# 14 Supplementary Material

Section 14.1 provides a list of the 76 papers in our sample, by country.

In Section 14.2, Tables 14.2.1 to 14.2.9 show which papers addressed which components of the cryosphere, by country and by region of Canada.

In Section 14.3, Tables 14.3.1 to 14.3.9 show which papers addressed which additional topics, by country and by region of Canada.

In Section 14.4, Tables 14.4.1 to 14.4.9 show which papers addressed which responses to change, by country and by region of Canada.

In Section 14.5, Tables 14.5.1 to 14.5.28 show which papers addressed which features of each component of the cryosphere by country with regions of Canada indicated. Figures 14.5.1 to 14.5.10 show the results by country and by region of Canada.

## 14.1 The papers in our sample, by country

### 14.1.1 Alaska

Brinkman, T.J., Hansen, W.D., Chapin, F.S., Kofinas, G., BurnSilver, S., and Rupp, T.S. 2016. Arctic communities perceive climate impacts on access as a critical challenge to availability of subsistence resources. *Climatic Change* 139(3-4):413-427. https://doi.org/10.1007/s10584-016-1819-6

Carothers, C., Brown, C., Moerlein, K.J., López, J.A., Andersen, D.B., and Retherford, B. 2014. Measuring perceptions of climate change in northern Alaska: pairing ethnography with cultural consensus analysis. *Ecology and Society* 19(4). https://doi.org/10.5751/ES-06913-190427

Chapin III, F.S., Knapp, C.N., Brinkman, T.J., Bronen, R., and Cochran, P. 2016. Community empowered adaptation for self-reliance. *Current Opinion in Environmental Sustainability* 19:67-75. https://doi.org/10.1016/j.cosust.2015.12.008

Cochran, P., Huntington, O.H., Pungowiyi, C., Tom, S., Chapin, F.S., Huntington, H.P., Maynard, N.G., and Trainor, S.F. 2013. Indigenous frameworks for observing and responding to climate change in Alaska. *Climatic Change* 120:557–567. Driscoll, D.L., Sunbury, T., Johnston, J., and Renes, S. 2013. Initial findings from the implementation of a community-based sentinel surveillance system to assess the health effects of climate change in Alaska. *International Journal of Circumpolar Health* 72(1):21405. https://doi.org/10.3402/ijch.v72i0.21405

Druckenmiller, M.L., Eicken, H., George, J.C. and Brower, L. 2013. Trails to the whale: reflections of change and choice on an Iñupiat icescape at Barrow, Alaska. *Polar Geography* 36(1-2):5-29. https://doi.org/10.1080/1088937X.2012.724459

Eisner, W.R., Hinkel, K.M., Cuomo, C.J., and Beck, R.A. 2013. Environmental, cultural, and social change in Arctic Alaska as observed by Iñupiat elders over their lifetimes: a GIS synthesis. *Polar Geography* 36(3):221-231. https://doi.org/10.1080/1088937X.2012.724463

Fall, J.A., Braem, N.S., Brown, C.L., Hutchinson-Scarbrough, L.B., Koster, D.S., and Krieg, T.M. 2013. Continuity and change in subsistence harvests in five Bering Sea communities: Akutan, Emmonak, Savoonga, St. Paul, and Togiak. *Deep Sea Research II* 94:274-291. https://doi.org/10.1016/j.dsr2.2013.03.010

Gadamus, L., Raymond-Yakoubian, J., Ashenfelter, R., Ahmasuk, A., Metcalf, V., and Noongwook, G. 2015. Building an indigenous evidence-base for tribally-led habitat conservation policies. *Marine Policy* 62:116-124. https://doi.org/10.1016/j.marpol.2015.09.008

Hansen, W.D., Brinkman, T.J., Leonawicz, M., Chapin III, F.S., and Kofinas, G.P. 2013. Changing daily wind speeds on Alaska's North Slope: implications for rural hunting opportunities. *Arctic* 66(4):448-458. https://doi.org/10.14430/arctic4331

Huntington, H.P., Braem, N.M., Brown, C.L., Hunn, E., Krieg, T.M., Lestenkof, P., Noongwook, G., Sepez, J., Sigler, M.F., Wiese, F.K., and Zavadil, P. 2013. Local and traditional knowledge regarding the Bering Sea ecosystem: selected results from five indigenous communities. *Deep Sea Research II* 94:323-332. https://doi.org/10.1016/j.dsr2.2013.04.025

Huntington, H.P., Quakenbush, L.T., and Nelson, M. 2016. Effects of changing sea ice on marine mammals and subsistence hunters in northern Alaska from traditional knowledge interviews. *Biology Letters* 12(8):20160198. https://doi.org/10.1098/rsbl.2016.0198

Huntington, H.P., Quakenbush, L.T., and Nelson, M. 2017. Evaluating the effects of climate change on indigenous marine mammal hunting in northern and western alaska using traditional knowledge. *Frontiers in Marine Science* 4:319. https://doi.org/10.3389/fmars.2017.00319

Ignatowski, J.A., and Rosales, J. 2013. Identifying the exposure of two subsistence villages in Alaska to climate change using traditional ecological knowledge. *Climatic Change* 121(2):285-299. https://doi.org/10.1007/s10584-013-0883-4

Moerlein, K.J., and Carothers, C. 2012. Total environment of change: impacts of climate change and social transitions on subsistence fisheries in northwest Alaska. *Ecology and Society* 17(1):213-222. https://doi.org/10.5751/ES-04543-170110

Rosales, J., and Chapman, J.L. 2015. Perceptions of obvious and disruptive climate change: community-based risk assessment for two native villages in Alaska. *Climate* 3(4):812-832. https://doi.org/10.3390/cli3040812

Sakakibara, C. 2010. Kiavallakkikput agviq (into the whaling cycle): cetaceousness and climate change among the Inupiat of Arctic Alaska. *Annals of the Association of American Geographers* 100(4):1003-1012. https://doi.org/10.1080/00045608.2010.500561

Sakakibara, C. 2017. People of the whales: Climate change and cultural resilience among Iñupiat of Arctic Alaska. *Geographical Review* 107(1):159-184. https://doi.org/10.1111/j.1931-0846.2016.12219.x

Voorhees, H., Sparks, R., Huntington, H.P., and Rode, K.D. 2014. Traditional knowledge about polar bears (Ursus maritimus) in Northwestern Alaska. *Arctic* 67(4):523-536. https://doi.org/10.14430/arctic4425

Watson, A., and Huntington, O. 2014. Transgressions of the man on the moon: climate change, Indigenous expertise, and the posthumanist ethics of place and space. *GeoJournal* 79(6):721-736. https://doi.org/10.1007/s10708-014-9547-9

### 14.1.2 Canada

Aporta, C. 2011. Shifting perspectives on shifting ice: documenting and representing Inuit use of the sea ice. *The Canadian Geographer/Le Géographe canadien* 55(1):6-19. https://doi.org/10.1111/j.1541-0064.2010.00340.x

Aporta, C., Taylor, D.F., and Laidler, G.J. 2011. Geographies of Inuit sea ice use: introduction. *The Canadian Geographer/Le Géographe canadien* 55(1):1-5. https://doi.org/10.1111/j.1541-0064.2010.00339.x

Carmack, E., McLaughlin, F., Whiteman, G., and Homer-Dixon, T. 2012. Detecting and coping with disruptive shocks in Arctic marine systems: a resilience approach to place and people. *Ambio* 41(1):56-65. https://doi.org/10.1007/s13280-011-0225-6

Cuerrier, A., Brunet, N.D., Gérin-Lajoie, J., Downing, A., and Lévesque, E. 2015. The study of Inuit knowledge of climate change in Nunavik, Quebec: a mixed methods approach. *Human Ecology*, 43(3):379-394.https://doi.org/10.1007/s10745-015-9750-4

Cunsolo Willox, A., Harper, S.L., Ford, J.D., Landman, K., Houle, K., and Edge, V.L. 2012. “From this place and of this place:” climate change, sense of place, and health in Nunatsiavut, Canada. *Social Science & Medicine* 75(3):538-547. https://doi.org/10.1016/j.socscimed.2012.03.043

Durkalec, A., Furgal, C., Skinner, M.W., and Sheldon, T. 2015. Climate change influences on environment as a determinant of Indigenous health: Relationships to place, sea ice, and health in an Inuit community. *Social Science & Medicine* 136:17-26. https://doi.org/10.1016/j.socscimed.2015.04.026

