



ECONOMICS

SUSTAINABILITY & CARS

How can the electric vehicle transition transform the automotive industry in Germany to be more sustainable?

**High
School**

How can the electric vehicle transition transform the automotive industry in Germany to be more sustainable while ensuring Germany remains competitive in the global auto market?

C3 Framework Indicator	D2.Eco.7.9-12., D2.Eco.13.9-12., D2.Eco.15.9-12., D2.Geo.9.9-12.	
Staging the Compelling Question	Students will study the history, benefits, and challenges of the electric vehicle transition.	
Supporting Question 1	Supporting Question 2	Supporting Question 3
How can the benefits of transitioning to electric vehicles contribute to a sustainable future, while overcoming potential obstacles?	How is the German government and auto industry playing a key role in the sustainable transition to electric vehicles?	How is German innovation in electric vehicles a key component of its sustainable development strategy?
Formative Performance Task	Formative Performance Task	Formative Performance Task
Students will view a lecture or video clip about the electric vehicle industry in Germany.	Students will create works in groups on creating a presentation about an assigned topic related to the transition to electric vehicles.	Students will present their assigned topic to the class. After the presentation students will write a reflection about what they learned.
Featured Sources	Featured Sources	Featured Sources
Source A: DW News Article Source B: DW News Article Source C: Reuters Article	Source A: DW News Article Source B: New York Times Article Source C: CNBC Article Source D: DW YouTube video	Source A: DW YouTube video Source B: DW YouTube video Source C: Forbes Article Source D: Forbes Article Source E: Forbes Article
Summative Performance Task	Argument: After each group has presented, the teacher will recap the main points that were highlighted by the student groups. Ask students to write a short reflection: “What do you think is the most significant factor influencing Germany’s EV industry, and why?”	
	Extension: Students can debate on whether Germany should invest more in EV’s or other sustainable technologies.	
Taking Informed Action: Using your voice to make change	Understand: Societies have different economic goals based on their needs, values, or traditions. Many of our current actions are not sustainable, such as the structure of the automotive industry. German society is currently striving to adjust their economic goals and embrace sustainable development practices to mitigate the adverse effects of climate change.	
	Assess: Research how Germany is committed to sustainable development goals; assess how Germany’s experiences could serve as a model to embrace more sustainable production of electric vehicles or consumption practices around the globe.	
	Act: Research the efforts for sustainable development of the automotive industry taking place in the United States. Inform others about these efforts as well as actions that we can take to make our society more sustainable.	

Sustainability & the Auto Market

Target Grade Level: 9-12

Target Course: Economics

Compelling Question

How can the electric vehicle transition transform the automotive industry in Germany to be more sustainable while ensuring Germany remains competitive in the global auto market?

Inquiry Overview

Students will learn about how Germany is playing an active role in the adoption of electric vehicles. They will investigate the benefits and challenges of electric vehicle adoption, how Germany is playing a leading role in the adoption of more sustainable forms of transportation, and how this issue will impact both the German economy and international relations in regard to trade policy. By the end of the lesson, students will be able to analyze how electrical vehicle adoption will impact not only Germany but the entire world.

Teacher Background Information

Germany is one of the leading countries in the automotive industry, with major companies such as Volkswagen, BMW, and Mercedes-Benz. These companies are not only among the world's largest car producers but are also at the forefront of technological innovation.

The origins of the automobile are closely linked to Germany. In 1885, Karl Benz developed the first car powered by an internal combustion engine. Although early alternatives such as steam and electric engines existed, the industry eventually settled on combustion engines due to lower production costs and the possibilities of mass production. The Ford Model T played a key role in this development, as it made cars affordable for a wider population and accelerated their global adoption.

After World War II, Volkswagen took this concept further with the mass production of the Beetle, which became a global icon and a symbol of Germany's postwar industrial strength. This success helped establish Volkswagen as one of the world's largest automotive companies. Other German manufacturers followed, establishing a strong position in the luxury car market, led by BMW, Mercedes-Benz, Audi, and Porsche.

Today, Germany remains Europe's largest car producer, with companies operating worldwide. However, the industry is undergoing major changes. Combustion engines contribute significantly to greenhouse gas emissions, leading governments to promote electric vehicles. German manufacturers are therefore investing heavily in electrification, but challenges remain, including consumer skepticism, sustainable battery production, and global competition—particularly from China, now the largest producer of electric vehicles. Companies such as Tesla have also expanded production in Germany.

The transition to electric mobility is essential both for maintaining global competitiveness and for addressing climate change. At the same time, it raises important challenges, such as the sustainable extraction of raw materials and the potential loss of jobs, as electric vehicles are generally easier to produce than traditional cars.

