

Visions of the Arctic Future: Blending Computational Text Analysis and Structured Futuring to Create Story-based Scenarios

P. W. Keys¹ and A. E. Meyer¹,

1. School of Global Environmental Sustainability, Colorado State University, Fort Collins, CO, USA

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- Figures S1- S10 documenting the story-based structured futuring methods for each scenario. (Supplement Pages 42 – 53)
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Additional Supporting Information (Files uploaded separately)

- "Table S1: Visions of the Arctic Future: Metadata for Arctic news corpus" containing the metadata for the corpus of text (uploaded as a PDF)

Ten Story-based scenarios.

The ten stories are attached in full below:

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1. Campus Utqiaġvik

“And to wrap up — I thank the entire Campus Utqiaġvik for supporting me the past 20 years. The Circumpolar Campus Alliance is our path forward. Together, with our partners, we can lead the world toward a more hopeful, peaceful, and just future.”

Edna paused outside the grocery store, as she smiled at the recording taken a few hours earlier, and then mouthed along silently with her own words, “The project of democracy and education are the same project.” She smiled. This was a *good* speech. She focused back to the present, and swiftly stepped aside as a group of laughing kids ran past, followed closely by a nanny drone.

The doors to the grocery slid open and Edna felt relief as the humidity disappeared in a cool blast.

She stepped into the store, and then out of the way, to continue watching the last moments of her departure speech “I am confident that your new Chancellor, Dr. Evelyn Wilhelm, will lead Campus Utqiaġvik deftly into the 22nd century.” Edna rolled her eyes, at her own politicking. “Moreover, I am grateful to be leaving my post under such a steady hand.” Grudgingly, Edna admitted that Evelyn was a fantastic choice, and that Campus Utqiaġvik could not do much better. But still.

As the applause lifted in the recording, she tapped out of her feed, and noticed a man’s trolley was getting away from him, and was about to tip to the side. She quickly lifted up the sagging corner, and smacked the top with her palm. The repulsors coughed in monotone static as they kicked back in, and the hover trolley righted itself. “Thank you!” said the man who was coaxing a sleeping infant back to sleep. “Oh! Chancellor!” said the man, surprised.

“*Former* Chancellor.” Edna smiled. “Just ‘Edna’ these days.” The man chuckled nervously.

“Unless you’re one of my students!” She squinted an eye, and pointed at the man. “Then it’s Dr. Edna” she laughed. This time, the man laughed too.

“Have a goodnight, Chanc— Edna.” The man passed outside into the late afternoon heat. Edna tapped a new trolley, and it hummed slowly up, alongside her.

Walking down the produce aisle, Edna saw that peaches were finally in season, and went to reach for one.

“Chancellor?” Edna turned around to see Press Secretary Earl Fechhelm. “It’s good to see you,” said Earl.

“Secretary Fechhelm, it’s great to see you too. And remember — just Edna now” she smiled warmly. “I’m surprised you’re here, I thought you’d still be at the gala?”

“No, my mother is ill,” said Earl, “so I’m bringing her some soup on my way home. Well it was —”

They both started as their Feed's chime with an emergency alert, nobody else appeared to notice, but Edna and Earl both glazed as they accessed their feeds. The Secretary of Labor had sent a briefing on the ongoing worker strike at the protein synthesis plant. The negotiation between the union and the government had reached a critical point, and the government administration was being notified in case there were any disruptions.

Earl is surprised to see that Edna was included in the update. Edna noticed — and thinks to herself "Damn right you still need this woman."

The briefing continued "...Finally, given the transition in Chancellor leadership, we have included both the incoming and outgoing administrations. We will keep you updated. Roberts out." Edna blinked, and looked at Earl.

"You might be a bit busier tonight than you expected," said Edna. Earl let out a long sigh.

"That's interesting", thinks Edna. "I wonder whether he has what it takes to do this job day in and day out." Her mind wanders to thinking of how tumultuous the past 50 years have been for Campus Utqiaġvik. The failure of the Federal government, then the collapse of state authority... In Alaska, at least, only the Native Corporations had the infrastructure — both human and physical — to persist. Then, the rise of the polar university city-states, and ... ah. Edna realized she had mentally wandered off a bit.

Edna waved as Earl said a goodbye, and quickly began speaking to his new Team. Edna moved on to get those newly delivered peaches. Edna heard a buzz in her Feed, and saw an alert that the Secretary of Food Security had sent a new message to the list... She realized that she might need to remind the powers-that-be that she should be kept *out* of the loop now. Strange that. Had Edna sought a third term, it would have been possible, but... No. While she was distracted, apparently on reflex, Edna had already punched in a brief message about the ongoing negotiations to her counterparts in Inuit Nunangat, in case there were unforeseen challenges in food distribution in the coming weeks. She caught herself, and laughed. As she deleted the message, she saw Earl walking back toward her.

"Hi Chancel— sorry, Edna — While you're here, do you have any comments that you would like to add to the press release?" Edna smiled, and considered how quickly the correct words swirled into her mind. "We must protect the community we have built, and the entire Alaskan family. This includes protecting workers rights and fair wages, across Campus Utqiaġvik. Indeed the nature of our unique civic and educational project is people, not profit." Blah blah blah. She smiled, and the words in her mind disappeared. "Thanks Earl, you can say "The Former Chancellor is fully confident in the new administration." Edna smiled wide, and Earl looked pleased. He thanked Edna as he carefully carried a large bulb of chicken soup to the exit.

That, Edna thought, was actually the truth. She looked down at her empty cart and realized that all she really wanted anyway was a frozen pizza, a large bulb of wine, and to watch a good movie tonight. So she kept the two peaches she already grabbed, and walked to the frozen food aisle. She fished out her favorite brand of inexpensive frozen veggie pizza, and a bulb of her favorite, though very expensive, Athabaskan wine. When she reached the exit, she heard a chirp in her Feed and the flash of her receipt.

As the sun disappeared, the humidity had dissipated and the outside air was cool on her face. The rotating sigil of Campus Utqiaġvik appeared in her Feed. Apparently the press release had been sent out already. Her instinct was to read it, but instead, she archived it, looked out at the city around her, and sighed contentedly. The markers of the past half century were clear. The husks of the abandoned oil refineries and processing plants had been turned into public art exhibitions — and even a kids playpark — though she'll never understand how people can actually *play* on those repulsor fields. The strange floodable buildings with adaptive foundations, the permafrost melt canals, and the too-warm air. The future of Campus Utqiaġvik was in good hands, and thankfully they weren't hers' any longer.

Edna smiled as she walked home.

2. Nanook Station

Dispatch #42.

The Nanook Station scientists might suspect something. I will be as detailed as I can in this briefing, since I may have to be quiet for some time.

As of July 1, the new station lead from Aarhus University, referred to as KL, has shaken up the researchers' rotations, changed the monitoring protocols for the polar bear neural lace program, and brought an external Assessor, to, as they told the crew, determine why the station budget has gone up so much in the last two years. However, the real purpose of the Assessor's visit will be made clear below.

A brief background. The position of the station on the western side of Devon Island is such that it provides maximum opportunity for the polar bears to access thickening sea ice throughout the Queen Elizabeth Islands, while staying close to the engineered salmon fishery and the nearby monitoring stations. The salmon fishery is a subject of continual discussion at the station, as wild spawning has only been successful for the past 5 years. Several of the scientists are skeptical that it will actually become permanent given the ongoing, highly variable fluctuations of the seasonal climate. Yet, KL is behaving as though it is guaranteed. The combined genetic manipulation and neural manipulation of the polar bears also appears successful. The modification of the polar bear genome to mimic certain brown bear traits, as well as the manipulation of neurotransmitter activities via the neural lace program, have been confirmed by polar bears hunting in rivers unlike any behavior observed in the past. I have also independently confirmed this via drone clouds. <<Personal comment: seeing polar bears hunting in rivers is among the more disturbing and uncanny things I have seen. >>

Since the station itself is a research partnership between the two public organizations, International Polar Bear Alliance and the Arctic Institute of North America, it lacks robust security and has no deterrence capabilities. The surface portion of the base is heavily camouflaged to appear as part of the landscape, and the underwater portion is designed for thermal and physical resilience to the enormous physical changes that occur seasonally. KL is notably trying to improve some of these aspects of security, but I can confidently say this will go nowhere given the scientist's reticence to add any complication to their routines. Entry and exit is possible above and below the water surface, and the updated access codes are appended to this message.

The purpose of my mission is to monitor the ongoing success of the scientists' efforts to insert a neural lace into a large mammal. The progress of the last two years continues, despite no mention of this work to any public agency or scientific organization. Last week, I observed a message sent from lead engineer TD, to KL. This message contained standard updates about uplink efficiencies, and neurotransmitter manipulations.

However, it also contained an update for the Assessor about the open channels to unknown off-station recipients.

This is where I learned that the Assessor is not actually an accountant from the University of Calgary. The Assessor, is a forensic computer scientist tracing access and flow of data around the polar bear neural lace program. Apparently, KL was put on this project to identify the source of the leak of the polar bear neural lace information. While we have accessed the neural lace program via different methods, I am concerned that the station leadership will become more aggressive in their search methods. I am certain that no one has found my backdoors to the neural lace program. Yet, if they search hard enough, they will.

I will not remove the access points that I have established, despite the risk it poses. If I am discovered, I will burn my trail and depart, one way or another.

However, given that you may not hear from me again for sometime, I recommend three things to consider as your next course of action.

First, the acceleration of our own research is at a critical point. Given that there is no public knowledge of the Nanook Station neural lace program, we can still be the first mover on this.

Second, KL does not know who the recipient of the station leak is. I have begun my own investigation and increased the number of network monitors in position, but I must tread lightly. Especially now that the Assessor is here. I recommend that we use the bulk download of communications traffic data (attached) to triangulate the destination of the neural lace data, and shut them down. We can not afford for another company to gain an advantage in R&D for their own neural lace programs.

Third, Nanook Station may come under aggressive oversight, if not full takeover, sooner rather than later — and not from our hidden competitors. The refugee crisis that is overwhelming some parts of Nunavut continues to expand northward into the Arctic Archipelago, and may soon consume Devon Island as well. The existence, and success, of a salmon fishery is soon to bring many unwanted fishermen. This will either be preceded or followed by Royal Canadian Naval forces. Until now, Canada has given Nanook Station special treatment, but if the salmon become a flashpoint for conflict, then armed forces will either be stationed onsite or take over operations for the safety of the scientific mission. If this happens, enhanced security review may find me out, and steps may have to be taken.

X.

3. Security Detail

"Good morning and welcome back for day number six of the 2078 Arctic Council Committee Members Meeting." A Danish man looked around the large auditorium with a sparkle of excitement in his eyes as he addressed the crowd. "May the record please state that the local time here in Nuuk, Greenland is 8:03 in the morning on July 27th, 2078. Arctic countries and observers, today's date may very well be remembered in history." The room lightly applauded at the introduction.

"Please," Kjell, a Norwegian Arctic Council representative, barely whispered to Britt, his associate. "I thought that's what they were saying about the last five days."

Else Larsen suppressed a laugh from where she stood at attention behind the Norwegian politicians. As their security agent, she had gotten to know Kjell and Britt quite well in the last week or so and enjoyed Kjell's sense of sarcasm. He'd crack jokes just loud enough for her to hear; however, she had taken an oath before getting assigned her position, swearing to remain professional, and most important, silent, when the Council was in session.

The Danish spokesman continued. "Thank you all for joining us again for another day as we work towards the monumental decision concerning the non-Arctic observer country of China and their request to join the Arctic Council as a Member State. This decision ultimately lies with the eight current Member states. This morning, we will once again invite each Arctic country to please summarize their supportive and opposing arguments, as well as their decision."

The past three days had all started the exact same: Member States expressed their opinion and got the opportunity to state whether they support, oppose, or are currently undecided about China becoming a Member State.

Not a single country had chosen a side yet.

However, Arctic Council meetings had historically lasted between one to two days, depending on the year. Now that they were starting Day 6, there was an air of impatience creeping into the room as everyone waited for the current Member states to finally take a stance on China's status.

Else didn't mind though. Her bosses had informed her of the importance of this decision and that, at the worst, she should prepare to be on assignment for weeks. She was hoping that her diligence and dedication to the security of Kjell and the other Norwegian representatives would not go unnoticed.

"I would like to remind you that the Arctic Council makes decisions through a consensus between all Member States. This does not mean that all eight of your countries need to

end at the same vote, but a decision will ultimately need to be made that can be agreed upon by all of you.

"May a representative from the United States please start us off." The spokesman stepped away from the microphone and sat down at a table in the front row of the auditorium.

She had never been to the U.S., but Else thought it might be a nice place to visit eventually, with all of their historic, creaky skyscrapers and such. When she was studying in college, she would watch movies with the President's Secret Service staff to keep her inspiration high, dreaming that one day she could serve and protect people as prestigious as a national president.

The American representative addressed the crowd in what Else assumed to be English. Else couldn't help but stare as his mouth formed shapes and words in a language that was completely unfamiliar to her. Nobody else in the room seemed phased. As she continued to watch, though, a clear, automated voice began in her ear, translating the representative in real time in proper Norwegian. The words "Active Automatic Interpretation" flicked on in red both above the American's head and on the bottom corner of her glasses, indicating that her earpiece was also working. *Look at the technology invested in this event*, she thought to herself.

After talking of world superpowers and Chinese prosperity, he came to the end of his speech. "On behalf of the United States of America, Member of the Arctic Council through the ownership of Arctic land in Alaska, and with the support of Indigenous Alaskans, we give our support to China as a Member State of the Arctic Council."

The room hummed with the sounds of muffled whispers and shuffling papers. Else became very alert, scanning the room for any potential threats.

"Finally!" sighed the Finnish representative seated a table over, physically reclining in his chair. "The stalemate is over."

Else continued to look around. Seeing that other representatives also seemed relieved told her that there wasn't any threat of danger, yet the room was full of hurried, frantic body mannerisms that said otherwise. Her lack of political experience felt obvious. She looked to her Norwegian representatives for guidance.

"Sir, why would the United States support China?", asked the newest and youngest Norwegian representatives to Kjell. "I thought the Americans were afraid of China gaining more power. They've already lost the title of World Superpower to China — so, why would the Americans want to support them now?"

"Anders, will you pass me the envelope with the declaration in it, please?" Britt whispered, leaning around Kjell to ask the aid on the other side of him without interrupting. Anders bent down from his chair to shuffle through some unorganized papers in his briefcase for a moment before pulling out the envelope. Without looking back up, he passed the envelope to Britt - passing right through Kjell's midsection. When Britt didn't grab the envelope, Anders sat up to find Kjell glaring at him.

"Oh my goodness, sir, I am so sorry!" He pulled his hand back. "I didn't realize where my hand was, I mean no disrespect sir. Please forgive me?" A look of horror was evident on Britt's face as she reached around Kjell's projection to grab the envelope, avoiding eye contact with the aid.

