

Biodiversity, Ecosystem Services, Human Health and Wellbeing in the Manitoba – Minnesota Transmission Project

PROVIDED TO THE CLEAN ENVIRONMENT COMMISSION FOR THE
MANITOBA – MINNESOTA TRANSMISSION PROJECT PROCEEDINGS

Presented by: Alyson McHugh, MSc, RPBio May 29, 2017



Introduction

Alyson McHugh, MSc, RPBio

- **Registered Professional Biologist, BC**
- **Associate Wildlife Biologist, USA**
- **Master of Science, Sustainable Forest Mgmt**
- **Bachelor's of Science, Fish & Wildlife Mgmt**
- **Certified Permaculture Designer**
- **BOD: Association of Professional Biology, BC**
- **Broad, ecosystem based background**
 - **holistic interdisciplinary approach**
- **Relevant experience:**
 - **hydropower dominated watersheds**
 - **impact assessments**
 - **adaptive management**
 - **effectiveness monitoring**
 - **Enhancements, co-benefits**
 - **Past CEC expert witness**

Purpose of Presentation

- **Provide Clean Environment Commission information to aid in decision-making**
 - **Concerned with rapid natural degradation**
 - **Conducted general ecological review of EIS**
 - **Manitoba Wildlands and CEC**
 - **Highlight small but significant issues within EIS**
 - **Encourage forward, future thinking in Manitoba Hydro development**
 - **Facilitate the implementation of regenerative sustainability**
 - **Conclusions & recommendations**
 - **References cited in CEC report**

Environmental Impact Statement Review

- **Examination of approach adopted in EIS**
 - **Does MMTP reinforce a healthy, mutually beneficial relationship between human activities and the environment?**
- **Documents reviewed include:**
 - **Environmental Impact Statement**
 - **Technical Data Reports**
 - **Information Requests and responses**
 - **Round 1 and 2**
- **The presentation and submission to the Clean Environment Commission details our examination of that relationship**

Is the Environmental Assessment Process Failing?

- Examine the integrity of natural systems
- Global Ecosystem Health and Integrity is Declining – and fast
 - Current EAs standards of practice for projects and mitigation
 - Utilize a conventional approach: mitigation of mostly significant adverse biophysical effects
 - This focus is *accelerating the decline of biodiversity, ecological integrity and ecosystem health*
 - Benefits from nature are in SHARP DECLINE
 - Impacts human health and human well-being

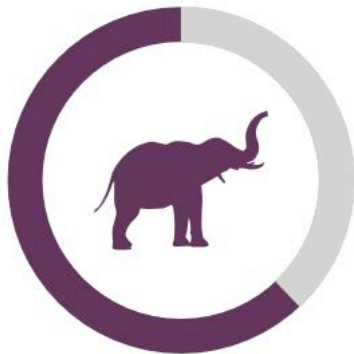
Is the Environmental Assessment Process Failing?

- **Examine the integrity of natural systems**
- **Global Ecosystem Health and Integrity is Declining – and fast**
 - **Freshwater species and ecosystems: most in decline**
 - At least 2/3 of all fresh water flowing into oceans was obstructed by 800,000 hydropower projects
 - All require transmission systems and converter stations like MMTP
 - Some areas up to 95% wetlands lost or severely impaired
 - **Most of the world's people live within 50km of a water source that is impaired >> impounded, diverted, polluted or running dry**
 - **By 2030, ½ global population will be under severe water stress**
 - Will communities in MMTP region be a part of that statistic?
 - Lake Winnipeg already under water stress in 2017

Is the Environmental Assessment Process Failing?

- **Examine the integrity of natural systems**
 - Humans have deforested more than 2 – 3 million square kilometers of primary forest
 - **2016 Living Planet Report (WWF)**
 - **Estimated vertebrate decline**
 - **Birds, fish, mammals and reptile populations cut in half (58%)**
 - **Predicted to decline by 67% by 2020**

Populations of vertebrate animals—such as mammals, birds, and fish—have declined by 58% between 1970 and 2012. And we're seeing the largest drop in freshwater species: on average, there's been a whopping 81% decline in that time period.



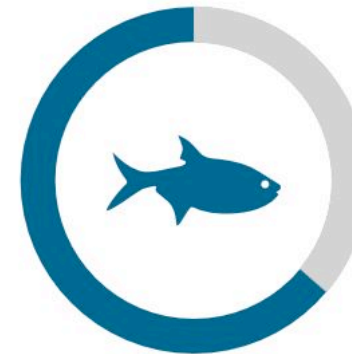
- 38 %

The terrestrial LPI shows that populations have declined by thirty-eight percent overall between 1970 and 2012.



- 81 %

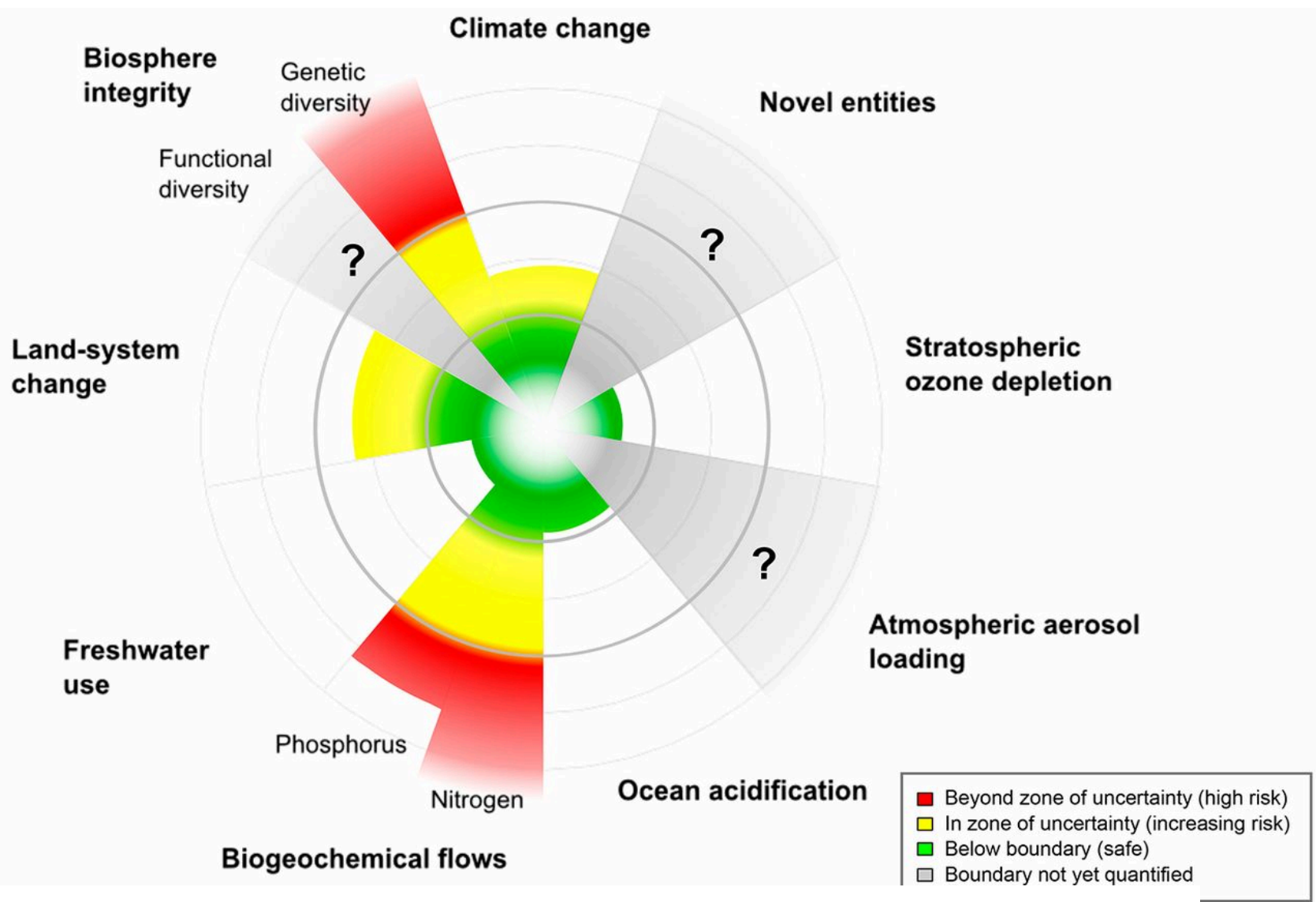
The freshwater LPI shows that on average the abundance of populations monitored in the freshwater system has declined by eighty-one percent between 1970 and 2012.



- 36 %

The marine LPI shows a thirty-six percent overall decline between 1970 and 2012.

The current status of the control variables for seven of the nine planetary boundaries.

