Building Resilience and Rural Health System Capability for Pre-Disaster Planning and Preparedness

Carol Amaratunga, JIBC

Greg Anderson, JIBC

Ron Bowles, JIBC

Robin Cox, Royal Roads University

Laurie Pearce, Pearces 2 Consulting

Colleen Vaughan, JIBC

Dawn Ursuliak, JIBC

Scientific Authority:
Paul Chouinard
DRDC Centre for Security Science

Defence Research and Development Canada – CSS

Contractor Report
DRDC CSS CR 2013-030
December 2013

Building Resilience and Rural Health System Capability for Pre-Disaster Planning and Preparedness

Carol Amaratunga, JIBC

Greg Anderson, JIBC

Ron Bowles, JIBC

Robin Cox, Royal Roads University

Laurie Pearce, Pearces 2 Consulting

Colleen Vaughan, JIBC

Dawn Ursuliak, JIBC

Scientific Authority:
Paul Chouinard
DRDC Centre for Security Science

Defence Research and Development Canada – CSS

Contractor Report
DRDC CSS CR 2013-030
December 2013

IMPORTANT INFORMATIVE STATEMENTS

These works were supported by the Defence Research and Development Canada Centre for Security under the CRTI program, CRTI 07-135RD- BUILDING RESILIENCE AND RURAL HEALTH SYSTEM CAPABILITY FOR PRE-DISASTER PLANNING AND PREPAREDNESS

Template in use: template-july2013-eng_V.03.01.dot

Abstract

The Rural Disaster Resilience Project (RDRP) was designed to strengthen community resilience and disaster management planning in rural, remote, and coastal communities (RRC) through community-based research that informed and influenced policy and practice.

Disaster resilience – the ability to survive and thrive in the face of uncertainty – is the foundation of rural life and the cornerstone of effective emergency management. There is much to learn about resilience from RRC communities, yet their emergency planning capacity is often constrained by a lack of resources and user-friendly tools and processes. This project capitalized on and learned from RRCs' expertise and knowledge while testing a unique approach to developing resilience and conducting disaster resilience planning.

The project generated substantial output in terms of web-accessible tools and resources, technical reports, peer reviewed and other articles, and national and international presentations. The project provided communities with paper and online access to resilience and disaster planning workspace (a Virtual Community of Practice), tools, and resources such as the RDRP Planning Guide, Rural Resilience Index, Hazard Risk Assessment, and Hazard Resilience Index.

RDRP directly contributed to the conversations and consideration of resilience within over 20 Canadian communities; enhanced networks amongst academic, government and non-governmental stakeholders in the national and international community of those invested in disaster resilience; and increased national disaster resilience capacity with the introduction of rural-specific tools.

Résumé

Le Projet de résilience face aux catastrophes en milieu rural (PRCR) a été mis sur pied dans le but d'accroître la résilience et les capacités de planification des mesures à prendre en cas de catastrophe des communautés rurales, éloignées et côtières (REC) au moyen de recherches axées sur le milieu communautaire permettant de mettre en place des politiques et des méthodes pertinentes et inspirées.

La résilience face aux catastrophes – soit la capacité de survivre à une catastrophe et de continuer à avancer malgré l'incertitude que cela amène – constitue le fondement de la vie en milieu rural et la pierre angulaire d'une gestion efficace en situation d'urgence. Bien qu'il y ait beaucoup à apprendre des communautés REC à propos de la résilience, celles-ci doivent souvent composer avec des capacités de planification d'urgence limitées par manque de ressources ainsi que de méthodes et d'outils conviviaux. Le PRCR s'est donc inspiré de l'expertise et des connaissances des communautés REC tout en mettant à l'essai une méthode unique de développement de la résilience et de planification des mesures d'urgence.

Ce projet a porté ses fruits en ce qui a trait à la création d'outils et de ressources en ligne, à la production de rapports techniques, à la rédaction d'articles revus par les pairs et de nature générale, et à la présentation d'exposés à l'échelle nationale et internationale. Grâce à ce projet, les communautés ont désormais accès à des documents papier et électroniques de planification des urgences (une communauté de pratique virtuelle) ainsi qu'à des outils et des ressources comme le Guide de planification du PRCR, l'Indice de résilience rurale, l'Évaluation des dangers et des risques et l'Indice de résilience face au danger.

Le PRCR a contribué directement à alimenter les discussions et la réflexion sur la résilience dans une vingtaine de communautés canadiennes. Il a aussi permis aux universitaires et aux représentants d'organisations gouvernementales et non gouvernementales d'enrichir leur réseau de contacts. Enfin, ce projet a permis d'augmenter la résilience nationale face aux catastrophes grâce à la création d'outils spécialement conçus pour le milieu rural.

This page intentionally left blank.

Table of contents

List of figures

List of tables

Acknowledgements

These works were supported by the Defence Research and Development Canada Centre for Security Science Public Security Technical Program. We would like to acknowledge the great debt we owe.

The project was jointly funded, coordinated and managed by Justice Institute of British Columbia (JIBC), the Public Health Agency of Canada (PHAC), and Centre for Security Science (CSS). Participating partners included Royal Roads University, Pearces 2 Consulting, and Natural Resources Canada.

Hazard Risk and Rural Resilience Tools were created by Robin Cox, Marti Hamlen, Ruth Legg, Catherine Luke, Laurie Pearce, Jennifer Pinette, Chantel Smiechowski.

Consultants and Researchers who completed the pilot and field site research were: Deborah Stiles, Brian Kayes, Cathy Addision, Codee Bowe, Anne Danielson, Bethan Lloyd, Alton Gervin, Siobhan Grey, Rachel Gruhs, Marti Hamlen, Mike Henderson, John Liesch, Catherine Luke, Brenda Murphy, Linda Myers, Pharis Romero, Brian Swanton, Erin Wanner, Trudy Watts, Gary Williams.

Design and development of the Virtual Community of Practice and Online Guide: Core Team, Natural Resources Canada, Michael Fabri, Alex Popov Melanie Meyers, Tannis Morgan, Dennis Yip, Communicopia, Explora Communications and Agentic Communications.

The project was jointly funded, coordinated and managed by Justice Institute of British Columbia (JIBC), Public Health Organization of Canada (PHAC), Centre for Security Science (CSS).

Core Project Team Members consisted of:

Carol Amaratunga, (Principal Investigator from 2007 - 2011 (retired July 2011) and as Co Investigator from 2011 to present), Greg Anderson (Administrative Project Lead & Co-Principal Investigator from 2011 to 2012), Ron Bowles (Co-Principal Investigator from 2011 to 2012), Robin Cox (Co-Investigator and Research Lead), Laurie Pearce (Co-Investigator), Murray Journeay (Co-Investigator), Colleen Vaughan (Co-Investigator). Project management and administration were coordinated by Dawn Ursuliak and Terry Bodaly.

Steering Committee Members consisted of:

Ahmad Khorchid (CRTI, Psychosocial Portfolio Manager, CRTI Development Research Defence Department of National Defence); Paul Chouinard (CRTI, Psycho-Social and Community Resilience Portfolio Manager, DRDC Centre for Security Science, Department of National Defence); Christine Burgess, the Public Health Agency of Canada (PHAC) (A/Project Champion - representing Sylvie Berube); Monique St. Laurent (PHAC, Project Manager); Jennifer Lew (PHAC, Deputy Project Manager, and subsequently Project Manager); Nicolas Palanque (PHAC Project Champion); Christina Prasad (Agriculture and Agri-Food Canada); Jo-Anne Stead (PHAC, Deputy Project Manager).

1 Introduction

The 2007 UN Global Risk Report noted that response capability development for rural, remote and coastal communities (RRC communities) has been minimal. In Canada and internationally, emergency planning and response investments for CBRNE and all-hazard events are generally directed to urban centres. However, intentional/ unintentional attacks on humans, food, water supplies will directly impact rural, remote and coastal (RRC) communities. Additionally, CBRNE threats in urban centres will compromise RRC health care infrastructure through loss of supply systems and personnel. RRC communities have a triple jeopardy: fewer professional and financial resources, less emergency measures infrastructure, and they experience unique challenges created by geography, isolation and demographics.

In response to the social imperative for enhanced emergency planning in 'forgotten communities', the Justice Institute of British Columbia (JIBC), in consultation with project partners and communities, proposed to design, evaluate and disseminate a suite of simple and effective indicators, tools, and training materials for decision makers/practitioners to assess the capability and resiliency of rural health care systems and communities.

In 2009, the Justice Institute of British Columbia (JIBC) received a research contract from the Canadian Safety and Security Program (CSSP)[1] to explore and develop processes and tools for an integrated community and hazard, risk and resiliency model for use in rural and remote communities. Public Health Agency of Canada was project champion , and project partners included Royal Roads University, Pearces 2 Consulting, and Natural Resources Canada. The Rural Disaster and Resiliency Project (RDRP) consisted of 5 phases including:

- Extensive literature review, interviews and focus groups
- Pilot work with two communities in British Columbia (Horsefly and Bamfield) exploring indicators of resiliency, leading to development of the pilot versions of the RDRP process and RRI tools
- Community-based research with three additional communities (Waskada, Manitoba, Lion's Head, Ontario and West Branch, Nova Scotia) to pilot paper-based version of the RDRP process, HRI, HRA, and RRI
- Revision and adaptation to create the Virtual Community of Practice (DRRPlan.net site) along with online versions of the RDRP Planning Framework and tools
- Further engagement with Lion's Head, Ontario and several communities from the Kent/Aggasiz region of British Columbia in an implementation trial of the online tools and processes

The project concluded by meeting all of its deliverables, including:

- RDRP Planning Framework: community-based process for disaster resilience planning, including extensive resources on how to build and maintain community involvement, develop a community

[1] Previously called Chemical, Biological, Radiation, Nuclear and Explosive Research Technologies Initiative (CRTI) and funded by Defence Research and Development Canada (DRDC), Department of National Defence.

profile, conduct disaster risk assessment, use hazard and community resilience indices to assess resilience and identify priorities, and develop/implement a prioritized plan for increasing community resilience.

- Suite of tools, in both online and paper formats, that allow for assessment and monitoring of community and hazard risk resilience over time: HRA, HRI, RRI, Strategy Reports, Customized Reports
- Template and customized reporting tools for hazard risk and community resilience indices
- 17 Reports and articles; 16 presentations at national and international venues
- A National Policy Forum and policy statement that was taken up through the Resilient Communities Working Group, National Platform for Disaster Risk Reduction
- Virtual Community of Practice: resource repository, links to RDRP process and tools, password protected community collaboration spaces.

The project has garnered significant interest through related initiatives with Emergency Management BC, Royal Roads University and the Conference Board of Canada, and the Canadian Red Cross. In addition, the web-adaptation of the RDRP Planning Framework and Tools won triple bronze in the international Horizon Interactive Awards. The JIBC continues to host and support the RDRP websites (the Virtual Community of Practice at: http://drrplan.net/; RDRP Planning Framework and Tools: http://wp-rdrp-dev.jibc.ca/).

The JIBC in association with Emergency Management BC, and with funding from CSSP, will host a national forum on implementation of disaster resilience initiatives in fiscal 2013/14. In addition, the JIBC will extend the RDRP through a recently submitted proposal to the 2013 CSSP Call, partnering with KaDSci (http://www.kadsci.com/) and their Value Focused Metrics project (funded through CSSP) to help Canadian Aboriginal Communities develop and implement community-based disaster resilience planning processes.

Background and Context for the Project

The goal of the Rural Disaster Resilience project (RDRP) was to develop and pilot a participatory, community-centered process for engaging rural, remote and small coastal (RCC) communities in disaster risk reduction (DRR) planning at the local level with a focus on enhancing local capacity and capability. The participatory approach to this research was designed to support the engagement of citizens in the pilot communities and to elicit and integrate their expertise and insights in the development of emergency planning project tools, curriculum, and process frameworks.

As communities continue to grow and develop in areas exposed to the impacts of a changing climate and related natural hazards, so too does the potential for increasingly severe and devastating events like the ones recently witnessed in Japan and New Zealand. Lessons learned from these and other recent disasters underscore the need for a comprehensive risk-based approach to community planning and emergency management at all levels of government. Disaster resilience planning is focused on actions that can be taken on the ground to reduce the vulnerabilities of people and critical assets, and to promote the safety, security and longer-term vitality of communities exposed to the impacts of existing and/or emerging hazard threats.

The UN ISDR and Canadian platforms for Disaster Risk Reduction provide an overarching framework of policies and institutional resources to help guide disaster resilience planning at the national and regional level. While these efforts have been successful in raising the awareness and commitment to community-based disaster risk reduction more generally, there is an urgent need to engage and support practitioners and researchers who are working toward sustainable development practices that have a potential to reduce disaster risk and increase the safety and wellbeing of individual communities across Canada.

Globally all hazard risks are occurring with greater frequency and greater intensity (Lancet, 2007). Yet, the 2007 United Nations Global Risk Report noted that response capability development for rural, remote and coastal communities (RRC communities) has been minimal. This situation continues to hold true; in Canada and internationally, emergency planning and response investments for CBRNE and all-hazard risks, remain largely directed to urban centres. RRC communities face a triple jeopardy:

- Fewer professional and financial resources
- Less emergency measures infrastructure and training
- Unique physical challenges created by complex geography, isolation and demographics

Approximately 20% of the Canadian population lives in rural communities with populations of one thousand or less in areas with population density of under four hundred people per square kilometre (du Plessis, Beshiri, Bollman, and Clemenson, 2002). At the same time, urban communities comprise a small portion of the Canadian landmass. Thus, substantial segments of Canada's territory and population lack effective risk assessment and resilience planning mechanisms.

Every year Canadian communities are affected by hazardous events that result in deaths, injuries, damage to livestock, buildings, homes and critical infrastructure. These events disrupt families and businesses and impact upon the economy and environment. In some cases they are small relatively isolated events such as the recent collapse of a shopping mall in Elliott Lake, Ontario (Alphonso & Davis, 2012) or the landslide in Johnson Landing, British Columbia ("Community gathers," 2012). In other cases, these hazardous events are much more widespread and result numerous deaths and injuries such as in the 1987 Edmonton Tornado ("1987: Deadly Edmonton," 2012) and or hundreds of millions of dollars in damage

and financial loss such as in the 1998 Ice Storms in Ontario and Quebec ("North American Ice Storm," 2012).

