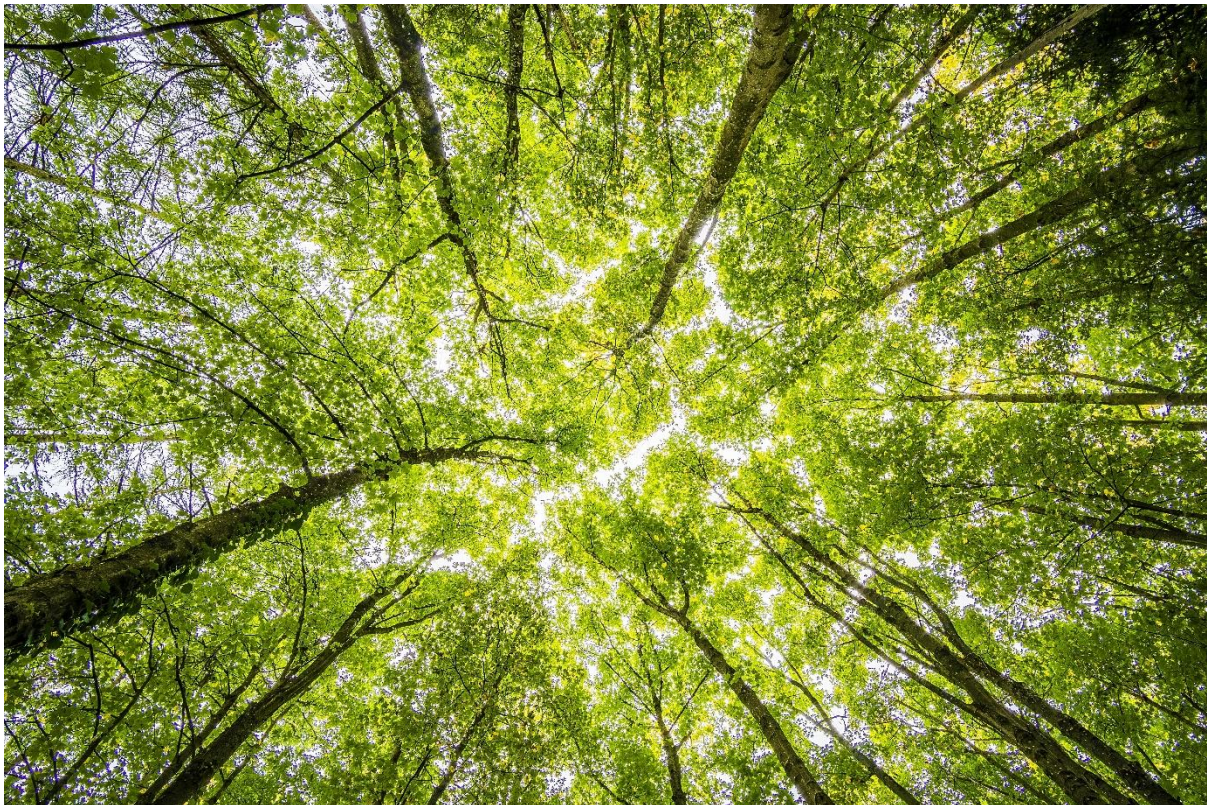


Think Biobased Lesson Plan

Contents of this document:

- An introduction to the topic of this lesson
- Lesson Plan
- References

Introduction



The global population is growing, and this has an impact on the environment. To ensure that there are enough food, water and prosperity in 2050, it is vital that we switch from a linear to a circular economy, to help mitigate our impact on our environment. A biobased economy is defined as a public good-orientated biobased economy based on production paradigms that rely on biological processes and simultaneously expend minimum amounts of energy and keep waste to a minimum as any waste produced by one process can be used as inputs for another process and therefore kept in the biological resource loop. The biobased resources used in this economy are of biological origin and stem from biomass. This biomass can be untreated or may have undergone physical, chemical or biological treatment. However, fossil based biomass, is created through geological processes that occurred several million to billion

years ago. In 2014, the fossil reserves exceeded global energy consumption of 540 EJ by 70 times. However, it is expected that crude oil, which makes up 24% of the reserves is expected to be the first reserve to be depleted.

