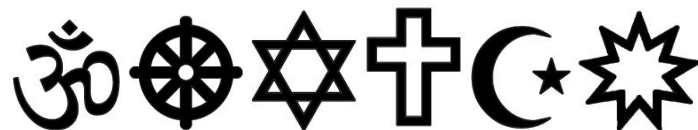




Muir Glacier 1941 vs 2004

# Scientific and Spiritual Dimensions of Climate Change - a Study Course



The purpose of this course is to facilitate the study of climate change from a scientific and a spiritual perspective. Any faith group can use these materials. The course was first published on the website of the [International Environment Forum](#) on 9 November 2009. It was up-dated in 2011, 2015 and again in 2017. The feedback of many participants and facilitators of study circles, weekend courses and summer schools in the UK, the USA, and Australia are incorporated in the present version. Suggestions for further improvement and feedback about your experiences with the materials are always appreciated.

Please contact Christine Muller at [chmuller99@hotmail.com](mailto:chmuller99@hotmail.com) (write "study course" in subject line).

6 November 2017

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You can also access this course online where it is frequently up-dated at <http://www.iefworld.org/ssdcc0.html>.

## Introduction: The Purpose of this Course

### Welcome to this Interfaith Study Course on Climate Change!

As a person of faith you are probably very concerned about the ongoing destruction of the natural world and worry about the future of our children. You may consider humanity's role in changing the climate an assault on God's creation. You may regard climate change as a moral issue and would like to do something constructive to mitigate it. However, like many people, you may be overwhelmed by the complexity of the issue. This is the reason why this course was created. It provides a systematic scientific explanation of climate change, relates the issue to our spiritual reality and to the ethical teachings inherent in religion, and empowers you to take action in a personal way that fits your beliefs and circumstances.

Some people though may argue that there are many other pressing social issues to learn about. **Why should we engage in a study course on climate change?** We could tell them to consider this:

Climate change may not be a threat to planet Earth, but it is a threat to the survival of a majority of plants, animals, human beings, and to human cultures and civilization. Such a threat is unprecedented in human history. Many people are already suffering from the devastating impacts of climate change such as increased water scarcity, more severe storms, floods, droughts, famines, malnutrition, diseases, and dislocation from their homes. The threat of climate change to our children and grandchildren is immense.

Climate change is not just an environmental issue. It has far-reaching implications for our efforts to relieve poverty, to establish and maintain peace, and for the economy. It is no exaggeration to say that the future of human civilization is at risk because we are destroying the foundation for life on this planet. Climate change is probably the greatest threat and the greatest challenge for humankind in the 21st century.

Al Gore said the following words after receiving the Nobel Peace Prize together with the UN Intergovernmental Panel on Climate Change: "We face a true planetary emergency. The climate crisis is not a political issue, it is a moral and spiritual challenge to all of humanity."

Baha'u'llah, prophet founder of the Baha'i Faith, counsels us *"Be anxiously concerned with the needs of the age ye live in and center your deliberations on its exigencies and requirements."* [1]

In recent years, **the awareness of the climate crisis** has been increasing geometrically. There are now thousands of local, national, and international organizations working to mitigate climate change in one way or another. Many religious communities have also started to take action. In the recently released Encyclical **Laudato Si**, Pope Francis points out that climate change must be addressed as a moral issue in order to protect the Earth, "our common home". This tremendous increase of global concern about the climate and of commitment to transform economic activities to be environmentally sustainable is a real cause for hope.

At the time of the publication of this course in 2009, no educational material was available. Therefore, it was considered necessary to provide a basic introduction into the causes and impacts of climate change in order to meaningfully relate spiritual and ethical principles to this issue. Today, the situation is very different: We are drowning in too much information. Now the course aims to provide the **essential knowledge**, based on trustworthy scientific and spiritual sources, to help participants navigate their own exploration of the topic and to be able to distinguish true scientific information from deliberate misinformation which has also proliferated.

This course has **four objectives**:

- To gain a deeper understanding of climate change by learning about its underlying causes and some of its impacts.
- To explore ethical questions connected to climate change, and to address them within the context of the spiritual teachings found in the world's religions.
- To practically apply spiritual teachings in your every-day personal life which will benefit the environment and future generations.
- To develop skills to be of service to your community.

In the process of exploring the various issues raised by climate change we will use both **science and religion**:

- A scientific approach is used to provide a basic understanding of climate change.
- A spiritual approach is used to explore the ethical dimensions of climate change.

The following materials are a compilation of up-to-date scientific research and spiritual texts from the world's religions. The course is **“text” based**, that means that authentic scientific sources, experts in the field, and religious scriptures are quoted as much as possible.

The course is based on the scientific findings of the **Intergovernmental Panel on Climate Change** (IPCC), especially on its most recent report released in 2014. This panel was established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme; both organizations of the United Nations.

The impacts of the rapid warming of the planet are becoming more and more apparent all over the globe, which has prompted intensive research on climate change. New findings are made public frequently and some of the most recent research is also included here. You will find all **references** listed at the end of each class.

As scientific understanding of climate change is constantly evolving and growing, the course is up-dated frequently. You can find the date of the last up-date on the front page and at the bottom of each class. Feedback from participants and facilitators is also considered with each up-date.

You are encouraged to investigate areas of special interest to you by using additional materials. Some resources are listed further down on this page.

This is an **interfaith course**. It includes the teachings and wisdom of many religions. A deliberate attempt was made to draw directly on the original holy writings, for example the Bible. Only occasionally, secondary source materials are used. The participants will notice that some sections feature predominantly Baha'i sources. One could explain this with the fact that the writer of the course is a Baha'i. It is unavoidable that this has influenced the author's thinking, but not the selection of texts. Scriptures were selected for their relevance in the context of climate change. That's why different religious scriptures are not represented equally in quantity. However, the respect shown for all religions is the same. Any faith group can use this course. The most interesting study groups may be those that represent the most diversity in the participants.

The course contains **9 classes**. They can be studied on average within 11 sessions of about two and half hours' duration. The **Facilitator's Guide** (see next section below) explains how to use the course creatively, how to adapt it to the needs and wishes of the participants, and how to shorten the course to 8 sessions or use it as a weekend workshop.

Some **videos** have been added to this recent edition. (They replace the power-point presentations that were part of the original 2009 course.)

All participants share the responsibility of nurturing a **spirit of love**, respect and unity within the study group. One helpful tool in that endeavor is to avoid talking about other people.

Throughout the course there will be many opportunities for **discussion**. This is a chance to share our knowledge, to learn from each other, and especially to stimulate and broaden our thoughts. It is not necessary to find the "right" answers to the questions discussed, as usually there will not be just one right answer. It is best to keep these conversations short and focused. Be satisfied with pointing out some major aspects, as it would be impossible to cover all aspects of the topics raised.

The purpose of this course is to spread accurate knowledge about climate change to many people. It should not be regarded as merely an enrichment for the participants. Therefore, you will be encouraged to practice presenting specific topics to family and friends. In this process you can practice the skill of explaining the problem of climate change and thus become an **agent for positive change**.

**Service** is an integral part of the course, as well as developing skills for service. This is accomplished by small **educational service projects** and a simple **community service project**.

The course emphasizes **action**. A major objective of this course is to lead the participants to an environmentally responsible life so that they will be part of the solution rather than part of the problem. This will happen by deepening our awareness of our interconnectedness with the earth and with all other people, and by realizing that an environmentally sustainable lifestyle is necessary for a spiritual life.

The despair that can be caused by the realization of the seriousness of the state of our world will be counteracted by opening up a spiritual perspective and by empowering the participants to action. A section in class 9 is devoted to dealing with the **emotional stress** that can be triggered when becoming more aware of the real threat of climate change.

Much effort has been made to compile the materials in an objective way. However, if the opinion of the author ever shines through, it constitutes only her personal view and **does not represent the views of any particular religion or institution.**

This short course doesn't claim to be comprehensive. The issue of climate change is vast and complex and its ethical implications are profound. Our purpose here is to lay a foundation upon which you will be able to build your own knowledge, to think on your own about the ethical dimensions, and to help make all your actions a service to humankind and a contribution to save the foundation for life on this planet.

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## REFERENCE

[1] Gleanings from the Writings of Bahá'u'lláh, section CVI

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## To the Facilitators

Thank you for serving as a facilitator of this course!

The **first task** of the facilitator is to help the group get together and to organize the time and place for the meetings. You are also asked to help provide an atmosphere where everyone is welcome and where different opinions may be expressed without fear of judgment or ridicule.

The **role of the facilitator** is

- To ensure that everyone gets to participate in reading and discussing.
- To keep the group focused on the materials to be studied.
- To keep track of time so that the material is covered in a timely manner.
- To prepare for the class by looking through all the materials ahead of time to be able to make good decisions about the allocation of class time.
- To let the group know about the assignments and the service project(s).
- To encourage the participants to follow up on their project(s).

You don't need to be an "expert" on climate change. It is also possible to have two facilitators who plan the classes together and take turns during the sessions.

If possible, ask the participants to read the brief **Introduction "The Purpose of this Course"** (see above) before the first class.

It is suggested that you begin each class with a **prayer** (alternating religious traditions if possible) and/or a short piece of music. Try to give all participants a chance to offer a prayer throughout the course.

As plenty of materials need to be covered in each class, encourage the participants to **focus** on the topic. It is desirable that, while reading the materials, participants add comments and engage in short discussions. Such discourse will make the classes lively and interesting. However, it may often be necessary to remind the participants to keep these discussions short so that you will be able to read through the whole lesson.

The primary objective of the course is to **understand** the scientific concepts and the meaning of the sacred texts. A few paragraphs in the materials may be difficult to understand with just one reading. You may help the understanding of the participants by asking someone to summarize the paragraph, to ask a key question, or simply to read the paragraph once more.

Feel free to **adapt the course** to the needs and interest of the participants. The course contains 9 classes. Most groups may like to study them in 11 sessions of about two and a half hours' duration. However, some groups may choose to come together less often, but longer. Some groups may want to spend more time discussing issues during class. In this case they may want to meet longer, more often, or may need to read a little bit more in between the classes. You can also shorten the course to only 8 sessions.



The **number of times groups meet** can vary quite a bit:

Class 1 Spiritual Reflections on Nature and Humankind	0 - 2 sessions
Class 2 The Impacts of Climate Change	1 session
Class 3 More Impacts of Climate Change	1 session
Class 4 The Causes of Global Warming	1 session
Class 5 Spiritual and Practical Dimensions - the Individual	1 - 2 sessions
Class 6 Climate Change Mitigation	1 session
Class 7 Spiritual and Practical Dimensions – the Role of Society	1 – 2 sessions
Class 8 Some More Climate Science	1 session
<u>Class 9 A Challenge to All of Us</u>	<u>1 – 2 sessions</u>
Total sessions	8 – 13 sessions

Therefore, study groups may meet about 8 to 13 times.

It is also possible to use the materials for a weekend program; see below after the instructions for each class.

**Group work** is often encouraged in this course. It is more interesting and enriching for the participants if groups are formed differently each time. In this way, everyone will have the chance to get to know and to work with everyone else.

There are **many different ways** to use the materials. Below you find suggestions for each class, how to structure it, and what activities may be included. Feel free to make changes and to incorporate your own ideas and the wishes of the participants.

For studying the materials in a group setting, it is best if all participants have their own **paper copies of the materials**. Printing double sided saves trees. You can also print on paper that was previously used one sided. This course is also available online [here](#).

The course materials contain several **videos**. If your group is large, it would be best to use a projector and screen. Small groups can watch the videos from a laptop. Perhaps you don't have internet or technical equipment available for your group study. In this case, you can encourage the participants to watch the videos at home before or after the sessions. If this is not possible, it's fine to only read the materials.

When studying the materials together, you may like to encourage the participants to highlight/underline the parts they think are important and those they would like to discuss.

### **Class 1: Spiritual Reflections on Nature and Humankind**

This class includes **three sections** of reading materials and the **video Home**. The movie is about 1½ hours long.

You have several options to cover these materials:

- Meet twice: In the first meeting, read the three sections, and in the second meeting watch the movie.
- Only meet once, but longer: Read the materials on a weekend afternoon, have dinner together, then watch the film.

- Only meet once for about two and a half hours: Choose the short version of the reading materials which you can cover in half an hour, then watch the movie together. You can download the short version of Class 1 [here](#).
- You can read and discuss the full version of the class in one sessions and have participants watch the film at home.

If you must cover the whole course in only 8 meetings, you may leave out Class 1.

*Optional Activity:* After reading the section about "Interconnectedness in Nature", play a game, practice a dance or do any kind of art project that expresses interconnectedness. (Think about an activity your group might enjoy when preparing for this class.)

When using the **short version** of the first class, it is suggested that the two pages are studied in groups of two, changing the groups for each page. The study of each page takes about 15 minutes. This short version includes all three sections. No further reading will be necessary. When using the longer version, try to also incorporate some group work in Section 2.

*Assignment:* If you cannot cover all the materials planned for the class, ask the participants to finish reading the materials of Class 1 or to watch the video at home.

## **Class 2: The Impacts of Climate Change**

This class contains **three sections** of reading materials and **two brief videos**. You should be able to cover this class in one session.

First, read the short opening paragraph and watch the **12 min. video** [Climate Change 2014: Impacts, Adaptation, and Vulnerability](#) with the whole group.

Afterward you have two options:

- Stay together as a whole group. This works especially well if you are a small group of seven or less participants. Read each section together allowing for brief comments and questions during, and a longer discussion after each section. Watch the **8 min. video** [Encroaching Seas - the Marshall Islands](#) (8min.) between the 2nd and 3rd section.
- Divide the participants into three groups. This works well with a larger group or a minimum number of 6 participants. Each group will study a different section and create a poster that contains the essential content of the section. The poster can consist of words or pictures or both. Then, with the help of the poster, each group will teach their studied impact of climate change to all the participants and lead a short discussion on the topic. (The suggested discussion questions may be used.) Reserve enough time at the end of class for these presentations and discussions. Watch the **8 min. video** [Encroaching Seas - the Marshall Islands](#) after the group presentations. Remember to bring poster boards, crayons, and markers to class.

*Assignment:* Encourage the participants to practice explaining the studied impacts of climate change with their family members or friends.

### **Class 3: More Impacts of Climate Change**

This class contains 8 sections of reading materials and **two brief videos**. It would be best to cover all the materials in one class.

At the beginning of class, stay together as a whole group. Read the first section “More Extreme Weather Events and Changes in Weather Patterns” and allow some time for discussion. Then watch the **video** [The Human Impact of Climate Change: Personal Stories from Somalia, Ghana, and Kenya](#). (almost 8 min.)

Then, divide participants into several small groups for the study of further impacts of climate change. This is one possible way of assigning sections to groups:

Group A: Section 2 “Soil Erosion and Desertification, Effects on Agriculture and Food”

Group B: Section 3 “Forests”

Group C: Section 4 “Loss of Biodiversity” and Section 7 “Multiple Stresses”

Group D: Section 5 “Ocean Acidification”, Section 6 “Effects on Human Health”, and Section 8 “Conflicts over Natural Resources”

If your study course has only a few participants, these short sections can also be assigned for individual study. Allow about half an hour to 40 minutes for this study and the preparation of a simple presentation.

Then each group (or individual) will present their topic(s) of study to all the participants. The presentations can be done with words, with a poster, with a skit or in any creative way the group chooses to communicate. After each presentation, encourage all the participants to ask questions on the topic just presented. The discussion questions may also be used to stimulate a whole group conversation. Reserve enough time for these presentations and discussions.

Remember to bring some poster boards, markers, and crayons to this class.

Watch the other **video** [World Oceans Day - Ocean Acidification](#) (4 min.) at the end of class.

*Assignment:* Continue to practice explaining some of the impacts of climate change to family and friends as the opportunity arises.

### **Class 4: The Causes of Global Warming**

This class contains **four sections** of reading materials and a **9 min. video**. You should be able to cover all these materials in one session.

Start the class with a prayer and/or meditate on the three short excerpts from Holy Writings.

Then read and study the four sections with the whole class together. This class on the causes of global warming is a prerequisite for participants to understand before studying the ethical and spiritual dimensions in the next class.

If you have a large group, you may like to split them into smaller groups of about four to eight participants. Each group would study the same materials.

Watch the **video** [Climate Change 2013: The Physical Science Basis](#) (9 min.) at the end of section 2.

At the end of this lesson, you will find some review questions. Depending on the needs and interests of the group they can be used in different ways. One meaningful way would be for the participants to write down the answer in their own words, either during class time or at home. This would help them to explain the causes of climate change to family members and friends. Perhaps the participants like to discuss some of the review questions.

***Educational Service Project:*** Encourage the participants to do a presentation of the causes and impacts of climate change to a circle of friends, or a youth group. Such a project would give the participants some practice explaining what they have learnt so far. They could do this individually, or present together, for example by distributing the topics among themselves. Take some time at the end of class to consult on this. Aim to carry this out within the next two weeks.

### **Class 5: Spiritual and Practical Dimensions - the Individual**

This class contains **five sections** of reading materials and a **20 min. video**. It is best to allow two sessions for this class. If your circumstances allow for only one session, it would be possible to squeeze most of the materials into 2 ½ hours. However, this would require brief and disciplined discussions and leaving out the video (or asking the participants to watch it at home).

In either case, if you are short of time, make sure to allocate at least 40 min. for the brainstorming of practical actions (Section 5) at the end of class.

Begin the class with reading section 1: “Stewardship of the Earth”.

Then view the **video** [The Story of Stuff](#) (20min.). It is available on the internet for free. You will find many other educational materials on that website as well.

Continue to study Sections 2 and 3 and then engage in the discussion questions.

Then read the brief Section 4 “Fostering Unity- Avoiding Judgmental Attitudes”.

It is best to cover **Section 5 “Actions of Individuals” as a brainstorming session:** Discuss practical actions individuals can take to reduce their own harmful impact on the environment. Use the course materials to make sure that all important aspects are being covered, especially that ideas are shared from the three domains of energy, transportation, and food. Do not distribute the materials of this Section 5 “Actions of Individuals” to the participants before this class. If participants already have all the materials of the course printed out, they can just put them away before this discussion. Let a participant write all the ideas on a blackboard. At the end, encourage a short discussion about which actions may save the most greenhouse gases.

The *Individual Activity* is basically an assignment for each individual.

***Educational Service Project:*** Take 5 min. to check in on the educational service project. If it's still in the planning stage, encourage the participants to include some of the spiritual principles and practical actions that were discussed in this class.

## **Class 6: Climate Change Mitigation**

This class contains **seven sections** of reading materials, one optional section, and a **9 min. video**. The materials would work for one session (in this case, leave out the optional Section 8), or you can take more time and study the materials in two sessions.

After the opening prayer, read the introductory paragraph and Section 1 “Mitigation and Adaptation” and watch the **video [Everything you need to know about the IPCC Fifth Assessment Report - WG3: Mitigation of Climate Change](#)** (9 min.) with the whole group.

Then study sections 2 to 7 in small groups, each group covering one or two sections. Form the small groups according to the participants’ interests in the topics.

Let each group present a short report on their section for the benefit of all participants.

Section 8 “Four Difficult Issues” is optional. You may choose to read together the topic(s) that are of most interest to your group. Or the participants can read this section at home.

Allow at least **20 minutes** to consult about the ***Community Service Project:***

As participants of this study course you are encouraged to take some action to help mitigate climate change. This service project can be very simple. You may confine it to just your group or invite others to participate. You may choose an educational project reaching out to a community of your choice (faith community, youth group, school, neighborhood), or a project to promote energy efficiency and conservation, or any other idea you may have.

You may also consider service in the area of adaptation, especially if you live in a developing country. An important objective of this group project is to create unity while planning and implementing it. Today, just brainstorm about what you would like to do. Write down some of your ideas.

The *assignment* is to think about the group’s community service project. Let them know that next week you will decide on a project and begin to plan and carry it out.

## **Class 7: Spiritual and Practical Dimensions - Society**

This class contains **eight sections** of reading materials and no video. It is best to allow two sessions for this class.

As all the materials of this class are central to this course, you can just read and then discuss each section.

If you are short of time, you can also divide the participants into four groups. Each group will study two sections. Allow enough time for the group work. Afterwards, each group will present the main points of their sections to all participants and lead a short discussion on their topics.

***Community Service Project:***

Reserve at least **half an hour** at the end of class to consult about and decide on your community service project. Apply the ideas for consultation and decision-making, which you discussed today (section 6). Consider the special circumstances of your group such as time constraints, special interests, and talents, as well as the needs of your community. Keep the project small and simple enough so that you can carry it out with joy. Plan to finish the project

by the end of this course or shortly afterwards.

The assignment is to take some action in preparation of your service project until you will meet again.

### **Class 8: Some More Climate Science**

This class contains **four sections** of reading materials and no video. It is best to cover these materials in one session.

Study all four sections as a whole group. Read, summarize certain paragraphs, ask questions and discuss some of the topics.

Set some time aside at the end for the discussion of two topics:

1. The **emotional stress** the participants may have experienced when learning more about the huge threat of climate change. It is important that everyone is able to share their views. If there are more than six participants in your study class, form smaller groups of three or four people for this discussion. It is not necessary for the small groups to report back to the whole group. Tell the participants that next week's class will address this emotional stress and will hopefully relieve much of it by the application of spiritual principles.
2. Consult about the **Community Service Project** as needed to carry it forward.

### **Class 9: A Challenge to All of Us**

This class contains **four sections** to read and **one very short video**. You may cover these materials in one or two sessions.

Read section 1: "Dealing with the Emotional Stress Caused by Climate Change". (If you didn't have time during last class for sharing and discussing the emotional stress caused by climate change, begin this class with asking the participants what kind of emotions they have experienced and why. You may like to write down the main points on a blackboard or poster board. After about 10 minutes, proceed to read section 1.)

Then watch the brief **video Katharine Hayhoe: Climate Change Evangelist 2:50**

Then continue reading and discussing the three remaining sections.

At the end of class, encourage a discussion about topics that you think would be useful or of interest to your group. Here some ideas:

- The group's community service project, if further consultation is required.
- How did this course change your view of the world?
- Would you like to share any plans or ideas how you could further serve humanity in your efforts to mitigate climate change?
- Would you be interested in facilitating a new study circle using this study course?
- Would you like to learn more about climate change and its spiritual dimensions?  
The **Wilmette Institute** offers an 8-week online course on climate change. Based on

this IEF course, the Wilmette Institute course includes more topics, readings, and videos, and numerous additional resources, and provides a forum for online discussions with participants from all over the world.

- Would you be interested in helping improve this study course by sharing your experiences and/or making suggestions for improving this course? If yes, please, contact Christine Muller [chmuller99@hotmail.com](mailto:chmuller99@hotmail.com) (write “study course” into the subject line).

**Suggestions how to use the course for a weekend program:**

In this case, it is recommended to cover the basics of climate change with a **video** as this is most time efficient, for example *Earth the Operator's Manual*. It provides a brief summary of classes 2,3,4, and 8, introducing the causes and impacts of climate change. Make sure to watch the film *before* studying the materials of classes 5, 7, and 9 about the spiritual and ethical dimensions of climate change.

- **[Earth the Operator's Manual](#)** (53:43) The film is perfect in length. This will allow for a half hour discussion afterward, before taking a good break. While providing a global perspective, the video contains some specific information about the USA.
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# Class 1

## Spiritual Reflections on Nature and Humankind

*"The heavens are telling of the glory of God; and their expanse is declaring the work of His hands."* The Bible [1]

*"All praise to the unity of God, and all honor to Him, the sovereign Lord, the incomparable and all-glorious Ruler of the universe, Who, out of utter nothingness, hath created the reality of all things, Who, from naught, hath brought into being the most refined and subtle elements of His creation, and Who, rescuing His creatures from the abasement of remoteness and the perils of ultimate extinction, hath received them into His kingdom of incorruptible glory. Nothing short of His all-encompassing grace, His all-pervading mercy, could have possibly achieved it. How could it, otherwise, have been possible for sheer nothingness to have acquired by itself the worthiness and capacity to emerge from its state of non-existence into the realm of being?"* [2] Baha'u'llah

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### Section 1: Nature and Creation

It may be fitting to begin an interfaith course on climate change with some excerpts from the authentic Writings of the world's religions about nature and creation. While the word nature describes our material (physical) world, the word creation applies both to the spiritual and to the material world.

*"In the beginning was the Word, and the Word was with God, and the Word was God. The same was in the beginning with God. All things were made by him; and without him was not any thing made that was made. In him was life; and the life was the light of men."* [3]

*"You are worthy, our Lord and God, to receive glory and honour and power, for you created all things, and by your will they were created and have their being."* [4] Christianity

*"Who created the waters and the plants? Who yoked the swiftness of the winds and the motion to the clouds? For I beheld Ahura Mazda (Wise Lord) as the primeval source of creation."* [5] Zoroastrianism

*"When God created the first human beings, God led them around all the trees of the Garden of Eden and said: "See my works, how beautiful and praiseworthy they are! Think of this, and do not corrupt or destroy My world."* [6] Judaism

*"Say: Nature in its essence is the embodiment of My Name, the Maker, the Creator. Its manifestations are diversified by varying causes, and in this diversity there are signs for men of discernment. Nature is God's Will and is its expression in and through the contingent world."* [7] Baha'i Faith

Discussion: What do the above Writings suggest about our membership as creatures in God's creation?

## **Section 2: Interconnectedness in Nature**

An often deeply held attitude in our culture is to view humans as separate from nature. This widespread perception is revealed by an examination of the word “environment” itself. The root of the French word “environ” means “around”. The environment means the natural world around us. The word itself expresses a separateness between us humans and other creatures.

Religious Writings provide profound statements about the interconnectedness of nature:

*"In the name of the merciful and compassionate God. The Merciful taught the Koran; He created man, taught him plain speech. The sun and the moon have their appointed time; The herbs and the trees adore; And the heavens, He raised them and set the balance, that ye should not be outrageous in the balance; But weigh ye aright, and stint not the balance. And the earth He has set it for living creatures therein are fruits and palms, with sheaths; and grain with chaff and frequent shoots; Then which of your Lord's bounties will ye twain deny." [8] Islam*

*"Reflect upon the inner realities of the universe, the secret wisdoms involved, ... the inter-relationships, the rules that govern all. For every part of the universe is connected with every other part by ties that are very powerful and admit of no imbalance, nor any slackening whatever." [9] Baha'i Faith*

*"We affirm and promote respect for the interdependent web of all existence of which we are a part." [10] The Seventh Principle of the Unitarian/ Universalists*

*"Even as the human body in this world which is outwardly composed of different limbs and organs, is in reality a closely integrated, coherent entity, similarly the structure of the physical world is like unto a single being whose limbs and members are inseparably linked together.*

*... Co-operation, mutual aid and reciprocity are essential characteristics in the unified body of the world of being, inasmuch as all created things are closely related together and each is influenced by the other or deriveth benefit therefrom, either directly or indirectly. Consider for instance how one group of created things constituteth the vegetable kingdom, and another the animal kingdom. Each of these two maketh use of certain elements in the air on which its own life dependeth, while each increaseth the quantity of such elements as are essential for the life of the other. In other words, the growth and development of the vegetable world is impossible without the existence of the animal kingdom, and the maintenance of animal life is inconceivable without the co-operation of the vegetable kingdom. Of like kind are the relationships that exist among all created things. Hence it was stated that cooperation and reciprocity are essential properties which are inherent in the unified system of the world of existence, and without which the entire creation would be reduced to nothingness." [11] Baha'i*

As human beings we physically share our existence with the animals on this planet. We are part of nature, of the interconnected web of life. Spiritually, however, human beings are different than animals, as God created us with an immortal soul. Our spiritual station endows us to differentiate between good and evil. Animals don't have this dilemma of choice. The human capacity of free will, to be able to consciously decide to do good or evil, comes with the great responsibility of moral action. This responsibility includes stewardship of God's creation.

Discussion: The previous paragraphs shed light on how everything in nature is interconnected. What concrete examples come to your mind? Is nature something we need to use and control or a community to which we belong according to the Writings above?

## **Photosynthesis**

The sun is the source of all physical energy and provides the warm temperature necessary for the existence of life. The energy of the sun also drives climate patterns and the weather, as differences in air and water temperatures create wind and ocean currents.

Plants absorb carbon dioxide and emit oxygen with the help of sunlight. This process is called photosynthesis. During photosynthesis, plants transform atmospheric carbon into organic compounds, especially glucose (sugars). That glucose is used in various forms by every creature on the planet for energy and growth. Photosynthesis is the foundation for all plant and animal life.

Fossil fuels such as gas, coal and oil were created many millions of years ago under great pressure over a very long period of time from broken down dead plants and animals. One could consider them as stored solar energy from ancient times. As we will see, today's rapid burning of fossil fuels brings nature out of balance.

## **Sustainability**

*"All men have been created to carry forward an ever-advancing civilization."* [12] Baha'u'llah

Sustainability is the practice of preserving the web of life and not disrupting its balance. Sustainability can be defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." [13]

Over several decades, many "developed" societies have become accustomed to a high standard of living that depends on an ever-growing global economy. At the same time, this global economic system has left some societies much less developed, with many people in poverty and struggling to survive, even in the developed societies themselves. While it is clear that poor people must be given the opportunity for some economic growth we must now accept the fact that we are living on a finite planet. Sustainability cannot be achieved without respecting the carrying capacity of the Earth's finite ability to support human life.

