WATER AVAILABILITY, ACCESS, AND USE

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Executive summary

Water is constantly moving around the Earth between the atmosphere, oceans, rivers, streams, snowpacks, ice sheets, and underground – it is a finite resource that naturally flows in a cohesive and connected cycle. However, the societal values and structural systems that have been implemented over the last few centuries have made it challenging for people to recognize the interconnectedness of water and the impact they have on the water system. Furthermore, it is difficult to understand that water is a finite resource when people cannot see what is available in underground aquifers.

While the state of Minnesota is considered water-rich, this perception has produced many issues in stewardship and conservation. An imbalance in the water cycle from mismanagement degraded the quality and quantity of the groundwater and surface waters, leading to public health, economic, social, and environmental challenges. As we come to understand the impacts from mismanagement of water, we recognize that to solve these water challenges is to view water in all its forms as an essential resource. It is important to characterize the entire water cycle – in both natural and built environments - to understand how we are using and impacting the water while considering how we can be more sustainable in making sure it will be available to future generations.

Water resource sustainability is dependent on many facets, the most important of which are water availability, access, and use. All three components must be present to have functioning water systems that accommodate water uses for a variety of purposes.

- **Water availability** is a culmination of water balance (where water demand for current and future human purposes does not significantly harm ecosystems) and water quality (where water chemistry does not preclude it for use).
- **Water access** is the ability of water to be reached or obtained physically– from clean, running water in faucets to recreational opportunities on a river, lake, or stream to water near plant and animal communities in order to sustain life. It is of little consequence if the water is available if no one can access it.
- **Water use** incorporates both direct (bathing, drinking, cooking) and indirect purposes (recreation, industrial processes). Often both water availability and access determine an individual's ability to use the water in an intended manner.

Water must recurrently be available, accessible, and usable for our water to truly be sustainable.

Today, nearly three million residents and numerous businesses and industries exist within the metro region, all using water in different ways for different purposes. No matter its intended use, water follows a predictable cycle – it starts from a source, it is extracted for use by users

(humans, ecosystems, etc.), it is used, and then returned to the source (Figure 1).

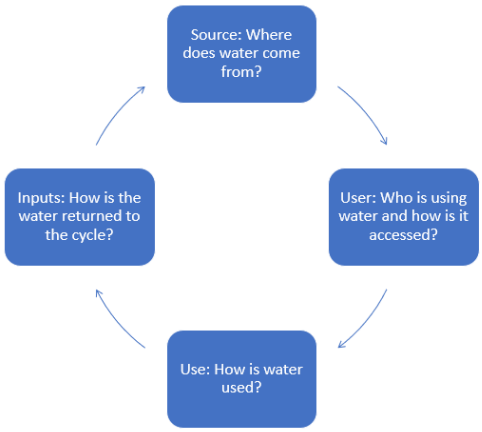

Figure1: A simple water cycle feedback loop

This paper follows this water cycle to delve deeper into our regional waters, how we interact with them, and how we can continue to do so without detrimental effects on our water cycle.

Issue statement

The availability of consistent clean water is crucial to the future of the metro region. Water availability, access, and use are affected by changing and variable sources of water; varying types and quantity of users; shifting user needs; and the methods by which water is returned to the source. Our goal is to improve, support, protect, and enhance access and availability of water for our ecosystems, residents, and business and industrial needs within the region.

The Metropolitan Council (Met Council) needs a more comprehensive assessment and water balance of the regional water cycle to better identify water needs and to work with partners to balance those needs to ensure water access and availability.

Our role in water availability, access, and use

While public water suppliers and the Minnesota Department of Health are responsible for providing safe drinking water, they do not have the authority or capacity to protect drinking water sources on their own. This is because much of the land within drinking water supply management areas is owned privately. They work with local decision-makers, other state agencies, and partner organizations like the Met Council to plan and implement activities that protect drinking water sources.

At the Met Council, we work with our partners in several ways to protect source water. Our roles and efforts include long-range visioning and planning, regional system investments, facility management, technical assistance, research and assessment, and partnerships. We fulfill these responsibilities through statutory authorities, interests, and regional influences and partnerships. Cross-agency coordination and partnerships are key to successfully managing the region's waters, whose sources do not always align with jurisdictional boundaries.

