

“Coastal resilience Caribbean Netherlands”: Outcomes of the Bonaire Stakeholder feedback Workshop

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1 Wageningen Marine Research

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Wageningen Marine Research

report: C096/25

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This research project was carried out by Wageningen Marine Research and subsidized by the Ministry of Agriculture, Fisheries, Food Security and Nature for the purposes of Policy Support Research Themes 'Coastal resilience Caribbean Netherlands ' (project no. BO-43-117-010) and 'Nature restoration of salinas and bays Caribbean Netherlands' (BO-43-117-007).

Wageningen Marine Research
Yerseke, December 2025

Wageningen Marine Research report: C096/25

Keywords: coral reef health, water quality, nature restoration, stakeholder engagement, Bonaire.

Client: Ministry of Agriculture, Fisheries, Food Security and Nature
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BO-43-117-010

This report can be downloaded for free from <https://doi.org/10.18174/704663>
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Photo cover: Erik Meesters

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KvK nr. 09098104,
WMR BTW nr. NL 8065.11.618.B01.
Code BIC/SWIFT address: RABONL2U
IBAN code: NL 73 RABO 0373599285

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A_4_3_2 V36 (2025)

Contents

Executive summary	4
1 Introduction	7
1.1 Delimitations	8
2 Materials and Methods	9
2.1 General	9
Workshop program	10
2.2 'Mentimeter' feedback session	11
2.3 'Liberating structures' discussion session	11
3 Results	12
3.1 'Mentimeter' feedback session	12
3.2 'Liberating structures' discussion session	19
3.2.1 Theme: water quality for coral reefs	19
3.2.2 Theme: restore nature in bays and salinas	20
3.2.3 Theme: reduce erosion	21
4 Discussion	22
4.1 Mentimeter	22
4.2 Liberating structures	22
4.3 Conclusions	23
5 Acknowledgements	25
6 Quality Assurance	26
References	27
Justification	28
Supplementary material 1 Raw data 'Mentimeter'	29
Supplementary material 2 Flipchart contents 17th October 2024	38

Executive summary

The marine nature of the Caribbean Netherlands and its ecosystem services are considered vital economic resources on these islands. A combination of global and local pressures, however, has led to a large-scale decline of the environmental quality and deterioration of the marine ecosystem and associated services. Balancing fisheries, agriculture, tourism and water management within the natural carrying capacity of the relevant ecosystems is therefore an urgent policy objective (KIA-LNV, Mission E, theme 2) for the Caribbean Netherlands. To address these challenges, the projects "Coastal Resilience Caribbean Netherlands (BO-43-117-010)" and "Nature restoration of salinas and bays Caribbean Netherlands (BO-43-117-007)", commissioned and funded by the Dutch Ministry of Agriculture, Fisheries, Food Security and Nature, were conducted by Wageningen Marine Research. Results and proposed policy recommendations from these two projects were shared with stakeholders during a workshop in Kralendijk, Bonaire, on the 17th October 2024. The aim of the workshop was to present key findings and proposed policy recommendations from the projects to local stakeholders, and to gather their feedback on the policy recommendations through interactive and structured discussions. By engaging participants from different sectors, the workshop sought to validate and refine selected recommendations, identify priorities, capture diverse perspectives, and explore practical ways forward for improving coastal resilience and ecosystem health in Bonaire.

The workshop was conducted as a trial on Bonaire, with the potential for more extensive interactive feedback and discussion in future Dutch Caribbean projects. Participation was limited to representatives from local government, maritime businesses conservation NGOs active in nature management, protection, and monitoring and included the researchers involved in the project. The tourism sector was largely absent, apart from one participant from a dive school, which may have influenced perspectives on tourism-related measures. During the workshop, only a selection of policy recommendations from the two commissioned projects "Coastal Resilience Caribbean Netherlands" and "Nature Restoration of Salinas and Bays Caribbean Netherlands" was discussed. The results presented here therefore reflect feedback on this subset of recommendations only, and cannot be extrapolated to measures not covered in the discussions. Moreover, this report reflects only the outcomes of the feedback and discussion components of the workshop and does not present the full research findings of the two projects. As such, the results of the workshop should be interpreted within its scope and limitations.

The workshop combined interactive polling and structured discussions to collect feedback from 36 participants representing government, NGOs, research institutions, and maritime businesses. To engage stakeholders and invite them to share their thoughts on the presented results, a combination of open and multiple-choice questions were posed through interactive questionnaires and polling with a facilitator and the program 'Mentimeter'. Responses were categorized according to overarching themes (for example 'wastewater treatment', 'pollution', 'erosion', 'education') and compiled. In addition, a selection of proposed policy recommendations from three themes (i.e. 'water quality', 'restore nature in bays and salinas' and 'erosion') were discussed in a structured manner using the Conversation Café method from 'Liberating Structures', a method to include and engage all participants. The policy recommendations were selected based on the urgency of the issues at stake and relevance to the broader community. The 'take aways' and 'ways forward' from the discussion session were written down on flipcharts and summarized.

Table 1: Selected policy recommendations per theme, based on the urgency of the issues at stake and relevance to the broader community:

<i>Policy recommendations</i>
Theme 1: Improve water quality for coral reefs
1) Take measures to prevent leaking of sewage & phase out cesspits 2) Increase the retention of water & sediment on land
Theme 2: Restore nature in bays and salinas
1) Deepen silted areas to restore lost areas 2) Structured clearing of accumulated Sargassum behind booms 3) Clear and maintain channels in mangrove forests to increase water circulation
Theme 3: Erosion
1) Stop over-grazing and actively manage free-roaming livestock 2) Increase vegetation cover in watersheds 3) Better spatial planning to reduce run-off and erosion

The quality of the coral reefs on Bonaire was rated as 'bad', 'very bad' or other negative terminology by most participants, based on an open-ended query from 'Mentimeter'. Participants identified water quality and erosion as priority issues. Awareness and involvement of the local community as well as policy implementation and enforcement of rules (for instance with respect to coastal development) were the main themes according to the 'Mentimeter' responses and discussion session. These topics were also often mentioned as ways forward. Population growth and policy implementation were also mentioned as major concerns with respect to coastal resilience and ecosystem health.

There was broad support from the workshop participants for the proposed policy recommendations during the structured discussion session. Participants flagged the complexity and broadness of some recommendations, stressing the need for clear implementation strategies, structural funding and incentives, community involvement and education, particularly among youth. Moreover, participants highlighted the need for integrating social science research in research conducted on Bonaire to bridge the gap between policy, science, and public understanding. Several suggestions for additions to the discussed policy recommendations were made such as a need to monitor the impacts of the measures related to water quality ('Take measures to prevent leaking of sewage and phase out cesspits' and 'Increase the retention of water and sediment on land') and to ensure measures are smart and feasible. Policy recommendations for restoring nature in bays and salinas ('Deepen silted areas to restore lost areas'; 'Structured clearing of accumulated Sargassum behind booms' and 'Clear and maintain channels in mangrove forests to increase water circulation') were generally supported by the workshop participants. While participants agreed with the necessity for these measures, methods of implementation were a point of discussion. The policy recommendations that were discussed on the subject of erosion ('Stop overgrazing and actively manage free-roaming livestock'; 'Increase vegetation cover in watersheds' and 'Better spatial planning to reduce run-off and erosion'), were generally supported by workshop participants but also considered to be too broad. The known issues that lead to erosion, such as overgrazing and low vegetation cover, were perceived as too complex to get to feasible solutions. A central vision for sustainable planning and clear communication between the different stakeholders were suggested in the context of erosion. Overall, the discussions highlighted that ecological interventions alone are not enough. Long-term success depends on combining technical measures with social and economic support including compensation, incentives, subsidized improvements to the (private) sewage system and more attention for poverty alleviation. Education and social science approaches were emphasized as tools to connect scientific knowledge, policy, and community engagement. Involvement of multiple stakeholders in the vision for sustainable spatial planning and development is needed. A need for sustainable tourism with local support was expressed, noting that it should provide income without placing excessive pressure on ecosystems. This outcome is noteworthy considering the tourism sector itself was not well represented.

This workshop contributed in several ways to the research conducted within the two policy supporting (Beleidsondersteunend Onderzoek (BO)) projects. Beyond the specific content, the workshop demonstrated

the value of participatory formats in science-for-policy contexts. The interactive methods encouraged open discussion, brought forward diverse perspectives, and provided researchers with feedback that can help refine recommendations. The discussed issues often proved complex and involved many different and sometimes conflicting interests. Exploring common denominators together is useful in these situations. It allows for validation or testing of ideas and recommendations from researchers and can gain support with stakeholders. It creates an opportunity for other perspectives and ideas to surface and can lead to additional or more specific recommendations. The workshop and use of techniques to engage participants was well received and we recommend this approach in future projects that involve a multitude of different stakeholders. To increase effectiveness such a workshop is ideally organized halfway and at the end of a project. Organising such workshops midway and at the end of projects allows for validation of proposed measures, identification of knowledge gaps, adjustments throughout the project, and increased stakeholder ownership of outcomes.

1 Introduction

The marine nature of the Caribbean Netherlands and the resulting ecosystem services are the most important economic resources for Bonaire, Saba and Sint Eustatius (Schep et al. 2012, van de Kerkhof et al. 2014a, 2014b). However, the islands are under great pressure, partly due to climate change, but also due to local causes such as increasing tourism, erosion, water use, pollution and eutrophication of coastal waters. Tourism and population on Bonaire have increased exponentially over the past 10 years and at the same time biodiversity has decreased significantly. This deterioration of environmental quality has been discussed extensively in the report "State of nature of the Caribbean Netherlands 2024" (Debrot et al. 2018, 2025). The consequence of this large-scale decline is that the ecosystem services (e.g. food provisions, coastal protection, nutrient cycling, recreational activities) that are associated to the marine ecosystem have deteriorated significantly. These ecosystem services are the basis of the local economy. Balancing fisheries, agriculture, tourism and water management with the natural carrying capacity of the relevant ecosystems is therefore an urgent policy objective (KIA-LNV, Mission E, theme 2) for the Caribbean Netherlands.

