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Project number: 2021-1-IE01-KA220-SCH-000027825

Energy Resources & Light Pollution Mitigation

Topic: Energy consumption and efficiency

Lesson Plan for Teachers - Age Group 10 - 12

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Project Information

PROJECT: CliC-PoliT

PROJECT TITLE: Engaging students and the society in environmental and climate change activities to raise awareness and strengthen responsible citizenship.

ACRONYM: Climate Action and Light Pollution Threat

PROJECT WEBSITE: https://www.clicpolit.eu/

PROJECT NO.: 2021-1-IE01-KA220-SCH-000027825

PROJECT COORDINATOR: CIT Blackrock Castle Observatory, Cork, Ireland

Project Partners

BLACKROCK CASTLE OBSERVATORY
The Space For Science

NUCLIO
Núcleo Interativo de Astronomia e Inovação em Educação

FTP-Europlanet gUG

ΑΙΕΝ ΑΡΙΣΤΕΥΕΙΝ
ELLINOGERMANIKI AGOGI

WROHellas
ΟΡΓΑΝΙΣΜΟΣ ΕΚΠΑΙΔΕΥΤΙΚΗΣ ΡΟΜΠΟΤΙΚΗΣ & ΕΠΙΣΤΗΜΗΣ

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Module: Energy Resources & Light Pollution Mitigation

Topic: Energy consumption and efficiency

Lesson Plan – Monitoring energy consumption and efficiency	
Duration: 2 lessons of 45 minutes (90 minutes)	
Short Description of the Lesson	Students complete three different activities to evaluate the energy consumption in a household and explore potential ways to reduce that consumption. The focus is on conservation and energy efficient electrical devices and appliances. The lesson reinforces the relationship between power and energy and associated measurements and calculations required to evaluate energy consumption. The lesson provides students with more concrete information for completing their culminating unit assignment.
Learning Goals	After this lesson, students should be able to: • Calculate energy use and analyze how changing behaviors and appliances affects energy use. • Conduct an experiment and make comparisons based on experimental evidence. • List and explain ways to conserve energy and explain how energy conservation can reduce the environmental impact of resource extraction; • Describe how buildings can be made more energy efficient and why is that so important
Green Competences Linked	• The learner understands the concept of energy efficiency and sufficiency and knows socio-technical strategies and policies to achieve efficiency and sufficiency. • The learner is able to clarify personal norms and values related to energy production and usage as well as to reflect and evaluate their own energy usage in terms of efficiency and sufficiency. • Can assess and question personal needs to carefully manage resources in the pursuit of longer-term goals and common interests • Can identify and adapt to different lifestyles and consumption patterns to use fewer natural resources as well as to mobilise others to adopt more sustainable choices. • Promoting a culture of social mindfulness and responsibility regarding energy consumption and renewable energy sources.
Target Group	Primary school students aged 10-12 years old
Educational Approach	Presentations, Videos, Discussions and Gamified activities
Link to School Curricula (if applicable)	Science, Physics, Earth and Environmental Sciences
Facility/ Equipment	• Classroom • Internet access • Projector

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Tools/ Materials	• Computer lab • Teacher's Handbook • Student's Presentation
Main Tasks	**Introduction to the Activity and links to the previous Lesson Plan** How you ever considered how exactly we calculate our energy consumption at home? Have you come up with some good ideas about how you might reduce your energy consumption? Have you ever heard about energy vampires? Yes, we all have energy vampires at home! In this lesson, we will explore more closely how we use energy in our homes and identify some ideas for conserving energy or using it more efficiently. **Recall these terms:** Conservation – not using consumer energy products (for example, turning lights off, walking instead of driving) Efficiency – benefiting from the value of using energy (for example, still being mobile), but consuming much less energy to meet same goal. **Video:** Energy Conservation vs. Energy Efficiency https://www.youtube.com/watch?v=lqJ3ckBncyY (1 min and 32 sec) **Task 1: Monitoring energy consumption at home (60 minutes)** **1.1 Introduction to energy consumption** (40 minutes) You can start the activity with the following videos explaining energy consumption at a global scale as well as in our cities. Remember that students already know form the previous lesson plan (Energy production and energy sources) how energy is produced and sources of renewable and non-renewable energy. **Video:** How much electricity does it take to power the world? https://www.youtube.com/watch?v=tjwrG4Debc4 (5 min and 1 sec) **Video:** Cities & Rising Energy Consumption 101 - Matt Ferrell x Student Energy https://www.youtube.com/watch?v=7itJt8c0V8M (6 min and 4 sec) You can use the following graphs and maps to illustrate energy consumption patterns and numbers worldwide. In addition, students may use these interactive maps to see the energy consumption per country and per source of energy production. **Chart:** Global primary energy consumption by source https://ourworldindata.org/grapher/global-energy-substitution?time=earliest..2021 **Chart/Map:** Annual change in primary energy consumption https://ourworldindata.org/grapher/change-energy-consumption?tab=map&time=2021 **Chart/Map:** Primary energy consumption https://ourworldindata.org/grapher/primary-energy-cons

