Climate Change Preparedness in the North Program

Project Proposal – Example of Project Form

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PROJECT TITLE:	Coastal hazard assessment for the community of Grise Fiord (Aujuittuq), Ellesmere Island
NAME: (Person/Organization)	David Didier, PhD., Université du Québec à Rimouski & Geological Survey of Canada-Atlantic Jordan Eamer, PhD., Geological Survey of Canada-Atlantic Alexandre Normandeau, PhD., Geological Survey of Canada-Atlantic
MAILING ADDRESS:	David_Didier@uqar.ca
PRIMARY CONTACT (Name, Title, Phone, Email)	David Didier, PhD., 1-418-318-0143, David_Didier@uqar.ca
BRIEF SUMMARY (2-3 sentences)	The community of Grise Fiord is facing coastal hazards during storms and is increasingly exposed to storm waves as protection from multiyear coastal sea ice is reduced. Wave energy is expected to increase at the coast for a longer period of time during the open water season as a result of sea ice shrinking, therefore impacting the coast and promoting coastal erosion, overwash and flooding. As climate changes in the Arctic, adaptation strategies is required in Grise Fiord in order to minimize the damages to roads and infrastructures. This project will establish a first quantitative assessment of coastal hazards, a shoreline evolution analysis and propose a coastal flood map for the community of Grise Fiord.
START & END DATE	September 1st 2020 – September 1st 2021 (Phase 1) September 1st 2021 – September 1st 2022 (Phase 2)
AMOUNT REQUESTED	$90 333 (Phase 1 -2020-2021) $136 333 (Phase 2 – 2021-2022)
AMOUNT PREVIOUSLY RECEIVED	$0

Project in brief

This project submitted to the Climate Change Preparedness in the North (CCPN) Program is intended to be implemented by a team of scientists from the Université du Québec à Rimouski and the Geological Survey of Canada. The team has a significant expertise in coastal sciences but also in multidisciplinary research focusing on multi-hazards and risk assessment. As preliminary discussions have already been started with CIRNAC and community members, the team will continue to work closely with the community of Grise Fiord toward direct actions to find better adaptation strategies under increasing storm impacts.

1. Backgrounds and Key Issues

The community of Grise Fiord is located at the base of westward-oriented mountainsides at low-altitude elevations on a mixed sand and gravel beach terrace. Affected by metocean conditions such as waves and tides, and locally constraint by topography, the coast of Grise Fiord is highly sensitive as its dynamic state is driven by sea ice conditions. That means that if sea ice conditions change, so does the beach morphology. Exposure to southerly winds in the open water season makes the coastline stability highly dependent on the presence of shorefast ice (i.e. sea ice in the nearshore zone). Sea ice typically provides a protective role against incoming wave energy, but as noted by community members, coastal erosion is now faster in the whole region. Although the scientific understanding of coastal dynamics is currently negligible in Grise Fiord, traditional knowledge is key to understand the impact of climate changes in this remote Arctic community. Recently, it has been shown that Grise Fiord is amongst the most sensitive community in the Canadian Arctic because it has the largest sensitivity of shorefast ice breakup to springtime temperature: in the future, this breakup will occur earlier in the season, reducing shorefast ice (Cooley et al., 2020). Storms are expected to hit harder, and more often, this inhabited coastline.

Coastal vulnerability in Grise Fiord was recently brought up by the community members and the Iviq Hunters and Trappers Association (HTA) as a top priority issue in a context of climate change. Preliminary virtual discussions with community members and elders underlined a general perception of a changing coastal environment in Grise Fiord. Residents feel that 'waves are getting bigger', and that waves and ice are now hitting the cabins, a first time in at least a decade. Moreover, according to residents, old campsites appear to be eroding, shacks are being damaged and house foundations are exposed to high waves during storms.

Climate change is also affecting daily activities such as fishing, namely by damaging fishing cabins on the upper beach – not just near the village, but also built around the Grise Fiord and Jones Sound. Changes have been noticed on the beach morphology as well. Originally, the beach was mostly composed of fine grained sediments, creating a mild slope and therefore a perfect access for the boats directly in front of the village. Gravel is now dominant, increasing beach slope and limiting the access. Trucks are now needed to bring the boats to the beach. Such changes directly impact the socio-economic development of the community: airplanes used to land on the beach, but it's not possible anymore. A small craft harbor is expected to be built soon by Transport Canada in Grise Fiord. Therefore, morphological and sedimentary changes on the beach need to be addressed in order to select efficient adaptation strategies around the harbor and the village. A recent feasibility study for the harbor underlined the need for better understanding of waves, wind and storms for an effective harbor project, because these factors impact the beach characteristics. Acknowledging that community resources is critical to the development of the harbour concepts, Advisian (2020) clearly mentioned a lack of information about beach topography. This research project will cover these aspects, which are crucial information for any coastal hazard assessment.