Kjell rolled his eyes in annoyance at the aid's faux faux. "Sanctions," he replied to the young representative's earlier question. "Even at an event like this, there is always the fear of sanctions. The U.S. is already in hot water with China. They do not want to be rocking the boat any more than they have to."

"Doesn't that break some sort of Arctic Council code, though? Holding another country's vote against them like that?"

"I don't know that they'd actually do it. But the fear was probably enough for the Americans. Honestly? I'm just thankful that someone had the nerve to finally voice an opinion on this thing."

Following the lead of the United States, Russian representatives declared their support of China as a Member State, pointing to China as the reason for their massive economic boom with deep appreciation.

"Thanks to the fully Chinese-funded Arctic spaceports back in the '40s, we have seen the largest financial and technological acceleration in Russian history. This historical work from more than three decades ago allowed the Arctic to help the lunar colony to establish itself completely and begin trade with Earth. China brought ports and trade to the Russian Arctic, even employing our local people to build them. We feel that, because of the prosperity they've brought to our land, it is only right that they get to help make Arctic decisions as well."

Neither Else nor the new Norwegian representative needed that decision explained. As the Russian representative took their seat, an Icelandic representative stood. Else recognized the man. A few days back, there had been a midday break in the meeting and Else found herself with twenty minutes and no responsibilities. She went outside to get some air when a group of representatives had walked past her on the sidewalk.

"I mean just look at that! Your parents ever tell ya about how they used to have to use big claw machines to move materials around when constructing a building?" Else overheard one of them say as they approached.

"You mean the ones where there had to be a person driving the machine too?", laughed the second.

"Yeah exactly. I mean, I get it, we can't really know what China would do as a Council Member. But look at all the shiny new stuff we've gotten from them before they're even a Member! Imagine what we'll get...." The group passed Else and were soon out of earshot.

"The Arctic state of Iceland is still weighing the implications of China becoming a member state. If the majority can reach an agreement, then Iceland will vote with the majority." When the representative from Iceland stated that his country was still undecided, Else was shocked. She had *heard him* talking as if China's member status was already declared. She couldn't understand why they wouldn't just state their support now, like everyone else.

The representatives from both Canada and Denmark, on behalf of Greenland, expressed deep concern about China being the only Member State without any land at risk.

"Decisions about the Arctic are inherently important to Arctic states because they have land in the game. What stakes does China have if their land *and* their population aren't at risk with every vote cast?"

The indigenous Inuit representative from Greenland also spoke, questioning China's concern for the environmental degradation that had already occurred when they'd expanded their trading capacity into the Arctic. Remote, pristine coastlines had been destroyed for shipping ports; pollutants from the ports seeped into local ecosystems, causing mutations in the native wildlife; and when the sea ice in the lower parts of the Arctic Circle completely stopped freezing over in wintertime, China used it as an opportunity to move more ships rather than ring any climate alarms. She questioned if China would be willing to consider past, present, and future environmental harm that they are directly causing in the Arctic if they are to become a Member State.

Even with all of these concerns, all countries had made it clear over the past few days that they couldn't just ignore the incredible opportunities that China had brought them. Shipping ports had been built in all Arctic states, connecting them to global trade networks like never before. This brought goods, jobs, a booming economy, and lifted many workers from poverty around the world. With countries becoming so interconnected and dependent on one another, they began to hold the other to higher standards. Nicer products meant careful labor, bringing both a pay increase and better work conditions to laborers around the world.

No one could really complain about that.

Britt stood up, turning and glancing at Else. It was time. Else followed Britt up the stairs, and as they neared the podium, Else took position a few feet behind her. Kjell was instantly projected in front of the podium standing next to Britt.

"My Arctic colleagues," Kjell started into the microphone. "As the past days have shown us, there are far more questions than answers at this point in time. Just a few representatives are expected to make a decision that may ultimately change the course of the Arctic, and the world, forever. Many of us are probably wondering: what happens if we make the wrong decision?... *Is there a wrong decision?*" Kjell looked around the room at each representative.

"With a 'yes' vote, this would make the world's largest superpower the first non-Arctic country to join the Arctic Council. What *else* will we allow them to be the first to do? These may be good firsts or bad firsts, but either way, the weight of this decision is immense." Britt flipped to the next sheet of paper on the podium for him.

"On behalf of Norway, in collaboration with the other Scandonavian states and with the support of the entire Nordic region, we have decided to take the leap and support China in whatever their next 'first' will be." The room erupted into noise once again; Else at least knew enough to expect it this time. When the Finnish and Swedish representatives took the stage and backed Kjell's statement, the room broke into applause.

The Danish spokesman took the stage again. "For those of you not keeping track, that means five out of eight member states have announced a positive supporting vote! We will take a break to process all that has happened today, and then I will leave it up to Iceland, Canada, and Denmark to make their closing statements. Remember: we do not need all eight countries to vote 'yes', but we do need an outcome to be discussed and agreed upon by all members. We will see you all back in here at 30 minutes past noon." As the room slowly emptied, Else began to make her way out.

"With Iceland, that's six votes."

Else looked around, unsure where the words came from; she couldn't help but notice the Chinese representatives hunched together and whispering. There was no "Active Automatic Interpretation" light on their table. *I shouldn't be able to understand them*, Else thought to herself, dismissing the idea. However, the dialogue continued.

"And you know that Denmark will vote with the rest of the Nordic countries now. That just leaves Canada," to which many voices laughed in time with the shaking shoulders of the Chinese representatives. It was then that Else noticed the red interpretation light was still on in the corner of her glasses.

"...so what's our next step?" One asked in Mandarin, though Else heard perfectly-timed Norwegian in her ear.

"We've already been over this," another representative began. "We know we have full Arctic support at this point. Why agree to a binding membership? We know that protecting the environment is their main concern, now that we've secured all of them economically. So as long as we set environmental regulations but keep up the good work, they'll want to collaborate with us into the future. It's really a win-win."

As Else walked out of the room, she couldn't help but think about what this could mean. *Others should definitely know about this*, she thought to herself. If she were an Arctic Council representative, she would want full information before making a big decision like this.

4. The Last Preserve

It was *cold*. That's how they knew they were getting close. It wasn't the same cold of a long, arctic winter night, but rather that chill you get when you walk into an underground cellar. It was an empty, almost eerie type of cold. The low-hanging, dreary clouds weren't helping.

School kids of all ages were in the process of bundling themselves in thick puffy down jumpsuits with the words "Canadian Archipelago Tours" embroidered across the chest. Everyone had been handed a suit as they loaded onto the high speed glider ship. Elementary teachers helped pull zippers and fasten boot laces for the youngest of the children, their eyes glowing in anticipation.

"Maybe this year I'll get to see a real whale! Not just a picture, but like a real, big whale!"

"Yeah, right!" One child scoffed. "My mom told me she only ever saw a whale once, and it wasn't even a whole whale. It was just the top part spraying water all over the place."

An automated female voice cut through everyone's thoughts. "It is time to finish the last of your preparations, we are almost at our destination. Please take your assigned seats along the deck of the ship." The youngest children mindlessly scratched at their ears. The speaker implants were governmentally approved to be inserted before the first day of primary school. It took some students longer than others to adjust to the permanent earphone.

The ship was cutting so fast through the water that it felt as if everyone was still standing on the Yukon coastline. As it began to slow, the oldest students, that of middle and high school age, found their seats while teachers herded the youngest to their chairs. The force of the waves swayed the ship side to side as they decelerated. All of the chairs began facing the bow of the ship.

Like a permanent fence arising out of the cold arctic water, reinforced steel beams with flashing orbs on top stretched out horizontally in front of them. The captain steered the ship through an opening in the fence. The nearest fence post to the gate had a steel platform with a small metal shelter sitting above the waves. Guards were permanently stationed here. One stood at a window in full military gear and nodded as the boat passed by. Onboard, the captain cut the ship's engine.

"Hello and welcome!", the voice began again in everyone's ear implant. "We are excited to have you onboard with us this morning. We ask that you listen to our directions very carefully to ensure a pleasant and memorable experience of the Arctic Archipelago Bubble Experiment, or the AABE." In a more serious tone, the voice said, "please remain in your seats the entire duration of the tour. Once we are back outside of the gates, you may move about the ship as you please. The ship may rock suddenly, so keep your lap

belt on as well." Some of the children laughed, knowing that the waves hitting the ship was one of the best parts of the entire trip.

The ship drifted forward through the water. Through the spraying mist of the ocean waves, a glow was visible in the distance. In a lighter tone, the voice continued, "feel free to ask any questions that come to mind. Whether this is your first trip or your thirteenth, there is always something new to learn about the AABE! Sit back, relax, and let the sights amaze you." The high school students had been on the AABE field trip so many times, they could practically recite the opening announcements themselves.

Schools were the only groups that received annual governmental funding to go see the Arctic Archipelago Bubble Experiment. Everyone else either had to have an enormous amount of money to pay for the private cruise, or just couldn't go after they graduated from high school. The Canadian government claimed something about always having the money for children to see the power of humanity.

As the glow up ahead grew closer, it became clear that the source was high in the sky and reflecting down. The voice started in everyone's ear again. "First, we'll begin today with a brief history lesson. The year was 2026. Global carbon emissions were high, places around the world were beginning to experience greater temperature changes and massive storms, but people still disagreed about the reality of climate change. Scientists had been ringing the warning bell for years, but it did not matter: people were too comfortable to change. If only they knew what was to come."

The voice paused, letting that sink in.

"At the time, a group of excited, young scientists had an idea: if people needed the motivation to change, maybe they needed to be shown the potential consequences of their actions."

"We needed to do something, anything," a recording of an interview with an elderly man began in their ears. "As scientists, we knew we needed a relic, something to show people around the world that climate change was worth fighting for. Numbers and graphs just weren't doing it."

"It started embarrassingly small. We used glass containers and filled them with plants, soil, microbes, and water. We'd seal the jar, put it in a sunny window, and then the jar would be able to survive all on its own with no outside inputs. We manipulated jars with increased temperatures to represent the real world as it was in the 2020's and you'd see the plants eventually die due to heat exposure. This was huge!"

But the old man laughed. "Of course, people didn't care! It's just a jar with some plants. It didn't matter that the plants, which convert the sun's energy to sugar, were the things we were relying on to fix climate change. It didn't matter that they were dying because it

was too hot for them to handle. The research didn't even make it to mainstream news. No one cared."

An elderly woman began to speak. "We knew we had to make things real. Our research had to be personal and actually matter to people. So we took our jar idea to a whole new scale.

"What if we put a *place* in a jar', one of our colleagues had asked us. We laughed at the ridiculousness of the idea at the time, but it was kind of our only hope. So we pondered the idea and, almost jokingly, began listing places to trap in a jar."

"Well I love my hometown, we could preserve that," one voice said.

"New York City, in a bubble!" said another.

"The Bahamas, so we could vacation whenever we wanted."

The old woman began again. "The jokes turned more serious though, as we began to think about a place like the tropics. Sea level rise and rising temperatures would surely affect these places, likely in our lifetime. Maybe trying to preserve a place like that wouldn't be so bad. Maybe a rescue mission was what we needed."

A clear wall appeared in front of the ship. It was nearly invisible, except for the waves crashing hard from the outside, and subtle, smooth lapping waves moving on the inside. The wall looked to be made of glass, though it was much stronger than that. Analogous to chain link fencing, nano-mesh was an extremely thin reinforced sheet of steel with microscopic threads, making it invisible to the human eye. This, blended into military-strength plastic, acted as the shell of the bubble and kept the outside world completely separate from the AABE.

The ship turned hard to the left and moved along the transparent wall. All chairs on the ship automatically turned to face the wall. Inside, the bright orb up above was shining right up to the wall, but its light didn't pass to the outside, creating a sharp contrast with the dreary weather that the boat passengers were experiencing.

Past the waves, a rugged coastline could be seen. Almost immediately beyond the coast, white-topped mountains stood tall and jagged. Every year, the school students took in the sight of the archipelagos, having never seen anything like it before. Their hometown in the Canadian Yukon, a remote and quiet place in previous generations, was now bustling with people and cityscapes. These boat trips were the most wild places that any of the students knew of.

The female scientist continued. "We decided that we wanted to rescue a place that was one of a kind and at severe risk of global climate change. But logistics kept popping up for every place we'd think of."

The voice of an interviewer asked, "how about a tropical island like the Bahamas?"

"Too many people, both locals and vacationers," the scientist responded.

"Okay, how about Antarctica. There are no people there."

"We'd interrupt too many scientific experiments that had been going on for decades. Who were we to say that our experiment was more important than all of those?"

"Well what about the Amazon Rainforest? Northern Alaska?"

"There's too much politics in the Amazon. We'd 'prevent too much economic growth'. Alaska was similar, although that idea did get us thinking."

The voice of the elderly male scientist started speaking again. "So here we were, with a brilliant idea and nowhere to put it, when one of our colleagues went on a Northern Canadian cruise. He called us up immediately. 'There's no one living on the north-westernmost islands above Canada, there's really little going on up there at all. Some of the Queen Elizabeth Islands, like King Christian, Borden, and Brock, are totally uninhabited! Just mountains, fragile arctic ecosystems, ice, and at-risk species. This could be it.' Man, when we heard that, we jumped on it."

"It took a lot of work and far more logistics than I care to go into. But construction started four years later, thanks to support from First Nations communities. Without them and their passion for these lands, we probably wouldn't have gotten anywhere."

"We had a plan: build in 360 degrees around the archipelago, and make sure that it is self-sustaining. This means everything needed to be inside the bubble, from the seafloor to a renewable source of sunlight. We couldn't risk anything. Opposition was high, but we had a point to prove."

As the boat toured along the outside of the clear wall, sea birds could be seen flying inside high in the sky. One soared across the ocean surface, swooping to grab a giant cod.

The original female narrator's voice spoke up. "And prove a point they did. Now, after nearly 50 years of confinement, the Arctic Archipelago Bubble Experiment remains the most diverse and ecologically-intact place on this Earth. What were once ecosystems at risk of sea level rise and ice melt continue to flourish today, the glaciers have been preserved, and the one-of-a-kind landscape has been protected from the human hand."

One child turned to their friend. "So I guess I still just don't quite get it... If someone figured out how to save this area, why didn't they know how to save the rest of the world?"

The sights of the Canadian Archipelago moved past the ship. The stark contrast between the empty, quiet of this place and the bustle of their home city were startling. A mass migration northward had occurred a decade or two after the AABE was built. As the threat of rising sea levels and warming temperatures began to sink in, people moved away from the tropics and towards cooler climates. They expected the once harsh, cold conditions to eventually turn temperate. And they were right. Many of the students' grandparents had moved from the United States up into Canada, toughing out the cold winters in order to experience more mild summers.

Meanwhile, tropical storms, high temperatures, and high humidity near the equator were creating a sort of cycling pattern. They were causing mass destruction and the worst storms ever recorded in human history, one after another.