In many cases these events were predictable and there are known steps that communities could have taken to reduce the likelihood of the event occurring and/or reduce the consequences of the event. Many strategies exist to reduce the social, environmental and economic losses of hazardous events or disasters. But prior to determining which strategies to adopt the three essential steps are to: (1) identify the potential hazards; (2) determine the likelihood of the hazard taking place; and (3) identify people, places, and buildings that are susceptible to harm from the event.

The necessity of taking these steps has been well-supported in the literature for decades. Hoetmer (1991) states that the emergency management process requires that the "community undertake a hazard and risk analysis, assess its current capabilities in the areas of mitigation, preparedness, response, and recovery, and devise action steps to close the gap between existing and required levels of capability." Hays (1991, p. 8) makes the point that a hazard, risk and vulnerability (HRV) analysis is only the first step of the disaster management process: an HRV analysis is not an end in itself; it is the means towards an end (i.e., to mitigate the risks and consequences of disasters). In other words, Hays believes that HRV analysis forms the cornerstone of mitigation. Clearly without understanding the extant hazards and vulnerabilities, it would be impossible for communities to achieve "sustainable hazard mitigation" (Mileti 1999, p. 215).

The importance of completing HRV analyses is also reflected in legislation (e.g., Emergency Program Act BC, 1993; Ontario Legislation, "The 2012 Provincial HIRA," 2012) and in standards such the CSA Z1600-08. "The risk assessment shall include evaluating the likelihood of a hazard or combination of hazards occurring, taking into account factors such as threat analysis, frequency, history, trends, and probability." (CSA, 2008, p. 5)

Thus, the RDRP process required development of a comprehensive, whole-of-community approach to resilience planning that includes community-resilience, hazard risk and hazard resilience assessment process. The RDRP process also rested on the concept of building resilience at the community level from the ground up, starting with and building upon the knowledge and capacities of residents and community leaders.

Disaster resilience – the ability to survive and thrive in the face of uncertainty – is the foundation of rural life. It is also the cornerstone of effective emergency management across all phases of a disaster from preparedness through response and recovery. As cited above approximately 20% of the Canadian population lives in rural communities. There is much to learn about resilience from these communities and the people who live there; their resilience is one of Canada's greatest assets. The daily challenges of living in rural and remote contexts may result in long-time rural residents being in some ways better prepared for disasters than many of their urban counterparts. The capacity of these communities to systematically plan and prepare for all residents, and for unexpected hazards (e.g., 100 year flood, catastrophic regional disaster) is constrained however, by resource constraints and limited access to planning tools and processes.

Public Safety and Emergency Preparedness Canada reports that approximately 80% of Canadian disasters are due to weather and weather-related hazards, such as tornadoes, hurricanes, hailstorms, blizzards, storm surges, ice storms, floods, and wildfires, and that these hazards are increasing (Hwacha, 2005). The general consensus of the Intergovernmental Panel on Climate Change (IPCC) is that the escalation of weather-related hazards is due to climate change, much of which is caused by human activities (IPCC, 2007). Impacts of these hazards worsen when humans have destroyed ecosystem services, such as those resulting from wetlands, flood plains, and forested hillsides. The other 20% of hazards in Canada are

mainly related to earthquakes, industrial accidents, and emerging pandemics — which have also been associated with climate change and globalization (e.g., cheap oil prices). Impacts of earthquakes caused by structures built near fault lines, and industrial accidents caused by negligence are also related to human activities.

Describing disasters only in terms of hazard occurrence, however, fails to incorporate an understanding of the ways in which vulnerability, risk and, ultimately, resilience are socially constructed. Disasters do not simply result from the occurrence of a potentially harmful agent (e.g., explosion, toxic spill, weather-related event), but from the intersection of that hazard with historically produced patterns of vulnerability (Oliver-Smith, 1998). This latter perspective acknowledges the uneven distribution of risk, skewed as it is globally to the poor and those disenfranchised on the basis of social variables (gender, race, age) and geography. This perspective also suggests that resilience is socially constructed, inviting a consideration of how access to resources (social, economic, cultural, material), decision-making power, and the capacity to influence policy (e.g., land use, resource management) influence and shape resilience.

In turn, this understanding of the social construction of vulnerability, risk, and resilience, suggests the importance of a community-centered approach to researching and supporting disaster resilience planning in RRC communities. Disaster resilience planning is a dynamic process; place-based and temporally specific, it is an outcome of an intersecting web of multiple community resources, capabilities, and inherent conditions, or "capital." Disaster resilience planning in remote, rural, and coastal contexts, then, requires understanding a community's situated history and the factors that have shaped the production, reproduction and distribution of resources or capital. It requires an examination of the local profile as it is embedded in and influenced by the broader social and political economy.

This further suggests that, in order to be viable, disaster resilience planning in RRC communities needs to work in a "bottom-up" approach to societal resilience. This approach will engage multiple partners—including community planning and development sectors and the general populace—not only to plan for and mitigate risks, but to also work at the local level to prevent disasters from occurring and/or escalating in their communities. Although in more urban contexts, capability planning would be conducted by emergency planning staff, in RRC communities these activities will necessarily need to involve community members who are both aware of hazards and risks and have the skills, capacity, and access to resources to assess and address those risks.

Thus, the RDRP framework was designed for use by a wide range of stakeholders within RRC communities (e.g., community leaders, planners and policy makers), individuals and governments who provide service to and/or support RRC communities. This approach better facilitated a broad-based assessment of disaster resilience and the participation of a wide range of stakeholders in the process.

2 Purpose

Goal and research questions

The goal of this research project is to develop and pilot a participatory, community-centered process for engaging rural, remote and small coastal (RCC) communities in disaster risk reduction planning at the local level with a focus on enhancing resilience and empowering communities to engage in local actions to prevent, mitigate and manage risks and build local capacity and capabilities.

The objective of RDRP was to ensure that the outputs of this research were relevant to the RRC community context and the project outcomes:

- to empower RRC communities to become engaged in disaster risk reduction planning and decision-making and enhance their communities' disaster resilience through local and regional activities
- to provide a sustainable platform for the dissemination of rural-friendly disaster risk management tools, processes and curriculum
- to shape and inform relevant regional, provincial/territorial, and federal policies through the research and the ongoing involvement of RRC citizens.

The project had five measurable outcomes:

- Knowledge synthesis of existing research findings/evidence
- Knowledge generation - the creation of new knowledge by asking new questions
- Planning tools and curriculum development
- Knowledge exchange through enhanced communications and networking
- Policy uptake of RDRP research findings

Several questions inspired this project. While not directly and explicitly addressed within the main body of the project, these questions served as a starting point for exploration and as a conceptual framework from which to address the specific outcomes noted above.

- Why some RRC communities are healthier and better prepared for emergencies/disasters?
- Why some RRC communities are more resilient than others – able to recover faster, better?
- Is resiliency a 'capacity' that can be built, fostered, enhanced by strategic investments?
- Are 'bottom-up' i.e. community 'owned' planning approaches more efficacious than traditional emergency management systems that deliver planning & preparedness support from traditional centres of knowledge like governments & universities to communities?
- How are resilience, risks, threats socially structured – what is the interplay among determinants of health, resilience and historically produced patterns of vulnerability?
- Why is there an uneven distribution of risk distributed across communities? How are risk and resiliency affected by the social construction and context of vulnerability?
- How is resilience impacted by the lack of access to resources e.g. economic, social, cultural, and political?

- Is it feasible to link community assets, decision making, and empowerment (agency and autonomy) directly to resiliency indicators?

3 Methodology

The RDRP project was designed as a multi-phase, mixed methods study (4 initial phases, plus an additional implementation phase that was subsequently funded by CSSP):

Main Study:

1. Development of pilot processes and tools
2. Pilot site phase
3. Field site phase
4. Web conversion phase

Additional component:

5. Implementation phase

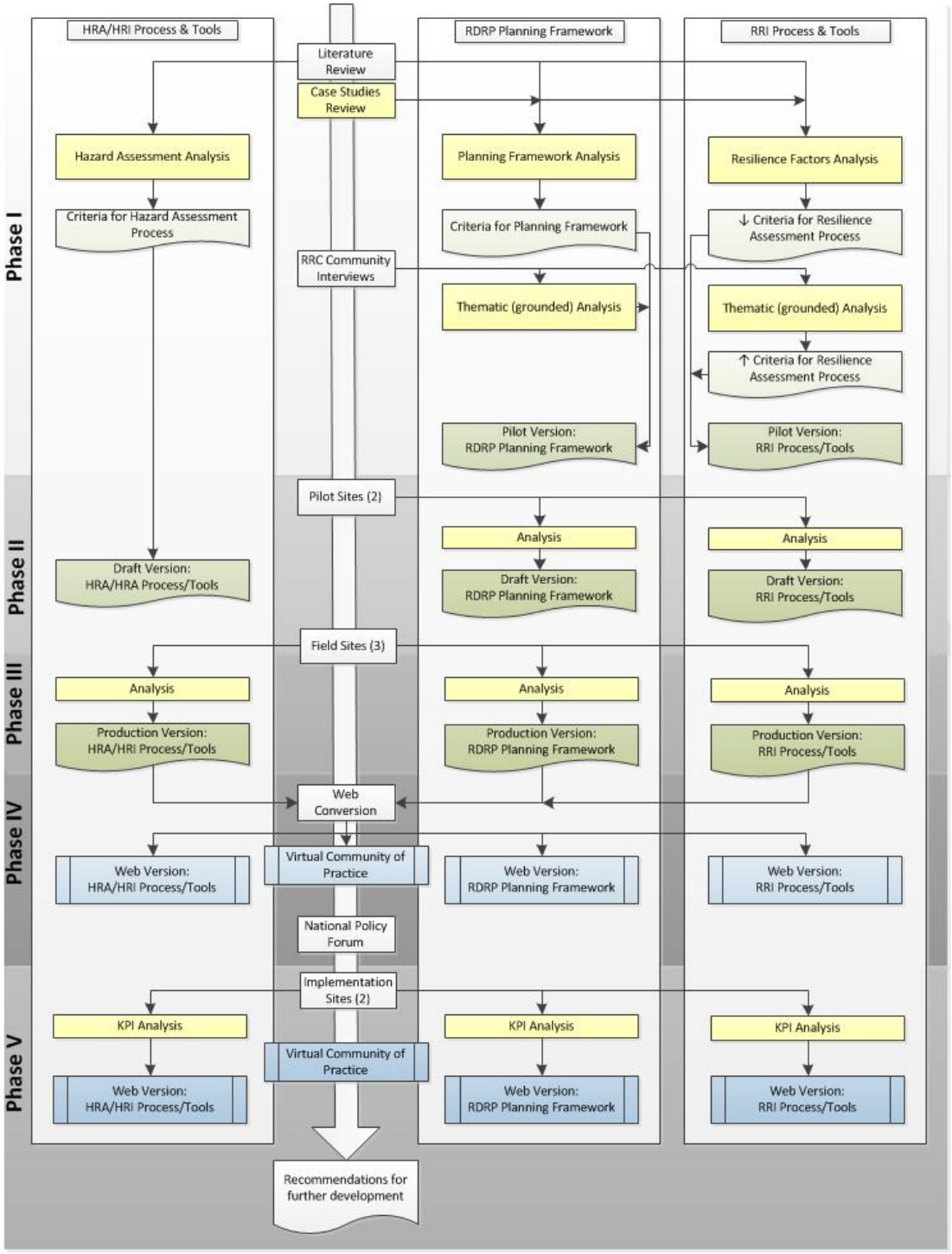


Figure 1. Project Design

Phase I consisted of a comprehensive review of the scientific literature on resilience, and a systematic analysis of extant disaster resilience assessment tools and methods. A series of semi-structured interviews was conducted with residents from nine selected remote, rural, and coastal communities in British

Columbia. The transcripts from 31 individual, and 2 group interviews were coded and thematically analyzed to identify characteristics of resilience (i.e., indicators) grounded in the experience of rural life. The goal of this phase was the development of an initial theoretical basis for the project, identification of community disaster resilience planning concepts and processes, and creation of initial processes and tools for rural resilience assessment and planning. The initial draft of the Rural Resilience Index was based on the combined analysis (i.e. interviews and extant tools). In addition, a systematic and comprehensive analysis of the scientific literature relating to hazard, risk, and vulnerability assessment models supported the development of the Hazard Risk Assessment (HRA) and Hazard Resilience Index (HRI) tools and processes.

In Phase II, the pilot versions of the Rural Disaster Resilience Project (RDRP) Planning Framework and Rural Resilience Index (RRI) processes and tools were piloted by community-based research teams in two pilot site communities. Further analysis and development based on the feedback of the community teams informed the refinement and further development of the RDRP framework and the RRI, HRA and HRI tools.

Phase III began with the finalizing the field-test (i.e., paper-based) versions of the RDRP framework and tools and the field testing of these versions in three rural Canadian communities. In this community-based research phase, researchers worked with 3 field site communities to implement and evaluate the draft tools and processes, and generate recommendations for further refinement. The result of Phase III was the production versions of the HRA, HRI, RRI, and RDRP Planning framework. In addition, the project hosted a National Policy Forum in 2010, the results of which were taken up by the Resilient Communities Working Group as part of PSC's National Platform on Disaster Risk Reduction.

In Phase IV, the research team adapted the production versions to a web-based format. In addition, the Virtual Community of Practice (VCoP) was operationalized. These deliverables completed the requirements of the initial research project.

Phase V consisted of an implementation study, bringing the web-based tools and processes to one field site and one new set of communities. Data was gathered on usability and users' experience with the site and tools. This phase resulted in revision of selected aspects of the site and tools and a set of recommendations for further development and sustainability of the RDRP.

Ethical Considerations

The RDRP project was conducted in communities across Canada and thus ethical approval was obtained through multiple jurisdictions, including:

- Justice Institute of British Columbia
- Royal Roads University
- Interior Health Authority
- Vancouver Island Health Authority
- Brandon University (Manitoba)
- Nova Scotia Agricultural College

Data Collection

Data was collected in multiple forms through a variety of methods. Two primary data sources informed this project: multidisciplinary literature, including academic work, government reports, and grey literature; selected case studies from disaster resilience literature; and the participation of individuals

involved in community-based research activities. Data collection methods included systematic reviews; observation, participation, and artifacts generated during community-based research activities; audio recording of interviews and focus groups; a variety of paper- and web-based surveys, and web-site statistics. Specific data and methods were associated with different phases of the research.

