MINNESOTA POLLUTION CONTROL AGENCY

# CLIMATE CHANGE RISK ASSESSMENT

## Summary Report – Abridged

December 2020

p-gen4-18

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# Executive summary

During the spring of 2019 and 2020, twenty Minnesota Pollution Control Agency (MPCA or Agency) programs showed strong engagement and acknowledgement of real opportunities to adapt their work for Minnesota's changing climate. Although programs voiced realistic concerns about the lack of resources to address climate risks, they also displayed a great deal of energy and thoughtfulness about their role to protect and improve the environment through changing conditions. The key take-away from the climate change risk assessments is the importance of empowering MPCA programs to confront the challenges ahead. Brainstorming climate risks and potential actions is only the first step in a process. The next step is taking actions that can help minimize impacts and build resilience to the effects of climate change on communities and the environment.

Through the brainstorming that each program completed, several common risk themes emerged, in order here from most risks identified to least:

- Insufficient rules and regulations
- Insufficient staffing and resources
- Negative environmental impact
- Increased stakeholder costs
- Impact to infrastructure
- Insufficient data and analysis
- Need for more training, communication and engagement
- Staff safety
- Need for operational transformation
- Risks to public health
- Impact to agriculture

Discussions with programs raised some underlying issues with the potential for long-term impacts:

- Reduced ability to protect the environment
- Financial impacts to stakeholders
- Difficulty achieving timely rulemaking
- Limited resources for next steps

As the facilitated workshops shifted focus from risks towards actions that programs might be able to take to address climate change, program participants brainstormed 530 ideas in total. These "potential actions" – which are subject to the availability of resources and many other constraints – have been grouped into the following types, in order here from most actions identified to least:

- Data, monitoring & modeling
- Research & analysis
- Communications
- Training for regulated parties & community
- Personnel, retention & program efficiency
- Assistance, funding & partnerships
- Standards, rules & regulations
- Staff training
- Permits & requirements
- Policy & budget
- Planning
- Staff safety
- Engagement
- Guidance
- Inspections & site visits

Common potential actions identified across many programs included:

- Better understand the science of climate change, existing and future impacts, and cumulative effects.

- Initiate more communication and engagement with regulated parties and community members.
- Increase outreach and collaboration with public entities and non-profit organizations.
- Update rules and regulations to stay relevant with the changing climate.
- Obtain more data, updated modeling, and investment in big data.
- Expand training of both staff and stakeholders.
- Evaluate and adapt existing processes and practices.
- Collaborate more among programs.

In addition to the potential for internal collaboration, many programs cited the opportunity for collaboration with outside groups as well.

Some identified potential actions are more transformative. Examples include:

- Explore new and more adaptive methods of regulation.
- Prioritize resources that reduce climate change impacts.
- Authentically integrate climate and environmental justice (EJ) into the core of MPCA activities.

Such transformative actions involve paradigm shifts, and a significant scale-up and/or reallocation of resources to accomplish the identified potential actions, both within the Agency and for the requisite technical and financial assistance to local units of government.

## Background

In 2018, MPCA leadership adopted the following goal in the 2018-2022 MPCA Strategic Plan: “Act on opportunities to increase resilience of communities and the environment to climate change impacts.”

It includes the following measures:

- Identifying climate adaptation leads for each program.
- Assessing climate change risks and identifying opportunities to reduce risk.
- Including climate adaptation in Program Plans.
- Taking action to reduce risk and increase resilience.
- Developing a series of data dashboards.

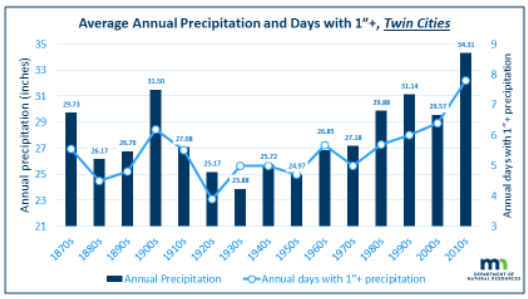
In total, the 20 external-facing MPCA programs assessed climate change risks and identified opportunities to reduce those risks by participating in a facilitated process conducted separately for each program (8 in 2019 and 12 in 2020):

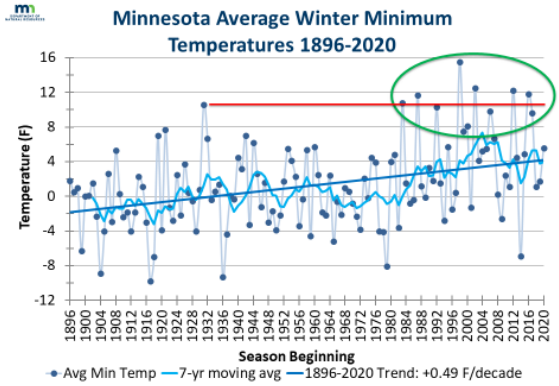
| 2019 | 2020 | |
|---|---|---|
| • Emergency Response | • Air Ambient | • Ground Water & WQS |
| • Feedlot | • Air Non-Point | • Hazardous Waste |
| • Solid Waste | • Air Point Source | • Petroleum |
| • SSTS | • Brownfields | • Superfund |
| • Stormwater | • Community & Business Assistance | • Tanks |
| • Surface Water Ambient | • Closed Landfill | • Toxics Reduction |
| • Wastewater | | |
| • Watershed | | |

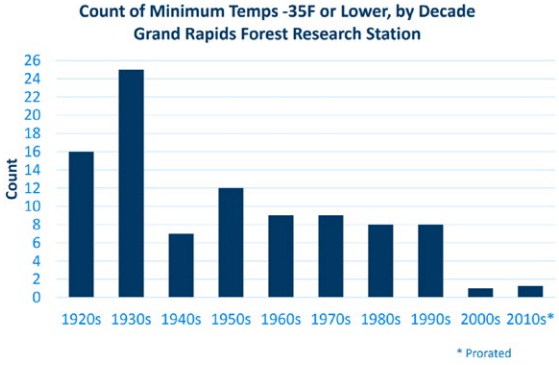
Prior to beginning the risk assessment process, each program reviewed information about Minnesota's changing climate from the Department of Natural Resources (DNR) State Climatology Office, which includes:

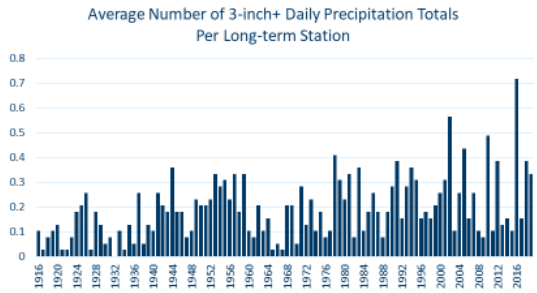
- Minnesota is becoming warmer and wetter.
- The state's lowest temperatures are warming fastest.
- Extreme rainfall events are increasing.

The following charts (updated for this document) depict the trends across these three areas over the past several decades. (Source: Hydro-climatic Change in the Twin Cities (Will it Always Be this Wet?) presentation by Dr. Kenneth ("Kenny") Blumenfeld, Sr. Climatologist DNR State Climatology Office to the Metropolitan Council in 2020)



The programs also reviewed the climate changes observed and projected in Minnesota, based on science summarized in the 2014, 2017, and 2018 National Climate Assessment reports, and from data analyzed by the Minnesota State Climatology Office (shown below in the updated version of the chart).

