May 2018

Identifying Knowledge Flow to Develop a Strategic Plan

Erika Marie-Meadows Stark
Worcester Polytechnic Institute

Jacob Lewis Wilson
Worcester Polytechnic Institute

Michael William Savoie
Worcester Polytechnic Institute

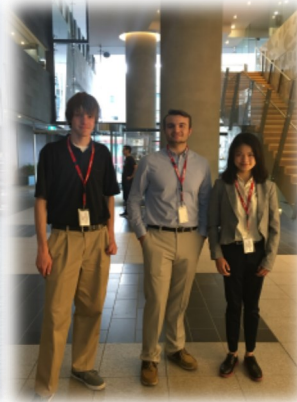Sze Yui Li
Worcester Polytechnic Institute

Follow this and additional works at: https://digitalcommons.wpi.edu/iqp-all

Identifying Knowledge Flow to Develop a Strategic Plan for The Port Phillip EcoCentre

Abstract

Nonprofit organizations need to consistently self-assess their programming and partnerships in order to function effectively to further the environmental governance movement. This project assessed the programming and partnerships of the Port Phillip EcoCentre, a sustainability focused nonprofit in Melbourne, Australia. Our program analysis determined that the EcoCentre's programming should focus on these areas: participant survey consistency with qualitative metrics, obtain feedback data on multi-session programs, more engagement through hands-on and active learning opportunities, and maintain their current quality of programming. We created knowledge flow maps to evaluate the flow of knowledge between the EcoCentre and its stakeholders, and a stakeholder diagram to evaluate these stakeholders' level of significance. This analysis concluded that the EcoCentre should focus their effort on the stakeholders they are the most connected with and those relationships that can produce systemic change with less effort. These recommendations and conclusions on programming and partnerships for the EcoCentre will serve as an outside look into the EcoCentre's operations for their Strategic Plan for the 2018-2021 cycle.

Team Members

Seles Li

Michael Savoie

Erika Stark

Jacob Wilson

D term

March 4, 2018

Advisors

Professor Lorraine Higgins

Professor Katherine Foo

Sponsor

Port Phillip EcoCentre

Nonprofits Need to Assess Their Programs and Partnerships

With the world using more of its finite resources than ever, developing sustainability is increasingly critical. Achieving a sustainable model requires cooperation between organizations and groups of all backgrounds. The sustainability movement is composed of partnerships among the public, private, and civic sectors.[1] Partnerships between these sectors can achieve greater success than if they were operating as independent entities. Communication and knowledge sharing are crucial to ensure that organizations between sectors run as efficiently as possible and to maximize their combined sustainability impact. Each organization within each sector must know its specific role in environmental governance and how the knowledge and activities it produces are disseminated.

In the civic sector, nonprofits can play an important role in environmental governance. Nonprofit organizations are different from private businesses in that they are driven by their environmental missions rather than profit.[2] In order to get funding for those goals, however, nonprofits need to market themselves to organizations who can provide funding and develop strong partnerships with volunteers, businesses, and other community organizations and government groups.

Successful nonprofit organizations have to consistently self-assess themselves. This follows a general pattern in which the organizations estimate their internal resources, use those resources to market themselves and complete their projects, and then assess their success plan and budget for the next cycle. The first step of this process for an organization is to determine their primary goals and prioritize their stakeholder relationships to fit these goals. After that step, they adjust activities, goals, or other organizational offerings to align with these findings. However, issues can arise in the process of self-assessment. If a nonprofit is unaware of the effectiveness of their programming or how they are impacting their cause, they will be unable to properly self-assess. They need funding, physical space, and collaborations with other organizations

to grow their business. A potential method such as knowledge flow mapping is one useful method that can highlight the current state that a nonprofit finds itself in relation to partners, donors, public or private institutions, or other sectors. Knowledge flow maps establish the flow of information types between organizations to assess areas of improvement and identify areas of importance.[3] This can help the organization mapping their activities understand the future direction these organizations should move towards.

In the current era of environmental governance, civic organizations, such as nonprofits, have limited resources to deploy in pursuing their missions. To maximize their impact, these organizations require an in-depth understanding of their stakeholders and how they produce and share knowledge with these groups in the community which can be achieved using knowledge flow maps and stakeholder analyses. Knowledge in this context refers to the information types that organizations share, give, or receive in cooperation with one another. It is important to understand this flow of knowledge to identify potential shortcomings and important collaborations, or establish influences between organizations. Therefore, our project is critical in assisting a nonprofit to evaluate its future direction of continuing pursuing its environmental mission.

Located in the St. Kilda area of Melbourne, the Port Phillip EcoCentre is a nonprofit organization which aims to increase sustainability through education in the local community and programming addressing environmental and sustainable concerns. The EcoCentre regularly engages in strategic planning. In this process, they assess recent partner and program successes and set goals for the next three years, at which point the strategic planning process begins again. The kind of knowledge the EcoCentre produces aims to encourage sustainable behavior change through sustainability education and community action.

This project provided an outside investigation into the EcoCentre's operations in order to assist with their strategic planning process. The objectives of this project were to:

- Determine how participants and funders perceive the usefulness and benefits of the EcoCentre's recent programming.

- Evaluate the flow of information between the EcoCentre's current stakeholders in order to determine the role of each in relation to the EcoCentre.

- Evaluate and compare the value of each stakeholder based on their level of influence determined by the amount of people they reach, and the amount and significance of the information flow between themselves and the EcoCentre.

