



Modernizing Sewage Infrastructure: A Climate Imperative

Upgrading sewage infrastructure to modern secondary and tertiary wastewater treatment systems represents one of the most impactful climate actions a community can take. As highlighted in Dr. Carolyn V. Currie's research, sewage pollution contributes 6.2 million tons of nitrogen annually to coastal waters, severely damaging marine ecosystems that regulate our climate.

This presentation explores five compelling reasons why towns and cities should prioritize sewage infrastructure upgrades, focusing on both environmental protection and economic benefits. We'll examine how targeted local action in high-impact watersheds can have disproportionate global benefits for ocean health and climate regulation.



by John Troughton

Protecting Marine Ecosystems and Carbon Sinks

Upgrading sewage infrastructure significantly reduces nitrogen pollution that devastates vital marine ecosystems. Modern treatment can cut nitrogen discharge by up to 40%, directly protecting seagrass beds and coral reefs that serve as critical carbon sinks.

These marine ecosystems store ten times more carbon than terrestrial forests and are essential for climate regulation. Currently, sewage pollution has degraded 56% of coral reefs and 88% of seagrass meadows worldwide, severely compromising the ocean's biological carbon pump.

For communities in high-impact watersheds like the Mississippi River, infrastructure upgrades amplify global impact by targeting areas responsible for nearly half of all wastewater nitrogen pollution.



Safeguarding Public Health and Local Economies

Untreated sewage introduces dangerous pathogens, pharmaceuticals, and heavy metals into waterways, with 51% of fecal indicator organisms coming from just 25 watersheds. These pollutants contaminate fish and shellfish, creating serious health risks including cancer and birth defects.

Modern treatment plants remove up to 99% of these impurities, directly protecting community health. Additionally, clean waterways support thriving tourism and fishing industries, which are currently threatened by sewage-driven coral bleaching and fishery declines.



