

THE COVID-19 PANDEMIC'S IMPACT ON PENNSYLVANIA'S MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) COMMUNITIES

(Preliminary Survey Findings)

January 2022



Volunteers Planting, Jenkintown Creek Restoration Project, Cheltenham Township, PA

(Credit: Tookany/Tacony-Frankford Watershed)



STORMWATER
LIVING LAB

Project Contacts:

Susan Myerov, AICP

Program Director - Watersheds

Pennsylvania Environmental Council


smyerov@pecpa.org

www.pecpa.org

Hong Wu, Ph.D.

Assistant Professor, Department of Landscape Architecture;
Director, Penn State Stormwater Living Lab

The Pennsylvania State University

huw24@psu.edu 

<https://sites.psu.edu/stormwaterlivinglab/>

Please feel free to contact either Susan or Hong for any questions and comments. Thanks.

Acknowledgment

Funding for this project was provided by the Pennsylvania Environmental Council (PEC) and Penn State University's Strategic Initiatives Seed Grant "Greening our stormwater: using campuses as living labs for green stormwater infrastructure." We wish to thank all the survey respondents for providing valuable input. Thanks are extended to Penn State Extension's Tyler Groh for hosting a Water Cooler Talk webinar in July 2021 for reporting preliminary findings, to the webinar attendees for providing feedback and future research ideas, and to Penn State Landscape Architecture alumni Yiru Zhang and PEC's Paul Racette, Joshua Raulerson, and Sally Tarhi for contributing to the final production of the report.

Disclaimer

This study was approved by the Institutional Review Board at Penn State University [STUDY00016323].

This report can be cited as:

Myerov, S. & Wu, H. (2022). "The COVID-19 Pandemic's Impact on Pennsylvania's Municipal Separate Storm Sewer System (MS4) Communities - Preliminary Survey Findings." Pennsylvania Environmental Council and Penn State Stormwater Living Lab.

Table of Contents

Executive Summary	1
I. Introduction and Background.....	1
A.Study Purpose	1
B. MS4 Definition.....	1
C. MS4 Program History.....	2
D. PA’s MS4 Communities and Requirements.....	2
II. Method and Tools for Analysis	3
A. Sampling Approach	3
B. Data Analysis methods	4
III. Results and Data Interpretation	4
A. Response rates.....	4
B. Results	5
<i>B1. MCM impacts</i>	<i>5</i>
<i>B2. PRP/TMDL projects impacts</i>	<i>6</i>
<i>B3. Impacts on compliance</i>	<i>6</i>
<i>B4. Impacts on maintenance</i>	<i>6</i>
<i>B5. Financial impacts</i>	<i>10</i>
<i>B6. Impacts by community type.....</i>	<i>10</i>
IV. Summary of Findings and Recommendations.....	11
V. Input by Online Seminar Participants.....	13
Appendix A: PEC+PSU Stormwater Agencies COVID-19 Impact Survey Instrument.....	15

Executive Summary

This preliminary report synthesizes results from a joint study by the Pennsylvania Environment Council and Penn State Stormwater Living Lab on the impacts of COVID-19 on Pennsylvania's Municipal Separate Storm Sewer System (MS4) Communities. Based on an online survey of 123 PA MS4 communities, the range and degree of impacts on the six minimum control measures (MCMs), review of private- or local government-led design and construction of PRP/TMDL projects, program compliance, other administrative functions, maintenance, and budgeting are discussed. In general, respondents displayed overall resiliency, with most program elements rated as experiencing slight to moderate impacts. Among the six MCMs, Public Involvement and Participation and Public Education and Outreach were the most impacted. The top three reasons cited for MCM impacts are staff hours shifted to other priorities, inability to hold in-person activities, and health and safety protocols (e.g., social distancing, separate vehicle travel). Future research may be necessary to verify the representativeness of the findings and further understand the variations in impacts to different communities over a longer term.

I. Introduction and Background

A. Study Purpose

In January 2021, researchers from the Penn State University's Stormwater Living Lab (PSU) and staff of the Pennsylvania Environmental Council (PEC) undertook two separate, but similar surveys to understand the impacts of the COVID-19 pandemic on Pennsylvania's local governments subject to the requirements of the US Clean Water Act's Municipal Separate Storm Sewer System (i.e., MS4) Permit program. Both surveys covered questions evaluating and measuring impacts to municipal water quality initiatives, including stormwater program implementation, capital investments, funding and financing, and administrative compliance efforts. Using networks of contacts throughout the state, the initial surveys resulted in 65 responses by April 2021. Upon learning of the efforts, PSU and PEC collaborated to jointly evaluate each survey's initial findings, re-tooled the survey instrument, and re-sent to the list of over 1000 PA MS4 permit holders in June 2021 to increase the number of responses. This report provides a summary of the outcomes of the two efforts, combining responses and analyzing results from a total of 123 responses.

The desire of both PSU and PEC to undertake this research was to assess the impacts of COVID-19 on the operational extent and budget of Pennsylvania MS4 communities. These findings will be used to help evaluate the types of resources needed the most among the Commonwealth's many stormwater permittees.

B. MS4 Definition

MS4 is an acronym for Municipal Separate Storm Sewer System. This refers collectively to the infrastructure that collects and conveys rainwater that falls to the nearest stream, creek, or river system. The municipal part of the acronym means that the system is owned or operated by a public agency, such as a city, town, county, flood control district, state, or federal agency. Separate means that the system does not connect to the sanitary sewer system and does not lead to a wastewater treatment plant. Finally, the term storm sewer system refers to the drains, ditches, curbs, and gutters that move stormwater from one place to another.

C. MS4 Program History

Passed in 1972, the Federal Clean Water Act (CWA) established the basic structure for regulating discharges of pollutants into the waters of the United States and regulated quality standards for surface waters. The CWA prohibits discharging “pollutants” through a “point source” into a “water of the United States” unless a National Pollutant Discharge Elimination System or NPDES permit is obtained. The NPDES stormwater program regulates some stormwater discharges from three potential sources: MS4s, construction activities, and industrial activities. Through the intervening years, significant progress was made cleaning up the major rivers of the US via controls on point sources through the NPDES program – including over 10,000 regulated industrial/sewage dischargers.

By 1987, the act was amended to establish a program to control non-point source pollution, or pollution not from a single pipe but from multiple, diffuse sources. The 1990 Phase I regulation required medium and large cities or certain counties with populations of 100,000 or more to obtain NPDES permits. In Pennsylvania, the Phase I cities included Philadelphia and Pittsburgh.

By 1999, the Phase II regulations required small MS4s in US Census Bureau-defined urbanized areas to obtain NPDES permit coverage for their stormwater discharges. Phase II also includes non-traditional MS4s such as public universities, departments of transportation, hospitals, and prisons. In Pennsylvania, the MS4 program is managed by the PA Department of Environmental Protection (DEP), which fulfills this role to comply with federal mandates under the CWA. The EPA has an oversight role because they are the federal agency charged with implementing the CWA. The authorization that MS4 Communities get from DEP to legally discharge stormwater into local streams and rivers is the NPDES permit.

D. PA’s MS4 Communities and Requirements

Pennsylvania’s Phase II permits were first issued in 2002, which required communities to develop and implement a stormwater management program to reduce contamination and address the following six minimum control measures (MCMs):

- Public Education and Outreach
- Public Involvement and Participation
- Illicit Discharge, Detection, and Elimination
- Construction Site Stormwater Runoff
- Post Construction Stormwater Management
- Municipal Pollution Prevention and Good Housekeeping

The permits are issued for five years. Municipalities needed to specify and implement practices that would meet the six MCMs. In addition, they must file an annual report to document progress on their stormwater programs and how they are meeting the six MCMs. During this time, many resources to assist MS4 permit holders were developed by PADEP, County agencies (e.g., Planning Commissions, Conservation Districts), regional NGOs and watershed groups, among others. These resources continue to be updated and refined to help meet the changing needs of the MS4 communities.