At the end of our project, we produced the following deliverables: a knowledge flow map, a visualization of information that indicates the flow of knowledge between stakeholders and the organization of concern and a stakeholder diagram based on their influence and interest.[3]

Knowledge Mapping as a Tool for Environmental Governance

In this section, we discuss how the place of nonprofits in the civic sector is directly connected to the concept of environmental governance, and how knowledge mapping is a useful tool to help a nonprofit to run more effectively.

Sector Cooperation: A Key to Sustainability

Cultural and societal changes drive sustainable development both locally and globally, involving decision making on both an individual and a collective level. Retaining the interest of individual people in regards to sustainable concepts is often difficult as it contrasts with the modern market culture.[3] Individual decisions are predominantly influenced by the cultural, societal, political, and economic influences in the community. Guiding these individual decisions is the concept of collective decision

making, the process by which a group or groups of individuals collectively make a decision based on the evidence placed before them.[1] Changing these influences then alters the manner in which collective decisions are made. The future of sustainable development rests on changing this collective decision making process. In an effort to change this process the United Nations has outlined a list of 17 Sustainable Development Goals, consisting of global benchmarks to be reached by 2030, covering a plethora of social, economic, and environmental goals.[4] Societies are addressing these sustainability goals and issues with the concept of environmental governance, which is defined as "the rules, policies and institutions that shape how humans interact with the environment,"[5] A large proponent of environmental governance is cross-sector cooperation (see Figure 1), allowing for different sectors to draw upon the strengths of each other.

Figure 1: Environmental Governance [1]

The three dominant sectors are 1) the government sector, consisting of various state and national agencies, 2) the market or business sector, consisting of companies and other profit-seeking organizations, and 3) the civic or community sector, which is made up of nonprofits and citizen-led initiatives.[1] Without making connections between sectors, inefficiencies such as overlaps, contradictions, or miscommunications may occur.

The cooperation between the state and market sectors is the most well-known. This interaction is referred to as a public-private partnership (see Figure 1), occurring mostly in the creation and enforcement of environmental legislation. When these laws were first implemented decades ago, the government generally worked alone which often resulted in the creation of overly harsh or restrictive laws that were at times damaging to local economies, unpopular, and costly to enforce, decreasing already short environmental agency budgets.[6] The newer public-private cooperation relies on influence from both the government and private businesses which, when carried out properly, results in business policies agreeable to both parties without creating legislation that is costly to enforce.[1] This process works because of the potential power of the government to create restrictive legislation if a private business does not follow through and regulate their own activities by staying ahead of government regulations. With businesses having a more sustainable model than required, the government is much less likely to tighten environmental laws. A second model of public-private partnerships, or at times a form of government-community partnerships, is when the government turns control of an environmental problem or solution to either a company or the general community.[6] This is referred to as comanagement (see Figure 1) which is when both the government and the public (or community organizations) are responsible for maintaining an area or implementing a solution.[1] This form of cooperation is more effective than a pure state approach directly involving citizens that are responsible for not only the solution but often also the problem and appealing to their self-interests. Giving funds to nonprofits is a further example of cooperation and comanagement, and is what allows for nonprofit organizations to survive in the business world. This is often done out of the belief that nonprofit organizations with their more specific knowledge on a particular issue are better able to solve sustainability issues within their specific areas of expertise.[1] This greater efficiency of nonprofits stems from government bureaucracy, which slows a government's response as well as the ability of nonprofits to manage already scarce resources as effectively as possible. In a similar fashion, private companies also partner with these local organizations to carry out their activities in a manner better suited to a nonprofit's area. In this paradigm of cross-sector cooperation, one of the most important components is the influence the civic sector has on the direction of environmental governance.

The Civic Sector Creates Room for Community Involvement in Environmental Governance

The civic sector is vital to the environmental governance movement. This sector is comprised of nonprofits, volunteer organizations, and other non-governmental organizations. By motivating the public to work towards sustainable living, this sector drives the sustainability movement. Falling between public and private organizations, the civic sector has a sense of responsibility of always doing what is best for the surrounding community. At the same time, it needs to stay competitive. In our focus area of nonprofits, staying competitive is especially important as they need to outsource funding, a critical aspect of nonprofit operations, from their partnerships. The government and the marketplace cannot provide everything for their community, so this is where nonprofits can help close the gaps between organizations and the community.[7] Closing the gaps then instills a responsibility onto the civic sector to make a difference in their areas of interest. This inherent responsibility holds civic organizations accountable.

As a major component of the civic sector, nonprofits have a very important and crucial role in the society. The five primary features that define nonprofits are private, non-profit distributing, self-governing, organized, and voluntary.[2] These five components are what primarily separate nonprofits from other organizations in the civic sector. Nonprofits are similar to the traditional business model in that they aim to be successful in a commercial
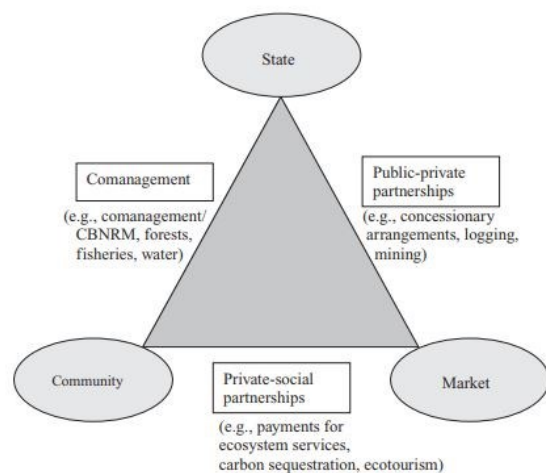
business sense, requiring them to continuously search for increased funding and partnership opportunities.[8]

