Labos 1point5

Colloque Labos 1point5 - ETES 2025
Enseigner les Transitions Écologiques et Sociales dans le Supérieur
7-9 juil. 2025 Lyon-Villeurbanne, France

Climate Tick-Tock: sparking climate action through a cooperative and educational game on climate change in the 21st century

EGU General Assembly 2024
Vienna, Austria, 14-19 April 2024

Session EOS1.5
Games for Geoscience
Abstract EGU24-12424
Poster A.143, 18 Apr. 2024

François Dulac[1] (francois.dulac@cea.fr) and the Climate Tick-Tock Team (climatictac@ipsl.fr):

Catherine Senior[2], Nada Caud[1], Thomas Planques[3], Igor Davin[4], Michaël Rambeau[4], Emmanuel Dubois[5], Fabien Bleuze[6], David Coppin[7,8], David Ernaux[9,10], Isabelle Genau[2], Priscilla Le Mézo[1,11], Valérie Lilette[9,12], Claire Magand[13,14], Valérie Masson-Delmotte[1], Alain Mazaud[1], Marie Pinhas-Diena[2], Gilles Ramstein[1], Camille Richon[1,15], Mehdi Serdidi[9], Annemiek Stegehuis[1,16], Susanna Strada[1,17], Aude Valade[2,18], Julie Sistenich[2,19], Anne-Fleur Barfuss[9], Abeer Al Mohtar[20], Bertrand Laforge[3], Julien Di Natale[3], Thomas Rogulski[3], Victor de Senneville[3], Frédéric Lutaud[3], Anne Cozic[1], Sauveur Belviso[1], and Brian Phouybanhdyt[1].

(1) Laboratoire des Sciences du Climat et de l'Environnement (LSCE), CEA-CNRS-UVSQ, Institut Pierre Simon Laplace (IPSL), Université Paris-Saclay, CEA Paris-Saclay 714, F-91191 Gif-sur-Yvette, France.
(2) IPSL, CNRS & Sorbonne Université, 4 place Jussieu, F-75005 Paris, France.
(3) Ikigai-Games for Citizens, 5 allée de l'Église, F-93340 Le Raincy, France.
(4) Bioviva, 10 rue Vieille, F-34000 Montpellier, France.
(5) CNRS MSH-SUD, Université Paul Valéry Montpellier 3, F-34199 Montpellier, France.
(6) DSI, CEA, 18 route du Panorama, F-92260 Fontenay-aux-Roses, France.
(7) LMD, IPSL & Sorbonne Université, 4 place Jussieu, F-75005 Paris, France.
(8) Now at Manufacture Française des Pneumatiques Michelin, ZI Ladoux, F-63118 Cébazat, France.
(9) ASTS, 54 avenue Edison, 75013 Paris, France.
(10) Now freelance film maker.
(11) Now on leave.
(12) Now freelance photoreporter and science mediator, Paris, France.
(13) IPSL, Sorbonne Université, 4 place Jussieu, F-75005 Paris, France.
(14) Now at OFB, 8 boulevard Albert Einstein, F-44300 Nantes, France.
(15) Now at LOCEAN, IPSL & Sorbonne Université, 4 place Jussieu, F-75005 Paris, France.
(16) Now at Laboratoire de Géologie, IPSL, CNRS, ENS & Université PSL, F-75231 Paris, France.
(17) Now at Inside Climate Service, 51 Viale della Navigazione Interna, I-35129 Padova, Italy.
(18) Now at Eco&Sols, CIRAD, 2 place Viala, F-34060 Montpellier, France.
(19) Now at Anamorphose Studio, 5 rue Michel Labrousse, 31100 Toulouse, France.
(20) CERENA, Instituto Superior Técnico Universidade de Lisboa, 1049-001 Lisboa, Portugal.

GEOSCIENCE GAMES NIGHT

Experience our board or video game (English or French version) during EGU Session NET10, Wed. 17 Apr., 18:00-19:30, room -2.31

You may register at https://www.gfc.ikigai.games/registration-climat-tic-tac-17-avril-2024

ABSTRACT (# EGU24-12424)

To make the mechanisms of human-induced climate change more understandable to the broad public and to raise awareness on climate change, climate scientists from LSCE proposed to develop an educative game to raise middle and high school student awareness. A science-based educational and cooperative board game for up to 5 players, named *ClimaTicTac* (https://climatictac.ipsl.fr), has been developed at IPSL with the help of ASTS, a scientific outreach association.