Phase I involved three streams of activity. The first stream involved a comprehensive review of the resilience literature that included multidisciplinary research literature; federal, provincial, and international governmental reports, and grey literature produced by non-profit organizations. This review included case studies in which communities had employed disaster risk reduction processes to enhance their disaster resilience. In addition, a systematic, thematic analysis of extant community resilience assessment instruments was undertaken to identify common, evidence-informed indicators of resilience. This review included: 1) the Coastal Resilience Index, developed with the support of the U.S. National Oceanic and Atmospheric Administration (NOAA) Program; 2) the operationalization of Twigg's (2007) guidance note; and ongoing efforts to test the University of Oklahoma Terrorism and Disaster Center's "Community Assessment of Resilience Tool" (2006).

The second stream of activity in Phase I emerged from semi-structured interviews held in selected communities in British Columbia. Communities were selected through a theoretic sampling strategy based on an emergent project definition of remote, rural, and coastal communities. Two experienced qualitative researchers were recruited based on their experience in community-based research and their knowledge of, and ability to, access relevant communities. The researchers used the project's definition of RRC communities and additional criteria to identify potential communities. Nine communities were identified in two regions of British Columbia with the goal of creating a balance of rural, remote, and coastal communities. A total of 31 individual and two group interviews were conducted. The interviews were audio-recorded and verbatim transcripts were developed as the primary data source for coding and analysis.

These interviews focused on local concepts and understandings of resilience and indicators of resilience. A systematic analysis of these interviews (see next section) resulted in an extensive list of characteristics and factors of resilience grounded in the experience of those living in rural communities. A synthesis of the findings from the systematic review of the resilience literature (Cox & Perry, 2011) and the community-based interviews supported and informed the development of the RRI and RDRP Planning Framework. and the development of core project concepts.

The final stream of activity in Phase 1 involved a focused literature analysis that called upon two meta-analyses to develop criteria for assessment of hazard, risk, and vulnerability (HRV) models that formed the basis of the HRA and HRI tools and processes. The first analysis (Pearce, 2000) identified eight HRV models based on four inclusion criteria: a focus on potentially disastrous events, all hazard approach, community based, and derived from a planning perspective. A second analysis by Journeay in 2010 assessed 21 risk assessment models based on their relevance to national level policy guidelines, best practices regarding analytic-deliberative methods, and compliance with national and international standards for risk management. Two additional frameworks were added to the overall analysis that provided definitions and standers for risk management.

In Phase II, two of the communities from Phase I were selected as pilot sites. The sites met the project criteria for RRC status and were willing to participate in the next phase of the project. Both sites were characterized as balanced in their need for disaster resilience planning and their capacity to participate. Both had been involved in prior disaster resilience planning and had also experienced natural hazard risks and threats in the past. Other communities were under-prepared or lacked sufficient infrastructure (e.g., municipal government or clearly identified local leadership). The goal of this phase was to gather data on

the communities' experience and response in conducing disaster risk resilience planning using pilot versions of the RRI and RDRP Planning Frameworks.

Data collection in this phase consisted of observation and participation by the community-based researchers in community activities undertaken as part of the RDRP process. These included activities such as workshops and town hall meetings, informal gatherings, interviews, and surveys. The results of the activities in both communities included locally defined resilience enhancement plans and strategic resilience enhancement activities, and evaluative feedback on the RDRP process and tools. This feedback was used to inform the refinement of the RDRP and RRI and associated resources.

During this phase, researchers gathered data and information from which to develop the extensive resources provided to RRC communities. These resources included comprehensive guides for community engagement and planning, consolidated resources defining and describing each of the 84 hazards, along with historical cases outlining the effects of hazards within Canadian communities, and a comprehensive list of strategies that communities could use to develop tailored and prioritized action plans for increasing community resilience.

Phase III provided data from three field sites chosen for implementation of the paper-based version of the project tools (i.e., RDRP framework. RRI, HRA, HRI). The three field communities were selected using the following criteria: 1) the community met the project definition of a remote, rural, or coastal community; 2) the community was able to put together a community-based research team (CBRT) who were interested in actively developing a resilience plan; 3) a local research lead was available to provide support and guidance to the community as they undertook the project; and 4) the community was subject to a range of hazards (natural, technological and biological).

Field site data collection was similar to the pilot site phase, including observation and participation by the community-based researchers in community involvement activities such as workshops and town hall meetings, informal gatherings, interviews, and surveys. In addition, data was gathered through artifacts and products created by participation in the community-based disaster resilience planning process.

In 2011, the project's annual review committee meeting was held in conjunction with Public Safety Canada's Annual National Roundtable on Disaster Risk Reduction, Resilient Communities Working Group meetings in Ottawa, ON. The project hosted a national policy forum in which participants from multiple levels of government, academia, and industry met to provide background and a starting point for a deliberative dialogue exploring the principles, goals and objectives of disaster risk reduction and climate change adaption with the aim of developing a common framework that will help guide disaster resilience planning in rural, remote, and urban communities across Canada. Data was collected through facilitated discussions in small group and plenary sessions, followed by presentation and discussion at the Resilient Communities Working Group meetings. The results were summarized in a National Policy Forum report.

Phase IV did not include data collection. In this phase, the paper-based processes and tools used in the field site communities were adapted to web-based delivery.

Phase V consisted of an implementation study involving one field site and one new community. The field site community was chosen based on the quality of its response in Phase III and the willingness of the community-based researcher to re-engage with the community for the implementation study. The new community was chosen in consultation with Emergency Management BC, who was working with the RDRP project to identify opportunities for implementation and sustainability of the RDRP process and tools. Criteria for community selection included meeting the project's definition of an RRC community, as well as the ability to provide a community project champion, complete an ethics consent form,

participate in the RDRP process (approximately 35 hours over 9-12 weeks), participate in the implementation study (approximately 3-4 hours per month), and share their products and documents (in confidence) as part of the implementation survey.

Data collection methods include participation in community workshops, focus group interaction and interviews, review of artifacts production through participation in the RDRP process (e.g. Hazard Risk Report), surveys, and web-site use statistics.

Analysis & Interpretation

The literature review employed comparative analysis strategies to develop core concepts, identify relevant features, and synthesize potential approaches to hazard assessment and community resilience planning.

As articulated in the previous section, development of the Rural Resilience Index combined top-down analysis of existing theoretical frameworks and bottom-up approaches to develop and foster articulation of tacit knowledge from the community. The juxtaposition and synthesis of these approaches integrated the best of academic research on community disaster resilience with the insights and expertise of those living and working in RRC communities. Core concepts were developed from the comprehensive review of the scientific literature and analysis of the CDR case studies. Community-based interviews explored the unique needs of communities in relationship to disaster preparedness. The data underwent thematic analysis using a two stage, inductive coding strategy informed by grounded theory practice transcripts (Strauss & Corbin, 1990). Initial coding frameworks were based on the researcher's questions and predetermined themes identified through the literature review. Inductive coding elements emerged throughout the coding process that explored the complex web of interrelationships between individual and community level process, broader policy and governance considerations, ad built, social, and natural environments. Analysis of the resulting data included frequency analysis, excerpts of coded text, and analysis of tree codes and free codes in relationship to the research question with the goal of better understanding concepts of resilience and processes of disaster resilience assessment from the community perspective.

Development of the Hazard Risk Assessment and Hazard Resilience Index employed comparative analysis techniques to identify key features, isolate common elements, and develop principles and criteria from which to build the HRA and HRI tools and processes. Analysis of two Canadian meta-analyses, along with four additional hazard, risk, and vulnerability models, formed the basis of developing criteria for assessment of hazard, risk and vulnerability in RRC communities.

The Implementation Study consisted of a key factor analysis and thematic analysis based on the usability, effectiveness, barriers and enablers in relationship to the overall goals of the project.

Limitations and Delimitations

This project was focused specifically on Canadian rural, remote, and coastal communities as defined by the project. A total of 15 communities directly participated in the development of this project (9 community interview sites, 2 pilot sites, 3 field sites, and an additional new site, with 6 local communities) in the implementation phase). The project selected communities with a breadth of characteristics such as geography, size, and diversity. Note, however, that the sample was not intended to be representative of Canadian RRC communities. Thus, as the project and its outputs are implemented more broadly, the team remains aware of the necessity to continue to adapt the RDRP processes and tools to meet the needs of broader groups of Canadian (and international) RRC communities.

A related limitation is that selection of sites in the study was based on community interest and capacity to engage in the project. Thus, the experiences of these communities are likely to be different than communities who do not have community members with direct experience or interest in disaster resilience planning.

More than half of Canada's Aboriginal population live in RRC communities (Ministerial Advisory Council on Rural Health, 2002). While aboriginal communities, and aboriginal members of other communities, were involved in both pilot and field site testing, the project did not explicitly address unique characteristics of Aboriginal RRC communities. This was built into the design of the project as, at the time of funding, Aboriginal stakeholders and communities were not in a position to formally partner with the project. Since then, the project team has worked with Aboriginal groups, both at local and national levels, as well as community and advocacy groups, to extend and apply the RDRP process within Aboriginal contexts. The adaptation of the RDRP process within Aboriginal contexts is the next, natural phase in the implementation of this project.

The communities in the field testing and implementation phases had both internet access and community members that were comfortable in using online processes. The implementation study used the production version of the tools are web-based, although paper-based versions of all resources were available. However, the final process has not been conducted solely on a paper-based process.

Validation Strategies

Creswell (2012) presented a summary of eight common validation strategies in qualitative research: (a) triangulation; (b) member checking; (c) peer review or debriefing; (d) negative case analysis; (e) rich, thick description; (f) clarifying researcher bias; (g) external audit; and (h) prolonged engagement and persistent observation. Creswell (2012) acknowledged a variety of perspectives and approaches to validation, noting that researchers must choose validation strategies that are appropriate to their research.

The RDRP project employed an iterative, emergent process that engaged multiple stakeholders over extended periods of time, allowing triangulation of data and findings as the project developed, articulated, and implemented new knowledge through literature review, pilot testing, field site research, through to the implementation study. Community-based research involves, by its nature, prolonged engagement of researchers and the community, allowing for the emergence of shared understandings.

The project employed a two-stage process to develop and validate the coding framework used in the design of the RDRP process and RRI tools. Analysis of Phase I interviews began with the development of a coding manual based on an independent review of the interviews by the two field-researchers who conducted them. Six interviews were then randomly selected for analysis using NVivo. A researcher naïve to the interview content and the initial code manual analyzed the interviews to identify emergent codes. The results of these two independent processes were then amalgamated, and a coding manual developed that was then used to code all 37 interview transcripts. Once coded, the interviews were further analyzed to examine the relative density or frequency of codes, and the relationships amongst the codes. Particular emphasis was placed on examining community members' descriptions of who and what specifically contributed to or diminished resilience, how resilience was manifested or constituted in their community, and what conditions supported the development or enhancement of resilience.

4 Results

Throughout this four year project, considerable insight and understandings have emerged from engaging with individuals, communities, and networks from RRC communities, researchers, and stakeholders in disaster resilience. Various stages of the project involved literature review, interviews, and community-based research. Discussion and further detail on project findings are available in relevant project deliverables. This section highlights summary findings from several of the streams of research involved in this project:

- Literature review
- HRA/HRI Development
- Pilot site findings
- Field site findings
- National Policy Forum
- Implementation Study

Literature Review

The project conducted a comprehensive multi-disciplinary review of literature with the goal of informing the development of the RDRP Planning Framework, the pilot RRI, and the draft HRA/HRI tools. This review drew from: multidisciplinary research literature; federal, provincial and international government reports; and grey literature produced by non-profit organizations, particularly the work of Genuine Progress Index (GPI) Atlantic.

The report is composed of five parts:

- A review of the relevant foundational constructs (e.g., rural, remote, coastal) and a brief overview of the RRC community disaster context in Canada.
- A review of the evolution in conceptualizing community disaster resilience.
- A review of CDR conceptual frameworks and measures, including a compendium of candidate indicators that could be considered in the development of the RCDRI. This review incorporates a discussion of the different methodologies adopted in indicator development.
- A review of selected case studies demonstrating the application of CDR indicators.
- A critical discussion of lessons learned and evidence-based practices.

Section one of the review provided the context for the larger project by: 1) addressing the diversity of definitions for key constructs within the project, and 2) by providing a brief overview of the rural disaster and health care situation in Canada. In particular, this section presented a definition of rural that draws on definitions currently in use by the Organization for Economic Co-operation and Development (OECD), Statistics Canada, Health Canada, the Rural Secretariat, and prominent resilience researchers.

For the purposes of the RDRP a ***rural*** a community would have to meet at least three of the following criteria:

- Population < 1,000 (Rural region: Population in regions where more than 50% of people live in an rural community);

- Predominately resource- or agrarian based economy;
- Be identified as rural by its residents;
- Located > 50 km from a service centre
- Population density < 150 people per square km;
- Located in a non-metropolitan region (one which does not have an urban community of 50,000 or more);
- Has limited access (e.g., single access road in winter – several small communities have alternate dirt road access in summer);
- Communication services are generally available but not necessarily reliable or, in the case of internet, not based on broad band or high speed access.
- In order to meet the definition of remote a community would have to meet the minimum criteria for definition as a rural or coastal community, be identified as such by its residents, and meet one or both of the following criteria adapted from those provided by the Public Health Agency of Canada (2009):
- Located > 200 km or three or more hours by car away from a community with an acute care hospital;
- Access is by water or air year round, or by roads that are inaccessible for portions of the year.

A **rural coastal community** would meet the above criteria and be geographically located on a coastline.