Those fortunate enough to be able to ignore it all lived business-as-usual, so as temperatures rose and harsh storms increased around the world, they just kept moving north. Cities began popping up across much of northern Canada. Though winters in the Yukon were not extremely pleasant, they were much more comfortable than they had been throughout much of the earlier parts of the century.

"Will we ever get to go inside?", a younger student asked.

A ship assistant wearing the same puffy jumpsuit as the students spoke up. "The Bubble Experiment is completely sealed off. It reaches high enough in the sky to mimic a multilayered atmosphere, as well as low enough into the Earth to permit natural geological processes below. The Bubble is like the jars from the original experiment: completely sealed with nothing coming in or out. No person, animal, or molecule will ever pass through the walls."

The boat turned away from the glass and headed south towards the gate to exit the massive fence and head back to the Yukon coast. All of the chairs rotated around to face the bow of the ship again. The female narrator spoke again. "Canadian Archipelago Tours would like to thank you for joining us today on this journey to the past. May this site of both scientific and historic significance be a reminder of what we once had, what we still have, and what is left to fight for."

As the ship exited the fence, it gained speed and the rocking of the waves was no longer noticeable. "The Arctic Archipelago Bubble Experiment may be the greatest legacy that humans have ever left. May we never forget it," the older students mumbled along with the female narrator as she wrapped up.

5. Concession 60

"I think we're almost there." said Esther "Maybe just another day or two." Misha smiled. This was their daily game. Walk 15 miles through the wilderness of northern Canada, and speculate about their unknown destination.

"Dangerous area to walk through" said a man's voice behind Misha, and a twig cracked underneath her foot as she turned.

NOW ARRIVING, CONCESSION 60, BLOCK 4.

Misha snapped awake. Carefully watching her pockets, as she exited the packed Loop, and followed the crowd of gray clad workers down the platform. Nobody rushing to get to work, the slow, measured steps shuffling the same, well-trod path toward the Pits. A few drones floated together overhead, almost as though they were on a smoke break, seeking idle conversation.

A push from her side shook Misha to her senses, as she realized she had stopped to look at the drones. Almost all at once a flash of light shone from the badges of the uniforms, and the red and white of C60 flashed to the blue and yellow of Concession 31.

"Another hostile takeover..." muttered someone from behind her, a tall black woman. "None of these Kleptos can hold onto anything..."

Misha panicked a little. What would this mean for her contact? — now that C31 was in charge of this Pit... She had heard about these takeovers, when one mining or oil company seized the assets of another, but she'd never actually seen it happen.

"Sorry — what does this mean?" Misha, concern noticeable in her voice, asked the woman behind her.

The woman gave Misha a long look, then sighed. "A whole heap of nothing." the woman said. "You must be new?" the woman gave an appraising look.

"Yes. Signed my Contract two weeks ago," said Misha.

"Well", continued the woman. "This happens often enough. Things flash to a different Klepto, and nothing happens. We were C42 for a whole week once, I liked the silver and gold that time." the woman smiles, but then "We were back to C60 before anything actually changed. Don't let it bother you." The woman patted her shoulder once, and brushed past Misha to catch up with someone else.

The crowd neared the entrance to the Pits, and groups started branching toward different arched corridors. Misha headed toward Pit 32, with the four other members of today's crew, and they each looked up at the entry arch. The arch scanned their eyes, keeping track of every single entry to the Pit. It chirped a digital "Have A Safe Day!" to everyone who walked underneath the arch.

Misha reached her arms into the next available set of sleeves, kept unbelievably clean given the permanent grime covering everything else. The sleeves purred mechanically, then the interlocking sections pressed comfortably around her arms, and the holo projector in her eye registered the connection to her medial nerve. She realized today was the first time she didn't notice the sleeves going slave.

A voice shouted from the up ahead, "Hey OREO! Let's go". Misha hustled to join the elevator with the rest of her crew, descending to her mine.

Nobody really spoke in the lift. Just like there was no rush to get to the arches, everyone was clearing their minds for the day's work ahead. Misha, closed her eyes, breathed slowly and cleared her head, just like she was instructed to do.

With a blast of stale, cool air, the elevator opened. Misha looked into the irregular cavern ahead, and saw the five seats, improbably small in the dim cavern. Yesterday was so claustrophobic, she nearly had a panic attack. She wasn't looking forward to the leg cramps though. After walking all day, every day, for nearly 2 years, her legs preferred to move.

They each took a seat, facing away from one another, and carefully placed their arms in the armrests. Misha began the activation sequence, and she could feel a part of her mind go elsewhere. She closed her own eyes, and heard the gentle, metallic snik as the swarms enclosed in her sleeves woke up and began seeking promising signatures in the rock. She remembered the explanation from her trainer that the swarm intelligence wasn't actually inside her head, it was just leveraging the raw power of the human brain to perform complex computations. But it still felt like the swarm was in her mind.

As she lay back, and let the swarm do its work, her mind wandered. OREO. What a funny name. She used to love oreos growing up. Concession 60 specialized in rare earth elements, as did most mining companies in The North. Searching deep in the crust for exploitable ores, she sat here, an operator looking for rare earth ore. OREO.

Screw those trainers — she just felt the swarm in her mind, something like excitement.. Sure enough, two seconds later her disp showed a seam of lithium ahead. She relaxed as the swarm went to work, and her mind wandered elsewhere.

Another twig cracked, then thwack... she felt the pain in the back of her head as she hit the ground. Then the sting of the slap to her face. Before she could do anything, before

the guy could do anything there was a blast. The guy crumpled forward, and Misha heard two more shots as Esther took care of the other one.

"You good?" Esther asked. "Misha, are you good?"

Misha shook her head - mechanically agreeing but then she started shaking.

"What the hell is wrong with her?" A voice to Misha's side woke her up. She was in her chair, a mile below the surface. "Med alert. We may have another scramble."

"I'm fine." Misha said. "Just a nightmare"

"Nice try." said the woman who had called the med alert, apparently the crew leader. "But your swarm responds to your mind. Stress for you - stress for them. Come back when you're unscrambled and you've been cleared."

Misha started to protest, but she knew they were right. She called back her swarm, and walked toward the lift. The smudged 'up' button didn't respond until she looked at the arch, which chirped and the door slid open.

As she ascended, she closed her eyes, and her mind wandered back to her dream.

"I want to go back!" yelled Misha as Esther held her. "I can't do this anymore." Misha sobbed into her palms. Esther took Misha's head in her hands, and looked into her eyes. "You can go on. You will. " said Esther softly. "We do what we have to do to survive."

Misha came back to herself, as the lift doors opened.

Up top, she left the sleeves to be cycled, and her disp connected to the net and directed her to a nearby private booth. As she sat there, the C31 colors flashed proudly, and were replaced by a concerned, female face. "Good morning, Misha Park. You appear to have experienced an elevated heart rate during your most recent session. What happened, may I ask?"

Misha knew the drill. Lying wouldn't work with these sensors. "Fell asleep, had memories of the road. Bad ones."

"I understand. I'm sorry to hear that." The female voice *sounded* concerned. "As a Contracted Migrant Laborer of C31, we care about your health. But we need you operating at peak capacity. You are lucky - not everyone's mind is suited to the mental load of navigating a mining swarm." the therapist's voice switched to a more commanding tone. "Please find your prescribed medication in the tray below." Misha saw a packet of pills drop down. "As a courtesy, we added the cost directly to your account."

Please medicate promptly, as your team has missed your contribution." The head winked out, and Misha stared down at her palm.

Misha dry swallowed the pills, and went back to her arch. She resleeved, took the lift down, and was back in her chair. The whole thing took less than 60 minutes. Settling back down she let her mind go blank, and let the swarm go once more. This time, the medicine helped her stay clear headed. And - apparently many hours later - she found she had exceeded her quota when the shift chime signaled the end of the day.

"Nice work MP." One of the crew mates gave her a smile, apparently referencing the two letters on her lapel. Misha nodded back, but didn't smile. No time for friends. Not yet.

They made their way back up. This time, though, the people were relaxed, smiling, chatting a little - knowing that their brains could rest for the next few hours.

On the Loop back to their barracks, Misha looked up and saw a faded poster. "The Top Minds Guarantee Mining Superiority", then a line of Migrant contract workers standing in a row, sleeves on. But no one navigated standing up. Dumb.

Misha saw another poster, of a shining city by the water. "Complete your contract and join us in Sea City!" A happy crowd ate at a restaurant, in the free, clean air. Somewhere sunny. But, more than anything, the image looked to Misha like something she hadn't felt in years. Safe.

She closed her eyes.

Misha felt the cool earth beneath her. Esther's voice spoke to Misha, but again, Misha couldn't reply. "Don't look back. Get to the coast. Sign a contract. Start over. You have to keep going. For both of us."

NEXT STOP. BARRACKS #6.

Misha looked around. She wasn't the only one that had dozed off. As she stood to exit, her tags flashed, and changed back to C60.

6. Putin's Gambit

The name Yermak Timofeyevich means little to Western ears, but he is a legendary Russian figure, found in countless poems, novels, movies, and plays. Yermak, a Cossack, was a brigand and river pirate for much of his life, robbing and murdering Russian citizens up and down the Volga river for decades. However, none of his villainous past mattered when, in 1582, he wrote his name onto the fabric of Russia.

Thirty-five years after Ivan the Terrible founded the Tsardom of Russia, Yermak was hired by an affluent merchant family to invade Asia on behalf of the tsar. After less than a year at the front of a preposterously small army of 840 men, he succeeded in defeating Kuchum, the fearsome Khan of Sibir, in battle and took the capital city of Qashliq. Although it eventually cost him his life, Yermak is credited in folklore with winning the "conquest of Siberia," and as such, is beloved by the Russian people. Why? Because this pragmatic strongman, by acting boldly, violently, and with a political savvy not dissimilar to the *realpolitik* of the modern era, grew the lands of the Rus by more than a third. He gambled and won, and for it, Yermak was all but canonized in the Russian mythos.

This story, however, is not about a Russian hero of old. It is not about a great Russian victory known to every schoolchild in Russia. This story takes place over 450 years later. Long after those same Siberian lands conquered by Yermak were found to contain the most bountiful oilfields in all of Russia. This story is about the fate of that oil.

This is History Hiccups with Vas Melnyck!

So, how did the world's largest exporter of natural gas and the second largest exporter of oil collapse, almost overnight? This is the story of The January Collapse. Today you will learn about the secret dealings that conspired to bring about the collapse of the last vestiges of Soviet-era Russia.

We all remember from KhanU history class that the end of fossil fuels in the 2030s, shook things up around the world. Right? We all know this. We also all know that some of the biggest losers from this change were the fossil fuel bigwigs, Saudi Arabia, Australia, and even the United States. But of course, one of the biggest, Russia, had in some ways the farthest to fall.

But why? Here we unpack how a handful of very consequential decisions by Russia's president during the first half of the 21st century, Vladimir Putin, failed to anticipate where the rest of the world was headed.

First, you probably remember the Russian attacks on Ukraine in the 2010s and 2020s. Now, even though a bunch of countries around the world said Russia should stop, and even deployed economic sanctions, Russia didn't stop. Right? Why would it? It wanted Crimea, so it took Crimea. It wanted access to the land that would allow it to transport

natural gas through Ukraine without any problems, so it took the land. This is no surprise. Nor is it disputed.

And most of these decisions can be traced to the Kremlin in Moscow, and specifically to Vladimir Putin's inner circle.

What this inner circle did not anticipate was how in a matter of a decade starting in 2021, the entire fossil fuel based economy would begin its inevitable death spiral. Now of course hindsight is 20/10, but the signing into law of the Glasgow Global Climate Treaty among the biggest economies in the world at the time, that is the United States and China, sent metaphorical earthquakes and aftershocks throughout the global economy. Namely, it signaled to fossil fuels that their time was over and that the plug was about to be pulled on the highly profitable subsidies and legal allowances the industry had received pretty much forever.

Despite this, Putin and his crew were looking the other way, perhaps backwards, hoping that this was just a blip, and the world would come crawling back to fossil fuels.

History doesn't always have a specific definitive event that separates the past very cleanly from the future. In this case however history is amenable, and the Prirazlomnoye Incident is this punctuation mark that ends one era. What was the Prirazlomnoye Incident? Find out after this message from our sponsors...

TRYING TO FINISH THAT REMOTE CONSTRUCTION JOB, AND YOU NEED ONE MORE WEEK TO WRAP IT UP? STUDYING FOR YOUR NEXT BIG KHANU EXAM, AND NEED A FEW DAYS OF FOCUSED ATTENTION? SOUNDS LIKE YOU NEED SNOWSTIMS. THE TRUSTED NAME WHEN YOU NEED TO GET THINGS DONE.

Welcome back. So, Prirazlomnoye. A name that ought to live in infamy, but really doesn't, right? How many of you actually know this name? Like that ancient shot heard around the world, Prirazlomnoye ought to inspire a sense of dread in all those who seek to cling to false hopes. In July, 2051, long after the Glasgow treaty was well into effect in America and China, let alone the rest of the world, Russia was still clinging to fossil fuel extraction. Decades of economic losses, abetted by corruption throughout the government, came to a figurative and literal head in the Arctic oil field, Prirazlomnoye. Originally hailed as Russia's first Arctic oil platform, but not the last, this field was remarkably productive during its lifetime. But, most of the fuel that it extracted languished in extensive remote storage sites throughout Siberia. This was only revealed, after decades of false sales and manipulation of trade information that had buoyed Russia's economy while all the other oil exporters collapsed.

Surprisingly, much of the military establishment had been tricked into thinking that Russia's economy persisted despite all other signals globally that oil was dead. As such, in July of 2051, as China's attempts to purchase the Arctic oil and gas fields from Russia

— for its own accelerated space program — the Russian military amassed one of the largest concentrations of destructive capacity at that time. And where was it amassed? None other than Prirazlomnoye.

Why, in the world, would Russia cling to something when China was willing to pay for it? Again, this is a surprising subject of vociferous historical debate. In retrospect, it seems clear that people who had been in power for an entire generation, were simply incredibly deluded. These were people, who liked being in power, who had extended their lives with their wealth, and who were not used to being told that their worldview, indeed their entire way of life, was dead in the water.

Here at History Hiccups we look for the weak signals in history, the evidence of nuance and surprise. And this is why we call this episode Putin's Gambit. We, here at History Hiccups, think that Putin really *did* know what was happening, and had to put on a show. Why? Well everyone around him depended on Russia, that is to say the fossil fuel world, the old world, the world of the 20th century, to make a game-winning play in the last 5 seconds. So even Putin, maybe, was hopeful that the game was still in play.

You know, and I know that the game had ended two decades prior.

So, we have warships and missiles armed and ready to go to defend Russia's interest in the Prirazlomnoye field. Who were they aiming this enormous concentration of military might at? That is the billion yuan question. Now, I am not an expert. I'm not a professor at KhanU, and I have never written a history book. But my guess is that Putin and his group of Kremlin cronies realized that a show of military force could rally his nation around this idea of oil, gas, and the whole fossil fuel world. That a show of might and aggression would somehow produce a reaction in the rest of the world like it used to. This was Putin's Grand Stand.

