



LESSON DESIGN MAP FOR A SYNTHESIZING MIND

UNSDG13 CLIMATE ACTION
PARIS AGREEMENT
SUSTAINABLE SINGAPORE

Economics
Geography
Chemistry
Physics
Biology
Ethics
Literature & Arts

01 What is climate change?	02 Who is responsible?	03 Why is it happening?	04 What is the impact to economy & society?	05 What can be done?	06 Why should we care?
Topics	Explanation & Links	Topics	Explanation & Links	Topics	Explanation & Links

<p>ATMOSPHERIC PROCESSES HAZARDS & MANAGEMENT</p> <p>PHYSICAL GEOGRAPHY CLIMATE CHANGE REFERS TO CHANGES IN AVERAGE WEATHER CONDITIONS OVER AN EXTENDED PERIOD OF TIME DUE TO EXCESSIVE PRODUCTION OF GREENHOUSE GASES.</p>	<p>MARKET FAILURE IMPERFECT INFORMATION</p> <p>Economics Topic Economics Concept</p>	<p>ATMOSPHERIC PROCESSES HAZARDS & MANAGEMENT</p> <p>PHYSICAL GEOGRAPHY ENHANCED GREENHOUSE EFFECT TRAPS MORE OUTGOING RADIATION, LEADING TO INCREASED GLOBAL TEMPERATURES.</p> <p>HUMAN GEOGRAPHY ANTHROPOGENIC CLIMATE CHANGE CAN BE DISCUSSED IN ALL TOPICS ACROSS HUMAN GEOGRAPHY.</p>	<p>MARKET FAILURE NEGATIVE EXTERNALITY TRAGEDY OF THE COMMONS (GLOBAL) PUBLIC GOOD</p> <p>Economics Topic Economics Concepts</p>	<p>ATMOSPHERIC PROCESSES HAZARDS & MANAGEMENT</p> <p>PHYSICAL GEOGRAPHY GLOBAL WARMING CAN WORSEN WEATHER HAZARDS SUCH AS CYCLONES AND DROUGHTS WHICH COULD LEAD TO DEVASTATING SOCIAL AND ECONOMIC EFFECTS.</p>	<p>MARKET FAILURE DEADWEIGHT LOSS</p> <p>Economics Topic Economics Concept</p>
<p>CHEMICAL BONDS CHEMICAL REACTIONS ARISING FROM INDUSTRIAL AND AGRICULTURAL ACTIVITIES CONTRIBUTE TO GREENHOUSE GASES SUCH AS CO₂, CH₄ (METHANE) AND N₂O (NITROUS OXIDE).</p>	<p>THE GLOBALIZATION OF ECONOMIC ACTIVITY POPULATION ISSUES & CHALLENGES URBAN ISSUES & CHALLENGES</p> <p>HUMAN GEOGRAPHY ARGUMENTS AGAINST THE ANTHROPOGENIC CLIMATE CHANGE OFTEN REFER TO THE MILANKOVICH CYCLES WHICH ARGUE THAT GLOBAL WARMING IS NATURAL.</p>	<p>ORGANIC CHEMISTRY SPECIFIC HEAT CAPACITIES</p> <p>COMPARE GREENHOUSE GASES (GASES TRAPPING HEAT) VS OTHER GASES.</p>	<p>ACIDS & BASES RISING OCEAN LEVELS WILL ACIDIFY SURFACE WATERS OF THE OCEAN WHICH COULD HAVE DEVASTATING IMPACT ON MARINE LIFE.</p>	<p>ACIDS & BASES REDOX REACTIONS</p> <p>USE OF RENEWABLE ENERGY SUCH AS SOLAR POWER, NUCLEAR POWER AND HYDROELECTRIC POWER.</p>	<p>GOVT INTERVENTION ECONOMIC INSTRUMENTS</p> <p>Economics Topic Economics Concept Such as taxes, subsidies, standards and tradable permits</p>
<p>ETHICS CHARACTER & MORAL EDUCATION</p>	<p>ETHICS CHARACTER & MORAL EDUCATION</p>	<p>ETHICS CHARACTER & MORAL EDUCATION</p>	<p>ETHICS CHARACTER & MORAL EDUCATION</p>	<p>ETHICS CHARACTER & MORAL EDUCATION</p>	<p>INTRO TO ECONOMICS PRIVATE PROPERTY</p> <p>Economics Topic Economics Concept</p>

FAST FASHION
A CASE EXAMPLE

What is Fast Fashion?

RUN WAY

What does it have to do with Climate Change?

ACCELERATES!

environmental pollution

2nd LARGEST INDUSTRIAL POLLUTER
Apparel industry accounts for 10% of global carbon emissions and remains the second largest industrial polluter, second only to oil.

FAST FASHION
A CASE EXAMPLE

WHY IS IT HAPPENING?

DRIVE-UP DEMAND
LOWER-COST FOR PRODUCERS
SHORTER CONSUMPTION CYCLE

We are all responsible. For example, do we as consumers take the effort to find out how our clothes are made?
Do companies in turn provide that information readily to us? Do companies also choose to produce using environmentally-friendly or environmentally-harmful processes?
Lastly, do governments regulate these activities?

RAPID PRODUCTION
PRICE COMPETITION
KEEPING UP WITH TRENDS

FAST FASHION
A CASE EXAMPLE

What can be Done?

GOVERNMENT
Governments can enact environmental standards and regulations on the use and disposal of chemicals.

COMPANIES
SCIENTISTS
DESIGNERS

COLLABORATE & DEVELOP

FAST FASHION
A CASE EXAMPLE

ECO-FRIENDLY INNOVATION

WELFARE LOSS
As a result, the environment becomes less liveable and more unpleasant. This will cause health problems and illnesses.

SEVERE WATER & ENERGY SHORTAGE

WELFARE LOSS
As a result, the environment becomes less liveable and more unpleasant. This will cause health problems and illnesses.

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Tackling Climate Change At Different Scales.
Examples of technology and design innovations include:
[write up on pg 28]

CITIES
Circular economy — close loops for materials, energies and resources instead of disposing them.
Smart cities and ICT could reduce global greenhouse gas emissions by 15%.

BUILDINGS
Use of solar energy.
Use of new materials on buildings that can reflect sunlight and radiate heat back into outer space to keep buildings cooled without the use of air-conditioning.

INDIVIDUALS
Wearable Technology:
Smart fabric that could cool/warm an individual directly.

These can reduce effects of acid rain and flue-gas desulfurization.
They can also remove atmospheric pollutants via catalytic conversion.

Practical application of Osmosis, Diffusion and Active Transport in environmental and material engineering can alleviate impact of climate change on water supplies.

Tackling climate change needs a good mix of technological solutions as well as economic incentives. For example, some scientific and technological solutions work via influencing supply by internalizing the external cost. Others work via influencing demand by switching demand towards greener solutions.

INTRO TO ECONOMICS
PRIVATE PROPERTY

Economics Topic
Economics Concept

"We are all immigrants to this place even if we were born here..."
(Margaret Atwood)

Literature and Arts can come in useful when students discuss how economists view nature and the environment, and whether that is an important issue to address.

Genesis, a photography collection by Sebastião Salgado helps student become more sensitive to the many ways societies are affected.

This introduces humanity's angle into the topic of climate change which is often depicted as the struggle between nature and humans.

This is a prototype of an artifact of the near future. It explores what a lesson plan could look like in 2020.

We welcome comments and feedback on this prototype. Requests for the latest digital version are also welcome.

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