The bioeconomy is expected to drive the transition towards a more sustainable economy by addressing some of the major global challenges such as food security, climate change and resource scarcity. The bioeconomy exploits new resources by building on renewable biomass sources. Through this, the introduction of innovative and resource use efficient production technologies and the transition to a sustainable society, this helps to substitute or reduce the use of limited fossil resources, thereby contributing to climate change mitigation. Governments play a pivotal role in the transition to a biobased economy. We as citizens can also participate. Lifestyle changes can have a positive impact if we switch to more biobased products. For this reason, we have focused this lesson, on the environmental consequences of choosing biobased products in one's daily personal care routine and how this small foundationally habit can help people switch to a more biobased lifestyle.

Lesson Plan

This lesson plan has been developed for use in classrooms for secondary level education

Introductory video

A link to the introductory video for this lesson can be found here:



<https://www.youtube.com/watch?v=ihSqSDGqPJY&feature=youtu.be>

Quiz

The following quiz can be used to consolidate the information learned during the lesson and to generate discussion:

Question	Choices	Answer explained
What is a bioeconomy?	<p>A. The study of biological processes and economics</p> <p>B. An economy based on the use of renewable raw materials</p> <p>C. Our current economy</p>	<p>B. An economy based on the use of renewable raw materials</p> <p>A biobased economy is defined as a public good-orientated biobased economy based on production paradigms that rely on biological processes and simultaneously expend minimum amounts of energy and keep waste to a minimum as any waste produced by one process can be used as inputs for another</p>

		process and therefore kept in the biological resource loop.
True or false , biobased products can replace fossil-based products currently on the market?	A. True B. False	A. True
True or false , biobased products are better for the environment?	A. True B. False	A. True
Are biobased products easily recyclable and biodegradable?	A. Seldom B. Often C. Never	B. Often Biobased products are frequently recyclable, but not always and most products biodegrade but not always
What type of biomass can be used to make biobased products?	A. Algae B. Food waste from households and supermarkets C. Forestry residues D. All of the above	D. All of the above Biobased products can be made from a large variety of biomass sources.
<i>You can take a break to discuss the first five questions before moving on to the next part of the quiz</i>		
With regards to the biobased lifestyle, in which ways do you think you can have the most impact on your environment?	A. Taking conscious efforts to reduce your own consumption and using biobased products B. Using biobased products and advocating for others to use it as well. C. Campaigning for corporations and governments to lead the change D. Taking conscious efforts to reduce your own	D. Taking conscious efforts to reduce your own consumption and using biobased products. Advocating for others to use it as well and campaigning for corporations and governments to lead the change. This choice is the most correct answer, the more actions you do relating to this sort of sustainability, will more likely lead to an optimum result.

	<p>consumption and using biobased products. Advocating for others to use it as well and campaigning for corporations and governments to lead the change.</p>	
<p>Why do you think that an unsustainable way of life is more popular today?</p>	<ul style="list-style-type: none"> A. Convenience B. Expense of the products C. Lack of knowledge about the alternatives D. It's become social convention E. A combination of the factors above 	<p>E. A combination of the factors above</p> <p>There are many factors which contribute to the current lifestyle of most people. Typically, all these factors play a role in varying degrees for different stakeholders and / or consumer groups.</p>
<p>What do you see as the biobased economy solution to coffee cups?</p> 	<ul style="list-style-type: none"> A. Conventional single use Fossil-based coffee cup B. Biobased solution like an edible coffee cup or a coffee cup made from coffee grounds C. Reusable coffee cup fossil based or biobased 	<p>B. Biobased solution like an edible coffee cup or a coffee cup made from coffee grounds</p> <p>Generally, biobased products which can easily be recycled and are biodegradable with low impacts on the environment are preferred.</p>
<p>What do you see as the biobased economy solution to cell phone cases?</p> 	<ul style="list-style-type: none"> A. Conventional Fossil-based cell phone case made from virgin material B. Bamboo phone case or other easily recyclable biobased phone case C. Phone case made from recycled fossil materials 	<p>B. Bamboo phone case or other easily recyclable biobased phone case</p> <p>Generally, biobased products which can easily be recycled and are biodegradable with low impacts on the environment are preferred.</p>
<p>How do you think you can benefit by switching to a biobased lifestyle?</p>	<p>(Open question)</p>	<p>This part of the quiz is not graded</p>

Discussion



This can be done in groups in the classroom or discussed together as a class:

Think of a typical product commonly used during school or in your classroom. Is it biobased? Is it sustainable? Describe the ways in which this product can become biobased and what hinderance a company might have in realising this goal?

