A photograph of a person standing in a forest, looking at a mobile device. The person is wearing a dark jacket and a cap. The forest is dense with tall trees and sunlight filtering through the canopy. The text is overlaid on a white rectangular background in the upper portion of the image.

**Challenge Dialogue  
Progress Report:  
Exploring Natural Asset Management  
Capacities and Practices in Canada**





## Acknowledgements

Thank you to all of the people who took the time to consider and respond to this Challenge Dialogue, hosted online by the Ethelo Platform 15 February to 31 March, 2022. The insights and comments responding to the challenging statements explore key issues affecting natural asset management (NAM) capacities and practices in Canada.

### Champion Organizing Team:

- [Dena Kae Beno](#), Challenge Dialogue System Network
- [Roy Brooke](#), Executive Director MNAI
- [Dr. Liese Coulter](#), Royal Roads University
- [Dr. Robin Cox](#), Royal Roads University
- [Dr. Michael Drescher](#), University of Waterloo
- [Joanna Eyquem](#), Intact Centre on Climate Adaptation, University of Waterloo
- [Vivian Forssman](#), Royal Roads University
- [Keith Jones](#), Challenge Dialogue System Network
- [Dr. Susan Nesbit](#), Environmental Engineering Program, UBC
- [Melina Scholefield](#), Professional engineer
- [Jeff Walker](#), CSA Group



**Resilience  
by Design Lab**

INSPIRING  
CLIMATE ACTION



**M  
NAI**.CA

**Making  
Nature Count**

This project was sponsored by:

Royal Roads University's Resilience By Design Lab and the Municipal Natural Assets Initiative.

Cover Image: Vancouver Island, British Columbia 2021 @LieseCoulter. Creative Commons Attribution-ShareAlike



Contents

Purpose ..... 1
Summary ..... 2
Key messages emerging from Challenge Dialogue ..... 2
Overview of Challenge Dialogue Comments by Participants ..... 3
Participant Recruitment ..... 5
Challenge Dialogue Statement Responses ..... 6
Alignment ..... 6
Q1: Goal for Canada-wide municipal Natural Asset Management (NAM) ..... 6
Q2: Envisioning the future of NAM in Canada in Vision #1: ..... 8
Q3: Envisioning the future of NAM in Canada in Vision #2 ..... 9
Q4: NAM and national reconciliation efforts in Vision #2 ..... 11
Q5: Formalizing NAM knowledge ..... 12
Q6: Key Challenge statement ..... 13
Q7: Expected Outcomes ..... 14
Q8: Background (Definitions) ..... 15
Q9: Background (Rationale for NAM) ..... 17
Q10: Background (Current State of NAM) ..... 19
Q11: Assumptions (Economic Subsector) ..... 21
Q12: Assumptions (Capacity Building Components) ..... 23
Q13: Assumptions (Measures of success for NAM) ..... 25
Q14: Assumptions (Other considerations) ..... 27
Q15: Critical questions for NAM capacity-building ..... 28
Conclusions and Recommendations ..... 30
Appendix ..... i

Please cite this report as:
Coulter, L., Cox, R. S., Forssman, V., & Brooke, R. (2022). Challenge Dialogue Progress Report: Exploring Natural Asset Management Capacities and Practices in Canada. Resilience by Design Lab. Victoria BC.

## Purpose

This is a progress report on research engaging a multi-stakeholder/rights holder group in a survey process (Challenge Paper questionnaire) and a subsequent virtual dialogue (Challenge Dialogue conversation) to explore and respond to a proposed set of Natural Asset Management (NAM) norms, identify core competencies, and explore user needs related to NAM training. Working with the Municipal Natural Assets Initiative (MNAI), this work builds on the efforts of the Adaptation Learning Network project led by Dr. Robin Cox and the Resilience By Design lab at (RRU).

The long-term goal of the project is to contribute to the ongoing evolution of the field of natural asset management through identifying a map forward for education and training curriculum that will help mainstream the practice across Canada. Ultimately, we hope this work will inform the design and development of learning opportunities that will contribute to upskilling a workforce for implementing and mainstreaming NAM more effectively.

The Challenge Dialogue System (CDS™) offers a framework to help diverse groups collaborate and innovate to accomplish complex tasks for change and transformation. Structured discussions allow groups to test the nature of the challenge, its context, crucial assumptions, and expectations. With this shared clarity, groups can better align on impactful strategies and clear action plans. Participants responded to an online- questionnaire hosted by a Canadian-based engagement platform called Ethelo. In this questionnaire they were asked to read a Challenge paper that outlines a suggested national pathway forward for education and training in NAM and to respond to questions about the assumptions and ideas presented in the paper.

This document summarizes the results to date of the Challenge Dialogue which was hosted online between 15 February to 31 March 2022 to explore issues affecting NAM capacities and practices in Canada. A Challenge Dialogue is a way to bring multiple stakeholders together to inform and plan an important transformation in business and society. This document should be read in conjunction with the material provided to participants, which is presented in association with each input request.

## Chronology

This report is the fourth step of six in the Challenge Dialogue process:

1. Draft a challenge paper, imagining potential future situations and outcomes, setting out assumptions and raising some critical questions. (complete)
2. Gain insights from subject matter experts and key stakeholders. (complete)
3. Invite feedback to explore and expand our understanding (complete).
4. Share a progress report with participants and in the Challenge Dialogue. (Spring 2022) (This document)
5. Convene a workshop to clarify understandings and plan strategic actions. (Fall 2022)
6. Publish a final report which is shared with all participants. (Winter 2022)

## Summary

The Challenge Dialogue has been framed by the statement regarding a potential future end-state, namely, that for there to be Canada-wide municipal natural asset management (NAM), *natural assets will be appreciated alongside built assets as integral to municipal infrastructure*, and that *local governments want to initiate NAM with the help of existing firms and organizations*. The statement also added that *widespread capacity to deliver NAM will depend on the availability of trained professionals working from norms, standards and certifications that makes their practices effective, comparable, and replicable*. This report is an assessment of the responses to these statements.

Challenge Dialogue participants were invited who were engaged directly with natural asset management projects, capacity building or advocacy. Links to the Challenge Dialogue were also posted to social media. In accordance with the ethics approval for this project by Royal Roads University, a project funder, no personal identifying information was recorded for the 55 unique participants, where 36 completed all input requests. The responses were analysed thematically in reference to each input request and the findings in this report will inform a small workshop to develop actionable next steps.

### Key messages emerging from Challenge Dialogue

- Building leadership and capacity to implement NAM across Canada needs a two-pronged approach to both educate those new to NAM and to upskill asset managers, engineers and service delivery planners wishing to integrate NAM into their professional practice.
- Four main activities guide NAM capacity building:
  - promoting policies that value natural assets' service delivery,
  - improving NAM technical and evaluation methods,
  - integrating a consideration of Indigenous knowledges and diverse worldviews in training and practice, and
  - protecting natural assets.
- Knowledge needs for NAM are both technical, to improve measurement, evaluation, and application of management practices, and cultural, where a whole-of-society effort requires a culture change within local governments, Indigenous governments (e.g., First Nations) and Indigenous knowledges keepers and communities from project conception.
- The expected increase in demand for NAM capabilities is driven by municipal needs for service delivery, climate resilience, the financial benefits of lower costs and efficiencies in using built and natural asset systems together, and the social, ecological, cultural and other benefits associated with greater valuing of natural asset systems.
- Course material addressing NAM is absent or lacking in most civil engineering and environmental science programs, with most courses referenced as under consideration or being developed.
- While not all skills relevant to NAM need to be embedded in a single position or individual, long-term commitment to collaborate within and across organizations is needed to develop shared understandings across the range of NAM skills.
- The financial sector was specifically highlighted as an area that would benefit from special training, especially related to NAM inventories and environmental, social and governance (ESG) valuation and reporting.

- In addition to needing a business case and strategic plans, NAM requires a values statement that addresses the need to incorporate Indigenous knowledges and consider non-economic values (e.g., cultural, social, ecological).

### Initial Actions

Six actions for moving NAM forward as a professional practice were proposed to Challenge Dialogue participants. All six gained over 80 % approval from participants. In order of support received, the actions are developing:

- 1) a strategic action plan to increase NAM capacity
- 2) a directory of current resources and initiatives.
- 3) support for continuing professional development and
- 4) NAM community of practice.
- 5) a competency framework for NAM
- 6) an inventory of NAM-related academic programming, training and certifications across Canada.

Actions 5 and 6 were in last place because participants expressed concerns that these actions might lead to over-regulation, impose cost barriers to new NAM practitioners, or disadvantage existing practitioners.

## Overview of Challenge Dialogue Comments by Participants

### Opportunities for Building Capacity for NAM

**Education & Upskilling:** Challenge Dialogue participant support for building capacity to implement NAM across Canada emphasised both education of new NAM practitioners and upskilling opportunities for current asset managers and service delivery planners. Building leadership was also seen as needing a similar two-pronged approach by increasing municipal work placements for new graduates of engineering, planning and asset management programs with significant NAM components, while supporting the influence of senior positions. It was also recognised that not all NAM skills need to be embedded in one position or individual, rather that the range of needed skills should be developed across multiple positions within an organisation.

