A comparison of the environmental regulatory framework on the production of shale gas in the European Union and the United States

Details

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<tr>
<td>AAQ</td>
<td>Ambient Air Quality</td>
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<td>CAA</td>
<td>Clean Air Act</td>
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<td>CE</td>
<td>Categorical Exclusion</td>
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<td>CEQ</td>
<td>Council on Environmental Quality</td>
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<td>CWA</td>
<td>Clean Water Act</td>
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<td>DWD</td>
<td>Drinking Water Directive</td>
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<td>EA</td>
<td>Environmental Assessment</td>
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<td>EC</td>
<td>European Commission</td>
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<td>ECJ</td>
<td>European Court of Justice</td>
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<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<td>EPA</td>
<td>Environment Protection Agency</td>
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<td>EPA2005</td>
<td>Energy Policy Act</td>
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<td>ERCRA</td>
<td>Emergency Planning and Community Right to know Act</td>
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<td>EU</td>
<td>European Union</td>
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<td>FRAC</td>
<td>Fracturing Responsibility and Awareness of Chemicals Act</td>
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<td>GWD</td>
<td>Ground Water Directive</td>
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<td>HAP</td>
<td>Hazardous Air Pollutants</td>
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<td>HD</td>
<td>Hydrocarbons Directive</td>
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<td>HF</td>
<td>Hydraulic Fragmentation</td>
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<td>IED</td>
<td>Industrial Emissions Directive</td>
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<td>MS</td>
<td>Member State</td>
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<td>MWD</td>
<td>Mining Waste Directive</td>
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<td>NEPA</td>
<td>National Environmental Policy Act</td>
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<td>NNAQS</td>
<td>National Ambient Air Quality Standards</td>
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<td>NSPS</td>
<td>New Source and Performance Standards</td>
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<td>REACH</td>
<td>Registration Evaluation Authorisation and restriction of Chemicals</td>
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<td>SDWA</td>
<td>Safe Water Drinking Act</td>
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<td>SEI</td>
<td>Strategic Environmental Assessment</td>
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<td>SGP</td>
<td>Shale Gas Production</td>
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<td>TFEU</td>
<td>Treaty on the Functioning of the European Union</td>
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<td>UIC</td>
<td>Underground Injection and Control</td>
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<td>UK</td>
<td>United Kingdom</td>
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<td>US</td>
<td>United States</td>
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<td>VOC</td>
<td>Volatile Organic Compounds</td>
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<td>Water Framework Directive</td>
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INTRODUCTION

It was hardly possible to open a newspaper at the beginning of this year without reading a headline about ‘Shale gas’ or ‘Hydraulic fragmentation’ (HF). These relatively unknown concepts in the European Union (EU) have had an enormous impact on the gas production in the United States (US) since 2003.¹ A ‘shale-gas-boom’ has exploded in the US since the beginning of the 21st century. Within 8 years the share of shale gas grown from less than 2% to 19% of the total US gas production and became an important source for energy production.² Shale gas is estimated to grow to 71% of the total of the US national gas production of the US by 2035. Not only in the US shale gas is found in rock formations deep under the surface: in Member States (MS) of the EU a vast amount of shale had been discovered. Shale gas has not been produced on large scale in the EU yet, although production might start on big scale in the near future.

Production of shale gas has obviously significant benefits. The main advantages of shale gas production (SGP) are inter alia: a decreasing dependence on gas imports by an increasing domestic gas production, gas as replacement for more carbon-intense fuels such as oil and coal in order to achieve a reduction in greenhouse-gas emissions, economic advantages by the export of gas and the creation of employment. On the other hand SGP conveys a variety of harmful impacts on the environment. Water contamination, air pollution, noise pollution and the release of chemicals into the environment causes harmful environmental pollution. In the anticipation on the start of shale gas production on big scale in the EU, the European Parliament has expressed its concern about the capability of the EU environmental regulatory framework to cover all environmental facets related to the production of shale gas.³

In this research the ‘preparedness’ of the EU environmental regulatory framework, protecting the environment from pollution caused by SGP by the technique hydraulic fragmentation (HF), is compared with the existing federal legal framework protecting the environment from SGP in the US. The US has been dealing with the production of shale gas since the 1940’s. Because of this rather long experience with shale gas production, the US possibly has experience in regulating the (environmental) issues concerning the production of shale gas and seems therefore to be a suitable legal regime to compare EU law with. Due to the recent developments in shale gas production, a comparison of US federal and EU environmental regulation is an interesting research regarding the discussion whether the already existing EU environmental legislation is able to control SGP in the near future.

Both US states and EU member states (MS) are receiving acts (US) or directives and regulations (EU) regarding environmental legislation, from ‘central governments’. Although differences appear in the US as a federation and the structure of the EU, not being a federation but a ‘collaboration’ of 27 states, there are similarities in the systems regarding protection of the environment through legislation. The main similarity between the two regimes is that both MS and states have to implement ‘directed’ central environmental legislation or have to deal with direct binding central regulations from a centralized (federal or EU) legislator. In this research environmental legislation in the US and EU is examined in relation to the extend states can derogate from the federal acts or directives and regulations according to SGP. By comparing the flexibility and applicability of already existing environmental legislation, this thesis tries to demonstrate whether the EU or the US establishes the most coherent system, where in all (member) states ‘central’ environmental laws provide a same minimum level of environmental protection. Therefore the main question in this research is: “Does the EU environmental regulatory framework provide a stronger and more coherent framework concerning the protection of the environment than the US related to the production of shale gas?”

In order to formulate an answer to this question, the first chapter examines environmental issues of SGP, the future of shale gas in the EU and US and about the main policies and statements of the EU MS and US states according to shale gas. Having an understanding of the background of the production of shale gas is necessary to address the environmental concerns and the related applicable legislation.

The second chapter examines the differences between environmental law making processes in the US and in the EU. In order to make a legal analysis between these two different legal systems it is necessary to understand the law-making procedures of both systems. In brief the structures and the law making processes are displayed. In addition, this chapter identifies advantages and disadvantages of centralized regulations, regarding regulating of the activity of SGP. In the third chapter applicable law on the production of SGP in both the U.S. and the EU is scrutinized. According to the magnitude of this research only a selection of the applicable regulations and laws are included. In the examination, open norms and possibilities for derogation by (member) states are addressed. By addressing these questions it is possible to determine which of both systems offer the most coherent and binding environmental provisions and establishes the most coherent framework with least opportunities for (member) states to derogate from the provisions of Federal or EU law. In the fourth and last chapter a comparison is made between the existing environmental law in the EU and US. By taking into account the observations and conclusions made during the discussed topics, an overview of the findings of in this research is made. Finally a conclusion is drawn in order to form an answer, guided by the addressed and discussed issues, on the main question of this research.
METHODOLOGY

According to the main question in this research and the supposition,

“*The EU environmental regulatory framework provides a stronger and more coherent framework protecting the environment from pollution caused by shale gas production than federal US law does.*”

the purpose of this thesis is to examine whether the existing environmental regulatory framework of the EU as such, is able to regulate the different components in the process of shale gas production (SGP) by hydraulic fragmentation (HF).

In order to define whether EU law is able to regulate all environmental aspects of shale production, a comparison between the US and the EU regulatory framework is made. Especially due to the fact that the US has dealt since the 1940’s with regulating the production of shale gas and related environmental issues, it is an appropriate regime to compare the EU law with. Due to the fact that the US has been dealing over 70 years with extraction, this thesis presupposes that a certain environmental protection has been developed in the US.

By making this comparison it will be possible to define whether the EU framework is more competent to protect the different environmental aspects from pollution due to shale gas produced by HF. The assertion in this research is that a regulatory framework, made on a central (federal) level, with regulations that are binding for (member) states is better able to maintain a strong protection of the environment instead of a regulatory framework with weak centralized regulation consisting of open norms and possibilities to deviate for the (member) states from those regulations. Argumentation and reasoning for this assertion is stated in chapter 2.3 of this research.

The analysis in this research is made on two features of the existing environmental legislation. Firstly, legislation that is applicable shale production activities is critically analysed on possibilities of application. Secondly: Does the existing legislation allow states to deviate from its provisions and are states allowed to use own interpretations or is the ‘central’ legislation strictly binding? By answering these questions, a conclusion can be established that the EU regulatory regime is more or less determinative and stringent in regulating the production of SGP than the US federal regulatory regime.

The scrutinized legislation in this research consists chiefly of relevant EU regulations, directives, reports on the effectiveness of regulations and policy documents. According to the US, applicable federal acts are used. Resources of the European Commission (EU) and Environment Protection Agency (US) are used to create a comprehensive overview of the legislations and to get a better view on how legislation and compliance is enforced in practice. Literature and publications are used for a
critical review on the existing legal framework to get a better understanding of the background of the environmental regulations in both states. In order to create an objective review, sources of both public and private institutions and resources from both EU and US scholars are used in this research to create a fair balance in the discussion.

The production of shale gas by HF has a wide range of discussable issues. Due to the magnitude of this research the scope is limited. This research examines the authorization- and permit process and the environmental regulation, regulating different components of the environment during and after the production process (air, water, chemicals). No focus is made on related issues such as ownership of natural resources, liability-issues in case of environmental harm and pollution and possibilities for litigation.

As an introduction the background and possibilities of SGP are elaborated in the first chapter of this research. In the second chapter an elaboration is made on the legal framework on the environment in the EU and US. The differences between EU and US federal law are addressed. An argumentation about the advantages and negative aspects of a centralized (EU or Federal) environmental legislation is as well provided in chapter 2.3. In the third chapter, the applicable environmental legislation is scrutinized. After every description of applicable laws related to the protection to a specific part of the environment, such as the protection of water or air pollution, the differences between the EU and US legislations are demonstrated under the header ‘Findings’, summarizing in short the strengths and weaknesses of the in EU and US currently existing legislation. With the results and the information gathered in the first and second part of this research an assessment is made on the differences between the US and EU regulatory frameworks.

In the concluding chapter the strengths and weaknesses of both frameworks are addressed by defining what system provides stricter norms and leaves few discretion up to (member) states to adopt legislation or implement Federal or EU legislation. With the results from this discussion a final conclusion is made. In this conclusion an answer on the main question is formulated by using the findings in the foregoing chapters of the research. In the final conclusion a short summary of the findings of this research is made and in addition a critical review is made on the eligibility of existing legal frameworks to protect the environment from pollution by SGP.
CHAPTER 1. What is shale gas?

Within this chapter the background of SGP in the EU and US is sketched. Due to the fact that SGP by HF is a relative new extraction method, some background is needed for a good understanding of the complications of HF. HF is a rather complicated process and differs significantly from the way ordinary natural gas is extracted. The following paragraphs provide a short overview of the extraction process, the possible environmental pollution, environmental policies and the current status of SGP in the EU and US.

1.1. A brief description of the extraction process of shale gas

Natural resources are roughly divided in two groups: conventional- and unconventional resources. Unconventional sources are the more unusual sources of energy including resources such as coal bed methane, tight sandstone and shale gas. Within the unconventional resources shale gas is considered as the most common resource.4 The production of shale gas needs to be altered by using somewhat more complicated techniques than the gathering of conventional gas.5 Shale gas is situated in reservoirs deep under the surface in rock formations and coal beds. The most common-known technique of extraction of shale gases is Hydraulic Fragmentation (HF) or ‘fracking’.

With the technique of HF a horizontal well is drilled under the earth’s surface into the ‘shale formation’, the earth layer containing the shale gas. After drilling, gaps are created in the horizontal part of the well. Once the well is completed and the gaps are created, explosive charges are fired into the horizontal part of the well through the gaps into the bed where the shale gas is situated. This firing perforates trough the gaps in the well and forms holes in the shale formation. The holes in the shale formation are called ‘fractures’. After the creation of these fractures a fluid is pumped under high pressure into the well and into the fractures. The ‘fracking’-fluid transports the gas from the rock formation to the top of the well. Due to the high pressure the fluids transport the gas to the top of the well where the gas and used fluids are gathered. The ‘fracking’-fluid consists of water, sand and chemicals. The sand or ‘proppant’ in the water keeps the fractures open in order to help the gas flow out of the shale formation and to transport it to the top of the well. The main function of the chemicals in the fluid is to reduce the friction in the pipelines and to pump the fluid in the rock formation.6 After the extraction process, when the gas resources are utilized, the well and the pipelines are removed and the drilling site is restored.