The game is well adapted to all players with good reading and abstraction capabilities (≈10+ years). It **simulates essential processes related to climate change and associated impacts, mitigation, and adaptation**. It is played on a board depicting a world map including (i) 31 cities vulnerable to climate change, which may become uninhabitable following damage accumulation, (ii) a timescale showing the rounds of play throughout the century, and (iii) a CO_2 atmospheric concentration scale. Randomly drawn cards set up the possible initial scenarios, and describe hazards or possible positive actions affecting CO_2 emissions and three categories of damages to cities (on health, food, or infrastructures). To win the game, players must reach a double objective, with thresholds depending on the game difficulty level: (i) **limit atmospheric CO_2 concentration** (i.e. global warming), and (ii) **restrain the number of cities rendered unliveable**. **Optional fun challenges** (drawing, mime, word-of-mouth) are randomly proposed to counteract eco-anxiety. Rules have been designed to help players feel the climate change impact at both global and local levels, and realize the importance of early reduction of CO_2 emissions, of collaboration for optimizing action strategies, and of inequalities in exposure to impacts. **The game fully relies on current knowledge and realistic events**, and the project team has been awarded the CNRS medal for scientific outreach.

The game has first been distributed by local authorities for open-licence use in middle schools. Science animators can carry game sessions for teenagers and adults, followed by discussions on climate change. Middle and high school teachers may also be trained. The game content has presently been translated into Catalan, English, Portuguese and Spanish (new translations welcome), and is available for self-printing and non-commercial use. Following success towards a variety of public, the board game has been slightly adapted as a family game by Bioviva Editions for distribution in France, Belgium, Canada and Switzerland under the name *Climat Tic-Tac* (see https://www.bioviva.com/fr/bioviva-famille/169-362-climat-tic-tac.html), incl. a semi-cooperative game option with lobbies. In addition, *Climat Tic-Tac* has been adapted by the association Games for Citizens as an electronic game available online on the *Ikigai* video game platform (https://ikigai.games/games/gameDetails/105). Challenges consist in quiz, gap-fill or timeline questions. Several connected players can share a game but a single player can simulate several players. Additional university-level educational content will be linked and an English video version has been put online for the EGU 2024 Geoscience Games Night (session NET10).

Finally, a multidisciplinary research project (EVABIO) is underway involving high school teenagers to investigate the impacts of play sessions. Integrating social psychology and experimental economics, it aims to analyse changes in explicit and implicit attitudes, transformations in social representations, enhancements in knowledge, and the extent to which the game influences pro-environmental behaviours.

1. OBJECTIVE

- **Develop an educational game on present and future stakes of climate change, in order to introduce fun in communication on this stressing issue, especially addressed to teenagers**

2. CONTEXT

- **Since more than 30 yrs., UN/IPCC assessment reports on climate-change has clearly established that:**
  - **the on-going rapid human-induced climate change (CC) is threatening the Earth's ecosystems and human society**
  - **changes in human activities and practices are urgently needed both to limit global warming by mitigating greenhouse gas (GHG) emissions, and to limit its impacts by adapting the society**
- **Lack of public (and stakeholders) consciousness about urgency**

- **Anxiety in young generations**
- **A climate scientific community willing to develop awareness and stimulate action** (see also the IPSL-Climactions poster X1.105)

3. DEVELOPMENT STRATEGY

- **Team work**
  - **call for volunteers within IPSL** (institute federating research labs of the Ile de France region studying climate-related sciences; ~1500 people)
  - **involving a scientific outreach non profit association** (ASTS)
- **Knowledge-based game**
- **Cooperative game**
  - **inspiration from the board game *Pandemic* :** cities with variable risks throughout the globe (but no specific roles are distributed to players in the standard game version)
- **XXIst century time scale**
- **Deal with both climate change mitigation and adaptation issues**
- **Include fun challenges**

4. DEVELOPMENT PROCESS

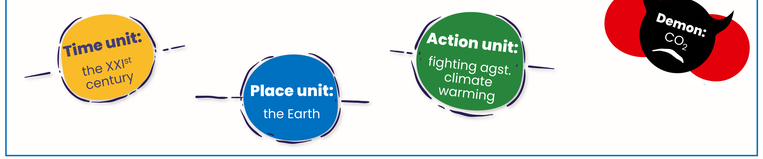
- **2015-2016:** 1-yr of weekly half-day meetings of up to 16 people
  Tests of a prototype in game festivals
- **2017-2019:** Numerous tests mainly in middle schools and with the general public
  Adjustment of rules ; prototype finalization of *ClimaTicTac*
  Funding by local authorities for distribution of ~1400 games, science outreach sessions and formation of teachers in middle schools of Paris region
  Translations of contents in English, Catalan, and Spanish

- **Feb. 2020:** Presentation at the International Game Festival, Cannes, France

- **2020-2021:** Adaptation by the French game editor *Bioviva* (project facilitated by SATT Lutech)
- **Sept. 2021:** Project awarded by CNRS for scientific mediation (see photo at bottom right)
  Commercial release of *Climat Tic-Tac* in France, Belgium, Switzerland and Quebec (in French)