**Climate changes observed and projected in Minnesota**

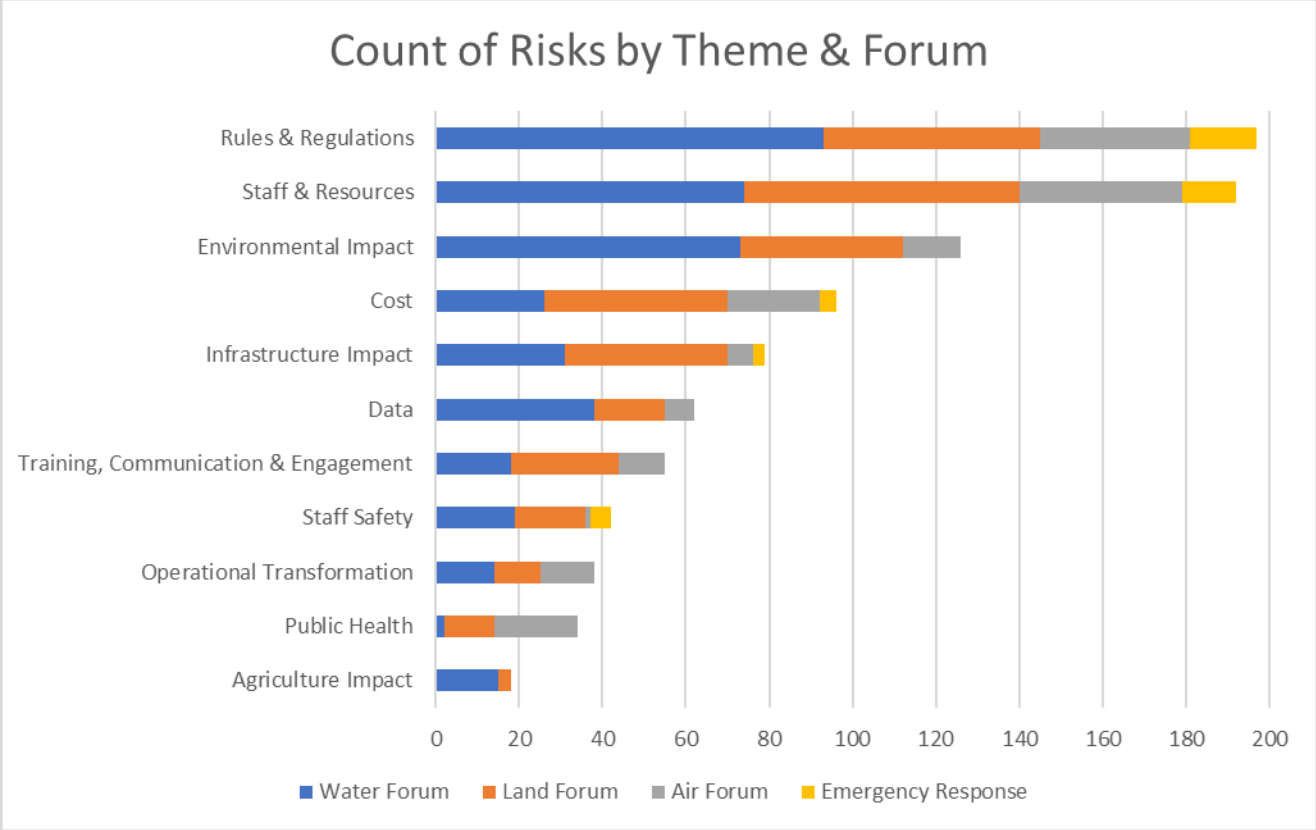
| Climate Parameter | Observations (through 2010s) | Projections (2041-2070) | Cause/Explanation |
|---|---|---|---|
| **Winter temperatures** | **Increasing** rapidly, loss of cold extremes | **Continued increases expected** with narrowing of winter season | Greenhouse gasses absorb escaping heat, warming winters and nights most while shrinking hemispheric snow cover and "cold air reservoirs" |
| **Rainfall** | **Increasing** all seasons, more extreme events | **Increases likely** but timing and seasonality uncertain | More moisture available for precipitating weather systems |
| **Snowfall** | **Increasing**, more extreme events | **Decreases likely** but some extreme events | More moisture available for snow-producing weather systems, but warming of winter eventually decreases opportunities for snow |
| **Heat waves & extreme heat** | **No trend** through 2019 | **Increases expected** by 2050, if not sooner | Warming to date concentrated in winters and nights, but heat waves more likely as seasonal and regional temperatures continue rising |
| **Drought** | **Decreasing** frequency, duration, coverage, and severity | **Increases possible** with longer dry spells and more "flash drought" | Wet trends have decreased drought regionally, but future precipitation increases projected to occur over fewer days, meaning longer dry spells |
| **Tornadoes, hail, t-storm winds** | **Trends unclear** or none observed | **Projections unclear** | Higher global temperatures increase thunderstorm size and rainfall intensity, but decrease wind shear required to for tornadoes, hail, and high winds |

Using this information, each program individually participated in a facilitated three-step process to assess climate change risks to the program, as follows:

1. Brainstormed risks to regulated parties and community members, to staff and program operations, regarding the adaptability for climate change of rules / regulations / guidance / inspections / permits / certifications / trainings, and for the program mission; then identifying broad themes for those risks (2-hour risk assessment workshop).
2. Independently assessed the brainstormed risks (completed homework by rating the risks in a prepared spreadsheet).
3. Reviewed the assessment data and identifying potential actions and benefits (2-hour final review workshop).

## Risk themes

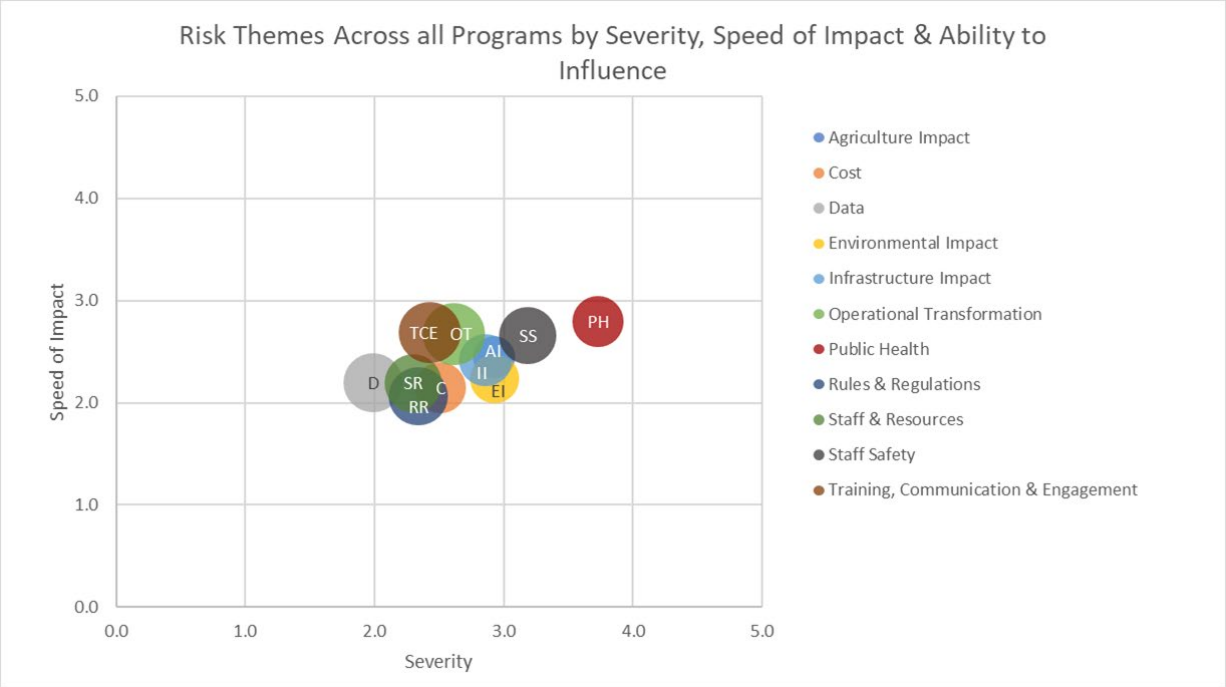
After all programs completed their risk assessments, several themes emerged as consistent across many programs. A chart summarizing the count of risks for each risk theme is shown below. The bar charts are stacked and contain the number of risks for programs grouped by media Forums – water, land, and air (as well as the Emergency Response Program) in the respective theme.