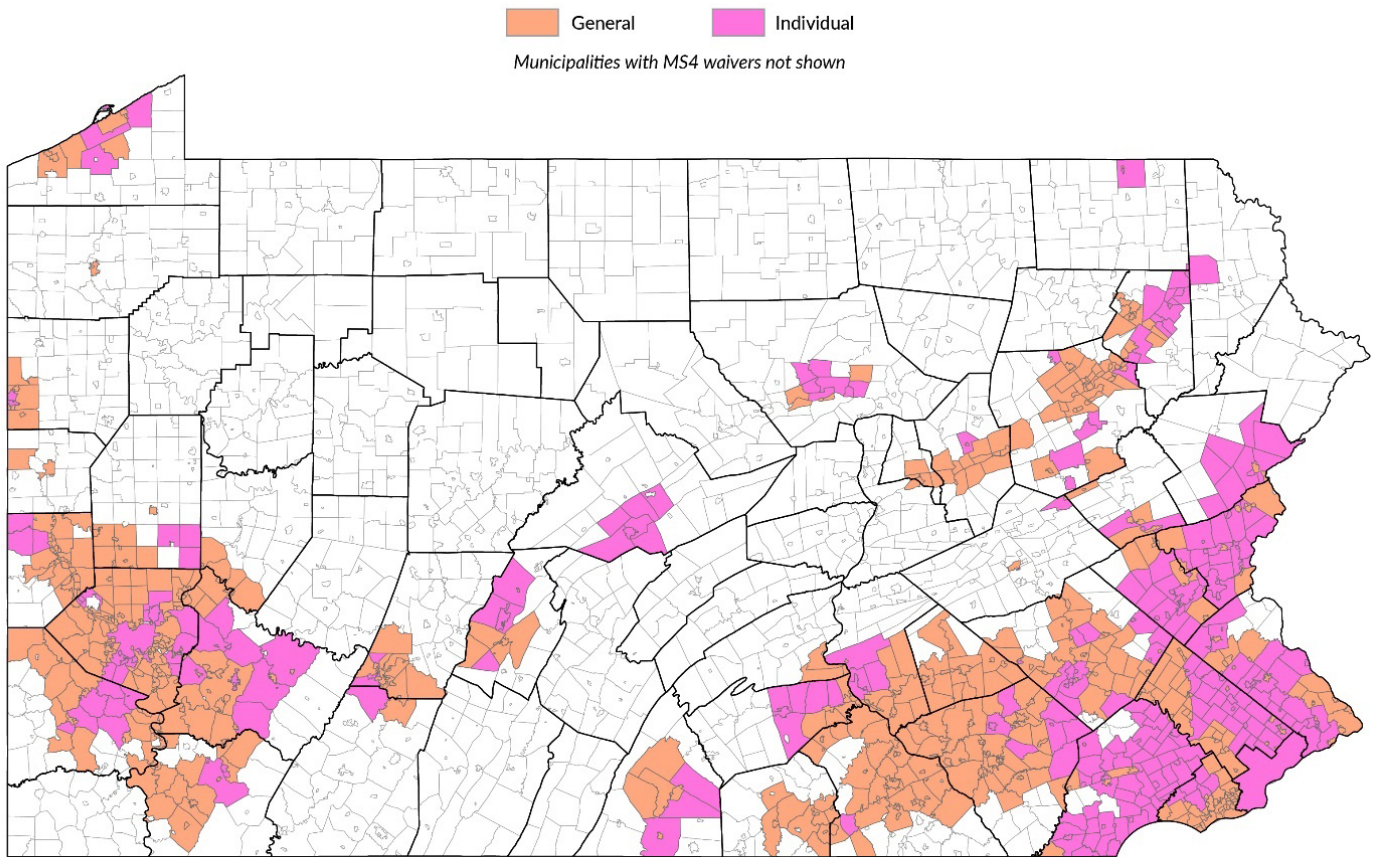
Changes to the permits were made after 2012 that impact the current MS4 permit round (2018-2023), including expanded opportunities for public review and comment on proposed Total Maximum Daily Load (TMDL) plans, and development of Pollutant Reduction Plans (PRP) for any MS4 community discharging to an impaired stream.

Currently, there are 1059 regulated small MS4s in PA and 2 large MS4s (Philadelphia and Pittsburgh). These are shown in Fig. 1 below.

II. Method and Tools for Analysis

A. Sampling Approach

Both PSU and PEC employed the method of an online survey to capture impacts from the COVID-19 restrictions on PA's MS4 permittees, recognizing and learning from insights gained from local partners. PEC utilized the Survey Monkey platform, and PSU used Qualtrics. Both initial surveys relied for distribution on partner networks, which included county planning commissions, county conservation districts, and MS4 program coordinators. The initial PEC survey questions were crafted to address specific permit activities that municipalities must include in their annual reports, including the six MCMs and activities in support of their Pollutant Reduction Plans (e.g., financing, pre-design, construction, post-construction monitoring). It also sought to learn about other indirect impacts and capture



Data Source: PEC, based on PA DEP MS4 municipal permittee database dated 3/5/2018
*Please note that the MS4 program is dynamic and may change at any time

Map created August 2021

Fig. 1 Pennsylvania MS4 communities

examples of potential positive impacts that could be shared more broadly. In addition, demographics and community characteristics were collected to allow analysis based on size, type, and location. The initial PSU survey included similar questions related to the impacts to certain aspects of the permit compliance requirements, with additional finance and budget questions.

By combining the topic areas of the separate surveys, the joint online survey took place in January-July of 2021 (see survey link and instrument in Appendix A). The instrument consisted of 38 questions, focusing on 1) the impacts to each MCM – degree and cause, 2) impacts on review of private development projects, or local government design/construction of PRP/TMDL projects, 3) frequency of maintenance activities, 4) extent of impacts to program compliance and other administrative functions, 5) budget implications, and 6) impacts on other municipal programs (e.g., trash, recycling, park use). Impacts were measured on a 5-point scale:

- 1 = No Change from Pre-Covid Activity;
- 2 = Slight Impact (some postponement, little interruption);
- 3 = Moderate Impact (some postponement and some interruption);
- 4 = Moderate to Severe (significant delay or disruption in activity);
- 5= Extreme (program activities stopped).

Using an ArcGIS shapefile of PA MS4 communities maintained by PEC and a contact information spreadsheet downloaded from the Pennsylvania Department of Community and Economic Development,¹ we reached out via email to all the mapped MS4s that had not responded to earlier surveys. Additionally, PEC and Penn State Extension helped distribute the survey to their network contacts through emails. By July 14, 2021, a total of 135 responses were collected, of which 123 were complete.

B. Data Analysis methods

All the data were analyzed using IBM® SPSS® version 28. We used descriptive statistics and group comparison tests (e.g., one-way repeated measures ANOVA with post-hoc tests and paired-sample T-Tests) to characterize the impact levels and test for differences among multiple aspects of MCMs, review of private/local government PRP/TMDL projects, program compliance, and maintenance. Additionally, the average ratings of the impacts on the six MCMs were calculated, and Pearson’s correlation tests were used to explore whether the average impact level significantly correlated to community types (i.e., watershed location, government type, population size, and the number of stormwater program employees).

III. Results and Data Interpretation

A. Response rates

As mentioned above, 123 (11.6% of all 1061 MS4s) complete responses were received by July 2021; 84 indicated their locations. They included 34 from the Delaware River Basin, 37 from Susquehanna River

¹ https://munstats.pa.gov/Reports/ReportInformation2.aspx?report=LocalOfficial_Excel