Nonprofits face a multitude of organizational problems that need to be addressed in order to run effectively. One such problem is funding, which is essential to keeping nonprofits functioning. As nonprofits, they have the opportunity to access donations, instead of bringing in their own funds.[9] However, even with access to private donations, an organization is not guaranteed to be able to get those donations. Another one of the largest issues that a nonprofit can face is a bad image or negative relationship to their branding. One of the largest causes of this issue is due to a lack of public confidence or trust, whether caused by a previous mistake, or limited public exposure. Building up this trust through positive interactions with the public and other organizations is incredibly important as increased public trust can lead to donations, partnerships, and other support that nonprofits require.[10] A major way in which nonprofits have improved this image of public accountability and trust is through the creation of annual reports. Annual reports highlight the functions and activities of an organization during a yearly period, providing the transparency that allows outsiders to see exactly what the organization is focused on accomplishing. This transparency allows a greater level of trust towards the organization and helps build a more positive image. Another cause of the problems that nonprofits face is a lack a growth. A lack of growth can result in stagnation or a decrease in donations, and can be a sign of decreased efficiency due to their use of limited resources. In order to help drive growth, it is essential for the organizations to follow a developmental cycle. The first and most critical step of this cycle is self-assessment, which reviews what and how they have done and understands where they need to focus most of their efforts to maximize the experience for the public. The next step of this cycle is to budget their own resources. In this step, they look at what kind of events and programs they are holding and where they may need help from their partners. They also have to understand how they should best present themselves to the public. This leads to the last step of the cycle - marketing, where they look at how they portray themselves to their community and other organizations and how they can attract more participants or

partners. Then, this goes back to the first step of the developmental cycle, and the process starts again by assessing where they can do better and achieve higher goals. An organization can also target growth opportunities through the creation of strategic plans that lay out an organization's goals for a determined length of time. Strategic plans allow a focused attention on certain key aspects of the organization and can direct the flow of resources, allowing optimal growth opportunities.[11] A more recent problem is the oversaturation of the nonprofit sector. The effect of this oversaturation is overlap amongst various nonprofits, where the same issue is tackled in the same manner by several different organizations.[12] This causes inefficiencies and wastes their minimal resources, harming a nonprofit organization's ability to survive. The most effective solution to this concern is to be unique in approach or fill a niche that other organizations do not occupy. Together, these causes are responsible for many of the problems faced by nonprofits; however, partnerships can help prevent or remedy these issues.[13]

Having partners in their geographic area gives nonprofits more credibility in their community. The right partnerships allow nonprofits to improve their performance and expand their outreach. However, this requires resources, and nonprofits do not always have access to the resources they need to address the needs of their community.[14] This is connected to the issue of fundraising while adding a second layer through the discussion of resources. Resources are not just monetary funds or volunteers but also knowledge which includes expertise, government advocacy, research, and publicity. When all these resources work together, nonprofits thrive. Nonprofits use these resources to influence businesses, lobby governments, and convince other organizations to change their ways and follow a more responsible business/action model from the view of the nonprofit.[15] A knowledge map is a useful visualization tool to assess an organization's relationship to its stakeholders.

Knowledge Mapping Allows for an Organization to Analyze the Contributions of Its Stakeholders

Nonprofits need to understand their partnerships—who their stakeholders are and the kind of knowledge produced and exchanged in working with them. By mapping existing knowledge flow among stakeholders, nonprofits can see where to expand and gain influence.

A knowledge flow map is a data visualization tool that shows the flow of knowledge between individuals, groups, or organizations.[3] This visualization enables organizations to assess their most important connections and where there may be bottlenecks or disproportionate flows that are more costly than beneficial.[3] The mapping system provides an in-depth overview of knowledge-related contents that consists of a contextual background layer representing the focus area of the map and individual elements or agents that are factors in connections.[16] Defining what knowledge constitutes is critical to the creation of a knowledge flow map. Knowledge can be separated into two types: explicit and tacit. Explicit knowledge refers to knowledge that has been documented in a chart, document, etc., whereas tacit knowledge is understood by individuals but not documented.[16] From an organizational standpoint, knowledge maps are useful in unearthing tacit and explicit knowledge and in showing where it resides, how it is shared and used. The way in which these forms of knowledge are used in relation to knowledge mapping is shown in Figure 2.

> "The right partnerships allow nonprofits to improve their performance and expand their outreach."
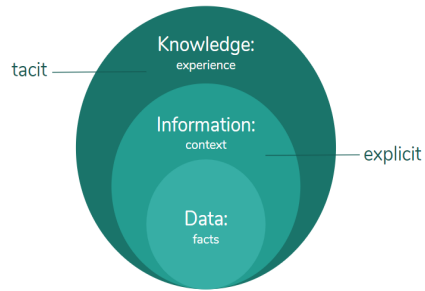
Figure 2: Progression from Data and Where Tacit and Explicit Knowledge Fit In[17]

In a traditional knowledge flow diagram, information flows from a centralized point (the organization or area of interest), and lines representing information and knowledge are shown to flow to and from the central organization and corresponding agents or elements (see Figure 2).[18] This process is especially important to the process of organizational development. It is a visual way to understand the organizational connection, which can highlight a few key components of focus. Variables for the flow diagrams are defined by an organization's goals, values or missions, which can vary in importance depending on what the organization decides to focus on. However, all variables that are mapped in a knowledge flow map have to meet certain set criteria. Such criteria are shown in Table 1.

