



**University of Manitoba: “What’s the Big Idea?”  
Series 3, Episode 2 Feiyue Wang**

**TITLE**

**Reimagining the Arctic with environmental chemistry expert, Feiyue Wang**

**INTRODUCTORY MONTAGE:**

**SOUNDS OF WIND AND OCEAN**

**The Weather Network, January 2024**

But how about Hudson Bay? This is an anomaly. There’s a lack of ice coverage across Hudson Bay, particularly on the South and Eastern side of it. Look at December of 2023. It’s dipped. It is not frozen over completely. In fact, there’s open water.

**Winnipeg City News, August 2024**

Tuesday marks the grand opening of the Churchill Marine Observatory. A state-of-the-art facility that will enhance Manitoba and Canada’s position as a world leader in Arctic research. The Churchill Marine Observatory is a first of its kind research hub dedicated to the detection, impact and mitigation of oil spills while also studying the best ways to support Arctic marine transportation and adaptation to climate change. By 2100, the projection is there will be no ice at all year round the Hudson Bay. Wang says is a major change for the high Arctic.

**Excerpt from opening ceremony of Churchill Marine Observatory, August 2024, Dr. Feiyue Wang:**

As we stand here on the grand opening day of the Churchill Marine Observatory, we look forward to continuously working with the communities and working with indigenous knowledge as we move forward.

**MUSIC SWELLS**

**INTRODUCTION:**

**MICHAEL:** Welcome back to season three of UM's award-winning podcast, What's the Big Idea? I'm your host, Michael Benarroch, president and vice chancellor of the University of Manitoba. In this episode, I sit down with Professor Feiyue Wang, a Canada Research Chair in Arctic environmental chemistry and Associate Dean in our Clayton H. Riddell Faculty of Environment, Earth and Resources. Professor Wang leads the globally unique Churchill Marine Observatory in Hudson's Bay. This innovative lab allows researchers and our global partners to do game-changing science that will advance economic opportunities in the region and beyond. In fact, Professor Wang is leading REACH, or Reimagining Arctic and Central Canada Accessibility, through Hudson's Bay. The new research initiative is poised to realize Manitoba's true potential as a maritime province. This is truly a big idea with incredible potential. Join me as I discuss the frontiers of environmental science with Professor Feiyue Wang

**MAIN INTERVIEW**



**MICHAEL:** Your big idea is that climate change is opening a new economic frontier in Manitoba as a maritime hub and that UM can help ensure we responsibly leverage these opportunities. You believe in this so much that you've created something that goes by the acronym REACH. What's this all about?

**FEIYUE WANG:** I believe in this so much that I actually start to go everywhere, introduce myself as Feiyue Wang from the maritime province of Manitoba. So especially this would generate some laughs when I'm traveling in maritime provinces. But even outside of maritime provinces, you would get a bit of a bewilderment followed by some revelation that, yeah, you're right. Manitoba is actually a maritime province.

So, REACH is short for a research initiative that I lead, and its full name is called Reimagining Arctic and Central Canada Accessibility through Hudson Bay. Folks in this country, they're all very familiar with our Eastern Seaway via St. Lawrence Seaway, via Montreal, Halifax, St. John's. Folks are also familiar, we have a Western Seaway via Vancouver, Victoria. But right in the middle, of a prairie province, we actually have the third seaway through Hudson Bay Rail, to Port of Churchill, to Hudson Bay. This third seaway has been there in operation for almost 100 years. We're actually just about to celebrate the centennial in the next few years. But of course, the third seaway, the Hudson Bay seaway, has never nearly realized its true potential, primarily because of Hudson Bay's sea ice condition.

So up to this day, the bay and the port and shipping through Hudson Bay are limited by a very narrow window of three and a half months a year. When you have a shipping window that narrow, it hardly gains enough traffic and market to attract the investment to maintain, to upgrade infrastructure. So as a result, the infrastructure is very much outdated. And the other impact is it results in very poor accessibility in the region, both Northern Manitoba, but as well as the Western Hudson Bay. However, things have changed, changed very fast because of climate change. Hudson Bay's sea ice condition has changed dramatically over the last several decades. So, from 1980s, every year we gained on average one more day of open water. At this very moment, on average, the Bay is six months ice-free.

