Climate Change Adaptation Planning for Northwest Skeena Communities

Summary Report for the Future Forest Ecosystem Scientific Council

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Recognizing that climate change and adaptation will play a role in the future of forestry and development in the Skeena region where Coast Tsimshian Resources, LP (CTR) operates, the company applied for funding from the Future Forest Ecosystem Scientific Council (FFESC) to launch '*Climate Change Adaptation Planning for Northwest Skeena Communities*' (CCAP). The goal of this interdisciplinary project is to build the adaptive capacity of CTR and its forest manager Brinkman Forest, and empower climate change adaptation planning for the resource-dependent First Nation and civic communities, so they can protect resource values in the Lower Skeena River Watershed. The project combines science, biophysical modelling, social science, and community engagement in order to better understand impacts and adaptation options, and to build integrative planning tools to support future collaboration and integrated landscape planning on a regional scale.

This project summary was written to meet the FFESC reporting requirements and includes links to the accompanying full report of the *Climate Change Adaptation Planning for Northwest Skeena Communities (Report for Communities)* study. The *Report for Communities* is a public document detailing the results and recommendations from each discipline and phase of the project, and is prepared for use by local stakeholders.

The following summary first describes the general research process for the overall project, notes deviations from the project plan, and then summarizes key findings and outcomes from each of the four components of the project. This is followed by a discussion of recommendations and opportunities for future work as identified by community leaders, stakeholders, research partners and practitioners. A number of technical documents and interim reports were generated which are referenced throughout this document.

Project Partners and Research Team

Given the broad scope of the project and the focus on communities, biometric and socio-metric data gathering and modeling methods were applied and monitoring analytics were developed. Outcomes have relevance to a broad range of stakeholders and are being made available on a web site. The four separate research components were undertaken by different teams, and the project lead and coordinator facilitated knowledge sharing and integration between each team. Table 1 identifies the research team members and their respective roles. More detailed information about these teams can be found in Appendix 1.1 of the *Report for Communities*. The *Skeena River Watershed Conservation Project*, jointly led by Coast Tsimshian Resources and World Wildlife Fund Canada, was not funded by the FFESC but integrated with the project at all stages. The FFESC project findings and elements complement those of the SRWCP and the work done by Cortex Consultants under the direction of WWF Canada.

Table 1

Project Component	Research Team / Advisors
Project Coordination, Integration of Research Components, and Community Engagement	**Brinkman Forest Ltd** (on behalf of Coast Tsimshian Resources:) Dirk Brinkman, Katie McPherson & Richard Chavez; **ESSA Technologies Ltd**: David Marmorek, President **WWF Canada**: James Casey **Environment Canada/ UBC Department of Forestry:** Dr. Stewart Cohen (advisor)
Social Science Research and Community Engagement	**UBC Department of Sociology:** Dr. Ralph Matthews; Jordan Tesluk, Georgia Piggot, Dr. Robin Sydneysmith (with support from coordination and integration team)
Climate and Vegetation Modelling for Study Area	**École Polytechnique Fédérale de Lausanne *(EPFL):*** Dr. Joe Melton and Dr. Jed Kaplan **ESSA Technologies Ltd:** Don Robinson, Sarah Buekema
Fisheries Sensitive Watershed Monitoring Protocol	**BC Ministry of Forests, Lands and Natural Resource Operations:** Lars Reese-Hansen **Ministry of Environment:** Richard Thompson **ESSA Technologies Ltd:** Marc Porter, Darcy Pickard, Katherine Wieckowski, ESSA.
Skeena River Water Conservation Project	**World Wildlife Fund Canada:** James Casey **Cortex Consultants Inc.:** Doug Williams, President; Jason Smith, Mike Buell

Research Objectives

The CCAP project was designed to meet four FFESC objectives, and despite having to make some changes to the original project plan, we feel that we successfully adapted our approach where necessary to ensure that these objectives were achieved. In addition, individual project teams had their own set of objectives, some which included obligations and deliverables for other funders.

