**PCAS 21 (2018/2019)**

**Supervised Project Report**
**(ANTA604)**

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# *Forecasting Game for Brainstorming Antarctic Futures*

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Abstract:

There is relatively little published work in Antarctic future studies. While future studies is a well-established field, its expansion to include polar research has been more limited, and with most of that focused on the Arctic rather than Antarctica. However, Antarctic future studies is a growing field, and there are increasing attempts to take established tools and methods from general future studies and apply them to Antarctic outlooks.

One of the approaches that has been successful in general future studies revolves around gameplay exercises. Gaming has had a rich history in foresight and future studies and has been used for idea generation, idea evaluation and scenario simulation among other purposes. That said, tools and methods around gaming have not yet been brought to bear on Antarctic future studies.

This project brings gameplay tools and methods to the subject. It applies game design ideas to modify game frameworks previously applied to both regional and generic foresight projects and put them into more gamified structure. Then it adapts a proposed Antarctic foresight framework into the game's content structure and posits how this could potentially build futures literacy in the Antarctic research and policy community.

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# 1 INTRODUCTION

### *Antarctic Futures*

This paper presents the work done to design a game that can increase futures literacy as it relates to Antarctic future studies. Antarctic future studies are the application of the methodological approaches used in general future studies, to imagine and explore the different possibilities for Antarctica's future. These approaches include extrapolatory, back-casting, exploratory and integral futures methods, and are not about predicting the future, but rather intended to explore *possible* future scenarios (Frame, 2019). There has not been much published literature in Polar futures when compared to future studies literature as a whole, and much of what has been published has focused on the Arctic (Liggett, Frame, et al., 2017). Since Antarctic futures have been neglected by comparison, applying future studies techniques to them is an endeavor rich with possibilities.

Inherent to this exploration is building an understanding of systems-level thinking. That is, an understanding of how different systems contribute to future possibilities and how those possibilities play out through those same systems and affect them, all key elements of integral futures (Slaughter, n.d.). A structure to guide this type of systemic thinking would "enable consistent analysis, interpretation and comparison" (Frame, 2019, p.6). Frame and Hemmings have proposed exactly such a framework for guiding analysis of Antarctic futures. The framework builds on an existing Intergovernmental Panel on Climate Change (IPCC) scenarios structure, applying it to Antarctica while linking in ongoing global futures projects (Frame & Hemmings, 2019).

Part of the prerequisite for the type of consistent analysis the framework is meant to address, and which futures studies relies on, is the concept of futures literacy (FL). There are 3 levels of FL, with the first and most basic being *awareness*, that is, a person's awareness of changes over time and across situations, where values and expectations are made explicit so stories about wants and expectations of the future can be developed and shared (Miller, 2007). Futures literacy is lacking from most people's experiences (Candy, 2018), yet there is a great need for it to understand Antarctic futures (Frame, 2019). Increasing FL would "enable debate across multiple disciplines, audiences, and knowledges [while the] skills gained would allow more value-laden, less objective, and necessarily incomplete activities to take place about futures" (Frame, 2018, p.47).

### *Gaming and Futures*

Games have a long history in future studies and provide a structure for thinking, imagining, probing, and navigating change (Candy, 2018, p.235). Since games are experiential in nature, they fit into the concept of experiential futures as "Tangible, immersive, live and playable modes are all in scope" (Candy and Dunagan, as cited in Candy, 2018). They engage

the brain fully by satisfying inherent desires for visible progress, concretizing abstractions and providing structured goals (Schell, 2015). Their use for foresight-related purposes leads to a greater likelihood of understanding futures and yields greater insights (Inayatullah, 2017) due to their ability to bring together "brain-body-spirit learning, i.e. all the ways of learning" (Inayatullah, 2017, p.105).

Games have multiple potential uses in future studies, including raising futures literacy and brainstorming tangible outcomes. Both uses benefit from well-designed games bringing "fun" to the task, making the future less remote for players and the distinctive modes of thinking about it – divergent in their examination of alternatives while staying concrete – less intimidating and thus more common (Candy, 2018).

Furthermore, as games are participatory and provide a structure for group participation, they allow "designing circumstances or situations in which the collective intelligence and imagination of a community can come forth" (Candy and Dunagan, as cited in Candy, 2018, p.242). This is an important element of integral futures, which recognizes value in players tuning in to individual and collective dimensions, and to the "ideas and sentiments circulating in their personal, organisational and cultural imaginaries" (Hayward & Candy, 2017, p.13).

While the underlying principles of gamification exist across multiple platforms and uses cases, including prediction markets and online social-media-oriented games, not all exhibit strong mechanisms for ideation and structured group participation, or reward distinctive foresight-oriented thinking, or provide for easy deployment. Among those that do are several card games such as *The Thing From The Future* (Candy, 2018), the *ForesightNZ* card game (McGuiness Institute & New Zealand Treasury, 2016) and the *Scenarios Game* (Frame, B., & Manaaki Whenua-Landcare Research, 2007). These games serve primarily as "combinatorial creative prompting system" (Watson, as cited by Candy, 2018, p.238) and while "Combinatorial play seems to be the essential feature in productive thought," (Einstein, as cited by Schell, 2015, p.503), these types of games could nonetheless have their game feedback loop tweaked with penalties and rewards in order to create higher engagement and better satisfy the stimuli sought by the player brain (Schell, 2015) rather that created by prompt-mechanics alone.

As such, this type of card game was chosen as the basis for adaptation in the Antarctic futures use-case. As no Antarctic-specific content had been created for these types of games before, the project was also a good test case for whether the Frame and Hemmings's Antarctic futures framework (Frame & Hemmings, 2019) could serve as the basis for such content.

# 2 DESIGN PHASE

## 2.1 Methodology

The approach to designing the game was to build from the accessible, pre-existing games-for-futures work, using it as a foundation and modifying it to (a) support Antarctic content, and (b) create engagement based on certain core game mechanics.

***Requirements Gathering***

I began by attempting to outline a set of expected short-term use-cases for the game based on feedback from Dr. Bob Frame, the project supervisor, then followed by longer-term hoped-for use-cases.

From there, I worked to distil those cases to a set of goals I felt the game should accomplish, given Dr. Frame's ongoing research and priorities, the use-cases, and those issues outlined in the current Antarctic futures-related literature.

The baseline use-case that exemplified most of the implicit short-term requirements was to be able to run small groups of players in parallel through the game during a 90-120 minute bilingual workshop at an upcoming Antarctic conference.

The primary goals of the game were to provide a fun and engaging experience through which players would:

> 1) increase their level 1 futures literacy as the game guided them through informed brainstorming around Antarctic future scenarios influenced by the Antarctic futures framework;
>
> 2) leverage multi-disciplinary knowledge and thinking by tapping into their group and more explicitly take into account systems-level interrelationships;
>
> 3) encounter concepts and pursue lines of thinking that would be novel and stimulating to them.

The game system also needed to be scalable as well, first through the ability to expand the content in the future, and second to be able to engage different types of audiences, from domain experts to lay-people. This type of scalability would also allow future tuning of the basic game system so it could (a) increase players' understanding of how disciplinary interrelationships impact futures forecasting, i.e. how one's field of expertise needs to inform, or be informed by, other disciplines to be effective in forecasting, and to encourage the use of this understanding in forecasting, (b) empower players to come up with *useful* futures scenarios and a more complete picture of their components, and (c) encourage

involvement and participation in Antarctic issues, as well as awareness of issues, in the short term while leaving players with a long tail of interest in the issues.