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Chart: Electricity production by source
https://ourworldindata.org/grapher/electricity-prod-source-stacked

Chart/Map: Per capita electricity generation
https://ourworldindata.org/grapher/per-capita-electricity-generation

Hint: In order to be easier for the students the amount of energy used globally you can show to them the following example comparing the energy consumption (mean) per household and globally.

2 – 8 MWh / year

500.000.000 – 10.000.000.000 MWh / year

At this point, you can use pages 22-23 of the Teachers Handbook to explain how the total energy consumption is highlighted above is distributed per sector (i.e. household, transport, industry etc.). Speaking of that, 28% of the total energy consumption is linked to the energy we are using in our houses (i.e. the 2-8 MWh/year). **Now the challenge begins!**

You may ask students if they can calculate their home energy consumption! To succeed this, they must first create a list or a drawing with the electric devices they have in their home, cooling/heating components etc.

It is also important to list all bulbs in their house (type, wattage and hours per day they lights are on - approximately)

1.2 Monitoring energy consumption at home (20 minutes)

After the students create the drawing or the list with all devices consuming energy in their home, they may start calculating the total electricity consumption and how much does it cost using the following App:

APPLIANCE CALCULATOR

Keep in mind that the calculator works for the US, hence, it would be useful to explain to students how we convert US dollars to Euros in order to be more realistic. You may use the following calculator to make all conversions:

Google 'us dollars to euros converter'

Task 2: Managing energy consumption and efficiency at home (30 minutes)

2.1 Introduction to energy conservation and efficiency (15 minutes)

You can continue to this lesson plan by explaining to the students that ok, now we know how much energy we consume on a daily or annual basis, but, what can we do to conserve energy or increase our house

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energy efficiency? What is the difference between energy conservation and energy efficiency?

Let's start with an explanation of what energy conservation and energy efficiency is:

Video: Energy Conservation vs. Energy Efficiency (1 min and 32 sec.)
https://youtu.be/lqJ3ckBncyY

Video: What is energy efficiency? (1 min and 3 sec.)
https://audiovisual.ec.europa.eu/en/video/I-196319?&lg=EN

Video: Energy efficiency? (3 min and 14 sec.)
https://www.youtube.com/watch?v=D11iFUw_ImU

Provide 1 worksheet per students (see Annexes) and ask them to answer the question on it (5 min)

2.2 Mapping Vampire Energy (30 minutes)
The first simple activity to understand what energy conservation is linked to the mapping of the vampire energy!
Visit the following webpage:
https://www.saveonenergy.com/learning-center/mapping-vampire-energy/
At first, you may ask students what they think that Energy Vampires are? (10 minutes)

Explain to students what Energy Vampires are. You can use all info presented on Teachers Handbook (pg.24)
Present Energy Vampires photo (Slide 34) on the projector about energy consumption of energy vampire devices at home. (15 minutes)
Estimate your Energy Vampires at the school classroom, labs etc. (20 minutes)

Here you can find the **Phantom Load Calculator**, with the potential to help you see which devices are costing you the most. Using this tool, students will better understand how much of their school money is wasted on the electronic devices they don't use. Using this tool, students will better understand how much of their school money is wasted on the electronic devices they don't use.
This application is already set-up for the United States; therefore, you can alternatively ask from students to find a city/state in the US that is located at the same parallel with their city, using the following maps:
Google Maps
Interactive map (you make drag US cities on top of Europe)
By selecting the appropriate State in the app (1st selection), students may start monitoring for 30 minutes different plugged and unplugged devices in their school.