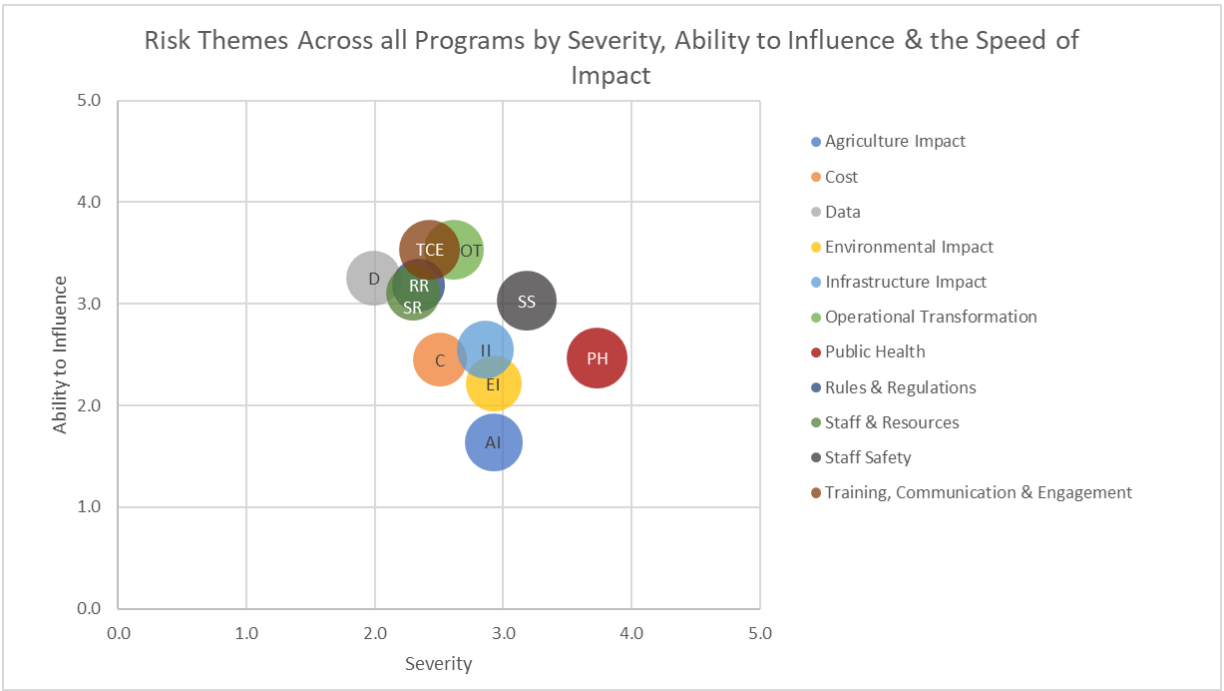

Viewing the data aggregated by overall themes provided the opportunity not only to assess the number and types of the risks identified, but also to visualize the programs' perceptions about:

- The severity of the risks.
- The speed of impact and needed response.
- Their ability to influence the adaptations necessary to address the risks.

To support understanding of the relationships between those pieces of information, some charts were developed. The first chart below focuses on the severity (x-axis) related to the speed of the impact and needed response (y-axis) for each theme. The size of the bubble represents the ability to influence.




The second chart below focuses on severity (x-axis) in relationship to the programs' ability to influence any adaptations associated with the risks identified (y-axis) for each theme. The size of the bubble represents the speed of impact and response needed. Note that aside from staff safety, those themes which programs have the most ability to influence are ones with less severity and lower speed of impact and needed response.



Following are some observations for the risk themes most directly connected to the work of MPCA programs:

### Rules & regulations

The adaptability for Minnesota's changing climate of current rules and regulations is a broad-based concern. Most programs feel that aspects of the existing rules and regulations may be outdated or insufficient in some regard. Some examples are:

- Outdated precipitation calculations.
- Lack of setbacks.
- Inadequate design specifications.
- Insufficient operator certification requirements.
- How often sites are inspected and what is focused on during those inspections.
- The concept of closed sites that are assumed to have stable conditions.
- Length of time a permit covers.

Rules and regulations may need to include more flexibility for changing climate conditions. The scale and speed of climate change impacts are not well-aligned with regulatory frameworks, which have assumed a stable and consistent baseline climate. Climate change could cause significant impacts to stakeholders that might make it very difficult to meet current rules without incurring a significant financial burden. Some current rules might not be possible for stakeholders to meet in the future because the design or performance requirements may not align with realities in the field. Additionally, climate change risks were identified in areas where MPCA has little to no control, including what is lacking and what is in conflict with federal, state, and local codes and regulations such as GHG regulation, agricultural practices, flood plain maps, building codes, and land use zoning.

### Staff & resources

Considerable discussion occurred about the impacts of the changing climate for staffing and resources. One of the most frequently cited concerns is the expectation that emergency or large area impacts will occur more often, causing a shift in priorities and focus for multiple programs. With an increasing number of emergencies, many programs anticipate challenges in completing their typical daily activities, and even more difficulty for their longer-term strategic projects. Updating rules and regulations to stay current with the changing climate puts a further strain on staffing, with extra staff time needed to customize each permit, undertake a lengthy rules adoption or revision process, and/or deal with the potential inability of stakeholders to comply with existing requirements under changed conditions.

### Cost

Many programs expressed concern about the ability of regulated parties to bear the costs of the changes that Minnesota's evolving climate may bring. Those changes range from damaged infrastructure caused by extreme weather events to the potential increased cost of regulations that may become necessary in the future. Programs recognize that if costs increase significantly due to climate change, regulated parties may be faced with difficult choices.

### Data

Nearly every program cited the risk that their data or ability to analyze the data is insufficient. Specific concerns include the quality or quantity of the data they are able to collect, program access to existing data in a usable (searchable) format, and lack of resources for more analysis of the data being collected. In addition, programs mentioned the potential for inaccurate readings or missing data that may be

caused by extreme conditions encountered by staff and/or damage to monitoring equipment in the field. A number of programs also noted that some of the models being used are outdated.