Fienup-Riordan, A., and E. Carmack. 2011. “The ocean is always changing”: nearshore and farshore perspectives on Arctic coastal seas. *Oceanography* 24(3):266–279. https://doi.org/10.5670/oceanog.2011.78Ford, J.D., Clark, D., Pearce, T., Berrang-Ford, L., Copland, L., Dawson, J., New, M., and Harper, S.L. 2019. Changing access to ice, land and water in Arctic communities. *Nature Climate Change* 9(4):335-339. https://doi.org/10.1038/s41558-019-0435-7

Galappaththi, E.K., Ford, J.D., Bennett, E.M., and Berkes, F. 2019. Climate change and community fisheries in the arctic: a case study from Pangnirtung, Canada. *Journal of Environmental Management* 250:109534. https://doi.org/10.1016/j.jenvman.2019.109534

Gearheard, S., Pocernich, M., Stewart, R., Sanguya, J., and Huntington, H.P. 2010. Linking Inuit knowledge and meteorological station observations to understand changing wind patterns at Clyde River, Nunavut. *Climatic Change* 100(2):267-294. https://doi.org/10.1007/s10584-009-9587-1

Harper, S.L., Edge, V.L., Ford, J., Willox, A.C., Wood, M., McEwen, S.A., and IHACC Research Team. 2015. Climate-sensitive health priorities in Nunatsiavut, Canada. *BMC Public Health* 15(1):605. https://doi.org/10.1186/s12889-015-1874-3

Harwood, L.A., Smith, T.G., Melling, H., Alikamik, J., and Kingsley, M.C. 2012. Ringed seals and sea ice in Canada's Western Arctic: harvest-based monitoring 1992-2011. *Arctic* 65(4):377-390. https://doi.org/10.14430/arctic4236

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Laidler, G.J., Hirose, T., Kapfer, M., Ikummaq, T., Joamie, E., and Elee, P. 2011. Evaluating the Floe Edge Service: how well can SAR imagery address Inuit community concerns around sea ice change and travel safety?. *The Canadian Geographer/Le Géographe canadien* 55(1):91-107.https://doi.org/10.1111/j.1541-0064.2010.00347.x

MacDonald, J.P., Harper, S.L., Willox, A.C., Edge, V.L., and Government, R.I.C. 2013. A necessary voice: climate change and lived experiences of youth in Rigolet, Nunatsiavut, Canada. *Global Environmental Change* 23(1):360-371. https://doi.org/10.1016/j.gloenvcha.2012.07.010

MacDonald, J.P., Willox, A.C., Ford, J.D., Shiwak, I., Wood, M., Government, R.I.C., and IMHACC Team. 2015. Protective factors for mental health and well-being in a changing climate: perspectives from Inuit youth in Nunatsiavut, Labrador. *Social Science & Medicine* 141:133-141. https://doi.org/10.1016/j.socscimed.2015.07.017

Ostapchuk, J., Harper, S., Willox, A.C., and Edge, V.L. 2012. Exploring Elders’ and seniors’ perceptions of how climate change is impacting health and well-being in Rigolet, Nunatsiavut/ᕿᒥᕐᕈᓂᖅ ᐃᓐᓇᐃᑦ ᐊᒻᒪᓗ ᐃᓄᑐᖃᐃᑦ ᐃᓱᒪᔾᔪᓯᖏᓐᓂᒃ ᕆᒍᓚᑦ, ᓄᓇᑦᓯᐊᕗᒻᒥ ᓯᓚᐅᑉ ᐊᓯᔾᔨᐸᓪᓕᐊᓂᖓᓂᒃ ᐊᑦᑐᐃᓂᖃᖅᑎᓪᓗᒍ ᐃᓗᓯᕐᒥᒃ ᐊᒻᒪᓗ ᖃᓄᐃᓐᖏᓂᖏᓐᓂᒃ. *International Journal of Indigenous Health* 9(2):6-24. https://doi.org/10.18357/ijih92201214358

Panikkar, B., Lemmond, B., Else, B., and Murray, M. 2018. Ice over troubled waters: navigating the Northwest Passage using Inuit knowledge and scientific information. *Climate Research* 75(1):81-94.

Pearce, T., Ford, J.D., Caron, A., and Kudlak, B.P. 2012. Climate change adaptation planning in remote, resource-dependent communities: an Arctic example. *Regional Environmental Change* 12(4):825-837. https://doi.org/10.1007/s10113-012-0297-2

Pearce, T., Ford, J., Willox, A.C., and Smit, B. 2015. Inuit traditional ecological knowledge (TEK), subsistence hunting and adaptation to climate change in the Canadian Arctic. *Arctic* 68(2):233-245. https://doi.org/10.14430/arctic4475

Prno, J., Bradshaw, B., Wandel, J., Pearce, T., Smit, B., and Tozer, L. 2011. Community vulnerability to climate change in the context of other exposure-sensitivities in Kugluktuk, Nunavut. *Polar Research* 30(1):7363. https://doi.org/10.3402/polar.v30i0.7363

Segal, R.A., Scharien, R.K., Duerden, F., and Tam, C.L. 2020. The Best of Both Worlds: Connecting Remote Sensing and Arctic Communities for Safe Sea Ice Travel. *Arctic* 73(4):461-484. https://doi.org/10.14430/arctic71567

Wesche, S.D., and Chan, H.M. 2010. Adapting to the impacts of climate change on food security among Inuit in the Western Canadian Arctic. *EcoHealth* 7(3):361-373. https://doi.org/10.1007/s10393-010-0344-8

Willox, A.C., Harper, S.L., Edge, V.L., Landman, K., Houle, K., and Ford, J.D. 2013. The land enriches the soul: On climatic and environmental change, affect, and emotional health and well-being in Rigolet, Nunatsiavut, Canada. *Emotion, Space and Society* 6:14-24. https://doi.org/10.1016/j.emospa.2011.08.005

Willox, A.C., Stephenson, E., Allen, J., Bourque, F., Drossos, A., Elgarøy, S., Kral, M.J., Mauro, I., Moses, J., Pearce, T., and MacDonald, J.P. 2015. Examining relationships between climate change and mental health in the Circumpolar North. *Regional Environmental Change* 15(1):169-182. https://doi.org/10.1007/s10113-014-0630-z

Wolfe, B.B., Humphries, M.M., Pisaric, M.F., Balasubramaniam, A.M., Burn, C.R., Chan, L., Cooley, D., Froese, D.G., Graupe, S., Hall, R.I., and Lantz, T. 2011. Environmental change and traditional use of the Old Crow Flats in northern Canada: an IPY opportunity to meet the challenges of the new northern research paradigm. *Arctic* 64(1):127-135. https://doi.org/10.14430/arctic4092

### 14.1.3 Fennoscandia

Eira, I.M.G., Oskal, A., Hanssen-Bauer, I., and Mathiesen, S.D. 2018. Snow cover and the loss of traditional indigenous knowledge. *Nature Climate Change* 8(11):928-931. https://doi.org/10.1038/s41558-018-0319-2

Horstkotte, T., Utsi, T.A., Larsson‐Blind, Å., Burgess, P., Johansen, B., Käyhkö, J., Oksanen, L., and Forbes, B.C. 2017. Human–animal agency in reindeer management: Sámi herders’ perspectives on vegetation dynamics under climate change. *Ecosphere* 8(9):e01931. https://doi.org/10.1002/ecs2.1931

Löf, A. 2013. Examining limits and barriers to climate change adaptation in an Indigenous reindeer herding community. *Climate and Development* 5(4):328-339. https://doi.org/10.1080/17565529.2013.831338

Rasmus, S., Kivinen, S., Bavay, M., and Heiskanen, J. 2016. Local and regional variability in snow conditions in northern Finland: a reindeer herding perspective. *Ambio* 45(4):398-414. https://doi.org/10.1007/s13280-015-0762-5

Riseth, J.Å., Tømmervik, H., Helander-Renvall, E., Labba, N., Johansson, C., Malnes, E., Bjerke, J.W., Jonsson, C., Pohjola, V., Sarri, L.E., and Schanche, A. 2011. Sámi traditional ecological knowledge as a guide to science: snow, ice and reindeer pasture facing climate change. *Polar Record* 47(3):202. https://doi.org/10.1017/S0032247410000434

Turunen, M., Vuojala-Magga, T., and Giguère, N. 2014. Past and present winter feeding of reindeer in Finland: herders' adaptive learning of feeding practices. *Arctic* 67(2):173-188. https://doi.org/10.14430/arctic4385

Turunen, M.T., Rasmus, S., Bavay, M., Ruosteenoja, K., and Heiskanen, J. 2016. Coping with difficult weather and snow conditions: Reindeer herders’ views on climate change impacts and coping strategies. *Climate Risk Management* 11:15-36. https://doi.org/10.1016/j.crm.2016.01.002