An integrated approach and better measurements of processes on land and at sea are essential to restoring the balance between the carrying capacity of ecosystems and economic activities through targeted interventions and to increase the resilience of nature, biodiversity and thus also that of society. However, there is a lack of fundamental knowledge to arrive at an integrated approach to coastal management in the Caribbean Netherlands. In the project 'Coastal resilience Caribbean Netherlands', a new infrastructure has been set up together with local stakeholders to better monitor the state of marine nature through smart technologies and citizen science (Dogruer et al. 2021). The intended infrastructure was used to measure the effects of land and sea use, to evaluate the effects of management measures on ecosystem services, and to optimize nature management. This project will contribute to the sustainability of agriculture, tourism and fisheries and the adaptability of the islands to climate change.

As part of this project, stakeholders on Bonaire were invited to a workshop at Kralendijk, Bonaire, where results and proposed policy recommendations from the projects "Coastal resilience Caribbean Netherlands (BO-43-117-010)" and "Nature restoration of salinas and bays Caribbean Netherlands (BO-43-117-007)" were shared. We thank LVVN (Ministry of Agriculture, Fisheries, Food Security and Nature) for subsidizing the Policy Support Research Themes "Coastal resilience Caribbean Netherlands" (project no. BO-43-117-010) and "Nature restoration of salinas and bays Caribbean Netherlands" (BO-43-117-007).

The project "Resilience restoration of nature and society in the Caribbean Netherlands" focuses on halting the decline of coral reefs in Bonaire, Saba, and Sint Eustatius, while enhancing the resilience of marine ecosystems and their associated services. In response to combined global and local pressures—such as climate change, pollution, erosion, and rapid coastal development—the project aims to establish a monitoring infrastructure in collaboration with local stakeholders. Using innovative tools including environmental DNA (eDNA), remote sensing, digital terrain modelling, and stakeholder engagement the project supports data-driven management and aims to strengthen sustainable practices in tourism, agriculture, and fisheries. This integrated approach provides insight into land–sea interactions and informs adaptive policy interventions to increase both ecological and societal resilience in the region.

The project "Nature restoration of salinas and bays in the Dutch Caribbean" addresses the degradation of coastal bays and salt lakes (salinas), which are vital for water regulation, sediment retention, and biodiversity. Due to increasing eutrophication and siltation, many of these ecosystems have lost functionality. The project investigates the causes and extent of this degradation and evaluates feasible, cost-effective restoration measures. Through field assessments and targeted studies on seagrasses, Sargassum influx, and mangrove habitat restoration, the project contributes essential baseline data and practical recommendations for nature restoration. The outcomes support informed spatial planning and management, with a view to securing the long-term ecological value and services of these coastal systems.

The aim of the workshop was to present key findings and proposed policy recommendations from the projects to local stakeholders, and to gather their feedback on the policy recommendations through interactive and structured discussions. By engaging participants from different sectors, the workshop sought to validate and refine selected recommendations, identify priorities, capture diverse perspectives, and explore practical ways forward for improving coastal resilience and ecosystem health in Bonaire. A selection of the proposed policy recommendations from both projects were further discussed during the workshop that consisted of feedback and discussion sessions involving the participants. The policy recommendations (Table 1.1) were selected by researchers prior to the workshop and organized in three themes: 1) water quality, 2) restore nature in bays and salinas and 3) erosion. This selection was based on the urgency of the issues at stake and relevance to the broader community.

Table 1.1 Selected policy recommendations per theme

<i>Policy recommendations</i>
Theme 1: Improve water quality for coral reefs
1) Take measures to prevent leaking of sewage & phase out cesspits 2) Increase the retention of water & sediment on land
Theme 2: Restore nature in bays & salinas
1) Deepen silted areas to restore lost areas 2) Structured clearing of accumulated Sargassum behind booms 3) Clear and maintain channels in mangrove forests to increase water circulation
Theme 3: Erosion
1) Stop over-grazing and actively manage free-roaming livestock 2) Increase vegetation cover in watersheds 3) Better spatial planning to reduce run-off and erosion

1.1 Delimitations

- The approach described in this report served as a trial with the potential to include more extensive (interactive) feedback and discussion with the stakeholders involved in future projects in the Dutch Caribbean. For this reason, it was only conducted on Bonaire at this stage.
- A selection of policy recommendations was discussed during the workshop. We would like to emphasize that outcomes of the feedback and discussion sessions cannot be extrapolated to policy recommendations that were not the subject of discussion during this meeting.
- This report concerns the results from the feedback and discussion section from the workshop, and not the results from the conducted research in the two BO projects. The workshop participants were from local government, research institutions and conservation NGOs who are active in nature management, protection and/ or monitoring and maritime related businesses

2 Materials and Methods

2.1 General

The workshop took place in Kralendijk, Bonaire, on 17th of October 2024. Workshop participants were invited from maritime related businesses (including dive and tourism sector), the local government and various nature conservation organisations. The number of participants was 39. This included 15 participants working with six nature conservation NGO's, eight people from two government departments, and six people from maritime related businesses. The tourism sector, whilst invited, was only represented by one participant from a dive school, categorized under maritime related business. Three students from Wageningen University & Research and seven researchers from Wageningen Marine Research (WMR) also participated in the workshop. The role of the researchers was limited to facilitating the workshop, taking notes and providing clarification if there were questions during the discussion session.

The workshop began with short presentations of the results and a selection of proposed policy recommendations from the projects 'Coastal resilience Caribbean Netherlands (BO-43-117-010)' and 'Nature restoration of salinas and bays Caribbean Netherlands (BO-43-117-007)' by researchers from Wageningen Marine Research. The policy recommendations were selected prior to the workshop based on the urgency of the issues at stake and relevance to the broader community. This selection was made by the researchers involved in each of the topics, based on their expertise, and discussed among the researchers involved prior to the workshop. After the presentations there was an interactive element with the audience using the interactive questionnaire and polling features of the presentation program 'Mentimeter' and structured group discussions (see full program on page 9) aimed at gathering feedback on the policy recommendations. Researchers and students were available for additional questions in relation to their presentations. However, researchers were asked not to respond to 'Mentimeter' questions during the feedback session or participate in the structured group discussions.

During the workshop Chatham House Rules applied. Under these rules: "Participants are free to use the information received, but neither the identity nor the affiliation of the participants nor that of any other participant, may be revealed." The only deviation from the rule, is that the identity and topic of the presentations by the researchers from WMR is public. All responses from the workshop have been anonymised, so that they cannot be traced back to individuals or organisations. 'Mentimeter' answers were anonymous as part of its set up.

Workshop program



WAGENINGEN
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Program 17 October 2024 - Workshop Coastal resilience Caribbean Netherlands

Location: Blue Lagun café, Kaya International 36, Kralendijk

Moderator: Lisa Becking & Roxanne-Lianna Fransisca

9:00 Welcome & introduction to the project – Erik Meesters

Stakeholders

9:10 Ministerie van Landbouw Voedselzekerheid en Natuur (LVVN) - Introduction

9:20-9:30 STINAPA - Vision on coastal management Bonaire – Roxanne Fransisca

Ecosystem health

9:30–9:50 State of Nature coral reefs – Erik Meesters

9:50-10:10 State of Nature Bays and Salinas – Matthijs van der Geest

10:10-10:25 Mentimeter

10:25-10:40 Break (15 min)

Water Quality

10:40-10:55 Nutrients & isotopes – Erik Meesters

10:55-11:10 eDNA – Linda Tonk

11:10-11:25 Toxins – Gulsah Dogruer

11:25-11:45 Mentimeter

11:45-12:00 Break (15 min)

Erosion

12:00-12:20 Erosion & run-off – Klaas Metselaar

12:20 – 12:30 Questions

Intro Feedback & Discussion

12:30 - 12:35 Explanation afternoon session

[12:35 – 13:45](#) [Lunch \(1:10\) at the Blue Lagun cafe](#)

Feedback & Discussion

13:45- 13:55 Recap of policy recommendations

13:55-16:00 Interactive discussion of perceptions & ways forward

16:00 -17:00 Wrap-up & drinks

2.2 'Mentimeter' feedback session

To engage stakeholders and invite them to share their thoughts on the presented results, the interactive questionnaire and polling features of the presentation program 'Mentimeter' were used. Participants answered questions using their smartphones. All responses were anonymous. A combination of 11 open and multiple-choice questions was presented. Some of these were scale-type multiple choice questions that provided the respondents with a scale to rate how strongly they agree or disagree with a statement. In these cases, the weighted average was calculated. This provides the average of the values that are scaled by importance and is calculated as the sum of weights times values, divided by the sum of weights. On a scale of 0 (strongly disagree) to 10 (strongly agree) categories were as follows: 0 -2 strongly disagree, 2-4 disagree, 4-6 neutral, 6-8 agree and 8-10 strongly agree. On a scale of 0 (strongly disagree) to 5 (strongly agree) categories were as follows: 0-1 (strongly disagree), 1-2 disagree, 2 -3 neutral, 3-4 agree and 4-5 strongly agree. Responses to open questions that consisted of several components, for instance when a response consisted of two answers each belonging to a different category, were split and treated as separate answers. Responses were categorized according to overarching themes such as wastewater treatment, pollution, erosion, education etc. The responses were added up per theme. Raw data is added as supplementary material 1.

2.3 'Liberating structures' discussion session

In the discussion session a selection of several proposed policy recommendations from each theme were discussed: 1) water quality, 2) restore nature in bays and salinas and 3) erosion (Table 1.1). The selection was made based on the urgency of the issues at stake and relevance to the broader community. The conversation cafe method from 'Liberating Structures' (a collection of structures to facilitate meetings and conversations) was used to facilitate the conversation (Lipmanowicz and McCandless 2025). Four groups were formed according to the themes mentioned above (note that water quality featured as a subject twice to achieve desired group sizes of seven participants). Each group included approximately seven participants and a host from WUR. Two or three proposed policy recommendations for each theme were written on a flipchart paper. The discussion was structured in four rounds per group. In the first round every participant had 1 minute to verbally respond to the policy recommendations on the flipchart. In the second round every participant had the opportunity to add or reflect on the responses of other participants. The third round was used for open conversation. In the fourth round every participant was presented with 1 minute for take aways on the subject of conversation. The take aways and ways forward were written down on the flipchart (see supplementary material 2). Take aways were scored (for instance by adding a star for importance) by participants. The outcomes on the flipcharts were summarized per flipchart by each group.

What are the priority issues?