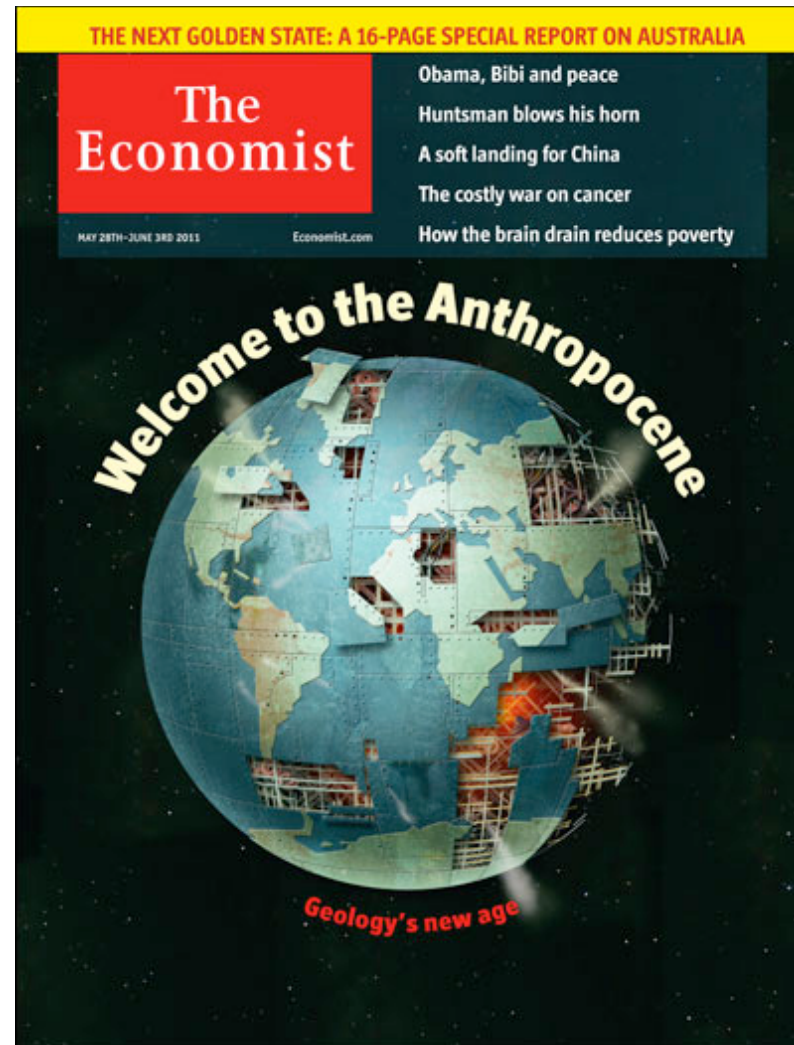


Will Steffen et al. Science 2015;347:1259855
Published by AAAS



Is the Environmental Assessment Process Failing?

- **Habitat loss, degradation, overexploitation of fish and wildlife**
- **Humans recognized as cause**
- **New geologic epic: Anthropocene**
 - **First Era where humans and their activities dominate global trends**



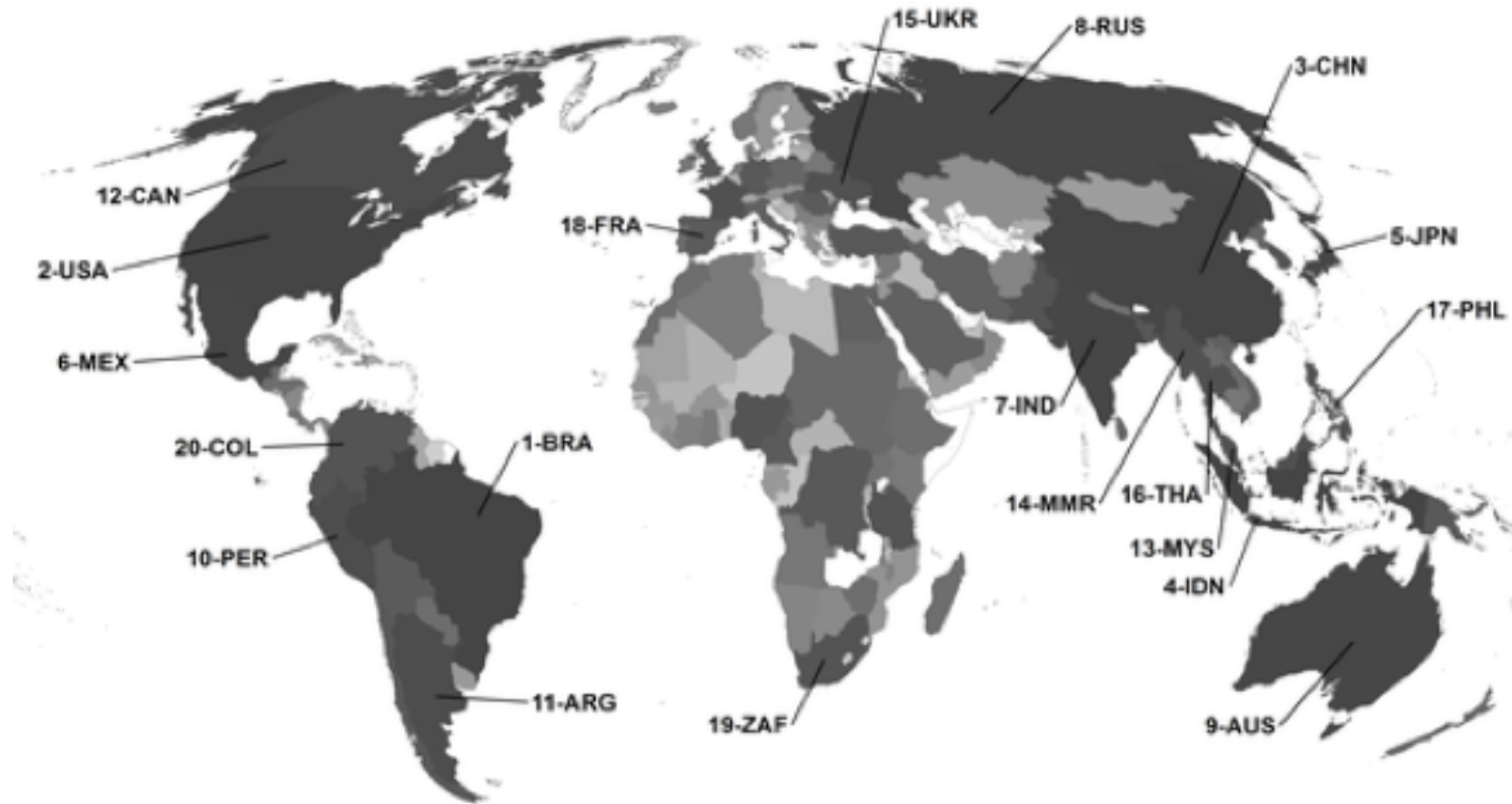
Is the Environmental Assessment Process Failing?

- Clearly, the EA process is failing.
- Who's fault is it?
- Is it my fault, as a Registered Professional Biologist?
 - BOD story – liability as professionals
- Have we, as professionals contributed to this decline?
- Have Environmental Assessments contributed?
- How effective is the EA process?

my
fault?