Vuojala-Magga, T., Turunen, M., Ryyppo, T., and Tennberg, M. 2011. Resonance strategies of Sámi reindeer herders in northernmost Finland during climatically extreme years. *Arctic* 64(2):227-241. https://doi.org/10.14430/arctic4102

### 14.1.4 Greenland

Baztan, J., Cordier, M., Huctin, J.M., Zhu, Z., and Vanderlinden, J.P. 2017. Life on thin ice: Insights from Uummannaq, Greenland for connecting climate science with Arctic communities. *Polar Science* 13:100-108 https://doi.org/10.1016/j.polar.2017.05.002

Buijs, C. 2010. Inuit perceptions of climate change in East Greenland. *Études/Inuit/Studies* 34(1):39-54. https://doi.org/10.7202/045403ar

Ford, J.D., and Goldhar, C. 2012. Climate change vulnerability and adaptation in resource dependent communities: a case study from West Greenland. *Climate Research* 54(2):181-196. https://doi.org/10.3354/cr01118

Hendriksen, K., and Jørgensen, U. 2015. Hunting and fishing settlements in Upernavik district of Northern Greenland–challenged by climate, centralization, and globalization. *Polar Geography* 38(2):123-145. https://doi.org/10.1080/1088937X.2015.1034222

Laidre, K.L., Northey, A.D., and Ugarte, F. 2018. Traditional knowledge about polar bears (Ursus maritimus) in East Greenland: Changes in the catch and climate over two decades. *Frontiers in Marine Science* 5:135.https://doi.org/10.3389/fmars.2018.00135

Lennert, A.E. 2017. Participatory mapping: an additional depositional layer of the Godthåbsfjord, Greenland. *Polar Geography* 40(3):227-250.

Nuttall, M. 2010. Anticipation, climate change, and movement in Greenland. *Études/Inuit/Studies* 34(1):21-37. https://doi.org/10.7202/045402ar

Tejsner, P., and Veldhuis, D. 2018. Climate change as (dis)equilibrium: behavioral resilience in the Greenlandic Arctic. *Human Ecology* 46(5):701-715.https://doi.org/10.1007/s10745-018-0026-7

### 14.1.5 Russia

Crate, S.A. 2011. A political ecology of “water in mind”: attributing perceptions in the era of global climate change. *Weather, Climate, and Society* 3(3):148-164.https://doi.org/10.1175/WCAS-D-10-05006.1

Crate, S.A., Ulrich, M., Habeck, J.O., Desyatkin, A.R., Desyatkin, R.V., Fedorov, A.N., Hiyama, T., Iijima, Y., Ksenofontov, S., Mészáros, C., and Takakura, H. 2017. Permafrost livelihoods: a transdisciplinary review and analysis of thermokarst-based systems of indigenous land use. *Anthropocene* 18:89-104.https://doi.org/10.1016/j.ancene.2017.06.001

Doloisio, N., and Vanderlinden, J.P. 2020. The perception of permafrost thaw in the Sakha Republic (Russia): Narratives, culture and risk in the face of climate change. *Polar Science* 26:100589. https://doi.org/10.1016/j.polar.2020.100589

Forbes, B.C., Kumpula, T., Meschtyb, N., Laptander, R., Macias-Fauria, M., Zetterberg, P., Verdonen, M., Skarin, A., Kim, K.Y., Boisvert, L.N., and Stroeve, J.C. 2016. Sea ice, rain-on- snow and tundra reindeer nomadism in Arctic Russia. *Biology Letters* 12(11):20160466. https://doi.org/10.1098/rsbl.2016.0466

Graybill, J.K. 2013. Imagining resilience: situating perceptions and emotions about climate change on Kamchatka, Russia. *GeoJournal* 78(5):817-832. https://doi.org/10.1007/s10708-012-9468-4

Istomin, K.V., and Habeck, J.O. 2016. Permafrost and indigenous land use in the northern Urals: Komi and Nenets reindeer husbandry. *Polar Science* 10(3):278-287.https://doi.org/10.1016/j.polar.2016.07.002

Klokov, K.B. 2012. Changes in reindeer population numbers in Russia: an effect of the political context or of climate? *Rangifer* 32(1):19-33. https://doi.org/10.7557/2.32.1.2234

Ksenofontov, S., Backhaus, N., and Schaepman-Strub, G. 2017. ‘To fish or not to fish?’: fishing communities of Arctic Yakutia in the face of environmental change and political transformations. *Polar Record* 53(3):289-303.https://doi.org/10.1017/S0032247417000134

Lavrillier, A. 2013. Climate change among nomadic and settled Tungus of Siberia: continuity and changes in economic and ritual relationships with the natural environment. *Polar Record* 49(3):260-271. https://doi.org/10.1017/S0032247413000284

Lavrillier, A., and Gabyshev, S. 2018. An emic science of climate: reindeer Evenki environmental knowledge and the notion of an extreme process of change. *Études mongoles et sibériennes, centrasiatiques et tibétaines* (49). https://doi.org/10.4000/emscat.3280

Nakada, A. 2015. Reindeer herding and environmental change in the Oymyakon District, Sakha Republic. *Czech Polar Reports* 5(1):33-43. https://doi.org/10.5817/CPR2015-1-4

Takakura, H. 2016. Limits of pastoral adaptation to permafrost regions caused by climate change among the Sakha people in the middle basin of Lena River. *Polar Science* 10(3):395-403. https://doi.org/10.1016/j.polar.2016.04.003

Takakura, H., Fujioka, Y., Ignatyeva, V., Tanaka, T., Vinokurova, N., Grigorev, S., and Boyakova, S. 2020. Differences in local perceptions about climate and environmental changes among residents in a small community in Eastern Siberia. *Polar Science*. https://doi.org/10.1016/j.polar.2020.100556

## 14.2 Coverage of cryosphere components by the papers in our sample

Table 14.2.1. Alaska

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Alaska** | **Temp** | **Sea Ice** | **Snow** | **Fresh Water** | **Permafrost** | **Glaciers** |
| Brinkman et al. 2016 | 1 | 1 | 1 | 1 | 0 | 0 |
| Carothers et al. 2014 | 1 | 1 | 1 | 1 | 1 | 0 |
| Chapin et al. 2016 | 0 | 1 | 0 | 0 | 1 | 0 |
| Cochran et al. 2013 | 0 | 1 | 1 | 1 | 1 | 0 |
| Driscoll et al. 2013 | 1 | 1 | 0 | 1 | 1 | 0 |
| Druckenmiller et al. 2012 | 1 | 1 | 1 | 0 | 0 | 0 |
| Eisner et al. 2013 | 0 | 1 | 0 | 0 | 1 | 0 |
| Fall et al. 2013 | 1 | 1 | 1 | 0 | 0 | 0 |
| Gadamus et al. 2015 | 1 | 1 | 1 | 0 | 0 | 0 |
| Hansen et al. 2013 | 1 | 1 | 0 | 0 | 0 | 0 |
| Huntington et al. 2013 | 1 | 1 | 0 | 0 | 0 | 0 |
| Huntington et al. 2016 | 0 | 1 | 1 | 0 | 0 | 0 |
| Huntington et al. 2017 | 1 | 1 | 1 | 0 | 0 | 0 |
| Ignatowski and Rosales 2013 | 1 | 1 | 1 | 1 | 1 | 0 |
| Moerlein and Carothers 2012 | 1 | 0 | 1 | 1 | 1 | 0 |
| Rosales and Chapman 2015 | 1 | 1 | 1 | 0 | 1 | 0 |
| Sakakibara 2010 | 0 | 1 | 0 | 0 | 0 | 0 |
| Sakakibara 2017 | 0 | 1 | 0 | 0 | 0 | 0 |
| Voorhees et al. 2014 | 0 | 1 | 0 | 0 | 0 | 0 |
| Watson and Huntington 2014 | 0 | 0 | 1 | 0 | 0 | 0 |
| **Total sum** | **12** | **18** | **12** | **6** | **8** | **0** |

Table 14.2.2. Canada

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Canada wide** | **Temp** | **Sea Ice** | **Snow** | **Fresh Water** | **Permafrost** | **Glaciers** |
| Ford et al. 2019 | 1 | 1 | 1 | 0 | 0 | 0 |
| Pearce et al. 2015 | 0 | 1 | 1 | 1 | 0 | 0 |
| Willox et al. 2015 | 1 | 1 | 1 | 0 | 1 | 0 |
| **Total sum** | **2** | **3** | **3** | **1** | **1** | **0** |