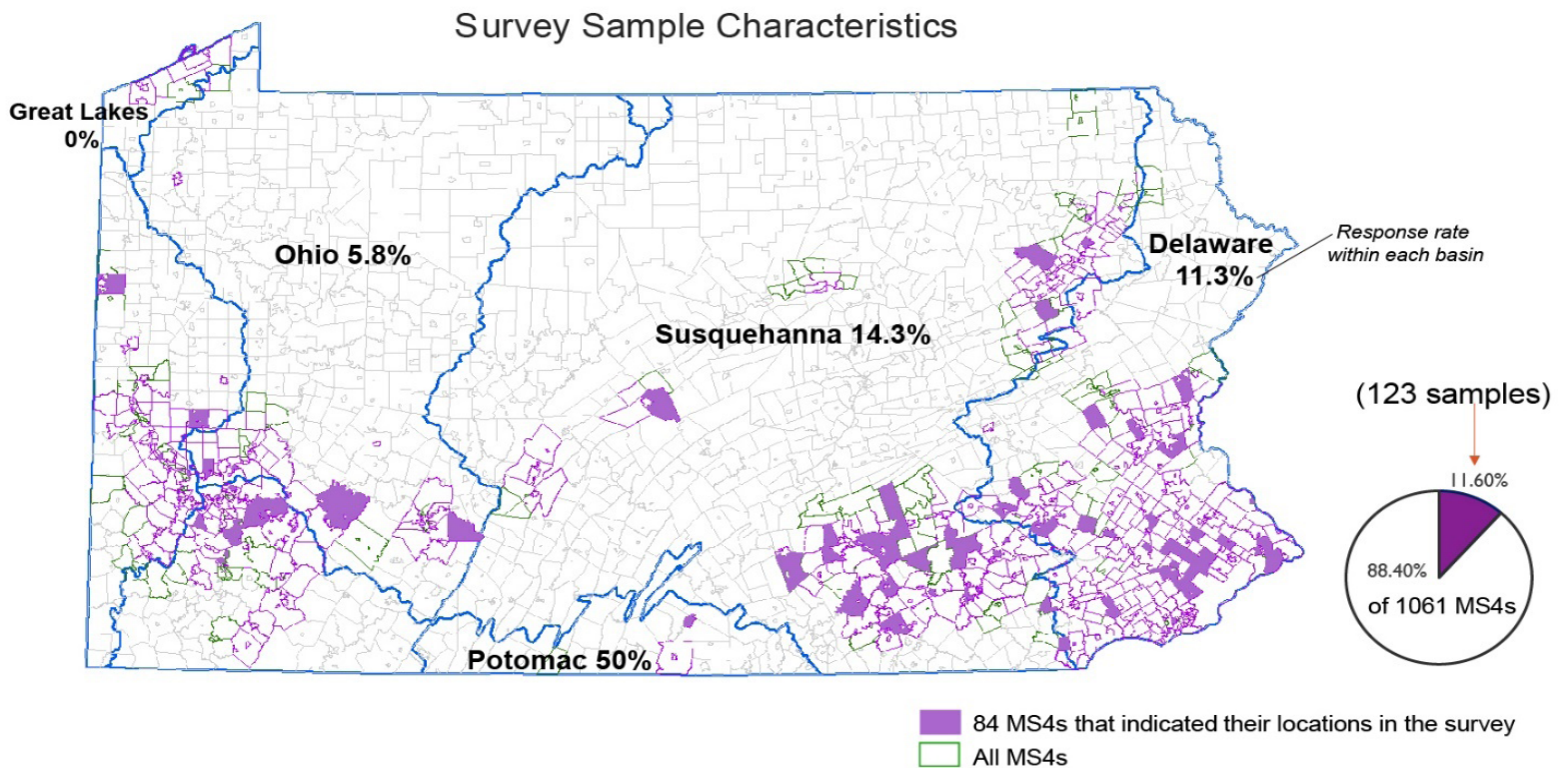


Fig. 2 Response Rates by River Basin

Basin, 17 from the Ohio River Basin, and 1 from the Potomac River Basin. The response rate in each basin based on these 84 samples (# of responded MS4s/total # of MS4s in this basin) is 11.3% (Delaware), 14.3% (Susquehanna), 50% (Potomac), 0% (Great Lakes), and 5.8% (Ohio).

B. Results

B1. MCM impacts

Among the six MCMs, MCMs 1 and 2, i.e., Public Involvement & Participation (MCM1) and Public Education and Outreach, were the most impacted. However, the impacts were rated from slight-moderate to moderate (mean ratings varying from 2.41 to 2.67). In contrast, MCMs #4 and #5, i.e., Construction Site Runoff Control and Post Construction Stormwater Management in New Development & Redevelopment, were the least impacted; the impacts were rated minimal-slight (mean ratings varying from 1.58 to 1.61). This result is illustrated in Fig. 3. More specifically, for MCMs #2 and #1, 32% and 20% of respondents rated the impacts as moderate-severe to extreme, respectively.

Regarding the reasons for individual MCM impacts, Fig. 4 shows how frequently each of the 11 types of impacts was cited by the participants. We analyzed the top three reasons for each MCM, and those most frequently listed across all MCMs were: staff hours shifted to other priorities (all 6 MCMs), inability to hold in-person activities (5 out of 6 MCMs), and health and safety protocols (e.g., social distancing, separate

Impacts on Six MCMs

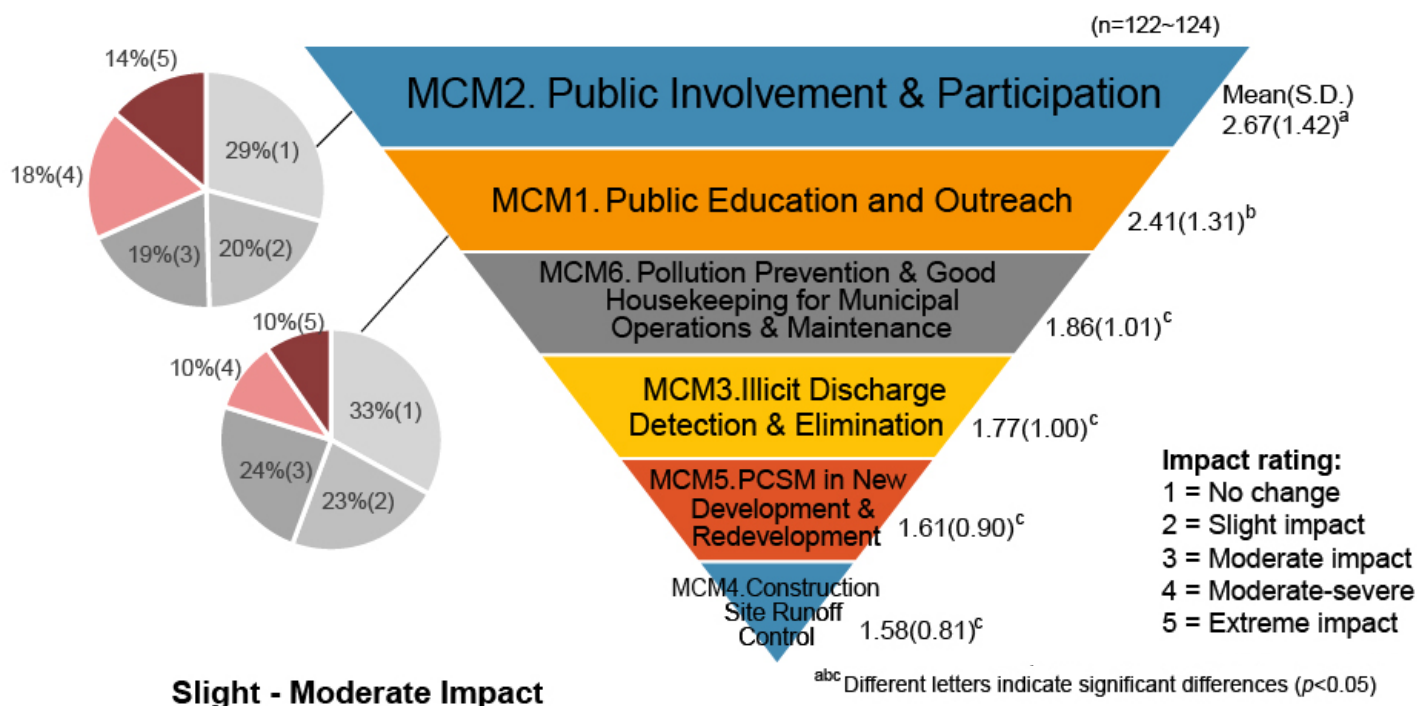


Fig. 3 MCM impacts

vehicle travel, etc.) (Fig. 5). Additional reasons characteristic of particular MCM(s) include construction pause, delay, or reduction; staff quarantine; and lack of coordination due to agency office closure.

B2. PRP/TMDL projects impacts

The review of private development projects or local government design/construction of PRP/TMDL projects was slightly impacted (Fig. 6). Local government-led planning/design of SCMs for PRP/TMDL plans was the most impacted among the four (mean = 1.99), and developer-led construction of new/retrofit SCMs (grey or green) was the least impacted (mean = 1.59).

The primary reasons for the review included staff hours shifted to other priorities; construction pause, delay or reduction; and health and safety protocols (Fig. 7). Budget reduction, grant delay, and inability to carry out in-person oversight were also listed.

B3. Impacts on Compliance

Program compliance and other administrative functions were slightly impacted (Fig. 8). Applications for NEW stormwater funding program support was the most impacted (mean = 2.17), and preparation of MS4 annual report was the least (mean = 1.66).

B4. Impacts on maintenance

The average frequency of maintenance activities during the pandemic (mean = 2.23) showed a significant difference from pre-pandemic levels (mean = 1.93) ($t(106) = -4.890, p < .0005$) (Fig. 9). The percentage of respondents choosing the category of frequent (monthly/bimonthly) had the biggest reduction from 41% to 24%.

