EXAMPLES OF I SEE MODULES: CLIMATE CHANGE & ARTIFICIAL INTELIGENCE

Giulia Tasquier & Laura Branchetti

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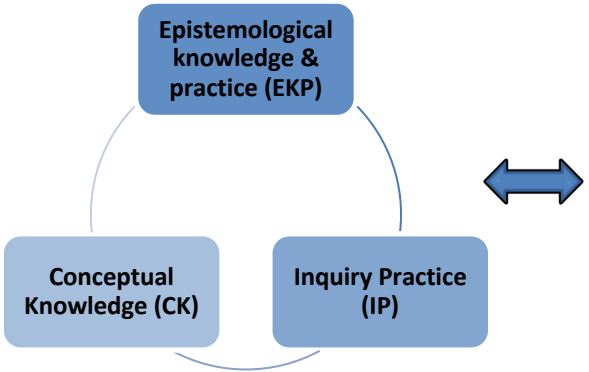
I SEE

It's your time to imagine the futures

ENCOUNTERING WITH THE FOCAL ISSUE

ENGAGEMENT WITH



Future-oriented practices

- activities to flesh out the future-oriented structure of scientific discourse, language and concepts
- activities inspired by future studies or by the working life and societal matters
- exposure activities to enlarge the imagination about possible future STEM careers
- action competence activities

SYNTHESIS OF IDEAS AND PRACTICES

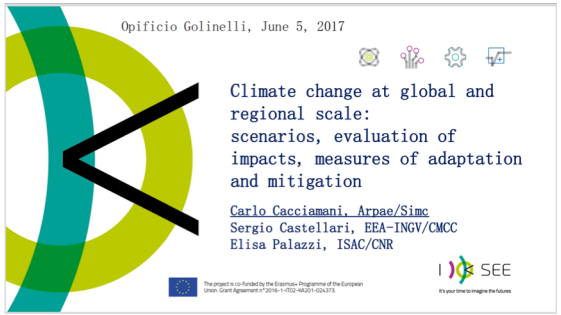
planning actions to contribute to ones' own desirable futures

The I SEE module on Climate Change

ENCOUNTERING WITH THE FOCAL ISSUE

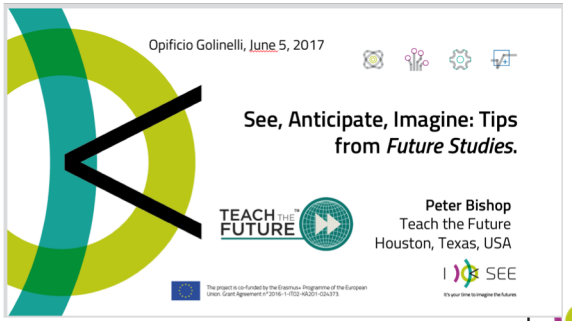
Overview on climate

(Prof. Cacciamani)



Overview on future

(Prof. Bishop)



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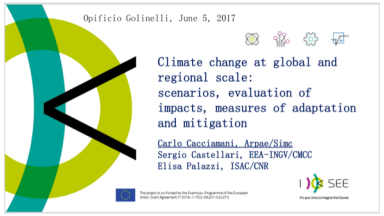
Climate (Prof. Cacciamani)



- The climate system and its complexity (global-local vision)
- Link between CC and the greenhouse effect
- Abnormal temperature trend over the last 150 years and some observable phenomenological evidence (eg reduction of extension and thickness of glaciers)
- Climate models and IPCC scenarios
- Introduction of languages and central concepts: climate system, feedback, scenarios and IPCC charts, forecast vs projection, ...)
- Implications of CC and their social dimension (risk, vulnerability, mitigation, adaptation, etc.)
- Examples of geo-localized impacts (from the growth of food insecurity for countries like Africa to heat waves in the Bologna area)

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Future (Prof. Bishop)

- Introduction of the framework of futures studies and distinction between prediction, forecast and foresight
- Introduction of the future cone (Voros) and distinction between plausible, possible and desirable futures
- Introduction of present-future dynamics and alternative futures
- Definition of the concept of scenario and examples of it
- Use of languages and central concepts (providing examples): scenarios and their construction, forecast vs projection, back-casting, drivers, values, anticipation, vision, etc.
- Implications of the theme of the future: social dimension and historical relevance (eg leadership)

