

Carbon Capture and Storage – CCS

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Carbon emissions into the atmosphere are considered to be the main cause of climate change and global warming. Curbing greenhouse gas emission and, in particular, carbon dioxide emissions is thus a major target in international, European and national politics. The discussions on the appropriate means to reach emission reduction goals include plans to capture carbon and store it in appropriate places instead of releasing it into the atmosphere.¹ This technique is called "Carbon Capture and Storage (CCS)".

These plans are by no means theoretical considerations. Actually large German energy suppliers are planning to use this technology and different methods to capture and store carbon are currently being tested;² in addition, there are a great number of pilot projects on an international level.³

Beside technical feasibility and economic efficiency,⁴ the legal classification of CCS demands clarification. Therefore, after looking at the main technical principles of CCS (I.), the national law will be examined in terms of its applicability to carbon storage (II.) and –

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¹ IPCC (Intergovernmental Panel on Climate Change), Special Report on Carbon dioxide Capture and Storage – Summary for Policymakers and Technical Summary, 2005, available via the internet <http://www.ipcc.ch/>. According to some NGOs and experts CCS is to be rejected as a measure of climate protection, as CCS comes too late, is too consuming in regards to energy and other natural resources (especially water), is a risky technology and too expensive, cp. Greenpeace, False Hope – Why carbon capture won't save the climate, p. 5 ff., available via internet <http://greenpeace.org/international/press/reports/false-hope>.

² BT-Drs. 16/5059, p. 2.

³ 15 projects, thereof 10 in Europe have been identified by the European Union, cp. http://ec.europa.eu/environment/climat/ccs/docs_en.htm.

⁴ Cp. McKinsey, Carbon Capture & Storage: Assessing the Economics, p. 6 f., available via the internet http://www.mckinsey.com/client-service/ccsi/pdf/CCS_Assessing_the_Economics.pdf: A pilot plant is and will be two or three times more expensive than a "normal" plant, but from 2030 on there is a possibility that the costs for using CCS will level the expenses of releasing one ton of carbon dioxide into the atmosphere according to the emission trading scheme (ETS). Also cp. Briefing by the Federal Government, Report on the Environment 2008 by the German Council of Environmental Advisors, Environment Protection and Climate Change, BT-Drs. 16/9990, p. 147.



with regards to a planned European Directive, specifically on carbon storage – challenges for a new legal framework shall be formulated (III.).

I. Technical principles of carbon capture and storage

The CCS technology comprises carbon capture, transport to the storage sites and subsequent carbon storage.

When looking at carbon capture three different processes are available:⁵ Pre-combustion systems separate the carbon by so-called (coal) gasification. Post-combustion systems use various technologies, mainly a filter or condensation, to separate the carbon. The third option is oxyfuel combustion – combustion of the fossil fuel in pure oxygen, which facilitates the capture of carbon through condensation. A pilot plant with the power of 30 MW equipped with the latter technology has been erected in the industrial park Schwarze Pumpe and has been put into operation in September 2008.

Since potential storage sites are at present not in the immediate vicinity of industrial plants, the captured carbon will have to be transported from the plant to the storage site⁶, generally by ship or through pipelines.⁷ It would also be possible – but from an ecological point of view not reasonable, at least not on an industrial level – to transport the material by rail or road.

The carbon can subsequently be stored in aquifers or in – still extractable or fully extracted – oil and gas storage sites.⁸ Extractable oil and gas fields are preferable storage sites as the injection of compressed carbon creates high pressure, which leads to more oil or gas rising from the spring than during conventional extraction or a longer exploitation period of dwindling springs (enhanced oil recovery [EOR] or enhanced gas recovery [EGR]). Therefore the use of this storage technology is currently tested in the Altmark.⁹

⁵ Cp. IPCC, Fn. 1, p. 2 ff. and 21 ff.; Donner/Lübbert, Kohlendioxid-arme Kraftwerke, CO₂-Sequestrierung: Stand der Technik, ökonomische und ökologische Diskussion, Wissenschaftliche Dienste des Deutschen Bundestags, 2006, p. 9 ff.; BMWA-Dokumentation Nr. 527: Forschungs- und Entwicklungskonzept für emissionsarme fossil befeuerte Kraftwerke, 2003, p. 46 ff.

⁶ For example, the distance between the industrial park Schwarze Pumpe and the final storage site in Salzwedel is approximately 357 km.

