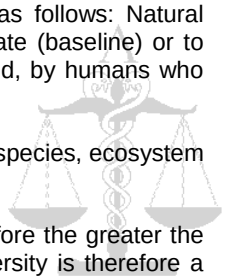
RLO Biodiversity Summary

The key additional uncertainty introduced by increasing the scope of liability for environmental change arises as a result of the potential for sudden transitions in ecosystems and the value of the services they provide. If transitions and their effects could be predicted with confidence then they may be insurable. In our view, the uncertainties are currently too large.

Biodiversity has come to represent an idealised view. The story is summarised as follows: Natural systems rely on complex feedback networks to create and maintain the current state (baseline) or to ensure that any change is slow. Slow change allows adaptation, both by nature and, by humans who exploit nature.



Feedback systems work best when they are complex, without reliance on one gene, species, ecosystem or human intervention.

The ideal concludes: that the greater the diversity the slower the change and therefore the greater the perceived sustainability of supply of those things we take from the biosphere. Diversity is therefore a kind of insurance mechanism. Reduction of diversity is described as a threat to our continued adaptation.

While there is some truth to this story, it is a simplification. Deserts have formed from jungle, plagues have come and gone, pandemics have passed, species have become extinct, bogs have dried up, bare mountains have become meadows after being dominated by pine forests. Natural processes continually change the balance of the available resources. Diversity is continually on the move, sometimes with remarkable speed, without any help from man.

The real problems are:

- Pace of change, not change itself. Complex systems can be driven to the point where they become unstable and fail. All systems can be driven to the point where supply of ecosystem services cannot meet demand. The annual cost of adaptation or failing to adapt may become too high if the pace of change is too high.
- Reversibility of change. Complex systems will always self stabilise. The work required to move from a new state induced by the insured to a state regarded as the right state can be complex and disproportionate.

Using private insurance as a mechanism to fund the restoration of biodiversity where it has been damaged by human act or neglect is an emerging concept. Policy makers have already written rafts of legislation to protect the environment or restore it, and to protect ecosystem services such as rain water runoff. But these have been piecemeal in nature, not designed within the framework of the bigger biodiversity concept. A unified view would take account of a very complex network of interactions and would have some kind of baseline standard to aim for. Given the complexity of these networks, the regulator is most likely to continue to aim for return to some previous state as the accepted baseline, but the scope of this baseline is likely to become much bigger than currently envisaged.

In the mean time, insurers should expect increased attention to the economic arguments arising from 'ecological justice'. In this, any dependency on ecosystem services would potentially be insurable by first and third parties. So long as loss can be measured and causation established, [and is not too remote], the agent of change could find a claim being made against them. BP are compensating fishermen and tourist services for economic loss in the Gulf of Mexico.

Biodiversity as a named subject has been on the commercial insurance[1] agenda for over 15 years. During that time the EU and the UN have been developing understandings that are increasingly coherent.

This summary provides a brief outline under some headings relevant to liability insurers.

Loss

Ecosystem services could have a measureable monetary value to those who have or could have access to them. There is no possibility of assigning a monetary value *per se*; the value depends on who is dependent/ benefiting from the service, how and why. If no-one is dependent/benefiting, the service has no meaningful value now, but could have at some later date.

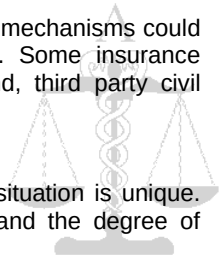
Ecosystem services include:

[1] Many people use the word insurance in this context, what they usually mean is that adequacy of net food supply is more reliable if diverse resources are available. Reducing diversity reduces the resilience of the food supply system, increasing diversity increases resilience, a kind of insurance policy. So diversity = insurance.

- Provisioning
- Regulating
- Cultural
- Supporting

A change in any of these could be assigned as being of a monetary value to someone, but the value of provisioning and regulating services would be most readily assigned to an individual/claimant.

Insurance or wealth redistribution
Loss of economic utility of ecosystem services could be measured. Insurance or tax mechanisms could both be used to restore a damaged service or provide indemnity for the loss. Some insurance mechanisms are already in place e.g. statutory remediation of contaminated land, third party civil liability.



Method of valuation
Assigning the monetary value of an ecosystem cannot be done generically; each situation is unique. Several methods have been shown to be valid depending on the circumstance and the degree of interference with the ecosystem service:

- Opportunity cost. (e.g. denial of access or alternate access)
- The cost of installing and running man-made alternatives, to the same end.
- Tradable value of the inputs and outputs, or change therein.
- The cost of actual or compensatory remediation and mitigation [within an agreed timescale].
- The cost of a license to operate and additional costs of biodiversity credits (aka biodiversity offsetting) to exceed an agreed level of activity.
- Willingness to pay (perhaps captured in the value of biodiversity credits).
- The replacement costs for biodiversity investments already made.