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	You can use **Printable no.4 (Students Worksheet). They can work in groups of 2 – 5.** **When the students finish their energy vampires monitoring, they can start adding all devices in the online app in order to estimate their total savings!** **2.3 Lighting Savings Calculator** (15 minutes) Mapping vampire energy was focused on energy conservation measures. However, energy efficiency is something different and most of the times a little bit more demanding and complex. A simple example is shown below. You can ask from students to fill in the information they have collected from Task 1 (count the number, wattage and type of light bulbs) on the following application: **Lighting Savings Calculator** With this simple exercise students understand how we can increase energy efficiency by changing our house bulbs. **Important note:** Remind to students the total annual energy consumption of a household! Having 7 bulbs working for 5-7 hours per day can reduce our energy consumption by approximately 1000 kWhs/year. Not bad! Hence, improving energy efficiency matters! **But, what if we have already changed our house bulbs to more efficient?**
Extracurricular Activities Inspire others to reduce their energy consumption	**Activity:** Home Energy Survey After the survey, students brainstorm how to reduce everyday energy consumption at home and in school (e.g. turning down radiators, unplugging appliances not in use). Each produces a Top 10 Tips (e.g. infographic, poster, social media post) aimed at other young people. Students next test the tips with their peers. What is the most effective way to persuade others to make changes?

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ANNEXES

Worksheet_1_Energy-Conservation-vs.-Energy-Efficiency

Student Name: _____ Date: _____

Energy Conservation vs. Energy Efficiency: What's the Difference?

Define the following terms using your own words without looking anything up.

Energy conservation: _____

Energy efficiency: _____

Read each statement below. Place the letters **EC** in the line if you think the statement represents energy conservation. Place an **EE** in the line if you think the statement represents energy efficiency. Write both if you think the statement refers to both energy conservation and energy efficiency.

_____1. Not driving to the video store so you can save gas

_____2. Combining errands to save gas

_____3. Wearing a sweater and using extra blankets in winter

_____4. Using a programmable thermostat to change the temperature at the house when no one is home

_____5. Using advanced technologies to provide better quality energy services with less energy

_____6. Using resources wisely

_____7. Eliminating energy waste

_____8. Using technology to reduce energy use

_____9. Turning off the lights by hand when you leave the room

_____10. Turning off the lights in the classroom by motion sensor

_____11. Turning off the computer on Friday before going home for the weekend

_____12. Turning the lights off on a vending machine without turning the vending machine off

_____13. Turning off the TV when you are not watching it

_____14. Driving a hybrid car

Now read over the statements you thought meant energy conservation. Reread your definition of energy conservation. Do you need to modify your definition? Do the same for statements you thought meant energy efficiency. Rewrite your definitions below.

Energy conservation: _____

Energy efficiency: _____

Watt Watchers of Texas watt-watchers.com

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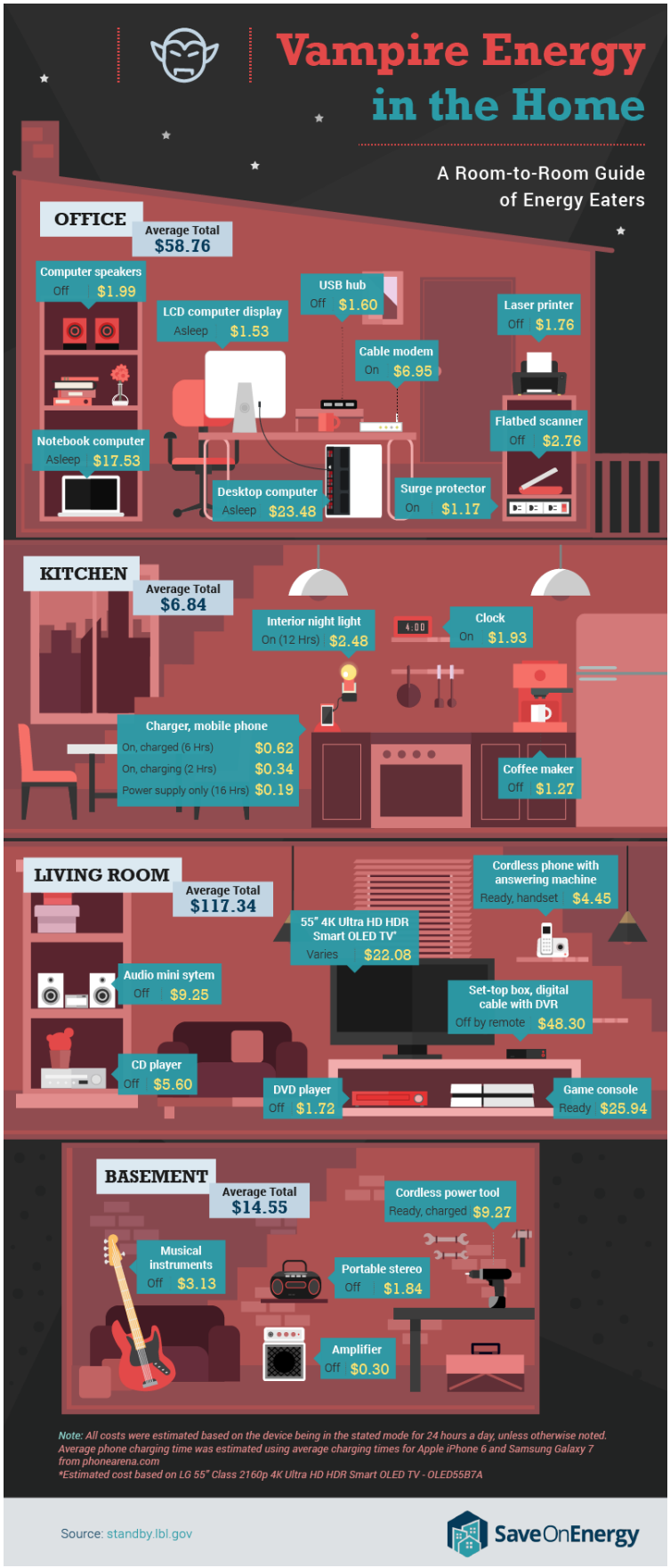
Printable1_home_costs_losses