Climate modelling projected by end of the century the Bay is essentially ice-free. By essentially ice-free, I mean not necessarily no ice at all, but the ice is thin enough. From a shipping point of view, it's essentially free. So, we talk about a seaway that is already on average half a year that's navigable, and yet it's only been operated at three and a half months, right? So, by working with the community, we recognize that the solution to community resilience to climate change mitigation could actually very well be climate change itself because the Bay is becoming more open. So that provides the prolonged shipping season associated with that, of course, is the possibility that we could actually ship things along the rail, the port, Hudson Bay for six months, for nine months, and potentially for twelve months a year. So that is all this rich project is about. And there's a lot of interest from business, from other sectors. But as researchers, our interest is to make sure that this kind of a nation building type of development, first of all, of course, it has to be economically viable. Otherwise, it will not go, right? But in the meantime, as important as economically viable, it has to be culturally sensitive and appropriate and has to be environmentally sustainable. So that's really the goal of this REACH initiative.

**MICHAEL:** That's really fascinating. We've had other guests on the show who've talked about the thinning of sea ice and the impact on the global climate, the rise in temperatures, the catastrophic



effects that it's going to have. But you're now talking about a potential economic impact that would be positive, because as I understand it, going through a northern port would actually reduce the distance to Europe and other locations. But how do we ensure that we don't kind of create some of the same problems we've seen in other ports where there's tremendous amount of pollution. I mean, Churchill is a fairly sensitive ecosystem. Beluga whales inhabit the bay for a period of time. And how do we ensure that that's sustainable?

**FEIYUE WANG:** Absolutely. I think that's really the goal of this research initiative. We're not policymakers. We're not advocating for the development or trying to make it happen.

But we see the potential and the very name we say reimagining. By reimagining, we recognize the mistakes we did in the past for such major projects. And we want to reimagine ways for engagement and participation from local communities, they call the region their homeland, right? So, the entire REACH project from the very beginning was driven by community folks, especially by the town of Churchill, by communities from Western Hudson Bay, the Kivalliq region, you know, with the communities there. And they wanted to see development. They recognized the challenges. One of the major challenges they have is the accessibility zone. Because there's no off-season roads and the very limited shipping, marine shipping. So, everything had to be fly-in, right? So that accessibility issue resulted in isolation, result in higher living expenses, everything getting there. If you travel to the North, you can recognize how expensive the things are, resupply and everything. So that's kind of what this REACH project could help by making the communities.

So, the very first, objective of REACH is the accessibility. How do we take advantage of the Bay becoming more open? How do we improve the accessibility collectivity among communities? And the second part is with the REACH project, it will also provide, really realize this third seaway so that commodities from central and Arctic resource-rich regions could readily get onto the global supply chain.

But the proposal itself, before we talk about the new road or the new planning, the focus on two things. One is human rights. So, we recognize human rights. We recognize indigenous people have their rights to development. The second one is we call it One Health. So that is the health of human, but also the ecosystem. To indigenous people, health is not just the lack of disease, not being sick, but it's the well-being of people. And that well-being of people includes the well-being of the land, of the water. So, from their perspective, they don't see conflict between improving social, economic well-being and health of themselves. So that's the kind of philosophy, that's the guideline we draw from them. And we want to make sure that the project is called that. I'm the overall lead, but the project has co-PIs.

They're from the communities. So, we have the Inuit knowledge, Inuit elder, Davinia Brown from Rankin Inlet. It's a co-PI. We have the community leaders from town of Churchill, Mike Spence from Chesterfield Inlet. That's Samiani Samatak. And we have Nastanya Moulin from Manitoba Inuit Association. So those are indigenous co-PIs that were involved from day one.

And so that's what separated this project apart from other mega development projects. We want to make sure that the governance is in place, a design fully take consideration of how to respect, protect instead of violate human rights. We try to protect the environment instead of pollute environment.



**MICHAEL:** And just for our listeners, PI is principal investigator. So, what's unique about this is really it's not primarily led by an academic, it's co-led by community leaders and their communities together with the university, in that rather than we turn that around the way we normally do it, which is that the university leads, right?

**FEIYUE WANG:** Absolutely. Most of us from University of Manitoba or any academia, we are so familiar in Western science, but we recognize when it comes to local indigenous communities, they have a wealth of indigenous knowledge, local knowledge, traditional knowledge, they know their land. They view the world differently from other knowledge systems. So, for core development, we want to bring this different knowledge system together and see how we can reconcile, how we can learn from each other. So hopefully with that kind of integration or collaboration from the very beginning, the knowledge, the technology we develop at the end, not necessarily has to be state of the art, but it has to be accessible and acceptable by communities.

So, you may develop the state-of-the-art technology, but it simply does not work in the specific location. So that's why this co-development is very important. And that is why it sets this initiative apart from others.