This research paper provides regional policymakers with information about opportunities to ensure clean water for future generations, specifically by protecting land that contributes to water supplies to prevent threats to water supplies from becoming a public health problem.

Equity and water availability, access, and use

Achieving water equity means everyone has reliable access to clean, safe water. It means there is a source with enough clean water for all the uses of all users, which is then input back to the source in perpetuity. It requires equitable investment in communities that are vulnerable and disproportionately affected by water availability issues. For these investments to be equitable, they must be community led and aim to undo a historic or existing inequity. Therefore, it is important to understand who is vulnerable across the metro region and the historic or existing inequities they face that reinforce barriers or conflicts regarding water availability, access, and use.

There are many historic and current practices that cause barriers and conflicts for vulnerable communities in relation to water availability, access, and use. These practices are interrelated, complex, and are connected to affordability, respect, and inclusion of differing perspectives:

- **Water affordability and accessibility are different for everyone.** One of the reasons people have difficulty accessing water is that it is not affordable or accessible for everyone. Water affordability is not only about how much things cost monetarily, but also about education, health, time, and social costs.
- **Representation is not equal.** An additional root cause is a lack of respect and representation of other cultural values in decision-making institutions. This has caused a dissonance in what people need versus what they are receiving regarding water accessibility and use. This lack of respect and representation shows up in the form of disregarding legal agreements, harmful policies, exclusive meeting venues, exclusive procurement practices, and ultimately, exclusive communities.

Crucial concerns for water availability, access, and use

We need to highlight the challenges we face as water moves through the sources, users, uses, and inputs phases of the cycle to improve water availability, access, and use across our region. To ensure that water resources and infrastructure are sustainable and resilient in order to meet the needs of present and future generations, it is important to understand what is within our control to manage and what we will need to adapt to moving forward. In this paper, we explore the primary drivers that influence related hazards and risks. With those drivers in mind, we need to highlight areas to focus policy and planning work (our key concerns). These then form the basis of our policy recommendations.

Population and employment growth

The metro region's population has doubled between 1960 and 2020, climbing from 1.5 million residents to 3.2 million residents, and it is forecast to continue to increase to 3.82 million by 2050. Without careful planning and best management practices, this growing population could place significant stress on water availability and quality through changes in water users and uses.

Land use and growth

Growth, economic development, and land use changes impact how water returns to the cycle and are factors which can be influenced by policy and decision-making. The metro region is expected to continue growing in population and diversity. With this growth and development will come increasing demand on our finite water resources. Different land uses across the region are associated with a range of potential contamination threats that pose public health and ecosystem risks to both surface water and groundwater.

Current and future climate

Minnesota's future climate projections are pointing toward a change in the amount of rain and snow and a shift in seasonal patterns including the length of the growing season. The impacts from climate change have the direct ability to affect water resources by decreasing the availability of water in sources and changing the volume and pathways of water inputs back to their sources. These changes are expected to impact infiltration, groundwater recharge, and the timing and volume of water flowing across the landscape. This could also affect the types of contaminants that are mobilized and cause other water quality concerns.

Current water restrictions

The metro region has areas with political constraints on their water resources, affecting the water sources and uses. These restrictions must be considered as we plan to ensure water is available and accessible for regional growth and the prosperity for our residents and businesses. These include restrictions due to court orders, contamination concerns, growth pressures, and areas where state protective restrictions limit commercial, industrial, or residential uses.

Key concerns within the metro area

Increasing water demand pressures

Characterizing the amount of available water and comparing it to withdrawal rates and demand projections provides a clearer picture of the regional risks and vulnerabilities. Estimates of future water demand in the metro region show an increase of about 20% by 2040. If increased water demand draws on the same sources currently being used, this may lead to lower levels in underlying aquifers.

Aquifer drawdown has the potential to impact surface waters. Increased groundwater withdrawals, in concert with decreased infiltration linked to increased impervious surfaces from urbanization, lead to a decrease in available water. Climate change contributes to the loss of infiltration by increasing drought duration and delivering precipitation in more extreme events. Soils become saturated during extreme precipitation events and more water runs off as stormwater. Recharge rates limit the amount of water that can be sustainably extracted from aquifers. If withdrawals of groundwater exceed recharge rates, the withdrawals are unsustainable (without intervention). This system imbalance causes vulnerabilities to water supplies and ecosystems.