Coastal erosion and flood mapping are adequate tools in helping a better planning in a context of climate change, such as selecting new safe areas to build or move houses. Focusing on coastal hazards, this project will address these issues and provides a new coastal hazard mapping for Grise Fiord in a context of changing sea ice covers and storm regimes.

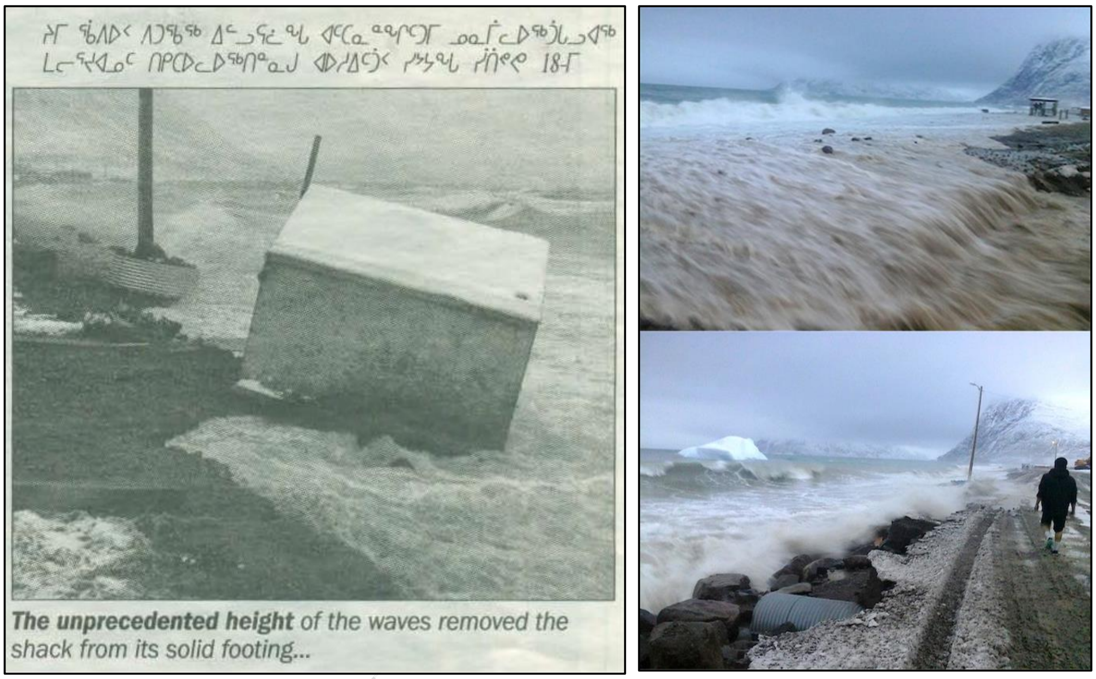

Figure 1. Picture taken by Jimmie Qaapik (left) in the NNSL media, September 18 2011 . The news mentioned ‘waves perhaps higher than residents’. During the event, a Nunavuk Power Corp. light pole was also affected by waves, along with boast and qamutiks. On the right, pictures by Bernard Ungalaaq Maktar in the Nunatsiaq News show major overwash and direct wave breaking on the rip rap that protects the road on August 20 2016. The news said that ‘big waves threatened infrastructure’.