Additional Resources

The following are links to additional videos and online sources that can be used as

Biochallenge Game:

- <http://www.fvaweb.eu/biochallenge/>

Bioeconomy Strategy Game:

- <http://www.fvaweb.eu/bes/>

'The bioeconomy in our everyday lives – BIOWAYS' Video:

- <https://www.youtube.com/watch?v=ir3MgOSmvLg>

'The Bioeconomy starts here!' Video:

- <https://www.youtube.com/watch?v=2xvXkOMRTs4>

References

- BioBased Economy. (2018). *Biobased Economy*. Retrieved from BioBased Economy: <http://www.biobasedeconomy.eu/>
- De Meester, S., Callewaert, C., De Mol, E., Van Langenhove, H., & Dewulf, J. (2011). The resource footprint of biobased products: a key issue in the sustainable development of biorefineries. *Biofuels, Bioproducts & Biorefining*, 5(5).
- European Commission. (2011). *Bio-based Economy in Europe: state of play and future potential - part 2*. European Commission.
- Government of the Netherlands. (2018). *From a Linear to a Circular Economy*. (Government of the Netherlands) Retrieved from Government of the Netherlands: <https://www.government.nl/topics/circular-economy/from-a-linear-to-a-circular-economy>
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- Lewandowski, I. (2018). *Shaping the Transition to a Sustainable, Biobased Economy*. Springer International Publishing.

THINK BIOBASED!

INTRODUCTION



The global population is growing, and this has an impact on the environment. To ensure that there are enough food, water and prosperity in 2050, it is vital that we switch from a linear to a circular economy, to help mitigate our impact on our environment. A biobased economy is defined as a public good-orientated biobased economy based on production paradigms that rely on biological processes and simultaneously expend minimum amounts of energy and keep waste to a minimum as any waste produced by one process can be used as inputs for another process and therefore kept in the biological resource loop. The biobased resources used in this economy are of biological origin and stem from biomass. This biomass can be untreated or may have undergone physical, chemical or biological treatment. However, fossil-based biomass, is created through geological processes that occurred several million to billion years ago. In 2014, the fossil reserves exceeded global energy consumption of 540 EJ by 70 times. However, it is expected that crude oil, which makes up 24% of the reserves is expected to be the first reserve to be depleted.



The bioeconomy is expected to drive the transition towards a more sustainable economy by addressing some of the major global challenges such as food security, climate change and resource scarcity. The bioeconomy exploits new resources by building on renewable biomass sources. Through this, the introduction of innovative and resource use efficient production technologies and the transition to a sustainable society, this helps to substitute or reduce the use of limited fossil resources, thereby contributing to climate change mitigation. Governments play a pivotal role in the transition to a biobased economy. We as citizens can also participate. Lifestyle changes can have a positive impact if we switch to more biobased products. For this reason, we have focused this lesson, on the environmental consequences of choosing biobased products in one's daily personal care routine and how this small foundationally habit can help people switch to a more biobased lifestyle.