Taking all of these into account, the design requirements boiled down to:

- Keep groups as self-sufficient as possible, to allow for workshops with limited resources;
- Have a short learning-curve to optimize available workshop time;
- Accomplish game goals through short game sessions, for the same reason;
- Support the scalability needs outlined above;
- Engaging set of rules, tapping into fundamental brain stimuli;
- Fulfillment of primary game goals as previously outlined.

***Application of Game Mechanics***

After examining the 3 card games mentioned previously for those aspects that both met the above requirements and those that did not, I selected a starting point for what gameplay and game elements could be reused and which would need to be tweaked or reinvented. In the end, there was no direct reuse of elements or rules, just of concepts and templates, specifically fact and role cards and challenge concepts from the *Scenarios Game* (Frame, B., & Manaaki Whenua-Landcare Research, 2007).

All 3 of the games depended on facilitators to help player groups and relied on long play sessions to create player experiences more akin to writing complex answers to essay questions rather than playing a game, while providing no clear scoring mechanisms. The result of this was suboptimal for my purposes and, I felt, did not tap into the prime brain mechanisms that respond to game concepts such as (a) competition (against self or others), (b) providing clear feedback on players' performance, (c) providing mechanisms through which a player can improve their performance (i.e. agency), and (d) providing clear cause and effect relationships between (b) and (c) to leverage (a). The clear relationship of cause and effect between player actions and consequences, and the ability to affect performance according to some coupled metric, is the essence of the game feedback loop that is so engaging in effective gamification.

In this case, given the requirements, what was needed was a feedback system to reward "better thinking," i.e. the ability to digest and respond to complex, cross-spectrum challenges by leveraging multiple cross-disciplinary viewpoints. Furthermore, the system needed some type of quantified competitiveness, rewarding ideas and multi-disciplinary integration, yet needed to remain simple enough to learn quickly and simple to score within

the group. It needed to encourage in-group participation, while motivating some amount of Us-vs-Them mentality between groups. Most importantly to the spirit of the endeavour, it needed to "produce" better thinking through simple involvement with and participation in the system. In other words, the more they played the game, the better a player would get, and implicitly, as their thinking optimized toward improving their performance, their ability to "think well" in this context would improve in conjunction.

This points to the importance of optimizing and tuning the game feedback loop, a process which relies on testing the game ("playtesting") at various stages of prototyping the ruleset and basic elements. The more testing can be done, the more the design can be iterated on and tweaked according to the results of testing. This iteration is key to improving game designs (Schell, 2015), though in this case was limited by time and available resources.

***Creation of Content***

While the intent of the game was to ultimately encourage certain types of thought and analyses processes, it had to be specific to Antarctica in its overall representation and notionally in the underlying facts it conveyed. The categories and elements in Frame and Hemmings's Antarctic futures framework (Frame & Hemmings, 2019), as summarized in *Appendix A – Table 1*, were used to shape the content concepts, providing the game's card content categories. However, because of the relatively high cost of creating new content, not just creating scenarios and categoric interplay, but also mining for underlying facts and figures, I sought to decouple as many card elements as possible to allow for combinatorial reuse that would make later content expansion easier and increase replay value of even a small set of content. Furthermore, the initial set of content was geared toward avoiding quantified statistics or other numbers-based facts as the basis of tying the content to Antarctica, as such digging up such numbers required research into often incomplete historical data sets.

However, before creating any Antarctic-specific content, I set out to design the framework of the game. This framework would consist of a set of rules and game elements (i.e. playable pieces, or the "user interface" through which players interact with and enact the rules) that together would consist of "the game". Specifying this framework is crucial to understanding how the game functions, how that content is used within the game, and thus how to create content for it in the first place.

Several permutations of game-elements-and-rules were created on the path to converging on a proof-of-concept (POC) that was playable and promising enough to create basic content for and then playtest. Those iterations can be seen in *Appendix B*. Through tinkering with these iterations on paper and through thought exercises to understand how they met the requirements established in section 2.1*,* I converged on a basic set of game rules and elements that felt sufficiently well-defined to serve as a spine for content creation and which would be worthwhile to playtest with a group of volunteers.

At this point it is important to discuss the historical and future timeframes used for the game. While future scenarios can be imagined any number of years forward, the farther out, the more difficult to keep them grounded in specifics. As such, the timeframe chosen for this game places "The Future" 20 years from now in 2039. "The Past" is situated 40 years ago (double the time delta of "The Future") in 1979. Drawing the past twice as far back as the future is forward (40 years vs 20 years) allows for more intuitive understanding of changes over time, as the pattern allows for easier interpolation around familiar touchstones. For that purpose it is not important that the present - the past = 2x the future - the present, versus 3x or any other multiple, just that it is a consistent multiple. As an example, in considering how phones might look 20 years from now, we can consider that 40 years ago most phones were corded rotary phones, then examine how things were 20 years ago, then 10 years ago, before trying to imagine what the scenario might look like 20 years from now. Furthermore, when the time deltas are at recognizable intervals, it makes recognizing patterns in changes over time easier. Or, if not enough data points are available to ascertain patterns, even imagining whether changes over time are linear or nonlinear becomes an easier exercise. Some of this was explored in the early paper & thought experiments captured in *Appendix B*.

Another consideration is selecting "The Past" at a point about which information is easier to find so that content can be researched and created more readily. Hence, were "The Past" to be placed at 1959 rather than 1979 it would be more difficult to create content as there is simply less information about Antarctica circa 1959 across all the categories in the Antarctic futures framework. Given the time-delta relationship between past, present and future, selecting the neighbourhood of 1979, 2019 and 2039 seems like it would give a good balance of historical data and a useful time window into the future.

## 2.2 First Playable Iteration

**Overview**

The resultant first playable iteration of the game is played by groups of 3-4 players, each group competing with the others. Within a group, players use their inherent storytelling abilities to try on several different perspectives and tell stories that link facts about the past to facts about the present. They then trade these bits of story with one another, creating an emergent narrative together that imagines a futures scenario built on top of their collective stories, and related to the facts they based their stories on. Futures that ultimately incorporate more stories, more perspectives and more facts earn higher scores.

## Game Elements

The playable elements of this game (i.e. game pieces) are LENS cards (see *figure 1* for an example), FACT cards (example in *figure 2*), and CHALLENGE cards (example in *figure 3*). Each type of card comes from a deck shared within a group (and each group has their own identical decks). In other words, each group has a deck of LENS cards, a deck of FACT cards, and a deck of CHALLENGE cards. The decks used for the playtest can be seen in their entirety in *Appendix D*.

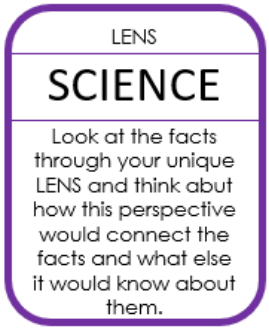
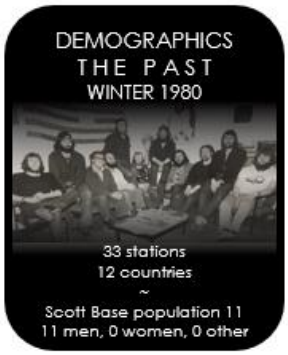



*Fig. 1: example of a LENS card, giving the "SCIENCE" perspective*



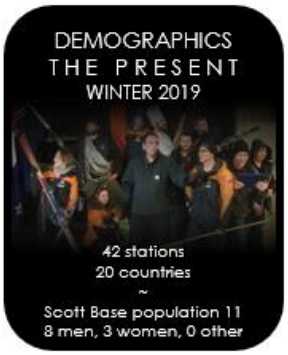




*Fig. 2: example of two sides of a FACT card, in the DEMOGRAPHICS category, showing a fact about the past and about the present.*


*Fig. 3: example of a CHALLENGE card incorporating the same category and element of the FACT cards.*

Additionally, players in each group are given empty STORYBITS (*figure 4*) and FUTURES (*figure 5*) templates which are filled out in the course of the game. These can also be seen in *Appendix C* at full scale.