Table 14.2.3. Nunatsiavut

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Canada Nunatsiavut** | **Temp** | **Sea Ice** | **Snow** | **Fresh Water** | **Permafrost** | **Glaciers** |
| Cunsolo et al. 2012 | 0 | 1 | 1 | 0 | 0 | 0 |
| Durkalec et al. 2015 | 0 | 1 | 1 | 0 | 0 | 0 |
| Harper et al. 2015 | 1 | 1 | 1 | 0 | 0 | 0 |
| MacDonald et al. 2013 | 0 | 1 | 1 | 0 | 1 | 0 |
| MacDonald et al. 2015 | 0 | 1 | 1 | 0 | 0 | 0 |
| Ostapchuk et al. 2015 | 1 | 1 | 1 | 0 | 0 | 0 |
| Willox et al. 2013 | 1 | 1 | 1 | 0 | 0 | 0 |
| **Total sum** | **3** | **7** | **7** | **0** | **1** | **0** |

Table 14.2.4. Nunavik

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Canada Nunavik** | **Temp** | **Sea Ice** | **Snow** | **Fresh Water** | **Permafrost** | **Glaciers** |
| Cuerrier et al. 2015 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Total sum** | **1** | **1** | **1** | **1** | **1** | **1** |

Table 14.2.5. Nunavut

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Canada Nunavut** | **Temp** | **Sea Ice** | **Snow** | **Fresh Water** | **Permafrost** | **Glaciers** |
| Aporta et al. 2011 | 0 | 1 | 0 | 0 | 0 | 0 |
| Aporta 2011 | 0 | 1 | 0 | 0 | 0 | 0 |
| Galappaththi et al. 2019 | 0 | 1 | 1 | 1 | 1 | 1 |
| Panikkar et al. 2018 | 1 | 1 | 1 | 1 | 0 | 0 |
| Prno et al. 2011 | 1 | 1 | 1 | 1 | 1 | 0 |
| Segal et al. 2020 | 1 | 1 | 0 | 0 | 0 | 0 |
| Gearheard et al. 2010 | 1 | 1 | 1 | 0 | 0 | 1 |
| Inuksuk 2011 | 0 | 1 | 0 | 0 | 0 | 0 |
| Laidler et al. 2011 | 0 | 1 | 1 | 0 | 0 | 0 |
| **Total sum** | **4** | **9** | **5** | **3** | **2** | **2** |

Table 14.2.6. Western Canadian Arctic

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Canada Western** | **Temp** | **Sea Ice** | **Snow** | **Fresh Water** | **Permafrost** | **Glaciers** |
| Carmack et al. 2012 | 1 | 1 | 0 | 0 | 1 | 0 |
| Fiennup and Carmack 2011 | 1 | 1 | 1 | 0 | 0 | 0 |
| Harwood et al. 2012 | 0 | 1 | 1 | 0 | 0 | 0 |
| Knopp 2010 | 0 | 1 | 0 | 0 | 1 | 0 |
| Pearce et al. 2012 | 1 | 1 | 1 | 1 | 1 | 0 |
| Wesche et al. 2010 | 1 | 1 | 1 | 1 | 1 | 0 |
| Wolfe et al. 2011 | 1 | 0 | 0 | 1 | 1 | 0 |
| **Total sum** | **5** | **6** | **4** | **3** | **5** | **0** |

Table 14.2.7. Fennoscandia

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Fennoscandia** | **Temp** | **Sea Ice** | **Snow** | **Fresh Water** | **Permafrost** | **Glaciers** |
| Eira et al. 2018 | 1 | 0 | 1 | 0 | 0 | 0 |
| Horstkotte et al. 2017 | 1 | 0 | 1 | 0 | 0 | 0 |
| Lof 2013 | 1 | 0 | 1 | 0 | 0 | 0 |
| Rasmus et al. 2016 | 1 | 0 | 1 | 0 | 0 | 0 |
| Riseth et al. 2011 | 0 | 0 | 1 | 0 | 0 | 0 |
| Turunen et al. 2014 | 1 | 0 | 1 | 0 | 0 | 0 |
| Turunen et al. 2016 | 1 | 0 | 1 | 1 | 0 | 0 |
| Vuojala-Magga et al. 2010 | 1 | 0 | 1 | 0 | 0 | 0 |
| **Total sum** | **7** | **0** | **8** | **1** | **0** | **0** |

Table 14.2.8. Greenland

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Greenland** | **Temp** | **Sea Ice** | **Snow** | **Fresh Water** | **Permafrost** | **Glaciers** |
| Baztan et al. 2017 | 0 | 1 | 1 | 0 | 0 | 0 |
| Buijs 2010 | 1 | 1 | 1 | 0 | 0 | 1 |
| Ford and Goldhar 2012 | 1 | 1 | 0 | 0 | 0 | 1 |
| Hendriksen and Jorgensen 2015 | 1 | 1 | 0 | 0 | 0 | 1 |
| Laidre et al. 2018 | 1 | 1 | 1 | 0 | 0 | 1 |
| Lennert 2017 | 1 | 1 | 0 | 0 | 0 | 1 |
| Nutall 2010 | 1 | 1 | 0 | 0 | 0 | 1 |
| Tejsner and Veldhuis 2018 | 1 | 1 | 0 | 0 | 0 | 1 |
| **Total sum** | **7** | **8** | **3** | **0** | **0** | **7** |

Table 14.2.9. Russia

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Russia** | **Temp** | **Sea Ice** | **Snow** | **Fresh Water** | **Permafrost** | **Glaciers** |
| Crate 2011 | 1 | 0 | 1 | 1 | 1 | 0 |
| Crate et al. 2017 | 1 | 0 | 1 | 1 | 1 | 0 |
| Doloisio and Vanderlinden 2019 | 1 | 0 | 0 | 1 | 1 | 0 |
| Forbes et al. 2016 | 1 | 1 | 1 | 0 | 0 | 0 |
| Graybill 2013 | 1 | 0 | 1 | 0 | 0 | 0 |
| Istomin and Habeck 2016 | 1 | 0 | 0 | 1 | 1 | 0 |
| Klokov 2012 | 0 | 0 | 1 | 0 | 0 | 0 |
| Ksenofontov et al. 2017 | 1 | 0 | 1 | 1 | 1 | 0 |
| Lavrilier 2013 | 1 | 0 | 1 | 0 | 0 | 0 |
| Lavrillier and Gabyshev 2018 | 1 | 0 | 1 | 1 | 0 | 0 |
| Nakada 2015 | 1 | 0 | 1 | 0 | 0 | 0 |
| Takakura 2016 | 0 | 0 | 1 | 1 | 1 | 0 |
| Takakura et al. 2020 | 1 | 0 | 1 | 1 | 1 | 0 |
| **Total sum** | **11** | **1** | **11** | **8** | **7** | **0** |

## 14.3 Coverage of additional topics by the papers in our sample

Table 14.3.1. Alaska

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Alaska** | **Social** | **Economic** | **Culture** | **Policy** | **Health** | **Mental Health** |
| Brinkman et al. 2016 | 1 | 1 | 1 | 1 | 0 | 0 |
| Carothers et al. 2014 | 1 | 1 | 1 | 0 | 0 | 0 |
| Chapin et al. 2016 | 1 | 1 | 1 | 1 | 0 | 0 |
| Cochran et al. 2013 | 1 | 1 | 1 | 1 | 1 | 1 |
| Driscoll et al. 2013 | 1 | 0 | 1 | 0 | 1 | 1 |
| Druckenmiller et al. 2012 | 1 | 0 | 1 | 0 | 0 | 0 |
| Eisner et al. 2013 | 1 | 0 | 1 | 0 | 0 | 0 |
| Fall et al. 2013 | 1 | 1 | 1 | 0 | 0 | 0 |
| Gadamus et al. 2015 | 1 | 0 | 1 | 1 | 0 | 0 |
| Hansen et al. 2013 | 1 | 1 | 1 | 0 | 0 | 0 |
| Huntington et al. 2013 | 0 | 0 | 0 | 0 | 0 | 0 |
| Huntington et al. 2016 | 1 | 1 | 1 | 0 | 0 | 0 |
| Huntington et al. 2017 | 1 | 0 | 1 | 0 | 0 | 0 |
| Ignatowski and Rosales 2013 | 1 | 1 | 1 | 0 | 1 | 0 |
| Moerlein and Carothers 2012 | 1 | 1 | 1 | 0 | 1 | 0 |
| Rosales and Chapman 2015 | 1 | 1 | 1 | 1 | 0 | 0 |
| Sakakibara 2010 | 1 | 1 | 1 | 1 | 0 | 0 |
| Sakakibara 2017 | 1 | 1 | 1 | 0 | 1 | 1 |
| Voorhees et al. 2014 | 1 | 1 | 1 | 1 | 0 | 0 |
| Watson and Huntington 2014 | 1 | 0 | 1 | 1 | 1 | 0 |
| **Total sum** | **19** | **13** | **19** | **8** | **6** | **3** |

