Methodology

The presentation and analysis of information in this document strives to utilize indigenous science and traditional ecological knowledge. To achieve this aim, the fundamental values of Anishinaabeg people will be used as the metrics to measure impacts. The use of oral histories will be supplemented with other empirically gathered data. It should be noted that terms, definitions, and other metrics used within are descriptions to help the assessment process. They do not represent, by any means, the only way to "be Anishinaabe".

Mino Bimaadiziwin

"The good life" is the Anishinaabeg goal. It is commensurate with the use of quality of life as an economic indicator. In this view, an economy, which is the movement of wealth in a society, should be for the purpose of creating happiness. This view does not prioritize gross domestic products or an export-based economy. Language is the key to understanding any culture. The following words/terms/concepts are how Anishinaabe identify their worldview and how Anishinaabeg act and think. These values serve as the framework for the analysis in this document.

→ reference UNDRIP articles on traditional ways of life.

Gichi Debwewin

"The great truth/the Creator's Law/Original Instructions." Anishinaabe have a historical understanding which remains today, that the Gichi Debwewin is the highest law, higher than the laws of nations, states, or municipalities, and that Anishinaabeg people are subject to Gichi Debwewin. This is common throughout many Indigenous communities. These instructions represent a community-specific spiritual and ethical code of conduct handed down for millennia that outlines how the people should honor their relationships and fulfill their responsibilities and obligations to all of creation, ancestors, future generations, and spirit worlds.

These principles are reflected in numerous other indigenous cultures. The Haudenosaunee have the principles of peace, power, and righteousness. The original teachings of all the nations of Turtle Island share similarities. These principles are what define Indigenous Peoples, the language they speak, the way they think, and the way they honor their Nation.

Following is a short summary and rough translation into English of the principles:

Ingwamazin

Being Determined: in the effort to learn about and live their lives as Anishinaabe. This includes putting teachings into practice.

Anishinaabe Inaadiziwin
Behavior, values, and way of living life are the pathways to how a person can be Anishinaabe in the fullest sense. The highest quality of Anishinaabe personhood is displayed in connectedness to the earth and in relationships to all of Creation.

Anishinaabe Inendamowin
The Anishinaabe way of thinking, their way of perceiving and of formulating thought resonating from Anishinaabe beliefs and foundational truths, is called *Anishinaabe Inedamowin.* It indicates philosophy and worldview.

Gidakiiminaan
This is the Anishinaabe connection and relationship to the land and all of Creation. It is the experience of knowing and understanding the relationships that exist throughout Creation, and understanding one's own role and responsibility in this relationship. This connection is the primary shaper of Anishinaabe identity, and it is this total relationship with Creation that informs Anishinaabe environmental ethic.

Anishinaabe Enawendiwin
Enawendiwin is the Anishinaabe way of relating to Spirit, each other, and all of Creation. It is an all inclusive relationship the honors the interconnectedness of all the relations of creation, and recognizes and honors the human place and responsibility within the family of Creation.

Anishinaabe Izhichigewin
Izhichigewin is the Anishinaabe way of doing things. It is the way of taking action with the Anishinaabeg life skills to live effectively in the world and contribute to building quality of life and community.

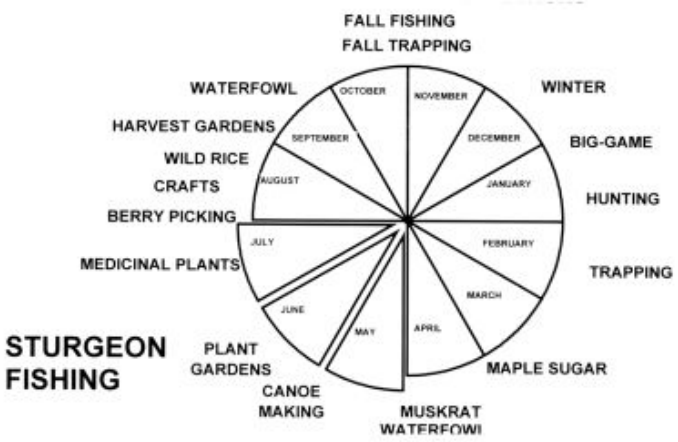
Anishinaabe Gikendaasowin
Gikendaasowin concerns Anishinaabe knowledge and ways of knowing. It is the body of knowledge that informs the people of their origins, way of life, way of being, and worldview.
This Anishinaabe way encompasses the whole of reality, considers all levels of knowing, is informed by all the senses (physical, emotional, intuitive and spiritual), and maintains the interdependent, interconnected, and holistic experience and integrity of the total environment.

