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UNIVERSITY OF  
NORTHERN BRITISH COLUMBIA

# **NSERC/Rio Tinto Industrial Research Chair on Climate Change and Water Security**

## **Annual Report – Year 2**

(1 July 2020 – 30 June 2021)



Prepared by Dr. Stephen Déry

## 2020-2021 IRC Annual Report

### Preamble

June 30<sup>th</sup>, 2021 marks the completion of the second year of the Natural Sciences and Engineering Research Council of Canada (NSERC)/Rio Tinto Industrial Research Chair (IRC) in Climate Change and Water Security at UNBC. The 5-year program of research started on July 1<sup>st</sup>, 2019 with the objective to better understand and quantify the roles of climate variability, climate change, and water management on the long term water security of the Nechako Watershed. Among other research topics, we are elucidating some of the complex interactions between climate change and human interventions on flow volumes and water temperatures in the Nechako River using a combination of in situ observations and computer modelling. This annual report provides a progress update on personnel recruitment and training, program management, our field activities and research, communication strategy and community engagement, and the budget.

### Personnel and Training

During the second year of activity, a number of highly-qualified personnel (HQP) were recruited to support the IRC program of research. In supporting roles, Jeremy Morris acts as the research manager (RM) while Justin Kokoszka is the data manager (DM). In addition, Barry Booth acted as the outreach coordinator (OC) until January 2021 after which Kelly Hurley stepped in as the interim OC. It is expected that the role of the outreach coordinator will fall under the responsibilities of a full-time research manager starting in July 2021.

Training of graduate and undergraduate students forms a central component of the IRC. Two undergraduate students from UNBC, Natalya Klutz and Danny Scurfield, were recruited as field assistants to support our spring/summer 2020 field activities while a research skills trainee recruited in fall 2020, Kelly Hurley, leads the preparations and planning for the fall 2021 TRARE field campaign. In the winter of 2020/2021, two new undergraduate students, Derek Gilbert and Spencer Woyke, were recruited as field and research assistants. Their positions started on 3 May 2021 and will run until the end of August 2021. They are responsible for conducting field work across the Nechako Watershed including site visits for data collection.

Two graduate students have been recruited so far under the IRC umbrella. As of May 2020, a MSc student, Justin Kokoszka, leads a project on the naturalization of flows in the Nechako River. Meanwhile, Bruno Sobral also started his PhD program in September 2020 investigating atmospheric rivers that affect the Nechako Watershed. Another student began an MSc program in September 2020 exploring spatio-temporal patterns in river water temperatures in the Nechako but unfortunately left the graduate program in spring 2021. We will now be recruiting another graduate student to undertake this project. Two post-doctoral fellows (PDFs) also joined the IRC program of research over the past year. Dr. Rajtantra Lilhare began his position as a PDF in September 2020 to lead the historical hydrological modelling efforts while Dr. Jingwen Wu started his PDF position in April 2021 working on hydrological modelling in the context of future climate projections.

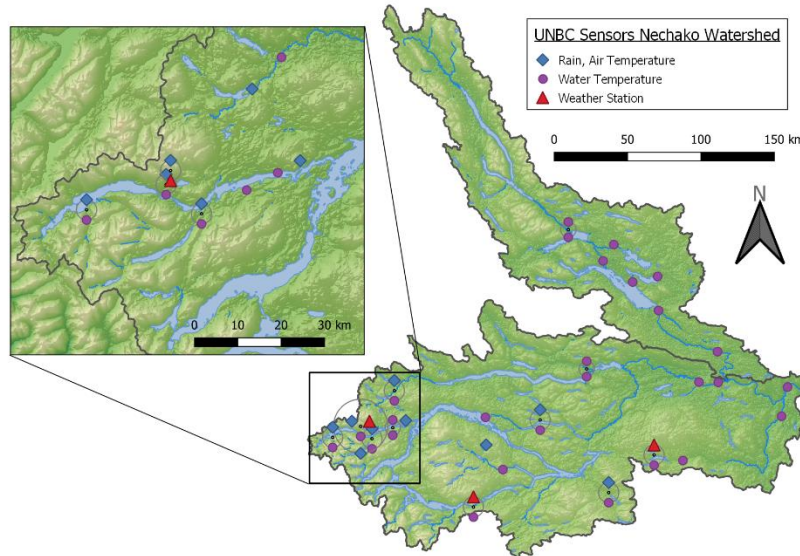
Recruitment of students will continue this summer to ensure a full slate of personnel is in place for the TRARE field campaign being held in September and October 2021.

