

Elevating Citizen Science Through an Evaluation Rubric

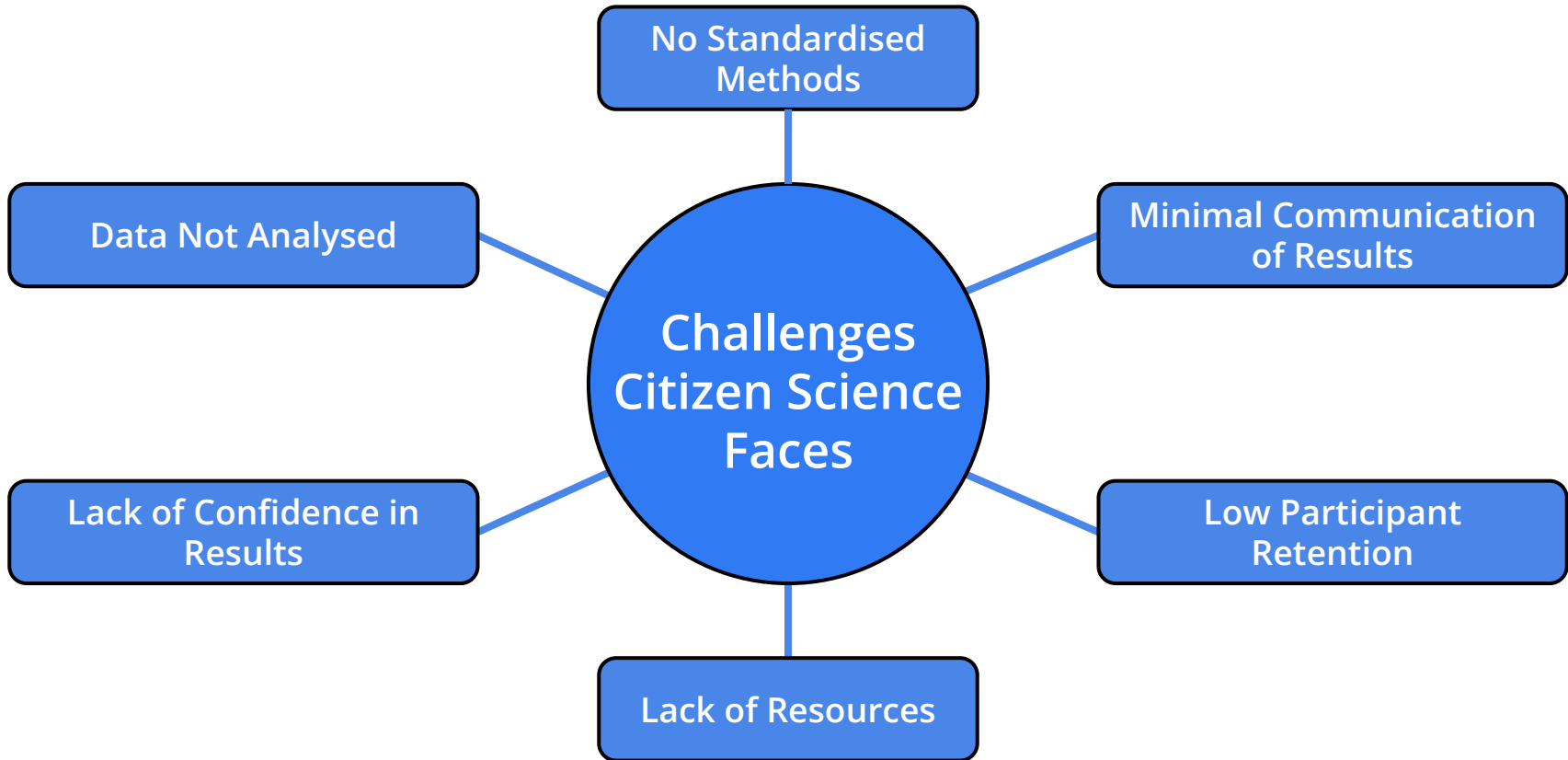
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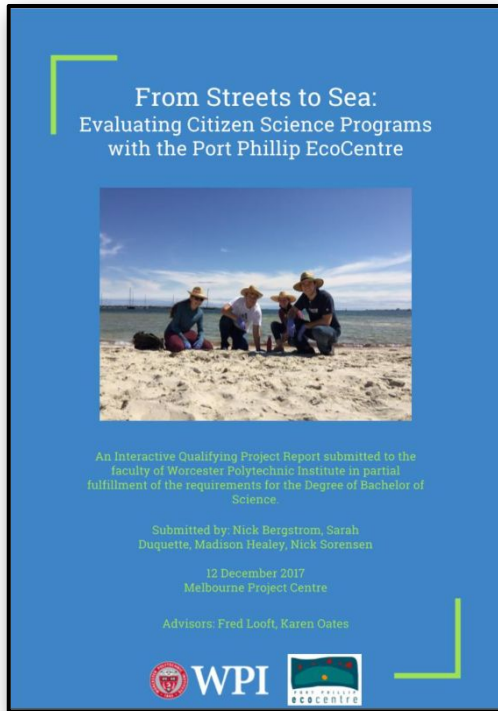
Citizen science fills data gaps, engages communities, and impacts policy