Table 14.3.2. Canada



Table 14.3.3. Nunatsiavut

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Canada Nunatsiavut** | **Social** | **Economic** | **Culture** | **Policy** | **Health** | **Mental Health** |
| Cunsolo et al. 2012 | 1 | 1 | 1 | 0 | 1 | 1 |
| Durkalec et al. 2015 | 1 | 1 | 1 | 1 | 1 | 1 |
| Harper et al. 2015 | 1 | 1 | 1 | 1 | 1 | 1 |
| MacDonald et al. 2013 | 1 | 1 | 1 | 0 | 1 | 1 |
| MacDonald et al. 2015 | 1 | 1 | 1 | 0 | 1 | 1 |
| Ostapchuk et al. 2015 | 1 | 0 | 1 | 1 | 1 | 0 |
| Willox et al. 2013 | 1 | 1 | 1 | 0 | 1 | 1 |
| **Total sum** | **7** | **6** | **7** | **3** | **7** | **6** |

Table 14.3.4. Nunavut

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Canada Nunavut** | **Social** | **Economic** | **Culture** | **Policy** | **Health** | **Mental Health** |
| Aporta et al. 2011 | 1 | 1 | 1 | 1 | 0 | 0 |
| Aporta 2011 | 1 | 1 | 1 | 0 | 0 | 0 |
| Galappaththi et al. 2019 | 1 | 1 | 1 | 1 | 1 | 0 |
| Gearheard et al. 2010 | 0 | 0 | 1 | 0 | 0 | 0 |
| Inuksuk 2011 | 0 | 0 | 0 | 0 | 0 | 0 |
| Laidler et al. 2011 | 1 | 1 | 1 | 0 | 0 | 0 |
| Panikkar et al. 2018 | 0 | 1 | 0 | 0 | 0 | 0 |
| Prno et al. 2011 | 1 | 1 | 1 | 0 | 1 | 0 |
| Segal et al. 2020 | 1 | 1 | 1 | 0 | 0 | 0 |
| **Total sum** | **6** | **7** | **7** | **2** | **2** | **0** |

Table 14.3.5. Nunavik

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Canada Nunavik** | **Social** | **Economic** | **Culture** | **Policy** | **Health** | **Mental Health** |
| Cuerrier et al. 2015 | 1 | 0 | 1 | 1 | 1 | 0 |
| **Total sum** | **1** | **0** | **1** | **1** | **1** | **0** |

Table 14.3.6. Western Canadian Arctic

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Canada Western** | **Social** | **Economic** | **Culture** | **Policy** | **Health** | **Mental Health** |
| Carmack et al. 2012 | 1 | 1 | 1 | 1 | 0 | 0 |
| Fiennup and Carmack 2011 | 1 | 0 | 1 | 0 | 0 | 0 |
| Harwood et al. 2012 | 0 | 0 | 0 | 0 | 0 | 0 |
| Knopp 2010 | 0 | 1 | 0 | 0 | 0 | 0 |
| Pearce et al. 2012 | 1 | 1 | 1 | 1 | 1 | 0 |
| Wesche et al. 2010 | 1 | 1 | 1 | 0 | 1 | 0 |
| Wolfe et al. 2011 | 0 | 0 | 0 | 1 | 1 | 0 |
| **Total sum** | **4** | **4** | **4** | **3** | **3** | **0** |

Table 14.3.7. Fennoscandia

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Fennoscandia** | **Social** | **Economic** | **Culture** | **Policy** | **Health** | **Mental Health** |
| Eira et al. 2018 | 1 | 1 | 1 | 1 | 0 | 0 |
| Horstkotte et al. 2017 | 1 | 0 | 1 | 1 | 0 | 0 |
| Lof 2013 | 1 | 1 | 1 | 1 | 0 | 0 |
| Rasmus et al. 2016 | 1 | 1 | 1 | 1 | 0 | 0 |
| Riseth et al. 2011 | 1 | 1 | 1 | 0 | 0 | 0 |
| Turunen et al. 2014 | 1 | 1 | 0 | 0 | 0 | 0 |
| Turunen et al. 2016 | 0 | 1 | 0 | 1 | 0 | 0 |
| Vuojala-Magga et al. 2010 | 1 | 1 | 1 | 1 | 0 | 0 |
| **Total sum** | **7** | **7** | **6** | **6** | **0** | **0** |

Table 14.3.8. Greenland

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Greenland** | **Social** | **Economic** | **Culture** | **Policy** | **Health** | **Mental Health** |
| Baztan et al. 2017 | 1 | 0 | 1 | 0 | 0 | 0 |
| Buijs 2010 | 1 | 1 | 1 | 1 | 0 | 0 |
| Ford and Goldhar 2012 | 1 | 1 | 1 | 1 | 0 | 0 |
| Hendriksen and Jorgensen 2015 | 1 | 1 | 0 | 1 | 1 | 0 |
| Laidre et al. 2018 | 0 | 1 | 1 | 1 | 0 | 0 |
| Lennert 2017 | 1 | 1 | 1 | 0 | 1 | 0 |
| Nutall 2010 | 1 | 1 | 1 | 1 | 0 | 0 |
| Tejsner and Veldhuis 2018 | 1 | 1 | 1 | 1 | 1 | 0 |
| **Total sum** | **7** | **7** | **7** | **6** | **3** | **0** |

Table 14.3.9. Russia

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Russia** | **Social** | **Economic** | **Culture** | **Policy** | **Health** | **Mental Health** |
| Crate 2011 | 1 | 1 | 1 | 1 | 1 | 0 |
| Crate et al. 2017 | 1 | 1 | 0 | 1 | 0 | 0 |
| Doloisio and Vanderlinden 2019 | 1 | 1 | 1 | 0 | 1 | 1 |
| Forbes et al. 2016 | 1 | 1 | 0 | 0 | 0 | 0 |
| Graybill 2013 | 1 | 1 | 1 | 1 | 1 | 0 |
| Istomin and Habeck 2016 | 0 | 1 | 1 | 0 | 0 | 0 |
| Klokov 2012 | 1 | 1 | 1 | 1 | 0 | 0 |
| Ksenofontov et al. 2017 | 1 | 1 | 1 | 1 | 0 | 0 |
| Lavrilier 2013 | 1 | 1 | 1 | 1 | 1 | 0 |
| Lavrillier and Gabyshev 2018 | 1 | 1 | 1 | 1 | 0 | 0 |
| Nakada 2015 | 1 | 1 | 1 | 0 | 0 | 0 |
| Takakura 2016 | 1 | 1 | 1 | 1 | 0 | 0 |
| Takakura et al. 2020 | 1 | 1 | 1 | 1 | 1 | 0 |
| **Total sum** | **12** | **13** | **11** | **9** | **5** | **1** |

## 14.4 Discussion of responses to change by the papers in our sample

Table 14.4.1. Alaska

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Alaska** | **Use IK** | **Ack. Var/flex** | **Shiftsin practices** | **Coop w/**  **outsiders** | **Coop. w/**  **Scientist** | **Sharing innov.** |
| Brinkman et al. 2016 | 0 | 0 | 1 | 0 | 0 | 0 |
| Carothers et al. 2014 | 1 | 0 | 0 | 0 | 0 | 0 |
| Chapin et al. 2016 | 1 | 0 | 0 | 1 | 1 | 1 |
| Cochran et al. 2013 | 1 | 0 | 0 | 1 | 1 | 1 |
| Driscoll et al. 2013 | 0 | 0 | 0 | 0 | 1 | 0 |
| Druckenmiller et al. 2012 | 1 | 1 | 1 | 0 | 1 | 1 |
| Eisner et al. 2013 | 1 | 0 | 0 | 0 | 0 | 1 |
| Fall et al. 2013 | 0 | 0 | 1 | 0 | 1 | 0 |
| Gadamus et al. 2015 | 1 | 0 | 0 | 1 | 0 | 0 |
| Hansen et al. 2013 | 1 | 0 | 1 | 0 | 1 | 0 |
| Huntington et al. 2013 | 1 | 1 | 0 | 0 | 1 | 0 |
| Huntington et al. 2016 | 1 | 0 | 1 | 0 | 1 | 0 |
| Huntington et al. 2017 | 1 | 0 | 1 | 0 | 1 | 0 |
| Ignatowski and Rosales 2013 | 1 | 0 | 0 | 1 | 0 | 0 |
| Moerlein and Carothers 2012 | 1 | 0 | 0 | 1 | 0 | 0 |
| Rosales and Chapman 2015 | 1 | 0 | 1 | 1 | 0 | 0 |
| Sakakibara 2010 | 1 | 0 | 1 | 1 | 1 | 0 |
| Sakakibara 2017 | 0 | 1 | 1 | 0 | 0 | 0 |
| Voorhees et al. 2014 | 0 | 0 | 0 | 0 | 1 | 0 |
| Watson and Huntington 2014 | 1 | 1 | 0 | 1 | 1 | 0 |
| **Total sum** | **15** | **4** | **9** | **8** | **12** | **4** |

