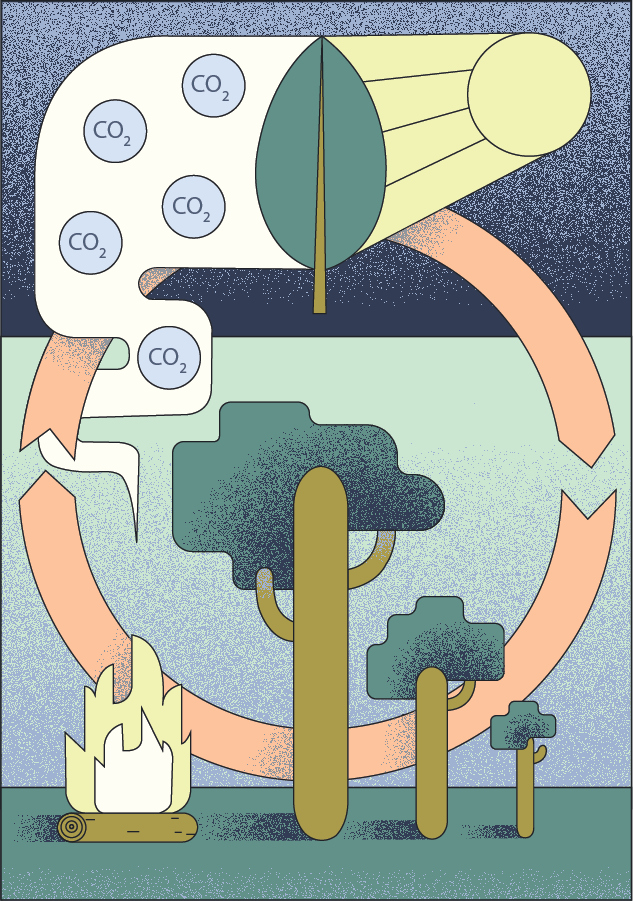
## **Abschätzung des Beitrags der Biomasse zur Energiewende**



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#[Wärmelehre](https://www.lehrplanplus.bayern.de/fachlehrplan/realschule/10/physik/wpfg1) #Wärmekraftwerke #[Energieversorgung](https://www.lehrplanplus.bayern.de/fachlehrplan/realschule/10/physik/wpfg1) #Energieträger

#Grundwissen zu Flächenumrechnungen #Energie #Energieformen #Wirkungsgrad

Bioenergie– Arbeitsblatt – Seite 1 von 2

1. In der Abbildung rechts ist der Kohlenstoffkreislauf dargestellt. Nenne  
   die bei **1** und **2** auftretenden Energieumwandlungen und Energieformen.

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1. Nimm dazu Stellung, inwieweit man Biomasse als CO2-neutral beschreiben kann.

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1. Ein Bild, das Karte enthält.

   Automatisch generierte BeschreibungBerechne jeweils mit Hilfe der nebenstehenden Abbildung, welche Fläche in Deutschland landwirtschaftlich genutzt wird, bzw. von Wald bedeckt ist.

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1. Ein Bild, das Pflanze, Feld enthält.

   Automatisch generierte BeschreibungZur Herstellung von Biomasse verwendet man unter anderem Mais, Pappel oder Raps. Diese wandeln mit einem durchschnittlichen Wirkungsgrad von maximal 0,5 % die Strahlungsenergie der Sonne in chemische Energie um. Die Sonne stellt in Deutschland eine Energie von pro pro Jahr zu Verfügung.
2. Bestimme damit die Energie, die pro in einem Jahr durch die Nutzung von Biomasse zur Verfügung steht.

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1. Bestimme die Energie, die in einem Jahr durch Biomasse zur Verfügung gestellt werden kann, wenn 30 % der landwirtschaftlichen Fläche *(siehe Aufgabe 3)* zum Anbau dafür genutzt werden kann.