Suggested Time Frame

3 class periods (40 Minutes)

Concept List

- Electric Vehicle (EV)
- Battery Electric Vehicle (BEV)
- Internal Combustion Engine (ICE)
- Sustainability
- Tariff
- Inflation Reduction Act
- Lithium-ion batteries
- Solid-state batteries
- Economy of scale
- Range Anxiety
- Greenhouse gases
- Carbon Footprint

Instructional Resources

- Whiteboards and markers
- Internet access or print resources for research
- Handouts with key questions to guide inquiry
- Chart paper
- Markers, pens or pencils
- Smartboard
- Articles and images of German electric vehicles
- Statistics on German auto industry

NCSS Thematic Strands

- People, Places, and Environments
- Production, Distribution and Consumption

C3 Framework Indicators

- **D2.Eco.7.9-12.** Use benefits and costs to evaluate the effectiveness of government policies to improve market outcomes.
- **D2.Eco.13.9-12.** Explain why advancements in technology and investments in capital goods and human capital increase economic growth and standards of living.
- **D2.Eco.15.9-12.** Explain how current globalization trends and policies affect economic growth, labor markets, rights of citizens, the environment, and resource and income distribution in different nations
- **D2.Geo.9.9-12.** Evaluate the influence of long-term climate variability on human migration and settlement patterns, resource use, and land uses at local-to-global scales.

Outcomes for Student Learning

- Define what a Battery Electrical Vehicle (BEV) is and how it is different than an internal combustion engine (ICE) powered car.
- Investigate the role the German government and auto companies are playing in the transition to Electric cars.
- Analyze how this will impact trade relationships with other countries, including the US and China.
- Identify the environmental, social, and economic impacts of electric vehicle transition.
- Propose ideas for how this process can be done to have the best possible outcomes for the environment, international relations and the labor force.

Germany-Related Learning Goals

- Promoting sustainability and environmental responsibility
- Understanding how Germany's economic development can play a role in global environmental policy
- Germany's trade relationship with allies and competitor nations
- Promoting responsible business practices
- Discuss the challenges and opportunities Germany faces in transition to a sustainable transportation system.

Compelling Question

How can the electric vehicle transition transform the automotive industry in Germany to be more sustainable while ensuring Germany remains competitive in the global auto market?

Introductory Activity

Students will view a short video about the BMW plant in Leipzig which produced the BMW i3 from 2013-2022. This was the first fully electric car mass produced by BMW. After the video is over students will view a photo that was taken during the TOP study tour visit to the plant. Ask students "What do you know about Germany's contribution to the automotive industry? How might these companies be addressing environmental challenges?" During this discussion briefly outline Germany's reputation as a global leader in automotive manufacturing and its recent pivot toward electric vehicles.

Supporting Question 1

How can the benefits of transitioning to electric vehicles contribute to a sustainable future, while overcoming potential obstacles?

Formative Performance Task 1

Students will learn about the economic goals of society, the potential for conflict among goals, and the need to reconcile and prioritize goals according to society's needs and values. Students will complete a note-taking guide as they work on this task. They will view a presentation covering the following key points. Alternatively, the teacher can show a video that will cover the following information.

- Historical Context: Germany's legacy in traditional automotive engineering.
- Key Players: Highlight companies like Volkswagen, BMW, and Mercedes, and their EV models (e.g., Volkswagen ID.4, BMW i4).

▶ Formative Performance Task 1

- Government Initiatives: Explain policies supporting EVs, such as subsidies, infrastructure investments, and the push to phase out internal combustion engines by 2035.
- Environmental Impact: Discuss how EVs contribute to reducing carbon emissions and how Germany’s energy mix (e.g., renewable energy integration) supports sustainability.

▶ Resources

DW News. “How Germany’s Critical Car Industry Could Stall Europe’s Biggest Economy | DW News.” YouTube, 23 Sept. 2024, www.youtube.com/watch?v=90jbSdVPEN8. Accessed 30 Dec. 2024.

“The Rise, Fall, and Return of EVs: An Automotive History.” Dw.com, 2024, www.dw.com/en/the-rise-fall-and-return-of-evs-an-automotive-history/video-70315765. Accessed 30 Dec. 2024.

Abnett, Kate. “EU Countries Approve 2035 Phaseout of CO2-Emitting Cars.” Reuters, 28 Mar. 2023, www.reuters.com/business/autos-transportation/eu-countries-poised-approve-2035-phaseout-co2-emitting-cars-2023-03-28/.

Supporting Question 2

How is the German government and auto industry playing a key role in the sustainable transition to electric vehicles?

▶ Formative Performance Task 2

Students will be divided up into small groups (this can be organized by the teacher or students can choose who they would like to work with) and assign each group one of the following topics:

1. Economic impacts of EVs on Germany’s workforce and economy.
2. German auto companies' commitments to electrification and innovation in battery electric vehicles.
3. Environmental benefits and concerns (e.g., battery recycling, raw material sourcing).
4. Challenges in EV infrastructure development (e.g., charging stations).
5. Global competition and Germany’s strategy to stay ahead.