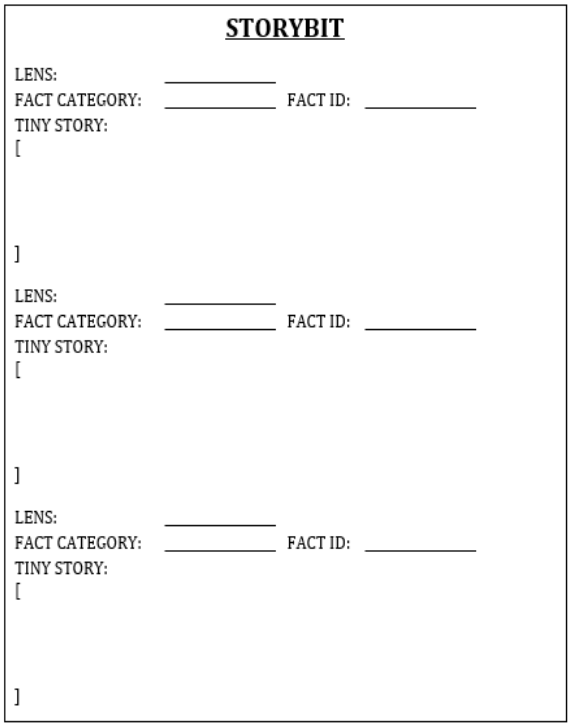



*Fig. 4: example of blank STORYBIT template card (printed on A6 size)*

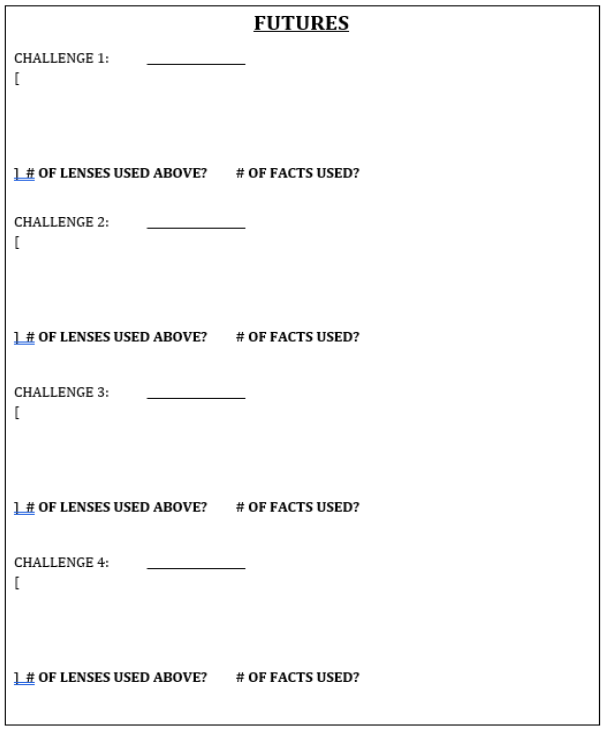



*Fig. 5: example of blank FUTURES template card (printed on A6 size)*

While the rules are explained below in detail, let us first, examine the purpose of the game elements described above.

*FACT and CHALLENGE cards*: These are the basis of each round's action. FACT cards are two-sided, with one side showing the past and one side showing the present. Each of these cards is also coupled to a separate CHALLENGE card asking related questions about the unknown future.

They basic action of the round is for players to link past and present facts with a very short story (called a "tiny story" to emphasize its brevity) to which they can bring their creativity and background knowledge and any other information they wish, so long as they keep it concise and phrase it as a story. These stories are thought of as "bits of stories" and so are written on STORYBIT cards. In other words, when players write tiny stories to connect facts, they result in STORYBITS. LENS cards also come into play when writing these stories, but that is explained in a later section below.

After a round of writing resulting in STORYBITS connecting past and present FACTS, the group moves on to using those STORYBITS in order to address the CHALLENGE cards. Note that CHALLENGE cards are not addressed *directly* with FACTS, but *only* with STORYBITS, i.e. with whatever the players were able to bring to their stories.

Each round can use *one or more* FACT cards, however while additional facts might seem to make the action of writing a story easier as they make more information available to the players, every additional FACT card brings with it an additional CHALLENGE card that must also be ultimately addressed.

Once all STORYBITS have been written in a round, CHALLENGE cards are addressed as a group. The FACT cards are put away, and the STORYBITS are examined for useful information that addresses each challenge. This information is then written on the FUTURES card in a form that addresses the questions implied by each CHALLENGE card.

*LENS cards*: When a player holds a LENS card, they take on the perspective given by the LENS when writing the tiny story that connects their past and present facts. There are several different types of LENS cards and only one of each per group: **Science**, **Geopolitics**, **Commercial Interests**, **Operations/Logistics**, and **The Public**. "Taking on the perspective" in this case can be thought of in terms of looking at the facts from the perspective of the lens and understanding the connection between facts through that perspective.

Now let us look at the rules in more detail.

**Ruleset**

The game is designed to be played in multiple rounds (i.e. "game rounds"), each composed of story-rounds and a challenge solve, the rules of which are:

Per overall game round, there are multiple story-rounds. In each one:

**(1)** Each player picks a LENS card and an empty STORYBIT;

**(2)** One player is selected to draw one FACT card and a matching CHALLENGE card. The FACT card is placed face up in the middle of the table. On another part of the table, the CHALLENGE card is also placed face up.

The team decides if to draw an additional FACT & CHALLENGE pair. If they choose to, the next player over draws the cards and places them again, positioning the new CHALLENGE card next to the previous one to form a CHALLENGE CHAIN. This can be repeated up to 3 times, i.e. up to 3 FACT and CHALLENGE cards are allowed. The more FACT/CHALLENGE cards, the higher the potential score for the round, but the more difficult the challenge.

**(3)** Timer is started (3 mins);

**(4)** Each player creates a STORYBIT by first picking which FACT card they want to write about, then writing down the LENS and the FACT category on the STORYBIT sheet, then writing a tiny story connecting FACT A to FACT B. Each player does this for only 1 FACT card, unless there are more FACT cards drawn than PLAYERS.

**(5)** At the end of timer, the STORYBIT is traded to the player on the left, and steps 3 and 4 are repeated. This is repeated until each STORYBIT sheet has 3 stories, or until each player has their original STORYBIT sheet back.

Now it is time to address the CHALLENGES, which is done only once per game round:

**(6)**: CHALLENGE SOLVE: Timer is started (6 mins) and players discuss STORYBITS to come up with FUTURES that address CHALLENGE CHAIN. One player writes down a FUTURE per CHALLENGE on the FUTURES sheet.

Once this has been completed for all CHALLENGES, the full round is over and the results can be scored.