**MICHAEL:** I mean, when you're speaking about this, you're speaking about developing the port or doing the research. At this point, it's really about doing the research, understanding the environment. But you talk about human rights, you talk about One Health. So, what kind of a team has to be brought together? I mean you've talked about elders and community leaders. What about on the research end?

**FEIYUE WANG:** Yeah, absolutely. So, this is, of course, is a very large scope research project. It cannot be led, cannot be done by a single person or somebody with limited training in certain disciplines. So, if you look at the team, it's truly what we call transdisciplinary in between and cross disciplines, but also sectors. So, it's not just academia, but also from communities, government. If we look at the University of Manitoba, I actually was reflecting on who was involved and who's not. So, the type of initiative we're envisioning, I think everyone on this campus could find some fit in it.

So, at this time, in addition to the co-PIs from communities, I just mentioned, those are all indigenous elders, community leaders, but we have folks from human rights, from faculty of law, we have folks from health science. They are working on infectious and public health disease and so on. We have folks from, of course, arts and business school, we have folks from social work, we have people from Faculty of Arts, Faculty of Science, Engineering. So just about every aspect that's related to how we can collectively create, working together with community, create the knowledge and technology needed. From the very beginning, we try to anticipate impacts. We anticipate what could be implications on human rights. What could be implications for environmental contaminants and for ecosystems.

And then we try to come up with a framework, whether it's governance, training, capacity building, or technology. For example, my own research will be related to oil spill. So, if you are talking about shipping, a lot of ships to this day, they need fuel, they need oil to power the ship. So, what if there's an oil spill in Hudson Bay? What can we do? First of all, if there's an oil spill in ice-covered water, do we even know whether there's oil?



And so, we need to develop technologies so that we can tell when oil spill happens, we know it's happening. And then we want to study the impact of that oil spill. And we are developing new technologies that are specifically adapted to cold waters so that if there is a spill, technologies are in place to mitigate. So that's the type of kind of a team that we bring together. And then of course, in addition to folks from University of Manitoba, we have academic researchers from University of Calgary, from Saskatchewan, from Wilfrid Laurier, from Ottawa, from Memorial University, just to name a few. And then we have collaborators, partners from all levels of government. Prairies Canada, for example, from Transport Canada, and provincial government. And we have indigenous-owned industry as our partner. That's the Arctic Gateway Group, owned by indigenous groups, including 40 some First Nations and the communities in the region. And of course, the type of research we do also has international implications. So that's why we have a large number of international collaborators, researchers from Denmark, from Finland, from Germany, from the UK, from the US, and from Morocco. So, it is indeed a very large, very heavily multidisciplinary team across not just academia, but government, communities, industry.

**MICHAEL:** And clearly with opportunities to have a global impact. I mean, you're talking about, the need for new technologies, for ways of doing things different in the North, which may not be in central parts of the world or in the southern parts of the world. And so, I think there's fascinating opportunities.

Now, I shared recently in our alumni magazine about the pride I have for our university being leaders in Arctic ice and climate change research. And I think we've talked a little bit about that. But you've been working in this field for a long time. How would you think of the evolution that's taken place that's led us to this point where we might be looking at opening this new gateway?

**FEIYUE WANG:** Yeah, that's a very good question. If I think about this one, it's actually very special for an otherwise prairie university to have a very strong and world-leading research program in Arctic science, in climate change. It's rather unusual. It's very special. If I think about evolution, if I think about the origin, I have to thank my former colleague and friend, Dr. David Barber.

You of course met him, and he suddenly passed away two years ago. David was a world-renowned expert in sea ice geophysics and in remote sensing on his own. But David was also a visionary researcher. From very early on of his career, he realized how fast the Arctic had been changing, especially from sea ice point of view. So, he recognized the need of understanding this change and potential larger scale social or economic implications. So, he realized that collectively, if we could bring a team with very different expertise, working together and mobilize at the same time, if we went to the field study, you have a group of people looking from different angles of a complex system, climate change and Arctic science is very complex.

And then you could do things that other groups will not be able to do. So that's the beginning of a centre called the Centre for Earth Observation Science, or C.E.O.S. for short. So C.E.O.S., the model of C.E.O.S. is a research centre, it's not a department. So, the faculty members associated with C.E.O.S., they came from very different backgrounds, from different departments. Myself, I'm an environmental chemist by training. You have a geophysicist, you have a microbiologist, you have folks from business school, from engineering, and from arts, and we work together. And so, when I think really now that I reflect on this



one, we were ahead of time when we talk about this multi-int-trans-disciplinary research. And then we can mobilize very quick, and we were able to really ahead of the curve and start to discover. It all started from front line, from scientific discovery. And with that, we really started to brought attention to all levels of government.