5 Bloomfield M., Support to the identification of potential risks for the environment and human health arising from hydrocarbons operations involving hydraulic fracturing in Europe, (AEA Technology plc. 2012), p.III.
1.1.1. Environmental concerns and the production of shale gas

As pointed out in the first paragraph production of shale gas is relatively complicated in comparison to the extraction conventional gas. Key component of the extraction process is the injection of the ‘fracking’-fluid into the fractures deep under the earth’s surface. The main environmental concern about this ‘fracking’-fluid consist the presence of the chemicals in the mixture (around 0,5%). In the extraction process not all fluid will be recovered after injection into the fractures. The inevitable effect of not recovering 100% of the fluid is that wastewaters including chemicals will be released in the environment. Due to the wastewaters both surface- and groundwater and could be contaminated by the chemicals.

Beside contamination of surface- and groundwater, HF may cause other kinds of pollution and impacts on the environment. Examples are the release of air pollutants, the land use by the extraction sites and needed infrastructure, the risk for animals, plants and humans in the environment around extraction sites, the potential noise from the extraction installation and the traffic from and to the extraction site, the visual impact of the environment and the increasing risk to of seismic events around the extraction area.

Currently in the EU, some concerns as described above are commonly covered by EU environmental legislation. Others parts of the environment are less protected from pollution by shale gas extraction. These concerns are adopted in a resolution of the European Parliament: “...Recognises that shale gas exploration and extraction may possibly result in complex and cross-cutting interactions with the surrounding environment, in particular owing to the hydraulic fracturing method employed, the composition of the fracturing liquid, the depth and construction of the wells and the area of surface land affected.”

In the US SGP took already place since the 1940’s. Because of this rather long experience in dealing with environmental problems and regulation concerning SGP, the US is an interesting legal regime to compare EU law with. Although in the EU SGP has not started on big scale yet, a piecemeal of directives and regulations are covering the environmental issues related to the production of SGP. The effects on the environment occurring from SGP are likely to have cross boundary effects such as water contamination and air emissions. Due to the complexity of environmental pollution and risks for environmental and human health caused by SGP, the environment pollution from shale gas extraction

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8 Supra, note 2, p.VI.
9 Supra, note 3
should effectively be regulated by the EU or by the US federal government in order to maintain a minimum environmental quality in the entire territory.\(^\text{10}\)

1.2. **The current status of shale gas production**

- **European Union**

To date, no major SGP has taken place in the EU. Some MS have started production activities on small scale; others have already issued permits and are in waiting for governments to give ‘green light’. According to the negative environmental effects SGP might cause, the debate in the EU about extraction of shale gas is on-going. However, pressure on the EU to start production of shale gas is increasing since it has (outside the EU) led to unprecedented and important changes in energy markets. As well for the EU a positive feature of shale gas is that the gas has good potential to become an important segment in the energy mix.\(^\text{11}\)

Nevertheless within the EU, opinions of MS about the production of shale gas differ widely. With regards to possibility to start SGP in the EU, concerns about HF are currently dividing the EU MS in supporting and reluctant opinions towards shale-gas production.\(^\text{12}\) MS are roughly divided in two groups. The first group is formed by a group of supporters for shale gas, both states and industries. From their point of view production leads to economic advantages, creation of jobs and decreasing dependence on gas imports. The second group of states is more aware of the harmful effects HF might cause and is reluctant to allow HF in the EU or on their own territory. This group bases its concerns mainly on the currently inconsistent quality and lack of the data assessing the effects on the environment by SGP.\(^\text{13}\)

Obviously, EU MS with major shale resources are more proponent of the extraction of shale gas than others. Poland can be considered as the most eager MS to start extraction. Understandable since the country possesses the biggest shale resources within the EU. Nonetheless Poland has not started shale-extracting activities yet. Beside Poland the United Kingdom (UK) has allowed the extraction of shale gas, which started in 2011. After a seismic event in Blackpool, possibly caused by shale extraction, there has been a temporary ban in the UK on HF in the UK.\(^\text{14}\) In addition to Poland and the UK some other states show their willingness to produce shale gas by allowing for example test-drillings.

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Other MS are more reluctant towards the production of shale gas. France and Bulgaria have introduced a moratorium on shale gas extraction due to environmental concerns. The German federal state North Rhine Westphalia has introduced a moratorium on HF, however the discussion in Germany about allowing shale production is still on-going.15 At the moment the Czech Republic and Romania are considering a moratorium.16 These moratoria may be introduced in the near for different reasons. In the Czech Republic a discussion is going on due to a petition signed by over 35,000 people. The minister of environment is considering introduction of a temporary ban in order to conduct scientific research on the impact of HF. The Romanian parliament has made an initiative for a moratorium but the Romanian Senate has rejected the proposal. Nevertheless currently two bills that could influence the application of HF are pending in the Romanian Parliament.17

The European Commission (EC) made clear in a statement of the EU commissioner for Environment Janez Potochnik, that the EC has the obligation to ensure that EU law is adequate to regulate the relatively new activity SGP by HF. Nevertheless the opinion of the EC about the production of shale gas by HF in the EU remains neutral.18 As pointed out in the next chapter, the extraction of shale gas is prevalingly the business of MS and not of the EU institutions. Nevertheless the existing legal environmental framework of the EU should be able to establish an effective regulatory regime that is competent to protect the environmental pollution in the entire EU.

- United States

Contrary to the EU, production of shale gas is in ‘full swing’ in the US. The production has revolutionized in the past decade. Currently about 20% of the total natural gas production of the U.S. consists of shale gas. The share of shale gas in the total national yearly production is estimated to grow up to 71% in 2035.19 Shale gas has had an enormous impact on the US gas-market; prices dropped significantly since shale production increased. With the domicile production of shale gas, the US sees opportunities to become less dependent of imports from other countries and secure their energy need with self-produced shale gas as substitute for fossil fuels such as oil.20

Shale resources have been discovered across the entire US in the majority of the states. Often, production of shale gas is welcomed by states, primarily because of the economic advantages as well the creation of a substantial amount of employment.21 However, the concern about environmental

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15 Supra, note 3.
16 Supra, note 12.
17 Idem.
19 Teusch, J. “Shale Gas and the EU Internal Gas Market: Beyond the hype and hysteria” (2012), Centre for European Studies (CEPS) 369, at 4.
21 Supra, note 1, p.925.
pollution is growing. Particularly in states that currently face degradation of the environment. These concerns have had effect and led to moratoria in several states.\textsuperscript{22}

Not only environmental concerns might influence the future of shale gas in the US. Since the explosion of SGP, gas prices dropped in the US. Although technology and efficiency of shale production improved significantly during the last years and production costs have decreased, investors in SGP are rather unsure if their investments will be recouped.\textsuperscript{23} While this is a more economic-related example of problems underlying the production of shale gas and beyond the scope of this research, these of underlying problems have to be taken into account when states decide to start or expand domestic production of shale gas.

In order for the understanding of the current energy policy and support of SGP it is noteworthy that there has been a desideratum in the US policies to become independent on the import of energy resources. Due to the strategy to become less dependent on imports of energy resources of the Bush administration, the US federal government introduced in 2005 the Energy Policy Act (\textit{EPA2005}). This act efficiently supports the domicile exploitation of energy resources in the U.S. (more in particular HF, see next chapter). The support for domicile energy production adopted in EPA2005, existed partially on the exclusion of environmental legislation for activities concerning the exploitation of these resources in order to stimulate the domicile production of energy resources, including shale gas. However, beside the stimulation of the US government, due to evidence of the negative effects of shale production, mainly by media attention, the pressure has increased to introduce a stricter legal regime concerning the extraction of shale gas.\textsuperscript{24}

\begin{thebibliography}{9}
\bibitem{supra} Supra, note 6, p.14.
\bibitem{supra2} Supra, note 20, p.4.
\end{thebibliography}
CHAPTER 2. Environmental law in the EU and the US

When comparing the EU and US environmental regulatory systems, the differences between the two legal structures have to be taken into account. Due to the different legal structures in the US and EU the accomplishment of regulations from the central governments is not always the same. In the following paragraphs an overview is made about the environmental law making processes in the EU and in the US.

2.1. Environmental law in EU

According to the law making process in general three institutions are forming the legislative power in the EU. The first power is the European Parliament (EP). The EU citizens directly elect the EP. The EP has the power to amend proposals for directives and regulations proposed by the European Commission (EC). The EC is the second power within the EU. The main tasks of the EC are: initiation of proposals for (environmental) legislation existing of proposals for directives and regulations, guarding compliance of MS with the treaties and controlling compliance of institutions and states with the policies of the EU. The EC ensures that EU law is applied correctly in the MS. The third power is the Council (Council) of the European Union, formed by all the ministers (portfolio-based). The main task of the Council is to establish prioritization of policies of the EU. The judicial body of the EU is the European Court of Justice (ECJ). The ECJ ensures that EU law is applied and interpreted in a coherent way in all 27 MS (TFEU).

All EU institutions are acting within the limits of power based on the Treaty on the Functioning of the European Union (TFEU). This holds that the EU has no unlimited regulatory power according to the environment. Only if the TFEU provides the EU institutions legislational power, the institutions are authorized to issue environmental law. The power of the EU to issue environmental regulations is based on Article 192 of the TFEU. Together with Article 191 TFEU, this article provides the general environmental principles on which the European Environmental policy relies. EU Environmental law exists to the utmost extend of directives and regulations. Directives are binding for MS in the way that the results and the targets set in directives are binding for the MS. MS have to transpose directives into national law. MS remain certain discretion in how to achieve the targets as set by directives trough their national legislation. In contradiction to directives, regulations do not have to be transposed into the national regulatory systems of MS. Regulations are directly binding. Once a regulation entered into force, it has priority above the national laws of MS. MS in the EU do have the possibility for a judicial review of the legitimacy of directives and regulations that have been introduced. 25 However in the EU it is not as common as it is in the US to challenge the legitimacy of directives and regulations

25 Article 263 Treaty on the Functioning of the European Union
on the provisions of the TFEU. Finally national judges have the possibility to ask the ECJ for preliminary ruling of EU law.\textsuperscript{26}

The EC functions as the main EU watchdog and controls if the national legislation implemented is sufficient to achieve the achievements as set in the directives and if MS have an effective enforcement of regulations. The EC forms the compliance mechanism between the EU legislation and legislation of the MS.\textsuperscript{27} If a member state does not or does not timely implement EU regulation effectively the EC can decide to warn the member state in violation and in case of default to sue the state in front of the ECJ. Beside the EU environmental legislation, MS are free to establish own environmental laws as long as this does not violate the provisions of EU law. Moreover MS are under certain conditions allowed to implement more stringent protective measures in their own environmental legislation than EU legislation does.\textsuperscript{28}

With regards to EU regulations, directly or indirectly of importance to SGP, the following note has to be made. Within the EU no environmental legislation is specifically designed to regulate SGP activities.\textsuperscript{29} Instead, general pieces of EU environmental law and mining regulations are applicable on activities concerning the production of shale gas. Because of the rather complex extraction process by HF, a substantial amount of EU directives and regulations are regulating SGP. At first the Hydrocarbons Directive provides in general regulation concerning the extraction of hydrocarbons. The directive focuses in first place at preventing monopolies on the extraction of minerals, creating a fair market for minerals and directing the management of minerals by MS. Moreover the directive contains regulation concerning the environment and the permit-procedures that has to be followed by member states.\textsuperscript{30} Secondly, mandatory environmental impact assessments are applicable to shale gas production activities. The EU regulation on impact assessment is established in the SEI and EIA directives. Depending on whether if shale production activities meet the requirements for an impact assessment, MS are obliged to perform certain assessments before these activities may start.\textsuperscript{31} The third category of applicable EU environmental law exists of a multiplicity of environmental regulations and directives covering and protecting the more ‘thematic’ different parts of environment such as air, water and the use of chemicals.

\textsuperscript{26} Article 267 Treaty on the Functioning of the European Union.
\textsuperscript{28} Article 193 Treaty on the Functioning of the European Union.
\textsuperscript{31} Directive 2011/92/EU of the European Parliament and of the Council, of 13 December 2011, on the assessment of the effects of certain public and private projects on the environment, preamble no. 18 and no. 19.
2.2. Environmental law in the US

The US has a rather different legal structure than the EU. The main difference exists of fact that the US is federation with a federal government and the EU is better considered as a ‘cooperation’ between 27 MS. Beside the state governments in every state, the US has a federal government. The US federal government derives its legislative power from the US Constitution. At first sight the US Constitution does not elaborate about the authority of the Congress to regulate environmental matters. However due to a broad interpretation of Commerce clause in the US Constitution the Congress, has gained legislative power in relation to the environment. Moreover, the US Constitution allows the federal government to protect federal lands and prevent these lands from polluting activities. In order enact environmental law or ‘acts’, the Congress must precede proposals trough the House of Representatives and the Senate. With the signature of the US president these proposals become law. Federal environmental law includes: statutes (legislations from the Congress), acts, laws, federal court rulings, regulations from agencies, presidential executive orders and international treaties ratified by the US Senate. Beside the federal legislation power of the congress, the second power in the US exists of the executive orders by the president of the US. The president of the US is only allowed to act within the powers that have been given to the president by the constitution or by a statute of the congress.

