Arctic's Plastics rules book V1

1   Introduction

The goal of this game is to raise public awareness on co-creation of knowledge on micro plastic pollution in the Arctic involving local communities knowledge.

This game took inspiration from research papers on Arctic pollution by (micro) plastics.

In this game you will go on a science campaign to collect samples in the Arctic to gain knowledge on plastic distribution in the Arctic flora and fauna. You manage a crew of researchers, a captain and technical staff to collect samples and bring them to your research vessel and land laboratories. Strategically upgrading your workers and collaborating with arctics communities will be key to win this game!

Figure 1: Yellow and orange players research vessels and land laboratories

Figure 2: Main board and red player research vessel and land laboratory

2 Components

2.1 Main board components

2.1.1 Hexagonal tiles

The main board is composed from hexagonal tiles:

- water tiles,
- deep water tiles,
- shallow water,
- forest tiles,
- snow forest tiles,
- sea ice tiles,
- pack ice tiles,

- mountains tiles,

- hazardous tiles:

  - nuclear power plant tiles,
  - military base tiles,
  - mine tiles,

- Arctic communities tiles,

2.1.2 Meeples

- the arctic community meeples: fishers (blue meeples) and hunters (brown meeples).

- the animal meeples: meeples in the shape of a

  - polar bear
  - whale
  - killer whale
  - krill
  - octopus
  - snow fox
  - snow owl
  - reindeer
  - seagull
  - crab
  - Greenland shark
  - Walrus
  - Seal
  - Salmon

2.1.3 Samples tokens

- water sample from the sea (water tiles) : blue wooden cube,

- water sample from the water column (water tiles): grey wooden cube,

- water sample from the bottom of the ocean (deep water tiles): black wooden cube,

- ice sample (sea ice or mountain tiles): white wooden cube,

- snow sample (ice pack/snow tiles): cyan wooden cube,

- animal sample token: cube shaped with the animal drawing on it.

Figure 3: Modular main board being constructed

2.1.4 Knowledge tokens on (micro) plastic pollution

The knowledge tokens represents some of the (micro) plastic that pollute the Arctic, you want to find as many as possible during the game:

- PS: Polystyrene knowledge token, PS is one of the most widely used plastics, with the scale of its production being several million tonnes per year. Polystyrene is naturally transparent, but can be colored with colorants. Uses include protective packaging (such as packing peanuts and in the jewel cases used for storage of optical discs such as CDs and occasionally DVDs), containers, lids, bottles, trays, tumblers, disposable cutlery, in the making of models, and as an alternative material for phonograph records.

- PP: Polypropylene knowledge token, PP is the second-most widely produced commodity plastic (after polyethylene). Its properties are similar to polyethylene, but it is slightly harder and more heat-resistant,

- PUR: Polyurethane knowledge token, PUR global production in 2019 was 25 million metric tonnes, accounting for about 6% of all polymers produced in that year

- PE: Polyethylene knowledge token, PE is a polymer, primarily used for packaging (plastic bags, plastic films, geomembranes and containers including bottles, etc.). As of 2017, over 100 million tonnes of polyethylene resins are being produced annually, accounting for 34% of the total plastics market.

- PMMA: Polymethyl methacrylate knowledge token, PMMA plastic is often used in sheet form as a lightweight or shatter-resistant alternative to glass

- PVC: Polyvinyl chloride knowledge token, PVC is the world's third-most widely produced synthetic polymer of plastic (after polyethylene and polypropylene). About 40 million tons of PVC are produced each year.

- PA6: Polycaprolactam knowledge token, PA6 is a significant construction material used in many industries, for instance in the automotive industry, aircraft industry, electronic and electro technical industry, clothing industry and medicine. Annual demand for polyamides in Europe amounts to a million tonnes.

- PC: Polycarbonate knowledge token, PC used in engineering are strong, tough materials, and some grades are optically transparent. They are easily worked, molded, and thermoformed. Because of these properties, polycarbonates find many applications,

- PET: Polyethylene terephthalate knowledge token, PET is the most common thermoplastic polymer resin of the polyester family and is used in fibres for clothing, containers for liquids and foods, and thermoforming for manufacturing, and in combination with glass fiber for engineering resins. In 2016, annual production of PET was 56 million tons.