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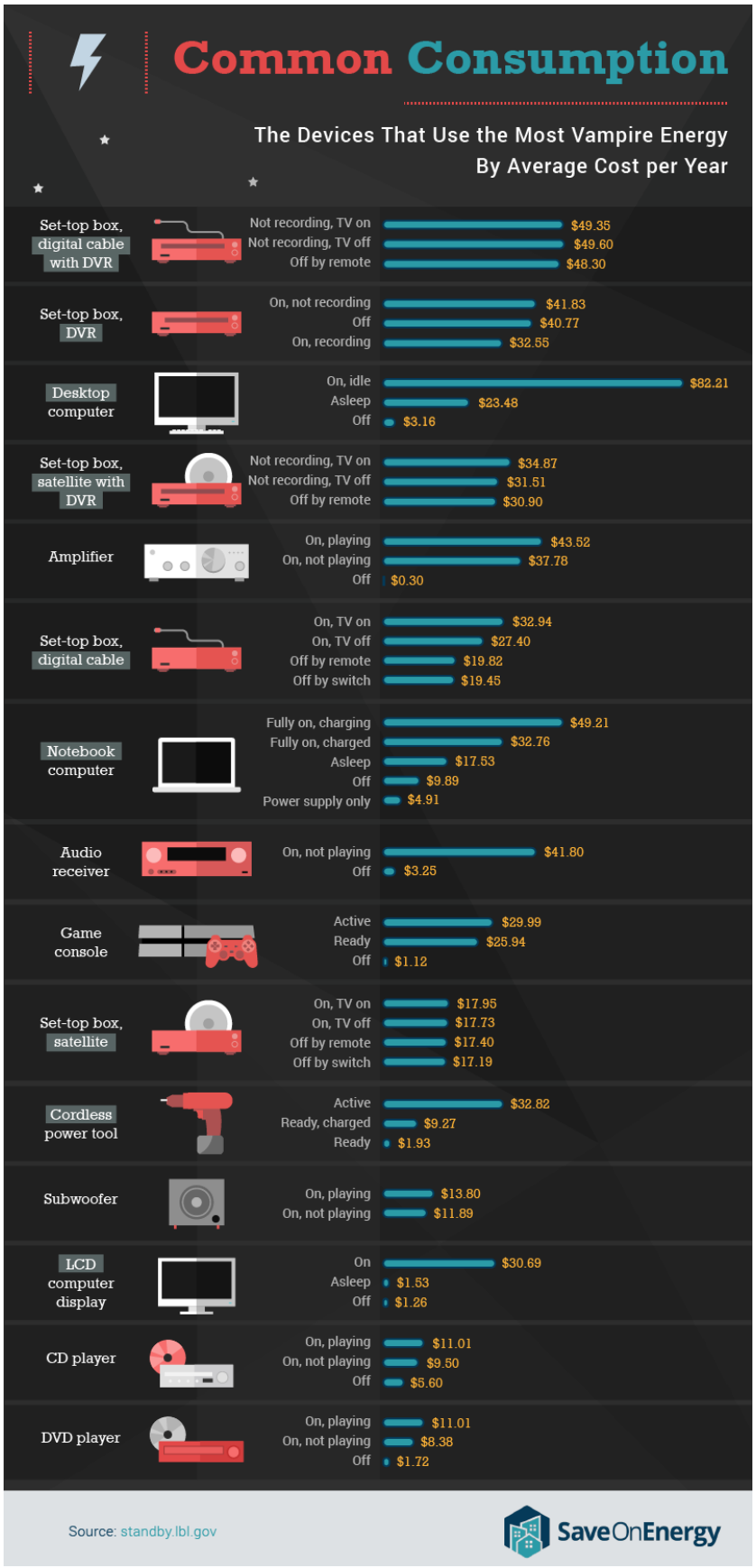
Printable2_Annual_costs_per_device