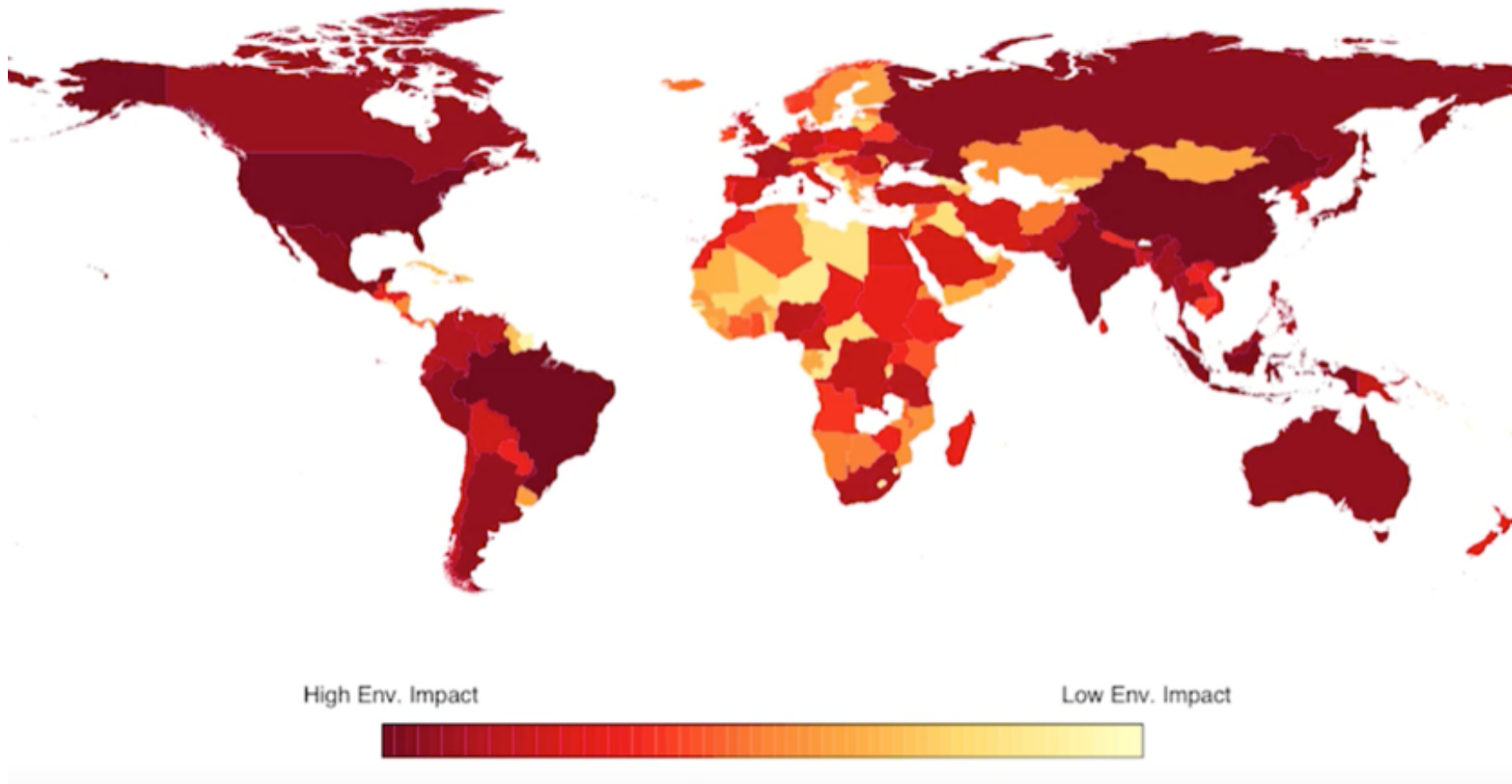


Is the Environmental Assessment Process Failing?



Environmental Impact of Nations expressed as a combination of their ranks for natural forest lost, habitat conversion, marine captures, fertilizer use, water pollution, carbon emissions, and proportion of threatened species. [Reproduced from Bradshaw and colleagues, 2010 and The Lancet Commission on Planetary Health, Whitmee 2015]

Is the Environmental Assessment Process Failing?



Environmental Impact of Nations expressed as a combination of their ranks for natural forest lost, habitat conversion, marine captures, fertilizer use, water pollution, carbon emissions, and proportion of threatened species. [Reproduced from Bradshaw and colleagues, 2010 and The Lancet Commission on Planetary Health, Whitmee 2015]

EIS Process is Not Facilitating Informed Decisions

- **Canada – out of 228 countries- ranks among the worst in world**
- **Case studies: Biodiversity, ecosystem functions and services are not being protected**
 - **35 EIS in South Saskatchewan River Watershed**
 - **Several Environmental Impact Assessments, US Case Studies**
 - **Indicators do not capture ecosystem services**
 - **Do not capture stress placed on watersheds and rivers**
 - **Keeyask Generation Station EIS**
 - **BC case studies**
 - **Coldstream Ecology Ltd. research practice**
 - **General public pushback on projects such as Site C Dam and Trans Mountain, for example**

Is the Environmental Assessment Process Failing?

Clearly, the EA process is failing.

- Are we asking the right questions?
- Are those questions in the correct context?
- What are we, as professionals, missing?
- Professionals like myself work very hard... still declines
- Where, why, how is EA process failing?
 - Questions increasingly important
- MMTP followed similar EA process
 - Unlikely to contribute to healthy ecosystems
- MMTP further demonstrates issues
- EA process is largely ineffective



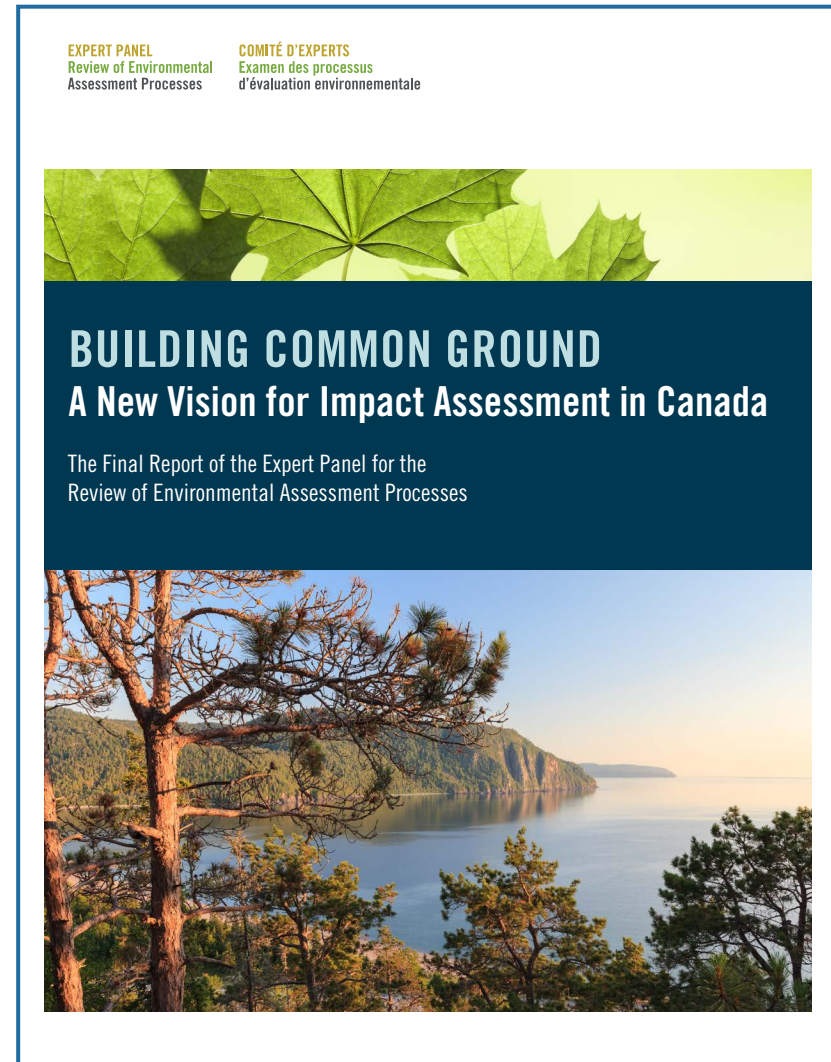
Is the Environmental Assessment Process Failing?

It is time to reconsider the relationship between human actions, human health, human well-being, environmental quality and ecological integrity.

The current societal approach we take in interacting with the planet, *including the way we exploit natural resources and assess consequential environmental impacts, needs to change.*

Building Common Ground: A New Vision

- **Dr. Robert B. Gibson**
 - Past expert witness to CEC, PUB
 - Leading sustainability researcher
 - Next Generation Environmental Assessment
 - Enhance prospects for lasting wellbeing
 - **Analysis and Review: Federal Environmental Minister Catherine McKenna's Expert Panel's Report (April 2017)**
 - *Building Common Ground*
 - Most important recommendation
 - ensure that the core objective of assessment law and processes, and all relevant assessments, make positive contributions to sustainability.



Sustainability Assessment Criteria

In the review of Building Common Ground, Dr. Gibson outlines the demands of an assessment regime with a sustainability focus. They would require:

1. that every undertaking to make a positive contribution to sustainability;
2. discouragement of trade-offs;
3. application of explicit, context-specified sustainability criteria;
4. identification of best options; and,
5. seeking multiple, mutually reinforcing, fairly distributed and lasting *gains*, while avoiding significant adverse effects.

In addition, Dr. Gibson noted four principles that underlie the vision and implementation guidelines in the Expert Panel's report. The principles require that the assessment process be:

1. transparent;
2. informed;
3. inclusive; and
4. meaningful.

Sustainability Assessment Criteria

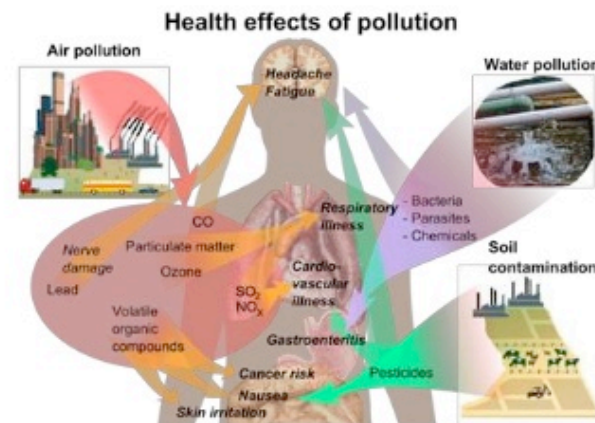
- **These requirements and principles outlined in The Expert Panel's report should drive the Scope and discourse in EAs and EISs, and set the tone for hearings conducted by the CEC.**
- **The Manitoba Hydro MMTP utilized a conventional approach in the EIS.**
- **The following sections aim to explore and demonstrate where the MMTP EIS falls short of**
 - 1. achieving positive contributions to sustainability through lasting gains;**
 - 2. avoiding significant adverse effects.**

Environmental Externalities

- Environmental Externalities
- Unintentional impacts that result from human activities such as MMTP and Keyask Dam

Negative Externalities:

- **Social impacts:**
 1. Impacts on health of local population.
 2. Increase in crime and deviant behaviour.
 3. Additional pressure on the existing physical infrastructure (sewage, water supply etc.).
 4. Changed cultural values.
- **Environmental impacts:**
 1. Depletion of natural resources.
 2. Destruction of habitats.
 3. Change in ph, oxygen level, toxicity of water.
 4. Global warming.
 5. Ozone depletion.

