Human impacts

Heat waves take their toll on human health and reduce labour productivity.

We can all get irritable, lethargic, and less focused when too hot. This is particularly problematic in the workplace. Not only do people work less effectively when in a hot and stuffy environment, they are also more likely to take time off due to work-related illness, and have more accidents when at work — facts that have been recognized by the IPCC. But what are the actual economic costs?

Kerstin Zander and colleagues (page 647) have examined this issue by analysing patterns of work absenteeism and reductions in labour performance in Australia, which has experienced an increasing number of heat waves over recent decades. This upward trend is expected to continue into the future as a result of climate change. To work out the potential economic impact of such changes, the researchers analysed self-reported estimates of work absenteeism and performance reduction caused by heat during 2013–2014, based on a representative sample of nearly 2,000 working adults who had completed an online questionnaire.

A substantial proportion of respondents — around three-quarters — said they been affected by heat in the workplace. Many also reported having taken at least some time off work, or having been at least less productive on occasion over the last year as a consequence of heat. Zander and colleagues then went further by estimating average annual costs at around US$655 per person. By extrapolation, this suggests a cost to the Australian economy of around US$6.2 billion. This may seem a modest sum when compared with Australia's government debt of around AUD 686 billion (US$524 billion) but it is nevertheless a substantial amount of money. No wonder then that Zander and colleagues highlight the need for adaptation measures to reduce the impact of future heat waves on labour productivity.

Of course Australia is not alone, even among developed countries, in facing the prospect of more frequent heat waves. In a separate study presented in this issue, Bryan Jones and colleagues (page 652) provide a model-based projection of population exposure to extreme heat for the continental United States. They find that heat exposure will increase four- to sixfold into the latter half of the present century compared with the late twentieth century. Their analysis also shows that changes in the size and distribution of the population, as well as climatic changes, affect levels of exposure, and that the relative importance of these factors varies across regions of the country.

Both of these studies underscore the need to foresee and (through adaptation and mitigation efforts) forestall the impacts of future heat waves on human health and welfare. ❒

Perfect storm

Action needs to be taken to mitigate the effects of climate change on deep-sea ecosystems.

It is often assumed that deep-sea ecosystems are shielded from the effects of climate change at the surface. On the contrary, such ecosystems are likely to be particularly sensitive to changing oceanic conditions. For one thing, many are energetically dependent on organically rich particles, which are produced in surface waters before sinking to the sea floor as 'marine snow'. Furthermore, because many deep ecosystems have experienced relatively constant conditions for millennia, even small perturbations of the physical and chemical environment could destabilize them. Many of the species supported by these ecosystems have long life spans and generation times, meaning that their capacity to adapt quickly enough to keep pace with environmental change may be limited. So what, if anything, can be done to protect them?

This was the topic of a meeting of stakeholders held in Hobart, Tasmania, the outcomes of which are discussed by Ronald Thresher and colleagues in this issue (page 635). The focus of the workshop was the deep-sea coral communities of the Huon Commonwealth Marine Reserve, off southeast Australia. These reef systems were established before the peak of the last Ice Age, and now have protected status. However, ocean acidification is likely to reduce the ability of taxa such as reef-building corals to calcify their skeletons. Without management intervention, these cold-water reef systems may well be seriously degraded or even lost within decades, a dire situation indeed.

To prevent this, the workshop recommended that short-term priority should be given to identifying and protecting sites in the world's oceans that are, or could become, refugia areas. But what other actions can be taken to protect deep-sea reefs? The Huon reefs are located on seamounts at depths of 1,000 meters or more — representing an important challenge in itself. Other cold-water reef systems are found at even greater depths elsewhere around the world; making it hard to observe and monitor them, let alone manage them through direct intervention. The workshop considered 17 options, some more desirable — or at least less undesirable — than others, and ranging in probable cost, practicality, and lead times for implementation.

Engineering-based solutions might include providing concrete structures as homes for species that normally live around live coral, or dumping bags of lime to improve conditions for coral growth. Biological interventions could potentially involve strategic translocation of colonies to or from refugia areas, or even genetically engineering coral species to make them more tolerant of warmer and more acidic conditions. Changes to regulatory frameworks to expand the size of legislatively protected areas might also be beneficial.

The truth of the matter is that deep-sea reef systems the world over face a perfect storm of threats and all attempts to save them may, unfortunately, prove futile. ❒

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