

# COMMENT

**ECONOMICS** Five books on inequality, issue of the age, compared **p.312**



**ART** Thousands of spiders, sprinklings of meteorite and 24 speakers **p.314**

**HISTORY** Robert Hooke speculated about alien life 300 years ago **p.315**

**OBITUARY** Mildred S. Dresselhaus, Queen of Carbon, remembered **p.316**

JIM RICHARDSON/NGC



Salt in the soil in the Grand Valley, Colorado, leaches to the surface or is pushed up by groundwater.

## The business case for soil

Action on soil sustainability must move beyond the farm and into the boardroom, urges **Jess Davies**.

**N**obody likes dirty business, but the business world must get to grips with dirt. Soil provides food, fibres and fuels, and regulates water resources and climate. Yet most businesses are unaware that their bottom lines depend on soil; nor are they aware of the risks they face from its degradation. More must recognize that improving soil quality is a smart investment.

One-third of all soils and more than half of agricultural soils are moderately or highly degraded. Erosion, loss of organic carbon, compaction and salinization reduce soil's fertility and ability to hold moisture<sup>1</sup>. Every year,

we damage another 12 million hectares — an area the size of Bulgaria — through deforestation, overgrazing, intensive farming, urbanization and pollution<sup>2</sup>. Climate change and biodiversity loss exacerbate soil problems. Yet global needs for food and resources are rising as populations grow, lifestyles shift and the world transitions to a low-carbon economy.

Many businesses in the agricultural and forestry arenas, and some in the food sector, describe the measures they've taken to reduce soil impacts in their sustainability reports. Most others do not. Soil is vital to all industries that use plant or animal

products in their supply chains, from fashion to pharmaceuticals and, increasingly, energy. Insurers and investors have a stake — when crops fail, they lose money, commodity prices rise and operations are disrupted.

Businesses are aware of the risks of climate change: more than 900 companies petitioned President Donald Trump for the United States to stay in the 2015 Paris climate agreement. Extreme weather, water scarcity, natural disasters and climate change were listed in the top five risks in terms of impact in the World Economic Forum's 2017 Global Risks Perception Survey. Soil cuts across ▶

▶ all these environmental concerns but was not mentioned.

If the private sector is serious about sustainability and commitments to climate change, it must take action on soil. In collaboration with researchers, businesses should advocate for international legislation, assess their soil risks and impacts and invest in maintaining and enhancing this resource.

### BURIED TREASURE

Soil's invisibility in the boardroom is the result more of unfamiliarity than apathy. For instance, last October, I ran a session on the risks and opportunities that soil presents at the annual meeting of the World Business Council for Sustainable Development (WBCSD), a chief-executive-led forum of more than 200 multinational companies. Participants from across the accounting, agriculture, chemicals, engineering and food sectors said that they were surprised to learn of soil's roles beyond agriculture.

Water regulation is one function in which business has a stake. Soil moisture is crucial for rain-fed agriculture, which accounts for three-quarters of human usage of fresh water<sup>3</sup>. Soils that are compacted, eroded or lacking in organic material hold less water. This increases the likelihood of floods and the impact of droughts, and intensifies competition for water resources. Water scarcity is widely acknowledged as a major risk to the global economy<sup>4</sup>: in 2016, droughts and shortages cost businesses US\$14 billion<sup>5</sup>. The contributions of soil to water problems and its potential for mitigating risks are uncertain, however.

Water-intensive industries such as beverages, mining and energy are taking action in the catchments where they operate. For example, the Coca-Cola Company has been

working with wildlife charity WWF and communities to maintain irrigation channels in Nepal, remove invasive sugar cane from the banks of Rio Grande and reforest in Mexico to improve water availability<sup>6</sup>. It should also look at protecting local soils by, for example, reducing disturbance and promoting conservation agriculture.

Climate risk and mitigation is another area in which businesses underappreciate soil's potential. It is the largest global reservoir of organic carbon. Land-use change and poor soil management have resulted in a loss of 42–78 gigatonnes of carbon from soils over the past century<sup>7</sup>. The majority was emitted as carbon dioxide. This compares with 450–600 gigatonnes of anthropogenic carbon emissions since the industrial revolution.

Sustainable land management can reverse this trend by increasing the amount of carbon stored in soils. On 21–23 March, the Food and Agriculture Organization of the United Nations (FAO) will hold the first Global Symposium on Soil Organic Carbon. The aim is to review the role of soils in climate change and integrate the issue into the regular assessment reports of the Intergovernmental Panel on Climate Change.