**Targeted Educational Initiatives:** A priority for capacity building is to start with including content specific to managing natural assets in post-secondary courses that educate future engineering and planning leaders. While a few first-year courses with significant material on natural assets have been included in civil engineering and environmental science programs, most comments referenced courses that were being considered or are under development. There was concern that without more specific requirements or regulation, practice notes guidelines such as those developed by Engineering and Geoscientists BC form only a first step in increasing the uptake of NAM in professional practice.

**Communities of Practice:** While university and other post-secondary programs were seen as vital to new NAM practitioners, a NAM community of practice (CoP) was seen as more useful to those already managing assets. The entity, *Natural Infrastructure New Brunswick* was mentioned as hosting a formal CoP which fosters use of nature-based solution (NBS) approaches to adapt to climate change. There was general interest in strengthening existing CoPs in related

fields (e.g. asset management, engineering) to be more focused on NAM and there was also mixed support for formalizing a NAM CoP .

**Policy:** In stating what NAM needs to achieve the stated desired end state, Challenge Dialogue responses were united through the goals of promoting policies that value natural assets for services to the community, improving NAM technical and evaluation methods, protecting natural assets, and integrating considerations of Indigenous knowledges and diverse worldviews in training and practice. Implementing NAM was seen as beneficial to asset management overall, partly through the emphasis on well-defined sustainable service delivery and as replacement for grey infrastructure as it ages.

### **Potential Barriers to Building Capacity for NAM**

**Financial & Economic:** Financial benefits to society from NAM included cost-effectively increasing human health and wellbeing, reduction of legal and financial risks, and support for biodiversity. However, viewing ecosystems in terms of the services they provide requires thoughtful and sensitive communication to account for a perspective that representing ecosystem value as the sum of the goods and services it provides can dismiss the value of it as a whole.

The economic question was important both in terms of how implementing NAM is to be financed and the inherent valuation of natural asset benefits. There was concern for the lack of municipal capacity due to scarce resources and the challenge of how to sustain and resource the whole concept over time.

Special training was recommended for the financial sector, especially related to ESG valuation and reporting. Potential financial metrics to assess benefits from NAM include evaluating grey infrastructure alternatives compared with both NA services delivery costs and the advantages of delivering multiple NA co-benefits.

Additionally, concern was expressed about the limited resources (financial and time) of local governments, and the dominance within municipalities of a reactive rather proactive approach to addressing issues. Both these issues may make the proactive approach of NAM difficult to integrate into municipal planning processes. Participants suggested that small steps are needed that take into consideration where municipalities are currently, given the collaborative visioning and planning necessary to implement NAM. NAM extends well beyond municipal boundaries, however, and the consensus was that in the long-term NAM should be integrated into asset management plans for all organizations that are required to undertake asset management.

**Terminology:** While mention of NAM has become more common within professional and local government studies and planning, these references generally remain incidental unless a NAM project is underway. Non-standardized terminology creates potential barriers to collaborations related to NAM.

**Long-term commitment:** Collaborations related to NAM are made further challenging because of the long-term commitment necessary for developing shared understandings and actions. It was suggested that NAM principles influence traditional asset management rather than conform to its limitations, with the ultimate success measure as the evolution of the natural capital.

## Participant Recruitment

An initial list of 117 invited participants was developed through professional contacts of the organizing team and those engaged directly with natural asset management projects, capacity building or advocacy. The focus of this recruitment strategy was to invite participation from people with experience in NAM policy, practice or education. In particular, responses were solicited from engineers, project managers and asset managers whose work either does, or can include natural assets. Similarly, educators and local government staff were invited who had interest in the skills needed to manage natural assets. In addition to individual invitations, links to the Challenge Dialogue were posted to social media accounts in Twitter, LinkedIn and Instagram. In accordance with the ethics approval for this project by Royal Roads University, no personal identifying information was recorded for the 55 unique individuals who participated in the dialogue process. The aggregated demographic information is shown in Table 1.

*Table 1. Respondent Demographic Information*

# PROFESSIONAL EXPERIENCE	# SECTOR	# Prov
16 Engineer	12 Education/Training Institution or Org.	19 ON
14 Project Manager	9 Municipal Government	18 BC
14 Researcher/Scientist	9 Not-for-Profit Org. or Foundation	6 NB
8 Policy Analyst	8 Consulting Services	4 AB
6 Biologists	3 Fed Gov	4 QC
5 Planner	3 Provincial Gov	2 NS
4 Asset Manager	3 Standards, Accreditation Organization	1 Int.
4 General Management	2 Not-for-Profit Conservation Authority	1 MB
4 Management Consultant	1 Agriculture Industry	
3 Agrologist	1 Applied research	
3 Forester or Forestry Technologist	1 Crown Corporation	
2 Geoscientist	1 Ecologics Design	
1 Communications and/or Public Relations	1 Energy Industry	
1 Design consultant	1 Environmental coalition	
1 Economist	1 Not-for-Profit Community Interest	
1 Energy Manager	1 Provincial Regulatory Body	
1 Information and Comms Tech or Data Scientist	1 Regional Gov	
1 Investment Analyst		
1 Land Management and Treaty Land Entitlement		
1 Management		
1 Program Evaluator		
1 Public Health Officer		
1 Public Works		
1 Sustainability Coordinator - local government		
1 Trainer		

## Challenge Dialogue Statement Responses

### Alignment

Several of the response requests asked participants if they were aligned with the statements provided in the Challenge Dialogue paper. In addition to choosing aligned or not, there were options for participants to comment, such as *I am aligned and ...* , or *I am aligned but ....* . Figure 1 shows that the majority of respondents were fully aligned with the challenge statements, with the exception of Input request Q11 which addressed multiple concepts.

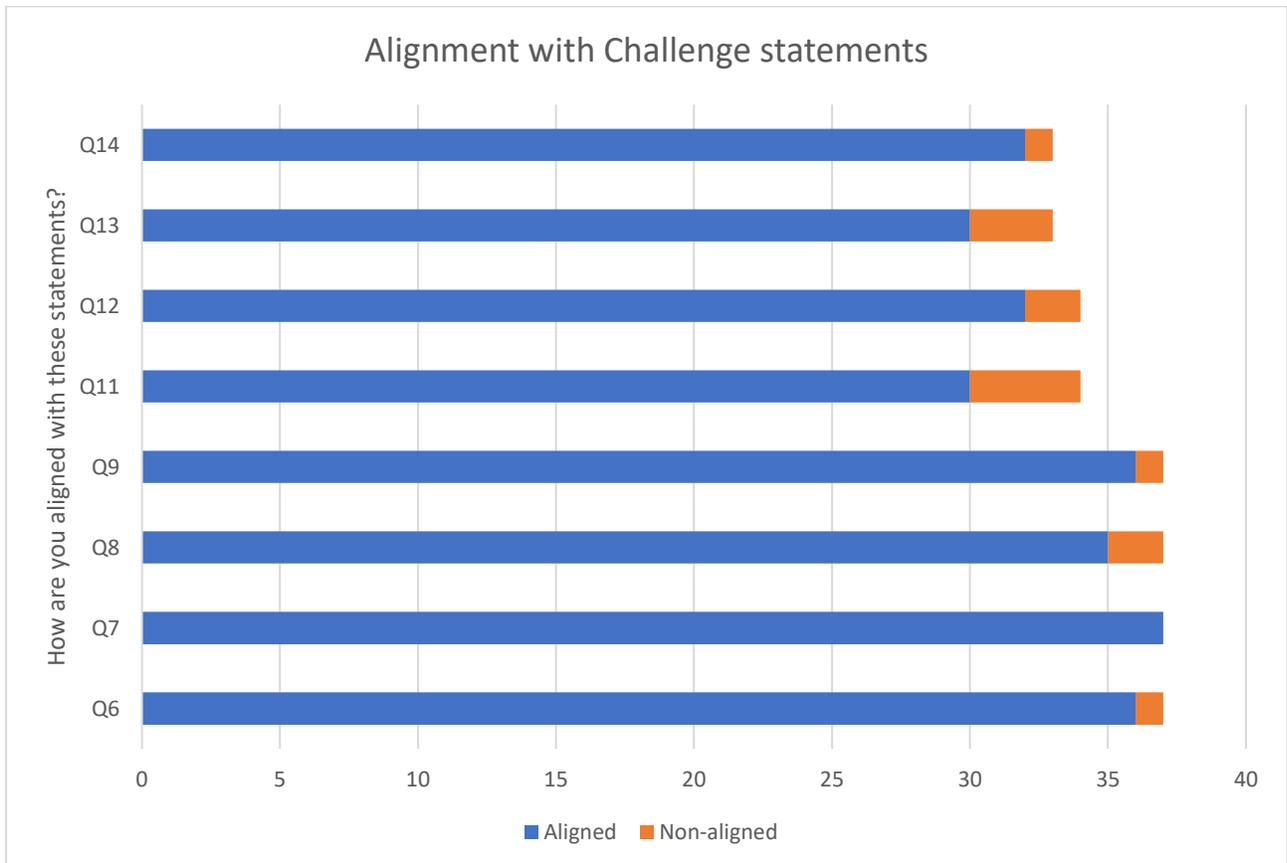


Figure 1. Graph showing relative alignment with Challenge Statements

### Q1: Goal for Canada-wide municipal Natural Asset Management (NAM)

*Challenge statement: Reaching a goal for Canada-wide municipal natural asset management (NAM) requires that:*

