，那么结果将是极难向一个想要合同的国家说‘不’。你一旦打开大门，就可能有数十万平方公里的深海面临着采矿开发失控的局面，而到时候国际海底管理局手中没有什么权利能遏制这个产业。”

杰西卡·奥尔德雷德，中外对话项目编辑，专注于包括海洋和生物多样性在内的全球性环境议题

The future of deep seabed mining

Can this week's meeting of the International Seabed Authority agree a way to develop mining whilst protecting biodiversity?

□ Jessica Aldred

It's one of the coldest, darkest places on earth, full of marine life – much of which is yet to be discovered – with a seabed rich in mineral deposits.

In the last decade, the floor of the deep ocean that lies outside the jurisdiction of any one country has been increasingly explored. A number of parties are assessing the size and extent of mineral deposits that could provide raw materials for everything from batteries and jet engines to wind turbines and mobile phones.

Some deep seabed mining has already taken place within countries' waters: Japan in 2017, and in Papua New Guinea where the controversial Solwara 1 mining project has ground to a halt. But this year will see a critical global debate on how to manage the resources that lie in “the area” – international waters of more than 200 metres deep that cover nearly two-thirds of the earth.

The question of who mines these – and how – is due to be formalised in a “code” being drawn up by the International Seabed Authority (ISA), the UN-appointed body responsible for managing the riches of the deep seabed for the “common heritage of mankind”.

Tasked with what some say is an impossible mandate of promoting the development of deep seabed mining while ensuring the practice does not harm the marine environment, the ISA's 168 members must agree on how these fragile and unique ecosystems will be protected, how the potentially multibillion dollar industry will be regulated,



A squat lobster looking out from within a deep sea octocoral, 1,150m beneath the Gulf of Mexico.

how any profits will be shared equitably, and how it can demonstrate accountability and transparency.

The clock is ticking. So far, the ISA has granted 29 exploration contracts of 15 years for three types of deposits across more than 1.3 million square kilometres of seabed in the Pacific, Indian and Atlantic oceans. Several of these contracts are due to expire in 2021, so the ISA has two key meetings in February and July in Kingston, Jamaica, to finalise the code and meet its deadline of 2020.

Those advising on the code say that for perhaps the first time in history, a governing body and its members have the chance to establish rules for an extractive industry before it begins. But civil society groups and scientists argue that

Deep-sea mineral deposits and the metals they contain



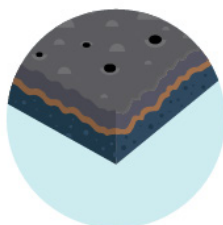
Polymetallic nodules

Source of nickel, cobalt, copper and manganese



Polymetallic sulfides

Copper, lead, zinc, gold and silver



Cobalt-rich crust

Cobalt, vanadium, molybdenum, platinum and tellurium

to hold more nickel, cobalt and manganese than all known terrestrial deposits combined. A recent MIT cost-benefit analysis found that mining these nodules would be profitable, with annual revenues of up to US\$2.2 billion a year.

Polymetallic sulphides are formed through hydrothermal activity when hot water, discharged from the earth's crust, hits the cold water and deposits a "heap" of minerals including iron, silver and gold. These vents look like

smokestacks, and are mostly located on the top of steep, semi-active volcanoes deep in the Pacific and Atlantic.

Cobalt crusts are found on underwater mountains, mostly in the Pacific, at depths of 400 to 7,000 metres, and contain rare earths.