So C.E.O.S. at the University of Manitoba was co-leading the Arctic Net program with Laval University and that followed by, of course, the Amazon Canadian Research Icebreaker program. U of M played a leadership role in the last International Polar Year program and then followed with the appointment and the recruitment of several international high-profile research chairs, two Canada Excellence Research Chairs.

One Canada, one 50 research chair. So, it is because of this, David's visionary approach and this connective, collaborative group of people at the core. I'm not saying all the Arctic research is from C.E.O.S. but acted as a core to draw resources, right? So that's what I reflect on our excellence in Arctic research at C.E.O.S. and the University of Manitoba.

**MICHAEL:** Well, and then I can see the link then to the current project to REACH. You were already really multidisciplinary or transdisciplinary. You were all already used to working with people from other disciplines and thinking in that way. And so, it would be a natural evolution then to think about a project while the scale of it might be a lot bigger. That approach of looking at it from a transdisciplinary framework, partnering with indigenous communities.

**FEIYUE WANG:** That's very true.

**MICHAEL:** Would be more to the evolution of the work that was being done.

**FEIYUE WANG:** To me, I see this as a natural evolution, that along the way, of course, we build the long-term relationship with Arctic communities. That's key. That's the key to our research.

**MICHAEL:** And I think David would be thrilled to see this.

**FEIYUE WANG:** I sure hope so.

**MICHAEL:** Let's talk about the Churchill Marine Observatory and how it's a critical piece of the work that REACH is doing and the future success. It's a really unique lab.

You know, there's people from around the world who are really excited about this opportunity. Can you tell us a little bit about the Churchill Marine Observatory, why people are interested in it and how it's going to generate new research and why it's so important to reach?

**FEIYUE WANG:** Yeah, absolutely. As we mentioned from the beginning, we are a maritime province, so I'm very happy that for the first time in our province history, we now actually have a marine research facility. So, to me, it's long overdue.

The Churchill Marine Observatory has several major components. It's located right in the town of Churchill, near the Port of Churchill. It's the only deep-water Arctic port in the entire North America,



especially with a ground access to the south. So that alone really make the location very unique. And so, the facility has two major components. The first one is what we call the ocean sea ice mesocosm. So essentially those are the fancy word about the two outdoor swimming pools. We fill the pools with Hudson Bay seawater and one of them we could use as a control study, the other one allows us to simulate, to model different scenarios.

The second component of the Churchill Marine Observatory is environmental observatories along the main shipping corridors from part of Churchill, the mouth of the Churchill River, through Hudson Bay to Hudson Strait. And what those observatories do is they are monitoring baseline conditions of oceanography, of sea ice conditions, of marine mammal behaviours. So, we can study the impact of shipping or other activity, other developments.

And along with that, we also have a partnership with the Arctic Research Foundation to have to operate a research vessel. So, for the first time, a Prairie University will now have a research vessel called the William & Kennedy. So, she could take researchers and community folks around the Hudson Bay that allow us to do direct sampling at different locations along the bay. So those three components make up the Churchill Marine Observatory.

And from its very stage conception to design, it's meant to facilitate, to improve understanding of what the current climate change, the rate is and what are the challenges and opportunities associated with development. So that's really the main mandate of the Churchill Marine Observatory, provides both a baseline, real-time baseline conditions to evaluate natural evolution of the system, but also allow us to study the potential impact and mitigation of development opportunities throughout the Bay and in the region.

**MICHAEL:**

So will researchers, will graduate students be able to bring their ideas and test them at the observatory?

**FEIYUE WANG:** Absolutely. So, this, the observatory itself, especially the mesocosm, essentially, it's an outdoor laboratory on the roof. So basically, using chemists' vocabulary, it's just a big vessel for me. It's a big beaker to me, right? So, this is where you can test ideas, you can develop technology, and you can also train people with new technology and work, experience of working in the Arctic. So just like most of the research facilities we have at the university, and those facilities, the primary users are indeed grad students, undergrad students, including in this case, indigenous youth and community researchers from town of Churchill, as well as from nearby region.

**MICHAEL:** So, they'll all have access to the Marine Observatory.

**FEIYUE WANG:** Yes, and if you, when you are going there to visit the Churchill Marine Observatory, I encourage you to find a little extra feature. In the design stage, we want to make sure that what we do in the pools, and folks could actually have a visual understanding or a realization of what we do. So, we actually, in the concrete wall, we built this viewable window. You can actually see how ice grow on top of the seawater, grow down where. So those are the features specifically meant for outreach, but also for school-aged kids so that they get understanding from their own eyes.