"Valuable groups are vital to the non-profit's success and they should, therefore, meet the needs of these groups to preserve and enhance the relationship. "

Table 1: Criteria for Knowledge Flow Map Variables[19]

Requirements for Knowledge Flow Map Variables
1. Mutually Exclusive Categories with minimal overlap
2. Collectively Exhaustive, covering complete classified domain
3. Categories are stable and objectively grouped
4. Categories are consistently named or labeled, with self-explanatory terminology
5. Adequate number of groups that can be managed for short-term memory

A knowledge flow map can indicate areas within organizations that are critical to operational function as they may be a common factor in information flow or have a significant number of connections. This can allow an organization to then prioritize their efforts with these key stakeholders or areas of interest that are the most beneficial. This visual can also be utilized to indicate the strengths and weaknesses in organizational knowledge, such as if there are few or weaker connections to the center or data that are not flowing to the destination where it was previously thought or understood to be connecting. In turn, the organization can then shift focus away from less high-impact areas to more important elements or allocate attention to these areas to improve existing connections. This methodology can be used to identify areas that an organization should focus their efforts on.

Knowledge flow maps can take several different shapes in the case of examining an organization's flow of knowledge from its stakeholders. The knowledge flow map shown in Figure 3 presents a color-coded flow of resources for relationships around a river basin. The colors of the arrows represent three variables: red for information flow, green for financing, and blue for implementation capacity. This example flow map shows the flow of particular types of information allowing for easy identification of valuable stakeholders. Flow maps are also useful in the identification of possibly troublesome features. One of these troublesome features is known as a 'black hole' which is where plenty of resources flow into the stakeholder/area, however very little flows out.[3] A prominent example of one of these black holes in Figure 3 is that of 'Irrigators', where nine arrows flow into the group, and only one flows out. These black holes may show an area or group where too much effort is spent and the relationship may not be worth maintaining. Valuable groups are also very easily spotted with this type of map where numerous connections both originate from and terminate at these areas (e.g., see the EU on Figure 3). Valuable groups are vital to the nonprofit's success and they should, therefore, meet the needs of these groups to preserve and enhance the relationship. We will use knowledge mapping to provide EcoCentre with such information on their current stakeholders.
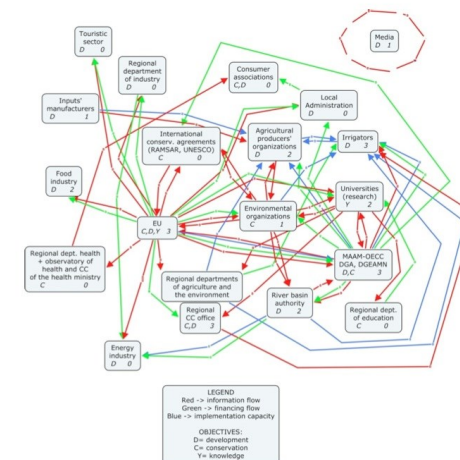

Figure 3: Knowledge and Resource Flow Map of Information Around a River Basin[20]

Methodology: The evaluation of EcoCentre programming and stakeholder relationships

In this section, we review methods we employed to achieve our two objectives: the evaluation of the EcoCentre's programs and identifying and evaluating the EcoCentre's current partnerships. Objective 1 covers the data collection and content analysis and coding of participant surveys, and Objective 2 covers the data collection and analysis of EcoCentre's stakeholders and flow of information to and from the EcoCentre.

Objective 1: Evaluating the EcoCentre's Programs

To evaluate the effectiveness of the programs that the EcoCentre operates, we set out to answer the following four questions: 1) What were the participants' initial expectations? 2) What positive comments did participants make (both on program features/logistics and on takeaways)? 3) What negative comments were made? 4) What suggestions did participants make? We drew on pre-existing data from five participant surveys taken by 367 EcoCentre program participants across four different programs: Steps to Sustainability conference, corporate volunteering, Schools Sustainability Festival, and excursions. We also participated in three programs ourselves: an Alive Outside program called Pamper the Penguins, a corporate volunteering program, and a Year 11 Biology-focused excursion. This helped us to better understand program structure and the source of the feedback that the EcoCentre has already received. We also conducted new surveys (labeled as Survey F in Table 2; see Table 3 for our survey questions) with the participants and volunteers in those programs we attended, asking them about program logistics, benefits that the program offered,

if they learned anything new from the experience, and the impact the program had on them.

At Alive Outside and Corporate Volunteering programs, we had an iPad for people to fill out the survey digitally. If the participants needed to leave right after the program, the survey was then emailed to those who provided an email. Paper surveys were distributed at the Year 11 excursion. Although the EcoCentre also had some notes on phone calls to participants (not a full transcript), some phone call records, project reports written by program managers, and a testimonial from a past volunteer, these were not included in our analysis because we were only interested in looking at raw participant survey data.

The questions on the past surveys we analyzed (A-E) were not consistent, but they tended to focus on satisfaction with logistics of programs, the return status of participants, reasons for attending, whether they learned something new, whether they would recommend the activity to a friend, and if this program offered any benefits to them or they had any takeaways (see Part B of Supplemental Materials for EcoCentre survey questions). We first matched the instrument questions on these existing surveys to the research questions we posed (Table 4).