Section Two provided a profile of the history and development of the term community disaster resilience. The emerging research on community resilience is multidisciplinary, and draws on concepts from a number of fields including psychology, sociology, engineering, ecology, and community development (Janssen et al., 2006). As a result there is enormous diversity in the definition and use of the term across intersecting fields of interest. Within the context of DEM, the concept of community resilience initially arose from critiques of risk-based models and a growing acknowledgement that community engagement processes need to focus on disaster mitigation initiatives. Following the Hyogo Framework for Action (2005), which emphasizes community disaster resilience, and the uptake of the concept by the International Federation of Red Cross and Red Crescent Societies (2004), community resilience has increasingly come to be understood as the best lens through which to view grass roots responses to disaster. Its application in rural contexts has been particularly useful.

Section Three provided a review of CDR measures and disaster management literature from which to inform the development of a RRI. Included in this is a compendium of indicators that could be considered in the development of the RRI, and a discussion of the different methodologies adopted in indicator development. The suite of tools explored in this section draws from a variety of approaches, disciplines and measures, all of which emphasize community resilience rather than risk. Collectively, they speak to the strength of community-based responses to disaster and the value of community consultation in formulating disaster plans.

Literature addressing CDR measures can be broken down into: 1) conceptual models addressing CDR (often later operationalized), and 2) specific assessment tools and/or community processes. Very few CDR measures adopt a hard and fast indices approach; rather, loosely structured indicators are more common. This reflects the common understanding that community resilience is not a uniformly defined state but rather a dynamic process that is uniquely situated within a specific place and time. Further this understanding reflects the complexity of this concept, one that is difficult to define and measure. Each community setting is also unique and processes of disaster resilience may reflect an eclectic blend of

social, economic, human, physical and natural capital (Mayunga, 2007). By closely working with communities, researchers and planners can ensure that the indicators are both relevant and likely to be effective within the context of disaster.

There are also unclear boundaries between conceptual models and assessment tools. Elements of conceptual models have been operationalized later and directly applied as indicators of CDR within case studies (e.g. Twigg 2007). In summary, Section Three provides a snapshot of: 1) conceptual models of CDR (and or community resilience); 2) measurement/assessment tools or indices; and 3) CDR assessment process tools focused primarily on community mobilization, consultation, participation.

Section Four demonstrated the application of CDR tools in St. Tammany Parish, Louisiana, Hilkot, Pakistan and several Mississippi counties. Additionally, a number of indices and tools were reviewed:

- the Coastal Resilience Index, developed with the support of the U.S. National Oceanic and Atmospheric Administration (NOAA) Program
- the operationalization of Twigg's (2007) guidance note; and ongoing efforts to test the University of Oklahoma Terrorism and Disaster Center's "Community Assessment of Resilience Tool" (2006).

Collectively, these case studies provide an on the ground view of community resilience assessments and demonstrate:

- The value of community engagement processes;
- The use of population data as indicators; and
- The benefits of applying a supplementary suite of tools along with CDR measures.

Finally, **Section Five** addresses evidence-based practices and lessons learned from the literature, tools, concepts and models. Ten critical points regarding CDR are identified and discussed in this section, including:

- The importance of focused measures that adopt broad methodological approaches;
- There is no need to reinvent the wheel when developing measures;
- Factors specific to Canadian contexts and RRC contexts should be accounted for, for example those raised by GPI Atlantic;
- Secondary data sets will likely enhance the measures adopted;
- CDR measures benefit from a diversity of associated tools;
- Ideally, the development and application of CDR measures should be an iterative process, linking community needs and considerations directly to the indices;
- As the NOAA Coastal Service Centre emphasizes – "indicators may make more sense than an index" (2006);
- Measures must adopt a balance between spontaneity and structure (Tierney, 2009);
- Measures should adopt an attunement to constraints that may present during assessment;
- Communities may require incentives and additional resources in order to adopt CDR enhancement measures.

Ultimately, the suite of indices, associated tools, and case studies explored in this review point to essential criteria for the effective assessment and enhancement of CDR in rural, remote and coastal Canada. The

recent shift to DEM paradigms that embrace community consultation and capacity over risk-based approaches, is a powerful argument for bottom-up approaches that recognize that communities often know best when it comes to preparing and responding to disaster.

The final selection of indicators, measures, and processes will reflect the ethos of this research project which calls for the design of tools and processes that are both relevant to the RRC context and flexible enough to be responsive to the imperative that RRC communities be able to identify and decide which specific factors or indicators are relevant to their community and their vision of community resilience. It is the intent for this research project to provide RRC communities with access to the necessary resources to implement strategies to sustain and enhance their community disaster resilience.

RRI Development

Two strands of research fed into the development of the RRI:

Literature review: The literature review (see ***section two***, above) involve a focused examination of the resilience literature and an analysis of extant resilience frameworks from various disciplines (e.g., psychology, sociology, environmental science), extant disaster resilience assessment frameworks and models, and research on disaster-related issues and concerns in rural communities. The analysis of the frameworks and literature resulted in working definitions of disaster resilience, rural and remote and the identification of 18 community disaster resilience frameworks, selected for more in-depth analysis in order to provide a cross-section of the most well-developed and/or most often sited (in peer-reviewed theoretical or applied research articles) frameworks. The in-depth analysis of the selected frameworks resulted in the identification of cross-cutting concepts and indicators which were thematically categorized into seven core domains based on a capitals-based approach: human capital; built capital; social capital; economic capital; natural capital; governance; and disaster preparedness. These core domains were further elaborated in 34 dimensions and over two hundred indicators.

Community Interviews: During analysis of the community interviews, particular attention was paid to community members' definitions of resilience, their descriptions of who and what specifically contributed to or diminished resilience, how resilience was manifest in their communities, and what conditions supported the development or enhancement of resilience. Themes were identified and translated into indicators of resilience that combined with the findings from the resilience framework analysis contributed to the development of a tool to assess resilience, the first draft of the Rural Resilience Index (RRI-I) described in the following section. In addition, the rich content of these interviews informed the project's understanding of how lives are lived in rural and remote communities and thus the scope and nature of the activities proposed in the initial planning framework.

This work informed the development of pilot versions of the RRI and RDRP Planning Framework. The initial version of the framework reflected the basic steps in a sustainable planning cycle and a whole-community approach to assessing and enhancing disaster resilience.

The pilot version of the RRI combined 51 dimensions of resilience organized in three primary categories: Social Fabric (16 dimensions), Community Resources (15 dimensions), and Disaster Management (20 dimensions). Each dimension was presented as an interval-based, multiple choice statement (i.e., Likert scale) and an array of indicators (approximately 5-6 per dimension). Each domain and set of indicators described specific community characteristics associated with social capital, culture, economics, governance, leadership, disaster preparedness, hazard awareness, risk mitigation, disaster planning processes, and disaster plans.

The RRI was further refined after piloting and field testing, resulting in an instrument with 2 organizing categories and The first section of the RRI, Community Resources, outlines 8 community characteristics associated with the quality and strength of residents' connections to each other, and the self-reliance, self-determination and self-sufficiency of the community. It also includes other characteristics of community functioning such as the presence of effective leadership, inclusive decision-making processes, and open, clear, and transparent communication channels also influence resilience. The indicators in this section address a complex and comprehensive profile of community functioning, adaption and the diversity and accessibility of resources, services, skills, expertise, and equipment that can be called on to prepare for, respond to, or recover from a disaster.

The second section of the RRI, Disaster Planning includes seven dimensions with indicators that assess such things as hazard and threat awareness, household and community mitigation and preparedness activities, the presence and quality of formal disaster plans and planning processes) and the availability, skill level and training of first responders and medical personnel.

HRA/HRI Development

Two major Canadian-based comprehensive reviews of HRV models have been conducted since 2000. The first meta-analysis was conducted by Pearce (2000) in her doctoral dissertation and the second is by M. Journeay (personal communication). Two additional models that were reviewed for the purposes of this project can be categorized as either defining the principles/standards for risk management (e.g., the CSA Q850 and NFPA 1500) or outlining the specific applications of such standards to a national framework (e.g. FEMA's NRF and the DRDC-TC). These analyses formed the framework for identifying and developing a HRV model for rural and remote communities.

None of the models that were reviewed were focused on small, rural and remote communities. The following section summarizes the key finding of the comparative analysis, focusing on six key elements.

Six criteria emerged from the literature review. These criteria were used to develop the HRA and HRI models for rural and remote communities in Canada:

- The importance of having an on-going process;
- Choosing qualitative versus quantitative assessment models;
- The need for community engagement;
- Adopting an all-hazards approach;
- The use of risk factors in completing the risk analysis; and
- Assessing levels of resiliency to specific hazards.

The key elements of the findings suggest that the following aspects be incorporated into the HRA and HRI models.

Objectives for the risk management process should be set by the stakeholders, and the process for assessment needs to be framed by their objectives. Science and expertise inform the process to the extent possible. Where communities lack access to such resources and/or there remains a high level of uncertainty with regards to probability, hazard risks should be ranked relative to one another based on extent and severity of impacts.

Stakeholder engagement/consultation and risk communication need to ongoing. As per the ISO standard iterations involve continuous consultation and communication with the public. Affected stakeholders must be involved early and often and new stakeholders should be included as they become apparent.

Rural and remote communities need to have a comprehensive list of potential hazards to work from. Over 70 identified hazards have affected these small communities across Canada in the past 20 years.

Hazards should be identified and profiled using appropriate assessment tools for the scale and scope of the assessment, including; research work from other agencies/external reports, and ideally, a cross-section of methods and tools.

Risk assessments must be responsive to change, and should be part of a larger, iterative process of adaptive risk management. Use of risk factors will assist community residents to understand the results of the assessment. Use of risk factors to identify and profile hazards must be done in such a way that the factors are monitored and updated on a regular basis as new information and evolving understandings emerge. Wherever possible, scientists and other experts should be included in the risk assessment process.

A resiliency/vulnerability assessment should be performed and it should include any resiliency factors that are directly, or indirectly applicable to specific hazards. These factors should consider demographics (are certain persons more susceptible to certain hazards?); buildings (are certain homes, businesses, or properties more likely to sustain post-disaster damage than others?); and how capable, or what capacity, does the community have to deal with a particular hazard (e.g., has the community developed and tested a plan to deal with a particular hazard)?

Pilot Site Findings

The pilot versions of the RRI and RDRP Planning Framework were implemented in two pilot sites. Analysis of the experiences of these communities led to refinement and draft versions of the Planning Framework and RRI. In addition, this research explored a number of facets related to disaster resilience planning in RRC communities. The draft versions of the Planning Framework, RRI, HRA, and HRI were then tested in 3 additional field sites. Results of this phase were used to develop the production versions of the Planning Framework and Tools. In addition, review of the experiences of the communities involved in the pilots and field sites

The following is a brief listing of relevant findings. Please refer to the project deliverable: *Rural Disaster Resilience: A Pilot Study of the Rural Disaster Resilience Planning Project* (Cox & Murphy, 2013) for complete details

Timing is everything. In many rural and remote communities, seasonal events (e.g., break-up, fishing season, and tourist influx) drive the pace of work and life. A planning process that is dependent on community engagement must be carefully scheduled to avoid coinciding with these events.

Flexible Planning Instructions and Tools: A major intent of this project was the development of a flexible, adaptable suite of tools for disaster resilience planning in rural and remote communities.

Despite the project's intention to create a guide that allowed for and even encouraged a flexible approach, the local teams felt that the wording of the planning framework was too prescriptive and needed to be revised to emphasize the possibility of adapting to suit the local context and cultural norms.

The planning framework included instructions and tools to assist in creating a community profile, an activity that was seen as an important basis for planning as well as a means of engaging the community. Both pilot sites gave this planning activity much less effort than was expected; one community, for example simply updated an earlier community profile. The response of both pilot communities suggests many residents of small rural communities, who are used to and seem to prefer figuring out how to do things their own way, might prefer a less structured outline of the process.

In addition, as a research project, the design was required to include processes associated with research ethics that made the process of engagement with and within the community more formal and bureaucratic than it might be otherwise.

Teams and Leadership: Leadership and team membership were crucial aspects of the project's implementation. In small communities, the public face of projects and community events is central to their success.

Community Involvement: Leadership and volunteer organizations are an important contributor to community resilience. In many of these communities, there is a great willingness to pitch in to help one another; this spirit of volunteerism was evidenced by numerous volunteer organizations and events in both of the pilot communities. However, it quickly became clear the teams and their communities had neither the capacity nor the interest in undertaking any process that required community meetings or workshops.

Abstract Ideas and Technical Language: The concepts of resilience and disaster resilience are complex and planning to enhance disaster resilience similarly so. Although attempts were made to simplify the planning process, that process involved the use of necessarily abstract concepts and considerable technical jargon associated with the terminology of disaster management.

Independence and Interdependence In Rural Communities: By their very nature, these communities thrive based in large part on the independence of their residents coupled with the residents' interdependence with one another in times of hardship and disaster.

Often resource-strapped and isolated from larger authorities (e.g. regional, provincial and federal agencies), small town community members are accustomed to taking care of their own concerns. In many cases, this is accompanied by mistrust of outside authority and of what is often perceived as external interference, particularly by urban dwellers.

Many participants and would-be participants became distrustful of the entire project. Several refused to participate. Despite the informed consent process, or perhaps because of it they worried that personal information would end up "out there" somewhere. It was also difficult to overcome a general suspicion that despite its rural focus, the research project was more likely to benefit the research organization than the community itself.

The independence evident in interactions with rural residents in the pilot research manifested itself both at the individual and cross-community levels, and was seen both as a contributing factor to resilience and a potential vulnerability. Project interviews uncovered concerns about the predominance of individuals whose reclusive and eccentric natures were known and tolerate but also made it hard to predict their willingness to cooperate with evacuation plans and other disaster preparedness or response measures. Similarly, new residents were understood as both contributing to and diminishing the community's resilience. On the one hand new residents brought new skills, knowledge, and contributed to the tax base, but they were also less familiar with local hazards, and often less self reliant.

Project participants were reluctant to answer questionnaires that required their making apparent judgments about their community and its characteristics, particularly with respect to social and cultural features. The experience of Pilot Site B team members led them to wonder how to encourage honest conversations in small communities without compromising individual confidentiality and privacy.

Resilience: From the fifty interviews conducted in the fall of 2009 and winter of 2010, and the results of the two pilot community planning efforts, a number of important characteristics of rural resilience in the context of small communities were identified.