⁷ IPCC, Fn. 1, p. 2 ff. and 26 ff.; Donner/Lübbert, Fn. 5, p. 16 ff.; BMWA-Dokumentation Nr. 527, Fn. 5, p. 59 f.

⁸ IPCC, Fn. 1, p. 2 ff. and 28 ff.; Donner/Lübbert, Fn. 5, p. 19 ff.; BMWA-Dokumentation Nr. 527, Fn. 5, p. 63 ff.

⁹ Cp. above, Fn. 5.



Injection of carbon in deep, non-mineable coal seams is another theoretically available technology; however, it does not seem to be technically advanced enough yet. Finally, ocean storage has also been discussed, but is categorically rejected for climate policy and environmental reasons.¹⁰

When looking at the CCS-technology the crucial questions thus are storage safety and the prevention of uncontrolled carbon emissions. If storage safety cannot be achieved the globally aspired advantage of carbon storage in terms of its climate protection benefits¹¹ would be lost. In addition carbon emissions from storage sites pose a significant local risk to health and life.¹² Consequently, research projects are still trying to determine whether carbon can be stored safely and without leakages for long periods of time. However, many experts consider carbon storage to be safe.¹³ In this line the IPCC holds a leakage rate of less than one percent is likely for a time period of 100 years,¹⁴ which the German Federal Government considers to be acceptable as a maximum leakage rate.¹⁵

II. Legal basis for carbon capture and storage

To date there is no special legal framework for CCS, neither on international nor on European nor on national level.¹⁶

However, immission control laws should be applicable to the carbon capture at the beginning of the process as such capture will regularly be carried out in immediate connection with a plant that has to be approved according to the Federal Immission Control

¹⁰ BT-Drs. 16/5059, p. 6.

¹¹ Which are denied by some as CCS draws attention and money from other instruments for reducing emissions such as energy efficiency measures and renewable energies, cp. Greenpeace, False Hope, Fn. 1, p. 5 ff.

¹² IPCC, Fn. 1, p. 11 ff.; Donner/Lübbert, Fn. 5, p. 30 f. According to Greenpeace, False Hope, Fn. 1, p. 7, a continuous leakage even at rates as low as one percent could negate climate migration efforts as no track records or cost estimates for CO₂ leaks in regard to possible remediation exist.

¹³ Donner/Lübbert, Fn. 5, p. 30 f.

¹⁴ IPCC, Fn. 1, p. 31.

¹⁵ BT-Drs. 16/5059, p. 7.

¹⁶ IPCC, Fn. 1, p. 14 and 32; cp. Report of Working Group 3 of the Second European Climate Change Programme, Carbon Capture and Geological Storage, as adopted on 1 June 2006, p. 7, available via the internet http://ec.europa.eu/environment/climat/ccs/index_en.htm; BT-Drs. 16/5059, p. 8; Report of the Committee on Education, Research and Technology Impact Assessment, Impact Assessment on CO₂-Capture and Storage in Power Plants, BT-Drs. 16/9896, p. 48.



Act^{17,18} Where carbon is transported through pipelines, such transport can be subject to sec. 20 ff. EIA Act¹⁹ as well as to the dangerous goods law.²⁰

Crucial for the regulation of CCS is the identification of the legal framework covering carbon storage. Waste, Mining and Water Laws are the main legal provisions that need to be considered. Their applicability and requirements will be examined in the following chapters:

1. Waste Law

According to sec. 2 (1) Federal Waste Act²¹, the waste law regime can only apply to carbon storage if the carbon to be stored constitutes waste in the sense of the law.

a) Waste quality of carbon

Good arguments indicate that carbon to be stored constitutes waste in the sense of sec. 3 (1) Federal Waste Act.²² Waste is any moveable object within the groups listed in Appendix I of the Federal Waste Act and which the owner disposes of, wants to dispose of or has to dispose of. The object quality of the carbon is the only criterion which could be challenged here. However, it can be affirmed when the separation and collection of carbon as the starting point of CCS is correctly taken into account: capturing the carbon in order to dispose of it properly instead of simply releasing it into the atmosphere. The European provisions of the Directive 2006/12/EC on waste²³ also define carbon as waste, since, according to art. 1 lit. a, it does not limit the term waste to "moveable objects". In addition, only "gaseous emissions into the atmosphere" are excluded from the application scope pursuant to art. 2 (1) lit. a of the Directive on waste, which is just what carbon storage aims to prevent.