- 1. The role of natural assets is appreciated alongside built assets.;*
- 2. There is market demand for NAM.*
- 3. A range of firms and organizations can help local governments implement NAM.;*
- 4. NAM is an integral part of municipal infrastructure.;*
- 5. Norms and standards are established so that NAM is undertaken in ways that are effective, comparable, and replicable.;*
- 6. Knowledgeable and trained professionals are available to support local governments with NAM standards and certifications.*

**Q1 What reactions, questions or suggestions do you have regarding this goal for Canada-wide municipal Natural Asset Management (NAM)?**

**Q1 RESPONSES**

As shown in Table 2, all respondents agreed with the statements and many saw NAM as a priority, while some offered additional suggestions. Many responses to the initial question related to financing and valuation. The economic question was important both in terms of how implementing NAM is to be financed and the inherent valuation of natural asset benefits. There was some tension with respondents calling for more holistic approaches to NAM across society and an emphasis on the inherent relationship to nature. Calls for the explicit involvement of FN were prominent as was interest in going beyond municipal applications. Issues of governance were raised connecting national and provincial systems, with one call for collaboration to extend internationally. Some respondents were more focused on the application of NAM through scientific and engineering methods and acknowledgement that municipalities may be lacking in the needed skills.

*Table 2. Focus topics and exemplar quotes responding to Input request 1.*

Focus topics	Exemplar quotes
NAM Needs	Point #1 is critical and #4 is accurate. AM for built infrastructure and for NA ultimately will need to come into a common framework as the practice matures.
Missing in the Challenge	integrate municipal NAM with complimentary sectors such as ecosystem service valuation ... and ... non-municipal ESS in support of also Indigenous, industry ... and ENGO approaches to people's relationship to the environment?
NAM Valuation	There is a lack of non-monetary value statements here regarding natural assets, that needs to be recognized.
Municipal Role	Connecting with municipalities working through the same problems and challenges with NAM would be very empowering and also save a lot of time.
Indigenous	When discussing NAM there must be inclusion of First Nations perspectives in the planning process. The boundaries of the natural infrastructure [are] not confined to municipal boundaries
Communication	A mission statement including why this is important, with the goal to shift perspectives and value natural assets for their benefits to people,
Financial	Achievement of the goal will also require investment in natural assets and their management, which could come from both public and private sources (impact investing).

## Q2: Envisioning the future of NAM in Canada in Vision #1:

*By 2027 ... Natural assets are integrated, but not standardized, into asset management planning by progressive municipalities. Capacity-building, while positive, is not dealt with systematically. The speed and scale of change is not commensurate with the challenges being faced, and decades of debate to create a uniform system remain. Canada has a limited number of training courses that address NAM, and an early-stage professional certification system is being developed. There are a variety of NAM approaches, untapped synergies, and poor engagement of many actors. Scarce resources within municipalities continue to limit NAM's potential. Donors and provincial advanced education ministries are more aware of NAM training and have funded a few projects. While there may be nothing inherently unacceptable in this vision, it is a slow movement in an era of urgent issues for urban and environmental resilience and climate action.*

## Q2: What reactions, questions or suggestions do you have regarding this Vision #1 for Natural Asset Management (NAM)?

### Q2 RESPONSE SUMMARY

As shown in Table 3, respondents overwhelmingly saw this vision as a failure over the five years ahead that does not address the urgency of the need for NAM. This was seen as an example of the current situation with recognition that a whole of society effort is needed to coordinate something more effective, including a culture change within organisations such a local governments and greater engagement with First Nations. Some called for greater financial and professional capacity as well as standards and targets to increase NAM uptake.

*Table 3. Focus topics and exemplar quotes responding to Input request 2.*

Focus topics	Exemplar quotes
Urgency	Need to accelerate adoption of NAM within municipalities, through communications, training, education and more case studies.
Municipal Role	The fundamental question ... is whether under-resourced municipal governments that are fiscally reliant on property taxes and development are best placed to manage our natural assets
Capacity Building	training should be for any provincial agency, watershed organization, municipality or other entity that is responsible for managing natural assets and owning, operating and maintaining infrastructure at multiple scales.
Natural Assets	Many have not recognized the role of natural assets as historically the environment has been used to offset cost without accounting for it.
NAM Needs	Agree, it has been a slow uptake from the broader set of municipalities. New thinking takes time to shift.
Inadequate	These seems like a predictable outcome but it would not meet many of the goals of the challenge statement.
Asset Management	I think in general asset management as a whole is not fully integrated into municipal infrastructure planning, so accelerating to a focus on natural assets may be a step ahead of getting fundamental asset management awareness in place

### Q3: Envisioning the future of NAM in Canada in Vision #2

*Vision #2: 2027 ... Natural assets are well-integrated into mainstream asset management planning by all municipalities and First Nations. Protocols are standardized and consistent. Investments are made by public and private sector actors to protect and restore natural assets integral to municipal service delivery. Efforts are aligned with the scale of challenges faced by local governments. Multiple Canadian post-secondary institutions have professional development courses and master's degree programs in NAM. A new generation of planners, engineers, geoscientists, biologists, agronomists, scientists, financial, and other experts have graduated with a solid understanding of the concepts and fundamentals of NAM. Academic programming is guided by professional norms and standards. Each new professional norm or standard has corresponding training offerings; they are supported by employers and recognized through micro-credentials and degrees. Academic programs and training encompass both technical knowledge and change management "soft skills." Mayors, Councils and municipal executives are taking advantage of specialized NAM training. Specific technical training is also available to manage issues such as carbon sequestration, reducing climate risks (e.g., flooding, extreme heat, drought), and ecosystem protection. Other countries have started to take notice and follow Canada's lead.*

### Q3 What reactions, questions or suggestions do you have regarding this Vision #2 for NAM?

#### Q3 RESPONSE SUMMARY

As shown in Table 4, respondents saw this vision as an urgent priority, however many thought it was ambitious or idealistic, considering the time horizon and needed culture change. Implementation was called for across society with a focus on addressing governance issues and a lack of capacity in municipalities due to scarce resources and few training programs. There was some reference to reconciliation, climate or biodiversity benefits and to extend NAM beyond municipal scales. Referencing grey infrastructure, one respondent considered NAM as disadvantaged due to the slow progress of natural systems and another characterized NAM as ‘essentially environmental engineering’.

*Table 4. Focus topics and exemplar quotes responding to Input request 3.*

Focus topics	Exemplar quotes
Urgency	This will require the start of action today, particularly in the development of the training programs needed to build the required capacity.
Capacity Building	training piece is what is needed for expeditious change ... a "pincer strategy" ... where new professionals are well informed AND the asset management ... is also on board.
Engagement	municipalities, especially in the financial departments, have long memories and while they are more agile than larger governments, they are still responsive to their voters.
Financial	To incentivize this rapid shift, funding will need to be available to incorporate inventories into traditional asset management programs, as different skill sets are required, and many municipalities are not up to date on asset management systems ...
Long-term	(... a vision for perhaps 2030). Although, by 2027 I can see some stepping stones in place to achieve the big picture, in addition to having achieved some of these goals.
Trained Professionals	5 years from now, the first graduates will be in the job place, but without enough experience or authority to integrate NAM into municipal processes.
Collaboration	Indigenous communities should be recognized as important users and contributors. Broaden this vision to include other agencies like watershed organizations and provincial agencies that may have a role in asset management planning.

## Q4: NAM and national reconciliation efforts in Vision #2

### *Vision #2: 2027 ... NAM and national reconciliation efforts*

*By 2027 a strong and increasingly robust understanding of how Indigenous worldviews, knowledge and experience can be interwoven into NAM. The integration of Indigenous knowledges in NAM is starting to make a contribution to national reconciliation efforts and support better stewardship of ecosystems.*

### **Q4 What reactions, questions or suggestions do you have regarding the interweaving of Indigenous worldviews, knowledge and experience into NAM?**

#### Q4 RESPONSE SUMMARY

As shown in Table 5, there was complete agreement among respondents with the importance of engaging ethically with First Nations communities and their vital role in facilitating the culture change needed to advance NAM. Engagement was wanted to address both reconciliation and NAM knowledge needs, while acknowledging these reflect changes in the relationship with nature that underpins asset management. However, it was also mentioned that “some people might perceive the integration of Indigenous approaches as unnecessarily complicating issues” in developing NAM. Secondary concerns related to issues of time and geography, citing the need for both urgent and long-term engagement and considering the diversity of cultures and geographies across First Nations. Little mention was made of the need to resource and build capacity in First Nations and a need for novel modes of governance.