Statutory liability
Regulators currently set standards in accord with public policy aims e.g. restoration of pre-event state and, have decided who should pay – the polluter. Commercial insurers should take account of standards drift and retrospective effects. Expansion of statutory liability mechanisms for managing disruption to ecosystem services is possible e.g. a decision to drain bog land could lead to a requirement to create an equivalent ecosystem elsewhere. Insurability would be judged on the basis of probable frequency of breach, size of effect, likelihood of detection, likelihood of enforcement, correlation with other associated losses, baseline...but can this be done?

Civil liability
Several theories need to be taken into account. Nuisance or negligence would seem to be the most likely initial choice to make. Proprietary interest would be the obvious decider here. Is there a need to show physical damage? Can an economic loss be compensated without physical damage? Can an economic loss be compensated if there is no proprietary interest in the site where the damage occurred? Is foreseeability required? Is it strict liability? Was there a permit in place? And others…

If an appropriate law is found then other issues to consider would include:

- Materiality – several authorities on ecosystem services state that they are usually resilient but that a point may come where the insult is so great that service tips into a non productive state. Given that a small insult to the system may have no detectable effect on it, say after the next breeding cycle is complete; could it be regarded as material? Would it be material only if other wrongdoers acted in the same way at the same time?
- Proximity – some interactions between biological systems are very complex. Diverting a stream in Scotland really could influence eel catches in the Atlantic.
- *De minimis* – still unclear what this means in scientific terms.
- Date of Knowledge – Increased use of ecosystem services has been the mainstay of economic growth for centuries. If the resource is overused, at what point should the consumer have known that their demands were not sustainable and that their use would cause a loss to others and that loss could reasonably be prevented?

Many of these arguments are currently being played out in respect of climate change litigation.

Class actions
Our rulers may decide that where the loss of an ecosystem service affects large numbers of people it may be necessary to introduce a greater facility for class actions. Biodiversity is thought of by academics as a ‘public good’ in the same way that groundwater is.

Offsets
Carbon trading has already been established. If a trade becomes void because of negligence or breach of contract a liability can be measured and recovery sought. Other forms of offsetting now come into the

frame if we talk about biodiversity. Obvious choices include oxygen production, water supply, habitat, cultural services…

Insurance issues
The total natural capital value of ecosystem services is very large indeed even if currently unused services are ignored. If it were insurable, the market would be very attractive from a volume of business point of view.

But.

Exposure predictability is very low indeed not just because regulators are not yet clear on how to handle these issues but also because an event could vary extremely widely in its loss implications. A great deal depends on the degree of dependency on an ecosystem service and on its resilience. What looks like a major loss of service could in fact be restored quite naturally by a resilient ecosystem with no need for expenditure on remediation attempts. Interventions may even detract from recovery.

An event (assuming gradual events are excluded) could trigger a number of types of loss of service e.g. forest clearance leads to river contamination, loss of fish, loss of drinking water and results in loss of rainfall in a nearby region. A single event could trigger a variety of geographically related losses e.g. payment protection, damage to unoccupied buildings etc.

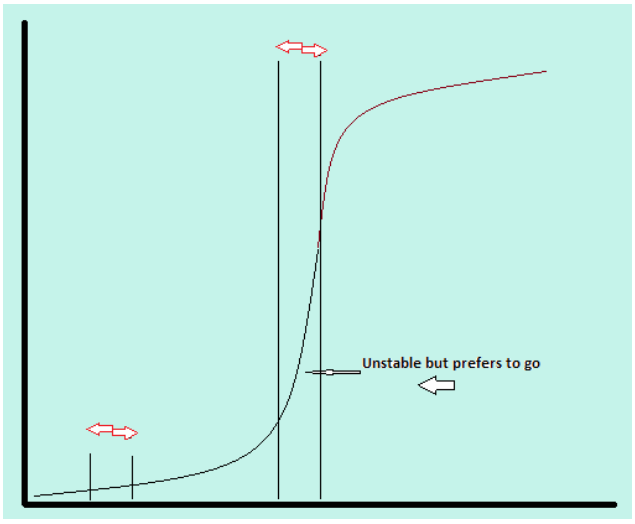
Retrospection already applies to contaminated land, why not also to forest clearance-related losses?