2. Partner Involvement

The research project will be implemented by academic and federal research scientists from the Université du Québec à Rimouski (UQAR) and NRCAN GSC-A. Due to the COVID-19 context and travel restrictions, a first phase of the project will take place using available and newly acquired datasets and remote sensing analysis using GIS and modelling. Data will be provided both by the Geological Survey of Canada and the Government of Nunavut Community & Government Services Planning & Lands Division will be provided alongside scientific expertise both from UQAR and the Institut des sciences de la mer (ISMER) teams. Topobathymetric data acquired by Advisian have already been shared by DFO and GSC-A, and will directly be integrated into the project. Moreover, Transport Canada shared oblique imagery from flight surveys over Grise Fiord. The Laboratoire de dynamic et gestion intégrée des zones côtières (LDGIZC, UQAR) will provide assistance in processing seamless topobathymetric products used in hazard simulations. With the help of a Master student, UQAR will offer scientific expertise in shoreline evolution assessment and coastal modelling for short to long-term land use planning in the coastal zone. More than ever traditional knowledge will directly validate hazard simulations and mapping. The Iviq Hunters & Trappers Association (HTA) and the Hamlet will therefore provide invaluable knowledge on coastal dynamics and historical extreme events. CIRNAC is already providing insights on the project development, and will continue to be informed in all steps.

During the second phase of the project, validation will take place with community members along the coast of Grise Fiord in the 2021 open water season. Active involvement from the Hamlet and HTA will help in understanding and monitoring actual coastal changes in natural areas and near the new harbor construction site. Interviews with residents, including youth, Elders, women, men, and families will help gathering qualitative information about coastal changes around the community but also around the land used during daily activities. A participatory project on coastal dynamics with community members using timelapse imagery will be proposed during community outreach, to eventually target an implementation along the coast. This would help scientists in determining the current natural hazards impacting the infrastructure and socio-economic development, but would also contribute to community engagement and empowerment to better address the community's priorities and increase the possibility for sustainable solutions in Grise Fiord. A detailed table including all partners and linkages is included below.

Table 1. Project team (science and Inuit knowledge)

Name	Role	Organization	Email and/or Phone no.
David Didier	Coastal evolution and hazard mapping	UQAR, GSC-A	David_Didier@uqar.ca
Alexandre Normandeau	Seabed mapping and sedimentology	GSC-A	Alexandre.Normandeau@canada.ca
Geneviève Philibert	Geomorpholgy and seabed mapping	GSC-A	genevieve.philibert@canada.ca
Antoine Boisson	Coastal evolution and hazard mapping	Université Laval and UQAR	antoine.boisson.1@ulaval.ca
Jordan Eamer	Coastal geomorphology and seabed mapping	GSC-A	jordan.eamer@canada.ca
Stéphanie Coulombe	Permafrost and climate change studies	POLAR	Stephanie.Coulombe@polar.ca
François Noel	Rockfall and landslide hazard mapping	Geological Survey of Norway	francois.noel@ngu.no
Inger-Lise Christensen	Inuit knowledge	Office manager of the HTO	iviq@baffinhto.ca
Marjorie Dobson	Inuit knowledge	Hamlet Senior Administrative Officer	gfsao@qiniq.com
Mathieu Belisle	GIS, remote sensing and drone surveys	UQAR, LDGIZC	Mathieu_Belisle@uqar.ca

3. Workplan, Research Goals and Priorities

The main objective of this proposal is to provide a first coastal hazard assessment for the community of Grise Fiord, including erosion and flooding. We specifically propose to:

1) Retrieve and acquire all available information on historical imagery, topographic and bathymetric data and provide a quantitative assessment of shoreline evolution for Grise Fiord (September 2020 - March 2021);
2) Model the wave and current conditions in the nearshore based on available historical wind datasets and, most importantly (September 2020 - March 2021);
3) Validate hydrodynamic model simulations with in situ measurement of waves and water levels April 2021 - March 2021);
4) Establish a coastal hazard map based on numerical and empirical models of total coastal water levels (Preliminary report in March 2021; Final report in March 2022);
5) Implement a coastal total water level prediction tool for Grise Fiord (Jan. 2022 - March 2022).

