

Designing a Renewable City Model

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Grades or Range: 3-6

This is lesson 6 of 7 of the educators' [Renewable City Unit](#)

Lesson 6: Designing A Renewable City Model	
Key Questions	How might we design a renewable city with sustainable systems that will help the inhabitants live equitably and reduce carbon?
Length of Lesson	One hour x 5-10 lessons (depending on type and number of models created)
Lesson Summary Description	Using the question, "How might we design a renewable city with sustainable systems that will help the inhabitants live equitably and reduce carbon?", students will research individually chosen topics and construct 3D models of different systems to help reduce climate change. Group collaboration will build community as students work towards the common goal of creating a sustainable city with renewable resources. A study of our local Quinalt community, currently in the process of moving their town to higher ground, will allow students to consider ways to better plan a city with changing weather and diminishing coastlines in mind. By tracking their climate footprint, students will see other important ways to reduce their personal carbon footprints. Students build written and oral communication skills by writing about their 3D design investigation, and sharing their ideas with an audience.
Learning Goals	Based on National Science Standards, National Core Arts Standards and 4th grade Common Core Writing Goals, Students will... Understand: • Creativity and innovative thinking are essential life skills that can be developed. (VA: Cr1) • Artists and designers experiment with forms, structures, concepts, media, and art-making approaches. (VA: Cr2) • Visual imagery influences understanding of and responses to the world. (VA: Re. 7) Be able to:

	• Brainstorm multiple approaches to a creative art or design problem. (VA: CR1.1.4a) • Explore and invent art-making techniques and approaches. (VA:Cr2.1.4a) • Analyze components in visual imagery that convey messages. (VA:Re.7.2.4a) • Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. (3-5-ETS1-3) • Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-3) • Define and delimit engineering problems. (3-5-ETS1-A) • Develop possible solutions. (3-5-ETS1-B) • Optimize the design solution. (3-5-ETS1-C) • Obtain and combine information to describe that energy and the fuels are derived from natural resources and that their uses affect the environment. (4-ESS3-1) • Analyze and interpret data from maps to describe patterns of earth's features. (4-ESS22) • Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks. CCSS.ELA-LITERACY.W 4.10
Objective	Students will: Evaluate their climate footprint, in order to think about ways they might help climate change and to prepare for creating a Renewable City. Choose topics to research and build three dimensional models of a sustainable city. These will include larger models of off-shore wind, hydropower generators, marine renewable resources, tiny houses and sustainable playgrounds, as well as an overall bird's eye model of the area. Learn about energy justice, discuss how local communities are forced to move their towns away from the coast to higher ground, and find ways to plan a city with changing weather and diminishing coastlines in mind. Write about their process, including failures, ways they evaluated and changed their designs, and challenges they overcame. Present their models and ideas to a local audience.

Resources for Tracking Carbon Footprint:

▶ [simpleshows explains the Carbon Footprint](#)

[How Big Is Your Carbon Footprint?](#)

Materials for Renewable City Model (Large Models):

[KidWind Basic Wind Experiment Kit - Vernier](#)

Video for constructing:

▶ [KidWind Wind Turbine Assembly](#)

Videos to see how you might design your blades:

▶ [The KidWind® Challenge](#)

▶ [Vertical Axis Wind Turbines - IN 60 SECONDS](#)

Kidwind Wind Turbine Kit

Tagboard and cardboard for creating additional blades

wood glue

Fan for testing energy

Meter for measuring blade speed

Resources for Blade designs using Biomimicry:

Jim Corrigan's book [Awesome Innovations:](#)

[Inspired by Whales](#)

<https://biomimicry.org/>

Hydropower Model

[\(see lesson four\)](#)

Sustainable Tiny houses & Playground

For Tiny House Building: [Tiny House Problem](#)

For Playground Building:

[Power Play! | LAGI-2012](#)

recycled shoe boxes

miscellaneous recycled materials (cardboard boxes, plastic containers)

straws

pipe cleaners

recycled fabric

tape

hot-glue gun & glue sticks

Materials for Renewable City Model (Birds-eye Model):

