

Liability and compensation for damage resulting from CO₂ Storage Sites

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Executive Summary[†]

Many believe that carbon capture and storage (CCS), involving the capture and permanent storage of CO₂, could provide an important contribution to climate change policy especially for those countries where further abatement of CO₂ emissions (mitigation) may be very costly. Some even argue that CCS is unavoidable especially given the world's largest economies deep commitment to fossil fuels. Many regulators are now increasingly interested in CCS, but questions also arise concerning the necessary regulatory framework to structure CCS.

There are good reasons to pay attention to the potential liability and compensation for damage resulting from CO₂ storage sites. One problem is that there may be long-term effects, meaning that CO₂ which is stored today could lead to potential damage in a distant future and damage could be substantial. Not only the long-term character may pose problems from a liability and compensation perspective (more particularly the need to guarantee funds even when operators may not be identifiable or solvent any longer); another potential problem is that the risks associated with CCS may be the type of long-tail and uncertain risks. There may indeed both be uncertainty with respect to the probability of damage as well as with respect to the magnitude of the damage. This makes *ex ante* calculation for example of actuarially fair premiums difficult.

The focus of the study will hence be on the question what recommendations could be made to policy makers in both OECD as well as non-OECD countries with respect to an efficient structuring of liability and compensation for damage resulting from CO₂ storage sites. Since the attention will be both on OECD countries as well as on non-OECD countries attention will

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obviously also be given to a few developing countries in which the situation may be quite different than e.g. in Europe and in the US. For example some traditional financing mechanism for losses (like commercial insurance) may not be available in all developing countries, which merits the question whether alternatives could be designed.

The crucial question that has hence been addressed in the study is what policy makers should do to stimulate solutions especially for the long term CCS liability.

A starting point for designing an optimal liability and compensation mechanism is obviously the importance to distinguish the specific risks involved in CCS and more particularly the risks in the different life cycles of the CCS. Recommendations can be made concerning the need to differentiate between the different life cycles of the CCS project, including a possible second best solution, related to climate change liability, the position of developing countries, concerning the design of an effective liability mechanism as well as a compensation scheme, at the same time asking the question whether there is a particular role for government.

What distinguishes CCS from other risks where there is equally uncertainty and potential damage in a distant future is that the CCS can be distinguished in various periods whereby the literature argues that this life cycle should be respected, since the inherent risks are different and also the possibility for operators to take preventive measures are different as well. As far as the operation and injecting phase is concerned all agree that the CCS facility remains financially responsible for harm that would occur. There should equally be financial responsibility of the operator for the second phase of the post closure monitoring. This study holds that given the fact that liability for long tail risks cannot generate *ex ante* incentives and moreover creates uninsurability liability for damage during the phase of long term stewardship should be excluded. Financing could only be requested for the monitoring costs, but those can of course be substantially less than the potential damage that could occur. Obviously such a transfer of liability to the state should only occur after a substantial period of intensive post closure monitoring and expert evidence that conditions for transfer of the responsibility to the state have been fulfilled. It is a model that is followed in the EU CCS Directive and that seems to correctly balance positive and negative externalities. Operators remain liable during the operation/injection and post closure monitoring phases, but after a (regulated and monitored) transfer of liability to the state has taken place liability of operators ends and is transferred to the state. Of course the precise question on the duration of each of

the three phases is a technical matter on which the opinions differ in the literature, but that is not the key issue. Key is that liability for long term stewardship can be transferred to the state and that obviously has consequences for the structure of a liability regime as well.

The position defended in this study, as just made clear again, is that liability for long-term stewardship should be transferred to the state. The logic behind this reasoning is that liability for long-term stewardship has, given the discounting factor, no positive incentive effects. However, at the policy-level decision-making concerning CCS may not only be influenced by considerations with respect to incentives for prevention, deterrence and economic efficiency. Some may, and as we indicated it are voices clearly heard in the literature, also stress that excluding liability from operators would be unacceptable from a fairness perspective and the argument would then be that operators reap the benefits from CCS and should therefore also bear the costs of future liability. Shifting liability to the state would amount to shifting the costs to future tax payers and hence subsidizing CCS which may be difficult to accept at a policy-level.