Threats to groundwater-dependent natural resources

Groundwater discharges to surface water features in areas where the water table intersects the ground surface – affecting water sources and uses. In areas where clean groundwater feeds surface water features, the quality of the water is generally enhanced. Groundwater lowers the

temperature of surface water, which provides habitat for groundwater-dependent biological communities. When water is allowed to infiltrate and flow through the subsurface, it is filtered through the pore spaces in the soil which can remove certain contaminants before water is discharged to ground and surface waters.

Groundwater-dependent natural resources are important because they greatly enrich the biodiversity of an area. They support plant and animal species that depend on optimum groundwater temperatures and/or chemistry to survive. Groundwater-dependent natural resources are relatively rare, so the associated plant and animal species are also rare. They are vulnerable to development and an increase in impervious surfaces. If recharge is limited or restricted upgradient of a groundwater dependent natural resource, its source of groundwater may be cut off. Additionally, water supply is often limited by the effects it will have on surface water features. High-capacity wells have the potential to draw down water levels in their vicinity and can draw water away from groundwater-dependent natural resources.

Growing water contamination

Water contamination affects our ability to use water and our commitment to protect and restore our water sources. It can affect ecosystem health and water availability for drinking water from both surface water and groundwater sources. With the abundance of lakes, rivers, and streams in the region, surface water contamination has the potential to have a significant impact on water availability. For groundwater sources, contamination often occurs through infiltration of contaminants through the ground or directly via the well system in cases of flooding and overtopping. The Met Council plays a role in identifying and supporting communities most impacted by these contaminants.

Aging infrastructure challenges

For residents, business, and industry to use water, it must be extracted from the source, treated, and transported to the end user. After its use, water must be treated and returned to a source. All movement and conveyance of water in the built environment requires water infrastructure. Water supply and wastewater treatment systems were installed as the region developed, creating a range of infrastructure age from newly installed to over a hundred years old. Similar to sanitary sewers and water distribution mains, storm sewer pipes are also prone to cracking and other age-related issues, require operation and maintenance, suffer from capacity issues, and need to be rehabilitated on similar timelines.

Recommendations for water resource policy and related strategies/actions

The document's intent is to share our current understanding of issues, identify current policy connections or gaps, and propose future policies and strategies to ensure sustainable water resources. Not all the recommendations included in this paper will move forward for inclusion into the Water Resources Policy Plan, and conversely, the Water Resources Policy Plan may include policies not discussed in this paper. The intent is to begin to develop a shared understanding and conversation about the protection of source water areas, which is foundational to a prosperous and sustainable region.

The scope of the issue presented in this research paper reveals the need for a regional One Water approach, increased strong regional policies, and better, more frequent collaboration to effectively act in ways that protect our source waters. Collaborations with cities and townships, watershed organizations, state and federal agencies, and other water practitioners can work to

undo past harms and plan for water availability, access, and use. Addressing our region's complex water challenges requires diversity of thought, multiple perspectives, and innovative solutions.

Each recommendation starts with a general description of the proposed policy, followed by *draft* proposed policy and strategy (specific actions) language.

These recommendations are intended to spark discussion about policy direction for the 2050 Water Resources Policy Plan. They are not to be considered final recommendations.

As staff developed the following language, they considered:

- The feedback loop of the water system: source, users, use, and inputs
- The full range of Met Council functions and how they relate to the simple feedback loop of the water system
- How the Met Council can enhance and leverage partners' programs
- How proposed policies and related actions represent an integrated water and/or watershed approach
- How resilient the proposed policy and related actions might be under different scenarios of future growth and climate
- The equity impacts of proposed policies and related actions
- Feedback from Metro Area Water Supply Advisory Committee, Water Resources Policy Plan Advisory Group, and Met Council staff during an internal workshop on the topic of public health.

Planning for sustainable waters

Regional policymakers should consider establishing a clear policy for long-range integrated water planning to better address the root causes of water access, availability, and use issues. This should incorporate the watershed approach and connect it to water management throughout all our water planning efforts (groundwater, surface water, wastewater). It should include support for long-term source water management.