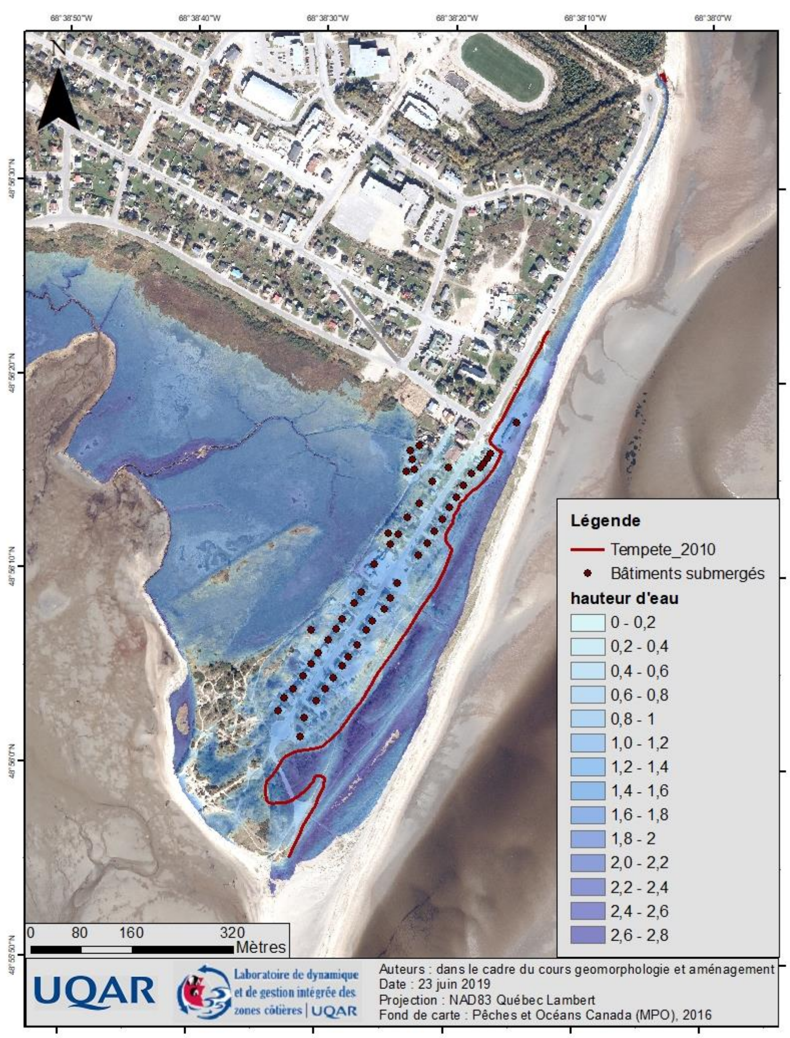

Figure 2. Example of a coastal flood hazard map made for the Pessamit community in the Gulf of St. Lawrence (work in progress at UQAR).

4. Methodology

4.1 Coastal evolution

This phase of the project is entirely done from remote analysis and image processing with the help of a master's student in geography based at UQAR. A second student (bachelor) would be hired to help with image rectification and shoreline delineation. Using available and newly acquired aerial and satellite imagery, a coastal evolution assessment will be implemented. Historical archived aerial imagery (1959-1995) will be ordered from the EODMS portal, numerized at 2000dpi from raw products, and orthorectified using PCI Geomatica and the ArcticDEM as the basis for vertical elevation reference (freely available online). High resolution satellite imagery (pix. 30-50 cm) covering the remaining period (1995-2020) will be acquired from Digital Globe for the entire Grise fjord, including the community of Grise Fiord and the coasts along Jones sound at the Fjord entrance.

The coastline will be manually digitized in ArcMAP for each image dataset, resulting in multi-year coastline vector layers. Coastline cross-shore migration will be calculated using the programming software Amber and MobiTC, both running under the R software (open source software). Statistical analysis will be performed to better understand long-term behavior of the shoreline, such as trends and cycles. Empirical predictions of future shoreline locations will be determined as a preliminary assessment of the erosion hazard.

4.2 Coastal Topography

Obtaining high-resolution digital elevation models (DEMs) is crucial for coastal flood assessment. The ArcticDEM will first be used as it is freely available, but its coarse resolution will need to be improved with field works in summer 2021. Drone surveys will be conducted over the community to recreate the coastal topography using photogrammetric analysis. This work will be carried out with local assistants to create a local expertise to conduct other similar repeated surveys throughout the following years. This will help in understanding the coastal dynamics and beach changes.

Cross-shore topographical beach profiles will be carried at specified interval, typically 50 m, to obtain the entire intertidal topography, including intertidal bathymetry, which is difficult to acquire both with drone flights and multibeam surveys. Using the available bathymetry provided by CHS and DFO, and combining these products with topographical datasets (ArcticDEM and newly made, more precise DEM products), seamless topo-bathymetric surfaces will be constructed in Grise Fiord, which will enable hydrodynamic modeling.