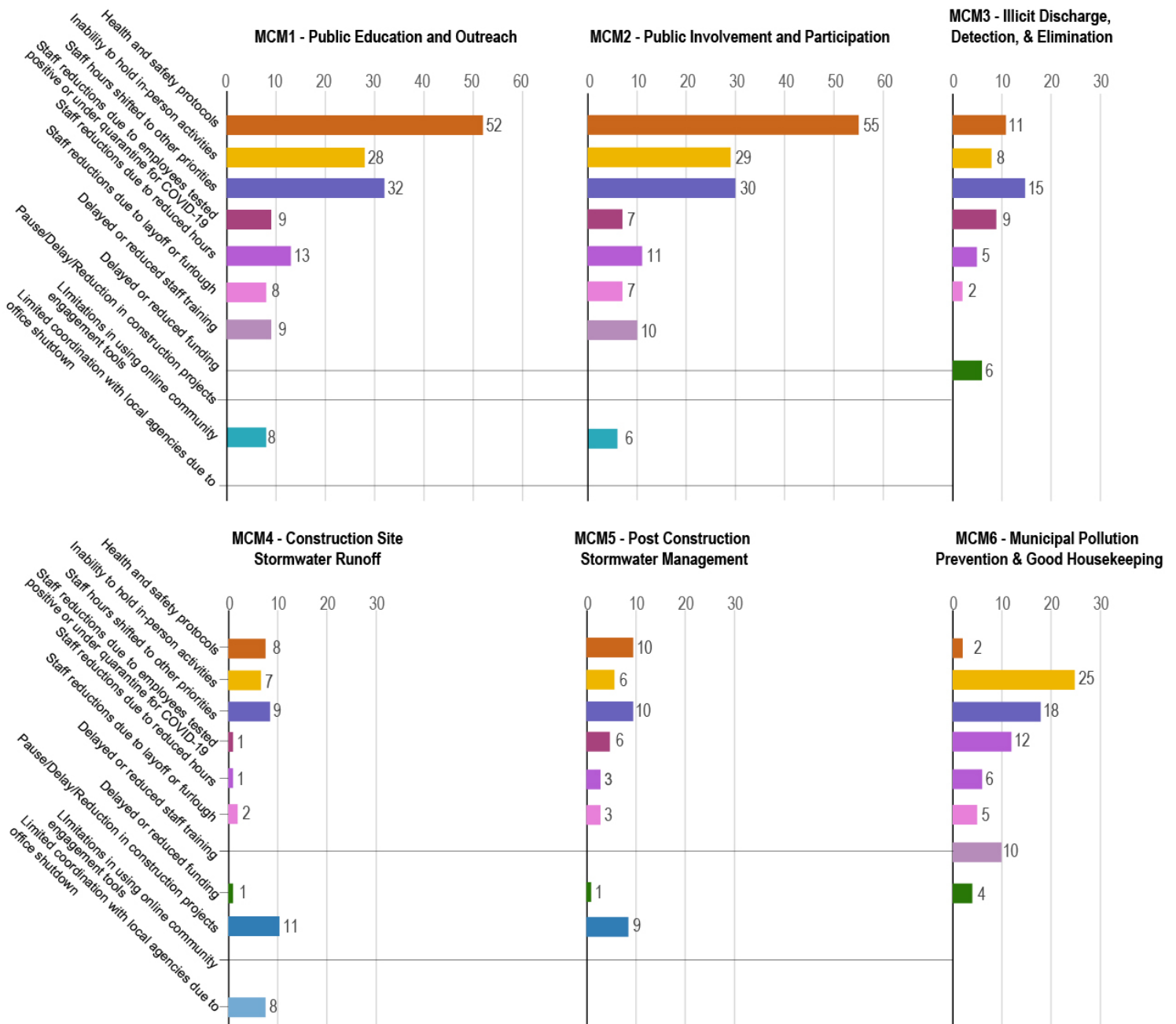


Fig. 4 Reason for individual MCM impacts

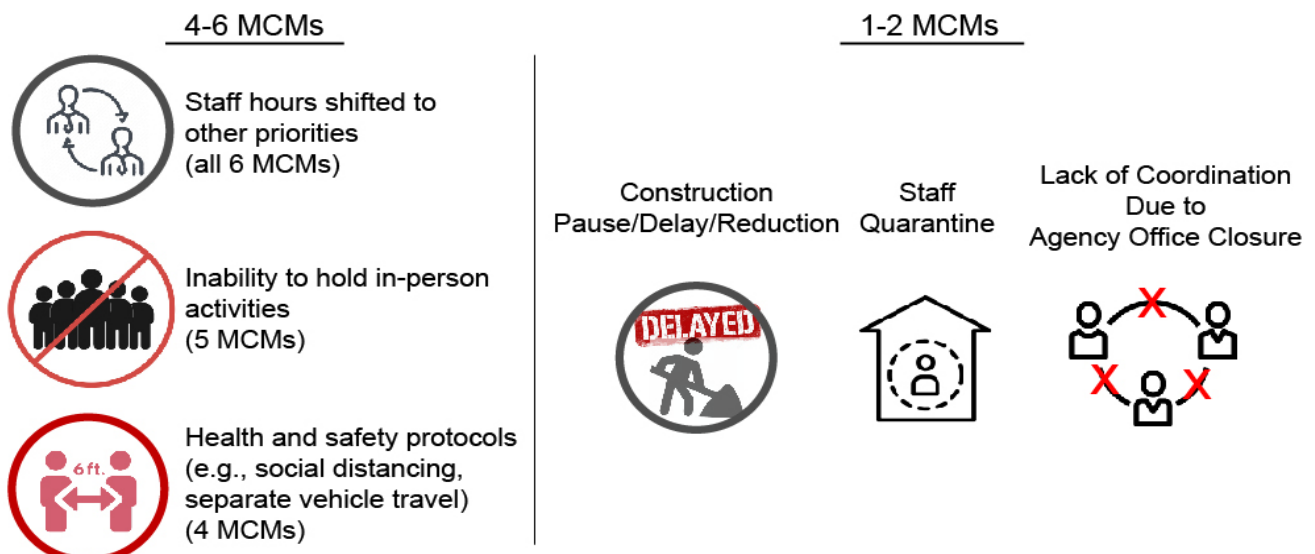


Fig. 5 Summary of primary MCM impacts

Review of private development project or local government design/construction of PRP/TMDL Projects

(n=116~119)

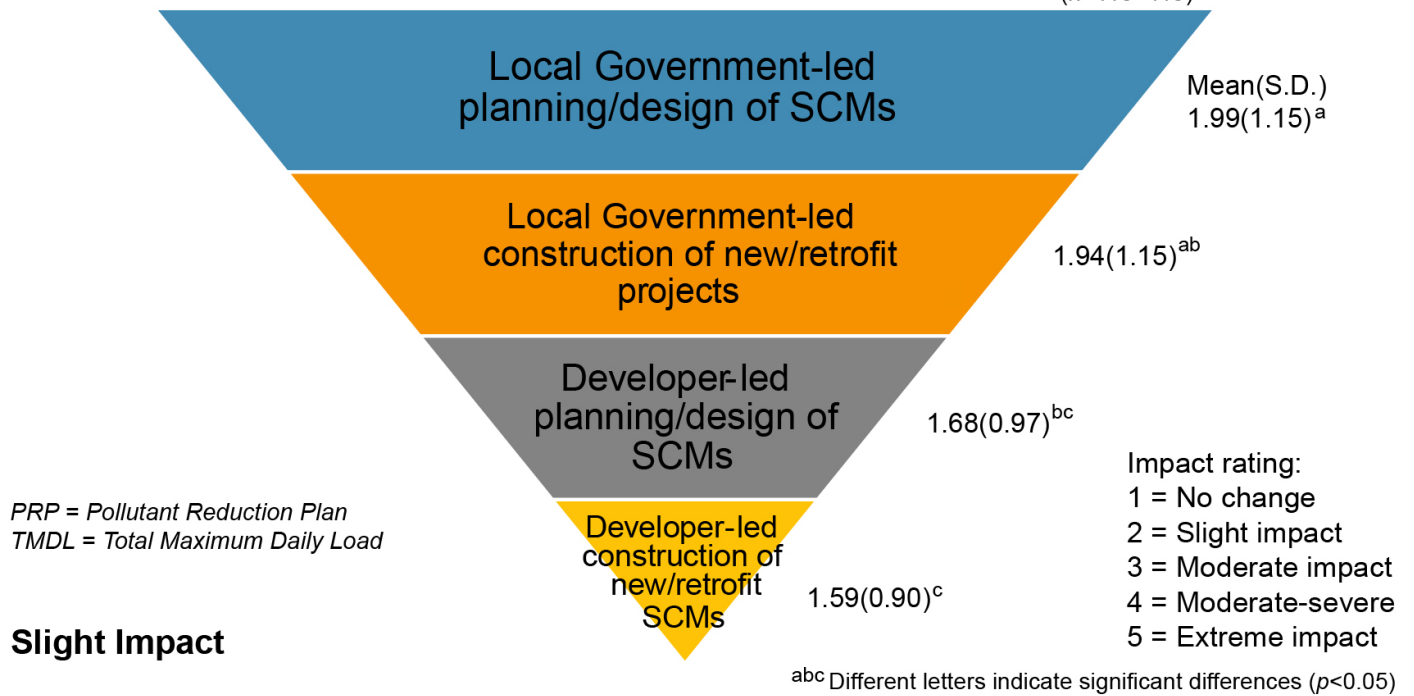


Fig. 6 Impacts on review of private or local government PRP/TMDL projects

Primary Impacts on Private/Government Planning/Construction Projects



Fig. 7 Summary of primary impacts on private or local government PRP/TMDL projects

