Issue: ***The risk of contaminating ground water reserves by Hydraulic Fracturing***

Forum: ***Environmental Commission***

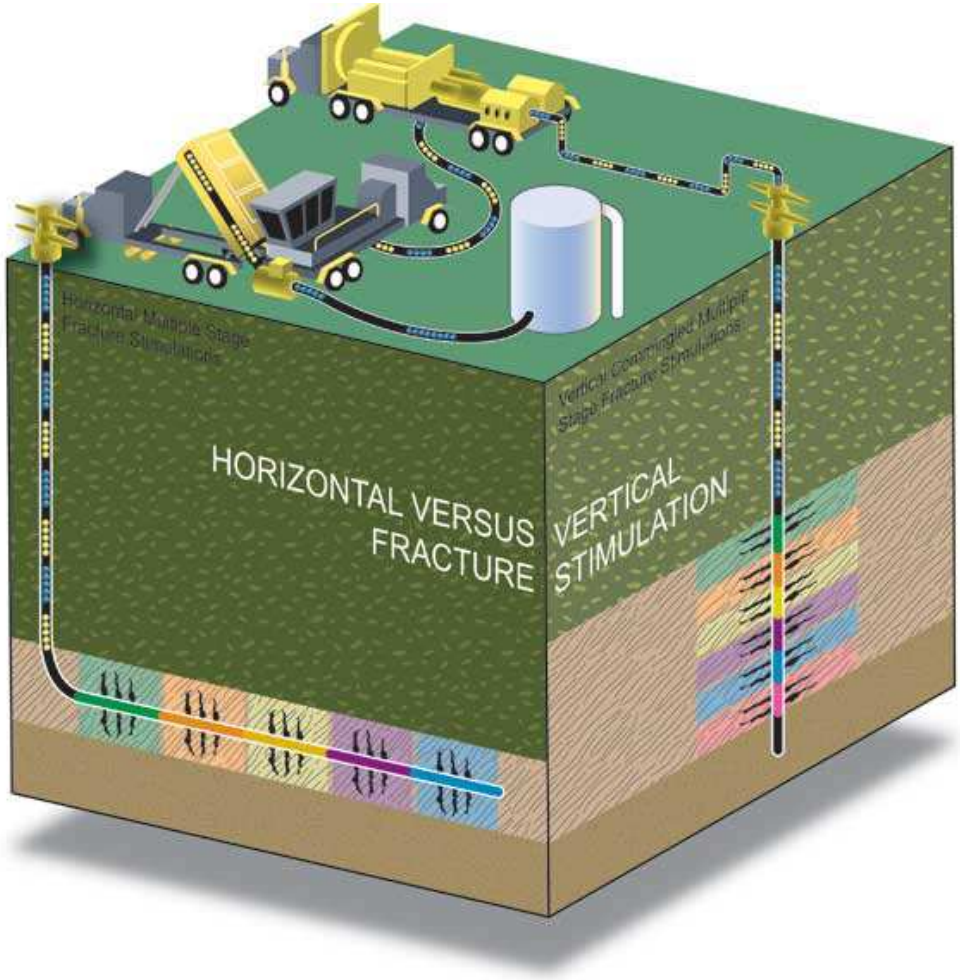
What is the problem?

Hydraulic fracturing is used for the conveyance of natural gas and mineral oil since 40 years now. The conveyance of mineral oil and especially natural gas is absolutely necessary until the “energy revolution” is concluded and the common energy sources are completely replaced by renewable energy since natural gas is much cleaner that for example coal. But due to the intensive use and conveyance of natural gas and mineral oil the reservoirs which that are best accomplishable are nearly depleted technologies are needed to reach reservoirs that are difficult to accomplish due to their deep layer. Therefore the technique of hydraulic fracturing is used which provoked international disputed between governments that advocate the use of hydraulic fracturing, energy groups that see the economic advantage of hydraulic fracturing and environmental activists and groups that see the threat hydraulic fracturing poses to the environment and especially to ground water reserves because of the use of various chemicals for each fracturing job that may escape into the groundwater system as a result of insufficient safety standards and the companies ignoring the already existing safety standards.

What is Hydraulic Fracturing?