**Scoring**

The scoring heuristic is meant to reward increasing complexity (number of challenges taken on and number of facts incorporated into stories and futures) and encourage the use of different perspectives by rewarding the instances of where lens usage brings something new to the envisioned FUTURE. In other words, the idea is that use of LENSES and FACTS trickle up to FUTURES through stories, but if the stories do not actually bring new information with them that is used when addressing the CHALLENGE, they do not make their way into the FUTURES and are thus not rewarded. Thus:

- For every CHALLENGE that is addressed with a written FUTURE:

  +1 point per CHALLENGE, then…

  Multiply by the number of FACTS used, then…

  Add the number of LENSES used.

Sometimes a CHALLENGE is not addressed in a FUTURE, perhaps because of a lack of time or lack of sufficient detail in a STORYBIT. Other times, a FACT did not trickle up through a STORYBIT into a FUTURE. Both of these situations are penalized to introduce a risk factor and balance the risk vs reward aspect of taking on more FACT and CHALLENGE cards. Thus:

- Per CHALLENGE in the chain **without** a FUTURE:

  -1 point per CHALLENGE

- Per FACT not used:

  -1 point per FACT

These numbers are totalled to get the final game round score. The totals are then compared across teams to determine the round winner.

**Details of Content**

The content of the FACT and CHALLENGE decks was created based on the categories and elements of Antarctic futures framework (AFF) discussed in the previous section and duplicated in *Appendix A – Table 1* for reference. Each card is tied to one of the categories of the AFF, and this category, or a related term, is written across the top of the card (see *figures 2 and 3*). The particular facts on each FACT card are based off one element within the category.

For a full deck of cards, multiple cards would be created for each category, with at least one for each element. However, for this iteration of the card decks (see *Appendix D*), only enough cards were made to serve the purposes of a playtest, i.e. for testing the playability of the POC game mechanics.

The categories selected for this iteration of the FACT cards were:

- Demographics: 2 cards - elements: human presence
- Economic development: 2 cards (labelled *Economics*) - elements: bioprospecting & tourism
- Environmental and ecological factors: 1 card (labelled *Ecology*) - elements: terrestrial processes: avifauna
- Policies: 1 card - elements: global policies
- Broader societal factors:
    - 1 card (labelled *Societal*) - elements: representations of Antarctica in arts and the media
    - 2 cards (labelled *Technology*) – elements: technological progress
- Technological development: 1 card (labelled *Science*) - elements: reseach priorities

Furthermore, except for one of the demographic cards, the factual details of the cards are mock-ups. In order to test the game's play mechanics, they represent what data might look like. While they are meant to be in the realm of believability and build on notions in the AFF, they are not meant to represent actual facts. Thus, a card mock-up in the "Ecology" category, presenting an avifauna element, would nonetheless discuss penguins rather than, say, ostriches.

Lastly, except for the same demographic card mentioned above, production art/photos were not sourced for these cards at this phase, and thus the cards are composed primarily of text.

# 3 PLAYTEST PHASE

## 3.1 Playtest Method

A playtest was organized to test the POC described in section 2.2 and determine how well it met the requirements and where it needed to be tweaked. The playtest lasted approximately 90 minutes and brought together 4 different players: 2 PCAS students and 2 of the PCAS tutors. I myself acted as a facilitator and observer of the game session.

A handout packet was prepared in advance, to be given to each player before the game. This packet contained an overview of the game, background information explaining the goals of the game, some text to set the mood if the story, along with instructions and STORYBIT and FUTURES cards. The "mood text" was prepared to give the game a less formal feel and coach it in more playful terminology against a mythic backdrop. See *Appendix C* to reference the full handout.

The card decks were printed in advance, but rather than be cut to size and put into their final form, each LENS, FACT and CHALLENGE card was simply printed on its own sheet. In the case of FACT cards, both sides of each card were printed side-by-side on the same sheet. This was done for convenience, acknowledging that the playtest did not fully examine the interface's form-factor as a result.

Once the group of players was gathered, I gave them a brief overview of the game and let them read through the handout.

We then proceeded into a first round, during which I was heavily involved in calling attention to certain rules and nudging players out of dead-ends that were not covered by the rules. I also answered questions, observed how player behaviour was unfolding and where I needed to issue corrections, while taking notes on the proceedings throughout. I left some things unexplained at first in order to see what players understood either directly from the instructions or in context of the game session itself.

Where the rules were discovered to break, due to unexpected interplay of game elements, or some other kind of mismatch in how the game unfolded, I quickly modified rules on the fly. Continuing past the first round, on through to the last, it was helpful to be flexible and use the playtest to try rule variations as needed to circumvent unforeseen snags in the game system or streamline suddenly obvious inefficiencies.

Ultimately 2 rounds of the game were played in their entirety. Afterwards, the players took turns offering me feedback about their experience: what they did or did not enjoy, what they did not understand, what they felt could be modified, and finally, simply, what their experience was like playing the game. I collected this information and took notes about my own observations.

## 3.2 Playtest Results

The playtest was extremely useful, highlighting what part of the game worked as planned and quickly surfacing strain points where certain aspects did not work properly.

At the end of the playtest, I collected not only my notes and feedback from the other players, but also the resultant STORYBITS and FUTURES created during the game so I could study how they compared to my expectations. However, these did not yield any more insight than the notes and feedback I had already collected.

In any case, the game worked mostly as intended, in general, but there were specific points of friction.

The group played 2 rounds of the game. In the first game round, only one FACT card and one CHALLENGE card were selected. This created a situation not anticipated in the ruleset. Step 5 of the rules, where players swap STORYBITS and are meant to write about a different fact every story-round, could not be played in this situation as there was only one fact on the table. In order to create more gameplay, I requested that players swap their LENS cards to the player on their right, in addition to swapping their STORYBITS to the player on their left. This allowed each player to write stories from different perspectives about the same facts and yielded interesting engagement.

In the second round, two FACT cards and two CHALLENGE cards were selected. Because again there were less FACT cards than the number of story-rounds intended by the rules, once again LENSES were swapped in addition to STORYBITS. In this case this created some confusion as players did not know what the point was of the swapped STORYBITS. Post-step 5, they each had in their hands STORYBITS that had other players' stories. Originally this was conceived for players who are holding on to a single LENS throughout the game round, and so they would be encountering other LENSES' perspective on FACTS, and using those other perspectives to inspire additional stories on their parts. However in this case, because LENSES were swapped as well, players sometimes got a STORYBIT with another player's story on it about the same fact they themselves were going to write about, *and through the same lens they were about to use*. This seemed to be a function of the number of players rotating through less than the total number of LENSES. As a result, I believe the solution, which we did not get a chance to try in practice, is to add an "invisible-player" position through which LENSES are also swapped. Meaning, if there are 4 players (and since there are 5 different lenses), a 5$^{th}$ player position is added just for the purpose of holding a LENS. LENSES are swapped to the right as before and shifted through this invisible-player position. This should prevent permutations where 2 facts and 4 lenses across 4 players create redundantly lensed-stories as there will always be one more LENS than the number of players.

**Other issues with the ruleset and game elements:**

1) Players took longer than expected to write FUTURES and needed more time to ingest each other's stories and understand how to apply them to the FUTURES.

2) Players were not sure how to use "lenses" to shift perspective.

3) Players were unclear on the concept of turning facts into "stories".

4) Players felt the FUTURES form was not clear.