Citizen science faces challenges that limit its potential

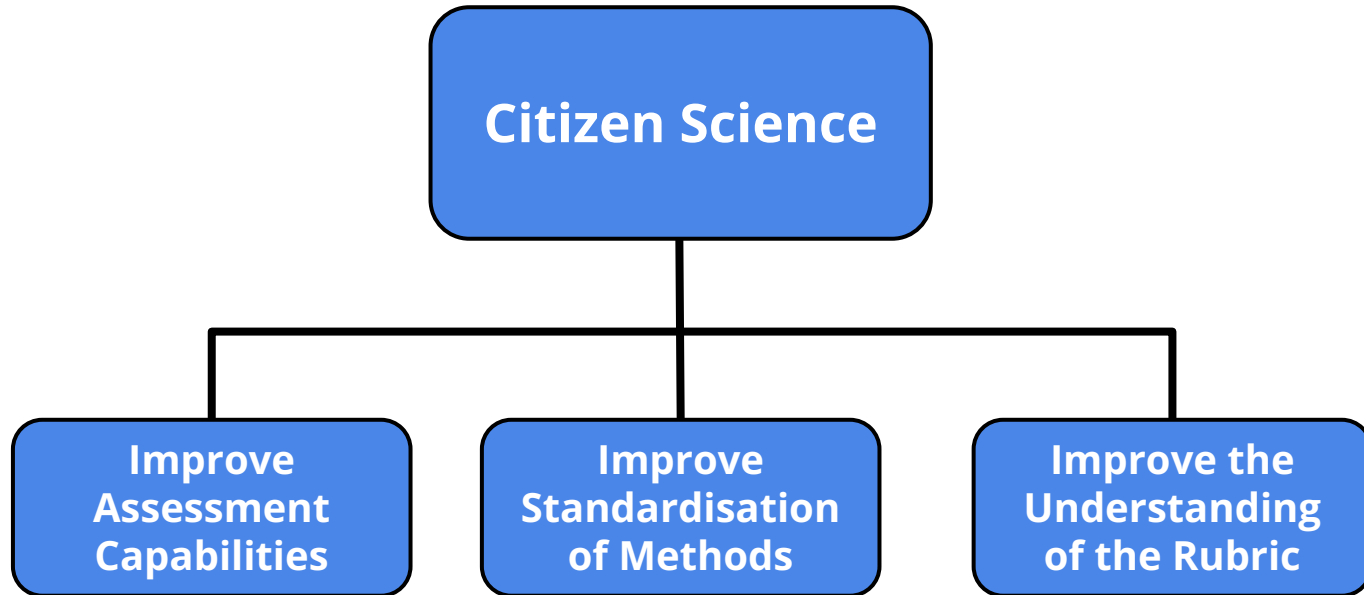


Citizen Science Evaluation Rubric



EcoCentre Rubric Elements and Subelements	
Elements	Subelements
Scientific Contribution	Project Objective
	Project Quality
	Data Analysis
	Project Robustness
Volunteer Recruitment/Retention	Volunteer Sourcing
	Volunteer Motivation
	Time/Effort Investment
	Returns
Communication	Content
	Project Story
	Comms Delivery

Our opportunity to elevate citizen science



Game plan



1

Interview prominent citizen scientists and analyze existing design resources



2

Use findings to update the EcoCentre's citizen science rubric



3

Develop and pilot a promotional workshop

Interviews and literature analysis

Sam Hudson

James & Ella

Big Al

Conservation Volunteers Australia

Australian Citizen Science Association

CSIRO

Melbourne Water

Elsternwick Park ASSOCIATION INC

Abbotford Riverbankers

TANGAROA BLUE

AUSTRALIAN MARINE DEBRIS INITIATIVE

River Connect

Berg Mt Martha

VICTORIAN NATIONAL PARKS ASSOCIATION

Overview Articles

A Rubric to Evaluate Citizen-Science Programs for Long-Term Ecological Monitoring

Citizen Science Hub Project Guide

Read on to access best practice information and resources to help you maximize the success and impact of your citizen science project.

Citizen Science Hub chapters

- Starting Out**
 - What makes a Citizen Science project?
 - Getting it Count
 - Finding Collaborators and Funding
- Involving Citizen Scientists**
 - Describe your Participants and their Environment
 - Design your Project with your Participants
 - List Key Activities
- Engage your Community**
 - Promote your Project to Participants
 - Build and Retain Participant Interest
 - Design your Communications
- Create your Plan**
 - Map your Project Timeline
 - Define your Goals and Key Milestones
 - Assess the Resources you Need
 - Create a Budget and Secure Funding
- Consider Approvals, Permissions and Licensing**
- Evaluate your Approach**

CITIZEN SCIENCE

HANDBOOK

Quality Assurance & Documentation

"Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it is the only thing that ever has."
-Margaret Mead

EPA United States Environmental Protection Agency
EPA 2006-18-001
https://go.usa.gov/view43