*Table 5. Focus topics and exemplar quotes responding to Input request 4.*

Focus topics	Exemplar quotes
Indigenous	We need to fund Indigenous-led teaching, learning, and collaboration to preserve and strengthen Indigenous knowledge - which may lead to progress in understanding how Indigenous knowledge systems can work hand in hand with "western" science
Worldview	unsure Indigenous worldviews are compatible with an asset management system ... foundation of many of these worldview ... consider natural assets as non-human people ... and consider the wellbeing of the "asset" itself rather than the service it provides people.
Norms & Standards	Mainstream Asset Management is based on a colonial capitalistic value set, so adapting or rebuilding asset management to align more with Indigenous values of nature as our relatives, rather than a resource would need to restructure the whole financial system
Equity	ensure incorporation of Indigenous knowledge follows a code of ethical conduct (e.g. free, prior and informed consent; confidential and protection of Indigenous knowledge)
Knowledge needs	We need to fund Indigenous-led teaching, learning, and collaboration to preserve and strengthen Indigenous knowledge - which may lead to progress in understanding how Indigenous knowledge systems can work hand in hand with "western" science.
Relationship to Nature	I think this is very important. Many Indigenous relationships with the land and water result in extremely sustainable stewardship. Some of this may be at odds with accounting for nature through NAM, so that needs to be kept in mind.
Engagement	I believe any guidance developed on NAM should include Indigenous communities and organizations to ensure it can be adapted and used by Indigenous and non-Indigenous communities across Canada.

## Q5: Formalizing NAM knowledge

*Vision #2: 2027 ... Research on best practices has led to the development of an accreditation system for professionals known as "natural asset managers" who must demonstrate an appropriate level of professional knowledge and practical experience to achieve certification. This accreditation system is managed by a not-for-profit or professional association (e.g., similar to Certified Public Accountant - CPA; Registered Professional Forester- RPF). A community of practice has evolved. People work to create more effective outcomes together. A continuous improvement approach and advancement of practices is iterated through professional development, education and communities of practice. Provincial and territorial ministries support coherent efforts. Professional development, academic programming, and communities of practice have led to improved norms and standards development; targeted and applied research; sharing of best practices; and greater interweaving of Indigenous knowledges and western science.*

### **Q5 What reactions, questions or suggestions do you have regarding the development of Natural Asset Management (NAM) knowledge through a professional community of practice?**

#### Q5 RESPONSE SUMMARY

As shown in Table 6, responses were largely in favour of growing a NAM community of practice however, there were concerns that competing CoPs might dilute the knowledge base. Building capacity in NAM was seen as essential while also supporting asset management more generally with calls for greater collaboration across organisations and all levels of government, including Indigenous. Support for greater levels of training and more standardised practices was tempered with concern that professionalization might exclude existing practitioners or create barriers for entry.

*Table 6. Focus topics and exemplar quotes responding to Input request 5.*

Focus topics	Exemplar quotes
NAM Needs	Having replicable standards will be critical for NAM going forward.
Capacity Building	rather than initiating a separate process, the current AM practices could increase the emphasis on NAM ... think more about hybrid solutions and the complementarity between green and grey infrastructure to solve service delivery challenges.
CoP	A CoP provincially or nationally would be very beneficial ... solid model for developing expertise and share knowledge to acceleration for core AM practices.
Norms & Standards	I recognize the need for standards, guidelines, implementation tools, but I consider certification useless, commercial-oriented and a barrier for most practitioners who may ... become certified but will not do it because of time, money and interest.
Trained Professionals	Would we seek to have accredited "municipal asset managers" that have to have knowledge of natural and built assets. Or would asset management require both "built" and "natural" asset professionals to get the job done?
Urgent	... this follows the LEED for building example, ... very effective - except that it has really taken about 20 years to become the norm. We need to expedite for NAM.
Credential	Developing an accreditation system may be far more challenging and time-consuming, especially if it is expected to be managed by multiple professional associations. Having a community of practice can be an easier first step.

## Q6: Key Challenge statement

Please reflect on the following statement and tell us if you are aligned with the general idea and direction of the statement (aligned, yes/no), if something should be changed (aligned, but ...) and if something more is needed (aligned, and ...). Please add other ideas or questions that come to mind.

*Engage a diverse group of stakeholders to inform, design and develop NAM capacity, which includes NAM-related knowledge, research, standards of practice, professional development, academic programming, communities of practice, and accreditation, across Canada.*

### Q6 How are you aligned with these statements? (36 aligned - 1 non-aligned)

#### Q6 RESPONSE SUMMARY

As shown in Table 7, all responses aligned with these statements with some suggestions. Additions to the challenge statement include goals for incentivization of NAM, tools to support decision makers, more case studies and real-world data, more implementation, monitoring and performance measures and collaboration. Equity was a significant issue for respondents who wanted specific mention of climate change and reconciliation goals as a foundation in NAM practice or were concerned for what the accreditation process would entail. Who would be considered stakeholders and the ways they might be involved in NAM were also seen as issues where values and equity need to be explicitly addressed. One respondent did not find the statement a challenge and suggested alternative wording: "Municipal governments are on the frontlines of climate action. NAM helps to reduce the burden on increasingly vulnerable municipal infrastructure, minimize the impacts of climate change such as floods and extreme temperature, while also ensuring we are protecting vulnerable ecosystems and populations ..."

Table 7. Focus topics and exemplar quotes responding to Input request 6.

Focus topics	Exemplar quotes
Missing in Challenge	mention goals for incentivization of NAM? There are structural governance issues that need to be addressed before we can aspire to NAM becoming the norm. What incentives do municipalities really have to manage/preserve natural assets ...?
Capacity Building	This process should be integrated with existing asset management processes and professionals.
Equity	I'm not sure about the importance of accreditation, and the key challenge statements needs to include a values-based foundation ... the intent of NAM is important, as it directs what is measured/assessed, and what is left out of the process.
Norms & Standards	I like to see ... implementation, monitoring and performance measures built in. It's not all about capacity - its about actually using this approach, assessing it and evolving it.
Innovation	include not just stakeholders ... but also early innovators in NAM and experts in the various related areas e.g., design of academic programs, standards developers etc.
Worldview	Indigenous peoples are not only stakeholders, but rights holders, and this needs to be recognized. Additionally, we are missing a Values statement regarding why and how this engagement will meet the needs of these stakeholders and rights holders.
NAM Needs	I feel NAM could be better defined. NAM could be absolutely huge in scope.

## Q7: Expected Outcomes

*This combined Challenge Paper and Challenge Dialogue aim to achieve:*

- *A common understanding of*
  - o *the gaps, needs and barriers;*
  - o *strategic opportunities;*
  - o *essential components of NAM capacity development; and*
  - o *the business case for developing NAM capacity.*
- *A shared vision for Canadian NAM capacity-building, which includes knowledge, research, standards of practice, professional development, academic programming, communities of practice, and accreditation.*
- *Plans to aid further NAM collaboration, resourcing, and fundraising with alignment on an immediate Action Plan*
- *Establishment of a more formalized community of practice.*

### **Q7 How are you aligned with these statements? (All 37 aligned)**

#### Q7 RESPONSE SUMMARY

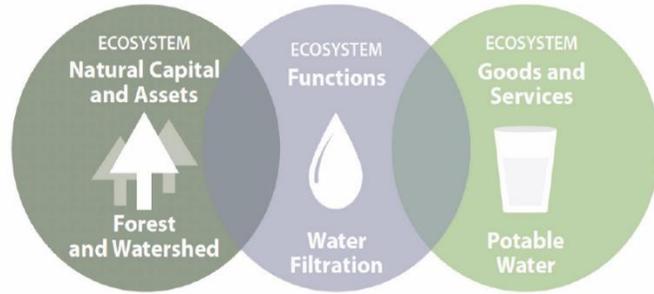
As shown in Table 8, all responses aligned with these statements with some additional comments. The level of detail in the statements was appreciated to make opportunities to contribute concrete and inviting. In these responses some themes are reinforced by the respondents, especially concerning issues of values and equity. There were calls for inclusion of Indigenous perspectives through worldviews and their active engagement in developing NAM capacity and knowledge needs. The practical aspects of funding NAM was also highlighted, including conflicts faced by municipalities reliant on their tax base for income.