5) In coming up with the FUTURES to address the CHALLENGES, players were not sticking solely to the information in the written STORYBITS, thus diminishing the purpose of the story rounds and undermining the concept of facts trickling up to the future through stories. As a result, CHALLENGE responses were not supported by lensed stories and could not be scored.

6) Players were worried scoring of FUTURES was not objective. They felt that once they understood how the game worked, they could craft stories loaded with the right details to maximize points and that there needed to be some counterbalance to keep other teams from abusing this, or outright cheating by counting their scores up in bad faith.

**Issues with the playtest/presentation**

1) Players felt there needed to be more explanation and communication up front from the facilitator to set the stage, set expectations and create a safe container for them to experiment.

2) Players felt certain aspects of the rules were not clear and needed to see "*how* to" examples not just "*what* to do".

**Positives**

1) Players felt that the game was fun and that the mechanism allowed their performance to improve over time.

2) Players were engaged and not bored. They felt they were playing, rather than "working".

3) Players felt the game opened their thinking and that during play they considered scenarios and elements they had not thought of before.

4) Players felt they were successfully bouncing ideas off of each other and encountering different perspectives and notions of multi-disciplinary thinking, in turn creating a positive feedback loop for themselves, where their own thinking went in unexpected directions.

5) Players remained engaged a few days after the playtest, and still thinking about it.

**Takeaways and points to modify**

1) Facilitator should emphasize that there are no wrong answers when writing stories or futures.

2) Better tutorial documentation/handout needed. Players want to see an example of how to use LENSES, how to turn FACTS into stories, and how to turn stories into FUTURES.

3) LENSES is not a naturally understood metaphor for shifting perspective. Better prompts are needed here, possibly like character definitions with specific characterization text explaining how the character sees the world. This is similar to the use of roles in the *Scenarios Game* (Frame, B., & Manaaki Whenua-Landcare Research, 2007) but with more specific characterization.

4) In any round where only 1 or 2 FACT cards are used, the rules should indicate that players should swap their LENSES in addition to their STORYBITS.

5) More time is needed for players during the CHALLENGE SOLVE / FUTURES portion of the game round. It seems that raising this from 6 minutes to 12-15 minutes would be a good next step.

6) Players should write the rationales behind their FUTURES to make it easier to connect them to stories.

7) Further, in order to stay on the track set by their stories and make sure their CHALLENGE SOLVES are based only on what they brought to those stories, when writing the FUTURES, players should take the perspective of people in the future who only have the story record to go on, without facts. This might also be helpful when writing STORYBITS, imagining themselves as people from the future who have traveled back to “The Past” and then “The Present” and must record what they have observed as a story to take back to “The Future”.

8) Once the story-rounds are complete, players should swap STORYBITS one extra time to before they go into the CHALLENGE SOLVE. This would force players to examine their STORYBITS more closely as they put them to use to create FUTURES and could help the FUTURES stay rooted in the stories. When players hold onto the last STORYBITS they wrote, they feel they know them and so do not refer to them, instead shaping the FUTURES in a more off-the-cuff fashion, resulting in FUTURES that are not rooted in the stories.

9) Players could flip a coin when at the start of the CHALLENGE SOLVE to determine whether to skew their FUTURES in an optimistic or pessimistic direction. The players indicated this would be a fun bit of agency and interaction and would also help them focus their thinking. Layering scenario ideation with this type of optimistic/pessimistic perspective has been used before (Hayward & Candy, 2017) and often yields rich possibilities (Liggett, Frame, et al., 2017).

10) The FUTURES and STORYBIT forms should be optimized to better facilitate tracking how FACTS trickle to STORYBITS and up to FUTURES and to facilitate scoring.

11) In its current form, the game could be scaled to function with a small amount of content similar to what was used for this playtest. In this case the game should consist of 2-4 game-rounds. The 1st game round should always be played with only one FACT and one CHALLENGE card, to help players learn. The 2nd round should be played with only two FACT and two CHALLENGE cards. Once cards have been played, they should be removed from the deck. From the 3rd round onward, the players could play with up to three of each of those cards. This would seem to alleviate some of the issues with the learning curve.

# 4 DISCUSSION

## 4.1 Playtest results

Based on my observations of the playtest and the feedback gathered, it seems the game framework holds promise for a larger deployment. Despite the small sample size, given the level of player engagement and their comments, it seems the design is on the right path. The playtest results indicate the game is engaging, taps into the performance-feedback loop and players' competitive instinct, without diminishing the ability to cooperate within a group. The ruleset seems to sufficiently structure brainstorming to allow players to feel they have come up with interesting contributions to the group dynamic while expanding their own thinking. At least in the moment, the game seems to increase players' futures literacy as it naturally guides them to consider changes over time and situations, a mark of level 1 FL. Furthermore, even though players grappled with the LENS system, the fact they engaged with it indicates they attempted to think broadly and bring in alternative perspectives.

While the game framework had some weak spots, none of them seem unfixable. Overall it seems the design succeeds in its intentions, at least within the circumstances it was tested.

After tweaking the rules and game elements to accommodate the changes suggested by the playtest results, more testing would likely uncover further optimizations or system tuning that could be of benefit in a workshop use-case. However, it is also possible the ruleset and game elements could be used as is, if the content as mocked up is deemed acceptable. If the content mock-ups are insufficient, then in addition to rule changes they would need to be changed as well.

## 4.2 Limitations

One of the issues surfaced through the playtest that should be addressed in follow-up testing or deployment is preparing the card decks for efficient printing in the format they are

conceived in, rather than on large sheets of paper. This would allow the tangible interactions with the cards to play a positive role in future game sessions.

To do this, the deck designs need to be laid out so double-sided cards are lined up in the correct way on the page for double-sided printing, and the file-options/layout should be sized correctly for the properly sized cards. If there is another pass on the content, to take cards out of the mock-up stage, or to beautify them with artwork/photos, fixing the above would be a step to add to that process.

Another limitation of the testing so far has been the lack of comparative results against which to measure if the game system offers any benefit over previous referenced card games in terms of "better" teaching, or at least more self-guided (with less facilitator overhead) and faster paths to futures literacy. This is not just a matter of comparing the game to other card games to see if it offers benefits in its current form, but also so that when future iterations of this game can be tuned to optimize it towards its goals. At the moment all testing would rely on anecdotal feedback, which is still usable but sometimes more difficult to tune against except in cases of very clear feedback. This version is not yet at the point of diminishing returns however, and so there are still easy optimizations to strive for.

## 4.3 Next iteration

The next iteration of the game should contain one or more of the following modifications:

1) Ruleset modification according to the takeaways listed in section 3.2.

2) Possibly combining FACT and CHALLENGE cards, where instead of having two-sided FACT cards, both past and present facts are on one side, and the CHALLENGE card is on the other (see *figure 6* below). At first glance this seems preferable, but it creates a hard coupling between the FACT and CHALLENGE cards that may not lend itself to more combinatorial play. The cards as they currently exist in *Appendix D* are practically coupled regardless, in that FACT and CHALLENGE cards work as a pair.

However, in the future it could be possible to create CHALLENGE cards that are not tied directly to FACT cards and instead rely on information from multiple FACT cards in order to be properly addressed. Shifting to that type of play would be more difficult if the CHALLENGE cards are physically linked to FACT cards. That said, at this point in time, there is no in-game advantage to them being separate, so streamlining them may make the game flow better, and may naturally take FACT cards "off the table", as they would have to be flipped over to access the CHALLENGE. This would in turn reinforce to players that they must rely on stories when addressing the CHALLENGE, as the FACTS would be explicitly out of view.

