Scenario Development for the Integrated Modelling Program for Canada

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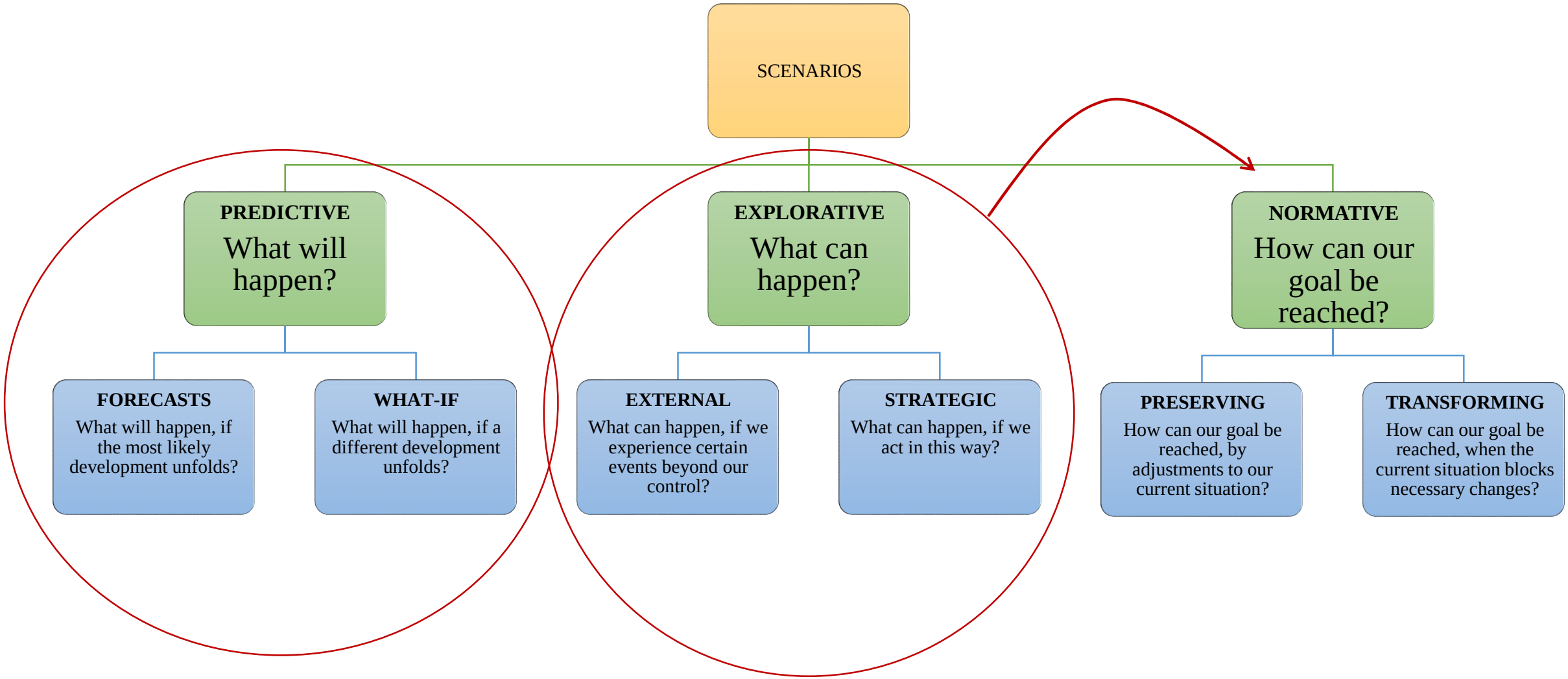