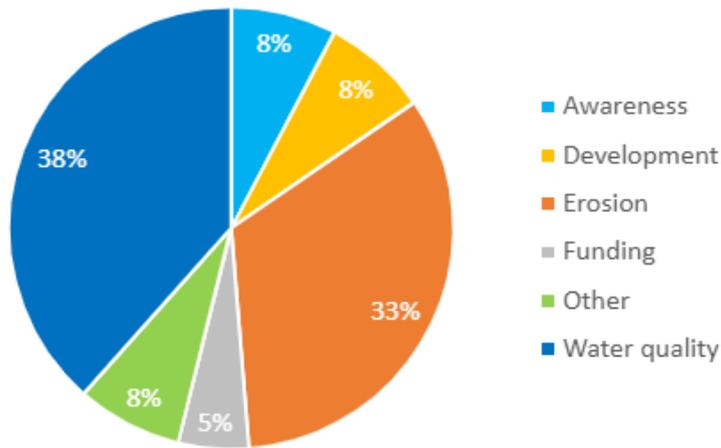


Figure 3.2 Pie chart of responses to question 2: "What do you see as priority issues that need to get tackled?" asked during the stakeholder workshop (17 October, 2024). There were 39 responses from 23 respondents.

Question 3 "Do you consider run-off induced infilling of the backwaters of Lac Bay and Lagun as a problem?" was a multiple-choice question and had 23 responses (Figure 3.3). The response 'yes for both Lac Bay and Lagun' was chosen most often (20 times).

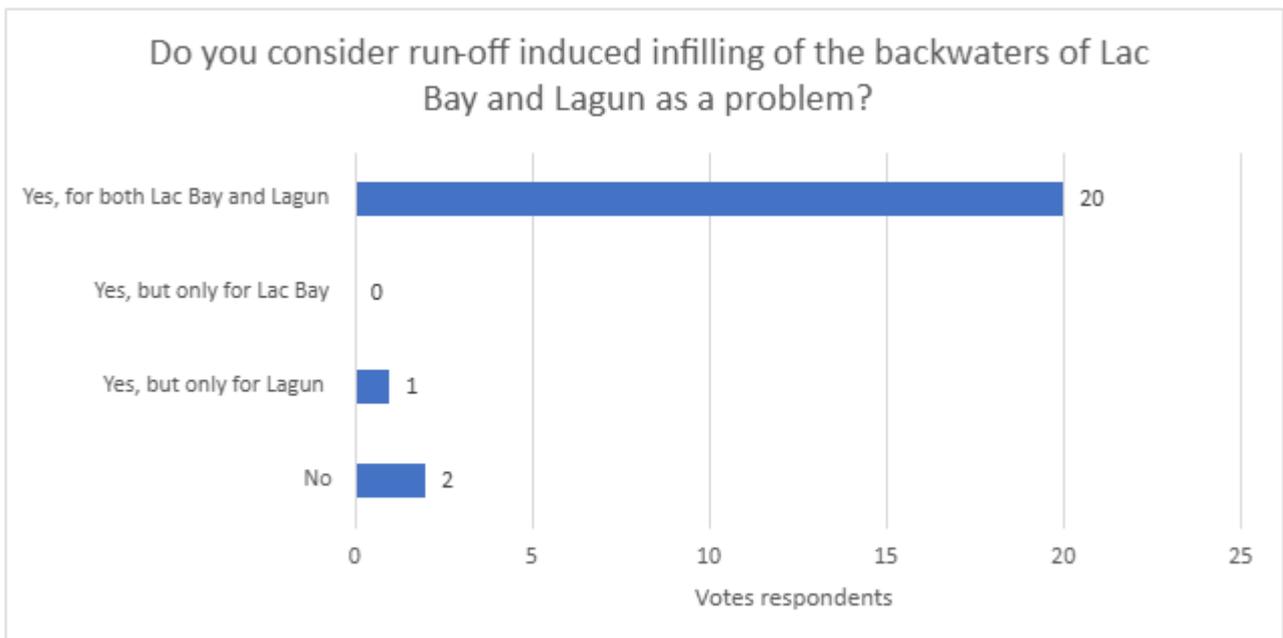


Figure 3.3 Bar chart of the votes to question 3: "Do you consider run-off induced infilling of the backwaters of Lac Bay and Lagun as a problem?" asked during the stakeholder workshop (17 October, 2024). There were 23 responses.

Question 4 entailed a response to the statement "Dredge infilled backwaters Lac Bay and Lagun to improve water quality" (Figure 3.4). On a scale of 1 (disagree) to 5 (strongly agree) how much do you agree with the statement? Scale 3 received most responses (9). The weighted average of 23 respondents was 3.65. This provides the average of the values that are scaled by importance and can be interpreted as in between neutral and agree. 12 out of 23 respondents agreed or strongly agreed, whereas 2 disagreed.

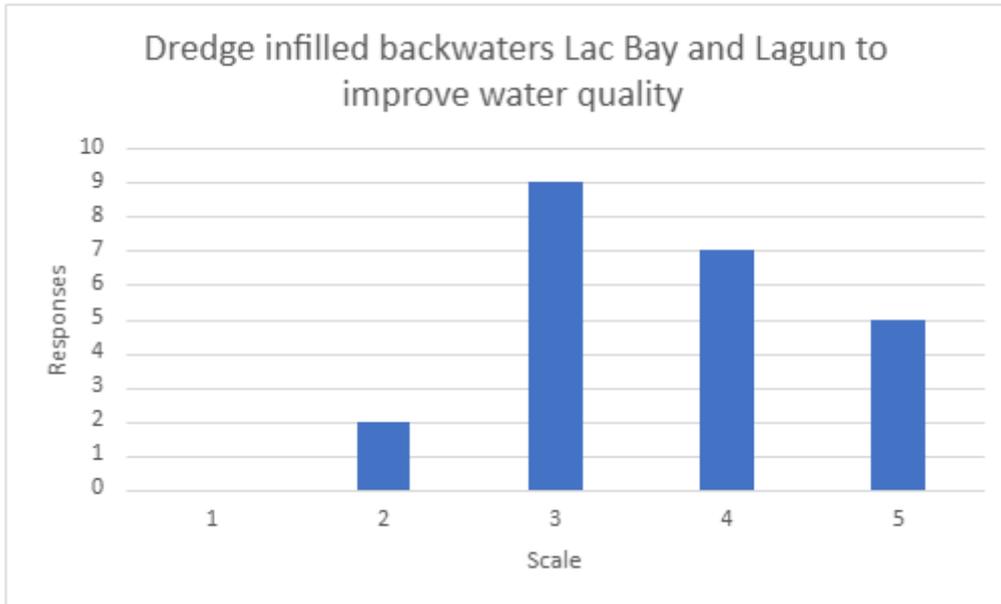


Figure 3.4 Bar chart of the responses on a scale of 1 (strongly disagree) to 5 (strongly agree) to statement 4 "Dredge infilled backwaters Lac Bay and Lagun to improve water quality" asked during the stakeholder workshop (17 October, 2024). There were 23 respondents.

Question 5 was a multiple-choice response to the statement 4: "I think restoring corals is a wasted effort if we don't 'restore' water quality or reduce pollution". Twenty people responded of which 70% agreed with the statement (Figure 3.5).

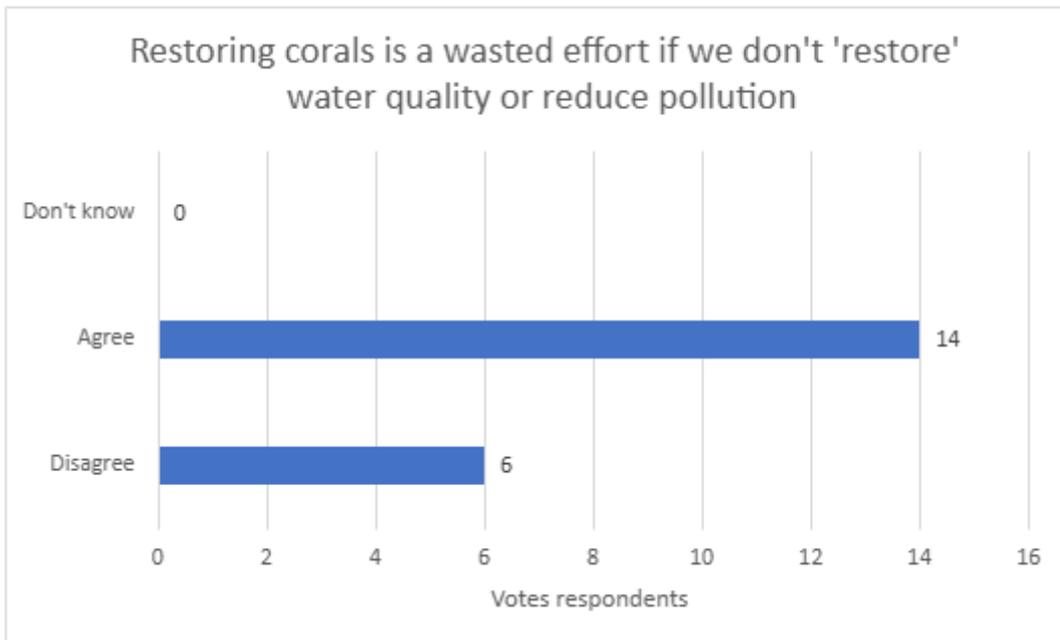


Figure 3.5 Bar chart of the responses to statement 5: "I think restoring corals is a wasted effort if we don't 'restore' water quality or reduce pollution" asked during the stakeholder workshop (17 October, 2024). There were 20 respondents.

Question 6 (open question) "What measures are needed to prevent untreated sewage and wastewater from entering the sea?" yielded 38 responses from 23 respondents and were categorized as wastewater treatment (22), research, policy & implementation (10), prevent erosion (3) and water retention (3) (Figure 3.6). In the category 'wastewater treatment', measures regarding the sewage system and connection were mentioned most often (7 times).