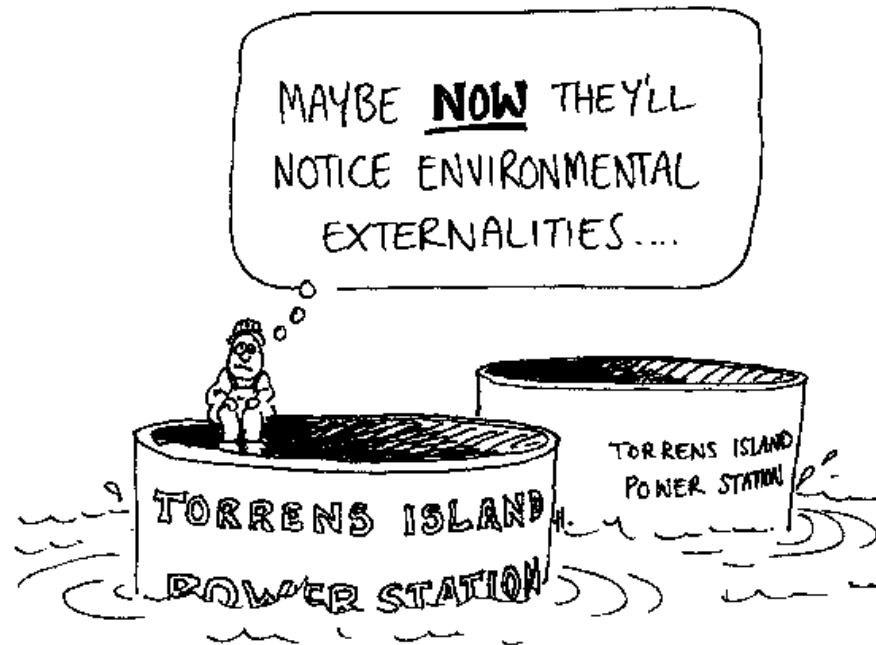


Environmental Externalities

- **Most benefits from nature are not currently captured in market economy**
- **Both positive and negative**
 - Not born equally
 - Both demonstrate market failure
- **Rarely accounted for in day to day decisions**
 - Business (including Manitoba Hydro)
 - Personal
 - National accounting, etc.
- **Implied value of ZERO or nothing**
 - The UNDP recognizes *“Methods of accounting for national wealth usually fail to reflect the value of biodiversity and ecosystem services to the economy, and the potential cost of replacing these if they are lost or damaged...”*

Environmental Externalities within MMTP EIS

- Manitoba Hydro does not recognize or define externalities within EIS
- No analysis within EIS on many externalities of proposed project impacts
- No analysis of natural capital depreciation in MMTP or Keeyask
- Needs to be accounted for in EIS process
- Therefore MH not addressing degradation of natural resources during project
- Repeated conclusion of no significant residual or cumulative effects is questionable
- MMTP should have explicitly included environmental externalities
- Ultimately costs society money



Costs to Society: Environmental Externality

- Valuation of externalities in EIS process is long overdue
- UN Development Program
 - Annual global ecosystem service loss at USD \$740 billion
- The Economics of Ecosystems and Biodiversity, TruCost, 2013
 - Assessment of total unpriced costs of global region sectors
 - Costs based on 6 categories of unpriced natural capital consumption
 - Water use, greenhouse gas (GHG) emissions, waste, air pollution, land and water pollution, and land use.
 - *None of top 20 industrial sectors would be profitable if environmental costs were included*
- Values are real
- Long-term costs are often permanent
- Investments in mitigation and infrastructure are only capturing a tiny fraction of costs

Mitigation of Significant Effects – Does it actually work?

- **Mitigation is most widely utilized global practice in hydroelectric and related projects**
- **Attempt to avoid, minimize restore or compensate adverse impacts**
- **MH defines it as “measures for the elimination, reduction, or control of the adverse environmental effects of a project and includes restitution for damages to the environment caused by those effects through replacement, restoration, compensation or other means.”**
- **Effectiveness of mitigation is influenced by numerous factors that differ at every site, such as,**
 - **Site and landscape conditions, hydrological regime, rate of development of ecosystem attributes, nutrient supply rates, disturbance regimes, seed bank conditions, invasive species, life history traits etc.**

Mitigation of Significant Effects – Does it actually work?

- Imperfect knowledge often inhibits successful mitigation efforts
- Mitigation, Restoration and Rehabilitation efforts don't work
 - World Commission on Dams: mitigation *not effective; costly*
 - Only 20% ecosystem impacts mitigated effectively
 - Significance? Cumulative effects?
 - Conclusion that dams have more negative than positive effects
- Numerous studies on wetland mitigation: mitigation efforts don't replace structure and function of ecosystems
- Numerous studies question the overall effectiveness of mitigation

Mitigation of Significant Effects – MMTP EIS

- **MMTP EIS assumption**
 - **Mitigation is effective most or all of the time**
- **Mitigation is not necessarily effective**
 - **Not sufficient evidence to support this assumption that mitigation will reduce or eliminate significant adverse environmental impacts**
- **Failed mitigation ultimately costs**
 - **Human health and well-being**
 - **society money**

Conventional EA Process: No Longer Appropriate

Given the state of global ecosystems, the sharp decline in the benefits we receive from nature, and the clear failure of the EA process to eliminate significant environmental effects and protect environmental and human health, it is time to focus on the enhancement of environmental conditions and ecosystem services, rather than the reduction of significant adverse effects, for the ultimate benefit of human health, human well-being and environmental health.

The following sections explore in detail how the MMTP EIS and other Manitoba Hydro project assessments and monitoring frameworks need to shift away from conventional environmental assessments and decision-making frameworks and begin to focus on conducting and monitoring enhancement activities that create benefits.



What are Ecosystem Services?

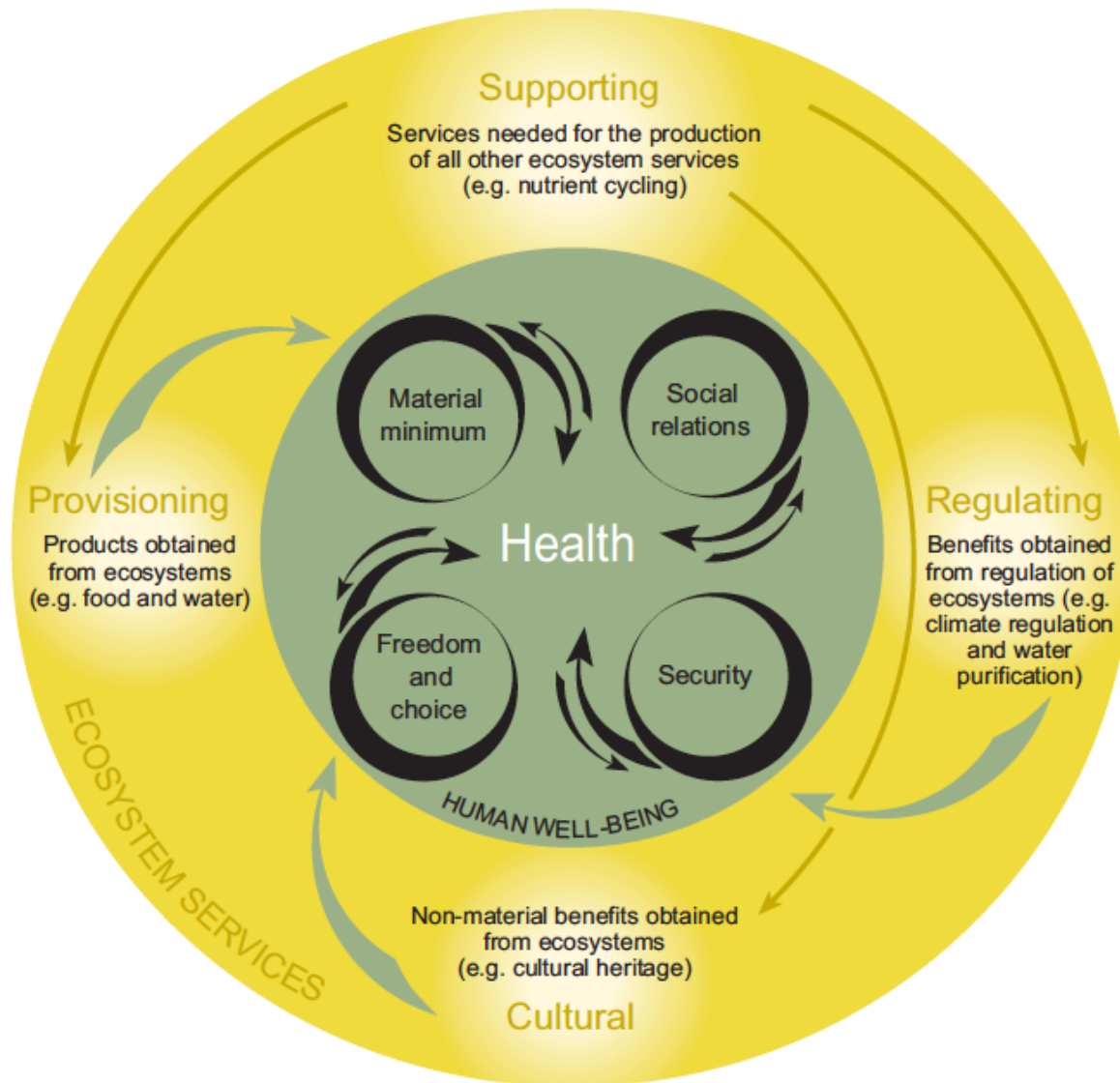
- **Based on holistic management of environmental systems**
 - **Humans are part of systems**
- **Both humans and non-humans depend on complex interactions of abiotic (i.e., environment) and biotic (i.e., species) ecosystem components**
- **Ecosystem functions encompass habitat, biological, or systems properties or processes of ecosystems**
- **Functioning ecosystems deliver specific services in perpetuity that sustain and improve human and non-human life**
- **Contribute to, and provide life support for the social and ecological functions we depend on**