So what happened? Why *doesn't* Prirazlomnoye ring out in everyone's mind as a turning point in our global future?

Stay tuned after a message from our sponsors...

TIRED OF NOT BEING IN CHARGE OF YOUR OWN LOVE LIFE? DO YOU WANT TO MAKE DECISIONS NOW? NUSEX PROVIDES THE FLUIDITY YOU WANT FOR YOUR LOVE LIFE ON A TIME FRAME THAT IS YOUR'S. GET YOUR IMPLANT AT YOUR NEAREST PARTICIPATING AUTODOC.

So. Here we are at a dramatic climax of this story - or is it actually an anti-climax? As global news outlets reported on the amassing of Russian firepower around the Prirazlomnoye Field, three significant things happened.

First, two anonymous leaks, one each from Gazprom and Rosneft, showed the companies were both not only bankrupt, but had been hemorrhaging their wealth for more than a decade. Only in a country governed by denial would an economic phenomenon like this be possible. Regardless, the global perception of these two anomalous companies somehow clinging to wealth, immediately evaporated.

Second, after these two anonymous leaks, the military establishment in charge of operations, not the oligarchic leadership far away in Moscow, realized they were helming a collection of worthless paper tigers. Immediately, the will to fight evaporated. Apparently there was a limit for too many lies, and Putin's Gambit flew past it.

Third, the subsidiary companies in charge of the Arctic fossil fuel extraction platforms, made a snap decision to sell to the Chinese government buyers. Given the geopolitical, economic, and social clout the Chinese already enjoyed in the 2050s, there was no way the Russian government could backtrack or overrule the final sales.

Thus, three strikes to the core of the Russian state. Economic, military, and reputational.

It is interesting in retrospect, that no one still knows what happened to Putin. That is, an entirely different story, that we sadly do not have time for.

As an aside, here at History Hiccups, it is always shocking how fleeting our memory is of the past. This event, a short 25 years ago, has led to an utter reshaping of the Arctic. Chinese hegemony of the Arctic space economy. A fractured former Russian Federation, with the wildly successful new Eastern states including the Sakha Republic. All stemming from the collapse that occurred during the Prirazlomnoye Incident.

That's it for this week, join us next week for Part 6 of our series, Rise of the Zeks! In this installment we will detail the 2061 student strikes in Murmansk and Saint Petersburg! What happened? Join us to find out!

7. Voice from the Past

"Thank you ministers and representatives for your time this morning," said Minister Kusugak. "I think we are making some progress toward understanding the perspectives of all present."

Perspectives, ha, thought Oolanie to herself. As she looked around the room she saw the familiar equanimous faces of her colleagues in the Inuit Nunangat government. She also saw the faces from the Native Alaskan delegation, and she knew, privately, they were onboard with everything that she had already said that day. And then, Oolanie looked over to the delegation from the Canadian government. Most of them seemed appropriately amenable, though she did note that one younger looking Canadian seemed visibly frustrated. Someone to keep an eye on.

She continued, "We have reached a critical juncture in the negotiation of the Iqaluit Transit Agreement."

As she said this, she noticed that the young Canadian was speaking to his colleague, not loudly enough for her to hear, but certainly loudly enough to be noticeably disruptive. She chose to ignore it.

"Come on, let's have some fun." her Memory whispered. Oolanie smiled, but continued.

"As minister for land water and ice here in Inuit Nunangat, I represent the interests of the indigenous community that has stewarded these lands,... Am I boring you?" Minister Oolanie Kusugak interrupted the young Canadian who had chosen to speak even more loudly this time.

"Well, I wouldn't say boring me" said the self-satisfied young Canadian, "but what I don't understand is how the Inuit Nunangat government can make such expansive claims about these lands. Only recently has your government taken things over from Canada. Now, I think —"

"You think..." interrupted Oolanie, now coldly.

"Yes I think," said the young Canadian, now with more fervor, "That your government needs to be whipped into shape a little."

The senior Canadian delegates suddenly realized who was talking and what was happening. One visibly swore, and the others grimaced knowing what would come next.

Oolanie closed her folder. "I see. Who do you think you are, who knows how this land ought to be managed?"

The young Canadian began to speak, but Oolanie cut them off.

"*That*, as you should have known, was rhetorical. I am not interested in your answer. I'm not sure who is supposed to be holding your leash, but I'm holding it now." Oolanie said. "And I'm going to educate you."

The young Canadian went to speak, but a more Senior Delegate gripped the shoulder of the young Canadian, and told them to be quiet.

"That," Oolanie inclined her head to the Senior Delegate, "Was a piece of wisdom. Let me start with your first comment, that our government has only recently taken over from the Canadians. This of course is embarrassingly short sighted. The Inuit Nunangat government has indeed recently taken control of these lands. Yet this is a return to the historical order." She paused.

"Come on..." said her Memory. Not Yet, thought Oolanie.

"*You* see a history where Canada has claimed this land for a few hundred years." said Oolanie, "Set that against the thousands of years that my people have inhabited and stewarded this land. Perhaps you choose to go a bit further back to the "discovery" of Rupert's land? Maybe the century or so of extraction from the Hudson's Bay Company? Fine, you explorers and colonizers get a few more decades. But all of that is over now."

The Canadian goes to say something. He is cut off.

"Do not speak." Oolanie's voice has changed, become deeper... sounding older. She feels a sense of letting go, and someone else taking over.

"Whipped into shape, you say? I was *born* on the ice, I can tell you of a life more closely tied to this place, than you can dream of. Whipped into shape? Let me tell you my experience, first hand, of being separated from my parents before I was age 10, where I spent close to a decade in a residential school actually being whipped and beaten for speaking the language of my people." Oolanie paused, the Memory now pouring out of her. "Don't sit there and tell me about how we need to be whipped into shape. Something tells me you have very little idea of what those words mean."

Recognition dawned on the young Canadians' face.

"Yes, you see now." The words tumbled out of Oolanie more quickly. "You see an Inuit woman, and you judge, you preconceive. You can plainly see that I am those things. I am also the Minister of Land, Water, and Ice." She paused, then let go, permitting the Memory Well to pour her ancestor's words out of her mouth. Jeannie Kusugak, Oolanie's great, great grandmother, now spoke through Oolanie, to the assembled audience. Oolanie/Jeannie continued to look at the young Canadian. It may be a trick of the meeting room, or a trick of the ears listening — but two voices seemed to speak in unison. "You are looking into a well of memory. I can remember what this world looked like before climate change. I can remember this place when your rules were violence, dispossession of culture, with no consequences for your theft, rape, and murder. You should be pleased that we the Inuit government are only seeking to steward our domain with justice and equity — rather than seeking vengeance for the past."

The assembly was silent. Perched on the edge of their seats.

"I remember the fights in government, the protests for recognition of our rights, and the slow progress of redress and returning of the lands to our people. Recognition of

Nunavut in 1999. Nunavik in 2055. Inuvialuit in 2061. This is not an aberration, or some new order. This is a return to the way this land was governed long before you ever set foot here."

Oolanie/Jeannie took a deep breath. Inviting an interruption. None came.

"You may claim that you had nothing to do with this. That it was not you, but people who came before you, that perpetrated this literal and figurative violence. But you sit there, on the spoils of history from which you continue to thoughtlessly benefit. I am not interested in any sort of apology, and I don't care for your excuses. It is irrelevant at this point."

Silence. Oolanie paused. Took a breath, and smiled, no longer with bared teeth, but with cold resolve. Although no change was visible, Oolanie closed her Memory Well, for now.

"This is not the end by the way, but the beginning. Our stewardship of these lands will continue and expand, with knowledge and cultural practice connecting into the past, and throughout the world, well beyond the Arctic. Our research and our development produced the technology of the Memory Well. This has allowed our communities to connect to centuries past — accessing first hand, lived-knowledge of how the land was, and how it might be again. We have shared this technology with other indigenous communities, who are similarly connecting their elders to their future leaders."

The visiting delegations from Alaska and Greenland, nod at one another.

Oolanie continued, "And we, as stewards of the pan-Arctic indigenous movement, are advancing Indigenous recognition and land claims throughout the polar regions. We support the Sámi communities, who won independence in 2075, Native Alaskan communities will join us as they separate officially in 2100. And we hope that our Kalaallit Nunaatwill family will join soon."

"So." Oolanie cleared her throat, as though to return to herself.. "The Iqaluit Transit Agreement."

She stared at the group of delegates, focusing her attention on the Canadian senior staff and representatives. She finished with a long look at the young Canadian.

"We have come to this table because *you* requested it. We have offered terms in good faith, terms that are fair, and that respect our view of stewardship of the land, water, and ice."

Oolanie looked to her colleagues momentarily, then they all nodded together.

"We had planned hours of negotiation today, perhaps even going into tomorrow," said Oolanie. "Now — we have decided that we are no longer doing that. The offer that we have made, stands. You may take it or you may leave it."

The Canadian ministers conferred briefly, the young Canadian noticeably excluded, and appearing suitably chastened from the dressing down.

Standing up, the senior Canadian delegate said, "Thank you for sharing your thoughts and your wisdom, Minister Kusugak. The Canadian government officially accepts these terms and we look forward to cooperating with the Inuit Nunangat government."

In Oolanie's mind, Jeannie chuckles, then sighs contentedly.

8. Icebreaker

The wind whipped past Shukhov as he reached over the railing, willing his fingers to connect with Artie's outstretched hand. He could see Artie's grip on the ladder rung slipping. The freshly shaken crushed ice field beneath them showed the black Arctic ocean between tank-sized chunks of ice.

Twenty minutes earlier.

"Absolutely not! That's impossible!" shouted Shukhov.

"What's impossible? The fact that you lost, or that you don't know the rules of the game?" said Artie wryly. "Because I assure you that both are — in point of fact — very possible." Artie smiled, putting his hands behind his head and leaning back on his chair.

Shukhov muttered under his breath.

The digital voice of the Shaker began its countdown. "Resonant Frequency Pulse countdown in 10, 9, 8,...."

"Ah come on, we'll play another game," Artie began to set the board up again.

"...2, 1... Pulse". The room gave a massive shudder, skittering the pieces across the board and onto the floor. "Ah! I didn't even hear that shake coming." exclaimed Artie.

"Me neither —" said Shukhov, "they just blend into the next."

They both fished the last few pieces off the deck, and put them back in the designated box, bolted to the table. Shukhov stretched, and yawned massively. Artie puttered around the room, righting a few things that had been shaken loose, that weren't attached to the tabletops. There was little, however, to pick-up. The routine of keeping things tucked away was beyond habit now. A breakfast pod had tipped on its side, though, spilling its contents on the mess table. Shukhov grabbed a spare rag, and wiped up the mess. He noticed the news was still unfurling across the holo tray "... Officials at the Murmansk Shipyards noted the indiscriminate use of force by Norway, and how the entire fleet docked in Kola Bay was functionally destroyed. Citizens have called for a response, and the President was heard saying Russian flags will soon fly from Spitsbergen..." Shukhov shut it off, and let out a sigh.

"Same old, same old?." said Artie, who had seen Shukhov's gaze on the news.

"Yes. Today it was Norway. Apparently..." Shukhov shook his head, and sat down.

"ALL HANDS. PRIORITY ALERT." Artie and Shukhov gave a confused look, then Artie swiped the nearest panel, and the Alert blossomed toward the holo tray. "Priority Alert from Barents Sea Ice Station Hub." The face of the Barents Sea Hub Commander appeared in the midst of the klaxons.

"Temporary Kara Sea Ice Station #32. At five hundred hours, a possible unknown submarine vessel may have been detected exiting the Barents Sea zone. Military command has confirmed it is not Russian. You are commanded to deliver an unscheduled resonant frequency pulse at seven hundred hours to assist in the acoustic confirmation of this unidentified vessel." Artie had already opened his eyes wide, staring directly at Shukhov, with a silent, questioning 'oh'.

The recorded alert went on. "Attached to this message is the required override code. Your Artificial Station Attendant will transfer the code. Thank you for your service to Rosatom, and to Russia." The Commander disappeared.

"Wow", said Artie. "There's an Artificial Station Attendant here?!" Shukhov threw the rag he'd been using to clean up the breakfast box. "And to think." continued Artie. "I'd just been calling these things Shakes. Who knew they were Resonant Frequency Pulses."

"Ah — so we're Temporary. Good to know." Shukhov said.

"Indeed " Artie kept the old joke going. "We must not grow too attached to this posting. Thirty years is, after all, an ephemeral blip on the cosmic radar."

"A fleeting third of a century," Shukhov said, hand over his heart, "Only a passing glance of three decades of service—"

Another alert sounded, letting them know they were nearing the shake window.

They both chuckled. Somehow the joke never grew old. Shukhov checked the diagnostics of the Station, and looked at the clock. Only 10 minutes till the unscheduled shake was due. "Let's get moving."

Artie and Shukhov both stood at the ready stations, and began tapping instructions into the holo screens. "Ready?" asked Shukhov. "Born ready." said Artie, through gritted teeth. Shukhov rolled his eyes.

"Testing countdown", said Shukhov. "Testing resonant frequency pulse in 3, 2, 1."

Nothing. Only the constant hum of the tokamak and the faint sound of wind, whistling on the station surface. Artie went to make a joke, thought better of it, and began swiping screens and checking diagnostics. After a moment of confusion, Shukhov began to do the same thing. If there's a nearby vessel, sometimes that can prohibit a shake from

happening. The Coastal Siberian Seaway is, after all, worth nearly 100 trillion rubles. And Rosatom would do close to anything to avoid sanctions for interrupting these shipping lanes.

Hmm. Tokamak status? Active. Fusion diagnostics? Good. Resonant frequency distributors? Nominal. Hmm.

Artie chimed in, "I think I found the glitch. It looks like the station AI failed to update to the latest software patch from Hub. Probably ice crusting the receiver dish on deck..."

"We really need to get a permanent heater up there to keep this from happening..." muttered Shukhov.

"Let's go." said Artie.

They wound their way up the spiral staircase to the deck hatch. Closer to the surface they could hear the wind whistling across the station deck. Shukhov tossed a hat up to Artie and put one on himself. They both put on the winter parkas stored near the exit. "It actually sounds kind of dicey up there." Artie said "Let's try and do this quickly." Shukhov nodded.

Artie tapped in the hatch release code, and the whisper of wind instantly became a roar. Bowing their heads to the cold they exited the hatch. As Shukhov emerged, Artie immediately clipped a safety tether to his belt, then patted his shoulder. "CAN'T BE TOO CAREFUL" yelled Artie. Shukhov could barely make out the words. They both peered up into the whipping wind, and saw icicles, formed horizontally on the receiver dish. Artie extended a two meter melt rod, and held it steady as Shukhov brushed the icicles and rime away. The dish was soon cleared, and Shukhov checked the clock, 5 minutes to go.