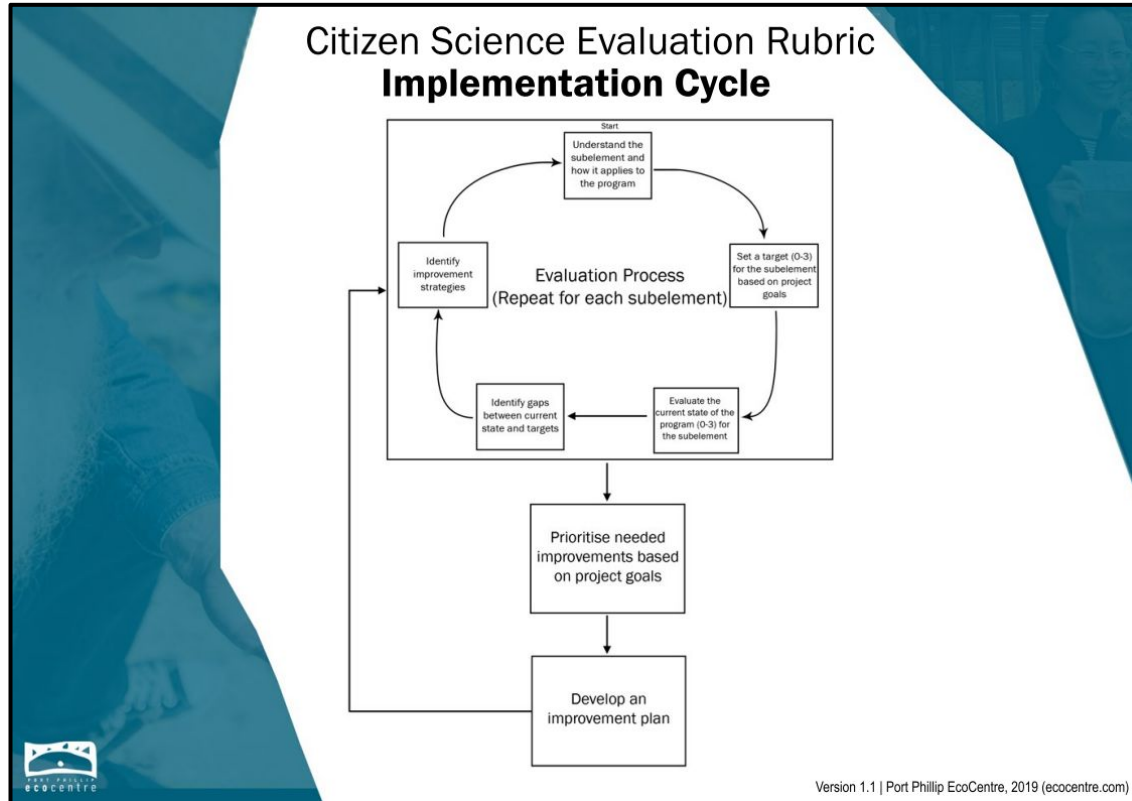
Key Findings and Rubric Updates



Rubric update overview

- 1** Introductory pages reimagined to guide users through using the rubric
- 2** Rubric format reworked to improve usability
- 3** New *Summary* section provides an overview of the evaluation process
- 4** New element and new subelements added

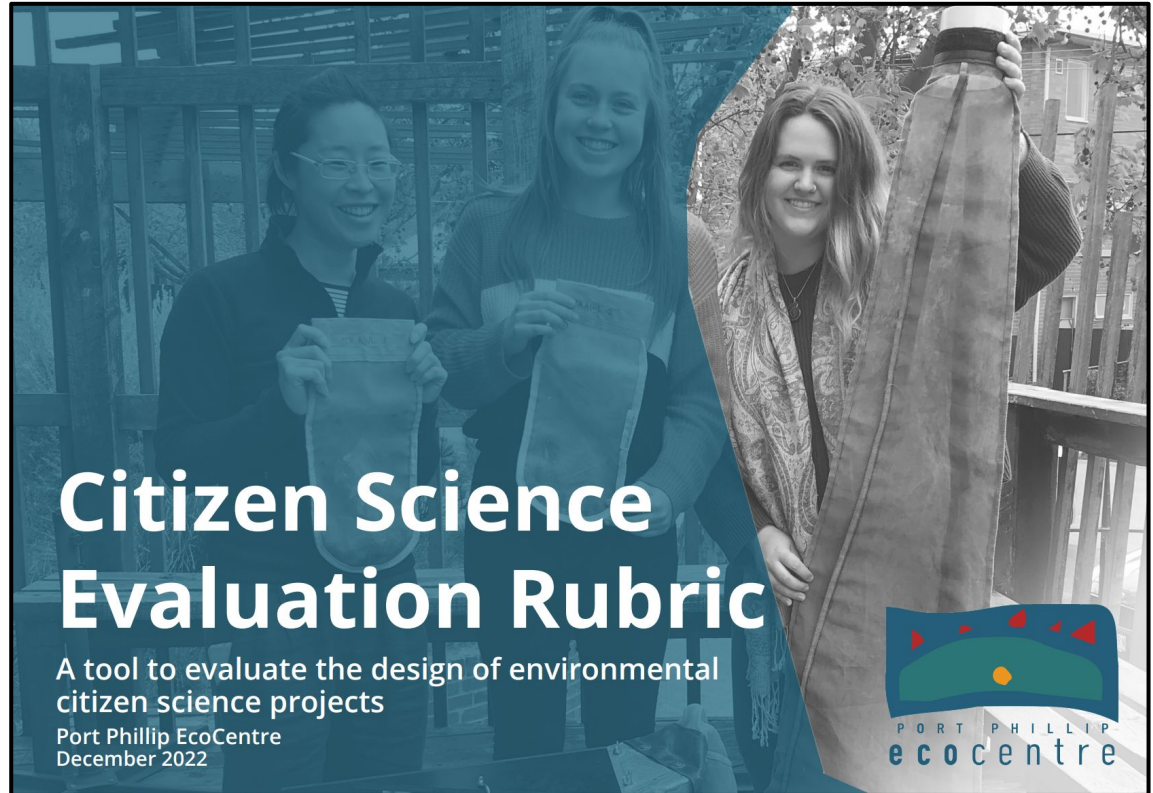
Introductory page was not intuitive



Reimagined introductory pages

Introduction:

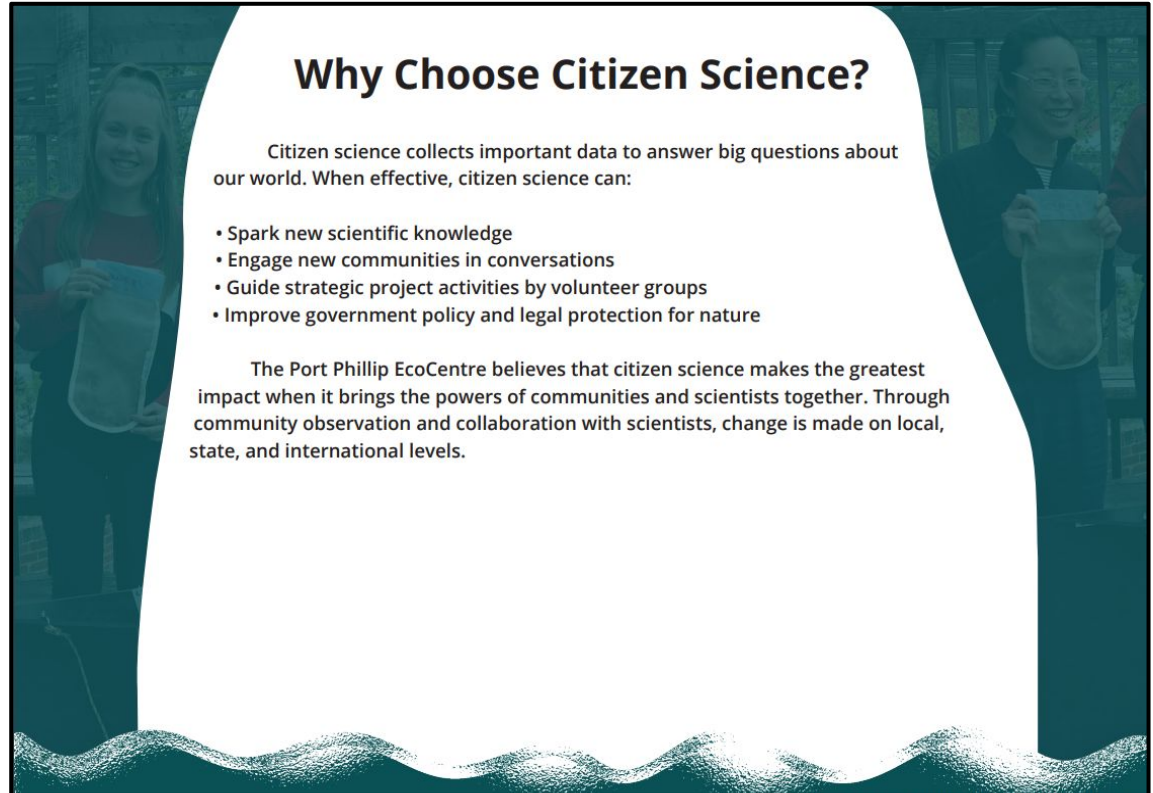
- Why Choose Citizen Science
- Designing Strong Citizen Science
- The Four Elements of a Citizen Science Project
- How to Use the Rubric



Reimagined introductory pages

Introduction:

- **Why Choose Citizen Science**
- Designing Strong Citizen Science
- The Four Elements of a Citizen Science Project
- How to Use the Rubric



Why Choose Citizen Science?

Citizen science collects important data to answer big questions about our world. When effective, citizen science can:

- Spark new scientific knowledge
- Engage new communities in conversations
- Guide strategic project activities by volunteer groups
- Improve government policy and legal protection for nature

The Port Phillip EcoCentre believes that citizen science makes the greatest impact when it brings the powers of communities and scientists together. Through community observation and collaboration with scientists, change is made on local, state, and international levels.

Reimagined introductory pages



Introduction:

- Why Choose Citizen Science
- **Designing Strong Citizen Science**
- The Four Elements of a Citizen Science Project
- How to Use the Rubric

Designing Strong Citizen Science

This rubric aims to help environmentally-focused citizen science organisations evaluate the design of their own citizen science projects. It takes about half of a day to complete as a team. At the end, you will identify actions to work towards a more credible, influential, and higher quality project.

The focus of a given citizen science project is dynamic and can change over time. Throughout this rubric, four icons will appear next to subelements that indicate a focus on each of a few target outcomes of a citizen science project. These icons are as follows:

	Community Engagement Community engagement focused programs strive to make a deep impact on the communities that a project takes place in		Environmental Accountability Environmental accountability focused programs strive to collect data necessary to hold polluters accountable for their actions
	Scientific Research Scientific research focused programs strive to produce findings about the environment and often result in publication		Policy Change Policy change focused programs strive to inform political decision makers when creating or changing public policy to benefit the environment

Reimagined introductory pages

Introduction:

- Why Choose Citizen Science
- Designing Strong Citizen Science
- **The Four Elements of a Citizen Science Project**
- How to Use the Rubric

The Four Elements of a Citizen Science Project

This rubric helps you guide your project's initial design, evaluates it at specific checkpoints, and clarifies areas for improvement. It breaks a project down into four fundamental categories before investigating each area further. After each of these four categories are analysed, they are further broken down into themes that each cover an aspect of their category. These four categories are as follows:

- **Project Scope and Deliverables:**
Identifying the who, what, when, where, why, and how of your project
- **Scientific Methods:**
Collecting and analysing data
- **Participant Recruitment and Retention:**
Engaging citizens and building the team
- **Communication:**
Communicating project findings and telling the story

Reimagined introductory pages

Introduction:

- Why Choose Citizen Science
- Designing Strong Citizen Science
- The Four Elements of a Citizen Science Project
- **How to Use the Rubric**

How to Use the Rubric

This rubric urges you to think critically about distinct aspects of your project through guiding questions. Descriptions of levels 1 to 4 standardise the level at which a peice of the project can be rated. Follow these three steps to analyse a theme:

1. Write down your target level: the level that you believe the project needs to be at. If you believe that this theme is not relevant to the success of your project, set a target score of N/A and skip this theme.
2. Write down the project's current level: the level that the project, whether in the design phase or ongoing, currently holds.
3. If the current level is below your target level, brainstorm and write out strategies to improve in this theme.

Likely, not all the parts of a project will achieve a perfect target or current level, but through repetition of project planning and evaluation you will be able to better understand the strengths, weaknesses, and opportunities of your project design and delivery. This will help you achieve your goals and benefit long term project success.