QUIZ

Part I

Question	Options
What is a bioeconomy?	<ul style="list-style-type: none">A. The study of biological processes and economicsB. An economy based on the use of renewable raw materialsC. Our current economy
<i>True or false</i> , biobased products can replace fossil-based products currently on the market?	<ul style="list-style-type: none">A. TrueB. False
<i>True or false</i> , biobased products are better for the environment?	<ul style="list-style-type: none">A. TrueB. False
Are biobased products easily recyclable and biodegradable?	<ul style="list-style-type: none">A. SeldomB. OftenC. Never
What type of biomass can be used to make biobased products?	<ul style="list-style-type: none">A. AlgaeB. Food waste from households and supermarketsC. Forestry residuesD. All of the above

Part II

Question	Options
<p>With regards to the biobased lifestyle, in which ways do you think you can have the most impact on your environment?</p>	<ul style="list-style-type: none"> A. Taking conscious efforts to reduce your own consumption and using biobased products B. Using biobased products and advocating for others to use it as well. C. Campaigning for corporations and governments to lead the change D. Taking conscious efforts to reduce your own consumption and using biobased products. Advocating for others to use it as well and campaigning for corporations and governments to lead the change.
<p>Why do you think that an unsustainable way of life is more popular today?</p>	<ul style="list-style-type: none"> A. Convenience B. Expense of the products C. Lack of knowledge about the alternatives D. It's become social convention E. A combination of the factors above
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How do you think you can benefit by switching to a biobased lifestyle?

DISCUSSION



In a group or as a class, think about the following and discuss it together:

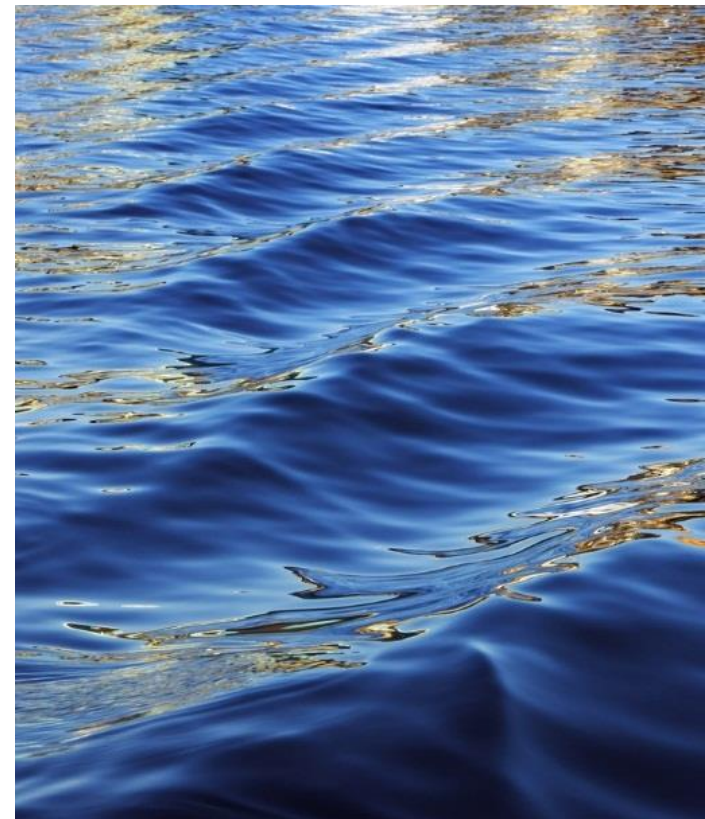
Think of a typical product commonly used during school or in your classroom. Is it biobased? Is it sustainable? Describe the ways in which this product can become biobased and what hinderance a company might have in realising this goal?

REFERENCES

- BioBased Economy. (2018). *Biobased Economy*. Retrieved from BioBased Economy: <http://www.biobasedeconomy.eu/>
- De Meester, S., Callewaert, C., De Mol, E., Van Langenhove, H., & Dewulf, J. (2011). The resource footprint of biobased products: a key issue in the sustainable development of biorefineries. *Biofuels, Bioproducts & Biorefining*, 5(5).
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- Lewandowski, I. (2018). *Shaping the Transition to a Sustainable, Biobased Economy*. Springer International Publishing.



**THINK
BIOBASED!**



Contents

- What is a biobased economy?
- Video
- Quiz
- Discussion

What is a Biobased Economy?