Many rural, remote, and coastal communities have experienced significant economic and demographic change over the past decades. Thus, those who live in these small communities have experienced and survived difficult changes, building a resilience they may not be aware of in addition to the resilience that has supported them through the frequent storms and power outages that are a common part of their lives.

Some participants in the project recognized that resilience is more than material resources and supplies and began to understand it as an innate or learned characteristic that people living in remote areas must understand, develop and nurture. They also identified a deep understanding of independence and interdependence as the foundation of this resilience. For many of those who were interviewed, the most pressing challenge to resilience was not the natural hazards and risks traditionally associated with disasters (e.g., floods, fires, infectious disease outbreaks) but the fragility of rural economics and the

impact of closures and job losses on rural culture and the ability of families and young people to continue to live in small communities.

Discussion

Most residents of the small communities that participated in the pilot research, through interviews or the planning process, felt well prepared for disasters, especially in terms of their own personal capacity to cope. There is, however, a significant difference across communities regarding formal planning and infrastructure and preparedness for non-local disaster events that may have devastating consequences for rural and remote communities (e.g., an earthquake disrupting food transportation, banking and communication infrastructure). While some communities have a well-established disaster planning process, others have no disaster plan at all. Many small communities, particularly those that are unincorporated, rely on regional/county plans but have little knowledge of what they contain nor any assessment of how relevant or accurately they address local capacity and constraints.

The project findings confirmed what researchers had suspected -- that many if not most longer-term residents of small, rural, remote, or coastal communities are self-reliant people whose relationship with the outdoors, which may have brought them to these locations, has equipped them with the knowledge, skills, and experience to be self-sufficient when it is required. Many people living in these communities have the equipment (e.g. 4X4 vehicles, tools, tractors), skills (e.g., the ability to use this equipment, and experience in using them in non-typical ways when the situation calls for it), and basic nature (e.g., the willingness to do what needs to be done) that are likely to be useful in disaster situations. Moreover, most residents of small communities have weeks (or more) worth of supplies and fuel to see them through in the event of power outages or isolation, and neighbours who know each other and who may need assistance. However, newer residents may not be as prepared for disaster, compared to long-term residents who have experience with the unique environmental challenges (e.g., harsh winter conditions, power outages, road closures) and other common realities of rural living. The changing demographics of rural communities includes an out-migration of young people and an in-migration of older and often retired people (Ministerial Advisory Council on Rural Health, 2002). This too has implications for resilience not only as a result of their newness but also because of the increased \potential that they bring with them the urbanites habitual reliance on formal structures and services that may be less available or not available at all in rural and remote communities.

Creativity, a particularly notable attribute of community resilience which is part of rural life, provides the capacity to manage independently with few, and often dwindling resources. Rural dwellers often have to make do with what they have and apply innovative solutions to make it work. The prevailing attitude is: if it needs doing, do it.

Rural, remote, and coastal communities are all unique and complex organisms with layers of history and various cultures coming together. For the most part, this diversity among residents is an asset, as they bring different skills and strengths to share with the community. On the other hand, this diversity may also contribute to community conflict and factions that are a counterpoint to the common bonds. Although residents seem confident that in a crisis they could depend on their neighbours' help, it seems also clear that this level of cooperation may not be present in more mundane, day-today activities. It is this latter point that speaks directly to researchers who may assume a level of interest and expect participation in research projects such as the one described here.

In observing disaster resilience planning in the two pilot communities, we found that certain of our assumptions about rural communities and the sources of their resilience were challenged. Specifically, we found that efforts to engage the communities in a planning process needed to be more flexible, involve fewer individuals, rely on effective local leadership including project champions, seek alternative and

better ways of achieving community buy-in, and allow for a flexible schedule that recognizes that seasonal events set the pace of work and life in these small communities. We also observed a unique tension in small communities between individual independence and interdependence, the understanding of which may assist us in better defining the features of community disaster resilience in rural and remote settings.

To understand and enhance rural, remote, and coastal community disaster resilience, researchers and planners must take their cues from the communities themselves, set aside their often idealized views of life in these communities, and recognize the diversity and uniqueness of these communities and the individuals who live there.

Field sites Findings

The three field sites provided invaluable information that informed both the project's understanding of resilience and how it emerges in remote, rural, and coastal communities, as well as improving both the RDRP processes and tools.

Part 1: Findings related to fostering resilience in RRC Communities

Process of Developing a Resilience Enhancement Plan

For each of the three communities in the Field site phase, undertaking the resilience planning process was as important as the outcomes. There is no doubt that the community engagement and data collection processes facilitated the development of adaptive capacity and social learning and encouraged communities to work collaboratively to solve complex challenges (Berkes and Ross 2013; Bullock et al. 2012). An interesting example of that is provided by Lion's Head which had a very capable and well-resourced CBRT. Despite these advantages, the CBRT struggled to engage the community effectively and learned through the data collection process that local residents were not well informed about the existing emergency management resources. On the community side, despite the problems faced by the CBRT, the process of disseminating information piqued local interest among some residents to learn more about local resilience. As a result, two members of the CBRT have made concerted efforts to reach out to local community groups and explain local emergency management plans. This process worked reciprocally to enhance both municipal and resident knowledge and, therefore, the adaptive capacity to deal with future hazards. Similarly, the West Branch CBRT noted increased interest and commitment to local resilience activities following the presentation of the resilience plan at the community centre.

In reviewing the characteristics of each field community, while all meet the definition of "rural", each had its own distinctive combination of history, geography, socio-economic structure, capabilities and hazards. This demands that a resilience enhancement planning process be flexible enough to allow each community to can act independently to meet their own needs (Berkes and Ross 2013). For instance, due to the large geographic area, the Waskada CBRT chose to undertake a driving photo shoot to document resources and hazards, in Lion's Head while pictures were taken, the characteristics of the small village site were easier to envision and an extensive inventory was already available through the Municipality. In West Branch, initial information was gleaned from secondary sources that was supplemented by the interviews. In response to this need, the IRAPF, while consisting of four inter-related steps, has been designed to allow communities to pick from a suite of resources to develop a customized approach to the planning process and report generation.

Community engagement was key to developing resilience plans that have broad community buy-in and are reflective of a broad range of community perspectives. One of the challenges in developing resilience enhancement plans is that collaborative engagement can be hampered by processes and terms that are seen to be "bureaucratic" or "academic". In Lion's Head, community resistance to a long questionnaire and the "resilience" term were hurdles faced by the CBRT.

In all cases, the local research team had the support of a local institution – either the municipality (Waskada and Lion's Head) or the community centre (West Branch). This facilitated community buy-in, access to information, wider dissemination of the project and more robust and meaningful data and resilience plans. Residents in both Lion's Head and West Branch identified the threat from the nearby nuclear plant; in the case of Lion's Head, this had not been an identified threat in the municipal risk

assessment. This is an apt demonstration that resilience planning is enhanced by empowering local community engagement (Walker & Salt 2006).

Resilience, Vulnerabilities and Change

As highlighted in resilience thinking, change is inevitable (Walker & Salt 2006). Identification of the major sources of change and uncertainty underpins effective community disaster resilience planning. Each of the three field site communities is facing different key drivers of change, related to their distinctive characteristics. In Waskada, the key change driver is related to the rapid growth associated with the oil industry, while in Lion's Head and West Branch, the lack of economic opportunities and the resulting aging demographic profile underlies much of the noted changes. In West Branch, an additional factor is the frequency of severe natural atmospheric disasters that regularly impact the region.

Change inevitably provides opportunities and challenges that can influence resilience and vulnerability (Walker & Salt, 2006). The oil boom in Waskada, for instance, is keeping the schools open and people employed but is, simultaneously destroying roads and leading to the increase risks from pollution. In Lion's Head, although the population is aging and young people often leave the area in search of work, the active and engaged senior community is supplying the community with a wealth of time and talent for volunteer activities. This includes the third member of the CBRT who is a retired school teacher.

Areas of resilience and vulnerability reflect similarities typical of rural, remote and coastal communities as well as local differences. As demonstrated by these field sites, strong social networks and the valuation of cultural traditions and historic sites are areas of resilience often associated with these spaces (Murphy, 2007). As is also common, the two larger communities Waskada and Lion's Head had access to volunteer fire fighting and emergency response plans, while West Branch had managed to establish itself as a comfort centre, but was struggling to get access to adequate emergency management services. Communication technology presented a mixed picture, with only Lion's Head having the most extensive range of venues including broadband, cellular coverage, radio and television signals. Lack of communication infrastructure is a struggle faced by many smaller communities across Canada.

Outcomes of Developing an Enhancement Plan

All three communities used the opportunity to undertake resilience planning as a community planning process (Berkes & Ross 2013). As such, each community developed a set of practical and doable goals that built on core strengths. All three communities emphasized the need for continued community engagement and education including having a public education program (Waskada), development of awareness through presentations to local groups (Lion's Head) and creating a regular column in the local newsletter (West Branch). In Waskada, practical goals related to developing a safer road network and local search and rescue capacity. In Lion's Head, installation of signage indicating the evacuation centre and development of a vulnerable persons registry figured prominently. Finally, in West Branch, the plan focused on such things as reducing the fire hazard, increasing the number of volunteer fire fighters and stocking the comfort centre.

In addition, all three plans linked local resilience to the need for outside support and commitments. The Waskada plan advocated for an increased police presence in the community, in Lion's Head provincial authority involvement is needed to provide the highway winter storm signage and in West Branch the need for regional and provincial authorities to provide information and workshops was highlighted.

Part 2: Findings related to the RDRP Process

In addition to assisting the three field site communities in developing community profiles, strategic priorities, and action plans, a key element of this phase was piloting of the RDRP processes and tools themselves. The following themes emerged from the experience of the field site communities:

Organization: it was difficult for the participants to understand how some parts fit within the overall process. Participants commented that they found it difficult not knowing what the next steps were, or how current activities fit into future activities. Many of the procedures were complicated and this was exacerbated by the quantity of information that was provided at times. Some procedures were described in ways that made them seem more complicated than they actually were.

Language: the language needs to be made clearer for non-professionals. Participants noted that there was a lot of confusing and/or difficult language. The tone was too academic in some places, and in others there was too much jargon.

Clarity: Many of the instructions were not clear or were phrased in confusing ways. The instructions often did not distinguish between required and optional components. Understanding "why" would help in many cases.

Dialogue: Participants found ongoing dialogue (between participants and with the community-based researchers) an essential element of the processes and was often all that was required to resolve problems with the process.

Practicality: many of the activities were not practical for specific communities. Sometimes, the activities did not apply to their context; in others, communities lacked the resources or expertise to perform the activities.

Commitment: Participants in all communities commented on the importance of developing and maintaining commitment. Participation of local people was key in moving the project forward and in gaining information.

Relevance: The resources and tools are extensive and there are many that do not have relevance to the community. There needs to be some mechanism or ongoing reminders that communities are not required to complete all activities. In fact, a key aspect of effectively engaging with the RDRP process appears to be determining which activities and resources are relevant and which are not.

Inclusion and exclusive emerged as ongoing concerns. Participants were aware that different groups of people may be required at different times, and that there are multiple ways of eliciting information. Teams also noted that it was important to recognize when groups or populations in the community were excluded.

Accessing Information: another recurrent theme was the importance of determining how to access different kinds of information. Teams need to know different ways of eliciting information, and noted that it was often difficult to obtain the information required in the process, especially online information.

Time commitment: The process is comprehensive and requires too much time. Parts of the RDRP process are too long, and do not provide information or solutions that are relevant to the community. Often decisions were made without adequate information due to time constraints. The process needs to be streamlined and information must be more easily accessible.

Redundancy: A lot of information is provided in multiple locations and is redundant. The process could be streamlined and better organized to reduce repetitive sections and activities.

Necessity: Continuing calls for clarification on which parts of the process and tools are mandatory and which are optional.

Modifications: The communities provided a variety of specific suggestions for improvements and streamlining. In particular, putting the tools and process on the web was seen as a way of better organizing and providing access to information and resources.

The feedback from the field site testing was incorporated into the production versions of the RDRP framework and tools. In addition, this feedback became essential data in the adaptation of the RDRP to an online format.

National Policy Forum

Selected stakeholders from communities, researchers, and all levels of government with an interest in community resiliency met on October 17, 2011 in Ottawa, ON. Participants discussed, validated, and extended the principles outlined in a draft RDRP Policy Framework document, then identified specific community-level principles and actions that are most critical to fostering disaster resilience planning at the community level. The results of the National Policy Forum were shared with the Resilient Communities Working Group (RCWG) session held on October 18, 2011 as part of the Public Safety Canada's Annual National Roundtable on Disaster Risk Reduction. The input from both sessions was synthesized into a final report and a National Policy Statement on Disaster Resilience Planning for Remote, Rural, and Coastal Communities.

The draft RDRP Policy Framework called upon principles from Climate Change Adaptation and the UN Hyogo Framework for Action and presented community-level actions to foster disaster resilience planning and potential target indicators. The participants in the forum identified four principles and actions as most relevant and critical to focus future efforts:

- Protect lives and maintain resilient and sustainable communities by fostering disaster reduction as a way of life
- Ensure that disaster mitigation is community-based, with a national commitment
- Reduce the underlying factors of vulnerability and risk
- Ensure that education programs and training on disaster risk reduction are in place in schools and local communities.
- Effective adaptation policy is strategic and systematic
- Develop and distribute tools to support communities in making strategic choices about adaptation
- Effective adaptation policy requires mainstreaming

Based on these principles and actions, four questions were forwarded to the RCWG:

- Disaster mitigation is best applied at the local level with national support and incentives. How can the RCWG further this agenda?
- Disaster resilience education and training need to be provided for schools and local communities. How can the RCWG further this agenda?
- Communities need to have access to strategies to adapt to climate change and a strategic framework to develop a plan of action. How can the RCWG further this agenda?
- Disaster resiliency planning needs to be explicitly incorporated throughout all aspects of community planning. How can we embed the principle of disaster resiliency in community planning processes?

Following the RCWG meetings, the findings of the National Policy Forum were presented in the *RDRP National Policy Forum* report.