### Research Management

The Science Advisory Board (SAB) formed in late 2019 oversees the progress of the IRC program of research and met on two occasions during the reporting period. The SAB comprises five members: Mr. Andy Lecuyer (Rio Tinto), Dr. Ellen Petticrew (UNBC), Mr. James Rakochy (Cheslatta Carrier Nation), Mr. Chelton van Geloven (BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD)), and Dr. Francis Zwiers (Pacific Climate Impacts Consortium). Mr. Benckhuysen retired from Rio Tinto in March 2021 and was replaced by Andy Lecuyer at that time. The SAB along with the UNBC Director of Research, Mr. Mark Barnes, met on 8 December 2020 and on 27 May 2021 to hear and evaluate progress thus far with the IRC program of research through online presentations by Dr. Déry and the IRC team. The SAB will continue meeting with the Chairholder and his personnel twice annually to ensure the IRC objectives are met and progress remains satisfactory. The SAB reports to the UNBC Vice-President of Research and Graduate Programs, Dr. Kathy Lewis.

### Field Activities

During our second year of activity and despite travel restrictions with COVID-19, we completed the successful deployment of 26 water temperature loggers, nine tipping bucket rain gauges, and two complete meteorological stations across the entire Nechako Watershed (Figure 1). Improved monitoring of water temperatures and hydrometeorological conditions across the Nechako Watershed is central to Theme 1 of the IRC program of research. Not only will these data provide high-resolution information on the spatio-temporal variations in water temperatures and rainfall in the Nechako Watershed, but will also assist with modelling efforts (Themes 2 and 3).



**Figure 1:** Map of water temperature logger, tipping bucket rain gauge and meteorological station sites.

The deployment of the water temperature loggers, tipping bucket rain gauges and meteorological station was generously supported by several First Nations and by Rio Tinto. Cheslatta Carrier Nation provided boat access to reach sites in the upper Nechako Watershed including streams flowing into Tahtsa Lake and to the south shore of the Nechako reservoir. Tl’azt’en First Nation also provided boat support and staff time to reach Kazchek Creek and the Middle River where water temperature probes were also deployed. Nak’azdli Whut’en provided staff support when accessing streams near Fort St. James. Finally, a memorandum of understanding (MOU) was signed with Stellat’en First Nation to allow UNBC researchers to access sites with their staff members along the Stellako and Endako rivers near Fraser Lake, BC. In addition, Rio Tinto provided generous support for helicopter flight time for deployment of the Eutsuk Narrows meteorological station. As well, Rio Tinto facilitated wintertime site visits to the Mt. Sweeney weather station to verify the status of the equipment and replenish antifreeze in the precipitation gauge.

Communication Strategy

We maintain a comprehensive communication strategy to ensure information on the IRC program of research is disseminated widely and in a timely fashion. This includes a [new website](#), presence on social media (e.g. Twitter, LinkedIn, and ResearchGate and Rio Tinto’s Facebook page), and a Slack workspace to facilitate interactions between the IRC team members. Dr. Déry is also profiled on [NSERC’s online Chairholder database](#). A media release was jointly issued by UNBC and Rio Tinto (30 June 2020) to report on the IRC’s achievements since the program’s inception, which led to several articles in the regional press and online media. The IRC team prepares a quarterly newsletter posted on the IRC website and emailed to our extensive distribution list to disseminate

further information on the IRC to the general public. The NSERC / Rio Tinto IRC was also profiled in the [Fall 2020 issue of the “This is UNBC Magazine”](#) available in digital form. Dr. Déry was interviewed twice over the past year (8 July 2020 and 8 January 2021) by CKPG News in Prince George to discuss high water levels in the Nechako Watershed.