Impacts on program compliance & other administrative functions

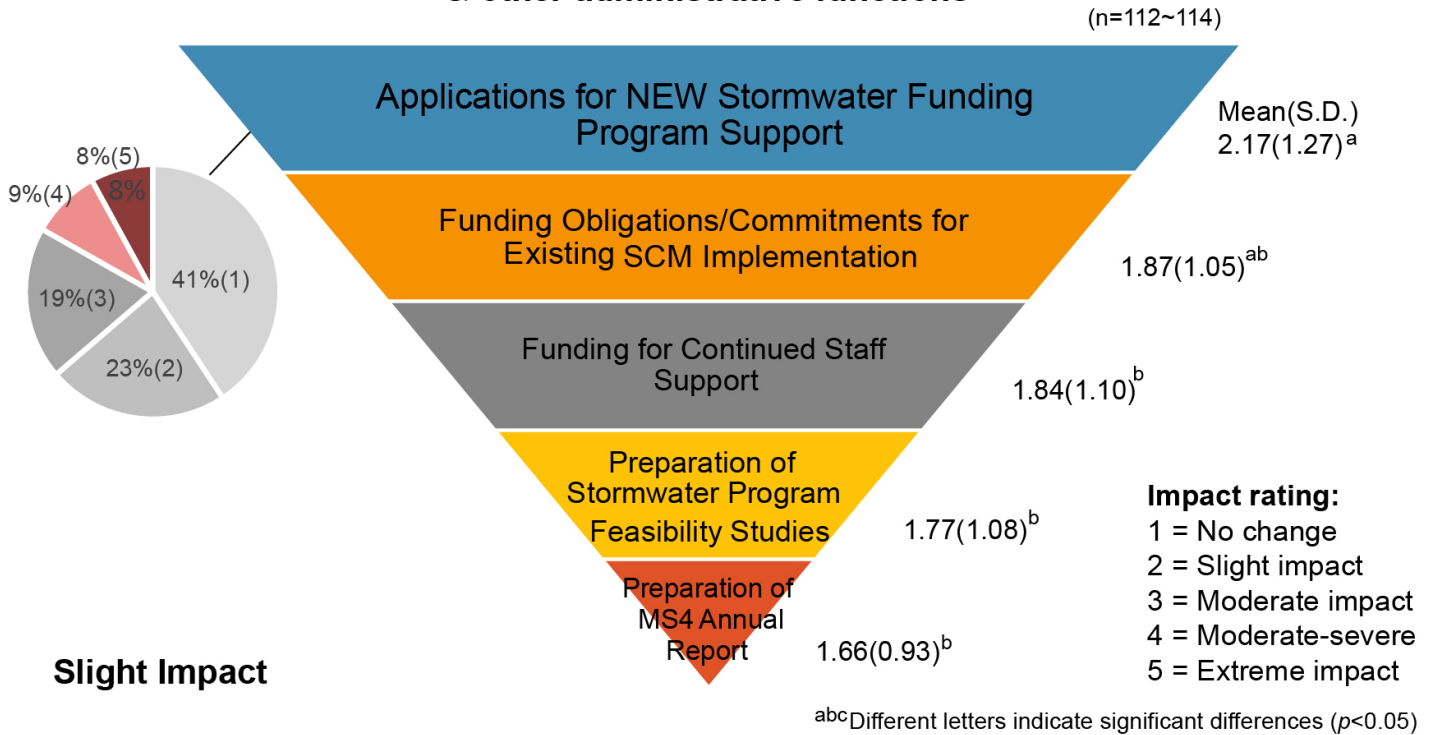


Fig. 8 Impacts on program compliance and other administrative functions

Impacts on Maintenance

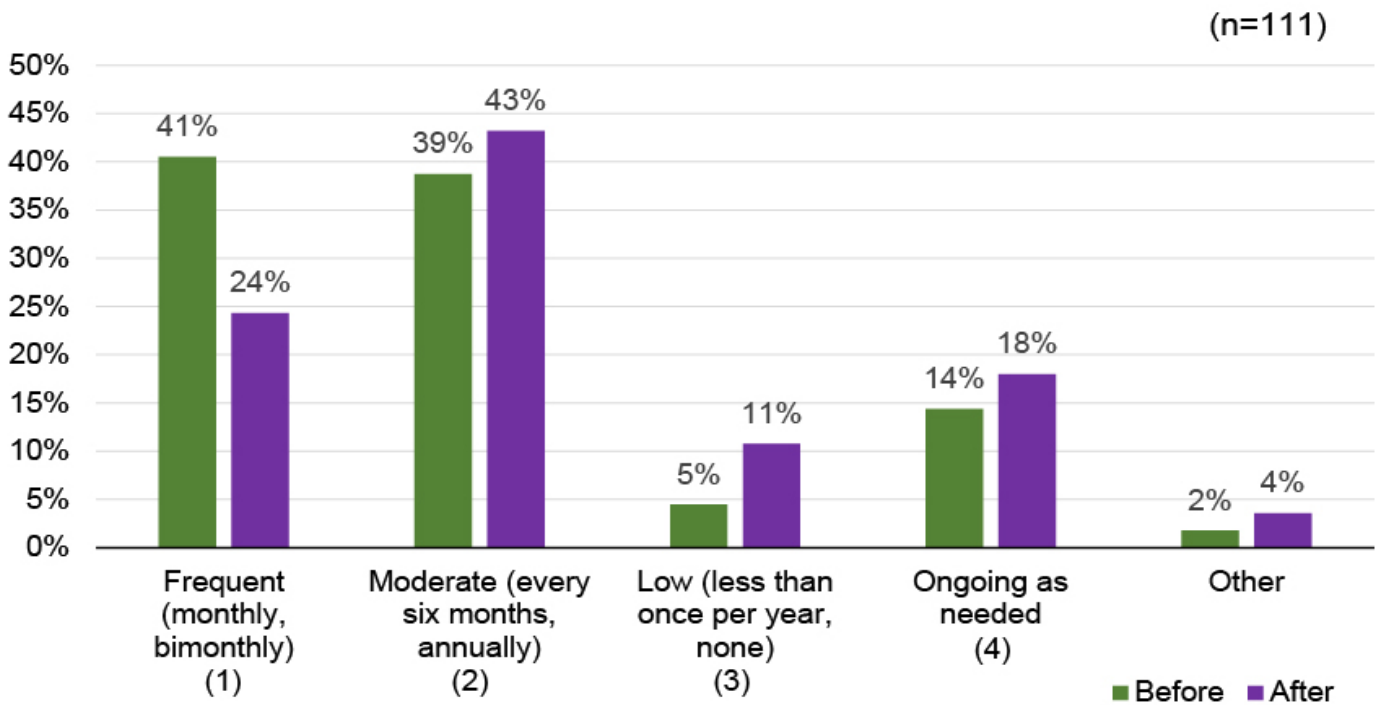


Fig. 9 Impacts on maintenance

B5. Financial Impacts

With regard to financial impacts, we asked about the current MS4 stormwater fee program status and the types and degree of impacts on budgets in three separate questions, for which 65, 29, and 24 provided input, respectively.

First, the vast majority (72% of 65) of the respondents indicated no presence of current stormwater fee programs, 20% reported fees being collected as usual, and 6% reported fee programs still under approval (Fig. 10-I). A few open-ended responses also helped shed light on the fee program and other impacts, such as *"Fee still needs approved [sic], but COVID-19 has caused financial hardships to many who will be forced to pay for this unfunded mandate"*; *"Our fee is being collected as usual; implementation of our new structure has been affected by COVID-19 and delayed until 2022."* Second, regarding types of budget impacts, 29 responses were received (Fig. 10-II). Delay in grant program approvals was the most mentioned (13), whereas reduction in typical grant funding available, budget freeze, and budget cuts were also commonly mentioned. Third, 24 responses were received regarding the degree of budget impacts (Fig. 10-III). Slightly over half (13 out of 24) of the participants indicated that budget *"stayed the same,"* whereas a few others (3 out of 24) reported a substantial budget decrease of over 40%. The overall impacts indicated by this small sample appear moderate; however, the open-ended responses below suggested certain communities might have more significant impacts. We need to obtain additional survey responses to more accurately quantify the more significant impacts.