Hydraulic fracturing is used for the extraction of the so called unconventional natural gas. There is no difference between unconventional and unconventional gas concerning the composition but the denomination only refers to the repository of the gas in place. Gases from unconventional repositories are surrounded by aquifuges whereat conventional gases lay in well permeable rock formations and can easily be produced. Since the natural gases from conventional repositories are already strongly used and the demand for natural gases is steadily increasing it is necessary to extract natural gases from unconventional repositories as well. This was enabled

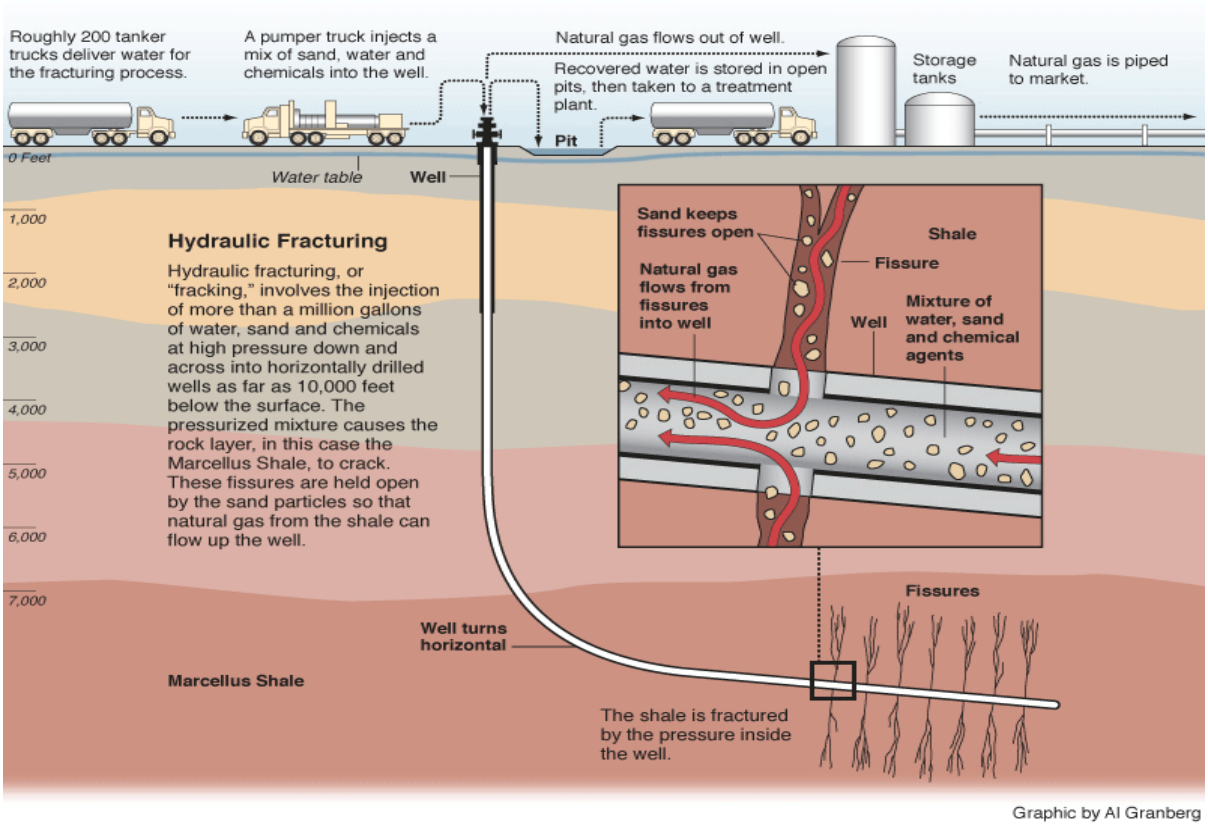
through the combination of two already existing techniques which are the technique of horizontal drilling and hydraulic fracturing.



The technique of Hydraulic Fracturing which is also commonly known as hydrofracturing or fracking is a mining technique to gain access to natural gases and oil that is located in very deep rock formations and therefore difficult to maintain. In this process a fluid is injected deep into the ground at a very high pressure. This fluid is mostly water mixed with sand and several chemicals. This technique is nowadays increasingly used because geologic formations such as tight sands, shales and coalbed methane formations contain large appearances of oil and gas but have a poor flow rate because of a low permeability which makes is complicated and demands expensive processes to gain access to these natural recourses.

How does Hydraulic Fracturing work?