**MICHAEL:** Right, so it's more than just a research facility. It's also an educational facility somewhere where we hope groups of students will come to learn and gain a better understanding.

**FEIYUE WANG:** Especially in the small town in the north, right? Any opportunities to engage youth, to engage school-age kids so that they could relate. My goal eventually is those research will be done by researchers from communities themselves. So, we're working together toward that.

**MICHAEL:** And when you think about opportunities like opening Canada's third port, here in Manitoba, and all the economic prosperity that that might bring, REACH and the CMO, I think are positioned right now as real game changers. If REACH achieved its highest goals, in your mind, what would the impact be for Manitoba?

**FEIYUE WANG:** For Manitoba, I would like to see that we are truly recognized as both a prairie province and a maritime province, that we have enormous opportunities and challenges as well in the north. And with the increase in shipping activities, I would like to see more meaningful engagement from the very beginning with the community to make sure any industrial economic development will benefit indigenous and local community first and foremost. And the increased collectivity among northern Manitoba communities and the mobility that it will result in, hopefully that will bring long-term social economic prosperity and, in the time, where climate change has indeed brought with it many challenges to communities both in the South and the North. But in this case, we think that this kind of development, enabled by a changing climate, could in the meantime address to some extent those challenges.

**MICHAEL:** Well, and clearly Canada and the leaders in Manitoba agree they've invested in the railway upgrade. And as you said, there's a lot of interest from other countries. So, what does this mean for positioning Canada and for those countries in the north? Again, if REACH were to be successful, what would it mean for all of them?

**FEIYUE WANG:** Yeah, I think from Canada, we do recognize the vast scope and the potential application to the entire country. So, this is indeed a nation building type of project that will change how shipping transportation is done in this country. We're not saying we introduce a new road. We're saying that we are enabling the third seaway that has been there for almost 100 years to realize its true potential. So, it will affect how accessibility in this country, how commodities, resources are being shipped in-out from Canada. Along with that, the benefit to Canada would be to see social economic prosperity, collectivity in one of the least connected communities, because of a lack of roads. And the other main major beneficiaries would be Central, Western Canada and Arctic Canada, we are resource rich and there has always been pressure to get commodities to the global supply chain. So, this would open up these two regions, Western Hudson Bay, Northern Manitoba, see improved the collectivity and central and Arctic Canada with better access to the global supply chain. We do believe that Canada as a whole will benefit from this development.

Looking at the globally, I think everyone is recognizing the increase in pressure on the global supply chain, right? Because of the geopolitical instability in different parts of the world. Almost every day we probably hear news here or there about how different roads become less reliable. In addition to that,





climate change also changing how global supply chain works, right? Panama Canal over the last 18 months, because of climate change, the canal is becoming shallower and shallower, and a lot of traffic are basically waiting to get through with a heavily congested Panama Canal. So having this new, renewed, reimagined third seaway from Northern Canada, hopefully will contribute to the global supply chain in terms of its stability and reliability. So as a team, we do feel this project has the potential for enormous implications, benefits to both the region, to Canada and the world.

**MICHAEL:** Well, thank you for that. And as you said, and our hope is in a sustainable way so that we can begin to model sustainable economic behaviour in shipping, which I'm not sure it's always taken that as a central feature of what its primary goal has been.

**FEIYUE WANG:** Thank you. That is exactly what drives this research. Again, we want to make sure that any future development plan, design optimization has this criterion that has to be economically viable, but it has to be culturally sensitive, appropriate, and environmentally sustainable.

**MICHAEL:** Thank you.

#### **Excerpt from Churchill Marine Observatory opening, August 2024**

**MICHAEL:** But I do think that one of the things that we're trying to nurture at the University of Manitoba are big ideas. And big ideas that we want to bring to life. And so, I think, what we're doing today is celebrating one of those big ideas that has been led by the University of Manitoba with many partners. The Churchill Marine Observatory was ramped up by one of the world's greatest sea ice researchers, the late distinguished professor, Dr. David Barber. I want you to know that everywhere you look in this building, David is there.

#### **[OUTRO MUSIC FADES IN](#)**

**MICHAEL:** Thanks for listening to What's the Big Idea? You can learn more about this and other big ideas by visiting [umanitoba.ca](http://umanitoba.ca). And don't miss the next episode, which will feature my upcoming event with the brilliant author, journalist, and UM alum, Amanda Lang. You won't want to miss it. Until then, keep thinking big.