Subelement analysis was cumbersome

Citizen Science Evaluation Rubric Evaluation Form

Element	Subelement	Target Level	Current Level	Ways to Improve	Priority Ranking
Scientific Contribution	Project Objective				
	Project Quality				
	Data Analysis				
	Project Robustness				
Volunteer Recruitment/Retention	Volunteer Sourcing				
	Volunteer Motivation				
	Time/Effort Investment				
	Returns				
Communication	Content				
	Project Story				
	Comms Delivery				

Version 1.1 | Port Phillip EcoCentre, 2019 (eccocentre.com)

Citizen Science Evaluation Rubric Subelement Descriptions

Element	Subelement	Key Questions to Ask About the Program
Scientific Contribution	Project Objective	<p>How is the scientific objective defined?</p> <ul style="list-style-type: none"> Is the objective well defined using the SMART method? Does it answer the research question? Does it address limitations involved? Do the methods produce data which fulfill this objective? <p>How is the quality controlled?</p> <ul style="list-style-type: none"> Are the methods standardised? Is the training standardised? Are methods simple and clear? Is the training simple and clear? Does the training emphasise the need for scientific rigor? Is there a preliminary quality control in place e.g. an acceptable range of values? <p>How is the data analysed?</p> <ul style="list-style-type: none"> Is data analysed with reference to a baseline or outside benchmark? Is it analysed in a standard way across the life of the project? Is it analysed by experts? Is data quality analysed? Is data quality accounted for in analysis? <p>How is the project sustained?</p> <ul style="list-style-type: none"> Are findings disseminated to the public? Are they disseminated to the scientific community? Are they disseminated transparently? Is feedback from the public and scientific community considered and incorporated as appropriate? Are individual managerial project roles simple? Are personnel cross-trained? Are there resources available to sustain the project?
	Project Quality	
	Data Analysis	
	Project Robustness	

Citizen Science Evaluation Rubric Detailed Rubric

Element	Subelement	Level 0	Level 1	Level 2	Level 3
Scientific Contribution	Project Objective	The scientific objective of this project is undefined and does not align with research questions and does not account for limitations. Methods don't produce data that fulfill this objective.	The scientific objective of this project is somewhat defined and partly aligns with the research question and some limitations are accounted for. Methods produce some data that fulfill the objective.	The scientific objective of the project is defined based on the research questions and most of the limitations involved. Methods produce data which mostly fulfill this objective.	The scientific objective of the project is well defined based on the research questions and any and all limitations involved. Methods produce data which completely fulfill this objective.
	Project Quality	Methods and training are complex, difficult to understand, and not regulated for standardisation. No initial quality control is conducted. Training materials do not promote a deep understanding of the project and don't emphasise scientific rigor.	Methods and training can at times be complex, difficult to understand, and not completely regulated for standardisation. Very little initial quality control is conducted. Training materials sometimes promote a deeper understanding of the project and have minimal emphasis on scientific rigor.	Methods, training, and accompanying materials are often simple, clear, and standardised. Some preliminary quality control protocol is in place. Training materials frequently promote a deeper understanding of the project, methods and have an emphasis on the need for scientific rigor.	Methods, training, and accompanying materials are simple, clear, and standardised. A preliminary quality control protocol is in place. Training materials always promote deeper understanding of the project, methods, and have a large emphasis on the need for scientific rigor.
	Data Analysis	There is no benchmark to reference data against, and data is not analysed in a standard way. Data quality is not accounted for.	Data is sometimes analysed in a standard way. Data quality is sometimes accounted for. The baseline or outside benchmark is not always accurate.	Data is most often analysed in a standard way. Data quality is usually accounted for. The baseline or outside benchmark is mostly accurate.	Data is analysed with reference to a preliminary baseline or outside benchmark in a standardised way by experts. Data quality is analysed and accounted for.
	Project Robustness	Public has no knowledge of the findings and there is no opportunity to provide feedback. Roles are complex and crucial personnel are not replaceable. Project has no access to ongoing resources.	Public is aware of some of the findings and are provided an opportunity to give feedback. Some roles are complex and there is minimal cross training. Project has limited access to ongoing resources.	Public has knowledge of most of the findings and feedback may be taken into consideration when making improvements. Few roles are complex and there is some cross training of crucial individuals. Project has sufficient access to ongoing resources.	Findings are transparently disseminated to the public and the scientific community and feedback is incorporated. Individual roles are simple and crucial personnel are cross-trained to ensure replaceability. The project has access to a surplus of ongoing resources.

Reorganized workflow

Detailed Rubric				
Element	Subelement	Level 0	Level 1	
Scientific Contribution	Project Objective	The scientific objective of the project is unclear and does not align with the research program requirements and does not account for limitations. Methods do not produce data that fulfil the objective.	The scientific objective of the project is somewhat defined and partly aligns with the research program requirements and some limitations are accounted for. Methods produce some data that fulfil the objective.	The scientific objective of the project is well defined based on the baseline paradigm. Methods produce data which mostly fulfil the objective.
	Project Quality	Methods and training are unclear, difficult to understand, and not appropriate for understanding the field. Quality control is not implemented. Training materials are not provided. Deep understanding of the project and field is not emphasized. Scientific rigour.	Methods and training are at times difficult to understand but appropriate for understanding the field. Quality control is implemented. Training materials are provided. Deep understanding of the project and field is emphasized. Scientific rigour.	Methods, training, and accompanying materials are clear, clear, and understandable. Some preliminary quality control protocol is in place. Training materials are provided. Deep understanding of the project, methods, and field is emphasized. Scientific rigour.
	Data Analysis	There is no benchmark to reference data against. Data is not analyzed in a standard way. Data quality is not assessed for.	Data is sometimes analyzed in a standard way. Data quality is assessed for. The baseline or outside benchmark is used. Data quality is not assessed for.	Data is analyzed with reference to a standard baseline or outside benchmark. Data quality is assessed for. The baseline or outside benchmark is used. Data quality is assessed for.
Project Robustness	Project Objective	Public has no knowledge of the findings and there is no opportunity for public feedback. Some data are available and are not shared. Project has no resources for ongoing monitoring.	Public has knowledge of most of the findings and there is opportunity for public feedback. Some data are available and are not shared. Project has limited resources for ongoing monitoring.	Public has knowledge of most of the findings and there is opportunity for public feedback. Some data are available and are not shared. Project has limited resources for ongoing monitoring.
	Project Quality	Public has no knowledge of the findings and there is no opportunity for public feedback. Some data are available and are not shared. Project has no resources for ongoing monitoring.	Public has knowledge of most of the findings and there is opportunity for public feedback. Some data are available and are not shared. Project has limited resources for ongoing monitoring.	Public has knowledge of most of the findings and there is opportunity for public feedback. Some data are available and are not shared. Project has limited resources for ongoing monitoring.
	Data Analysis	There is no benchmark to reference data against. Data is not analyzed in a standard way. Data quality is not assessed for.	Data is sometimes analyzed in a standard way. Data quality is assessed for. The baseline or outside benchmark is used. Data quality is not assessed for.	Data is analyzed with reference to a standard baseline or outside benchmark. Data quality is assessed for. The baseline or outside benchmark is used. Data quality is assessed for.