Implementation study

The implementation study was conducted to validate the use of the revised process and tools, paying particular attention to how participating communities engaged with the online Rural Disaster Resilience

Planning Framework (RDRP Guide), Virtual Community of Practice (VCoP), worked through the planning process, and used the tools and resources. One new community and one field site community (who had used the paper based tools) were recruited. Feedback was solicited through surveys which provided feedback on the tools and process. From the responses, overall, the process, steps and instructions were easy to follow and they found the tool to be useful for community resilience planning in their community. Feedback and specific concerns have been addressed in the online version of the tool. A broad communication strategy and an engagement strategy detailing the engagement of partner and collaborator organizations to bring awareness of the VCoP and Planning Framework to remote, rural and coastal communities is also included.

Feedback during Participation Tasks

Feedback on the process and usability of the guide and tools were noted through formal and non-formal feedback workshops, emails, calls and discussions. While the overall feeling is that the guide is very useful to communities and the comprehensiveness is easier to work through online there are a few consistent items for review.

Terminology used in the indicators is sometimes inconsistent with local terminology. This was especially apparent in several Aboriginal communities, who wished to see additional indicators and hazards that are more directly related to their unique contexts.

Some confusion in use of the three tools, particularly around creating three different lists of strategies and reports. Some groups suggested consolidating the generation of Strategy Reports to simplify this process.

The language and usefulness of some strategies is too simplistic. Would like to see the strategies at a bit deeper a level, however, recognize that this may be difficult in a "general" report.

Users would like the ability to add categories and indicator for Hazards. While this can be done on the paper-based version, there is no way to add your own categories in the online version at present.

Users would like to have the option to review all potential strategies, even if no relevant hazards have been chosen.

Users commented that the process made sense once you had been through it. However, they indicated that the process would be richer and will have a greater chance of success if it is facilitated to some degree.

Users discussed the trade-off between a robust and comprehensive process and the capacity of small communities to engage in that process. Strategies to streamline the process include targeting specific hazards rather than assessing against all hazards.

Two themes emerged from review of the Implementation Study:

- *Sustainability*: The key to project sustainability is the implementation of an engagement and accessibility strategy. Communities must understand that the tools are out there and which tools will meet their needs for emergency preparation. Currently communities lack capacity and funding to develop plans. With funding towards education and capacity building communities will be able to use the tools in an efficient and timely manner.
- *Communication Strategy*: Building upon the National Platform, Resilient Communities – Get My City Ready Campaign, BC Resilient Communities Committee and the National Resilient Communities Workshop create and education others on the tools currently available and how the

RDRP tools fit into the puzzle. Build tools for facilitators to take the tools into communities. Create and provide different materials for different users – (community / organizational / public). These may include: documents, one pagers, webinars, access to research and materials.

Recommendations from the study included:

Recommendation 1: Operationalize the VCoP and Online Planning Framework by funding a community gardener or community engagement person to roll out the tools nationally. Key elements would be to:

- Engage Canadian rural, remote and coastal communities in resilience planning.
- Further develop a sustainable framework and process.
- Further develop an implementation and communication plan.
- Develop a set of facilitator tools for those working with communities using the suite of online tools (such as Emergency Management BC, the Canadian Red Cross).
- Further improve, synergize and fine tune the tools.

Recommendation 2: Build synergies between groups and projects working on community resilience and disaster resilience.

- Be part of a national emergency management strategy in the dissemination and education of tools and strategies for communities.
- Build upon the Community Development proposal on Building Resilient Communities. Use this as a first step to national cohesion and planning.
- Using EMBC as a pilot move the BC Resilient Communities Committee across Canada.

5 Transition and Exploitation

The RDRP project generated substantial output in terms of tools, resources, reports, articles, and presentations. In addition, the RDPR had a significant reach and impact, such as directly contributing to the conversations and consideration of resilience within over 20 Canadian RRC communities; enhancing the networks amongst academic, government and non-governmental stakeholders in the national and international community of those invested in disaster resilience; and increasing national disaster resilience capacity with the introduction of rural-specific tools.

The following section outlines the transition and exploitation of the RDRP project.

Figure 2. Rural Disaster Resilience Project: Reach and Impact

Transition to End Users

The RDRP project resulted in a significant series of project outputs and resources.

RDRP Planning Framework: community-based process for disaster resilience planning, including extensive resources on how to build and maintain community involvement, develop a community profile, conduct disaster risk assessment, use hazard and community resilience indices to assess resilience and identify priorities, and develop/implement a prioritized plan for increasing community resilience:

- Community Profile
- Skills and Knowledge Inventory
- Mapping
- Collecting Information
- Working Together
- Hazard Risk Profile Template
- Integrated Resilience Profile Template
- Glossary

Suite of tools that allow for assessment and monitoring of community and hazard risk resilience over time:

- HRA, HRI, RRI
- Strategy Reports
- Customized Reports
- Templated and customized reporting features:
    - Hazard risk and community resilience indices
    - Strategies

Reports, articles, presentations:

- Reports and Articles (21) (See Appendix C)
- Presentation (22) locally (e.g., EPP), nationally (e.g., Summer Symposia, CRHNet, etc.), and internationally (e.g., Colorado, World Congress on Disaster and Emergency Medicine: Sri Lanka, Victoria, Dublin, & Manchester)

National Policy Forum

- Policy Statement
- Policy Report

Virtual Community of Practice

- Resource repository, links to RDRP process and tools, password protected community collaboration spaces.

In addition, the RDRP project resulted in increased resilience and disaster planning by over 20 Canadian communities, with further uptake internationally:

Community uptake:

- 9 Phase I sites
- 5 pilot and field sites
- 6 communities in Kent/Harrison region

The RDRP process and tools have been accessed and considered by a number of third parties:

- Royal Roads University and the Conference Board of Canada, Centre for the North conducted a resilience assessment project with northern Aboriginal communities
- Canadian Red Cross expressed interest in using the RDRP in a pilot project with 11 Canadian Aboriginal communities
- Colorado (both state and academic institutions)
- An Australian community is using RDRP as a basis for its disaster resilience planning

Partners & Stakeholders:

Participation in the RDRP project resulted in the development and enrichment of a number of partnerships and stakeholder relationships. These relationships resulted in the extension of the RDRP project into an Implementation study and in the development of two follow-on proposals:

- RDRP Participating Partners (CSSP, Public Health Agency of Canada, Public Safety Canada, Natural Resources Canada, Royal Roads University)
- Participation in extension projects:
    - Implementation study: Emergency Management BC
- 2012 CSSP Call: Aboriginal Disaster Resilience Study (accepted for full proposal; not funded):
    - Aboriginal Affairs & Northern Development Canada, Assembly of First Nations, Canadian Red Cross, Public Safety Canada, Coach house Enterprises, Resilient Communities Working Group)
- 2013 CSSP Call: Aboriginal Disaster Resilience Planning Project synopsis proposal submitted July 2013):
    - Aboriginal Affairs & Northern Development Canada, Assembly of First Nations, Canadian Red Cross, Public Safety Canada, Coach house Enterprises, Resilient Communities Working Group, KaDSci)

Follow on Development and R&D Recommendations

The JIBC is committed to ongoing support of the RDRP Virtual Community of Practice, the RDRP processes and tools, and future rural disaster resilience projects.

The JIBC continues to host and maintain the Virtual Community of Practice and online RDRP tools. JIBC is working with Emergency Management BC on further promotion and uptake of the RDRP project. The JIBC continues discussions with, and support of, individual communities and initiatives that seek to employ the RDRP outputs.

As noted earlier, over half of Canada's Aboriginal peoples live in remote, rural, and coastal communities. RDRP has been considered, evaluated, and taken up by a number of Canadian Aboriginal communities, and adaptation of the RDRP to meet the unique needs of Canada's Aboriginal communities seems a natural next step in the evolution of the project. To this end, the JIBC has submitted two proposals (2012,

2013) with CSSP to adapt the RDRP for use within Aboriginal contexts. These proposals have support of local, provincial, and federal agencies and stakeholder groups.

The RDRP forms a significant component of the JIBC's upcoming 2013 proposal for an NSERC Industrial Research Chair for Colleges in Resilient Communities. As well, the JIBC won support, along with EMBC, for an upcoming national workshop on disaster risk and resilience. In addition, the JIBC is working to ensure the long term sustainability of the project through enriched relationships (e.g. with EMBC), funding proposals (Vancouver Foundation, Real Estate Foundation of British Columbia, CSSP 2012 and 2013), and internal support (JIBC Emergency Management Division).

Intellectual Property Disposition

The JIBC currently hosts and maintains the RDRP Planning Framework, along with the Virtual Community of Practice and the HRI, HRA, and RRI tools. As noted in the previous section, the JIBC continues to seek ongoing sustainability funding to maintain the site and tools.

6 Conclusion

The Rural Disaster Resilience Project had significant reach and impact at the local, regional, national, and international levels. Specific project outputs included:

- Creation of tools, process, and resources to support disaster risk resilience in remote, rural, and coastal communities
- Development of relationships with national partners and funding agencies: Canadian Safety Security Program, Public Health Agency of Canada, Public Safety Canada, and Natural Resources Canada.
- Development of relationships with local and national partners and collaborators: Emergency Management BC, CRHNet, Resilient Communities Working Group, Pearces2 Consulting, Royal Roads University, University of Manitoba, Sir Wilfred Laurier University, Nova Scotia Agricultural College.
- Award winning translation to technology-supported formats (Triple bronze medal winner Horizon Interactive Awards: http://www.jibc.ca/news/justice-institute-british-columbia-wins-triple-bronze-interactive-media-production)
- Uptake of project outputs from the Resilient Communities Working Group, Canadian Red Cross, Royal Roads University and the Conference Board of Canada, and Emergency Management BC
- Interest and potential future partnerships with KaDSci (Value Focused Metrics; a CSSP funded DRR project in Nanaimo and Parkesville), communities in Australia, state emergency planners in Colorado, and (through the 2012, 2013 CSSP funding calls) future extension of RDRP in Aboriginal contexts with Aboriginal Affairs and Northern Development Canada, Assembly of First Nations, Public Safety Canada, and the Canadian Red Cross.

The Justice Institute of British Columbia wishes to thank the Canadian Security Science Program, and in particular our Portfolio Managers, Ahmad Korchid and Paul Chouinard, for their support of this important initiative, along with Nicolas Palanque and Jo-Anne Stead from the Public Health Agency of Canada. In addition, the JIBC would like to again acknowledge the participation of the 15 communities who engaged in the project, and our supporting partners: Public Health Agency Canada, Public Safety Canada, Natural Resources Canada, Royal Roads University, and Pearces2 Consulting. Finally, thanks to the project members and supporting personnel from the Justice Institute of British Columbia for their contributions to the project.

References

Alphonso, C., & Davis, S. S. (2012, June 24). One confirmed dead after roof collapse in Elliot Lake. The Globe and Mail. Retrieved from http://www.theglobeandmail.com

Berkes, F., Colding, J., & Folke, C. (2003). *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change***.** Cambridge, MA: Cambridge University Press.

BC Provincial Emergency Program. (2003.). Hazards, Risk and Vulnerability Analysis Toolkit. Retrieved September, 27, 2012 from http://www.pep.bc.ca/hrva/toolkit.html

Berkes F. & Ross, H. (2013). Community Resilience: Toward an Integrated Approach. *Society and Natural Resources, 26*(1), 5–20 DOI: 10.1080/08941920.2012.736605

Bruneau, M., Chang, S. E., Eguchi, R. T., Lee, G. C., O'Rourke, T. D., Reinhorn, A. M., Shinozuka, M., Tierney, K., Wallace, W. A. & von Winterfeldt, D. (2003): A framework to quantitatively assess and enhance the seismic resilience of communities, *Earthquake Spectra, 19*(4), 733–752.

Bullock, R., Armitage, D., & Mitchell, B. (2012). Shadow Networks, Social Learning, and Collaborating through Crisis: Building Resilient Forest-Based Communities in Northern Ontario, Canada. *Collaborative Resilience: Moving Through Crisis to Opportunity*, 309.

CAN/CSA-Z1600-2008 (2008). *Emergency management and business continuity programs*. Canadian Standards Organization, Ontario, Canada.

Canada's Rural Population since 1851. (2012). Retrieved September, 27, 2012 from http://www12.statcan.gc.ca/census-recensement/2011/as-sa/98-310-x/98-310-x2011003_2-eng.cfm

Cox, R.S. (2011, October). *Concepts of Community Resiliency.* Presentation at Canadian Risk and Hazards Network Annual Symposium, Ottawa, Ontario.

Cox, R.S. & Murphy, B. (2013). *Rural Disaster Resilience: A Pilot Study of the Rural Disaster Resilience Planning Project.* New Westminster, BC: Justice Institute of British Columbia.

Cox & Perry, 2011

Du Plessis, V., Beshiri, R., Bollman, R. D., & Clemenson, H. (2002).Definitions of" rural" (No. 28031). Statistics Canada.

Hays, W. W. (1991). Hazard and Risk Assessments in the United States. *Episodes, 14* (1), 7-12.

Hoetmer, G. (1991). Introduction. In Drabek, T. E. & Hoetmer, G. J. (Eds.), *Emergency Management: Principles and Practice for Local Government* (pp. vii-xxxv). Washington, D.C.: International City Management Association

Hwacha, V. (2005). Canada's experience in developing a national disaster mitigation strategy: A deliberative dialogue approach. M*itigation and Adaptation Strategies for Global Change,* 1*0,* 507-523.

International Federation of Red Cross and Red Crescent Societies . (2004). W*orld disaster report 2004: Focus on community resilience.* World Disaster Reports. Geneva, Switzerland: International Federation of Red Cross and Red Crescent Societies.

Janssen, M. A., Schoon, M. L., Ke, W., & Börner, K. (2006). Scholarly networks on resilience, vulnerability and adaptation within the human dimensions of global environmental change. *Global Environmental Change, 16*(3), 240-252.

Journeay, M. (2010). *Suitability of Risk Assessment Methods for Use in Canada. Unpublished report.* Vancouver, BC: Natural Resources Canada.

Mayunga, J. S. (2007). Understanding and applying the concept of community disaster resilience: A capital-based approach. United Nations University, Institute for Environment and Human Security, Summer Academy 2007.

Mileti, Dennis S. (1999). *Disaster by Design*. Washington, DC: Joseph Henry Press.

Ministerial Advisory Council on Rural Health. (2002). *Rural Health in Rural Hands: Strategic Directions for Rural, Remote, Northern and Aboriginal Communities.* Ottawa, ON: Health Canada.