*"Carrying capacity"* refers to how many organisms can live sustainably in a particular environment without destroying its resources. Many things can be limiting factors, such as food or water supply, amount of shelter, or capacity to absorb wastes. If we apply this concept to humans we must consider the different degrees to which people are using the planet's resources. There is a wide range from bare survival needs, to a modest standard of living, to luxurious, to quite extravagant. Also, the type and level of technology used has an effect on the human carrying capacity of Earth. The planet could support many more people living a simple rural village life than an American suburban lifestyle. Obviously, these points raise significant moral issues of equity and justice in the distribution of wealth, technology, and natural resources when determining Earth's carrying capacity for human civilization.

The idea of carrying capacity relates closely to that of sustainable development, because both refer to the need to live off of interest rather than capital. If we cut down forests faster than

they can grow back, intensify agriculture until it robs the soil of its fertility, and make profligate use of non-renewable resources such as minerals and fossil fuels, we can increase our standard of living and/or the number of people living on the planet, but we reduce its capacity to support people in the future. The success of development in the West has come partly from diminishing stocks of non-renewable resources, and partly from the import of cheap primary commodities often produced by over-exploitation in developing countries, just as the empires of earlier times flourished through colonial exploitation.” [14]

Another tool to measure our impact on the Earth is the “ecological footprint”. It measures the amount of ecological “space” required to support a person, family, or community. Summing this over a specific population, or the Earth’s total population, gives a rough measure of the amount of resources, the “share” of Earth’s resources needed to support that population at the specified standard of living.

”Today humanity uses the equivalent of 1.5 planets to provide the resources we use and absorb our waste. This means it now takes the Earth one year and six months to regenerate what we use in a year.” [15]

Sustainability is not an entirely new idea. The Iroquois Confederacy, a Native American group, for instance, already taught the wisdom of considering the impacts of our actions on the future: “Look and listen for the welfare of the whole people and have always in view not only the present but also the coming generations, even those whose faces are yet beneath the surface of the ground – the unborn of the future Nation.” [16]

We are all part of the biosphere, the ecosystem Earth. True awareness of our interconnectedness and interdependence with all other living things and the Earth instills a profound feeling of humility. Such a state of mind is the necessary foundation for a sustainable approach to all our activities. Bahá'u'lláh wrote:

*“Every man of discernment, while walking upon the earth, feeleth indeed abashed, inasmuch as he is fully aware that the thing which is the source of his prosperity, his wealth, his might, his exaltation, his advancement and power is, as ordained by God, the very earth which is trodden beneath the feet of all men. There can be no doubt that whoever is cognizant of this truth, is cleansed and sanctified from all pride, arrogance, and vainglory.” [17] Baha'u'llah*

Discussion: (When you discuss the following questions it is not necessary that you exhaust the topics. Just find some examples and share some thoughts.)

- 1.What are some unsustainable practices current today?
- 2.How can we implement sustainability in our everyday life?
- 3.How are humility and the awareness of interconnectedness and interdependence important for sustainability?
- 4.What would a sustainable society look like?

### **Section 3: Science and Religion**

#### **Science**

*“The faculty of intellectual investigation into the secrets of creation... is the most praiseworthy power of man, for through its employment and exercise the betterment of*

*the human race is accomplished, the development of the virtues of mankind is made possible...*" [18] `Abdu'l-Baha

Our whole civilization, life as we know it, is built on scientific and technological advances. Science is a specific process of learning to understand the reality of the universe. It is both an individual and a collective process that is progressing over time. Science is a method of investigating reality that minimizes the influence of bias or prejudice. Depending on the discipline of the science, the scientific method encompasses various steps and procedures usually including experimental tests. These experiments must be well documented in order that other scientists can repeat these experiments to check their validity. This replicability of experiments is critical to the scientific method.

A *scientific theory* or law represents an explanation for observed occurrences, which has been confirmed through repeated experiments and has gained acceptance over time. As used in science, the word "theory" is in contrast to its common, everyday use: For example, when one says "it's only a theory" it implies that something is unproven or speculative. However, nobody would choose to ignore a scientific theory or law of nature such as Newton's theory of gravity and step off from a high cliff because "gravity is only a theory". A scientific theory is a well-confirmed explanation of some aspect of nature, made in a way consistent with accepted scientific knowledge and methods.

*Peer Review* is an integral and expected part of the process of publishing the results of a scientific study in a reputable scientific journal. It means that the prospective publishers put a paper presented to them for publication out for prepublication review by independent scientists (often two or three, who usually remain anonymous), who have expertise in the author's field of research. The purpose of the process is to check that the methodology, analysis, and results are reasonable and properly conducted and presented according to accepted standards.

There is always some degree of *uncertainty* in science. Scientific results are subject to revision in the future as new experiments are done and as knowledge is applied in the "real world" and the results are reviewed in the light of that experience.

*Scientific consensus* is the collective judgment of the community of scientists in a particular field of study; it implies general agreement, not necessarily unanimity. Differences of opinion on some detailed aspects of a subject are always present in a scientific community even if there is consensus about the general subject. However, communicating that consensus to those outside the field can be difficult. The usual discussions surrounding the always present uncertainty can seem like a lack of consensus to outsiders, indicating greater disagreement and uncertainty than actually exists. Conveying scientific consensus can prove difficult because of differences between the level of understanding about an issue by scientists, politicians, and the lay-public.

The term "*Settled Science*" is sometimes used where the opinion of a vast majority of scientists knowledgeable in a field are in agreement that there is no longer reasonable doubt about a certain scientific result or conclusion that would justify any significant expenditure of energy or money at the current time trying to disprove a particular consensus opinion or change their direction of study. Global warming caused by anthropogenic greenhouse gases is considered "settled science" by the vast majority of climate scientists, even though there are still many questions to be answered about the specific details of future climate impacts

and its implications for human society. Although scientists must adhere to certain ethical principles such as truthfulness and fairness, science does not provide an ethical framework that could guide us in the responsible use of the products of scientific research. Therefore, the ethical values derived from religion are crucial in the implementation of any technology. The science of climate change can explain and describe what is happening to the planet, for example, why glaciers are melting so fast, why sea levels have been rising, and why extreme weather conditions like heat waves, droughts, floods, and stronger storms have been increasing. Science and technology can also propose solutions to mitigate or adapt to climate change. However, the choice of solutions involves value judgments that are beyond the realm of science. The value system necessary for making decisions including climate-change policy is provided by religion.

## Religion

Religion serves the individual by providing enlightenment and spiritual guidance. At the same time it helps society by providing an ethical framework:

*"God's purpose in sending His Prophets unto men is twofold. The first is to liberate the children of men from the darkness of ignorance, and guide them to the light of true understanding. The second is to ensure the peace and tranquillity of mankind, and provide all the means by which they can be established."* [19]

*"Religion is the greatest of all means for the establishment of order in the world and for the peaceful contentment of all that dwell therein."* [20]

Baha'u'llah explains that society is negatively affected when people turn away from religion or when religion becomes corrupted:

*"... Religion is a radiant light and an impregnable stronghold for the protection and welfare of the peoples of the world. ... Should the lamp of religion be obscured, chaos and confusion will ensue, and the lights of fairness and justice, of tranquillity and peace cease to shine..."* [21]

The following paragraph explores what happens when people turn away from religion:

*"The perversion of human nature, the degradation of human conduct, the corruption and dissolution of human institutions, reveal themselves, under such circumstances, in their worst and most revolting aspects. Human character is debased, confidence is shaken, the nerves of discipline are relaxed, the voice of human conscience is stilled, the sense of decency and shame is obscured, conceptions of duty, of solidarity, of reciprocity and loyalty are distorted, and the very feeling of peacefulness, of joy and of hope is gradually extinguished."* [22]

We can experience the truth of these words written by Shoghi Effendi in 1936, in all aspects of our society today.

You may be surprised about the positive portrayal of religion in the above paragraphs as you may be a realistic observer of today's world. The Baha'i teachings explain that religions are going through cycles. At the beginning they are full of spiritual light and enkindle increasing numbers of people. A new culture, a new civilization develops. After a while, human made dogma and rituals begin to cloud its light. Corruption and power-seeking individuals engulf its institutions. Then it is time for a new divine revelation and the beginning of a new cycle. Today

we need this divine and transformative power of religion more than ever as we are facing planetary crises that are unprecedented in human history. Religion provides a clear framework of ethics that can guide us in our actions to address these crises.

"Religion exerts a profound influence on all societies and many of the world's peoples. Throughout history, it has proven to be the primary force for social progress, motivating individuals to develop spiritual qualities, and empowering them to sacrifice for their fellow human-beings and to contribute to the betterment of their communities." [23] The role of religion as a motivator for action will be further discussed in Class 9. Ethical principles derived from religion will be discussed in Classes 5 and 7.

## Science and Religion

"The principle of the harmony of science and religion means...that everything in this creation, all aspects of human life and knowledge, should be studied in the light of [religious] revelation as well as in that of purely rational investigation [i.e., science]." [24] The Universal House of Justice

Science and religion are tools to investigate reality from two different angles. Each discipline asks a fundamentally different question.

Science asks: "How does the universe work?"

Religion asks: "Why is there a universe and what is its purpose, and what is our purpose of existence as human beings?"

If science and religion ask fundamentally different questions and are complementary, how are they each to be used when we examine an issue of social concern? The role of science is the assessment of facts and their potential physical and social consequences. After scientists provide citizens, politicians, and other stakeholders with the facts and consequences of concern, all stakeholders must use ethical values to make policy decisions about any actions to be taken that may affect society. Values and ethics are the domain of religion. In the case of climate change, science can explain the causes of global warming and project with various amounts of certainty the impacts of the resulting changes in climate. It is then up to the public and to governments to consider these facts, to apply values, and then to act accordingly.

## Misuse of Religion and Science

*"Any agency whatever, though it be the instrument of mankind's greatest good, is capable of misuse."* [25] `Abdu'l-Baha

When talking about religion we should be aware that abuse and perversion of religion have often caused intolerance, fanaticism, oppression and even war. This is, of course, in stark contradiction to the original teachings of all the world's religions. The Baha'i Faith, for example, admonishes that "religion should unite all hearts and cause wars and disputes to vanish from the face of the earth, give birth to spirituality, and bring life and light to each heart. If religion becomes a cause of dislike, hatred and division, it were better to be without it, and to withdraw from such a religion would be a truly religious act..." [26] Or as stated by Baha'u'llah,

*"In matters of religion every form of fanaticism, hatred, dissension and strife is strictly forbidden."* [27] Baha'ullah



At the heart of the Christian Faith is love. It is a love not limited to our own family, nation or coreligionists. It embraces everyone, even our enemies:

*“But I say unto you which hear, love your enemies, do good to them which hate you, bless them that curse you, and pray for them which despitefully use you.”* [28] Jesus

The Baha'i Faith teaches that all religions have the same divine origin and that we should *“consort with the followers of all religions in a spirit of friendliness and fellowship.”* [29]

Most important for avoiding religious fanaticism is the use of reason and science.

Science can also be abused. The most widespread abuse of science and technology is their use without spiritual or ethical consideration. Such abuse frequently results in human rights violations and/or environmental problems and degradation. For example, if a company manufactures and sells sterile seeds, the farmers become dependent on that company to buy seeds every year. If bioengineered seeds are sold, they can contaminate many native species of crop plants, which may result in the eventual loss of all these important food plants. The way much of scientific research is controlled and exploited by corporations frequently shows the lack of an ethical framework.

Deliberate misrepresentation of science by economic interests and political interference is another form of abuse. A case in point is the systematic disinformation campaign by the climate change skeptics. They are not following responsible scientific criticism, but through various tactics endeavor to shed doubts on climate science.

### **Independent Investigation of Truth**

*“...Man must independently investigate reality, for the disagreements and dissensions which afflict and affect humanity primarily proceed from imitations of ancestral beliefs....”* [30] `Abdu'l-Bahá

Every human being has the responsibility to investigate reality and search for the truth, both in the realms of physical as well as spiritual reality. The principle of independent investigation of truth has applications in everyday life. When we watch news on TV, listen to the radio, or read an article in a newspaper we can think about whether this is really factual, partially true or even false. When we hear or read about an issue, we should relate it to what we have already learned from sources we trust and check out underlying sources.

You have probably seen in the media the controversy over different views about the science of climate change. The media often give equal time to scientific information and the views of climate skeptics. While for many social issues it is beneficial to hear different opinions, in the case of climate change this is not the case, as it is a matter of science education. Different human opinions don't affect the laws of physics and chemistry. It is a huge problem that the general population is not well- and even mis-informed about climate change, for the consensus of a large portion of the population is needed to support meaningful actions that could help mitigate it and avert a catastrophe. In a democracy, citizens must be informed enough that they feel comfortable making value judgments and choosing policies based on scientists' assessed risks and benefits.

Baha'u'llah admonished the writers of newspapers *“to be purged from the promptings of evil passions and desires and to be attired with the raiment of justice and equity. They should inquire into situations as much as possible and ascertain the facts, then set them down in writing. ... Fair speech and truthfulness, by reason of their lofty rank and position, are*

*regarded as a sun shining above the horizon of knowledge.” [31]*

Next time you read a newspaper, go on the internet, or see news and advertisements on TV, think about what you consider as credible information.

Given the spiritual principles of the independent investigation of truth and consultation, should this course give only one view of climate change science if there are other opinions? Why are these other views not given equal value? The warming of our planet Earth is a fact and not an opinion. That's the consensus of an overwhelming majority of scientists everywhere. The new report [32] by the IPCC's Working Group 1 of the Intergovernmental Panel on Climate Change states: “Warming of the climate system is unequivocal.” “It is virtually certain that globally the troposphere has warmed since the mid-20th century.” The footnote explains the probability of “virtually certain” as 99–100%.

The report also says that “It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century.” “Extremely likely” is defined as 95 – 100%. “The evidence for this has grown, thanks to more and better observations, an improved understanding of the climate system response and improved climate models,” explains a recent IPCC press release. Most leading religious institutions have called for action on climate change as a moral responsibility including the institutions of the Baha'i Faith.

The purpose of this course is to give a very basic introduction to the science of climate change. Based on that knowledge, we will apply spiritual principles and ethical standards as found in the scriptures of the world's religions. After establishing that foundation, we will be ready for a consultation about what we could do as individuals and religious communities to make a contribution to mitigate climate change. The objective of the course is not to debate whether climate change is happening or not.

### **Science and Religion in this Course**

This course is based on both science and religion. Whenever the perspective of religion is used, quotations from religious scriptures are presented because they provide the ethical foundation. Moreover, the Word of God has the power to change human hearts. Similarly, when the perspective of science is used, scientific facts and direct statements from scientists are presented. These numbers, graphs and details don't need to be memorized; they are included to provide depth to our understanding and to illustrate the scope of the problems discussed.

*“Religion and science are the two wings upon which man's intelligence can soar into the heights, with which the human soul can progress. It is not possible to fly with one wing alone! Should a man try to fly with the wing of religion alone, he would quickly fall into the quagmire of superstition, whilst on the other hand, with the wing of science alone he would also make no progress, but fall into the despairing slough of materialism.” [33] `Abdu'l-Bahá*

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**Watch the video "Home", about 1 1/2 hours**

<https://www.youtube.com/watch?v=jqxENMKaeCU&t=3s>

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## Class 2

# The Impacts of Climate Change

*“God saw everything that he had made, and indeed, it was very good.”* The Bible [1]

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For the past 150 years, the Earth has been warming:

- Since the industrial revolution, global average temperature has increased by 1.1°C (2°F). [1A]
- This temperature increase does not seem to be a big deal. However, as you will see, climatic changes can be observed almost everywhere, and in many areas, climate change is already disrupting people’s lives.
- Each of the last three decades has been successively warmer at the Earth’s surface than any preceding decade since 1850. [2]
- 2016 was the hottest year on the historical record and the third consecutive record-breaking year. Of the 17 hottest years ever recorded, 16 have now occurred since 2000. [3] [4]
- Present emission trends put the world plausibly on a path toward 4°C (7.2 °F) warming within this century. [6]

In Class 4, you will learn about the causes of global warming more in depth. Now you just need to know that the main reasons for the warming are the burning of fossil fuels (oil, coal, and natural gas) and deforestation, which are adding more greenhouse gases to the atmosphere.

Global warming has serious long-term impacts on the climate, which affect various areas of the world in different ways and to different degrees.

Often, the terms global warming and climate change can be used interchangeably. Depending on the context though, one of them is sometimes more accurate. Global warming describes the global average increase in the Earth’s surface temperature, while climate change is used to emphasize the effects of that warming on the Earth’s climate.

In this and the next class we will examine some of the impacts of climate change.

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### Watch this video:

**Climate Change 2014: Impacts, Adaptation, and Vulnerability**, a report by the Working Group II of the Intergovernmental Panel on Climate Change (IPCC) 12 min.

<https://www.youtube.com/watch?v=jMIFBJYpSgM>

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## **Section 1: Melting of Glaciers and the Polar Ice Caps**

Due to warmer temperatures, mountain glaciers all over the world are receding. The dramatic worldwide shrinking of the glaciers is one of the most visible evidences of global warming. Glaciers act as a kind of global fever thermometer. People and governments in many countries are alarmed.

In the Alps, the glaciers lost about 1/3 of their area and half of their volume between 1850 and 1975. Since then much more has melted. Switzerland went so far as to cover one of its most rapidly melting glaciers to slow down the loss. [7]

In the United States, the glaciers in “Glacier National Park” are retreating so quickly it has been estimated that they will vanish entirely by the year 2030. [8]

In the case of Kilimanjaro, the highest mountain in Africa, global warming has definitely been a contributing factor for its loss of one third of its ice within 12 years. [9] About 82% of its icecap surveyed in 1912 is now gone.

Melting glaciers pose multiple dangers: Initially, the increasing amount of meltwater can have a positive effect for hydropower. At the same time, emerging glacial lakes have the potential of sudden drainage that can cause devastating floods. In the long term, severe water shortages can be expected when there will be no or only very little ice left to melt in the summer. The time frame for this to happen varies greatly depending on the geographic location; it may be a matter of just a few years, decades, or, in the case of the Himalayas, several centuries.

Most worrisome is that the polar ice caps began melting as well. The accelerating speed of their melting has even surprised scientists who predicted the thawing. Between the 1960s and the 1990s, sea-ice depth in a large section of the Arctic Ocean declined by nearly 40%. [10] From 1979 to 2005, Arctic sea ice has shrunk roughly 250 million acres (1,011,714 km<sup>2</sup>), an area the size of New York, Georgia, and Texas combined. [11] For a European comparison, this is the size of Germany, Italy and Poland combined.

“The most dramatic loss of ice in recent years has been the decline of summer sea ice in the Arctic Ocean. Between 1953 and 2006, the area covered by sea ice in September shrunk by 7.8 percent per decade, more than three times as fast as the average rate simulated by climate models. Researchers were further stunned in the summer of 2007 when Arctic sea ice extent plummeted to the lowest level ever measured, more than 20 percent below the 2005 record. This decline is rapidly changing the geopolitics of the Arctic region, opening the Northwest Passage for the first time in recorded history and triggering a scramble among governments to claim large swaths of the potentially resource-rich Arctic sea floor. Many now believe the summer Arctic Ocean could be ice-free by 2030, decades earlier than previously thought possible.” [12]

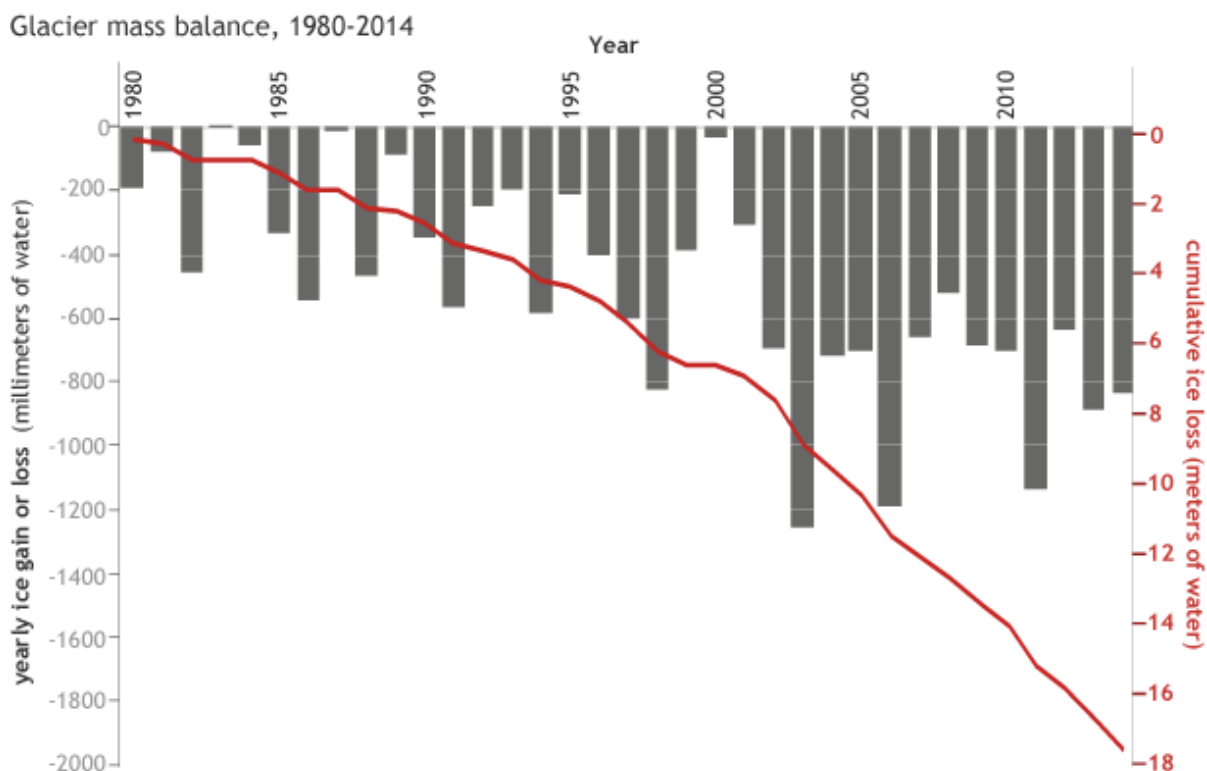
On 21 December 2010, large areas of open water persisted across much of the area between Greenland and Canada. While the US Northeast and Europe experienced a cold spell, a vast region in Northern Canada was extremely mild. According to David Phillips, a senior climatologist with Environment Canada, the implications for people have been widespread. “Last New Year’s Eve, the big story was ice breaking up,” says Phillips. “This year there was no ice to break up.” Worst of all, he adds, “it’s impossible for many people in parts of the eastern Arctic to safely get on the ice to hunt much-needed food for their families—for the second winter in a row. Never before have we seen weather impact a way of life in so many

small and big ways.” [13]

The Greenland ice sheet is also melting. It holds enough water to raise sea levels worldwide by 7m (23 feet). [14] "If greenhouse gas emissions are not controlled, the total disintegration of the Greenland ice sheet could be set in motion in a matter of decades. Although the process could take centuries to fully play out, once begun, it would be self-reinforcing, and hence virtually impossible to stop." [15]

Even on the coldest continent, Antarctica, the effects of global warming have set in. The ice on East Antarctica still seems to be stable. But scientific research revealed that the temperature over West Antarctica has probably increased by 2°C (3.6°F) since 1950. Measurements on the much smaller Antarctic Peninsula showed temperature increases of up to 3°C (5.4°F). “The substantial warming on the Peninsula has been cited as a contributor to the dramatic breakup of a Rhode Island-sized portion of the Larsen B Ice Shelf in 2002.” [16] Then, on July 12, 2017, the New York Times reported the breaking away of an unprecedented large part of the Larsen C Ice Shelf on the Antarctic Peninsula: “A chunk of floating ice that weighs more than a trillion metric tons broke away from the Antarctic Peninsula, producing one of the largest icebergs ever recorded and providing a glimpse of how the Antarctic ice sheet might ultimately start to fall apart.” [16A] The size of the iceberg is larger than the island of Bali in Indonesia and comparable to the state of Delaware or four times the city of London. [16B]

The World Glacier Monitoring Service released this graph [16C] showing the glacial mass balance of 37 glaciers from 1980 – 2014. As you can see, 1983 saw the last slight increase in ice mass.



## Why are the polar ice caps melting so fast?

Scientists explain this with three major reasons:

1. A major reason is the albedo (reflectivity) effect: Snow and ice are the best reflectors of solar radiation. They reflect about 70% of the sun's radiation (and absorb 30%). Water on the other hand is a poor reflector. It reflects only 6% of the sun's radiation and absorbs most of the heat (94%). The intense thawing of ice and snow creates more water surfaces. The warming of the water contributes to the regional rise in temperature, which again causes more ice to melt. This ice - albedo feedback is believed to be the major reason why the Arctic is warming so rapidly. [17]
2. As the volume of ice is shrinking, the surface is getting down to lower elevations where temperatures are higher.
3. "Many marine-terminating glaciers have accelerated (near doubling of the flow speed) and retreated since the late 1990s. A consensus has emerged that these retreats are triggered at the terminus of the glaciers when a floating ice tongue breaks up." [18]

*Discussion:* Why should we be concerned about the melting of glaciers and of the polar ice caps? What could be some of the impacts on local people and cultures, on local ecosystems and on the world at large?

## Section 2: Sea Level Rise

There are two major reasons why sea levels have been rising: 1. When water warms up, its volume increases. This is called thermal expansion. 2. The melting of glaciers and of the polar ice caps adds huge amounts of freshwater to the oceans.

"Over the past 100 years, global sea level has risen by between 10 and 25cm (3.9 and 9.8 inches)." [19]

The rate of global average sea level rise has increased from 1.8mm/yr to 3.1mm/yr from 1961 to 1993. This trend of accelerating sea level rise is expected to continue for many centuries.

"Warming of 4°C (7.2°) will likely lead to a sea-level rise of 0.5 to 1 meter, (1meter = 3.3 feet) and possibly more, by 2100, with several meters more to be realized in the coming centuries. Limiting warming to 2°C (3.6°F) would likely reduce sea-level rise by about 20 cm by 2100 compared to a 4°C world. However, even if global warming is limited to 2°C, global mean sea level could continue to rise, with some estimates ranging between 1.5 and 4 meters above present-day levels by the year 2300. Sea-level rise would likely be limited to below 2 meters only if warming were kept to well below 1.5°C." [20] The rising of sea levels will result in land and habitat loss in many countries. Bangladesh may lose almost 20% of its land area. Hundreds of coastal communities, Small Island states in the Pacific and Indian Oceans and the Caribbean would be inundated, forcing their population to relocate. [21]

The low-lying island nation of Tuvalu, midway between Hawaii and Australia, is already pursuing plans to evacuate. Some inhabitants of Kiribati have already left their country and resettled in New Zealand and other places. [22] The atoll-based nation of the Maldives is also significantly at risk to disappear into the ocean.



## **The Impact of Climate Change on the MARSHALL ISLANDS:**

"What would you do if you knew that your country was to disappear in the next two to three decades, and together with your country you would also lose your home, your culture, your way of life? This is what faces the people who live in the four atoll nations in the world - Marshall Islands, Kiribati, and Tuvalu located in the Pacific Ocean, and the Maldivian Islands located in the Indian Ocean. These atolls will cease to exist in the next few decades as a result of sea level rise.

The Marshall Islands is a country totally made up of atolls, which consist of more than a thousand individual islands. All these very small islands make up a total land area of only about 70 square miles spread out in an ocean area of over 750,000 square miles. Thus most of the country is the vast open ocean.

Atolls are formed from the coral reefs that grow in warm tropical ocean waters. The foundation of atolls is made up of dead coral skeletons. Their formation took many millennia: As old corals died their skeletons remained, and other new corals grew on top of them, ever reaching for sunlight through the ocean water. All atoll islands are flat and barely rise above high tide sea levels. Today the average elevation of the Marshall Islands is 7 feet (2.1m) above sea level, but in many places where people today are living the land surface at high tide is only one foot or less above the water line.

The people of the Marshall Islands developed a very close knit, cooperative, and community-oriented culture that has assured their survival for at least two millennia. They have developed fine-tuned ways of getting along in very small spaces with extremely limited resources, which could serve as a model for the rest of the world's people.

As sea levels are rising because of climate change, the inhabitants of these islands will lose their home. What will happen to their language that describes so well this environment of an atoll, with numerous words describing in detail the various daily and seasonal phases of the ocean tides, or the stages of the development of a new coconut, or the detailed descriptions of the ocean currents, which are used to navigate around the vast expanses of ocean? What will happen to the people, to their way of life, their cohesiveness, their understanding of how to get along in such isolated circumstances? What about their cultures? And finally, what will happen to their enthusiasm for life, their laughter, their amazing generosity, their ways of being all inclusive towards everyone, their gentleness - their "spirits"?

Now put yourself in their circumstances: total devastation of your way of life, caused by the actions and life styles of others, and totally out of your control to change or stop this destruction! How does this make you feel? What are the spiritual implications? Where is justice?" [23]

Experts with the United Nations University estimate that rising sea levels and environmental deterioration have already displaced about 50 million people. The greatest cost of rising sea levels will not be measurable. It is the inevitable disruption of communities and cultures that cannot be replicated elsewhere. [24]

However, in the more distant future, that is later on this century and beyond, hundreds of millions of people will become displaced if sea levels will rise a few meters. Many important, historical cities around the world like Venice, New Orleans, Miami, and Amsterdam will be lost to the ocean. Many of the largest cities in the world will sooner or later share the same fate, including Shanghai, Manhattan, Alexandria, and Dhaka.