Table 14.4.2. Canada

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Canada wide** | **Use IK** | **Ack. Var/flex** | **Shifts in practices** | **Coop w/outsiders** | **Coop. w/Scientist** | **Sharing innov.** |
| Ford et al. 2019 | 1 | 1 | 1 | 0 | 1 | 1 |
| Pearce et al. 2015 | 1 | 0 | 1 | 1 | 1 | 0 |
| Willox et al. 2015 | 0 | 1 | 0 | 1 | 0 | 0 |
| **Total sum** | **2** | **2** | **2** | **2** | **2** | **1** |

Table 14.4.3. Nunatsiavut

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Canada Nunatsiavut** | **Use IK** | **Ack. Var/flex** | **Shifts in practices** | **Coop w/outsiders** | **Coop. w/Scientist** | **Sharing innov.** |
| Cunsolo et al. 2012 | 0 | 0 | 0 | 1 | 0 | 0 |
| Durkalec et al. 2015 | 1 | 1 | 1 | 0 | 0 | 0 |
| Harper et al. 2015 | 1 | 0 | 0 | 1 | 1 | 0 |
| MacDonald et al. 2013 | 1 | 0 | 0 | 1 | 1 | 0 |
| MacDonald et al. 2015 | 1 | 0 | 0 | 1 | 1 | 0 |
| Ostapchuk et al. 2015 | 1 | 0 | 1 | 1 | 0 | 0 |
| Willox et al. 2013 | 0 | 1 | 0 | 1 | 0 | 0 |
| **Total sum** | **5** | **2** | **2** | **6** | **3** | **0** |

Table 14.4.4. Nunavut

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Canada Nunavut** | **Use IK** | **Ack. Var/flex** | **Shifts in practices** | **Coop w/outsiders** | **Coop. w/Scientist** | **Sharing innov.** |
| Aporta 2011 | 1 | 0 | 0 | 0 | 1 | 0 |
| Aporta et al. 2011 | 1 | 0 | 0 | 0 | 1 | 0 |
| Galappaththi et al. 2019 | 1 | 1 | 0 | 1 | 1 | 0 |
| Gearheard et al. 2010 | 1 | 1 | 0 | 0 | 1 | 1 |
| Inuksuk 2011 | 1 | 1 | 1 | 0 | 0 | 0 |
| Laidler et al. 2011 | 1 | 1 | 1 | 1 | 1 | 1 |
| Panikkar et al. 2018 | 1 | 1 | 1 | 1 | 1 | 1 |
| Prno et al. 2011 | 1 | 1 | 1 | 1 | 1 | 0 |
| Segal et al. 2020 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Total sum** | **9** | **7** | **5** | **5** | **8** | **4** |

Table 14.4.5. Nunavik

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Canada Nunavik** | **Use IK** | **Ack. Var/flex** | **Shifts in practices** | **Coop w/outsiders** | **Coop. w/Scientist** | **Sharing innov.** |
| Cuerrier et al. 2015 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Total sum** | **1** | **1** | **1** | **1** | **1** | **1** |

Table 14.4.6. Western Canadian Arctic

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Canada Western** | **Use IK** | **Ack. Var/flex** | **Shifts in practices** | **Coop w/outsiders** | **Coop. w/Scientist** | **Sharing innov.** |
| Carmack et al. 2012 | 1 | 0 | 0 | 0 | 1 | 0 |
| Fiennup and Carmack 2011 | 1 | 0 | 0 | 1 | 1 | 0 |
| Harwood et al. 2012 | 0 | 1 | 0 | 0 | 0 | 0 |
| Knopp 2010 | 1 | 0 | 0 | 1 | 1 | 1 |
| Pearce et al. 2012 | 1 | 0 | 1 | 1 | 1 | 1 |
| Wesche et al. 2010 | 0 | 1 | 1 | 0 | 0 | 1 |
| Wolfe et al. 2011 | 1 | 0 | 0 | 1 | 1 | 1 |
| **Total sum** | **5** | **2** | **2** | **4** | **5** | **4** |

Table 14.4.7. Fennoscandia

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Fennoscandia** | **Use IK** | **Ack. Var/flex** | **Shifts in practices** | **Coop w/outsiders** | **Coop. w/Scientist** | **Sharing innov.** |
| Eira et al. 2018 | 1 | 1 | 1 | 1 | 1 | 0 |
| Horstkotte et al. 2017 | 1 | 1 | 1 | 1 | 1 | 1 |
| Lof, 2013 | 0 | 0 | 1 | 1 | 1 | 0 |
| Rasmus et al. 2016 | 0 | 0 | 1 | 0 | 0 | 0 |
| Riseth et al. 2011 | 1 | 0 | 1 | 1 | 1 | 0 |
| Turunen et al. 2014 | 1 | 0 | 1 | 0 | 0 | 0 |
| Turunen et al. 2016 | 1 | 0 | 1 | 1 | 1 | 1 |
| Vuojala-Magga et al. 2010 | 1 | 1 | 1 | 0 | 1 | 1 |
| **Total sum** | **6** | **3** | **8** | **5** | **6** | **3** |

Table 14.4.8. Greenland

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Greenland** | **Use IK** | **Ack. Var/flex** | **Shifts in practices** | **Coop w/outsiders** | **Coop. w/Scientist** | **Sharing innov.** |
| Baztan et al. 2017 | 1 | 1 | 1 | 0 | 1 | 1 |
| Buijs 2010 | 1 | 1 | 1 | 1 | 0 | 1 |
| Ford and Goldhar 2012 | 1 | 1 | 1 | 1 | 1 | 1 |
| Hendriksen and Jorgensen 2015 | 1 | 1 | 1 | 1 | 1 | 0 |
| Laidre et al. 2018 | 1 | 0 | 0 | 1 | 1 | 0 |
| Lennert 2017 | 1 | 1 | 1 | 0 | 0 | 0 |
| Nutall 2010 | 0 | 1 | 1 | 1 | 1 | 0 |
| Tejsner and Veldhuis 2018 | 1 | 0 | 1 | 1 | 1 | 1 |
| **Total sum** | **7** | **6** | **7** | **6** | **6** | **4** |

Table 14.4.9. Russia

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Russia** | **Use IK** | **Ack. Var/flex** | **Shifts in practices** | **Coop w/outsiders** | **Coop. w/Scientist** | **Sharing innov.** |
| Crate 2011 | 1 | 0 | 1 | 1 | 1 | 1 |
| Crate et al. 2017 | 1 | 1 | 1 | 1 | 1 | 1 |
| Doloisio and Vanderlinden 2019 | 1 | 0 | 1 | 0 | 1 | 1 |
| Forbes et al. 2016 | 0 | 1 | 0 | 0 | 1 | 1 |
| Graybill 2013 | 0 | 1 | 0 | 1 | 1 | 1 |
| Istomin and Habeck 2016 | 1 | 0 | 1 | 0 | 1 | 0 |
| Klokov 2012 | 0 | 1 | 0 | 1 | 1 | 0 |
| Ksenofontov et al. 2017 | 0 | 1 | 0 | 1 | 0 | 0 |
| Lavrilier 2013 | 0 | 1 | 1 | 1 | 0 | 0 |
| Lavrillier and Gabishev 2017 | 1 | 0 | 1 | 1 | 1 | 0 |
| Lavrillier and Gabyshev 2018 | 1 | 1 | 1 | 1 | 1 | 1 |
| Nakada 2015 | 0 | 0 | 0 | 0 | 0 | 0 |
| Takakura 2016 | 1 | 1 | 0 | 1 | 1 | 1 |
| Takakura et al. 2020 | 1 | 1 | 0 | 1 | 1 | 1 |
| **Total sum** | **8** | **9** | **7** | **10** | **11** | **8** |

## 14.5. Discussion of specific features of each cryosphere component

Table 14.5.1. Sea ice features, Alaska

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Alaska** | Coastal protection | Ridges/topography | Moving ice | Shorefast ice | Extent | Thickness | Breakup | Freezeup |
| Brinkman et al. 2016 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| Carothers et al. 2014 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Chapin et al. 2016 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Cochran et al. 2013 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| Driscoll et al. 2013 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| Druckenmiller et al. 2012 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| Eisner et al. 2013 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 |
| Fall et al. 2013 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| Gadamus et al. 2015 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Hansen et al. 2013 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| Huntington et al. 2013 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| Huntington et al. 2016 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 |
| Huntington et al. 2017 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| Ignatowski and Rosales 2013 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| Rosales and Chapman 2015 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| Sakakibara 2010 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Sakakibara 2017 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| Voorhees et al. 2014 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |

Table 14.5.2. Sea ice features, Canada

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Canada** | Region | Coastal protection | Ridges/ topography | Moving ice | Shorefast ice | Extent | Thickness | Breakup | Freezeup |
| Ford et al. 2019 | Canada wide | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| Pearce et al. 2015 | Canada wide | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 |
| Willox et al. 2015 | Canada wide | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| Cunsolo et al. 2012 | Nunatsiavut | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| Durkalec et al. 2015 | Nunatsiavut | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| Harper et al. 2015 | Nunatsiavut | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| MacDonald et al. 2013 | Nunatsiavut | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| MacDonald et al. 2015 | Nunatsiavut | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Ostapchuk et al. 2015 | Nunatsiavut | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| Willox et al. 2013 | Nunatsiavut | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| Cuerrier et al. 2015 | Nunavik | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| Aporta 2011 | Nunavut | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| Aporta et al. 2011 | Nunavut | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| Galappaththi et al. 2019 | Nunavut | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| Gearheard et al. 2010 | Nunavut | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| Inuksuk 2011 | Nunavut | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 |
| Laidler et al. 2011 | Nunavut | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| Panikkar et al. 2018 | Nunavut | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| Prno et al. 2011 | Nunavut | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| Segal et al. 2020 | Nunavut | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 |
| Carmack et al. 2012 | Western | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| Fiennup and Carmack 2011 | Western | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| Harwood et al. 2012 | Western | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| Knopp 2010 | Western | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| Pearce et al. 2012 | Western | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| Wesche et al. 2010 | Western | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |

Table 14.5.3. Sea ice features, Greenland

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Greenland** | Coastal protection | Ridges/topography | Moving ice | Shorefast ice | Extent | Thickness | Breakup | Freezeup |
| Baztan et al. 2017 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| Buijs 2010 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Ford and Goldhar 2012 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| Hendriksen and Jorgensen 2015 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| Laidre et al. 2018 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| Nutall 2010 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| Tejsner and Veldhuis 2018 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |

Table 14.5.4. Sea ice features, Russia

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Russia** | Coastal protection | Ridges/topography | Moving ice | Shorefast ice | Extent | Thickness | Breakup | Freezeup |
| Forbes et al. 2016 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |

Table 14.5.5. Sea ice features, by country

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Coastal protection | Ridges/ topography | Moving ice | Shorefast ice | Extent | Thickness | Breakup | Freezeup | Any sea ice |
| Alaska | 2 | 2 | 0 | 7 | 16 | 14 | 10 | 11 | 18 |
| Canada | 0 | 4 | 4 | 8 | 13 | 25 | 21 | 19 | 26 |
| Greenland | 0 | 0 | 0 | 4 | 6 | 6 | 4 | 5 | 7 |
| Russia | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |

Table 14.5.6. Sea ice features, by region of Canada

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Coastal protection | Ridges/ topography | Moving ice | Shorefast ice | Extent | Thickness | Breakup | Freezeup | Any sea ice |
| Canada-wide | 0 | 0 | 0 | 1 | 2 | 3 | 3 | 2 | 3 |
| Nunatsiavut | 0 | 0 | 0 | 0 | 4 | 6 | 5 | 4 | 7 |
| Nunavik | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| Nunavut | 0 | 4 | 4 | 6 | 3 | 9 | 8 | 8 | 9 |
| Western | 0 | 0 | 0 | 1 | 4 | 6 | 4 | 4 | 6 |

Figure 14.5.1. Percentage of papers covering specific sea ice features of the total papers covering sea ice, by country

Figure 14.5.2. Percentage of papers covering specific sea ice features of the total papers covering sea ice, by region of Canada

Table 14.5.7. Snow features, Alaska

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Alaska** | Depth/ thickness | Drifts | Different timing | More snow | Less snow | Moldy snow | Late snow | Compaction | Different characteristics | Ice-on-snow |
| Brinkman et al. 2016 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carothers et al. 2014 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Cochran et al. 2013 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Druckenmiller et al. 2012 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fall et al. 2013 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gadamus et al. 2015 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Huntington et al. 2016 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Huntington et al. 2017 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Ignatowski and Rosales 2013 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Moerlein and Carothers 2012 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Rosales and Chapman 2015 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Watson and Huntington 2014 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 14.5.8. Snow features, Canada

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Canada** | Region | Depth/ thickness | Drifts | Different timing | More snow | Less snow | Moldy snow | Late snow | Compaction | Different characteristics | Ice-on-snow |
| Ford et al. 2019 | Canada wide | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pearce et al. 2015 | Canada wide | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Willox et al. 2015 | Canada wide | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cunsolo et al. 2012 | Nunatsiavut | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Durkalec et al. 2015 | Nunatsiavut | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Harper et al. 2015 | Nunatsiavut | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| MacDonald et al. 2013 | Nunatsiavut | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| MacDonald et al. 2015 | Nunatsiavut | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| Ostapchuk et al. 2015 | Nunatsiavut | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Willox et al. 2013 | Nunatsiavut | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Cuerrier et al. 2015 | Nunavik | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Galappaththi et al. 2019 | Nunavut | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Gearheard et al. 2010 | Nunavut | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Laidler et al. 2011 | Nunavut | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Panikkar et al. 2018 | Nunavut | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Prno et al. 2011 | Nunavut | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| Fiennup and Carmack 2011 | Western | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Harwood et al. 2012 | Western | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pearce et al. 2012 | Western | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Wesche et al. 2010 | Western | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |

Table 14.5.9. Snow features, Fennoscandia

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Fennoscandia** | Depth/ thickness | Drifts | Different timing | More snow | Less snow | Moldy snow | Late snow | Compaction | Different characteristics | Ice-on-snow |
| Eira et al. 2018 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Horstkotte et al. 2017 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| Lof 2013 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| Rasmus et al. 2016 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| Riseth et al. 2011 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 |
| Turunen et al. 2014 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| Turunen et al. 2016 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| Vuojala-Magga et al. 2010 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |

Table 14.5.10. Snow features, Greenland

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Greenland** | Depth/ thickness | Drifts | Different timing | More snow | Less snow | Moldy snow | Late snow | Compaction | Different characteristics | Ice-on-snow |
| Baztan et al. 2017 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Buijs 2010 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Laidre et al. 2018 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

Table 14.5.11. Snow features, Russia

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Russia** | Depth/ thickness | Drifts | Different timing | More snow | Less snow | Moldy snow | Late snow | Compaction | Different characteristics | Ice-on-snow |
| Crate 2011 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| Crate et al. 2017 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Forbes et al. 2016 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Graybill 2013 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Klokov 2012 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Ksenofontov et al. 2017 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lavrilier 2013 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| Lavrillier and Gabishev 2017 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lavrillier and Gabyshev 2018 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Nakada 2015 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Takakura 2016 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Takakura et al. 2020 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 14.5.12. Snow features, by country

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Depth/ thickness | Drifts | Different timing | More snow | Less snow | Moldy snow | Late snow | Compaction | Different characteristics | Ice-on-snow | Any snow |
| Alaska | 4 | 3 | 1 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 12 |
| Canada | 8 | 2 | 4 | 0 | 13 | 0 | 0 | 3 | 2 | 2 | 20 |
| Fennoscandia | 7 | 1 | 3 | 0 | 0 | 3 | 5 | 6 | 6 | 6 | 8 |
| Greenland | 3 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 |
| Russia | 5 | 0 | 4 | 7 | 1 | 0 | 0 | 0 | 1 | 3 | 11 |

Table 14.5.13. Snow features, by region of Canada

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Depth/ thickness | Drifts | Different timing | More snow | Less snow | Moldy snow | Late snow | Compaction | Different characteristics | Ice-on-snow | Any snow |
| Canada-wide | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 |
| Nunatsiavut | 5 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 1 | 1 | 7 |
| Nunavik | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Nunavut | 0 | 1 | 1 | 0 | 3 | 0 | 0 | 2 | 1 | 0 | 5 |
| Western | 2 | 0 | 0 | 0 | 3 | 0 | 0 | 1 | 0 | 0 | 4 |

Figure 14.5.3. Percentage of papers covering specific snow features of the total papers covering snow, by country

Figure 14.5.4. Percentage of papers covering specific snow features of the total papers covering snow, by region of Canada