¹⁷ Federal Immission Control Act, i.e. Bundes-Immissionsschutzgesetz (BImSchG).

¹⁸ Dietrich/Bode, CO₂-Abscheidung und Ablagerung (CAA), p. 21-23; Much, ZUR 2007, 130 (131).

¹⁹ Environmental Impact Assessment Act, i.e. Gesetz über die Umweltverträglichkeitsprüfung (UVPG).

²⁰ Dietrich/Bode, Fn. 18, p. 24; Much, ZUR 2007, 130 (132).

²¹ Federal Waste Act, i.e. Kreislaufwirtschafts- und Abfallgesetz (KrW-/AbfG).

²² According to the Impact Assessment on CO₂-Capture and Storage in Power Plants, BT-Drs. 16/9896, p. 46, fluent and contained gasiform CO₂ shall constitute waste, whereas the waste quality of supercritical fluent or gasiform CO₂ shall remain unclear. Also cp. Stevens, UPR 2007, 281 (284).

²³ Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste.

**b) Provisions of the Waste Law**

Carbon storage can therefore be subject to the principle requirements of the Waste Law with its preference of recycling (sec. 4 (1) No. 2 Federal Waste Act) as well as the principle of waste disposal compliant to public safety (sec. 10, 11 Federal Waste Act). Without going into the details of the provisions of the Waste Law, its main aspects shall briefly be presented:

aa) The carbon storage in extractable oil and gas fields in the EOR/EGR process may be considered as a "recycling" process according to sec. 4 (3) Federal Waste Act, since its main purpose is not to eliminate the pollutant potential of carbon, but to significantly increase the production of an oil or gas field by injecting carbon.²⁴ As there is no sub-statutory legislation with more specific requirements with regards to non-pollutant recycling of carbon on the basis of sec. 7 Federal Waste Act yet, the general principle waste law obligations pursuant to sec. 5 Federal Waste Act apply to its recycling. Thereby, carbon has to be stored in a proper and non-pollutant way (sec. 5 (3) 1), especially in conformity with public law provisions (sec. 5 (3) 2) and in a way from which no negative impact on general public safety is to be expected (sec. 5 (3) 3 Federal Waste Act).

bb) Carbon storage in aquifers or in fully exploited oil and gas fields, however, constitutes waste disposal. In this case such aquifers and gas and oil fields would have to be approved waste disposal sites according to sec. 27 (1) 1 Federal Waste Act, which, pursuant to sec. 31 (2) 1 Federal Waste Act, are subject to the planning permission obligations²⁵ with environmental impact assessment (see sec. 31 (2) 2 Federal Waste Act)²⁶.

In addition the Landfill Regulation²⁷ applies, which does not contain any specific provisions on storing carbon. However, storage sites will mainly be category IV landfills (sec. 2 No. 10 Landfill Regulation)²⁸, into which carbon can only be injected in a gaseous and not in a liquid state of matter according to sec. 7 (1) No. 1 and sec. 7 (2) No. 1 Landfill Regulation.²⁹

²⁴ Much, ZUR 2007, 130 (134).

²⁵ Cp. Impact Assessment on CO₂-Capture and Storage in Power Plants, BT-Drs. 16/9896, p. 48.

²⁶ The same applies to storage of supercritical and liquid CO₂: Much, ZUR 2007, 130 (134).

²⁷ Landfill Regulation, i.e. Deponieverordnung (DepV).

²⁸ Dissenting: Much, ZUR 2007, 130 (134).

²⁹ Agreeing: Much, ZUR 2007, 130 (134).



c) Conclusion for Waste Law

In conclusion, the captured carbon should constitute waste in the sense of the Federal Waste Act and CCS should therefore be subject to the Waste Law. The principle waste law obligations, which are partially substantiated in the Landfill Regulation, therefore apply. However, these laws only rudimentarily cover the particularities of CCS.