Figure 3. Installation of pressure sensors for wave and water level measurements (A), drone surveys (B) and high-resolution vertical measurements of the beach topography using RTK-GPS (C). These works will be conducted in summer 2021 to validate the preliminary assessment.

4.3 Waves and Flood Hazard Modelling

Traditional knowledge has shown that the wave climate has changed in recent decades in Grise Fiord, particularly during in August and September. Due to a longer open water season, wave propagation in the nearshore zone (i.e. when the bathymetry becomes shallower) is also expected to change as the offshore waves are becoming higher due to sea ice shrinking during more intense and more frequent storms. During a preliminary discussion with community members, some people recently witnessed extreme wave heights that have never been seen before. A community member further mentioned that they were once able to bring their boats on the beach, while ‘’*trucks are now necessary because the beach are steeper and more rocks are present*’’. These changes in the coastal environment could be due to many factors, but presumably a change in wave breaking patterns and location under changing storm surge amplitudes could be the cause. During this project, these coastal changes will be studied.

In most Arctic communities, there is a lack of in situ measurements of waves and storm surge. According to the Advisian technical report (i.e. the feasibility study for the harbor construction) (Advisian, 2020), southerly storms dominate and thus incident wave propagation toward the community is mostly from the south. According to numerical simulations using Mike21, Advisian obtained 50-yr significant wave height of ~3 m just offshore the community. These simulations indicate significant wave height (denoted H_s) close to 1 m on the beach. However, the model was not validated against in situ observations, and this step is necessary in any coastal hazard assessment to better understand model uncertainty.

Wave and water level will be acquired using both an offshore buoy and nearshore bottom-mounted sensors. This will help in understanding wave energy dissipation between the offshore zone and the beach, and to better assess the contribution of nearshore processes to the total water level on the beach, such as wave setup and runup. These datasets will be directly integrated into hazard modeling, but also to validate the wave model results. Wave simulations will need to be validated against observations prior the creation of coastal risk maps in order to minimize the uncertainties prior the selection of any adaptation strategies.

4.4 Coastal Hazard Mapping

We propose a coupled, two-steps approach (Fig. 4) to assess the coastal flood hazard in Grise Fiord. A 'bathtub' flood simulation (Fig. 4A) will first be conducted based on available digital elevation models (ArcticDEM) and empirical total water level (TWL) relationships. TWL is the summation of the observed water level (including the tide level plus the storm surge) and the wave runup component, calculated using typical formulations widely used in coastal management and engineering (Didier et al., 2020; Stockdon et al., 2006). Using the already available simulated datasets of waves and surge from the Advisian report, a first preliminary coastal flood assessment will be carried out, and flood maps will be produced. Coastal erosion and flood hotspots will be identified with this approach. It should be noted that since these simulated waves were not validated against in situ observations, uncertainties are expected at this preliminary step, but field works in 2021 will help in accurately determining the model performance (see section 4.3).

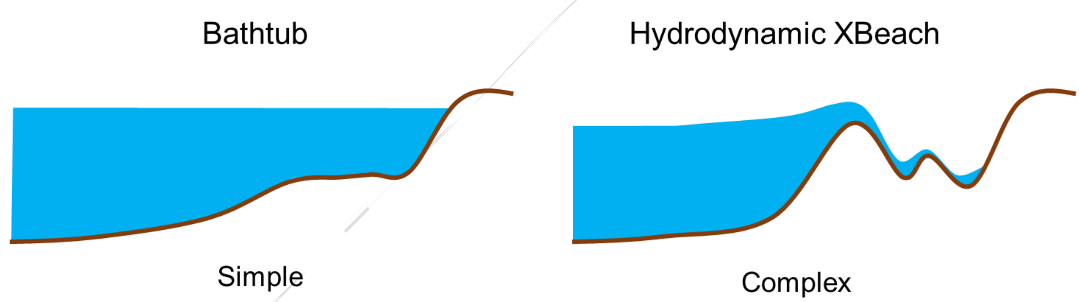

Figure 4. Example of a coastal flood hazard map made for the Pessamit community in the Gulf of St. Lawrence (work in progress at UQAR).