### Training, communication & engagement

The range of risks associated with insufficient training, communication, and engagement is wide. There is a general recognition that MPCA staff need additional training to understand more completely the future direction of climate change and how it will affect programs. Additionally, there is broad agreement that regulated parties and the general public will benefit from clear communication and examples of the impacts climate change is already having.

### Staff Safety

Staff safety concerns vary by program and staff responsibilities, but there was a consistent awareness that vigilance for unsafe conditions is necessary. Concerns ranged from protocols and associated staffing in high risk situations (some duties would be safer if conducted with two staff members rather than just one or delayed until conditions improve), to the suitability of equipment, to mobile working during emergency response and field work. Programs noted that conditions might not allow staff to complete some work safely, and protocols may need to be revised for increasingly high-risk situations.

### Operational transformation

The risks associated to operational transformation recognize that a future where climate change continues to grow in impact will require MPCA to approach its work in significantly new ways ranging from reprioritization of work to the need to reimagine regulations and enforcement to achieve the goals of protecting the environment.

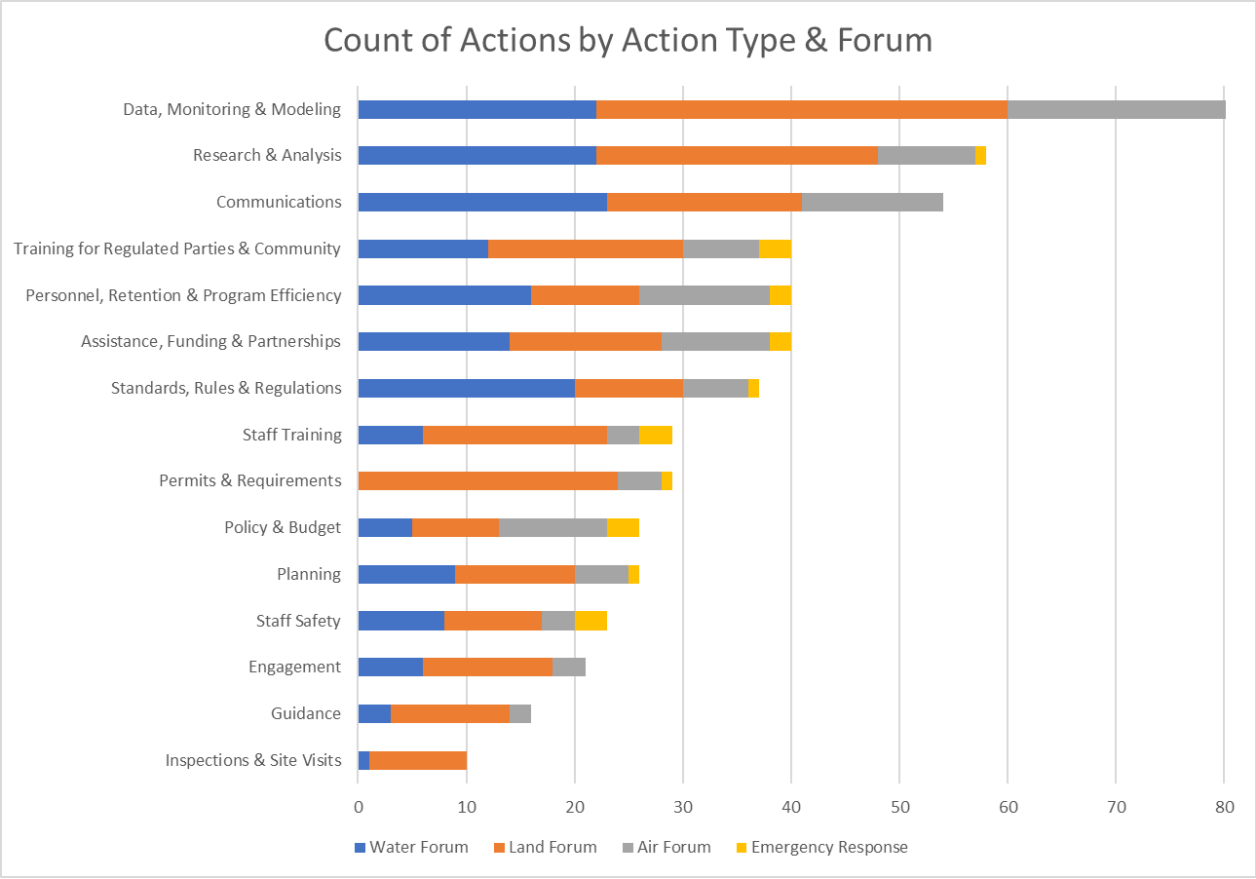
Three issues that may require operational transformation and have the potential for significant negative long-term impacts if not adequately addressed are:

- **Reduced ability to protect the environment** – There is an underlying concern that changes in the climate could potentially overwhelm the pace of regulatory processes, and that funding may not be sufficient to address the need for adaptive best practices throughout the state. As a result, stakeholders may find themselves unable to comply with performance requirements and Minnesota could face increasing failures of systems and best management practices.
- **Financial impacts for stakeholders** – Many programs expressed concern for stakeholders who could be affected directly by the changes in our climate as well as by potential changes to standards, rules, regulations and enforcement. Programs recognized there may be significant financial impacts to stakeholders and raised the question of whether that could lead to difficult choices for being able to avoid negative environmental impacts.
- **Lack of timely rulemaking** – Programs raised concerns that new rulemaking that includes climate change in its development will confront obstacles such as gaps in available data, sufficient political support, and limited knowledge by the public or stakeholders about climate change and its impacts. These obstacles could add to an already lengthy process. On the other hand, programs also shared that insufficient or outdated rules affect program efficiency and effectiveness by increasing the amount of staff time that has to be spent on permit writing and enforcement efforts, responding to public complaints with additional communications or inspections, and trying to scale up voluntary adoption of best practices.
- **Limited resources for next steps** – As described in the sections that follow, all of the programs brainstormed potential actions needed to address the risks they identified for customers and stakeholders, staff and program operations, adequacy of rules and regulations, and program/agency mission. Programs showed strong engagement and acknowledgement of real

opportunities to adapt their work for Minnesota's changing climate. They displayed a great deal of energy and thoughtfulness about their role to protect and improve the environment through changing conditions. Many of the programs, however, clearly stated that they currently do not have the staffing and budgetary resources to implement many of these needed actions.

## Potential actions

While the Risk Assessment Workshop for each program focused on identifying potential risks and assessing those risks, the Final Review Workshop provided each program the opportunity to consider the risk assessment collectively and discuss what actions the program may initiate to address their climate change risks. Completion of the facilitated Climate Change Risk Assessment process for all 20 MPCA programs allowed for the brainstormed actions to be aggregated and analyzed to identify common types of actions and assess where opportunities may exist for collaboration. To simplify the following graphical presentation, action counts are grouped by the Forums used to track environmental results at MPCA – Water, Land, and Air. Emergency response actions are counted separately because they cross all three Forums.




