



Considering Cultural Uses of GIS: Intersections with Climate Science

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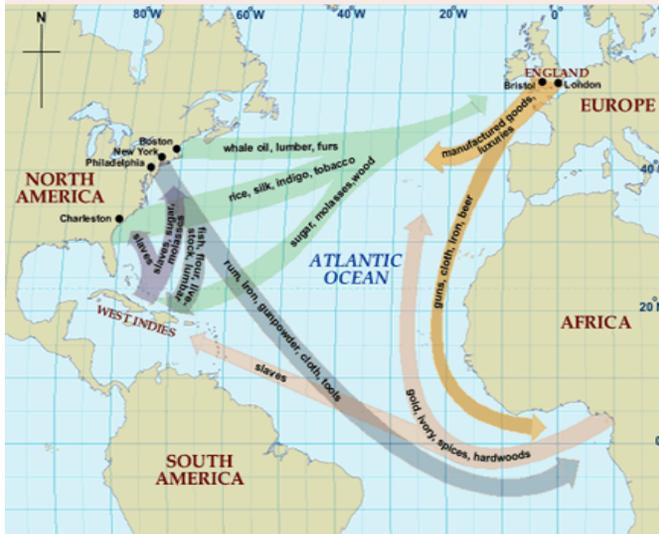


Overview

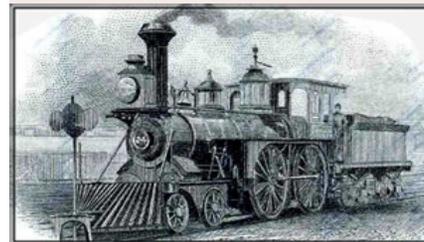
- The context: conflict
- Indigenous Knowledge: the spatial aspects
- Geospatial technologies
 - Geography, Science, Technology
- Examples of synergy

Meta-narratives Timeline

The Columbian Exchange



The Industrial Revolution



The Scientific Revolution



Globalization



The Age of Discovery and Exploration



1418-1565

1492

1550-1750

1775-1860

1950 - 201?



Who are Indigenous Peoples?

- Indigenous peoples are diverse in their culture, religion, and socioeconomic organization.
- They share a common experience as:
 - original inhabitants of their lands,
 - share a legacy of colonialism
 - have a set of values in contrast Western priorities
 - seek to maintain a spiritual and sustainable connection to homelands

UN Secretariat of the Permanent Forum on Indigenous Issues, 2004

What is Indigenous Knowledge?