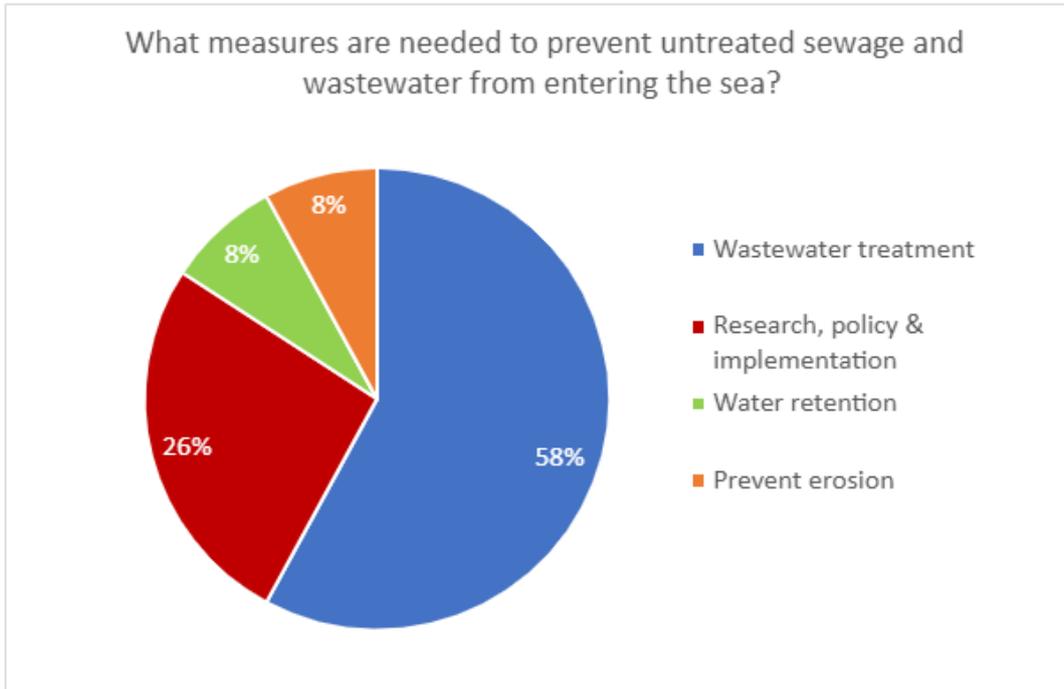


Figure 3.6 Pie chart of responses to question 6: "What measures are needed to prevent untreated sewage and wastewater from entering the sea?" " asked during the stakeholder workshop (17 October, 2024). There were 38 responses from 23 respondents.

Question 7 (multiple choice) "On a scale of 0 to 10 how much do you agree with the following statements concerning wastewater, sewage and run off?" yielded 24 responses that were used to calculate the weighted average of the values scaled by importance (Figure 3.7). In this case, 0 means strongly disagree and 10 means strongly agree, whereby the weighted average is the average of the values that are scaled by importance. 'Building permits should require clear plans on preventing erosion, runoff, and storage of rainwater' scored the highest (weighted average is 9, or towards strongly agree), followed by 'closed septic tank systems should be mandatory' (weighted average 8.83, strongly agree) and 'it is not feasible to replace all cesspits by stand-alone wastewater systems or to connect to main sewage system' (weighted average 3.21, between somewhat disagree and neutral).

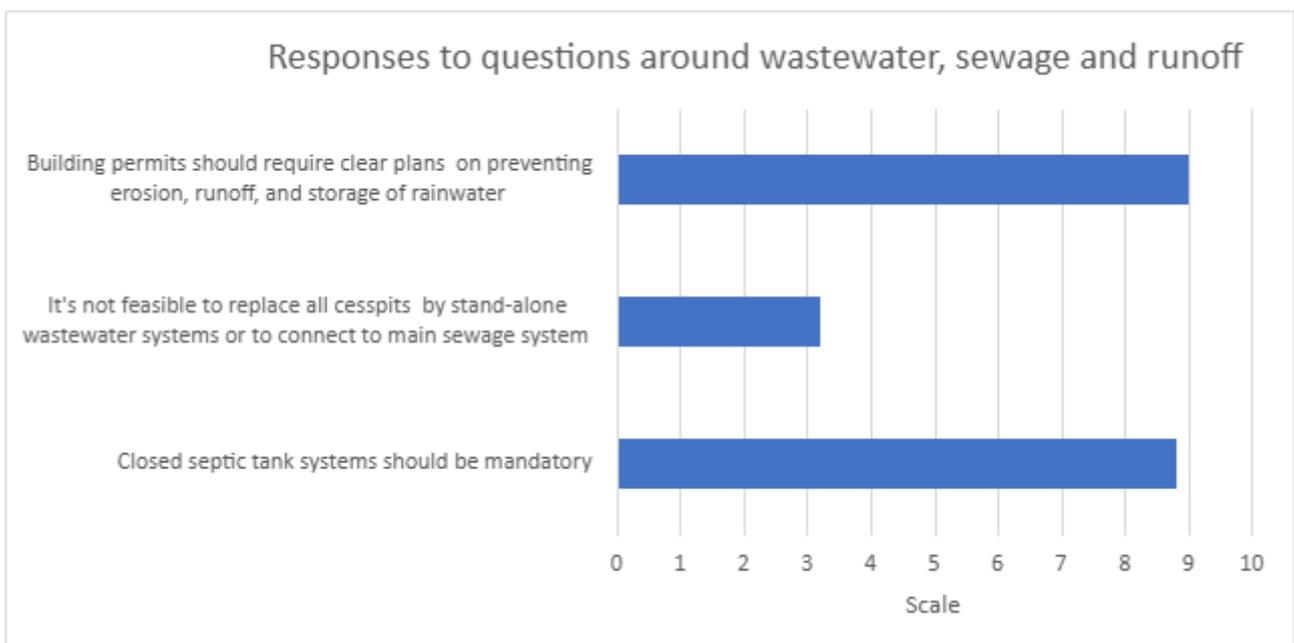


Figure 3.7 Weighted average of responses to question 7: questions regarding wastewater, sewage and runoff. Scale 0 to 10, where 0 means strongly disagree and 10 means strongly agree. Weighted average is the average of the values that are scaled by importance.

Question 8 (open question) "Coastal resilience and ecosystem health: what is your biggest worry?" yielded 50 responses from 28 respondents (Figure 3.8). Responses were categorized as 'population growth & development' (18), 'policy & implementation' (12), 'ecosystem loss' (7), 'awareness & involvement' (5), 'water quality management' (3), 'economic & social' (3) and 'other' ('alignment and combination of stressors multiplying each other') (2) (Figure 3.8). 'Population growth and development' (coastal and urban) constituted 36% of the responses. Uncontrolled growth of the population on Bonaire or overpopulation without proper planning (infrastructure, schooling systems, provisioning) leading to economic, environmental, and social issues was specifically mentioned five times.

Coastal resilience and ecosystem health: what is your biggest worry?

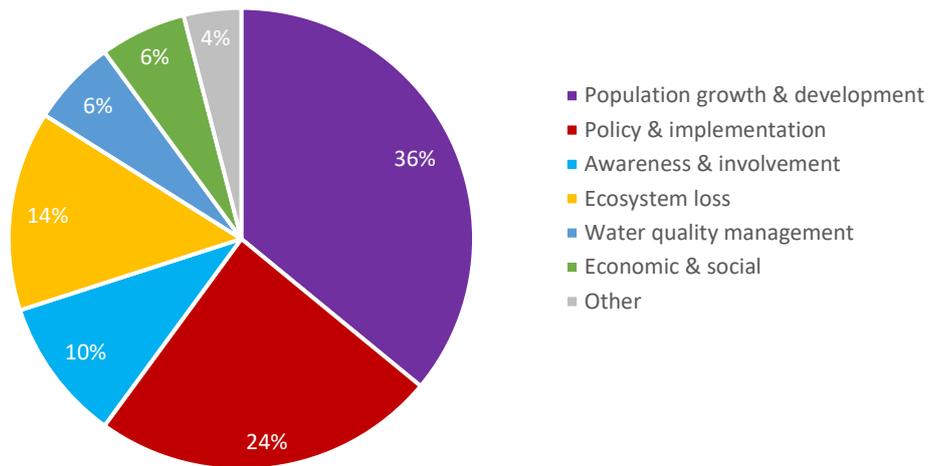


Figure 3.8 Pie chart of responses to question 8 "Coastal resilience and ecosystem health: what is your biggest worry?" asked during the stakeholder workshop (17 October, 2024). There were 50 responses from 28 respondents.

Question 9 (open question) "Coastal resilience and ecosystem health: what research is still needed?" yielded 29 responses from 21 respondents (Figure 3.9). Responses were categorized as 'applied research, intervention & implementation' (11), 'social science' (8), 'monitoring & validation' (4), and 'other' (6) (Figure 3.9). 'No more research time for action', 'better implementation of research results' and 'who's responsible' were categorized as other but are also important signals. The response 'stop watching it degrade and look for solutions' was categorized as applied research, intervention & implementation.

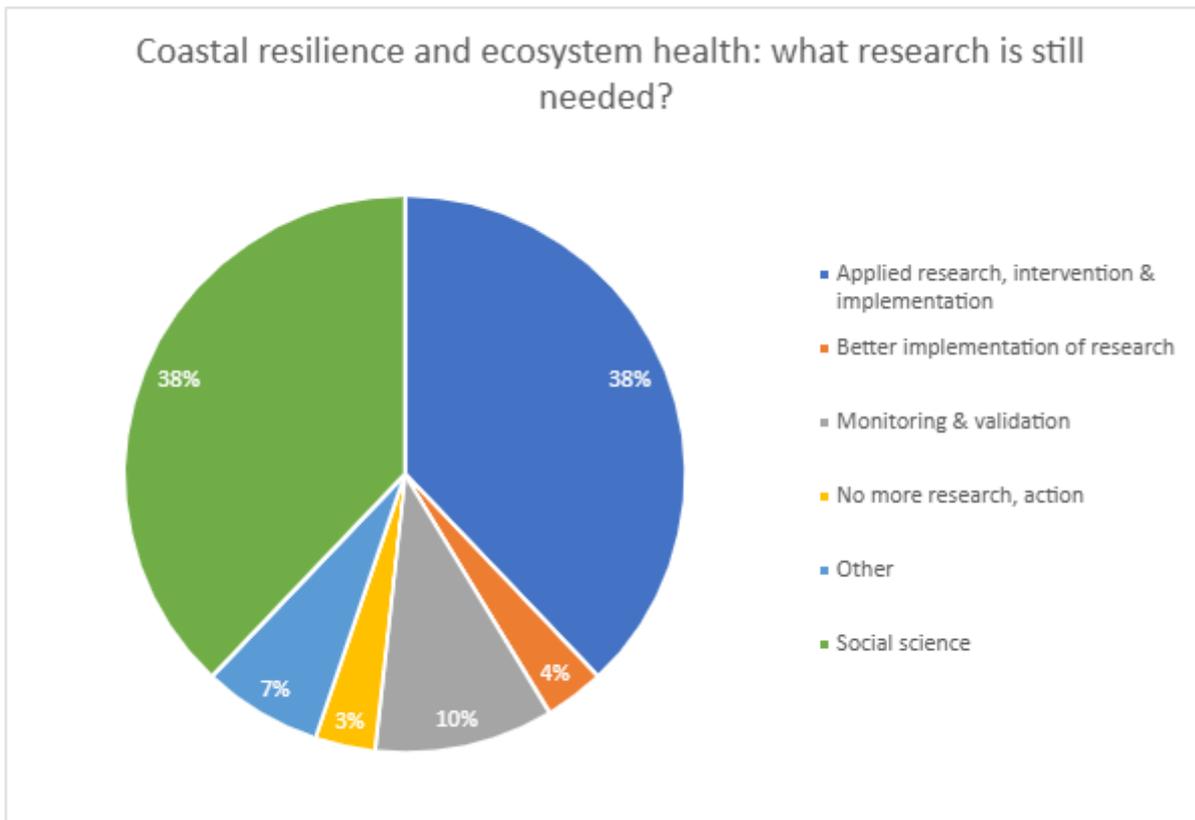


Figure 3.9 Pie chart of responses to question 9 "Coastal resilience and ecosystem health: what research is still needed?" asked during the stakeholder workshop (17 October, 2024). There were 29 responses from 21 respondents.