The Congress may empower federal agencies to regulate environmental matters. If empowered, agencies have the authority to promulgate regulations binding for individual conduct. The Environmental Protection Agency (EPA) and the Council on Environmental Quality (CEQ) are the principal federal agencies concerned with environmental legislation. The mission of the EPA is to protect the environment of the US and thereby indirectly human health. The EPA is commonly empowered by environmental federal acts as the administrator of the environmental regulation and executive agency in order to set environmental minimum standards and requirements that have to be met by state governments.

Beside the US constitution and federal law, each state in the US has an own state constitution and (environmental) laws. State laws may not be contrary to federal law. Federal laws have to be implemented into state law via plans that have been approved by federal agencies. In case state law is not aligned with a federal law, federal law supersedes state law. Every state has own

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32 Article 1 (8) of the Constitution of the United States
34 Article 1 (7) of the Constitution of the United States
35 Article 2 (1) of the Constitution of the United States
36 Supra, note 33, p.519.
38 Supra, note 1, p.930.
40 Article 4 (2) of the Constitution of the United States
environmental laws implementing the federal environmental regulations. According to the planning of for example natural resources and wildlife, states are the primary regulators.

It is important to remark the issue of conflicts between federal and state laws in the US. In the US it is not unusual that federal law and the state law collide. The US the Supreme Court is empowered to test the legitimacy of federal laws on the provisions US constitution.\(^{41}\) If states claim that federal law is not in compliance with the US constitution, the Supreme Court is allowed to test the laws on their legitimacy according to the US constitution. Whilst in the US it is common and rather convenient to litigate on the legitimacy of federal laws and state laws, in the EU this is more uncommon and complicated. By the implementation of directives intricacies of which law should be applied or legitimacy of federal laws are more or less avoided. In the US this is rather different and in several cases it could happen that Federal and State laws exist and applicable more parallel to each other, a more ‘litigation’ culture is observable in the US.\(^{42}\) According to federal environmental regulations a sensitive area is the limitation of the right of ownership of private lands. In the past environmental regulation including (in)direct limitations for private ownership have been challenged.\(^{43}\)

In the 1970’s the federal government introduced a whole set of federal environmental regulations.\(^{44}\) As in the EU in the US, a piecemeal of federal legislation is applicable on SGP. Applicable legislation includes inter alia: the National Environmental Policy Act (NEPA), the Emergency Planning and Community Right to Know Act (EPCRA), Clean Water Act (CWA), Safe Drinking Water Act (SDWA) and the Clean Air Act (CAA). It is notably that SGP is exempted from many of these federal environmental acts and that states maintain a strong position in regulating SGP in their own jurisdiction. An important note is that states are allowed to adopt more stringent regulations on top of the environmental regulations established in the acts as named above. Implementation of the named acts is established via a corporation of the federal agencies requiring individual plans to carry out plans for implementation.\(^{45}\) The Environment Protection Agency (EPA) is commonly the executing agency of environmental legislation is commonly authorized to implement additional standards and requirements to acts.\(^{46}\)

2.3. Is (member) state regulation or federal and EU law preferable?

Opinions in the EU and the US differ on whether harmonized central environmental legislation or legislation on regional (state) level is more competent to protect the environment from pollution resulting from SGP.\(^{47}\) The US has experienced this difficult issue due to their (recent) history in

\(^{41}\) United States Supreme Court, Marbury vs. Madison, 24 February 1803.
\(^{43}\) Supra, note 33, p.527.
\(^{44}\) Supra, note 42, p. 846.
\(^{45}\) Supra, note 1, p.930
protecting the environment from damage by SGP. Illustrative is the widely varying law on disclosure of chemicals in several states. Disclosure of chemicals for the SGP industry is not regulated at federal level and is currently only regulated by state law. This resulted in divergent regulations across the individual states in the US. In some states proficient regulation has been introduced. In other states important regulation on disclosure is missing or regulations are ineffective. Federal regulation setting out minimum standards and requirements could prevent this kind of problems. Although the EU does not have the same experience with implementing environmental law to protect the environment from SGP as the US, opinions in the EU are divergent about the (dis) advantages of environmental laws at EU level.

In general in the US a preference remains for state primacy in environmental regulation instead of legislation at federal level. The main reasoning for this preference consists inter alia of the wish of states to govern and adopt own environmental policies, take into account economic and social concerns at state or regional level and the ability for quick and adaptive responses to environmental matters (changes). Other repeatedly mentioned advantages are the involvement of public at regional level, effectiveness and customised environmental regulations on local level. Especially divergent problems concerning local environments within a state are prevalingly to be regulated by local or state governments. On the other hand it is characteristic for environmental pollution, and especially pollution from SGP, not to be bound by state borders or jurisdictions. At central level, governments are able to implement a more holistic regulatory framework for the entire country, which avoids cross-border environmental legislative issues. Federal or EU legislation harmonizes environmental law across state borders: it ensures minimum protection and requirements at both sides of the border and prevents environmental in different (member) states from gaps and loopholes. Federal law and EU law is able to regulate ‘migratory resources’ as for example migrating contaminated waters and air pollution, typical issues of SGP by HF with cross border effects. However contra-argumentation can be based on the differences of production methods and geographical areas where the shale gas is produced. Local authorities might be better able to ‘tailor’ legislation to the local circumstances and take more local factors into account that a federal law does. Nevertheless this ‘tailored’ law could also be introduced on top of federal or EU law, which establishes minimum requirements and regulations.

EU and federal environmental legislation can easily be adopted by states. If preferred states might even strengthen their own environmental laws up to the level they consider as necessary for an

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48 Supra, note 6, p.4.
49 Supra, note 3
50 Supra, note 1, p.959.
51 Supra, note 33, p.529
52 Supra, note 1, p.930
effective level of protection the environment.55 Currently the federal legislation in the US seems to have difficulties with establishing minimum standards and environmental regulation, resulting in the fact that across the 50 states in the US an enormous variety of environmental legislation applies to the production of shale gas. A negative aspect of EU or federal environmental law is that extensive and costly studies are needed for designing effective federal environmental regulation. The costs of federal regulations are possibly higher than regulation on local level and have be to designed in a way the legislation is appropriate in the all states. Moreover federal studies may overlap state or local studies and might result in double costs.56 In addition, federal studies have proved to be more time consuming than the processes of state authorities. Nevertheless, it is rather unpredictable to suppose that federal or EU studies will be more costly than the costs of local governments together. Closer studies are needed to scrutinize about these uncertainties.

Currently few states have implemented a strict environmental regime, whilst in the majority of states a lower level of environmental protection is established. Individual states face difficulties in balancing interest when deciding whether or not they introduce a high level of environmental protection, or stimulate the economy by the production of shale gas. The theory for this problem is called the ‘tragedy of commons’, which stands for short-term self-interest of states, instead of the interest of the group of commons (the entire country). Federal or EU governments will possibly be the more competent institutions to oversee the self-interest of states and take the interest of the entire country into account in their legislation and decision-making.57 On the other hand, federal or central policies will face the same kind of issues on bigger scale. Illustrative is possible collision of federal or EU priorities or targets. For example: the policy of the US federal government regarding the energy independency and on the other hand environmental protection. The introduction of the EPA2005 is evidence for the prioritization of energy dependency above protecting the environment from pollution.58

Another advantage of federal or EU environmental regulations is related to the strong lobbyism of the industry. Especially at regional and state level, ratios of authorities might be significantly influenced by powerful industries. The federal and EU governments can be expected to be less sensitive to pressure from the industries. Federal or EU law is more able to take holistic approach into account and might be able to find an effective balance between both the economic and environment concerns than local or state authorities do. EU or federal environmental law prevents states from a ‘race-to-the-bottom’ effect. This effect is based on the idea that a competition will arise between states in order to make their regulatory systems attractive for the industry, resulting in decision making in which

56 Supra, note 54.
57 Supra, note 1, p.932.
58 Supra, note 54, p.1756.
economic incentives will be prioritized above environmental concerns, leading to a degradation of environmental regulation. Contra argumentation can be found in the fact that some local legislators might have the tendency to adopt broad policy goals and are willing to protect their own environment. Implementation of federal legislation may lead to unnecessary double coverage or errors in correct implementation. However, other states, with relatively weak environmental protection, might benefit and save expenses from the environmental frameworks set out by the federal or EU government.

In the past decade it has been proved that technology for the extraction of natural resources is able to develop rapidly. Where local and state governments face difficulties to adopt effective legislation to continuing changing technologies, a central or federal regulation is able to supply up to date legislation in the entire country (for all states) in once. However, changing standards and legislation may impose negative effects for the industry. Environmental legislation on federal level establishes an extra burden for the shale gas producers to comply with. Overall costs will increase and risks related to liability-issues are disadvantages for the industry. Nevertheless, federal environmental or EU legislation sets out minimum standards for environmental regulation in the entire country. By these minimum standards a minimum environmental protection is guaranteed. States can tailor additional legislation, if needed. No matter what states decide to introduce the essential environmental the federal legislator in this case establishes minimum environmental protection.

As stated in the outline of this research, in case of the environmental regulation concerning SGP the advantages of US federal or EU legislation are dominant. With a framework of minimum standards and requirements provided by federal or EU legislation, environmental (minimum) protection is ensured in the entire country. Moreover, with environmental minimum standards, the EU or federal legislator creates a level playing field for the industry: in every state is the same environmental minimum protection granted. States will still have the authorization to decide whether or not they want to introduce stricter environmental legislation and in how far that will influence their position as ‘competitor’. Especially regarding the production of shale gas federal or EU law should prevail. With the potential to start production on short terms in a variety of countries with a varying quality of environmental law, the rapid development of shale production and increasing pressure on states to extract shale gas, strong federal or EU environmental law is decisive for a high level of environmental protection.

60 Supra, note 53, p. 731.
61 Supra, note 2
62 Supra, note 1, p. 955
63 Supra, note 1, p. 954.
64 Supra, note 55, p. 618.
CHAPTER 3. The legislation on shale production in the EU and US

A patchwork of directives and regulations in the EU and acts in the US are applicable on the activities concerning protection of the environment due to SGP. As stated in the foregoing chapter no EU law or US federal legislation is specifically designed to protect the environmental from the pollution by the production of shale gas. In the first paragraph of this chapter the complications of the right to extract minerals in the US and EU are addressed. In the following paragraphs an overview of the applicable environmental regulations in the EU and US is provided. Directives, regulations and acts are critically examined to which extend individual states are able to deviate from the provisions in the regulations provided by EU or US federal legislation. In addition the competence of the EU and federal US legislation to protect the environment from the pollution effects arising from shale production is examined and compared.

3.1. Extraction of natural resources

The first issue in the production of mineral resources in the EU and US is the ownership of natural resources and eligibility of individual states to choose and produce their own energy-mix. Some major differences in the EU and US regulatory systems occur in this area. The next paragraphs will elaborate about the regulations on ownership of lands and the right to extract with the land associated minerals.

3.1.1. The right extract natural resources in the EU

The EU and the MS have ‘shared competence’ in implementing environmental protection measures.66 This shared competence insists that both MS and the EU institutions may adopt legislation in this area.67 Nevertheless the MS have discretion to compose their energy mix and to decide whether or not their mineral resources will be extracted in principle EU legislation may not result in hampering this discretion (Art. 192 TFEU). Another important note is that in the majority of the EU MS minerals are owned by the state and not by landowners.68 Beside the ownership of states the EU as institution does not own land or minerals within the EU.69

According to Article 194 (2) of the TFEU, MS are free to set requirements for permits for the exploitation of shale gas. An exemption to this discretion is established in Article 192 (2) (c) TFEU. By the provision of this article the EU Council may, when acting unanimously and after revision of the parliament, adopt environmental legislation that significantly affect the choice of the energy mix of MS. Nevertheless in principle MS have the sovereign right to decide if and in which areas the

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66 Article 4 (1) (I) Treaty on the Functioning of the European Union
67 Article 2 (2) Treaty on the Functioning of the European Union
68 Supra, note 7, p.8.
69 Article 194 (2) Treaty on the Functioning of the European Union
exploration and extraction of shale gas will take place. Although the MS are in principal sovereign in their decision to extract natural resources and choose their own energy mix, EU environmental legislation is binding for these activities and set the requirements with which all operators have to comply. Hence MS are free to decide whether they utilize shale gas resources as long as the activities comply with the EU environmental law.