Table 2: Program (Survey Type)

Survey Code	Program(s)
A	Steps to Sustainability Conference 2015
B	Steps to Sustainability Conference 2017
C	Corporate Volunteering
D	Sustainable Schools Festival
E	Excursions
F	Alive Outside: Pamper the Penguins, Corporate Volunteering, Year 11 Biology Excursion

Table 3: Survey Questions for Participants

Our Survey Questions for Participants (Survey F)
1) What program are you participating in?
2) Where did you first hear about the EcoCentre?
3) Why did you decide to participate in this program?
4) Is this your first time participating in an EcoCentre Program? (Yes/No)
4a) If No: Why did you decide to participate again?
5) What were your expectations for today's programs?
6) Would you say that your expectations were met? (Yes/No)
7) What did the program do well?
8) What could the program do better?
9) How would you improve your experience?
10) Any other questions or suggestions?

Table 4: Assessment questions and their corresponding survey questions from the EcoCentre's existing data and our new surveys

Research Questions	Corresponding Survey Questions
1. What were their Initial expectations/ reasons for attending?	F (3,5)
2. What were the positives?	A(1-3); B(1-5); C(1); FGH (3,5,7-10); D(1-4); E(1-4)
3. What were the negatives?	A(1-4); B(2-5); C(1); D(2,4); E(2,4); F(8)
4. What suggestions do they have?	A(2-4); B(2-5); C(1); D(2-4); E(2,4); F(8,9)

We then conducted a content analysis of participant responses, noting common themes that emerged for each of our research questions. We then identified the most common themes across programs and by the program.

Objective 2: Identifying And Evaluating the EcoCentre's Partnerships

In order to identify the current partnerships that the EcoCentre has, we analyzed its stakeholders to identify the types of knowledge that each organization provides to the EcoCentre, as well as where the EcoCentre itself sends knowledge. The purpose of this analysis was to create a map tracking the types and flow of knowledge produced and shared between the EcoCentre and its stakeholders. This map would allow for easy identification of valuable partners and possible holes or opportunities in the flow of knowledge. The variables or types of information required

Map Variable	Data Source	Map Representation
Number and Type of Stakeholder:	Annual Reports	
Type of Knowledge Shared/Created:	Annual Reports, Staff Interviews	
Direction of Knowledge Flow	Annual Reports, Staff Interviews, Stakeholder Interviews, Staff Workshop	
Connections Between Stakeholders	Staff Workshop	
Strength of Connection	Annual Reports, Staff Interviews, Stakeholder Interviews	
Level of Effort	Staff Interviews	

Figure 4: Variables we investigated, sources we used to get information on each variables, and how represented each visually on our map.

for this knowledge flow map are shown in Figure 4, with the source we consulted to get information on each, and a quick representation of how we visualized each variable on our map.

The first step of this process was to identify all of the EcoCentre's *stakeholders.* This was accomplished through reading the EcoCentre's annual reports. Examples of stakeholders include other sustainability nonprofits, community action groups, local businesses, and schools. Each stakeholder was classified by their *type* of organization: local government, state government, business, community organization, education, trusts/funds, or other. This examination gave a list of 170 current stakeholders over the past three years (the time period of interest during the last strategic plan). These stakeholders were also, grouped into 31 groups of various sizes determined by their areas of interest and relationship with the EcoCentre. For example, one such group consisted of organizations that are involved in the news scene including three radio stations, one news station, and one magazine. Another example is research groups, which were organizations primarily involved in conducting citizen science activities and work in that manner with the EcoCentre. Twelve organizations, such as Sustainability Victoria, were decided to be too large or important to be grouped with other organizations and were given a stand-alone status to prevent skewing the contribution of a group through a disproportionate amount of information flowing through one of these single organizations. On the knowledge flow map, these different types of stakeholders are shown by different colored stakeholder nodes as pictured in Figure 5. Groups of stakeholders also have a different color on the map.

Type of Stakeholders:

Local Government: ●
State Government: ●
Businesses: ●
Community Organization: ●
Education: ●
Trusts/Foundation: ●
Other: ●
Group: ●

Figure 5: Representation of type of stakeholder on the knowledge flow map

The second step in this process was identifying the different *types of knowledge* that are exchanged or created between organizations. This was accomplished through discussions with the EcoCentre's CEO, and reading through the EcoCentre's annual reports from the last three years (2014-2015, 2015-2016, and 2016-2017). In the annual reports, common types of knowledge appearing in the interactions between the EcoCentre and other organizations were identified, such as numerous organizations obtaining advice or consulting the EcoCentre during their operations. The discussions with the EcoCentre's CEO identified other common forms of knowledge, such as networking that the EcoCentre is seen as providing for other organizations. The important types of knowledge that were identified in this process were: policy advocacy and development (where an organization lobbies for the cause of another or creates new policy for or with the EcoCentre), consulting (where advice or expertise is transferred), event/project cooperation (another organization working with the EcoCentre to host or create events), scientific research (transfer of collected information pertinent to a topic of interest), sustainability networking (connecting with other organizations based on mutual beliefs or complementary services), and publicity

(spreading one organization's message to other groups). On the knowledge flow map itself, these different types of knowledge were represented by coloring the connections between organizations as shown in Figure 6 taken from the knowledge map's key.