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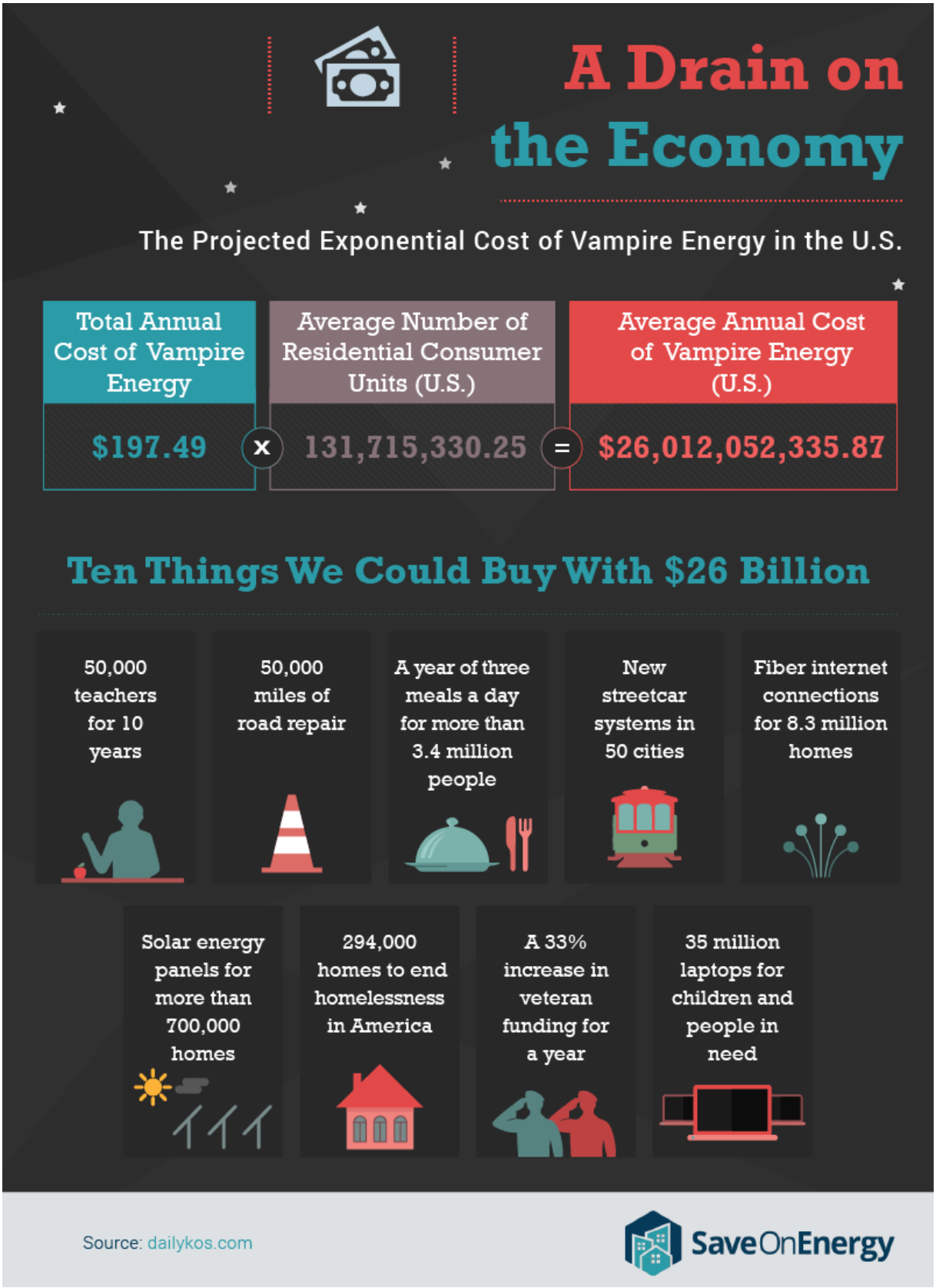
Printable_3_vampire-energy_3