Pathogen Reduction

Advanced treatment removes 99% of disease-causing organisms from wastewater



Safe Seafood

Prevents contamination of fish and shellfish with toxins and heavy metals



Tourism Protection

Clean beaches and waterways attract visitors and support local businesses



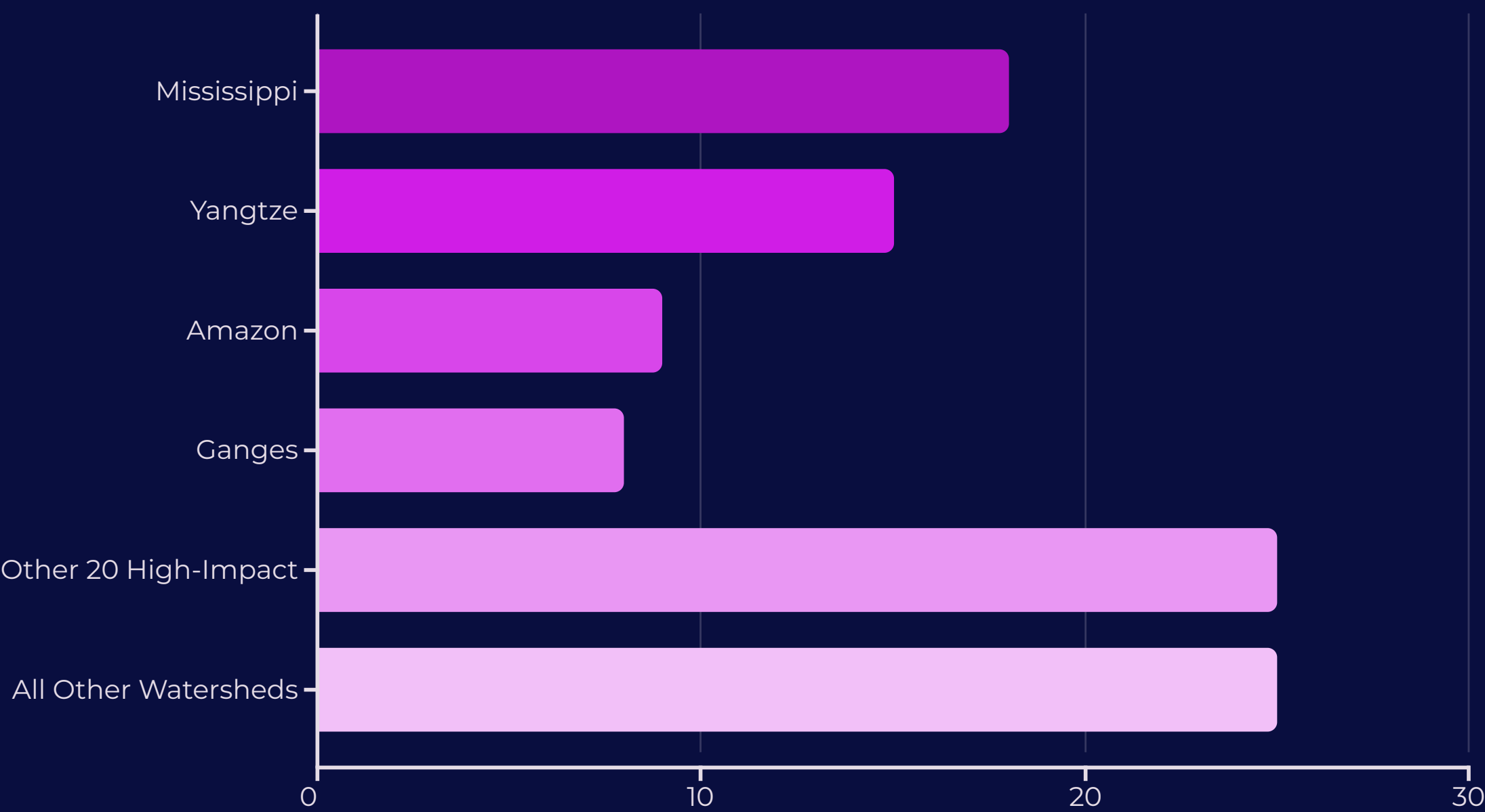
Reduced Healthcare Costs

Fewer waterborne illnesses mean lower community medical expenses

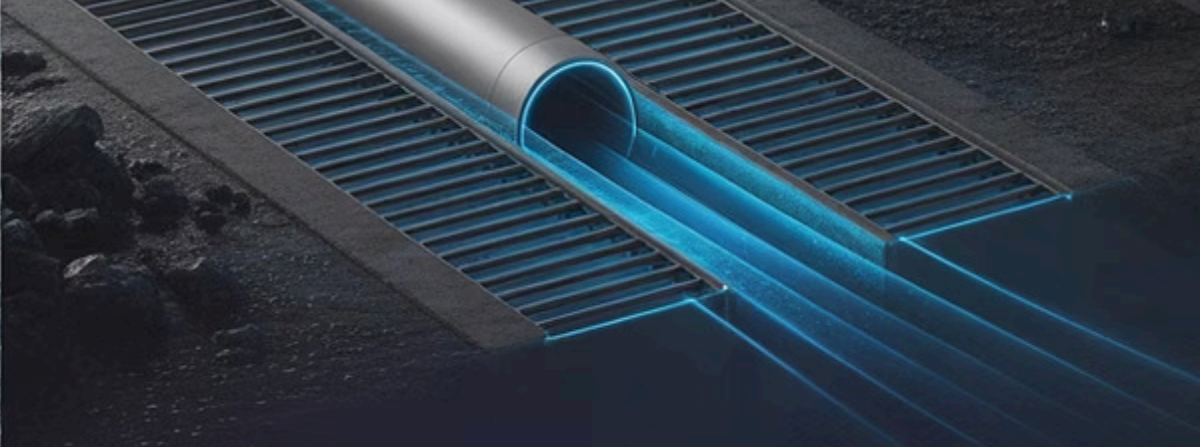
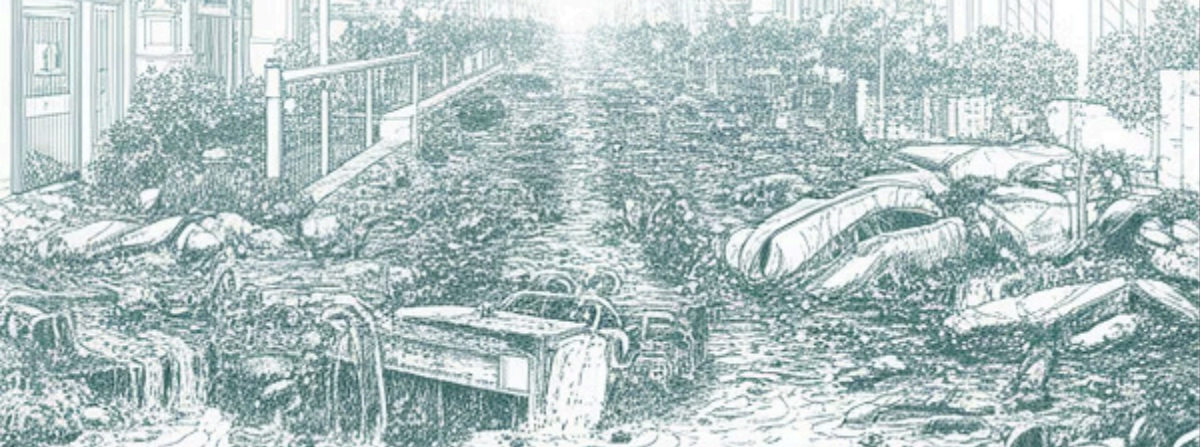
High-Impact Local Action for Global Climate Goals