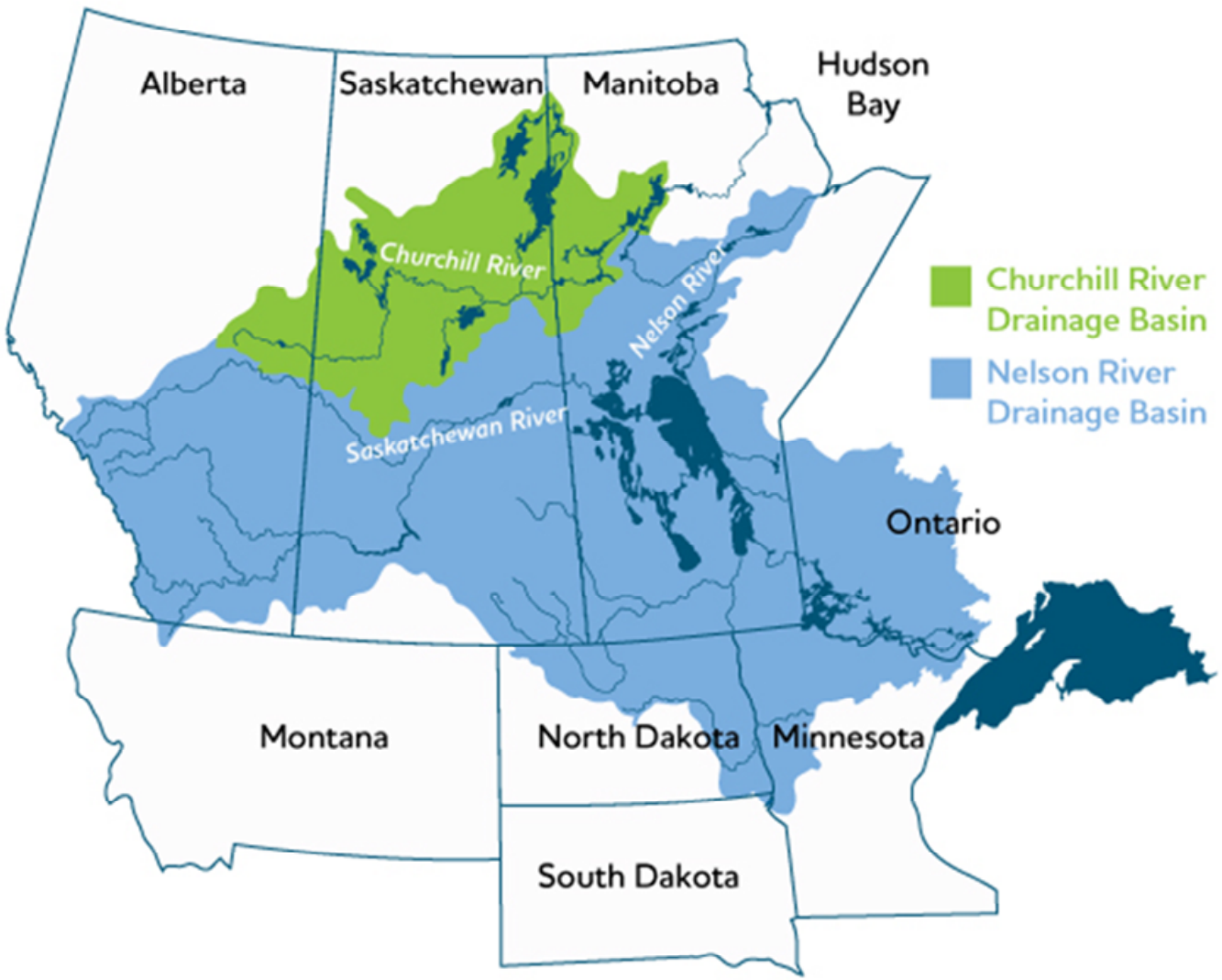
“Consistent stories about the future for systems that are too complex to predict.” (Wiek, 2013)