Ecosystem Services: Goods and Services

- **Market and non-market ecosystem benefits individuals, households, communities and economies receive from ecosystems**
- **Delivered as goods and services**
 - **Goods: clean water, food, shelter, electricity medicine, etc.**
 - **Services: purifying drinking water, waste decomposition, flood regulation, climate regulation, recreation, etc.**
- **Most basic service example: Clean Water**
 - **Good: daily supply of clean fresh water**
 - **Services: terrestrial and freshwater systems provide the services of gathering, purifying, providing, and delivering the good**
 - **Local and regional terrestrial and aquatic ecosystem services MMTP region contribute to the provision of food for local people**
 - **Collectively referred to as Ecosystem Services**

United Nations Millennium Ecosystem Assessment (MEA, 2005)

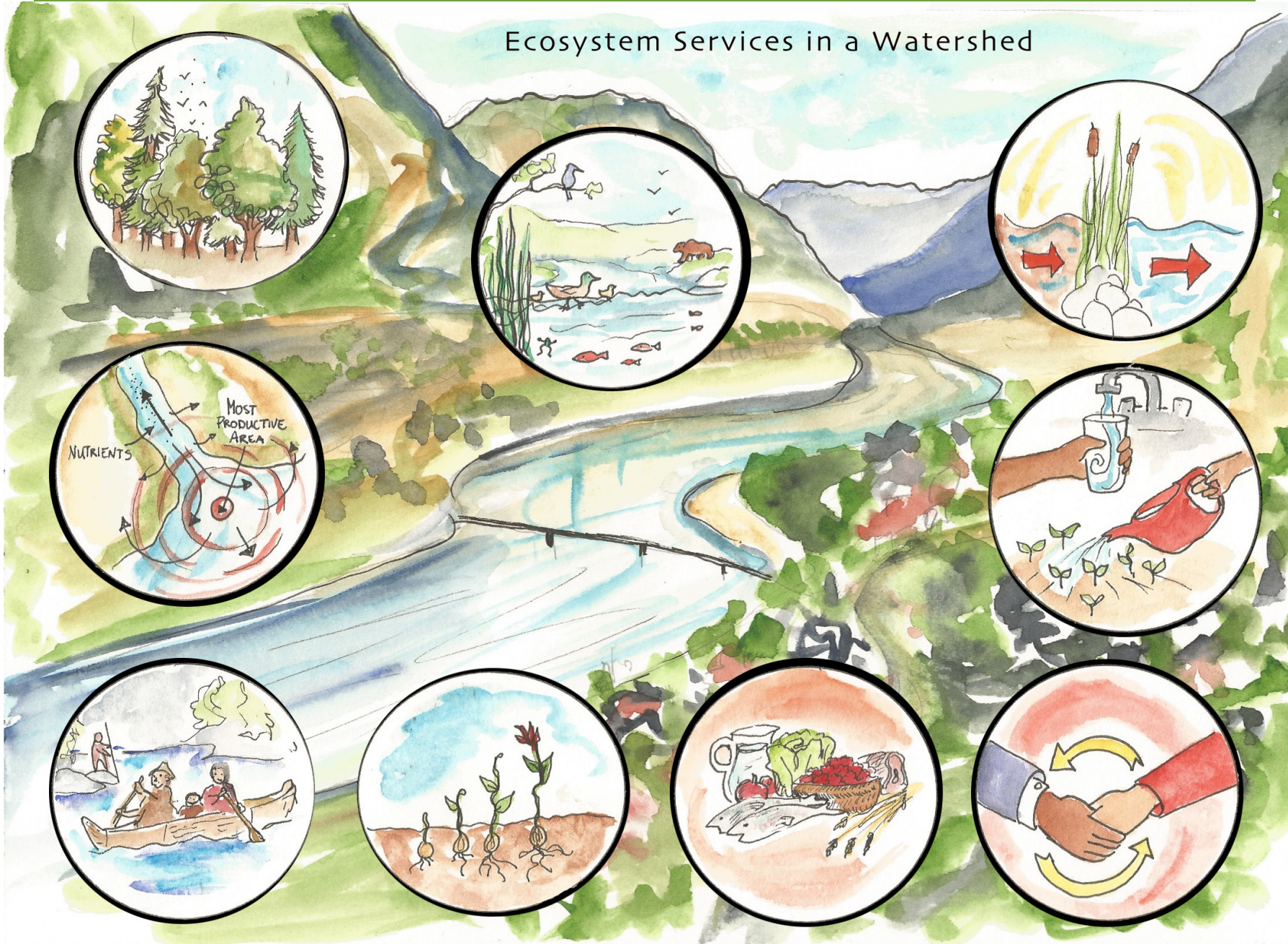
WHAT ARE ECOSYSTEM SERVICES?



Estimated that 60% of ecosystem services that were examined were being degraded or used in a way that was not sustainable

Ecosystem Services in an Watershed

Ecosystem Services in a Watershed

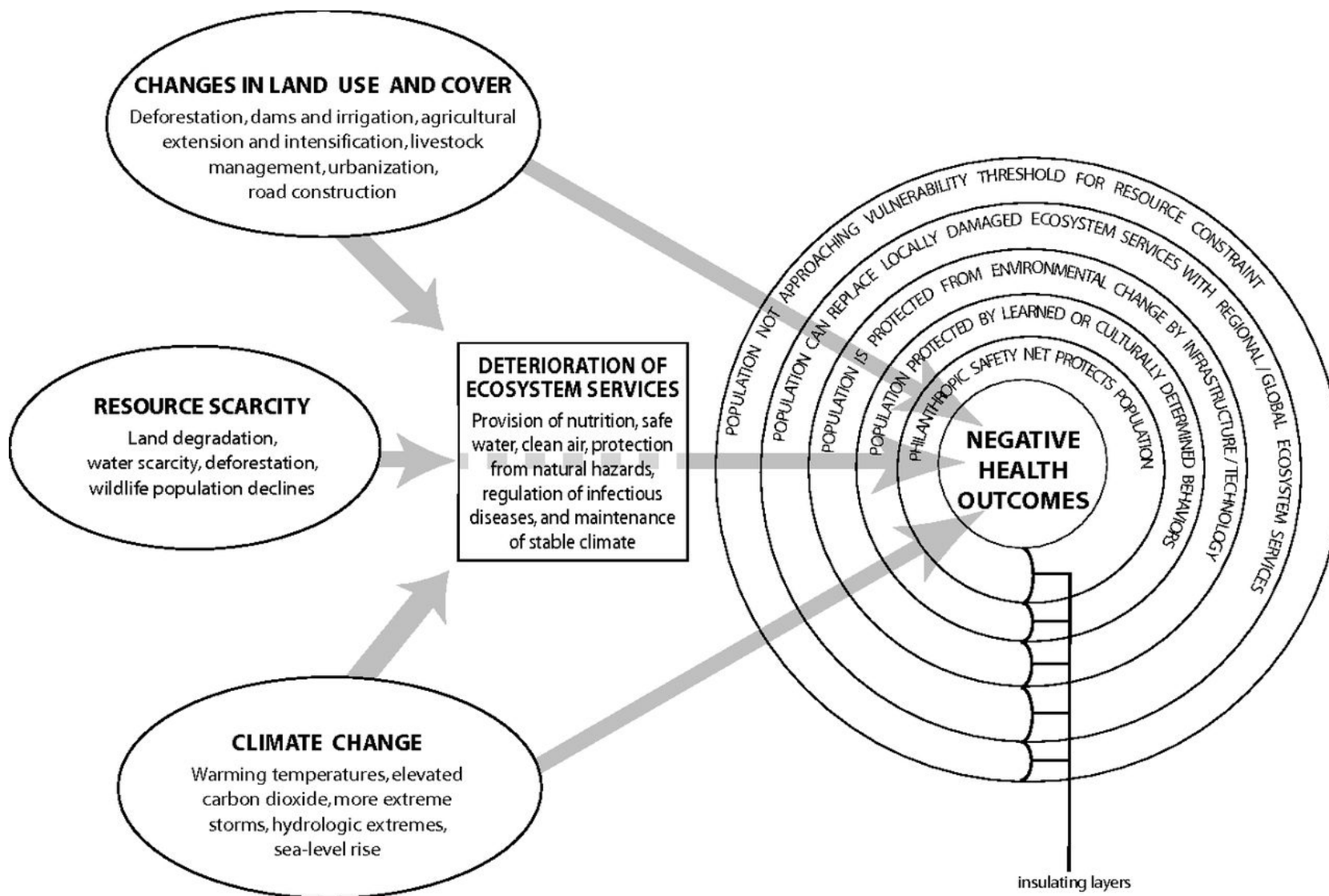


WHAT ARE ECOSYSTEM SERVICES?