*Table 8. Focus topics and exemplar quotes responding to Input request 7.*

Focus topics	Exemplar quotes
Knowledge Needs	It's limiting to provide resources on a discipline-by-discipline basis when the biggest challenge is creating practices where transdisciplinary teams are commonplace.
Financial	many municipalities have limited resources and are likely reactive in their current approach while, in parallel, proactive planning NAM. Take small steps that make sense with where municipalities are now
Collaboration	Perhaps a tangible outcome could be the creation of a reference that transcends disciplinary boundaries, that every discipline will find useful.
Communication	NAM terminology could be reconsidered. Framing what many Indigenous people consider living non-human relatives as natural "assets" is a barrier to ... inclusion
Capacity Building	more recognition to the role of elected officials and CAOs needs to be given in terms of capacity-building and education
Missing in Challenge	Need more detail on "fundraising with alignment on an Immediate Action Plan" ... no indication on what this might entail or what the expectations are...
Worldview	needs a values statement - it can't only be a business case and strategic planning, but if the groups intend to incorporate Indigenous ways of knowing, the non-economic value needs to be included in the language.

## Q8: Background (Definitions)

*This is a chance to consider and reflect on some of the important assumptions behind natural assets. Please reflect on the following statements and tell us whether or not you are aligned with their general idea and direction (aligned), if something should be changed (aligned, but ...) and if something more is needed (aligned, and ...).*



**What are natural assets?** Natural assets have been commonly named ‘natural capital’ – an economic metaphor for the earth’s limited stocks of physical and biological resources. From these stocks, ‘ecosystem goods and services’ flow like interest or dividends (Visual above), supporting and influencing all life on earth. Ecosystem goods are the products from natural capital such as food, fibre, clean air, and water. Ecosystem services are the less tangible but no less significant benefits from ecosystem processes such as nutrient cycling, water purification and climate regulation, and non-material benefits such as recreation, aesthetic and cultural benefits.

**What are municipal natural assets?** The term municipal natural assets refers to the stock of natural resources or ecosystems that a municipality, regional district, or other form of local government could rely upon or manage for the sustainable provision of one or more local government services (e.g. potable water services).

**Q8 How are you aligned with these statements? (35 aligned - 2 non-aligned)**

**Q8 RESPONSE SUMMARY**

As shown in Table 9, this was the first instance where any response was not aligned with the Challenge Statement. The non-aligned respondent considering municipal natural assets as too narrow a term that assumes assets are within municipal jurisdiction. All other responses were aligned. The definitions were generally seen as necessary however their consistent use was limited by lack of agreement on both fundamental concepts and their different interpretation in practical applications. These responses highlighted the benefits to people from NAM as cornerstone of how the terms are defined and applied. References to the ways that NA concepts are communicated ranged from a training and education perspective to calls for greater engagement, notably with Indigenous communities. The need for financial valuation of natural assets, and the practices around such calculations also drew mixed responses. Viewing ecosystems in terms of their services through an economic lens was seen as problematic within the current financial system.

*Table 9. Focus topics and exemplar quotes responding to Input request 8.*

Focus topics	Exemplar quotes
Natural Assets	the definitions are good however not broadly understood and often mixed up with other asset classes such as green infrastructure
NAM supports Society	Ecosystem goods & services are benefits to humans, natural assets/capital is a financial metaphor for limited stocks that benefit people ...anthropocentric model.
Communication	good graphic ... text speaks to natural assets and natural capital and then skips over functions ... In this description - it is not clear ... the differences between ecosystem functions (water filtration) and ... services (nutrient cycling)
Consistency	definition should correlate with IPBES terminology "Nature' contributions to people" to identify goods and services apply to humans [not] all living beings/ecosystems.
Municipal Role	'municipal natural assets' suggests local government ownership. ... Consider also stating that local governments 'could rely upon and/or manage' such assets.
Ecosystem	I struggle with the term ecosystem as it is used in many different contexts and not well understood ... have worked with "nature's benefits" "nature's services"
NAM Valuation	assuming people can calculate the inclusive value of natural assets is flawed, as the reduction of the value of an ecosystem to the sum of the goods and services it provides dismisses the value of it as a whole.

## Q9: Background (Rationale for NAM)

1. *Why manage natural assets? A growing number of local governments recognize that it is as important to understand, measure, manage and account for natural assets as it is for engineered ones. Doing so can enable local governments to provide core services such as stormwater management, water filtration, and protection from drought, urban heat, flooding and erosion, as well as additional services such as those related to recreation, biodiversity, health and culture. Outcomes of what is becoming known as municipal NAM can include cost-effective and reliable delivery of services, support for climate change adaptation and mitigation, and enhanced biodiversity.*
2. *Goal of Asset Management. The goal of asset management is sustainable service delivery. Achieving this goal requires asset management processes that consider whole infrastructure systems, recognizing both engineered and natural assets, and the interactions between them.*
3. *Positive outcomes from NAM. Effective NAM can contribute to a range of positive outcomes that support health and the economy, including:*
  - a. *Cost-effective and reliable delivery of core services for local governments that may currently be service deficits or are provided through conventional engineered infrastructure or systems including flood mitigation;*
  - b. *Carbon sequestration and storage;*
  - c. *Climate change resilience and adaptation;*
  - d. *Increased biodiversity and ecosystem recovery.*

**Q9 How are you aligned with these statements? (36 aligned - 1 non-aligned)**

**Q9 RESPONSE SUMMARY**

As shown in Table 10, responses named many benefits to society of NAM, notably in cost-effectively increasing human health and wellbeing, reduction of legal and financial risks, and support for biodiversity. The need for whole of government involvement was repeated to support integrated and strategic planning to maximise benefits and reduce unintended consequences. There were calls to both increase and reduce emphasis on carbon sequestration as a goal for NAM, which remains a contentious issue. Implementing NAM was seen as beneficial to asset management overall, partly through the emphasis on well defined sustainable service delivery and as replacement for grey infrastructure as it ages. Recognition of Indigenous knowledges was noted as missing in the challenge. Considering natural assets compared to built assets, financial benefits included improving operating and maintenance costs, and efficiencies in using both systems together.

*Table 10. Focus topics and exemplar quotes responding to Input request 9.*

Focus topics	Exemplar quotes
NAM Supports Society	positive effects on human health and quality of life ... offsetting of costs [healthcare] ... De-emphasize carbon sequestration and storage ... benefits are small compared to other ... options, ... emphasize [NAM] is important at all levels of government
Natural Assets	NAM an emerging concept of interest for all levels of government, watershed organizations and NGOs [in] management and restoration. All need to be involved.
Missing in Challenge	NAM can lower risks associated with unintended consequences of removing natural assets; NAM [can] help us recognize and celebrate Indigenous knowledge; Sustainable service delivery needs a definition and parameters for measurement and indicators
Benefits	potential improved outcomes for species at risk and their critical habitats ... potential reduction of legal risk for municipalities to ... emergency protection order under SARA.
NAM Valuation	as currently AM is not managed for the value of the service delivery, only risk, condition and cost of replacement. using both systems together may change how maintenance is planned,
Financial	expand on the cost effectiveness of NAM ... potential for lower operation and maintenance costs of natural assets compared to built assets.
Grey Infrastructure	NAM may have a positive influence on AM ... as replacement of a service currently being provided by a grey asset could be ... a natural asset which gains value as a grey asset loses value.

## Q10: Background (Current State of NAM)

1. *NAM includes learning from traditional and modern Indigenous knowledge, values and expertise, especially as it relates to stewardship and inter-connectivity within natural systems.*
2. *NAM is a rapidly evolving field with elements including:*
  - a. *Expanding case experience at a local government level (In Canada alone, 90 local governments will have worked on NAM by the end of 2021)*
  - b. *Emerging and planned norms and standards for NAM*
  - c. *Emerging curriculum / training / professional development (together known as 'curriculum') and various providers of curriculum*
3. *Canadian infrastructure is stressed; it is aging, maintenance is being deferred, renewal is required, and is increasing pressure on the existing aging engineered stock and the ability of current systems to meet emerging issues and service outcomes related to climate change, environmental protection, affordability, among other challenges.*
4. *Recent Canadian developments in support of NAM capacity-building include:*
  - a. *Growing awareness and market demand for natural asset valuation and management among municipalities and financial sector stakeholders, as demonstrated by the support from 69 organisations, who agree that public entities should have the opportunity to reflect the value of natural assets on their financial statements.*
  - b. *Release of Local Government Asset Management Professional Practice Guidelines by Engineering and Geoscientists BC, which explicitly includes natural assets, and has legal weight of professional practice.*
  - c. *Secured funding for the development of a national standard for natural asset inventories, the first step in the NAM process (to be announced soon).*
  - d. *Inclusion of NAM in a fourth-year civil engineering course, offered in Fall 2021 by the University of British Columbia.*
  - e. *Initial funding from Royal Roads University to take deliberate steps towards NAM capacity-building, through this Challenge Dialogue process, as part of climate adaptation capacity-building initiatives (e.g. Adaptation Learning Network)*

*Stakeholders participating in this Challenge Paper are invited to provide details of other recent developments that support NAM capacity-building.*

**Q10 What other initiatives are you aware of that will round out our understanding of the current state of natural asset management?**

**Q10 RESPONSE SUMMARY**

As shown in Table 11, the specific examples of natural asset management training and practice that were included in all of the responses are listed in the Appendix. However, considering the list of initiatives mentioned in this input request, few additional resources were mentioned. While a few first-year courses with significant material on natural assets have been included in civil engineering and environmental science programs, most references were to courses that were being considered or are under development. There was concern that without more specific requirements or regulation, that practice notes such as those developed by Engineering and Geoscientists BC were only a first step in increasing the uptake of NAM in professional practice. Respondents noted seeing and hearing more frequent references to natural asset management within professional circles, among natural resource authorities and from people working with local government. In planning documentation and studies, these mentions are often incidental unless a NAM project was underway. A natural infrastructure community of practice ([www.naturalinfrastructurenb.ca](http://www.naturalinfrastructurenb.ca)) is being hosted in New Brunswick with a goal to build capacity to use NBS approaches to adapt to climate change. The twin goals of municipal service delivery and climate resilience were both mentioned as drivers for an expected increase in demand for NAM capabilities.