FFESC Objective	Project approach and results
1. Increase understanding of how forest and range ecosystems may change due to climate	• Use LPJ-GUESS model to simulate regional vegetation and potential impacts of climate change and forestry on tree species, carbon, runoff, and fire risk. • Engage experts through FSW and SRWCP to determine cumulative impacts of climate and forestry operations on water quality and fish habitat. • Synthesize historical climate data to identify trends and for presentation to public audiences. • Through community workshops share and discuss these results with community leaders, resource managers, and local experts to raise awareness and discuss adaptation options.
2. Develop projections of changes to forest and range ecosystems.	• Model and map projected impacts of climate change on 19 tree species and grass. • Model potential impacts of three different climate change scenarios on ecological processes and present outputs to local experts and local audiences to define potential local consequences. • Develop cumulative effects analysis tool to project combined impacts of climate change and forestry at the site and landscape scales. • Publish and present results through this report, posters, online, in a number of academic presentations and through workshops. • Develop a regional model that can be improved and refined over time as data availability and knowledge increase. • Use sociological research methods and local experts to better understand the implications of changing forest and range management practices and policies on ecosystems and socio-economic factors.
3. Develop methods to adapt forest management in response to climate change to reduce impacts on forest and range ecosystems and productivity.	• Advance the development of a monitoring protocol that will help land managers assess the effectiveness of their watershed management within candidate FSWs in the Lakelse drainage. • Develop a cost-effective approach that can be used for watershed-based fish values and FSW monitoring. • Through the SRWCP, develop a cumulative effects analysis tool to facilitate future integrated management of multiple sectors. • Post-project results from all phases to be used to inform the development of future management plans for TFL-1. • Develop policy-relevant research and recommendations from local communities about methods for land and tenure management to improve adaptive capacity. • Identify in collaboration with clients potential avenues for future work to build on research findings, fill knowledge gaps and advance modelling capacity. • Develop new sociological methodology (the Sustainability Matrix) for assessing vulnerability to climate change and identify community priorities in relation to forest and range values.
4. Research the economic and social consequences to BC of changing forest and range ecosystems, and the effects of the proposed adaptation options.	• Identify and prioritize community and environmental resource values in a manner that is useful for directing local policy and decision making around resource management. • Hold community-based workshops that identify adaptation options along with barriers and enablers • Work with CTR and Brinkman Forest staff to identify adaptation options and barriers to change to better realize adaptive management and identify actions and policies that could facilitate it. • Collect and analyse community-level data that will be used to support numerous future reports and serve as a baseline for assessing improvements in adaptive capacity and regional sustainability, especially from a sociological perspective.

Collaboration and Communication:

For all teams, the initial phases of the project included collating existing data relevant to their respective areas of expertise. Throughout the course of the project, team members prepared internal information reports and presentations to inform each other's work and to integrate the actions and direction of the overall research project. Given the interdisciplinary nature of the group, these presentations and reports were also an educational opportunity for those on other teams unfamiliar with the various methodologies being applied.

The project was first introduced to communities and prospective participants during a trip to each community in July 2010. An introductory brochure was distributed in Terrace, Prince Rupert, and Lax Kw 'alaams that outlined some of the projected impacts of climate change in the Skeena and invited participation in the project. The Year 1 team meeting in Terrace was organized to coincide with the Climate Action Secretariat meeting, allowing an opportunity to network with regional stakeholders and other researchers. During the Year 1 meeting, the team reviewed research progress and determine a revised agenda and work schedule for Year 2 (see Deviations from Project Plan). Moving into Year 2, more team meetings were held and an interactive internal project website was created to bring the various elements of the study closer together. In January 2011, a public website was developed to provide communities with further information and post interim results (http://brinkmanforest.com/ffesc). Due to CTR resource constraints and extenuating circumstances at the end of Year 1, coordination responsibilities were transferred from Richard Chavez at the CTR office in Terrace to Katie McPherson at the Brinkman office in New Westminster.

Over Year 2 integration proceeded on several fronts. The team selected the social, cultural and ecologically significant Lakelse Lake watershed to pilot the Fisheries Sensitive Watershed Monitoring Protocol, and ensured an opportunity for community members to be involved in the data collection process, resulting in a strong response from participants in community workshops in support of watershed monitoring. This work entailed extensive collaboration with key developers of the province's Forest and Range Evaluation Program's riparian, water quality and fish passage indicators. As a monitoring framework with defined indicators, the FSW work was also linked into the development of the cumulative effects analysis tool and led to further integration between the CCAP and SRWC projects.