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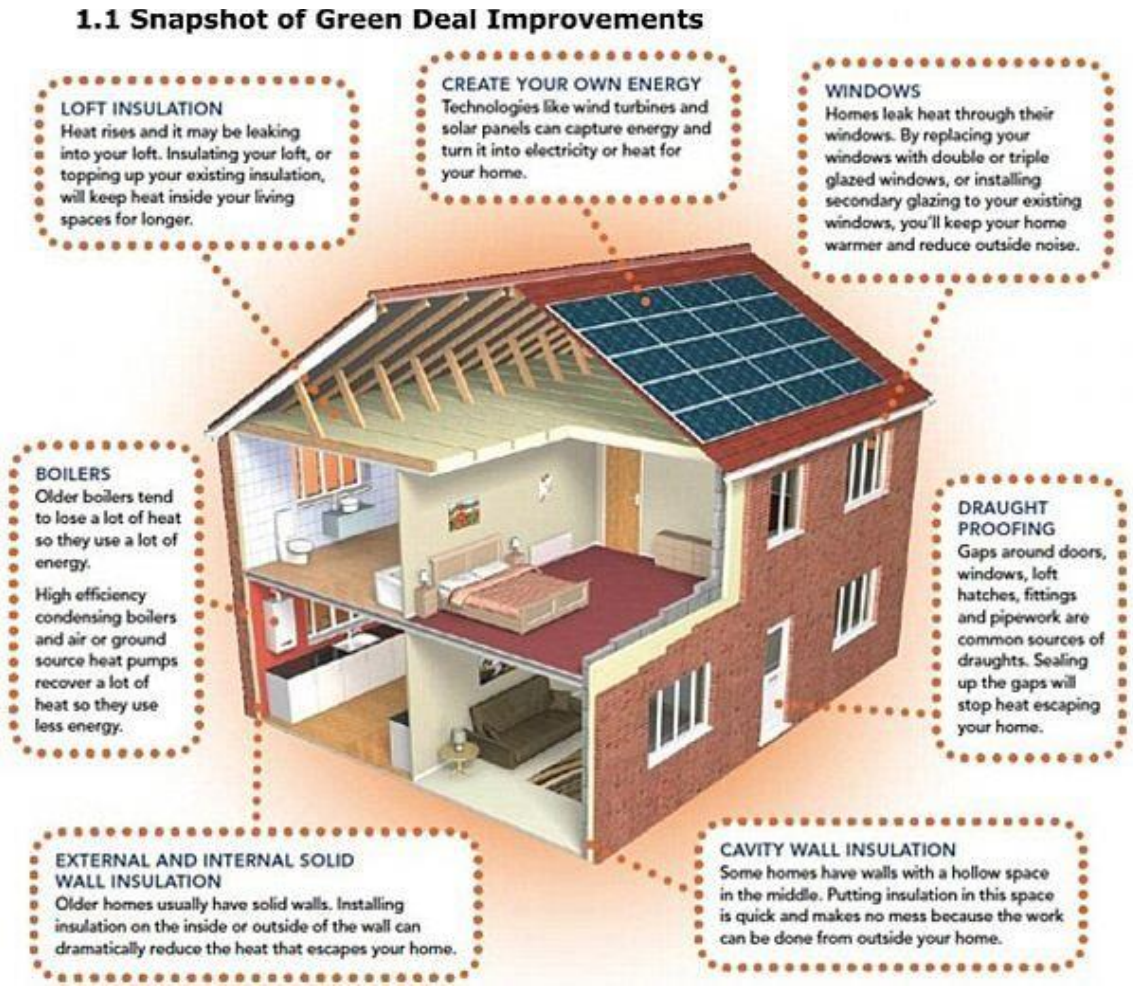
Printable4_Renovation_ideas



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