Secondly, morphodynamic simulations (Fig. 4B) will be implemented using the process-based model XBeach (Roelvink et al., 2009). The results from numerical simulations with XBeach will inform stakeholders about wave heights and energy on the beach, varying water levels along the coast during storms, and water depth and current velocities inland in the case of overland flows such as during the August 2016 event. The final products of the two hazard mapping approaches will be similar to Figures 2 and 4. The morphodynamic module of XBeach will also be explored during this work as it will help in understanding morphological beach changes during storms. Various storm scenarios will be run with the model, and the change in sediments and slopes observed by community members will be studied with numerical simulations.

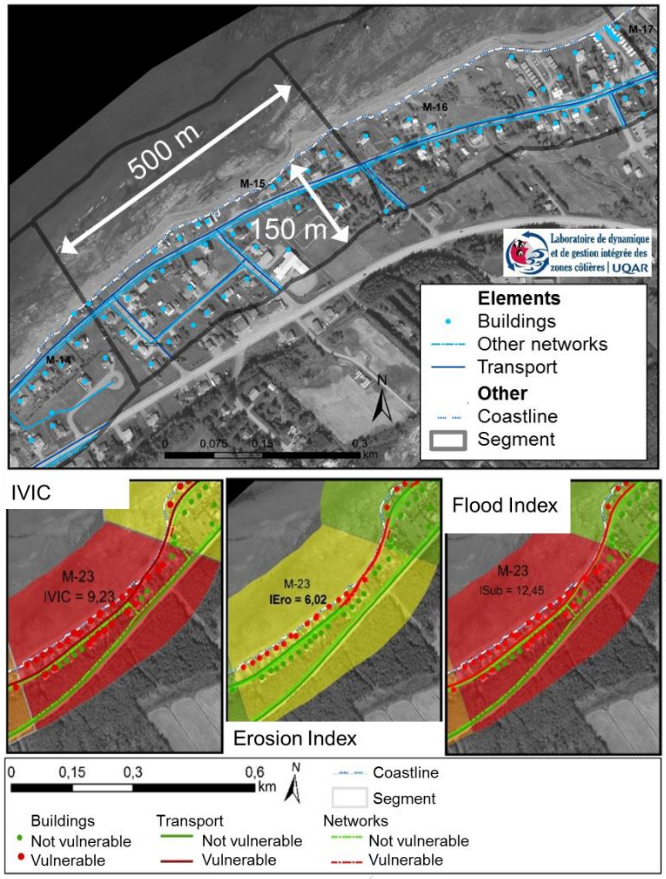

Figure 5. Brief summary of the quantification of the exposed elements to coastal hazards (top) and of the calculation the coastal infrastructure vulnerability index (IVIC) to both erosion and flooding (bottom) for a community in the St. Lawrence Estuary (Sainte-Flavie). The gradient from green to red indicate a combined vulnerability considered as low to high, and the GIS products offered to the stakeholders can be used to extract the underlying cause of the hotspot areas. For instance, in the bottom right panel, 67% of the exposed infrastructure is impacted by flooding events (33% to erosion).

Field works conducted in 2021 will also help us to establish a relationship with community members and committees, to do community outreach and to create a local expertise in addressing similar coastal-related issues. These collective, participatory works will already be started since community members will actively contribute to develop a network of time-lapse cameras that will be deployed at specific locations already identified by the Iviq Hunters and Trappers Association in Grise Fiord as erosion and flooding hotspots. These observations will serve to validate (qualitatively in 2020) the storm-induced impacts. In 2021, more robust installations of these cameras will be done with the HTA to upgrade the systems into more advanced technologies to quantify the coastal changes with the imagery.

Being located at the base steep mountain slopes, Grise Fiord is also constraint by topography. We will also assess the risk associated to rock falls using the stnParabel software developed by a team member (Francois Noel). This step will be done in 2021 since high-resolution topographical data are required and will therefore be available after the first field campaign. The outputs of this analysis will be integrated with the coastal hazards maps as multi-layers risk maps. The combination of multi-hazard and vulnerability maps will help stakeholders in determining the most suitable adaptation strategy alternatives for Grise Fiord's land planning and development in the context of climate change.

4.5 Total Water Level Storm Index

The last step of the project is to develop a community-based predictive storm tool based on coastal total water level and offshore wave observations (or modeled waves). This step is exploratory as substantial field works will need to be carried out before, but is more than suggested to give the community various forms of information, warnings or alerts in a timely manner about potential threats caused by developing storms. To predict TWL along the community, tide prediction will be added to the expected barometric surge and wave runup at the coast based on empirical formulations. We are currently developing a similar system in the St. Lawrence and we intend to apply the same framework for Grise Fiord.