Ecosystem Services in the MMTP

- Let's examine MMTP's use of ecosystem services
- We recognize MMTP has a broader examination of services
- Demonstrates Manitoba Hydro's commitment to considering previous recommendations
 - Improvement, but was it enough?
- Some ecosystem services were assessed within EIS
- But not necessarily in correct context (HIA, next sections)
 - Major EIS gap
- Assessment of significant and cumulative effects requires an integrated approach, across all relevant information
 - How do changes impact the environment, but also human health and human well-being?
- MMTP EIS should not discuss human and environmental health separately
- Reduction or decline of services has local and global human health and human well-being implications

Schematic of the complex relationships between altered environmental conditions and human health.



Human Health and Environmental Health

- **World Health Organization defines ‘Health’**
 - “A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.”
 - **Broad concept – extends beyond human only context**
 - **Encompasses other species, ecosystems, and ecological underpinnings of the drivers and protectors of health risk**
- **Biodiversity**
 - **Globally, regulates earth’s material and energy flows and its responses to gradual or abrupt change.**
 - **At the micro scale, biodiversity of our very own bodily microbial communities contributes to our nutrition; helps regulate our immune system and also prevent infections**
 - **Provide goods and services that are essential to human health and well-being.**
 - **Biodiversity is a key environmental determinant of human health, and environmental degradation reduces the ability of ecosystems to provide essential life sustaining services.**
 - **Consequently, the maintenance and enhancement of ecosystem services ultimately benefits human health.**
 - **Therefore, it is important that policies that govern the development of projects such as MMTP, should prevent the loss of biodiversity.**
 - **This would simultaneously promote environmental protection and human health protection during the life-span of the project.**

Human Health and Environmental Health

- **Dr. Gibson draws attention to the Expert Panel's recommendation of five pillars of sustainability:**
 1. **Environmental**
 2. **Social**
 3. **Economic**
 4. **Health; and**
 5. **Cultural**
- **Not a novel idea, rather typical First Nation philosophy**
 - **Holistic, interconnected web of life where humans are an interacting part of nature**
 - **Integrated lens is a relatively new western scientific concept**
 - **New discipline: Planetary Health**
 - **Fresh lens with which to assess our relationships with the natural world, and more relevant to this review, environmental assessments.**

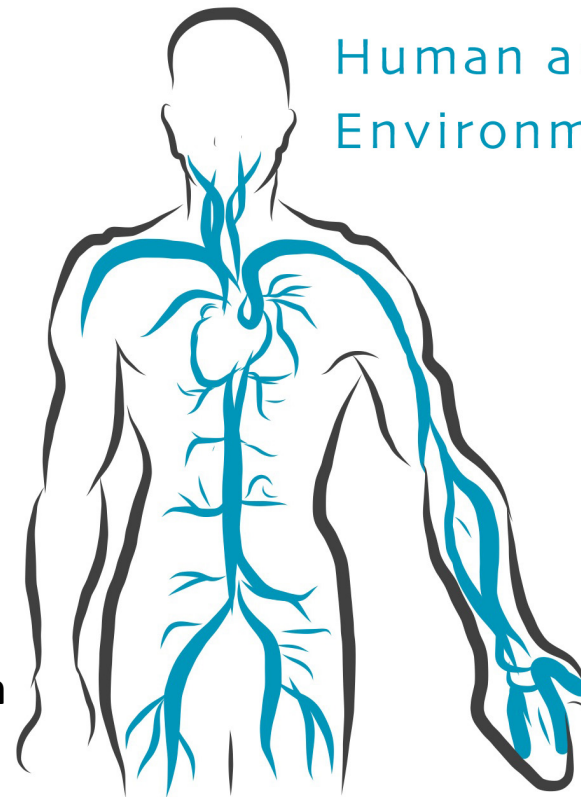
Planetary Health

- **The Rockefeller Foundation- Lancet Commission on Planetary Health**
 - “the health of human civilizations and the natural systems on which they depend,” (The Lancet Commission, 2016).
 - The environmental determinants of health, and the recognition of biodiversity and health linkages are emphasized in the Planetary Health discipline.
 - It is a foundation for the integration of relevant ecological and social information to be valued and presented in public health and environmental policies
 - Planetary Health should be explored and utilized to facilitate more effective Environmental Assessments.



Human Health and Environmental Health

- **Other non-traditional approaches that can be utilized in EAs**
- **Example from Coldstream Ecology**
 - **Analogy of the integration of human and environmental health in my local community.**
 - **Hydro dams dominate watersheds**
 - **Headwaters, tributaries blocked, ecosystem declines**
 - **Circulatory system blocks, heart attack**
 - **Declines and potential near-term extirpation of salmon**
 - **both a human health and environmental health concern**



Human and
Environmental Health

Coldstream Ecology's artistic rendition of the complexity, integration and interconnectedness of human health and environmental health.

Human Health and Environmental Health

- **Indigenous communities I work with, as well as Manitoba First Nations and Metis Federation**
 - **Numerous references connect human health to the natural ecosystems they rely on**
 - **Areas rich in medicinal plants referred to as *'our pharmacy' or 'our medicine cabinet'***
 - **Washow Peninsula as a 'kidney' for Lake Winnipeg**
 - **integrated philosophy and observation of the lake's health as parallel to a human system, with ecosystem contributions, or organs that are needed for the lake, or human body, to function effectively.**
 - **The concept of a kidney integrates the health and ecology of the entire Lake Winnipeg ecosystem.**
 - **These references demonstrate how traditional knowledge identifies the complexity of ecosystems and their contributions to ecosystem services that sustain human health, in specific areas.**
 - **This could be used in an EA to identify important areas relevant to projects such as MMTP, for example**

Human Health and Environmental Health

- **Human Well-being: Social**
 - Social and psychological impacts of ecological degradation
 - *Loss of identity or “sense of place”*
 - *Depression*
 - *Emotional stress*
- **Human Well-being: Physical**
 - Risk to crop pollination
 - Loss of potential pharmaceuticals
 - Loss of wild food crop relatives
 - Increase in zoonotic diseases
 - Let's talk about ticks



Blacklegged tick

Human Health and Environmental Health

- **Recent critical research finds it is “impossible to disconnect the mutual influences of global changes such as deforestation, land use change and climate change on tick-borne pathogen transmission systems” (Dantes-Torees 2015).**
 - **Evidence that biodiversity declines cause increased disease transmission**
 - **Global environmental changes impact host availability, vegetation cover and climate**
 - **Tick distribution is changing**
 - **MMTP region identified by Manitoba Health as high risk location for ticks**
 - **CBC – three articles just this month (May 2017)**
 - **Lyme Disease Society predicted a bad year for disease here**
 - **Canada’s top public health office – major cause for concern**
 - **Hikers on Mantario Trail – pulled of hundreds of ticks in 3 days**
- **Interactions between hosts, human disease, and the changing risk of disease transmission in relation to changing environmental conditions.**

Human Health and Environmental Health within MMTP

- **Significant and concerning EIS GAP:** No discussion in MMTP how potential cumulative impacts or residual effects regarding changes in host availability, vegetation cover or the climate; and how changes may or may not influence the prevalence of human and wildlife disease in affected communities.
 - Extends, generally, to other MH projects, provincial projects, federal projects
- Does land use change within MMTP potentially pose a risk to human health?
- HIA – Health Impact Assessment – was conducted
 - In general, the HIA context did not extend to biodiversity, and there was little discussion regarding how changes in the environment, such as land use, ecosystem conversion, etc. could potentially pose a risk to human health.
- **MMTP would have been more effective if it an integrated environmental and health assessment approach was taken,**
- Specific links and vectors associated with biodiversity declines and disease transmission should have been included in the assessment.