Type of Knowledge with Color Code:

Policy Advocacy & Development: ➡
Scientific Research: ➡
Event/Project Cooperation: ➡
Sustainability Networking: ➡
Consulting: ➡
Publicity ➡

Figure 6: Types of knowledge we tracked

There were several steps in determining the actual *directional flows of knowledge* between other organizations and the EcoCentre, each pertaining to a different source of information. The first of these was through reading the EcoCentre's annual reports, where direct transfers of knowledge or creation of new knowledge were identified directly from the text. The second step was interviewing several of the EcoCentre's stakeholders chosen due to their varying relationships with the EcoCentre. Twelve stakeholders in total were interviewed (see Table 5 for full list) ranging from charitable funds and nonprofits to city governments and agencies. Questions that we asked each stakeholder revolved around the relationship between the EcoCentre and the target organization including questions such as asking for examples of collaboration between the organization's, what benefits the EcoCentre provides to the organization, the benefits the organization provides to the EcoCentre and the type of change that the partnership between the EcoCentre and organization resulted in individual, collective, and/or societal level, among other questions (see Table 6). These

interviews allowed for the direct identification of flows of knowledge between the EcoCentre and these particular stakeholders and provided an in-depth look at their relationships.

Table 5: Stakeholders that were interviewed

Stakeholder Name	Type
City of Port Philip	Local Government
City of Stonnington	Local Government
Dolphin Research Institute	Community Organization
Earthcare St. Kilda	Community Organization
Environmental Education Victoria	Community Organization
Friends of Westgate Park	Community Organization
Helen Macpherson Smith Trust	Trusts/Foundation
Lord Mayor's Charitable Foundation	Trust/Foundation
Love Our Street 3184	Community Organization
St. Kilda Primary School	Education
Sustainability Victoria	State Government
Worcester Polytechnic Institute	Education

Table 6: Survey Questions for Stakeholders

Our Survey Questions for Stakeholders
1) How would you describe your organization's mission?
2) Why do you partner with other organizations?
3) How long have you connected with the EcoCentre?
4) Can you give an example of some collaboration you have done with the EcoCentre?
5) What is the role of the EcoCentre in your partnership?
6) How would you describe the EcoCentre to a colleague?
7) What is the nature of your relationship with the EcoCentre?
8) What do you value about your partnership with the EcoCentre?
9) Why did you choose to partner with the EcoCentre?
10) What benefits does the EcoCentre provide for you?
11) What benefits do you provide for the EcoCentre?
12) As a result of working with the EcoCentre, where has change occurred? Societal level such as supporting a ban on plastic bags? Collective level such as removing the use of Styrofoam in a company? Individual level such as personally living more sustainable? Please give examples.
13) Are there any improvements you would make to your current relationship with the EcoCentre to further
14) In today's sustainability movement, what do you believe is the most important thing that the EcoCentre
15) Where do you see your relationship with the EcoCentre in the future?
16) Do you work with any other organizations that you believe function better as a sustainability organization

The flows and creations of knowledge between stakeholders are also represented on the knowledge flow map as directional arrows. A staff workshop with the EcoCentre's CEO and the EcoCentre's founder assisted us with determining these flows and creations. The workshop consisted of the various groups of stakeholders and individual standalone stakeholders placed around a large sheet of paper as shown in Figure 7. The staff members then, drew arrows between stakeholders to represent knowledge flows with colors corresponding to the types of knowledge. This information will allow for the final knowledge flow map to include knowledge flows between not only the EcoCentre and its stakeholders but also between the stakeholders themselves showing the major players in the greater sustainability scene, not just in relation to the EcoCentre.

Figure 7: EcoCentre staff identifying stakeholder connections

The final step in collecting information on the directional flows was through interviewing the EcoCentre's CEO. During this interview, the CEO described the relationship with each stakeholder one at a time explaining their activities and potentially where knowledge was flowing. The relationships were then, examined for any flows of knowledge between the stakeholder and the EcoCentre through their relationship. Examining the relationships in this interview provided more flows of knowledge for every stakeholder finalizing the collection of directional flows. Together, these identified flows on the knowledge flow map were shown by colored arrows from one organization to another, or a mutual exchange represented by a two-way arrow as shown in Figure 8 from the knowledge flow map's key.
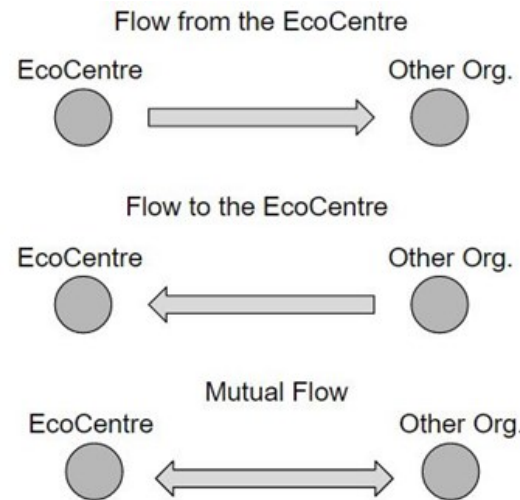

Figure 8: Representation of directional flow of knowledge on the knowledge flow map

Each knowledge flow varied by *strength* determined by the relationship between the stakeholder and the EcoCentre for each knowledge flow. "Opportunistic" relationships (organizations working irregularly together only when the opportunity arises) were the least strong, "regular" relationships (working together throughout normal operations on a consistent basis) were considered to be strong, and "deep" relationships (significant cooperation between organizations to accomplish their strategic goals) were considered to be the strongest connections. For example, a radio station that holds one interview with the EcoCentre over the course of a year would have an opportunistic relationship for publicity while a nonprofit which co-hosts events with the EcoCentre regularly would be a deep relationship for event/project cooperation. On the knowledge flow map, this strength is shown by the thickness of the connection as shown in Figure 9.
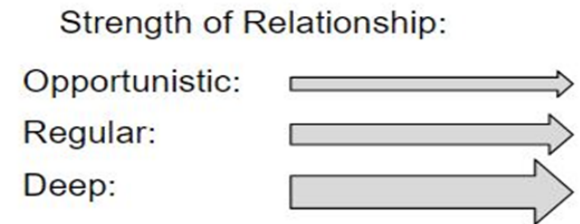
Figure 9: Representation of flow strength on the knowledge flow map

