1. Considering what you already know about the theme, and after some research, answer the following questions:
   1. What are the main differences between a renewable and a non-renewable energy? To help you answer, use the table below, to indicate the advantages and disadvantages of each presented energies (renewable and non-renewable). **Note:** it is possible to access the links below on the section “To Learn More…”. Use the respective keyword to find information about this question).

|  |  |  |
| --- | --- | --- |
|  | **Advantages** | **Disadvantages** |
| **Oil** | -Easy to obtain  -Lots of possibilities to use  -Relatively cheap  -Always available (e.g., wind energy has specific periods when it can be used)  -High calorific value | -Environment problems such as CO2 emissions and GHG rise  -Water pollution  -Oil refining produces highly toxic substances, such as CO  -It will, eventually, run out |
| **Natural gas** | -Cheaper than oil  -It is the fossil fuel less detrimental to the environment (but still has problems)  -Its storage is easier when compared to other energies (e.g., solar and wind) | -Its conversion process is slow  -Environmental problems such as CO2 emissions and GHG rise  -Water pollution  -Produces highly toxic substances such as CO  -It will, eventually, run out  -It is extremely flammable |
| **Coal** | -Easy to obtain  -Lots of possibilities to use  -Relatively cheap  -Can be used in its liquid and gaseous form  -Frequently used in ironworks and metallurgical industries  -Easy to use (e.g., to cook)  -Its storage is easier when compared to other energies (e.g., solar and wind) | -Environmental problems such as CO2 emissions and GHG rise  -Water pollution  -It will, eventually, run out  -Coal refining produces highly toxic substances, such as CO  -Its exploration produces noise pollution and can originate exposure to high levels of radiation  -Long term, regions where coal is explored become inhabitable |
| **Solar energy** | -Renewable  -Clean energy (its use reduces GHG and CO2 going to the atmosphere)  -Reduction of monthly electricity costs | -Its exploration can lead to deforestation  -Limited time to explore it (limited solar exposure during certain times of the day)  -Its storage can be complex |
| **Water energy** | -Renewable  Clean energy (its use reduces GHG and CO2 going to the atmosphere)  -Reduction of monthly electricity costs  -Constant production of energy, not a lot of variation | -Environmental consequences, such as transition of the migration flow of birds and marine species, as well as changing the natural flow of rivers  -High initial costs  -The area for the reservoir is limited  -Risks of interruptions due to extreme climate phenomenon such as drought |
| **Wind energy** | -Renewable  -Clean energy (its use reduces GHG and CO2 going to the atmosphere)  -Production process is automatic, once it starts  -Small production costs | -Its exploration can cause problems to wild species due to blades from the turbines and the noise pollution  -Noise pollution  -High initial costs  -Risks of interruptions due to lack of wind |

* 1. Considering the answers given in 1.1., how does the use of these sources lead to problems such as climate change and air pollution?

It should be concluded that the exploitation of some energy sources, such as fossil fuels, can lead to the worsening of problems such as climate change and air pollution due to the high emissions of C02 and GHG (greenhouse gases) when exploiting them.

* 1. Considering the answers given in 1.1., would you say that renewable energies are always better than non-renewable energies? Justify tour answer.

This question intends for students to reflect factually on an issue that is often taken as the utmost truth, namely, that renewable energy is always better than non-renewable energy. However, there is no doubt that the exploitation of renewable energies, from the point of view of reducing GHG and CO2 emissions to the atmosphere, presents itself as an advantage over non-renewable energies, also combining the fact that they are, as the name indicates, renewable (inexhaustible). Even so, as verified in the table in question 1.1, renewable energies present some environmental problems, such as deforestation and alteration of the migration of marine species and birds, as well as economic problems, such as their high initial costs, and also some production problems, such as production inconstancy, for example, in solar and wind energy

**To Learn More…**

If you would like to explore further about this class theme, on the Keywords Table there are several links available, with additional information, related to each keyword. To access this information, click on the corresponding link on the section “References”.

**Keyword Table**

|  |  |
| --- | --- |
| **Keywords** | **Reference Number** |
| Advantages and disadvantages of solar energy | **[1]** |
| Advantages and disadvantages of wind energy | **[2]** |
| Advantages of water energy | **[3]** |
| Advantages and disadvantages of non-renewable energies | **[4]** |
| Advantages of renewable energies | **[5]** |
| Advantages and disadvantages of Oil | **[6]** |
| Advantages and disadvantages of coal | **[7]** |
| Advantages and disadvantages of natural gas | **[8]** |

**References**

**[1]** <https://www.empower-solar.com/blog/the-advantages-disadvantages-of-switching-to-solar-energy/>

**[2]** <https://www.energy.gov/eere/wind/advantages-and-challenges-wind-energy>

**[3]** <https://www.solarreviews.com/blog/hydroelectric-energy-pros-and-cons>

**[4]** <https://greengarageblog.org/21-advantages-and-disadvantages-of-non-renewable-energy>

**[5]** <https://www.un.org/en/climatechange/raising-ambition/renewable-energy>

**[6]** <https://www.4gas.com/advantages-disadvantages-using-oil-energy/>

**[7]** <https://eartheclipse.com/energy/advantages-disadvantages-of-coal.html>

**[8]** <https://group.met.com/en/media/energy-insight/advantages-and-disadvantages-of-natural-gas>