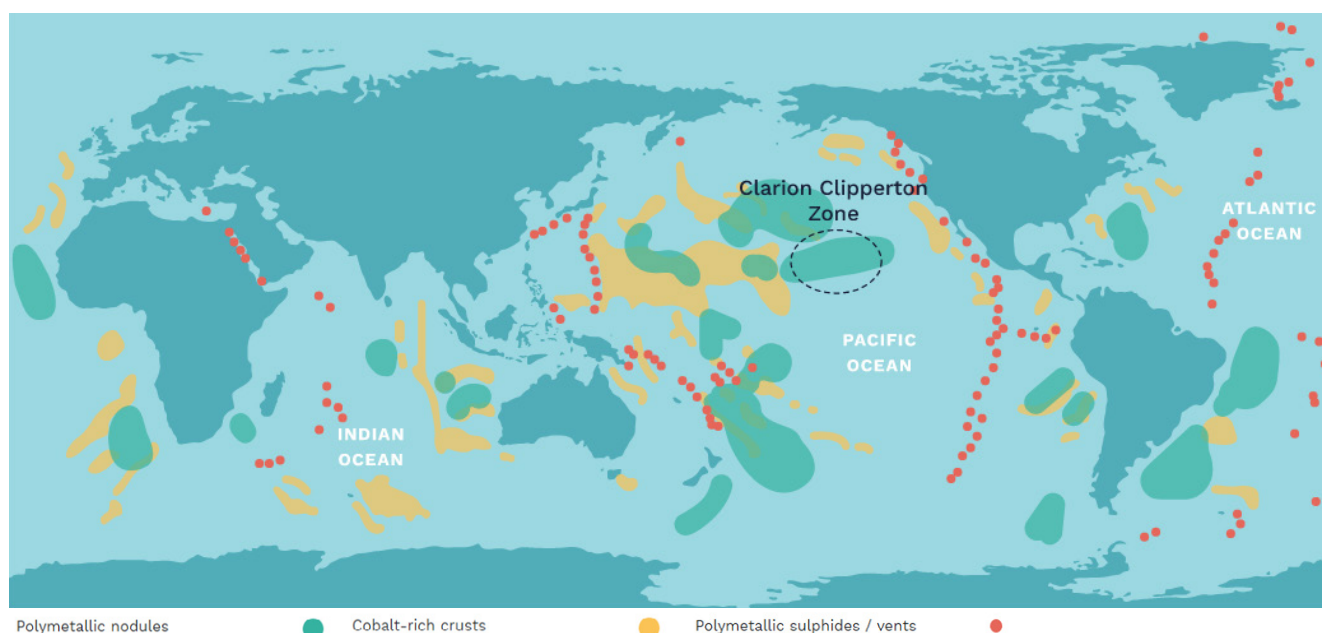
The 29 exploration contracts have been granted to a mix of private entities sponsored by national governments, including China, France, Germany, India, Japan, the Republic of Korea, the Russian Federation and the Interoceanmetal Joint Organisation (a consortium of Bulgaria, Cuba, the Czech Republic, Poland, the Russian

the world's ocean is already severely stressed from climate impacts and overfishing, and that regulations are being developed without a full understanding of the risks.

Deep sea mineral formations contain a number of highly prized metals, including copper, zinc, manganese, cobalt and rare earth elements.

Polymetallic nodules, consisting mainly of manganese, are bumpy, usually potato-sized balls suspended in mud on the floors of the deep abyss. They're found in an exploration zone of the eastern Pacific known as Clarion-Clipperton. This is the area of greatest commercial interest, estimated

A map showing what is being mined and where



Seabed Mining Sponsoring State	Contractor
China	China Minmetals Corporation
Cook Islands	Cook Islands Investment Corporation
UK and Northern Ireland	UK Seabed Resources Ltd.
Singapore	Ocean Mineral Singapore Pte Ltd.
Belgium	Global Sea Mineral Resources NV
Kiribati	Marawa Research and Exploration Ltd.
Tonga	Tonga Offshore Mining Limited
Nauru	Nauru Ocean Resources Inc.
Germany	Federal Institute for Geosciences and Natural Resources of Germany
India	Government of India
France	Institut français de recherche pour l'exploitation de la mer
Japan	Deep Ocean Resources Development Co. Ltd.