More recent scientific research includes the faster than expected ice melt and projects “that continued high emissions would result in multi-meter sea level rise this century and lock in continued ice sheet disintegration such that building cities or rebuilding cities on coast lines would become foolish.” [24A]

Discussion: What are the two reasons why sea levels have been rising? Which areas of the world are most at risk? What is the danger with continuous sea level rise in the future?

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**Watch this video:**

**Encroaching Seas - the Marshall Islands 8min.**

<https://www.youtube.com/watch?v=INpSVKnx620#t=13>

Encroaching Seas are rapidly eroding away the 24 atolls of the 60,000 residents in the Republic of Marshall Islands. With an elevation of merely 10 feet above sea level, every inch of sea level rise is a major threat to life.

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### **Section 3: Water Scarcity**

*Water flows from high in the mountains,  
Water runs deep in the Earth.*

*Miraculously, water comes to us, and sustains all life.”[25] Thich Nhat Hanh*

In our physical existence, water is essential for life. That's one of the reasons why it is used so often in spiritual writings as a metaphor. In nearly all the world's major religions water plays an important role as a symbol and in ceremonies.

In the Baha'i Writings we often read about the water of life. It usually refers to the revelation of the Word of God to humankind. Our spiritual life depends on it. Read and meditate for a moment on this prayer by Baha'u'llah:

*“My God, my Adored One, my King, my Desire! What tongue can voice my thanks to Thee? I was heedless, Thou didst awaken me. I had turned back from Thee, Thou didst graciously aid me to turn towards Thee. I was as one dead, Thou didst quicken me with the water of life. I was withered, Thou didst revive me with the heavenly stream of Thine utterance which hath flowed forth from the Pen of the All-Merciful.*

*O Divine Providence! All existence is begotten by Thy bounty; deprive it not of the waters of Thy generosity, neither do Thou withhold it from the ocean of Thy mercy. I beseech Thee to aid and assist me at all times and under all conditions, and seek from the heaven of Thy grace Thine ancient favor. Thou art, in truth, the Lord of bounty, and the Sovereign of the kingdom of eternity.” [26]*

Now, let's examine some issues of the tangible water: Globally, water is scarce and demand is growing. “Many millions of people around the world face water shortages and a daily struggle to secure safe water for their basic needs.” [27]

The amount of freshwater is finite while demand is increasing. “One billion people around the world don't have access to clean, safe water. In developing nations, waterborne illnesses like cholera, typhoid and malaria kill 5 million people each year -- 6,000 children every day. And global warming is exacerbating this crisis as severe, prolonged droughts dry up water supplies in arid regions and heavy rains cause sewage overflows.” [28]

In Africa, by 2020, 75 to 250 million people are projected to be exposed to an increase in water stress due to climate change. [29]

"In Sana'a, the capital of Yemen—home to 2 million people—water tables are falling fast. Tap water is available only once every 4 days; in Taiz, a smaller city to the south, it is once every 20 days." [30]

"People who fall ill from waterborne diseases can't work. Women and girls who travel hours, sometimes more than seven hours a day, to fetch clean water for their families can't go to school or hold on to a job. Without proper sanitation, human waste pollutes waterways and wildlife habitat. Global warming and population pressures are drying up water supplies and instigating conflict over scarce resources." [31]

"In many parts of the world, lakes are shrinking or disappearing and rivers are running dry. Lake Chad, for example, has shrunk by 95% since about 1960. This had disastrous consequences for the local population. The main causes are the diversion of water for irrigation and less rainfall because of climate change. Many large rivers like the Yellow River, the Colorado River or the Nile don't reach the ocean anymore. [32]

### **Reduced water availability from glaciers**

The most serious threat to water supply is the disappearance of glaciers which provide much needed melt water during the summer. More than one-sixth of the world's population will be affected. [33]

Ice and snow are huge water reservoirs, which feeds rivers during the summer. 80% of the South American Glaciers could disappear within only 15 years. The consequences for the water supply will be devastating. Lima's 12 million inhabitants derive their water almost exclusively from the glaciers' melt water.

It is estimated that 30 million people are at risk of losing their glacial water supply in the Andes due to climate change. The Chacaltaya glacier near La Paz has experienced 99 percent loss since 1940. With glaciers projected to disappear, and no other water sources available, millions of people will be forced to migrate. Ecuador, Peru, and Bolivia are all affected by glacier melting. Conflicts have arisen in urban areas over privatized water, and a greater struggle exists between those seeking water for cities versus those needing resources for agriculture.

Outside of the polar regions, the Himalayas have the largest concentration of glaciers in the world and their melt water is the major source of water for the Indus and the Ganges rivers. Satellite images have revealed an "alarming recession" of glaciers in the Bhilangna basin of the Garhwal Himalayas since 1965. Its largest glacier, the Khatling, had receded 4,340 meters and had fragmented into multiple valley glaciers. "The alarming retreat and fragmentation of valley glaciers into smaller glaciers may have profound impact on the future sustainability of Himalayan glaciers and water availability." [33A]

The following statement from the IPCC's 2007 Synthesis report summarizes the vast reaching threat of climate change to water security: "Climate change is expected to exacerbate current stresses on water resources from population growth and economic and land-use change, including urbanisation. On a regional scale, mountain snow pack, glaciers and small ice caps play a crucial role in freshwater availability. Widespread mass losses from glaciers and reductions in snow cover over recent decades are projected to accelerate throughout the 21st

century, reducing water availability, hydropower potential, and changing seasonality of flows in regions supplied by meltwater from major mountain ranges (e.g. Hindu-Kush, Himalaya, Andes), where more than one-sixth of the world population currently lives.” [34]

### **Water and Food**

“The link between water and food is strong. We each drink on average nearly 4 liters (about 1 gallon) of water per day in one form or another, while the water required to produce our daily food totals at least 2,000 liters (528 gallons)—500 times as much. This helps explain why 70 percent of all water use is for one purpose—irrigation.” [35]

Aquifers are over-pumped in many countries. “There are two types of aquifers: replenishable and nonreplenishable (or fossil) aquifers. Most of the aquifers in India and the shallow aquifer under the North China Plain are replenishable. When these are depleted, the maximum rate of pumping is automatically reduced to the rate of recharge.

For fossil aquifers, such as the vast U.S. Ogallala aquifer, the deep aquifer under the North China Plain, or the Saudi aquifer, depletion brings pumping to an end. Farmers who lose their irrigation water have the option of returning to lower-yield dry land farming if rainfall permits. In more arid regions, however, such as in the southwestern United States or the Middle East, the loss of irrigation water means the end of agriculture.” [36]

The U.S. embassy in Beijing reports that wheat farmers in some areas are now pumping from a depth of 300 meters (nearly 1,000 feet). Pumping water from this far down raises pumping costs so high that farmers are often forced to abandon irrigation and return to less productive dry land farming. [37]

Changes in precipitation patterns are observed in many parts of the world. The timing and amount of rain are very important for crops. Farmers need to adapt and learn how to do things differently, for example plant different seeds, or different crops, or plant them at a different time of the year.

#### Discussion:

- Why is water so important?
- Summarize some of the reasons why water supply is scarce.
- Why does climate change exacerbate water scarcity?

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## Class 3

### More Impacts of Climate Change

#### Section 1: More Extreme Weather Events and Changes in Weather Patterns

It is important to know the difference between **weather** and **climate**:

“Weather is what the forecasters on the TV news predict each day. They tell people about the temperature, cloudiness, humidity, and whether a storm is likely in the next few days. Weather is the mix of events that happens each day in our atmosphere.

Climate is the average weather in a place over many years. While the weather can change in just a few hours, climate usually takes hundreds, thousands, even millions of years to change.” [1] Summarized in everyday language one could say “Climate is what you expect; weather is what you get.”

Many regional temperature changes have already been observed: Since 1950, in many regions of the world, records show a decrease in the number of very cold days and nights and an increase in the number of extremely hot days and warm nights. Spring starts earlier in the Northern Hemisphere than it used to a few decades ago. [2]

Although climate change is a reality all over the globe, the warming is not evenly distributed. At the poles, for example, climate change is already occurring at an accelerating pace. In the Arctic, annual average surface air temperature over land is now 3.5°C (6.3°F) warmer than at the beginning of the 20th century. [3] The Arctic continues to warm at a rate about twice as fast as the rest of the world. The national Snow & Ice Data Center reported on March 6, 2017, that the “February air temperatures over the Barents Sea ranged between 4 to 5°C (8 to 9° F) above average.” [3A] Scientists, as well as the indigenous people of the Arctic, have noticed dramatic changes that have affected ecosystems and wildlife, and the way of life of indigenous peoples. [4]

Abnormally severe heat waves are increasing and causing much human suffering. In 2013, Australian forecasters had to add new colors to their temperature charts to adequately show their record heat. [4A]

Heatwaves are becoming extreme in many parts of the world. For example, in early summer 2017, temperatures in Southern Italy exceeded 40°C (104°F). [4B] Pakistan probably suffered the most that summer with temperatures up to 54°C (129.2°F). [4C]

Devastating forest fires claimed more than 60 lives in Portugal in June 2017 [4D] and, in Sicily, forced the evacuation by boat of more than 700 tourists. [4E]

Changes in precipitation (rain and snow) are already occurring in many regions of the world. It has become significantly wetter in eastern North and South America, northern Europe and northern and central Asia, but drier in the Sahel, southern Africa, the Mediterranean, and southern Asia. There is less snow and more rainfall in northern regions. Widespread increases in heavy precipitation events have been observed, even in places where the total amount of precipitation has decreased. These changes are associated with increased water vapor in the atmosphere arising from the warming of the world's oceans, especially in the lower latitudes. There are also increases in some regions in the occurrence of both droughts and floods. [5] Europe, for example has been suffering from both droughts and floods in the



past years.

Even on a warming planet we may still encounter some cold spells and hard winters. With more water vapor in the atmosphere, the occurrence of very heavy snowfalls is expected to increase.

The severity of extreme weather conditions is increasing. “As sea surface temperatures rise, particularly in the tropics and subtropics, the additional heat radiating into the atmosphere causes more destructive storms.” [6] “The number of Category 4 and 5 hurricanes worldwide has nearly doubled over the past 35 years. The change occurred as global sea-surface temperatures have increased over the same period.” [7]

Increases of extreme weather events in recent years seem to be the first consequences of global warming. Australia suffered from an extremely severe drought over many years, and then in 2010 had to endure an extensive flood. Early in 2011, a terrible cyclone devastated the same region. Pakistan’s flood in 2010 was one of the worst in history. Many unusual floods throughout the United States and Europe were reported during the same year. The 2012 drought in the United States impacted about 80 percent of agricultural land, making it the most severe drought since the 1950s. [8]

Cyclone Haiyan (2013) was the strongest storm ever measured to make land fall. [9] And only a year later, typhoon Hagupity seriously set back the efforts to recover from Haiyan.

2017 may likely have been the worst flood year humankind has ever experienced. The flooding of the Gulf Coast by hurricane Harvey was unprecedented. The human suffering and the economic damages are impossible to take in. The flood in South Asia in August 2017 was even worse. More than 1000 people died and at least 41 million people in Bangladesh, India and Nepal have been directly affected by flooding and landslides resulting from the monsoon rains. One third of all of Bangladesh was under water. [10] That's an unimaginable catastrophe.

We shouldn't be surprised though. Scientists have warned that floods will become more frequent and more severe, because of global warming. More moisture evaporates from warmer soils and oceans, and warmer air can hold more moisture. So when it rains (or snows) there is much more water. Another important reason for the worsening floods is sea level rise, which we discussed in the last class.

As the Earth is continuing to warm, such devastating floods and storms will likely become much more frequent and even worse.

Discussion: Did you observe any changes in climate in your region? Or have you heard personal reports from people who were affected by a change in climate in another part of the world?

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### **Watch this video:**

#### **The Human Impact of Climate Change: Personal Stories from Somalia, Ghana, and Kenya 7:55**

<https://www.youtube.com/watch?v=Bg9GXL0LpiQ>

This video shares the stories of real people affected by the impacts of climate change in Africa due to global carbon pollution. We tell the stories of Somali refugees affected by

drought and famine forced to flee to Kenya just to survive. In Ghana, rising sea levels are driving residents of coastal villages further and further inland. And in Kenya, a lake that once provided fisherman with their livelihoods is rapidly drying up, driving political instability. [19]

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## **Section 2: Soil Erosion and Desertification, Effects on Agriculture and Food**

*"The earth is the Lord's and the fullness thereof."* The Bible [11]

"The thin layer of topsoil that covers the planet's land surface is the foundation of civilization. This soil was formed over long stretches of geological time as new soil formation exceeded the natural rate of erosion. As soil accumulated over the eons, it provided a medium in which plants could grow. In turn, plants protect the soil from erosion. Human activity is disrupting this relationship.

Sometime within the last century, soil erosion began to exceed new soil formation in large areas. The accelerating soil erosion can be seen in the dust bowls that form as vegetation is destroyed and wind erosion soars out of control. Among those that stand out are the Dust Bowl in the U.S. Great Plains during the 1930s, the dust bowls in the Soviet Virgin Lands in the 1960s, the huge one that is forming today in northwest China, and the one taking shape in the Sahelian region of Africa. Each of these is associated with a familiar pattern of overgrazing, deforestation, and agricultural expansion onto marginal land, followed by retrenchment as the soil begins to disappear. ...

The 2 to 3 billion tons of fine soil particles that leave Africa each year in dust storms are slowly draining the continent of its fertility and, hence, its biological productivity. In addition, dust storms leaving Africa travel westward across the Atlantic, depositing so much dust in the Caribbean that they cloud the water and damage coral reefs there. ...

Ethiopia, a mountainous country with highly erodible soils on steeply sloping land, is losing an estimated 1 billion tons of topsoil a year, washed away by rain. This is one reason Ethiopia always seems to be on the verge of famine, never able to accumulate enough grain reserves to provide a meaningful measure of food security." [12]

Climate change will exacerbate soil degradation in many parts of the world. In drier areas, climate change is expected to lead to salinization and desertification of agricultural land. [13]

"By 2025, Africa could lose as much as two-thirds of its arable land compared with 1990, and there could be declines of one-third in Asia and one-fifth in South America. Migration – from the Sahelian regions to the West African coast, from sub-Saharan Africa to Europe, from Mexico to the United States – will be an inevitable consequence as poor people are driven off their land." [14]

In some countries in Africa, agricultural yields could be reduced by up to 50% by 2020. [15]

Higher temperatures take a great toll on agriculture. "More people on the planet depend on rice than on any other crop. Rice plants react very quickly to temperature change: they show a 10 percent drop in yield for every 1°C (1.8°F) rise in minimum temperature. In parts of the Philippines, farmers have had to stop growing rice completely during the droughts caused by the 'El Nino' years, and river delta and coastal rice production has already suffered badly across South-East Asia because of storms that overwhelm sea defenses and salt-water intrusion into paddy fields. An Asian Development Bank report warns that rice production in

the Philippines could drop by 50–70 per cent as early as 2020.” [16]

Although higher harvests can be expected in some northern areas because of the fertilization effect of more CO<sub>2</sub>, world wide, agriculture will be severely affected and global food production will decline. And we already have a problem with hunger: “More than 800 million people worldwide suffer from malnutrition. About 24,000 people die every day as a result.”

[17] Since 2002, when Kofi Annan made this statement, a global food crisis has started to emerge. There are many reasons for it: The diversion of good agricultural land to grow plants for bio-fuels, environmental degradation of agricultural lands, declining fisheries, and last, but not least, climate change impacts, especially droughts, heat waves, floods and unpredictable changes in precipitation patterns. According to Oxfam International “climate -related hunger could be the defining human tragedy of this century.” [18]

*Discussion:* Why is there widespread soil erosion and desertification? What are the consequences for agriculture and people? What’s the impact of climate change on soils and plants?

### **Section 3: Forests**

*Cut down the forest of desire, not the forest of trees.* [21] The Buddha

Forests play a vital role in maintaining the balance of the Earth's ecosystems. They provide habitat for more than half of all terrestrial species, help filter pollutants out of the air and water, and prevent soil erosion. Rainforests also provide essential hydrological (water-related) services. For example, they tend to result in higher dry season streamflow and river levels, since forests slow down the rate of water or rain run-off, and help it enter into the aquifer. Without a tree cover, the water tends to run off quickly into the streams and rivers, often taking a lot of topsoil with it. Forests also help the regional climate as they cycle water to the interior of a continent. The shrinking of the Amazon Rainforest reduces regional rainfall, which in turn threatens the health of the remaining forest and of the agricultural land in Southern Brazil. This also results in an increased fire risk.

Forests and their soils also play a critical role in the global carbon cycle. The level of CO<sub>2</sub> in the atmosphere depends on the distribution or exchange of carbon between different “carbon pools” as part of the carbon cycle. Forests and their soils are major carbon pools, as are oceans, agricultural soils, other vegetation, and wood products: the carbon stored in the woody part of trees and shrubs (known as “biomass”) and soils is about 50% more than that stored in the atmosphere.

Trees continuously exchange CO<sub>2</sub> with the atmosphere. The release of CO<sub>2</sub> into the air is due both to natural processes (respiration of trees at night and the decomposition of organic matter) and human processes (removal or destruction of trees). Similarly, CO<sub>2</sub> is removed from the atmosphere by the action of photosynthesis, which results in carbon being integrated into the organic molecules used by plants, including the woody biomass of trees. Thus forests play a major role in regulating global temperatures by absorbing heat-trapping carbon dioxide from the atmosphere, and storing it in the form of wood and vegetation – a process referred to as “carbon sequestration”.

Unfortunately, the global benefits provided by trees are being threatened by deforestation and forest degradation. We use the term ‘deforestation’ as shorthand for tree loss. Forest

'degradation' happens when the forest gets degraded, for example due to unsustainable logging practices which remove the most valuable species, or artisanal charcoal production in which only a few trees are harvested. The Earth loses more than 18 million acres of forestland every year—an area larger than Ireland—according to the United Nations Environment Programme (UNEP). [22]

Deforestation is a major cause of global warming. When trees are burned, their stored carbon is released back into the atmosphere. As a result, tropical deforestation (including forest degradation) is responsible for about 12-15 percent of total annual global warming emissions according to estimates released for the climate change conference in Copenhagen.

The reasons for deforestation are complex. The most important factors are clearance for agriculture (including cattle ranching), poor governance (illegal logging, corruption, and ineffective law and order), insecurity of land tenure, the system of international trade, poor planning (e.g. building of major trunk roads in forest areas), and unsustainable logging.

“The tropical deforestation in Asia is driven primarily by the fast-growing demand for timber. In Latin America, by contrast, the growing demand for soybeans and beef is deforesting the Amazon. In Africa, it is mostly the gathering of fuelwood and the clearing of new land for agriculture as existing cropland is degraded and abandoned. Two countries, Indonesia and Brazil, account for more than half of all deforestation.” [23]

Agricultural clearance is overall the most important cause of deforestation – it is estimated to be responsible for up to three quarters of deforestation and degradation. While some of this is for commercial biofuel crops like oil palm and soybean, which grow very well in tropical forest areas, much of it is also due to the basic problem of how to feed a burgeoning world population. Also many of the 'agents of deforestation' are among the poorest people in the world, often without land, who are forced to clear forest areas to feed their families. Therefore the solutions are far from simple, and go to the roots of the problems of sustainable development, as will be discussed in Class 6.

At the same time, forests that have so far escaped deforestation are now threatened by climate change: In many regions of the world, more trees will die because of increasing insect infestations and forest fires. [24] (More insects are surviving milder winters.) “Wildfires have been on the rise worldwide for half a century. Every decade since the 1950s has seen an increase in major wildfires in the United States and around the world.” [25]

Tropical rainforests, rich in biodiversity, are suffering from warmer temperatures and less rainfall, both caused by climate change. In the past, rainforests were a sink for CO<sub>2</sub>. Now with hotter temperatures, their growth is impeded, and some are actually emitting CO<sub>2</sub>. [26]

If climate change is not mitigated, rainforests will not be able to survive. “If the IPCC's most severe projection comes true, much of the Amazon rainforest will transform into savannah.” [27]

*Discussion:* What is the significance of forests for the climate system? Besides their role of absorbing CO<sub>2</sub>, what other important environmental services do forests provide? How are forests threatened today?

## **Section 4: Loss of Biodiversity, Changes in Ecosystems**

*“Diversity of hues, form and shape, enricheth and adorneth the garden, and heighteneth the effect thereof.” [28] ‘Abdu’l-Bahá*

According to the 2014 Living Planet Report by WWF, there was a 52% loss of populations of mammals, birds, reptiles, amphibians, and fish between 1970 and 2010. [29]

Until now, the major reason for species decline and extinction was the loss of habitat. Now, climate change poses an even greater threat. We can already observe how species are moving towards the poles or up the mountains. In Britain, the comma butterfly, for example, expands its territory northwards, about 80km (50 miles) per decade. [30]

Changes can be quite dramatic. In the Arctic, for example, suddenly robins and mosquitoes appeared that were previously unknown there.

Many plants and animals cannot move or evolve quickly enough to adjust to the new climate conditions; so they die out. In fact, climate change has already caused the extinction of some species: The Golden Toad, for example, disappeared when reduced precipitation in the Monteverde cloud forests dried out the shallow pools where eggs were laid and tadpoles developed. [31]

Approximately 20 – 30% of plant and animal species are at increased risk of extinction if increases in the global average temperature exceed 1.5 – 2.5° C (2.7 – 4.5°F).” [32]

We hope that we can prevent that much of a temperature increase. However, if we continue with business as usual, temperatures will increase even more than that, which could result in catastrophic species extinctions of between 40 – 70% by the end of this century.

Each extinct species is a loss for humanity. We will not be able to use these species for the development of new crops or for the research of new medicines and treatments. Furthermore, species extinctions create holes in the web of life, which disrupt the ecological balance and have far-reaching negative impacts on directly and indirectly connected species. Moreover, each species has intrinsic value that cannot be measured by a one-sided utilitarian approach. Our extermination of our fellow inhabitants of Earth raises strong moral questions.

Whole ecosystems can get out of balance. The ecosystems that are most threatened by climate change are wetlands, mountainous regions, coral reefs, mangroves, and tropical rain forests. In the long term, all ecosystems will be affected by climate change.

Discussion: Have you seen a species or an ecosystem that is endangered by global warming?

## **Section 5: Ocean Acidification**

Oceans have absorbed at least a quarter of our carbon dioxide emissions. This absorption of CO<sub>2</sub> has been very helpful for the climate because it reduced CO<sub>2</sub> in the atmosphere and, as a consequence, reduced the warming we have witnessed so far. However, as the gas dissolves in the water it produces carbonic acid. “The acidity of ocean surface waters has increased by 30 percent since the 17th century.” [33] Such a change in ocean chemistry is significant and has long-term effects:

“Typically, seawater is heavily saturated with dissolved calcium carbonate from eroded limestone. This neutralizes any acid that forms from CO<sub>2</sub> and leaves plenty of carbonate for marine creatures to use for shell- and reef-building. But as oceans absorb increasing amounts of CO<sub>2</sub> from fossil fuels, their stores of calcium carbonate dip. Over time, this reduces carbonate available for marine creatures. Shell and coral formation slows.” [34] Existing shells can even dissolve. Many ocean creatures depend on calcium carbonate. The most spectacular ones are the corals, which will not be able to survive if the current trend of acidification continues. This problem may have even wider implications, because some zooplankton are also affected. They are at the basis of the marine food web. This means that many fish and other animals are also threatened by the increasing acidification of the oceans.

As with many other effects of climate change, scientists are extremely concerned to see that these changes progress much faster than anticipated.

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### **Watch this video:**

**World Oceans Day - Ocean Acidification** 4 min. [35]

<https://www.youtube.com/watch?v=Pw0phjeptF8>

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## **Section 6: Effects on Human Health**

There are several direct and many indirect effects of climate change on human health. Most obvious is the threat of heat waves. During the European heat wave in 2003, almost 35,000 people died. [36] Such extreme weather events will become more frequent, prolonged and severe. Vector born diseases are becoming more widespread because more insects survive the milder winters. Lyme disease is spreading, and so is Malaria. Malaria transmitting mosquitoes are multiplying in areas that get more rain and floods, and they are spreading to higher altitudes and latitudes because of warmer temperatures. “It is estimated that climate change has contributed to an average of 150,000 more deaths from disease per year since the 1970s, with over half of those happening in Asia.” [37] Doctors say it's contributing to a rise in seasonal hay fever and allergic asthma in the USA, where the pollen season has lengthened up to 16 days since 1995. If carbon dioxide emissions continue to increase, they expect allergic conditions to worsen, adding to the discomfort of allergy sufferers as well as swelling U.S. health care costs.

Yet, the biggest effect on global health will most likely be the more indirect effects of climate change on water, food security, and economic and social instability. According to an Oxford University study on the future of food, "more than half a million people worldwide are likely to die annually by 2050 because of the impact on agriculture of a changing climate." [37A]

## **Section 7: Multiple Stresses**

Often, a plant, an animal or a whole ecosystem is affected by more than one problem. Let's look at the example of coral reefs: They have been suffering from chemical runoff from agriculture, mainly fertilizers and pesticides. Then marine pollution has been an additional burden. Now with global warming, water temperatures are increasing. Corals are very sensitive to temperature rises. On top of that comes the acidification of the ocean. All these



factors combined have contributed to coral bleaching (dying of coral reefs). “Unless significant measures are taken to reduce the stress on coral reefs from human activities, 60% of the world’s coral reefs may die by the year 2050.” [38]

Not only plants and animals are affected by a combination of environmental stresses. Unfortunately, people are also suffering from multiple stresses in many parts of the world, for example from the combined disasters of soil erosion, water scarcity and poverty. The Intergovernmental Panel on Climate Change stated, “Africa is one of the most vulnerable continents to climate change because of multiple stresses and low adaptive capacity.” [39]

Discussion: Do you know a country or a region where people are suffering from multiple stresses including climate change?

## **Section 8: Conflicts over Natural Resources**

Degradation of freshwaters, decline in food production, energy issues, increase in storm and flood disasters and environmentally induced migration are all potential causes for conflict. [40] “A global population predicted to increase to about 9 billion by the mid-21st century, combined with stresses on water, land, and food resources could create the ‘perfect storm.’” [41]

According to a report titled “Insurgency, Terrorism and Organised Crime in a Warming Climate: Analysing the Links Between Climate Change and Non-State Armed Groups,” climate change does not “automatically lead to more fragility and conflict.” Rather, the authors see climate change as a threat multiplier, noting that it “interacts and converges” with other existing risks and pressures in a given context and “can increase the likelihood of fragility or violent conflict.” [41A]

Many countries could face war for scarce land, food and water as global warming increases. More than 60 nations, mainly in the Third World, are likely to have existing tensions exacerbated by the struggle for diminishing resources. Others now at peace - including China, the United States and even parts of Europe - are expected to be plunged into conflict. Even those not directly affected will be threatened by a flood of hundreds of millions of environmental refugees.

The threat is worrying world leaders. UN Secretary-General Ban Ki-moon said: “In coming decades, changes in the environment - and the resulting upheavals, from droughts to inundated coastal areas - are likely to become a major driver of war and conflict.” [42]

These conflicts could happen at the local, national, regional or international level.

UN Secretary-General Ban Ki Moon sees a direct link between the social and political unrest in Darfur and its roots in an ecological crisis, at least partly attributable to climate change. Thousands of people have died or been driven from their homes in the Darfur region of Sudan. Ban writes: “Two decades ago, the rains in southern Sudan began to fail. ... Scientists at first considered this to be an unfortunate quirk of nature. But subsequent investigation found that it coincided with a rise in temperatures of the Indian Ocean, disrupting seasonal monsoons. This suggests that the drying of sub-Saharan Africa derives, to some degree, from man-made global warming.” [43]

Massive migrations and shortages of resources have the potential to cause political instability, which may overwhelm many poor countries and result in many more failed states. According



to the International Organisation for Migration (IOM), there could be 200 million refugees by the year 2050.

Discussion: How does climate change contribute to scarcity of resources and to human conflicts?

Now that you are familiar with some of the impacts of climate change you will be able to understand the following general remarks on a deeper level:

"Climate Change is a real thing. It's not something dramatic now - that's why people don't really react. But it will be dramatic for our children and our children's children - the risk is too big not to care." [44] Konrad Steffen

"Climate change is no longer just an environmental issue, it is a looming humanitarian catastrophe." [45] Catherine Pearce

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## Class 4

# The Causes of Global Warming

*“God saw everything that he had made, and indeed, it was very good.” [1] The Bible*

*“No defect canst thou see in the creation of the God of Mercy: Repeat the gaze: seest thou a single flaw?” [2] The Qur'an*

*“How great, O my God, is this Thy most excellent handiwork, and how consummate Thy creation, which hath caused every understanding heart and mind to marvel!” [3] Baha'u'llah*

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### **Section 1: Scientific Observations of Global Warming and Changes in Climate**

Over the past few decades the science of global warming has made much progress. Now, there is certainty that the planet has been warming. Also the estimated likelihood of human beings being responsible for that warming has increased from 90-100% in 2007 to 95-100% in 2013:

“Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased.” [4]

This statement comes from the most recent report by the Working Group 1 of the Intergovernmental Panel on Climate Change, issued on Sept. 30, 2013 and is also included in the Synthesis Report released on Nov. 1, 2014.