As research progressed through Year 2, the modelling team provided the wider group with a number of sample outputs. These were collectively reviewed and it was decided that useful outputs for the community and clients would include information about: runoff (key for understanding the impact of climate and forestry on water quality, flooding, and road construction); carbon flux and storage (critical for determining the capacity of regional forests to contribute to carbon sequestration and inform potential investment and adaptive management); tree species composition (to inform adaptive practices and identify risks and opportunities for ecosystems and forest industry); fire risk (to analyze vulnerability and assess need for adaptive management). Later in Year 2 Brinkman identified 3 hypothetical harvest scenarios to be modelled by LPJ-Guess to represent potential future impacts of

land-use and climate change. In December 2011, 9 members from the research team travelled to Prince Rupert, Lax Kw'alaams, and Terrace to share research results and facilitate day long community workshop conversations around adaptation and steps to identify means of carrying the research work forward through each community's identified actions.

Communication with external researchers and community stakeholders was facilitated through a number of posters, presentations, and activities listed below:

- **July 2010,** Project brochure designed and distributed in Terrace, Prince Rupert, and Lax Kw 'alaams (J. Melton, S. Cohen, R. Sydneysmith)
- **October 2010,** Participation in CAS workshop and Year 1 team meeting in Terrace (all members)
- **February 2011,** Climate Change Adaptation and Sustainable Forest Management Conference

  Posters
  - *Project Overview: Climate Change Adaptation Planning for NW Skeena Communities & Skeena River Water Conservation Project* (K. McPherson)
  - *Skeena River Water Conservation Project. Introducing Scenario-based thinking into Forested Watershed Management* (J. Casey)
  - *Process-based regional dynamic vegetation modelling of the Skeena Region of British Columbia: Investigating forests response to projected climate change* (J. Melton, D. Robinson, J. Kaplan)
  - *Assessing community capacity to respond to climate change in the Northwest Skeena. (*G. Piggot, J.Tesluk, R. Matthews, R. Sydneysmith)

  Presentations (available as webcasts here)
  - *The challenge of adaptive integrated development in a changing climate with reference to two studies: Climate change adaptation planning for Northwest Skeena Communities (FFESC) and the Skeena River Water Conservation Project.* (D. Brinkman)
  - *Linking climate change and adaptive capacity: The role of institutions and values (*R. Matthews)
- **February 2011**, Year 2 planning session – internal presentations for all teams on research status
- **March 2011,** presentation on SRWCP and CCAP for Terrace City Council (R. Chavez)
- **May / June 2011** FSW Watershed Team Provided multi-day training in the use of all three of the province's FREP/BC MOE field-based monitoring protocols to: FLNRO, MOE and DFO agency staff; representatives from the University of Northern BC, Northwest Community College, Kitimat-Stikine Regional District, and the Lakelse Watershed Society; and staff from local consulting companies in the Skeena Region.
- **June 2011, Presentation:** *From carbon to conifers and sawmills to salmon: Climate change and forest ecosystems in the northwest Skeena region, British Columbia* Presented for Columbia Mountains Institute of Applied Ecology Conference: Carbon Management in British Columbia Ecosystems (J. Kaplan, J. Melton)
- **June 10-18, 2011, Participation:** *EU Rural Economic Development Exchange with northern BC and northern Sweden,* tour of community institutions, health, education, research, eldercare,

tourism, biorefinaries, forest equipment shows; participating and presenting project ideas at a Rural Exchange Conference at the Intemediate Universitite in Sundsvall and an EU Rural Economic conference in Ostervall, Sweden, including travelling with a dozen leaders from northern BC (R. Matthews, D. Francesca, D. Brinkman)