2.2 Players components

2.2.1 Worker Components

In this game you will begin with an uncertified crew that you can upgrade/certify during the game. All possible workers in the game are:

- the captain: the captain can be junior (red meeple)/senior (magenta meeple)/legendary (purple meeple)

- the generic researcher: this your "uncertified level" researcher (wood color meeple) it can be upgraded/certified to a specialized researcher:

  - the glaciologist (white meeple),
  - the snow specialist (cyan meeple),
  - the oceanologist: junior (Grey meeple)/senior (black meeple),

- the technician: the technician can be junior (yellow meeple) or senior (orange meeple),

The upgraded/certified meeples will have better effect when used in the rooms of your research vessel and the rooms of your land lab.

2.2.2 Your research vessel

Your research vessel has the following rooms:

- the bridge room: it is where the captain and one technician drive the ship,

- the laboratory room: send a researcher here to analyze samples, this will score you points at the end of the game,

- the publication room: when you have analyzed samples and gain information on plastic pollution you can contribute to the research by publishing an article to the community: this will allow you attract a new uncertified researcher to your research vessel or to your land lab,

- the crane control room: use a technician to unload/load the fast boat or the submarine,

- the diving room: use the captain with a researcher to dive with the submarine and collect water samples,

- the dormitories room: the place where all the workers return after the journey. A dormitory can have a maximum of 2 meeples in it.

- the certification room: the place where you can upgrade the workers by making them pass certification to be able to carry better actions,

- the fast boat room: the place in the research vessel where the fast boat is located, the fast boat can accommodate 2 workers, it can be used to collect water, snow, ice and animal samples.

2.2.3 Your land lab

Your land based lab has the following room:

- the dormitories room: the place where the workers return after the journey,

- the study room: the place where you can upgrade the workers!

- the lab room: send a researcher here to analyze samples, this will score you points at the end of the game,

- the snowmobile room: send a researcher here to deploy the snowmobile on snow/ice.

3 Setup of the game

3.1 Global board set up

Set the up the global board according to figure 2

3.2 Personal boards

At the beginning of the game you have 12 workers: a junior captain, a junior technician and 10 uncertified researchers.

The junior captain and the junior technician must go on your research vessel, place them in a dormitories room. You can them choose to allocate your uncertified researchers to either the land lab or the research vessel, but you can't have more meeple than the number of beds available: 12 beds in the research vessel and 6 beds in the land lab (2 beds per dormitory room).

4 Game play

In Arctic's Plastics players take turns in clockwise order starting from the first player until the end of the game is triggered. When the end of the game is triggered by a player the game end immediately. When it is your turn you take one action: send 1 or 2 workers from a dormitory room to another room in the research vessel or the land lab. When you don't have any workers left in your dormitories (in the research vessel and the land lab) you pass. When all players have emptied their dormitories a new day start: take all the workers back to the dormitories and start a new day following turn order.

4.1 Rooms and tiles effects depending on the workers specialization

4.1.1 Research vessel

The research vessel token is a representation of the location of your ship on the map. The personal board in the shape of the research vessel represents the

inside of your ship, it has the following rooms:

Bridge room: Only the captain and the technicians can go in this room, use:

- a junior captain and a junior technician to move the research vessel 1 tile,

- a junior captain and a senior technician to move the research vessel 2 tiles,

- a senior captain and a junior technician to move the research vessel 3 tiles,

- a senior captain and a senior technician to move the research vessel 4 tiles,

- a legendary captain and a junior technician to move the research vessel 5 tiles,

- a legendary captain and a senior technician to move the research vessel 6 tiles.

Notes:

- your research vessel can only move on the following two tiles: water and deep water tiles. It can't move on sea ice tiles or land tiles.

- You can't move the research vessel if the captain is diving in the submarine or traveling in the fast boat!