Question 10 (open question) "Coastal resilience and ecosystem health: what measures are needed?" yielded 56 responses from 21 respondents (Figure 3.10). Responses were categorized as 'awareness & involvement' (e.g. local involvement, education and engagement of youth) (15), 'policy implementation & enforcement' (10), 'nature protection & restoration' (10), 'sustainable population growth & development' (7), 'wastewater treatment' (4), 'funding' (3), 'sustainable tourism & development' (2), 'organizational' (2), 'poverty reduction' (1), 'other' (i.e. more resilience restoration) (1) (Figure 3.10).

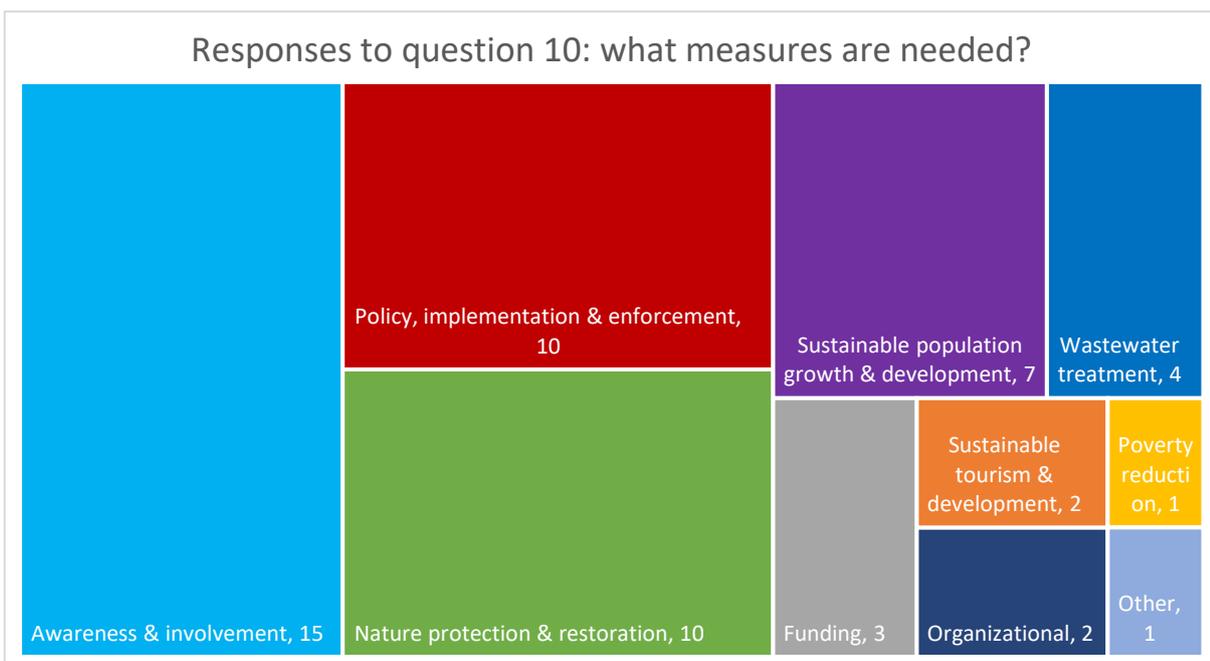


Figure 3.10 Treemap of responses to question 10 "Coastal resilience and ecosystem health: what measures are needed?" asked during the stakeholder workshop (17 October, 2024). There were 56 responses from 21 respondents.

Question 11 (open question) "Coastal resilience and ecosystem health: what is the role of tourism?" yielded 34 responses from 20 respondents (Figure 3.11). Responses were categorized as 'need for sustainable tourism' (13), 'pressure/negative' (8), 'financial resource' (7), 'positive' (3) and 'other' (i.e. 'Who benefits and who pays?', 'Big role, rules need to be clear, implemented and enforced', 'Nature is the main attraction for tourism' (3) (Figure 3.11).

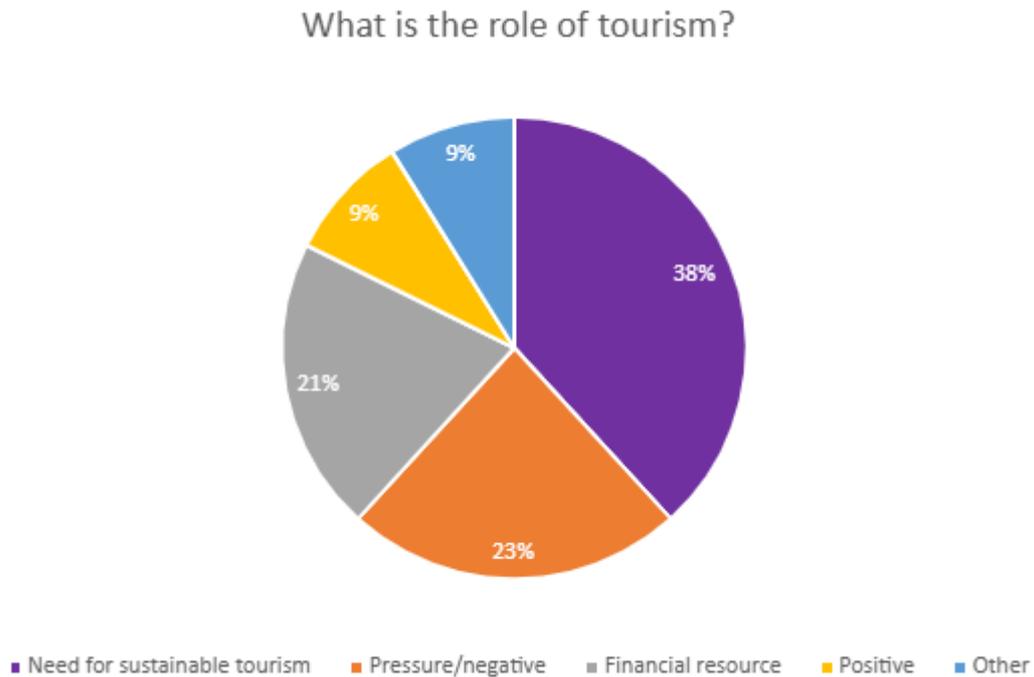


Figure 3.11 Pie chart of responses to question 11 "What is the role of tourism?" asked during the stakeholder workshop (17 October, 2024). There were 34 responses from 20 respondents.

3.2 'Liberating structures' discussion session

During the discussion session, several proposed policy recommendations from each theme were reviewed to gather feedback through structured discussions (Table 1.1). This process produced additional perspectives and more specific recommendations.

3.2.1 Theme: water quality for coral reefs

Proposed policy recommendations: 1) Take measures to prevent leaking of sewage & phase out cesspits; and 2) Increase the retention of water & sediment on land. This theme and its proposed policy recommendations were discussed by two groups. A summary of take aways and ways forward taken from the flipcharts (supplementary material 2) of both groups is presented in table 3.1.

Table 3.1: Summary of take aways and ways forward from the discussion of policy recommendations of theme 1: Improve water quality for corals reefs.

Policy recommendations theme 1: Improve water quality for coral reefs	
1. <i>Take measures to prevent leaking of sewage & phase out cesspits</i>	
2. <i>Increase the retention of water & sediment on land</i>	
Take aways group 1:	Ways forward group 1:
<ul style="list-style-type: none"> Both policy recommendations were supported by the workshop participants. A need to evaluate negative consequences of the recommendations was expressed. Making measures smart and feasible was marked as important. Education on why these policy recommendations are necessary. Who is going to pay for the resources? Compensation for private investment. Removal or containment of goats (and donkeys) and more vegetation in general are important factors influencing water and sediment retention on land. Decentralized wastewater treatment or a cost-effective balance between centralized and decentralized wastewater treatment. Integration of sewage (old and new systems) in the overall water management plan. Implementation was emphasized because many plans are drafted but never executed. Short-term funded projects often lack follow-up, limiting their long-term impact. No wastewater leakage within a certain timeframe. Ability of households and nature to increase water retention. 	<ul style="list-style-type: none"> Support from the local government to implement sewage treatment. A clear vision (of the local government) on rainwater retention and nature inclusive planning. Providing education on why improving water quality or measures are necessary. Compensation for private investments. Education and local involvement scored highest as well as a better understanding of how to involve local organizations and people (use of social science). Poverty among the people of Bonaire and costs for resources were considered a major concern. Subsidizing wastewater removal for low incomes and working with incentives or compensation (for instance for goat removal) to stimulate sustainable mindset or behaviour. Locating and prioritizing (sewage) leakage, prioritizing greenery and removing goats. Better management of sewage and waste from yachts and cruise ships and enforcement of rules.
Take aways group 2:	Ways forward group 2:
<ul style="list-style-type: none"> Both policy recommendations were supported by the workshop participants. Public awareness is important. Need for local stakeholder responsibility and accountability. Improving water quality not just for corals, but also for people. Island's capacity for population growth (residents and tourists) needs to be defined. Importance of efficient infrastructure. 	<ul style="list-style-type: none"> Establishing local protective limits or thresholds. Enforcement of legislation (for instance for construction of new buildings). The importance of sharing information and creating awareness with locals. Educating younger people. Several ideas were pitched on this topic and included simple explanation of scientific findings (what can you do?) and

<ul style="list-style-type: none"> • Importance of research and monitoring. • A need for financial resources to implement recommendations. • Completing projects and follow up on commitments (e.g. local government). 	<p>several media forms (radio, visuals and social media).</p> <ul style="list-style-type: none"> • Need for a long-term vision (comprehensive) and planning of water and sediment retention and incorporation in the planning of new urban development. • Structural funding to implement policy recommendations.
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3.2.2 Theme: restore nature in bays and salinas

Proposed policy recommendations: 1) Deepen silted areas to restore lost areas; 2) Structured clearing of accumulated Sargassum behind booms; 3) Clear and maintain channels in mangrove forests to increase water circulation. This theme and its proposed policy recommendations was discussed by one group. A summary of take aways and ways forward taken from the flipcharts (supplementary material 2) of both groups is presented in table 3.2.

