CO-CREATION OF INDIGENOUS WATER QUALITY TOOLS

A community-driven project (Six Nations & Lubicon Cree) in collaboration with McMaster University to address water security, water sovereignty, and environmental solutions and resiliency of First Nations communities.

The overarching aim of this project is to develop Indigenous knowledge/traditional ecological knowledge co-create tools, technology to improve water monitoring, assessments, training, management and foster resilience.
CO-CREATION OF INDIGENOUS WATER QUALITY TOOLS

• PI: Dawn Martin-Hill, Indigenous Knowledge, Department of Anthropology
• Ecosystem: Dr. Chow Fraser (Co-PI), Ecosystem Health Assessment Team Leader, Professor, Department of Biology,
• Health: Christina Moffat, Associate professor, Department of Anthropology
• Sensing: Ravi Selvaganapathy (Co-PI), Sensing Systems and Data Synthesis Team Leader, Professor, CRC in Biomicrofluidics, Dept Mech Eng.

Co-investigators:

• Charles de Lannoy, Assistant Professor, Dept. of Chemical Engineering
• Altaf Arain, Professor, School of Geography and Earth Science
• Emil Sekerinski, Associate Professor, Dept. of Computing and Software
• Nancy Doubleday, Hope Chair in Peace & Health, Professor, Dept. of Philosophy
• Nidhi Nagabhatia, Adjunct Professor, School of Geography and Earth Sciences
• Zoe Li, Assistant Professor, Department of Civil Engineering
• Peter Kruse, Associate Professor, Department of Chemistry and Chemical Biology
KAHSWENHTHA ~ TWO ROW
Made with Dutch, Europeans have their ways, laws, religion and we ours; we will co-exist peacefully do not try to steer our canoe.

... “While humans have “significantly altered” environments, these trends have been less severe or avoided altogether in areas held or managed by Indigenous peoples. Indigenous people could contribute to global sustainability efforts if provided legal and political rights to use and steward the lands they know so well”

(Sandra Díaz (Co-Chair, Argentina), Josef Settele (Co-Chair, Germany), Eduardo Brondízio (Co-Chair) Brazil/United States of America). UN 2019
What is Indigenous knowledge anyway?

According to Elders ‘knowledge’ aka science, without application, transmission or mobilization as conceptualized in the language which is “verb” based; not a “noun” based language - therefore “knowledge” is an *action with intention* based on accumulated empirical evidence & logic over thousands of years. The tension between IK is nested in Western Knowledge is abstract, linear & descriptive and does not meet the Indigenous metric of ‘knowledge’ aka science and western science devalidates IK as *non-scientific*. Conceptually
Indigenous culture & identity is constructed from their geographic location. i.e. the word "Mohawk" is Kanien’kehá:ka or "Flint Stone Place" or "People of the Flint Nation"

“People of the Flint” the ecological knowledge is embedded in stories, dance and song. From the fish dance to the alligator dance, the origin and location of species are expressed in dance, song, ceremony and root words linguistically.

Ohen:ton Karihwaṭehkwen (Thanksgiving Address)  
this teaching instructs us to believe in the interrelatedness and interdependence of all parts of the natural world, it is our paradigm.  
The thanksgiving speaks of a time the dinosaurs roamed and of their extinction, and gives thanks to the thunder’s for driving them underground so humans could live.  
It gives thanks to all life including water, Ohneganous ‘water is precious’

The research undertaken reflects the principles of everything being related
“Kahnekaronnyon - Water Is Everywhere”

Which means the Earth is covered in water

Example of a digital story
Culturally and spiritually, every morning in our schools at Six Nations we say the thanksgiving address. We give thanks to the water, all bodies of water. We give thanks to the lakes, river and streams, the large bodies and small bodies of water, even down to our groundwaters. The water that flows under our feet to bring life and helps sustain our people, this is very important and we have recognized this since the beginning of time. We need to keep recognizing that, protecting our ground water.
GWF1: Co-Creation of Indigenous Water Quality Tools (Phase 2)

Teams:
- Traditional Ecological Knowledge Team
  - Dawn Martin-Hill
- IK and Community
  - Dawn Martin-Hill
  - Nicholas J. Reo
- Community Health
  - Christina Moffat
  - Karen Stote
- Collaborator Deliverables
- Biological Sciences
  - Mark Servos
  - Karen Kidd
- Physical Engineering
  - Charles de Lannoy
  - Zoe Li
  - Emil Sekerinski
  - Alalaf Arain
- Ecosystem Health
  - Team
  - Charles de Lannoy

Deliverables:
- Living Bilingual TEK/IK Archive
- Bilingual IK Relationship Mapping
- Bilingual IK/WS Digital Map
- Virtual Reality Exhibit
- WTP Operator Training[^1]
- River Remediation Knowledge Exchange
- Health Survey Deployment and Analysis
- Biological Sampling (Human Hair)
- Literature Review (Reproductive Health)
- Great Art for Great Lakes Art Project
- Online Module for Engineers
- Water Contaminant Info (e-DNA)
- Water Contaminant Info (Fish/Turtles)
- Data Visualization Tools
- Surface Water Quality Info (Sensors)
- Sensor Training, Testing, Validation
- Risk Assessment/Remediation Proposal
- Climate Change Projections
- Establishing Quality Baseline Metrics

Committees:
1. Involvement of Lubicon (Treaty 8)[^2]

Figure 10d
CCIWQT (Phase 2) – Deliverable Map
CCIWQT, SSDS, Ohneganos
Global Water Futures

*Refer to Slide 2.
Putting it all together: A Holistic Vision for Community

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Elders wanted water testing including heavy metals - Dr. De Lannoy test found mercury in tap water with other contaminants
Health data - water usage survey in each household & tap, cistern, well water was tested.