"LET'S GET MOVING", yelled Shukhov. He tapped his watch, and Artie nodded in recognition. As Artie telescoped the melt rod back, the wind whipped the other direction pulling Artie off balance, snapping his tether, and folding him over the railing.

"ARTIE!" called Shukhov, and Shukhov dove after him. Nearly falling down the ten meters to the water below, Artie had grabbed the topmost ladder rung, already slick from the ice and saltwater.

The wind whipped past Shukhov as he reached over the railing, willing his fingers to connect with Artie's outstretched hand. He could see Artie's grip on the ladder rung slipping. The freshly shaken crushed ice field beneath them showed the black Arctic ocean between tank-sized chunks of ice.

His coverall ripped at the shoulder seam, and the outer lining of his arm tore away revealing the dull plastisteel beneath. Finally, their fingers met, and Shukhov was able to

pull Artie up and over the railing. It looked like something was wrong with Artie's shoulder. Shukhov turned, opened the hatch and helped Artie down into the station.

Catching their breath in the mess room, Shukhov said "I'll get that update, then it's time to shake."

"Shake and bake" trying to joke, but only managing a wince, Artie held his shoulder gingerly. Shukhov turned to the panel, tapped in the update sequence. The software quickly updated, and they were ready for the shake sequence.

"Ready?" asked Shukhov. Artie gave a quick nod.

"Shaking in three, two, one. Shake." The entire station gave a lurch, and then was quiet again. "Well," said Shukhov, "I hope all of that was worth an unscheduled resonant frequency pulse." Artie snorted, then grimaced at the pain in his shoulder. Shukhov brought the medkit over to look at Artie's injury, and whistled. "It looks like you won't be able to play chess for a few days." said Shukhov. "Too bad." Shukhov set the autostitcher on Artie's shoulder to fix the torn ligaments, and repair any bruising.

"You wish!" said Artie, though noticeably in pain. "But seriously, thank you. I owe you one." The autostitcher chirped its completion, and Shukhov placed it back in the medkit.

"Good. Then *you owe me* a few days peace before you subject me to more chess." Shukhov smiled. Then he turned to the mess table, rolled up his sleeve, carefully sliced off the torn nanoskin, and inspected the damage to his arm. The plastisteel arm appeared unscathed, and the diagnostics were good. The nanoskin would need replacing, but mechanically everything looked fine. Shukhov dismissed the diagnostic window, discarded the shredded nanoskin, and rolled his sleeve back down.

"Do you think we'll find out what that was?" Shukhov asked Artie.

"As two dauntless employees of Rosatom," Artie responded with mock seriousness, "I can confidently say - No." Shukhov smirked, then patted his friend's *good* shoulder, and set about preparing the next scheduled break of the ice, 20 minutes to go and counting.

9. Assisted Migration

"As the caribou cluster together, we can see the determination in their eyes. These next few days will be the herd's greatest test." Gillian intoned, eyes heavy with meaning, as she looked into the camera.

"And, cut! I think we got it that time!" Hank said.

Rachel and Niillas looked at each other, and mimicked Gillian's tone, "... their greatest test..." then they laughed, stood up, and stretched.

"I know I'm laying it on thick, but the viewers are going to want drama, right?" said Gillian. "And if we don't add our own drama, this will be .. pretty boring."

Gillian was, of course, right. As the Porcupine herd was leaving the Gwich'in Environmental Management Area, and headed into the Prudhoe Coastal Refuge, things were - mostly - very safe. The permafrost bogs could be dangerous given how soft and unpredictable the tundra was. But the caribou were adaptable.

"Think we can make Prudhoe Bay by Sunday?" asked Hank, hopeful at the thought of a warm bed.

"Maybe" said Niillas. , "The drone monitors show good forage all the way to the coast." He showed the drone display to the crew, and a 3D map with red veins crisscrossed through a miniature map of the region, with large areas of green.

Rachel pointed to a section of red line split in half, "What happened there? Is that drill road out?" The old oil roads, now serving as refugia for some plants and animals from the surging seas, were also strange, elevated corridors through the swamp. When big chunks of subsurface permafrost melted, the roads would sometimes collapse too, in big gaping sections.

"Not sure," said Niillas. "We could try steering the herd around the gap, are you concerned?" asked Niillas

"Maybe, I just don't think we want an ambush." said Rachel.

"We can't re-route," said Gillian. "Our funding depends on documenting the full migration. Driving them away from the gap means we could fall behind in the jostle, and we can't lose them now."

"Agreed. It's just a short bit." said Rachel.

The Porcupine migration crew was in their fourth season together. Niillas, still on an Arctic conservation exchange, was wrapping up his PhD at the University of Helsinki. Gillian and Hank were both ecologists from the Athabaskan Research Institute, and Rachel was the government biologist - mandated under the Murkowski Assisted Migration Act.

The MAMA crew was responsible for monitoring the migration of the Porcupine herd, as part of the Global Conservation Pact. This was, probably, their last year together, as Niillas would be returning to Finland, and Rachel would likely rotate to a different crew.

The crew prepared to make their way down the hilltop they were perched on since the herd was giving indications they would start moving soon. Despite the swampy tundra, the caribou could still move fast, so each MAMA crew member had their own Strider. A lightweight, maneuverable, land walker. Each rider, perched on a small chair, sat strapped in their strider. It took getting used to, but Striders could easily keep up with the caribou, and in a pinch could even sprint away from a predator. What they gained in speed, though, they gave up in protection. A nickname for the Striders was also fast food.

"My left leg is a little sticky, so probably no sprinting for me today," said Gillian. "Just a heads-up." No joking at this. The crew knew that everyone's suit needed to be as functional as possible to keep moving.

"We'll get it checked when we get to town," assured Hank. The crew finished checking each others' Striders, and just in time, since the herd had begun their daily trot.

The Porcupine caribou herd still completed the largest land migration of any animal, anywhere on Earth, but now, it was an assisted migration. Contrary to global expectations early in the 21st century, the world was well on its way toward tackling the myriad collective action problems required to address climate change. By 2050, the world had mostly reached net-zero carbon emissions, and technologies were being rolled out to go negative within the decade. But centuries worth of carbon had already been emitted to fuel industrial growth, and there it would remain till it could be sucked out of the atmosphere. A consequence of all of this was that global ecosystems around the world, particularly those with migratory ecologies, were in dire straits. Entire ecosystems needed assistance to keep pace with changing conditions of temperature, rainfall, and seasonal cycles. The Global Conservation Pact, a descendent of earlier agreements like the Convention on Biological Diversity, was a binding agreement by all signatory countries to assist in the migration of entire ecosystems, along the best available pathways through continents.

"Race you to the front of the herd!" yelled Rachel, and Niillas was hot on her Strider's heels. They didn't actually race, since that would terrify the herd into a dangerous stampede, but they did move swiftly along the sides. Not all species had adapted to the

Striders well. In Sweden and Finland, the Sámi used different tech to keep up with the big herds, mostly solarmobiles. But here, the Porcupine herd tolerated the Striders which were cheaper, lighter — and more fun.

"Radio comms up, confirm." said Gillian

"Confirmed," said Hank.

"Confirmed" huffed Niillas, still striding to the front of the herd.

Silence.

"Rachel — please confirm." said Gillian.

Static sound, then "—esss".

"Niillas, what's going on, can't you see Rachel?" asked Hank, concern in his voice.

"Drones show her as standing next to that open patch of the drill road. Her Strider is motionless, but it's functional, and her comms are on."

Static, then... "lvess..."

Gillian got it first, and swore. "Wolf sighting. Niillas, confirm sighting."

The silent drone swarm above the herd, changed direction like an uncanny flock of birds, and sure enough, a pack of 10 Arctic wolves were crouched in the gap. Rachel was motionless in her Strider, only 50 feet away from the gap, but safe, around a corner from the wolves.

"Joo. Kymmenen susia... ah, sorry. Yes. 10 wolves." said Niillas, then "Ghost baby?"

Hank laughed, "Not again!"

"Yes. Do it," said Gillian.

Niillas sent five of the drones well over the gap in the road, and fanned them out 200 yards behind the wolves. Then they started all crying, in synchrony, like a human baby. It was creepy, but effective. Almost all at once the wolves spun around toward the new sound behind them, the three closest to the drones began snarling. Continuing their baby cry, the drones began clumping together as they coaxed the wolves closer, then the drones would back off further away, drawing the attention of the wolves further from the herd.

"Thank God for ghost baby." whispered Rachel.

A few of the wolves lingered looking at the herd, and then spun following the pack, running away, as the drones drew them further from the gap.

"OK everyone. Double time to the northeast corner of the herd. Then, Niillas, bring the ghost baby back to the herd. We don't want the pack to go hungry today, they need food as much as the bou."

The MAMA crew could hear Niillas muttering. Old habits die hard, and he had always begrudged the wolves on this migration.

"Niillas — please confirm." said Gillian.

"Confirmed. Good to go." said Niillas.

The crew began moving calmly, and quickly, to the corner of the herd, Gillian's Strider lagging a bit behind with the gummed up leg.

"Release the ghost baby" said Gillian.

No one laughed, despite the absurdity. Niillas sent the crying ghost baby back toward the gap in the road, and then turned off the sound. The wolves were back on the hunt, if only a bit confused.

The herd reacted predictably to the wolves, scattering a bit and running faster toward their goal. Niillas' drones caught footage from multiple perspectives showing the pack picking off a slower, older member of the herd. As the wolves began feeding, the herd stopped their panicked run, and slowed to a trot. The Striders kept pace a good distance away.

"Thanks," said Rachel, as she strode up next to Gillian. "You said you wanted drama today, right?"

Gillian laughed, "I'm just happy you're safe. Let's keep our distance a bit so we don't spook the herd again."

They all agreed, and their Striders kept up a steady, satisfying splosh as they made their way toward the flooded coast of Prudhoe Bay.

10. School's out forever

Reindeer looked up at the sound of laughter, and the friendly banter that floated out of the homestead. The sun was low on the horizon, and lights could be seen in the distance as the night shift was starting in Verkhoyansk.

"No way, grandfather!" exclaimed Svetlana.

"Yes way!" Laughed Anton.

Svetlana did not look convinced.

"Okay okay, I will start at the beginning again." said Anton. "First, you go to school for about 12 years, and you try and do very well. After you go to school for this time, you hope that your grades—"

"What are those again?" asked Svetlana.

"Hah... they are the evaluations that you received in the classes that you took, about how well you learned the content in that class."

"And how were they given to you? I mean, your peers gave these to you?"

Anton rocked with laughter. "If only. No, the instructor who was nominally an expert in the material would give you these grades. You hoped that you received good grades, so that you could continue going to school."

Svetlana was shaking her head.

"Now I know this seems very strange to you," said Anton, now more earnestly. "But you must understand that everything has truly changed, and the absence of any sort of system now is very strange to me. So — the next stage was called university or college. And this is where you would learn what you would be trying to do for your job, and you—"

"This is where the whole thing just falls apart. Your job? We have many jobs... don't we?" asked Svetlana.

"Indeed," said Anton. "The wisdom of the present time is very clear in this regard. And what is true now, was similarly true in the past, in that your job or jobs often did not reflect what you did at college or university."

"This doesn't make any sense!" said Svetlana, holding her face in her hands. "But please continue — so what did you do in all of this? Did you really go to college or university?" said Svetlana trying to keep her incredulity out of her voice.

"Oh yes." said Anton. "I studied extreme environment robotics in Vladivostok, among other things."

"Don't let him trick you!" shouted Yegor, from the other room. "He studied drinking and chasing girls!"

"What do you know, Yegor?" shouted a smiling Anton.

Yegor peaked his head around the corner. "Well, Papa, I can tell you that from the sound of it, your way was much more fun. But, what I know is very different" said Yegor, who turned toward his daughter, "In 2041, about when I was in 3rd grade, the Florida Flu emerged — and that pandemic lasted 5 years." Yegor looked into the distance.

"What does that mean?" asked Svetlana.

"It means" interjected Anton, "that for five years, governments around the world struggled to contain a deadly virus. Even though society had learned much from the COVID19 pandemic way back in 2020, they had apparently not learned enough."

"Indeed", said Yegor. "The start and stop of governments trying to kickstart the global economy, well, it eventually led to economic hardship—"

"That's a word for it..." said Anton. "I would call it collapse!"

"We are still here" chided Yegor, with eyebrows raised. "But yes, things broke down. One thing was the massive increase in machine intelligence and automation during this time, while governments, companies, everyone scrambled to try and make things work without infecting one another."

"Yes." said Anton. "This led to fewer and fewer jobs. People stopped going to expensive universities. Why would you? No jobs! Then.... In the midst of this, KhanU emerged as a way to learn specific things, for specific jobs, and they kept your credentials in a blockchain."

"Ah," said Svetlana, "I know the chain."

"Yes you do," said Yegor proudly. "But I interrupted your grandfather telling you his tale first. Papa, please continue" said Yegor with a bow to Anton.

"Pah." Anton smiled at Yegor as he waved him away with his hands. "Where was I... Ah, yes. Robotics in Vladivostok. This experience took me to North America, to a small town called Dawson in Canada. This was before the Florida Flu, before all of that. In fact — this is way back when we really thought that we could do something to stop the climate from changing. And so, enormous effort was being poured into almost any strategy that promised to help reduce the amount of carbon in the atmosphere." Anton paused, looked outside at the stunted, tundra forest.

"I was in Dawson," said Anton, "working for a company that was trying to harvest carbon from the atmosphere, and then sequester this carbon underground. The company needed roboticists to help transport the carbon solids into abandoned mines. Anyway... this is just history now, and it didn't work anyway."

"In the midst of this, I met your grandmother, Katya." Anton smiled. "Shortly thereafter, we met this thorn in my paw" Anton smiled, and patted Yegor's shoulder. "And as Yegor has already explained, many things changed so we came back to Siberia. To home."

"So — you came back here, and started herding reindeer" said Svetlana, "I can't believe a robotics expert would become a herder..."

"It is a good profession!" said Anton. "But you know I never stopped, Sveta." Anton winked. "The Shepherds do their work, and I maintain the Shepherds." Anton looked out the window proudly, at the hulking multi-legged robots, now resting on their plastic and metal haunches as the reindeer milled peacefully around them.

"And here we have lasted for many years. Me working odd jobs and tending the homestead." said Yegor.

"Papa — " said Svetlana, turning to Yegor. "When did Mama fit into this?"

"Ah, my sunshine." said Yegor, smiling, but sad. "Your mama was a wonderful, brilliant woman. And we were a happy family. But, you know, the Flu came back..." Yegor stopped, eyes suddenly moist.

"Yes," said Anton. "The second wave of the Florida Flu took too many. My Katya, Yegor's Galina." said Anton. "But —" he whispered, as he scooped up Yegor's and Svetlana's hands, "We are still here." Anton said, squeezing their hands gently.