"We were able to budget for the design for projects but no implementation. We are not even close to being able to sustain the complete program."

"Merely holding off to determine cash flow."

"Revenue has decreased, and costs have increased, causing a \$1M deficit."

"ALL funding disappeared just before COVID."

"We're currently catching up from lost hours coordinating projects, so budgets won't be spent this year as planned."

"Operating funds remained the same, but no capital funds were authorized."

B6. Impacts by community type

No significant correlations were found between the average impact of the six MCMs and other variables concerning community type (i.e., basin, government type, population size, and the number of stormwater program employees). It appeared that the Delaware River Basin had the highest share of higher-impact MS4s (defined as average MCM impact >3.0). Of the 15 MCMs that indicated higher impact with a known location, 10 (67%) were from the Delaware River Basin. More data needs to be collected to verify any significant pattern and identify the underlying reasons.

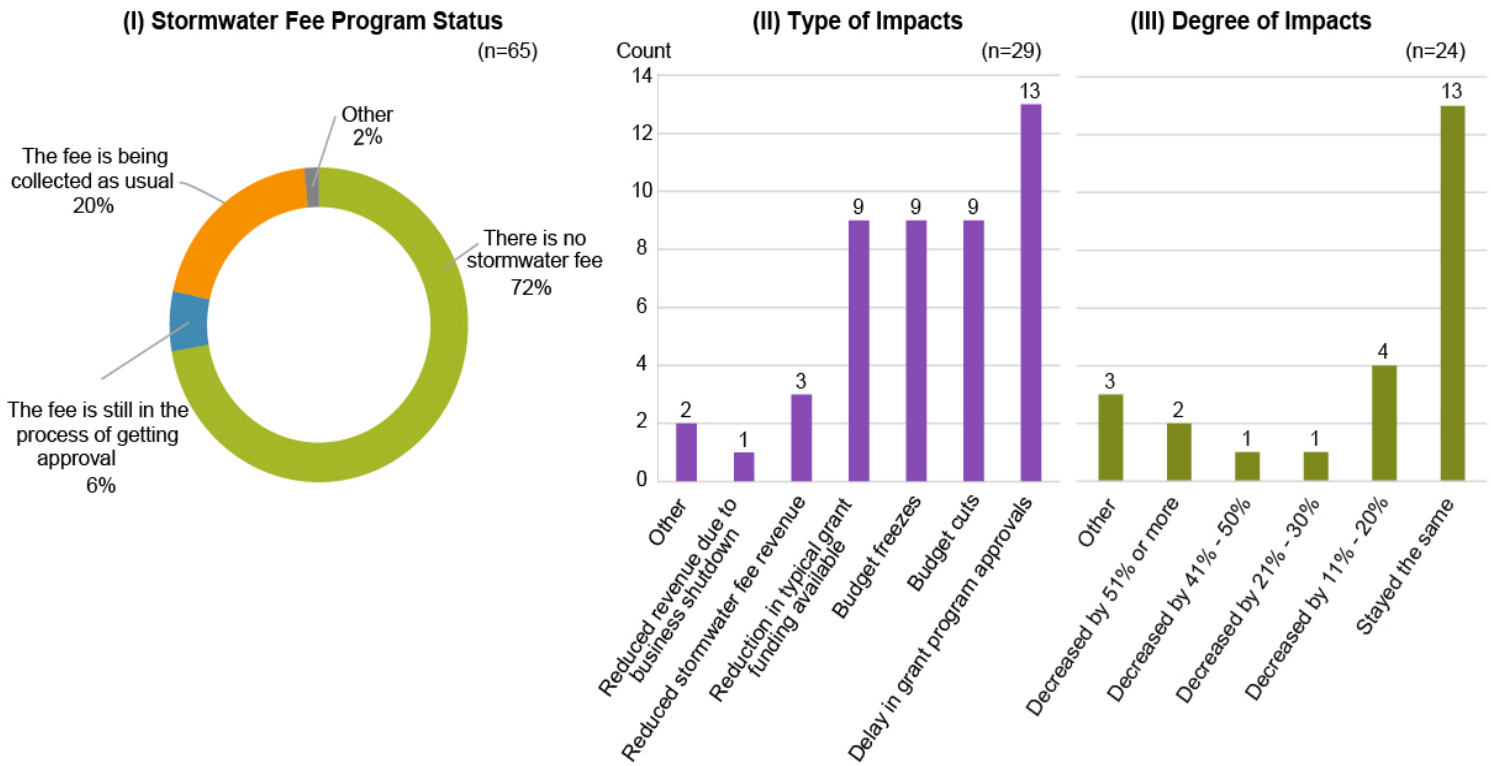


Fig. 10 Financial impacts

IV. Summary of Findings and Recommendations

Primary findings:

1. Respondents displayed overall resiliency, with most program elements rated as experiencing slight to moderate impacts.

This finding indicated that most of the respondents were able to adapt/continue MS4-related programs, especially with respect to their six minimum control measures. The research team was a bit surprised at this particular finding, which may have resulted from the relatively low response rate. More survey data is necessary to verify the representativeness of the finding.

2. The most impacts were expressed on public outreach and education.

As might be expected, the most disrupted program aspects centered on MCMs #1 and #2 – both related to public education and public involvement. Those impacts reflected the inability to hold in-person events as the top reason for program disruption.

This finding indicated the need to provide resources to permit holders that can help fulfill MCMs #1 and #2 requirements. Resources include those available via PSU Extension and other non-profit organizations such as PEC and local watershed groups. All of these agencies and non-profits are very interested in supporting pollution-prevention education.

- PSU research/Extension resources (<https://extension.psu.edu/stormwater-basics>)

- PEC stormwater management resources (<https://pecpa.org/program/stormwater-education>)

3. Redirection of staff priorities was a leading reason for other program impacts.

On a more general note, the top reasons cited for other program-related disruptions, including Stormwater Control Measures maintenance, enforcement, and construction management functions, were consistently related to staffing being redirected to other municipal priorities, or to staff reductions overall. These staffing alterations delayed or created difficulties in carrying out tasks such as site inspections. For construction-related impacts (those associated with MCM5 – Post Construction Stormwater Management), the second-most cited reason for disruptions was related to reduction in construction activities.

Recommendations:

Based on the findings above, there is a need for MS4 communities to increase future resilience to staff shortages. This could include training of others such as community volunteers to provide additional checks on existing infrastructure, and working with community watershed associations who may be able to offer assistance in site maintenance activities. Other steps include workforce development in Green Infrastructure operation and maintenance, which is an emerging trend in many regions. These efforts are aimed at developing professional career paths for individuals to help manage and maintain vegetated infrastructure. Examples include:

- Power Corps PHL (<https://powercorpssphl.org/>) “engages disconnected young adults and returning citizens” in advancing their lives through service. Power Corps PHL enrolls members in full-time AmeriCorps service to support Philadelphia’s workforce development priorities, environmental stewardship, and youth violence prevention.
- The Center for Watershed Protection’s Clean Water Certificate (CWC) Training Program (<https://www.cwp.org/cwc/>) is a certificate program that provides basic skills and knowledge for adults to secure an entry-level job in the stormwater industry.
- The Chesapeake Bay Landscape Professional (CBLP) Certification Program (<https://cblpro.org/>) is a voluntary certification program for professionals in Virginia, Maryland, Pennsylvania, and the District of Columbia who design, install, and maintain sustainable landscapes. The credential training and examination are based on a core set of standards in sustainable landscaping, emphasizing stormwater retrofit best practices and conservation landscaping with native plants to benefit the environment. There are two levels of training that focus on landscape professionals: an Associate program for the youth workforce and a pilot entry program initiated in 2019 for maintenance crews.
- Additional resources can be found in the Stormwater & Green Infrastructure Workforce Development Local Government Forum Report by the Alliance for the Chesapeake Bay Local Government Advisory Committee.²

² Alliance for the Chesapeake Bay Local Government Advisory Committee. (2020). Stormwater & Green Infrastructure Workforce Development, Local Government Forum Report. Center for Watershed Protection. https://www.chesapeakebay.net/channel_files/39804/copy_of_2019_lg_forum_report_-_printable_version.pdf

V. Input by Online Seminar Participants

As a follow-up to the survey, PEC staff and PSU Stormwater Living Lab researchers hosted an online seminar at the PSU Extension Water Cooler Talk on July 21, 2021, to present findings from the survey. The following are comments and questions received by ~40 attendees, including municipal elected officials and staff, MS4 consultants, NGO staff, PSU faculty, Extension educators, students, and interested citizens.