Murphy, B. L., 2007. Locating Social Capital in Resilient Community-Level Emergency Management, *Natural Hazards, 41*, 297-315.

National Oceanic and Atmospheric Administration. (2006). Gulf of Mexico Alliance working web site. Retrieved March 9, 2010, from http://www2.nos.noaa.gov/gomex/restoration/.

Oliver-Smith, A. (2002). Theorizing disasters: Nature, power and culture. *Catastrophe & Culture.* School of American Research Press, Santa Fe, 23-47.

Pearce, L. D. (2000). *An Integrated Approach for Community Hazard, Impact, Risk and Vulnerability Analysis: HIRV*, University of British Columbia, Vancouver, BC.

Pearce, L. (2005).The value of public participation during a hazard, impact, risk and vulnerability (HIRV) analysis. *Mitigation and Adaptation Strategies for Global Change, 10*(3), 411-441.

Strauss, A., & Corbin, J. (1994). *Grounded theory methodology. Handbook of qualitative research*, 273-285.

Tierney, K. (2009). *Disaster response: Research findings and their implications for resilience measures* Boulder, CO: Department of Sociology and Institute of Behavioral Science Natural Hazards Center, University of Colorado.

Twigg, J. (2007). *Characteristics of a disaster-resilient community: A guidance note.* London: Department for International Development, Disaster Risk Reduction Interagency Coordination Group.

United Nations International Strategy for Disaster Risk Reduction. (2005). *Hyogo Framework for Action*, 2005-2015. (A/CONF.206/6). Retrieved from http://www.unisdr.org/we/inform/publications/1037

Wyche, K. F., Pfefferbaum, R. L., Pfefferbaum, B., Norris, F. H., Wisnieski, D., & Younger, H. (2011). Exploring community resilience in workforce communities of first responders serving Katrina survivors. *American journal of orthopsychiatry*, 81(1), 18-30.

Walker, B., & Salt, D. (2006). *Resilience Thinking: Sustaining Ecosystems and People in a Changing World,* Washington: Island Press.

Annex A Project Team

The Core Project Team consisted of:

- Carol Amaratunga, (Principal Investigator from 2007 – 2011 (retired July 2011) and as Co Investigator from 2011 to present),
- Greg Anderson (Administrative Project Lead & Co-Principal Investigator from 2011 to 2012),
- Ron Bowles (Co-Principal Investigator from 2011 to 2012),
- Robin Cox (Co-Investigator and Research Lead),
- Laurie Pearce (Co-Investigator),
- Murray Journeay (Co-Investigator),
- Colleen Vaughan (Co-Investigator).

Project management and administration were coordinated by Dawn Ursuliak and Terry Bodaly.

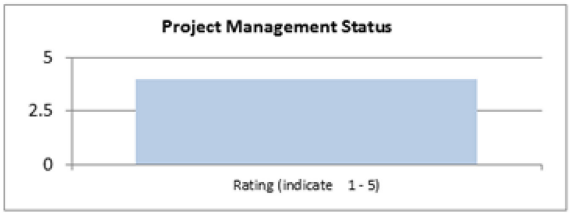
The Steering Committee Members consisted of:

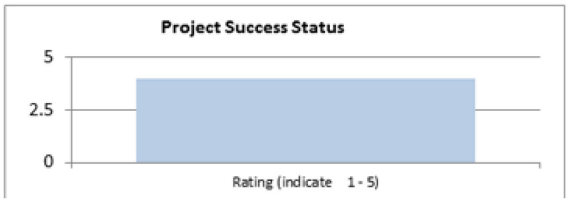
- Ahmad Khorchid (CRTI, Psychosocial Portfolio Manager, CRTI Development Research Defence Department of National Defence)
- Paul Chouinard (CRTI, Psycho-Social and Community Resilience Portfolio Manager, DRDC Centre for Security Science, Department of National Defence)
- Christine Burgess, (Public Health Agency of Canada (PHAC), A/Project Champion - representing Sylvie Berube),
- Monique St. Laurent (PHAC, Project Champion),
- Jennifer Lew (PHAC, Deputy Program Manager, and subsequently Project Manager),
- Nicolas Palanque (PHAC, Project Champion),
- Christina Prasad (Agriculture and Agri-Food Canada),
- Jo-Anne Stead (PHAC, Deputy Project Manager)

Annex B Project Performance Summary

PROJECT PERFORMANCE SUMMARY

Project/Study #	Project Management Status					Project Success Status				
	Technical Milestones	Schedule (Slippage)	Cash Flow	Risk Exposure	Avg	Client/ Market Pull	TRL Maturity	Deliverable Status	S&T Perf Cap Dev	Avg
0	4	4	4	4	4	4	4	4	4	4





Technical Performance Summary:

The Rural Disaster Resilience Project (RDRP) demonstrated and validated project outputs, specifically the Virtual Community of Practice, the RDRP Planning Framework, and the HRA, HRI, and RRI online tools and processes in the Implementation Phase of this project. Thus, the project has met its Technical Performance objectives.

Schedule Performance Summary:

The RDRP project was completed within the scheduled time frames. The RDRP was extended, through the CSSP funded Implementation Study, to June, 2013. This report constitutes the final deliverable of the project.

Cost Performance Summary:

Project costs and cash flow were completed per schedule. The project is now complete.

Annex C Publications, Presentations, Patents

Table 1: Knowledge Synthesis

Deliverable	Title	Due	Completed
Literature Review of Indicators	CRTI 07-0135RD Lit Review Report #1	March 31st, 2010	March 31, 2010
Literature Review	Gender and Disaster in Canada, Literature Review: Understanding the Gender Issue		March, 2010
Bilingual Knowledge Synthesis Paper / Report	CRTI 07-0135 RD Building Resilience and Rural Health System Capability for Pre-Disaster Planning and Preparedness Inception Meeting and Steering Committee Workshop Report	4 Bilingual Knowledge Synthesis Paper Due: June 30th, 2013	April, 2009
Bilingual Knowledge Synthesis Paper / Report	Community Disaster Resilience Context and Preliminary Indicators From a Genuine Progress Index (GPI) Perspective	4 Bilingual Knowledge Synthesis Paper Due: June 30th, 2013	October, 2009
Bilingual Knowledge Synthesis Paper / Report	CRTI 07-0135 RD Building Resilience and Rural Health System Capability for Pre-Disaster Planning and Preparedness: Research Involving Aboriginal Peoples	4 Bilingual Knowledge Synthesis Paper Due: June 30th, 2013	November, 2009
Bilingual Knowledge	Risk Communication with nurses during	4 Bilingual Knowledge	Journal of Emergency Medicine

Deliverable	Title	Due	Completed
Synthesis Paper	infectious diseases outbreak: Learning from SARS	Synthesis Paper Due: June 30th, 2013	Vol 7, No 5, September 2009
Bilingual Knowledge Synthesis Paper	Managing the risks of bovine spongiform encephalopathy: a Canadian perspective	4 Bilingual Knowledge Synthesis Paper Due: June 30th, 2013	Int. J. Risk Assessment and Management, Vol. 14, No. 5, 2010
Bilingual Knowledge Synthesis Paper	Infectious Respiratory Disease Outbreaks and Pregnancy: Occupational Health and Safety Concerns of Canadian Nurses	4 Bilingual Knowledge Synthesis Paper Due: June 30th, 2013	Prehospital and Disaster Medicine Vol. 26, No. 2, May 2011
Bilingual Knowledge Synthesis Paper	Building Community Disaster Resilience through a Virtual Community of Practice (VCOP)	4 Bilingual Knowledge Synthesis Paper Due: June 30th, 2013	July, 2011 International Journal of Disaster Resilience in the Built Environment
Bilingual Knowledge Synthesis Paper	Building Disaster Resilience in Rural, Remote, and Small Coastal Communities: Some Preliminary Observations	4 Bilingual Knowledge Synthesis Paper Due: June 30th, 2013	Winter, 2011: Canadian Risks & Hazards Network Volume 2 No. 2 Winter 2011
Bilingual Knowledge Synthesis Paper	Building Disaster Resilience in Rural, Remote, and Small Coastal Communities Article 2	4 Bilingual Knowledge Synthesis Paper Due: June 30th, 2012	Winter 2011 Canadian Risks & Hazards Network Volume 2 No. 2 Winter 2011
Bilingual Knowledge Synthesis Paper	Rural Disaster Resilience: A Pilot Study of the Rural Disaster Resilience Planning Project	4 Bilingual Knowledge Synthesis Paper Due: June 30th, 2013	September, 2012 February, 2013

Deliverable	Title	Due	Completed
Bilingual Knowledge Synthesis Paper	Field Site Article	4 Bilingual Knowledge Synthesis Paper Due: June 30th, 2013	Final edits prior to submission Aug 2013
Integrated Risk Assessment Planning Framework: first Draft interim report IRAPF (RDRP	IRACM - First Draft Interim Report Due June 30 2010.pdf (RDRP)	Draft: June 30, 2010	June, 2010
Framework and model of a preliminary Rural Resilience Index: Rural Resilience Index Preliminary Report	Developing the Rural Resilience Index	September 30th, 2010	September, 2010
Bilingual Framework, Model and Report of Rural, Remote and Coastal Community Index	FINAL: Rural Disaster Resilience Planning Guide	Final: August 31st, 2012	June, 2012 – English version
Bilingual Framework, Model and Report of Rural, Remote and Coastal Community Index	FINAL: Rural Disaster Resilience Planning Guide	Final: August 31st, 2012	June, 2013 – French version

Table 2: Knowledge Generation

Deliverable	Title	Due	Completed
#1 Bilingual Focus Group Report	Pilot Application of the Rural Disaster Resilience Planning Guide – Bamfield, BC	August 31st, 2012	June, 2012
#2 Bilingual Focus Group Report	Pilot Application of the Rural Disaster Resilience Planning Guide – Horsefly, BC	August 31st, 2012	June, 2012
#3 Bilingual Focus Group Report	Field Site Application of the Rural Disaster Resilience Planning Guide	August 31st, 2012	June, 2012
Comparative Analysis Overview and Executive Summary	Research Report	August 31st 2012	Aug 2013
Presentation to Disseminate Findings	Building Community Disaster Resilience through a Virtual Community of Practice	August 31st 2012 Up to 6 [bilingual abstracts submitted to Technical Authority prior to event]	Asian Conference on Disaster Reduction Sri Lanka, June, 2011 International Conference on Emergency Medicine, Dublin June, 2012
Presentation to Disseminate Findings	National Policy Forum	August 31st 2012 Up to 6 [bilingual abstracts submitted to Technical Authority prior to event]	CRHNet, October 2011 Ottawa, Ont.
Presentation to Disseminate Findings	Integrated Resilience Enhancement Planning for Rural Communities	August 31st 2012 Up to 6 [bilingual abstracts submitted to Technical Authority prior to	CRHNet, October 2011 Ottawa, Ont.

Deliverable	Title	Due	Completed
		event]	
Presentation to Disseminate Findings	Rural Resiliency: An Ontario Case Study	August 31st 2012 Up to 6 [bilingual abstracts submitted to Technical Authority prior to event]	CRHNet, October 2011 Ottawa, Ont.
Presentation to Disseminate Findings	A Virtual Community of Practice for Disaster Resilience Planning in Canada	August 31st 2012 Up to 6 [bilingual abstracts submitted to Technical Authority prior to event]	CRHNet, October 2011 Ottawa, Ont
Presentation to Disseminate Findings	RDRP: A Model for Social Change	August 31st 2012 Up to 6 [bilingual abstracts submitted to Technical Authority prior to event]	BCIT Symposium on Convergence of Complex Systems on Health Technology Research November 01, 2011
Presentation to Disseminate Findings	Rural Disaster Resilience Planning	August 31st 2012 Up to 6 [bilingual abstracts submitted to Technical Authority prior to event]	PHAC Emergency Preparedness and Response Forum, Edmonton, Alberta, January, 2012
Presentation to Disseminate Findings	Research as a Tool for Social Change and Social Justice -- Rural Disaster Resilience Project: A Model for Change in Rural Communities	August 31st 2012 Up to 6 [bilingual abstracts submitted to Technical Authority prior to event]	University of Victoria, Aboriginal Health Institute, Aboriginal Summer Institute, May, 2012
Presentation to Disseminate Findings	Community Engagement as a Prerequisite for Emergency Medicine	August 31st 2012 Up to 6 [bilingual abstracts submitted to Technical Authority prior to	International Conference on Emergency Medicine, Dublin, Ireland, June, 2012

Deliverable	Title	Due	Completed
		event]	
Presentation to Disseminate Findings	Plans and Practices: Promoting Rural Community Resilience	August 31st 2012 Up to 6 [bilingual abstracts submitted to Technical Authority prior to event]	Annual Natural Hazards Research and Applications Workshop, Boulder Colorado, July 2012
Presentation to Disseminate Findings	Rural Disaster Resilience Project	August 31st 2012 Up to 6 [bilingual abstracts submitted to Technical Authority prior to event]	Pacific NorthWest Economic Region, Power of Partnerships Conference, Saskatoon, Sask., July, 2012
Presentation to Disseminate Findings	The Rural Disaster Resiliency Process - Hazards Resiliency Index (HRI)	August 31st 2012 Up to 6 [bilingual abstracts submitted to Technical Authority prior to event]	CRHNet, Vancouver, BC, November, 2012
Presentation to Disseminate Findings	Online tools for Disaster Resilience Planning in Canada	August 31st 2012 Up to 6 [bilingual abstracts submitted to Technical Authority prior to event]	CRHNet, Vancouver, BC, November, 2012
Presentation to Disseminate Findings	The Rural Resilience Index	August 31st 2012 Up to 6 [bilingual abstracts submitted to Technical Authority prior to event	CRHNet, Vancouver, BC, November, 2012
Presentation to Disseminate Findings	Disaster Resilience Planning for Rural and Remote Communities	August 31st 2012 Up to 6 [bilingual abstracts submitted to Technical Authority prior to	CRHNet, Vancouver, BC, November, 2012