2. Mining Law

Additionally to the Waste Law regime the Mining Law could also apply to carbon storage if the requirements of sec. 2 Federal Mining Act³⁰ are met.

a) Carbon injection in the EOR/EGR process

The Mining Law applies to the EOR/EGR process³¹, which aims for the recovery of oil and gas (sec. 4 (2) Federal Mining Act) as natural resources (sec. 3 (3) Federal Mining Act)³² as a traditional mining activity according to sec. 2 (1) No. 1 Federal Mining Act. Therefore, the use of the EOR/EGR process requires governmental approval within the framework of the operating plan procedure (sec. 51 ff. Federal Mining Act) with compliance to the applicable provisions. Upon termination of production, the approval of a separate operating plan of closure (sec. 53 Federal Mining Act) is required. Extensive post-closure care obligations arise due to the duration of the supervision by mining authorities according to sec. 69 (2) Federal Mining Act.

b) Carbon storage as underground storage

Pursuant to sec. 2 (2) Federal Mining Act, the Mining Law does, however, not apply to carbon storage in aquifers and fully exploited oil and gas fields.³³ This is due to the fact that "storage" in the sense of sec. 2 (2) Federal Mining Act covers temporary storage only whereas CCS aims at permanent storing the captured carbon.³⁴

³⁰ Federal Mining Act, i.e. Bundesberggesetz (BBergG).

³¹ Much, ZUR 2007, 130 (133).

³² As hydrocarbons, oil and gas fall into the category of resources included in freehold ownership; cp. Boldt/Weller, BBergG, 1984, sec. 3 ref. 21.

³³ Dietrich/Bode, Fn. 18, p. 13-15; Much, ZUR 2007, 130 (134); Lenz, Glückauf 144 (2008) Nr. 5, 237 (241); Impact Assessment on CO₂-Capture and Storage in Power Plants, BT-Drs. 16/9896, p. 48.

³⁴ But the Federal Mining Act could be applicable where CO₂ shall be stored for research in sites already subject to Mining Law regulations, cp. Freytag/Thiem, Glückauf 142 (2006), Nr. 5, 213 (216 f.).



3. Water Law

Where the carbon comes into contact with groundwater during its storage, the Federal Water Act³⁵, substantiated in the water laws of the Federal States, also needs to be considered.

a) Carbon injection in aquifers

Carbon injection in saline aquifers constitutes a “discharge of substances into the groundwater” as a genuine water use in the sense of sec. 3 (1) No. 5 Federal Water Act. Therefore, a water law allowance (sec. 7 Federal Water Act) or permit (sec. 8 Federal Water Act) is required.³⁶ Whether the requirements for this are met depends on the specific geological and hydrogeological conditions of each individual case.

Where the carbon pushes saline groundwater into upper beds suitable for potable water, it could pose a prohibited risk to the public water supply in the sense of sec. 6 (1) Federal Water Act; such risks would have to be prevented or cleared through additional licensing requirements (sec. 4 Federal Water Act). If the carbon reacts with the deep groundwater, the (chemical and physical) qualities of the water may also deteriorate in comparison to its prior condition and therefore also in comparison to its natural condition.³⁷ In this case an allowance in the sense of sec. 7 Federal Water Act would have to be declined due to sec. 34 (1) Federal Water Act. However, if storage sites are selected carefully, the German Federal Government considers these risks to be a controllable.³⁸

b) Carbon injection in oil and gas storage facilities

Being injected in oil and gas storage sites, carbon does not necessarily come into contact with the groundwater. However, according to sec. 3 (2) No. 2 Federal Water Act, this will often constitute an “artificial” use, for which permission is also required, since there is a risk of groundwater quality being affected in the case of a leakage. Contact with the groundwater is also possible when the oil or gas storage site has already partially been filled with water.³⁹

³⁵ Federal Water Act, i.e. Wasserhaushaltsgesetz (WHG).

³⁶ Impact Assessment on CO₂-Capture and Storage in Power Plants, BT-Drs. 16/9896, p. 48; Lenz, Glückauf 144 (2008) Nr. 5, 238 (241).

³⁷ Cp. on the term of deterioration: Czychowski/Reinhardt, WHG, 8th edition, sec. 34 ref. 7 and sec. 26 ref. 26.

³⁸ BT-Drs. 16/5059, p. 9.

³⁹ Much, ZUR 2007, 130 (134); Dietrich/Bode, Fn. 18, p. 16-21.



Such permission requires that any negative effects are impossible or can be excluded by additional licensing requirements (sec. 4 Federal Water Act). Pursuant to sec. 34 (2) Federal Water Act, storage has to be carried out in a way that there is no concern about groundwater contamination or any other negative effect on its qualities. In accordance with the jurisdiction of the Federal Administrative Court, strict criteria are to be applied.⁴⁰

c) Conclusion for Water Law

In summary, Water Law is relevant for carbon injection and carbon injection requires approval by the competent authorities. Both, carbon injection in aquifers and carbon injection in oil and gas storage sites, seems to be approvable, however, only if negative effects on the groundwater are or can be excluded.