Indinawaymuganidoog
"We are all related." There is a very clear knowledge that the natural world is animate, and that people are related to all other beings and instructed to have reverence for these beings

as part of this life. Within this, there is also a clear understanding that what occurs in one place, will affect another.

Cyclical thinking and Natural limits

Most IP have a concept of time that is cyclical and rooted in the realities of the cycles of nature. The economic life cycle of the Anishinaabeg is based in seasons and the natural wealth of the land and waters.



Considering the Seventh Generation

The Anishinaabe are told that in each deliberation they should consider the impact upon the seventh generation from the present. They are told and understand that their ancestors negotiated treaties with great agency and ability, so that today their people could hunt, fish, harvest, gather, and be Anishinaabeg. That responsibility continues.

If Anishinaabe are trying to take care of an economy which will care for their future generations, protecting and enhancing the wealth of their region, they will need to change from the path which is proposed to a path and a paradigm which will accomplish that vision. This is the Anishinaabe teaching of the two paths.

On a worldwide scale, ecologic economic analysis is increasingly being used to guarantee a sustainable future. This economic system utilizes many of the precepts of Indigenous Economics such as intergenerational justice, intra- & inter-species distribution of wealth, and sustainability. Ecological economics utilizes a full cost accounting methodology to analyze the worth/impact of projects.

Indeed, the economic paradigm of an export based economy, driven by Keynsian analysis and the invisible hand of Adam Smith, or Market Economics, is being discarded as unsustainable. It is not sustainable as it is based on the assumption that there is an endless supply of natural resources. There is no full cost accounting: mining companies have not had to assess the full value of their waste stream, nor have most companies had to assess their carbon footprint. That is no longer a realistic or responsible economic model.

In Western industrial societies, a growing awareness of the need for sustainable development and planning has been evident since the publishing of the 1987 Brundtland Commission report, Our Common Future. Two frameworks that Western sustainability proponents have used to counter uncontrolled growth are ecological economics and the precautionary principle. Ecological economics encompasses many concepts and themes, but is mostly concerned with quantifying (in monetary terms) natural capital.[1] The precautionary principle is an alternative to standard risk assessment methodologies. Many Western sustainability proponents have also realized that the original source of sustainability teachings can be found in Indigenous cultures. This realization is somewhat reflected in the increasing use of community-based, participatory planning by international development organizations and ecosystem level analysis by environmental scientists.[2] These concepts, ecological economics, the precautionary principle, community led decisions, and systems level analysis, are analogous to native science methodologies.

Anishinaabeg Values Into Metrics

Element of Anishinaabeg World View	**Analytical Principle or Metric**
Decisions for the 7th generation	Lifecycle and intergenerational analysis
Historic Trauma	Existing stressors and current health conditions.
Use of Indigenous Science and Traditional Ecological Knowledge	Ecological assessment
Importance of the Manitous and the Intangible	Protection of sacred lands
Intergenerational equity	No discounting (Service-Acre-Years SAY, not Discounted Service-Acre-Years DSAY). The convention is to discount at 2 or 3% per year, making impacts beyond 30 years essentially worthless.
Inseparability, reciprocity, and responsibility between humans and the rest of creation	Cumulative impact analysis, ripple effects, at least additive (as long as double counting is avoided). Ecosystem services, including the environmental, social, economic, and other costs. Life-cycle analysis (cradle to grave) impacts, including post-operational impacts of

1

For more information on ecological economics see Krishnan, Rajaram, Harris, Jonathan M., and Goodwin, Neva R., ed. 1995 A Survey of Ecological Economics.