- **July 2011,** *report on Economic Opportunities for Pine Mushrooms in the Skeena Region for CTR.*
- **August 2011,** Presentation of findings and SRWCP cumulative effects tool to CTR Board of Directors, Prince Rupert (J. Casey, K. McPherson)
- **September 2011,** Fall 2011 newsletter mailed out to interview participants and regional stakeholders (K. McPherson)
- **September 2011,** Year 2 Workshop Planning Session presentation of results for all team members.
- **September 2011**, Phase 2 of FSW pilot and data collection in the Lakelse Watershed, including participation for previously trained local stakeholders.
- **November 2011,** (ASTTBC) Tech Green award presented to CTR for partnership and support of the CCAP and SRWCP studies, and for showing leadership in environmental initiatives.
- **November 2011,** Expert Workshop: Aquatic Ecosystems and Hydrological Indicators for the Skeena, (J. Casey, J. Smith, K. McPherson)
- **December 2011,** Forest Day Poster Presentation. *Climate Change Adaptation Planning for NW Skeena Communities*, COP 17**,** Durban (F. Vroom on behalf of Brinkman Forest).
- **December 2011,** Preliminary Community Reports for Lax Kw alaams.
- **December 2011,** Community Climate Adaptation Workshop Series in Prince Rupert, Lax Kw 'alaams, and Terrace. Presentations and workshop outcomes discussed in Report for Communities Chapter 2 and accompanying appendices.
- **December 2011,** AGU 2012 Fall Meeting Presentation: *Climate Change Adaptation Planning for the Skeena Region of British Columbia, Canada: A combined biophysical modelling, social science, and community engagement approach (*J. Melton).
- **December 2011,** FSW Site Tour: Lars Reese-Hansen, Dirk Brinkman and Chris Johnston (RPF) of Brinkman Forest toured select sites from FSW field work to view areas of concern and better understand the impact of historical and recent harvesting practices on sensitive streams.
- **April 2012,** Poster presentation at SISCO Winter Workshop in Salmon Arm
- **April 2012,** Follow up meetings with community leaders, resource managers, practitioners and knowledge users in Terrace, Prince Rupert, Lax Kw 'alaams to discuss project results and use of the integrated online 'toolkit'
- **June 2012,** Poster presentation and discussion at FFESC closing conference
- **June 2012,** Presentation at the Northern Silviculture Committee Summer Workshop tentatively booked for June 19-20.

Future and ongoing work includes:

- Additional refinement and piloting of the FSW monitoring protocol is being facilitated through a Tides Canada grant supporting a partnership between ESSA and the Don Morgan of the Bulkley Valley Research Centre.

- Analysis of sociological research data, including towards for Jordan Tesluk's PhD. Thesis, and ongoing research by Georgia Piggot through UBC Department of Sociology.
- Preliminary discussions about regional collaboration and further refinement of climate models have occurred between Brinkman Forest and the Sustainability Coordinator for the City of Terrace.
- WWF Canada is currently engaged in discussions to support the development of a local climate story for the Grandmothers of Lax Kw 'alaams to further engage youth in the climate change conversation.
- Coast Tsimshian Resources is working with FP Innovations to explore feasibility of local processing of forest products.
- Informal Ministry of Forests, Lands & Natural Resource Operations discussions around potential for integrated resource management and piloting of new options analysis framework.

Summary of Key Research Findings

The following section is broken down to provide a summary of outcomes and key findings from each of the research teams, with a concluding discussion around the outcomes of integration through community workshops and next steps. All information and findings is expanded on through the *Report for Communities*, and links to respective sections are included throughout.

1. Sociological Research Component: Valued Community Resources and Drivers of Change

Sociological research interviews conducted in each of the three participating communities provided the research team with key information about the perceived value and condition of a range of community and environmental resources. This work also gives insight into and differentiates the unique perspectives and prominent issues in each community; and helps to place climate change within the unique context of local, regional, and global influences. The full results from the research interviews are included in Chapters 3 and 4 and accompanying appendices. Key points and interesting findings include:

- A number of `Drivers of Change' are perceived to be of greater influence for the future of the region than climate change.
- Concern over climate change impacts and forest resources is projected differently in each community and between individual participants.
- In Lax Kw 'alaams, discussion of climate change is more often associated with concerns over local food availability and ocean resources.
- In Terrace and Prince Rupert, concerns about climate change are often related to impacts on the resource economy, transportation and infrastructure.
- There is significant concern about environmental change, natural resource sustainability, and in particular, the future of salmon.
- Salmon is ranked as the most important environmental resource for regional well-being, AND as the most threatened environmental resource also in declining condition, when results for all three communities are combined.
- In all 3 communities, every environmental resources included in the sustainability matrix is perceived to have declined in condition over the last 20 years.