Table 3.2: Summary of take aways and ways forward from the discussion of policy recommendations of theme 2: Restore nature in bays and salinas.

Policy recommendations theme 2: Restore nature in bays and salinas	
<i>1. Deepen silted areas to restore lost areas</i>	
<i>2. Structured clearing of accumulated Sargassum behind booms</i>	
<i>3. Clear and maintain channels in mangrove forests to increase water circulation</i>	
Take aways:	Ways forward:
<ul style="list-style-type: none"> • To maintain the ecosystems associated to bays and salinas (mangroves, seagrass beds and lagoons), the measures mentioned in the policy recommendations are necessary. • Sediment needs to be removed from the silted areas; however, dredging was mentioned as a last resort. • Pilot studies are needed, in combination with a stepwise restoration plan including monitoring (satellite and field research) of the effects of the measures. • It is important to include different perspectives and expertise when tackling the issues around restoration of bays and salinas in a structured manner leading to solutions and actions (not resulting in endless debate). • Educational programs to explain to citizens of Bonaire what is happening. 	<ul style="list-style-type: none"> • Education, awareness and inclusion of the local people is needed to create support. • More comprehensive approach involving everyone and everything to maintain the ecosystems. • Fair representation of different viewpoints. • Combine research and fieldwork and connect to people of Bonaire. • Reduce poverty in Bonaire. • Not just talk, action is also needed. • Expand channel restoration

3.2.3 Theme: reduce erosion

Proposed policy recommendations: 1) Stop overgrazing and actively manage free-roaming livestock; 2) Increase vegetation cover in watersheds; 3) Better spatial planning to reduce run-off and erosion. This theme and its proposed policy recommendations was discussed by one group. A large part of the discussion around this theme pointed towards awareness, involvement and education. The policy recommendations were deemed too broad. A summary of take aways and ways forward taken from the flipcharts (supplementary material 2) of both groups is presented in table 3.3.

Table 3.3: Summary of take aways and ways forward from the discussion of policy recommendations of theme 3: Reduce erosion.

Policy recommendations theme 3: Reduce erosion	
<i>1. Stop over-grazing and actively manage free-roaming livestock</i>	
<i>2. Increase vegetation cover in watersheds</i>	
<i>3. Better spatial planning to reduce run-off and erosion</i>	
Take aways:	Ways forward:
<ul style="list-style-type: none"> • The issues leading to soil erosion are known but they are perceived as too complex to get to feasible solutions (for instance for spatial planning). • A central vision for sustainable planning and clear communication between the different stakeholders is needed. • Positive effects (meat quality) or other functions of free-roaming livestock are overlooked (policy recommendation 1). • Looking into more or alternative solutions was suggested (policy recommendation 2). • Policy recommendation 3 needs to be more specific. • It needs to be clear how improved spatial planning can help to reduce run-off. And why this is needed. • More awareness, community involvement and education is needed 	<ul style="list-style-type: none"> • Different education approaches (all levels: primary school, high school and MBO) • Use of social science to create support, social acceptance and awareness • Communication should be easy to understand for everyone • Positive thinking

4 Discussion

The aim of the workshop was to present key findings and proposed policy recommendations from the projects to local stakeholders, and to gather their feedback on the policy recommendations through interactive and structured discussions. This workshop contributed to the research in several ways. The discussed issues often proved complex and involved many different and sometimes conflicting interests. In such cases, exploring common denominators together is particularly valuable. It allows for validation or testing of ideas and recommendations from researchers and can gain support with stakeholders. It creates an opportunity for other perspectives and ideas to surface and can lead to additional or more specific recommendations.

4.1 Mentimeter

From the 'Mentimeter' feedback session it became clear that most participants rated the quality of the coral reefs on Bonaire as 'bad' or 'very bad'. Water quality and erosion were seen as priority issues. Considering that the responses to the mentimeter questions were likely triggered by the presentations on these topics prior to the feedback session, it is also important to include responses regarding topics or issues that were not covered in the presentations. For instance, issues such as awareness (education and influencing policy makers) or coastal development and sustainable city planning are examples of responses flagged as priority issues that were not main topics in the presentations. Proposed measures to prevent untreated sewage and wastewater from entering the sea mostly pointed to the categories 'wastewater management' and 'research, policy and implementation'. Population growth and coastal (but also urban) development were mentioned as biggest worries with respect to coastal resilience and ecosystem health as well as responses categorized under 'policy and implementation'. After Bonaire was given the status of 'special municipality' of the Netherlands in 2010, the population increased from 15,679 permanent residents in 2011 to 25,133 on January 1st of 2024, mainly due to immigration (Verweij 2024). When asked what research is still needed, responses mostly fell in the category 'applied research, intervention and implementation' with a strong emphasis on putting research outcome into action. In addition, social science was often mentioned to increase awareness and sense of urgency as well as local involvement. Proposed measures pointed mostly towards the category 'awareness and involvement' with a focus on education for children and engaging locals. Responses to the final question: 'What is the role of tourism?' showed that tourism is needed, but also creates pressure, or can negatively impact the ecosystem. An urgent need for tourism to become more sustainable was expressed.

While the mentimeter session provided valuable insights, it also has limitations. The outcomes depend on who was present and how questions were framed and should be seen as indicative rather than comprehensive. Even with these limitations, the session helped to highlight the main concerns of participants and point to priorities worth exploring further.

4.2 Liberating structures

The selection of proposed policy recommendations was generally supported by the participants. The proposed policy recommendations for water quality 'Take measures to prevent leaking of sewage & phase out cesspits' and 'Increase the retention of water & sediment on land' were discussed by two different groups. Both groups of workshop participants supported the selected policy recommendations. Several suggestions for additions were made such as a need to monitor the consequences of these measures (positive as well as negative) and to ensure that measures smart, feasible and enforceable. Participants also emphasized the importance of involving local communities, using incentives and education to promote sustainable actions, and sharing information in accessible ways, including in local languages and through

interactive approaches. The second group placed additional emphasis on awareness, population growth and implementation of legislation. They highlighted the need for structural funding, subsidies for homeowners, and accountability for large sources of wastewater. Both groups noted the necessity of integrating sewage and water retention measures into comprehensive urban planning and infrastructure development, and they discussed the balance between centralized and decentralized wastewater treatment systems as well as the importance of defining island capacities for population and tourism. Some tensions and trade-offs were also noted, such as reconciling environmental goals with poverty alleviation priorities, cultural and economic considerations around removing goats and donkeys, and challenges in ensuring follow-through on previously drafted plans. Overall, participants recognized that improving water quality for coral reefs is closely linked to human wellbeing, requiring both ecological and social strategies. The discussions revealed strong support for the proposed policy measures, coupled with practical considerations for community involvement, enforcement, funding, and long-term planning.

Although the three policy recommendations that were discussed to restore nature in bays and salinas ('Deepen silted areas to restore lost areas', 'Structured clearing of accumulated Sargassum behind booms' and 'Clear and maintain channels in mangrove forests to increase water circulation') were also generally supported and the need for these measures was clear, the ways to go about implementing these presented a point of discussion. Sediment removal was seen as necessary, though dredging should be a last resort. Participants highlighted the value of pilot studies and stepwise restoration plans, supported by both fieldwork and satellite monitoring, to assess the ecological effects of each measure. Similar to the water quality discussion, participants stressed the importance of integrating different perspectives and expertise, but in a structured way that leads to actionable solutions rather than prolonged debate. Education, awareness, and active involvement of local communities were seen as essential to foster support and ensure the long-term success. Overall, while the need for intervention in bays and salinas is clear, successful restoration depends not only on technical measures but also on careful planning, monitoring, and inclusive participation, reflecting the broader pattern identified in the water quality discussions.

The policy recommendations discussed on the subject of erosion were generally supported but also deemed too broad. The known issues were perceived as too complex to get to feasible solutions. A central vision for sustainable planning and clear communication between the different stakeholders were suggested. These points highlight that effective implementation will require coordination among local stakeholders, government authorities, and scientific advisors, alongside clear governance, funding, and monitoring systems. Across all three themes, a consistent pattern emerged: technical measures alone are insufficient. Effective environmental management requires structured planning, monitoring, and inclusive participation, with attention to social, economic, and governance dimensions. Holistic approaches that integrate multiple perspectives, provide education, and foster community support are essential to make these interventions successful and sustainable.

While these discussions provided valuable input, they should be seen as exploratory rather than definitive, as outcomes depend on the mix of participants and the framing of the exercise. Nevertheless, the process was effective in surfacing both support for the measures and the practical considerations that need attention in future planning.

4.3 Conclusions

The general perception of the participants is that the coral reefs are in a bad state. Based on the 'Mentimeter' responses and the discussion rounds, population growth and policy implementation were considered as the major concerns with respect to coastal resilience and ecosystem health. Awareness and involvement of the local community, as well as policy implementation and enforcement of rules, were the main themes according to the 'Mentimeter' responses and discussion session. These topics were also often mentioned as ways forward.

The discussions highlighted that ecological interventions alone are not enough. Long-term success depends on combining technical measures with social and economic support including compensation, incentives,

subsidized improvements to the (private) sewage system and more attention for poverty alleviation. Education and social science approaches were emphasized as tools to connect scientific knowledge, policy, and community engagement. Involvement of multiple stakeholders in the vision for sustainable spatial planning and development is needed. A need for sustainable tourism with local support was expressed, noting that it should provide income without placing excessive pressure on ecosystems. This outcome is noteworthy considering the tourism sector itself was not well represented.