#### **Some global warming facts:**

- “The first decade of the 21st century was the warmest on record, according to NASA. [5]
- Since the Industrial Revolution, global average temperature has increased by 0.8°C (1.4°F).
- “Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90% of the energy accumulated between 1971 and 2010 (high confidence). It is virtually certain that the upper ocean (0–700 m) warmed from 1971 to 2010, and it likely warmed between the 1870s and 1971.” [6]
- The warming is not evenly distributed. Some areas have warmed much more. Parts of the Arctic have warmed by 2° - 3°C (3.6°-5.4°F) just since the 1950s. [7]

As we have seen in the last two chapters, this warming has serious consequences, especially for low-lying areas and poor countries, but in the near future also for all of humanity.

## **Section 2: What Is Global Warming?**

*“We, assuredly, have decreed a cause for all things and vouchsafed everything with an effect. All of this is by virtue of the effulgence of My Name, the Efficacious (the 'Producer of Effects') upon existing things. Verily, thy Lord is the One Who exerciseth command over all that He willeth.” [8] Baha’u’llah*

### **The Carbon Cycle**

For the understanding of global warming it helps to have some insight into the carbon cycle: “The biosphere is maintained by a complex set of delicately balanced systems which are still poorly understood. The atmospheric conditions that permit life to exist were themselves created in part by the action of living things. The early plants removed carbon dioxide from the atmosphere and added oxygen, making animal life possible. Dead plants, both the remains of marine plankton and terrestrial vegetation, were buried and fossilized as coal, oil and gas, and their carbonate skeletons became layers of limestone, locking a significant part of the Earth's carbon away in geological formations.

Carbon cycles through the biosphere, as plants take up carbon dioxide to make organic matter, while animals and decomposers return the carbon dioxide to the oceans and atmosphere.” [9]

### **The Greenhouse Effect:**

Atmospheric gases like carbon dioxide (CO<sub>2</sub>), methane and nitrous oxide are called greenhouse gases because they act similar to the glass in a greenhouse by trapping heat. Or more specifically worded: “the greenhouse gases are transparent to most incoming radiation from the sun, which passes through the atmosphere and hits the Earth. The Earth is warmed by this radiation, and in response radiates infrared (long wavelength) energy back into space. That is where greenhouse gases come into play. These atmospheric gases absorb some of the outgoing infrared radiation, trapping the heat energy in the atmosphere and thereby warming the Earth.” [10] Life on Earth is only possible because of this greenhouse effect. It has kept the Earth’s average surface temperature stabilized at around 13.5°C (56.3°F) for a long time.

Since the industrial revolution, greenhouse gases have sharply increased - upsetting the previously long-lasting balance. Scientists confirm that this increase of greenhouse gases is for the most part anthropogenic (man-made). The increase comes mainly from emissions from power plants, cars, airplanes, deforestation and industrial activities. We are “returning carbon to the atmosphere and oceans that has long been out of circulation.” [11]

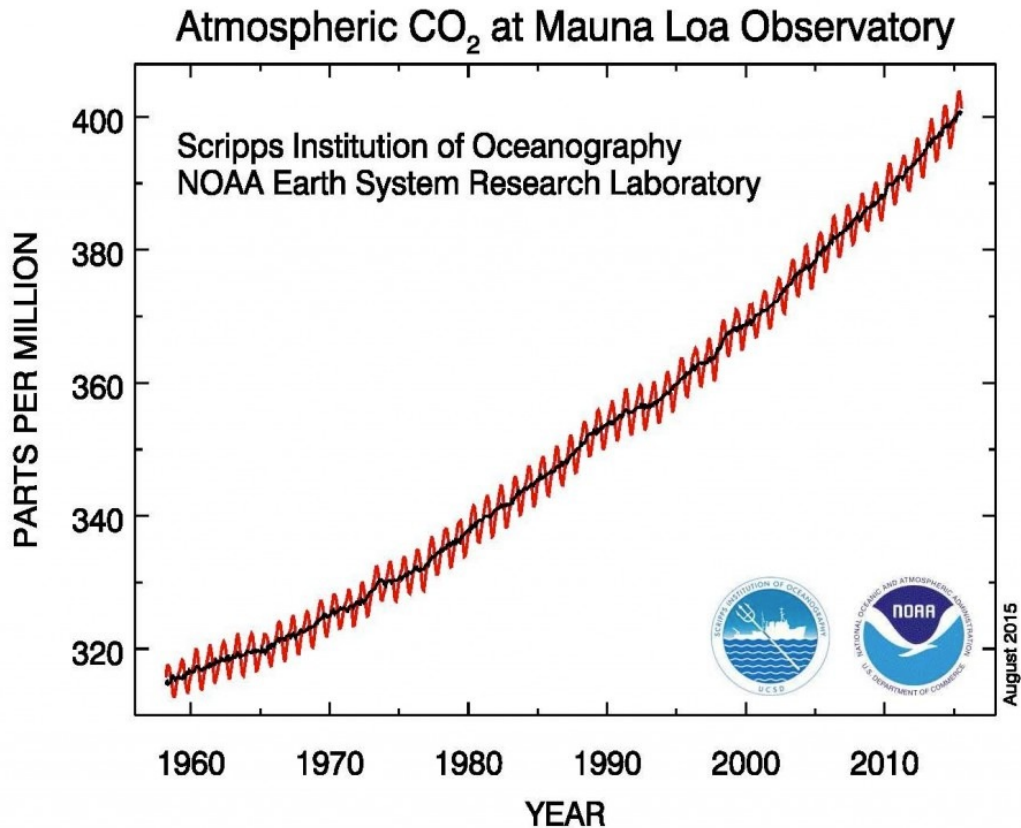
The more greenhouse gases there are in the atmosphere the warmer our planet becomes.

### **A little bit of climate science history**

The Greenhouse Effect has been an accepted scientific fact since the 19th century. Already in the 19th and early 20th century, some scientists suggested a possible future global warming caused by human emissions of CO<sub>2</sub>, but this theory was only confirmed later. Instrumental to this discovery was Prof. Charles Keeling. In 1958, he began daily measurements of

CO<sub>2</sub> concentrations in the atmosphere. The resulting curve showed a steady increase of CO<sub>2</sub> concentrations (see graph 1 below). Each year, there is a temporary decline in the curve: Whenever it is spring and summer in the Northern Hemisphere (which has much more land mass than the Southern Hemisphere), CO<sub>2</sub> concentrations in the atmosphere fall, because growing vegetation is taking in more CO<sub>2</sub>.

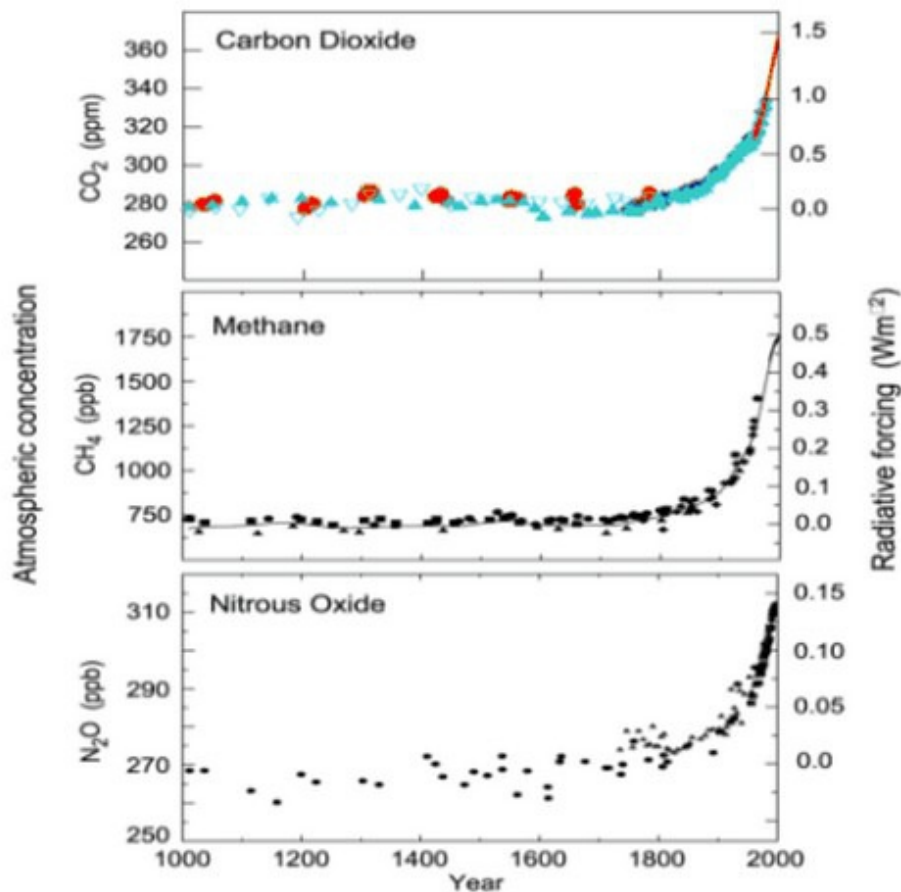
Graph 1: [12]



Many more studies have been done since then. Besides carbon dioxide (CO<sub>2</sub>), the main greenhouse gases are methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O). (Water vapor, a naturally occurring greenhouse gas, will be discussed in class 8, section 2.) Scientists collected data on the atmospheric concentrations of these three greenhouse gases during the past 1000 years by studying ice core samples. As you can see on the curves below, for a long time their levels were pretty constant with only minor variations, but then they started to increase dramatically in the 19th century.



Graph 2: [12A]



This graph shows the increase in greenhouse gas (GHG) concentrations in the atmosphere over the last 2,000 years. Increases in concentrations of these gases since 1750 are due to human activities in the industrial era. (Concentration units are parts per million (ppm) or parts per billion (ppb), indicating the number of molecules of the greenhouse gas per million or billion molecules of air.) [13]

- **Carbon Dioxide (CO<sub>2</sub>)** is emitted primarily by burning fossil fuels and by the clearing of forests. CO<sub>2</sub> remains in our atmosphere for many decades and some of it for many centuries and longer.
- **Methane (CH<sub>4</sub>)** is emitted from landfills, coalmines, oil and gas operations, beef production and rice paddies. Methane is a very powerful greenhouse gas. It stays in the atmosphere for about 12 years. Measured over a period of 20 years, methane is 90 times more powerful as a greenhouse gas than CO<sub>2</sub>, and over 100 years it is 30 times as powerful. [13A]
- **Nitrous oxide (N<sub>2</sub>O)** is emitted by nitrogen based fertilizers and industrial activities. It stays in the atmosphere on average for 114 years.

The atmospheric concentrations of carbon dioxide (CO<sub>2</sub>), methane, and nitrous oxide have



increased to levels unprecedented in at least the last 800,000 years. CO<sub>2</sub> concentrations have increased by 40% since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions. The ocean has absorbed about 30% of the emitted anthropogenic carbon dioxide, causing ocean acidification.” [14]

We should also be aware of another category of greenhouse gases, the Fluorocarbons or F-gases. Chemical engineers have designed these gases specifically to trap heat. That’s why they are very powerful greenhouse gases. These chemicals are used mainly “in refrigeration and air conditioning, but also as solvents, as blowing agents in foams, as aerosols or propellants, and in fire extinguishers. The Intergovernmental Panel on Climate Change calculated that the cumulative buildup of these gases in the atmosphere was responsible for at least 17% of global warming due to human activities in 2005. The most commonly used F-gases are the hydrofluorocarbons (HFCs). HFCs were developed by the chemical industry in response to the discovery of damage to the Earth’s ozone layer due to chlorofluorocarbons (CFC) use. But this development ignored the known global warming effect of the newer chemicals. Fortunately, there are environmentally safe, efficient, technologically proven, and commercially available alternatives to F-gases in almost all domestic and commercial applications.” [15] The chemical industry has so far resisted the use of these natural alternatives. As many F-gases stay in the atmosphere for a very long time, it is extremely important that we discontinue their use and production.

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**Watch this video:**

**Climate Change 2013: The Physical Science Basis** 9 min.  
<https://www.youtube.com/watch?t=28&v=6yiTZm0y1YA>

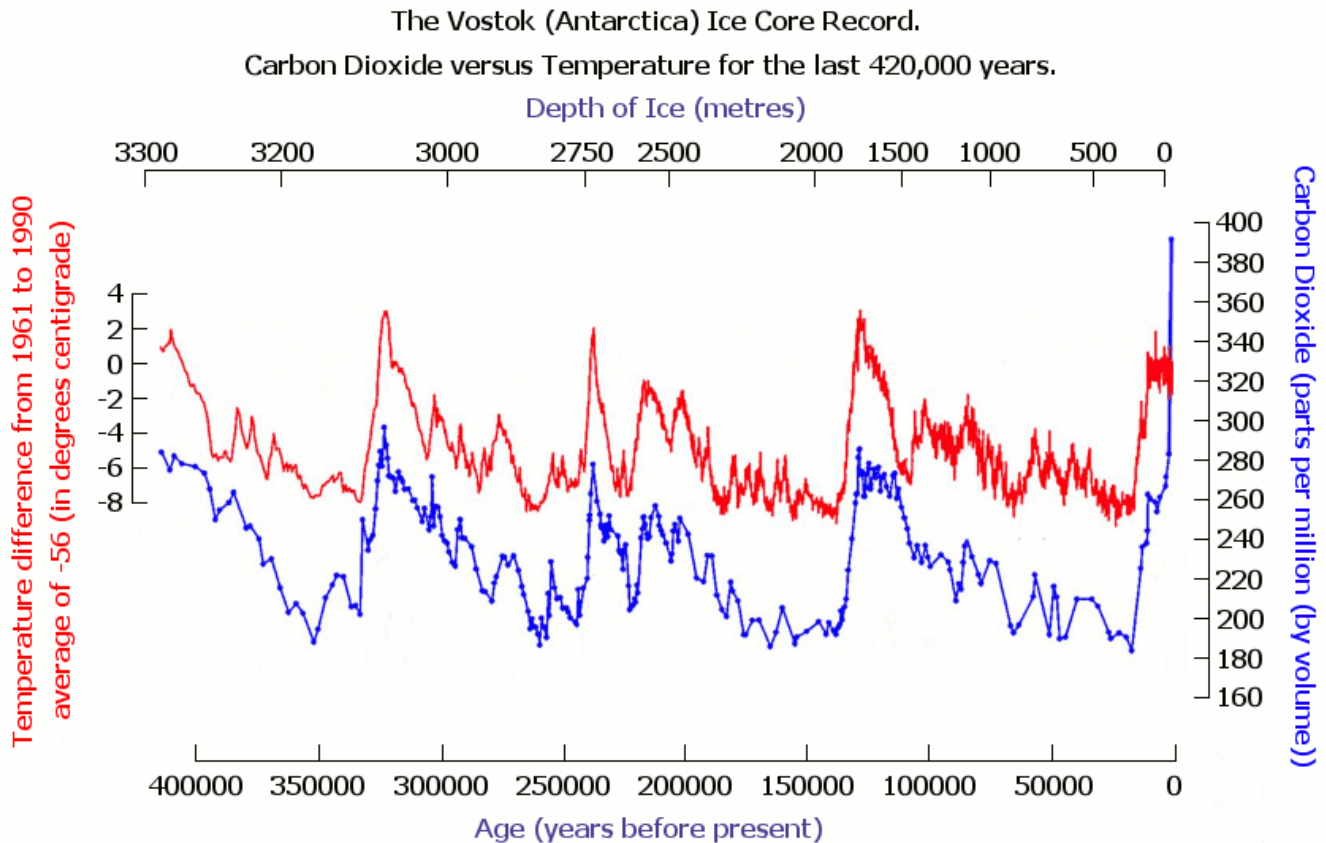
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### **Section 3: A Look into the Past**

*“Science is the discoverer of the past. From its premises of past and present we deduce conclusions as to the future”.* [16] 'Abdu'l-Baha

Looking back into the more distant past we know that there have been natural cycles of warming and cooling. The Earth went through many ice ages and interglacial periods. British scientists drilled three kilometers deep into the Antarctic ice and measured gas concentrations in pockets of air that have been trapped in the ice for thousands of years. From the analysis of the ice cores they could figure out the temperatures and CO<sub>2</sub> concentrations of the past 400,000 years:

Graph 3: [17]

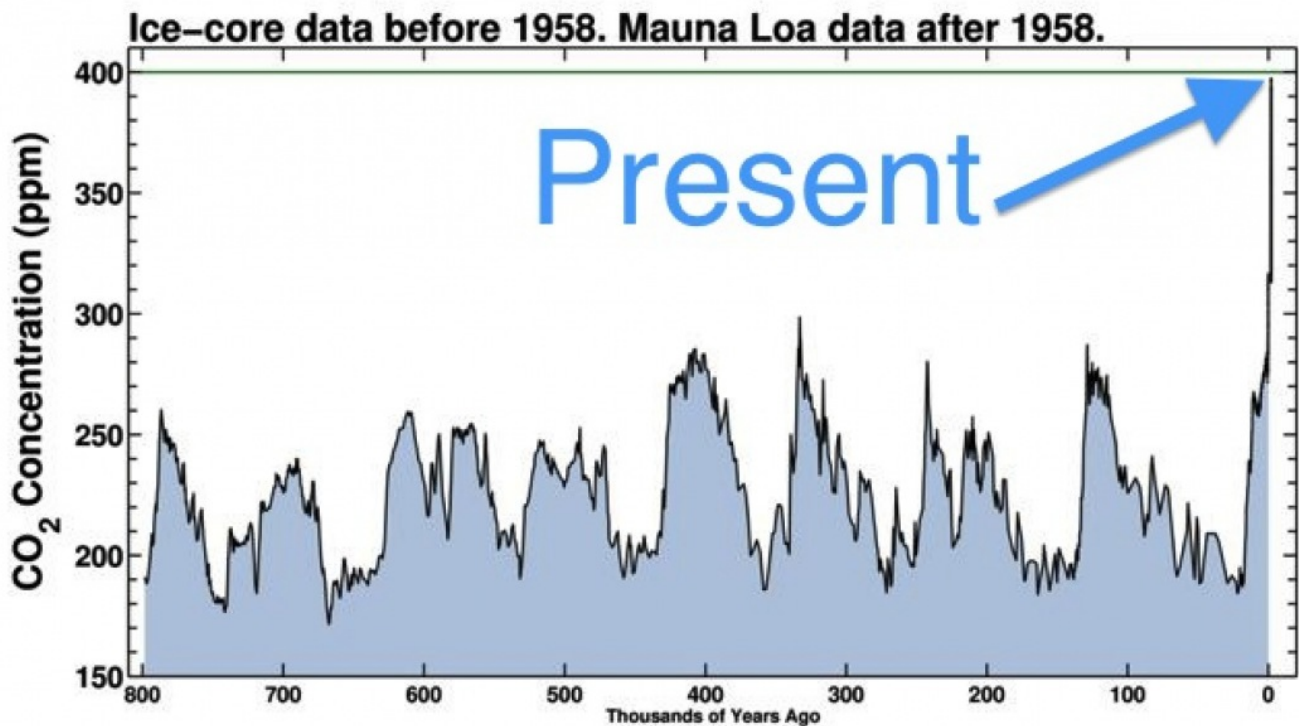


Let us first look only at the temperature changes shown by the higher (red) curve. The areas with low temperatures signify ice ages; the peaks going up signify the briefer interglacial periods. The last dip down on the right shows the last ice age more than 10,000 years ago. These climate changes were caused by natural factors. The main factors were slight variations in the earth's rotation, namely the cyclical changes in the tilt of the Earth's axis of spin and the shape of the Earth's orbit around the sun. Solar variation and volcanic eruptions played a minor role as well.

Now, let us look at the CO<sub>2</sub> concentrations, which is the lower (blue) curve. You can easily see how similar the two curves are. When temperature is up, CO<sub>2</sub> is up and vice versa. Although the graph may look simple, the relationship between CO<sub>2</sub> level and temperature is very complex. As we said before, in the past, the reasons for climatic changes were all natural processes, especially shifts in the Earth's rotation. Temperatures affected CO<sub>2</sub> levels due to feedback mechanisms (more about that in class 8, section 2). In turn CO<sub>2</sub> had an effect on temperature by augmenting the warming or cooling trend. In other words: Without the atmospheric CO<sub>2</sub>, the changes in temperatures would have been much smaller.

Graph 4 below includes another study. It shows the atmospheric CO<sub>2</sub> concentrations over the past 800,000 years. In addition, we can see present (2014/2015) levels.

Graph 4: Carbon Dioxide Concentrations in the past 800,000 years and today [18]



“The atmospheric concentrations of CO<sub>2</sub> consistently fluctuated between 200 parts per million (ppm) during the ice ages and 280 ppm during the warm intervals. This shift from ice age to warm period occurred many times and always within this CO<sub>2</sub> range. When the Industrial Revolution began, the atmospheric CO<sub>2</sub> level was roughly 280 ppm.” [19]

On the graph we can see that CO<sub>2</sub> never went above 300ppm. In 2014, atmospheric CO<sub>2</sub> concentrations reached an extraordinary 400ppm! From this and other studies we know that 400ppm “is not only far above any level over the last 740,000 years, it may be nearing a level not seen for 55 million years. At that time the Earth was a tropical planet. There was no polar ice; sea level was 80 meters (260 feet) higher than it is today.” [20] Let's put the number of 740,000 years into proper perspective. What we consider human civilization doesn't extend farther back than 10,000 years. At that time a relatively warm and stable climate emerged which allowed agriculture.

#### **Section 4: The Present and the Future**

The situation today is very different from the past's natural cycles. In a very short period of time, human beings have burnt huge quantities of stored solar energy (fossil fuels), thereby releasing unprecedented amounts of greenhouse gases into the atmosphere. That's why greenhouse gas concentrations have been so rapidly rising.

The global warming we have already experienced and the many changes in climate all over the world can only be explained by these tremendous increases in greenhouse gases. They cannot be explained by any natural cycle or changes in solar activity or volcanic eruptions. Today, human activities have a stronger impact on climate than natural occurrences: “We have so much CO<sub>2</sub> in the atmosphere that its huge radiative forcing overwhelms the changes associated with orbital forcing. No ice age could start at this point!” [21]

If greenhouse gases were held constant at today's level, it is estimated that it would take several decades for their full impact to be felt. The Earth would continue to warm until the climate was in balance with the current greenhouse gases. Unfortunately, CO<sub>2</sub> levels are not constant but are continuing to rise which will change the climate and the living conditions on Earth in a very dangerous way.

Review questions on the causes of climate change:

- What is the “Greenhouse Effect?”
- Why are global temperatures rising?
- What are some of the greenhouse gases and where do they come from?
- What are the reasons for the sudden increase of greenhouse gases since the 19th century?
- What human activities emit greenhouse gases?

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## Class 5

# Spiritual and Practical Dimensions – The Individual

### Section 1: Stewardship of the Earth

All religions and many traditions teach that the Earth is God's creation and that it is our responsibility to preserve it:

**American Indian Tradition:** The most sacred force in 1700 Quapaw religious practice was called Wakondah or Wakontah. Wakontah was an energy or force that permeated everything that existed and kept everything in balance. Since the Quapaw revered this force and the force was in everything, the Quapaw respected everything. Because they revered both nature and animals, they were in a sense the first environmentalists in North America. They felt obligated to honor animals they had killed in a hunt with ceremonies. [1]

**Judaism:** *“When God created the first human beings, God led them around all the trees of the Garden of Eden and said: “See my works how beautiful and praiseworthy they are! Think of this, and do not corrupt or destroy My world.” [2]*

**Christianity:** *“In the beginning God created the heaven and the earth.” [3]*

*“And God created humankind in God's image... having dominion over the earth.” [4]*

Some theologians and religious leaders say the word 'dominion' should not be understood as a license to dominate and exploit nature, but rather as an obligation of stewardship of the Earth.

*“And the LORD God took the man, and put him into the garden of Eden to dress it and to keep it.” [5]* Another translation says: *“The Lord God took the man and settled him in the Garden of Eden to cultivate and take care of it.”*

**Islam:** *“If any Muslim plants any plant and a human being or an animal eats of it, he will be rewarded as if he had given that much in charity.” [6]*

**Sikhism:** *“Air is the guru, water is the father, and Earth is the mother of all.” [7]*

**Buddhism:** *“Water flows over these hands. May I use them skillfully to preserve our precious planet.” [8]*

**Jainism:** *“Nonviolence is the supreme religion. One who looks on the creatures of the Earth, big and small, as one's own self, comprehends this immense world.” [9]*

**Baha'i Faith:** *“Know thou that every created thing is a sign of the revelation of God.” [10]*

*“Religions can help us to recapture a sense of the sacredness of creation, for nature mirrors the beauty and love of God.” [11] (Stefan Edman)*

Religion also warns us what can happen when we transgress against its teachings:

*“The earth mourneth and fadeth away, the world languisheth and fadeth away, the haughty people of the earth do languish. The earth also is defiled under the inhabitants thereof; because they have transgressed the laws, changed the ordinance, broken the everlasting covenant.” [12] Isaiah 24:4-5*



*"... ye walk on My earth complacent and self-satisfied, heedless that My earth is weary of you and everything within it shunneth you." [13]*

*"This is the Day whereon the earth shall tell out her tidings. The workers of iniquity are her burdens, could ye but perceive it." [14] Baha'u'llah*

Discussion: What will change in our personal lives and in society when we act with the intention of stewardship of the Earth?

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**Watch this video:**

**The Story of Stuff 20 min.**

<http://storyofstuff.org/movies/story-of-stuff/>

The Story of Stuff is a fast-paced, fact-filled look at the underside of our production and consumption patterns. The Story of Stuff exposes the connections between a huge number of environmental and social issues, and calls us together to create a more sustainable and just world.

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## **Section 2: Spirituality as Opposed to Materialism**

Let's stop for a moment and think about how we allowed this environmental crisis to reach the critical point of endangering our very survival. There may be two main factors: In the past, we honestly didn't know the unintended consequences of industrialization, and now, we are in the grip of materialism. Let's examine these two reasons a little closer:

Scientific and technological advances have allowed our cultures to progress in numerous positive ways. Just think about means of communication, like the telephone or the Internet, or about the unprecedented fast means of transportation that allowed the coming together of cultures. Since the industrial revolution, machines have been doing much of our work connected to our everyday needs, freeing up large parts of humanity to have some free time to pursue other activities such as science, art, literature and music. Instead of gathering wood and tending to a fire we just turn on the stove or the heat. Instead of walking or riding, we save much time with a car and therefore can get much more done. Electrical appliances have made our lives much easier. There is nothing inherently evil in all of that.

Before the 1980s there was no strong evidence of global warming. We just didn't know that the burning of fossil fuels would have these unintended consequences.

Now, our whole existence is dependent on fossil fuels: our transportation, our food system, and especially our energy supply are all based on fossil fuels. Even with best intentions it's not easy to get out of these systems, to think out of the box, and to act in an environmentally responsible way.

And materialism has greatly exacerbated the magnitude of the environmental crisis. Many people are not connected to a higher purpose in life and therefore fill their inner emptiness with material things. This all-pervasive materialism results in excessive consumption.



“Millions of people try to find meaning in their lives by shopping and owning. One scholar even called consumerism the first global religion.” [15] However, several scientific studies indicate that, once basic needs are met, human beings don’t increase their life satisfaction or happiness by accumulating greater wealth. Religion confirms that point:

*“Man is, in reality, a spiritual being, and only when he lives in the spirit is he truly happy.”* [16] 'Abdu'l-Baha

Materialism is the root cause of greed, over-consumption, injustice and the destruction of the environment.

*“Consider the peoples of the West. Witness how, in their pursuit of that which is vain and trivial, they have sacrificed, and are still sacrificing, countless lives for the sake of its establishment and promotion.”* [17]

*“Why, then, exhibit such greed in amassing the treasures of the earth, when your days are numbered and your chance is well-nigh lost? Will ye not, then, O heedless ones, shake off your slumber?”* [18] Baha'u'llah

Being slaves of our material desires and our self-interest prevents us from growing as human beings. We can rise beyond that to attain our true human station of nobility.

*“Noble have I created thee, yet thou hast abased thyself. Rise then unto that for which thou wast created.”* [19] Baha'u'llah

Spirituality is the antidote for materialism and consumerism. All religions teach that human beings are essentially spiritual beings. A spiritual outlook can help us shift the emphasis from consumption to well-being and a meaningful life. We cannot and don’t want to go back to the kind of life people led 200 years ago. However, science tells us that we do need to lower our greenhouse gas emissions significantly, not just a little bit. Scientists estimate that in industrialized countries we need to lower them by 80-90% by mid-century and phase them out completely by the end of the century. This is huge and will require major changes and some sacrifice.

#### Discussion:

- What is consumerism? How does it manifest itself in our lives?
- How can a spiritual attitude help mitigate climate change?