Also of interest to the EcoCentre was the level of *effort* that the EcoCentre was putting into maintaining the relationship with each stakeholder. Effort is measured as the estimated amount of hours that the EcoCentre spends each year on the relationship with each stakeholder. This information was gathered through an interview with the EcoCentre's CEO, where an estimate of the number of hours was listed for each stakeholder. On the knowledge flow map, this is represented by the size of the stakeholder's node: a smaller circle represents an organization producing less change while an organization producing more change is represented by a larger circle (see Figure 10)
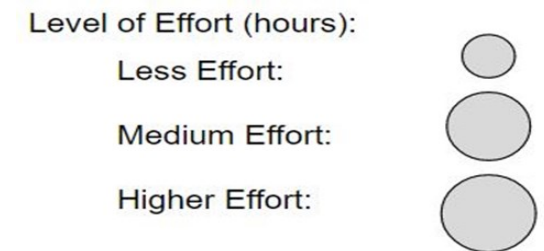
Figure 10: Representation of effort on the knowledge flow map

The finished map illustrated the entire flow of knowledge surrounding the EcoCentre, showed the type of organization mapped, type of knowledge produced or shared, direction of knowledge flow, the strength of the flow, and the type of change. This map highlights the EcoCentre's most important stakeholders through strength and number of connections from the EcoCentre to the Stakeholder, the importance of stakeholders in relation to the greater sustainability movement, and issues in the flow of knowledge such as 'black holes' or gaps. Black holes refer to organizations that have many connections, especially stronger connections, that are directed into the organization, yet very little knowledge is received or created in return, representing a disproportionate flow. An example of a potentially significant gap in knowledge would be that of the vast majority of a particular type of knowledge coming from a single source, which could be potentially disastrous if that stakeholder were to be lost.

To physically create this knowledge flow map, the software program Gephi was used. The open-source software, Gephi was chosen because it is able to vary the size of connections between nodes, size of individual nodes, direction of connections, color of connections, and color of nodes, all required for representing the necessary variables for the map. Unlike many other mapping software, Gephi has a variety of options that can be utilized for filtering a complicated map. One such filter removes nodes below a particular amount of connections, a particularly useful feature for organizations like the EcoCentre that may want to view only their most connected stakeholders at a particular time. Other important filters allow for the map to be filtered such that only specific types of knowledge flows are shown, useful for seeing only publicity flows, for example. The same is true for nodes on the map to be filtered by type, making it easy to see only local government organizations, for example. Together, these filters make Gephi a very useful software for visualizing the flow of knowledge into and out of the EcoCentre easily. Gephi also allows for the easy importation of information via spreadsheets from outside sources. Information of the EcoCentre's knowledge flows is on a spreadsheet outside of the program that can be updated by EcoCentre staff and re-uploaded to Gephi to create an updated map. Together, the features provided by Gephi will make interpreting, filtering, and keeping data easier for the EcoCentre than any other software examined. Furthermore, these features also make the map itself much easier to interpret data from compared to the spreadsheets themselves. These filters easily allow different parts of the data to be hidden at once, compared to the complex calculations that would be required for a spreadsheet.

After creation of the knowledge flow map, the amount of effort put into each relationship was then represented against the change that each stakeholder created. **Effort** is as defined earlier in this section as the number of hours required for the EcoCentre to maintain a relationship. The **type of change** that the EcoCentre's partnership with each stakeholder was creating is defined by one of three types. "Individual" change (one person or individuals change their actions) was considered to be the least important, "collective" change (a group of people together decide to make a change) was important, and "systemic" change (legislation or policy is created to bring about a change) was the most important. As a result of a partnership, there may be a single type of change or multiple types of change. These types of changes were determined by interviews with stakeholders where this exact question was asked and in an interview with the EcoCentre's CEO. These levels of effort and change were then represented on a 3x3 diagram, with the y-axis representing the type of change created by the organization and the x-axis representing the level of effort of maintaining the relationship. The following is a general description of the squares on this diagram and the organizations' significance to determine the EcoCentre's approach to dealing with an organization falling into this category. The x-axis of effort was separated into three different sections, with each corresponding to a range of hours. From left to right, the first section was 39 hours or under per year, the second section was 40 to 60 hours per year, and the third section was 61 or more hours per year. Each type of change also had a corresponding section, with the lower section being individual change, collective change in the middle, and systemic change at the top. The following are brief descriptions of the relationships from top to bottom, left to right. Organizations with a low level of effort but a high level of change (top left) are the most significant as it is a high return for a low cost, so effort should be prioritized to expand these relationships, further creating more impact on the society. Organizations with a low level of effort but a medium level of change are significant and can also be valuable as it has great return for a low cost and may be beneficial to expand the relationship to further create more change. Organizations with both a low level of change and effort (bottom left corner) are less significant and should be shown consideration but do not offer a great deal in creating change, so these organizations should not be focused on. Organizations producing systemic change with medium effort are also very significant, and these relationships must continue to be maintained. However, by reducing the cost in hours, these relationships could become even more valuable. Organizations with both a medium level of change and effort are significant and should be committed to as they create a fair amount of change, yet they are mildly costly to support, so steps should again be taken to reduce the cost of these relationships. Organizations with a low level of change and medium level of effort are also less significant, and should be shown consideration but do not offer a great deal in creating change, so they should not be focused on either. Yet, their relationships are more costly to maintain, and thus, steps should be taken to reduce the amount of hours required to maintain these relationships. Organizations with a high level of effort are generally equivalent in significance (in terms of change created) as the prior (medium time commitment) section, however these relationships are extremely costly to maintain, so steps should be taken, if possible, to reduce these costs. With those organizations where there is only individual change with a high cost, these relationships may need to be reconsidered as the effort spent on maintaining these connections may be better spent elsewhere. As shown in Figure 11, this diagram shows the position of each stakeholder and their significance to the functioning of the EcoCentre.