4. Conclusion for current legal basis

CCS is not forbidden by applicable laws which already provide an extensive catalogue of provisions for the use of this technology especially enabling the operation of pilot plants. Apart from the Immission Control Act for carbon capture, the Waste, Mining and Water Laws with their approval procedures and requirements provide the legal framework for the various methods of carbon storage:

Carbon injection in aquifers constitutes waste disposal, so that the storage site has to be approved in a landfill planning permission process. In addition, it constitutes a (genuine) groundwater use, the approvability of which can be problematic⁴¹ and consequently depends on the specific circumstances of each individual case.

The carbon injection in extractable or fully extracted oil and gas fields should be approvable to a large extent. With regards to the Water Law, contact with and therefore contamination of groundwater (especially through leakages) have to be excluded. Furthermore, carbon injection in fully extracted oil and gas fields probably requires a planning permission since they should constitute landfills according to Waste Law provisions. However, if carbon is used in the EOR/EGR process, it does not constitute waste disposal, but rather waste recycling, which can be approved in the course of the operating plan allowance of oil and gas production.

⁴⁰ Federal Administrative Court, dec. of. 26 June 1970 – 4 C 99.67, NJW 1970, 1890 (1892); dec. of. 16 July 1965 – 4 C 54.65, ZfW 1965, 113 = DVBl. 1966, 496.

⁴¹ Cp. Impact Assessment on CO₂-Capture and Storage in Power Plants, BT-Drs. 16/9896, p. 48.



In summary, it has to be noted that the current legal framework can be the basis for current pilot plants but still includes several legal barriers for the use of CCS on an industrial level.⁴² Therefore it is necessary to create a legal framework that covers all parts of the process, guarantees storage safety, prevents negative impacts on human health and the environment and provides legal certainty for both, pilot plants and the large-scale use of CCS on an industrial level.

III. Challenges for a future legal framework

To reduce the remaining legal barriers for CCS in the current law the European Commission proposed a Directive on carbon storage⁴³ in the beginning of 2008,⁴⁴ as the Commission sees CCS as a necessary option to reduce carbon emissions in addition to the preferred instruments of energy efficiency and renewable energies.⁴⁵

1. Proposal for a Directive on carbon storage

The subject matter of the European Commission's proposal for a Directive is the establishment of a legal framework for carbon storage. The proposal is divided into eight chapters:

- a) The first chapter – compliant with the general structure of European legislation – includes general provisions and regulations on carbon storage. The key element is the definition of the purpose of the Directive: the permanent containment of carbon in such a way as to prevent or reduce as far as possible negative effects on the environment and any resulting risk to human health (art. 1 (2)). Ocean storage of carbon in the water columns is prohibited (art. 2 (4)).⁴⁶

⁴² According to the Impact Assessment on CO₂-Capture and Storage in Power Plants, BT-Drs. 16/9896, p. 8 and 49, even the current pilot projects shall not be approvable under the applicable laws.

⁴³ Proposal for a Directive of the European Parliament and of the Council on the geological storage of carbon and amending Council Directives 85/337/EEC, 96/61/EC, Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC and Regulation (EC) No. 1013/2006 (COM/2008/0018). Cp. the Draft Report of the European Parliament, Committee on the Environment, Public Health and Food Safety, Rapporteur; Chris Davies (Davies Report), 2008/0015(COD).

⁴⁴ And was, in principle, positively received in Germany: Decision of the German Federal Council of 14 March 2008, BR-Drs. 104/08.

⁴⁵ Cp. Doppelhammer, ZUR 2008, 250.

⁴⁶ Cp. in this respect the negative attitude of the Federal Government as well: BT-Drs. 16/5059, p. 6; cp. the agreements under international law which the recitals 9 and 10 of the proposal refer to. Also cp. Doppelhammer, ZUR 2008, 250 (251).