### Common Actions

To make sense of the 530 potential actions identified across all programs, a series of categories were selected and tested through a sorting process. Ultimately, all the actions were assigned among a reasonable number of common categories called action types, as shown in the above graph. Following is an overview and some examples of the potential actions identified for each action type:

### Data, monitoring & modeling

Three-quarters of all programs identified potential actions relating to data, monitoring or new approaches to modeling. There is a broad recognition that in order to fully understand and adopt the most effective measures for adapting to climate change, programs need more data, and some different data than they are collecting today. For example, groundwater flows and interaction with surface waters may be changing. Mobilization of contaminants could occur. An action identified by multiple programs was the need for monitoring closed sites for future climate change risks. Ability to track best management practice (BMP) failure and working with partners to obtain needed data also were cited as important actions.

Beyond the raw data, programs identified needs for enhanced technology and analytics capabilities. They want to continue to explore new methods to adapt current modeling approaches. The impacts to modeling could be significant as more is learned about interactions between climate and the environment.

### Research & analysis

The second largest number of suggested actions were grouped together in Research & Analysis. There is a strong desire to conduct significantly more research and analysis on how climate change is affecting the environment and the responsibilities of MPCA programs. A sampling of the potential actions identified in this category include: research the adequacy of current rules and regulations; collaborate to better understand and address climate impacts on proposed redevelopments; develop case studies to document how sites may have been affected by climate change impacts; assess historical water table data to identify potential climate change linkages; evaluate climate susceptibility of remedial systems; reassess effectiveness of stormwater best management practices; explore the causes and effects of changing hydrology; conduct cost-benefit analyses for better decision-making; increase cumulative effects analysis; and increase analysis of sites and impacts to environmental justice communities.

### Communications

Many programs expressed the need for more communication with regulated parties and the public about climate change and its impacts related to their program areas. The overarching goal of increased communication is to provide reliable and credible information in plain language for regulated parties and the public about climate change and its anticipated effects for them and the environment.

### Training for regulated parties & community

More than 80 percent of the programs identified potential training actions targeted at regulated parties and communities. Training needs to be updated to include increased hazards related to climate change trends. Another important action is evaluating and supporting alternatives, and dissuading use of practices such as excessive use of road salt, inattention to erosion control, and the increase in backyard recreational fires – all of which amplify negative climate change effects on water and air quality. Programs discussed the need to prepare consultants and contractors to handle extreme events that may occur more frequently. Training and educating operators to self-identify potential issues rather than through inspection and enforcement was suggested as well.

### Personnel, retention & program efficiency

Three-quarters of all programs identified actions related to personnel, retention of staff or opportunities to enhance program efficiency. While touching on a wide variety of specific potential actions, the two consistent threads focus on getting the right amount of staff with the skills needed to meet climate change challenges of the future, and making MPCA a desirable place to work so that knowledgeable employees stay longer.

### Assistance, funding & partnerships

A consistent topic among more than half of the programs was the desire to be more active in providing assistance, whether through information sharing, financial resources, or partnerships to address specific issues. There is a common recognition that the Agency has knowledge and resources that can be beneficial for both regulated parties as well as communities. Many communities want to plan for and take action to adapt and become more resilient to climate change. They need additional understanding of climate change, guidance on where to start and the most impactful steps to take, and the technical and financial resources for project implementation.

### Standards, rules & regulations

Standards, rules and regulations was an action category that was frequently identified. The suggested actions emphasize adaptive approaches, collaboration, and the packaging of changes to increase the efficiency of rulemaking and contain costs for everyone involved. Actions in this category also addressed very specific potential changes including significant revisions to older rules. A few programs also recommended more dialogue with other states to stay updated on regulatory developments and emerging best practices.

### Staff training

Staff training actions were suggested by nearly three-quarters of programs. Most elemental is making sure MPCA employees understand climate change trends and anticipated impacts. Potential actions often focused on safety issues such as better understanding of protocols for hazards that are expected to increase. Reassessing program and Agency training requirements for emergency response was identified as important, including whether additional Incident Command System (ICS) training is needed to support emergency response. Other potential actions included training on communication techniques, including ways to be more outward thinking about the work programs do, and how to handle difficult situations with various constituencies around climate change. Training of staff to support the increased need for modeling and simulations related to climate change also was identified.

### Permits & requirements

Many of these potential actions from programs focus on the ways that permits and other points of leverage can be structured to reduce the impacts of climate change on facilities and sites to prevent adverse effects on nearby communities and the environment. Requiring more frequent updates to permits, whether or not the previous application was reviewed, was suggested. Reviewing older permits and plans for site closures with the assumption that future conditions will change and incorporating anticipated climate change impacts are important actions identified. Making changes to vegetative cover and to operations and maintenance (O&M) practices also were suggested. It was acknowledged that changing climate conditions may require alterations to a site, so planning for reengaging stakeholders was another potential action identified.

### Policy & budget

Many programs brainstormed potential actions that require legislative authorization and/or budget appropriations. Some policy and budget-related actions, however, can be addressed by programs directly, such as developing contingency plans to fund infrastructure compromised or damaged by climate change impacts. Programs discussed the possibility of managing their budgets to prioritize for greatest impact. An especially important action raised is working through the legislative process to meet funding needs for resilient infrastructure.

### Planning

More than half of all programs identified opportunities to improve planning in ways that would enhance the agency's efforts to address climate change. Some programs focused on the need for regular assessments to ensure the Agency is staying up to date with developments in climate science as well as addressing the areas of focus and progress that will be most impactful to the public and regulated parties. Other programs identified opportunities to improve planning in areas where there is a high likelihood that climate change already is, or soon will begin, having significant effects. Advance planning will allow the programs to respond more quickly and take either preventive steps or quick reactive steps.

### Staff Safety

Many programs already are experiencing the effects of climate change – including more frequent and extreme weather events – and the corresponding impacts on staff, particularly those who go out into the field. A significant number of actions associated with ensuring staff safety were identified. Many actions focus on either equipment, processes/procedures, or training. Additionally, it was recognized that staff would benefit from improved equipment that assists in operating in extreme weather conditions, and there is a significant need to create more clear and consistent processes, procedures and guidance on whether and how staff should work in a variety of conditions. Conducting a job hazard analysis, with expected climate change considerations incorporated, was suggested as a potential action to standardize safety guidance and training.

### Engagement

Programs brainstormed actions around two types of engagement. One is authentic engagement with communities to address environmental justice issues as they relate to the specific work of programs. The need for MPCA to figure out better approaches for authentic engagement was cited. Another aspect of engagement that programs raised is collaboration with other state and local governmental units to share information and tackle difficult issues. Connecting better with local governments on climate-related land use issues was a theme of multiple action ideas. Actions to engage with consultants, developers, and regulated parties also were proposed.

### Guidance

Many programs recognized that their program guidance can be improved to better address current effects on sites and facilities. Programs also can communicate the need for regulated parties to take steps to address anticipated climate change impacts as they evolve. Guidance is an area that programs have the ability to continue to adapt and update as the science and environmental conditions change. Examples identified as opportunities to incorporate climate adaptation include guidance for operators, site closings, soil vapor, groundwater sampling, and more.