- Forest industry, forest health and diversity, and timber supply are perceived to be in poor condition and declining in all three communities.
- Access to education and skills training is extremely important for the well-being of the region, and is perceived to be improving.
- First Nations treaty settlement is ranked as the number one driver of change across the region.
- Environmentally responsible economic diversification is a common vision among a large number of respondents.
- Uncertainty and economic pressures are a commonly cited as barriers to investing in climate change planning.
- There is a strong desire to see investment in small business development, especially in Terrace and Prince Rupert.
- There is a perceived need to strengthen regional collaboration and planning around a common vision for the future that includes economic investments and diversification, natural resource management, and environmental sustainability.

2. LPJ-GUESS Modelling Component: Climate projections and vegetation modelling for the study area

Researchers used the LPJ-GUESS dynamic regional vegetation model to simulate the potential impact of three different climate scenarios on tree species and ecosystem functions and services. In addition, three different future harvest scenarios were applied to each of the climate scenarios, to understand how and if harvesting could interact with future climate scenarios across the region. Information about the LPJ-GUESS model and methods used are described in Chapters 5 and 6 along with the complete set of modelling results.

Projected Shifts in Temperature and Precipitation

- The climate of the Skeena region will likely warm significantly and become wetter into the future.
- Precipitation patterns will likely shift to drier spring months with much wetter autumn months.
- The actual magnitude of the changes in temperature and precipitation are highly dependent upon emissions/model scenarios.
- Extreme precipitation events are likely to increase, primarily in the cold season months, while extreme minimum and maximum temperatures are also likely to increase into the future.
- Evidence from ecosystem studies suggests that this enhanced variability could have stronger impacts upon the ecosystems of the study region than any of the overall trends and shifts in annual values (Jentsch et al., 2008).

Projected impact of climate change on vegetation and tree species

- Common species in the study region, such as western hemlock and amabilis fir will likely become more dominant as the proportion of lesser species decreases.

- As the climate warms into the future, the areas of alpine tundra will likely become afforested, though the actual rate of colonization by trees is highly uncertain.
- In the lower elevation regions, the forest will likely experience increased growth due to CO_2 fertilization, increased moisture and higher growing season temperatures.
- Changes in the damage due to forest pests and diseases are highly uncertain but likely to increase into the future.
- The impact of extreme events on the forests is not adequately modelled in LPJ-GUESS but could result in higher mortality and extensive changes to forest composition.

Carbon dynamics and future projections

- The region has primarily acted as a carbon sink through the historical period and the region is expected to continue as a carbon sink until at least 2040 when it may become a carbon source, depending on the climate/emissions scenario the world will follow.
- The simulated variability in ecosystem carbon dynamics across the historical period is smaller than the spread of variability between the different climate scenarios.
- The influence of the spread in future climate scenarios is far greater than the influence of historical or estimated future harvesting, for the regions' carbon dynamics.
- The potential for natural fire disturbance increases in the future, in a small region of the eastern part of the study area. This increase would be similar to conditions in the past that led to higher fire activity during the period of 1906 – 1915.
- Increased harvesting is simulated to decrease the risk of fire by reducing available fire materials.
- Any attempts to manage the region's forests for carbon sequestration will become riskier into the future due to the large, and unpredictable, influence that climate and pests can have on forest ecosystems (unless the climate adjusted seed zone modelling gets it right).

Runoff

- Changes in total annual surface runoff follow the projected changes in precipitation reflected in the climate scenarios.
- The major changes to surface runoff depict a possible decline in summer runoff and a significant increase in autumn runoff.
- The summer decline could result in lower river levels and be representative of higher moisture stress for vegetation in some parts of the study area.
- Higher autumn surface runoff likely indicates higher water levels in rivers and, combined with higher likelihood of extreme precipitation events, a greater chance of flood events.
- The influence of harvesting on surface runoff for the regional scale appears to be small but this result is unlikely to be applicable on a site-level, where other models, like the one used in the SRWCP, are more applicable.

Harvesting schedules

- The historical and future harvesting scenarios simulated by LPJ-GUESS show a relatively modest influence on the region's runoff and carbon dynamics.
- On a regional scale, the influence of climate's inter-annual variability will have a much more significant impact than historical or future harvesting patterns.