- b) The selection of suitable storage sites is of significant importance.⁴⁷ Therefore, basic provisions for carbon storage sites are formulated in chapter two, particularly in art. 4. Member states are to determine areas for carbon storage which comply with the provisions of the Directive. Storage sites must not have a significant risk of leakage and significant negative environmental or health impacts must be unlikely.⁴⁸

Annex 1 includes precise process regulation criteria for the selection of potentially suitable carbon storage sites in the shape of a four step assessment. Member States can issue an exploration permit for investigating the suitability of a site for carbon storage.

In order to protect and promote investment into explorations, exploration permits may be granted for a limited capacity and a limited period of time,⁴⁹ during which the holder of the permit shall have the sole right to explore the potential carbon storage complex.⁵⁰ Still in debate is the question whether an exploration permit shall grant a priority right for a subsequent storage permit.⁵¹ This could prevent third parties from using the results of expensive explorations to obtain a storage permit. Currently, the exploration permit holder's advance in knowledge is the only protection against this.

- c) Storage permits as regulated in chapter three are the core element of the future legal framework and the main instrument in order to ensure compliance with the provisions of the Directive (art. 6).⁵² Issuing a storage permit particularly requires the applicant to provide the permit authority with information regarding the storage site and the carbon to be stored. A monitoring plan, a corrective measures plan in the case of a leakage, a post-closure plan and proof of financial security are also required.

⁴⁷ Cp. Doppelhammer, ZUR 2008, 250 (251).

⁴⁸ Demanding more detailed regulation: German Federal Council, BR-Drs. 104/08, no. 4 and 21.

⁴⁹ Art. 5 (4) of the Commission's proposal includes a maximum period of two years, renewable once for a maximum of two years; according to the Davies Report, Fn. 43, p. 18, Am. 24 to art. 5 (4), the duration of the exploration permit should not exceed the period necessary to carry out the exploration.

⁵⁰ Including protection against other competing uses of the site, cp. Doppelhammer, ZUR 2008, 250 (252).

⁵¹ In favour of such a priority right cp. the Davies Report, Fn. 43, p. 17, Am. 23 to art. 5 (2).

⁵² Doppelhammer, ZUR 2008, 250 (252).



One provision in the proposal, which needs to be emphasized and critically questioned with regards to the subsidiarity principle,⁵³ requires the European Commission to be consulted according to art. 8 (2) and art. 10 before issuing the permit and allows the Commission six months for review.⁵⁴ Such review on a European level shall help to ensure that the Directive is implemented coherently in the entire Union while also enforcing the public's trust in carbon storage, especially at the beginning of the enforcement of the Directive.⁵⁵ The European Commission's opinion is non-binding; however, reasons have to be stated when deviating from it.

- d) Chapter four of the proposal provides the concrete requirements for the documents to be supplied with the permit as well as those for operating the storage site.

The Directive includes precise provisions in art. 13 and Annex II especially with regards to the required monitoring plan. The plan shall be submitted to and approved by the competent authority. It shall be updated during the operational phase. The purpose of monitoring is to determine whether the behaviour of stored carbon corresponds to modelled behaviour, to detect migration or leakage and to determine whether a detected leakage has any adverse effects on the surrounding environment or human health.

Art. 12 of the proposal regulates the substantial requirements for the stored carbon and demands that the carbon stream shall consist overwhelmingly of carbon. It is still being debated whether a precise percentage is to be provided by the Directive.⁵⁶ However, in practice it seems to be more significant that no waste and other matter may be added for the purpose of disposal. Therefore, the carbon shall be assessed before storage and the quantities and characteristics of carbon-streams delivered shall be documented in a register. Of even greater importance in practice than any general regulation is the fact that the carbon is suitable for the local geological formation in order to ensure storage safety (art. 4); this will have to be assessed for each individual case during the permit process.

⁵³ German Federal Council, BR-Drs. 104/08, no. 15.

⁵⁴ According to the Davies Report, Fn. 43, p. 25, Am. 38 to art. 10, the Commission shall have the right to object permits within one month; such objections will suspend the permit until such time as agreement may be reached between the competent authority and the Commission and made public.

⁵⁵ Doppelhammer, ZUR 2008, 250 (252).

⁵⁶ According to the Davies Report, Fn. 43, p. 14, Am. 18 to art. 3 (12), and p. 29 f., Am. 44 to art. 12 (1), a CO₂-stream shall consist of not less than 90% CO₂.