Federation and Slovakia), as well as small island states such as the Cook Islands, Kiribati, Nauru, Singapore and Tonga.

China, the world's largest consumer and importer of minerals and metals, is a very influential party, with the most contracts, according to Conn Nugent, director of the Pew Charitable Trusts Seabed Mining Project, which is pressing for a "precautionary" mining code. "National prestige is at stake here. Xi [Jinping] has the 'three deeps' – deep space, deep earth, deep ocean. And that tells me that they are going to be throwing a lot of resources into this."

Once the code is agreed, seabed mining would not necessarily start immediately. Under ISA draft rules, contractors will have to carry out an environmental impact assessment and demonstrate financial and technological capacity. The Belgian firm Global Sea Mineral Resources has said it is ready to start as early as 2023. Observers forecast anything from 2025-27, while others question whether the "geologists' fantasy" will get off the ground at all.

Any recovery of seabed ecosystems will certainly not be seen on human timescales

Michael Lodge, the secretary-general of the ISA, says commercial deep seabed mining depends on three things: "Firstly, the regulations, which we expect to finalise in 2020. Second the technology developments, where we have seen an increase in investment in recent years. Thirdly, the commercial aspect – the market price of metals."

Meeting demand

While there have been a number of failed attempts to exploit these minerals, there are reasons

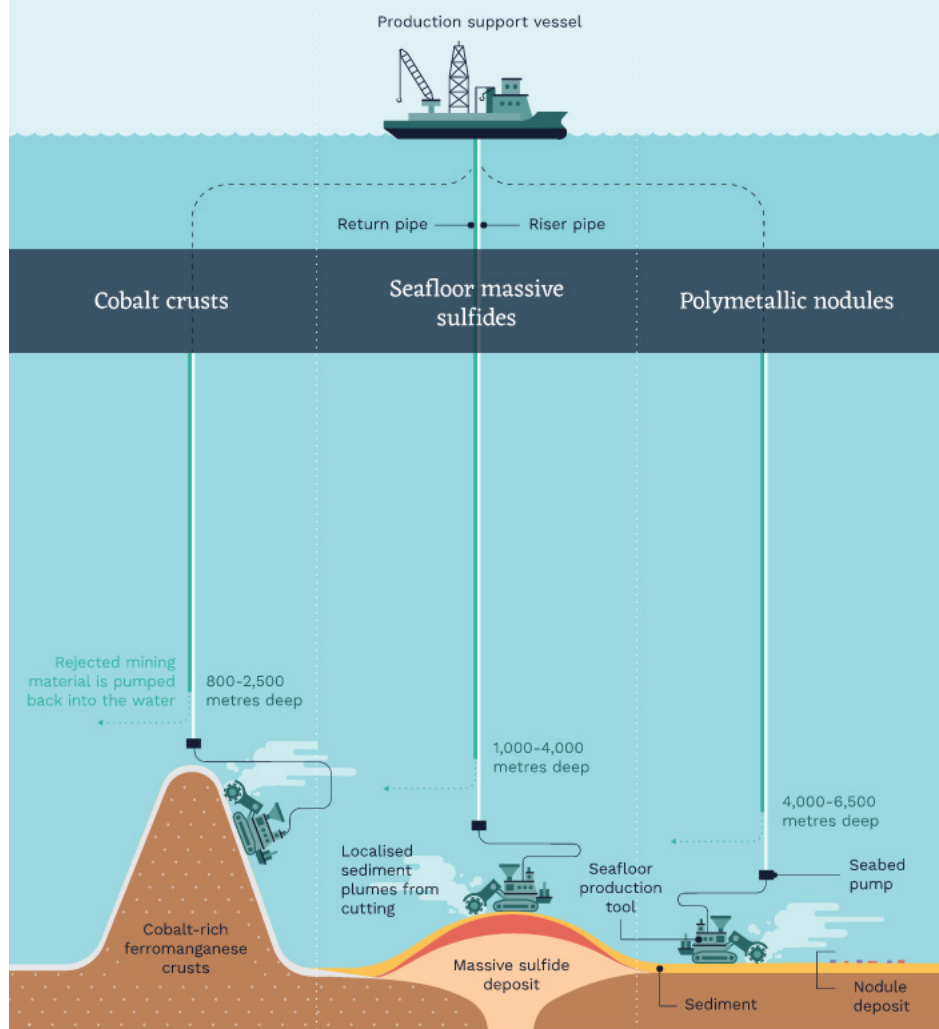
why the latest phase of exploration could succeed. John Parianos, chief geologist of Nautilus Minerals, says it comes down to demand from a growing, resource-hungry population. "What we are facing today is a much bigger market thanks to more widespread industrialisation which is directly linked to a reduction in world poverty."