Funding

- *"I think future impacts or concerns should be raised with communities because of the potential for long-term funding impacts (from local, state, and federal sources). ARPA funding is short-term, and these are long-term projects and management issues."*
- *"We are waiting for regulations on how we can use the ARPA funds for stormwater management, MS4 projects."³*
- *"It is hard for municipalities to not fund stormwater since it is a required service within an increasing number of communities, [sic] a dedicated funding stream."*
- *"Interesting - and encouraging - that construction projects did not seem to be heavily impacted!"*
- *"Expected more municipalities to express financial impacts."*
- *"Expected more financial impacts on MS4 programs."*

Virtual vs. In-person Meetings

- *"Comfort with virtual meetings provides opportunity to reach more residents with education outreach who may not find the time to travel and attend in-person."*
- *"We noticed that at beginning of pandemic shutdown, there was a learning curve to adapt and learn new online and virtual meeting tools. In last few months, there were more education and outreach activities scheduled."*
- *"Virtual meeting tools are here to stay and can reach more people. Continuing learning tools and best practices will be helpful. Also, we expect more hybrid meetings with both in-person and virtual participation options; we'll need to learn how to hold hybrid meetings in the future."*
- *"Need to see resources provided that support combined in-person and hybrid outreach (e.g., audio resources); more people can then be reached via hybrid events."*

Questions and Possible Future Research Topics

- *"Can municipalities use America Rescue Plan Act funds to support MS4 programs?"⁴*
- *"Seems like grant applications were one of the areas that were very impacted - curious if you have a sense of why? Was it mostly due to staff shortages/capacity? This seems likely to affect PRP"*

3 Note: Interim Final Coronavirus State and Local Fiscal Recovery Funds Interim Final Rule was published by US. Treasury on May 17, 2021 and comment period opened.

4 Yes, see above Interim Final Rule – Eligible uses include ... "improve access to clean drinking water, improve wastewater and stormwater infrastructure systems."

implementation next year.”⁵

- “What could be the short-to-long (term) impact on construction and implementation of different projects, specifically due to construction limitations, supply chain, and general public input?”
- “Since supply chain and costs of materials have skyrocketed - will this impact implementation/ construction long term?”⁶
- “Do you think drinking water concerns (clean water and access to water for handwashing) were of more concern than stormwater during covid?”⁷
- “Are municipalities caught up? Are effects still being felt, or have they fully adapted?”⁸
- “Were higher impacts found in Environmental Justice Communities?”
- “Could you compare results between municipalities with established stormwater fee programs and those without fees?”

Based on these comments and questions, PEC staff and PSU Stormwater Living Lab researchers identified the following next steps and future research directions: 1) disseminate the present preliminary report to PA MS4s and relevant agencies such as the Pennsylvania Department of Environmental Protection for a discussion of primary findings, their representativeness, and underlying reasons; 2) identify research plans to further probe the research questions underlined above that focus on long-term impacts and impacts by community type.

5 From the limited survey responses, it appears that staff shortages and uncertain funding may have increased delays in grant funding program implementation.

6 These questions related to supply chain issues would need further research or evaluation by economic development specialists.

7 While we did not explicitly ask about clean water access, there have been studies showing that these issues were prevalent in certain communities within the US (e.g., Warner, M. E., Zhang, X., & Rivas, M. G. (2020). Which states and cities protect residents from water shutoffs in the COVID-19 pandemic? *Utilities Policy*, 67, 101118. <https://doi.org/10.1016/j.jup.2020.101118>).

8 This could be a question for a follow-up study.

VI. Appendix A: PEC+PSU Stormwater Agencies COVID-19 Impact Survey Instrument

Survey link: <https://bit.ly/PAMS4COVIDIMPACTS>

QR code:



We welcome more survey responses. Please click to provide your input if you have not done so already. Thank you!

COVID-19 impacts on the six minimum control measures (MCMs)

MCM1

Please rate the extent COVID-19 has impacted the minimum control measure of Public Education & Outreach (MCM1) required for stormwater program implementation.

- No Change from Pre-Covid Activity (1)
- Slight Impact (some postponement, little interruption) (2)
- Moderate Impact (Some postponement and some interruption) (3)
- Moderate to Severe (Significant delay or disruption in activity) (4)
- Extreme Impact (Program Activities stopped) (5)

Please describe the reasons for MCM1-Public Education & Outreach impacts (check all that apply).

- Inability to hold in-person activities
- Health and safety protocols (e.g., social distancing, separate vehicle travel, etc.)
- Limitations in using online community engagement tools
- Staff hours shifted to other priorities
- Staff reductions due to employees tested positive or under quarantine for COVID-19
- Staff reductions due to layoff or furlough
- Staff reductions due to reduced hours
- Delayed or reduced staff training
- Other (please specify)

MCM2

Please rate the extent COVID-19 has impacted the minimum control measure of Public Involvement & Participation (MCM2) required for stormwater program implementation.

- No Change from Pre-Covid Activity (1)
- Slight Impact (some postponement, little interruption) (2)
- Moderate Impact (Some postponement and some interruption) (3)
- Moderate to Severe (Significant delay or disruption in activity) (4)
- Extreme Impact (Program Activities stopped) (5)

Please describe the reasons for MCM2-Public Involvement & Participation impacts (check all that apply).

- Inability to hold in-person activities
- Health and safety protocols (e.g., social distancing, separate vehicle travel, etc.)
- Limitations in using online community engagement tools

- Staff hours shifted to other priorities
- Staff reductions due to employees tested positive or under quarantine for COVID-19
- Staff reductions due to layoff or furlough
- Staff reductions due to reduced hours
- Delayed or reduced staff training
- Other (please specify)

MCM3

Please rate the extent COVID-19 has impacted the minimum control measure of Illicit Discharge Detection & Elimination (MCM3) required for stormwater program implementation.

- No Change from Pre-Covid Activity (1)
- Slight Impact (some postponement, little interruption) (2)
- Moderate Impact (Some postponement and some interruption) (3)
- Moderate to Severe (Significant delay or disruption in activity) (4)
- Extreme Impact (Program Activities stopped) (5)

Please describe the reasons for MCM3-Illicit Discharge Detection & Elimination impacts (check all that apply).

- Inability to hold in-person inspections
- Health and safety protocols (e.g., social distancing, separate vehicle travel, etc.)
- Staff hours shifted to other priorities
- Staff reductions due to employees tested positive or under quarantine for COVID-19
- Staff reductions due to layoff or furlough
- Staff reductions due to reduced hours
- Delayed or reduced funding for inspection
- Other (please specify)

MCM4

Please rate the extent COVID-19 has impacted the minimum control measure of Construction Site Runoff Control (MCM4) required for stormwater program implementation.

- No Change from Pre-Covid Activity (1)
- Slight Impact (some postponement, little interruption) (2)
- Moderate Impact (Some postponement and some interruption) (3)
- Moderate to Severe (Significant delay or disruption in activity) (4)
- Extreme Impact (Program Activities stopped) (5)

Please describe the reasons for MCM4-Construction Site Runoff Control impacts (check all that apply).

- Inability to hold in-person inspections
- Health and safety protocols (e.g., social distancing, separate vehicle travel, etc.)
- Staff hours shifted to other priorities
- Staff reductions due to employees tested positive or under quarantine for COVID-19
- Staff reductions due to layoff or furlough
- Staff reductions due to reduced hours
- Delayed or reduced funding
- Pause/Reduction in construction projects
- Limited coordination with local agencies due to office shutdown
- Other (please specify)

MCM5

Please rate the extent COVID-19 has impacted the minimum control measure of Post Construction Stormwater Management in New Development & Redevelopment (MCM5) required for stormwater program implementation.

- No Change from Pre-Covid Activity (1)
- Slight Impact (some postponement, little interruption) (2)
- Moderate Impact (Some postponement and some interruption) (3)
- Moderate to Severe (Significant delay or disruption in activity) (4)
- Extreme Impact (Program Activities stopped) (5)

Please describe the reasons for MCM5-Post Construction Stormwater Management in New Development & Redevelopment impacts (check all that apply).

- Inability to hold in-person inspections
- Health and safety protocols (e.g., social distancing, separate vehicle travel, etc.)
- Staff hours shifted to other priorities
- Staff reductions due to employees tested positive or under quarantine for COVID-19
- Staff reductions due to layoff or furlough
- Staff reductions due to reduced hours
- Delayed or reduced funding
- Pause/Reduction in construction projects
- Other (please specify)

MCM6

Please rate the extent COVID-19 has impacted the minimum control measure of Pollution Prevention & Good Housekeeping for Municipal Operations & Maintenance (MCM6) required for stormwater program implementation.