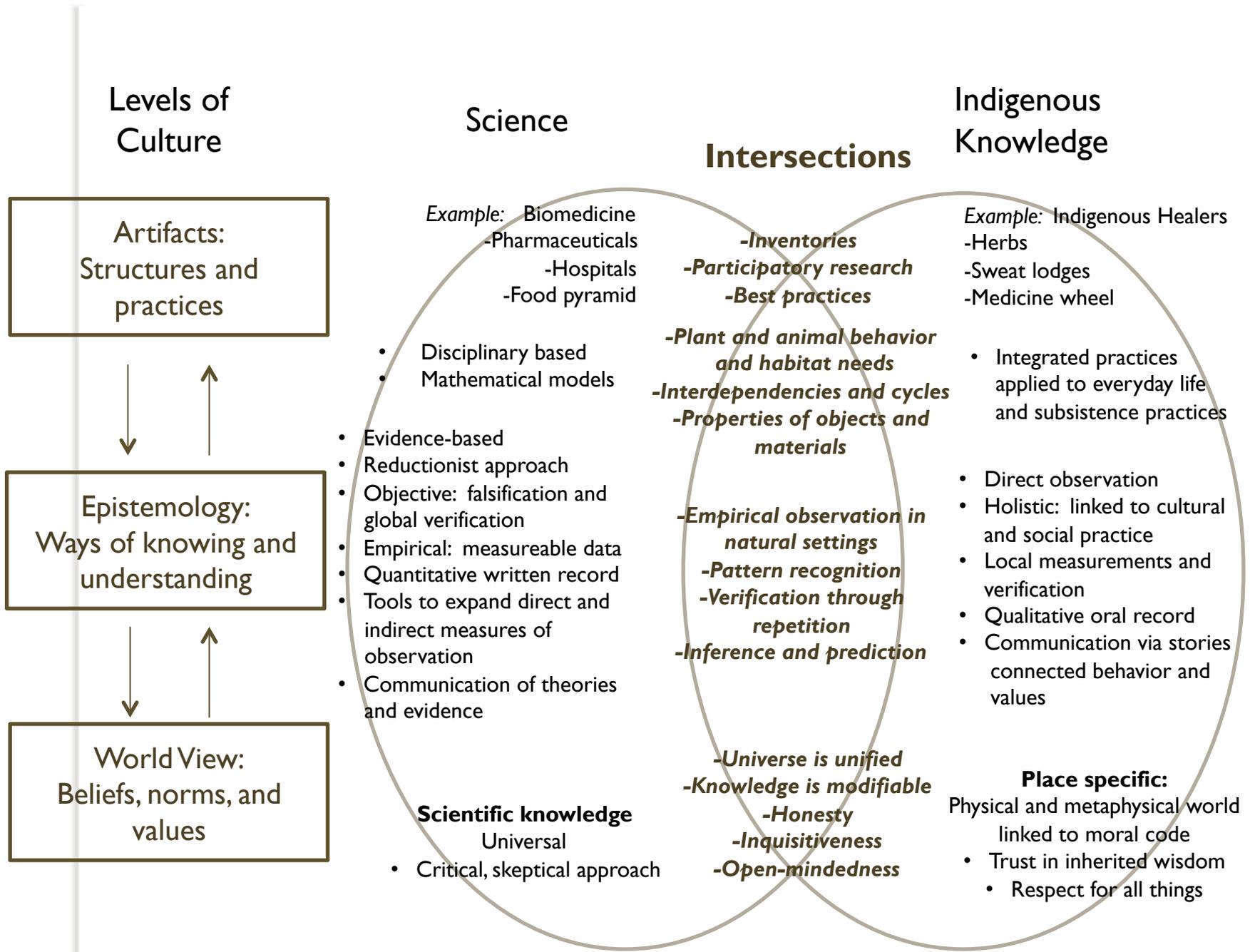
- Local knowledge embedded with particular place and culture
 - Numerous representations of IK throughout the world
- Tacit and dynamic knowledge
 - Spiritual, symbolic, qualitative
- Distributed database: stored amongst members of community
 - Intergenerational sharing
- Shared via cultural norms and practices
 - Oral tradition

IK issues:

- Local struggles linked to global initiatives
- Identity:
 - Self-autonomy
 - Cultural heritage
- Sovereignty:
 - Land tenure/Land rights
- Resource management
 - Water resources
 - Plants
- Adaptation to climate change

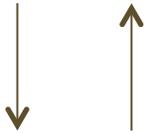


<http://www.ocs.mq.edu.au/~cjone005/painting.htm>

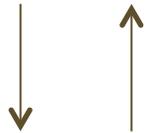


Levels of Culture

Artifacts:
Structures and practices



Epistemology:
Ways of knowing and understanding



World View:
Beliefs, norms, and values

Science

Example: Biomedicine
-Pharmaceuticals
-Hospitals
-Food pyramid

- Disciplinary based
- Mathematical models
- Evidence-based
- Reductionist approach
- Objective: falsification and global verification
- Empirical: measurable data
- Quantitative written record
- Tools to expand direct and indirect measures of observation
- Communication of theories and evidence
- **Scientific knowledge**
Universal
- Critical, skeptical approach

Intersections

- Inventories
- Participatory research
- Best practices
- Plant and animal behavior and habitat needs
- Interdependencies and cycles
- Properties of objects and materials
- Empirical observation in natural settings
- Pattern recognition
- Verification through repetition
- Inference and prediction
- Universe is unified
- Knowledge is modifiable
- Honesty
- Inquisitiveness
- Open-mindedness

Indigenous Knowledge

Example: Indigenous Healers
-Herbs
-Sweat lodges
-Medicine wheel

- Integrated practices applied to everyday life and subsistence practices
- Direct observation
- Holistic: linked to cultural and social practice
- Local measurements and verification
- Qualitative oral record
- Communication via stories connected behavior and values
- **Place specific:**
Physical and metaphysical world linked to moral code
- Trust in inherited wisdom
- Respect for all things