- At any start of a new day, if your land lab and research vessel are on adjacent tiles you can choose to change the distribution of your crew in the research vessel and the land lab, make sure to respects these two rules:

    - the captain and the technicians can't leave the research vessel

    - you must have enough beds for your crew in the research vessel/land laboratory and the ones on a mission in the submarine/fast boat/snowmobile/4x4 (even if they are not back from their trip).

Crane control room: Only technicians can go in this room, use:

- a junior technician to load or unload the fast boat or the submarine, you can't do both during one action, you must choose one)

- senior technician: load or unload the fast boat and the submarine (you can do both at the same action)

Laboratory room: Only researchers can go in this room, use:

- any researcher (uncertified or specialized) to analyze a water sample from the surface of the sea, (blue wooden cube),

- any researcher (uncertified or specialized) to analyze a sample from an animal, (square wooden cube with a drawing of the animal on it),

- a glaciologist to analyze an ice sample, (white wooden cube),

- a snow specialist to analyze a snow sample (cyan wooden cube),

- a junior oceanographer to analyze a water sample from the water column (grey wooden cube),

- a senior oceanographer to analyze a water sample from the bottom of the ocean (black wooden cube).

When you send a researcher with a sample to the lab try to gain a new knowledge token from the plastic bag:

- draw as many tokens from the bag as you have collected different samples: if you have only one type of sample draw 1 token, if you have 4 different samples draw 4 tokens and so on,

- if it is the first time you do the action for each tokens you drew from the bag gain a matching token from the supply. Put back the knowledge token that you drew from the bag in the bag.

- if it is not the first time you do an analyze action only keep new knowledge token that you don't have already. If you draw a token you previously had, that is bad luck, you already have that knowledge, put the token back in the bag and don't gain the token from the supply.

Notes:

- the more sample you have the more probable it is you will gain a new knowledge token,

- if there is no knowledge token matching the one you drew from the bag in the general supply you don't get anything! Too late (and too bad) the other labs have already analyze this and we don't get new knowledge from your analyzes...

Publication room: Only researchers can go in this room, use any researcher (uncertified or certified) to publish a paper on knowledge you gain on (micro) plastic pollution, you gain a new uncertified researcher, choose if you want to put it in a research vessel dormitory or a land lab dormitory.
Notes:

- you must have enough beds for all your workers currently in the research vessel/land lab, the one in a trip on the submarine/fast boat/snowmobile/4x4 plus the new researcher, if not you can't accept the new researcher.

- you must have collected a new knowledge token from the laboratory room to do this action, previous knowledge do not count.

Certification room: All uncertified and intermediate workers can go in this room. The meeple will be kept for X days for testings in the certification room, they don't return in the dormitory at the end of the day (but you still need to count them when gaining a new researcher with the publication room action), use:

- a junior captain to certified it to a senior captain: 2 days of tests and it must have done at least one fast boat travel,

- a senior captain to certified it to a legendary captain: 3 days of tests and must have done at least one dive in the submarine),

- an uncertified researcher to certified it to:

  - a glaciologist: 2 days of tests,

  - a snow expert: 2 days of tests,

  - a junior oceanographer: 2 days of tests and it must have done at least one dive in the submarine,

- a junior technician to certified it to a senior technician (2 days of tests)

- a junior oceanographer to a senior oceanographer: 4 days of tests and it must have done at least one dive with a senior captain in the submarine.

Submarine room: Only the captain can move the submarine, it have one more spot for a researcher, use

- a junior/senior/legendary captain to move the submarine 1/2/3 tile(s) away from the research vessel after the deployment action (crane control room), please note that the submarine can only move on water and deep water tiles,

- an uncertified researcher to collect a water sample, the submarine must be on a water sample. Collect the sample from the general supply (blue wooden cube)

- a senior captain and a junior oceanographer to collect a water sample from the water column (grey wooden cube). The submarine must be on a water tile to do it,

- a legendary captain and a senior oceanographer to collect a water sample from the bottom of the ocean (dark wooden cube). The submarine must be on a deep water tile to do it.