The scope of the current workshop was to obtain the views of local stakeholders (local government, conservation NGOs and maritime businesses) on results and policy recommendations from two projects commissioned by the Ministry of LVVN: "Coastal Resilience Caribbean Netherlands (BO-43-117-010)" and "Nature restoration of salinas and bays Caribbean Netherlands (BO-43-117-007)". This cohort of participants generally supported the selection of proposed policy recommendations. A next step would be to conduct a workshop with more commercial parties, particularly from the tourism sector, to ensure that their perspectives are fully reflected. As mentioned in the "Material & Methods" section, only a selection of all the policy recommendations that were presented, was further discussed with the participants. We would like to emphasize that support for the policy recommendations discussed here cannot be extrapolated to policy recommendations that were not the subject of discussion during this workshop.

This workshop was considered a trial, a format to potentially use in future projects involving multiple stakeholders. The workshop and use of techniques to engage participants was well received and we recommend this approach in future projects involving complex problems and a multitude of different stakeholders. It is also advised to conduct such a session with a focus on commercial stakeholders. To increase effectiveness, such a meeting is ideally organized halfway and at the end of a project. This approach leaves more opportunity for potential adjustments throughout the project.

5 Acknowledgements

We thank all participants of the workshop held in Kralendijk, Bonaire for their enthusiasm and input. We thank Klaas Metselaar (WMR), Gulsah Dogruer (WMR) Tobia de Scisciolo (University of Aruba), Katarzyna Kujawa (Environmental Technology Group WUR) and Jamilla Huizer (WUR) for their contributions and help on the day. We thank July-Ann Frans and Kerenza Rannou (STINAPA) for their help with organizing the workshop and STINAPA for hosting the DNA workshop on the 18th of October 2024 at the STINAPA office and Elise Arrindel-Weerstand from the Blue Lagun Café for hosting the workshop on the 17th of October 2024. We thank LVVN (Ministry of Agriculture, Fisheries, Food Security and Nature) for subsidizing the Policy Support Research Themes 'Coastal resilience Caribbean Netherlands' (project no. BO-43-117-010) and 'Nature restoration of salinas and bays Caribbean Netherlands' (BO-43-117-007) and Melissa Kashiku van Hoorn (LVVN) for the introduction at the meeting.

6 Quality Assurance

Wageningen Marine Research utilises an ISO 9001:2015 certified quality management system. The organisation has been certified since 27 February 2001. The certification was issued by DNV.

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Justification

Report: C096/25

Project Number: 4318100362

The scientific quality of this report has been peer reviewed by a colleague scientist and a member of the Management Team of Wageningen Marine Research

Approved: X.M.B. Verschuur
Colleague scientist

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Date: 5 December 2025

Approved: C.J. Wiebinga, PhD
Business Manager Projects

Signature:  Signed by:
C.J. Wiebinga
D41E9304A710493...

Date: 5 December 2025

Supplementary material 1 Raw data 'Mentimeter'

Question 1	
Date	2024-10-17
Session	1
Type	wordcloud
Question	Describe in max. 3 words: how do you generally rate the condition of the coral reefs by Bonaire?
Respondents	23
Responses	
Degraded Diseased	
Poor Stressed Decaying	
Sad Deteriorating Sick	
Bad Sad Alarming	
Declining	
Degraded Declining Diseases	
Declining At_risk Sad	
constrained In_decline Stressed	
Moderate	
Stressed	
A_lot_of_small_fish	
Concerned Bad Sad	
Declining Sick Essential	
Poor Degraded Disease	
I_can_rely_only_on_opini I_saw_beautiful_pictures Good_sometimes_and_bad	
Disastrous Saddening Hopeless	
Declining Stressed	
Critical	
Sad Decling Devastating	
depends_on_the_site declining	
Declining Vulnerable	
Bad Sick Polution	
Sad_detoriating_deva detoriating Devaluating	
Question 2	
Date	2024-10-17
Session	1
Type	open
Question	Given that there is limited funding for nature conservation: What do you see as priority issues that need to get tackled? (short answers)
Respondents	22
Responses	
Upvotes	
Goat removal	0

Water quality, land run off	0
Pollution	0
Sustainable city planning	0
Pollution	0
Overgrazing	0
Sewage sistem in place	0
Free roaming animals	0
Water quality	0
Coastal development	0
Erosion & sedimentation, land based pollution	0
Wastewater	0
Reforastation	0
Water retention	0
Overgrazing	0
Run off	0
Water quality	0
Attack pollution	0
Too many tourists	0
Waste water and pollution but most important goat removal	0
Education for youth and adults	0
Awareness raising and education.	0
Removal of grazers.	0
Sewage.	0
Reforestation, pollution	0
Keep on coral reef restoration	0
Islands olaning	0
Minimize pollution	0
Goat & Donkey removal	0
Get more funding	0
Overgrazing	0
With more research better information. More founding nesenary	0
Building the coast	0
Water quality	0
Influence policy makers	0

Question 3

Date	2024-10-17
Session	1
Type	choices
Question	Do you consider run-off induced infilling of the backwaters of Lac Bay and Lagun as a problem?
Respondents	23
Choices	Votes
No	2
Yes, but only for Lagun	1
Yes, but only for Lac Bay	0
Yes, for both Lac Bay and Lagun	20

Question 4

Date	2024-10-17
Session	1

Type	scales
Question	Statement: Dredge infilled backwaters Lac Bay and Lagun to improve water quality
Respondents	23
Choices	Weighted average
Dredge infilled backwaters Lac Bay and Lagun to improve water quality	

Question 5

Date	2024-10-17
Session	1
Type	choices
Question	Statement: I think restoring corals is a wasted effort if we don't 'restore' water quality or reduce pollution
Respondents	20
Choices	Votes
Disagree	6
Agree	14
Don't know	0

Question 6

Date	2024-10-17
Session	1
Type	open
Question	What measures are needed to prevent untreated sewage and wastewater from entering the sea?
Respondents	23
Responses	Upvotes
Prevent erosion	0
Sewage system	0
Wastewater treatment	0
Water retention	0
More decentralized wastewater systems	0
Treatment	0
Sewage system	0
Wastewater treatment and removing goats	0
Dam restoration	0
Extend sewage system	0
Better management	0
Treatment	0
Better central sewage, address leaky septic tanks, control devegetation	0
Constructed wetlands!	0
Government policy and enforcement. Frequent testing and monitoring.	0
Large investment in sewage system	0
Replace cesspits, better connection to treatment plants	0
Boats connected to system	0
Good system	0

Decentralized units	0
Filtering the water	0
Wastewater treatment	0
Septic tanks and sewage treatment. No irrigation with grey water	0
More connections, incentives to pump out wastewater	0
And control	0
Better understanding of the related problems	0
Reuse treated sewage for islands	0
Better management	0
Periodic analysis	0
No dumping water at lvv	0

Question 7

Date	2024-10-17
Session	1
Type	scales
Question	Wastewater, sewage, runoff
Respondents	24

Choices	Weighted average
---------	------------------

Closed septic tank systems should be mandatory
 It's not feasible to replace all cesspits by stand-alone wastewater systems or to connect to main sewage system
 Building permits should require clear plans on preventing erosion, runoff, and storage of rainwater

Question 8

Date	2024-10-17
Session	1
Type	open
Question	Coastal resilience and ecosystem health: what is your biggest worry?
Respondents	28

Responses	Upvotes
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Population growth	0
Water management	0
Mesen beseffen de waarde van natuur niet	0
Overdevelopment	0
Loss of ecosystem services	0
Urbanization	0
Unsustainable tourism	0
Development	0
Ignorance	0
Overdevelopment	0
Biodiversity loss on land and underwater	0
Not enough action	0
Uncontrolled growth	0
(Lack of) policy implementation	0
Loss of the reefs and the effect on the population of Bonaire	0

Population growth	0
In fact what i just heard from the last discutant	0
Lack of control	0
Growth growth growth	0
Population	0
Implementation of policy recommendations	0
Combination of stressors multiplying each other	0
Lack of enforcement	0
Wrong government priorities	0
Uncontrolled growth of the population on Bonaire leading to economical, environmental, and social issues	0
Development	0
Geen visie voor het eiland	0
Popilation growth. Uncontroled building.	0
Removal of vegetation in coastal zone	0
More decline	0
Over population	0
Maintaining good water quality	0
Ecosystem collaps	
Loss of biodiversity	
Loss of tourism	
Inaction to tackles problems	0
Rapid coastal development	0
No involvement of locals	0
Reinforcement	0
Uncontrolled 'growth' without proper planning - infrastructure, schooling systems, provisioning	0
Geen gevoel voor urgentie bij het bestuur	0
Alignment	0
Te weinig lokale input	0
(Lack of) Visioning	0
Adjust legislation about coastal devrlopment, inadequate setback zone etc	0
Maintaining the water systems	0
Too little people working to act	0

Question 9

Date	2024-10-17
Session	1
Type	open
Question	Coastal resilience and ecosystem health:what research is still needed?
Respondents	21

Responses	Upvotes
How to create organisms that can deal with the stressors.	0
Subterranean groundwater discharge	0
Research on the effect of different measures	0
Changes in biodiversity due to climate change	0
None, action to tackle pollution and run off is needed	0
How to revitalize old dam system on private land	0
Onderzoek moet beter ontsloten worden, zodat er meer mee gedaan wordt	0
Social research: how to increase understanding and a sense of urgency.	0
Local perceptions	0
What does the government, dutch and local need to be responsible for	0

Feasibility studies on various intervention methods and how to implement	0
Determining pollution sources to take action	0
Social research	0
No longer watching it degrade, but looking for solutions	0
On wastewater and solid treatment - appropriate solutions tailored made	0
Awareness, local input	0
Studies on ocean literacy	0
Limits of acceptable change	0
Costs of setback zone expansion	0
Who is responsible?	
When?	
How?	0
How to include the population of Bonaire in citizen science	0
Demos of treatment system to show they are functioning and easy to operate	0
Hoe kunnen we voldoende voedsel laten groeien voor geiten, zodat die minder vrij rondlopen, maar opgesloten kunnen worden	0
People awareness	0
How to influence policy makers	0
Water retention	0
Educative programs	0
More funding towards solutions	0
Funding	0

Question 10

Date	2024-10-17
Session	1
Type	open
Question	Coastal resilience and ecosystem health: what measures are needed to protect or improve?
Respondents	21