Adapted from Borjeson et al. (2006)

- ‘Environmental scan’ - **a scoping exercise to learn more about water management challenges in the basin** and the policy options available (Riddell et al. 2018; Spaniol and Rowland, 2018).
- This process was used to find system variables and normative future projections associated with those variables for exploratory, participatory modelling (Keeler et al. 2015).
- Contributes to an understanding of **normative preferences** across groups, times and space, and scenario elements that will be considered **desirable** (Wiek, 2009), **relevant** (White et al. 2015), and **plausible** (Wiek et al., 2013) by stakeholders involved in water governance in the basin. These have been shown to be important elements in scenario development.



Manitoba
Conservation Districts
Association

KEYSTONE
AGRICULTURAL
PRODUCERS
of MANITOBA

MANITOBA
CHAMBERS OF
COMMERCE

In stakeholder documents we were looking for:

What water issues are people talking about?

Securing Water Supplies

Balancing water for various purposes

Quality of water supplies

Water outflows and effluent

Delivering water to user

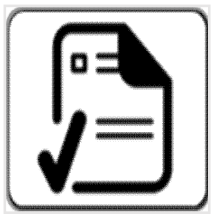
Water-related hazards

What policy tools are they considering to solve these issues?

Grey infrastructure

'Green' infrastructure

Economic and Efficiency Tools

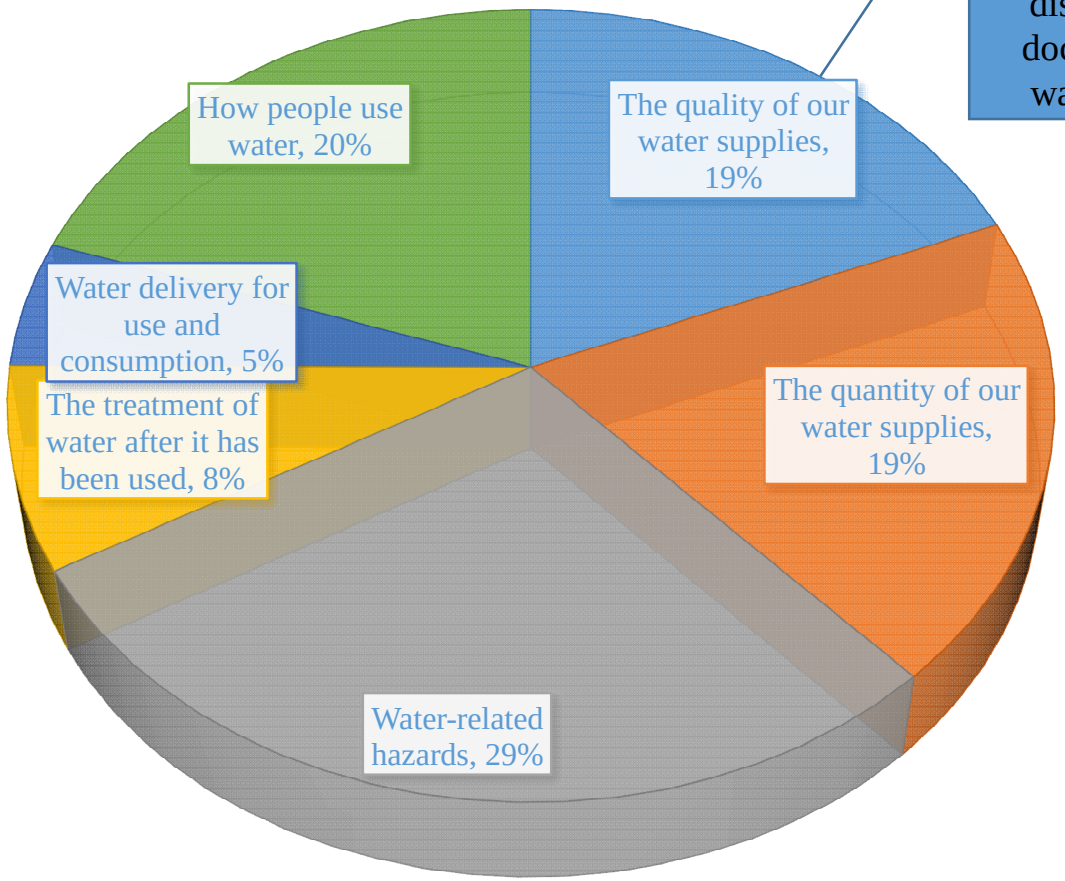


Regulatory Tools

Information based tools

Organizational policy tools

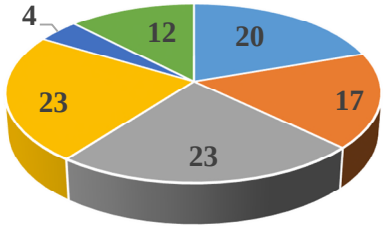
What water issues are people talking about in the Nelson-Saskatchewan Basin?