Partnership between IK and Science

Indigenous Knowledge Approach	Convergence	Scientific-based Approach
Identify locally specific mechanisms of change	Common goal	Mechanisms for observed change
Describe locally specific impact of change in ecosystems	Common geographic and temporal foci and scale	Interpret observed changes and assess importance in larger context of space and time
Ground-truth remotely sensed information for model input	Common phenomenon	Quantify observed changes and trends over time
Use in monitoring and reporting observations during seasons	Common unit of analysis	Identify changes not easily captured by IK systems (biogeochemical cycling)
Prioritize targets and locations for future research	Integrated datasets and analysis	Provide information on predictions of change

Adapted from Furgal, et al. 2006



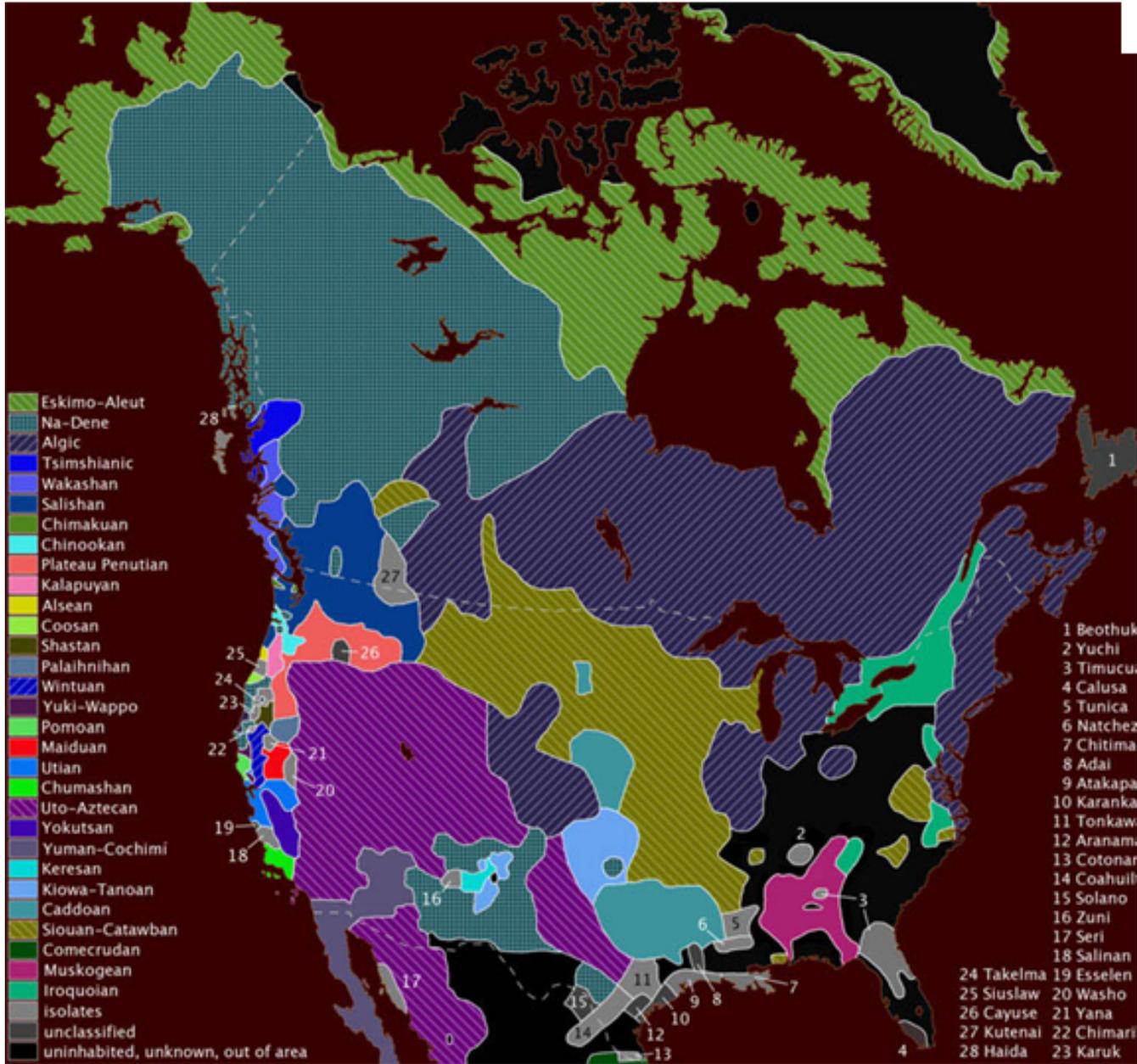
The Geospatial Landscape

- **Think spatially**
 - Where and why
- **Spatial literacy**
 - Projection, rectification, resolution, scale, datum, coordinate systems