Notes:

- The meeples stays in the submarine room for as long as the mission takes.

- When unloading the submarine from the crane control room, place the submarine token on a water tile adjacent to your research vessel token. The submarine token represent the position of your submarine on the main board.

- To load the submarine back in the research vessel, the submarine token must be on a water tile adjacent to the research vessel token. Remove the submarine token from the main board and return the meeples to a dormitory room in the research vessel.

Fast boat room: Any worker except the technicians (you need them to operate at the crane control room or the bridge room) can go the fast boat, use:

- a junior/senior/legendary captain to move the fast boat 2/3/4 tiles away from the research vessel after the deployment action (crane control room), please note that the fast boat can only move on water, deep water and sea ice tiles,

- a researcher (certified or not) to move the fast boat 1 tile,

- an uncertified researcher to collect a water sample from a water tile,

- a glaciologist researcher to collect an ice sample (white wooden cube) from a sea ice tile.

Notes:

- The meeples stays in the fast boat room for as long as the mission takes.

- When unloading the fast boat from the crane control room, place the fast boat token on a water tile/sea ice tile adjacent to your research vessel token. The fast boat token represent the position of your fast boat on the main board.

- To load the fast boat back in the research vessel, the fast boat token must be on a water tile/sea ice tile adjacent to the research vessel token. Remove the fast boat token from the main board and return the meeples to a dormitory room in the research vessel.

4.1.2 Land Lab

Note: the rooms explained in the research vessel and present in the land lab work the same way.

Snowmobile/4x4 room: Use any researcher in this room to use the snowmobile. They do not go back to the dormitory when on a mission. But you still need to count them for the beds count when doing the publication room action. Actions:

- going out of the land laboratory: take the snowmobile/4x4 token and put them on a snow(or ice)/land tile adjacent to the land lab,

- you can move the snowmobile/4x4 2 tiles per day (including the one it goes out of the lab),

- going in the land laboratory: when the snowmobile/4x4 is adjacent to the land lab you can remove it from the main board and put the meeple back in a dormitory room of the land laboratory.

5 Encounters

The following encounters can happen during the game:

- with an animal: when a researcher on a fast boat/snowmobile/4x4 encounter an animal on a tile (water/land/ice/snow), you gain an animal sample corresponding to the type of animal you meet on the tile. The first player to go to the animal token remove it from the main board and gain the corresponding animal sample token from the supply. The animal token is move back to the supply, it doesn't go to your personal board.

- with arctic communities: when a researcher on a snowmobile/4x4 encounter an arctic community meeple it can choose to spend 2 days on the tile with the meeple. If so on the third days the arctic community meeple is removed from the board and the player gain an animal token corresponding to the type of the meeple:

  - hunters gives any animal token on the board that is on a land tile. The animal token is removed immediately by the player and you can keep it. It is the only way in the game to keep an animal token instead of animal sample token.

  - fishers give any animal token on the board that is on a water tile. The animal token is removed immediately by the player and you can keep it. It is the only way in the game to keep an animal token instead of animal sample token.

- with a hazardous tile: if you choose to cross a hazardous tile you will lose:

  - one day for a mine,
  - 2 days for a petrol rig,
  - 4 days for a military base,

5.1 End of the game

5.1.1 Triggering

After an analyze action in the lab if a player have 6 or more knowledge tokens on micro plastic pollution, the game ends immediately! There is no more actions for the others players. So I suggest that you keep an eye on others players personal board during the game!

5.1.2 Scoring points

Count the victory points in your personal board in two steps: first count:

- 2 points per animal sample tokens

- 10 points per knowledge tokens

them multiply your score by two for every animal token you have:

- 0 animal token: multiply your score by 1,

- 1 animal token: multiply your score by 2,

- 2 animal tokens: multiply your score by 4,

- n animal tokens: multiply your score by $2 \times n$

- 1 point for every pollution token still onboard of your ship (regardless of the color).

Please note that if you only have animal tokens but no other tokens than your score is 0.

The player with the most points at the end of the game wins.

In case of a tie, players tied share the victory.