Estimates vary, but if mineral demand were to increase at the predicted 1% annual rate, it would be about 60% higher by 2050. For specific commodities such as copper, there could be up to a 341% increase in demand. The ISA says that up to 15% of global demand for copper and nickel could be met from the deep seabed.

At the same time, land-based deposits of metals have become more difficult and less profitable to extract. Cobalt is mined almost exclusively in the Democratic Republic of Congo, one of the poorest, most violent and corrupt nations in the world. Advocates of deep sea mining argue that it could offer – in far richer concentrations than are found on land – a reliable, clean and ethical source of the raw materials that are critical to high-tech and renewable energy technologies.

However, a 2016 supply and demand review concluded that even under the most ambitious scenario – 100% renewable energy by 2050 – projected demand could be met

How minerals could be mined from the seabed



needed to extract and process these minerals in the harsh conditions of the high seas. In April, a Belgian firm will lower a world-first 25-tonne robotic tractor 4,500 metres to the Pacific seabed.

Based on existing designs, deposits will be pumped up to a surface ship through a tube several kilometres long. Nodules will be harvested by a giant caterpillar that will roll over the ocean floor, injecting water into the mud to disturb the deposits, sucking them out and ejecting the mud behind. The sulphides will require a huge robotic machine to roll over the seabed and use mechanical teeth to grind up the top few metres. These giant machines, which weigh nearly twice as much as a blue whale, will leave heavy, long-lasting footprints.

These processes will affect the seabed, the water column above it and surrounding areas. The scraping of the ocean floor

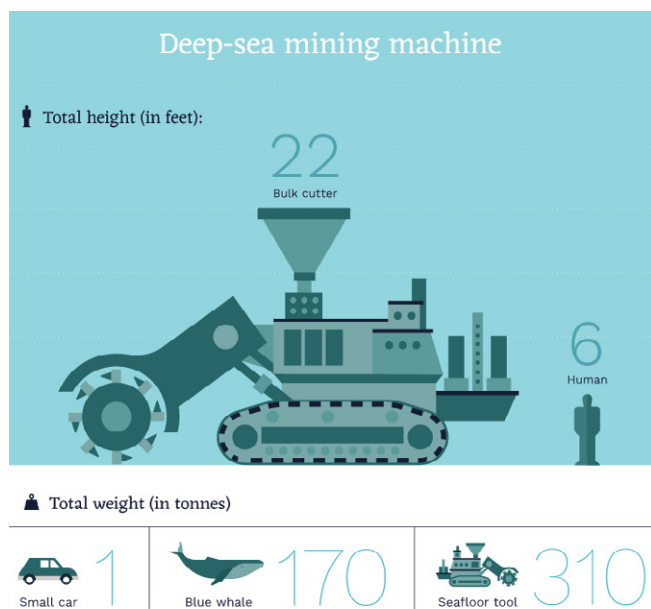
by existing terrestrial mining, improved metals recycling, and more. “Deep sea mining promotes the belief that you can continue unparalleled growth, but in different ways,” says Andy Whitmore, of the Deep Sea Mining Campaign (DSMC), a coalition of NGOs and local people from the Pacific, Americas and Canada opposed to mining.