- **Explicit information**
 - Data, data formats, database management – integrated and shared databases
- **Exists within a computer**
 - Computer literacy, software/programming understanding, Internet literacy
- **Integrative tool**
 - Common/similar sites
 - Multiple scales: time and space
 - Inter-relationships
- **Cartographic output**
 - Interactive maps
- **Suite of technologies**
 - GIS, RS, GPS, Internet



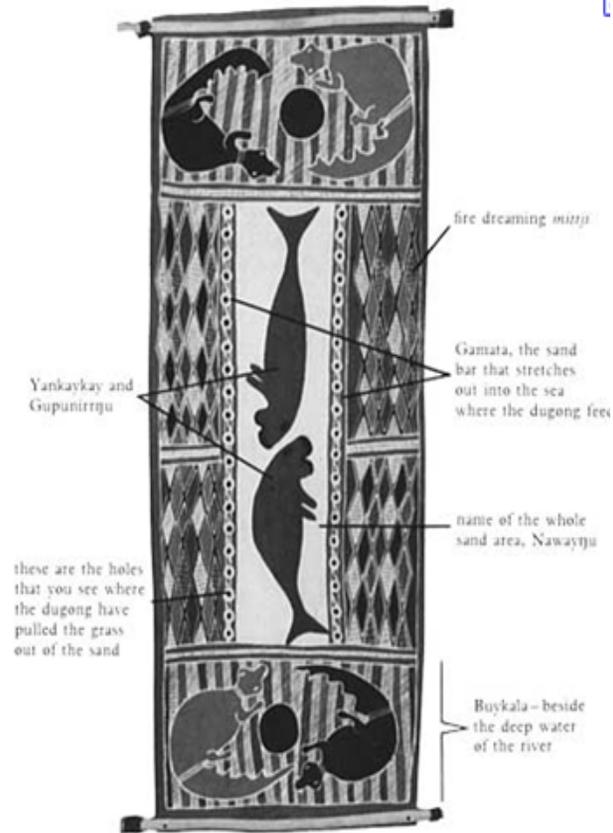
Do Geospatial Technologies reflect a reliable landscape?

- Reductionist approach, holistic applications
- Whose information?
- Knowledge transmission
- Software limitations

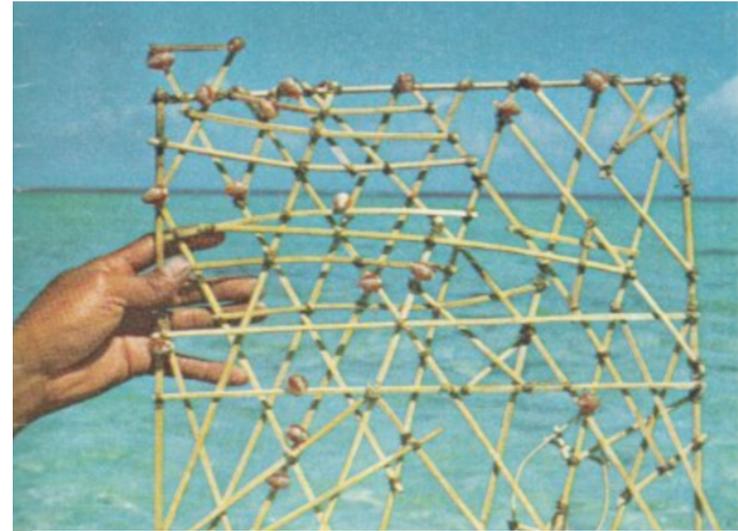


Indigenous representations of space and time

Australian Aboriginal dream tracks



Marshall Islanders stick charts



Greenland Inuit wooden coastal map



Sources: <http://territories.indigenousknowledge.org/exhibit-5/3>, www.marshallislandschamber.net/Stick_Chart.htm, www.learner.org/courses/amerhistory/interactives/cartographic/1-2.html