Yegor smiled, with streaked cheeks, and Svetlana smiled, too.

"And you are here doing amazing things!" said Anton looking happily at Svetlana. "Can you believe it, that when I was in school only a small number of people could work as effortlessly with computers as you do?"

Svetlana frowned. "That doesn't make any sense, everyone needs to know how to code."

Yegor chuckled. "Of course you are right, now. But back then, when your grandfather was a boy, very few people knew how to code. In fact, it was a very highly valued skill. One of the best jobs that you could have would be to work for a company and to write their computer programs."

Svetlana bursts out laughing. "Now you are certainly trying to make fun of me." she said smiling.

"I know this is impossible to grasp," said Yegor, "but what you did this morning, checking the predictive solar array and diagnosing the errors in the protein synthesizer - are two skills that would each have required a University education!"

"Well, then," Svetlana said, "may I have two degrees, please?"

"You can have any degree that you want," said Anton, smiling back.

They all laughed, and the reindeer herd looked up again at the sounds, then returned to wandering in their pens among the dwarf oak and slumped shepherds, as the sunset turned to dusk.

Figures S1- S10

The methodological overview for tracing the topic model output to the story-based scenario are outlined for each of the ten scenarios.

The methods for the ten stories:

1. Campus Utqiagvik (Supplement Page 44)
2. Nanook Station (Supplement Page 45)
3. Security Detail (Supplement Page 46)
4. The Last Preserve (Supplement Page 47)
5. Concession 60 (Supplement Page 48)
6. Putin's Gambit (Supplement Page 49)
7. Voice from the Past (Supplement Page 50)
8. Icebreaker (Supplement Page 51)
9. Assisted Migration (Supplement Page 52)
10. School's Out Forever (Supplement Page 53)

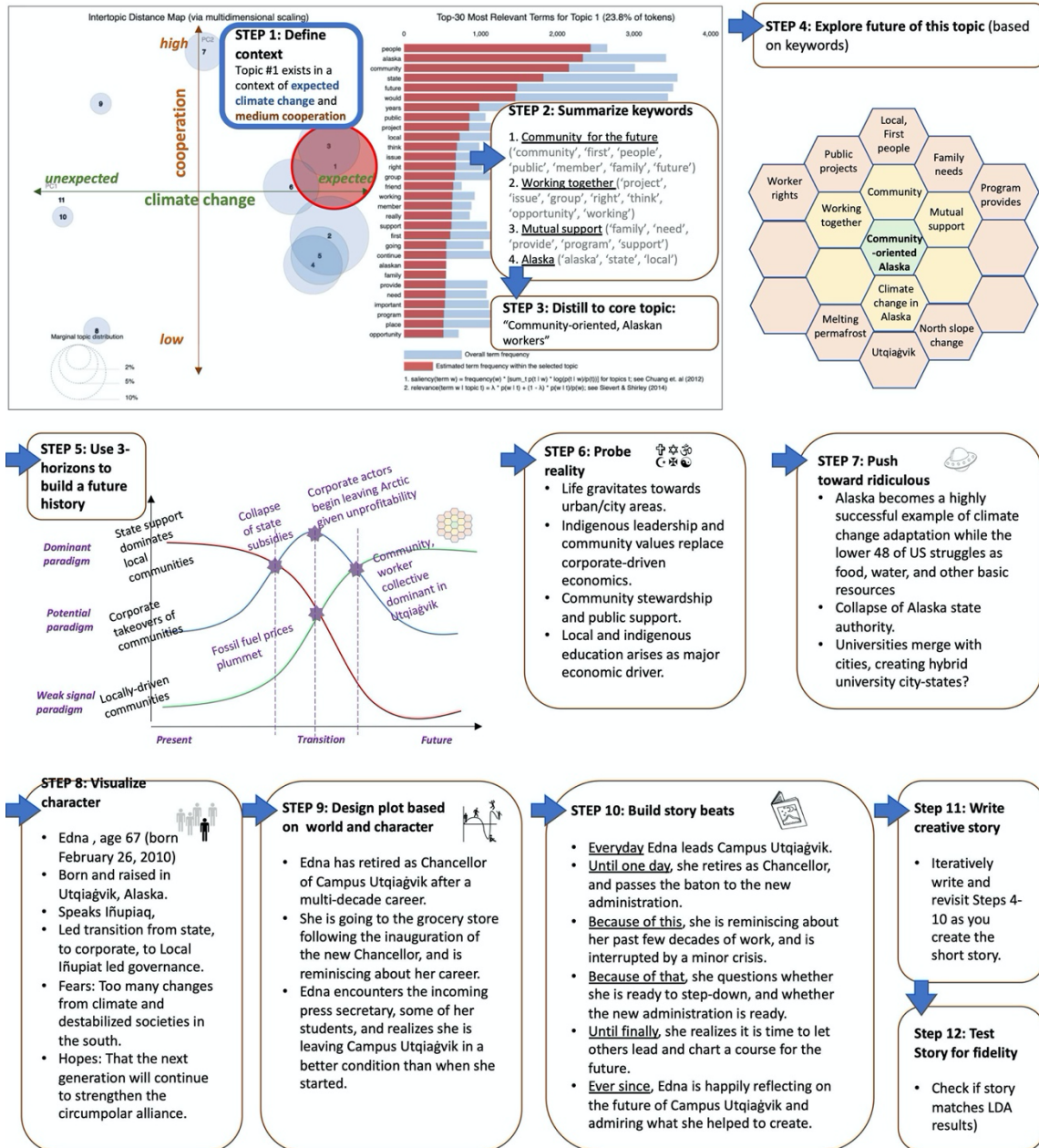


Figure S1. Methods for Topic #1 "Campus Utqiagvik."

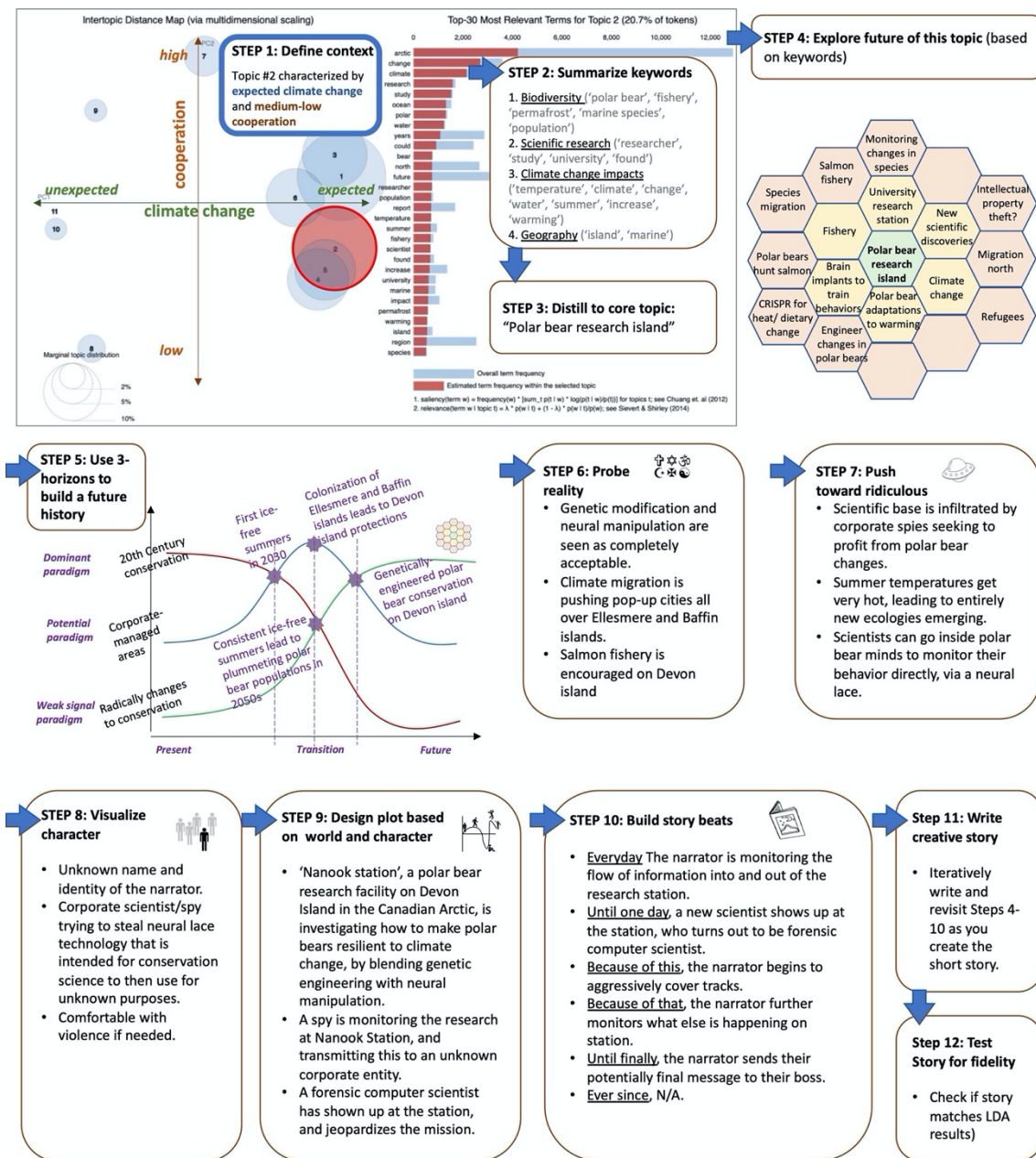


Figure S2. Methods for Topic #2 "Nanook station."

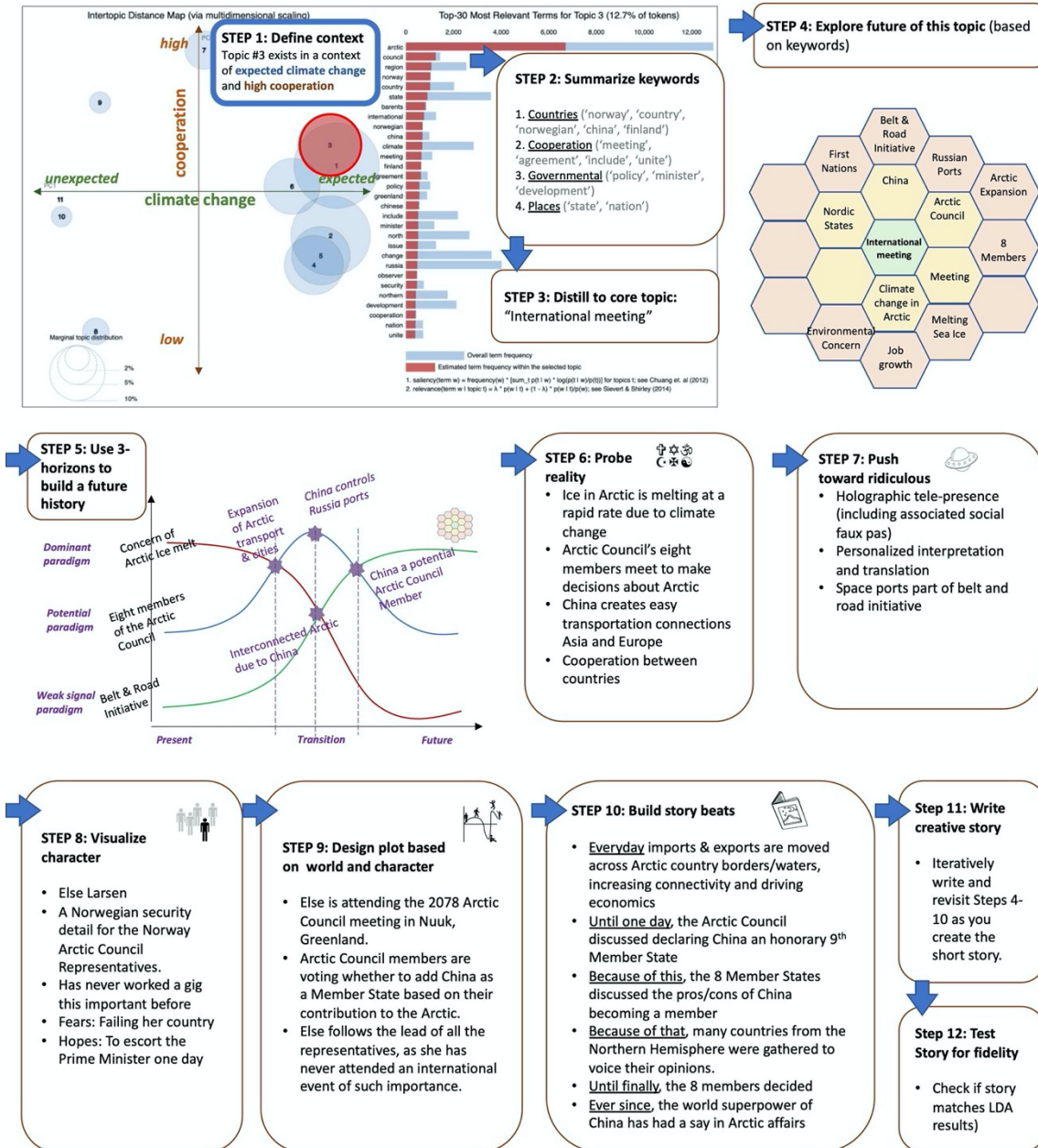


Figure S3. Methods for Topic #3 "Security Detail."