Subelement Descriptions		
Element	Subelement	Key Questions to Ask About the Program
Scientific Contribution	Project Objective	<p>How is the scientific objective defined?</p> <ul style="list-style-type: none"> Is the objective well defined using the SMART method? Does it answer the research question? Does it address limitations involved? <p>How is the quality controlled?</p> <ul style="list-style-type: none"> Do the methods produce data which fulfil this objective? Is the training standardised? Is the training simple and clear? Are methods simple and clear? Is there a preliminary quality control in place e.g. an acceptable range of values?
	Project Quality	<p>How is the data analysed?</p> <ul style="list-style-type: none"> Is data analysed with reference to a baseline or outside benchmark? Is data analysed in a standard way across the life of the project? Is data quality analysed? Is data quality assessed for in analysis? <p>How is the project sustained?</p> <ul style="list-style-type: none"> Are findings disseminated to the public? Are they disseminated to the scientific community? Are they disseminated transparently? Is feedback from the public and scientific community considered and incorporated as appropriate? Are individual managerial project roles simple? Are resources available to sustain the project?
	Data Analysis	<p>How is the data analysed?</p> <ul style="list-style-type: none"> Is data analysed with reference to a baseline or outside benchmark? Is data analysed in a standard way across the life of the project? Is data quality analysed? Is data quality assessed for in analysis? <p>How is the project sustained?</p> <ul style="list-style-type: none"> Are findings disseminated to the public? Are they disseminated to the scientific community? Are they disseminated transparently? Is feedback from the public and scientific community considered and incorporated as appropriate? Are individual managerial project roles simple? Are resources available to sustain the project?
	Project Robustness	<p>How is the data analysed?</p> <ul style="list-style-type: none"> Is data analysed with reference to a baseline or outside benchmark? Is data analysed in a standard way across the life of the project? Is data quality analysed? Is data quality assessed for in analysis? <p>How is the project sustained?</p> <ul style="list-style-type: none"> Are findings disseminated to the public? Are they disseminated to the scientific community? Are they disseminated transparently? Is feedback from the public and scientific community considered and incorporated as appropriate? Are individual managerial project roles simple? Are resources available to sustain the project?

Evaluation Form				
Element	Subelement	Target Level	Current Level	Ways to Improve
Scientific Contribution	Project Objective	Level 3	Level 1	Project Objective
	Project Quality	Level 3	Level 1	Project Quality
	Data Analysis	Level 3	Level 1	Data Analysis
	Project Robustness	Level 3	Level 1	Project Robustness
Public Engagement	Volunteer Recruitment	Level 3	Level 1	Volunteer Recruitment
	Volunteer Retention	Level 3	Level 1	Volunteer Retention
Communication	Time/Effort Investment	Level 3	Level 1	Time/Effort Investment
	Returns	Level 3	Level 1	Returns
	Content	Level 3	Level 1	Content
Project Story	Project Story	Level 3	Level 1	Project Story
	Content Delivery	Level 3	Level 1	Content Delivery

Scientific Methods

How are the methods standardised and quality controlled?

Is participant training standardised and does it emphasise the need for scientific rigour?
Is there a preliminary baseline in place e.g. an acceptable range of values?
Have you confirmed that minimal bias is present?
Do you conduct regular or randomly scheduled quality checks for the data being collected?
Is there a specific procedure that must be followed when conducting quality checks?

	Level 1	Level 2	Level 3	Level 4
Project Quality	<p>Methods and training are not standardised. Training materials do not promote deeper understanding of the project or emphasise scientific rigour. No quality and bias checks are conducted.</p>	<p>Methods and training are not standardised. Training materials sometimes promote deeper understanding of the project and minimally emphasise on scientific rigour. Quality and bias checks are minimal.</p>	<p>Methods, training, and accompanying materials are standardised. Training materials promote deeper understanding of the project's methods and emphasise scientific rigour. Quality and bias checks are decent.</p>	<p>Methods, training, and accompanying materials are standardised. Training materials exceptionally promote deeper understanding of the project's methods and bias checks are extensive.</p>
Target Level / Not Applicable	Actions			
Current Level				

Summarizing a project is valuable

“Utilizing a full rubric, while that would be probably best practice, is not something that we all have time to do... So something that summarizes and touches on the key elements would be a handy starting point”

- Kade Mills, VNPA ReefWatch Coordinator

Summary section

Summary Rubric

	Level 1	Level 2	Level 3	Level 4
Project Scope and Deliverables	Project aims are undefined and roles don't exist. Partner organisations are absent or hinder overall project delivery.	Project aims are loosely defined and roles are identified without clarity. Partner organisations contribute minorly to funding or overall project delivery.	Project aims and roles are well defined. Partner organisations contribute somewhat to funding and/or community engagement, scientific expertise, or overall project impact.	Project aims and roles are incredibly well defined. Partner organisations contribute significantly to funding, community engagement, scientific expertise, or overall impact of the project.
	Target Level	Actions		
	Current Level			
Scientific Methods	Scientific aims are not being achieved. Methods are not documented. The project lacks quality control and data analysis.	Few scientific aims are being achieved. The project funding, documentation, quality control and data analysis is minimal.	Most scientific aims are achieved. Project resources achieve reasonable quality control and data analysis. Document storage is decently sustainable in the long term.	All scientific aims were achieved. The project had excellent quality control, data analysis and document storage. The project was sustainable for the intended timeframe.
	Target Level	Actions		
	Current Level			