3) Reducing the amount of text on the FACT and CHALLENGE cards and adding some kind of artwork/photos to make them more intuitively understandable (as well as aesthetically pleasing).

4) Adding space on the cards to accommodate Spanish text.

5) Rooting FACT cards in actual facts rather than mocked-up ones.

6) Expanding the number of cards.


*Fig. 6: example of two-sided FACT+CHALLENGE card, where past and present facts are on one side of the card, and the paired CHALLENGE is on the other side*

## 4.4 Future tests & iterations

Once the game has been tweaked and the next iteration of it created, it could be tested at future workshops.

At that point, it would be useful to have a standard survey that travels alongside future workshop deployments of the game and can be used to collect feedback from future players about the game itself. Furthermore, pieces could be added to the survey over time to measure the effect the game has on a metric of futures literacy, multi-disciplinary thinking, and level of engagement with Antarctic futures. As a starting point, these could simply be self-reported according to definitions given in the survey itself. Eventually the survey could be deployed electronically to workshop participants after the workshop to measure longer-term effects.

As the system develops, at some point a full set of content could be created to address the full AFF categories and elements. This would enable repeat play within the same group of people rather than keeping them limited to 3 or 4 rounds. It is possible that the game has different effects over time, different from what its effects are after first contact.

# 5 CONCLUSIONS

This project may possibly be the first attempt to bring foresight-type game frameworks to bear on Antarctic futures. The game design was influenced by 3 different card games, then tweaked to optimize certain game mechanics in order to meet the goals set out during the requirements gathering phase. The resultant card game system was fleshed out with data categories and elements from Frame and Hemming's Antarctic futures framework in order to create a playable proof-of-concept.

This proof-of-concept was then playtested and demonstrated to be fun, engaging and potentially educational and useful insofar as futures literacy is concerned, one of its primary goals. The faults discovered during the playtest seem to be fixable and guidelines have been presented on how to achieve the next iteration of this game. If the current version is proof-of-concept, the relatively simple tweaks described would push it to an alpha prototype.

With minor modification of its current form, the game could be usable in a workshop setting, even if just as another "playtest" of a pre-alpha version. However, with further iteration, it could potentially develop into a scalable platform for use in the research or policy communities, or even with non-domain laypeople.

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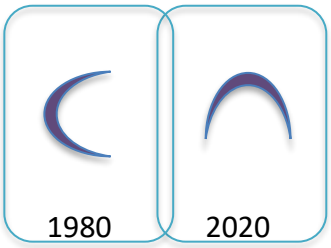
# 7 APPENDIX

## A. Content categories and elements

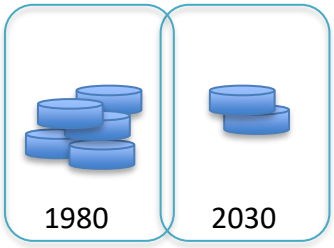
***Table 1:*** *Possible Categories and Elements for Antarctica Scenarios. (Frame & Hemmings, 2019)*

| Category | Elements for Antarctic scenarios |
|---|---|
| **Demographics** | Human presence - research community |
| **Economic development** | Fishing and bioprospecting |
| | Tourism |
| **Welfare** | Provision and equity of access including health care infrastructure and SAR. |
| **Environmental and ecological factors** | Terrestrial processes including avifauna |
| | Oceanographical processes including freshening, ice-shelf, ice-sheet, and sea-ice |
| | Marine processes |
| | Biological invasions |
| **Resources** | Natural resources (Including fossil fuels, renewable energy potentials, etc.) |
| | Minerals extraction |
| **Institutions and governance** | Effectiveness of ATS and UN institutions |
| | Participation and legal instruments for member states, non-member states and other interest groups |
| **Technological development** | Research priorities in Antarctica |
| **Broader societal factors** | Technological progress and role of science in society |
| | Dominant global attitudes to environment values and world views |
| | Representations of Antarctica in arts and the media |
| **Policies** | Global policies that impact on or are determined by activity in Antarctica |

## B. On the road to a working POC: initial game elements, rulesets & notes




FACT 1a FACT 1b

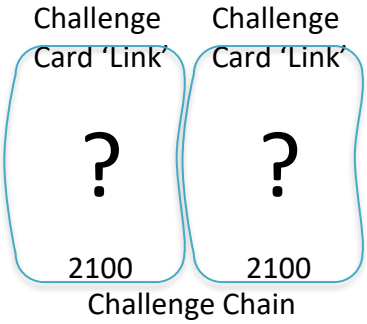



FACT 2a FACT 2b

STORYBIT 1:
- shape B is a version of shape A rotated 90' CW that exists 40 years later
- They are actually the same shape. The base shape apparently rotated over 40 years, not all at once overnight.

STORYBIT 2:
- There were 5 pucks originally, and 50 years later there were 2.
- Were they 2 of the originals, or 2 different ones? i.e. do they dissipate at 3 every 50 years? 1 every 16.66 years? Or on a much shorter frame, then replenish at some rate?

The key to answering is to share STORYBITS in order to understand context or some out-of-sight parameters and take them into account. The key to STORYBITS containing the answer is to construct the facts correctly (during the design process).




Challenge Chain

CHALLENGE cards should be created so that a STORYBIT only ever partially addresses it.

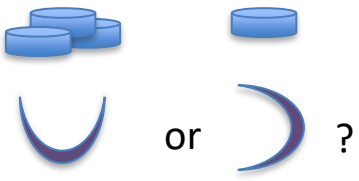
Solutions depend on story specifics:

- Do crescents rotate at linear rate? Continuously or in one shot?
- Do multiple pucks replenish/breed if no outside forces?

What solution fits better?

What solution makes better use of stories?

What stories fit the facts better?




Future A Future B

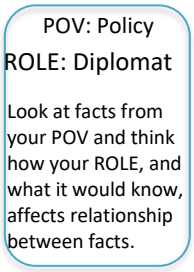
*Sample Ruleset Proof-of-Concept (POC) 1 – 2 versions, players can compete or cooperate*

**(1)** each player picks an A/B-FACT card from the deck; **(2)** timer is started (2-3 mins);
**(3)** each player creates a STORYBIT by writing a tiny story connecting FACT A to B on an A6 notecard;
**(4)** at the end of timer, STORYBIT is put into common pile and FACT cards are discarded;
**(5)** each player draws a CHALLENGE LINK card and places it in middle, forming a CHALLENGE CHAIN;

**(6)** each player draws a STORYBIT;
**(7a, cooperative)**: Timer is started (6 mins) and players discuss STORYBITS to come up with FUTURES that address CHALLENGE CHAIN, while group facilitator* funnels it and writes it down on A6 [*note this could be a player, and if so, this position rotates CW around the group each round];

*Alternatively* **(7b, competitive)** each player, writing on an individual A6, attempts to construct a FUTURE to the CHALLENGE CHAIN by (1) using their STORYBIT and (2) trading info from it to other players in exchange for missing info (which they supply from their drawn STORYBITS).

**(8)** Facilitator scores the FUTURES, rewarding points [TBD] for how many FACTS are used and how many CHALLENGE links are addressed.