- However, as noted above this does not mean that harvesting will not have significant impacts on local resource values like salmon at the site-level, and this requires the use of different tools and finer scale data to test.
  Note: harvesting simulations do not evaluate harvesting impacts upon other parts of the ecosystem such as disruptions to wildlife, soil erosion, and changes in species diversity, wind speeds, or vegetation-atmosphere energy fluxes.

3. Fisheries sensitive watershed monitoring protocol and research component

The Fisheries Sensitive Watershed Monitoring component of the study achieved a number of important results (See Chapter 9 for detailed information and accompanying technical reports). The protocol was piloted in the Lakelse Lake watershed, an area of significant social, cultural, ecological, and economic value to the region. Throughout the course of the project, a number of local experts and government employees were trained in the protocol; building local capacity to engage in monitoring in the future. If implemented under an adaptive, integrated resource management framework, this protocol can be employed to assess the effectiveness of land-use practices and support new and improved approaches to management. The training, data collection, and protocol development process had a number of important findings for the Lakelse drainage including:

- The historical effects of poor logging practices, including the harvest of riparian areas, has had a long term negative impact on hydrology and stream health.
- Recovery can occur even after completely devastating stream course changes and complete drying of old stream beds, but recovery in some areas is being further delayed by continued land-use, including harvesting, even though current practices meet legislative requirements.
- There is a need to assess cumulative impacts spatially and over-time, in order to facilitate recovery of non-functioning streams.
- Other industry and land-users besides forestry and oil and gas (such as energy, transportation, and mining) should also be required to abide by practices that protect water resources, in order to minimize cumulative effects and improve land-use practices.
- Poor stream crossings and culvert maintenance are negatively affecting the watershed.
- Climate change poses additional risks to stream health and function, many of which can be mitigated by adjusting land-use practices.
- Predicted shifts in the timing and levels of peak and low flows as a result of precipitation patterns are likely to increase the vulnerability of salmon.
- Options to improve resilience include: leaving wider riparian buffers in sensitive areas, consulting with local experts to determine high-value spawning areas and special measures, and monitoring culverts and road crossings to ensure they are functioning properly.
- Continued training and engagement of local stakeholders in monitoring protocols and to identify at-risk streams is necessary.
- Road building standards should be reviewed to ensure roads and crossings can withstand projected increases in runoff and precipitation associated with climate change.

4. Skeena River Water Conservation Project (SRWCP)

The Skeena River Water Conservation Project (SRWCP) is an independent project that shares a number of similar objectives with the CCAP, and evolved through considerable collaboration with the CCAP

research teams. The SRWCP was designed to develop and test an approach for managing water values and resource development, using existing land management objectives and scenarios about possible future conditions. The cumulative effects analysis framework developed by Cortex Consultants uses a number of the hydrological indicators from the FSW monitoring component, in combination with land-use and climate scenarios, to help decision makers better understand the cumulative effects of operations that impact water resources and plan accordingly. This study complements the regional scale climate and vegetation modelling conducted as part of the CCAP project, by providing site-level analysis of broader trends. In addition, because the SRWCP framework used a different approach to modelling climate impacts than the CCAP project, there is a unique opportunity to compare these two methods and their respective reliability, as climate impacts are monitored into the future. At the time of the workshops, scenario outputs had not yet been released, however details about the cumulative effects framework are included in Chapter 9 and a full summary of the project can be found as Appendix 9.1. The final report for the SRWCP will be available in the summer of 2012 and will be made available via the project website.

Key findings and outcomes of the SRWCP include:

- Development of a unique planning tool to support adaptive integrated resource management, through predictive modelling and scenario-planning capacities.
- Improved capacity to understand site-level impacts of climate change and forestry on water resources and fish habitat in the Skeena region.
- Ready-to-use planning and modelling framework that can be adapted to include a range of land-use plans and industry operations, including run-of-river hydro, mining, and oil and gas in the Skeena region.
- Unique insight into regional issues and challenges through engagement with independent advisory group participants.
- Clearly voiced concerns over the lack of required community consultation for forestry operations, and confusion over the planning process.
- Identification of hydrological indicators and specific vulnerabilities of the Skeena watershed by local experts.
- Expert workshop provided a unique opportunity for local stakeholders and experts to exchange ideas and concerns about hydrological vulnerabilities, to better understand the regulatory systems governing resource use and planning in the region, and to identify possible next steps for improvement.
- There are significant opportunities for integrated resource management options analysis to find appropriate blends of multiple value management practices, but the Ministry of FLNRO will have to participate in these decisions in order to ensure an equitable cost/benefit distribution.