Within that perspective the question could arise whether other instruments still could be employed as a second best solution to deal with those future losses for the long-term risk. One obvious solution that then comes to mind is the compensation fund. As indicated there, the problem is that if one wish to construct a compensation fund in an efficient manner it should be such that risks are sufficiently differentiated, i.e. higher risk operators should pay higher contributions to the fund than low risk operators. This hence supposes that the government (in the assumption that government would run the fund) has better information than operators in order to apply a correct risk differentiation. This may be particularly difficult, given the fact that one would have to pay a contribution for losses that may (or may not) occur in a very distant future. If risk differentiation is absent a compensation fund would simply be financed by a tax on current operators without any beneficial effect on incentives for prevention. Moreover, large amounts of funds may (via the contributions to the fund) be immobilized, whereas it is uncertain that the money will actually be necessary.

Efficient liability rules

Efficient liability rules in order to provide incentives to stakeholders to prevent harm and to stimulate insurability can be structured according to the following principles:

- Given the potentially hazardous character of CCS operators should be strictly liable for damage resulting from CCS.
- Liability should, however, also take into account the behaviour of the victim to the extent that the victim could either prevent the damage or mitigate the damage; the claim in compensation of the victim should hence in principle be reduced to the extent that the victim has contributed to the loss in order to provide appropriate incentives to victims as well.
- Operators should not be held liable when the damage is caused by force majeure. However, natural disasters such as flooding or earthquakes do not automatically qualify as a force majeure that would free the operator from liability. To an important extent operators have to foresee the likelihood of those natural hazards and hence have to take that into account in a proper siting decision and operation management. Force majeure hence only excludes liability when a disaster would have an exceptional and unforeseeable character.
- A channelling of liability should be avoided.
- Compliance with regulatory standards should not automatically free an operator from liability.
- The risk of causal uncertainty should not be shifted to the operator; rather a proportional liability rule should be applied to deal with causal uncertainty.
- Policy makers should be cautious with the introduction of joint and several liability regimes as that could increase the potential scope of liability for CCS operators and could endanger the insurability of the liability.
- Operators should no longer be held liable if, after post closure monitoring, the site has been properly transferred to the government.
- Liability should in principle be unlimited in amount. The policy maker should hence not introduce financial caps on the liability of the operator. Caps may lead to underdeterrence and undercompensation.

Compensation

Different types of compensation mechanisms can be used for different phases of the CCS project life cycle, potentially also in combination:

Operation and injection

- For large operators self-insurance should be allowed, provided that the regulator regularly verifies the adequacy of the self-insurance provided.
- For smaller operators self-insurance can still be used just as during the operation as a first layer (retention) in addition to other instruments.
- Other instruments that can play a role in providing compensation in this phase are insurance, potentially bonding (although in more limited role) and guarantees.

Post closure monitoring

- Given the long tail character of post closure monitoring insurance will usually not be available to cover potential damage in this phase.
- Self-insurance can still be used as during the operation and injection phase.
- Bonding may not be useful since bonds are typically used for short term risks, not for risks with a long tail character.
- A risk sharing agreement concluded between operators on a voluntary basis could provide compensation. Such an agreement has, moreover, the advantage of stimulating mutual monitoring between operators. Also, no pre financing of premiums is required under a risk sharing agreement; hence, unnecessary illiquidity may be avoided.
- Eventually a government run (not financed) compensation fund could play a role in this phase if the manager of the fund were able to charge risk dependant contributions reflecting the risk posed by the different operators in order to provide incentives for prevention (avoiding moral hazard) and avoiding a negative redistribution. In the normal case a risk sharing agreement between operators would be preferred; only when it is considered that operators may not be able to create a risk sharing agreement could a government facilitated compensation fund be created.

Long term stewardship

- Operators only provide an advancement for monitoring costs that have to be objectively determined on the basis of expert evidence.
- Potential damage during this phase will be directly financed by government.
- Only when this would be preferred (either from the perspective of guaranteeing availability of funds or the equality principle) could this financing takes place via a government financed compensation fund; the comparative advantages of using a fund

for this compensation (instead of direct compensation via the public budget) are, however, relatively limited; administrative costs can be substantial.