

Environmental Impacts of the Planned Colorado Piceance Basin Oil Mining Project

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The primary goal of all mining operations is to extract valuable mineral resources found on or under the earth's surface. The profits gained from minerals extracted often hinder people from facing other impacts that the mining operations bring about. The mining process brings about both positive and negative effects on the environment, the earth's structure, and the hydrosphere.

	Irreversible effects	Synergistic effects	Positive effects.
lithosphere	The extraction process will modify the appearance of the landscape through soil erosion and deposition.	Changes in the chemical composition of the soil, such as pH, are due to the effects of chemical spillage.	Modification of the lithosphere aids in achieving land stability, which prevents disasters like landslides.
hydrosphere	Acid mine drainage and oil contaminations could leave the water bodies unsafe for human and animal consumption.	Oil and acid spillage in water bodies affects the water's air capacity, lowers the pH, and affects the conducive requirements for marine life survival.	The oil shale is found below the water table, and during the extraction of oil, underground water has to be pumped to the surface to avoid flooding.
Atmosphere	Carbon monoxide and carbon dioxide gases released by the machinery involved in the extraction process could lead to global warming.	The carbon oxides and nitrogen oxide gases released into the atmosphere react with the ozone layer, reducing its effect of screening harmful sun rays.	The Colorado Piceance Basin, oil mining project, can, however, use special filters to control the emission of carbon oxide gases and also plant numerous trees to facilitate carbon dioxide elimination.

Main Environmental Impacts of the Planned Colorado Piceance Basin Oil Mining Project

The proposed Colorado Piceance Basin oil mining project will modify the mining area in a couple of ways. These modifications will bring about both negative and positive impacts on the environment. However, oil mining projects can ensure that they are environmentally sustainable by coming up with strategies to prevent and reduce the effects of the mining procedures. The environmental impacts that are likely to be experienced due to the Colorado Piceance Basin oil mining project include loss of biodiversity, climate change, erosion, and formation of sinkholes. The measures are recommended for the Colorado Piceance Basin oil mining project since they are economically advantageous. For instance, it is cheaper to prevent the occurrence of soil erosion than to reverse the effects of soil erosion. Some of the practices that the Colorado Piceance Basin oil mining project can employ include reducing the amount of waste output, water conservation, use of clean, renewable energy, and minimizing land disturbance. The Colorado Piceance Basin, an oil mining project, can also prevent soil erosion and harmful gas emissions. The last alternative measure that could be applied is the successful reclamation of mined lands (Ashraf 2011, 1240).

Minimal Land Disturbance

The exploratory drilling, site preparation, and clearance will require vast sizes of land. The Colorado Piceance Basin, oil mining project, will need to find measures and alternatives to minimize the amount of land under exploitation. To start with, the project should reduce the overall footprint of the mining area. Footprint areas under mining can be reduced if only the areas identified during exploratory drilling that possess the oil shale are exploited. The project should use modern offshore and onshore drilling rigs that occupy less space compared to the previous drilling technologies. The advanced technologies are considered to conduct what is commonly known as clean mining. They are also more efficient regarding space conservation and output delivery. Another alternative that the project can utilize in efforts to achieve minimal land disruption is performing experiments and studies such as seismic studies of the area. These studies and trials help discover the exact areas with the full potential for oil exploitation, and the project can exploit the specific areas identified rather than exploit different positions that do not possess the oil shale. Minimal land disturbance helps us to prevent environmental impacts such as the loss of biodiversity and erosion of the lithosphere. (Ashraf 2011 1220).