Case Studies: Synergy

- First Peoples Internet adoption
- Online Disaster Response Community
- Maori communities, Northland, New Zealand
- Wind River Indian Reservation, Wyoming, USA
- Community mapping, Botswana
- Herder communities, Mongolia
- Perception mapping, Kenya



Local/Indigenous Online Activity

- Identify the First Peoples in a global environment
 - Self-determination
- Deliberation and decision-making for generations to come
 - Recognition of the role of the Internet for empowerment and communication
- Inventory: data, methods, and information
 - Tribal documents
 - Policy development
 - Protected databases
- Identify Local/Indigenous Information Technology Islands
 - Networks

Types of Local/Indigenous Websites

Type	Characteristics
Cultural frameworks	<ul style="list-style-type: none"> -Multi-media -Integration of oral histories, native language, education -Limited access
Bridging the cultural digital divide	<ul style="list-style-type: none"> -Inter-cultural communication -Cross-generational communication
Combinations of information	IK with state-of-the-art computer and satellite technology
Specific training for IK practices for First Peoples	<ul style="list-style-type: none"> Cultural base maps Cognitive maps Boundaries Best practices
Data repositories	<ul style="list-style-type: none"> Historical maps GIS data Patents
Tribal websites	Lots....
Specific projects	<ul style="list-style-type: none"> Repatriation of Indian remains – National NAGPRA Database Inventory of resources – Environment for Social Change, Philippines Land claims – Uma Banaag Residents Association, Malaysia Planning – Mobile Interactive GIS Inventories of environmental and cultural resources – Amazon GIS



Climate Change: Indigenous Adaptation strategies

- Compendium of climate change case studies, adaptation and Indigenous Peoples, UNU-IAS (www.unutki.org)
- Climate Change: Indigenous People and Adaptation Symposium, 2011
- Indigenous People's Global Summit on Climate Change (www.cakex.org)



On-line Disaster Response Community

- **Linking the physical world to the symbolic world**
 - Where harm originates and where action occurs
- **Global community: Disaster awareness and humanitarian aid programs**
- **Regional community:**
 - On-line disaster response network
- **Local community:**
 - First responders of the wired world (Currion, 2005)



Community participation in Disaster Management

- **Role of community in disaster management**
 - Community self-discovery
 - Participatory process: empowerment
 - Local knowledge
 - Understanding natural safeguards
 - Community initiatives to protect local, small-scale activity
- **Integrative approach**
 - Include in decision-making



Local knowledge for disaster management:

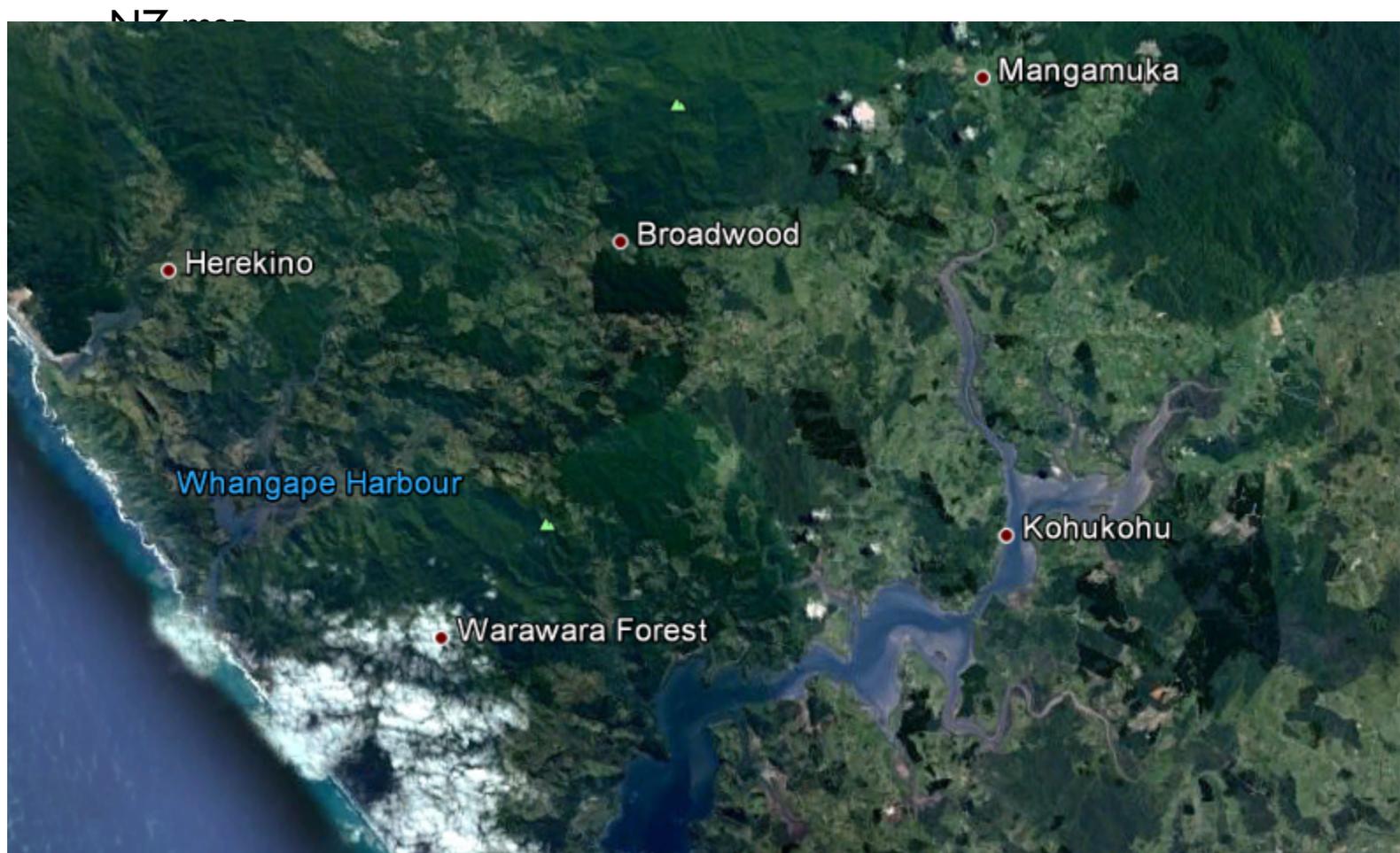
Integrated Approaches to Participatory Development

- Peru: terraced agricultural fields to prevent landslide and flooding
- Swaziland: flood prediction via identification of biophysical indicators
- Andaman Islands tribes, Sea gypsies of Thailand: avoidance of tsunami through observations wind and wave patterns
- Vietnam: flood protection via mangrove planting
- Pacific islanders: Local, lightweight materials to absorb torrential rainfall and withstand earthquakes



Maori communities, Northland, New Zealand

- Economic development
 - Self-determination
- GIS, Resource Management Act, Treaty of Waitangi
 - Technology transfer
- Consultation
 - Trust
 - Data collection, database construction