Unseen devastation

While the debate over demand continues to divide, the mining industry has made huge advances in the technology

to extract the nodules could destroy deep sea habitats of octopus, sponges and other species. Mining of the vents, which harbour massive animal communities at densities that make them one of the most productive ecosystems on earth, is likely to stir up sediment that could smother some animals. Other species that are uniquely adapted to the lack of sunlight and high pressure of deep water, could be affected by the noise and pollution.

“The areas these mines will cover will be massive: up to 10,000 square kilometres,” says Matthew Gianni, co-founder of the Deep Sea Conservation Coalition. “Sediment



plumes could go tens of kilometres off the site itself. Even if they only travelled a few kilometres, there could be an overall impact two to three times the size of the actual mining site itself that would degrade these ecosystems and eliminate species.

He adds that after 30-40 years of exploration and disturbance of the Clarion-Clipperton zone there is very little recovery. “Any recovery will certainly not be seen on human timescales.”

Last year, an article in *Frontiers in Marine Science* concluded that the vulnerable nature of deep-sea environments, limited technology to minimise harm, significant gaps in ecological knowledge, and uncertainties of recovery meant the mining industry “cannot deliver an outcome where there is no loss of biodiversity”.

While the mining areas look like vast expanses of mud and rock, a 2016 survey of life in the Clarion-Clipperton zone found a surprising diversity of life. Of the 12 animal species collected in an area roughly the size of one mine, seven were new to science.

Carl Gustaf Lundin, the director of International Union for Conservation of Nature’s global marine and polar programme, says: “Our current knowledge of the deep sea is not sufficient to protect the unique species that live there from mining operations. It is alarming to see contracts being

granted for these still largely unexplored and vulnerable areas. We need a 10-year moratorium on seabed mining exploitation.”

“Probably the most important constraint on mining is the fact that we don’t know enough about the deep sea. We will be trashing areas before we even know what’s down there,” says Gianni.

But Parianos believes that deep seabed mining can have fewer environmental and social impacts than terrestrial operations. “If you accept that you need to get your metals from somewhere, there are all sorts of benefits with deep sea compared to land. No vegetation is harmed, it’s self-contained, there is no freshwater pollution. I think it’s good for the environment – if we can get it right.”

Some argue that decades of regulation governing terrestrial mining have failed to prevent ecological disaster. “If you have deep-sea mining, you will still have terrestrial mining, one will not simply replace the other,” says Whitmore. “There are deep concerns that even if you have sets of regulations, can companies protect this environment – which is so unseen and away from human eyes?”

The draft regulations of the ISA cite protection of the marine environment as a “fundamental principle”, but there has been no agreement so far on how that protection will be ensured. The code needs to define what would constitute an acceptable level of harm to the environment, develop guidelines for the mining companies to conduct environmental assessments and agree on a regime or body to monitor that.

Among the proposals for protection are no-mining zones in ecologically important areas, known as “regional environmental management plans”, or REMPs. These could cover up to 32% of “the area” and while they may work for the fields of manganese nodules, experts question whether they would be of benefit for the hydrothermal vent zones.

Once you open the door you have the potential for runaway mining of the deep ocean.

“For many people there is an instinctive reaction that mining is destructive and dangerous (based on people’s perception of land-based mining). But it is important to consider the issue of deep seabed mining in a broader context. Deep-sea mining is one of the most tightly regulated uses of the ocean. It is the only part of the global commons that is administered under an international regime,” says Lodge.

“No state or entity can explore or exploit the seabed except under contract to the ISA, agreed to by all 168 members. We have spent many years preparing for deep seabed mining, and we know exactly what to do to regulate it and ensure minimum environmental impact. Interest in deep-sea minerals has also led to a massive increase in funding for deep-sea science, most of which is specifically aimed at better understanding the marine environment.”