*Table 11. Focus topics and exemplar quotes responding to Input request 10.*

Focus topics	Exemplar quotes
Capacity Building	ACT, SFU's (NbS) hub is advancing best available research to practice, business cases, and engagement and partnership in local and regional contexts
Municipal role	I see is a growing appreciation of green infrastructure among municipal engineering, ... meeting municipal services, incorporated designed natural components and provide improvements from land planning and quality of life (recreation, aesthetics).
Communication	Some watershed and subwatershed studies [and] community storm water master plans are making reference to NAM ... [mainly] incidental as opposed to formal
Mainstream	RRU [developing NBS] micro-credential that could be incorporated into a variety of post-secondary programming so that early-career ... and ... grads of professional programs, have competencies to include NAM in policies, planning and projects.
NAM Supports Society	Inclusion of NAM in a first-year environmental science class at UBCO in Fall 2021. NAM programs recognized in 2021 by Canadian Association of Municipal Administrators and Alberta Municipalities for environmental awards
Natural Assets	Recent developments could also include Natural and Nature-based Infrastructure Community of Practice based in NB: <a href="http://www.naturalinfrastructurenb.ca">www.naturalinfrastructurenb.ca</a>
Trained Professionals	natural asset management practice amongst professionals is still somewhat fractured ... there is a deficit of qualified professionals to actually do the required work.

### Q11: Assumptions (Economic Subsector)

*The next four sections reflect on assumptions that apply to NAM.*

*If the field of NAM is to mature, and the practice to become mainstream, then there is a need for an economic subsector characterized by:*

- a) market demand for NAM;*
- b) multiple players to meet that demand;*
- c) norms and standards;*
- d) Knowledge, networks, academic programming, training and certifications that will ensure that
  - i) norms and standards are applied effectively,*
  - ii) there is a trained community of professionals who can support local governments effectively,*
  - iii) certification and accreditation is core to NAM practice.**

**Q11 How are you aligned with these statements? (30 aligned - 4 non-aligned)**

**Q11 RESPONSE SUMMARY**

As shown in Table 12, this was the first instance where multiple responses (4) were not aligned, either viewing market demand as too aligned with motives of profit over common good or objecting to certification and accreditation as limiting rather than stimulating NAM adoption. These responses showed a preference for a performance-driven approach focused on technical benefits. The fundamental differences expressed in these responses aligned to issues of regulation and control, changes to current practices and concern that linking profit motive and accreditation could be a disincentive for the adoption of NAM practices. Structuring the input request around a supply and demand model may have impacted how respondents assessed the need for regulation in capacity building and economic terminology did not resonate with some respondents. Combining economic and credential issues may have made this input request too complex, however as one respondent put it “The need for accreditation, the value it provides and administration needs to be carefully thought through.”

*Table 12. Focus topics and exemplar quotes responding to Input request 11.*

Focus topics	Exemplar quotes
Capacity Building	the effective application of norms and standards is crucial. there needs to be flexibility in the application of those standards as value and management varies by municipality dependent on capacity and prioritization
Demand	how [is]"market demand" ... being used here ... I don't think the free market will be the driver. I think the "demand" is more likely to come top-down from federal & provincial governments setting norms and standards that local governments have to meet.
Conflict	I am not convinced of the need to obtain certification/accreditation. and i repeat that a values/mission statement is needed; i do not think certification and accreditation is core to NAM practice
Regulation	Perhaps a tiered approach ... that aligns with preserving ... benefits to people [and] the intrinsic value of an ecosystem's right to exists; certification & accreditation [will] capture a market for private interests, unless regulated by Law for public good.
Financial	market demand requires an actual market to exist; I am not sure this is there yet; terminology [is] confusing ... I am not an economist! [Does] market demand ... mean ... demand from local governments for NAM and therefore requires people to apply it?
Credential	I don't see the value of accreditations, certifications, micro-credentials beyond those that already exist ...; The need for accreditation, the value it provides and administration needs to be carefully thought through.
NAM Needs	to evolve the science and practice of NAM, there needs to be strong recognition of adaptive management, monitoring, performance evaluation, and sharing of learnings.

## Q12: Assumptions (Capacity Building Components)

*Knowledge, networks, academic programming, training and certifications are particularly relevant to this Challenge Dialogue and the use of this term includes:*

- a. Discipline standards (e.g. Professional Practice Guidelines for Engineers in BC)*
- b. programming ranging from entry-level NAM courses through to full post-secondary programming (professional development courses and academic programs);*
- c. Accreditations, certifications, micro-credentials;*
- d. Work-integrated learning programs, mentorship and other on-the-job training;*
- e. Different types of knowledge domains including Indigenous, Western science, and the humanities;*
- f. Continuous improvement system between NAM training, academic programming, applied research and NAM practice*

**Q12 How are you aligned with these statements? (32 aligned - 2 non-aligned)**

**Q12 RESPONSE SUMMARY**

As shown in Table 13, responses to suggested training and practice needs ranged from a focus on skilling up new NAM practitioners in related professions to ensuring that current practitioners are not disadvantaged. There was a similar divide in supporting NAM leadership by new practitioners (increase municipal work placements) or driving change from the top-down (support opportunities for more senior positions). Responses to certification included concern that it might act as a barrier for some, especially if not adequately funded, and that a national approach was needed. Because the practice of NAM occurs across disciplines, there were also concerns that differing worldviews will impose barriers to working collaborations, without any reference to Indigenous knowledges. One response sought more emphasis on limits to inventory work through the lack of available data, rather than other capacity limitations. Climate issues were referenced obliquely in one response calling for NAM application to link with building back better after extreme weather events.

*Table 13. Focus topics and exemplar quotes responding to Input request 12.*

Focus topics	Exemplar quotes
Capacity Building	geared towards those new to the workforce. Also need ... opportunities for ... more senior positions or leadership roles ... to drive change from the top-down
NAM Needs	I would also like to see more work placements with municipalities for students who might help lead or support NAM thinking; Available data is now limiting our ability to have a strong foundation for NAM ... emphasis on [data] collection and assessment
Communication	acronym NAM [easily] mixed up with NAMS (out of Australia but also active through NAMS Canada); a short description of what market demand means might help here
Conflict	Only if discipline standards are nationally applicable (it is not helpful to have varying standards by province/territory) and adequately funded
Missing in the Challenge	Application of NAM within the context of building back better after extreme events could be included: I would add support networks for smaller local governments
Regulation	seems like a lot of opportunity for exclusion with certifications being necessary;
Worldview	regarding item 5, integrating different types of knowledge domains (which I take to mean different epistemologies), is a significant challenge, requiring the cultivation of trust through empathy, metacognition, systems thinking and other mental habits.

### Q13: Assumptions (Measures of success for NAM)

1. *Measures of success include:*
  - a. *Coordination – for greater efficiency of effort;*
  - b. *Speed and scale – NAM needs to be deployed to meet climate change related challenges and their urgency;*
  - c. *Effectiveness and relevance – ensuring that training and academic programming is purpose-and-demand driven;*
  - d. *An engaged and responsive community of practice.*
2. *Achieving success is a substantial multi-year undertaking.*

**Q13 How are you aligned with these statements? (30 aligned - 3 non-aligned)**

**Q13 RESPONSE SUMMARY**

As shown in Table 14, measures of success were interpreted to apply to either the successful implementation of NAM practices, or the successful building of capacity to implement NAM, with some degree of confusion. Potential effectiveness metrics for benefits from NAM included evaluating grey infrastructure alternatives compared with both NA services delivery costs and multiple NA co-benefits. Effectiveness of a NAM project could be measured at the landscape level by measuring the amount of natural space created, reclaimed or expanded within an initiative. Making the link between NAM capacity and practice, one response called for more coordination and consistency to achieve success in preserving and enhancing nature-related services on the ground. This view was reinforced by an emphasis on measurability and developing a common monitoring and evaluation framework to increase capacity to compare and learn across multiple projects. Suggested additions to the challenge include how to sustain and resource the whole concept over time and developing implementation case studies. Knowledge concerns included technical issues in accessing data (e. g. LiDAR) and tools (e.g. GIS) as well as the social requirements for an engaged, responsive and diverse community of practice.