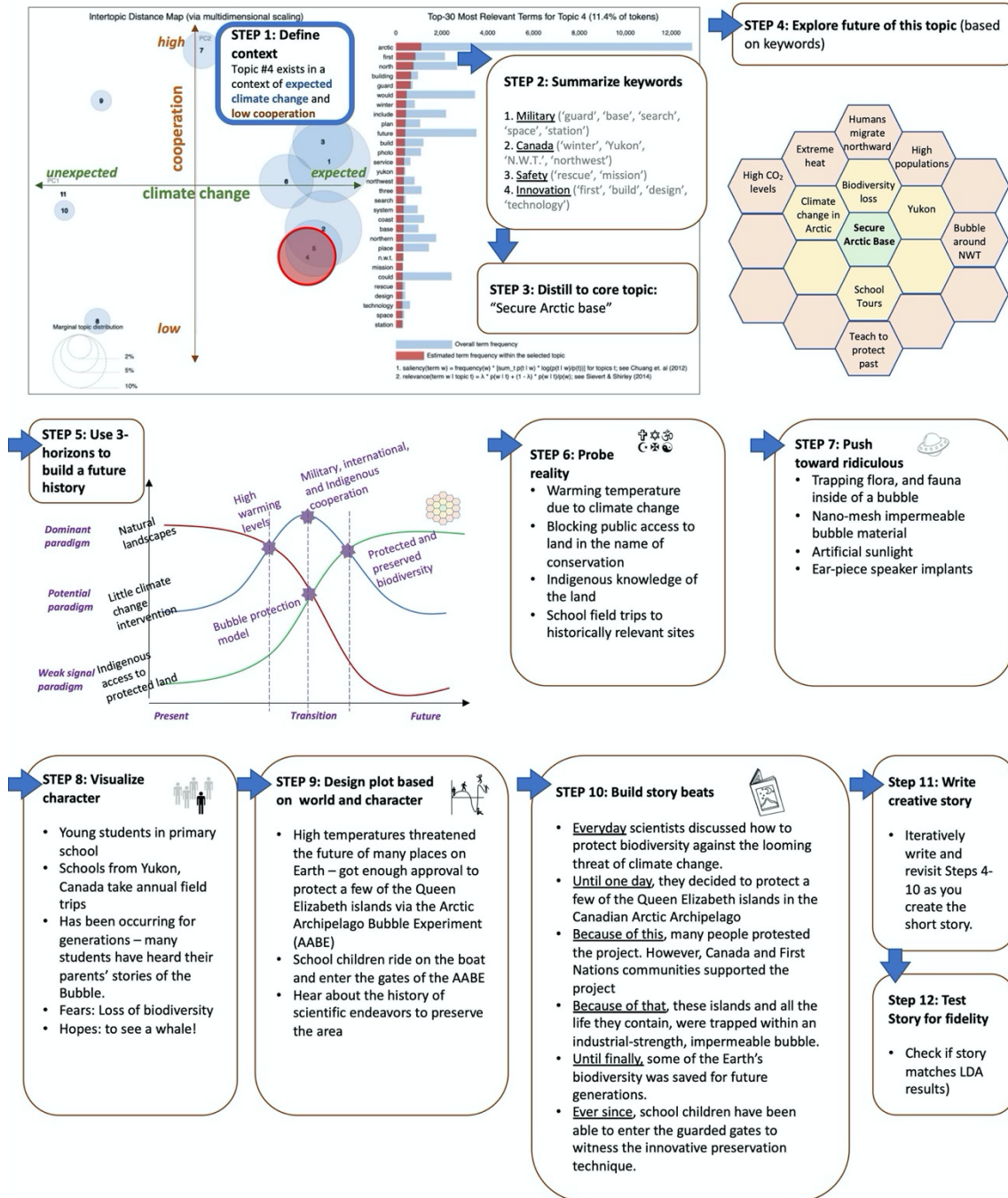


Figure S4. Methods for Topic #4 "The Last Preserve."

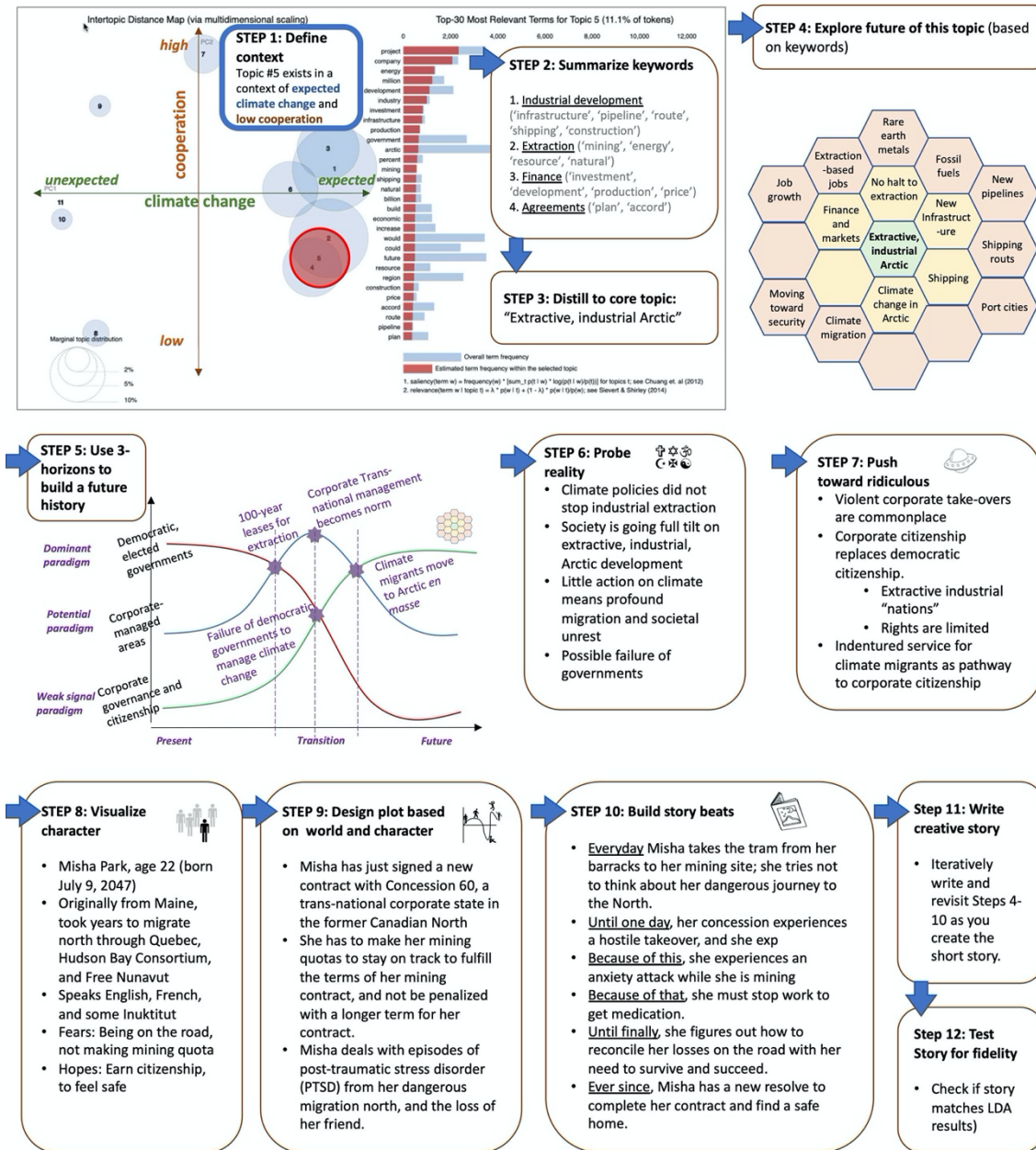


Figure S5. Methods for Topic #5 "Concession 60."

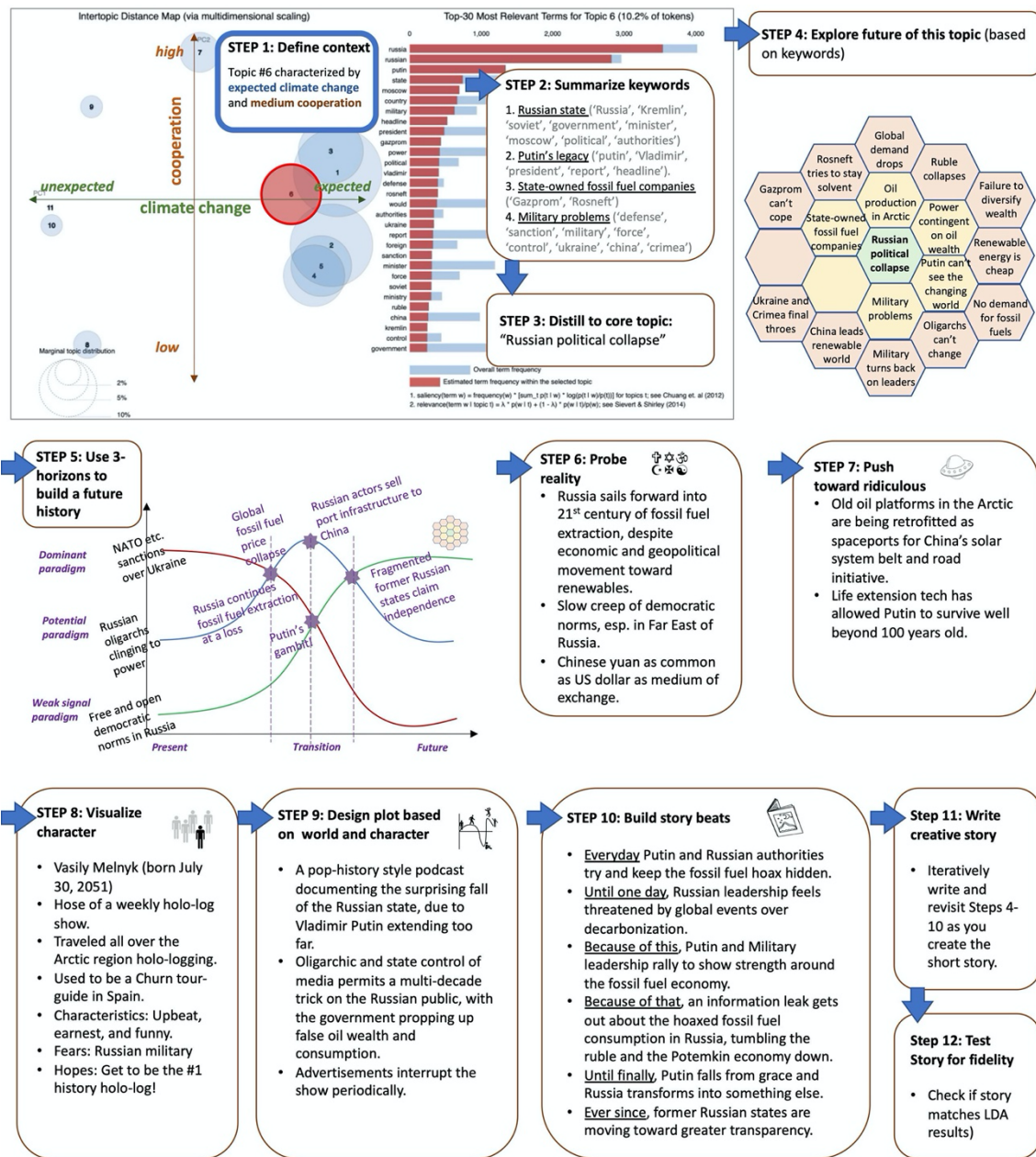


Figure S6. Methods for Topic #6 "Putin's Gambit."

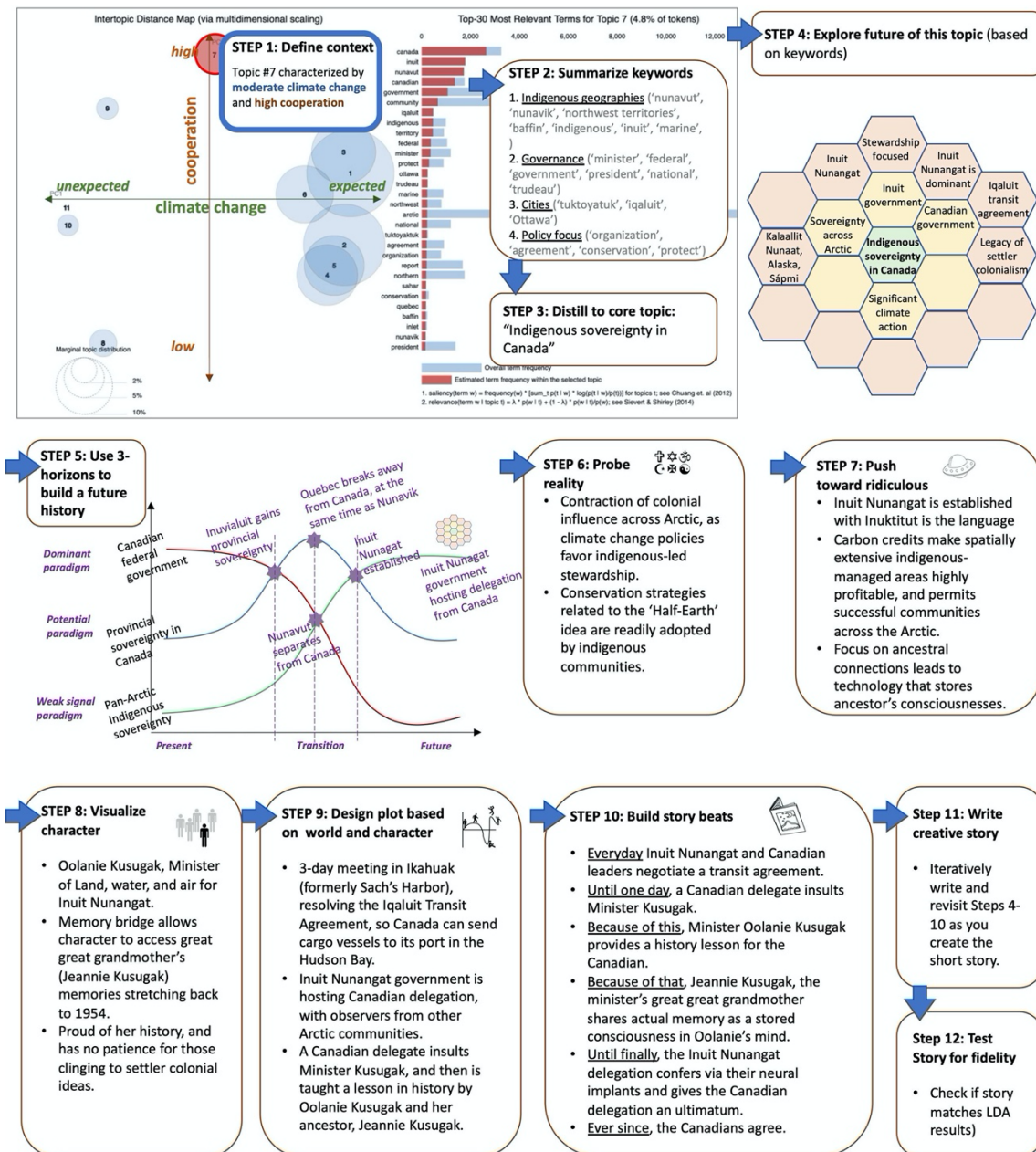


Figure S7. Methods for Topic #7 "Voice from the Past."