Bioenergie– Arbeitsblatt – Seite 2 von 2

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1. Wälder wandeln die Strahlungsenergie der Sonne *(E = 1000 kWh pro m² pro Jahr)* mit einem Wirkungsgrad von maximal 0,35 % in chemische Energie um.
2. Bestimme damit die Energie, die pro in einem Jahr durch die Nutzung von Holz zur Verfügung steht.

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1. Bestimme die Energie, die in einem Jahr durch Holz zur Verfügung gestellt werden kann, wenn 40 % der Waldfläche dafür genutzt werden.

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***Hinweis:*** *Eine „Nutzung von 40 %“ bedeutet* ***nicht****, dass jedes Jahr 40 % der gesamten Waldfläche dafür geerntet werden müssen! Da die Bäume die Strahlungsenergie der Sonne in chemische Energie umwandeln, speichern sie die Energie langfristig. Wenn man einen Baum fällt und thermisch verwertet, nutzt man die gesamte Energie, die der Baum im Laufe seines Lebens eingespeichert hat. Daher genügt es, wenn man jährlich nur einen kleinen Bruchteil der Bäume von der 40%igen Nutzfläche fällt.*

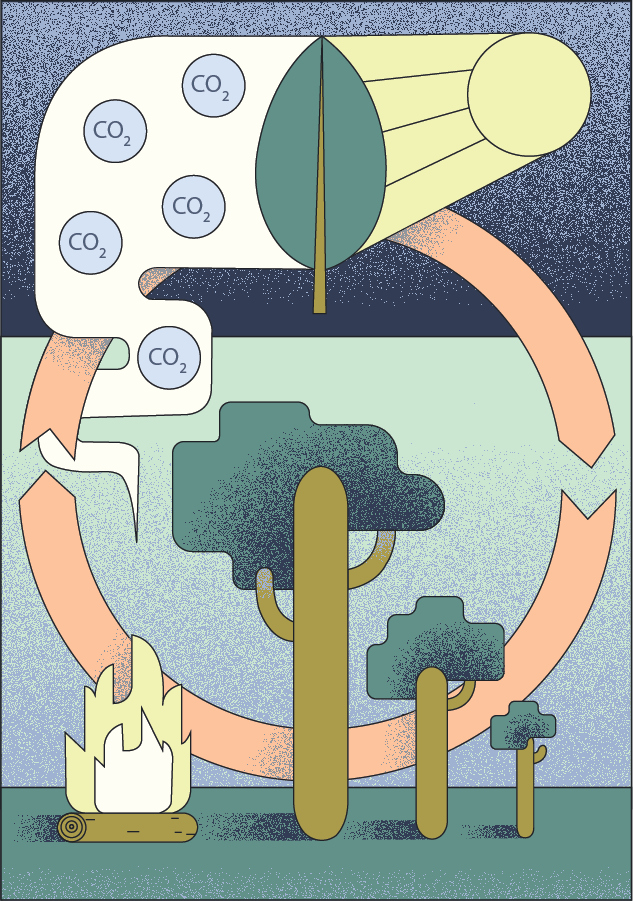
1. Vergleiche die Ergebnisse aus Aufgabe 4) und 5) mit dem Bedarf an Primärenergie von 120 kWh pro Person pro Tag in Deutschland. Beachte, dass ca. 15 % der Energie für den Anbau und die Ernte benötigt werden.

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1. Diskutiere die Vor- und Nachteile der Nutzung von Bioenergie.

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## **Abschätzung des Beitrags der Biomasse zur Energiewende - *Lösungen***



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**Lösungen** zur Bioenergie– Arbeitsblatt – Seite 1 von 2

1. In der Abbildung rechts ist der Kohlenstoffkreislauf dargestellt. Nenne  
   die bei **1** und **2** auftretenden Energieumwandlungen und Energieformen.