*Table 14. Focus topics and exemplar quotes responding to Input request 13.*

Focus topics	Exemplar quotes
Missing in the Challenge	multiple co-benefits - projects managed for different outcomes recognizing this may be a long-term goal;
Evaluation	The stated measures seem to refer to the success of the program to expand the uptake of NAM rather than the success of NAM ... measures of NAM [success] would consider its effectiveness in delivering a range of values at a lower cost than alternatives.
Effectiveness	perhaps include a piece around monitoring of sites, and having a consistent effectiveness monitoring framework so projects can be compared?
NAM Needs	Ultimate outcome should be preservation and enhancement of nature-related services on the ground. Coordination and consistency?
Knowledge Needs	ensure that training meets the needs of the full spectrum of practitioners (operators are often overlooked); NAM AutoCAD is a stretch ... [Instead] "Integrating satellite, LiDAR imagery and GIS tools in planning, implementing, monitoring and NAM"
Long-term	success needs to incorporate the dynamic nature of natural assets and management/ enhancement/ restoration of them. The biggest challenge I think is how the whole concept can be resourced and sustained as it is an ongoing and evolving process.
Landscape	these are not measures of success ... Impact measures would detail the amount of natural space created, reclaimed or expanded in a NAM-focused initiative

## Q14: Assumptions (Other considerations)

1. *There is growing evidence that natural assets can be effectively integrated into local government asset management, which local governments are required to adopt in any case.*
2. *There is a need to accelerate training and academic programming (e.g. utilizing a broader range of post-secondary institutions)*
3. *There may be a need to diversify NAM training and academic programming to include other facets related to NAM practice (e.g., NAM AutoCAD training may be better suited to technical colleges).*
4. *NAM is interdisciplinary (brings in knowledge from many disciplines) and so will embrace a number of different worldviews, learning, practice, and organizational cultures.*

### Q14 How are you aligned with these statements? (32 aligned + 1 non-aligned)

#### Q14 RESPONSE SUMMARY

As shown in Table 15, the mix of four assumptions drew almost universal agreement and led to diverse comments, which are discussed in order. Comments addressed the role of municipalities, pointing out their limited resources and the need to support engaged local governments to progress in NAM. More inclusion was wanted with other agencies such as conservation authorities. There was interest in improving course offerings and better coordinating training at established post-secondary institutions. Skill diversification was seen as important in both technical and 'soft' people skills. However, it was recognised that all skills do not need to be embedded in one person, and the range of needed skills should be developed across an organisation. It was suggested that NAM principles influence traditional asset management rather than conform to its limitations, with the ultimate success measure as the evolution of the natural capital.

*Table 15. Focus topics and exemplar quotes responding to Input request 14.*

Focus topics	Exemplar quotes
Communication	new knowledge emerges from successful teams who negotiate a common understanding of issues relevant to specific locales.
Knowledge Needs	NAM does not just use knowledge from different disciplines. Successful NAM requires unique, place-based, knowledge.
Capacity Building	I would prefer to see a focus on improving the course offering and co-ordination of training at existing, well-established post-secondary institutions.
NAM Needs	The wider international direction is towards integrating natural assets / natural capital into economic decision-making - building on examples other countries. e.g. UK working on Biodiversity Net Gain, TNFD
Effectiveness	natural assets already do provide service delivery, they just typically aren't managed or thought of in that way; interdisciplinarity ... [often] disciplinary people working in multi-disciplinary groups ... a lot of effort for effective cooperation across disciplines.
Municipal Role	local governments do not necessarily have ... the resources to adopt NAM but more involved [municipalities] would benefit from more funds, community of practice, etc.
Credential	while standards are critical, there is a line to be walked in terms of being too prescriptive vs too open-ended

## Q15: Critical questions for NAM capacity-building

The following questions arose as we considered this Challenge Dialogue. You may want to suggest others.

If you have limited time.....

- Focus on those questions of most importance or interest to you.
  - Please reference the number in your comments (e.g. “Regarding #2, I recommend developing abc by doing xyz”)
1. What are the significant priority needs and gaps in NAM academic programming, training and certifications over the next 1, 3 and 5 years?
  2. Do we need a unique competency framework for NAM? Could we build on existing competency frameworks (e.g. Asset Management Competency Framework; Climate Adaptation Competency Framework)?
  3. What can be learned about how other emerging fields have developed academic programming, training and certifications?

**Q15 Please respond to all the questions or only those that most interest you (please refer to the question number you are responding to when appropriate). What additional critical questions are missing that you would like to have addressed in this Dialogue?**

### Q15 RESPONSE SUMMARY

As shown in Table 16, these comments addressed three key topics, NAM priorities, frameworks and lessons for others.

**Priorities:** Start with post-secondary courses to educate future engineering and planning leaders; research to better understand both NAM practice and implications (e.g. ecosystem response to changing land uses); increase awareness among related professionals and the public to mainstream NAM concepts; help understand the business case of investing in natural asset management; develop MoUs with multiple stakeholders to co-develop and promote training; continually raise the importance of including Traditional Knowledge and First Nations in the planning process; provide programming and training at various levels, costs, and durations for many different types of learners, and leave certifications for later.

**Frameworks:** make ecosystem service valuation more mainstream, develop a pathway or roadmap from introduction to expert knowledge, use academic programming to inform NAM inventories and assessments leverage trust in supporting institutions to increase acceptance of a standard; reassure the public that NAM will be supported and disciplined through a competency framework, do not neglect professional development and continuing education.

**Lessons:** Learn from the Climate Risk Institutes, Planning Associations, Engineers Canada, BRACE, landscape architects, adaptation and climate change professionals, ESG training for the financial sector; take advantage of existing programming that could better reflect natural assets; scale the extensive sustainability science literature to inform training; identify models for supporting different disciplines to successfully work together; develop more policy support to strengthen the business case for investing in NAM education (e.g. follow lead of ON to require that AM plans include NA).

Table 16. Focus topics and exemplar quotes responding to Input request 15.

Focus topics	Exemplar quotes
Capacity Building	ensuring there is demand for these types of skills, while making sure that people will invest in taking courses to be available to fill demand; post-secondary [courses] would create a cohort of knowledgeable ... practitioners to help drive this forward;
Knowledge Needs	Can learn from Planning ... Institutes and Associations; obtain lessons learnt from Climate Risk Institutes IRP Program; make ecosystem service valuation more mainstream; convey the importance of including First Nations in the planning process
NAM Needs	need pathways from intro to expert knowledge; need research; (1) need more post-secondary programs that have at least own courses, or NAM integrated into existing courses (2) ability for continuing education
Norms and Standards	acceptance of a standard is fundamentally connected to the trust in the supporting institution ... a competency framework does not ... guarantee competent practitioners, but does reassure the public that there is support and discipline in case of malpractice.
Credential	NAM should also be integrated into existing courses on Sustainability / Climate Change (e.g. BRACE training); Streamlined access to NAM programming, integration of NAM content into engineer and planning post secondary programs
Credible	What work needs to be done to help understand the business case of investing in natural asset management?
Trained Professionals	Research in how water and stream ecosystems respond to changing land uses would help support NAM - typically through Science or Environmental programs.

## Conclusions and Recommendations

Initial Actions: These six options were prioritized in the following order by 36 respondents.

1. Develop a roadmap that describes a desired future state and the tactics to achieve it over time
2. Develop a resource directory which describes what organizations are doing.
3. Determine top priorities for continuing professional development learning topics.
4. Formalize a NAM community of practice.
5. Develop a competency framework for NAM
6. Conduct an indexed inventory of NAM-related academic programming, training and certifications across Canada

Figure 2 illustrates the option ranking to prioritize first steps in terms of relative choice approval, average support, consensus, and conflict. While all options gained more than 80% approval, as shown in Figure 2, the first two options were the most widely agreed choices for first steps. In reviewing comments that give context for these numeric values, there was little conflict in supporting increased NAM competency. The main concerns focused on supporting existing practitioners and not creating barriers to widespread NAM practice through regulation.