- No Change from Pre-Covid Activity (1)
- Slight Impact (some postponement, little interruption) (2)
- Moderate Impact (Some postponement and some interruption) (3)
- Moderate to Severe (Significant delay or disruption in activity) (4)
- Extreme Impact (Program Activities stopped) (5)

Please describe the reasons for MCM6-Pollution Prevention & Good Housekeeping for Municipal Operations & Maintenance impacts (check all that apply).

- Health and safety protocols (e.g., social distancing, separate vehicle travel, etc.)
- Staff hours shifted to other priorities
- Staff reductions due to employees tested positive or under quarantine for COVID-19
- Staff reductions due to layoff or furlough
- Staff reductions due to reduced hours
- Delayed, reduced or ineffective staff training

- Delayed or reduced funding
- Other (please specify)

Impacts on review of private development projects, or local government design/construction of Pollutant Reduction Plan (PRP) or Total Maximum Daily Load (TMDL) projects

Please rate the extent of COVID-19 impacts on your review of Developer-led Planning/Design of Stormwater Control Measures (SCMs).

- No Change from Pre-Covid Activity (1)
- Slight Impact (some postponement, little interruption) (2)
- Moderate Impact (Some postponement and some interruption) (3)
- Moderate to Severe (Significant delay or disruption in activity) (4)
- Extreme Impact (Program Activities stopped) (5)

Please describe the impacts on your review of Developer-led Planning/Design of SCMs (check all that apply).

- Inability to carry out in-person oversight of development process
- Health and safety protocols (e.g., social distancing, separate vehicle travel, etc.)
- Staff reductions due to layoff or furlough
- Staff hours shifted to other priorities
- Pause/Reduction in construction projects
- Other (please specify)

Please rate the extent of COVID-19 impacts on your review of Developer-led Construction of New/Retrofit SCMs (Grey or Green).

- No Change from Pre-Covid Activity (1)
- Slight Impact (some postponement, little interruption) (2)
- Moderate Impact (Some postponement and some interruption) (3)
- Moderate to Severe (Significant delay or disruption in activity) (4)
- Extreme Impact (Program Activities stopped) (5)

Please describe the impacts on your review of Developer-led Construction of New/Retrofit SCMs (check all that apply).

- Inability to carry out in-person oversight of development process
- Health and safety protocols (e.g., social distancing, separate vehicle travel, etc.)
- Staff reductions due to layoff or furlough
- Staff hours shifted to other priorities
- Construction delayed
- Other (please specify)

Please rate the extent of COVID-19 impacts on your review of Local Government-led planning/design of SCMs for PRP/TMDL plans.

- No Change from Pre-Covid Activity (1)
- Slight Impact (some postponement, little interruption) (2)
- Moderate Impact (Some postponement and some interruption) (3)
- Moderate to Severe (Significant delay or disruption in activity) (4)
- Extreme Impact (Program Activities stopped) (5)

Please describe the impacts on your review of Local Government-led planning/design of SCMs for PRP/TMDL plans (check all that apply).

- Health and safety protocols (e.g., social distancing, separate vehicle travel, etc.)
- Staff reductions due to layoff or furlough
- Staff hours shifted to other priorities
- Reduction/delay in funds allocated for grant applications and fees
- Reduction/delay in funds allocated for design costs
- Delay of public meetings for PRP
- Other (please specify)

Please rate the extent of COVID-19 impacts on your review of Local Government-led construction of new/retrofit projects for PRP/TMDL plans (example: Naturalization of Basins).

- o No Change from Pre-Covid Activity (1)
- o Slight Impact (some postponement, little interruption) (2)
- o Moderate Impact (Some postponement and some interruption) (3)
- o Moderate to Severe (Significant delay or disruption in activity) (4)
- o Extreme Impact (Program Activities stopped) (5)

Please describe the impacts on your review of Local Government-led construction of new/retrofit projects for PRP/TMDL plans (check all that apply).

- Staff reductions due to layoff or furlough
- Staff hours shifted to other priorities
- Reduction in budget
- Delay in grant award
- Delay in advancement of survey and design activities
- Delay in construction
- Other (please specify)

Program Compliance and Other Administrative Functions

Please rate the extent that COVID-19 has impacted program compliance and other administrative functions.

	No Change from Pre-Covid Activity (1)	Slight Impact (2)	Moderate Impact (3)	Moderate to Severe Impact (4)	Extreme Impact (5)
Preparation of Stormwater Program Feasibility Studies					
Applications for NEW Stormwater Funding Program Support (capital and/or administrative)					
Funding for Continued Staff Support (operations, maintenance, inspection, enforcement, plan)					
Funding Obligations/ Commitments for EXISTING SCM Implementation (cash or in-kind match included)					
Preparation of MS4 Annual Report					
Other (please specify)					

Please comment on any specific impacts related to program compliance and other administrative functions.

- o Preparation of Stormwater Program Feasibility Studies
- o Applications for NEW Stormwater Funding Program Support (capital and/or administrative)
- o Funding for Continued Staff Support (operations, maintenance, inspection, enforcement, plan)
- o Funding Obligations/Commitments for EXISTING SCM Implementation (cash or in-kind match included)
- o Preparation of MS4 Annual Report
- o Other

Maintenance

Frequency of public stormwater infrastructure maintenance activities BEFORE COVID-19?

- o Frequent (monthly, bimonthly)
- o Moderate (every six months, annually)
- o Low (less than once per year, none)
- o Ongoing as needed
- o Other _____

Frequency of public stormwater infrastructure maintenance activities DURING COVID-19?

- o Frequent (monthly, bimonthly)
- o Moderate (every six months, annually)
- o Low (less than once per year, none)
- o Ongoing as needed
- o Other

Budget and fees

What is the current status of your MS4's stormwater fee?

- o There is no stormwater fee
- o The fee is still in the process of getting approval
- o The fee is being collected as usual
- o The fee is still being collected, but at a reduced amount
- o The fee is/was temporarily postponed due to COVID-19, and customers are required to pay the accrued amount from this period in the future
- o The fee is/was temporarily postponed due to COVID-19, and customers are NOT required to pay the accrued amount for this period in the future
- o The fee has been approved by local government, but initiation of fee collection is delayed due to COVID-19
- o The fee has been approved by local government, but initiation of fee collection has not begun for reasons other than COVID-19
- o Other (please specify)

Which of the following funding-related impacts has your MS4 program experienced due to COVID-19? Select all that apply.

- None
- Budget cuts
- Budget freezes
- Reduced stormwater fee revenue
- Reduction in typical grant funding available
- Delay in grant program approvals
- Other (please share any comments you have)

Which change best describes the CURRENT impact to your MS4's program budget due to COVID-19?

- o Increased
- o Stayed the same
- o Decreased by 1% - 10%
- o Decreased by 11% - 20%
- o Decreased by 21% - 30%
- o Decreased by 31% - 40%
- o Decreased by 41% - 50%
- o Decreased by 51% or more
- o Don't know
- o Other (please specify)

Impact on other programs

Have you experienced any of the following in your community during the COVID-19 pandemic? (check all that apply)

- Increased littering/illegal dumping
- Increased park/trail use
- Increased recycling volumes
- Decrease in/cancellation of recycling collection events (Electronic-waste, Household Hazardous Waste, paper shred, etc.)
- Cannot think of any
- Other (please specify)

Have any programs ended due to COVID-19? (Please describe).

Please describe any success stories or adaptations you would like to share about MS4 program implementation during COVID-19.

What can we do to help?

Both of PSU and PEC's missions include collaborating with and supporting Pennsylvania communities to advance stormwater management research and practice. How could we assist you in the future?

- (PEC) Identify local partners and funding opportunities to support program implementation
- (PEC) Provide information on resources available to support education/outreach and public involvement activities
- (PSU) Provide more PSU faculty or student research collaboration
- (PSU) Fund PSU student interns or recent graduates to work at your agency
- Provide additional training opportunities (Please suggest training topics)
- Other (please specify)

Local Government Type

- Borough
- Township
- City
- County
- Authority
- Other

Population

- Under 10,000
- 10,001 - 25,000
- 25,001 - 50,000
- Over 50,000

Location

- Delaware River Basin
- Great Lakes Basin
- Ohio River Basin
- Potomac River Basin
- Susquehanna River Basin

Number of Professional Administrative Staff (excluding Police and Fire)

- 1-10 Employees
- 11-20 Employees
- 21-50 Employees
- 50+ Employees

If you would like to receive a copy of the final report OR participate in a virtual interview (maximum 1-hour) and answer more in-depth questions on the impact of COVID-19 on stormwater MS4s, you may click on this [link](#) and enter your email address.

Please provide the name of your Municipality, County, or Authority (This is for research purposes only and will help us analyze the spatial distribution of the impacts; no identifying information will be included in the final report)

Thank you so much for participating in this study!