Conflict of interest

Any money made from eventual mining will be subject to a benefit-sharing regime and distributed among member states, taking into account the needs of developing nations. The payment regime is still being considered, and the ISA has contracted MIT to compare a number of economic models.

“Countries are starting to realise that even a dozen or more mining operations aren’t going to pay a lot in royalties if it’s divided by the 167 nations plus the EU. But they can make potentially good money by being a so-called sponsor state where they tax the mining company directly,” says Gianni.

This conflict of interest concerns critics. “It’s deeply worrying that the ISA is creating the rules at the same time as making money out of the rules it creates,” says Whitmore. “The tie between the companies and the countries sets up unhealthy situations in terms of transparency and accountability.”

“Even with the best regulations in place, if the economics are sufficiently strong to drive this industry forward, it’s going to be extremely difficult to say no to a country who wants a contract,” says Gianni. “Once you open the door you have the potential to have runaway development for mining of the deep ocean over hundreds of thousands of kilometres and the ISA will have very few tools in its chest to constrain that industry.” ☞

Jessica Aldred is special projects editor for chinadialogue, focusing on globally important environment themes including the ocean and biodiversity.

全新亮相的智利海洋公园

迭戈·拉米雷斯-德雷克海峡公园将为濒危鸟类和鲸鱼提供一片栖息之地。

□ 杰西卡·奥尔德雷德



© 奥马尔·巴罗佐

灰头信天翁的繁殖地主要集中在南极洲的6个群岛，这其中就包括迭戈·拉米雷斯群岛。这些群岛也是鲸鱼和其他鲸类迁徙路线中的重要地标

智利南端的迭戈·拉米雷斯-德雷克海峡公园已经成为各类稀有海洋物种及其栖息地的保护伞。这个公园去年获批，上个月刚刚开始生效。这里将成为美洲最南端的

公园，为濒临灭绝的企鹅、信天翁和鲸鱼提供总面积 14.439 万平方公里的避难所，同时保护该地区重要的海床结构。🌀

杰西卡·奥尔德雷德，中外对话项目编辑，专注于包括海洋和生物多样性在内的全球性环境议题

Chile's latest marine park

The Diego Ramírez-Drake Passage park will protect endangered birds and whales

□ Jessica Aldred



© Omar Barroso

The Diego Ramírez archipelago is one of the least explored places on Earth



© Omar Barroso

The park will provide a haven for many bird species, including the grey-headed albatross. This majestic seabird faces extinction due to the combined threats of climate change, which is affecting the location of squid, its main food source, entanglement in fishing gear and invasive species on the islands where it nests.

Rare marine species and habitats in extreme southern Chile have come under protection in the Diego Ramírez-Drake Passage marine park. Approved last year and entering into force last month, it will be the most southerly park in the Americas and provide a 144,390 square kilometre refuge for endangered penguins, albatrosses and whales. It will also protect important seabed formations. 🌀

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科学家们正在收集样本。这个公园位于美洲大陆架的最南端，对于监测全球气候变化具有重要的战略意义

Scientists collecting samples. The park's location, at the southern end of the continental shelf of the Americas, makes it a strategic area for monitoring global climate change