The fracking process occurs after a well has been drilled and a steel pipe has been inserted as far as 10,000 feet below the earth`s surface in the well bore. Each hydraulic fracturing well requires an average of 400 tanker trucks to carry water and supplies to and from the site and it takes 1-8 million gallons of water to complete one fracturing job. This water is mixed with sand and several chemicals to create the fracturing fluid. Approximately 40,000 gallons of chemicals are used for each fracturing job. This fracturing fluid is injected at high pressure into the ground through a drilled pipeline. When the mixture of water and chemicals reaches the end of the well the high pressure causes the nearby shale rock to crack and creates fissures because the target formation will not be able to absorb the fluid as quickly as it is being injected and thus the natural gas or oil flows into the well. During this process, methane gases and toxic chemicals may leach out from the system and contaminate nearby groundwater. When the hydraulic pressure is removed from the well, small grains of for example sand or aluminum oxide hold these fractures open once the rock achieves equilibrium.



The existing risks for ground water reserves:

The technique of hydraulic fracturing requires large volumes of water which is taken from local surface or subsurface water bodies. Due to the fact that water which is used for hydraulic fracturing can be contaminated, it cannot be returned to these water bodies without extensive treatment. This permanent loss of fresh water can potentially affect water quality and availability and thereby conflicts directly with irrigation, drinking water and aquatic ecosystem needs. During the process of hydraulic fracturing various chemicals are injected in the drilled wells which may have hazardous consequences in case of a leak or spill which can occur due to a not proper storage or during the hydraulic fracturing process itself. After the hydraulic fracturing process, some of the fracturing fluid, often referred to as flowback, returns to the surface. These flowbacks contain not only the before injected chemicals but also the so called product water which is a naturally-occurring fluid that may contain hydrocarbons, heavy metals and salts, and naturally occurring radioactive materials (NORM), and therefore can be toxic. This waste water has to be stored in surface pits to prevent the toxic components from entering the groundwater system and contaminating groundwater reserves. But if these stores are inadequately regulated or constructed the hydraulic fracturing fluids are a dangerous threat for many aquatic ecosystems, for various species and furthermore the human health. The wells used for hydraulic fracturing jobs are usually constructed of steel pipes that are either completely or partly cemented to prevent the fracturing fluids, flowbacks or the gained oil or gas to escape these pipes and enter the ground water. But if these wells are improperly constructed they can act as a migration pathway for the toxic fluids to contaminate groundwater reserves.

What are the risks?

The use of chemicals during a hydraulic fracturing job is necessary since they are used to decrease attrition and to prevent bacteria from attaining to the repository of the natural gas. But due to the fact that more than 600 different chemicals are used for hydraulic fracturing at which the most common are amongst others Lead, Uranium, Radium, Methanol, Mercury, Hydrochloric Acid, Ethylene Glycol and Formaldehyde scientists and residents of hydraulic fracturing facilities are very

concerned by the risk of groundwater contamination. Experts reported that the Methane concentrations are 17 times higher in drinking-water wells near fracturing sites than in normal wells and furthermore there have been over 1,000 documented cases of water contamination next to areas of gas drilling as well as harmful effects on the human health such as sensory, respiratory, and neurological damage due to ingested contaminated water. Due to the fact that only 30-50% of the fracturing fluid is recovered, the rest of the toxic fluid is left in the ground and is not biodegradable. Therefore the technique of hydraulic fracturing has raised international environmental concerns and is challenging the adequacy of existing regulatory regimes. These concerns do not only include the risk of contaminating groundwater by hydraulic fracturing but also the risks to air quality, migration of gases and hydraulic fracturing chemicals to the surface, mishandling of waste, and the health effects of all these. Energy groups and governments that support the use of hydraulic fracturing to gain access to deep lying natural gas resources say that the chemicals used during these processes are common and generally harmless but some of the used chemicals are acknowledged i.e. by the EPA as human carcinogens and furthermore many of them are not well-described in the scientific literature which means that their possible impacts are not fully known. Even though most countries have laws that should regulate the process of hydraulic fracturing these are often not very useful since they are full of loopholes when it comes to the treatment of wastewater or the use of chemicals which are normally forbidden for other uses. Furthermore these regulations do not include the duty of hydraulic fracturing operators to disclose the chemicals they use and to report to their government. The long-term consequences of many used chemicals and of the hydraulic fracturing process itself are still not very well known but still hundreds of new wells are drilled worldwide every year. An EPA (Environmental Protection Agency) report is expected to be published in 2016 an the groundwater pollution by hydraulic fracturing which will hopefully clear up the existing risk of contaminating groundwater reserves by hydraulic fracturing.