Significant Adverse Residual and Cumulative Effects

- **Dr. Gibson points out, that The EA Expert Panel explicitly recognizes the avoidance of adverse effects and the minimization of trade-offs as critical components of the recommended EA approach. The Panel says,**

A sustainability approach seeks to ensure that projects are planned to avoid or minimize harm and deliver benefits for current and future generations [p.20]

- **High-level compilation summary of significant residual adverse effects and project contributions to cumulative environmental effects**
- **Manitoba Hydro noted that some negative effects will occur, however due to mitigation and other factors such as environmental resilience, and low magnitude, frequency and duration of exposure to the effect...**
- **Overall, effects and impacts are predicted to not be significant.**

Significant Adverse Residual and Cumulative Effects

Valued Component (VC)	Environmental Effects	Significance of Residual Effects	Significance of Cumulative effects
Community Health and Well-being	Changes in: health resulting from socio-economic change or associated with the mobile workforce; levels of stress and annoyance; Aboriginal health; and capacity of or demand on health care and infrastructure services. Section 19.3.2.2 (Page 19-14 bulleted list)	(...)the residual effects of the Project on community health and well-being are predicted to be not significant. Section 19.7.1 (Page 19-66)	It is not anticipated that any of these activities or uses will result in any additional effects on community health and well-being [...] Section 19.6.4 (Page 19-66)
Fish and Fish Habitat	Changes in fish habitat or fish mortality. Section 8.5 (Table 8-9)	[... R]esidual environmental effects on fish and fish habitat are predicted to be not significant. Section 8.7.1 (Page 8-70)	No cumulative environmental effects on changes in fish mortality or health have been identified. (8.7.2)
Human Health Risk	Changes in: Country Food Quality, Electro-magnetic Field (EMF), Noise, and Air quality. Section 18.3.2.2 (Table 18-3)	The residual environmental effects of [...] are predicted to be not significant. Section 18.7.1 (Page 18-56)	[... T]he residual cumulative effects of the Project [...] are predicted to not be significant. Section 18.7.2 (Page 18-56)
Land and Resource Use	Changes in private property and rural residential development, designated lands and protected areas and resource use (forestry, groundwater, mining/aggregates, hunting and trapping). Section 16.3.2.1 (Page 16-18)	[... R]esidual effects of the project on land and resource use [...] are anticipated to be not significant. Section 16.7.1 (Page 16-115)	As such, the Project contribution to cumulative effects is considered not significant. Section 16.7.2 (Page 16-116)
Traditional Land and Resource Use	Changes in availability of resources and access to land. Section 11.3.2.2 (page 11-13)	The effects of the Project on the TLRU are assessed as not significant. Section 11.7.1 (Page 11-650)	Considering the cumulative effects assessments for VC's related to TLRU and the characterization of effects on known and assumed TRLU sites, the cumulative effects on TLRU are assessed as not significant (last sentence in 11.7.2)
Vegetation and Wetlands	Changes in: Landscape intactness, native vegetation cover class, wetland class, invasive plant species, rare plant species, and traditional use plant species. Section 10.3.2. (Table 10-3)	Based on these summaries, potential Project effects on vegetation and wetlands are considered not significant. Section 10.7.1 (Page 10-112)	With the addition of Project effects, cumulative effects on vegetation and wetlands are assessed as being not significant. Section 10.7.2 (Page 10-112)
Wildlife and Wildlife Habitat	Changes in mortality risk to wildlife and capacity of critical habitat. Section 9.3.2. (Table 9-3)	With the application of mitigation and environmental protection measures, the projects residual effects on wildlife and wildlife habitat are assessed as not significant. Section 9.7.1 (Page 9-113)	The cumulative effects of the Project and future projects on current conditions of wildlife and wildlife habitat are assessed as not significant. Section 9.7.2 (Page 9-115)

Significant Adverse Residual and Cumulative Effects

- **Conclusions of no significant effects: based on assumption that mitigation is effective**
 - ecological mitigation measures are not documented as being necessarily effective at reducing or eliminating impacts
 - are clearly not proven effective in maintaining, replacing or enhancing critical life sustaining ecosystem services, like the continued provision of clean fresh water and traditional, nutritious foods.
- **Going back to Dr. Gibson's Next Generation Environmental Assessment principals, and**
- **Global ecological decline,**
 - *How meaningful are MMTP EIS conclusions?*

Significant Adverse Residual and Cumulative Effects

- **Traditional Food and nutrition, as example for exploration**
- **Malnutrition: leading cause of global disease**
 - **“Even one single serving of traditional animal source foods may result in significantly increased clinical levels of energy, protein, vitamin A, vitamin B6/12, vitamin D, vitamin E, riboflavin, iron, zinc, magnesium and fatty acids thus reducing the risk of micronutrient deficiency,” (Romanelli 2015).**
- **Primary concern for First Nations and Metis Federations**
 - **continued maintenance of ecosystem services surrounding food and nutritional provision**
- **Manitoba Hydro heard this loud and clear**
 - **VC Country Food Quality**
 - **Effects to plant harvesting**
 - **Wildlife and wildlife habitat**
- **Identified many important significant impacts**

Significant Adverse Residual and Cumulative Effects

In Section 19.5.5, Manitoba Hydro states, However, based on the available information, it is likely that the Project will to some degree alter, interfere with access to and participation in traditional and cultural activities, and **may contribute to decreased consumption of subsistence foods and traditional medicines for some community members.**

Section 19.5.5.3.1 states, The assessment of residual effects for plant harvesting will result in **adverse effects** on plant harvesting by decreasing the availability of traditional use plant species and reducing the land base available for traditional plant harvesting activities.

Section 19.6.3.3 – Residual Cumulative Effects for Aboriginal Health: Effects are listed as expected to be **permanent, continuous and irreversible.** Cumulative effects on several of the VCs that influence traditional land and resource use, will also experience **permanent effects**; and The cumulative assessment of change in habitat availability (Chapter 90 – Wildlife and Wildlife Habitat) indicated that the contribution of future projects to wildlife mortality risk in the wildlife habitat RAA **will be permanent, and that birds (a source of food identified by the Peguis First Nation) will be the most vulnerable to cumulative effects.**

Significant Adverse Residual and Cumulative Effects

- **Aquatic and terrestrial wildlife populations are important dietary source of micro and macro nutrients**
 - **Populations without wild meat consumption, children had:**
 - **Higher risk of iron deficiency anemia**
 - **Sickness and death from infectious disease**
 - **Reduction in IQ and learning ability**
 - **Reduced capacity for physical activity**
- **Human Well-being: Ecosystem Services and Nutrition**
 - **Degradation of services can cause nutritional crisis**
 - **If wildlife and fish are no longer sufficient to support harvest of human nutrition, then**
 - **What will be the substitute?**
 - **How will it be substituted?**
 - **Does substitution have same nutritional value?**
 - **What will this cost?**

Significant Adverse Residual and Cumulative Effects

Manitoba Hydro finally concludes in the summary of Chapter 19, (Section 19.1) that,

Project residual effects on community health and well-being **are assessed as not significant;** and

Project effects on Aboriginal health related to the availability of traditionally harvested food, and thus food security, **will not be significant because changes in harvested foods within the RAA will not contribute to acute or chronic physical or mental health outcomes via adverse changes that are irreversible and detectable at a population level using existing population indicators;** and finally,

Cumulative effects on community health and well-being **are assessed as not significant.**

Significant Adverse Residual and Cumulative Effects

- **Conclusions require three assumptions:**
 - 1) **that food, and the nutritional quality of that food, can be easily replaced by hunting or gathering in another area;**
 - 2) **that local changes in biodiversity and ecosystems do not affect the nutritional quality of food; and**
 - 3) **that changes in these parameters are currently detectable at a population level.**
- **All three of these assumptions are likely incorrect, at least some of the time.**
- **Manitoba Hydro failed to examine these parameters in an integrated way.**
- **Further, no plan in place for continuing to monitor Community Health and Well-being VCs, as law does not require it.**
- **The MMTP Socio-Economic and Land Use Environment – Technical Data Report (2015) : excellent baseline summary document.**
 - **a starting point to begin integrating the interactive human and environmental health effects.**

Self Assessments within EIS

- Evidence presented so far has caused me to question the conclusions of no significant effects
- Was the EIS really meaningful?
- Does Self Assessment have anything to do with the conclusions?
 - Environmental Assessment conducted by the proponent
 - Proponent files EA
 - In this case Manitoba Hydro
- Perhaps an Independent Assessment is needed.

Regenerative Sustainability and Design

- The foundation of industrial revolution activity has been based on degenerative design.
 - “We take earth’s materials, make them into stuff we want, use it for a while, and then toss it away... . It’s a one way system that runs counter to the living world, and it’s devouring the sources of it’s own sustenance,”
 - Take-Make-Use-Lose (Raworth, 2017).
- Gibson (2017) explains the federal EA Expert Panel’s position on commitments to positive contributions to sustainability. The Panel says,

“Sustainability should be central to federal IA. To meet the needs of current and future generations, federal IA should provide assurance that approved projects, plans and policies contribute **a net benefit** to environmental, social, economic, health and cultural well-being (p.20).”

Regenerative Sustainability and Design

The EA Expert Panel Report and this MMTP EIS submission present evidence that the current societal approach we take in interacting with the planet, including the way we exploit natural resources and assess the consequential environmental impacts in projects such as MMTP, needs to change to reflect a new, more holistic and interdependent relationship with the earth (Planetary Health).