2

See Taylor-Ide, Taylor, Daniel and Carl E. 2002. Just and Lasting Change: When Communities Own their Futures. Baltimore:
John Hopkins University Press.

	reclamation, contamination, and restoration. Current conditions in the existing pipeline corridor are used as the model for what the new corridor will look like over time.
Healing landscapes. Place is part of Anishinaabe ancestral heritage, present, and future.	Landscape ecology, systems-level integration. Quantification of landscape impacts and health impacts from landscape disruption.
Village, doodems, and other social structures	Health and quality of life given importance over nutrition and chemical-caused risk to individuals. Identifies cultural keystone species. Used to justify a multiplier of SAY impact.
Historic gardening and landscape management practices	Access to land vital for food production and harvesting
Spatial economics (those economies that are tied to use of land for the provision of food, medicine, and other goods) are tied to political boundaries	Limits to land access created by political boundaries negatively impact economic activity
Anishinaabe Mino Bizamoanin	Quality of life more important than product production
Seasonality of Anishinaabeg Economics	Seasonal ecosystem services and seasonal impacts must be evaluated
Historic Theft	Remaining resources have increased in value in the contemporary baseline
Value of Manoomin	Indigenous economics and natural capital impacts, Cultural keystone species, ecological keystone species of particular ecological value, economic keystone species. Remaining rice lakes have extraordinary value for culture, economics, ecology, plus associated services that the lake provides.
Use of wild plants for medicine	Edge effects- impact large game and forbs used as medicines.
Manido Nibi, anji bimaadisiiyan	Condition of waterbodies: pollution burden, morphology, and ability to flow freely
Embodiment	Indigenous health includes healthy people in a healthy environment

Full Cost Accounting and Life-cycle analysis

These two methods are different sides to the same coin. Rather than looking at a discreet section of economic activity, such as invest/return, these methods expand the boundaries of the question and incorporate the full environmental, social, and economic costs and benefits of a proposed project/business. Full-cost accounting focuses on the relationship between the three. It is known as the 'triple bottom line' and considers all three aspects in their totality. Life-cycle analysis looks at the impacts of a product over its entire lifetime. These methodologies provide a solid analytical framework or context within which to consider sustainability and sustainable communities.

Example:
Two companies produce a t-shirt. Company A utilizes full-cost accounting and life-cycle analysis, company B utilizes conventional economic analysis. Company b looks at the costs of production (the raw materials, labour, equipment, etc), marketing, distribution and attempts to minimize these costs. This may cause them to use sweat-shops, environmentally damaging fibres, questionable marketing campaigns and distribution networks. At the same time they are attempting to maximize their selling prices, thus maximizing profits.

Company A looks at their sources of fibre- how is it produced, where is it produced, how are the producers treated, their manufacturing process- how are the labourers treated, what are the waste streams from the production process, etc. They look for ways to decrease the waste from these system, and the environmental impact of the production process. They look for ways to improve the working conditions for the labourers. They work with other sustainability minded organizations for marketing and distribution, to ensure these processes have a small environmental impact and a positive social impact. They also look at what happens to their t-shirt at the end of its life. Can it be returned to be recycled, is it compostable, will it last long enough to be re-used by someone else? They, of course, also look to make a profit, but not at the expense of the environment and others.

The term full-cost accounting has been corrupted in its use in infrastructure management and finance, and is generally limited to only being applied if managing waste or introducing a resource is going to create more revenue for the business, ignoring the social and full environmental impact, leaving only the primary weight on the economic cost/benefit.

In advanced ecological economics/engineering, production methods are maximized to eliminate waste. In these systems, production facilities are networked to use the waste from one industry as the feed-stock for another one. This is referred to as "closed-loop systems" and strives to emulate the functioning of ecosystems. In nature, there is no waste and there is no room for wasteful systems in Anishinaabe Akiing.

Sustainability: Maintaining our Life Support Systems

"Economics should remind itself that sustainability is 'economic's life support system.'"
(Costanza et al. 1995: 56).

By choosing to only focus on the monetary value approach, the American economic system therefore exacerbates the threat to natural life-support system's abilities to sustain and regenerate themselves (Costanza & Daly, Kristen, Harris and Goodwin, 1995). None of the economic structures adhered to at this time can guarantee sustainability. Sustainability cannot be separated from justice within/between species and the future generations, therefore demanding an altered economic approach.

Intra- and Inter-species Distribution of Wealth

> "Wealth is ultimately the capacity to support life and the enjoyment thereof."
> (Costanza et al. 1995: 56).