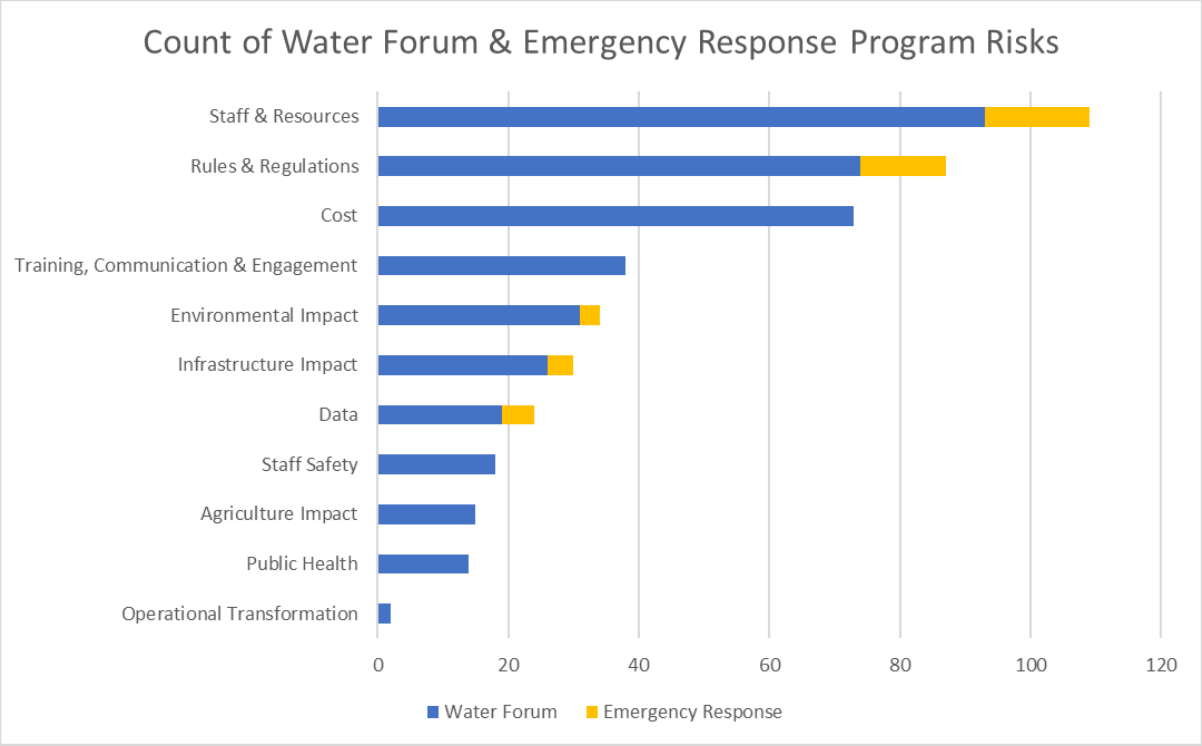
### Inspections & site visits

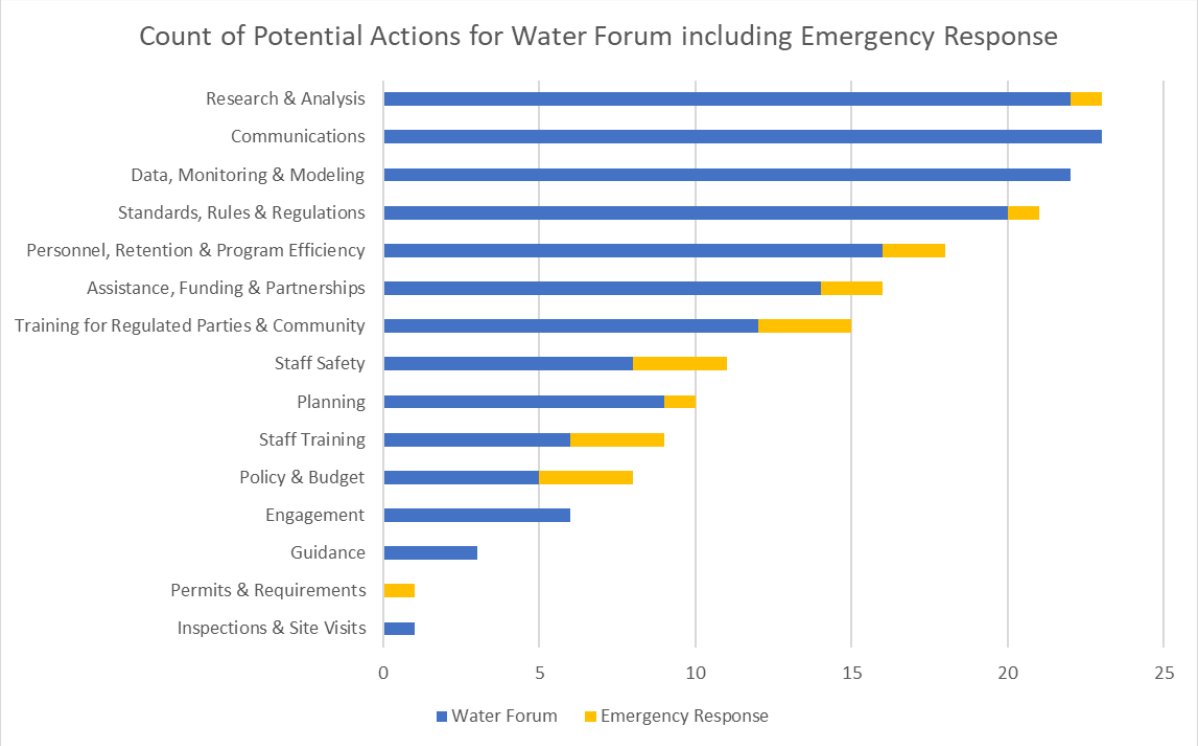
Actions of this type brainstormed by programs include stressing the need to prioritize inspections for sites and infrastructure at highest risk from climate change impacts. Programs raised the need for more frequent site, facility, and infrastructure inspections, and suggested pursuing multi-program inspections as a possible approach to stretch staff resources. Incorporating climate risk factors into site reviews and risk assessments is a potential action. It was suggested that criteria be formalized for modifying scheduled site visits based on weather forecasts or recent extreme weather events. Programs also mentioned expanding informal site visits, which provide additional opportunities to share information about climate change and best practices for adaptation.