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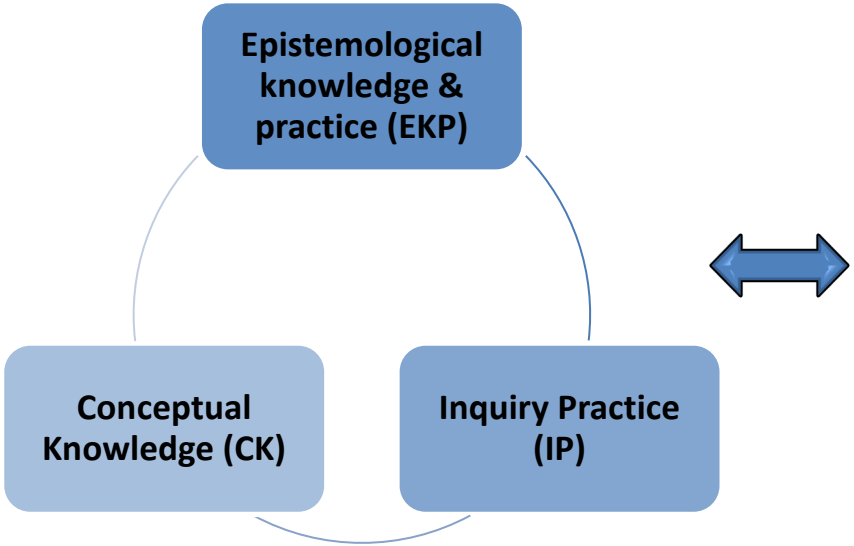

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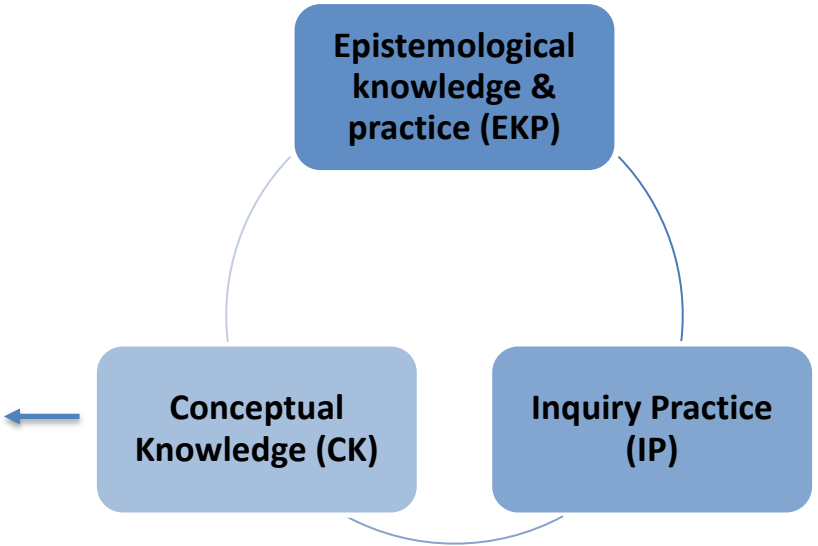
i) This dimension refers to the disciplinary contents (in this case related to the greenhouse effect) that are reconstructed paying particular attention to the ‹critical details› necessary to promote meaningful learning and consistency between **local problems and global logic**.

In this case the details concerned:

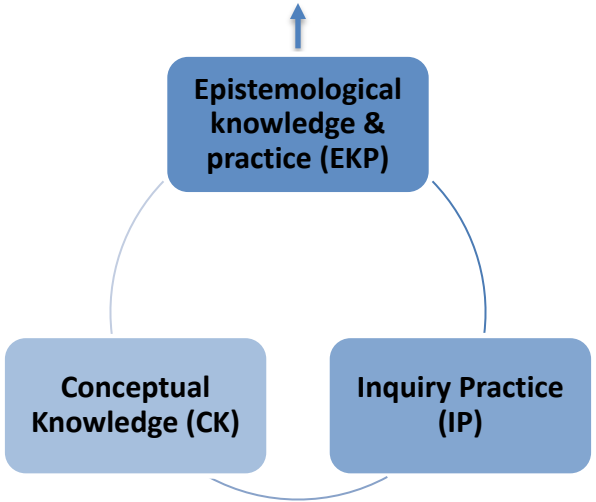
- the importance of the concept of **stationary equilibrium** in terms of **absorbance** and **emission** by objects;
- the property of **transparency**;
- the construction of a relationship between the change in the **absorbance of the atmosphere** (due to the variation of a certain type of gas) and the **temperature**.