Modern economics operates within a paradigm which has determined that humans should be acquiring ever-increasing levels of wealth (Costanza & Daly, Kristen, Harris and Goodwin, 1995). Once examining the sustainability approach, reflecting on intra- and inter-species distribution of wealth becomes of core importance. All animal species live in an equitable manner and a fairly similar 'standard of living.' They live at a consistent level of 'per capita resource' which does not alter over time thus creating a sustainable approach with guaranteed longevity. "Ecological economics can act as a 'check on human perceptions' and 'allow us to study the economics of nature which do not include humans.'" (ibid).

Discounting Intergenerational Justice and the Time Delay Trap

The current approach leads to discounting intergenerational justice (Costanza & Daly, in Kristen, Harris and Goodwin, 1995). Discounting may be a consequence of a social trap which limits vision to the short term. Discounting is a process by which the value of things-such as ecosystem services is determined for future generations. How can that value be determined without the future generations. This is the time delay trap. Short term social needs, wants, and incentives potentially conflict with the needs of future generations and the long term consequences of current approaches, on the unborn generations (ibid). This leads to intergenerational 'injustice.' If non-sustainable, environmentally destructive approaches continue to operate in order to serve short term incentives, then future generations shall be burdened massively in an attempt to reverse these anthropogenic consequences – if that, is even possible, by then.

Justice as Fairness

> 'None of the existing forms of economic organization can adequately guarantee sustainability and we should begin to investigate the conditions for an economy that is "ecologically bound" '
> (Pearce, in Kristen, Harris and Goodwin, 1995: 58).

Intergenerational justice is of vital importance in economics. Rawls' intratemporal approach attempts to acknowledge the ignorance of this generation in understanding the

impacts on future generations, their needs and incentives thereof (Pearce, in Kristen, Harris and Goodwin, 1995). Subsistence living often has a greater and more direct relationship with the surrounding ecosystem through work such as agriculture and fishing. This ultimately dictates that they are adversely affected and experience far greater injustice when environmentally destructive patterns such as mining are introduced. It destroys their economy, serves immediate incentives mostly for those of greater wealth, and is unsustainable in the long term.

The Rawlsian approach argues for a distributive approach to justice, a model which accommodates sustainability (Pearce, in Kristen, Harris and Goodwin, 1995). This approach does not focus on the location of individuals in life, based on their wealth and position in society, but rather on their interaction between life plans and primary goods along with a knowledge of society's functions. In other words how they interact between their ecosystem and the economy. This approach, through valuing the environment and nature, hence builds a more sustainable economic approach that paves the way for justice for the current and future generations (ibid).

Page argues against Rawls approach and advocates an intertemporal theory (Pearce, in Kristen, Harris and Goodwin, 1995). It is weak in that it draws conclusions as to what the values of future generations would be. This approach states that each generation should maximize the present value of net gains and this theory is defended on the assumption that these gains would be passed onto future generations, so if the ecosystem breaks down then the future generations can manage on what has been passed on (ibid). This is unrealistic and assumes the planet is infinite in potential even though the facts state otherwise.

Non-monetized Values and the Partial Quantification Gap

Quantification requires precision and in relation to economics is often limited to monetary values (Costanza et al. 1995). This equates to 'injustice' as not all values can be accounted for in monetary terms. Wealth can also be conveyed through cultural and traditional values along with monetary influence. The Happy Planet index demonstrates a qualitative economic approach. The quantitative approach is insufficient to be able to consider environmental impacts and thus contributes to destruction of our ecosystems along with cultural and traditional values (ibid).

Geographic Scope

Throughout this document, Geographic Information System (GIS) created maps will be used.[3] These maps are widely recognized, yet lack a significant amount of Indigenous depth. As such, they are somewhat limited. However, GIS maps are useful for tasks such as tracking vegetation change, mapping contaminated sites, and illustrating other geographical impacts. The limitations of the software are such that geographical boundaries must be created. For this initial document, mapping areas are bounded by

[3] All of our maps were created through publicly available data.

watersheds that intersect with the treaty zones of northern Minnesota. In no way are these maps intended to circumscribe Anishinaabe territory. These boundaries are only for analysis purposes. As each state maintains different libraries of GIS data, it is sometimes difficult to extend analysis across state lines, especially when dealing with such a large area. This is not an ideal situation, but by confining the use of data to Minnesota information, the chance for errors and data discrepancies is reduced.