Responses	Upvotes
Poverty reduction	0
Involve local people in implementing solutions	0
Local involvement	0
Replanting the coastal zone	0
Remove free roaming goats	0
Actually build constructed wetlands.	0
Education and engagement of youth	0
Wastewater treatment	0
Goat free zones	0
Wastewater treatment	0
Support of local policymakers and enforcement. Effective climate mitigations measures	0
Stop over grazing by donkeys and goats	0
Enforcement	0
Land environmental protection	0
Improving infiltration of rain	0
Enforcing policies	0
Immigration slow down	0
Governance and enforcing	0
Enclosing the goats & donkeys	0
Beter VTH	0

Involving local people	0
Better infra (conncection to ww plant, fixing dams, etc)	0
Restoration corals and mangroves	0
Education and communication	0
Local Education	0
Subsidies?	0
Imigration slow down	0
More subsidies	0
Enforcing on large scale perpetrators instead of individuals	0
Education from scratch	0
Educative programs	0
Improve policy, control n enforcement	0
Waterboard CN	0
Sustainable tourism, less cruiseboats	0
Sustainability embraced by community, Setback zones, limit pop growth, wastewater treatment, runoff cntrol	0
Focus group discussions	0
Funding	0
Mensen moeten het probleem inzien	0
Improve policy and inforcement	0
Training of government persons for controlling of water quality and contamination prevention	0
Nature inclusive spatial planning	0
Runoff control in New urbanization	0
Improve local awareness	0
Better sewerage, enforcement of rules	0
Bonairean 'waterschappen'	0
Awareness to and for bonaireans	0
Tourism quotum	0

Question 11

Date	2024-10-17
Session	1
Type	open
Question	Coastal resilience and ecosystem health: What role does tourism play?
Respondents	20

Responses	Upvotes
Wie heeft de baten en woe heeft de kosten?	0
Its a main funding source	0
Bad for ecosystem health	0
Straining infrastructure to handle excess wastewater	0
Economy	0
Tourism should be more sustainable and not polluting	0
On the economy	0
Economic growth. Funding for local NGOs.	0
Tourism is fine as long as pollution is reduced/under control	0
revenue from responsible tourism key	0
Need a damage control policy	0
Study on sustainable tourism	0
A big role, economically speaking	0
Cruise tourism bad	0

Nature is main attraction for tourism	0
Quality over quantity	0
Negative - overuse of resources, pollution	0
Its a significant stressor	0
Makes people happy	0
Bonaire not equipped for the amount of tourists	0
Tourism can drive conservation if the focus is on ecotourism	0
It can be an ally	0
Cruise tourists are not beneficial	0
A big role, they need to be informed of the rules, and local authorities need to act when rules are broken	0
Spread the word over the beauty of the nature	0
Tourism plays a major role. The island needs to work towards sustainable tourism and other ways of doing tourism.	0
Profile is changing - becoming more likely aruba - losing nature focus/protection	0
Ecotourism not greenwashing	0
Cruise boats are bad for marine environment, they are too big	0
We are not equipped for this amount of tourist	0
Needs to be a balance	0
Determining the tourist targetted	0
Profiling and targetting the ideal tourist	0

Date

Session 1

Type choices

Question Coral Health: I find research into coral reefs:

Respondents 0

No votes for this session

Question 13

Date

Session 1

Type scales

Question Statement: I think restoring corals is a wasted effort if we don't 'restore' water quality or reduce pollution

Respondents 0

No votes for this session

Question 14

Date

Session 1

Type open

Question Lagun: What is your idea on how to reduce the impact of pollution?

Respondents 0

No votes for this session

Question 15

Date

Session	1
Type	open
Question	In your opinion, when is an ecosystem healthy?
Respondents	0

No votes for this session

Supplementary material 2 Flipchart contents 17th October 2024

Asterisks indicate that additional people agreed with the written statement.

Flipchart 1 (IMG 6839): Improve water quality for coral reefs (group 1)

- 1) Take measures to prevent leaking of sewage & phase out cesspits
- 2) Increase the retention of water & sediment on land

Take aways:

- 0) Goats & retention*
- 1) Ensure zero wastewater leakage within a certain time frame
- 2) Increase retention by households and nature (see report Haskonig)
- 3) Decentralized WWT (wastewater treatment) plants*
- 4) Make it smart & feasible****
- 5) Enforce implementation
- 6) Statements 1 & 2 are good!****
- 7) Evaluate negative consequences of 1 & 2
- 8) Maintenance and monitoring of measures (-)
- 11) Compensation for private investments**
- 9) Educate why necessary**
- 10) More green!*
- 12) Many plans drafted but never implemented “put your money where your mouth is”. (arrow to [5] enforce implementation).

Ways forward

- Prioritize and map leakages (types, locations)*
- Prioritize greenery*
- Funding for compensation*
- Prioritize “biggest bang for your buck”*-
- Work with incentives to stimulate desirable behaviour*
- *Involve & inform local communities: by Bonairians for Bonairians*****
- For goats: incentives, involvement, compensation, going forward not backwards.
- Education: sediment ⇔ rainwater ⇔ coral reef*****
- Support from local government for implementation sewage treatment + creation for rainwater retention vision & nature inclusive spatial planning *
- *Understand better how to involve local organizations and civilians & companies
- Remove goats * *donkeys*
- *Yachts & boats**

Flipchart 2 (IMG 6836): Water quality....continuing after flipchart 1 (IMG 6839) second round people adding

- Who is going to pay for the resources? ****
- Donkey removal
- Missing measures for yachts and boats
- Education & life experience @ higher levels: interactive
- Long-term social science integration
- *Poverty alleviation has higher priority *
- Integrate sewage into an overall water plan
- Integrate old systems for integration for new systems/techniques

- Ocean literacy
- Bigger scale water retention plans into measures (roads/neighbourhoods)
- Cruise ships sewage; enforcement of rules
- New buildings have to adhere to wastewater recommendations
- Balance between centralized system and de-centralized system! More cost-effective?
- Subsidizing wastewater emptying for low incomes

Flipchart 3 (6851): Improve water quality for coral reefs (group 2)

1) Take measures to prevent leaking of sewage & phase out cesspits

2) Increase the retention of water & sediment on land

Take aways:

- *Improving water quality not only for corals, also for people =>
- Defining the island capacities for population growth (residents + tourists)
- Need financial resources to implement the recommendations
- Completing projects and follow up on commitments (e.g. local gov.)
- Importance of efficient infrastructure
- Local stakeholder responsibility & accountability
- Importance of research & monitoring
- Public awareness

Ways forward

- Sharing information and creating awareness with the locals*****
 - Channel of information sharing
 - Radio and in the mother language
 - Simple formulation of scientific findings => what can you do?*
 - Visuals and social media
- Structural funding***
- General rules to prevent emissions
- Establishing local protective limits/thresholds*
- Education of young people*****
- Independent scientific review of policy plans/decisions

IMG 6855 & 6856 *continuation Water quality, flipchart 3*

Water Quality

Take aways

- Education of public and local communities' support
- Water quality for the people
- There is legislation on construction

Ways forward

- Incentives (\$) and subsidies for homeowner to upgrade
- Share results with public
- Accountability for large sources
- Enforcement of legislations
- Define baseline for the island
- Increase accessibility of results
- Training of enforcers of importance of adequate sewage systems
- Create a plan & long-term vision (comprehensive) of water and sediments retention
- Water retention must be part of new urban development planning

Flipchart 4 (IMG 6845): Restore nature in bays & salinas

1) Deepen silted areas to restore lost areas

2) Structured clearing of accumulated Sargassum behind booms

3) Clear and maintain channels in mangrove forests to increase water circulation

Take aways:

- Manmade solutions for manmade problems *

- 1 point is not a good measure, hard to accomplish
- Satellite and ground research is very important => monitoring
- Bringing different types of people together (from different expertise) to discuss these problems
- Dredging is a last resort
- Put solutions into actions, instead of talking and talking but now already 2 points are covered
- To keep the ecosystems these are necessary measures to take^{^^^}
- Do remove the sediment from the silted areas^{^^}
 - Pilot studies
 - To restore, not all at once
 - See what the effects are
- Educational programs to explain to citizens of Bonaire what is happening

Way forward

- Make sure to involve everyone and everything for maintaining the ecosystem**
- Fair representation of different viewpoints**
- Keep going! (fine the way it is)
- Combine researchers & fieldwork + also connect the people from Bonaire**
- Reduce poverty in Bonaire
- Talking is good, but also action (don't talk in circles)**^
- Expanding channel restoration**
- Sargassum storage
- Fine tuning, plan for moving forward, future directions
- Use dredged sediment for building dykes etc.

Flipchart 5 (IMG 6857): Reduce erosion

1) Stop over-grazing [*responsible*] and actively manage free-roaming livestock [*has positive aspect – quality of meat*][*other, indigenous functions*]

2) Increase vegetation cover in watersheds [*keep open water, when water needed*] -> authority [*water retention and reuse*] [*governance*][*more water retention options(storage)*][*suggests solutions, there are more options*]

3) Better spatial planning to reduce run-off and erosion [define why is “bad”][or not optimal][be specific!]

[*These statements are too broad, smart goals*]

Take aways:

1. Involvement needed, awareness
ask for help -> inclusion (shame)
lower barriers
2. Importance of education
Central vision of sustainable spatial planning
3. Are people on the same page on diverse problems? (mismatch)
4. Complex, education, involvement,... shared vision
5. knowledge is there, we ‘cover the eyes’
It is so slow; community involvement
6. all mentioned (see above), make a change
All to be part of the solutions
We know what is the problem, switch needed with people (all)
7. Communication too complex
Lower barriers
Communicate in a common language
8. Bottleneck, we believe that people will not accept
Let's propose solution (containment or ‘removing’)
Spatial planning should be more inclusive, multistakeholder

Ways forward: Additions for clarification made by the discussion leader are marked in red.

Money – M

Policy – P

Research – R

Education -E

1. School curricula (basic) going with kids to petting zoos (kinderboerderijen). Broader education (decision makers) **M, E**
2. Raising child – expensive
It is always too expensive **P, E**
Education, awareness, good examples
3. MBO programs
Different education approaches, *social will*
Social capacity (education, awareness, behaviour) **R **** involve social science
4. Erosion should not be seen separately but part of fabrique **P**
5. -"-
6. Do not comply*, see it positively **R - Social Science**
Positive future for generate
It is always about money
See growth in another way, step back from momentary thinking **P**
People should be more equal**
Do not give up!
continue

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