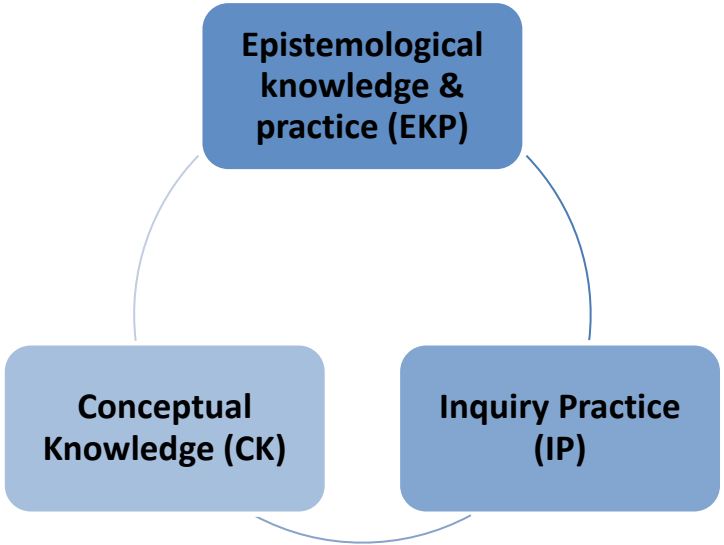


ii) This dimension refers to epistemic practices such as **modelling**, **argumentation** and **explanation**.

The epistemological reflections in a complex subject like climate allow students to grasp the transition from the deterministic paradigm to the perspective of complex systems, starting to highlight the difference between::

- **sequential linear reasoning** and **equilibrium reasoning** (necessary in explaining the greenhouse effect to avoid falling into the wrong conception of entrapment);
- **linear** and **circular causality**.



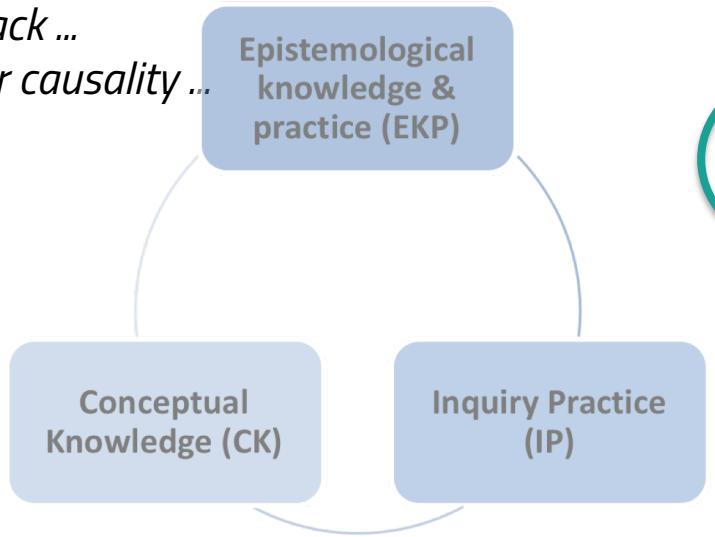


iii) This dimension refers to the development of inquiry skills, like:

- ask **questions** about a particular phenomenon, formulate **hypotheses**, plan and refine the questions,
- trigger a **peer-to-peer** interaction,
- to recognize **modelling** as a process of isolation of a particular phenomenon and to pass **from models to experiments** and vice versa.

These skills in the specific case were developed through the methodology with which the experiments were carried out.

Modelling ...
Local-Global ...
System ...
Feedback ...
Circular causality ...
...



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Complexity as a transition from science to the future

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Activity: ***The biodiesel story***

Aim: to underline that the future is intrinsic to the epistemological structure of science and strictly related to its models of causal explanation

Description:

- Read and interpret a scientific text (using the acquired knowledge) in order to recognize and reformulate the logical and causal structure of the phenomena described in it and translate them into a map
- Indicate causal reasoning behind the identification of positive and negative feedback in the map
- Switch from local specific feedback to its location in the global map

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Use and Production of Bio Fuels: The Biodiesel story

[…]

As to the reduction of emissions related to the mechanism of production of the biomass itself, using biodiesel brings about a reduction of two well-known greenhouse gases emission, CO (50%) and CO_2 (78,45%), since the carbon emitted during combustion is the one already existing in the atmosphere, fixed by vegetables during their growth. The carbon is not, as is the case with gasoline, the offset which has been sedimented under the earth's crust from time immemorial.