Manitoba Hydro Contributions and Co-benefits

- What are the co-benefits, besides jobs and revenue sharing?
- Did MMTP clearly identify benefits of the project?
- Ecological benefits within each chapter were either not expressly identified or were difficult to locate.

- One specific area focus was on net benefits.
 - Enhancement of critical habitat is planned for a bird species of concern, the Golden-winged warbler
- This model should be extended for all species and ecological concerns – birds, plants, fish, wildlife etc.

- Manitoba Hydro is the largest industrial employer in Manitoba, with the most infrastructure. One would therefore logically conclude that Manitoba Hydro projects and infrastructure should confer the largest benefits to ecosystems and humans alike.

Recommendations to CEC regarding MMTP

- **Actively fill knowledge gaps and reduce uncertainty**
- **Complex linkages between ecosystems and public health need to be identified, characterized, understood and integrated into environmental assessments.**
- **Steps to reduce these uncertainties and increase the effectiveness during the EIS process, or during the life of the Project should:**
 - **Focus on VCs that encompass the ecological determinants of human health and wellbeing;**
 - **Catalogue the ways in which the changes to the environment directly or indirectly impact human health;**
 - **Facilitate a better understanding of the health services provided by biodiversity and how changes to ecosystems influence disease risks;**
 - **Focus on documenting how the project, policies and management actions and subsequent environmental changes improve environmental health and human health;**

Recommendations to CEC regarding MMTP

- **Steps to reduce these uncertainties and increase the effectiveness during the EIS process, or during the life of the Project should:**
 - **Focus on changes in the availability of critical ecosystem services like the “quality of water and food, how changes in land and water use affect biodiversity, and if those changes potentially alter the transmission of vector borne, zoonotic and other infectious agents,” (Romanelli 2015);**
 - **Focus on reducing uncertainty regarding the effects of changes on the frequency and intensity of extreme events in aquatic and terrestrial systems;**
 - **Make intentional decisions and design for environmental and human health co-benefits by looking purposefully for win-win situations;**
 - **Facilitate key actions before key ecosystem services disappear and irreversible ecosystem changes occur; and**
 - **Build on local resources and capacities to steward ecosystems and their services for the protection of human and environmental health.**

Final Comments

- **Given the rapid earth changes, and the escalating degradation of the benefits we receive from nature, it is important that we not only assessed the content of the MMTP EIS for potential adverse effects, but that we examined the effectiveness of the process itself.**
- **We engaged in an examination of the relationships that were adopted in the Manitoba Hydro Manitoba – Minnesota Transmission Project EIS approach, assessment and conclusions.**
- **One overarching question drove our review: Did the MMTP EIS reinforce healthy relationships between human beings and the environment?**
- **This submission detailed our examination of that relationship.**
- **Small but significant set of issues were identified.**

Final Comments

- **Highlighted Issues:**
 - **Context and overall effectiveness of the MMTP Environmental Impact assessment process;**
 - **Assumptions regarding the effectiveness of mitigation;**
 - **Significant gaps in important information relating to biodiversity, ecosystem services, human health and human well-being; and most importantly,**
 - **a failure to link relevant ecological information to human health and human wellbeing in current and future contexts within project specific and cumulative effects.**
- **Conclusions in the MMTP EIS are not necessarily accurate or meaningful, nor do they appear to be effective in safeguarding the environment and protecting human health and human well-being.**

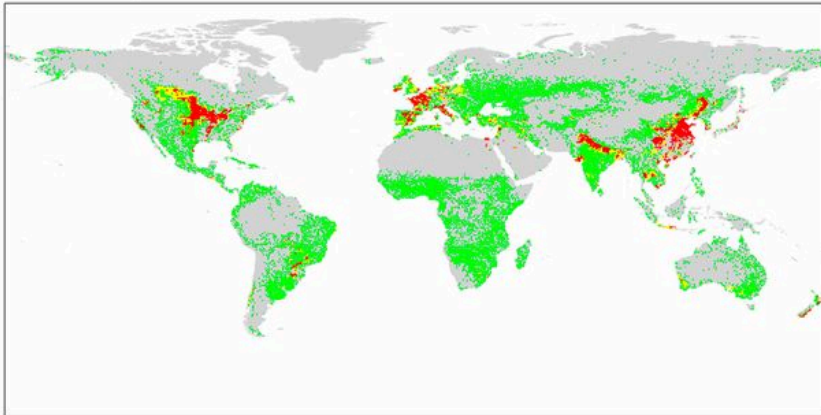
Opportunities for Professionals and Manitoba Hydro

- EAs provide an immense opportunity to society and those impacted by proposed projects, to engage in meaningful, truthful and transparent reporting about potential project implications.
- Manitoba Hydro, and other EA professionals need to embrace integrated framework
 - Begin accounting for essential life-sustaining ecosystem services
 - Move away from moderating or mitigating adverse effects towards a net-benefit model.
 - Appropriately scoped to include the full range of potential risks, impacts and benefits
 - Reflect today's ecological realities
 - Reflect today's societal values
- Planetary Health as a foundation for EAs
 - Nature based solutions
 - Nature can and will contribute to addressing health and social challenges of our time
- By focusing on integrated health, environmental, cultural and socio-economic effects, risks, and most importantly benefits, a real opportunity to begin designing win-win situations has arrived.

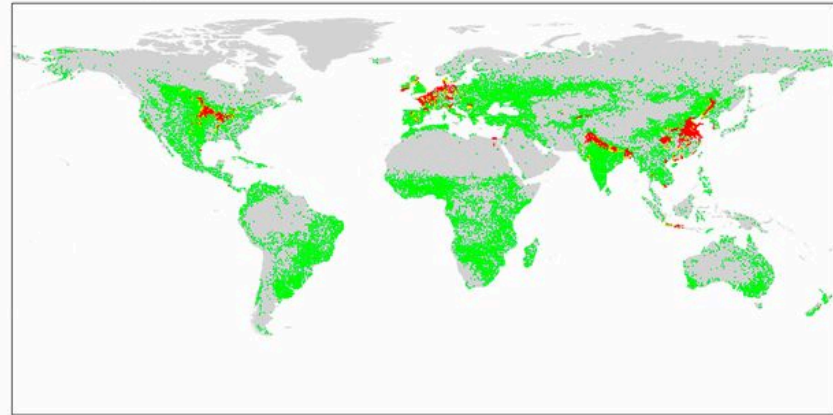
THANK YOU.

The subglobal distributions and current status of the control variables for (A) biogeochemical flows of P; (B) biogeochemical flows of N; (C) land-system change; and (D) freshwater use.

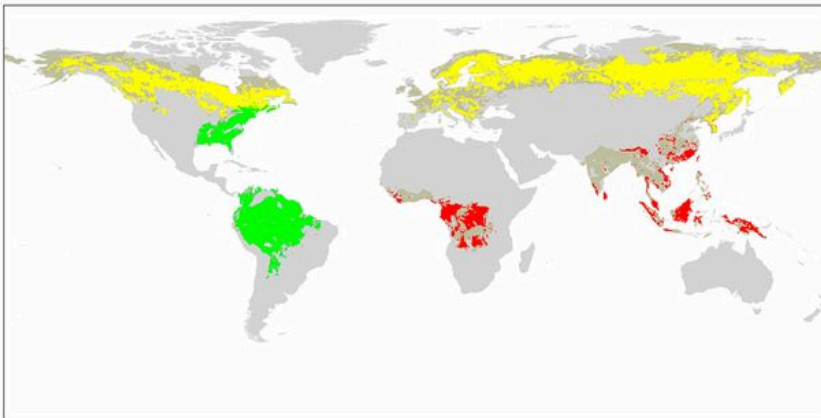
A Phosphorus



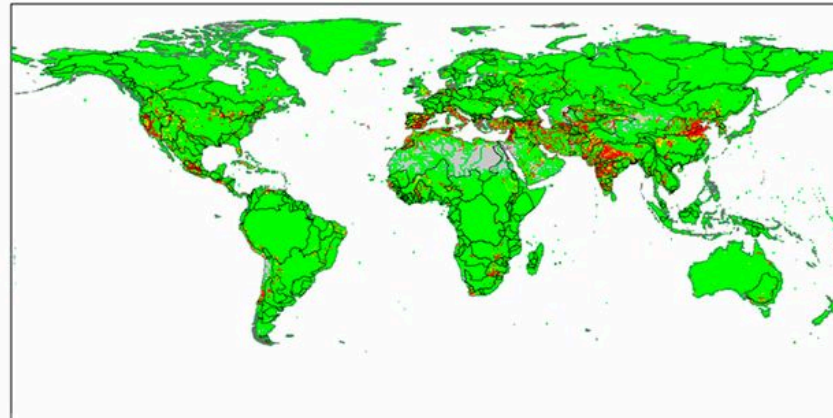
B Nitrogen



C Land-system change



D Freshwater use



■ Beyond zone of uncertainty (high risk)

■ In zone of uncertainty (increasing risk)

■ Below boundary (safe)