Each group can create either a poster or slideshow presentation for their assigned category. Depending on class size, the teacher can either add or subtract the number of groups. The teacher can provide a list of resources that can be used below, such as articles and videos that might be helpful for their assigned category. Students will also have time to research with their group to find more information for their assigned topic.

▶ Resources

“Why Are German Drivers Hesitant to Buy Electric Vehicles?” Dw.com, 2024, www.dw.com/en/why-are-german-drivers-hesitant-to-buy-electric-vehicles/video-69405449. Accessed 30 Dec. 2024.

Ewing, Jack. “What Happened When a German Car Factory Went All Electric.” The New York Times, 9 Apr. 2024, www.nytimes.com/2024/04/09/business/volkswagen-electric-vehicle-factory.html.

Meredith, Sam. “Germany’s Auto Giants Are Struggling to Stay Relevant.” CNBC, 18 Oct. 2024, www.cnbc.com/2024/10/18/vw-bmw-mbg-germanys-top-car-brands-are-struggling-in-the-ev-era.html.

“Why Electric Cars Are Finally Taking Over.” Wwww.youtube.com, www.youtube.com/watch?v=aEOoExg1Nm0.

Supporting Question 3

How is German innovation in electric vehicles a key component of its sustainable development strategy?

► Formative Performance Task 3

Student groups will present their findings to the class. Each group will have created either a poster or presentation on their assigned topic. After each group presents, teacher will allow time for questions. This will help facilitate a class discussion on the interconnections between the topics and students' personal opinions on the EV industry and Germany's role in the electrification of the auto industry.

After each group has presented the teacher will recap the main points that were highlighted by the student groups. Ask students to write a short reflection: "What do you think is the most significant factor influencing Germany's EV industry, and why?"

► Resources

DW News. "Why Are Electric Cars Still Not Mainstream? | DW News." YouTube, 20 Dec. 2023, www.youtube.com/watch?v=snZTdJctDmQ. Accessed 30 Dec. 2024.

DW News. "EVs Were Supposed to Be the Future. Not Everyone Is Buying It | DW News." YouTube, 26 July 2024, www.youtube.com/watch?v=Og1eA3SZ25M. Accessed 30 Dec. 2024.

Westfall, Chris. "Europe's Richest Economy Struggles as Layoffs Rock the Auto Industry." Forbes, 25 Nov. 2024, www.forbes.com/sites/chriswestfall/2024/11/25/europes-richest-economy-struggles-as-layoffs-rock-global-auto-industry/.

Winton, Neil. "Europe's Wobbling EV Mandate Will Force Hard Choices." Forbes, www.forbes.com/sites/neilwinton/2024/05/19/europes-wobbling-ev-mandate-will-force-hard-choices/.

Winton, Neil. "EU May Water down Harsh 2035 EV Mandate and Reprive Hybrids." Forbes, 27 Mar. 2024, www.forbes.com/sites/neilwinton/2024/03/27/eu-may-water-down-harsh-2035-ev-mandate-and-reprive-hybrids/.

Summative Performance Task

Essay / Presentation	<p>Presentation: Students will use all of the information, concepts and evidence that they gathered to create a presentation on the topic that they were assigned. They will have 5-10 minutes to present this information to the class. This can be done as either a poster or a slideshow. The teacher can allow for student choice or require a certain format based on the available resources and room structure.</p> <p>Essay: After each group has presented, the teacher will recap the main points that were highlighted by the student groups. Ask students to write a short reflection: “What do you think is the most significant factor influencing Germany’s EV industry, and why?”</p> <p>Extension:</p> <ul style="list-style-type: none"> • Debate: Students can debate on whether Germany should invest more in EV’s or other sustainable technologies. • Case Study: Students can analyze a specific German city, such as Berlin, Munich or Stuttgart, and its role in supporting EV adoption. • STEM Connection: Students can investigate the technology behind lithium ion batteries in EVs and their environmental lifecycle. They can also investigate the role German auto companies are playing in the development of new types of batteries such as solid-state batteries.
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Taking Informed Action

Understand	<p>Societies have different economic goals based on their needs, values, or traditions. Many of our current actions are not sustainable, such as the structure of the automotive industry. German society is currently striving to adjust their economic goals and embrace sustainable development practices to mitigate the adverse effects of climate change.</p>
Assess	<p>Research how Germany is committed to sustainable development goals; assess how Germany’s experiences could serve as a model to embrace more sustainable production of electric vehicles or consumption practices around the globe.</p>
Act	<p>Research the efforts for sustainable development of the automotive industry taking place in the United States. Inform others about these efforts as well as actions that we can take to make our society more sustainable.</p>

Modifications for Differentiation

Groups can be predetermined, based on learner needs. Allowing for student choice on either a poster or slideshow to be presented to the class.

ELL: Pre-teach key vocabulary terms, use peer mentoring to determine groups, use of visual content and audio with native language captions.



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