Renewable Energy

The Colorado Piceance Basin oil mining project is a very energy-intensive operation. The extraction of oil from the shale and construction of the required infrastructures, such as site offices, powerhouses, and drilling rigs, require the use of diesel-driven trucks and excavators. The project can use clean,

renewable energy from renewable sources such as hydroelectricity to drive this equipment. To start with, most of the renewable energy sources are cheaper compared to fossil fuels (coal and petroleum products), and this will increase the project's profit levels. Renewable energy is also advantageous since its operation does not lead to the formation of harmful carbon dioxide and carbon monoxide. The project should consider the installation of solar panels and wind turbines to produce environmentally friendly energy. Despite the high initial installation costs, the two sources of energy are excellent alternatives to fossil energy since their operational and maintenance costs are low.

Reduced Waste Output

The Colorado Piceance Basin, oil mining project, should take into consideration that it will be producing thousands of tons of waste. The plan should develop significant waste management schemes to control its solid, liquid, and gaseous waste. First, the project should recycle some of the waste. For example, contaminated water can be treated and reused in the plant. Another alternative is that the project requires designing appropriate waste storage facilities. Some of the recommendations under waste control are expensive to implement, but the process of cleaning up the effects of irresponsible waste management is more costly. Proper waste management will also aid in minimizing land disturbance. Vast dumpsites will not be constructed as most of the waste is recycled. For example, the recycling of contaminated water eliminates the need to build vast pools to hold it. The Colorado Piceance Basin, oil mining project, can also reduce the amount of waste produced through process re-engineering. The process of process re-engineering works by identifying the operations that should be modified to reduce their waste output (Holmes 2001 74).

Water Conservation

Oil extraction processes require large amounts of water to run. This is evident in the Colorado Piceance Basin oil mining project since the plant will need 323,000 gallons of water to produce 1.55 million barrels of oil. The planned mining process will have adverse impacts on the surrounding surface and groundwater. Water conservation is one of the primary strategies that the Colorado Piceance Basin oil mining project can utilize. Water conservation is advised without regard to the location of the site. Recycling of water is the most effective method of water conservation. Statistics show that mining industries save up to 33% of water intake due to recycling. The project can also divert ground waters such as rivers to prevent the likelihood of them getting contaminated. Since the oil shale is below the water table, the Colorado Piceance Basin oil mining project can pump the groundwater for industrial purposes. The groundwater will not only increase the quantity of water available but will also improve the quality of water the plant can use. With the project using groundwater, there will be enough water downstream for the marine ecosystem and other municipal water utilities. Water conservation is helpful, especially in arid and semi-arid areas. The Colorado Piceance Basin, oil mining project, also runs at a high level, causing acid rock drainage (ARD) in the water sources near the mine. The project needs to come up with advanced technology to detect,

prevent, and resolve acid rock drainage. To manage ARD, the scheme should cover waste rocks and store the sulfide rocks below the water table to ensure that the rock will never be in contact with water. Another possible alternative to controlling ARD is mixing the acidic rock solution with acid-buffering materials to counter its effect. (Hendryx 2009 360).

Restoring Environmental Functions At The Mine Site.

The location of oil shale is dynamic, and the mining process at certain places could be temporary. As the project shifts from one point of extraction to another, it should leave the departed site in a suitable condition for human and wildlife re-use. Filling of sinkholes using debris drilled from the new extraction site is the best way of reclaiming the appearance of the landscape. Another alternative is the planting of trees to try and retrieve the lost biodiversity. (O'Rourke 2003 794).

The impact of the planned Colorado Piceance Basin oil mining project to the environment could be reversed if the project utilized some of the alternatives addressed in this paper. Some non-profit organizations such as the newly created Clean Mining Alliance also highly recommend the above alternatives when undertaking oil extraction. Greenhouse gas emissions should also be controlled. To ensure a successful reclamation process of affected environments, The Colorado Piceance Basin project should reconstruct the appearance of the landscape, plant trees and ensure that all sinkholes have been filled. However, the proposed alternatives do not guarantee 100 percent environment protection. For example, the appearance of the landscape cannot be reconstructed exactly to the original shape. Despite the protective measures being expensive, the oil mining company should incorporate all the required specification to ensure that it's operation do not have adverse impacts on the environment.

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