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### **Section 3: Moderation**

All religions teach us to be satisfied with little and to live a simple life:

Buddhism teaches restraint and moderation in all things:

*“The one I call holy, letting go of attachment to humans, rises above attachment to gods, and is independent from all attachments.*

*The one I call holy calls nothing one’s own, whether it be in front, behind, or between, is poor and free from attachment.”* [20] From “Sayings of the Buddha”

Islam condemns wasting natural resources:

*“Eat and drink, but waste not by excess: He loves not the excessive.” [21] The Qu'ran*

*“And give thy kinsman his due and the poor and the son of the road; and waste not wastefully, for the wasteful were ever the devil's brothers; and the devil is ever ungrateful to his Lord.” [22] The Qu'ran*

The Baha'i Faith teaches:

*“Fear ye God, and take heed not to outstrip the bounds of moderation, and be numbered among the extravagant.” [23] Baha'u'llah*

*“Content thyself with but little of this world's goods!” [24] Abdu'l-Baha*

Being satisfied with little is not only a social and environmental imperative, but also a prerequisite for our spiritual growth and hence for the fulfillment of our potential as a human being. Baha'u'llah said:

*“O my brother, when a true seeker determineth to take the step of search in the path leading to the knowledge of the Ancient of Days, he must, before all else, cleanse and purify his heart, which is the seat of the revelation of the inner mysteries of God, from the obscuring dust of all acquired knowledge. ... That seeker should ... be content with little, and be freed from all inordinate desire.” [25]*

Religion warns us to avoid over-consumption and injustice:

*“Take from this world only to the measure of your needs, and forgo that which exceedeth them. Observe equity in all your judgments, and transgress not the bounds of justice, nor be of them that stray from its path.” [26]*

*“Take heed, ... that ye hunt not to excess. Tread ye the path of justice and equity in all things.” [27] Baha'u'llah*

Gandhi warns us in a similar way:

*“The earth provides enough to satisfy every man's needs, but not every man's greed.”*

*“God forbid that India should ever take to industrialism after the manner of the West. ... If [our nation (India)] took to similar economic exploitation, it would strip the world bare like locusts.” [28]*

We can evaluate our impact on the planet with the help of the ecological footprint. “The ecological footprint is a tool that measures how much land and water area a human population requires to produce the resources it consumes and to absorb its wastes. When resources are consumed faster than they are produced or renewed, the resource is depleted and eventually used up.” “Today humanity uses the equivalent of 1.5 planets to provide the resources we use and absorb our waste. This means it now takes the Earth one year and six months to regenerate what we use in a year.

Moderate UN scenarios suggest that if current population and consumption trends continue, by the mid 2030s we will need the equivalent of two Earths to support us. And of course, we only have one.” [29]

We can observe the depletion of our resources in the loss of groundwater in much of the world, in collapsing fisheries, and deforestation. Carbon-induced climate change is another example. The carbon footprint measures the demand on biocapacity that results from burning

fossil fuels in terms of the amount of forest area required to sequester these carbon dioxide emissions. Note that this does not suggest planting forests is 'the solution' to climate change; on the contrary, it shows that the biosphere does not have sufficient capacity to sequester all the carbon we are currently emitting.

In many countries, people are living beyond the means of our Earth. If everyone lived like the average North American, for example, we would need 5 planets. Society and individuals made the assumption that more was better. We must learn to live within the limits of one planet. In a sustainable world, society's demand on nature is in balance with nature's capacity to meet that demand. [30]

For example, wealth and greed are strong drivers of deforestation. Western 'over-consumption' is exerting a big demand for harmful crops in rainforest areas like palm oil and soybean. In fact our food consumption patterns can have a big influence on deforestation rates. If we could shift to a more vegetarian diet, the area needed for food production, including via livestock grazing, would be much reduced. We therefore need to consider the carbon footprint of everything we do and eat.

Mahatma Gandhi made the point very clear with his famous statement:

"Live simply so that others may simply live."

Already in the 19th century, Baha'u'llah appealed to society to observe moderation in everything, and specifically moderation in civilization:

*"Whoso cleaveth to justice, can, under no circumstances, transgress the limits of moderation. The civilization, so often vaunted by the learned exponents of arts and sciences, will, if allowed to overleap the bounds of moderation, bring great evil upon men.... If carried to excess, civilization will prove as prolific a source of evil as it had been of goodness when kept within the restraints of moderation.... The day is approaching when its flame will devour the cities. ..."* [31] Baha'u'llah

Scientists now repeat this call for moderation. They say we need to reduce the amount of CO<sub>2</sub> we are releasing into the atmosphere. That means to stop all the waste that is going on, to use energy more efficiently, to conserve our resources, to significantly reduce our burning of fossil fuels, to eat lower on the food chain, to buy less stuff, and generally to adopt a simpler lifestyle.

This doesn't mean that we should lead a life of asceticism. Even when observing moderation it is possible to enjoy life on this beautiful Earth including its material joys. Knowing that we are not harming the Earth and other people will increase our happiness. In addition, increasing our capacity for contentment will bring us a step further in our personal spiritual development.

It takes great courage to live a simple lifestyle today when society, the media, and the all-pervasive commercials advocate a philosophy, which says "more and bigger is always better".

Discussion:

- How much are we personally affected by consumerism?
  - What can we do in practice to take less from the Earth and away from future generations?
  - How can we teach this concept to our children?
- 

#### **Section 4: Fostering Unity - Avoiding Judgmental Attitudes**

It is necessary to speak up for the truth and the reality of the state of the planet, to take decisive actions as individuals and communities. At the same time we must avoid criticism or fundamentalist attitudes, and nurture sincere tolerance towards each other.

The way most societies are currently structured, it is impossible to live a life without generating greenhouse gas emissions. We all need to eat and have shelter. Our goal is to substantially reduce our personal emissions. How we do this is a personal decision. We all are in different life situations; our levels of environmental awareness vary greatly; and we have different priorities of what we think is important and of what we are able and willing to do. Encouraging each other and sharing ideas on how to reduce greenhouse gas emissions can help us all along the path of treading lighter on the Earth.

*“Show forbearance and benevolence and love to one another. Should any one among you be incapable of grasping a certain truth, or be striving to comprehend it, show forth, when conversing with him, a spirit of extreme kindness and good-will. Help him to see and recognize the truth, without esteeming yourself to be, in the least, superior to him, or to be possessed of greater endowments.” [32]*

*“The heaven of true understanding shineth resplendent with the light of two luminaries: tolerance and righteousness.” [33] Bahá'u'lláh*

Discussion: How could different levels of environmental awareness cause disunity, and what could be done to avoid that?

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#### **Section 5: Actions of Individuals**

*“Let your light shine before men, that they may see your good works, and glorify your Father who is in heaven.” [34] The Bible*

*“Let deeds, not words, be your adorning.” [35] Baha'u'llah*

How we live makes a big difference in the way our lives impact the environment, and in turn other people as well, especially in these three major sectors: Energy use, transportation, and food. Not everyone will be able to carry out all the things suggested below, but everyone is able to do adopt many of these practical ways of treading lighter on the Earth:

## **Energy:**

- Choose green, carbon-free power. In many parts of the world, electricity providers offer green power at a slightly higher price than regular power.
- Insulate your home.
- Turn your thermostat down in the winter.
- If you live in a hot climate, only use air-conditioning if absolutely necessary and turn the thermostat up.
- Hang up your laundry instead of using the dryer.
- Wait with doing laundry until you have enough clothes to fill your washing machine.
- Take short showers. Heating water uses energy.
- Replace your incandescent light bulbs with LEDs or compact fluorescent (CFL) bulbs. Fluorescent light bulbs use only about  $\frac{1}{4}$  to  $\frac{1}{5}$  of the energy as incandescent bulbs and can last 10 times longer. If every household in the United States replaced one regular light bulb with an energy-saving model, we could reduce global warming pollution the same as taking 6.3 million cars off the road. [36] CFLs must be recycled properly by taking them to a collection center, and disposal directions must be followed if a bulb breaks, because they contain a small amount of mercury, about one fifth as much as a watch battery. Much of the energy in China, the United States, and some other countries comes from coal fired power plants which emit mercury in addition to greenhouse gases. Rain brings the mercury to earth, which pollutes our waters, which in turn results in high mercury levels in fish. [37] As CFL bulbs and LEDs use significantly less electricity than incandescents, their use will reduce both greenhouse gases and mercury pollution.
- Turn off your computer, TV, lights etc. after use.
- Unplug chargers when not in use. Many electronics, such as TVs and computers, have a “sleep” mode, so that they can be started instantaneously or by remote control. They use a small amount of electricity in this mode, but over time it adds up. Turn them all the way off instead of putting them to sleep.
- Reuse water containers; purify tap water instead of buying bottled water.
- Reuse and recycle whatever you can.
- If your roof is sunny, install solar power.

## **Transportation:**

- Go car-free if at all possible: cycle, walk, ride the bus or carpool and car-share.
- Use and support public transportation.
- Buy a fuel-efficient car if you can't go without.
- Don't let your car idle.
- Avoid any unnecessary car trips and flights.

- Combine shopping trips into one big trip rather than a bunch of small ones.
- Encourage your city to establish bike lanes to grocery stores, farmers' markets, and other frequently visited businesses.
- Use a bicycle to make small trips. It's good for the environment, and good for your health.

### **Food:**

- Reduce your meat consumption, especially beef.
- Generally eat lower on the food chain, which means fewer animal products.
- Grow some of your own food or participate in a community garden.
- Buy locally grown and produced food.
- Shop at your local farmers' marketplace.
- Buy organically grown food.
- Avoid products with a lot of packaging.
- Compost your kitchen scraps with your yard leaves and lawn clippings.
- In general, just use less and live mindfully.
- Buy only what you really need.
- Consider the life cycle of everything you take into your hand. Where did it come from? Who made it and under what conditions? What were the costs to the environment and to people to grow or manufacture this item? How far did it travel? What will happen to it when it is broken and needs to be discarded?

### **In addition** to the suggestions above, you can also

- Try to generate less household garbage. Remember when throwing things away that there is no away.
- Use cloth shopping bags.
- Naturalize your lawn and replace chemicals with alternatives. Many lawn chemicals are carcinogens. Children are particularly vulnerable and the most likely to be exposed to lawn chemicals. Children living in homes using pesticides are at higher risk for developing brain cancer, childhood leukemia, lymphoma, and asthma. Lawn chemicals pollute drinking water and have numerous other detrimental effects on the environment. Lawn mowers and fertilizers also emit a lot of greenhouse gases. Reducing the size of your lawn and growing your own food in its place is a win - win situation!
- Plant trees. They soak up CO<sub>2</sub>, make shade, block wind and prevent soil erosion.
- Continually educate yourself. Read some of the many books on climate change. Also read inspiring books about actions you can take, for example about permaculture and

community gardening.

- Take your footprint quiz. You can search on the internet for a site where you can calculate your own carbon footprint or your general ecological footprint. See [www.earthday.net/footprint](http://www.earthday.net/footprint), for example.
- Discuss climate change with your family and friends to help them become more aware of these issues.
- Teach a sustainable lifestyle by example.
- Encourage action. Be an advocate for environmentally responsible actions in your family, at your workplace, in your religious community and social circle.
- Support and vote for new laws and policies that help mitigate climate change.

Imagine the positive effect for the planet when millions of people simply save energy and water, recycle, and generally adopt a more simple and sustainable lifestyle.

### Individual Activity:

Think about actions that you can undertake to mitigate climate change and to help the Earth heal. You may like to write down a few actions that you will be able to carry out now, some that you are planning to implement within the next weeks, and some that you would like to consider for the future. Then share some of your ideas with the group at your next meeting. And most importantly: follow through!

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## Class 6

# Mitigating Climate Change

By now you know that climate change is a very complex issue: There are many causes and a wide range of harmful effects. Working on a solution is equally complex. There is no simple prescription to solve the problem of global warming. However, it is quite possible to effectively mitigate it by taking a holistic approach. This means reducing emissions in all sectors of human activity. We already discussed numerous beneficial actions individuals can undertake to reduce their personal carbon footprint. While it is very important that individuals begin leading a sustainable life, it is not sufficient. It would take too long until everyone on the planet is educated about climate change and motivated to change the way they live. Moreover, many changes must be made on a much larger scale, in the local community, as a nation, and particularly on the global level. In this class you will learn about some areas where it is imperative that society takes action.

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### **Section 1: Mitigation and Adaptation**

There is a need for humanity to take action on climate change in two ways:

- We need to reduce greenhouse gases in the atmosphere. This is called *mitigation*.
- We need to reduce vulnerability to climate change impacts. This is called *adaptation*.

#### **Mitigation**

Greenhouse gases are emitted from many sectors in society: Power plants, deforestation, transport, agriculture, industry, buildings, waste. Everywhere, emissions must be significantly trimmed. Much can be accomplished with energy conservation and efficiency, and by the use of carbon free energy and new technology. This will require a re-thinking and re-organizing of almost everything we are doing as a society and as individuals.

#### **Adaptation**

Climate change is already under way. Adaptation is necessary. For example: In many areas, farmers may need to change their crops to plants that are more drought resistant or can stand higher temperatures. In low-lying areas, zoning plans may need to consider sea-level rise. Human settlements may have to be moved and certain areas evacuated. Many poor countries will need technical and financial support from rich countries. However, there are limits to adaptation. If we continue with business as usual (if we don't reduce our greenhouse gas emissions), many of the effects of climate change will be too great for our ability to adapt.

Discussion: How could climate change affect the region you are living in? What kind of adaptation measures would be helpful to mitigate the impact?

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The remaining sections of this class are all part of *mitigation* efforts. Adaptation to a changing climate and building resiliency to better cope with rising sea levels and stronger storms is very important, but there is not enough time in this course for discussing this further.

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**Watch this Video:**

**Everything you need to know about the IPCC Fifth Assessment Report - WG3: Mitigation of Climate Change 9 min.**

<https://www.youtube.com/watch?v=E3PO7ntKhG8>

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## **Section 2: Energy Generation and Use**

The production of energy is responsible for the largest share of greenhouse gas emissions compared to all other sectors. It is responsible for almost 26% of total emissions. [1]

The quickest and most cost effective measures to reduce greenhouse gas emissions are energy conservation and efficiency. It is estimated that far reaching conservation practices combined with energy efficiency could save 40% of energy!

We need worldwide efficiency standards for household appliances. “The standards would be raised every few years to take advantage of the latest technological gains in efficiency. The principal reason that consumers do not buy the most energy-efficient appliances is because the improved design and insulation increase the upfront costs. If, however, societies adopt a carbon tax reflecting the health care costs of breathing polluted air and the costs of climate change, the more efficient appliances would be economically much more attractive.” [2]

“Within the industrial sector, there is a hefty potential for reducing energy use. In the petrochemical industry, moving to the most efficient production technologies now available and recycling more plastic can cut energy use by 32 percent. With steel, gains in manufacturing efficiency can cut energy use by 23 percent. Even larger gains are within reach for cement, where simply shifting to the most efficient dry kiln technologies can reduce energy use by 42 percent.

The retrofitting of buildings can reduce energy use by 20–50%! Such a reduction in energy use combined with the use of green electricity to heat, cool, and light the building means that it may be easier to create carbon-neutral buildings than we may have thought. [3]

### **Carbon Free Energy**

A few generations have already used up about half of the Earth’s oil reserves. The remaining oil will take more energy to extract. Furthermore, as the easily accessible oil fields are becoming depleted, new drilling increasingly occurs in dangerous off shore places and in fragile ecosystems. This is the major reason why drilling accidents like the one in the Gulf of Mexico are so devastating and why, in the long term, oil is getting increasingly more expensive.

Recently, oil prices sank because of the application of unconventional technology which allows the exploitation of shale oil. Hydraulic fracturing combined with horizontal drilling increased US oil production by 1.7 million barrels between 2008 and 2012. [4] This technology is highly controversial though and has already resulted in serious water contamination and high methane emissions. Hydraulic fracturing also requires huge amounts of freshwater, often in areas that already suffer from water scarcity. With growing populations

and growing economies we will run out of oil sooner than later anyway. Now, the threat of climate change forces us to act even more quickly to get away from fossil fuels. The CO<sub>2</sub> concentration of the atmosphere will stay elevated because of human carbon emissions for a very long time. In fact, CO<sub>2</sub> concentration will stay elevated by about 25% of the cumulated anthropogenic carbon emissions for thousands of years. [5] That's why the quick reduction (and ultimately elimination) of CO<sub>2</sub> emissions should get first priority. Phasing out coal-fired power plants (and not building new ones) should get first priority in mitigating global warming according to NASA scientist James Hansen. There are many other environmental and health benefits with abandoning the burning of coal, as these power plants emit huge amounts of toxic chemicals, especially mercury.

Now is the time to move to carbon free energy, usually called renewable energy. "Renewable energy technologies tap into natural cycles and systems, turning the ever-present energy around us into usable forms. The movement of wind and water, the heat and light of the sun, heat in the ground, the carbohydrates in plants—all are natural energy sources that can supply our needs in a sustainable way. Because they are homegrown, renewables can also increase our energy security and create local jobs." [6] It is necessary to use the already available technology to build wind turbines and solar energy systems on a large scale as quickly as possible. At the same time, much more research needs to be done in the area of renewable energy. As it takes energy to create the capital equipment (wind turbines, solar cells etc.) for our sustainable energy future, we should use the relatively cheap fossil fuel energy while we still have it to do exactly that.

In recent years, solar energy has advanced with astonishing speed. The technology has become better and less expensive and is being widely implemented, for example:

- "More than 46,000 solar panels have been laid out across 45 acres of land to fuel the operations of Cochin airport, India's fourth largest in terms of international passenger traffic." [7]
- U.S. solar employs more workers than any other energy industry, including coal, oil and natural gas combined, according to the U.S. Department of Energy's second annual U.S. Energy and Employment Report, published in January 2007. [8]
- Even the Baha'i House of Worship in India now produces about one quarter of its energy use with solar power. It is the first major public site in Delhi to have installed a "net metre", which means that it is connected to the city grid. [9]

The will to use renewable energy has gained strength both for environmental as well as for economic reasons. Progress is being reported from all corners of the world:

- In South Australia, wind and solar have become the new "base load" power. [10]
- Costa Rica was powered for 76 straight days on carbon-free electricity from June 16 to Sept. 2, 2016. [11]
- In Uruguay renewable energy sources provide 94.5% of the country's electricity. Prices are lower than in the past relative to inflation. There are also fewer power cuts because a diverse energy mix means greater resilience to droughts. [12]

Commitment is growing to transition to renewable energy:

- On 14 June, 2016, the Norwegian Parliament voted to reduce and offset carbon emissions so that its emissions are net zero by 2030. [13]
- In May 2017, The California Senate passed a bill that will mandate that all of its power will come from renewable energy, such as solar and wind power, by 2045. [14]
- Salt Lake City committed to transition to 100 percent renewable energy sources by 2032. [15]
- After Sweden suffered extreme heatwaves last summer and one of the worst bushfires in the country's history, its government has committed to taking action to protect its citizens from the effects of climate change in the future. Sweden now plans to become "one of the first fossil-free welfare states in the world." [16]

Many innovative ideas are being tried out.

- For example, Portland generates electricity from turbines installed in city water pipes. [17]
- Two custom-designed wind turbines are generating power for the Eiffel Tower producing the equivalent to the power used by the commercial areas of the Eiffel Tower's first floor. [18]

Replacing fossil fuels with renewable energy doesn't have one easy solution. No other non-nuclear energy source is as powerful as fossil fuels. A range of different energy sources needs to be used. The choice of energy sources will depend on their local availability. A new energy infrastructure needs to be built based on renewable energy in order to satisfy long-term energy needs in a climate friendly way.

### **Section 3: Transportation:**

"Society currently relies almost exclusively on petroleum-based fuels, such as gasoline, for transport. This fuel use is responsible for 13% of worldwide greenhouse gas emissions." [19] In addition, in many of the world's cities like Beijing or Mexico City the quality of daily life is deteriorating because of heavy air pollution. Breathing the air in some cities is equivalent to smoking two packs of cigarettes per day. In the United States, the number of hours commuters spend sitting in traffic going nowhere climbs higher each year.

Some cities have already taken successful measures in addressing their traffic problems and often at the same time other pressing issues: Bogotá, Colombia, achieved a greatly improved quality of life by putting the interest of people before cars. Within just 3 years, the city banned the parking of cars on sidewalks, created or renovated 1,200 parks, introduced a highly successful bus-based rapid transit system, built hundreds of kilometers of bicycle paths and pedestrian streets, reduced rush hour traffic by 40 percent, planted 100,000 trees, and involved local citizens directly in the improvement of their neighborhoods. [20] In Paris, authorities have set up an official city-wide bike-rental system to encourage the use of bicycles instead of cars. Britain and France are planning to ban new diesel and gas cars by 2040, India by 2030, and Norway by 2025. [21]

Very important for curbing greenhouse gas emissions is a good public transportation system. A prerequisite for an efficient public transport is good city planning and the avoidance of urban sprawl.

Japan is leading the world with its high-speed bullet trains, which achieve a speed of up to 306 km (190 miles) per hour. "On some of the heavily used intercity high-speed rail lines,

trains depart every three minutes. Japan's high-speed rail network stretches for 1,360 miles, linking nearly all its major cities. Once high-speed links between cities begin operating, they dramatically raise the number of people traveling by train between cities. For example, when the Paris-to-Brussels link, a distance of 194 miles that is covered by train in 85 minutes, opened, the share of those traveling between the two cities by train rose from 24 percent to 50 percent. The car share dropped from 61 percent to 43 percent, and CO<sub>2</sub>-intensive plane travel virtually disappeared." [22]

Fuel efficiency standards for cars should be raised to the highest possible with current technology. The price of energy should reflect its true cost to society. A current estimate of the full cost of gasoline to society is about \$15 a gallon (2.4 British pounds per liter). Once such hidden costs are incorporated in the pricing system, alternative energy will become financially much more attractive. The use of electric cars could be encouraged with financial incentives. However, electric cars will only help mitigate climate change if the electricity comes from clean energy sources. Hopefully, higher prices for less polluting cars will help to reduce the numbers of cars on the world's street. Car pooling and sharing are also necessary, as well as people adopting less car dependent lifestyles.

#### **Section 4: Sustainable Agriculture**

*"The land shall not be sold in perpetuity, for the land is mine; with me you are but aliens and tenants."* [23] The Bible

*"Whoever brings dead land to life, that is, cultivates wasteland, for him is a reward therein."* Muhammad

The beginning of our civilization happened about 10,000 years ago, at a time when the Earth's climate became more stable. Our civilization depends on agriculture, which requires a climate with only minor variations. As we have seen in class 3, most changes in climate are detrimental to agriculture and threaten global food supply.

Although agriculture will be one of the first casualties of climate change, it is also a major contributor of greenhouse gases. "Overall, land use and land use changes account for around 31% of total human-induced greenhouse gas emissions into the atmosphere." [24] Both this section on agriculture and the next section on reforestation address land use.

Current agricultural practices and the whole food economy are greatly contributing to global warming. One way of practicing stewardship is with sustainable agriculture. "Growing plants can remove huge amounts of carbon from the atmosphere and store it in vegetation and soils in ways that not only stabilize the climate but also benefit food and fiber production and the environment." [25]

Organic agriculture can significantly reduce carbon dioxide emissions. Synthetic fertilizers release greenhouse gases into the air. But the organic approach sequesters carbon: It takes carbon out of the air and puts it back in the soil. The use of compost increases organic matter and therefore leads to more fertile soils and better water retention capacity, which makes plants more flood and drought resistant. [26]

Organically grown crops can better withstand the higher temperatures caused by global warming. Many experts believe that organic agriculture is not only a tool to reduce emissions

of greenhouse gases, but also a way to alleviate poverty and improve food security in developing countries.

A study found that “beef cattle raised organically on grass emit 40% less greenhouse gases and use 85% less energy making beef than cattle raised on grain.” [27]

Livestock are responsible for 18 percent of greenhouse gas emissions, a bigger share than that of transport. The major reason for the high carbon dioxide emissions by livestock is “deforestation for the expansion of pastures and arable land for feed crops. It generates even bigger shares of emissions of other gases with greater potential to warm the atmosphere: as much as 37 percent of anthropogenic methane, mostly from digestive processes of cows, and 65 percent of anthropogenic nitrous oxide, mostly from manure. [28]

Besides climate change, other serious problems are associated with meat production: Farms and food processing plants have grown into gigantic factories. This development has not been in the interest of people: Farm hands and employees often work under slave like conditions; the quality of the food is greatly diminished; salmonella poisonings have become more frequent; chemical fertilizers, pesticides and herbicides are polluting soil and water and affect human health; they contribute, for example, to the rising cancer rates. Human health is compromised by the regular administration of antibiotics and growth hormones to livestock. For example, the regular use of antibiotics for livestock is already causing serious human health problems and even deaths because some dangerous bacteria have developed antibiotic resistance. Also, if thousands, often tens of thousands of animals are living in the extremely close proximity of a factory farm, the danger of disease is high. That’s why new diseases like avian or swine flu are emerging. Moreover, the vast amount of animal waste not only releases substantial amounts of greenhouse gases, especially methane, but is also very toxic. “In North Carolina, hogs outnumber citizens, and they produce more fecal waste than California, New York, and Washington combined.” [29] “The livestock sector also contributes to water depletion; currently, the livestock sector accounts for 8 percent of human water use globally.” [30]

“Researchers found that the difference between a vegan diet and a red-meat diet in terms of greenhouse-gas emissions equaled the difference between driving a sedan and driving a sport-utility vehicle.” [31] The benefits of a vegetarian diet were expressed by the voices of religion and of science way before the climate crisis came to our attention.

*“The food of the future will be fruit and grains. The time will come when meat is no longer eaten.”* [32] 'Abdul'-Baha

"Nothing will benefit human health and increase chances for survival of life on earth as much as the evolution to a vegetarian diet." [33] Albert Einstein

It is still possible to raise some livestock in a sustainable way. However, meat can only play a small part in feeding a growing world population. In sustainable agricultural practices, smaller sized local farms grow a diversity of crops and animals. The manure of the animals is a welcome fertilizer for the plants. Here just one example: “In many densely populated Asian nations, where demand for seafood is growing fastest, fish farming is a natural addition to existing rice farming operations. This isn’t new. Archeological evidence shows that Chinese farmers have been raising fish in rice paddies for nearly 3,000 years. Vegetable scraps and crop residues are fed to fish, which in turn produce waste that is used to fertilize the fields.



Farmers can also use fewer pesticides and herbicides, since fish help control pests by consuming their larvae and eating weeds and algae that compete with rice for nutrients. (Fish farming also helps to control malaria, since fish eat mosquito larvae.)” [34]

A decentralized agriculture cuts down on costs and CO<sub>2</sub> emissions resulting from the transportation of food. A further positive effect of a decentralized agriculture is that it greatly increases food security. (More on decentralization in class 7, section 6.)

### **Section 5: Reducing Deforestation and Planting Trees [35]**

*“If anyone has a palm shoot in his hand on the last day he should plant it.” [36] Muhammad*

*“When we plant trees, we plant the seeds of peace and seeds of hope.” [37] Prof. Wangari Maathai*

There are two main ways in which trees and forests are vital for tackling the climate change crisis: through the avoidance of carbon dioxide emissions by conserving forests (as opposed to deforestation), and by planting trees to sequester or soak up carbon from the atmosphere.

As regards the avoidance of emissions, forest ecosystems are estimated to store about 70% of global terrestrial carbon, and tropical forests alone store about 25% of all terrestrial carbon. The peat forests of Southeast Asia are particularly important for carbon storage - a hectare of tropical peat forest stores between 3,000- 6,000 tons of carbon.

The prevention of carbon emissions via forest conservation used to be called ‘avoided deforestation’ (AD), but it is now known as ‘Reduced Emissions from Deforestation and forest Degradation’ (REDD). One of the few things on which there was wide agreement at the UNFCCC meeting at Copenhagen in December 2009 was that REDD must be a key part of any solution to climate change; several donors committed significant funding to help developing countries develop their national REDD programmes.

But REDD is also quite controversial, partly because it has the potential either to contribute to reducing poverty (for example, it could result in significant economic support for indigenous groups who are the most effective forest guardians), or it could increase poverty depending on how REDD is carried out.

Carbon sequestration in a forestry context refers to the net absorption of CO<sub>2</sub> from the atmosphere during the growth phase of planted trees; this acts as a “carbon sink” (or sponge) for industrial and other carbon emissions. While carbon sequestration is most pronounced in the growing phase, mature tropical forests are also important carbon sinks according to recent research.

“There are already many tree planting initiatives under way that are driven by a range of concerns, from climate change to desert expansion, to soil conservation, to making cities more habitable. These include the worldwide Billion Tree Campaign launched in 2007, urban tree planting initiatives in many cities, the Great Green Wall being planted in China, and the Saharan Green Wall of Africa, as well as a big push to expand tree plantations within a number of countries.

The Billion Tree Campaign was inspired by Kenyan Nobel laureate Wangari Maathai, who had

earlier organized women in Kenya and several nearby countries to plant 30 million trees. The United Nations Environment Programme, which is administering the Billion Tree Campaign, reported that by the end of 2009, more than 7.4 billion trees had been planted under this campaign by participants in 170 countries.