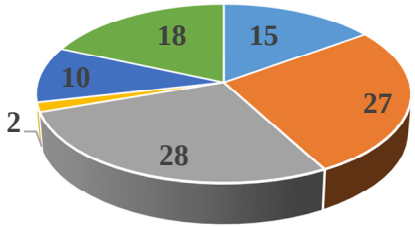
19% of the discussion across all documents was about water quality issues.

Water issues discussed in the Nelson-Churchill Basin.

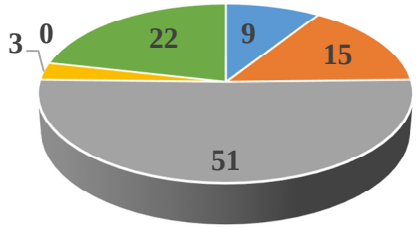
This pie chart shows the percentage of dialogue in the 58 stakeholder documents dedicated to six different water issues. The miniature pie charts (right) show how the discussion changes across stakeholder groups – numbers represent the percentage of dialogue dedicated to each water issue within that stakeholder group.



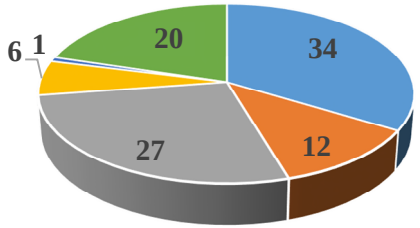
Provincial Governments



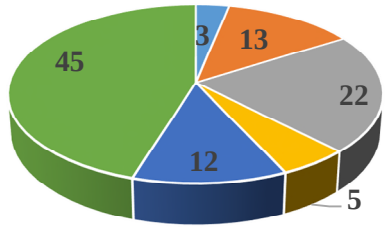
Agricultural Groups



Environmental Groups



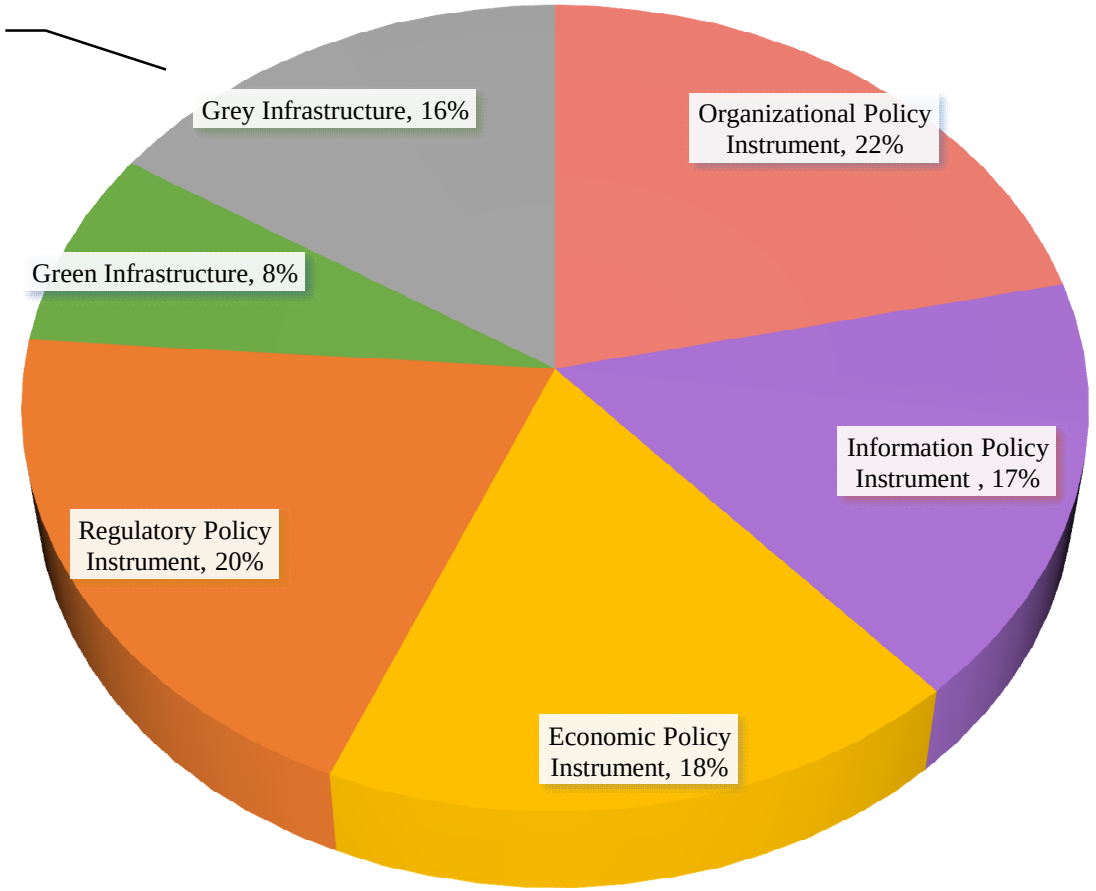
Watershed Organizations



Industry

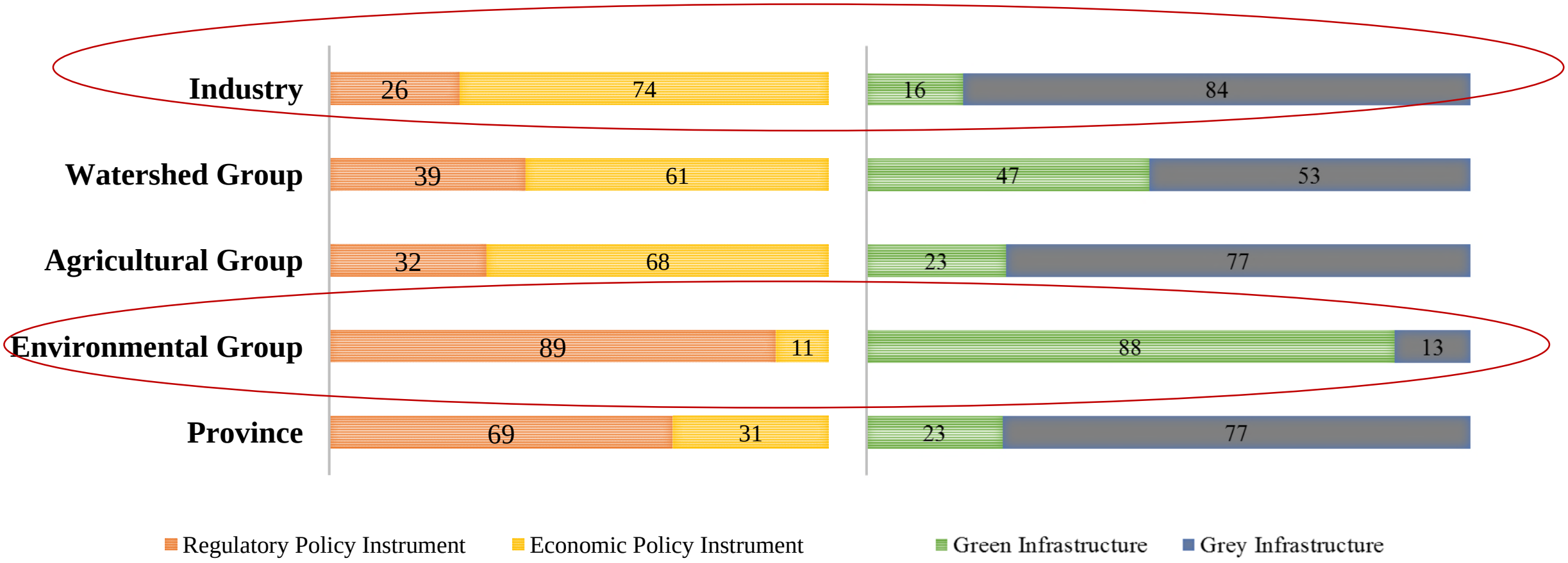
What kinds of policy solutions for water issues are people talking about in the Nelson-Saskatchewan Basin?