4.6 Training for Coastal Monitoring in the Grise Fiord Area

Community outreach and meetings will be organized during the project, but the planning of these sessions will be determined depending of the evolution of travel restrictions associated with covid-19. In order to make sure that training is properly done despite the pandemic situation, it is therefore planned that during the summer 2021 field work in Grise Fiord, a practical training on how on to monitor beach changes, download the data from cameras, do the cameras and nearshore sensors deployment and maintenance will be implemented with the graduate student, scientists, community members and HTA. Carefully planned with a community member responsible for attending to the equipment, this will be a major part of the project because of the short open water season; we need a proper work force in the community to complete the tasks collaboratively, validate the hazard area but also install (remove) the bottom-mounted sensors after spring breakup (before fall sea ice formation).

References

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Cooley, S.W., Ryan, J.C., Smith, L.C., Horvat, C., Pearson, B., Dale, B., Lynch, A.H., 2020. Coldest Canadian Arctic communities face greatest reductions in shorefast sea ice. Nat. Clim. Chang. https://doi.org/10.1038/s41558-020-0757-5

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Stockdon, H.F., Holman, R.A., Howd, P.A., Sallenger, A.H., 2006. Empirical parameterization of setup, swash, and runup. Coast. Eng. 53, 573–588. https://doi.org/10.1016/j.coastaleng.2005.12.005

BUDGET (next page)

Expense Categories	Funding Request for Year 2020-2021				Funding Request for Year 2021-2022					TOTAL
	CIRNAC	Partner #1 (UQAR)		Partner #2 GSC	CIRNAC	Partner #1 (UQAR)		Partner #2 GSC	Partner #3 GSN	
	Cash	Cash	In-Kind	In Kind	Cash	Cash	In-Kind	In Kind	In Kind	
	Funding requested from INAC for 2020-2021	Money received from Partner #1 for 2020-2021	Monetary value of goods and services received from Partner #1 for 2020-2021	Monetary value of goods and services received from Partner #2 for 2020-2021	Funding requested from INAC for 2021-2022	Money received from Partner #1 for 2021-2022	Monetary value of goods and services received from Partner #1 for 2021-2022	Monetary value of goods and services received from Partner #2 for 2021-2022	Monetary value of goods and services received from Partner #3 for 2021-2022	TOTAL
	2020-2021				2021-2022					
Salaries and Wages (and Northern benefits where applicable) - Master student - Bsc student	20000		15000	16000	20000		15000	8000	5000	99 000
Travel, Transportation, Accommodation and Living Allowance					30 000					30 000
Training and Workshops, outreach	10 000				20 000					20 000
Professional Services (contractors or sub-contractors)	1 050		10 400		1 050		10 400			22 900
Hiring community members Field tech Bear monitor	2 500				10 500					13 000
Communications (social-media, radio, video production)	1 000				1 000					2 000

Reports and translation	9 000		1 000		9 000		1 000			20 000
Equipment	15 000		20 000		12 000		20 000			67 000
Data acquisition: Imagery and topography, lab analysis	15 000				10 000					25 000
Wave and flood modelling	15 000				5 000					20 000
TOTAL before indirect costs	**78 550**		**46 400**	**16 000**	**118 550**		**46 400**	**8 000**	**5 000**	318 900
Indirect costs	**11 783**				**17 783**					29 565
TOTAL asked to CIRNAC	100 333				136 333					**256 230**

ANNEXE – Online discussions

From David to Dennis (Sept. 14 2020)

Didier David
lun. 14/09/2020 08:45
Éléments envoyés

Marquer comme non lu

À : Basudde2, Dennis (AADNC/AANDC) <dennis.basudde2@canada.ca>; Iviq HTA <iviq@baffinhto.ca>;
Cc : Christina Béland <christina.beland@qhrc.ca>; Méthot Catherine; alexandre.normandeau@canada.ca; jordan.eamer@canada.ca; gwen.marty2@canada.ca;

1 pièce jointe

Devis_CCPN ~.pdf

Hi Dennis,

I understand your comments and questions. I modified the budget respectively. The salary (salary and wages) is mostly associated to a master student (about $15K/y) but I included a $5K more to make sure we can hire someone on the field, for instance someone from the community during field work (Phase 2) or a bachelor student that could help in processing the data (Phase 1). Also, if only someone interested in a PhD applies, that gives a little margin to make sure we find a candidate. I should have underlined that more: now I explicitly mentioned that in the ection 4.1.