Deliverable	Title	Due	Completed
		event	
Presentation to Disseminate Findings	Fostering Community Capacity: Implementation of the Rural Disaster Resilience Project	August 31st 2012 Up to 6 [bilingual abstracts submitted to Technical Authority prior to event	18th World congress on Disaster & Emergency Medicine May 28-31, 2013
Bilingual Web-based and Paper-Based Self-Assessment Tool	• Rural Resilience Index Hazard Risk Assessment • Hazard Resilience Index • Rural Resilience Strategies • Hazard Resilience Strategies	Draft: December 31st, 2011 Final: June 30th, 2012	July 30, 2012 - English
A pilot site and field site tested curriculum syllabus review to assist in the development of web-based curriculum	Rural Disaster Resilience Planning Framework	Draft: December 31st, 2011 Final: June 30th, 2012	Draft: December, 2011 Final: June 2012
Web based, user friendly, step by step process for using the suite of tools and VCoP.	Rural Disaster Resilience Planning Guide	Draft: December 31st, 2011 Final: June 30th, 2012	Draft: December, 2011 Final: June, 2013
Research report	Rural Disaster Resilience Project Validation and Implementation Study Report	June, 2013	June, 2013

Table 3: Tools and Curriculum Development

Deliverable	Title	Due	Completed
Bilingual Web-based and Paper-Based Self-Assessment Tool	• Rural Resilience Index Hazard Risk Assessment • Hazard Resilience Index	Draft: December 31st, 2011 Final: June 30th,	July 30, 2012 - English

Deliverable	Title	Due	Completed
	• Rural Resilience Strategies • Hazard Resilience Strategies	2012	
A pilot site and field site tested curriculum syllabus review to assist in the development of web-based curriculum	Rural Disaster Resilience Planning Framework	Draft: December 31st, 2011 Final: June 30th, 2012	Draft: December, 2011 Final: June 2012
Web based, user friendly, step by step process for using the suite of tools and VCoP.	Rural Disaster Resilience Planning Guide	Draft: December 31st, 2011 Final: June 30th, 2012	Draft: December, 2011 Final: June, 2013

Table 4: List of Project Tools and Resources

Title	Description	On-Line and/or Paper Copy Available
Virtual Community of Practice Website	Overview and summary of all the resources.	www.drrplan.net
Planning Guide		
Rural Disaster Resilience Planning Guide	Background and objectives for disaster planning along with four steps and related activities for Disaster Resilience Planning.	Online and paper versions http://wp-rdrp-dev.jibc.ca/
Resources		
Resource Summary	Overview and summary of all the resources.	Online and paper versions http://wp-rdrp-dev.jibc.ca/
Community Profile	Guidance and a helpful template for completing a Community Profile	Online and paper versions http://wp-rdrp-dev.jibc.ca/
Skills and Knowledge Inventory	A template for collecting information regarding local skills and knowledge	Online and paper versions http://wp-rdrp-dev.jibc.ca/
Mapping	Guidance for approaching community-based mapping	Online and paper versions http://wp-rdrp-dev.jibc.ca/
Collecting Information	Guidance for collecting community-based information	Online and paper versions http://wp-rdrp-dev.jibc.ca/
Working Together	Guidance for working collectively	Online and paper versions http://wp-rdrp-dev.jibc.ca/
Hazard Risk Profile Template	A template to compile your information from the Hazard Risk Assessment.	Online and paper versions http://wp-rdrp-dev.jibc.ca/
Integrated Resilience Profile Template	A template to compile and analyse Rural Resilience Index and Hazard	Online and paper versions http://wp-rdrp-dev.jibc.ca/

Title	Description	On-Line and/or Paper Copy Available
	Resilience Index information.	
Glossary	A list of terms related to disaster planning.	Online and paper versions http://wp-rdrp-dev.jibc.ca/
Resiliency Tools		
Rural Resilience Index (RRI)	A tool to help you assess your community's disaster resilience in order to provide information on areas of resilience that can be enhanced.	Online and paper versions http://wp-rdrp-dev.jibc.ca/
RRI Instructions	Instructions on how to work through the resilience tools.	Online and paper versions http://wp-rdrp-dev.jibc.ca/
Rural Resilience Strategies (RRS)	Concrete action strategies for enhancing disaster resilience. These strategies are based on research on best practices in disaster management and resilience.	Online and paper versions http://wp-rdrp-dev.jibc.ca/
Hazard Tools		
Hazard Assessment Overview and Instructions	Overview of what hazards are including a list of 16 categories and 86 associated hazards along with instructions for us assessing community hazards	Online and paper versions http://wp-rdrp-dev.jibc.ca/
Hazard Risk Assessment (HRA)	16 specific hazard documents including definitions of the hazards, discussion points and "it happened here". It includes hazard specific factors to assess your risk.	Online and paper versions http://wp-rdrp-dev.jibc.ca/
16 Hazard Assessment Documents	Instructions, Accidents, Food Shortages Astronomical, Geological, Atmospheric, Hazardous Material Spills, Explosions and Leaks, Contamination and Pollution, Hydrological, Dam Failure and Structural Collapse, Nuclear Failure, Diseases, Power and Water Outages, Earthquakes, Tsunamis and Volcanoes, Riots, Fires, Terrorism	Online and paper versions http://wp-rdrp-dev.jibc.ca/
Hazard Resilience Index (HRI)	16 specific hazard resilience documents to rate and assess your community's resilience to hazards.	Online and paper versions http://wp-rdrp-dev.jibc.ca/
16 Hazard Resilience	Instructions, Accidents, Food Shortages Astronomical, Geological, Atmospheric,	Online and paper versions

Title	Description	On-Line and/or Paper Copy Available
Documents	Hazardous Material Spills, Explosions and Leaks, Contamination and Pollution, Hydrological, Dam Failure and Structural Collapse, Nuclear Failure, Diseases, Power and Water Outages, Earthquakes, Tsunamis and Volcanoes, Riots, Fires, Terrorism	http://wp-rdrp-dev.jibc.ca/
Hazard Resilience Strategies (HRS)	16 specific hazard resilience strategies documents to help you develop your disaster resilience plan.	Online and paper versions http://wp-rdrp-dev.jibc.ca/
16 Hazard Resilience Strategies Documents	Instructions, Accidents, Food Shortages Astronomical, Geological, Atmospheric, Hazardous Material Spills, Explosions and Leaks, Contamination and Pollution, Hydrological, Dam Failure and Structural Collapse, Nuclear Failure, Diseases, Power and Water Outages, Earthquakes, Tsunamis and Volcanoes, Riots, Fires, Terrorism	Online and paper versions http://wp-rdrp-dev.jibc.ca/

Table 5: Participating Communities

Interviews	Pilot	Field Sites
Wells, BC	Pilot site: Bamfield, BC	Field site: Waskada, MB
70 Mile House, BC	Pilot site: Horsefly, BC	Field site: Lion's Head, ON
Likely, BC		Field site: West Branch, NS
Horsefly, BC		
Williams Lake, BC		
Tofino, BC		
Bamfield, BC		
Port Alberni, BC		
Ucluelet, BC		
Waskada, MB		
Lion's Head, ON		
West Branch, NS		

Bibliography

Justice Institute of British Columbia (2010). *Literature Review Report: Rural community disaster resilience*. New Westminster, BC: JIBC.

List of symbols/abbreviations/acronyms/initialisms

CBRNE	Chemical, biological, radiological, nuclear and explosive
CRTI	CBRNE (Chemical, biological, radiological, nuclear and explosive) Research and Technology Initiative
CSS	Centre for Security Science
DND	Department of National Defence
HRA	Hazard Risk Analysis
HRI	Hazard Resilience Index
HRS	Hazard Resilience Strategies
JIBC	Justice Institute of British Columbia
OPI	Office of Primary Interest
PHAC	Public Health Agency of Canada
R&D	Research & Development
RDRPG	Rural Disaster Resilience Planning Guide
RRC	Rural, Remote and Coastal
RRI	Rural Resilience Index
RRS	Rural Resilience Strategies
RRU	Royal Roads University
UN	United Nations

DOCUMENT CONTROL DATA

(Security classification of title, body of abstract and indexing annotation must be entered when the overall document is classified)

1. ORIGINATOR (The name and address of the organization preparing the document. Organizations for whom the document was prepared, e.g. Centre sponsoring a contractor's report, or tasking agency, are entered in section 8.)

Defence R&D Canada – CSS
222 Nepean St
Ottawa, Ontario K1A 0K2

2. 2a. SECURITY MARKING
(Overall security marking of the document including special supplemental markings if applicable.)

UNCLASSIFIED

2b. (NON-CONTROLLED GOODS)
DMC A
REVIEW: GCEC APRIL 2011

3. TITLE (The complete document title as indicated on the title page. Its classification should be indicated by the appropriate abbreviation (S, C or U) in parentheses after the title.)

Building Rural Resilience and Rural Health System Capability for Pre-Disaster Planning and Preparedness

4. AUTHORS (last name, followed by initials – ranks, titles, etc. not to be used)

Amaratunga C.; Anderson G.; Bowels R.; Cox R.; Pearce L.; Vaughan C.; Ursuliak D.

5. DATE OF PUBLICATION (Month and year of publication of document.)	6a. NO. OF PAGES (Total containing information, including Annexes, Appendices, etc.)	6b. NO. OF REFS (Total cited in document.)
December 2013	73	32

7. DESCRIPTIVE NOTES (The category of the document, e.g. technical report, technical note or memorandum. If appropriate, enter the type of report, e.g. interim, progress, summary, annual or final. Give the inclusive dates when a specific reporting period is covered.)

Contractor Report

8. SPONSORING ACTIVITY (The name of the department project office or laboratory sponsoring the research and development – include address.)

Defence R&D Canada – CSS
222 Nepean St
Ottawa, Ontario K1A 0K2

9a. PROJECT OR GRANT NO. (If appropriate, the applicable research and development project or grant number under which the document was written. Please specify whether project or grant.)	9b. CONTRACT NO. (If appropriate, the applicable number under which the document was written.)
CRTI 07-0135RD	

10a. ORIGINATOR'S DOCUMENT NUMBER (The official document number by which the document is identified by the originating activity. This number must be unique to this document.)	10b. OTHER DOCUMENT NO(s). (Any other numbers which may be assigned this document either by the originator or by the sponsor.)
DRDC CSS CR 2013-030	

11. DOCUMENT AVAILABILITY (Any limitations on further dissemination of the document, other than those imposed by security classification.)

Unclassified/Unlimited

12. DOCUMENT ANNOUNCEMENT (Any limitation to the bibliographic announcement of this document. This will normally correspond to the Document Availability (11). However, where further distribution (beyond the audience specified in (11) is possible, a wider announcement audience may be selected.))

Unlimited

13. ABSTRACT (A brief and factual summary of the document. It may also appear elsewhere in the body of the document itself. It is highly desirable
that the abstract of classified documents be unclassified. Each paragraph of the abstract shall begin with an indication of the security classification
of the information in the paragraph (unless the document itself is unclassified) represented as (S), (C), (R), or (U). It is not necessary to include
here abstracts in both official languages unless the text is bilingual.)

The Rural Disaster Resilience Project (RDRP) was designed to strengthen community resilience and disaster management planning in rural, remote, and coastal communities (RRC) through community-based research that informed and influenced policy and practice.
Disaster resilience – the ability to survive and thrive in the face of uncertainty – is the foundation of rural life and the cornerstone of effective emergency management. There is much to learn about resilience from RRC communities, yet their emergency planning capacity is often constrained by a lack of resources and user-friendly tools and processes. This project capitalized on and learned from RRCs' expertise and knowledge while testing a unique approach to developing resilience and conducting disaster resilience planning.
The project generated substantial output in terms of web-accessible tools and resources, technical reports, peer reviewed and other articles, and national and international presentations. The project provided communities with paper and online access to resilience and disaster planning workspace (a Virtual Community of Practice), tools, and resources such as the RDRP Planning Guide, Rural Resilience Index, Hazard Risk Assessment, and Hazard Resilience Index. RDRP directly contributed to the conversations and consideration of resilience within over 20 Canadian communities; enhanced networks amongst academic, government and nongovernmental stakeholders in the national and international community of those invested in disaster resilience; and increased national disaster resilience capacity with the introduction of rural-specific tools.

Le Projet de résilience face aux catastrophes en milieu rural (PRCR) a été mis sur pied dans le but d'accroître la résilience et les capacités de planification des mesures à prendre en cas de catastrophe des communautés rurales, éloignées et côtières (REC) au moyen de recherches axées sur le milieu communautaire permettant de mettre en place des politiques et des méthodes pertinentes et inspirées.
La résilience face aux catastrophes – soit la capacité de survivre à une catastrophe et de continuer à avancer malgré l'incertitude que cela amène – constitue le fondement de la vie en milieu rural et la pierre angulaire d'une gestion efficace en situation d'urgence. Bien qu'il y ait beaucoup à apprendre des communautés REC à propos de la résilience, celles-ci doivent souvent composer avec des capacités de planification d'urgence limitées par manque de ressources ainsi que de méthodes et d'outils conviviaux. Le PRCR s'est donc inspiré de l'expertise et des connaissances des communautés REC tout en mettant à l'essai une méthode unique de développement de la résilience et de planification des mesures d'urgence.
Ce projet a porté ses fruits en ce qui a trait à la création d'outils et de ressources en ligne, à la production de rapports techniques, à la rédaction d'articles revus par les pairs et de nature générale, et à la présentation d'exposés à l'échelle nationale et internationale. Grâce à ce projet, les communautés ont désormais accès à des documents papier et électroniques de planification des urgences (une communauté de pratique virtuelle) ainsi qu'à des outils et des ressources comme le Guide de planification du PRCR, l'Indice de résilience rurale, l'Évaluation des dangers et des risques et l'Indice de résilience face au danger.
Le PRCR a contribué directement à alimenter les discussions et la réflexion sur la résilience dans une vingtaine de communautés canadiennes. Il a aussi permis aux universitaires et aux représentants d'organisations gouvernementales et non gouvernementales d'enrichir leur réseau de contacts. Enfin, ce projet a permis d'augmenter la résilience nationale face aux catastrophes grâce à la création d'outils spécialement conçus pour le milieu rural.

14. KEYWORDS, DESCRIPTORS or IDENTIFIERS

Rural Health; Preparedness; Community Resilience; Emergency Planning; Disaster Planning.