3.1.2. The right to extract natural resources in the US

Prior to the examination of the US environmental law it is worth to mention the difference in the ownership of natural resources between the US and the EU. In the EU prevailinglly MS are the owner of minerals such as shale gas. This is different in the US. In the US commonly landowners are owner of the minerals under their lands surface. This implies that landowners have the exclusive right to extract the minerals under their lands. Beside the ownership of private landowners, the federal government owns on large-scale land including minerals in the US.

According to the production of shale gas it is common that landowners enter into a contract with an extraction company. The profit for the landowner is relied in the royalty payments he receives from the extractor for the extraction of minerals under his land. Due to this private ownership instead of two actors in the EU (the governments and the extractors), three actors are involved in the US (the governments, the landowners and the extractors). The production of shale gas has proved to be rather lucrative and creates an incentive for landowners to have a positive attitude towards shale operations. In contrast to the US landowners, EU citizens will not be compensated for the use of their lands in case of shale extraction, what leads to a more reluctant attitude of the public towards SGP.

State law regulates the production of shale gas on non-federal areas. Each state establishes a scheme that states what royalties should be paid and has to develop an own regulation and licensing programme for the extraction of natural resources. According to federal lands, the US Constitution allows the federal government to protect federal lands and prevent these lands from polluting activities and allows them to adopt federal acts to protect these lands.

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71 Supra, note 7, p.9.
74 Sakmar, Susan L. “Global Shale Gas Initiative, Will the US be the role model for the development of shale gas around the world” Houston Journal of International Law (2010-2011) 33, at 396
75 Supra, note 72, p.376.
77 Supra, note 33, p.535.

Before elaborating about the applicability of environmental law in the US, a short introduction of the EPA2005 is vital. With the EPA2005, the federal government has implemented a regime supporting the domicile energy production in the US. Since 2005, the EPA2005 is the main act regulating the energy production in the US. The EPA2005 has been introduced to regulate issues as economic growth, energy security and environmental quality. The EPA2005 regulates a variety of energy related topics such as: energy efficiency, oil and gas production, electricity, tax incentives and hydropower, energy savings and geothermal energy. In Section 300 of the EPA2005, provisions regarding the environmental regulation of oil and gas production are included. The activity of HF is explicitly mentioned in Section 322 of the EPA2005. This section includes clarifications of provisions in other acts concerning protection of environment that are applicable on HF. In short terms, the provisions of the EPA2005 are for the most part excluding the production from key federal environmental regulations. Which federal environmental regulations are affected by the EPA2005 will be examined in the following paragraphs.

3.3 Permits and authorizations

The first step towards the production of shale gas is the permit procedure, allowing the extractors to start shale production activities. With the authorization to issue permits, states have a first possibility to take the environment into consideration in their decision making process and states could decide to adopt requirements in the permits preventing the environment from any pollution by setting conditions for operators to comply with.

3.3.1 Permits for shale gas production in the EU

According to the discretion of MS to extract their minerals, permits and authorisations are issued by the MS. States have the discretion to empower authorities to issue permits and licences for the production of shale gas. This has led to a first possible derogation from EU regulation where different MS in general do not have the same authorities issuing authorizations and permits for shale gas extraction: different authorities in different MS are dealing with granting authorisations.

The directive concerning the authorization, monitoring and issuance of permits for extraction of gas in the EU is the Hydrocarbons Directive (HD). The HD focuses on the procedures and principles that have to be followed by authorities in permits procedures. The HD prohibits any discrimination

82 Art 194 (2) Treaty on the Functioning of the European Union
83 Supra, note 7, p.17.
between entities regarding access to extraction activities, provides guidelines for issuing and granting authorizations of extraction permits and general provisions in which way the authorizations and grants should be announced. Within these standards states may decide which parties receive permits and authorisations. On the other hand states have the right to refuse authorizations on grounds listed in the directive.

With regards to the application of the HD concerning environmental pollution by SGP, neither a focus on environmental protection nor minimum standards are mentioned in the HD. Although the HD is not specifically aimed to protect the environment, Art. 6 (2) of the HD refers to the environment. This provision states that ‘protection of the environment’ may be taken into account in the conditions and requirements set by the MS in order to issue permits or authorizations for the extraction natural resources. In the permit-procedure for SGP, the environment can be a reason to reject a permit for the production of shale gas. Nevertheless considering ‘the environment’ is not mandatory requirement for MS and the states retain discretion in their decision to take the environment into account in the decision-making procedure for the issuance of permits for HF.

Findings EU legislation: the HD leaves discretion for MS to issue licences for SGP. Hence MS have discretion in their decision-making process to issue permits. It is up to the authorities of each state to consider the environment in their decision-making process. Due to this discretion an interpretational gaps and differences in consideration of environment in the permit procedures might arise between MS. Concerning the production of shale gas, the HD establishes no (extra) threshold related to the environmental consideration in the permit procedure of MS authorities.

3.3.2. Permits for shale gas extraction in the US

In the US, state governments are authorized to issue permits for the exploration of national resources. Commonly, instead of a central state government, regional authorities are issuing permits at lower level. Some states are supporting the issuance of authorizations on regional level others prefer to have the issuance of permits and authorizations centralized at the state government. However currently, due to economic impacts as the variety of harmful effects on the environment shale gas extraction, a trend of removing the authorization from municipal level to more centralized institutions at state level is observable.

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85 Article 2 (2) Directive 94/22/EC (Hydrocarbons Directive)
86 Article 3 Directive 94/22/EC (Hydrocarbons Directive)
88 Directive 94/22/EC (Hydrocarbons Directive)
89 Article 6 (2) Directive 94/22/EC (Hydrocarbons Directive)
91 Supra, note 1, p.915.
In the majority of the states mining authorities are responsible for the issuance of permits for shale extraction. The permits have to comply with the state’s environmental statutes. If local communities have local regulations on the environment, which are not aligned with the law of the state, state laws will supersede these regulations. Due to the increased SGP in the US in the last decade, in some states, regulators and authorities meet an overwhelming amount of applications for permits and have problems with handling them. Disturbing is whether these authorities are able to handle this pressure and maintain a correct decision-making process and effective control on compliance with environmental regulations.92

As environmental law does, requirements for permits set by states vary widely over the country.93 As in the EU, requirements and minimum standards for permits and authorizations vary from state to state due to the discretion of every state to set these requirements. In order to assist states, the federal agency EPA has drafted a guidance-document for issuing authorizations and permits for the production of shale gas by HF. Although this documentation provides some guidance for the permit of ‘underground injection’ (see chapter 3.6) these guidelines are not binding for state authorities and are merely focussing on the effectiveness of the SWDA.94

The regulations on permits and authorizations for shale production on federal owned land are different from the regulations on private lands. The Bureau of Land Management (BLM) of the US department of interior administers the minerals found under the federal lands.95 The EPA is the competent authority to issue the permits for federal operations on federal lands. In addition to the environmental statutes of the state federal authorities have to execute an additional assessment before they might start production activities. If a federal authority is planning to conduct activities with the possibility of environmental harm, is possibly has the obligation to execute an impact assessment under the National Environmental Policy Act (NEPA). 96 An elaboration about NEPA procedure is made further below.

**Finding US legislation:** All states are entitled to establish their own authorities concerning the issuance of permits and authorizations for the exploitation of shale gas. No federal legislation is applicable and harmonizing federal regulation in the decision-making process of the issuance of permits for private landowners. For the private owned lands the environmental or mining law of states is applicable. According to the production of shale gas on federal lands, the NEPA procedure is

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92 Supra, note 1, p.945.
95 Leasing of onshore federal oil and gas resources, United States Department of the interior at Bureau of Land Management, http://www.blm.gov viewed (visited 2 may 2013)
96 Supra, note 10, p.52.
applicable. Hence no federal regulation refers to the environmental as a mandatory consideration in the permit procedures for production on private lands.

**Conclusion comparison EU and US legislation environmental consideration in permit procedure:**

Although it is dubious whether or not EU MS will take the environment into account in their decision making process to issue permits for shale production, the environment is named in the EU legislation, the HD. In the US no federal regulation is applicable on the decision making process for permits by state governments. Based on the examined legislation, states decide without federal guidelines, whether or not they take the environment into account in their decision making process. This cannot lead to the conclusion that the system in the EU or US is offers more comprehensive protection than the other. However, both regimes do not mention the environmental consideration in the permit procedures. In the EU, the HD at least refers to the environment.

3.4 Impact Assessments

A preparatory requirement in order for starting SGP is possibly the performance of impact assessments. An impact assessment is a procedure that is implements the prevention principle; preventive action should be taken before a harmful project for the environment can take place. In order to assess the environmental impacts of SGP, before permits are issued, parties might be obliged to perform such assessments. In the EU two kinds of EIA’s exist: the Strategic Environmental Impact Assessment and the Environmental Impact assessment. In the US the National Environmental Policy Act is the main regulation concerning environmental impact assessments.

3.4.1 Environmental Impact Assessments in the European Union

- **Strategic environmental assessment Directive** (SEA)

The SEA implements the idea that in a stage of planning the effects on the environment already have to be taken into account, before plans are adopted. In order to define the subjective plans and programs, the SEA-directive contains a list of criteria determining which activities are subjected. Due to the broad scope of this list it seems that SGP is covered within the scope of the SEA. Nevertheless small production areas might be exempted from the SEA because the accumulated effects of some small production sites may not be considered as ‘likely to have significant effect on the environment’. When an activity is not subjected to a mandatory SEA procedure it does not rule

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99 Supra, note 27, p.354.
100 Annex II Directive 2011/92/EU (EIA Directive)
102 Supra, note 5, p.79.
out mandatory performance of an EIA. 103 The SEA procedure differs from the EIA procedure. An SEA is executed in the screening stage of the planning program in order to allow the adoption of plans. In contradiction to the EIA an SEA requires to list alternatives (this is not an EIA requirement) and a sufficient quality of the environmental reports.104

When a plan or a programme, in case the production of shale gas, is likely to have significant environmental harm in another MS, the preparing MS shall forward the plans and findings of the SEA to that other MS.105 Decisive is the interpretation of MS in order to decide whether a plan to start shale gas extraction is likely to have significant harm on the environment or not. Although the broad scope of the SEA, MS have the decisive power to determine when a SEA should be made or not. It might be likely that the production of shale gas has to be subjected to SEA since quite a few environmental may occur from production. However underestimation of the environmental consequences of HF by MS can result in omitting the performance of an SIA.

- Environmental impact assessment Directive106 (EIA)
With the performance of an EIA all cumulated effects of a project that is likely to cause harm on the environment have to be assessed.107 The results of the EIA are obliged to be taken into account by the authorities in the decision-making procedures to issue permits for shale gas extraction. MS have certain discretion in introducing thresholds and requirements for the performance of an EIA. It is noteworthy that an EIA is not required for projects, for which national laws of a MS already regulate the details.108 However, is it because of the recent development of the technique of HF unlikely that MS already have implemented an adequate regulation on the assessment of SGP activities.

In the case of performance of an EIA due to start SGP, an assessment should include a holistic evaluation of the entire shale production project. All cumulated effects of a prospective project have to be taken into account in the decision to require an EIA.109 Hence all effects on the environment by a project concerning the production of shale gas, from the exploring phase of the area to the final removal of the well, have to be assessed.110 This establishes rather broad reports since the environmental effects of shale production are numerous. Though, it might be rather difficult to define on beforehand what environmental effects will arise form SGP sites since uncertainties about the effects still exist.111

103 Supra, note 27, p.357.
105 Article 7 Directive 2001/42/EC (SEA Directive)
106 Preamble, Directive 2011/92/EU (EIA Directive)
107 Supra, note 27, p.346.
109 European Court of Justice, Commission vs. Ireland, 21 September 1999, C-392/96
110 Supra, note 27, p.346.
Although the EIA seems to be applicable on SGP, the EIA Directive does not explicitly state that an EIA is needed in all cases of SGP. States remain the discretion to decide if they require an EIA for projects when listed in the annex of the EIA Directive.\footnote{Legal context of the Environmental Impact Assessment, at European Union, http://www.europa.eu (visited 27 February)} Criteria, on which the decision has to be based, are the location, characteristics of the project and the characteristics of the potential impact of the project. These criteria are listed in annex of the directive.\footnote{Supra, note 5, p.80.} Shale production sites exceeding emissions of 500 tonnes of gas per day are obliged to perform and EIA. Nonetheless, for producers producing less than this threshold performance of an EIA is not mandatory.\footnote{Annex I, no. (1), (14), Directive 2011/92/EU (EIA Directive)} In this case MS could still decide to require the performance of an EIA, based on the guidelines in Annex II of the directive. Nevertheless, differences in the interpretation or refusal of MS could to require an EIA creates gaps in the comprehensive EU law on the performance of environmental impact assessments. To avoid uncertainties, a specification or naming of ‘shale gas extraction’ or ‘HF’ would ensure that all plans to start SGP have to perform an EIA before production can start.\footnote{Supra, note 5, p.85.} Due to the complexity of the SGP by the technique of HF, the activity should be named in the EIA to ensure that all MS will apply an EIA before permits are issued.