Proposed policy recommendation:

The Metropolitan Council will work with our partners to develop and support sustainable waters through integrated water resource planning that addresses the region's water uses and needs.

Proposed actions:

- Convene a regional discussion to redefine the concept of "sustainable water" in order to direct and align efforts to support sustainable water resources.
- Update estimates of available water supplies, future water demands, and impacts of systemic shocks on metro region water.
- Through the review process for comprehensive plans, local water plans, and watershed management plans, Met Council staff will make water resources management a critical

part of land use decisions, planning protocols, and procedures. This will ensure these plans are making progress toward achieving state and regional goals for protection and restoration of water resources.

- The Met Council commits to regional long-term investments in our wastewater treatment and collection system to safeguard sustainable water – from both water supply demand and capacity impacts to wastewater system – for all residents and areas of the region.
- Create a guide to assist public water utilities in implementing asset management programs to identify aging and deficient areas of their water supply, treatment, storage, and distribution systems; estimate the costs to replace or rehabilitate these systems; prioritize the recommended improvements; and implement the improvements over a scheduled timeframe of 1 to 30 years.
- The Council will evaluate a range of water sources available for users in the region to tap for a variety of purposes, matching water quality and quantity to the requirements of the use.
    - Consider alternative water sources (i.e., surface water suppliers) for public water systems with groundwater supply challenges and/or drinking water standard exceedances.
    - Use reclaimed water for cooling systems, irrigation alternatives, etc., where feasible.

Research and data collection

Regional policymakers should consider establishing a more focused and integrated policy to gather and create data to assess regional water resources (groundwater, surface water, and wastewater). The region has additional assessment needs that are discussed in other research papers.

Proposed policy recommendation:

The Metropolitan Council will collaboratively research and gather regional water data and information on the quality and interconnection of the region's rivers, lakes, streams, and aquifers – to quantify impacts on regional water resources and measure success in achieving regional water goals.

Proposed actions:

- Research and understand how water use and access may be affected by gentrification, land use policies, etc., across the region.
- Create a database of narratives around the regional waters to understand how different people experience water and are impacted by policy and planning for city and township, watershed, and regional planners and water utility providers.
- Explore and identify data sources to support the understanding of water value and use, especially to increase the effectiveness of the Priority Water List.
- Research what "water access" means to people and understand all the pieces of water access at play in our region.
- Investigate cross-disciplinary water equity issues across Met Council planning systems – recognize how environment, housing, and infrastructure are linked across time and space." (Keeler et al., 2020)

- Evaluate the impact of climate change on water quantity and availability to inform water demand decisions.
- Monitor PFAS data in public and private wells sampled by the State of Minnesota to determine areas of detections in the metro region (see MDH Interactive Dashboard at ***Interactive Dashboard for PFAS Testing in Drinking Water - MN Dept. of Health (state.mn.us)***
- Investigate data, research, and regulations with respect to drinking water contaminants, including radionuclides, manganese, selenium, PFAS, and other emerging contaminants, and work with state health officials to track current trends and recommended best management practices.

Modeling and interpretation

Regional policymakers should consider establishing a more focused and integrated policy to develop models, tools, and resources to understand the impact of drivers and pressures on our regional water resources (groundwater, surface water, stormwater, and wastewater). The region has additional tools and resource needs that are discussed in other research papers.

Proposed policy recommendation:

The Metropolitan Council will collaboratively develop tools and resources to better understand pressures on and interconnection of the region's rivers, lakes, streams, and aquifers to help regional, local, and watershed planners and water utility staff make informed water management decisions.

Proposed actions:

- Develop a regional water budget based on different demand and supply scenarios.
- Research what "water access" means to people and understand the factors that limit or promote water access in our region.
- Determine and plan regional growth to mitigate potential aquifer level decline through forecasting groundwater modeling, scenario planning, and targeted water conservation and efficiency efforts.
- Evaluate the uncertainty of aquifer productivity and extent, particularly in the parts of the metro region where the Prairie du Chien-Jordan aquifer is not present or currently being overused.
- Identify, map, and evaluate groundwater recharge areas that are vulnerable to development so that their recharge value can be protected (e.g., wellhead protection areas).
- Model groundwater flow in the water table and interactions between surficial (Quaternary) aquifers and surface flows to better assess groundwater and surface water interactions.
- Develop injection capacity maps of regional aquifers to determine where intentional aquifer recharge could be viable to help mitigate withdrawal impacts on groundwater sources.