It seems most likely that insurers will not develop biodiversity insurance policies until a regulatory framework determines a need. Even then, exposure uncertainty will at least require an extensive period of experience development before products can be made widely available. Legacy issues could present serious difficulties. Until then, existing policies (e.g. fire and flood insurance) could be affected by ESG issues and some experience/expertise could be generated through study of these.

Thus far it seems politicians have not held out the hope that somehow insurance will provide a ready answer to the externalisation-of-value problem. They are taking a wide range of other measures.

Tipping Points
A key concept for biodiversity is the so-called tipping point. Understanding this concept illuminates the insurance problems: proximity, material contribution and remediation and illuminates the “diversity = insurance” view held by environmentalists. Biodiversity risk is not the same as contaminated land risk; effects can and do occur well outside the property owned and controlled by the insurer.

The predator/prey graph below contains the basic concepts. The y axis is prey population density, x axis predator population density, the curve is prey population density. Predator population increases to the left.



Starting at the bottom left. As the number of foxes reduces to the right, the number of rabbits increases as more survive to reproductive age. More rabbits result in an increase of the fox population and the number of rabbits falls again. There is a small range of natural variability when measured over 2 season cycles (coupled red arrows).

For external reasons, the window of variation (vertical lines) can drift, but so long as foxes want to and can eat rabbits the rabbit population will remain in the bottom left quadrant. External reasons include for example, years of increased rainfall, predation on foxes.

Drift can be influenced by the availability of other fox prey. If mouse numbers increase then so do rabbit numbers; foxes can only eat so much! If rabbits eat mouse food then rabbit numbers could fall or rise depending on the importance of the food for rabbit or mouse health. The reproductive benefits of the food to rabbits could outweigh the effect of reduced mouse numbers leading to greater predation on rabbits.

If fox population densities are drastically reduced e.g. by disease then rabbit population densities go through the transition point and adjust to new higher level, limited only by the availability of food, other predators and overpopulation stress. Surviving foxes ought to be very successful but disease means that living in close proximity to each other results in an increased death rate and number densities are kept in check. A small range of natural variability is expected, the window can still drift around.

So, some insurance issues have been illustrated by this story:

- Proximity: a biodiversity risk assessment is extremely complex. Change can occur which is apparently remote from the intervention. Killing foxes could cause desertification by overgrazing, leading to reduced rainfall in another region, spreading desertification.

- Causation: as with proximity, the linking of consequences to actions could be very complex.

  Linking both together, although the politicians seem to want to increase the scope of liability it would be difficult to do so, so long as proximity and causation are valid defences.

- Material contribution: man might kill half the foxes one year, next year they are harder to find. Provided the population is in the bottom left quadrant: rabbit numbers increase but after a year or so the rabbit population falls again as foxes return or new predators move in. The same intervention at the steep part of the curve results in an order of magnitude increase in rabbit densities and vegetation is devastated by grazing. The same intervention was either immaterial or, drastic, depending on where on the curve you were and the time window in which you make the observation.

- Remediation: having caused a drastic change in rabbit populations the insured must restore biodiversity to the bottom left quadrant and pay for the loss of economic utility caused by grazing damage. The insured must somehow drive the curve back to the tipping point and over the edge. The degree of effort depends upon where the transition ended. A slow gentle intervention could be assisted or resisted by drift forces, a fast intervention will certainly be resisted by drift forces. Any intervention could cause a transition in another species.

- Diversity = insurance: If foxes have a choice of prey or if there are multiple competing predators, then the slopes are reduced and transitions made less likely. Desertification is avoided by giving foxes a choice. Diversity protects against transitions.

- Correlation: desertification would have an impact on all kinds of insurance.

- Emerging risk: by increasing the scope of biodiversity liability to include the effects of tipping points the uncertainty in underwriting EIL or similar policies is greatly increased.

Strategic
Public concern for biodiversity is increasing, politicians are increasing the scope of liability in terms of measurement of significant change, remediation targets, material interests and remoteness of damage. Insurers would be expected to:

- Develop new policies to support regulation.
- Adopt policies to reduce adverse operational impacts from their own businesses and those they invest in.

Interest in insurance for biodiversity offsets, “green” projects and “green” technologies is likely to increase. A market opportunity.

Market strategy should be sensitive to change

- e.g. a fishing community fails because the fish have been overexploited; no-one needs insurance.
- e.g. flood risk increases because of bog drainage.

Work to do
The UN has developed economic costing tools and a number of scenarios have been worked through. Insurers could study these and consider where, if anywhere, the loss could have been insurable and or what policy constraints would be needed to make them insurable.