Best practices for avoiding drinking water contamination by Hydraulic Fracturing:

There are dozens of measures that oil and gas producers can adopt to reduce the risks hydraulic fracturing poses to groundwater reserves. Below is a summary of key recommendations according to the non-profit organization Natural Resources Defense Council (NRDC):

Detailed Site Characterization and Planning

- Geologic and hydrologic mapping and risk analysis to demonstrate geologic suitability and the presence of an appropriate confining zone to inhibit vertical migration of contaminants.
- Identification of existing wellbores, determination of the integrity of those wellbores (i.e. casing, cement, plugs, etc.), and mitigation where necessary.
- Estimation of full life-cycle fresh water use.
- Estimation of full life-cycle wastewater volumes and assessment of the ability of the various disposal options to safely handle these volumes without adverse effects on the environment or human health.
- Comprehensive assessment of potential impacts to water resources used to supply hydraulic fracturing base fluid.
- Baseline water testing and ongoing monitoring of potentially affected ground and surface waters.

Chemical Disclosure

- Public disclosure on a well-by-well basis of all chemicals planned for a hydraulic fracturing operation at least 30 days beforehand, and a report on chemicals actually used within 30 days following hydraulic fracturing.

Proper Well Construction

- Best management practices for construction, cementing and casing of wells that undergo hydraulic fracturing.

- For example, ensure surface casing consists of only new pipe and will be set at least 100' below the deepest protected water and fully cemented in place to create an effective barrier.

Robust Operating & Monitoring Requirements

- Site-specific three-dimensional models of the subsurface geology to safely design and implement fracture treatments.
- Continuous monitoring of key performance indicators, such as pressures and injection rates, during hydraulic fracturing operations.
- Appropriate use of techniques to measure actual fracture growth, such as micro seismic monitoring.

Proper Water Use & Wastewater Handling

- Restrictions on water withdrawals to levels that ensure protection of ecological function and water body health.
- Recycling or reuse of flowback and produced water in lieu of using freshwater where appropriate.
- Use of closed tanks to collect flowback and produced water instead of pits.
- Routine and preventative maintenance to help prevent spills.
- Adequate buffer zones from potential sources of contamination for surface waters such as rivers, streams, and lakes, and for sensitive groundwater resources.
- Adequate treatment of waste water before discharge; no discharge to publicly owned treatment works; stricter requirements for siting, constructing, operating, monitoring, and closing disposal wells; and no road spreading of wastewater.

United Nations Environment Program:

The United Nations Environment Program (UNEP) which was established in 1972 is the organ responsible for environmental issues within the United Nations. The UNEP

is publishing annual reports on their research and work to help developing a wise and sustainable use of the global environment and its resources. UNEP has raised their concern about hydraulic fracturing several times since they estimate it beside its economic and energy security benefits as harmful to not only groundwater reserves but also for example to biodiversity and ecosystems as a whole. And furthermore they consider these possible impacts of hydraulic fracturing as a threat to public health. Therefore they see the need to strengthen the existing regulations on hydraulic fracturing since the already existing ones are insufficient and new policies and technical considerations have to be made to secure the environment from possible harmful impacts of hydraulic fracturing. The UNEP elaborates detailed on this topic in their latest published report on hydraulic fracturing from November 2012 with the headline: Gas fracking: can we safely squeeze the rocks?

United States Environmental Protection Agency (EPA):

The EPA is an independent agency of the US government to monitor and secure the environment and human health. They were founded by President Nixon in November 2nd 1970 and today employ 17.000 employees. The EPA has published reports and statements on hydraulic fracturing, its possible environmental effects and other related issues so far and a further report is to be published in 2016. Their work covers the education of people concerning environmental issues, publishing information, doing research on environmental issues and furthermore working together with the US government by setting standards for laws that are written by the congress and NGOs to strengthen their work and make it more effective. Regarding to the issue of hydraulic fracturing EPA mainly aims to improve the scientific understanding of the technique and thereby reduce the risk of a possible contamination of groundwater reserves to its minimum. Since EPA is an organization that only operates in the USA its reports and researches only influences the US policy concerning hydraulic fracturing so far and does not research in any other countries.