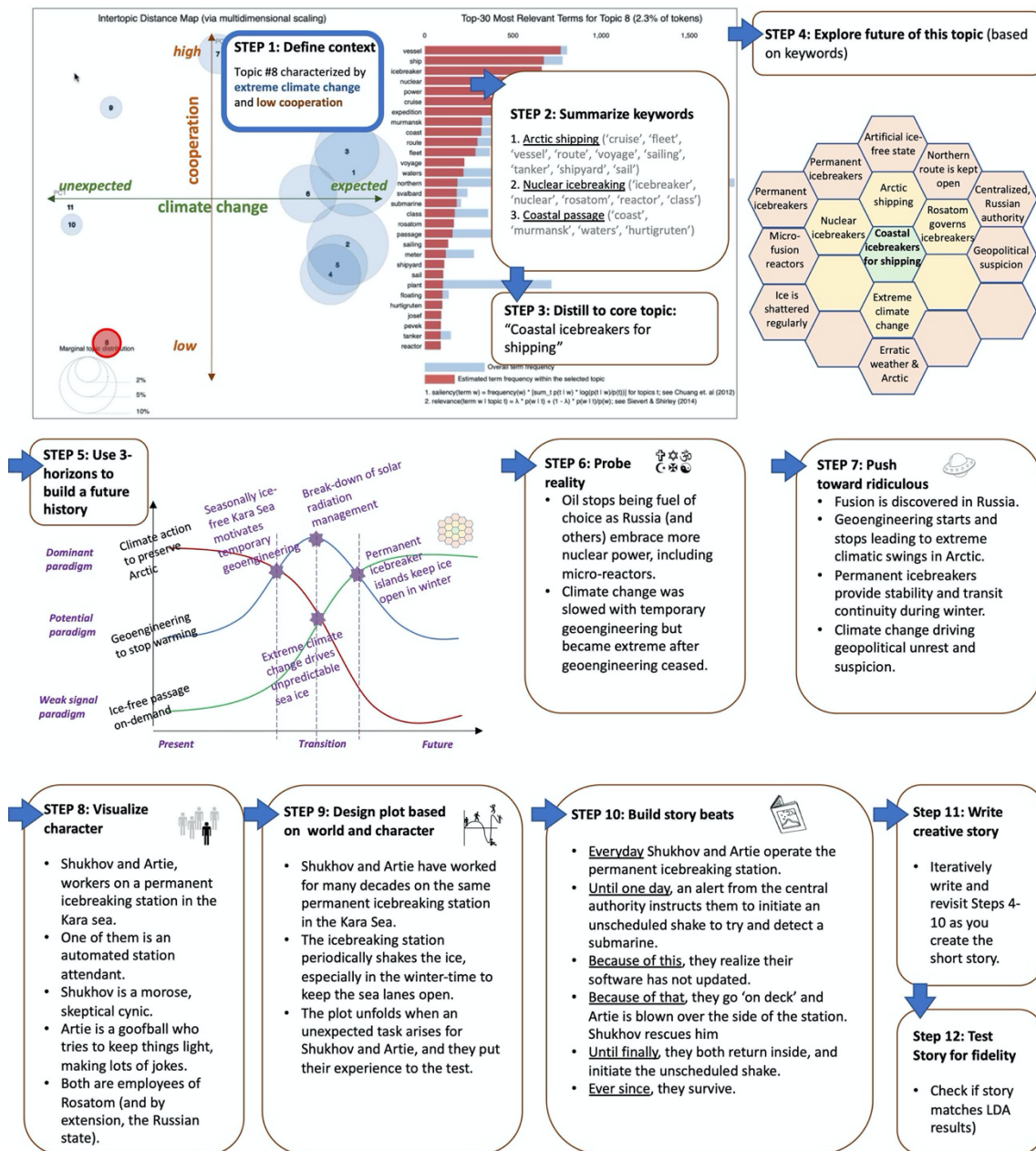


Figure S8. Methods for Topic #8 "Icebreaker."

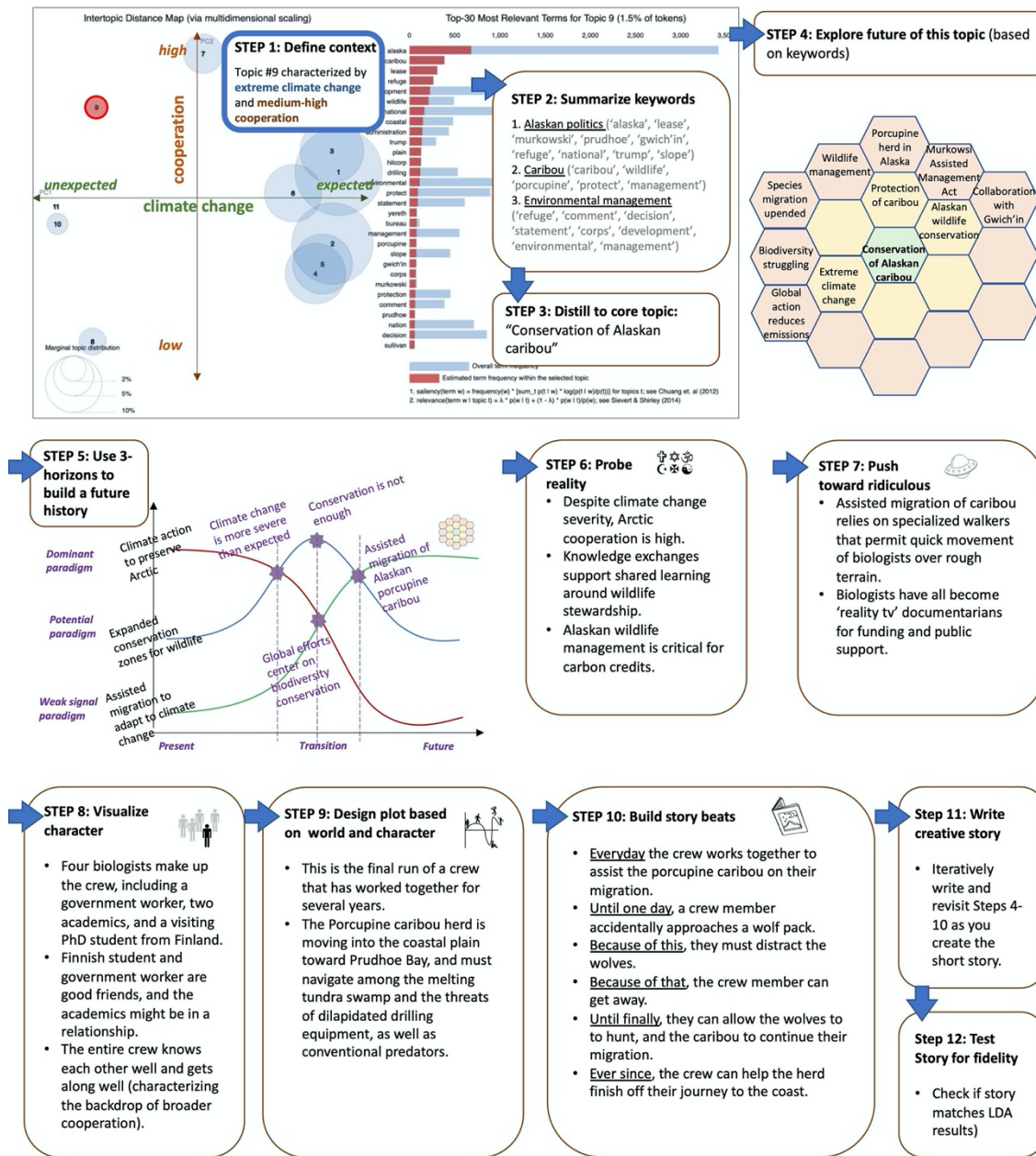


Figure S9. Methods for Topic #9 "Assisted Migration."

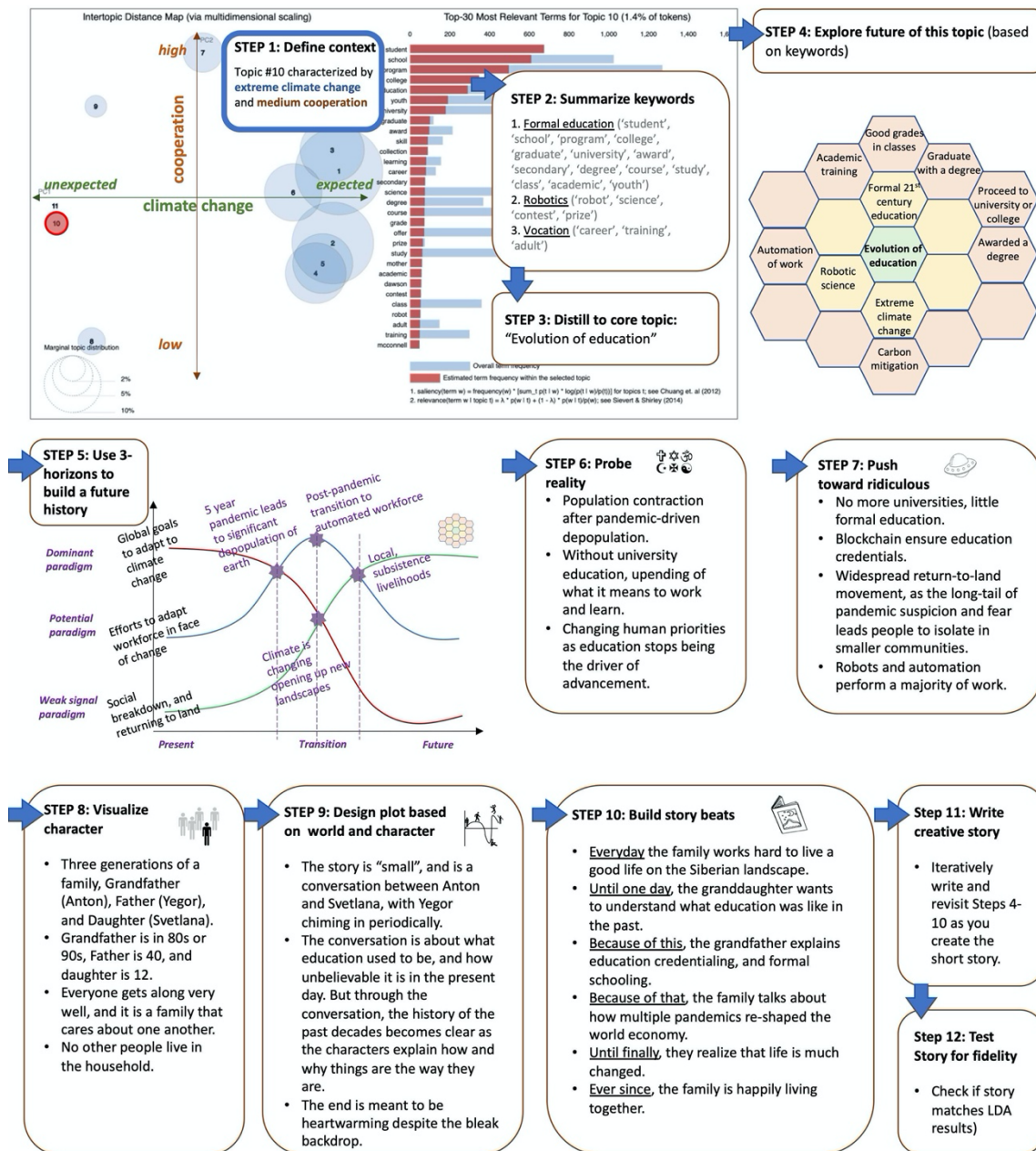


Figure S10. Methods for Topic #10 "School's Out Forever."

Additional information for corpus distribution by year of publication date.

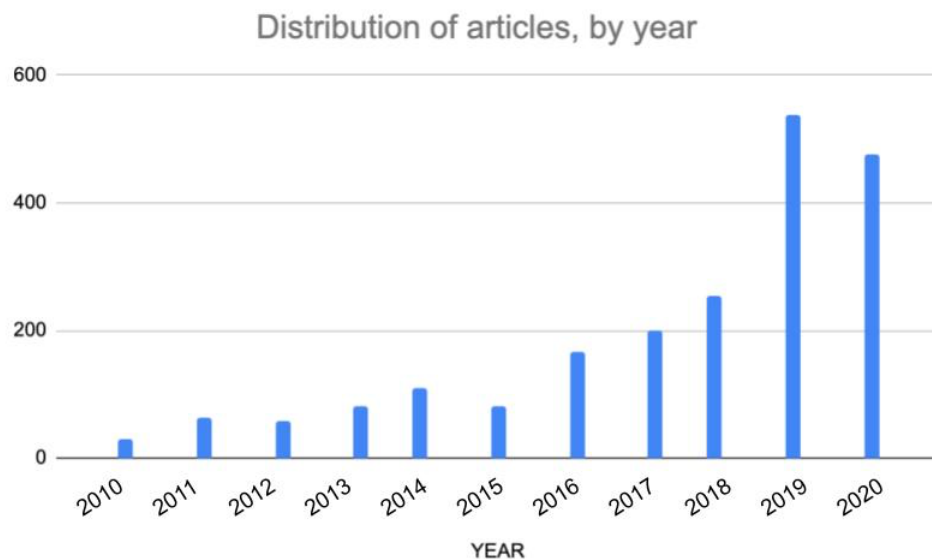


Figure S11. Graph showing distribution of articles across the 2,058 text corpus, between the years 2010 and 2020.

Additional information for Coherence score analysis

An iterative analysis based on varying the number of topics was performed to identify the highest Coherence score.

Comparison of number of topics versus Coherence score

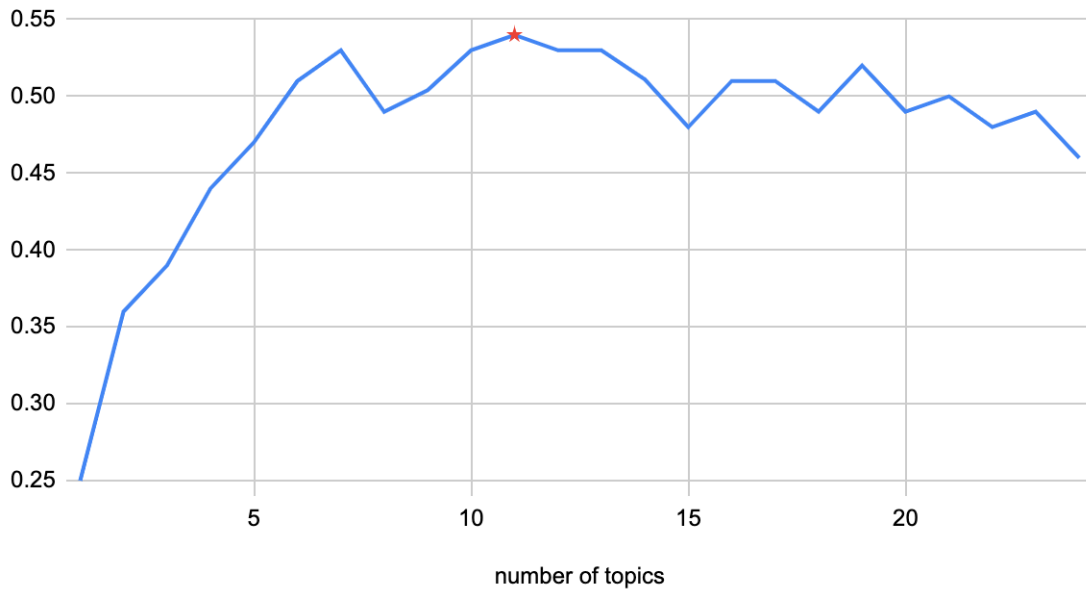


Figure S12. Graph showing the comparison of number of topics versus coherence score, using the metric C_v . The red star indicates the highest Coherence score of 0.54 corresponding to 11 topics. For more information on Coherence scores please see Röder et al., 2015.