24% of the solutions dialogue focuses on infrastructure approaches – but mostly grey infrastructure.



Policy approaches discussed in the Nelson-Churchill Basin.

This pie chart shows the percentage of dialogue in the 58 stakeholder documents dedicated to six different policy approaches.


Industry
26
74
16
84
Watershed Group
39
61
47
53
Agricultural Group
32
68
23
77
Environmental Group
89
11
88
13
Province
69
31
23
77
Regulatory Policy Instrument
Economic Policy Instrument
Green Infrastructure
Grey Infrastructure

Takeaways

- Water-related hazards are important – this is the dominant water issue discussed overall and this holds true across most stakeholder groups and regions, particularly post 2012.
- Certain policy tools are discussed more often with respect to particular water issues
- Various ‘visions’ of regulated versus de-regulated approaches
  - Albertans with strong environmental views prefer water management policies based on regulation, demonstrated low support for water markets, have higher trust in government and less supportive of maintaining current water system (surveys by Bjorlund et al. 2013a).
- More groups involved in water governance = more diversity in policy tool discussion.
  - Strong support across rural and urban regions for aesthetic and environmental water uses. Suggests multiple groups want similar outcomes but disagree on the ‘best way’ to get there (surveys by Bjorlund et al. 2013b).

Outputs of Phase 1

- Variables to develop future projections from for modelling,
- Collected information to frame scenarios.

Policy Instrument Types

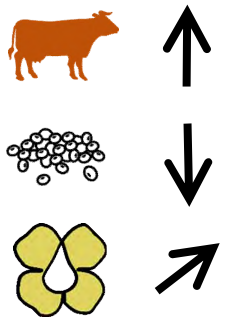
Grey Infrastructure | Green Infrastructure | Regulatory | Economic | Information | Organizational

Drivers

- Consumption habits (e.g. meat vs. plant-based protein diets)
- Climate changes (e.g. growing degree days, frost dates, corn heat units, etc.)
- Accessible market opportunities (e.g. local processing)
- Trade disputes
- Producer adaptive responses

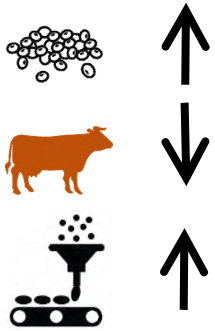
Narrative Descriptions

Future Projection I



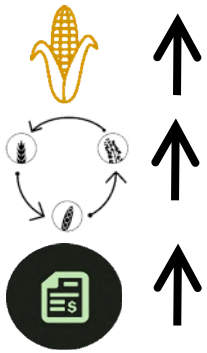
Per capita meat consumption in China, Japan, the U.S.A increases. Herd size and forage crop acreage increases in Canada, particularly in Alberta . There is also a modest increase in cereal grain acres for finishing diets. Growth in oilseed acres continues but slows; specialty crop and pulse crop acres decline. There is less emphasis on value-added processing and sustainable crop rotation. India imposes tariffs on the import of pulse crops.

Future Projection II



Per capita meat consumption in China, Japan, the U.S.A decreases. Plant-based proteins diets become more important globally; lentils, beans and chickpeas are consumed more frequently in the United States and domestically. There is a renewed focus on value-added processing and an expansion in specialty crops like vegetables, essential oils and potatoes, and the processing and canning of pulse crops.