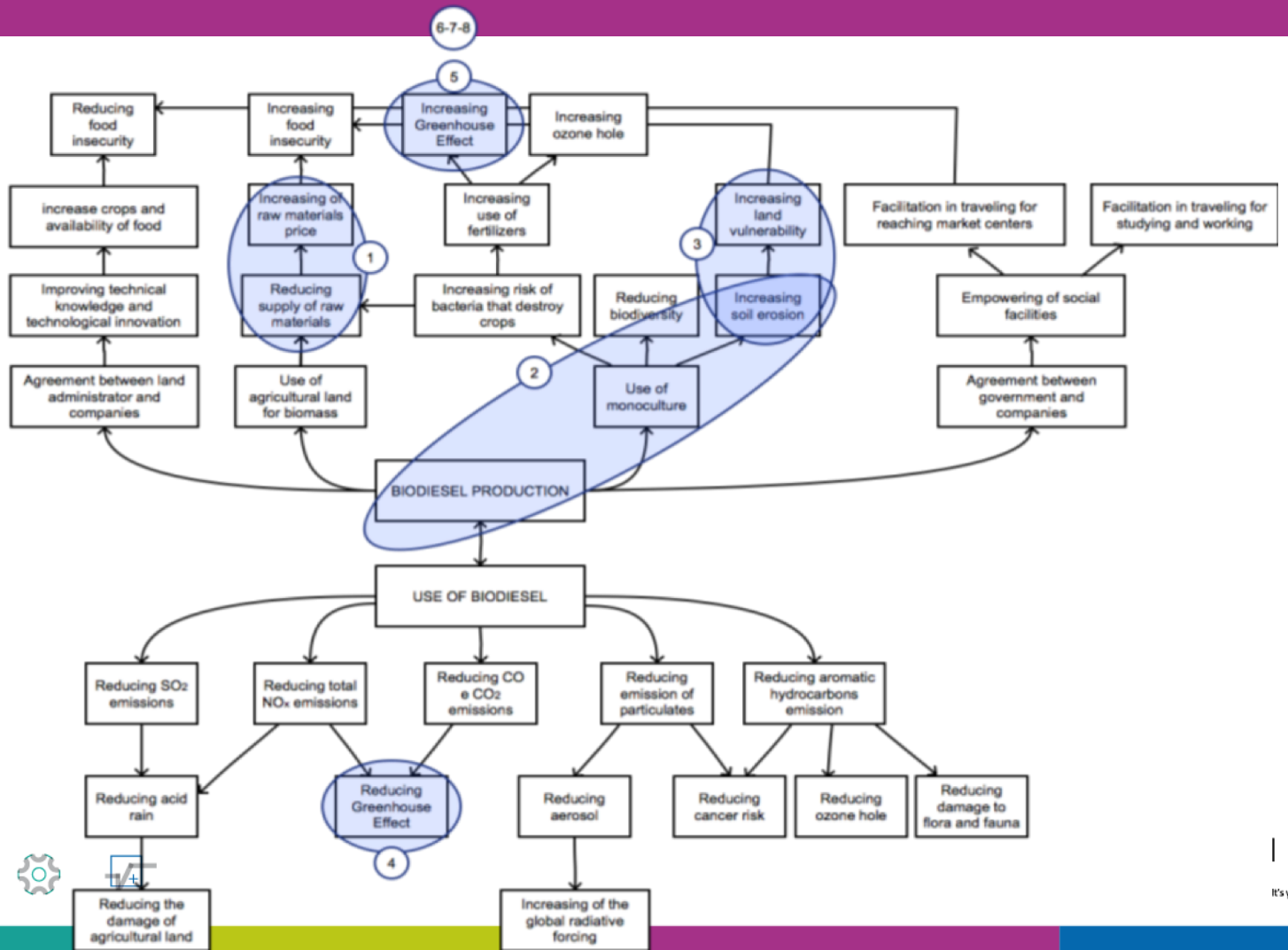
Besides, a 71% reduction of the emission of aromatic hydrocarbons is also reported; these compounds, that are naturally present both in oil and in carbon are extremely toxic to the environment, human beings and animals as well as to flora and are numbered among the substances responsible for the ozone hole.