Table 14.5.14. Freshwater features, Alaska

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Alaska** | Shallow rivers | Flood from ice jam | River breakup | Thin ice | Lakes formed by thermokarst | More rain/ flood |
| Brinkman et al. 2016 | 0 | 0 | 1 | 0 | 0 | 0 |
| Carothers et al. 2014 | 1 | 0 | 0 | 0 | 0 | 0 |
| Cochran et al. 2013 | 0 | 0 | 0 | 1 | 0 | 0 |
| Driscoll et al. 2013 | 0 | 0 | 0 | 1 | 0 | 0 |
| Ignatowski and Rosales 2013 | 1 | 0 | 0 | 0 | 0 | 0 |
| Moerlein and Carothers 2012 | 1 | 0 | 0 | 0 | 0 | 0 |

Table 14.5.15. Freshwater features, Canada

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Canada** | Region | Shallow rivers | Flood from ice jam | River breakup | Thin ice | Lakes formed by thermokarst | More rain/ flood |
| Cuerrier et al. 2015 | Nunavik | 0 | 0 | 1 | 0 | 0 | 0 |
| Galappaththi et al. 2019 | Nunavut | 0 | 0 | 0 | 1 | 0 | 0 |
| Panikkar et al. 2018 | Nunavut | 1 | 0 | 0 | 0 | 0 | 0 |
| Prno et al. 2011 | Nunavut | 0 | 0 | 0 | 1 | 0 | 0 |
| Pearce et al. 2012 | Western | 1 | 0 | 0 | 0 | 0 | 0 |
| Wesche et al. 2010 | Western | 1 | 0 | 0 | 0 | 0 | 0 |
| Wolfe et al. 2011 | Western | 1 | 0 | 0 | 0 | 0 | 0 |

Table 14.5.16. Freshwater features, Fennoscandia

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Fennoscandia** | Shallow rivers | Flood from ice jam | River breakup | Thin ice | Lakes formed by thermokarst | More rain/ flood |
| Turunen et al. 2016 | 0 | 0 | 1 | 0 | 0 | 0 |

Table 14.5.17. Freshwater features, Russia

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Russia** | Shallow rivers | Flood from ice jam | River breakup | Thin ice | Lakes formed by thermokarst | More rain/ flood |
| Crate 2011 | 0 | 0 | 0 | 0 | 0 | 1 |
| Crate et al. 2017 | 0 | 0 | 0 | 0 | 0 | 1 |
| Dolosio and Vanderlinden 2019 | 0 | 0 | 0 | 0 | 0 | 1 |
| Istomin and Habeck 2016 | 0 | 0 | 0 | 0 | 1 | 0 |
| Ksenofontov et al. 2017 | 1 | 0 | 0 | 1 | 0 | 0 |
| Lavrillier and Gabyshev 2018 | 1 | 0 | 0 | 0 | 0 | 0 |
| Takakura 2016 | 0 | 1 | 0 | 0 | 1 | 0 |

Table 14.5.18. Freshwater features, by country

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Shallow rivers | Flood from ice jam | River breakup | Thin ice | Lakes formed by thermokarst | More rain/ flood | Any freshwater |
| Alaska | 3 | 0 | 1 | 2 | 0 | 0 | 6 |
| Canada | 4 | 0 | 1 | 2 | 0 | 0 | 7 |
| Fennoscandia | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| Russia | 2 | 1 | 0 | 1 | 3 | 3 | 8 |

Table 14.5.19. Freshwater features, by region of Canada

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Shallow rivers | Flood from ice jam | River breakup | Thin ice | Lakes formed by thermokarst | More rain/ flood | Any freshwater |
| Nunavik | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| Nunavut | 1 | 0 | 0 | 2 | 0 | 0 | 3 |
| Western | 3 | 0 | 0 | 0 | 0 | 0 | 3 |

Figure 14.5.5. Percentage of papers covering specific freshwater features of the total papers covering freshwater, by country

Figure 14.5.6. Percentage of papers covering specific freshwater features of the total papers covering freshwater, by region of Canada

Table 14.5.20. Permafrost features, Alaska

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Alaska** | Warming | Thawing | Stability | Thermokarst |
| Carothers et al. 2014 | 0 | 1 | 0 | 0 |
| Chapin et al. 2016 | 0 | 0 | 1 | 0 |
| Cochran et al. 2013 | 1 | 1 | 0 | 0 |
| Driscoll et al. 2013 | 0 | 1 | 1 | 0 |
| Eisner et al. 2013 | 1 | 0 | 0 | 0 |
| Ignatowski and Rosales 2013 | 0 | 1 | 1 | 0 |
| Moerlein and Carothers 2012 | 1 | 0 | 0 | 0 |
| Rosales and Chapman 2015 | 0 | 0 | 1 | 0 |

Table 14.5.21. Permafrost features, Canada

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Canada** | Region | Warming | Thawing | Stability | Thermokarst |
| Willox et al. 2015 | Canada wide | 0 | 1 | 0 | 0 |
| MacDonald et al. 2013 | Nunatsiavut | 1 | 0 | 0 | 0 |
| Cuerrier et al. 2015 | Nunavik | 0 | 1 | 0 | 0 |
| Galappaththi et al. 2019 | Nunavut | 0 | 1 | 0 | 0 |
| Prno et al. 2011 | Nunavut | 0 | 1 | 0 | 0 |
| Carmack et al. 2012 | Western | 0 | 1 | 0 | 0 |
| Knopp 2010 | Western | 1 | 1 | 0 | 0 |
| Pearce et al. 2012 | Western | 0 | 1 | 0 | 0 |
| Wesche et al. 2010 | Western | 0 | 1 | 0 | 0 |
| Wolfe et al. 2011 | Western | 1 | 1 | 0 | 0 |

Table 14.5.22. Permafrost features, Russia

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Russia** | Warming | Thawing | Stability | Thermokarst |
| Crate 2011 | 0 | 1 | 1 | 0 |
| Crate et al. 2017 | 1 | 1 | 1 | 1 |
| Doloisio and Vanderlinden 2019 | 1 | 1 | 1 | 1 |
| Istomin and Habeck 2016 | 0 | 1 | 1 | 1 |
| Ksefontov et al. 2017 | 1 | 1 | 0 | 0 |
| Takakura 2016 | 0 | 1 | 0 | 1 |
| Takakura et al. 2020 | 1 | 1 | 0 | 1 |

Table 14.5.23. Permafrost features, by country

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Warming | Thawing | Stability | Thermokarst | Any permafrost |
| Alaska | 3 | 4 | 4 | 0 | 8 |
| Canada | 2 | 9 | 0 | 0 | 9 |
| Russia | 4 | 7 | 4 | 5 | 7 |

Table 14.5.24. Permafrost features, by region of Canada

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Warming | Thawing | Stability | Thermokarst | Any permafrost |
| Canada-wide | 0 | 1 | 0 | 0 | 1 |
| Nunavik | 0 | 1 | 0 | 0 | 1 |
| Nunavut | 0 | 2 | 0 | 0 | 2 |
| Western | 2 | 5 | 0 | 0 | 5 |

Figure 14.5.7. Percentage of papers covering specific permafrost features of the total papers covering permafrost, by country

Figure 14.5.8. Percentage of papers covering specific permafrost features of the total papers covering permafrost, by region of Canada

Table 14.5.25. Glacier features, Canada

|  |  |  |  |
| --- | --- | --- | --- |
| **Canada** | Region | Ice melt impact | Retreat |
| Cuerrier et al. 2015 | Nunavik | 1 | 0 |
| Galappaththi et al. 2019 | Nunavut | 1 | 0 |
| Gearheard et al. 2010 | Nunavut | 0 | 1 |

Table 14.5.26. Glacier features, Greenland

|  |  |  |
| --- | --- | --- |
| **Greenland** | Ice melt impact | Retreat |
| Buijs, C. 2010 | 1 | 1 |
| Ford and Goldhar 2012 | 0 | 1 |
| Hendriksen and Jorgensen 2015 | 1 | 1 |
| Laidre et al. 2018 | 0 | 1 |
| Lennert 2017 | 1 | 1 |
| Nutall 2010 | 0 | 1 |
| Tejsner and Veldhuis 2018 | 0 | 1 |

Table 14.5.27. Glacier features, by country

|  |  |  |  |
| --- | --- | --- | --- |
|  | Ice melt impact | Retreat | Any glaciers |
| Canada | 2 | 1 | 3 |
| Greenland | 2 | 6 | 6 |

Table 14.5.28. Glacier features, by region of Canada

|  |  |  |  |
| --- | --- | --- | --- |
|  | Ice melt impact | Retreat | Any glaciers |
| Nunavik | 1 | 0 | 1 |
| Nunavut | 1 | 1 | 1 |

Figure 14.5.9. Percentage of papers covering specific glacier features of the total papers covering glacier, by country

Figure 14.5.10. Percentage of papers covering specific glacier features of the total papers covering glacier, by region of Canada