While there are dangers in isolating projects and confining their impacts to one geographic area or one temporal event, it is also necessary to draw boundaries in order to do some forms of analysis. For this process, three scales are used: the area of interest, the region of influence, areas of concern, and the extended areas of concern.

Area of Interest (AOI)

Anishinaabeg AOI is the whole of creation and the next seven generations. This is a much different framework than any used by US State or Federal level decision making process. AOI will defined as the area that will be directly affected by the proposed project. The immediate areas impacted by these proposed projects are;

- existing Enbridge Lakehead corridor
- proposed Enbridge Ex-Lakehead corridor
- proposed mines —Polymet and Tamarack
- Potential AOI R.D. Offutt Company's (RDO) lands with historic and future impacts.

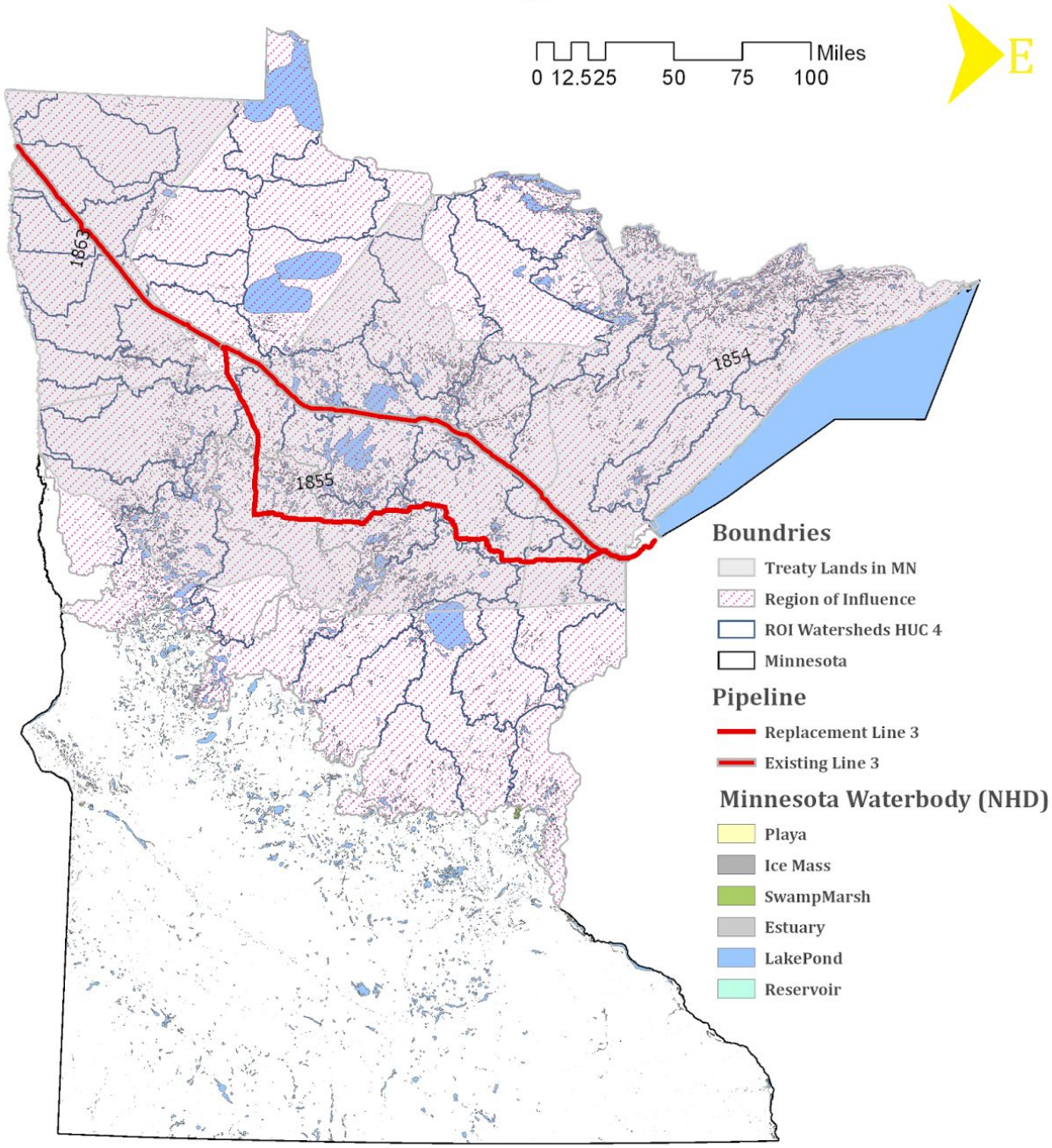
These areas will be summarized with inset/area specific maps.