*Table 17. Focus topics and exemplar quotes relating to suggested initial actions.*

Focus topics	Exemplar quotes
NAM Needs	Work on ... policy and technical requirements ... & how to incentivize LGs; Forums/mechanisms for municipal governments to pool resources and conduct strategic planning that goes beyond jurisdictional boundaries
Norms and Standards	Establish a municipal NAM advisory body; Develop provincial strategies for natural hazard management and biodiversity [that] consider ... NAM; integration into existing frameworks as opposed to creating a new one.
Capacity Building	Identify gaps in existing NAM-related academic programming, training and certification across Canada; support providing more resources to natural asset managers
Community of Practice (CoP)	many of these actions would be by-products of a CoP; Formalize a NAM community of practice; A CoP can assist in identifying the gaps, needs and priorities; Develop a resource directory which describes what organizations are doing.
Communication	Develop a roadmap [for geospatial planning and disaster risk reduction] that describes a desired future state & the tactics to achieve it over time [including NAM];
Trained Professionals	competencies need to be identified by existing professional associations; Develop a competency framework for NAM; Determine top priorities for continuing professional development learning topics.
Knowledge Needs	Develop an impact measures framework; Develop and fund centres of Indigenous knowledge/learning/training

## Ranked Options

### Choice approval, average support, consensus and conflict

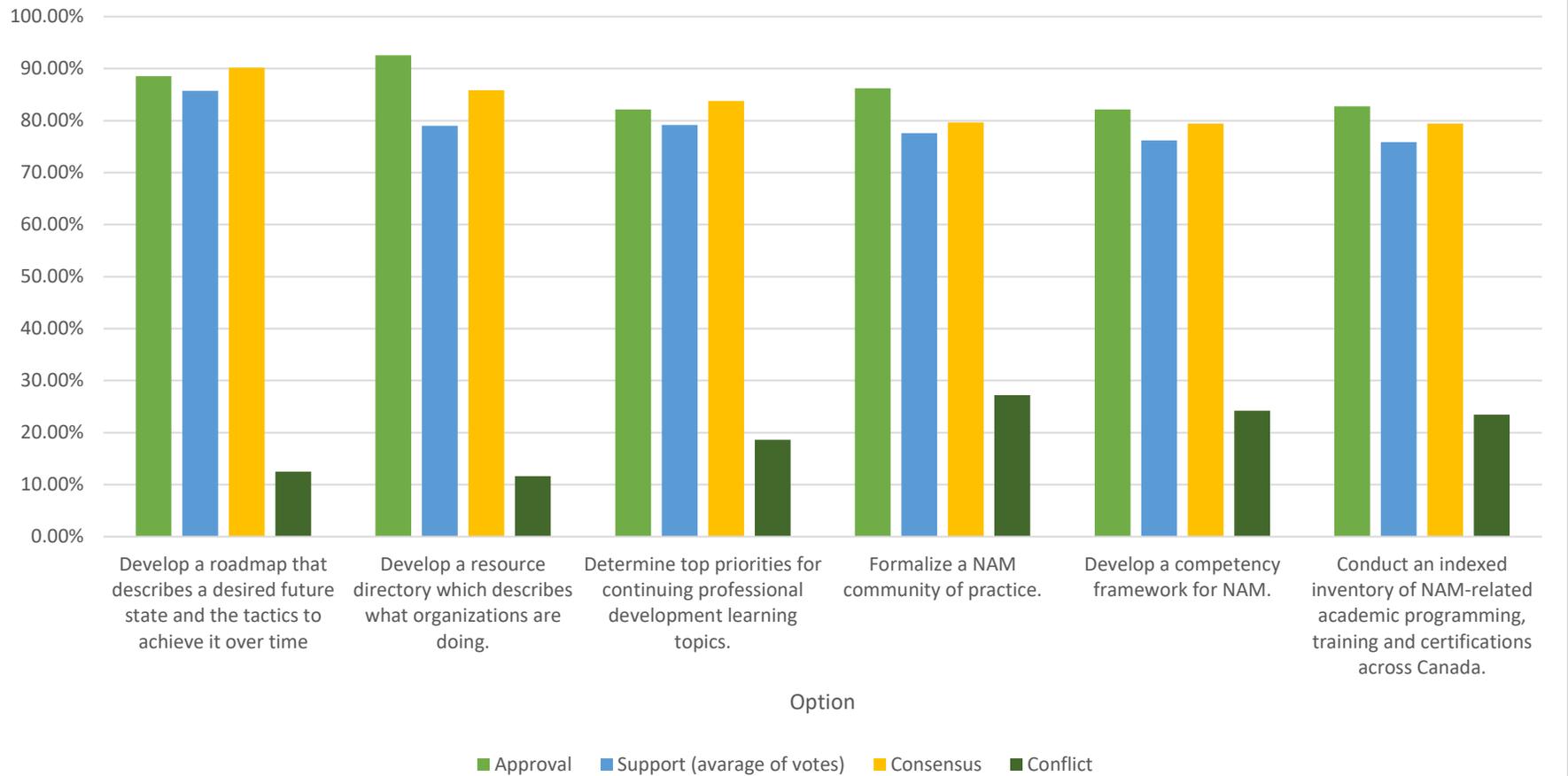


Figure 2. Priority ranking of first steps to progress NAM, showing relative approval, support, consensus and conflict in the option choices (n=36).

The suggested additional actions referenced resourcing both NAM as a practice through policy and technical improvements, and to improve NAM capacity and awareness through strategic planning based on a roadmap describing a desired future state. Nominated actions to better include NAM in professional norms included establishing a municipal NAM advisory body and integrating NAM into existing frameworks. There were calls for a NAM competency framework to be informed by existing professional associations with continuing professional development as a priority. Suggestions included strengthening a NAM community of practice (CoP) although support for a new and formal Cop was mixed. Additional NAM knowledge needs were identified as both technical (Develop an impact measures framework) and social (Develop and fund centres of Indigenous knowledge /learning/ training).

Participants were invited to make any additional comments at the end of the engagement. Among the few responses that were not aligned with the challenge statements, this comment articulates a common concern: “while I support the intended end game - the approach which seems to be advocated (based on the questions in this challenge) will lead to an elite set of practitioners which is not where this should be headed - mainstream and complement what is already being taught and applied in the industry”.

One comment mentioned the ranking of next steps was difficult because they all seemed important and urgent. Another comment brought up the funding question of ‘who will pay?’ This comment considering municipal roles in NAM is included in its entirety.

*“This is an important concept to integrate into asset management plans at all levels and for organizations that are required to undertake asset management, not just municipalities. I understand the focus on “municipal” but there needs to be a strong acknowledgement that since natural assets function at a watershed scale, an understanding of the watershed and influence over how it is managed are vital for NAM at the local level to be effective over the long term.”*

## Appendix

The analysis of responses to the Challenge Dialogue statements in the main body of this report considered responses to the Challenge Statements as well as topics and opinions introduced and explored by participants. This appendix includes lists of specific references in comments and responses that might otherwise be lost in the overall analysis.

### *Course Content Providers*

University of British Columbia, Simon Fraser University, Royal Roads University, Envision Sustainability Professional (ENV SP), Natural Resources Canada's Building Regional Adaptation Capacity and Expertise (BRACE) Program, the Climate Risk Institute (Infrastructure Resilience Professional program; IRP).

### *Named Associations*

- Alberta Municipalities
- Canadian Association of Municipal Administrators
- Canadian Institute of Planners
- Climate Risk Institute
- Engineers Canada
- Fraser Basin Council in BC
- Institute for Sustainable Infrastructure
- Municipal Natural Assets Initiative (MNAI)
- Ontario's conservation authorities, especially Credit Valley
- Professional Standards Board
- Provincial and Territorial Institutes and Associations
- Public Sector Accounting Board
- Regional Service Commissions in New Brunswick

### *Suggested Sources to inform NAM Practices*

- in Europe, South America, Asia, Africa, Australia and NZ.
- follow the LEED for building example (which has been very effective - except that it has really taken about 20 years to become the norm)
- UK working on Biodiversity Net Gain, Taskforce on Nature-related Financial Disclosures (TFND).

### *Communities of Practice*

- Natural and Nature-Based Climate Change Adaptation Community of Practice: [www.naturalinfrastructurenb.ca](http://www.naturalinfrastructurenb.ca) Hosted by New Brunswick Environmental Network.
- Green Shores: <https://stewardshipcentrebc.ca/green-shores-home> Hosted by Stewardship Centre of BC (SCBC).
- Cold Regions Living Shorelines: <https://www.ccadaptation.ca/en/crlscop> Hosted by the Climate Risk Institute.

### *Locations in Comments*

Montreal QC, Toronto ON, Vancouver BC, Okotoks AB, Credit River Watershed ON,

### *Caveats*

- Training courses should highlight the importance of including First Nations in ... planning
- Current AM courses already have NAM components
- There needs to be a business case for investing in these types of skills in the marketplace.
- What courses are available to understand economic aspects of NAM?
- emerging disciplines in engineering seem to come from the universities ... then trickle out into the industry ... starting ... at the post-secondary level would create a cohort of knowledgeable and motivated young practitioners to help drive this forward

### *Named Professions*

- Engineers
- Geoscientists
- Landscape architects
- Certified Public Accountant - CPA;
- Registered Professional Forester- RPF
- Adaptation professionals (e.g. ASAP - Association of Adaptation Professionals)
- Climate change professionals (ACCO - Association of Climate Change Officers).

### *Additional Next Steps ...*

- course work or training targeting professional planners
- programming ranging from entry-level NAM courses through to full post-secondary programming (professional development courses and academic programs).
- tools to evaluate the services provided by NI and the economic benefits are key but the balance of the courses and certifications are not supported
- a focus on improving the course offering and co-ordination of training at existing, well-established post-secondary institutions
- more post-secondary programs that have at least own courses, or NAM integrated into existing courses
- ability for continuing education
- integrated into existing courses on Sustainability and Climate Change