Furthermore, it needs to be emphasised that the competent authority shall review the permit not only in the case of irregularities, but generally every five years (art. 15 and art. 11 (3) lit. d).⁵⁷ In addition, routine inspections shall be carried out annually. The competent authority shall review and if necessary withdraw the storage permit, especially if it has been notified of significant irregularities or leakages (art. 16 and art. 11). This involves great administrative expense and its practical use is yet to be examined, especially in comparison to other high-risk projects.

Art. 17 and 18 include a special codification of the polluter pays principle and the principle of the common burden: the operator – as polluter – remains responsible during and after the closure of a site; however, the responsibility shall ex officio or on the operator's request be transferred to the competent authority – and therefore to the community – if the relevant conditions stated in the post-closure plan have been met and it can be assumed that the storage site is sealed.⁵⁸ The precondition for this transfer of responsibility is that all available evidence must indicate that the stored carbon will be completely contained for the indefinite future. However, it remains to be seen whether this is technically feasible. For this purpose the operator shall prepare a report documenting that this criterion has been met.

Finally, the Directive itself only partially includes instructions on how to deal with leakages. The provisions of the Directive on environmental liability⁵⁹ shall apply to local damages and the emission trading scheme to global damages, especially climate damages. To guarantee that all obligations arising from closure and post-closure procedures as well as from inclusion of the emission trading scheme in the case of leakages as well as corrective measures obligations in the case of significant irregularities or leakages arising from this Directive can be met, art. 19 demands that financial security is presented by the operator.

- e) Chapter five includes another particularity of the proposal: all potential users shall be able to obtain access to carbon transport networks and storage sites. The aim of this provision is the establishment of a fair and open access to the carbon transport networks and storage sites, basically only limited by available capacity

⁵⁷ Dissenting German Federal Council, BR-Drs. 104/08, no. 20.

⁵⁸ Critical: German Federal Council, BR-Drs. 104/08, no. 18.

⁵⁹ Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control; Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage.



and technical reasons. This provision shall ensure access to the carbon transport networks and storage sites as this could become a precondition for entry into the domestic power and heating market and for the competition on such market, depending on the relative prices for carbon emission and carbon storage.⁶⁰

- f) Chapter six and eight include general provisions on the competent authority, transboundary co-operation, penalties, reporting, amendments and relevant committee procedures as well as general (final) provisions typically included in directives.
- g) Finally, chapter seven includes regulations for the amendment of existing directives into which the Directive on carbon storage shall be integrated as smoothly⁶¹ as possible: The obligation for an environmental impact assessment, inclusion of carbon capture facilities in the application scope of the IPPC Directive and the Directive on environmental liability⁶² should be emphasised.

A clarifying exception for the Water Framework Directive⁶³ and its prohibition to inject harmful substances into the groundwater is as well included in the proposed Directive as the exclusion of carbon storage from the regime of the European Waste Legislation⁶⁴; the European Commission states the opinion that the proposed Directive should and can ensure a high level of environmental and health protection.⁶⁵ Therefore exceptions from the European Water and Waste Legislation regime seem to be justified in order to abolish legal barriers for CCS. The exception from the Water Framework Directive shall allow the injection of carbon in saline aquifers.⁶⁶

⁶⁰ Agreeing: German Federal Council, BR-Drs. 104/08, no. 3. Also cp. Doppelhammer, ZUR 2008, 250 (253).

⁶¹ German Federal Council, BR-Drs. 104/08, no. 7.

⁶² Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control; Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage.

⁶³ Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

⁶⁴ Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste.

⁶⁵ Doppelhammer, ZUR 2008, 250 (253).

⁶⁶ Cp. Doppelhammer, ZUR 2008, 250 (253).



Finally, the legal obligation for large combustion plants⁶⁷ to be “capture ready” from the date the proposed Directive comes into effect needs to be mentioned.⁶⁸ Large combustion plants, for which the original construction license or the original operating license is granted after the Directive comes into effect, shall have suitable space for the equipment necessary to capture carbon and shall have assessed the availability of suitable transport and storage possibilities.⁶⁹ This is to legally introduce the transition to low-carbon power generation – beyond the emission trading scheme as a market tool.⁷⁰

- h) The European Commission plans to complete the European legislative procedure by the end of 2008, but at the latest in spring 2009. In case of meeting this ambitious schedule the Directive would have to be implemented by the Member States within one year (art. 36), meaning as early as spring 2010.

2. Smooth implementation in national law

Two ways are available for implementing the planned Directive on carbon storage: by literal 1:1 implementation in a statute on carbon storage or alternatively by integration into the existing environmental legislation.