**Finding EU legislation:**

MS mainly decide whether SGP will be harmful for the environment and in that case have the obligation to require performance of SEA’s. This discretion of MS possibly results in different benchmarks between MS whether they require performance of SEA’s. MS have the discretion to decide whether or not to require an EIA when a production site is not exceeding 500 tonnes of gas per day. It is uncertain whether if shale gas wells will produce more than 500 tonnes of gas per day. If not, MS could decide to not to require performance an EIA. For smaller extraction projects MS can decide by case-by-case examination or set thresholds or criteria when to require an EIA. Deviations in thresholds for EIA performances could arise if individual MS are allowed to set these requirements.

### 3.4.2. Environmental impact assessment in the US

In the US the National Environmental Policy Act (NEPA) is the main federal acts concerning the assessment of environmental impacts.\footnote{Supra, note 10, p.52.} The aim of the NEPA is to oblige all branches of the government to consider the effects on the environment of their plans, to ensure environmental consideration in the decision making process for federal actions or plans.\footnote{National Environmental Policy Act, at Environment Protection Agency, http://www.epa.gov/ (visited on 5 April 2013)} The federal Council for Environmental Quality (CEQ) oversees the NEPA. In addition, the EPA is required to overview the impacts of federal actions and comment them in public. By this requirement the transparency and the
balancing of environmental considerations in federal decision-making procedures, including starting the production of shale gas, is ensured.\textsuperscript{118}

Within the NEPA three steps have to be taken to evaluate environmental effects of federal plans, in case production of shale gas. In addition an evaluation of the possible alternatives for the proposed plans is required. The first step in the procedure is to consider a group of activities that is excluded from NEPA, the so-called ‘Categorical Exclusion’ (CE). Activities listed as CE are not required to perform environmental assessments. The second step is to determine whether if the plan belongs to the activities that significantly might harm the environment. An Environmental Assessment (EA) has to determine whether or not the activity would cause significant harm. If an EA points out that an undertaking might cause significant harm, the third step, an Environmental Impact Statement has to be performed by the federal agency that is planning to start SGP.

An important note according to SGP is that only production on federal owned land or private owned land with federal nexus (for example subsidised lands)\textsuperscript{119} could be obliged to perform an environmental assessment under the NEPA.\textsuperscript{120} SGP on private lands is not covered by the NEPA. However, this possible obligation Sector 390 of the EPA2005 determines that oil and gas well drilling are adopted in the CE category from the NEPA. In other words: due to this exclusion, SGP plans are exempted from the performance of environmental impact assessments under the NEPA.\textsuperscript{121}

In case activities or plans are listed as CE, stake holding parties could still try to enforce a NEPA-procedure by the federal agencies. However, the stakeholder is rather hampered since stakeholders have the burden of proof to bring evidence that the decision made by a federal authority "might harm the human environment significant."\textsuperscript{122} In addition although the NEPA constitutes a positive obligation to perform an impact assessment, it seems to be rather rare that federal agencies will perform shale gas extracting activities. No federal licensing program is applicable to the extraction onshore oil and gas wells and hence SGP by HF is excluded.\textsuperscript{123}

\textit{Findings US legislation:}
States remain the right to determine if an environmental impact assessment has to be performed. No minimum standards or provisions on impact assessments are provided by federal legislation for the extraction of gas resources on private lands. From state to state it can vary whether or not an impact

\textsuperscript{118} Idem.
\textsuperscript{119} Section 390 (b) Energy Policy Act 2005.
\textsuperscript{120} Fish, Jared B. “The rise of hydraulic fracturing: A behavioural analysis of landowner decision-making”, \textit{Buffalo Environmental Law Journal} (2011-2012) 19, at 228.
\textsuperscript{121} supra, note 1, p.941.
\textsuperscript{122} National Environmental Policy Act Sector 102, 42 USC § 4332.
assessment is required. The examination of a NEPA is only required for federal activities. Due to the exclusion of shale production from the NEPA by the EPA2005, federal agencies do not have to execute a proper environmental assessment before starting shale production activities.

_Finding comparison EU & US legislation on impact assessments_

The requirement of an EIA ensures that environmental considerations are taken into account in the decision-making processes of state authorities before allowing SGP. Although the EIA and SEA directives are concerned with the harmonization of impact assessments among MS, derogation from the provisions by member states is still possible. In the US only the activities and plans of federal agencies fall under the scope of the NEPA. Hence, the provisions of the NEPA are not binding plans of individual states or private landowners. By the exception of the EPA2005, even federal plans to start SGP are not bound by the NEPA. With the SIA and EIA the EU has established a more coherent law framework on the assessment of environmental among MS than the US.

3.5. Air quality and emissions regulation

Because of emissions form installations and rigs at shale production sites and traffic related to SGP, both air quality- and industrial emission regulations are important to shale production by HF. Both EU law and US federal laws lay down basic requirements for air quality and standards for instruments and machinery used for shale production. In the EU the Industrial Emissions Directive regulates industrial emissions from extracting industries. The Air Quality Directive sets standards and requirements for the air quality.124 In the US the Clean Air Act establishes the main environmental regulation regarding emissions from shale production.125

3.5.1. Air quality and emission regulation in the European Union

- Industrial Emissions Directive (IED)

The IED is established to integrate different approaches to prevent and control several kinds of industrial emissions.126 The main objective of the IED is to implement a holistic approach of protecting the environment from pollution: instead of individual sectors all sectors of the environment are taken into account when permits for emissions are issued. Regarding SGP the IED contains regulation on air emissions and moreover emission of wastewaters resulting from HF.127

The IED achieves the targets through emission-permits issued by MS: only when mandatory environmental conditions are included in permits, state authorities may allow emissions.128 An important feature of the IED is the implementation of the Best Available Techniques (BAT) principle.

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126 Preamble, IED Directive
128 Preamble, IED Directive
According to available techniques, the conditions for emission permits are set. By using BAT reference documents, the BAT techniques as included in permits are used in the same way in all MS of the EU.\textsuperscript{129} However since HF is a new used technique in the EU currently no BAT-reference documents are available for HF.\textsuperscript{130}

The IED covers air emissions from SGP when emission thresholds (minimal emissions) are achieved by production sites. Therefore applicability of the IED is not secured for all SGP-sites. It is uncertain if every production will reach the limits as set in the IED. If these limits are not reached, the IED is not applicable on HF, what results in unregulated air emissions by the IED.\textsuperscript{131} In case the air emission-threshold is not achieved by a SGP-production, the IED might still be applicable due to the wastewaters produced during HF. When wastewaters are considered as ‘hazardous waste’ regardless to the amount of emissions, the IED will applicable.\textsuperscript{132} If we take a closer look on what waste is considered as ‘hazardous waste’ it is questionable if the wastewaters from HF will be classified as ‘hazardous waste’. Since the chemical composition in wastewaters is not disclosed on forehand, it will be hard in practice to determine if wastewater can be classified as ‘hazardous’. If wastewaters are considered as hazardous a stricter regime on the disposal and transportation of these waters is applicable and the IED covers automatically SGP.\textsuperscript{133}

MS have to implement the measures as provided in the IED in their emission-permit-procedures.\textsuperscript{134} If a MS authority issues an emission permit under the IED, strict emission-limits and environmental monitoring measures have to be included in the permit. Obviously, shale gas producers have to comply with these limits and measures.\textsuperscript{135}

The IED has to be implemented by MS into national legislation. In this implementation differences in application of the directive between MS could occur. In their application of the IED MS might use different measures and minimum requirements resulting in a varying level of effectiveness of the directives among the MS. Moreover MS have to implement monitoring and controlling measures for compliance with the issued emission-permits by operators. Therefore enforcement mechanisms have to be implemented. Because the IED does not provide provisions concerned with enforcement or control mechanisms, it will depend on the authorities of MS in how compliance with the IED will be enforced.\textsuperscript{136}

\textsuperscript{130} Supra, note 5, p.III.
\textsuperscript{131} Article 10 Directive 2010/75/EU, (IED Directive)
\textsuperscript{132} Supra, note 29
\textsuperscript{134} Supra, note 5, p.XIV.
\textsuperscript{136} Supra, note 5, p.96.
The directive on Ambient Air Quality (AAQ) establishes the framework on the air quality regulation in the EU. The aim of the AAQ is to establish common methods and criteria in all EUMS in order to assess and maintain air quality, promote reduction of air pollution and to establish objectives preventing human health and the environment from negative effects of by a bad air quality.\footnote{\textit{Supra}, note 27, p.418.}

Limit values for air quality are established by the AAQ.\footnote{Article 13 Directive 2008/50/EC of the European Parliament and the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (Air Quality Directive) \textit{Supra}, note 5, p.XIV.} MS are obliged to introduce plans to achieve quality targets and ‘good’ air quality.\footnote{Article 7 Directive 2008/50/EC (Air Quality Directive) \textit{Supra}, note 5, p.XIV.} MS decide singly how to achieve these targets. The AAQ does not require MS to regulate or include emissions from SGP in their protective measures.\footnote{Article 14 Directive 2010/75/EU (IED Directive) \textit{Supra}, note 5, p.XIV.} However, the AAQ provides standards for maximum emissions according the protection of human health. MS have to ensure that limits stated in the AAQ are not exceeded when SGP take place in their territory.

It is noteworthy that the AAQ is linked to the IED. This connection establishes that in case environmental (air) quality standards are set stricter than the BAT as described in BAT-reference documents, additional requirements for the industrial installations might be included in the emission-permits.\footnote{Article 14 Directive 2010/75/EU (IED Directive) \textit{Clean Air Act, at Environment Protection Agency, http://www.epa.gov/air/caa/} (visited on 10 April 2013) \textit{Clean Air Act, 42 U.S.C. §7401}} Hence according to SGP-installations extra requirements might be included in permits when the installations are not able to deal with the air-quality restrictions.

\textit{Findings EU legislation:}

SGP is only covered by the IED in case air-emissions reach the thresholds of the IED or waste waters from HF are considered as ‘Hazardous Waste’. However in case the IED covers the activity of GSP, the IED sets out an effective regulation in the entire EU. The AAQ sets minimum standards for the air quality in the EU. Nevertheless, the AAQ does not set standards for individual GSP sites and does not directly result in additional requirements for SGP.

\subsection{Air quality and emission regulation in the US}

\textit{- Clean Air Act}

The Clean Air Act (CAA) is the widespread federal law regulating air emissions and is established to protect the public health and welfare from air pollution.\footnote{Clean Air Act, at Environment Protection Agency, http://www.epa.gov/air/caa/} Under the CAA the EPA is required to establish air pollution limits for the entire country.\footnote{Clean Air Act, 42 U.S.C. §7401} States and local governments have to comply with these limits: the so-called ‘National Ambient Air Quality Standards’ (NAAQS). According to

\begin{itemize}
\item \textit{Clean Air Act, at Environment Protection Agency, http://www.epa.gov/air/caa/} (visited on 10 April 2013)
\item \textit{Clean Air Act, 42 U.S.C. §7401}
\end{itemize}
achieve these standards states are obliged to monitor the air quality and inspect the industries.\textsuperscript{144} States are free to select the methods for achieving these standards.\textsuperscript{145} If necessary, the EPA provides supporting studies and financial aid to state and local governments to achieve the NAAQS targets.\textsuperscript{146} States are individually free to implement plans or regulations concerning tightening the air quality standards on specific emitting sources. Up to now few states have been introducing regulations for the emissions from SGP.\textsuperscript{147} However the NAAQS as such is not directly binding the shale gas producers since it sets out targets that have to be achieved in states and not just at individual productions.