Region of Influence (ROI)/Areas of Concern (AOC)

The ROI and AOC often overlap and are the areas directly impacted by the various pipeline and mining proposals; the AOC are specific areas within the ROI that are especially sensitive or culturally significant. To avoid calling out exact locations of sacred sites, sensitive species, and otherwise significant locations, a surrogate methodology is applied. This is used to avoid revealing tribal intellectual property. While these areas are geographically discrete, they are used to give a comprehensive understanding of the landscape level impacts of the projects we evaluate. This area, which is the geographic extent of the resources found within the AOI, has been delineated by intersecting Hydrological Unit Code (HUC) 4 watersheds with the 1837, 1854, and 1855 ceded territories. This delineation is for the purposes of Geographic Information System (GIS) assessment only, as these project spans state and national boundaries. As various states and nations have different levels of GIS data, the decision to limit GIS assessment to the state of Minnesota has been made to limit data errors and data gaps.

Map 1. Minnesota with intersecting treaty areas with the HUC 4 watersheds, existing pipeline, and the proposed pipeline.

Cumulative Impact Assessment: Region of Influence



Extended Area of Concern (X-AOC)

As explained in the Anishinaabeg:Akiing section, the Anishinaabe world is defined inter-relationships and responsibilities to other parts of reality. It would be a disservice to limit this assessment to previously mentioned geographic areas such as; Anishinabeg Akiing, various treaty zones, or other political boundaries. Infrastructure projects such as pipelines and mining projects have massive impacts to ecosystems at an intergenerational magnitude. In the case of Line 3, that includes communities near the extraction of the tar sands, communities downstream around refineries, communities where the oil is combusted, and communities that supply energies to move a million barrels of oil. Power-lines are proposed throughout treaty territories, and the power for these lines must be sourced. These projects have significant probable global impacts, including continuing climate chaos, increased fossil fuel investment -when we need to transition-, and increased exposure to toxins, etc.

The impacts of these projects on downstream communities will be reviewed. The communities downstream of this project are both the Anishinaabe Tribal communities and the multitude of communities impacted directly by the tar sands refineries. Downstream communities impacted by Minnesota mining projects are defined as any community downstream that could be impacted by a wastewater spill or impacted by the energy production for the mine.

There are many regions of influence and areas of concern that are impacted by the pipeline and mining proposals outside Anishinaabe Akiing and the Northern MN treaty zones. The impacts that these areas face must also be addressed to comprehend the full impact of these proposals. Three different categories of communities will be addressed in this document:

The extraction communities

These pipelines pose a significant daily hazard to the land and peoples of the extraction zones. The primary extraction zones addressed in this document are the Metis and First Nations zones in the Alberta tar sands area and the Mandan, Hidatsa and Arikara Nation in the Bakken region. These communities have been facing land loss and degradation, loss of traditional diets and lifestyles, contaminated air, land and water, man camps, and the diseases and illnesses that follow all these risk factors. Communities and workers in the oil patch are being exposed to known carcinogens, endocrine disruptors, and other toxic chemicals.[4] Many of these communities also lack potable water and infrastructure. The Western Canadian province is the start of the energy corridor that will eventually turn into

[4] http://www.eesi.org/articles/view/new-research-documents-frackings-health-effects-on-workers-and-communities, Colborn T, Kwiatkowski C, Schultz K and Bachran M. 2011. Natural Gas Operations from a Public Health Perspective. Hum Eco Risk Asses: an Inter Jorn. Available at: http://www.tandfonline.com/doi/abs/10.1080/10807039.2011.605662#preview

the Lakehead system once it crosses into the U.S. The Alberta Tar Sands breach the homelands of the Mikisew Cree First Nation, Athabasca Chipewyan First Nation, Fort McMurray First Nation, Fort McKay Cree Nation, Beaver Lake Cree First Nation, Chipewyan Prairie First Nation, and the Metis Nations.

The refinery communities

At the end of crude oil pipelines are refineries. The communities around refineries are subjected to countless chemicals, noise pollution, and often violence.