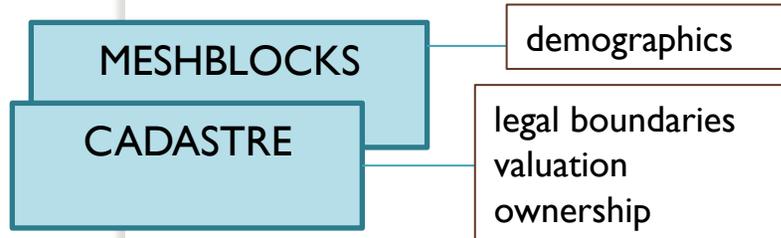


Google Earth image

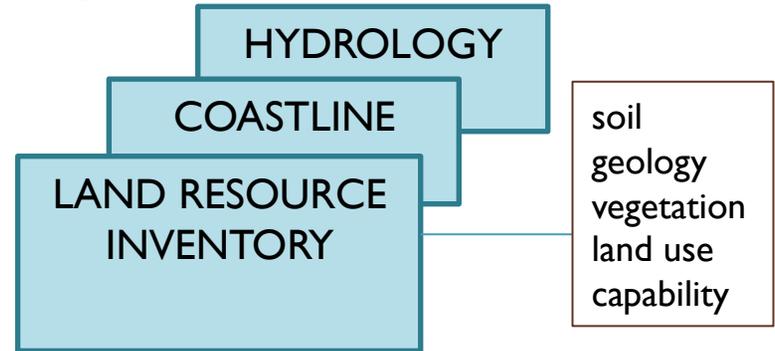
North Hokianga Project Data layers

Communal Database

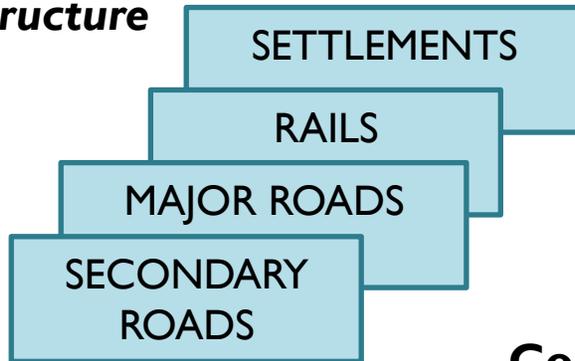
Socio-economic data



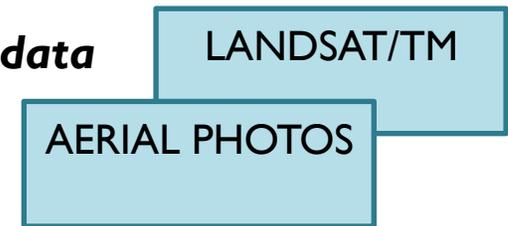
Physical/Natural Resources



Infrastructure



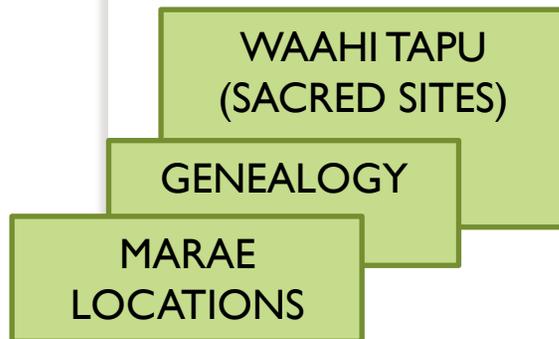
Remotely Sensed data



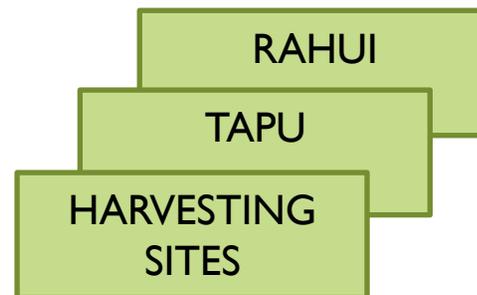
Community Database

restricted assess

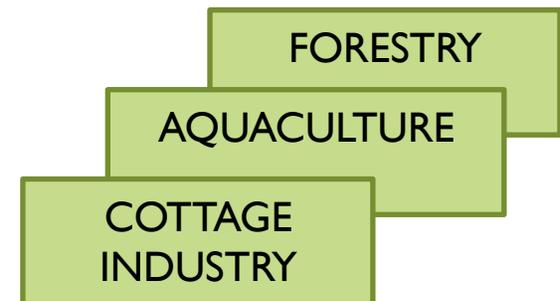
Cultural sites



Traditional land use



Potential development

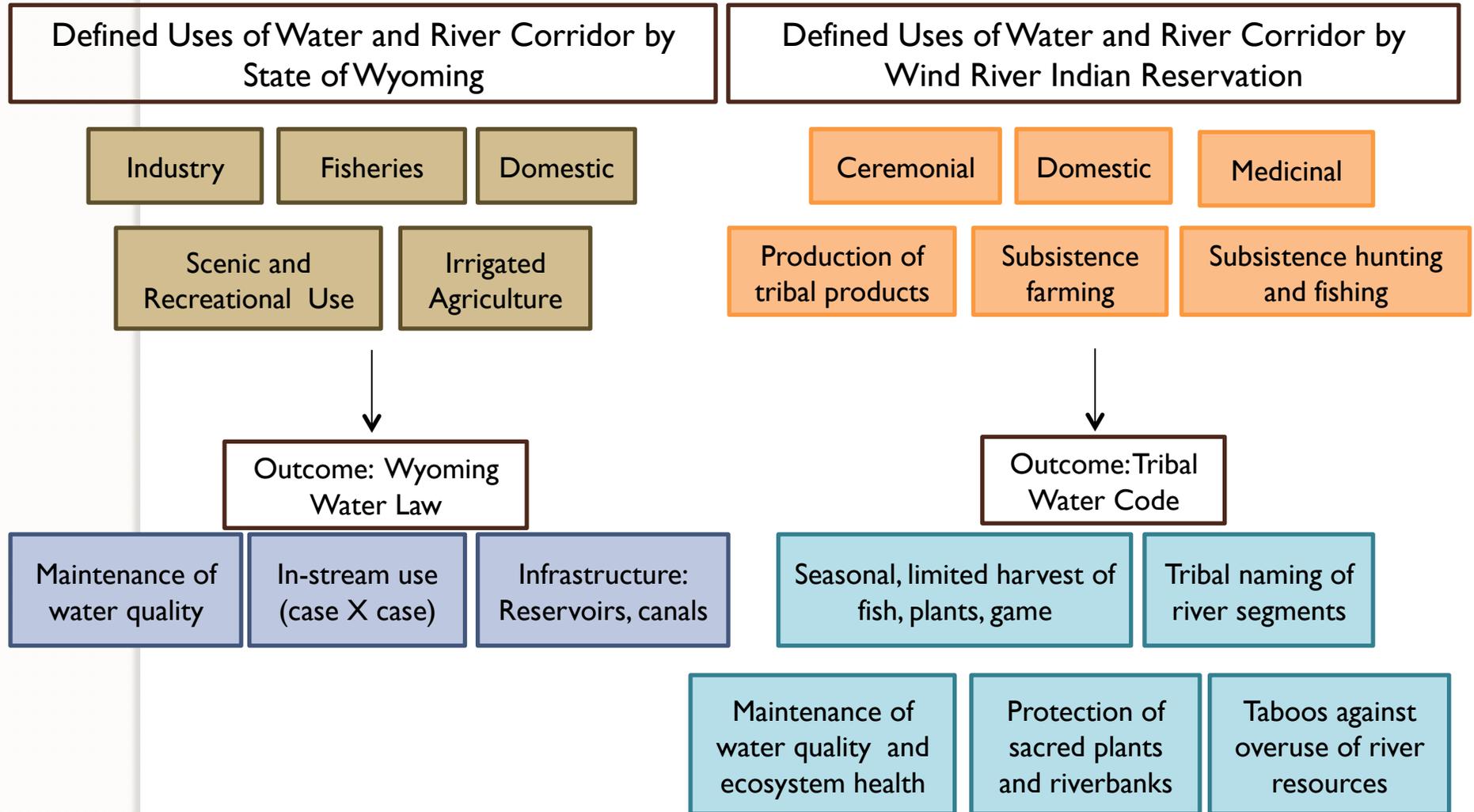




Wind River Indian Reservation, Wyoming, USA

- Water resource management plan
 - Self determination
- GIS, cultural and ecological information
 - Technology transfer
 - Collection methodologies
- Negotiated research
 - Trust

Wind River Project: Comparison of River Corridor Management





Google Earth image



Community Mapping, Botswana

- Mapping community resources
 - Traditional plants
- Participatory activity
- Integrate into GIS
- Prepare maps for conservation planning



Pastoralists in Mongolia

- Participatory mapping of migration patterns
- Observations and adaptations to climate change

Use of pastures

Strategies for movement





Perception mapping, Kenya

- Student mapping of study site
- Verification with local community
- Establishment of monitoring sites
- Overlay with satellite and GIS data for enhanced mapping



Accessibility to geospatial activities

- Digital divide
- Context
 - Purpose and participants
 - Social-spatial context: Who participates?
- Connectivity
 - Policies and infrastructure
 - Materiality of cyberspace
 - Method of connectivity
- Capabilities
 - Access to education, experience, skills
 - Basic, computer, spatial literacy
- Content
 - Data and applications
 - Socio-political process: Who is empowered?
 - What data is accessible? Whose data?



Concluding thoughts

- Science and IK
 - Recursive relationship between technology and culture
 - Ethics in research
- Partnerships in research
- Educational opportunities
- Unintended consequences
- Trust

The Circadian Geography of the Network

