

Study Guide – Science of Global Warming and Climate Change

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- Suggested Reading:**
1. Global Warming, A Very Short Introduction by Mark Maslin published by Oxford University Press, 2009
 2. What We Know About Climate Change, 2nd Edition by Kerry Emanuel, The MIT Press, 2012.

Study Objectives

Explore the reality (science) of global warming and climate change. Learn about the relationship between global warming and the release of greenhouse gases and the computer models used to make climate change predictions. Understand the need to mitigate the effects of global warming as well as how the global warming process may be slowed and eventually reversed.

Outcomes

It is important for the scholar to develop a framework and basic knowledge of all aspects of global warming and climate change, likely the most important environmental challenge facing our planet in this century. In so doing the scholar will have the necessary background as to how to educate themselves and develop the capacity to find and evaluate relevant information. They will feel empowered to participate in the numerous debates on global warming and climate change and act accordingly.

Specific Outcomes

The scholar will:

- Understand what is meant by climate change and how it can be confidently evaluated over the past millions of years.
- Understand the relationship of the numerous factors that contribute to climate change.
- Understand what is meant by greenhouse gas and the greenhouse effect as it contributes to global warming.
- Be introduced to global climate models used to predict effects of greenhouse gases, global warming and climate change.
- Learn of the effects of global warming and climate change and the possibility of adapting to their effects.
- Learn how global warming may be managed.
- Understand the local, provincial, national and international responses to the prospect of global warming and climate change and how these responses might affect you.
- Understand the language used to discuss the science of climate change and impact of global warming.
- Develop skills for independent learning.
- Be able to appreciate and participate in the political debate over the reality and reaction to global warming and climate change.

Course Outline

TOPIC
<p>Overview of Global Warming and Climate Change.</p> <ul style="list-style-type: none">• Overview of subject: discovery, science, evidence/ impact, models, prediction, adaptation and mitigation.• Why learn about GW and CC? – Newspapers and media.• Weather vs. Climate (What is the difference?) (What are we talking about?).• IPCC and the UNFCCC (Visit the web sites.)• Believe or not to believe/ react or not react• Approach to development of scientific basis of global warming and climate change, identification of probable impacts, ways to adapt to these impacts and approaches to mitigation <p>Sources of Knowledge of Global Warming and Climate Change</p> <ul style="list-style-type: none">• Reliable sources of information (Who are you going to believe?).• Introduction to the IPCC Web Site and other recommended sources of information. <p>Discovery of climate change.</p> <ul style="list-style-type: none">• Evidence for global warming and climate change in earth's history.• Significance of historic changes in earth's climate.
<p>Introduction to IPCC AR5 WG 1.</p> <ul style="list-style-type: none">• Go to IPCC web site – read summary documents. <p>Science of Climate Change</p> <ul style="list-style-type: none">• Energy budget for earth.• Greenhouse effect.• Carbon cycle and carbon quantification.• Hydrological cycle. and distribution of water on earth.• Global circulation – atmosphere.• Ocean currents.• Biosphere.• Radiative forcing concept.• Greenhouse gases. (Why are we looking at GHG's?).
<ul style="list-style-type: none">• Data used to observe global warming and climate change.• Computer models and confirmation of science.<ul style="list-style-type: none">○ Description of computer models.

- Data used in computer models.
- Verification of computer models.
- Greenhouse gas emissions (GHG's)
 - Why the emphasis on GHG emissions?
 - Measurement of GHG's (greenhouse gases) in the atmosphere.
 - History of concentration of GHG's in the atmosphere.
 - Sources of GHG's – carbon cycle.
 - Fate of GHG's – carbon cycle.
 - Estimation of quantities of GHG's presently being emitted to atmosphere.
 - Sources of data on GHG emissions

Introduction to IPCC AR5 WG 2.

- Go to IPCC web site – read summary documents.

Impact of global warming and climate change.

- Historical.
- Observed.
- Use of computer models used to predict climate change .
 - Scenarios.
 - Quality of predictions.
- Prediction of impacts due to climate change including ocean acidification.

Adaptation

- Meaning of adaption.
- How do we adapt locally or globally?

Introduction to IPCC AR5 WG 3.

- Go to IPCC web site – read summary documents.

Mitigation -

- Meaning of mitigation.
- Use of computer model predictions to identify mitigation strategy.
- Identification of contributors or GHG's.
- Mitigation opportunities.
 - Reduction in GHG production.
 - Carbon capture and sequestration (variations).
 - Alternative energy sources.
 - Improving efficiency of energy use.
 - Carbon management concepts.
 - Community response.
 - Other ideas (reforestation, geo-engineering, conservation)

tillage, etc.).

Response to global warming and climate change.

- International
- National (Canada in particular).
- Provincial and state (Alberta in particular).
- City and municipality.
- Industry.
- Individual.