The Enbridge mainline system is tied into many refineries, but the ones we are focusing on are the refineries and chemical plants in the Aamjaning areas (Sarina), the Detroit area, and the Flint Hills area (Minnesota). Much has already been written about the conditions that the communities in Aamjaning and Detroit face; less attention has been paid to Flint Hills and the hundreds of other refineries across the nation and world.

While there is indication that much of new pipeline capacity will be bound for international markets either as crude or refined products, Enbridge's system, which Line 3 is a major component of, feeds into several refineries across Turtle Island. As the refining of the oil will increase the pollution burden of these communities, we will examine a few case examples and develop a profile of their pollution burden.

The global community

The whole planet and generations to come are impacted by the continued use of and investment in fossil fuels. There are a number of communities already facing the consequences of climate change. Not surprisingly, these communities are also often Indigenous communities.

The Youth

As Greenhouse Gas (GHG) levels continue to rise, there is another community that will face the full brunt of the repercussions of climate change-- the youth and unborn generations. Tellingly, youth around the world are standing up and demanding their voices be heard. These youth are challenging their governments' lack of action on climate change. These same people, and their children, will also face a toxic legacy of the era of the extraction economy. Climate change impact studies indicate that four generations from now, significant and catastrophic problems will be the reality if the world continues on the current, scorched path.

Geographic Assessment methodology

To assess the impact to these areas, several processes will be used. The first one is a general display and discussion of the existing conditions- pre-existing stressors. The second one is an attempt to assign a value to the loss and potential loss of wealth for the ROI using ecosystem services valuation. When it comes to ecosystem valuation, there are several different methodologies used to derive values.[5] These methods include inferring value based on what people spend to enjoy ecosystem services, deriving values through surveys, or participatory approaches and value transfers. When utilizing a value transfer approach, values derived for a geographically similar area are applied to a study area. This is the approach this project will take. Just as there are several techniques for deriving values, there are several uses for the resulting information.[6] These uses included developing prices for natural resources, developing conservation plans, providing compensation for environmental damage, and developing payment amounts for ecosystem managers.

Regarding the use of GIS for studying health impacts, many studies indicate numerous difficulties with the process. These articles outlined the various difficulties with using GIS for health studies. These include; how addresses/census data is geocoded, existence or nonexistence of baseline health data (specifically as it relates to exposure), level of aggregation of health data and related privacy issues, determining exposure routes, assessing cumulative impacts, latency period of chronic diseases and mapping the potential migration of chemicals of concern. While there are numerous difficulties associated with GIS applications for this type of research, there is also great potential. Often times,

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[5] Troy, Austin and Wilson, Matthew A. 2006 "Mapping ecosystem services: Practical challenges and opportunities in linking GIS and value transfer," *Ecological Economics* 60 : 435-449.
Costanza, Robert and Folke, Carl. 1997 "Valuing Ecosystem Services with Efficiency, Fairness, and Sustainability as Goals," in *Nature's Services: Societal Dependence on Natural Ecosystems*. Ed.: G. Daily, 49-67 Washington, D.C.: Island Press
Raudsepp-Hearne, C, Peterson, G.D, and Bennett, E.M. 2010. Ecosystem services bundles for analyzing tradeoffs in diverse landscapes. *PNAS* 107: 243-247.
Sutton, Paul C and Costanza, Robert. 2002. Global estimates of market and non-market values derived from nighttime satellite imagery, land cover, and ecosystem service valuation. *Ecological Economics* 41: 509-527.
Zhao, Sheng, Hong, Huasheng, and Zhang, Luoping. 2008. Linking the concept of ecological footprint and valuation of ecosystem services: A case study of economic growth and natural carrying capacity. *International Journal of Sustainable Development & World Ecology* 15: 448-456.