When taking a closer look at the CAA the following has to be considered: installations used for SGP are considered as so-called ‘fugitive installations’. Presently the CAA does not include regulation on fugitive emissions installations used for SGP. In the near future the EPA might decide to introduce regulations concerning emissions of these installations under the CAA.\textsuperscript{148} According to the air emissions from the SGP, it is rather questionable whether the CAA will directly affect shale production. By SGP it is common that multiple but differentiated parts of the operation (multiple installations) release pollutants into the air. It is unlikely that the EPA will aggregate these emissions, which results in the fact that the CAA is not applicable to these emissions, if calculations are made separate. However, indirectly the CAA has some effect on shale productions since the emissions of the production will hamper the eligibility of states to achieve their NNAQS.\textsuperscript{149}

Beside the NAAQS programme (under the CAA), the EPA has established emission standards for Hazardous Air Pollutants (HAP). These standards indicate mandatory degrees of reduction of emissions. The EPA standards are based on the available technology, and therein show some similarities with the EU IED. However, to fall within the scope of the HAP standards, a minimum amount of emissions have to be emitted by SGP. As stated before, individual extraction sites will possibly not reach those limits and remain therefore unregulated under the CAA.\textsuperscript{150}

In 2012 the EPA introduced minimum air pollution standards for the oil and gas industry. The so called ‘New Source and Performance Standards’ (NSPS) are established to ensure that reduced emissions completions are achieved by all wells, by setting minimum standards for installations of producers. By this plan the EPA can effectively harmonize the reduction of emissions by HF at federal level. The NSPS requires the industry to reduce the emissions of Volatile Organic Compounds (VOC’s). Operators are directly bound be the provisions of the NSPS. Though, the regulation is

\begin{footnotesize}
\begin{enumerate}
\item Carbon monoxide implementation, at Environmental Protection Agency, http://www.epa.gov (visited on 16 April 2013)
\item Supra, note 33, p.535.
\item Supra, note 142
\item Supra, note 93, p.289.
\item Supra, note 123, p.508.
\item Supra, note 90, p.288.
\item Supra, note 10, p.51.
\end{enumerate}
\end{footnotesize}
applicable on equipment modified or reconstructed after august 2011, resulting in the fact that only installations built or modified after this date are bound by the of the NSPS.

Findings US legislation:
Under the CAA, the EPA has an important role regulating emissions from SGP-sites. By setting minimum standards for the equipment for HF on federal level, the regulatory regime is applicable across all individual states. The CAA itself does not directly regulate the emissions from SGP, since it only sets out goals for the air quality that ‘overall’ have to be met by states via the NAAQS. SGP is only covered by federal regulation in so far that the emissions from GSP have influence on the allowed emissions under NNAQS by states. The NSPS is directly binding for the oil and gas industry and sets minimum requirements for equipment of SGP sites and binds all installations built after 2011.

Findings comparison EU & US legislation on air emissions
The IED directive is an effective tool to regulate emissions of pollutants in the air by industries. To fall under the scope of the IED, the total sum of the environmental pollution pollutants has to be taken in account; nevertheless it is not sure if all SGP sites will reach the thresholds of IED. To ensure the applicability of the IED, SGP should be added to the annex of the IED. The AAQ does not directly regulate GSP: under the AAQ MS are required to maintain certain air quality. Nevertheless the emissions from HF will hamper MS to achieve their targets under the AAQ directive and is therefore indirectly of importance to SGP.

The US CAA has more or less the same functions as the AAQ in the EU. The EPA sets out minimum requirements where states have to comply with. However, the EPA is entitled to set direct binding standards such as the NSPS. Under this provision shale producers are directly bound by the minimum requirements for their equipment, at a nationwide level. With this tool the EPA has a direct influence on the industry and their equipment, as far as shale gas rigs are covered by the regulation. When comparing the US and EU, the NSPS and IED set out strong regulation on harmonized level. Nevertheless, the EU IED is able to cover all installations in all MS and leaves little space for derogation in national legislation, where the US NSPS only covers SGP installations built after 2011.

3.6. Regulation on Water
Due to the extensive water use by HF, environmental regulation on water is crucial for effective environmental protection from pollution by SGP. At first underground injection of water containing ‘fracking’-fluids and the injection of wastewaters resulting from the HF process might have a high

152 Supra, note 123, p.476.
153 Supra, note 5, p.88.
potential to contaminate groundwater resources. Secondly the vast amounts of wastewaters and storm waters resulting from the extraction process are dangerous pollutants for surface waters. In the EU and US extensive regulations on surface, drink- and groundwater are regulating water quality standards and control the discharge of waste waters.

3.6.1. **Regulation on water in the EU**

- **Water-framework Directive (WFD)**

The holistic approach of the WFD requires national legislation in all MS, which is able to protect the all areas in which streams, rivers, and lakes are flowing. The WFD points on three sources and areas of water: surface water, groundwater and water in protected areas. Under the WFD MS are obliged to implement so-called ‘basic measures’ in their national legislation. These measures establish minimum requirements for water quality. The WFD requires from national legislation to be designed in a way the overall objectives of the WFD will be achieved in the entire EU.

MS have the obligation to limit contamination of groundwater resources. In the national legislation of MS a prohibition of the direct discharges into groundwater has to be included. Since underground injection of (waste) waters might be considered as a direct discharge, this provision is therefore important to SGP. However, regarding shale gas production and in general ‘extraction of hydrocarbons’ an exemption on this protecting requirement is made in the WFD. Both underground injection of ‘water needed for technical reasons’ as ‘water containing substances resulting from the operations of extraction of hydrocarbons’ might, under specified conditions, be allowed by MS. By this provision MS might decide to allow the underground injections individually. In other words: it depends on the national legislation of MS, whether discharge of wastewaters or water containing ‘fracking’-fluids is allowed to be injected underground. Hence via the implementation in national legislation MS can decide individually if the will allow or ban SGP by HF.

Beside underground injection, the second concern is the contamination of surface waters by disposal of wastewaters resulting from the extraction process. MS might allow discharge of wastewaters into other water resources, as long this does not lead to immediate failure or danger to these (ground) waters. It would be striking if wastewaters resulting from HF containing chemicals and possibly qualifying as ‘hazardous waste’ (see below) under the waste directive are allowed to be discharged into water bodies when realizing that the waters may contain more or less 0,5% of chemicals.

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154 Supra, note 27, p.394.
160 Supra, note 29, at 308.
However for now the EU regulations on water seems to leave the decision to allow discharge and injection to the MS. As long as MS comply with the achievements under the WFD, discharge of wastewaters seem to be a concern of MS and remains unregulated by EU legislation. Nevertheless when the waters would qualify as hazardous waste, the stricter disposal regime of the hazardous waste directive would be applicable.\(^\text{161}\)

**- Mining Waste Directive (MWD)**

The MWD contains duties of caretaking of the mining waste by requiring a management plan drawn by the operator as a precondition for the permit to start SGP. Permits for storing mining waste such as wastewaters from HF have to be issued before extraction or production activities can start. The MWD aims to prevent the environment from pollution by mining waste.\(^\text{162}\) Due to the fact that waste waters are in fact waste from the extraction, the MWD is applicable on waste waters from HF.\(^\text{163}\) The MWD gives that “all establishments and undertakings engaged in surface or underground extraction of mineral resources for commercial purposes including extraction by drilling boreholes”.\(^\text{164}\) By this wording the MWD covers the activities of shale gas extraction.\(^\text{165}\)

However this finding of applicability of the MWD does not stipulate stricter regulation for wastewaters resulting from SGP than the WFD already does. Water resulting from the HF process has to be considered as mining waste since it is resulting from the extraction process. However the MWD explicitly excludes the injection of wastewaters from HF its provisions and refers instead to the WFD.\(^\text{166}\) As stated before, the MWD leaves the decision to allow injection of waste waters up to the discretion of MS. Hence the MWD does not provide more regulation for wastewaters from the extraction process than the WFD already does.

**- Drinking Water Directive (DWD)**

Waters used in and resulting from HF might contaminate drink water resources. Under the DWD, chemical parameters for water resources are established. The objective of the DWD is to protect drinking water in order to maintain a status for drinking water that is clean, tasty and healthy. To achieve this target the DWD sets minimum standards for the substances that drinking water may contain. MS are not allowed to implement lower standards in their national legislation, though they may introduce higher standards.\(^\text{167}\)

\(^{161}\) Supra, note 29.

\(^{162}\) Supra, note 27, p.491


\(^{165}\) Supra, note 27, p.305

\(^{166}\) Article 2 (2) (c) Directive 2006/21/EC (Mining Waste Directive)

\(^{167}\) Quality of Drinking water, at European Union, http://ec.europa.eu/environment/water (Visited on 10 April 2013)
The DWD does not explicitly name pollution from or by the exploitation of shale gas or other extraction and does not explicitly establish stricter regulation in addition to other directives regulation concerning water resources. However in indirectly DWD establishes additional restrictions for shale gas production by hampering production in certain environments. At first, two kinds of water resources are exempted from the DWD: resources containing natural mineral waters used for exploitation and marketing and second waters used for the production of medicines. SGP will not be allowed to take place close to these kinds of waters because in case of contamination by wastewaters from HF these waters will not be considered as ‘mineral’ or useful for the production of medicines anymore. A way to deviate from the provisions of the directive is that under the DWD derogation of the quality standards or parameters for drinking water is allowed under exceptional circumstances with a maximum duration of four years. Although, it is unlikely that SGP is an exceptional circumstance and will be allowed to derogate from the quality standards as set in the DWD. The provisions of the DWD result in the assumption that shale production may not take place in areas where waters protected under the DWD are situated.

- **Groundwater directive (GWD)**

According to groundwater resources the GWD provides regulation on the pollution of groundwater by (hazardous) substances. The GWD requires MS to implement measures to prevent and limit pollution of groundwater. Under the GWD MS are obliged to monitor and protect their groundwater resources. In the GWD two ways of discharge are defined: ‘direct’ and ‘indirect’ discharge. Direct discharge is insertion of a substance into the groundwater without percolation into the underground. Indirect discharge means the contamination of groundwater after percolation. If there is a risk on indirect discharge, an investigation shall be made before the national authorities may issue an authorisation for discharging substances.

Important to the production of shale gas: the GWD obliges MS to prevent discharge of dangerous substances into groundwater. Though, MS may allow the injection of substances such as the wastewater from HF as long as it does “not immediate lead to a failure of the established environmental goals and management plans”. With regards to the exemption of underground injection of wastewaters in the WFD, the GWD refers to the same exemption of injection of contaminated water into groundwater according to the exploitation of hydrocarbons as in the WFD. This makes that underground injection of the wastewaters from HF is not prohibited in EU law, into

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171 Supra, note 29
172 Supra, note 29, p.308.
groundwater if this does not lead to an immediate failure of the environmental goals and quality standards of the water resource. Hence EU law is not prohibiting underground injection and MS may decide individually whether if they allow underground injection of ‘fracking’-fluids and wastewater.

Findings EU legislation:

According to SGP, MS may allow underground injection of wastewaters. However injection of waste waters or waters containing ‘fracking’-fluids is more or less restricted by the different EU water-directives. At first the DWD does not allow any derogations except ‘exceptional circumstances’, however it is unlikely that SGP will qualify as ‘exceptional’ since SGP will probably be considered as a planned activity. Hence in principle no SGP can take place in areas protected by the DWD.

Similar to the WFD the GWD allows underground injection of wastewaters if provisions are implemented in national law of MS. This imposes that MS may decide whether they allow underground injections of wastewaters and waters containing ‘fracking’-fluids. Although MS may decide to allow underground injection, they have to comply with the minimum quality standards as set by the WFD: under the WFD, MS have a rather wide range of possibilities to implement environmental their own targets and ways how to achieve these targets. A more general comment is that the WFD has the possibility to create a legal framework in which SGP may be allowed is to be regulated by the MS self. Due to the discretion of MS to allow HF, differences in environmental legislation may occur and lack of environmental regulations might arise.

3.6.2. Regulation on Water in the United States

- Safe Water Drinking Act (SWDA)

The SWDA contains health related standards according to the quality of drinking water in the US. By the SWDA the EPA is authorized to set minimum requirements. The EPA sets nationwide standards for tap water and requirements for water treatments. Under the SWDA, state governments are allowed to implement even stricter standards than the standards as set by the EPA.