*1) Strahlungsenergie chemische Energie*

*kurz: E Strahlung Echem*

*2) chem. Energie Wärmeenergie, Strahlungsenergie  
kurz: E chem Wth ; E Strahlung*

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1. Nimm dazu Stellung, inwieweit man Biomasse als CO2-neutral beschreiben kann.

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| *- CO2 -neutral, wenn der Rohstoff zeitnah nachwächst*  *- nicht CO2-neutral, wenn ein langer Zeitraum des Wachstums, wie z. B. bei Urwäldern* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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Ein Bild, das Karte enthält.

Automatisch generierte Beschreibung

1. Berechne jeweils mit Hilfe der nebenstehenden Abbildung, welche Fläche in Deutschland landwirtschaftlich genutzt wird, bzw. von Wald bedeckt ist.

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1. Ein Bild, das Pflanze, Feld enthält.

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| *geg.: ; (in 1 Jahr) ges.: E nutz* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| *Lsg.:* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| *(in 1 Jahr)* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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1. Bestimme die Energie, die in einem Jahr durch Biomasse zur Verfügung gestellt werden kann, wenn 30 % der landwirtschaftlichen Fläche *(siehe Aufgabe 3)* zum Anbau dafür genutzt werden kann.

**Lösungen** zur Bioenergie– Arbeitsblatt – Seite 2 von 2

landw. Fläche für Biomasse:

Energie aus Biomasse in Deutschland:

30 % = 0,3

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1. Wälder wandeln die Strahlungsenergie der Sonne *(E = 1000 kWh pro m² pro Jahr)* mit einem Wirkungsgrad von maximal 0,35 % in chemische Energie um.
2. Bestimme damit die Energie, die pro in einem Jahr durch die Nutzung von Holz zur Verfügung steht.

geg.: ; *(in 1 Jahr)* ges.: E nutz

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|  | Lsg.:  *(in 1 Jahr)* |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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1. Bestimme die Energie, die in einem Jahr durch Holz zur Verfügung gestellt werden kann, wenn 40 % der Waldfläche dafür genutzt werden.

nutzbare Waldfläche:

Energie aus Wald in Deutschland:

**40 % = 0,4**

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***Hinweis:*** *Eine „Nutzung von 40 %“ bedeutet* ***nicht****, dass jedes Jahr 40 % der gesamten Waldfläche dafür geerntet werden müssen! Da die Bäume die Strahlungsenergie der Sonne in chemische Energie umwandeln, speichern sie die Energie langfristig. Wenn man einen Baum fällt und thermisch verwertet, nutzt man die gesamte Energie, die der Baum im Laufe seines Lebens eingespeichert hat. Daher genügt es, wenn man jährlich nur einen kleinen Bruchteil der Bäume von der 40%igen Nutzfläche fällt.*

1. Vergleiche die Ergebnisse aus Aufgabe 4) und 5) mit dem Bedarf an Primärenergie von 120 kWh pro Person pro Tag in Deutschland. Beachte, dass ca. 15 % der Energie für den Anbau und die Ernte benötigt werden.

*geg.: Anzahl der Einwohner in Deutschland: ca. ; Tage pro Jahr: 365*

*Lsg.:*

*A.: Mit Bioenergie kann maximal des gesamten Primärenergiebedarfs gedeckt werden.*

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1. Diskutiere die Vor- und Nachteile der Nutzung von Bioenergie.

*Vorteile: - Versorgungssicherheit: Einsatz nach Bedarf, da speicherfähig (Holz, Biogas)*

*- ökologischer Anbau bzw. Nutzung teilweise möglich*

*- hohe Leistungen möglich*

*Nachteile: - geringer Gesamt-Wirkungsgrad* 🡪 *sehr hoher Flächenbedarf*

*- Konkurrenz mit Nahrungsmittelanbau*

*- Wald als Lebensraum und CO2-Senke*

*- Förderung von Monokulturen*

*- hoher Schadstoffausstoß bei manchen Heizungsarten*

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