Heavy poster board for base

Plaster strips or paper mache

modeling materials: sculpey for smaller parts

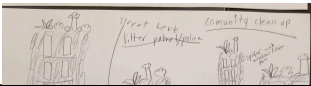
acrylic or tempera paint

pencils

sharpies

smaller wood sticks & toothpicks



	sticky notes butcher paper Articles used for energy justice: Quinault Tribe: Taholah Village Relocation Master Plan Tribal Land & Climate Change: Climate Change NCAI Map to locate tribes in our region: Native-Land.ca Tribal Funding: Biden-Harris Administration Makes \$135 Million Commitment to Support Relocation of Tribal Communities Affected by Climate Change U.S. Department of the Interior Quinault Relocation News: Quinault Indian Nation to receive \$25 million for climate change relocation Articles used to further investigate what our renewable city might need: Site for Analyzing our state's power: Interactive Energy Map High speed construction of a wind-turbine (run at 2x): Wind Turbine Farm Installation From Scratch Site will miscellaneous Innovative technology: Alliant Energy Kids Hand-out used for presentation preparation or written descriptions: Renewable City Present & Write
Subject Matter Integration	English Language Arts: Oral and Written Communication skills. Students will write a description of their model, and include information about the process and how the model helps solve climate change. Geography: In order to create the large model, students will view topographic maps to see shapes of land in order to create a more realistic model. Art: Students use sketching as a way to brainstorm ideas for their models and explore different art materials when creating models.
Questions	Topic questions: • How might we design a renewable city with sustainable systems to better care for our planet? • How does my model help reduce carbon in the atmosphere? • What can I do personally to help reduce climate change? • How is climate change affecting different human populations?
Procedure	Demonstration: Students begin the lesson by tracking their carbon footprint using this website: How Big Is Your Carbon Footprint?. They review the video  simpleshow explains the Carbon Footprint and discuss personal ways they might make changes, and how their city might help reduce carbon. 

Using this question, “How might we design a renewable city with sustainable systems that will help the inhabitants live equitably and reduce carbon?”, students choose a topic from a list to explore, and the teacher creates cooperative groups. Initially these small groups of students research articles about their subject and sketch ideas. Then the whole group creates a large sketch of their city using sticky notes of systems they would like to see in the city, based on their individual research.

Throughout the next few weeks, students work to create either a larger model using the design process as they work (large Kidwind offshore wind model, advanced hydropower model, tiny house, sustainable house with efficient insulation, sustainable playground) or a birds’ eye model of the whole Renewable City and systems. Students who work quickly may work on several models.



Throughout the process, the class “pauses” at intervals to share what they are learning, to reconsider new resources about energy justice, to discuss different ways to live sustainably, or to learn from new sources for reducing carbon. The class revisits the phenomena of climate change as they learn more about systems to help with carbon removal on our planet.

Finally, the model and ideas are shared within the school and/or the wider community. Students use this form to prepare for an presentation:

[Renewable City Present & Write](#)

Distribution: The use of a rolling cart(s) to store different models in their own boxes is useful. Teacher pre-distributes materials on different tables before they arrive so time can be used efficiently.

Work-Period: Students work independently on their models, and the teacher works as a facilitator to help them construct, refine their process, and ask or answer questions. Checklists for groups can be used to help students work efficiently.

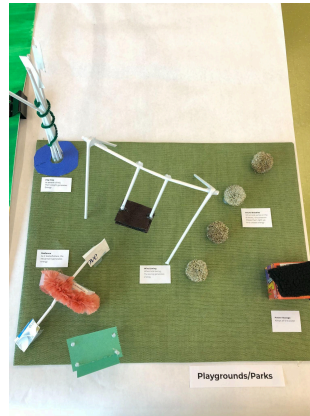
Clean-Up: Students are responsible for cleaning their own materials and returning everything to the rolling cart.

Closure: The models will be shared with an audience at their school or within the community.

Model Testing
Insulation:



Sustainable
Playground:



Bird's Eye
Model:



Assessment

Teacher monitors formatively during class. Did each student...

- Research subject and create notes or sketch ideas before modeling?
- Create a 3D model using the design process? Does this work include measuring effectiveness (if appropriate), analyzing design, and revising model?
- Write a summary of the experience which includes why the type of model helps with climate change?
- Share their Renewable City model with an audience.

Models Presented for School Principal

