Student Handout: Mackenzie Basin Case Study

The Mackenzie River is the longest river system in Canada and the second largest drainage basin in North America (after the Mississippi). With an area of 1,805,200 km^2, the river basin is about one-fifth of the entire area of Canada! The river is known by many names to local communities (e.g., Dehcho in Slavey, Nagwichoonjik in Gwich'in, and Kuukpak in Inuvialuktun), and it has been key to the survival of Indigenous Peoples in the North for thousands of years. The river basin stretches across large parts of western Canada and is home to more than 400,000 people (as of 2001), 10% of whom are First Nations, Métis, and Inuvialuit (MRBB 2003; GNWT 2010). The river falls under multiple jurisdictions:

- BC, Alberta, Saskatchewan, Yukon, and the Northwest Territories;
- Treaties 6, 8, and 10; and
- Multiple First Nation Reserves and several Metis settlements.

This freshwater biome is surrounded by boreal forests, wetlands, sparse vegetation, foothills, and some prairie, and is situated in both the taiga (boreal) forest and tundra biome area. The Mackenzie River Basin has a large fish ecology as noted by the Elders in the area, notably the Inuvialuit. The subsistence fishery of the Mackenzie features numerous species including broad whitefish (Coregonus nasus) and loche (Lota lota).

ISSUES FACING THE MACKENZIE:

The Mackenzie River is vulnerable to multiple stressors such as climate change, commercial fish harvesting, and resource development activities. Primary development in the area is associated with oil extraction and deforestation. Pipelines and associated spills, forestry, and mining activities have changed the quality and flow of water in the region. The socio-ecological impacts from these activities also affect fishing livelihoods, which is a significant component of traditional food systems for many of the people relying on the river.

SOCIO-ECOLOGICAL IMPACTS IN THE INUVIALUIT REGION:

Fishing activities are considered very important. Fishing contributes to the traditional food system, and it represents an essential part of traditions, including traditional knowledge. A study done in the Inuvialuit region to assess the importance of fishing livelihoods identify socio-ecological change in the fish using Indignoeus Knowledge, and understand critical impact of the socio-ecological changes in fishing livelihoods. The study found that fishing for subsistence is particularly significant, with the majority of research participants declaring more than half of their food consumption comes from harvesting, but there are several areas of concern affecting fish harvesting. Table 1 below summarizes recurrent socio-ecological changes related to fish quality, but these changes vary from year to year.

Theme	Indicator	Observation	Livelihoods impacts
Fish quality	Flesh texture	Softer flesh, particularly in whitefish during the summertime	Preference for fish from the ocean during the summertime
	Fish appearance	Smaller and skinnier burbot (loche) Increase of scars and lumps, particularly in inconnu (coney)	N/A Not edible
	Livers	Discoloured or black spots in livers, particularly in burbot (loche)	Not edible
	Parasites & worms	More fish with higher parasite loads, particularly in inconnu (coney)	Not edible
Fish population	New species	New observations of chum salmon in the Delta, but fewer whitefish	Additional species for consumption
	Less fish	Fewer burbot (loche)	Change of fishing practices or locations

Table 1: Inuvialuit Knowledge indicators of change in fisheries

Inuvialuit fishing livelihoods are complex, dynamic, and ever-changing systems that are essential contributors to the Inuvialuit food system as well as to cultural practices around harvesting. The different changes the Inuvialuit face have caused them to adapt their fishing practices and livelihood strategies. Inuvialuit knowledge plays a key role in both understanding these challenges and building adaptive capacities.

Harvest from a Délınę Fish Camp
Photo Credit: Chelsea Martin

ADAPTIVE CAPACITY

"Adaptive capacity" relates to the ability of humans and other organisms to adjust in response to potential damage or change, and to take advantage of opportunities.