On 23 October 2020, the IRC team met a group of School District 91 high school students from Vanderhoof who visited the UNBC campus for an information exchange tour organized by the Koh-learning project. During this event, the IRC team discussed its ongoing research in the Nechako and demonstrated how a weather station functions. Dr. Déry also presented a progress report to the Kitimat Public Advisory Committee on 8 September 2020 and to the main table of the Water Engagement Initiative (WEI) on 10 February 2021. Dr. Déry also participated in a presentation with other members of UNBC’s Integrated Watershed Research Group’s Evening in the Nechako event on 23 February 2021 during which the IRC was profiled. Dr. Déry also delivered a presentation on Pineapple Express Storms to the Terrace City Council on 12 April 2021. Finally, he further did a brief summary of ongoing IRC research at the Nechako Watershed Roundtable’s spring technical meeting on 26 May 2021.

Given many of the research projects for the IRC are in their infancy, no results have yet been disseminated via conferences or peer-reviewed publications. However, one publication that directly involves hydrometeorological data collected in the Nechako Watershed is now in final preparation for submission to *Earth System Science Data*. As well, Justin Kokoszka delivered a poster presentation on his IRC project to the UNBC community for one of his required courses at UNBC. It is anticipated that as the HQP begin to generate results over the course of this year, our publication and presentation list will expand.

### Community Engagement

The success of the IRC relies on a broad communication strategy and community engagement. To that end, efforts are routinely made to communicate with First Nations as to where field work and other research is being undertaken as part of the IRC. Over the past year, we have engaged in a meaningful way with four First Nations: Cheslatta Carrier Nation, Stellat’en, Nak’azdli Whut’en, and Tl’azt’en First Nations. This has been of particular importance due to concerns expressed by some First Nations relating to outside activities in traditional territories during the COVID-19 pandemic. As well, our outreach efforts led on 15 July 2020 and on 14 May 2021 to site visits and meetings with James Rakochy, Mike Robertson and other members of the Cheslatta Carrier Nation to discuss plans for the deployment of meteorological equipment and water temperature loggers in the upper Nechako and the Cheslatta Watersheds. Finally, in spring 2021 we hosted a youth intern, Konnor McIntosh, of the Lheidli T’enneh First Nation, who is keen on learning about climate change issues in the traditional territory of his Nation.

Another engagement over the past year included meeting with Mitchell Harborne of the Fisheries and Oceans Canada’s Nadina River Spawning Channel where a tipping bucket rain gauge was

installed. As well, we have interacted with Gary Thompson of Lowprofile Ventures and with Telus employees to access the alpine site at Mount Sweeney. We also met Brad and Wendy Thompson at Nadina Lake Lodge during our stay there while undertaking field work in the upper Nechako Watershed. We also entertained discussions with Centerra Gold who shared their data for two meteorological stations at field sites on their Berg Property. Furthermore, we maintain regular conversations with Shane Flynn, the general manager of Imperial Metals' Huckleberry Mines, where the TRARE field campaign will be based. We anticipate interactions with members of the community to expand this summer as we return to our field sites for data collection and as we undertake the 2-month TRARE field campaign in the upper Nechako Watershed.

Dr. Déry remains fully engaged in Rio Tinto's Water Engagement Initiative (WEI) and participates in monthly main table and bi-weekly technical working group meetings. The annual reports and the IRC quarterly newsletters are distributed to the entire WEI mailing list. Additional information on the IRC is posted on Rio Tinto's [Get Involved website](#). Further, Dr. Déry is involved in the Nechako Watershed Roundtable and participated in its annual meeting on 24 February 2021 and its spring technical meeting on 26 May 2021. The 2019-2020 IRC annual report was also sent to the District of Vanderhoof Council for their information and review. Over the past year, Dr. Déry has also been attending the Centerra Gold Community Sustainability Committee's quarterly meetings as a guest participant.