- **Oct. 2022:** Highlight of the game at the French National Fête de la Science
  Public release of a video version (in French) by Ikigai-Games for Citizens
- **2022-2023:** Preliminary tests on playing impacts by experimental psychologists (Rennes-Orléans and Montpellier universities)
- **2023:** Translation of *ClimaTicTac* contents in Portuguese
- **2024:** Video version in English
- **2024-2025:** New video version focused on coastal areas and islands for the project FORTEIM of training seafaring professions for transition
  Link to Educational modules for higher education students

5. THE GAME AS A CLASSICAL GREEK TRAGEDY



6. PROCESSES ACCOUNTED FOR BY THE GAME

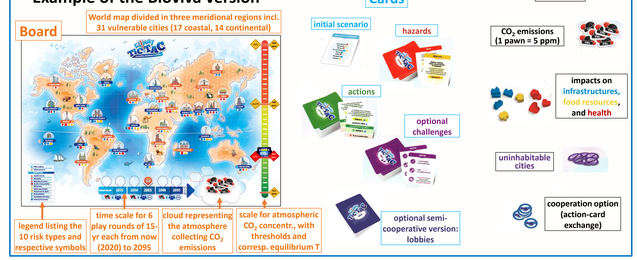
- **Climate change-induced limits to planet livability**
- **Man-made CO_2 emissions, and their increase with time due to the growing world population**
- **Increasing CO_2 atmospheric concentration and related global warming level**
- **Threshold effect at +2°C warming causing:**
  - **Positive feedbacks on warming**
  - **Repetition of severe climate events**
- **Climate hazards and their randomness**
- **Variable vulnerability of world cities**
- **Climate damages on:**
  - **Health**
  - **Food resources**
  - **Infrastructures**
- **Inhabitability of cities following damage accumulation**
- **Climatic migrations**
- **Climate change mitigation**
- **Adaptation to climate change**
- **Variable scales and leaders of actions (from local to global, by citizens, local authorities, states, and the international community)**
- **Limitation of action possibilities**
- **Need for good cooperation and empathy towards the most at-risk populations**
- **Challenge-depending action results**
- **Potentially risky technological solutions**
- **Lobbies with individual interests (semi-collaborative board game option)**

7. STANDARD GAME PRINCIPLES

- **Set-up**
  - **an initial scenario card is drawn to distribute problems on cities listed on the card**
  - **each player receives 3 action cards and makes them visible to other players**
  - **CO_2 emissions are initialized as a function of the player number**
- **During 1 round (10 or 15 yr according to version), each player successively:**
  - **discusses his action possibilities, selects, reads and applies effects of 1 of his/her action cards**
  - **possibly draws a fun challenge card : the result of his/her action is improved or decreased depending on his challenge success or failure**
  - **discards 1 of his/her 2 left action cards and draws 2 new cards for next round**
  - **draws, reads and applies effects of a hazard card**
- **Collective checks**
  - **a city becomes definitively uninhabitable as soon as it cumulates 4 (or more) problems or 3 of the same nature (colour)**
  - **uninhabitability of a city cause migrations : a total of 2 infrastructure problem pawns must be added to cities of the same region as desired by players**
  - **at the end of each 15-yr round, the atmospheric CO_2 level is increased depending on remaining emissions**
  - **if the 2°C warming threshold is reached, hazard cards already drawn are mixed with the remaining hazard cards, making cities already impacted more vulnerable, and more impacting "2°C threshold" hazard cards are added**
  - **emissions (CO_2 tokens) are reinitialized at the beginning of each new run, with increments from the 3rd round on in order to simulate the effect of increasing world population with time**
- **Two winning conditions (both necessary)**
  - **Number of uninhabitable cities and level of atmospheric CO_2 (i.e. global warming) both limited**

8. PLAY MATERIALS

- **Example of the Bioviva version**



9. ON-GOING STUDY ON THE IMPACTS OF PLAY SESSIONS (EVABIO project)

- **Aims to measure and understand the impacts of Climate Tick-Tock on sensitization of high school students about climate change.**
- **A 20-people team project.**
- **Measures of sensitization include:**
  - **Changes in social representations (social psychology);**
  - **Change in both explicit and implicit attitudes (social psychology);**
  - **Pro-environmental behaviors (experimental economics).**
- **Understanding the mechanisms of sensitization through:**
  - **Analysis of social interactions (with video capture of game sessions);**
  - **Acquisition of knowledge.**
  - **Records of wins and losses.**

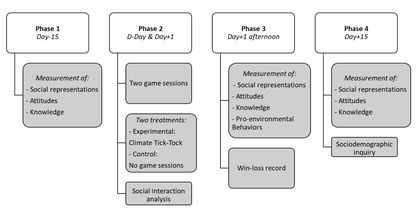


Fig. EVABIO experimental protocol

Bioviva board game (FR commercial version)

Ikigai video game (FR, EN)