To achieve scalable solutions, the global business community needs to be engaged. For instance, soil sequestration could easily be highlighted to businesses through the Low-Carbon Technology Platform, developed by the International Energy Agency, the United Nations and the WBCSD at the Paris climate meeting.

### MUDDY PROFILE

Lack of regulation perpetuates the problem: the need to comply with laws raises awareness. Soil is a global resource; its degradation has consequences for society and business

everywhere (see 'Dirty business'). Yet there is no international legislation governing soils directly<sup>8</sup>. The European Commission proposed a Soil Framework Directive in 2014, but it failed to be adopted. Only a handful of countries, including the United States, Switzerland and Australia, have national soil policies.

Business awareness could be elevated through non-legally-binding initiatives such as the UN's 17 Sustainable Development Goals (SDGs). When the SDGs were launched in 2015, 71% of businesses surveyed planned to engage with them, and 41% said they would embed them into their strategies within five years<sup>9</sup>. But soil is not one of those goals. It gets a mention in four targets, including sustainable food production and zero land-degradation, but not in water security and climate change.

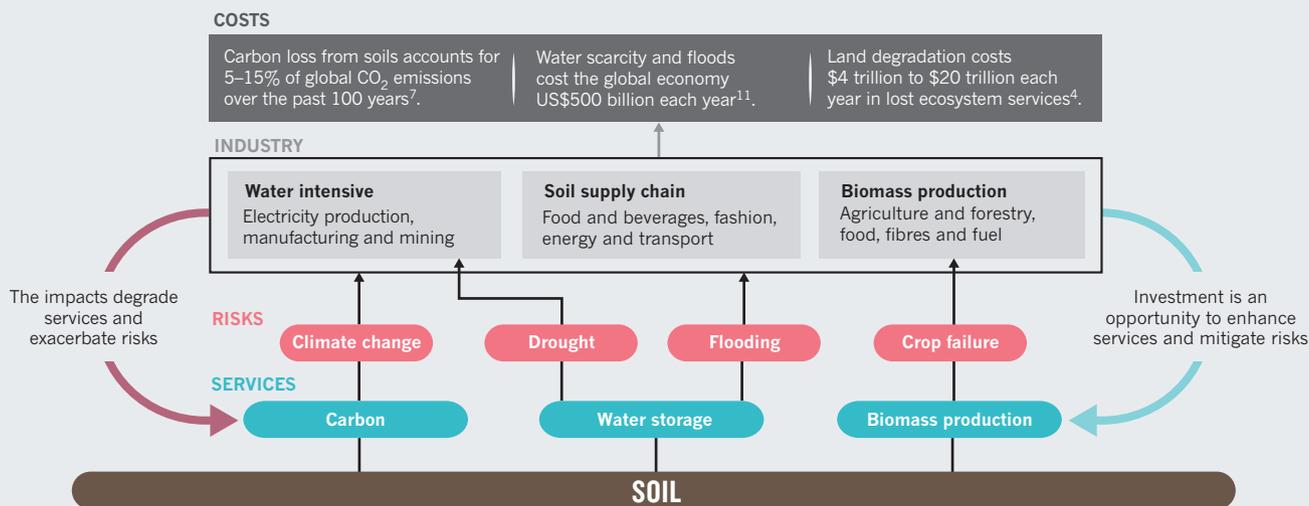
Last December, the FAO endorsed the UN's Voluntary Guidelines for Sustainable Soil Management. These are an important step. But they focus only on agriculture.

Soils are buried in the scientific frameworks, such as 'planetary boundaries'<sup>10</sup>, to which businesses turn to develop sustainability strategies. Scientists know that soils are central to nitrogen and phosphorus flows, the integrity of the biosphere, and changes to the climate and land system. But without naming a limit for soil loss or degradation that humanity must live within, the issue is easily overlooked.

Soil is missing from corporate environmental reporting standards, such as those of the Global Reporting Initiative (GRI). Even in the companies that are moving in the right direction by publishing soil-related numbers in their sustainability analyses, these remain entangled in other statistics. In 2015, for example, Kering (the parent group of the

## DIRTY BUSINESS

Soil quality underpins all industries that involve food, fibres and fuel. Land degradation lowers soil's ability to store water and releases carbon, adding to global risks such as those posed by climate change, and costing businesses trillions of dollars per year. Investing in soil maintenance and protection limits such risks.





Tractors in Pantanal, Brazil, erode soils and kill marshland.