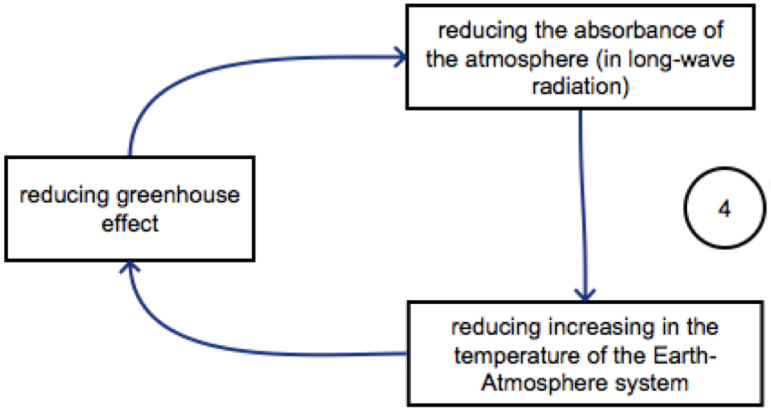
Furthermore using biodiesel, sulfur dioxide (SO_2) emissions are almost totally eliminated; yet, these, once entered the atmosphere, interact with oxygen and water vapor and form sulfuric acid[4].

[…]

An example of effect of the production process is the following: he conversion of terrains destined to the growing of plantations into areas where biodiesel is produced implies an increase of the price of raw materials in the Third World (compared to high transport costs of food imported from other Countries), resulting in the increase of food insecurity[7] both from the point of view of availability and of access to food.

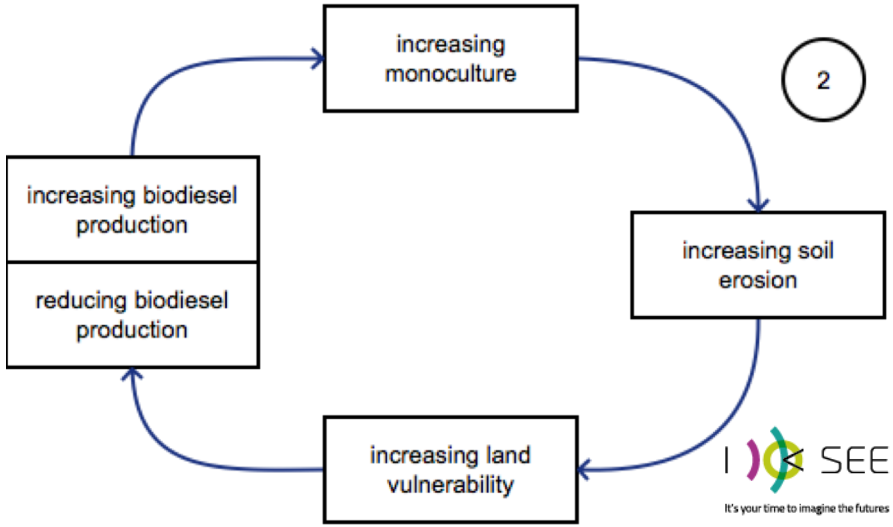
[…]


6-7-8
5
Reducing food insecurity
Increasing food insecurity
Increasing Greenhouse Effect
Increasing ozone hole
increase crops and availability of food
Increasing of raw materials price
Increasing use of fertilizers
Increasing land vulnerability
Facilitation in traveling for reaching market centers
Facilitation in traveling for studying and working
1
3
Improving technical knowledge and technological innovation
Reducing supply of raw materials
Increasing risk of bacteria that destroy crops
Reducing biodiversity
Increasing soil erosion
Empowering of social facilities
2
Agreement between land administrator and companies
Use of agricultural land for biomass
Use of monoculture
Agreement between government and companies
BIODIESEL PRODUCTION
USE OF BIODIESEL
Reducing SO2 emissions
Reducing total NOx emissions
Reducing CO e CO2 emissions
Reducing emission of particulates
Reducing aromatic hydrocarbons emission
Reducing acid rain
Reducing Greenhouse Effect
Reducing aerosol
Reducing cancer risk
Reducing ozone hole
Reducing damage to flora and fauna
4
Reducing the damage of agricultural land
Increasing of the global radiative forcing



Example of positive feedback

Example of negative feedback



The next step is to apply concepts and reasoning typical of the science of complex systems from activities related to science to activities typical of *futures studies* in which it is asked to reason on:

resolutions of problems (maps of present) and creation of future scenarios

Future-oriented practices

- activities to flesh out the future-oriented structure of scientific discourse, language and concepts
- activities inspired by future studies

THE IDEAL CITIES

matters
- exposure activities to enlarge the imagination about possible future STEM careers
- action competence activities

The I SEE module on artifical inteligence ...