CLIMATE CHANGE IMPACTS:

The Mackenzie River Basin may be one of the world's river basins most threatened by climate change. The Mackenzie is a cold-water basin that is full of permafrost. Rising temperatures cause permafrost to melt, resulting in ground slumping, collapse of spruce tree forests, and changes in flooding patterns. Communities who rely on the river are consistently seeing changes in water quantity and quality, drying conditions, warmer weather temperatures, and impacts on fish that people rely on for food. They also notice changes to the ice, including thinner ice in the winter, earlier spring thaw, and later freeze ups in the fall. The warmer weather caused by climate change leads to warmer water temperatures overall, which in turn leads to fish spawning at unusual times compared to the past, and an increase in new fish species to the areas (such as chum salmon in the high Arctic).

The increase in temperature is a problem for the Indigenous people who rely on the river for their livelihoods. Much of the diet of the Indigenous people living in and around the Mackenzie river consists of traditional foods, but climate change is having serious impacts on that diet. Climate change not only affects the health and habitat of the fish, but it also has major implications on how the Indigenous peoples access their traditional harvesting areas. Landslides and/or bank erosions are being seen in the area with more frequency, creeks are drying up, water levels are decreasing in many areas, and precipitation has been decreasing. The shorter ice coverage season and the decrease in water levels are major travel concerns. A shorter ice season means that traditional traplines are altered, and spring and fall hunting seasons are shortened. Lower water levels impact the river flow and causes reefs and sandbars to rise, making travelling more dangerous. In previous years, the ice used to be thick and solid, but warming temperatures has resulted in thinner ice with air pockets that makes the ice less stable.

Délınę Fish Camp
Photo Credit: Chelsea Martin

TRACKING CHANGE RESEARCH EXAMPLE: RESEARCH IN THE SAHTU REGION (NORTHWEST TERRITORIES)

Overview:

Research in the Sahtu region investigates how the livelihoods of fishers are impacted, including how these people are adapting to climate related changes. This research was conducted by Chelsea Martin. The objectives of this research include:

- Learning about the environmental variability and change in the Great Bear Lake area using local and traditional knowledge;
- Determining how these changes affect peoples' fishing livelihoods; and
- Considering the means by which knowledge is shared, interpreted, and/or transformed between generations.

Research Structure:

Researchers interviewed Sahtú Got'ine Elders, fishers, and youth. Elders were crucial for this research because their lifetime knowledge helped to identify a 'baseline' environmental norm. The oral histories shared contemporary observations of variability and change in Great Bear Lake, Mackenzie River, and surrounding region. Expert fishers who interact with the environment on a regular basis identified which changes are having the greatest impact on their livelihoods.

Research Findings:

There are many observable changes in the Great Bear Lake region:

- Most significantly, fish flesh is softening.
- An increasing number of cysts on the fish is attributed to warming water temperatures.
    - Declining fish harvest generates an increase in consumption of store-bought food rather than traditional foods, causing monetary and physical stresses.
- Déļįne community members' understanding of climate change is strongly influenced by the prophecies foretold by Prophet Ayah.
    - They understood that changes were going to come, and their conversations and definitions on the topic demonstrates their view of the world. Their resiliency to change is grounded in their worldview.

Looking Towards the Future:

In the Mackenzie Basin, Tracking Changes research projects span five provinces and territories, and include 11 Indigenous organizations representing over 40 Indigenous communities. The projects draw on local and traditional knowledge to investigate water quality and quantity changes, fish health and migration, and fishing livelihoods across five major subwatersheds.

The research in the Mackenzie River Basin focuses on projects led by local community researchers, Elders, and land users. Communities and Indigenous organizations design and carry out their own investigations to gather Indigenous and local knowledge about water quality, fish and fish migrations, and the impacts of development. This information is shared through social networks that extend over space and cross provincial and territorial borders. These community projects are supported by graduate students and academic researchers who provide additional knowledge and expertise when requested or required by the community.

Example:

Community-based environmental monitoring programs have the potential to foster an environment for learning. Importantly, they place value on Indigenous knowledge. The Kátł'odeeche First Nation is currently developing a community-based environmental monitoring program that is driven by Indigenous knowledge and built around seasonal traditional harvesting activities. The research done with the Kátł'odeeche First Nation and Tracking Change will help contribute to establishing a baseline of environmental information.

Cover Photo: Drying Fish, Délınę First Nation, Sahtu Region
Photo Credit: Chelsea Martin