## Risks and potential actions by Forum

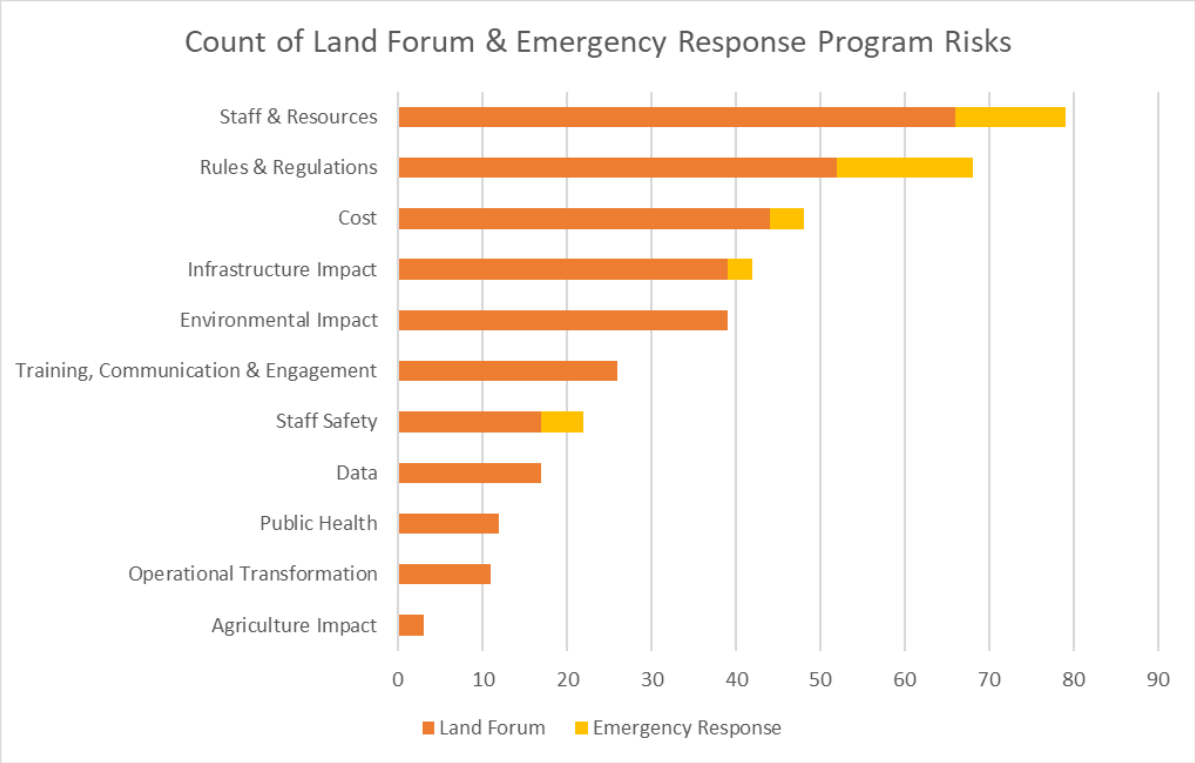
The following presentation of data allows a clear method of seeing both the categories and counts of risks and potential actions identified by the programs associated to each Forum.

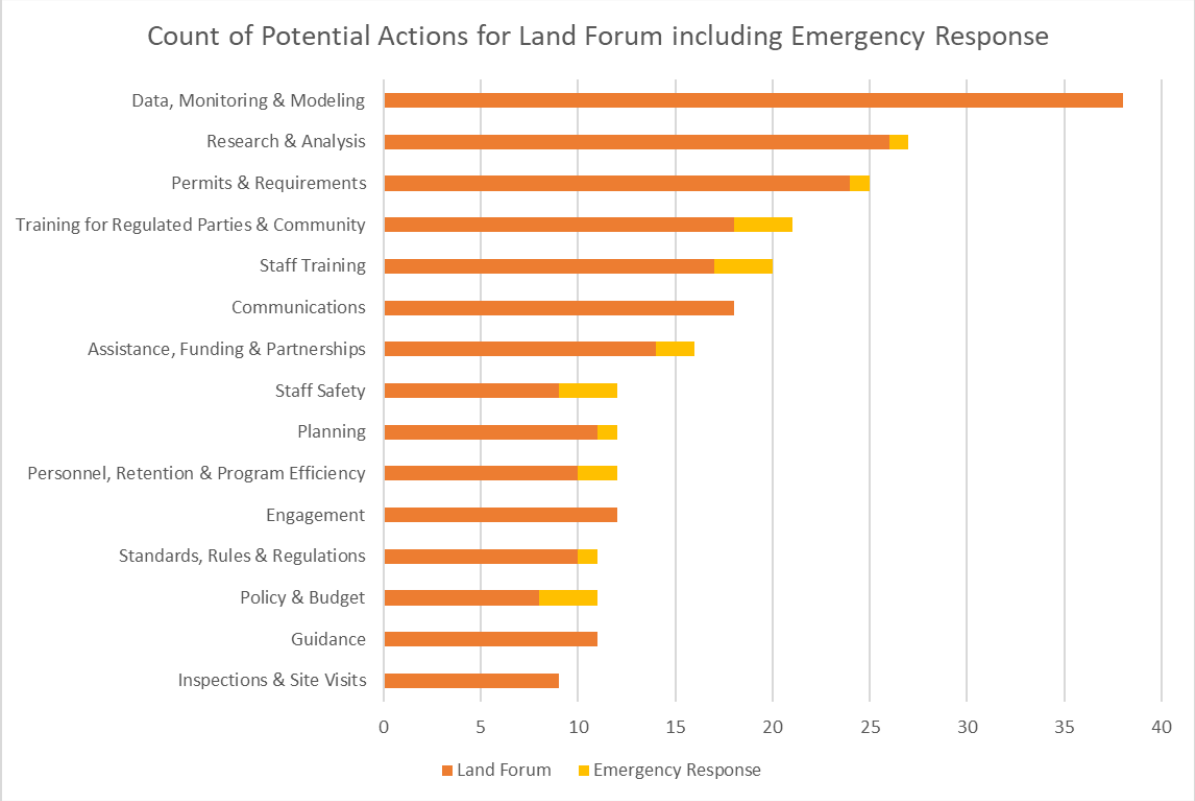
Water Forum



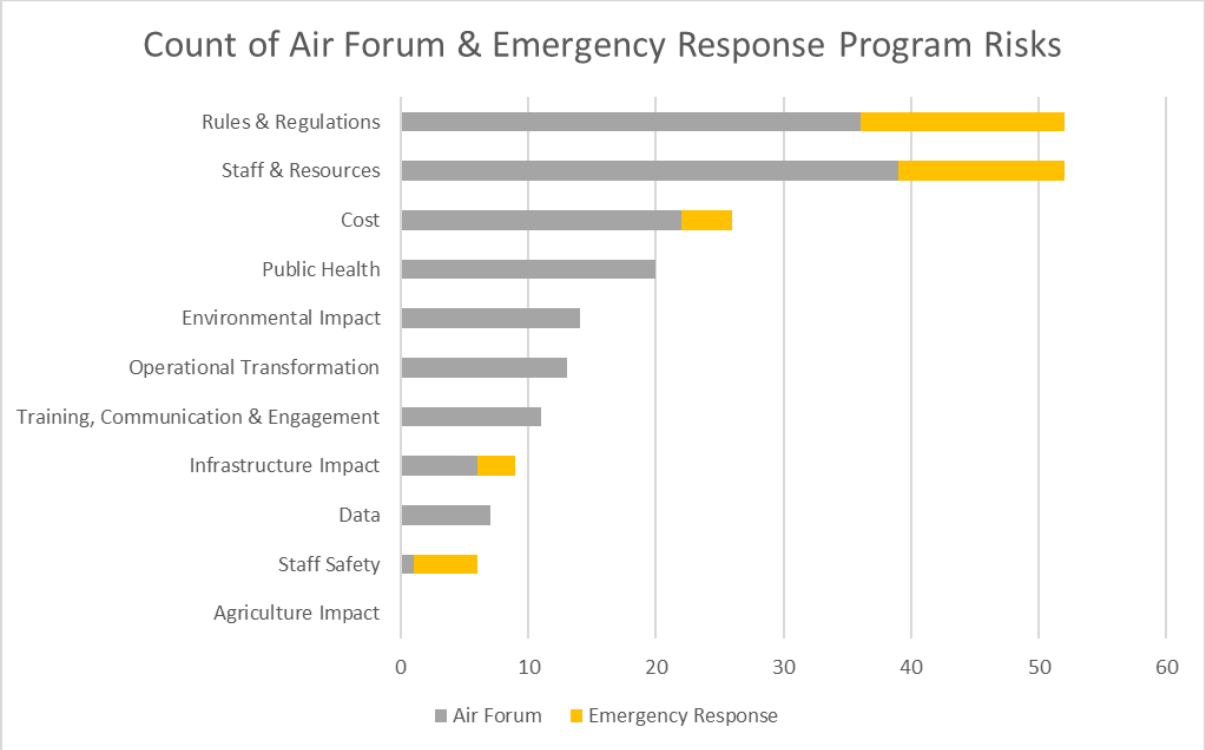



Land Forum


Count of Land Forum & Emergency Response Program Risks
Staff & Resources
Rules & Regulations
Cost
Infrastructure Impact
Environmental Impact
Training, Communication & Engagement
Staff Safety
Data
Public Health
Operational Transformation
Agriculture Impact
0
10
20
30
40
50
60
70
80
90
Land Forum
Emergency Response