“South Korea is in many ways a reforestation model for the rest of the world. When the Korean War ended, half a century ago, the mountainous country was largely deforested. Beginning around 1960, under the dedicated leadership of President Park Chung Hee, the South Korean government launched a national reforestation effort. Relying on the formation of village cooperatives, hundreds of thousands of people were mobilized to dig trenches and to create terraces for supporting trees on barren mountains. Se-Kyung Chong, researcher at the Korea Forest Research Institute, writes, “The result was a seemingly miraculous rebirth of forests from barren land. Today forests cover 65 percent of the country, an area of roughly 6 million hectares.” [38]

We should keep in mind though that planting forests is only a partial and temporary solution to climate change. Growing trees in a young forest absorb a lot of CO<sub>2</sub>, but once the forest matures, they absorb far less. Planting forests will only compensate for a small fraction of emissions. The most urgent measure is to stop deforestation, especially in Indonesia and the Amazon, as deforestation accounts for about 12-15% of all greenhouse gas emissions.

As regards tackling deforestation, there is a reasonable consensus on what is needed, but many of the actions or measures needed will require major political will, including on the part of developing country governments, since they involve tackling vested interest groups (e.g., loggers, ranchers, people involved in illegal charcoal production, etc.). The most important measures are:

- More land intensive and labor using agricultural production;
- Improved governance (law and order in forest areas, including clamping down on illegal logging, increased transparency and accountability, etc.) and land tenure reforms which favor the rural poor and promote sustainable natural resource management;
- More careful planning of major roads and infrastructure projects in tropical forest regions;
- Reducing the consumption of beef;
- Paying forest communities or farmers for the environmental services they provide as a result of looking after the forests – these payments can be for climate stabilization, biodiversity and hydrological or water-related benefits.

Even more fundamentally, a sustainable solution to the problems requires tackling much of the inequity which encourages people at all levels to exploit rather than nurture their natural resources, as well as thinking of more enlightened ways of tackling the population explosion. We cannot look at a problem like deforestation and come up with simple solutions, in view of the complex and interdependent nature of the causes.

## **Section 6: Garbage – an Obsolete Concept**

Waste is contributing to global warming in more than one way. Landfills release methane, garbage trucks emit CO<sub>2</sub>, and most of the things we throw away could be recycled to produce consumer goods with much less energy than from new materials. Society got used to throw away towels, napkins, plates, cups, handkerchiefs, shopping bags etc. Even reusable products and machines are usually not manufactured with longevity in mind, only with reduction of production costs.

“The throwaway economy is on a collision course with the Earth’s geological limits. Aside from running out of landfills near cities, the world is also fast running out of the cheap oil that is used to manufacture and transport throwaway products. Perhaps more fundamentally, there is not enough readily accessible lead, tin, copper, iron ore, or bauxite to sustain the throwaway economy beyond another generation or two.

The challenge is to replace the throwaway economy with a reduce-reuse-recycle economy. Officials should worry less about what to do with garbage and think more about how to avoid producing it in the first place.” [39]

San Francisco is at the forefront of American cities in waste reduction. It recovers 72 percent of the materials it discards and has created the first large-scale urban collection of food scraps for composting in the country. The city’s goal is to achieve zero waste by 2020. [40]

It is possible to develop a comprehensive reuse and recycle economy. Products can be designed so that they last for a long time and that after their lifespan, they can be disassembled and their materials reused again.

## **Section 7 Economic Changes**

Mitigating Climate change also demands transforming our economic system.

Our current financial system is based on loans and interest. It requires continuous growth to work. “Debt is the reason the economy has to grow in the first place. Because debt always comes with interest, it grows exponentially – so if a person, a business, or a country wants to pay down debt over the long term, they have to grow enough to at least match the growth of their debt. Without growth, debt piles up and eventually triggers an economic crisis.”[40A] However, it is impossible to have unlimited economic growth on a finite planet. That’s why, tackling the climate problem requires a rethinking of our economic system.

One specific problem in the current system is that the “external” economic costs of burning fossil fuels are not incorporated in the price of fossil fuels. These are the costs of fossil fuels to society. They include the costs of cleaning up oil spills, the cost of health care for all the people who are getting sick from air pollution, and the costs incurred by natural disasters caused by climate change, etc. This cost is usually referred to as the Social Cost of Carbon. Section 8, #4, will discuss the carbon fee, a proposed solution for this problem.

It is also clear and evident that fossil fuel subsidies must end. “A fossil fuel subsidy is any government action that lowers the cost of fossil fuel energy production, raises the price received by energy producers, or lowers the price paid by energy consumers.” [40B] According to a US government report, the US pays USD 4.7 billion in tax provisions alone for the fossil fuel industry annually. This number does not include other fossil

fuel subsidies. [40C] It is estimated that, “internationally, governments provide at least \$775 billion to \$1 trillion annually in subsidies”. [40D] These subsidies put fossil fuels at an economic advantage compared to other energy sources. Of course, it doesn't make any sense to put public money towards finding and burning more fossil fuels at a time when it is so urgent to reduce and eventually abandon their use.

The economic initiative of divestment is very promising. Several universities, financial institutions, charities, and religious organizations have started to divest from fossil fuels. British universities are leading the world in that effort. [40E] The assets of religious organizations that are divested usually include congregational endowments and staff pension funds. The United Church of Christ was the first major religious organization in the U.S. to vote to divest from fossil fuel companies. Rev. Jim Anthal wrote "This resolution becomes a model for all faith communities who care about God's creation and recognize the urgent scientific mandate to keep at least 80 percent of the known oil, gas and coal reserves in the ground. . . By this vote, we are amplifying our conviction with our money." [40F] Many other religious organizations around the world have already or are considering divestment from fossil fuels.

## **Section 7: Four Difficult Issues**

Some measures to reduce our greenhouse gas emissions are complex and controversial. This course does not endorse any policy; it only wants to inform about the scientific facts. In the next class we will talk about spiritual and ethical principles. It is left to the participants to make up their own individual opinion on the following topics. Here are some of the facts on bio-fuels, nuclear power, carbon capture and storage, and the legal measures cap and trade versus regulations by government agencies (for example with a carbon tax):

**1. Bio-fuels** have already become a large industry in some countries. The experience has shown that it is necessary to use that resource responsibly so that companies' profits are not made at tremendous costs to the world's poor and to the environment.

Bio-fuels are a renewable and theoretically carbon neutral energy source because the amount of carbon dioxide created by the burning of bio-fuels is equal to the CO<sub>2</sub> absorption capacity of the plants. Bio-fuels are derived from sugar, starch (especially corn), or oil seed crops.

The increasing demand for land for bio-fuel plantations is causing deforestation and destruction of some of the last and largest primeval forests, which are being logged and burned to clear land for these bio-fuel plantations. In Indonesia, millions of acres of primordial rainforest are at stake. The government plans to clear vast tracts of this forest for oil palm plantations for bio-diesel for export to Europe, threatening the existence of wildlife including orangutans, rhinoceros and tigers.

The logging and burning of forests for bio-fuel plantations releases huge quantities of greenhouse gases, which are unlikely to be offset by the bio-fuels created from the crops grown on these former forest lands for many years. The burning of the forests of Indonesia each year (largely for oil palm plantations) makes it the world's third largest producer of global carbon emissions, even though most of the population lives in poverty.

Indigenous peoples who depend on forests for food, medicine, shelter, livelihoods or culture are being forcibly displaced from their lands in some countries to make room for bio-fuel plantations.

“The biotechnology industry is using rising demand for bio-fuels as a new way to sell their problematic genetic engineering technology. One company is genetically engineering trees for release in the Southeast US and Brazil that have specifically been modified to produce cellulosic ethanol. Studies on the risks of releasing GE trees into the environment in plantations are virtually non-existent. However, the escape of engineered pollen and seeds from these plantations into native forests up to hundreds of miles away is inevitable and irreversible. The results of this genetic contamination are predicted to be very serious both for humans and wildlife.” [41]

In many countries, corn and sugar are grown for bio-fuels on agricultural land. “Producing and using first-generation bio-fuels can release more greenhouse gases than are absorbed during biomass growth. These emissions occur when new land is cleared for cultivation; when fertilizer and pesticides are manufactured, transported, and applied; when energy is used to run farm machinery, pump irrigation water, and operate refineries; and when the fuel is transported and used. The total global warming footprint depends on what feedstock is used, how and where this feedstock is grown, any land-use changes, and how the fuel is processed. Some estimates suggest that corn ethanol provides only a 12 to 18 percent net reduction in emissions compared to gasoline, but these figures assume that the refineries are fueled by natural gas. If more-polluting coal power is used, the lifecycle emissions are higher than those associated with gasoline.” [42]

Bio-fuels are creating competition between food for people and fuel for cars, leading to skyrocketing grain prices and increasing numbers of people who cannot afford to eat. As one example, the amount of grain needed to create enough ethanol to fill the tank of a single SUV could feed one person for an entire year. There simply isn't enough grain to feed all of the people and all of the cars. Already now, bio-fuels are partly to blame for the increasing global food crisis.

However, bio-fuels could have a small but important place in mitigating global warming if produced responsibly, for example from waste materials. Also several perennial plants like switchgrass, which grow on marginal lands and don't require fertilization, could be used in a sustainable way and without competition with food crops.

**2.** Due to the pressure of cutting greenhouse gases quickly, some concerned people are advocating **nuclear energy**. Here again it is necessary to be fully informed about all the facts:

Nuclear energy is not completely carbon free. It is true that the operation of a nuclear power plant doesn't emit CO<sub>2</sub>. However, the construction of such a plant uses a lot of concrete, which releases vast amounts of CO<sub>2</sub> during its production. Once the plant is built, uranium needs to be mined and transported, both of which processes require fossil fuels. Its waste will have to be transported as well.

Radioactive waste from nuclear power plants stays highly toxic for hundreds of thousands of years. It is probably possible to build a somewhat safe storage site that can last several hundred years. However, a few hundred years is nothing compared to the lifespan of the

waste's toxicity. How will future generations cope with the radioactive waste we have already produced? And they will not have the fossil fuels available to deal with the problem.

Although nuclear energy has been used in many countries for many decades, no country in the whole world has found a safe place or a safe method for the storage of its waste.

There is always the danger of an accident due to human error or technological failure. One of the worst nuclear accidents happened in Chernobyl in 1986. In the aftermath, more than 130 000 people were evacuated from a 30-km (18.6 mile) zone around the reactor. The WHO estimates that around 4 million people in Belarus, Russia and the Ukraine have been affected by the nuclear disaster. Roughly one million are undergoing medical treatment for consequential health impairments. A direct link between the accident and thyroid cancer among children is recognized internationally. The nuclear disaster at Chernobyl effectively deprived Belarus of 22 per cent of its agricultural land and 21 per cent of its forests. The official Chernobyl Committee in Minsk, which is responsible for dealing with the consequences of the disaster, estimates the total damage for the Republic at USD 235 billion. This is more than ten times the gross national product of 1997 and about 60 times the annual national budget. [43]

Everyone will remember the nuclear meltdowns at the Fukushima nuclear power plant after the Tsunami in March 2011 and the following release of significant amounts of radioactive materials. Vast areas of the environment were polluted exposing the affected population to health risks and displacing many from their homes.

Nuclear power plants are a potential threat to peace and security: The enriched plutonium of nuclear power plants can be used to make nuclear weapons. Also, a terrorist attack on a nuclear power plant cannot be ruled out.

Nuclear power plants require huge amounts of cooling water. Increasing water shortages are a great threat to their operation. In addition, as the used water is returned to the river, it raises its temperature damaging its ecosystem. As the oxygen content in the warmer water is reduced, it can result in killing all the fish. That's why nuclear power plants in Europe often have to reduce their production during heat waves. This problem will be exacerbated greatly in the coming decades when heat waves will be more severe and river flow reduced in the summers because of the disappearance of glaciers.

Nuclear energy is very expensive. Until now it could compete economically with other energy sources because it has been heavily subsidized by governments and because expenses of building safe storage facilities and maintaining them for hundreds of thousands of years are not included in their financial statements, nor are the costs of past or possible future accidents.

The building of a new nuclear power plant requires huge amounts of money which will no more be available for investment in renewable energy, both in research and in projects.

Despite all these threats, it's important to stay open minded to new scientific research. For example, James Hansen, who heads NASA's Goddard Institute for Space Studies and is regarded as one of the world's leading climate scientists, believes that our first priority of action to lower greenhouse gas emissions should be energy conservation and efficiency, and the use of renewable energy. However, he and many others think that these efforts may not be sufficient to lower our emissions enough to prevent dangerous climate change. He

suggests intensifying research on “4th generation” nuclear power. This type of nuclear power could also help us solve the nuclear waste problem that we have already created because it would use that waste as fuel. This would eliminate the need for further mining. Moreover, the remaining radioactive waste would have a much smaller volume and a half-life of decades rather than hundreds of thousands of years. [43] This research still needs to be done and we cannot rely on that option.

**3. Carbon Capture and Storage:** One ingenious way of mitigating climate change would be to somehow getting rid of all that CO<sub>2</sub>. Scientists have been exploring various ways to capture CO<sub>2</sub> from industrial sources, especially from coal-fired power plants. The captured CO<sub>2</sub> would be pressurized into a liquid. The next step would be to pump it into geological formations such as deep saline aquifers more than 2000 feet (610m) underground or into depleted oil and gas fields, or injected into deep-sea sediments where it would be stored for a long time.

Several technical problems and environmental risks arise with Carbon Capture and Storage. CO<sub>2</sub> would need to be transported to the storage site requiring an extensive transportation system unless it's possible to build a power plant near the storage site. CO<sub>2</sub> could leak, or migrate and pollute drinking water. The cost of CCS is extremely high. It requires huge amounts of water. The process of separating and compressing the CO<sub>2</sub> is highly energy-intensive. It would reduce a power plant's energy output by a quarter or more.

A major problem with CCS is that its technology will not be available until 2020 or 2030. We don't even know yet whether it will be technically or economically feasible. And we are not in a position to wait with reducing our greenhouse gas emissions. Nevertheless, the respected Union of Concerned Scientists advocates for more research on Carbon Capture and Storage: “CCS technology holds sufficient promise that commercial-scale demonstration projects can and should be undertaken. These projects can inform subsequent decisions about whether mass deployment of CCS is warranted and cost-effective.” [45]

Renewable energy may turn out to be economically more feasible. While doing research on CCS it is imperative not to build any more new coal fired power plants without CCS and to curtail greenhouse gas emissions on a grand scale in all sectors of human activity. [46]

**4. Laws that limit greenhouse gases** are indispensable. Currently, two basic options are discussed in many countries, one is the *Cap and Trade System*, the other one a *Carbon Tax*.

Some governments have already taken well-intentioned first steps towards limiting CO<sub>2</sub> emissions with a carbon cap. “Cap and trade is a market-based policy tool for controlling large amounts of emissions from a group of sources. A cap and trade program first sets an aggressive cap, or maximum limit, on emissions. Sources covered by the program then receive authorizations to emit in the form of emissions allowances, with the total amount of allowances limited by the cap. Each source can design its own compliance strategy to meet the overall reduction requirement, including the sale or purchase of allowances, installation of pollution controls, and implementation of efficiency measures, among other options. Individual control requirements are not specified under a cap and trade program, but each emission source must surrender allowances equal to its actual emissions in order to comply. Sources must also completely and accurately measure and report all emissions in a timely manner to guarantee that the overall cap is achieved.” [47]



Companies are issued emission permits. They are allowed to trade these carbon credits. Many people have pointed out that in practice, this system of carbon trading hasn't resulted in true global emissions reductions, as emissions are often just shifted to other areas. Some countries could easily abuse the system by "exporting" its emission problems (usually to developing countries) and avoiding emissions at the source. Some projects have also been controversial; especially those that cut down old growth forests replacing them with fast growing trees or monocultures like palm trees. Another major problem with this system is that it is very complicated and therefore difficult to monitor. [48]

Some economists point out that a transparent cap and trade system has the potential of effectively reducing CO<sub>2</sub> emissions, especially if the caps will be gradually, but significantly lowered to reduce emissions by 80% by 2050. Cap and trade may be a good transitional tool to reduce greenhouse gas emissions, especially when they are used for renewable energy projects.

Not everyone agrees. This is the opinion of NASA scientist James Hansen: "A carbon cap that slows emissions of CO<sub>2</sub> does not help, because of the long lifetime of atmospheric CO<sub>2</sub>. In fact, the cap exacerbates the problem if it allows coal emissions to continue. The only solution is to target a (large) portion of the fossil fuel reserves to be left in the ground or used in a way such that the CO<sub>2</sub> can be captured and safely sequestered. A rising carbon price is essential to 'decarbonize' the economy, i.e., to move the nation toward the era beyond fossil fuels. The most effective way to achieve this is a carbon tax (on oil, gas, and coal) at the well-head or port of entry. The tax will then appropriately affect all products and activities that use fossil fuels. The public's near-term, mid-term, and long-term lifestyle choices will be affected by knowledge that the carbon tax rate will be rising. The public will support the tax if it is returned to them, equal shares on a per capita basis. No large bureaucracy is needed. A person reducing his carbon footprint more than average makes money. A person with large cars and a big house will pay a tax much higher than the dividend. Not one cent goes to Washington. No lobbyists will be supported. Unlike cap-and-trade, no millionaires would be made at the expense of the public. The tax will spur innovation as entrepreneurs compete to develop and market low-carbon and no-carbon energies and products. The dividend puts money in the pockets of consumers, stimulating the economy, and providing the public a means to purchase the products. A carbon tax is honest, clear and effective. It will increase energy prices, but low and middle-income people, especially, will find ways to reduce carbon emissions so as to come out ahead. Effects will permeate society. Food requiring lots of carbon emissions to produce and transport will become more expensive and vice versa, encouraging support of nearby farms as opposed to imports from half way around the world." [49]

Other experts in the field of climate change agree that a carbon tax is indispensable because it makes environmentally destructive behavior more expensive. At the same time, it rewards environmentally responsible actions. When such a carbon tax is gradually increased it could become the best tool to move away from fossil fuels to renewable energy and to bring society back to a lifestyle in harmony with nature.

Several countries and districts have already successfully established some type of a carbon tax, among them British Columbia, Costa Rica, Ireland, and Finland. [50]

The word "tax" has been tainted with a negative connotation. However, in a fair system, a tax

is a contribution of individuals and businesses to the common good. In turn, everyone benefits from government services like good schools, public transportation, or public safety services. And, of course, everyone will benefit if we can avert the threat of irreversible catastrophic climate change.

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### **Community Service Project:**

As participants of this study course you are encouraged to take some action to help mitigate climate change. This service project can be very simple. You may confine it to just your group or invite others to participate. You may choose an educational project reaching out to a community of your choice (faith community, youth group, school, neighborhood), or a project to promote energy efficiency and conservation, or any other idea you may have. An important objective of this group project is to create unity while planning and implementing it. Today, just brainstorm about what you would like to do. Write down some of your ideas. Think about these ideas until you get together next time.

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## Class 7:

### Applying Spiritual and Ethical Principles – The Role of Society

Einstein said, "You cannot solve a problem at the same level of consciousness that created it." [1] What better tool do we have to raise our minds and hearts to higher levels than divinely revealed spiritual principles? They deepen our understanding of spiritual reality and provide us with ethical standards on which we can build a just and environmentally sustainable society.

In this class we will study spiritual and ethical principles that are directly applicable to the climate crisis. Many of these principles are taught by all major religions in different words. In these cases you will find quotations from various Holy Writings. Some of these principles are new or more elaborated on in the Writings of Bahá'u'lláh and you will find more references to the Bahá'í Faith.

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#### Section 1: Various Aspects of Justice

Climate change raises many issues of fairness or justice:

##### 1. Vulnerable Populations

Some areas in the world are much more severely affected by climate change than others. One such area is Africa: It is not only the poorest, but also one of the most vulnerable continents to climate change. There is a decrease in rainfall over large regions where it is already dry. Water scarcity is worsening. Most of Africa relies on rain-fed agriculture. 70% of the population lives by farming. The consequences are more famines, death and human suffering. In some central areas of Africa, climate change results in an increase in rainfall. This causes mosquitoes to thrive and results in the further spread of malaria.

Other vulnerable people are the millions who live on small islands and low-lying coastal lands who will be displaced by sea-level rise, and the indigenous people in the Arctic who are losing their way of life.

All these populations emit very little greenhouse gases. The parts of the world that are rich and industrialized are responsible for the huge greenhouse gas emissions that drive climate change. [2] The poorest people are affected the worst, as they have no means of adapting to the changing conditions.

##### 2. Inequitable Emissions

"In one year, the average American produces the same amount of greenhouse-gas emissions as four and a half Mexicans, or eighteen Indians or 99 Bangladeshis. ... Why should anyone have the right to emit more than others? ... Democratic ethos demands equal per capita rights to global environmental resources." [3]

Effective global action on climate change requires very low per capita greenhouse gas emissions. Currently, humanity is emitting about 7 billion tons of carbon and is headed to increase that amount to about 20 billion tons in this century. However, emissions need to be

reduced to 2 ½ billions in the next 30 years. How do we allocate who gets to use those 2 ½ billion tons? Does the US get to use more per capita than China or India? [4] "If the world took climate change as a moral issue, each country will have to reduce their greenhouse gas emissions to their fair share of global emissions." [5]

### **3. Economic Injustice**

"Those who produce greenhouse gas emissions are bringing about climate change, thereby imposing costs on the world and future generations, but they do not face directly, neither via markets nor in other ways, the full consequences of the costs of their actions." [6] Who will pay for the damages of climate change?

Another aspect of economic justice is the following: Greenhouse gas emissions in China, India, and other countries with growing economies have been increasing steeply over the past years, giving cause to much criticism by developed countries. However, we must bear in mind that a large quantity of products bought in developed countries are being produced in these emerging economies since the world economy has become more and more globalized. Therefore, every consumer in the developed world buying a product from these countries with rising carbon emissions is also responsible for their emissions, not just the country itself.

### **4. Intergenerational Injustice**

Future generations will have to live on an impoverished planet, plundered of its resources, polluted with chemicals and radioactivity, on an earth with less species of plants and animals, with degraded soil, polluted and scarce water supplies and a changing climate! For the short-term economic benefits of a few, the long-term well-being of everyone is sacrificed.

"Climate change will have serious impacts within the lifetime of most of us alive today. Future generations will be even more strongly affected, yet they lack representation in present-day discussions". [7] Who is in charge of advocating for future generations? People of faith are particularly called to speak out for future generations.

### **Justice as Taught by Religion**

Religion calls on us to uphold justice. "Far from encouraging the punitive spirit that has often masqueraded under its name in past ages, justice is the practical expression of awareness that, in the achievement of human progress, the interests of the individual and those of society are inextricably linked." [8]

*"What does the Lord require of you? To do justice and love kindness and walk humbly with your God."* [9] The Bible

*"O ye who believe! Stand fast to justice, when ye bear witness before God, though it be against yourselves, or your parents, or your kindred, whether the party be rich or poor. God is nearer than you to both. Therefore follow not passion, lest ye swerve from truth. And if ye wrest your testimony or stand aloof, God verily is well aware of what ye do."* [10] The Qur'an

*"No light can compare with the light of justice. The establishment of order in the world and the tranquillity of the nations depend upon it."* [11]

*"The light of men is Justice. Quench it not with the contrary winds of oppression and tyranny. The purpose of justice is the appearance of unity among men."* [12] Baha'u'llah

(In the above and similar quotations, the word "men" signifies human beings in general; no

gender bias is intended.)

*"We ask God to endow human souls with justice so that they may be fair, and may strive to provide for the comfort of all, that each member of humanity may pass his life in the utmost comfort and welfare. Then this material world will become the very paradise of the Kingdom, this elemental earth will be in a heavenly state and all the servants of God will live in the utmost joy, happiness and gladness. We must all strive and concentrate all our thoughts in order that such happiness may accrue to the world of humanity."* [13] Abdu'l-Baha

Another area of social justice is rewarding environmentally responsible actions and discouraging harmful behavior with good environmental laws. We find this standard in religious teachings:

*"The structure of world stability and order hath been reared upon, and will continue to be sustained by, the twin pillars of reward and punishment".* [14] Baha'u'llah

Discussion: What strikes you most about justice in relation to climate change?

## **Section 2: Poverty and Climate Change**

"From Ghana to Germany, South Africa to Spain, the gap between rich and poor is rapidly increasing, and economic inequality has reached extreme levels. In South Africa, inequality is greater today than at the end of Apartheid. Seven out of 10 people live in countries where the gap between rich and poor is greater than it was 30 years ago. Worldwide, inequality of individual wealth is even more extreme. At the start of 2014, Oxfam calculated that the richest 85 people on the planet owned as much as the poorest half of humanity." [15]

The first victims of climate change are the poor all over the world. Many people who are threatened by sea-level rise are poor, for example many millions of Bangladeshi citizens. All international efforts to relieve poverty and to promote sustainable development in developing nations could be nullified by climate change.[16]

Even in the developed countries are the poor first at risk from the impacts of climate change. They will be most affected by rising food prices or by dislocation because of severe storms. In general, one can say that those most vulnerable to climate change are often least able to afford adaptation measures such as dikes, irrigation to compensate for droughts, or moving away from flood or storm prone areas. [17]

"Climate change is the central poverty issue of our times," said Jeremy Hobbs, Executive Director of Oxfam International. "Climate change is happening today and the world's poorest people, who already face a daily struggle to survive, are being hit hardest. The evidence is right in front of our eyes. [18]

Poverty also exacerbates climate change. Poor people are often forced to exploit their environment unsustainably, for example by cutting down forests. This contributes to climate change, and the degraded environment in turn exacerbates poverty - a vicious circle. It is necessary to address the root causes of poverty and to provide basic education in order to make progress in sustainable development. Poor societies have the largest population growth. Family size among the very poor of the world tends to be large because of a high infant mortality rate and because there is no social safety net, so parents need to rely on a



male offspring to support them in old age. Population growth in turn increases poverty because more people will have to share the scarce land and resources. In addition, larger populations emit more greenhouse gases and therefore exacerbate climate change.

Poverty alleviation plays a vital role within the complex issue of climate change. It is also a central issue of religion:

*"When the Son of man shall come in his glory, and all the holy angels with him, then shall he sit upon the throne of his glory: And before him shall be gathered all nations: and he shall separate them one from another, as a shepherd divideth his sheep from the goats: And he shall set the sheep on his right hand, but the goats on the left.*

*Then shall the King say unto them on his right hand, Come, ye blessed of my Father, inherit the kingdom prepared for you from the foundation of the world: For I was an hungred, and ye gave me meat: I was thirsty, and ye gave me drink: I was a stranger, and ye took me in: Naked, and ye clothed me: I was sick, and ye visited me: I was in prison, and ye came unto me.*

*Then shall the righteous answer him, saying, Lord, when saw we thee an hungred, and fed thee? or thirsty, and gave thee drink? When saw we thee a stranger, and took thee in? or naked, and clothed thee? Or when saw we thee sick, or in prison, and came unto thee? And the King shall answer and say unto them, Verily I say unto you, Inasmuch as ye have done it unto one of the least of these my brethren, ye have done it unto me." [19] The Bible*

*"It is not righteousness that ye turn your faces to the East and the West; but righteous is he who believeth in Allah\* and the Last Day and the angels and the Scripture and the prophets; and giveth wealth, for love of Him, to kinsfolk and to orphans and the needy and the wayfarer and to those who ask, and to set slaves free; and observeth proper worship and payeth the poor-due." [20] The Qur'an  
(\*Allah means God in Arabic.)*

*"Give up extravagance and be sparing and moderate in your expenditure. Do not let the pleasures of today make you forget the tomorrow, the Day of Reckoning and Judgement. Keep money with you strictly according to your real requirements and give away the rest to the poor so that it may act as a provision for you in the next world." [21] Islamic Scriptures*

*"Let the rich satisfy the poor implorer, and bend his eye upon a longer pathway. Riches come now to one, now to another, and like the wheels of cars are ever rolling." [22] Vedas*

**"O YE RICH ONES ON EARTH!**

*The poor in your midst are My trust; guard ye My trust, and be not intent only on your own ease." [23]*

**"O CHILDREN OF DUST!**

*Tell the rich of the midnight sighing of the poor, lest heedlessness lead them into the path of destruction, and deprive them of the Tree of Wealth. To give and to be generous are attributes of Mine; well is it with him that adorneth himself with My virtues." [24] Baha'u'llah*

In the Baha'i Writings humankind is compared to a family. *"Because of lack of harmonious relations some members are comfortable and some in direst misery, some members are satisfied and some are hungry, some members are clothed in most costly garments and some families are in need of food and shelter. Why? Because this family lacks the necessary reciprocity and symmetry. This household is not well arranged. This household is not living under a perfect law. All the laws which are legislated do not ensure happiness. They do not provide comfort. Therefore a law must be given to this family by means of which all the members of this family will enjoy equal well-being and happiness."* [25]

*"Each one of you must have great consideration for the poor and render them assistance. Organize in an effort to help them and prevent increase of poverty. The greatest means for prevention is that whereby the laws of the community will be so framed and enacted that it will not be possible for a few to be millionaires and many destitute."* [26]

Discussion: How can we apply the spiritual teachings of compassion and empathy to relieve poverty and to mitigate climate change?

### **Section 3: The Empowerment of Women**

Women are disproportionately more affected by the impacts of climate change. They generally have less access to resources such as land, credit, decision-making bodies, agricultural inputs, technology and educational services that could help them to cope with or adapt to the changing climate. Their lives are also severely impacted by increasing water scarcity and diseases like malaria that are spreading to new areas because of climate change.