WATER SECURITY

is the inability to “access and benefit from affordable, adequate, reliable, and safe water for wellbeing and a healthy life” (Young et al. 2019)

THIS IMPACTS

• Psychosocial, cultural, physical, and environmental health
• Reduces productivity
• Rates of interpersonal violence, social violence, and political tensions
WATER SECURITY RESULTS

60% of respondents (40/66) were water insecure based on the HWISE scale rating (over 12).

Average Water Security Rating = 14.5
ECOSYSTEM HEALTH

- The aim is to investigate the impacts of climate change on hydrologic processes, and exploring the effects on the water and ecosystems health. Elders directed Pat on what waters, where and why they should be assessed.

Youth from Six Nations with biologist Dr. Chow-Fraser and her students
Ohneganos Ohnegahdę:Gyo (TEK)
Indigenous Ecological Knowledge, Training & Co-creation of Mixed-Methods Tools

PROJECT INFORMATION Resiliency & Preparedness

- **Main objective:** to develop educational and wellness tools (e.g. bilingual mapping waterscapes, turtle tagging, mental health app, bilingual science textbooks developed from CCIWQT findings)
- Partnering with local college - *educational pathways* e.g. TEK diploma, water operator certification, experiential learning initiatives) for Indigenous youth.
- **Methodology:** Innovative approach to knowledge creation/epistemology reconciliation – co-constructing knowledge by corroborating Western Science and Indigenous Knowledge through digital mapping, building a platform for all water material, data and training

MEETING SDG 3,4,13, 14 15
- **Community Partners:** Six Nations and Lubicon Lake Nation

Figure 1: Youth leadership – opening at the UN Youth Climate Summit.
Project Impact: Sustainable Development Goals, UN.

- Traditional Ecological Knowledge and data from Western Science impactful addressing: SDG-3, 5, 6, 9, 16
- Technology identified as priority to create Interactive experience with both TEK - WS by employing Indigenous pedagogies (digital storytelling, Apps, VR & simulation, experiential learning) and cutting-edge technologies such as holograms.

- Virtual reality, 3D modelling, volumetric

Figure 2: Volumetric capture to create a hologram for storytelling at Mohawk College (Personal, 2019).
Virtual Reality of the Longhouse
MENTAL HEALTH

• Uncontrollability, unpredictability increases the level of stress
• “Toxic stress” – Toxic environments
• Water anxiety – Trauma-informed lens important

• **Mental health** together with physical health, and spiritual wellbeing necessary to maximize potential

CCIWQT found youth in the community were distressed about lack of access to clean water, the condition of the Grand River and on-going water insecurity. A youth specific survey is being developed, youth events to empower Youth.
The Stages of the Trauma-Informed School Process/Movement

Adapted from the Missouri Model: A Developmental Framework for Trauma-Informed, MO Dept. of Mental Health & Partners (2014).

Trauma-Aware (Facts/Data)

Trauma-Woke (New Lens on Life)

Trauma-Sensitive (Thinking Differently)

Trauma-Responsive (Responding Differently)

Trauma-Informed (Empathic Leadership)

*Trauma-Empowered:
"The people most impacted by any given social problem are the “experts.” They know how they were pushed out & what values were eroded in the process. They find their way back in growing the values at stake within themselves, from each other & what they give back to their communities." ~Jessie Sutherland
STORY’ING OUR LAND, COLONIAL MAPS PRESENT ‘EMPTY WILDERNESS’-WE POPULATE THEM WITH ANCIENT HERITAGE, ECO-SYSTEM KNOWLEDGE and CREATION OF A LIVING ARCHIVE
THE SIX NATIONS BIRTHING CENTRE AND MCMASTER PEDIATRICS IDENTIFIED AS A PRIORITY
OVER HALF OF HOME BIRTHS ARE TO HOMES WITHOUT RUNNING WATER

Traditional stories identified priority of maternal health
- Water as first environment
- Significant indicator of ecosystem health, water quality and human health
- Turtles identified by elders as well as priority in determining resiliency
- Survey & Midwives assessment of prenatal health related to water.
- Sampling hair to assess impact of contaminants
Project Title: Transformational Science: Community Engagement

KM Training Highlights:

**Ohnegahdę:Gyo** - Indigenous Ecological Knowledge, Training & Co-creation

*Warrior science camp, engineers & Ticats, training water testing*

*Project outreach: Youth-led Climate Event Six Nations*

*Dr. Chow- Fraser ecosystem assessment, Lubicon Cree*


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Grandmothers Council
Community Lead: Dr. Bev Jacobs & Lori Davis Hill.
Clanmother Mary Sandy & Faithkeeper Norma Jacobs
(Grandmothers Council),
Renee Thomas Hill (Elder in Residence, ISP.,
Education Committee:
Lorraine Carter-Continuing ed.
Lorraine Vanderzwet-Servos,
Kamala Kruse (Mohawk College),
Lubicon Band Council (Elders & Youth Water Council)

HCC-Water Committee
SNEC, SNHS
Leroy Hill (Haudenosaunee Resource Centre),
John Williams (Hamilton Ticats,
James Knibb (Lamouche-Indigenous Elders & Youth Council),
(Woodland Cultural Centre) and,
Cam Hill (Traditional Medicine Clinic at Six Nations)
Kawenni:io
Environmental Office
Fish & Wildlife
Lubicon Elders Council