The Greening of Insurance

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Every sector of the economy telegraphs climate risks to its insurers. In turn, climate change stands as a stress test for insurance, the world’s largest industry, with U.S. $4.6 trillion in revenues, 7% of the global economy (1–6). Insurers publicly voiced concern about human-induced climate change four decades ago (1). I describe industry trends, activities, and promising avenues for future effort, from a synthesis of industry progress in managing climate change risk [see supplementary materials (SM)].

Increasingly, multifaceted weather- and climate-related insurance losses involve property damage, business discontinuities, health impacts, and legal claims against polluters. Worldwide, insured claims that were paid for weather catastrophes average $50 billion/year (about 40% of total direct insured and uninsured costs); they have more than doubled each decade since the 1980s, adjusted for inflation (7, 8). Insurers must also adjust to risks emerging from society’s responses to climate change, including how structures are built and energy is produced.

Where there are risks, there are also opportunities. Responding to the push of shareholders and regulators and the pull of markets, a trio of global initiatives [United Nations Environment Programme Finance Initiative (1995), ClimateWise (2007), and the Kyoto Statement (2009)] has aggregated 129 insurance firms from 29 countries (table S1). Member commitments include supporting climate research, developing climate-responsive products and services, raising awareness of climate change, reducing in-house emissions, quantifying and disclosing climate risks, incorporating climate change into investment decisions, and engaging in public policy. Since the mid-1990s (3), these and many other insurers, reinsurers, intermediaries, brokers, industry associations, catastrophe-loss modelers, and regulators have engaged in this work (see the figure) (fig. S1, A to C), often in partnership with universities, development agencies, nongovernmental organizations, foundations, think tanks, and governments (9). These increasingly sophisticated efforts were sustained through the economic malaise of the past few years; one-fifth of the activities identified in the figure began after 2008.

Climate Science, Adaptation, and Mitigation

As past experience is an ineffective predictor of future losses, many insurers are using climate science to better quantify and diversify their exposure, more accurately price and communicate risk, and target adaptation and loss-prevention efforts (table S2). Insurers also analyze their extensive databases of historical weather- and climate-related losses, for both large- and small-scale events (7–11). Insurers from North America, Asia, and Europe have expanded their collaborations through the three latest Intergovernmental Panel on Climate Change assessments into projects such as harmonizing economics-based insurer catastrophe models with climate models. Insurers’ models extrapolate historical data rather than simulate the climate system, and they require outputs at finer scales and shorter time frames than climate models.

Insurers can reactively adapt to rising losses by tightening availability, prices, and terms. Instead, some have sought to help vulnerable customers improve their resilience to a changing climate. Strategies include financial and physical risk management, often in collaboration with noninsurance entities (table S3). Insurers have championed a broadened definition of sustainability that includes resilience to disaster and a low carbon footprint. Beyond signaling that loss-prone development is unsustainable, insurers are supporting interventions with benefits for both emissions reduction and adaptation (table S4 and fig. S2). Integrated actuarial and environmental science is enhancing adaptive capacity to climate change in the developing world, where poor populations enjoy little access to insurance. Decades ago, public and nonprofit sectors offered microinsurance (small premiums for modest coverage), with commercial insurers later adding tens of millions of policies for life, health, and property (table S5). Some employ parametric and index-based triggers for climate-sensitive crops and livestock by using remote sensing. Others promote adaptation, e.g., improved soil management.

Numerous insurers aim to curb greenhouse-gas emissions from homes, businesses, transport, industry, and agriculture (table S5). They have brought to market at least 130 products and services for green buildings. Many pay claims that fund rebuilding to a higher level of energy efficiency after losses. Insurers have introduced at least 65 offerings for renewable energy systems.

Some climate-change mitigation technologies align with lower-risk behavior. Nearly 3 million pay-as-you-drive policyholders enjoy more accurate roadway accident premiums using telematics to verify distances driven. This price signal could reduce U.S. driving by 8%, worth $50 to $60 billion/year, thanks to reduced congestion and lower probability of accidents, while reducing cross-subsidies from those who drive less than average to those who drive more (12). Risk-based premium credits are also offered for low-emissions vehicles and green buildings (table S5).