Future Projection III



Warm variety crops become more viable due to a longer growing season and the accumulation of growing degree days. However, severe weather impacts, flood and drought events become more pronounced and producers adapt through diversifying crop rotations. There is a renewed focus on local value-added processing and an expansion in specialty crops. Trade disputes with the U.S. and India slow exports.

Trend Projections

Crop Type	Alberta	Saskatchewan (LDDA)	Saskatchewan (Dryland)
Pulses	1%	16%	9%
Cereals	30%	25%	41%
Oilseeds	17%	41%	32%
Forage	43%	18%	18%
Specialty Crops	8%	0%	0%
Other	1%	0%	0%

Crop Type	Alberta	Saskatchewan (LDDA)	Saskatchewan (Dryland)
Pulses	19%	31%	24%
Cereals	30%	25%	41%
Oilseeds	13%	37%	30%
Forage	23%	1%	2%
Specialty Crops	15%	6%	3%
Other	1%	0%	0%

Crop Type	Alberta	Saskatchewan (LDDA)	Saskatchewan (Dryland)
Pulses	12%	27%	20%
Cereals	32%	26%	43%
Oilseeds	12%	35%	28%
Forage	26%	1%	2%
Specialty Crops	18%	10%	7%
Other	1%	0%	0%

Drivers

- Scale and Type of Investment (e.g. public versus private, $M to $B's, etc.)
- Farm level economics and producers interest
- Political support
- Government planning framework (e.g. long-term cost-sharing guarantee)
- Accessible market opportunities

Narrative Descriptions

Future Projection I

The SK Gov't irrigation framework continues to concentrate on infill to mid-Century. By 2020, driven by the 2014 Irrigation Strategy, 10,000 in each district and non-district irrigation are added. Similar strategies are pursued beyond 2030. There is a continued increase in private irrigation relative to district development, although generally interest in irrigation among producers remains low….Infill represents an investment of about $1 B.

Future Projection II

The SK Gov't introduces an aggressive irrigation development strategy for mid-Century…the Federal Government which allocates $1.5 billion in federal funding to irrigation development. Farm level economics improve and there is more interest in irrigation among Saskatchewan producers as additional local processing opportunities emerge…allowing for development of the Qu'Appelle South Irrigation Project.

Future Projection III

Significant industry interest in funding major conveyance works to secure water supplies, interest from several private investors in irrigation development, as well as the introduction of new market opportunities in local processing, prompts the provincial government to introduce a long-term development strategy for irrigation expansion…focuses on infill in existing districts and development of the Westside and Qu'Appelle South project.

Trend Projections

	Resulting Irrigated Acres							
	SWDA District	SWDA Private	LDDA District	LDDA Private	NDA District	NDA Private	SWDA District	SWDA Private
	19954	140360	120403	44918	3431	50221	8437	39616
	19954	140900	230963	45458	3431	50761	8437	40156
	19954	140360	605433	44918	3431	50221	8437	39616

Scenarios (recall: consistent stories about the future) will be *different combinations* of the future projections of these variables in ways that are plausible, consistent and adequately different, with stakeholder guidance.

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Irrigation Water Use: Crop Mix	Future Projection 1	Future Projection 2	Future Projection 1	Future Projection 3	Future Projection 3
Irrigation Water Use: Expansion	Future Projection 2	Future Projection 1	Future Projection 3	Future Projection 2	Future Projection 1
Irrigation Water Use: Efficiency	Future Projection 3	Future Projection 3	Future Projection 2	Future Projection 3	Future Projection 2
Environmental Flows	Future Projection 2	Future Projection 2	Future Projection 1	Future Projection 1	Future Projection 3
Water rights	Future Projection 1	Future Projection 2	Future Projection 3	Future Projection 2	Future Projection 2
Water markets/ transfers	Future Projection 2	Future Projection 1	Future Projection 2	Future Projection 3	Future Projection 1
….					