LENS card
(pov + role)

| **ROLE (to the right) POV (bottom)** | *Diplomat* | *Scientist* | *NAP Rep* | *Lawyer* | *Base Staff* | *Trade Rep* | *Tourist* |
|---|---|---|---|---|---|---|---|
| *Policy* | X | X | X | X | - | X | X |
| *Research* | - | X | X | X | X | X | X |
| *Commercial* | - | X | X | X | X | X | X |
| *Operational* | - | X | X | - | X | X | - |

POVs can be thought of as "hats", as in, "if I put on my policy hat…" ***
**Maybe better to think of POVs as INTERESTS?**

A player's LENS is like them saying, "As a [ROLE], if I put my [POV] hat on…" or "As a [ROLE] what do I think of the [POV] aspects of this [FACT]?" e.g. "As a Scientist, if I put my Policy hat on…" or "As a Tourist, what do I think of the Policy aspects of these facts?"

*Maybe just SIMPLER LENSES?* Forget compound lenses (POVs+ROLES) and just use 1-category lenses: science, geopolitics, business, international law / public policy, member of public / public interest, NAP operations

*Sample Ruleset POC 2 – players cooperate, groups compete*

**(1)** One player is the Round Master (RM) each round, a position that rotates around the group clockwise each round.

**(2)** The RM draws a FACT and a CHALLENGE and put them face up where each player can examine them, then each player (incl the RM) draws a LENS.

**(3)** Timer is started for 2 mins, and each player thinks about the facts through their LENS's point of view and writes down some notes on an A6.

**(4)** When timer stops, there's a group discussion to piece together a FUTURE that addresses the CHALLENGE using each player's LENS (each player weighs in). RM writes it down on a sheet of paper.

[If facilitator is available per group, then FUTURE's scoring should be done at this point. Otherwise at the end?]

**(5)** Next RM, next round, and so on until all players have been an RM or a set # of rounds has been played.

*Scoring:* Points for how well FUTURE incorporates FACTS, and how well (or how many?) LENSES are represented in each FUTURE, i.e. in essence how well they extrapolate off the known facts.

***Explorations towards adding more complexity:***

***WIP Variant C1***

1) Each player writes a storybit through a lens
2) Facts discarded, storybits put into new pile and shuffled.
3) Player draw challenge cards and put them in the middle as part of a challenge chain.
4) Players draw storybits and new lenses and address challenge chain (to the amount they can) using their storybit and lens.

Possibilities to explore:

- Players rotate storybits and lenses to get more info and construct more complete solution to challenge chain;
- Players have to draw action card first, that they can use to (a) get another storybit (from someone), (b) get another lens, (c) get a couple of facts.
- Players can choose to play fact cards or storybits to answer a challenge - perhaps there are a limited # of facts one can use, and stories are more powerful than facts?
- In addition to CHALLENGE cards, perhaps define SPOILER cards and ACTION cards.

***WIP Variant C2***

1) Everyone picks multiple FACT cards
2) Challenge cards are laid out
3) Everyone puts FACT card they think is most useful down on the challenge cards
4) Everyone picks a lens
5) Everyone writes a storybit through the lens they picked, using the facts on the table to answer the challenge
6) Points for how many facts are used and challenges addressed; more points for how well storybits mesh together across lenses?

Questions to consider:

- If somebody picked a spoiler card and chose to put it down as a fact, and somebody used it, extra points?
- Do all facts interrelate or are some just thought provokers?

## C. Playtest Handout

The following handout packet was provided to each player in the playtest:

EYES OF STEEL

* *

~~ GAZE HARD, GAZE LONG ~~

* *

ICE OF FIRE

---

**Look into the past to understand the future.**

**Go from AntarctiCAN'T,**
**(*know*)**
**to AntarctiCAN!**
**(*foresee*)**

---

## PURPOSE

The purpose of this game is to help players imagine trends that could define future scenarios, while increasing their understanding of how these scenarios are defined by different perspectives coming together to interpret past and present.

## GOAL OF THE GAME

CHALLENGES link together to define a CHALLENGE CHAIN describing unknown aspects of an unknown future. Free your imagination but root it in FACTS as you work with your teammates to create the story of this future. Each team's goal is to look at past and present FACTS from different perspectives in order to imagine these unknown aspects of the future. The more FACTS and the more CHALLENGES, the greater the score.

The highest scoring team wins the EYES OF STEEL, the ability to gaze hard into the past and long into the future! Lowest score wins ICE OF FIRE, a future possibility so impossible to contemplate it cooks you just thinking about it. Don't be that team!

## GAME ELEMENTS

| | |
|---|---|
| LENS cards: | Each player draws one, gaining a new perspective. |
| FACT cards: | Each round, a team draws up to four. |
| CHALLENGE cards: | For every FACT card, a relevant CHALLENGE card is added to the chain. |

## RULES

Every round:

**(1)** Each player picks a LENS card and an empty STORYBIT;

**(2)** One player is selected to draw one FACT card and one CHALLENGE card. The FACT card is placed face up in the middle. Beneath it, the CHALLENGE card is placed face up. The team decides if to draw another FACT & CHALLENGE pair. If they choose to, the next player over draws the cards and places them again, placing the new CHALLENGE card next to the previous one to form a CHALLENGE CHAIN. This can be repeated up to 3 times, i.e. up to 3 FACT and CHALLENGE cards are allowed.

**(3)** Timer is started (3 mins);

**(4)** Each player creates a STORYBIT by first picking which FACT card they want to write about, then writing down the LENS and the FACT category on the STORYBIT sheet, then writing a tiny story connecting FACT A to FACT B. Each player does this for only 1 FACT card, unless there are more FACT cards drawn than PLAYERS.

**(5)** At the end of timer, the STORYBIT is traded to the player on the left, and steps 3 and 4 are repeated. This is repeated until each STORYBIT sheet has 3 tiny stories, or until each player has their original STORYBIT sheet back.

Done only once:

**(6)**: CHALLENGE SOLVE: Timer is started (6 mins) and players discuss STORYBITS to come up with FUTURES that address CHALLENGE CHAIN. One player writes down a FUTURE per CHALLENGE on the FUTURES sheet.

## SCORING

Per CHALLENGE addressed with a FUTURE:

1 point per CHALLENGE

Multiply by the number of FACTS used.

Add the number of LENSES used.

Per CHALLENGE in the chain **without** a FUTURE:

-1 point per CHALLENGE

Per FACT not used:

-1 point per FACT

TOTAL IT UP.

Highest scoring team: EYES OF STEEL!

Lowest scoring team: ICE OF FIRE!

# STORYBIT

LENS: _____

FACT CATEGORY: _____ FACT ID: _____

TINY STORY:

[

]

LENS: _____

FACT CATEGORY: _____ FACT ID: _____

TINY STORY:

[

]

LENS: _____

FACT CATEGORY: _____ FACT ID: _____

TINY STORY:

[

]