The empowerment of women is not only a human rights issue, but also a key element to fight poverty and climate change. Experience has shown already that the participation of women in climate change mitigation efforts is vital. Women have always been leaders in working for the health and well being of their families and communities.

*"In Honduras, for example, the village of La Masica was the only community to register no death in the wake of 1998's Hurricane Mitch. Six months earlier, a disaster agency had provided gender-sensitive community education on early warning systems and hazard management. Women took over the abandoned task of continuously monitoring the warning system. As a result, the municipality was able to evacuate the area promptly when the hurricane struck."* [27]

*And in Kenya, women's groups are planting thousands of trees to reforest two mountain areas as part of the Green Belt Movement. This activity provides "poor rural women with a small income and some economic independence as well as capture some 350'000 tons of CO<sub>2</sub>, restore eroded soils, and support regular rainfall essential to Kenya's farmers and hydroelectric plants."* [28]

The United Nations noticed that development projects work better where women are fully involved in decision-making. Here is just one example in the area of water security: *"In most societies, women have primary responsibility for water supply, sanitation and health at the household level. Women have considerable knowledge about water resources, including location, quality and storage methods, and they are often the most motivated to ensure that water supply and sanitation work."* [29]

The status of women has a direct impact on population growth. Greenhouse gas emissions have only reached such a dangerously high level because of the large numbers of people living on our planet. Today, there are about 7.2 billion people. In 2050 it is estimated that there may be 8 to 10.5 billion of us. [30]

UNFPA, an international development agency of the United Nations states: "The ability of women to control their own fertility is absolutely fundamental to women's empowerment and equality. When a woman can plan her family, she can plan the rest of her life. When she is healthy, she can be more productive. And when her reproductive rights—including the right to plan her family in terms of birth timing and spacing, and to make decisions regarding reproduction free of discrimination, coercion and violence—are promoted and protected, she has freedom to participate more fully and equally in society.

Where women's status is low, family size tends to be large, which makes it more difficult for families to thrive. Population and development and reproductive health programmes are more effective when they address the educational opportunities, status and empowerment of women. When women are empowered, whole families benefit, and these benefits often have ripple effects to future generations." [31]

"Only as women are welcomed into full partnership in all fields of human endeavor, including environment and development, will the moral and psychological climate be created in which a peaceful, harmonious, and sustainable civilization can emerge and flourish." [32]

The Baha'i teachings say:

*"The world in the past has been ruled by force, and man has dominated over woman by reason of his more forceful and aggressive qualities both of body and mind. But the balance is already shifting; force is losing its dominance, and mental alertness, intuition, and the spiritual qualities of love and service, in which woman is strong, are gaining ascendancy. Hence the new age will be an age less masculine and more permeated with the feminine ideals, or, to speak more exactly, will be an age in which the masculine and feminine elements of civilization will be more evenly balanced."* [33] Abdu'l-Baha

#### **Section 4: The Oneness of Humankind**

"Through our scientific and technological genius, we have made of this world a neighborhood and yet we have not had the ethical commitment to make of it a brotherhood ... We must all learn to live together as brothers or we will all perish together as fools." Martin Luther King

Martin Luther King said these words in a context unrelated to climate change. Yet, embracing the concept of the oneness of humankind is vital for its mitigation.

The Earth Charter clearly spells out the need for the unification of humankind: "The choice is ours: form a global partnership to care for Earth and one another or risk the destruction of ourselves and the diversity of life. Fundamental changes are needed in our values, institutions, and ways of living. Our environmental, economic, political, social, and spiritual challenges are interconnected, and together we can forge inclusive solutions.

To realize these aspirations, we must decide to live with a sense of universal responsibility, identifying ourselves with the whole Earth community as well as our local communities. We

are at once citizens of different nations and of one world in which the local and global are linked. Everyone shares responsibility for the present and future well-being of the human family and the larger living world. The spirit of human solidarity and kinship with all life is strengthened when we live with reverence for the mystery of being, gratitude for the gift of life, and humility regarding the human place in nature." [34]

Baha'u'llah said: *"The well-being of mankind, its peace and security, are unattainable unless and until its unity is firmly established."* [35]

"The central spiritual issue facing all people, whatever their nation, religion, or ethnic origin, is that of laying the foundations of a global society that can reflect the oneness of human nature. The unification of the earth's inhabitants is neither a remote utopian vision nor, ultimately, a matter of choice. It constitutes the next, inescapable stage in the process of social evolution, a stage toward which all the experience of past and present is impelling us. Until this issue is acknowledged and addressed, none of the ills afflicting our planet will find solutions, because all the essential challenges of the age we have entered are global and universal, not particular or regional." [36]

"Only through the dawning consciousness that they constitute a single people will the inhabitants of the planet be enabled to turn away from the patterns of conflict that have dominated social organization in the past and begin to learn the ways of collaboration and conciliation." [37]

*"What we are witnessing is the beginning of the history of humankind, the history of a human race conscious of its own oneness."* [38]

*"So powerful is the light of unity that it can illuminate the whole earth."* [39]

*"It is not for him to pride himself who loveth his own country, but rather for him who loveth the whole world. The earth is but one country, and mankind its citizens."* [40] Baha'u'llah

"Recognizing the world as an ecosystem makes us all global citizens." [41] Lester Brown

*"He Who is your Lord, the All-Merciful, cherisheth in His heart the desire of beholding the entire human race as one soul and one body."* [42] Baha'u'llah

Embracing the concept of the oneness of humanity will change our perspective of climate mitigation efforts in many ways. For example, some people and governments in rich countries have argued that the costs for mitigating global warming are too high for their economy. They ignore the fact that the first severely harmful effects of climate change are happening primarily in other countries. Such reasoning will change when we regard the world as just one country and humankind as one family. With such a consciousness we equally value the lives of people in other countries who may often be poor or of a different race.

**Meditation and Discussion:** Take a few moments to ponder the oneness of humanity in your heart. Visualize the Earth as one country and humankind as one big family. Then discuss the implications of this concept for mitigating climate change.

## **Section 5: The Need for a World Federal System**

The environmental crisis demands that all of humanity works together to implement solutions. "The solution to climate change exceeds the capacities and resources of any one nation and requires the full cooperation of all nations, each according to their means." [43]

Strong and enforceable laws need to be created to limit greenhouse gas emissions, not only on the local and national level, but also on the international level. There is a desperate need for global environmental governance. Pollution has no boundaries: The high levels of arsenic found in Nevada come from Mongolia. The cars driven in Nevada contribute to global warming which affects the climate in Mongolia. [44]

The United Nations Framework Convention on Climate Change asserts, "The global nature of climate change calls for the widest possible cooperation by all countries and their participation in an effective and appropriate international response, in accordance with their common but differentiated responsibilities and respective capabilities and their social and economic conditions." [45]

History shows that such global cooperation is possible, but not easy. The Montreal Protocol of 1987 was probably the first successful international environmental agreement. As a result the chlorofluorocarbons that have been depleting the ozone layer were substantially reduced. Other attempts of international cooperation have been less successful: The Kyoto Protocol was established to reduce greenhouse gases. However, the US didn't join it, although it was by far the greatest emitter of CO<sub>2</sub>. So the laws of an international order must have binding authority and they must be enforced throughout the world.

The economist Jeffrey D. Sachs says about climate change, "The main problem is not the absence of reasonable and low-cost solutions, but the difficulty of implementing global cooperation to put these solutions in place." [46]

Maria Ivanova explains how the United Nations Environment Programme (UNEP) was created: "With a growing recognition that global problems demand global solutions, governments have created an increasingly complex network of international environmental treaties and organizations to deal with environmental challenges. Yet, international environmental problems persist unabated and are even increasing in scale and scope, attesting that our first attempt at global environmental governance has been 'an experiment that has largely failed.' Short-term economic considerations and sovereignty concerns have often overridden the political will to effectively combat environmental problems. The institutions created have been weak and 'woefully inadequate to meet global environmental challenges.'... The United Nations Environment Programme (UNEP) was not purposefully established as a 'weak, underfunded, overloaded, and remote organization.' Rather, it was created as the 'anchor institution' for the global environment to serve as the world's ecological conscience, to provide impartial monitoring and assessment, to serve as a global source of information on the environment, to 'speed up international action on urgent environmental problems,' and to 'stimulate further international agreements of a regulatory character.' Most importantly, the mission of the new environment Programme was to ensure coherent collective environmental efforts by providing central leadership, assuring a comprehensive and integrated overview of environmental problems and developing stronger linkages among environmental institutions and the constituencies they serve." [47]

Maria Ivanova and many others in the field advocate for a strong international environmental

institution, which has the authority to enforce environmental law on the global level.

The United Nations Framework Convention on Climate Change was created to "stabilize greenhouse gas emissions... at a level that would prevent dangerous anthropogenic (human caused) interference with the climate system." [48] However, at present the agencies of the United Nations are limited in their effectiveness because of an outdated system of sovereign nation states.

Shoghi Effendi wrote already in 1936, "The anarchy inherent in state sovereignty is moving towards a climax. A world, growing to maturity, must abandon this fetish, recognize the oneness and wholeness of human relationships, and establish once for all the machinery that can best incarnate this fundamental principle of its life." [49]

Organizing and coordinating the affairs of humanity on a global level requires a new way of thinking, one that transcends the limits of nations. The Baha'i teachings explain, "The principle of the Oneness of Mankind ... is no mere outburst of ignorant emotionalism or an expression of vague and pious hope. ... It implies an organic change in the structure of present-day society, a change such as the world has not yet experienced. ... It calls for no less than the reconstruction and the demilitarization of the whole civilized world – a world organically unified in all the essential aspects of its life, its political machinery, its spiritual aspiration, its trade and finance, its script and language, and yet infinite in the diversity of the national characteristics of its federated units. It represents the consummation of human evolution – an evolution that has had its earliest beginnings in the birth of family life, its subsequent development in the achievement of tribal solidarity, leading in turn to the constitution of the city-state, and expanding later into the institution of independent and sovereign nations." [50]

"It will ensure the creation of binding legislation that will protect both the environment and the development needs of all peoples. Ultimately, the restructuring or transformation of the United Nations system that this movement is already bringing about will no doubt lead to the establishment of a world federation of nations with its own legislative, judicial, and executive bodies." [51] Such a world order is not only new in that it encompasses all of humankind, but also new in the underlying philosophy: The first priority is the well being of everyone on the planet. National, regional and local interests are respected, but are considered in the light of humankind being one family. The representatives of people on the local, national and international level must be trustworthy and "regard themselves as the representatives of all that dwell on earth." [52]

*"O ye the elected representatives of the people in every land! Take ye counsel together, and let your concern be only for that which profiteth mankind and bettereth the condition thereof."* [53] Baha'u'llah

A world order whose goal is to ensure the rights and well-being of all individuals and countries of the world must include global institutions and laws to mitigate global warming and effective measures to help poor people and countries adapt to the already unavoidable impacts of present and future climate changes.

Discussion: How do you envision a global institution that effectively mitigates climate change?

## **Section 6: Decentralization and Consultation**

### **Decentralization:**

Decentralization is an environmental necessity. Fertile lands need to be preserved for agriculture. As much as possible, food should be produced where it will be eaten.

"The globalization of the world food economy will be reversed, as the higher price of oil raises the cost of transporting food internationally. In response, food production and consumption will become much more localized, leading to diets based more on locally produced food and seasonal availability." [54] (see also class 6, section 4)

Decentralization is also the way to go for much of our energy production. Wind, solar and geothermal energy is used best in the area where it is produced."Whereas fossil fuels helped globalize the energy economy, shifting to renewable sources will localize it." [55] Decentralization will make local communities more resilient to increasing climate change impacts.

The Baha'i concept of a global order "repudiates excessive centralization on one hand, and disclaims all attempts at uniformity on the other. Its watchword is unity in diversity..."[56]

"Development must be decentralized in order to involve communities in formulating and implementing the decisions and programs that affect their lives. Such a decentralization need not conflict with a global system and strategy, but would in fact ensure that developmental processes are adapted to the planet's rich cultural, geographic, and ecological diversity." [57]

### **Consultation:**

Consultation must replace confrontation and domination in order to gain the cooperation of the family of nations in devising and implementing measures that will preserve the earth's ecological balance. [58]

People at the grass roots need to have a voice in the decisions that will affect their lives. Minorities and indigenous people must be especially empowered to take part in all plans for sustainable development. In fact, development projects have proven to be much more beneficial if the knowledge and experience of the local population are incorporated.

"Top-down models of community development can no longer adequately respond to modern day needs and aspirations. The world community must move toward more participatory, knowledge-based and values-driven systems of governance in which people can assume responsibility for the processes and institutions that affect their lives. These systems need to be democratic in spirit and method, and must emerge on all levels of world society, including the global level. Consultation -- the operating expression of justice in human affairs -- should become their primary mode of decision-making." [59]

In such a consultative process, "individual participants strive to transcend their respective points of view, in order to function as members of a body with its own interests and goals. In such an atmosphere, characterized by both candor and courtesy, ideas belong not to the individual to whom they occur during the discussion but to the group as a whole, to take up, discard, or revise as seems to best serve the goal pursued. Consultation succeeds to the extent that all participants support the decisions arrived at, regardless of the individual opinions with which they entered the discussion. Viewed in such a light, consultation is the



operating expression of justice in human affairs.

So vital is it to the success of collective endeavor that it must constitute a basic feature of a viable strategy of social and economic development." [60]

*"The heaven of divine wisdom is illumined with the two luminaries of consultation and compassion. Take ye counsel together in all matters, inasmuch as consultation is the lamp of guidance which leadeth the way, and is the bestower of understanding."* [61]

*"Consultation ... is a shining light which, in a dark world, leadeth the way and guideth. For everything there is and will continue to be a station of perfection and maturity. The maturity of the gift of understanding is made manifest through consultation."* [62] Baha'u'llah

Policies to mitigate climate change or adaptation projects will be beneficial and effective when everyone affected can participate directly or with representation in such a consultative process. If the above principles are applied, consultation and decentralization can prevent human rights abuses, conflicts and violence, and ensure the well-being of everyone. People at the grassroots will be empowered and the actions taken will have a much greater chance of success because the knowledge and support from a wide diversity of people went into the planning of these projects.

## **Section 7: Trustworthiness – an Antidote for Corruption**

Corruption is a major cause of both poverty and environmental degradation throughout the world.

"Anti-corruption measures are integral to fighting both poverty and climate change. Weak institutions, poor governance practices and the excessive influence of private interests will continue to undermine the best efforts to promote equitable and sustainable human development, for which we need a vigorous, honest exchange of expertise and development cooperation between rich and poor countries.

Hunger, child mortality and illiteracy cannot be eradicated as long as corruption continues to sap resources from the world's poorest countries. One key lesson from the last 30 years of development efforts is that the progress in poverty alleviation in the world's poorer countries with high level of corruption and weak institutions has not been substantial or sustained.

Similarly, environmental regulation, including CO<sub>2</sub> controls, forest and biodiversity protection will not be effective as long as law enforcement and other decision-makers can be bought.

The possibility of a world where all countries and all people can share in the wealth of the global economy hinges on fighting corruption, strengthening public institutions and improving governance and standards of accountability and transparency across the world." [63]

Corruption needs to be eliminated not only in government and business, but also on the individual level. This is just one example: "Residents in Paris can rent a sturdy bicycle from hundreds of public stations and pedal to their destinations, an inexpensive, healthy and low-carbon alternative to hopping in a car or bus. Unfortunately, many of the specially designed expensive bikes are showing up on black markets in Eastern Europe and northern Africa. Many others are being spirited away for urban joy rides, then ditched by roadsides, their wheels bent and tires stripped." [64]

All religions call for a life of integrity, which means that our actions are in harmony with our spiritual and moral values.

*"In truth, religion is a radiant light and an impregnable stronghold for the protection and welfare of the peoples of the world, for the fear of God impelleth man to hold fast to that which is good, and shun all evil. Should the lamp of religion be obscured, chaos and confusion will ensue, and the lights of fairness and justice, of tranquillity and peace cease to shine."* [65] Baha'u'llah

One particular moral value is trustworthiness. Trustworthiness is the antidote to corruption.

*"Trustworthiness is the greatest portal leading unto the tranquillity and security of the people. In truth the stability of every affair hath depended and doth depend upon it. All the domains of power, of grandeur and of wealth are illumined by its light."* [66] Baha'u'llah

Discussion: Discuss the importance of trustworthiness in the efforts to mitigate climate change.

## **Section 8: Education**

Universal education is a prerequisite to combating climate change. Children and youth comprise a large part of the human population. Their consumer choices will have the strongest impact on the climate. Also, young people can more easily change their habits. Moreover, their generation will have to shoulder the responsibility of mitigating and adapting to climate change in the near future.

However, as immediate strong actions to mitigate climate change are required, education about climate change needs to extend to people of all ages. An informed public is a prerequisite for responsible policy decisions in a democracy.

The following three aspects of education are especially relevant in the context of climate change:

- Environmental education should be considered as part of basic education, equally important as literacy. In industrialized nations, emphasis should be on teaching the causes and impacts of climate change, and what each individual can do to mitigate it. In developing countries, it would be more meaningful to teach sustainable development (based on low or carbon free energy and sustainable agricultural practices), adaptation strategies, for example, agricultural methods (water saving irrigation techniques, different crops or seeds), malaria prevention, and the value of preserving forests and of planting trees.
- Education to world citizenship should be at the heart of the curriculum everywhere. Only when we view humanity as one human family will we have the motivation to take the strong and far reaching actions needed to mitigate climate change.
- Moral education is important throughout all grade levels. An ethical framework is a prerequisite for environmentally and socially responsible actions.

Discussion: Are the three concepts above an important part in the schools of your area? If not, would you have ideas how to incorporate or enhance them?

The media could play a meaningful role in education, but at present they are often a source of misinformation and of degradation of the human spirit. Imagine if the media served to educate people about climate change and the reality of the state of our planet, if they promoted a sense of world citizenship and discouraged extravagant consumption! They could spread scientific knowledge and practical know how to mitigate and adapt to climate change. The media have the potential to be a major tool in the transformation of society towards a sustainable way of life.

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### **Community Service Project:**

Decide on your community service project. (See last paragraph of Class 5 for more information.) Apply the principles for consultation and decision-making, which you discussed today in section 6. Consider the special circumstances of your group such as time constraints, special interests, and talents, as well as the needs of your community. Keep the project small and simple enough so that you can carry it out with joy. Plan to finish the project by the end of this course or shortly afterwards.

The *assignment* is to take some action in preparation of your service project until you will meet again.

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## Class 8

### Some More Climate Science

Planet Earth will continue to exist despite climate change, although in a much impoverished state, as there will be much less species of plants and animals. In the course of many thousands of years a rich biodiversity will probably evolve again on the Earth and the climate return to its natural cycles. The only question is whether human civilization will survive. Currently we are on a direct course to self-destruction.

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#### **Section 1: Historical Perspective**

We know from earlier civilizations that the lead indicators of economic decline were environmental, not economic. The trees went first, then the soil, and finally the civilization itself. To archeologists, the sequence is all too familiar. [1]

#### **Two Examples:**

The ancient *Sumerian civilization* flourished on the central floodplain of the Euphrates River in the fourth millennium BC. The Sumerians had the first written language and built the first cities. They had a very productive agriculture with a sophisticated irrigation system. Unfortunately their irrigation system caused salination of the soil because of water evaporation. For a while the Sumerians could survive by planting more salt tolerant crops. However, their civilization collapsed and until today their once fertile land is almost a desert, with only little vegetation. [2]

*Easter Island* in the South Pacific was settled around ad 400. Its civilization flourished on a volcanic island with rich soils and lush vegetation, including trees that grew 25 meters (82 feet) tall with trunks 2 meters (6,6 feet) in diameter. Archeological records indicate that the islanders ate mainly seafood, principally dolphins—a mammal that could only be caught by harpoon from large sea-going canoes. The Easter Island society flourished for several centuries, reaching an estimated population of 20,000. As its human numbers gradually increased, tree cutting exceeded the sustainable yield of forests. Eventually the large trees that were needed to build the sturdy canoes disappeared, depriving islanders of access to the dolphins and dramatically shrinking their food supply. The archeological record shows that at some point human bones became intermingled with the dolphin bones, suggesting a desperate society that had resorted to cannibalism. Today the island has fewer than 4,000 residents. [3]

In other parts of the world, similar events happened in the past. A culture flourished. Population grew. Demand on the environment increased. Civilization reached a peak, then declined and collapsed because the environment could not sustain it any longer.

The situation today is unique because this time the whole planet is at stake and therefore civilization as we know it. "Our global economy is outgrowing the capacity of the Earth to support it, moving our early twenty-first century civilization ever closer to decline and possible collapse. ... We are consuming renewable resources faster than they can regenerate. Forests are shrinking, grasslands are deteriorating, water tables are falling, fisheries are collapsing, and soils are eroding. We are using up oil at a pace that leaves little time to plan beyond peak



oil. And we are discharging greenhouse gases into the atmosphere faster than nature can absorb them, setting the stage for a rise in the earth's temperature well above any since agriculture began." [4]

As mentioned previously, global temperatures of the last 10,000 years have been about the most stable in the Earth's history which allowed humans to develop a civilization built on agriculture. We are in one of the naturally occurring warm interglacial periods. The Earth did experience warmer temperatures than now, but the last time temperatures were warmer than at present was about 125,000 years ago, at a time when humans survived as hunter-gatherers.

The extremely high concentration of greenhouse gases in the atmosphere, however, is unprecedented in all of human history. Scientists are virtually certain that this commits us to more global warming in the future without us adding more greenhouse gases to the atmosphere. They just can't tell us yet the exact amount of warming still in store. And of course, atmospheric greenhouse gas concentrations are continuously increasing as humans are burning fossil fuels.

## **Section 2: Future Threats**

Best current estimates for temperature rise by the end of this century is 4°C (7.2°F) if we continue with business as usual. It's hard to imagine a 4°C warmer world. Scientist James Hansen explains how our world could potentially look like with 2.8°C (5°F) warming: "Our best information comes from the Earth's history. The last time that the Earth was 2.8°C (5°F) warmer was three million years ago, when sea level was about 24m (80 feet) higher. Twenty-four meters! (Eighty feet!) In that case, the United States would lose most East Coast cities: Boston, New York, Philadelphia, Washington, and Miami; indeed, practically the entire state of Florida would be under water. Fifty million people in the US live below that sea level. Other places would fare worse. China would have 250 million displaced persons. Bangladesh would produce 120 million refugees, practically the entire nation. India would lose the land of 150 million people.

A rise in sea level, necessarily, begins slowly. Massive ice sheets must be softened and weakened before rapid disintegration and melting occurs and the sea level rises. It may require as much as a few centuries to produce most of the long-term response. But the inertia of ice sheets is not our ally against the effects of global warming. The Earth's history reveals cases in which sea level, once ice sheets began to collapse, rose one meter (3.3 feet) every twenty years for centuries. That would be a calamity for hundreds of cities around the world, most of them far larger than New Orleans. Devastation from a rising sea occurs as the result of local storms which can be expected to cause repeated retreats from transitory shorelines and rebuilding away from them." [5]

More recent studies (July 2015) show an unexpected acceleration of glacial melt all over the world. "Glaciers are now losing mass twice as fast as they were in the period from 1901-1950, three times as fast as in the period from 1851-1900, and four times as fast as in the period from 1800-1850, the researchers found." [6]

"The rates of early 21st-century mass loss are without precedent on a global scale, at least for the time period observed and probably also for recorded history, as indicated also in



reconstructions from written and illustrated documents. This strong imbalance implies that glaciers in many regions will very likely suffer further ice loss, even if climate remains stable." [7]

As if this was not enough, there are several issues that should prompt us to quick and effective actions:

- The projected *sea-level rise scenario* as described in the previous two paragraphs is based on a 2.8°C (5°F) warming. The United Nations Environment Programme (UNEP) stated that national pledges to cut carbon emissions, even if fully implemented, would see temperatures rise by 3°C above pre-industrial levels, far above the "well below 2°C" of the Paris Climate Agreement. [8]  
We should be aware that already an increase of 2°C (3.6°F) would displace people from Small Island States and from low-lying coastal areas including from many heavily populated large cities such as Miami [8A], Tokyo, Shanghai, and New York. [8B]
- *Inertia of the Climate System*: Even if we could keep carbon dioxide levels stable at today's levels, the planet would continue to warm for decades. It takes a long time for the oceans to warm. As long as they are still in the process of warming, the atmosphere cannot reach equilibrium. Unfortunately we are not even on a path to stabilize CO<sub>2</sub> levels. On the contrary, atmospheric CO<sub>2</sub> concentrations are continuing to rise every year.
- *The Limit of Carbon Sinks*: Almost half of the CO<sub>2</sub> which humanity has emitted since the industrial revolution has been absorbed by plants during photosynthesis, especially by trees, and by the water and phytoplankton in the oceans. Without this absorption, the warming we have already experienced would have been stronger. However, this process has already started to change because there is a limit to this carbon sink. Due to warmer temperatures, some old growth forests are now releasing more CO<sub>2</sub> than absorbing. The oceans used to be a huge carbon sink as well, but some show signs that they are close to reaching their capacity to absorb CO<sub>2</sub>. (The absorption of CO<sub>2</sub> into the oceans makes the water more acidic. For more information about the harmful consequences of ocean acidification, see Class 3, More Impacts of Climate Change, Section 5.)
- *Aerosol Pollution*: The burning of fossil fuels not only emits greenhouse gases, but also toxic air pollutants, especially sulfate aerosols. These aerosols are a serious health hazard (lung disease) and cause acid rain and crop losses. Ironically they have a cooling effect on the local climate as they reflect some of the sun's rays back into space. Of course, we cannot consider them a "solution" to the climate crisis because of their negative effects. Also they remain in the lower atmosphere for only several weeks while greenhouse gases stay many decades and centuries. Cleaning up our air pollution will have some warming effect on the climate.

The inertia of the climate system, the carbon sinks, and aerosol pollution have so far clouded the effects of climate change. Without these factors, the warming we would have experienced so far would have been considerably greater. Now, with the climate system changing to new patterns, carbon sinks reaching their limits, and (hopefully) aerosol pollution diminishing (with

pollution control and reduction of fossil fuel burning), the warming will accelerate and its impacts become much more severe.

### **Feedback Mechanisms:**

Many feedback mechanisms can accelerate the warming of the Earth. The following are the most important known feedbacks:

- **Ice - Albedo:** Snow and ice are the best reflectors of solar radiation. Water on the other hand is the worst reflector. It absorbs most of the heat. Expansive thawing of ice and snow, therefore, increases the absorption of solar energy. This ice - albedo feedback is believed to be the major reason why the Arctic is warming so rapidly (see Class 4, Section 1).
- **Melting of the Permafrost:** When permafrost melts, organic material that has been frozen for thousands, even millions of years, will break down, and in the process release CO<sub>2</sub> and methane. [9] Once permafrost starts to melt over extensive areas, for example in Alaska or Siberia, it initiates a feedback mechanism that intensifies the thaw. As the huge volume of thawed vegetation breaks down, it will release immense amounts of greenhouse gases. Once the process reaches this point of no return it will continually affect the global climate regardless of whether we reduce our carbon emissions or not. "In most parts of Alaska, the permafrost has warmed by 1.7°C (3°F) since the early 1980s. In some parts of the state it has warmed by nearly 3.3°C (6°F)." [10]

Researchers found expansive areas in western Siberia, which have started to melt and turn into mud and lakes. Billions of tons of methane could be released into the atmosphere. Methane is 20 times more potent as a greenhouse gas than CO<sub>2</sub>. Sergei Kirpotin at Tomsk State University in western Siberia who made the discovery said that the situation was an "ecological landslide that is probably irreversible and is undoubtedly connected to climatic warming". [11]

A report by UNEP (United Nations Environment Programme) on Policy Implications of Warming Permafrost projects the following. "Arctic and alpine air temperatures are expected to increase at roughly twice the global rate and climate projections indicate substantial loss of permafrost by 2100. A global temperature increase of 3°C means a 6°C increase in the Arctic, resulting in anywhere between 30 to 85% loss of near-surface permafrost. Such widespread permafrost degradation will permanently change local hydrology, increasing the frequency of fire and erosion disturbances. The number of wetlands and lakes will increase in continuous permafrost zones and decrease in discontinuous zones, but will decrease overall as the continuous permafrost zone shrinks, impacting critical habitat, particularly for migratory birds. Risks associated with rock fall and erosion will increase, particularly in cold mountain areas. Damage to critical infrastructure, such as buildings and roads, will incur significant social and economic costs." [12]

The most far-reaching implications of the thawing of permafrost is the amplification of anthropogenic climate change caused by the release of huge amounts of methane.

- **Water Vapor:** The warmer the air, the more moisture it can hold. As the planet is warming up, there is more water vapor in the atmosphere. Water vapor is a powerful

natural greenhouse gas, which magnifies the impact of man-made greenhouse gases.