[6] Farber, Stephen et al. 2006. Linking Ecology and Economics for Ecosystem Management. BioScience 56: 117-129.
Jenerette, G Darrel, Marussich, Wendy A., and Newell, Joshua P. 2006. Linking ecological footprints with ecosystem valuation in the provisioning of urban freshwater. Ecological Economics 59: 38-47.
Pagiola, Stefano. How Useful is Ecosystem Valuation? Economics and Conservation in the Tropics (2008) http://www.rff.org/Documents/08_Tropics_Conference/Tropics_Conference_Papers/Tropics_Conference_Pagiola_Ecosystem_Valuation.pdf
Graymore, M.L.M, Sipe, Neil G., Rickson, Roy E. 2010. Sustaining Human Carrying Capacity: A tool for regional sustainability assessment. Ecological Economics 69: 459-468.

epidemiologists neglect the spatial aspect of their research, which can provide a wealth of information as it relates to environmental health.[7]

Risk Assessment

Three components to the risk assessment process: human health (using appropriate exposure scenarios), ecological health, and socio-cultural/socio-economic health, all of which are elements of the overall eco-cultural system: [8]

> *A healthy ethno-habitat or eco-cultural system is one that supports its natural plant and animal communities and also sustains the biophysical and spiritual health of its native peoples. These are living systems that serve to help sustain modern Native American peoples' way of life, cultural integrity, social cohesion, and socio-economic well-being. Larger ethno-habitats can include multiple interconnected watersheds, discrete geographies, seasonal use areas, and access corridors.*
>
> (Harris and Harper, 2000)

The ethno-habitat of concern here is Anishinaabeg Akiing. As explained in the Geographic Scope section, this document will limit its analysis to the ROI.

Risk is defined as the product of exposure and sensitivity, pre-existing stressors, or co-risk factors should be identified for each type of effect. This assessment is being undertaken not only protect current subsistence and cultural practices, but also promote and enhance the restoration of tribal practices and values that are protected by treaties between Tribal Nations and the United States.

In conventional risk assessment, exposure scenarios and pathways are used that do not reflect indigenous lifestyles. Indigenous communities' subsistence lifestyle, pre-existing stressors and community structure increase their exposure risk. In indigenous communities, there are often

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[7] 2 Saberi, P. "Navigating Medical Issues in Shale Territory" New Solutions Vol 23(1) 209-221, 2013.
3 Korfmacher, KS, Jones, WA, Malone, SL, and Vinci, LF. "Public Health and High Volume Hydraulic Fracturing" New Solutions Vol. 23(1) 13-31, 2013.
4 Vine, MF; Degnan, D; and Hanchette, C. "Geographic Information Systems: Their Use in Environmental Epidemiologic Research" Environmental Health Perspectives Vol 105(6), June 1997.
5 Maantay, J. "Mapping Environmental Injustices: Pitfalls and Potential of Geographic Information Systems in Assessing Environmental Health and Equity" Environmental Health Perpsectives Vol 110(2), April 2002.
6 Richards, TB; Croner, CM; Rushton, G; Brown, CK; Fowler, L. "Geographic Information Systems and Public Health: Mapping the Future" Public Health Reports, Vol 114, July/August, 1999.
7 Nuckol, JR; Ward, MH; and Jarup, L. "Using Geographic Information Systems for Exposure Assessment in Environmental Epidemiology Studies" Environmental Health Perspectives. Vol 112 (9), 2004.

[8] **"Using Eco-Cultural Dependency Webs in Risk Assessment and Characterization of Risks to Tribal Health and Culture"** Harris, S and Harper, B. *Environ. Sci & Pollut. Res.* Special Issue 2 (2000)

mandates to protect elders, children and unborn generations. These populations are often also the most at risk from exposure. As such, acceptable risk for indigenous communities is much lower than US State/Federal levels.

.. the combined effects of an environmental stressor on health and well-being can permeate both individual and the collective community levels whereby an entire community may be impacted by exposure (e.g. McGee 1999, Elliott et al. 1999, Luginaah et al. 2002)[9].

When estimating the impact on indigenous communities, a seven generations perspective must be taken (or the cumulative impact over the next 140 years). Research shows (and will be covered in the Health Impacts section) that the loss of the ability to continue traditional ways negatively impacts the physical and psychological health of Tribal communities.

Manoomin is a Traditional Cultural Property of the Anishinaabeg, and diminishing ability to harvest this crop presents a potential loss of cultural and economic basis of these communities. Any project that would threaten manoomin stands require Tribal communities' Free, Prior, and Informed Consent. This consent has not been given.

[9] Luginaah I, Smith K & Lockridge A. 2010. Surrounded by Chemical Valley and 'living in a bubble': the case of the Aamjiwnaang First Nation, Ontario. Jrnl of Enviro Plan and Mana. 53: 353-370.