Technology, behavior, and training

Data collection and interpretation can provide a greater understanding of the interconnectedness of our regional waters; however, without the implementation of new technologies or changes in our behaviors, we will not achieve our desired outcome of clean waters for future generations. Policymakers should consider establishing a policy to promote and support regional water actions to have positive influences on our water availability, access, and use.

Proposed policy recommendation:

The Metropolitan Council will support and encourage residents, businesses, and water utilities to incorporate new technology and behaviors, where feasible, as a means of achieving water sustainability in the region.

Proposed actions:

- Support research and pilot projects with public water utilities to evaluate and use newer technologies such as predictive analytics to identify potential asset failures, accelerate repairs, and complete in situ underground pipe repair. This may optimize the use of funds when replacing and rehabilitating water distribution systems.
- Evaluate and consider community water softening treatment for public water systems that discharge chloride to sanitary sewer collection systems and ultimately to the Met Council wastewater treatment plants with our partners and public water utilities.
- Encourage private well owners to sample and test their well water for arsenic, PFAS, and other contaminants and install point of use treatment devices (i.e., reverse osmosis and granular activated carbon filtration systems) as needed.
- Encourage partners and residents to participate in the Board of Soil and Water Resources' Lawns to Legumes program or other local turf grass alternative grants and implementation programs.
- In agricultural areas, promote agriculture best management practices including the timing, rate, placement, and source of fertilizer application; best healthy soil practices; and vegetated filter strips to provide vegetated land areas between pollutant sources and surface water bodies for non-agricultural areas.

Conservation and reuse

As investigated in the Water Reuse research paper, state and regional policymakers should consider improving the clarity and focus of the current reuse policy, in addition to our water conservation policy. This would include recommended reuse and conservation approaches to increase water resources for water availability, access, and use more comprehensively.

Proposed policy recommendation:

The Metropolitan Council supports water conservation and stormwater and wastewater reuse in Minnesota, where feasible, as a means of achieving water sustainability in the state and region.

Proposed actions:

- Continue to support programs targeting water conservation implementation and efficient water use efforts like the Minnesota Technical Assistance Program (MnTAP) to assist local businesses.

- Promote customer engagement efforts to increase water conservation to extend the life expectancies for critical water infrastructure components.
- Determine if there are any major users of water that could be identified and targeted for water quantity reductions, conservation, and reuse where applicable.
- Encourage the Interagency workgroup on water reuse to develop recommendations that further stormwater and wastewater reuse and decrease demands on clean potable water while protecting residents and infrastructure from harm.
- Support ongoing research to direct residents and developers to identify alternatives to using drinking water supplies for lawn watering, install low-maintenance turf (e.g., no-mow grass), or avoid turfgrass landscaping altogether to reduce impacts on summer water demand.

Funding & Support

A general understanding of how water and water infrastructure works and supports the prosperity of our region is vital. Public support and funding help to maintain and operate water infrastructure and will be needed as our infrastructure ages. This paper highlights the importance of a shared understanding and inclusion of multiple perspectives to sustain affordable and accessible waters.

Proposed policy recommendation:

The Metropolitan Council will support local water suppliers and other water organizations to develop regional water and water utility knowledge and funding mechanisms to operate and maintain water infrastructure to achieve usable, sustainable waters in the region.

Proposed actions:

Support organizations promoting water equity and educational efforts improving the connection and relationship with residents and regional waters.

Public water utilities should study and implement water utility rates that provide adequate funding to replace and rehabilitate aging infrastructure in addition to covering operational costs and depreciation.

Public water systems should aggressively pursue federal and state infrastructure funding programs, as well as adopt public policies that promote innovation in the water sector.

Strong policies and coordinated water governance are vital to protect our regional water supplies. This paper includes proposed policies to address region-specific water concerns, mitigate and plan for limitations in water availability (where possible), ensure equitable access to waters, and safeguard our waters for beneficial use now and for future generations.