The 1:1 implementation in a statute on carbon storage (or a separate chapter in the environmental code that is currently in the legislation procedure) could be preferable as it ensures conformity with the Directive and enables a consistent legal standard within the European Community. Furthermore, a statute covering all steps of CCS provides a monolithic regulation that can help to enforce the necessary public acceptance of the technology.⁷¹

⁶⁷ Directive 2001/80/EC of the European Parliament and of the Council of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants.

⁶⁸ Critical: German Federal Council, BR-Drs. 104/08, no. 13.

⁶⁹ More detailed provisions for plants to be “capture ready” are formulated in the Davies Report, Fn. 43, p. 46, Am. 74 to art. 9a (1) Directive 2001/80/EC.

⁷⁰ Such requirements do not only arise with implementation of the directive; similar conditions were contractually required of a power supplier when planning a large power plant in Hamburg; see the homepage of the authorities for urban development and the environment as well as that of the authorities of industry and trade of the Free and Hanseatic City of Hamburg.

⁷¹ Cp. Impact Assessment on CO₂-Capture and Storage in Power Plants, BT-Drs. 16/9896, p. 52.



3. Legislative measures prior to implementation of the Directive

Until enactment and subsequent implementation of the Directive, additional provisions for regulating CCS can already be stipulated by means of a regulation today on the basis of the existing powers of authority, especially of the Waste Law, namely sec. 7, 36c Federal Waste Act. This would be particularly appropriate as sub-statutory legislation could provide legal security for current projects⁷² in case of any delay in the European legislative procedure.⁷³

In addition to the proposal itself, the provisions of the Landfill Regulation on underground storage including regulations on their construction, operation, closure and post-closure procedures as well as particularly on emissions and emission control could serve as a model. Furthermore, the regulations of the Directive on underground waste storage can be applied to carbon use, which in particular include material requirements as well as provisions on proof of long term security (see sec. 4, 2 No. 2 Directive on underground waste storage).

Particularly a "Regulation on Carbon Storage" – until implementation of the Directive on carbon storage – could include provisions on the condition of the storage site, material purity of the carbon, injection procedure and especially regulations on monitoring and reporting of storage.⁷⁴ As one result it would have to be ensured that the carbon behaves environmentally friendly, is locally stable and pressure robust. Furthermore, the necessary organisational and financial measures could be implemented.⁷⁵

Alternatively it seems possible to integrate provisions on CCS into the existing Mining Law,⁷⁶ since its subject already is underground storage. This can for example be seen in sec. 126 (3) Federal Mining Act, which includes provisions on the final storage of radioactive material; there are further analogies in connection with the underground storage of gas according to sec. 126 (1) Federal Mining Act. In addition, the operating plan of clo-

⁷² Cp. Impact Assessment on CO₂-Capture and Storage in Power Plants, BT-Drs. 16/9896, p. 49.

⁷³ Especially: Research projects on CO₂ injection in Ketzin (CO₂-SINK) and Schleswig Holstein (RWE Dea) as well as injection projects in the Altmark (Gaz de France subsidiary EEG).

⁷⁴ Cp. Report of Working Group 3 of the Second European Climate Change Programme, Carbon Capture and Geological Storage, as adopted on 1 June 2006, p. 9, available via the internet http://ec.europa.eu/environment/climat/ccs/index_en.htm.

⁷⁵ BT-Drs. 16/5059, p. 8 and 13.

⁷⁶ German Federal Council, BR-Drs. 104/08, no. 11; an integration of provisions regulating CCS into the Mining Law is considered for pilot and research projects, cp. Impact Assessment on CO₂-Capture and Storage, BT-Drs. 16/9896, p. 50.



sure and the mining supervision included in the Mining Law are both instruments for a permanent and post-closure responsibility.

IV. Conclusion and outlook

Current applicable laws already allow CCS and provide an extensive legal framework, in particular, for the current pilot projects. However, under the applicable laws legal barriers remain for the large-scale use of CCS on an industrial level.

It has to be appreciated that the recently published European proposal for a Directive will eliminate these still existing legal obstacles and will establish regulations for a high level of protection. With regards to the legal framework to be established, the question is whether the homogenous approval regime for carbon storage is to be implemented under the existing statutes covering aspects of CCS or as an independent carbon storage statute; both options are possible and realisable in terms of legal regulations.