JOEL SARTORE/NGC

fashion brands Gucci and Puma) reported that 45% of its environmental impacts are associated with producing raw materials such as wool, cotton and leather. The biggest contributor, land-use change, totalled €191 million (US\$202 million) in damages per year. The effects of soil degradation are hidden in this cost.

### THREE PATHS

The business community should follow three paths in partnership with scientists: advocacy, assessment and investment. All three can be successful only if they are supported by robust research.

First, businesses should join researchers in lobbying for better soil policies and practices. International legislation should be a priority. Making the case will require compelling narratives that describe the benefits of action over inaction, equivalent to, for example, the 2 °C global-warming goals. For instance, what would a 2% loss in soil carbon mean in terms of production and water storage, carbon emissions and socio-economic costs? Or what would a 40% degradation in soil resources mean in those terms?

The momentum of the Paris climate agreement should be harnessed. Hundreds of companies signed up in Paris to coalitions such as the UN's Non-State Actor Zone for Climate Action, and We Mean Business. These should extend their mandate to protect soils. The Global Soil Partnership and the Intergovernmental Technical Panel on Soils could broaden their remit beyond soil's agricultural functions.

Second, companies need to assess how much their operations and value chains

depend on soils. Metrics and tools should be developed and integrated into reporting frameworks such as the GRI, as well as into 'natural capital' approaches for assessing environmental business risks (such as the Natural Capital Protocol, launched in 2016 by a coalition of more than 200 leading organizations).

Third, soils need to be seen as an investment opportunity to mitigate the risks associated with disruption to climate, water, energy and supply chains. Global funds should be put in place to support soil remediation where it is needed most, in much the same way as those approved by the World Bank for climate change. These could be funded through voluntary payments or through regulations and levies on soil users (with care that taxation policies incentivize good practice). Funds could also come from existing climate-mitigation pots.

Projects to promote natural rather than built infrastructure in business should champion soils. For example, the WBCSD's natural infrastructure work programme, chaired by Shell and Dow, is constructing wetlands and enhancing biodiversity schemes to provide pollination and catchment afforestation. These help recharge aquifers. Soil measures could easily be added.

Scientists need to listen and learn the language, priorities and procedures of the business world to facilitate change. A scientific

strategy to help build business cases for action on soil should include: international and long-term monitoring of soil resources; creating metrics that matter to business and measuring the socio-economic impacts of degradation; illuminating the risks and consequences of inaction or intervention; and tools that support decision-making and soil investment.

Soil is a common good and an essential resource. With the support of science, governments, civil society and businesses must ensure that it is not treated like dirt. ■

**Jess Davies** is lecturer in sustainability at the Pentland Centre for Sustainability in Business, Lancaster Environment Centre, Lancaster University, UK.  
e-mail: [jess.davies@lancaster.ac.uk](mailto:jess.davies@lancaster.ac.uk)

**“Global funds should be put in place to support soil remediation where it is needed most.”**

1. Intergovernmental Technical Panel on Soils. *Status of the World's Soil Resources* (FAO, 2015); available at <http://www.fao.org/3/a-i5199e.pdf>
2. United Nations Convention to Combat Desertification. *The UNCCD: Securing Life on Land (2016–2017)* (UNCCD, 2016); available at [go.nature.com/2masla3](http://go.nature.com/2masla3)
3. Hoekstra, A. Y. & Mekonnen, M. M. *Proc. Natl Acad. Sci. USA* **109**, 3232–3237 (2012).
4. Mekonnen, M. M. & Hoekstra, A. Y. *Sci. Adv.* **2**, e1500323 (2016).
5. Corporate Water Disclosure. *Thirsty Business: Why Water is Vital to Climate Action* (CDP, 2016); available at [go.nature.com/2dkwcbf](http://go.nature.com/2dkwcbf)
6. WWF and The Coca-Cola Company. *A Transformative Partnership to Conserve Water*, Annual Report 2015 (WWF and Coca-Cola, 2015).
7. Lal, R. *Science* **304**, 1623–1627 (2004).
8. Montanarella, L. *Nature* **528**, 32–33 (2015).
9. PWC. *Make it Your Business: Engaging with the Sustainable Development Goals* (PWC, 2015)
10. Steffen, W. et al. *Science* **347**, 1259855 (2015).
11. Sadoff, C. W. et al. *Securing Water, Sustaining Growth: Report of the GWP/OECD Task Force on Water Security and Sustainable Growth* (Univ. Oxford, 2015).