Version 2.0 | Port Phillip EcoCentre, 2022 (ecocentre.com)

Summary Rubric

	Level 1	Level 2	Level 3	Level 4
Participant Recruitment and Retention	The participant pool lacks diversity and ongoing motivation to continue. Coordination requires a large amount of time and effort.	Some participants are from diverse backgrounds and motivated. Participant recruitment requires unreasonable amounts of time and effort.	Participants are diverse, motivated, require relatively little time and effort to coordinate. Many participants are satisfied and remain involved.	Participants are exceptionally diverse and motivated. Recruitment and retention requires minimal time and effort for coordination. The project perpetuates its own growth.
	Target Level	Actions		
	Current Level			
Communication	There is no communication or storytelling of results to participants or the wider community.	There is minimal communication or storytelling of results to participants or the wider community. Information and updates are irregularly delivered through limited sources.	There is moderate communication or storytelling of results to participants and the wider community. Information and updates are regularly sent to participants and the wider community through many sources.	The project is communicated to achieve both scientific and emotional interests. Information and updates are regularly sent to participants and the wider community through a range of effective mediums.
	Target Level	Actions		
	Current Level			

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Project scope should not be overlooked



Project Scope and Deliverables element



Project Objectives



Managing Partnerships



Delegation of Roles

The new rubric

Content Additions



Project Scope and Deliverables



Documentation



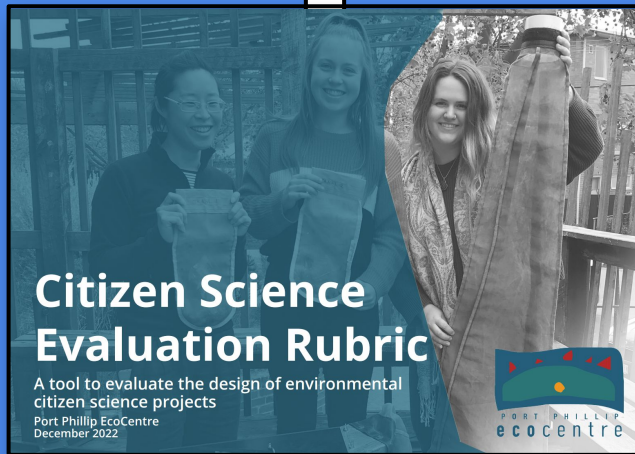
Precision in Communication



Long Term Engagement



Regular Quality Checks



User Experience Enhancements

New Introductory Pages



Reimagined Workflow



Added Summary Section



Language Simplified



Not Applicable Level Added



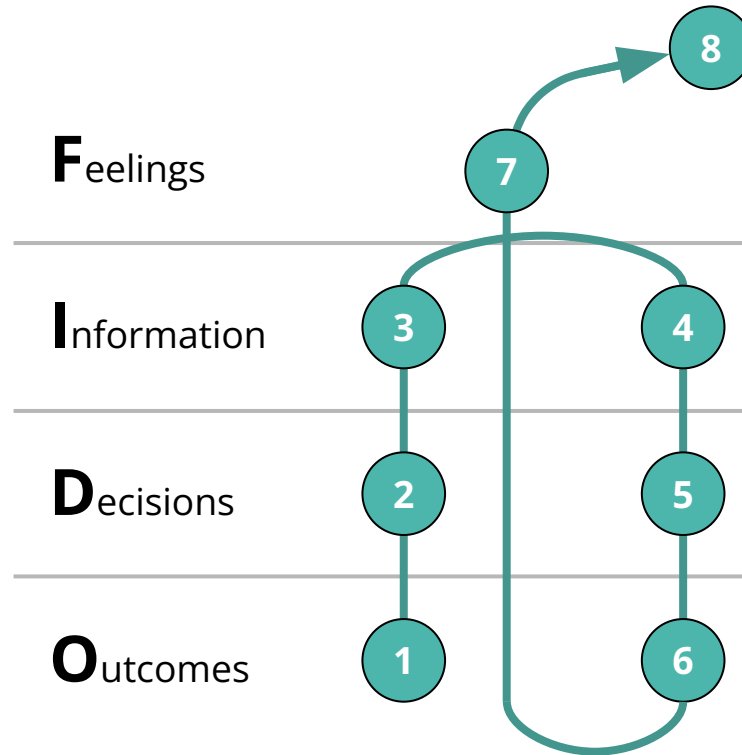
Disseminating the Updated Rubric



Delivering a promotional workshop



The FIDO metaprocess guided design

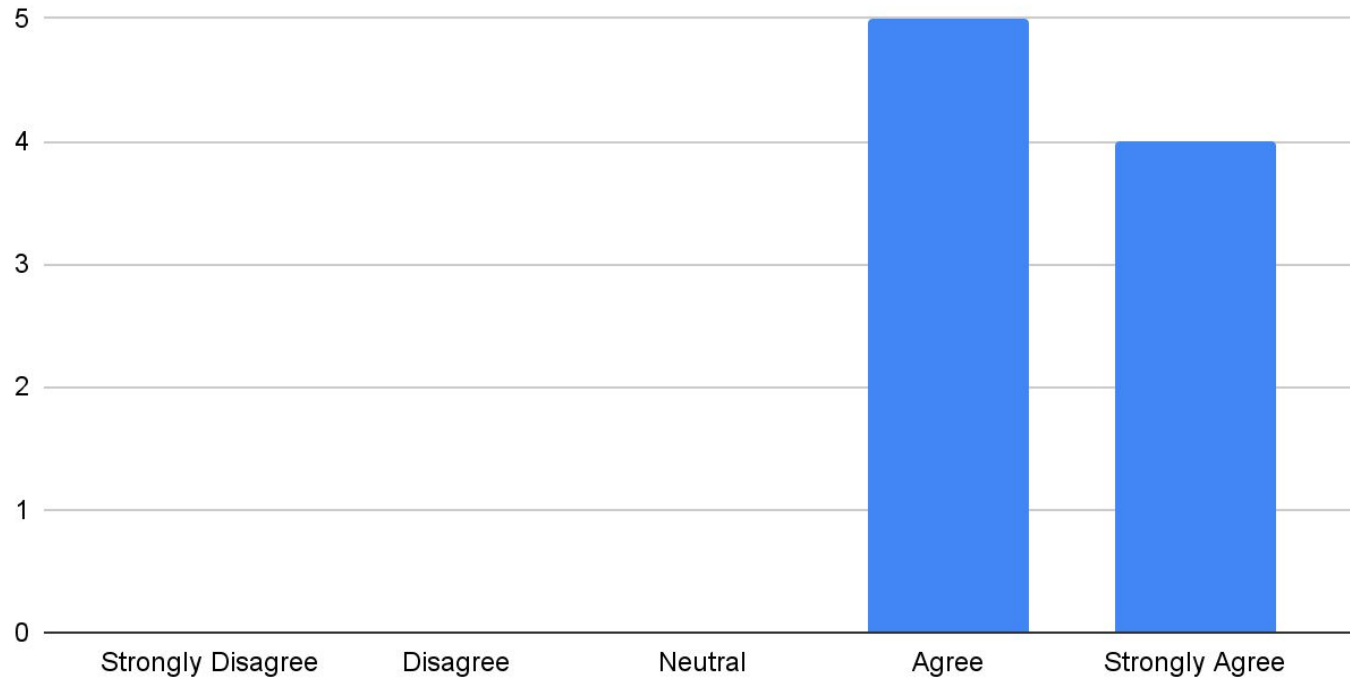


Interactive design engaged participants



Constructive and optimistic feedback

The information explained in the workshop was easy to understand



Moving Forward



Next steps: rubric



Create a digital interactive version of the rubric



Further simplify the rubric's language



Advertise the rubric with a blog post and increase website visibility

Next steps: workshop

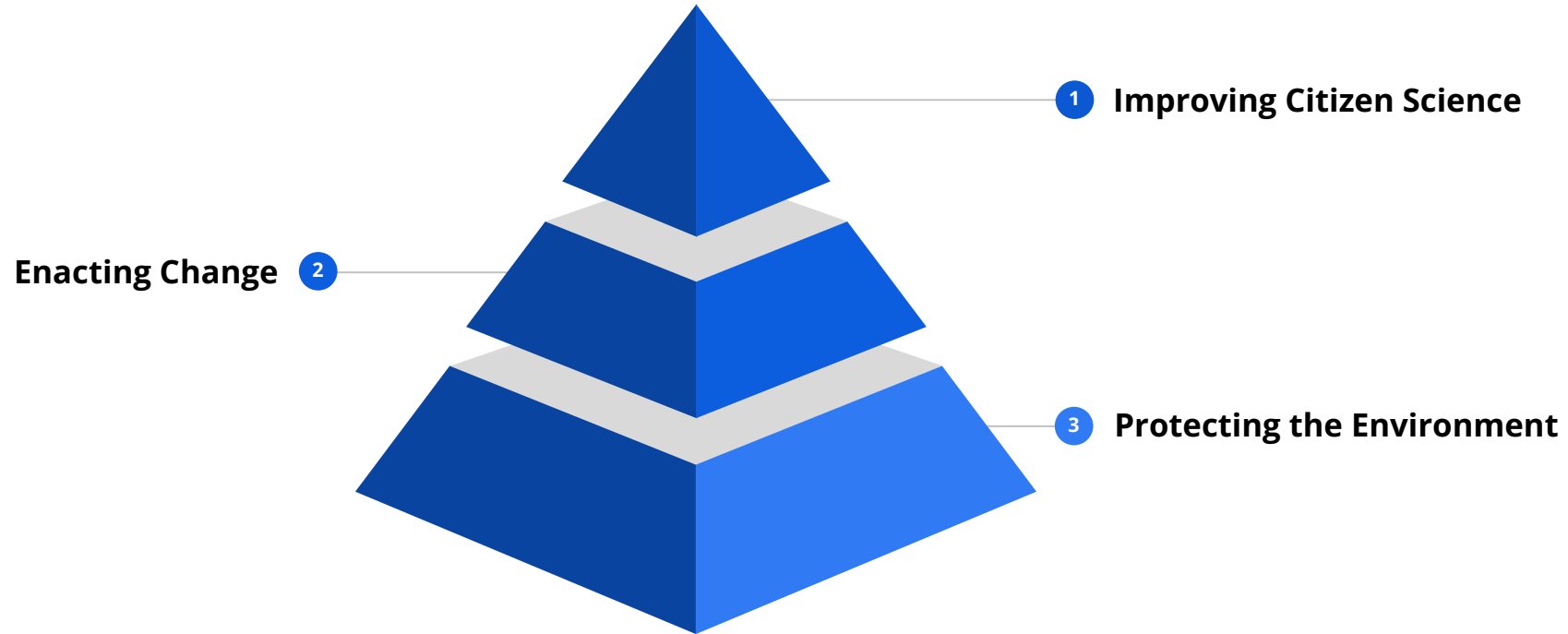


Refine the workshop using feedback from the pilot



Present the workshop at citizen science related conferences

The bigger picture



Acknowledgements

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All of our interviewees

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- Michelle Fisher
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- Professor Holly Ault
- Professor Stephen McCauley



References

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