Sewage pollution remains a neglected aspect of climate change, absent from COP28's Global Stocktake despite its role in 93% of planetary warming since the 1950s. By targeting nitrogen pollution in high-impact watersheds, towns can make disproportionate contributions to global ocean health.

Advanced treatment systems that reduce nitrogen by 40% directly support the ocean's role as a climate regulator. This represents a faster, more cost-effective climate action than many emission reduction technologies like solar panels or electric vehicles.



This chart illustrates how just 25 watersheds contribute nearly 75% of global nitrogen pollution, making targeted local action in these areas globally significant. Upgrading sewage treatment in these regions aligns with the 2023 UN High Seas Treaty goals for marine biodiversity protection.



Enhancing Community Resilience to Extreme Weather

Climate change is intensifying extreme weather events, with sewage pollution contributing to altered ocean currents and warming waters that fuel hurricanes and floods. Outdated combined sewer systems frequently overflow during heavy rain, releasing untreated wastewater directly into waterways.

Modern infrastructure separates stormwater from sewage and incorporates technologies like swirl concentrators to prevent overflows during storms. This separation is crucial as climate-driven weather events become more frequent and severe.



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Heavy Rainfall

Climate change increases storm intensity

Separate Systems

Stormwater diverted from sewage

Treatment Maintained

Wastewater properly processed despite storms

Protected Waterways

No raw sewage discharge during floods

Economic Benefits Through Resource Recovery

Modern treatment plants transform from pollution sources into resource recovery hubs. By extracting nutrients like nitrogen and phosphorus from wastewater, facilities can produce valuable fertilizers while simultaneously reducing pollution.

These resource recovery operations can offset 10% or more of treatment plant operational costs, creating a sustainable funding model. Additionally, preventing environmental degradation preserves economic assets like fisheries, where 60% of U.S. Atlantic bays already show seagrass decline due to pollution.



Regulatory Compliance and Cost Avoidance

Investing in modern sewage infrastructure helps communities avoid costly regulatory penalties under laws like the U.S. Marine Protection, Research and Sanctuaries Act or EU Urban Wastewater Treatment Directive. These regulations are increasingly enforced as awareness of sewage pollution impacts grows.

Beyond direct fines, communities face potential litigation costs from affected industries like tourism and fishing. The economic impact of environmental degradation from sewage pollution far exceeds the cost of infrastructure upgrades, particularly when considering long-term ecosystem service losses.

Regulatory Fines

Non-compliance penalties can reach millions of dollars annually under federal and state clean water regulations, creating ongoing financial liability for communities with outdated systems.

Litigation Costs

Businesses and property owners affected by sewage pollution increasingly pursue legal action, resulting in settlements and judgments that drain municipal budgets.

Ecosystem Service Losses

Degraded marine environments provide fewer economic benefits through reduced fishing yields, decreased tourism, and diminished coastal property values.

Remediation Expenses

Cleaning up pollution after it occurs costs substantially more than preventing it through proper infrastructure, especially for persistent contaminants in sediment.

Taking Action: Next Steps for Communities

Upgrading sewage infrastructure represents one of the most impactful climate and environmental actions a community can undertake. By reducing nitrogen pollution by up to 40%, towns directly address the urgent crisis of ocean pollution while protecting public health and local economies.

For communities in high-impact watersheds, this initiative offers an exceptional return on investment through environmental protection, improved community wellbeing, and leadership in sustainable climate action.

Assessment

Evaluate current infrastructure capacity and pollution impacts on local waterways

Planning

Develop comprehensive upgrade strategy with phased implementation approach

Funding

Secure financing through municipal bonds, federal grants, and public-private partnerships

Implementation

Execute upgrades with focus on nitrogen reduction and resource recovery capabilities

Monitoring

Track environmental improvements and economic benefits to demonstrate success