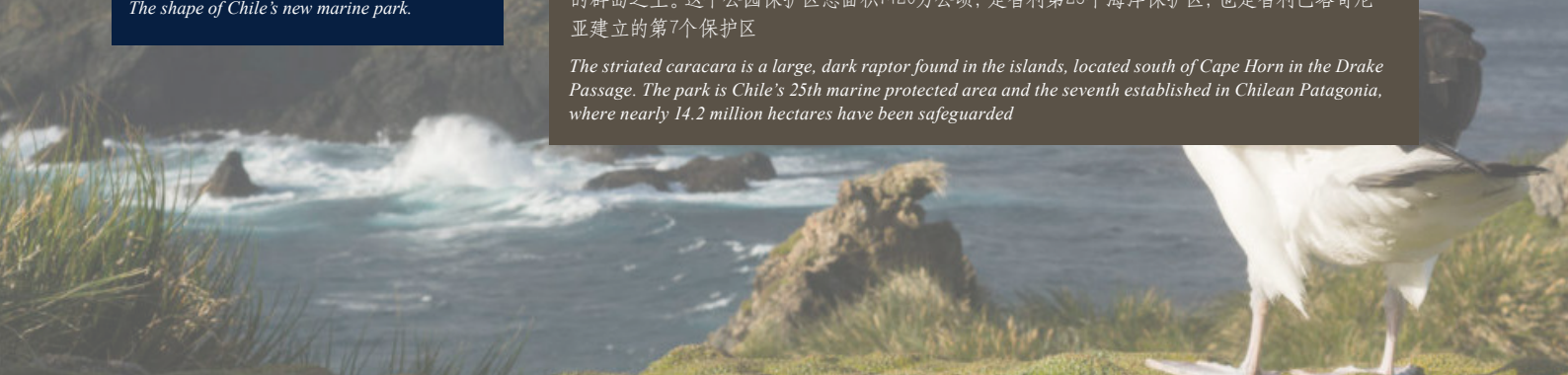
迭戈·拉米雷斯-德雷克海峡公园地图

The shape of Chile's new marine park.



条纹长喙/卡拉 (phalcoboenusaustralis) 是一种大型黑色猛禽，主要出现在合恩角南部德雷克海峡的群岛之上。这个公园保护区总面积1420万公顷，是智利第25个海洋保护区，也是智利巴塔哥尼亚建立的第7个保护区

The striped caracara is a large, dark raptor found in the islands, located south of Cape Horn in the Drake Passage. The park is Chile's 25th marine protected area and the seventh established in Chilean Patagonia, where nearly 14.2 million hectares have been safeguarded



中老铁路将为老挝带来便捷吗？

THE CHINA-BUILT RAILWAY CUTTING THROUGH LAOS

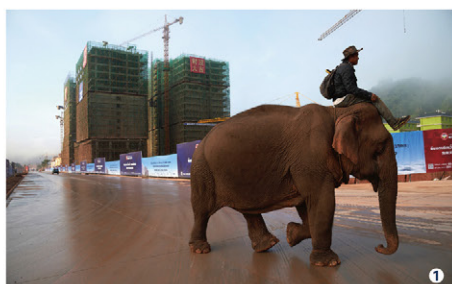
苏利耶·泉 / Surya Chuen

旅客们如果想坐大巴从老挝北部最大城镇——琅南塔向南到首都万象，就必须为长达18个小时的痛苦旅程做好准备。中国正在改变这一状况。作为“一带一路”倡议的一部分，中老铁路于2016年下半年动工，计划于2021年底完工，车程将缩短至仅仅3个小时。

As part of China's expansive Belt and Road Initiative, China started construction of a new high-speed China-Laos railway in late 2016 that is set for completion at the end of 2021, which will shorten the journey from 18 to 3 hours.



中老高速铁路路线示意图
Map of China-Laos Railway



- 1 万象省南莱河大桥，火车驶出群山进入平原
Nam Like River Bridge in Vientiane province, here the trains will roll down from mountains into the plain
- 2 琅勃拉邦的蔬菜种植以满足中国铁路工人的需求
Luang Prabang residents grow vegetables for Chinese workers, who have flooded the city to construct the railway
- 3 中老铁路始发站磨丁，新经济特区吸引了15亿美元投资
The high-speed railway crosses from China into Laos at Boten, a reported US\$1.5 billion pumped into it
- 4 铁路从琅勃拉邦南下到万荣，中国探险者与企业随处可见
From Luang Prabang the railway runs down to Vang Vieng, more and more Chinese adventurous and businesses venture here

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