Other involved organizations and countries:

The USA is one of the most important parties concerning hydraulic fracturing. They were one of the first countries to use this technique to gain access to unconventional natural gases and today are using it very intensively. Therefore they already have many existing regulations on this issue which may be considered as a basis for international standards that are necessary. Due to their long usage of hydraulic fracturing and the research of EPA the environmental and health effects of this technique are well known. Further countries that use hydraulic fracturing are for example Norway, Spain, Russia and the Ukraine. But besides these countries that use hydraulic fracturing there are several countries that have completely banned it. These are for example France, Italy and Australia. Since many citizens not only in the USA but for example in many European countries strongly oppose the use of hydraulic fracturing, especially when drilling a well is planned near their houses or the groundwater reserves they use. Many national organizations and action groups were formed when the use of hydraulic fracturing was discussed by their governments. These groups mostly demand a total ban of hydraulic fracturing.

Timeline of events

- 1860s: Fracturing as a method to stimulate shallow, hard rock oil wells is firstly used
- 1930s: The idea to use acid as a non-explosive fluid for well stimulation was introduced
- 1947: The relationship between well performance and treatment pressures was studied by Floyd Farris of Stanolind Oil and Gas Corporation. This study became a basis of the first hydraulic fracturing experiment
- 1949: The patent and exclusive license for hydraulic fracturing was granted to the Halliburton Oil Well Cementing Company (USA)
- 1968: Pan American Petroleum applied the first massive hydraulic fracturing treatment in Stephens County, Oklahoma, USA
- 1970s: Massive hydraulic fracturing quickly spread to western Canada, Germany, Netherlands on onshore and offshore gas fields, and the United Kingdom sector of the North Sea
- 1991: The first horizontal well was drilled in the Barnett Shale

- 2004: EPA publishes the Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs
- 2011: The UN General Assembly informs the Human Rights Council that the environmental damage caused by hydraulic fracturing for natural gas poses “a new threat to human rights”
- 2013: Massive hydraulic fracturing is used on a commercial scale to shales in the United States, Canada, and China and several further countries are planning to use hydraulic fracturing for unconventional oil and gas production
- 16 July 2014: UNAI is hosting a convention on hydraulic fracturing

List of important documents:

- A Human Rights Assessment of Hydraulic Fracturing for Natural Gas, Environment and Human Rights Advisory
- UNEP Global Environmental Alert Service (GEAS): Gas fracking: can we safely squeeze the rocks? → http://www.unep.org/pdf/UNEP-GEAS_NOV_2012.pdf
- (225 ILCS 732/) Hydraulic Fracturing Regulatory Act
- Safe Drinking Water Act by the USA
- Intervention on the Issue of Hydrofracking, Presented by the Haudenosaunee to the United Nations Permanent Forum on Indigenous Issues → http://www.ailanyc.org/wp-content/uploads/2010/09/Hydrofracking-Intervention.pdf
- Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs Study (2004) by the EPA

Helpful links & "how to prepare as a delegate"

http://www.unep.org/

http://mmun.nse.cn/sites/mmun.nse.cn/files/UNEP%202.pdf

http://www2.epa.gov/hydraulicfracturing

Sources

http://www.dangersoffracking.com/

http://en.wikipedia.org/wiki/Hydraulic_fracturing

www.propublica.org/special/hydraulic-fracturing-national

http://www2.epa.gov/hydraulicfracturing/process-hydraulic-fracturing

http://www.earthworksaction.org/issues/detail/hydraulic_fracturing_101#.U4nUrXJ_s-k

http://fracfocus.org/hydraulic-fracturing-how-it-works/hydraulic-fracturing-process

http://www.nrdc.org/water/fracking-drinking-water.asp

http://www.nebone.gc.ca/clfnsi/archives/rnrgynfmtn/nrgyrprt/ntrlgs/prmrndrstndngshlgs2009/prmrndrstndngshlgs2009-eng.html#s8

https://academicimpact.un.org/content/unai-host-conversation-fracking-16-july

Questions the delegate should consider while doing research

- Does my country use Hydraulic Fracturing as a method to gain access to deep-seated oil and gas resources?
- Is my country advocating or opposing the use of hydraulic fracturing?
- Does my country depend on fossil fuels?
- What are my countries arguments to justify the use of Hydraulic Fracturing?
- If my country is against Hydraulic Fracturing how does it justify this position?
- Is the access to resources or the possible impact on groundwater reserves preferential for my country?
- If my country advocates/ already uses hydraulic fracturing which safety standards, rules etc. does it think are necessary to ensure a safe use?