Count of Potential Actions for Land Forum including Emergency Response
Data, Monitoring & Modeling
Research & Analysis
Permits & Requirements
Training for Regulated Parties & Community
Staff Training
Communications
Assistance, Funding & Partnerships
Staff Safety
Planning
Personnel, Retention & Program Efficiency
Engagement
Standards, Rules & Regulations
Policy & Budget
Guidance
Inspections & Site Visits
0
5
10
15
20
25
30
35
40
Land Forum
Emergency Response

Air Forum


Count of Air Forum & Emergency Response Program Risks
Rules & Regulations
Staff & Resources
Cost
Public Health
Environmental Impact
Operational Transformation
Training, Communication & Engagement
Infrastructure Impact
Data
Staff Safety
Agriculture Impact
0
10
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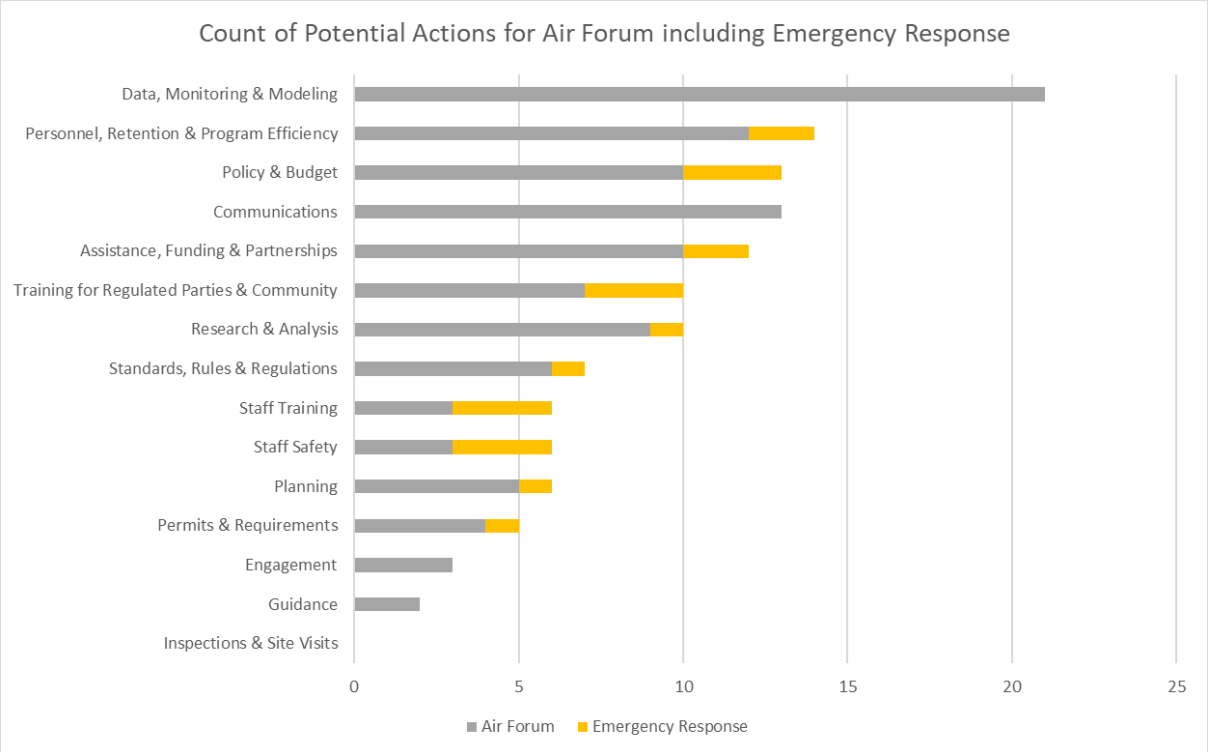
50
60
Air Forum
Emergency Response


Count of Potential Actions for Air Forum including Emergency Response
Data, Monitoring & Modeling
Personnel, Retention & Program Efficiency
Policy & Budget
Communications
Assistance, Funding & Partnerships
Training for Regulated Parties & Community
Research & Analysis
Standards, Rules & Regulations
Staff Training
Staff Safety
Planning
Permits & Requirements
Engagement
Guidance
Inspections & Site Visits
0
5
10
15
20
25
Air Forum
Emergency Response

## Operational transformation

Numerous programs identified actions they felt could be transformational, some of which include:

- **Explore new and more adaptive methods of regulation** – There is a recognition that climate change will continue to affect the environment in new and unexpected ways, and with that, rules and regulations that are more adaptive would be very useful in ensuring that MPCA is able to meet its mission. The scale and speed of climate change impacts are not well-aligned with regulations that assume a stable and consistent baseline climate. Climate change could cause significant impacts to stakeholders that might make it very difficult to meet current rules without incurring a significant financial burden. The potential need for rules to address cost related risks was identified as something for MPCA to explore.
- **Prioritize resources that reduce climate change impacts** – Resources are limited so several programs suggested prioritizing investments in areas that generate the most significant efficiency increases and measurably reduce climate change impacts. One example is rulemaking that could help streamline related program processes and/or address adaptation issues for multiple programs.
- **Authentically integrate climate and EJ into the core of all MPCA activities** – Both climate change and environmental justice are important priorities for MPCA. Some programs expressed the challenge of addressing these issues for already resource-strapped programs. There was no lack of desire or interest but there is concern about how programs can most effectively embed these two issues into the work they do.

## Collaboration

### Opportunities for stakeholder collaboration on actions

In addition to the potential for internal collaboration, many programs cited the opportunity for collaboration with outside groups, including:

- Desire to connect with local governments, for example to learn about upcoming land use conversations, or to collaborate on protections and zoning requirements to address sites near bodies of water with potential for contaminant migration.
- Opportunity to leverage data and experiences of other states and the federal government.
- Growing understanding that external groups can assist MPCA with climate adaptation efforts.

## In summary

The key take-away from the climate change risk assessments is the importance of empowering MPCA programs to confront the challenges ahead. Brainstorming climate risks and potential actions is only the first step in a process. The next step is taking those actions that can help minimize impacts and build resilience to the effects of climate change on communities and the environment. It is important both to foster a workplace that supports programs taking action to address climate change impacts and to explore institutional changes that will make these efforts successful. Encouraging collaboration within the Agency and through other partnerships will pave the way for more efficient use of existing resources and build outside support for the allocation of additional resources to increase resilience to Minnesota's changing climate.