### Industrial Partner Engagement

Dr. Déry interacts on a regular basis with the industrial partner via email, phone, and in person meetings. The principal contact person at Rio Tinto for research was Justus Benckhuysen (Nechako Operations Coordinator) until his retirement in March 2021 and then Andy Lecuyer, while for outreach interactions are facilitated by Lianne Olson (Advisor Communications/Communities). Additional communication with Bruno Larouche and Alec Mercier on the water management team proceeds on a periodic basis for the exchange of data and metadata, information on Rio Tinto's operations and system in the Nechako Watershed, and to identify monitoring and information gaps in the basin. On 17 November 2020, the entire IRC team met with three Rio Tinto staff members for an introduction and a presentation on their operations in the Nechako Watershed.

In 2020, the UNBC team applied for a permit to access and deploy hydrometeorological equipment in Tweedsmuir North provincial park with support from Rio Tinto staff. The 5-year permit has been granted and allowed the installation of a joint meteorological station at Eutsuk Narrows on 20 October 2020. There was close collaboration between Scott Klassen of Avison Management Services and Jeremy Morris during the preparation and deployment of meteorological equipment at Eutsuk Narrows. Dr. Rajtantra Lilhare has been interacting closely with Dave Warburton of Triton Environmental Consultants on digital elevation models and maps of the Nechako Watershed prior to reservoir development. Jenifer Bond at Triton also has provided water temperature data for three sites monitored by their consulting firm in the Nechako Watershed. Alec Mercier and

Bruno Larouche have provided up-to-date streamflow data at the Kemano Powerhouse and water level data for the Nechako Reservoir that are being integrated in multiple IRC projects. Finally, Justus Benckhuysen has provided continuous support by sharing his knowledge on Rio Tinto's operations across the Nechako Watershed.

### Budget

The IRC program of research is supported equally by NSERC and Rio Tinto with a total budget of \$1.5M over five years. Approximately half of this budget is allocated to support Dr. Déry's salary and benefits. With the release of these funds and to fulfil the requirements of NSERC's IRC program, UNBC hired in September 2020 a new tenure-track faculty member (Dr. Siraj ul Islam) to build institutional capacity in hydrometeorology. As of 31 March 2021, the remainder of the available funds for Year 2 was disbursed mainly for the support of HQP (87.4%) and to purchase new equipment and for field work (13.6%). As of the end of March 2021, we expended 71.0% of the overall allocated funds for Year 2 of the IRC. Any year-end surplus of funds will be transferred to Year 3 as expenditures are expected to ramp up for the support of new trainees, expanded field work including the TRARE field campaign, travel and outreach activities.

While NSERC and Rio Tinto provide the bulk of the funding for the IRC program of research, additional support was provided through Eco Canada (four successful applications to date for a total sum of about \$35K since July 2019) and the Nechako Environmental Enhancement Fund (previously secured with members of the UNBC Integrated Watershed Research Group). An application to Global Water Futures has secured additional funding that is supporting a new part-time MSc student at UNBC who started in January 2021 on a project focusing on *compound events* associated with landfalling atmospheric rivers, including those affecting the Nechako Watershed. A proposal for an equipment grant is currently in preparation for submission in June to the Canada Foundation for Innovation. If successful, this would provide additional resources to monitor atmospheric rivers in the upper Nechako Watershed and to assess components of the water budget for Nechako headwater catchments. In spring of 2020, we secured \$11.8K through an internal call to the Real Estate Foundation of BC to assess land cover changes on recent major floods in the province including within the Nechako Watershed. An application to the 2021 internal call for funding to the Real Estate Foundation of BC was also successful, and will allow the purchase of a complete meteorological station in Terrace, BC. The meteorological data collected in Terrace will benefit the IRC program of research by providing a counterpoint to observations collected further east in the upper Nechako Watershed.