Community Workshop Outcomes

The above information was presented to communities during the December 2011 workshop series. Workshop outcomes included the identification of community goals and actions for sustainability and adaptation, not all of which are related directly to climate change or forestry. Significant outcomes have included: an agreement by local Terrace residents to establish a Climate Change Advisory Group; ongoing collaboration between the Grandmothers of Lax Kw ‘alaams and WWF Canada to develop

locally relevant climate stories to be shared with youth in the community; and an agreement with the Lax Kw ‘alaams School Trustees to pursue the development of a science based high school credit curriculum for climate change.

Common themes across all communities included:

- The ongoing need for regional awareness and communication about climate change and the engagement of youth in the climate change and natural resource conversation.
- Concern over perceived lack of transparency in the planning and development of mega-projects.
- Desire for watershed-scale planning and an integrated network of communities in the watershed region (common to Prince Rupert & Terrace)
- A need for revision of current tenure system to reflect multiple values and support management opportunities.
- Concern over a lack of community input and engagement in forest and resource management plans.
- Desire for integrated management of resources and the enforcement of regulations protecting fish and watershed values across all land-use sectors (not just forestry and oil and gas).
- Desire for economic diversification including local processing of forest products.
- Regional energy independence.
- Support for continued refinement and implementation of FSW monitoring protocol across the entire watershed.
- Vulnerability of the transportation and electrical power corridor to slides.
- The importance of engaging youth in adaptation dialogue and actions.

Additional details and community specific recommendations are included in Chapter 2 of the Report for Communities.

Recommendations for Resource Managers, Policy Makers, and Community Leaders to Build Adaptive Capacity in the Northwest Skeena Region

- Resource managers, government, and local stakeholders should collectively invest in tools to support integrated adaptive management across the land-base.
- Support ongoing refinement and implementation of FSW monitoring protocol
- Government must address conflicting policy initiatives that serve as a disincentive for long-term planning, and deter collaboration among land-users.
- Legislate and enforce protective planning, practices, and monitoring for fisheries sensitive watersheds across ALL land-use sectors.
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- Government must consider legislation which supports adaptation planning that is flexible on a local scale and requires a level of accountability from all resource users**.**
- Improve communication between forest managers and community stakeholders, including clarity of forest stewardship plans, and information sharing about future plans.
- Explore opportunities for collaboration between resource managers who operate within the Skeena watershed.
- Continue funding of academic-practitioner partnerships to improve reliability of modelling tools and to pilot adaptation and monitoring strategies.
- Invest in local students and colleges to create training programs around integrated and adaptive resource management, and around new tools and methods for adaptive management.
- Empower youth with knowledge of local climate change projections and adaptation strategies, and enable them with tools, resources and mentors, to become future community leaders.
- Explore potential for partnerships between local resource managers, First Nations, and colleges to engage local residents and students in data collection and monitoring.
- Create a permanent repository for this, and other related projects, to provide ongoing public access to data and the opportunity to continue growing the knowledge base.

Future Research Opportunities

- Expand on current work by adding economic analysis.
- Explore options for integrated resource management in the Skeena.
- Compilation of regional studies and data into common database to facilitate improved access to information for stakeholders and researchers working in the Skeena region.
- Improve input data and validate results from LPJ-GUESS model
- Comprehensive vegetation inventory data for application to LPJ-GUESS
- Include snowpack accumulation in future assessments of runoff and modelling
- Test proposed adaptation strategies through model simulations and pilot programs.
- Build on CCAP initiatives through integration of findings with other FFESC projects (including C. Bulmer, *Soil and Ecological Baseline Data: Improvement and Delivery* and D. Morgan*, Multi-scale trans-disciplinary vulnerability assessment.)*
- Refine 'Sustainability Matrix' methodology for use as socio-ecological vulnerability assessment tool