# FUTURES

CHALLENGE 1: _____

[

] **# OF LENSES USED ABOVE?** **# OF FACTS USED?**

CHALLENGE 2: _____

[

] **# OF LENSES USED ABOVE?** **# OF FACTS USED?**

CHALLENGE 3: _____

[

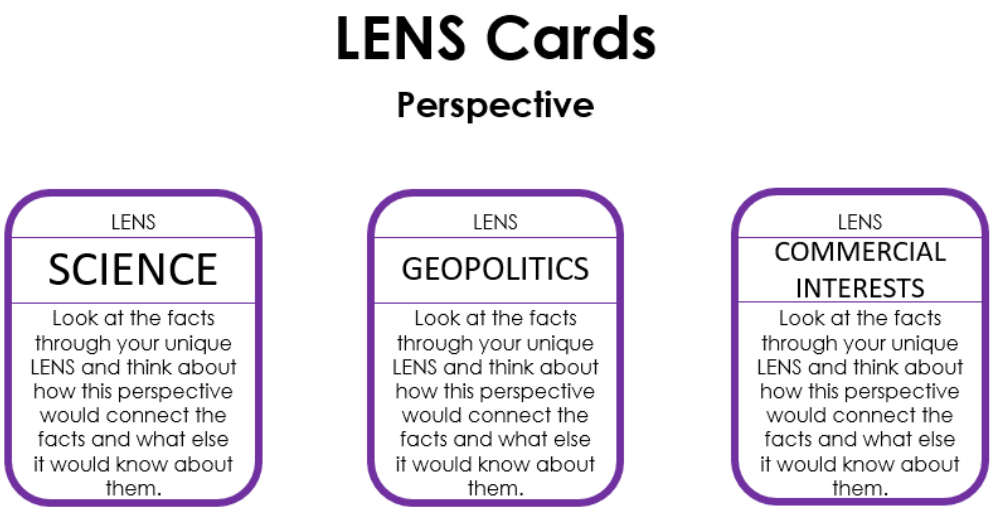
] **# OF LENSES USED ABOVE?** **# OF FACTS USED?**

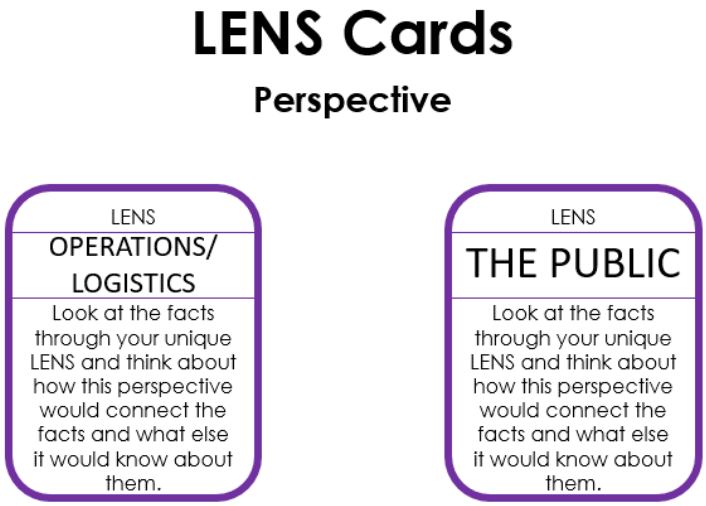
CHALLENGE 4: _____

[

] **# OF LENSES USED ABOVE?** **# OF FACTS USED?**

## D. Initial Iteration of Card Deck, as Used for Playtest

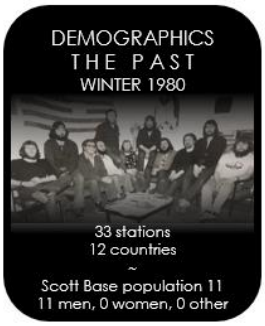


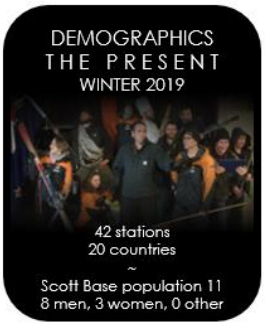



# FACT Cards

## category: DEMOGRAPHICS

Side A




Side B

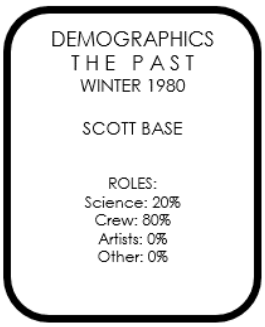
Side A photo source: Scott Base, Antarctica, 1980 Winterover crew
Side B photo source: adam.antarcticanz.govt.nz, 2015-2016 Winterover Crew, photographer: Anthony Powell

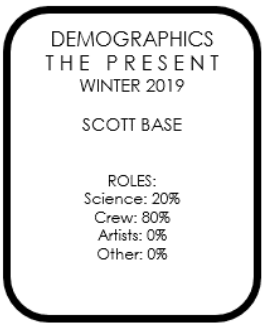
Base & Country numbers derived from https://en.wikipedia.org/wiki/Research_stations_in_Antarctica
Population numbers derived from photos.
Note: 2019 Statistics are mockups; base/countries are from 2014, and population from 2015-16.

# FACT Cards

## category: DEMOGRAPHICS

Side A



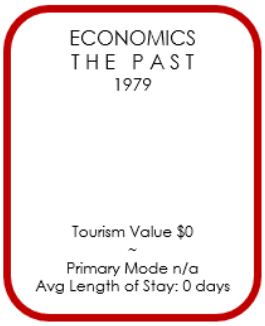

Side B

Fact details are mockups.

# FACT Cards

## category: ECONOMICS

Side A





Side B

Fact details are mockups.

# FACT Cards

## category: ECONOMICS

Side A



Side B

Fact details are mockups.

# FACT Cards

## category: ECOLOGICAL PROCESSES

Side A

ECOLOGY
THE PAST
1979

PENGUIN POPULATIONS
~
Gentoo: 200,000
Chinstrap: 3,000,000
Adelie: 1,800,000
Emperor: 600,000

ECOLOGY
THE PRESENT
2019

PENGUIN POPULATIONS
~
Gentoo: 400,000
Chinstrap: 2,000,000
Adelie: 2,150,000
Emperor: 400,000

Side B

Fact details are mockups.

# FACT Cards

## category: POLICIES

Side A

POLICIES
THE PAST
1979

GLOBAL

The Antarctic Treaty

POLICIES
THE PRESENT
2019

GLOBAL

The Antarctic Treaty +
Annexes
Madrid Protocol
CCAMLR
CCAS

Side B

Fact details are mockups.

# FACT Cards

## category: SOCIETAL

Side A



Side B

Fact details are mockups.

# FACT Cards

## category: SCIENCE

Side A



Side B

Fact details are mockups.

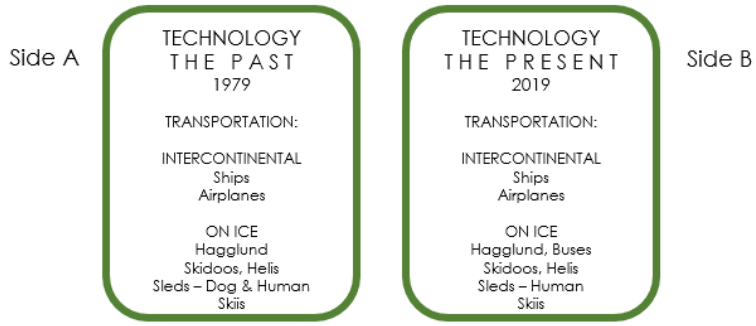
# FACT Cards

## category: TECHNOLOGY


Fact details are mockups.

# FACT Cards

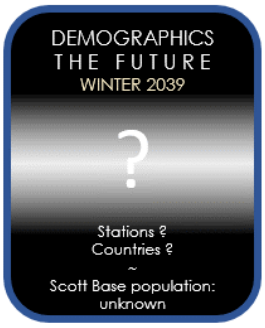
## category: TECHNOLOGY




Fact details are mockups.

# CHALLENGE Cards

## DEMOGRAPHICS





# CHALLENGE Cards

## ECONOMICS



## ECOLOGICAL PROCESSES


## POLICIES

# CHALLENGE Cards