- A biobased economy is an economy that uses resources that are mainly from biomass
- It uses renewable raw materials



Video

Link: <https://www.youtube.com/watch?v=ihSqSDGqPJY&feature=youtu.be>





Quiz Part I



Quiz Answers

• **B**

• **A**

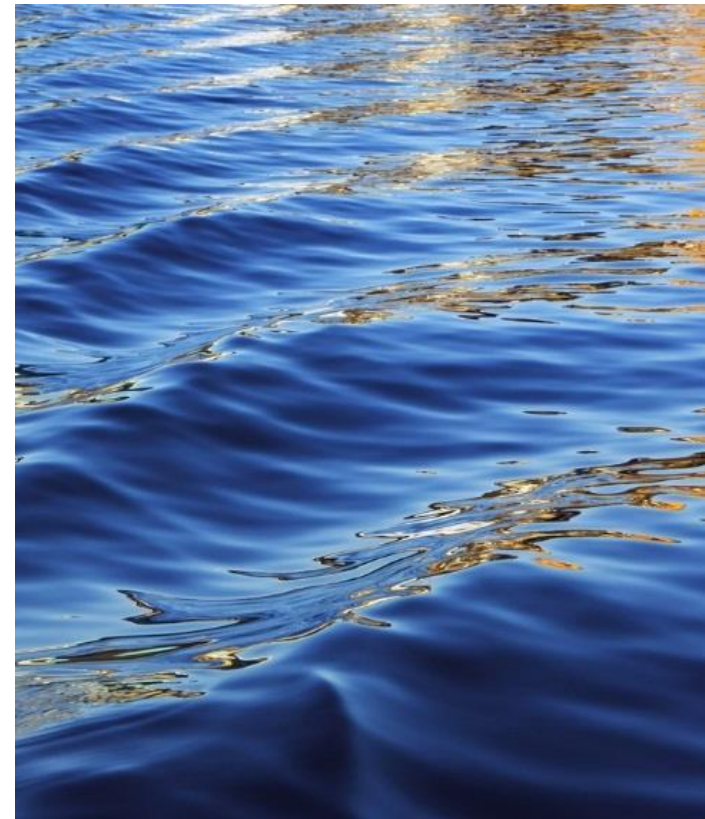
• **A**

• **B**

• **D**



Quiz Part II



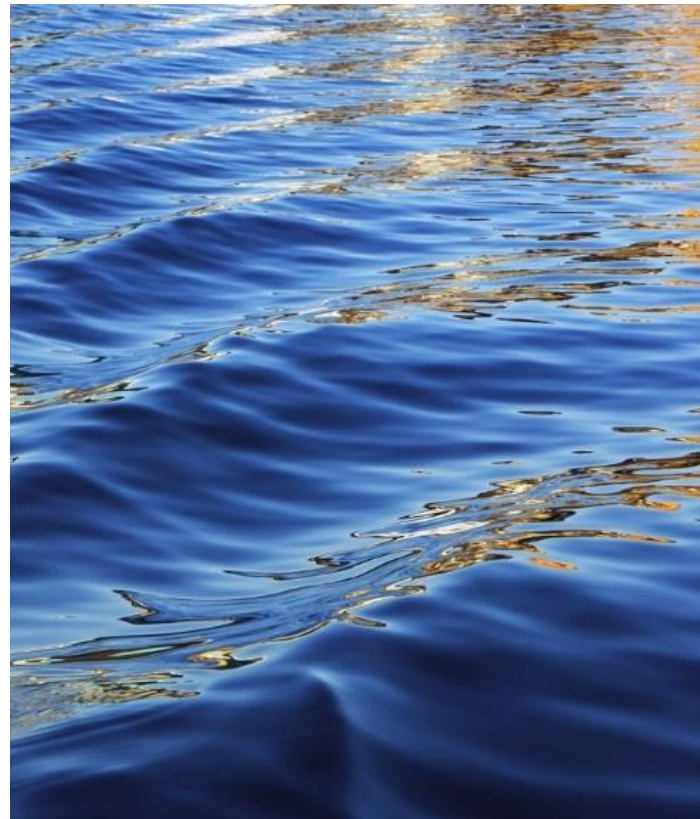
Quiz Answers

• **D**

• **E**

• **B**

• **B**



Discussion

Think of a typical product commonly used during school or in your classroom. Is it biobased? Is it sustainable? Describe the ways in which this product can become biobased and what hinderance a company might have in realising this goal?

Additional

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