It's hard to increase the salary for the first year for community member hiring because there is theoretically no field work this fall/winter. Its therefore hard to plan any field training, and also because sea ice is already coming in the next few weeks in Grise Fiord. I will send trail cameras to IVIQ HTA, but I need funding before buying the cameras... which could arrive in Grise Fiord after sea ice. If I can buy the equipment sooner with another budget I have, that would be a first hiring for this fall, where the 2500$ is partly allocated to. IVIQ HTA mentioned that hiring a community member cost approximately 250$/day, I also included the same amount for bear monitor, based on similar cost in Kugluktuk/Cambridge Bay. I updated the amount for second year, to hire 2 people locally including a bear monitor, full-time in summer 2021 to help a student for an estimated 3 weeks field work (21 days). Students or youth would also be more than welcome to participate! Please note I also adjusted the amount for travelling next year since we will most probably add 2 people to the field crew to make sure we do everything in 3 weeks.

The role of the hired community members would be wildlife monitoring, everyday field work along the coast, and interviews with community members. With a training they would become eventually our main contact for maintenance and future deployment. I am already in contact with the community (IVIQ) and they gave me the address to attend the equipment. I will add a virtual training to the workplan too. I did not included the renting of ATVs or boat, but it would go under data acquisition.

The professional service would be to orthorectified the imagery we will acquire (a GIS specialist at UQAR working from another lab).

Don't hesitate if you have more questions. I hope this proposal makes more sense for you. We are looking forward working on this as soon as we can.

If you feel I can already send a Master project advertise, please tell me so I could find someone quickly.

Best regards,

david

From Dennis to David (Oct. 9 2020)

À : Didier David;
Cc : christina.beland@qhrc.ca; iviq@baffinhto.ca; Normandeau, Alexandre (NRCAN/RNCAN) <alexandre.normandeau@canada.ca>; Eamer, Jordan (NRCAN/RNCAN) <jordan.eamer@canada.ca>; Méthot Catherine; Marty2, Gwen (AADNC/AANDC) <gwen.marty2@canada.ca>; 'Gwen Marty' <gmarty100@gmail.com>;

Vous avez répondu le 14/09/2020 08:27.

Action Items | + Obtenir des applications supplémentaires

Hi David,

Thanks for the proposal. It looks great. I have a few questions and comments:

Budget (CIRNAC):

- **Salary and Wages** – Can you please clarify which role(s) the $20k (requested to CIRNAC) would support under the *Salaries and Wages* for both project fiscal years.
- **Hiring of community members** is projected at $2,500 (I anticipate this may be a bit low unless there is some overlap under the Salary & Wages category) – could you clarify the roles, responsibilities and expected number of persons we anticipate hiring.
  - Also, would there be a person in the community responsible for attending to the equipment (i.e., the nearshore bottom –mounted sensors), and liaising with the scientific team? If so, is there a training component for this that should be added to the workplan?
- **Professional Services:** what kind of professional services do we anticipate the $1,050 will support?
- **Reports and translations (<u>CIRNAC will cover this under the expenditure category of Communications once we finalize our commitment in our Approval Letter</u>):** I believe we will need to add more budget to this category. We should ensure that we are able to produce a simple reference summary for the community to use (and maybe even include some animated descriptions) as to what the findings have revealed and any potential adaptation solutions.
  - Having this report in both English and local Inuktitut dialect will be important. I would suggest adding $9k under this year's budget line and next year's budget line for CIRNAC for a total of $18k from CIRNAC's contribution.
  - Please note, that we will use a funding mechanism (called Flexible funding) where any unspent funds in this fiscal year can be carried over for use to the next fiscal year.
- **3. Research Goals and Priorities** – could you revise this title to say ***Workplan, Research Goals and Priorities;*** and then add the fiscal year and/or the time period where the task will take place beside the item. For example, 1) Retrieve and acquire... (September to March 2020-21)

- FYI – once we confirm funding in our approval letter, we will roll the budget for *Wave and Flood Modelling* into 'Data Acquisition'

Thank you for working collaboratively in putting the proposal together. Let me know if there is anything you would like to discuss.

Dennis