Any of these feedback mechanisms could bring the Earth's climate system to a tipping point. We don't know where that tipping point is. It's quite likely that the planet will cross over that threshold without humanity noticing. Once we will wake up to that reality, it will be too late because this is an irreversible process. Some scientists think that we are already close to that point. "Computer models of the Earth's climate suggest that a critical threshold is approaching. Crossing over it will be easy, crossing back quite likely impossible." [13] The long atmospheric lifetime of CO<sub>2</sub> implies that global warming will last a long time. "20 to 25% of fossil fuel CO<sub>2</sub> will still persist after a thousand years, and 10 to 12% will still remain in the atmosphere after ten thousand years." [14]

### **Section 3: Present Challenges**

So far, the approach of political leaders when they consider cutting carbon dioxide emissions has not been effective at all, because their first concern has always been what is politically feasible. There must be a complete turn around: Actions need to be taken according to the reality of the threat, which means that they must be taken in accordance with science. What do scientists say about how much CO<sub>2</sub> emissions must be cut to avoid irreversible climate change?

NASA climatologist James Hansen said that if we want to preserve creation, the planet on which civilization developed, CO<sub>2</sub> levels need to be stabilized at below 350ppm. [15] "Halting the increase in global warming at far below 2°C (3.6°F) is possible, and lowering global warming as rapidly as possible to below an increase of 1°C (1.8°F) appears critical if there is to be a high probability of preventing dangerous climate change. The emissions reduction actions required to achieve this are massive and appear to be at the outer edge of what is technically and economically feasible. Scenarios that can start to get within reach of these temperature goals require greenhouse gas emissions to peak before 2020 and then to drop toward 85% below 1990 levels by 2050, with further reductions beyond this time." [16]

It is an enormous task to reduce our emissions and to stabilize atmospheric CO<sub>2</sub> levels. The world is moving rapidly towards the threshold of irreversible climate change. [17] As the threat of reaching a tipping point is becoming increasingly close, Nobel Peace Prize winner Al Gore challenged the United States to "produce 100% of its energy from renewable energy and from truly carbon free sources within 10 years. [18]

Many experts in the field believe that with a concerted effort it is still possible to avoid the worst scenarios of climate change. "It is encouraging to know that we now have the technologies to build a new energy economy, one that is not climate-disruptive, that does not pollute the air, and that can last as long as the sun itself. The question is no longer whether we can develop a climate-stabilizing energy economy, but whether we can develop it before climate change spins out of control." [19]

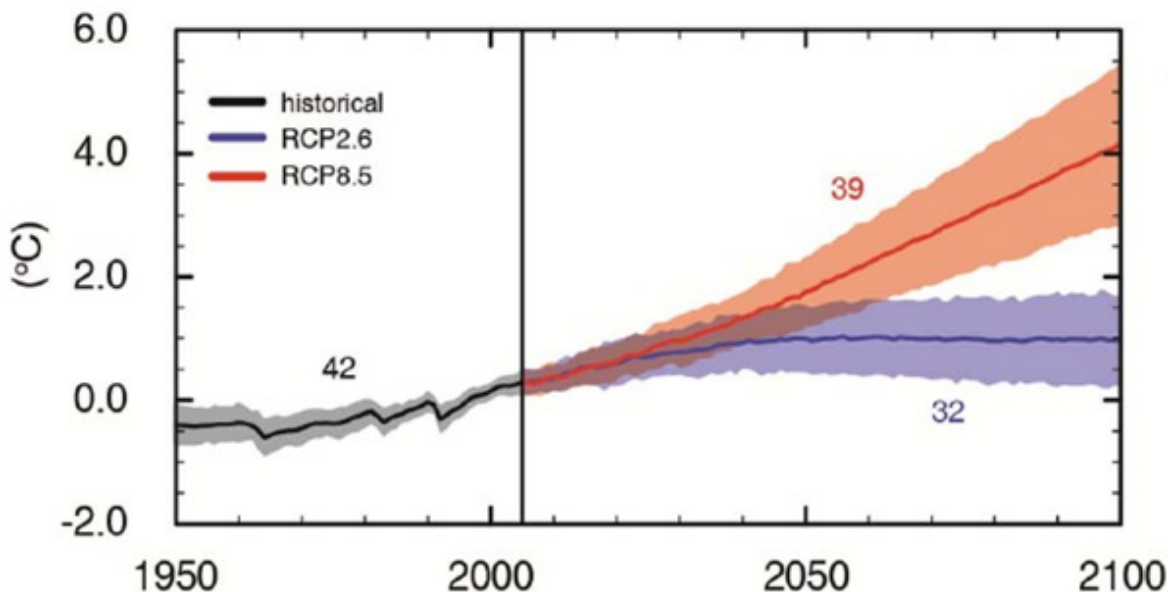
Of course, it is not only the energy system that must quickly be transitioned away from fossil fuels. We also must change our transportation system, agricultural practices, our general land use, waste management, diet, and stop deforestation. The challenges are many and complex.

## Section 4: Prospects for the Future

All prospects for the future are only estimates based on certain assumptions. We really don't know how exactly climate change will play out, how fast temperatures will rise or how specific geographical regions will be affected. The climate system is extremely complex. The two main uncertainties are:

1. The threshold of numerous feedbacks that will reinforce the warming, how these feedbacks will interact in the very complex climate system, and how sensitive the climate system will react.
2. Human behavior: we don't know how much greenhouse gases humans will emit in the future. That's why climate models calculate different emissions scenarios.

The graph below illustrates that point very well. It is from the most recent report by the Working Group 1 of the IPCC issued on Sept. 30, 2013. [20]



You can see two emission scenarios. The red curve shows the projected temperature rise under a scenario of business as usual. The reddish field (upward curve) shows the uncertainty in the projections. Temperature rise could be anywhere between about 2.4 and 5.7°C (4.3 and 10.3°F), but the most likely is the mean which is indicated as the red line heading to 4°C (7.2°F).

The blue line (lower curve) indicates a scenario with strong emissions reductions. With this scenario, global warming can be stopped below 2°C (3.6°F). The emissions reductions required for that scenario are massive. Currently we are well on the path of the red line. The blue line is much less realistic.

The content of this class is difficult to digest. How can we deal with all this scary information, and how should we respond? This will be the topic of the next and last class.

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### ***Community Service Project:***

Consult about the Community Service Project as needed to carry it forward.

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## Class 9

# A Challenge to All of Us

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### Section 1: Dealing with the Emotional Stress Caused by Climate Change

Becoming aware of the immense climate crisis can be emotionally stressful. A variety of emotions can strike:

- A sense of loss: The disappearance of species, of glaciers, of nature as we know it.
- A sense of anger: at big polluters or at people in power who have been ignoring the issue and resisting decisive action to mitigate climate change.
- A sense of guilt: at being part of society that pollutes the atmosphere with greenhouse gases.
- A sense of fear: for the immediate future of many vulnerable people, for the future of our children, for the well-being of all life on Earth, and even for the survival of our civilization.

How can we deal with that stress? The most convenient reaction is to put our heads into the sand and continue with life as usual. In fact, it is quite tempting to deny the problem of climate change and to avoid learning more about it. By now we know that this is not really an option.

Openly acknowledging the potential devastation of climate change is a quite severe mental test. However, tests purify us and can help us progress in our spiritual development. The story of Job in the Jewish and Christian traditions tells us of his untold suffering and unwavering belief in God. It shows that God's justice and mercy is a mystery, way beyond our understanding. The Baha'i Writings say the following about suffering:

*"The mind and spirit of man advance when he is tried by suffering.... Man is, so to speak, unripe: the heat of the fire of suffering will mature him. Look back to the times past and you will find that the greatest men have suffered most. ... To attain eternal happiness one must suffer. He who has reached the state of self-sacrifice has true joy. Temporal joy will vanish." [1]*

*"O Son of Man! If adversity befall thee not in My path, how canst thou walk in the ways of them that are content with My pleasure? If trials afflict thee not in thy longing to meet Me, how wilt thou attain the light in thy love for My beauty?" [2]*

*"O Son of Man! My calamity is My providence, outwardly it is fire and vengeance, but inwardly it is light and mercy. Hasten thereunto that thou mayest become an eternal light and an immortal spirit." [3]*

It takes great courage to recognize the scope of the threat of climate change. We can gain that courage by developing our capacities to know and to love, the most essential functions of the human being. [4] This is the same spiritual love which is at the heart of all religions: the love for our Creator, the love for creation or nature, and the love for our fellow human beings, including those we don't know personally, and who may live in a different country or a different

continent. We need to include in that love future generations who will suffer the full extent of the impacts of climate change. We may want to include also the love for our own culture and the many diverse cultures all over the world, for music and art, and for all positive aspects of our civilization, because they are also threatened by the long-term impacts of climate change.

Religion provides us with spiritual disciplines or tools that can sustain us in our spiritual journey. We know that prayer can strengthen us to cope with any situation. It can also support and guide us in our actions to mitigate climate change. Meditation can help us get a deeper understanding of our place as humans in the universe. During meditation we feel connected to God, to nature, to all other human beings who have lived in the past and in the present and who will live in the future. This experience provides us with motivation, courage, and spiritual strength.

Summoning that courage we can continually educate ourselves about the reality of the state of our planet and the living conditions of people all around the world: "As individuals, our most important responsibility is a commitment to know the truth as best we can, truth that is both technical and ethical. Our saving grace will be a broadened scientific awareness combined with an empathy that enables us to understand the plight of the poor, the dispossessed, the young people without hope, or the rural communities challenged by bewildering change. Gandhi called his life an experiment in 'living in truth'. That approach will have to become the experiment of our generation as well." [5]

Psychologist Daniel Jordan explained how the Baha'i teachings can help us cope with the present-day challenges: "The Writings reduce general anxiety and doubt to manageable proportions by making sense out of human history and the world's present state of perpetual crisis. This means that we need not pretend the crises do not exist or refuse to face them. Thus understanding something of the problems which face us not only reduces anxiety but attracts courage." [6]

Going out into nature can also help restore our body and soul. Working the soil with our own hands and growing plants is healing. It also provides the satisfaction that comes with creating beauty and at the same time taking good care of a small part of creation by nurturing soil quality, by helping to maintain biodiversity, and by growing some of our own food, which reduces one's personal carbon footprint.

Finally, we as individuals have the power to take some actions, large or small, in our own lives to mitigate climate change. We can reduce our own greenhouse gas emissions. We can also join an organization that is similarly concerned. Together with others we can make a contribution to the betterment of the world by, for example working together on an aspect of mitigating climate change. Our actions don't need to be grandiose. The small efforts of millions of people will accomplish much change including the necessary changes in laws and policies. And action is the best antidote to "doom and gloom".

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**Watch this brief video:**

**Katharine Hayhoe: Climate Change Evangelist 2:50**

<https://www.youtube.com/watch?v=T1eGJLqxxKQ>

Katharine Hayhoe is Associate Professor of Atmospheric Sciences at Texas Tech University. She co-wrote a book with her husband about climate change from an Evangelical Christian



perspective.

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## **Section 2: The Role of Religious Communities**

As long as humans have existed, the Earth has always been here, providing us with all life-support systems, seemingly inexhaustible and taken for granted. Now, climate change threatens to destroy the foundations of life on this planet and the survival of human civilization.

"How, faced with the largest crisis humans have yet created for themselves, have we simply continued with business as usual?" [7] Many people are wrestling with that question. Lester Brown writes quite optimistically in his book "Plan B" about how we could use new technology and build a new economy that would be climate friendly and sustainable. However, he then openly agonizes about the seemingly insurmountable difficulty of mobilizing large numbers of people and governments to quickly implement these profound and far reaching changes: "It is hard to find the words to convey the gravity of our situation. How can we convey the urgency of this moment in history? Will tomorrow be too late? Do enough of us care deeply enough to turn the tide now?" [8]

Apart from widespread ignorance about climate change, the major reason for our slow response may be that we are still trapped in our animal nature. Probably for the first time in history, each person on the planet will have to make sacrifices to benefit the survival of our species. This kind of cooperation fundamentally goes against our animal nature. Evolutionary theory expects us all to be selfish, even if cooperating would benefit the species as a whole. Self-sacrifice and cooperation for the good of the whole goes against our "biology" or the "rules of nature" in the physical dimension. [9] Thus we are forced to rise up to the divine dimension and seek spiritual solutions. It's the ultimate test for humanity as a whole: are people willing to rise above their personal desires to save the species? Can our cultural and spiritual development override the deeply set animal tendencies to put ourselves above others, even when the personal sacrifice is marginal compared to the potential calamity facing mankind as a whole?

The greatest achievement of religion has been the elevation of human beings to their spiritual station, thus transforming their moral character: "Through its teachings and through the examples of human lives illumined by these teachings, masses of people in all ages and lands have developed the capacity to love. They have learned to discipline the animal side of their natures, to make great sacrifices for the common good, to practice forgiveness, generosity, and trust, to use wealth and other resources in ways that serve the advancement of civilization. Institutional systems have been devised to translate these moral advances into the norms of social life on a vast scale. However obscured by dogmatic accretions and diverted by sectarian conflict, the spiritual impulses set in motion by such transcendent figures as Krishna, Moses, Buddha, Zoroaster, Jesus, and Muhammad have been the chief influence in the civilizing of human character." [10] In fact, they have been the spiritual driving force behind the unfoldment of human civilizations. Their message is "endowed with such potency as can instill new life into every human frame." [11]

*"The disease which afflicts the body politic is lack of love and absence of altruism. The spiritual teachings of the religion of God can alone create this love, unity and accord in*

*human hearts.*" [12] 'Abdu'l-Baha

*"Be compassionate as God is compassionate."* [13]

*"So, whatever you wish that men would do to you, do so to them."* [14] The Bible

Religion helps us to overcome egoism and to be concerned with loving, helping, and serving our fellow human beings. It is a prerequisite for us to be willing to adopt a simpler lifestyle and to change long-standing habits that cause pollution. At the same time, religion raises the consciousness of whole cultures and societies. Today, religion can expand our spirit of solidarity to include all of humankind, indeed all living beings on this planet.

Therefore, religious communities are especially responsible for responding to the moral imperative to take action, to apply spiritual principles to action, and to initiate the necessary changes in lifestyle. It is heartening to see how environmental awareness and ethical response in religious communities are growing. There are now many faith based environmental initiatives. The USA, for example, has the Coalition on the Environment and Jewish Life, the Islamic Foundation for Ecology and Environmental Studies, the Eco Justice programs of the National Council of Churches, and the interfaith organizations Green Faith and Interfaith Power and Light. [15] Similarly in the UK, we find the Islamic Foundation for Ecology and Environmental Science [16], the Christian Operation Noah [17], and Big Green Jewish, a Jewish web-based environmental resource [18]. And in Australia, the Australian Religious Response to Climate Change [19], a multi-faith network, is committed to taking action on climate change.

It is necessary though that this movement doesn't remain at the fringes of religious life, but becomes a priority in every community and in the heart of every individual.

Discussion: Discuss how the following passage sheds light on the necessary process of spiritualization.

*"Chaos and confusion are daily increasing in the world. They will attain such intensity as to render the frame of mankind unable to bear them. Then will men be awakened and become aware that religion is the impregnable stronghold and the manifest light of the world, and its laws, exhortations and teachings the source of life on earth."* [20] Baha'u'llah

### **Section 3: What is Progress?**

Every crisis is also an opportunity. Climate change is an issue that demands global cooperation on a level never before attained. It is quite possible that the climate crisis will pressure humankind to come together in order to survive. "Whether in the life of the individual or that of society, profound change occurs more often than not in response to intense suffering and to unendurable difficulties that can be overcome in no other way. Just so great a testing experience, Bahá'u'lláh warned, is needed to weld the Earth's diverse peoples into a single people." [21]

The unification of humankind can set the stage to solve other social problems as well. Abandoning war and weapons production could provide more than enough resources to build a carbon free economy, to restore such natural resources as forests and fisheries, to eradicate poverty, and to provide education and health care for everyone on the planet.

Building an environmentally sustainable society could be the beginning of a new civilization that is more conducive to the individual's spiritual and society's cultural development. In rich countries, the widespread individualistic lifestyles, with their major objective of increasing personal wealth, may gradually give way to a more community oriented way of life. Such community building can happen in many ways, for example through community gardens, with decentralized renewable energy projects, with the use of public transportation, and the sharing of resources. Such a reorientation has the potential to free the human mind from pursuing excessive material goods and to make space for creativity, more social interaction and spiritual development. Everyone will be more fulfilled and happier than in today's isolated and stressful way of life.

In less developed countries, hunger and malnutrition could be eradicated, education and health care improved, thus enabling people to develop their potentials and to be full participants in their local and global community. This can only be achieved if their economic development is sustainable, which means based on renewable energy. If the mistakes of fossil fuel dependency are repeated in developing countries, all other efforts to restore the Earth or to eradicate poverty would fail.

There is no question that such propositions challenge long held, but obsolete, values, such as the limitless liberty of individuals to do whatever they want or the myth of unlimited economic growth. Thus we may need to redefine what constitutes true progress. In the past, a growing economy could justifiably be considered as desirable, and this still holds true for many poor people and countries of the world today. However, for the rich countries and for the planet as a whole, we have reached the limits of growth; in fact we have already surpassed them. The current capitalistic economy exploits the Earth and destroys its life-support systems. It also exploits many people and exacerbates the extremes of wealth and poverty. A mental and spiritual re-orientation is necessary which embraces the concept that a sound economy depends on a healthy environment. Shoghi Effendi said, "Political and economic theories are solely designed to safeguard the interests of humanity as a whole, and not humanity to be crucified for the preservation of the integrity of any particular law or doctrine." [22] One of the concepts that must be abandoned is that of a limitless economic growth. The new thinking will see the economy as a tool for the well-being of all people and for the sustainable management of the Earth's resources.

"We need a change of heart, a reframing of all our conceptions and a new orientation of our activities. The inward life of man as well as his outward environment have to be reshaped if human salvation is to be secured." [23]

The Earth Charter speaks directly to this issue: "The dominant patterns of production and consumption are causing environmental devastation, the depletion of resources, and a massive extinction of species. Communities are being undermined. The benefits of development are not shared equitably and the gap between rich and poor is widening. Injustice, poverty, ignorance, and violent conflict are widespread and the cause of great suffering. An unprecedented rise in human population has overburdened ecological and social systems. The foundations of global security are threatened. These trends are perilous-but not inevitable.

The choice is ours: form a global partnership to care for Earth and one another or risk the destruction of ourselves and the diversity of life. Fundamental changes are needed in our values, institutions, and ways of living. We must realize that when basic needs have been

met, human development is primarily about being more, not having more. We have the knowledge and technology to provide for all and to reduce our impacts on the environment. The emergence of a global civil society is creating new opportunities to build a democratic and humane world. Our environmental, economic, political, social, and spiritual challenges are interconnected, and together we can forge inclusive solutions.

To realize these aspirations, we must decide to live with a sense of universal responsibility, identifying ourselves with the whole Earth community as well as our local communities. We are at once citizens of different nations and of one world in which the local and global are linked. Everyone shares responsibility for the present and future well-being of the human family and the larger living world. The spirit of human solidarity and kinship with all life is strengthened when we live with reverence for the mystery of being, gratitude for the gift of life, and humility regarding the human place in nature." [24]

#### **Section 4: A Promise and a Responsibility**

*"One generation goes and another generation comes; but the Earth remains forever."* [25] Ecclesiastes 1:4, Judaism

*"Soon will the present-day order be rolled up, and a new one spread out in its stead."* [26] Bahá'u'lláh

In the past 200 years, humanity has gone through unprecedented growth in every area: steep advances in scientific knowledge, the industrial revolution, and a quickly growing world population. The enormous pressures on the planet to feed and satisfy the needs and luxuries of the growing world population have assumed huge and dangerous proportions, bringing humanity to the brink of self-destruction.

At the same time, new ethical principles and standards of moral conduct have emerged and are becoming mainstream. For example: The concept of the equality of men and women, although not established everywhere, has become a commonly accepted standard of human civilization. Slavery, although unfortunately still widespread, is rejected as an unacceptable practice in our time. The concept of the planet as one homeland for one human family has started to permeate the thoughts and feelings of people all over the globe. And within only a few years, the knowledge about climate change has dramatically increased; we could say it has truly exploded. More and more scientists in many branches of science, ranging from geology to biology, are intensely studying the innumerable aspects of climate change. That knowledge is available to the general public. Movements to mitigate climate change are sprouting up in large numbers in all corners of the world and are gaining increasing momentum and strength. And governments and people in leadership positions have begun to take the issue seriously and to take action.

In many religions and traditions there are prophecies or visions of a glorious future for humankind.

These words are from the Judeo-Christian Religion:

*"And it shall come to pass in the last days, that the mountain of the LORD's house shall be established in the top of the mountains, and shall be exalted above the hills; and all nations shall flow unto it."*

*"And many people shall go and say, Come ye, and let us go up to the mountain of the LORD, to the house of the God of Jacob; and he will teach us of his ways, and we will walk in his paths: for out of Zion shall go forth the law, and the word of the LORD from Jerusalem.*

*"And he shall judge among the nations, and shall rebuke many people: and they shall beat their swords into plowshares, and their spears into pruninghooks: nation shall not lift up sword against nation, neither shall they learn war any more. O house of Jacob, come ye, and let us walk in the light of the LORD." [27]*

The following words are from the Baha'i Writings:

*"Justice is, in this day, bewailing its plight, and Equity groaneth beneath the yoke of oppression. The thick clouds of tyranny have darkened the face of the earth, and enveloped its peoples.*

*"Through the movement of Our Pen of glory We have, at the bidding of the omnipotent Ordainer, breathed a new life into every human frame, and instilled into every word a fresh potency. All created things proclaim the evidences of this world-wide regeneration. This is the most great, the most joyful tidings imparted by the Pen of this wronged One to mankind. Wherefore fear ye, O My well-beloved ones?" [28]*

The positive spiritual developments and the assuring religious prophesies and visions provide us with hope and encouragement. Far from being a license for inaction, religious teachings call on us to take responsibility: The Universal House of Justice writes: "Humanity's crying need ... calls ... for a fundamental change of consciousness ... that the time has come when each human being on earth must learn to accept responsibility for the welfare of the entire human family." [29]

"Climate change is one of the greatest, if not the greatest, challenge ever faced by human society. But it is a challenge that we must confront, for the alternative is a future that is unpalatable, and potentially unlivable. While it is quite clear that inaction will have dire consequences, it is likewise certain that a concerted effort on the part of humanity to act in its own best interests has great potential to end in success." [30]

If we want to realize the vision of an ever-advancing civilization and of a spiritually developing world community, we must act now to preserve our Earth's living conditions.

*"That one indeed is a man who, today, dedicateth himself to the service of the entire human race....*

*Blessed and happy is he that ariseth to promote the best interests of the peoples and kindreds of the earth." [31] Bahá'u'lláh*

A spiritual transformation of humankind is required to solve the climate crisis. It is quite exciting to be part of that process. Consider the following statement by 'Abdu'l-Bahá:

*And the honor and distinction of the individual consist in this, that he among all the world's multitudes should become a source of social good. Is any larger bounty conceivable than this, that an individual, looking within himself, should find that by the confirming grace of God he has become the cause of peace and well-being, of happiness and advantage to his fellow men? No, by the one true God, there is no greater bliss, no more complete delight. [32]*

Can we build an environmentally sustainable economy and a spiritually ever-advancing civilization? Quite possibly—but that clearly will require great effort on the part of each of us!

*"Let your vision be world-embracing, rather than confined to your own self."* [33] Bahá'u'lláh

*"Be the change you want to see in this world."* [34] Anonymous, often attributed to Gandhi

*"Great is the station of man. Great must also be his endeavours for the rehabilitation of the world and the well-being of nations."* [35] Bahá'u'lláh

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**Congratulations for finishing this course!** Now, express what you have learnt in your personal and community life, and carry out your group's **community service project**. You are now part of a quickly growing world-wide community of individuals and groups who are working toward the same goal - a spiritual, just, peaceful, and environmentally sustainable world civilization.

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## Recommended Reading

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*"Eaarth: Making a Life on a Tough New Planet"* by Bill McKibben, Times Books; First Edition (April 13, 2010), a clear analysis of the present climate crisis, suggests valuable community based solutions.

*"Down to the Wire - Confronting Climate Collapse"* by David W. Orr, 2009, Oxford University Press. This book provides illuminating insights to the climate crisis. If you enjoy reading the writings of Shoghi Effendi, you will enjoy this book as well.

*"World on the Edge: How to Prevent Environmental and Economic Collapse"* by Lester Brown, Earth Policy Institute, W. W. Norton & Company (January 6, 2011), available for free download at [http://www.earth-policy.org/images/uploads/book\\_files/wotebook.pdf](http://www.earth-policy.org/images/uploads/book_files/wotebook.pdf) This book is a treasury of up-to-date data on the state of the world's ecosystems and of its people, and provides very practical solutions.

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## The Wilmette Institute Course on Climate Change

Would you like to learn more about climate change and its spiritual dimensions? The [Wilmette Institute](#) offers an 8-week online course on climate change. Based on this IEF course, the Wilmette Institute course includes more topics and numerous optional resources, and provides a forum for online discussions with participants from all over the world. The course is usually offered once a year in the spring.

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## Glossary

**Anomaly:** Change from long-term average

**Anthropogenic:** Caused by humans

**Arable land:** Land suitable for agriculture

**Aquifer:** A water-bearing stratum of permeable rock, sand, or gravel

**Biosphere:** Our biosphere is the global sum of all ecosystems. It can also be called the zone of life on Earth.

**Carbon dioxide:** CO<sub>2</sub>, chemical compound composed of two oxygen atoms covalently bonded to a single carbon atom. It is a gas at standard temperature and pressure, a component of the Earth's atmosphere.

**Carbon sequestration:** The process of removing carbon from the atmosphere and depositing it in a reservoir (in trees, algae in the ocean, ultimately in rocks and ocean sediments).

**Decentralization:** The process of dispersing decision-making closer to the people and/or citizens.

**Decomposers:** Organisms that break down dead or decaying organisms, agents of the natural process of decomposition.

**Exigencies:** Urgent needs or demands

**Feedback mechanisms:** Self-reinforcing cycles

**Habitat:** The place or environment where a plant or animal naturally or normally lives and grows.

**Half-life:** Half-life is the period of time it takes for a substance undergoing decay to decrease by half, frequently used for radioactive decay.

**Mangroves:** Tropical maritime trees or shrubs that send out many prop roots and form dense masses important in coastal land building and as foundations of unique ecosystems.

**Methane:** CH<sub>4</sub>, chemical compound, a powerful greenhouse gas.

**Mitigate:** To make less severe or painful, to lessen in force or intensity, to make milder or more gentle. Similar words: alleviate, moderate.

**Orbital forcing:** Slow changes in the tilt of the Earth's axis and shape of the orbit affect the climate by changing the total amount of sunlight reaching the Earth.

**Permaculture:** An approach to design in human settlements and agricultural systems that are modeled on the relationships found in natural ecologies. Permaculture aims to create stable, productive systems that provide for human needs, harmoniously integrating the land with its inhabitants.

**Primordial rainforest:** Primordial means existing at or from the very beginning. Primordial rainforests are very old, mature forests that have not been disturbed for hundreds of years.

**Primeval:** Of or belonging to the first age or ages, especially of the world. Synonyms: primary, primordial, pristine

**Phytoplankton:** Planktonic plant life

**Plankton:** Minute animal or plant life in a body of water, most of them so small that they are not visible to the eye.

**Quagmire:** 1. Soft miry land that shakes or yields under the foot, wet spongy earth (as of a bog or marsh), 2. a difficult, precarious, or entrapping position: predicament.

**Radiative forcing:** A measure of the influence a factor has in altering the balance of incoming and outgoing energy in the Earth-atmosphere system. It is an index of the importance of the factor as a potential climate change mechanism.

**Saline:** Consisting of or containing salt.

**Salinization:** Increasing salt content in the soil. Salt harms plants.

**Sequester:** To remove or set apart; segregate; to hold (as a metallic ion) in solution especially for the purpose of suppressing undesired chemical or biological activity. See Carbon Sequestration.

**Slough:** 1. A place of deep mud or mire, a swamp 2. an inlet on a river. 3. a creek in a marsh or tide flat, 4. a state of moral degradation or spiritual dejection. According to the Merriam Webster Dictionary, the pronunciation of “slough” rhymes with blue, crew, or glue.

**Soil erosion:** Loss of top soil by heavy rain, floods, and wind.

**Species:** A species is one of the basic units of biological classification. A species is often defined as a group of organisms capable of interbreeding and producing fertile offspring.

**Twain:** An archaic term for the cardinal number two.

**Zooplankton:** Plankton composed of animals. (See plankton)

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### Acknowledgements

Warmest thanks and deep appreciation go out to many friends around the world – from the UK, Honduras, the US, Switzerland, Australia, and Bosnia Herzegovina – who contributed to this course and have made it a consultative ongoing project. The following individuals helped in big and small ways with sharing experiences as facilitators, with contributing their professional scientific or technical expertise, with proof reading, and in other ways: Arthur Dahl, Peter Adriance, Michael Richards, Larry Staudt, Ray Frackelton, Carol Curtis, Michel Muller, Martina Muller, Gerhard Muller, Philip Koomen, Jenny Lockwood, Al Riebau, Sharon Miller, Melodie Taylor, Margie Smith, Mary Hansen, Michael Moum, Gary Colliver, Laurent Mesbah, and Wendy Wisniewski. The feedback of the many participants of study groups, of weekend courses at Louhelen, Green Acre, and Bosch Baha'i Schools in 2010, and of the Wilmette Institute Courses in 2013, 2014, and 2015 has been especially helpful in shaping the course.

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Last updated 6 November 2017

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