According to underground injection the SWDA contains the ‘Underground Injection Control’-program (UIC). This program introduces a set of standards controlling safe underground injection of wastewater, chemicals and other pollutants, such as wastewaters from SGP. It is important to note that individual states and not the federal government are responsible for the protection of (ground) water resources. The injection of waters into the ground should be considered as an injection of

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contaminated waters since they contain a vast amount of chemicals. The UIC-programme requires authorizations of local or state governments before injection and so SGP can take place.\textsuperscript{176}

Although, the effectiveness of the SWDA is to a certain extend affected by the EPA2005. Especially concerning underground injection the EPA2005 has vast impact on the SWDA. Since the EPA2005, underground injections of wastewaters resulting from HF do not require a preliminary permission or authorisation from the state authorities anymore.\textsuperscript{177} Only if diesel is used in the ‘fracking’ -fluids or wastewaters, operators need preliminary authorization.\textsuperscript{178} Before the introduction of the EPA2005, the EPA had regulatory power to set the minimum standards for the entire UIC-program. After the EPA2005, the EPA has nearly no power to tighten the requirements for underground injection.\textsuperscript{179} As a result, individual states are currently at decentralized level the regulators of the UIC-program.\textsuperscript{180} For this reason currently divergent regulations concerning underground injection across different states are implemented. This divergence may lead to interstate problems in case environmental pollution occurs after HF, because states have different environmental requirements and quality standards.

- \textit{Clean Water Act (CWA)}

The CWA is prohibiting the discharge of wastewaters into water bodies. The CWA aims to prevent water resources from water runoffs such as storm waters released during HF.\textsuperscript{181} The CWA attempts to control releases into water bodies by a system that exists on so-called ‘point sources’. Only at point sources, state authorities may allow release of wastewaters. By this system an effective control on water pollution is maintained.\textsuperscript{182}

To achieve the targets as set in CWA, the National Pollutant Discharge Elimination System (NPDES) has been introduced. Under the NPDES both the EPA and state authorities are the entitled institutions to issue permits for discharges into surface water. Depending on the quality criteria, limits are provided in NPDES-permits.\textsuperscript{183} Based on available technology to control environmental pollution, minimum and maximum values are established in the CWA. The standards in the CWA are directly applicable at state level. State legislation is obliged to comply with the measures as set by the CWA.

The NPDES-permission procedure is applicable on wastewaters from HF. Shale gas operations need a NPDES-permits in order to discharge wastewaters resulting from the HF process into other water

\textsuperscript{176} \textit{Supra}, note 24
\textsuperscript{177} \textit{Supra}, note 24, p.98.
\textsuperscript{178} \textit{Supra}, note 111, p.118.
\textsuperscript{180} \textit{Supra}, note 26, p.303.
\textsuperscript{181} \textit{Supra}, note 10, p.49.
\textsuperscript{182} Clean Water Act, at Environmental Protection Agency, http://www.epa.gov/agriculture/cwaa.html (Visited at 17 May 2013)
bodies. However due to a rather broad exception in the CWA, shale gas producers are not required to acquire an NPDES permit for discharge. Nevertheless direct discharge of wastewaters is not allowed. Possible ways of indirect discharges are the use of pits, using ponds for evaporation and underground injection. Particularly with regards to the underground injection it is rather remarkable that the EPA addresses this method as an ‘indirect’ way of discharge of waste waters. Especially when taken into account that the underground injection is excluded from the SWDA and therefore remains partially unprotected.\textsuperscript{184} The only permit needed is the storm water permit under the CWA for storm waters resulting from the construction of the well, before starting the production process.\textsuperscript{185} These exemptions in the CWA and SWDA made the legal framework prevention water resources from pollution rather weak in the US.

Another way of disposal of wastewaters resulting from HF, could be the discharge into sewage-systems connected to ‘public owned treatment works’. However it is unsure if these facilities are able to remedy the wastewaters containing chemicals, to an acceptable quality. Although the CWA is able to regulate the disposal of wastewaters in to surface waters, the acts does not provide proper regulation regarding underground injections of waste waters and regulation on storm waters resulting from the HF process.\textsuperscript{186}

\textit{Findings US legislation:}

The CWA and SWDA set out nationwide standards and minimum requirements for water quality. Both regulations are implementing control-systems administered by the federal EPA. At first sight this seems to be an effective method to set minimum standards for water quality at federal level. States have some autonomy, but are anyway bound by the minimum standards from the EPA. However, due to the EPA2005, the exploitation of shale gas is radically excluded from the SWDA. As a result, only minor water runoffs need authorization required on federal level. No federal legislation is applicable on safe drinking water since the EPA2005 has mainly exempted SGP form the SWDA. Because of this lack of federal legislation it is mainly up to individual states to implement regulations protection their water resources.

\textit{Findings comparison EU and US legislation}

Although the EU has a rather extensive legal framework on water, protection of water bodies from pollution form SGP remains mainly under the regulations of individual MS. The DWD and the GWD support the WFD in establishing minimum standards at EU level. MS are free in their decision to allow underground injections and other SGP related pollution as long as the standards are met and minimum standards from the EU directives are implemented. In the US the NPDES of the CWA

\textsuperscript{184} \textit{Supra}, note 29, p.307.
\textsuperscript{185} \textit{Supra}, note 39, p. 192.
\textsuperscript{186} \textit{Supra}, note 179, p. 486.
created a tool to monitor the amount of discharges into the surface waters. In addition, the SWDA entitles EPA to set nationwide minimum standards and regulate (indirect) the pollution regarding shale gas extraction. Nevertheless, the EPA2005 has mainly exempted the (waste) waters HF from these provisions. Neither the NPDES program nor the UIC is applicable on HF activities since they are excluded by the EPA2005. It is up to individual states to regulate these issues since no federal regulation is applicable. In this sense, EU law sets out a more binding set of regulations than US law does.

3.7. Regulation on chemicals

Chemicals are essential for shale gas production by HF. The main issue related to the use of chemicals is the disclosure. Disclosure is essential for different purposes in case chemicals are released into the environment. Essential is the access to information of the used chemical composition in the production processes. In the next paragraphs the existing regulations on the registration, disclosure and usage of chemicals in the EU and in the U.S. will be scrutinized.

3.7.1. European Union Regulation on Chemicals

- Registration Evaluation Authorisation and restriction of Chemicals (REACH)

REACH is the cornerstone legislation in the EU law with regards to chemicals. 187 REACH is applicable to all substances and requires that all substances are registered before they are allowed to be marketed in the EU. 188 The REACH is applicable on all substances used, imported or produced in quantities exceeding the amount of 1 tonne (on yearly basis). This holds that all substances (exceeding 1 tonne) used in SGP, have to be registered at the European Chemicals Agency (ECA). 189 REACH aims on gathering technical information about all chemical substances via technical dossiers of each substance including all details and data available. 190

REACH seems to establish an effective mechanism for the enclosure of chemicals used for SGP. Beside the mandatory registration of used chemicals, also the access to information seems to be safeguarded by REACH. 191 In case shale gas producers want to make use of so-called ‘high’-risk substances in the ‘fracking’-fluids, substances that may cause negative effects to the environment or human health, an assessment has to be made by the producer to investigate in how far alternative (less toxic or dangerous) substances are available to replace these dangerous chemicals. 192 This establishes a first threshold for producers to consider the effects of the chemicals they use in the extraction process. Another important feature of the regulation is that under REACH all chemicals used in the

188 Article 5 Regulation (EC) No 1907/2006 (REACH)
189 Article 7 Regulation (EC) No 1907/2006 (REACH)
190 Article 12 Regulation (EC) No 1907/2006 (REACH)
191 Article 118 Regulation (EC) No 1907/2006 (REACH)
192 Article 57 Regulation (EC) No 1907/2006 (REACH)
HF process have at least to be registered before they may be used in the process. This results (indirectly) from the obligation for chemical producers to register and disclose information about the chemicals at the ECA. Therefore REACH ensures that data about chemicals is available at the ECA in case of distress, investigation or other purposes. In this sense REACH breaks with ‘trade secrets’ and ‘commercial interests’, in order to get information of chemicals available for the public. Nevertheless there are some exceptions from the disclosure in case of commercial interest.\(^{193}\) In addition it remains unsure whether the provisions of REACH cover used chemicals not exceeding the amount of 1 ton.

REACH can be considered as an adequate system to control the use of chemicals in SGP since the majority of used chemical products will have to be registered and operators are obliged to apply appropriate measures and risk assessments on the usage of chemicals.\(^{194}\) A regulatory gap could arise from the implementation of REACH by MS, by for example the timing of implementation. Illustrative is that Poland has not yet implemented REACH.\(^{195}\) Another concern is the enforcement of the regulation. Enforcement of the REACH and other EU as well may lead to another concern of coherent implementation in all the EU MS, however it is outside the scope of this research to address these problems. In short MS have to report about their implementation to the EC. Since MS have to report about the enforcement of REACH to the EC, a rather small risk on derogation from the provisions by MS might occur since the EC has strong instruments to enforce compliance with EU law.\(^{196}\)

**Findings EU legislation:**

The provisions of REACH are directly binding for MS since it is a EU regulation. Due to the fact that REACH is a regulation, it has not to be implemented by the MS and therefore contains just a few possibilities regarding different interpretations and implementation by MS. According to the chemicals used in SGP, REACH seems to establish two important facets. At first all the chemicals used in the fracking-fluids have to be listed at the ECA. Secondly, the operators must be aware of the risks and chemicals and are obliged to take appropriate measures to ensure risk to human health and the environment remain controlled.

### 3.7.2. Regulation on chemicals in the US

In the US currently only state laws regulate the disclosure of chemicals, since no federal act provides regulation on this issue. The regulations vary widely from state to state. Where some states require disclosure of chemicals used for the production of shale gas, others do not. Furthermore the requirements for the content of the chemical information vary commonly. Some states require

\(^{193}\) *Supra*, note 5, p.113.

\(^{194}\) Article 37 Regulation (EC) No 1907/2006 (REACH)

\(^{195}\) *Supra*, note 14

specified information (quantities, numbers) of all the chemicals used in the fracking-fluids, others may just require which chemicals are used without requiring quantities.\(^1\)

- **Fracturing Responsibility and Awareness of Chemicals Act (FRAC)**

Due to the raising concern about chemicals used in SGP, the so-called FRAC act has been proposed and is currently pending at the Congress.\(^2\) The FRAC contains inter alia amendments of the currently existing SWDA. The amendment of the SWDA would introduce an obligation for shale gas operators to disclose to the authorities, before operations can start, a list with the quantities of chemicals intended to use in the HF-process. In addition to this prior-operation disclosure, FRAC requires that at the latest 30 days after the operation a list of eventual used chemicals be submitted to the controlling authorities.\(^3\) The FRAC would also establish (limited) public access to chemical information and require disclosure of the chemical information in case of medical emergencies.

This would be a breakthrough in states where state laws protect trade secrets strictly, preventing shale gas operators to disclose the composition of the chemicals they use in HF. With the FRAC information about the chemical mixture will establish open access of information to the public and so break with trade secrets.\(^4\) However regulating the disclosure of chemicals in of chemicals used in HF is a rather complex issue. The majority of the states contain trade secret protections. These protections makes that the information about the chemicals used in the fracking-fluid is secret and do not oblige to be made public. State laws vary widely on these trade secrets. Some states have a weaker protection where others established a strong regulatory regime. Some states laws rule that only in case of medical necessity trade secrets have to be submitted.\(^5\) By imposing the new FRAC Act, the US seems to admit that an adequate and harmonized regulation on the disclosure of chemicals is necessary. Although the proposal does not require public disclosure, the EPA or state health professionals will have access to chemical substances used in the production of shale gas and possibly released into the environment.

- **Emergency Planning and Community Right to know Act (EPCRA)**

The EPCRA provides regulations for federal and state governments in order to provide the public access to information of chemicals released into the environment. The EPCRA requires that parties releasing, storing or using hazardous chemicals, must report about their activities. This information requirement includes ‘material safety data sheets’: detailed information that provides all data about the used chemicals and their effect on health and the environment. Within this report-duty producers do

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1. Supra, note 6, p.6.
2. Supra, note 52, p.711.
3. Supra, note 6, p.3.
4. Supra, note 90, p.133.
5. Supra, note 6, p.10.
have to submit an estimation of the used amount of chemicals on a yearly base. The tendency of the EPCRA seems to embrace typically activities like oil and gas extraction because via HF a vast amount of chemicals will (in)directly be released into the environment. Nevertheless, simultaneously like the paralysation of the SWDA by the EPA2005, the oil and gas industry is excluded from the provisions of the EPCRA. At first, this exclusion results in the fact that shale producers operating with HF are not required to submit datasheets with chemical information. At second no public access is ensured by the EPCRA. Once more, the EPA2005 has negative effect on regulations regarding the protection of the environmental and human health.