Other products insure financial shortfalls if energy savings or low-emissions power generation projects underperform or manage risks in carbon-trading transactions, ranging from carbon release from wildfires to infrastructure appropriation by foreign governments. Insurance strategies assuming these risks and minimizing losses align with the broader policy objectives of verifiable, bankable, and persistent emissions reductions.

Technology, Governance, and Policy

When risks are too great or undefined, insurers withdraw coverage or increase prices. Climate change mitigation and adaptation present dual challenges in this regard: unintended risks (e.g., nuclear power and weapons proliferation) and climate vulnerabilities (e.g., biofuels and water needs) (tables S6 and S7). Insurers abhor unquantified and unpriced risks, as well as market distortions, such as equally subsidizing technologies that have divergent risk profiles (13).

Emerging technologies lack the operational history desired for underwriting. The most unwieldy of these are “climate-engineering” techniques, ranging from carbon capture and storage (CCS) to artificially modifying the radiative properties of the atmosphere. Insurers have entered the CCS market in a circumscribed manner, excluding riskier strategies or financial arrangements, limiting coverage to short time frames, and ceding long-tail risks to the public sector. Conversely, energy efficiency is arguably the lowest-risk mitigation strategy (followed by renewables), with abundant benefits (14). Societal dithering forces reliance on approaches that are riskier and less amenable to insurance underwriting.

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Insurers are dually exposed to internal governance risks (e.g., underestimating climate-related losses) and those taken by their customers (e.g., polluters). More than one in four corporate directors anticipate liability claims stemming from climate change (15). Litigation often requires insurers to furnish legal defense and to pay damages. Insurers have responded with new liability products and by excluding climate-change claims where customer behaviors are unduly risky. Insurance regulators and investors are seeking climate-risk disclosure (table S8 and fig. S3), compelling insurers to formally consider climate change in operational, business, and investment practices. Liability risks are rising as climate science becomes more settled.

With $25 trillion in assets—equal to global mutual funds or pension funds—insurers are central players in world financial markets. They have invested at least $23 billion in emissions-reduction technologies, securities, and financing, plus $5 billion environmentally focused funds (table S9 and fig. S4).

Emissions from insurers’ energy-intensive buildings, data centers, and business travel are 12 megatons CO₂/year with a 10-fold variation in carbon intensity (per unit of revenue) across companies (9). Scores of insurers have reduced their emissions, with at least 26 carbon neutral (table S10 and fig S5).

Insurers have influenced public policy, striking agreements on pricing risk and government’s role in risk management and shaping land-use planning and energy policy in many countries. They have engaged in climate policy forums since the mid-1990s (2, 3), including participation in the international climate negotiation process. Lloyds of London is one of the more prominent; they view climate change as the industry’s number-one issue (5). Insurers are uneasy with mercurial policies on natural hazards and energy. Shifts in public incentives or indemnity practices can adversely influence risk-taking (moral hazard), heightening insurers’ exposures.

From Risk to Opportunity
Climate-focused efforts have benefitted millions of insurance customers and have mobilized billions of investment dollars, although public and policy-maker engagement in these efforts remains low. Little climate-related innovation has occurred in certain market segments, e.g., life and health (microinsurance being an exception), maritime, aviation, and heavy industries. Greater scale is needed if the insurance industry is to realize its potential.

Independent auditors found an 88% compliance rate among signatories of the Climate-Wise principles (table S1) (16). Yet, many companies remain on the sidelines or offer only token gestures, perhaps because of insufficient demand, ideological discomfort with policy responses, inadequate science literacy, or inertia to institutional change. Insurers face external barriers as well. Some regulators and consumer groups resist risk-based pricing and insurer innovations (17).

It is argued by some that private insurers have not effectively advanced climate change mitigation and adaptation and that the risks may even become uninsurable (18). Mandatory climate-risk disclosure identified a broad consensus on the relevance of climate change among U.S. insurers, but only one in eight companies have a formal strategy.

Public insurers could be similarly criticized (19). As insurer of last resort (e.g., $1.3 trillion coverage for flood and $115 billion for crops in the United States), they could learn from their private counterparts. Governments could boost demand for market-based “green insurance” by using it in their own operations.

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**References and Notes**

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**Supplementary Materials**

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