Findings US legislation:
With the introduction of the FRAC-act an effective monitoring tool would be established in order to review and oversee the usage of chemicals in the US. It provides access to chemical data in case when needed by stakeholders in case of emergency. With the FRAC a harmonized, federal ‘disclosure’-system would be established. Though, since the FRAC has not yet entered into force, no federal regulation on the use and disclosure of chemicals is applicable in the US. As discussed, from state to state varies the regulation on the use and disclosure of chemicals by SGP.

Findings comparison EU & US regulation on chemicals
Because the fact that REACH is a regulation, it is directly applicable in all MS. Shale producers have to comply with the registration of chemicals used in HF. Beside the enforcement and timing of implementation of REACH, MS cannot derogate from the provisions of REACH since it is directly binding. REACH establishes access to chemical data en requires assessment and disclosure from shale producers in the entire EU. Due to the fact that REACH is an EU regulation it leaves little space for MS to derogate from its provisions. In the US, the FRAC establishes effective federal regulation obliging shale gas producers to report their use of chemicals and create access to chemical data. Especially due the fact that the act will be controlled the EPA establishes and harmonized system on federal level. However, the FRAC has not entered into force yet. The ERCRA does not have exactly the same tendency as the FRAC; it contains a duty to report the use of chemicals on a public available forum. Once more SGP has been excluded from the requirements as set out by an act concerned with environmental regulation. Due to the lack of federal regulation, only state regulations are applicable and a weak federal regime on the use and disclosure of chemicals is established. This has resulted in divergent state regulations on the use and disclosure of chemicals.

204 Supra, note 6
CONCLUSION

Guided by the scrutinized issues in the forgoing chapters, in this conclusion a review and answer are formed on the question whether if the EU environmental legal framework establishes a more sufficient and united legislative framework on the environmental protection from the production of shale gas by HF, than the US federal legal framework does.

As first a clarification of the statement that a more centralized legal regime on shale gas extraction by HF, is preferable above a legal regime that exists of regional regulations, is in place. In both the EU and US a central legislating institution has opportunities to adopt environmental legislation and so establish environmental protection in the entire EU or US. However according to SGP individual states remain in both EU and US the discretion to decide whether or not they want to allow production of shale gas. Depending on the policy of states, shale gas extraction may be allowed under the condition that the activities are in compliance with environmental legislation. In the case of SGP harmonized legislation on central level prevails above (member) state regulation. This statement is based on the following reasoning. At first the effects on the environment due to HF will not occur only within the borders of a state. Illustrative for these cross-border environmental effects are the water contamination of water and air pollution: environmental problems that will inevitably cross the borders of states. In case all states stick to just their own national environmental laws and do not implement ‘centralized’ minimum standards, every case of transboundary pollution might result in a complex (legal) situation. Illustrative is this situation: where in state A on the left side of the border for example threshold for air pollution does not exceed the allowed maximum values, in state B on the right side of the border values does exceed because of a more stringent legal regime. Harmonized minimum level (and legislation) could prevent these unavoidable differences in environmental protection within the EU or US.

Having harmonized environmental regulations across states ensures that minimum standards are applied by individual states within the boundaries of the union or federation. Although states may have their own additional restrictions or bans, all states are offering a shared minimum level of protection that is provided in ‘central’ regulation. These minimum standards ensure that the environmental considerations are taken into account in the decision-making procedure of state governments and their local authorities on every decision-making level. In addition, central environmental laws may limit the effect of lobbies from industries trying to influence the decisions on (local) state level, no derogation at local level is possible: the EU or federal regulation provides minimum standards. With a strong ‘centralized’ regime, local governments will not face the temptation of accepting a lower degree of environmental standards by the industrial influences. Another positive aspect of a strong ‘central’ harmonized legislation is a lower pressure and necessary
effort to establish continuously up-to-date legislation for the high-speed developing industries and used techniques. Central legislation is able to respond to these changes at once, instead of the probably slow response of all individual state governments.

When comparing the already existing ‘central’ environmental legislative framework in the EU and US applicable on the SGP, the differences of the legal systems and the implementation of individual (member) states are important to take in consideration. The EU can be considered as an economic and politic cooperation with EU institutions authorized to issue environmental legislation. Where in the EU regulations are directly binding and applicable in MS, directives have to be transposed into national legislation. The EC functions as the compliance body and ensures compliance of the MS with directives and regulations. The structure in the US is different. The US has a federal government making environmental law. Acts issued by the federal government are commonly directly applicable in individual states or have to be implemented in state legislation. If authorized the EPA is the administrator of environmental legislation and may issue guidance for implementation by states. In this sense the EPA forms a certain kind of compliance body. The EPA has also the authority to control the compliance of individuals with environmental regulations.

In comparison of the applicable existing legislation covering the activity of shale extraction two issues have been scrutinized: 1. Is there law applicable covering the component of the shale extraction process? 2. If applicable law is protecting the environmental concerns, does this law set minimum standards applicable in all (member) states or does it leave a wide margin of discretion to states to implement the provisions in their own vision? Guided by the applicable regulations and directives in the EU and federal acts in the US, the following conclusions can be drawn.

At first, the decisions of states (EU and US) to allow the extraction of shale gas in their territory. In the EU, MS have the authority to issue permits for SGP. No central EU institution governs these permitting procedures. The issuance of permits and authorizations takes place at member state level. The HD, guides MS in the issuance procedure of permits and refers to the environment as factor in the decision making process of states. Nevertheless the HD does not establish a mandatory environmental consideration for MS issuing permits for SGP. Hence no harmonized regime of the environmental considerations is adopted in the EU’s legislation concerning the issuance of permits. As in the EU, in the US states are authorized to issue of permits for SGP. No federal environmental legislation is regulation the permissions for states. Although the EPA has drafted guidelines for specific issues in the permitting procedure, no nationwide federal provision harmonizes the environmental consideration in the permitting procedures. In both EU and US no central environmental law requires obligatory environmental consideration in the licensing process. It is noticeable that a weak reference to the
environment is made in the EU HD; mandatory consideration of the environment should be adopted for a first moment of environmental consideration already in the permit-procedure.

When considering the environmental assessments in the EU and US, the EU has established the requirement of a mandatory environmental impact assessment before SGP can take place. Nevertheless to oblige all states to execute assessments an explicit mentioning of the activity of HF would ensure that indeed an EIA is performed before SGP can take place. In US federal law a similar environmental assessment exists: the NEPA. Nevertheless, the NEPA is only applicable to the activities of federal agencies and does not require all individual states to implement a mandatory environmental impact assessment. The EPA2005 exempted shale gas operations from the federal government explicitly from the NEPA. Hence no federal law establishes a mandatory impact assessment in the US. With the EIA and SIA, the EU has established a strong legal framework over the entire union, requiring the impact assessments before shale production can take place. States do not have much opportunity do derogate from the directives. Nevertheless it is rather recommendable to add the activity of shale gas extraction explicit in the directive in order to ensure environmental impact assessments are made for all production sites.

In the EU, the IED effectively cover the regulation on emissions and air pollutants from shale production activities. However in order for the IED to be applicable, production sites need produce a minimum amount of (air) emissions. To ensure applicability of the IED the threshold in the directive should be lowered or even more preferable: shale production activities should explicit be named in the annex. When applicable, the IED establishes minimum requirements for the prevention of pollution for all SGP-sites in the EU. The AAQ does not implement (minimum) requirements applicable on SGP. The AAQ sets out measures and indirect targets for MS but does not create direct obligations or provisions for the MS and industry. In the US a similar system to the AAQ is established. With the NNAQS regime, individual states have to deal with air quality targets. In addition, the EPA has introduced a new programme to improve the air quality of the oil and gas industry. This programme is established to reduce the Volatile Organic Compounds (VOC’s) of industrial facilities and is nationwide applicable on the oil and gas industry. However the programme only sets requirements for equipment installed after 2011. The IED establishes a regulatory framework on air emissions and production of pollutants and waste from shale production in general. Due to the fact that the IED requires all MS to name to limited emissions values in the permits, no derogation of MS is possible and a harmonized system is established. However before the harmonization of the IED concerning the activities of shale gas production is applicable in all MS a BAT-reference document has to be prepared.
Regulation on water is essential for the protection of the environment against the adverse effects of SGP. In the EU, the WFD leaves MS a wide margin of discretion in their decision to allow underground injection of wastewaters resulting from the extraction process. Discharge of waste waters may be allowed by the MS, as long as they can comply with action plans to improve water quality. It is worth noting that if wastewaters resulting from HF would be considered as ‘hazardous’ waste under the Waste Framework Directive, would restrict the treatment of waste (waters) from HF significant. The US federal legislation concerning the protection of water resources can be considered as weak. The SWDA is not applicable on the extraction of shale gas due to the explicit exclusion by the Energy Policy Act 2005. States remain the authority to establish regulations concerning the critical underground injection of wastewaters. The EPA does only provide guidelines trying to help states in their decision-making processes. In addition to the SWDA currently the CWA is as well not able to protect water resources from HF. Both the EU and US do not offer a strong harmonized regime concerning the water regulation. Nevertheless the EU legal framework offers a more coherent regulation on the protection of EU waters, with fewer loopholes for the shale producers. Especially with regard to waters, harmonized regulation prevails in the case of HF due its enormous amounts of water use and possible discharge, migration of these wastewaters and the disposal of wastewaters into other water bodies that have commonly trans-border connections.

Essential for an effective environmental protection against chemicals used by SGP is regulation regarding disclosure of chemicals. The EU REACH requires that all substances used in the extraction process are registered at the EU’s central institution (ECA): only registered chemicals may be used for SGP. REACH ensures public access to chemical information. To certain extend, REACH breaks with trade secrets and ensure disclosure of used chemicals, however some reservations are made. Due to the fact that REACH is a regulation, it has directly effect in all MS of the EU and does not have to be transposed into national legislation. Besides the timing of implementation and enforcement mechanisms of MS, no derogations by MS are possible from the regulation. In the US regulation concerning the disclosure of chemicals falls short. In the US the EPRCA is not applicable on the activities of shale gas extraction. This act, usually creating access for the public to be informed about environmental pollution, explicitly excludes access in case of SGP. All individual states remain the opportunity to implement their own legislation on chemical disclosure. However the promising FRAC is pending. This act will amend the current regulations chemical disclosure of the ‘fracking’-fluid in the entire US and will restore the provisions regarding underground injection in the SWDA. However, currently no harmonized legislation on chemical disclosure in the US is in force. Due to all harmful effects occurring, it is worrying that federal law does not regulate the use of chemicals in the US and the current legislation on chemicals exists of a piecemeal of state regulations.
After discussing and elaborating the environmental legislation in the EU and US, it is striking to observe that the environmental protection on the US federal level is currently rather weak. Due to the EPA2005, cornerstones of the US federal environmental legal framework seem to be paralyzed in order to support the domicile shale gas production. However, some states do offer strict environmental legislation and are aware of the possibilities of environmental harm. Just a few federal regulations are able to regulate the environmental aspects of the production of shale gas. Although the EU environmental legislative framework has not dealt with a vast amount of production of shale gas yet, it seems to establish a more coherent regime for the EU MS. Nevertheless some explicit references to the extraction of shale gas in directives are welcome to ensure the applicability of those regulations on the activity of shale extraction.

With regards to the fact that the production methods of shale gas extraction are in a constant face of evolution, it is not an easy task to set out an effective environmental legal framework. EU Regulations or federal law might prevail in this sense above legislation such as directives that have to be implemented by individual states. The implementation period of directives might require more time before effective implementation and the risk of derogation and other implementation is present. Nevertheless, due to the fact a rather extensive amount of EU directives and regulations already establishes a coherent the EU legal framework on the environment, with some adjustments and specifications, it would be possible to set out minimum legal environmental protection against to the production of shale gas. Due to the fact that MS will remain their right to exploit their resources, it is unavoidable that some environmental aspects remain unprotected from central EU regulations.

Although federal legislation would establish a more coherence in legislation among states, the US has not succeeded in regulation the activity of shale gas extraction by HF properly. However when EPA2005 would be amended and the exceptions for shale gas extraction in other acts reneged, the US legal framework would be able to establish a more stringent environmental protection. With the existing EU environmental legal framework, more prevention for environmental harm at central level is established. Although no shale gas extraction by HF has yet taken place in the EU, the legal framework seems already be more able to protect the environment that the legal framework in the US.
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