Change

	Effort (hours/year)		
	39 or Under	**40 - 60**	**61+**
Systemic	Most Significant -Prioritize Effort-	Most Significant -Maintain, Reduce Effort if Possible-	Most Significant -Maintain, Reduce Cost-
Collective	Significant -Prioritize Effort-	Significant -Maintain, Work To Reduce Effort-	Significant -Consider, But Costly, Must Reduce Effort-
Individual	Less Significant -Show Consideration-	Less Significant -Consider, Do Not Focus-	Less Significant -Extremely Costly, Prioritize Elsewhere-

Effort (hours/year)

Figure 11: Metric for Determining Stakeholder Importance

Results: The evaluation of EcoCentre programming and stakeholder relationships

Objective 1: Results for EcoCentre's Program Assessment

This section details the results of the content analysis of the participant surveys from 6 programs. We categorized the responses corresponding to our four research questions. Common themes that emerged were noted for each program separately as well as across all programs. Bolded themes on the tables for each program are ones that were mentioned more than three times from survey data, the frequency of the theme noted in parenthesis next to it. Common themes that appeared across programs are summed up in the last table. Positives are presented in two columns: one corresponding to program takeaways and the other to program features.

Steps to Sustainability: Participant Survey Results

Surveys analyzed in this section were for two years of the Steps to Sustainability conference, 2015 (Survey A - a total of 49 respondents) and 2017 (survey B - a total of 84 respondents) to determine the positives and negatives the participants saw as well as their suggestions for this program (See Table 7).

For positive responses, there were 12 themes that appeared more than three times. The largest one was a program takeaway, which was *overall good response* with 51 appearances. There was a general feeling of satisfaction with the program, as respondents mentioned they would recommend the conference and that the day was excellent. Of the 35 responses for the question that asked "Would you

recommend this program to other people? Why/why not?" in the 2015 survey, only one respondent said they would not recommend it. One respondent's comment from the 2015 conference stated that the event was: "inspiring and showed how educational gains can be made by linking teachers with sustainability and environmental education."

The second most appearing response was a program feature, *the venue*, with 43 appearances. The 2017 conference was held at the Melbourne Zoo, which was a selling point for the event. One respondent from the 2017 conference "loved it at the zoo, fresh air, living things around us, lovely sounds and things to look at." The third most prevalent theme was a program feature: *a focus on education*. The 2015 respondent who stated that the event was inspiring also commented on the links between teachers and sustainability education.

Networking as a program takeaway was the fourth most prevalent of the emerging positive themes with 27 appearances. Respondents appreciated the ability to network with other teachers trying to accomplish the same goals, presenters, facilitators, or other like-minded individuals. One respondent mentioned in the 2015 survey that, "networking and hearing the positivity of other teachers" was "very refreshing", while another respondent mentioned that they "enjoyed meeting other attendees and sharing information."

For the negatives, there were 6 themes that emerged, but were not as prevalent across respondents as positives were. The most commonly noted negative was on the *food packaging* at the 2017 conference, with 3 mentions. It was not eco-friendly, as respondents noted the single-use wrappers. There were also comments on how respondents could not go to everything they wanted to, as there were *multiple sessions happening at once* during the conference. One respondent feedback that encapsulates this is that the individual "would have liked more freedom between the modules rather than staying at only one." A negative that appeared both in the 2015 and 2017 responses were *criticisms of religious elements* included at the conference as a result of the local church of St. Louis being a sponsoring organization. One respondent commented that they would recommend the conference to other people "if the religious elements were cut." Other negatives included

individual respondents stating that the *learned nothing new* at the conference and that the *quality of individual sessions* were not consistent as they did not enjoy the entirety of the sessions they attended. There was one presentation at the 2017 conference where the *IT did not work properly*, which took away from the presentation, one respondent noting: "A shame about the IT glitch for morning presenter. This hampered the presentation delivery."

The largest theme of suggestions for the conference related to future topics to include in future conferences, *ResourceSmart* and climate change being mentioned in both 2015 and 2017. There were 39 appearances of the theme of the topics mentioned in Table 7. One respondent suggested: "Perhaps there could be a session solely focused on getting started with ResourceSmart. Not everyone has a good understanding of this framework and it would have been useful to have a 'beginner's guide' to what is involved in becoming a ResourceSmart school." The second most appearing theme was a sense of "more", which related to what people wanted to see more of at the conference and the timing for the day. This is related to the negative comments about not being able to go to everything that they wanted, with multiple people suggested more than 1 day for the conference, giving the opportunity to go to more sessions. One respondent suggested that the conference be "Extended to two days to allow for participation in more than one stream."

Table 7: Steps to Sustainability Feedback

Positives: Takeaways	Positives: Program Features	Negatives	Suggestions
Overall good response: would recommend, fantastic, great day, excellent (51)	**Venue (43)**	Food packaging not eco-friendly (3)	Include these topics in the future: climate change, schools, ResourceSmart, grant applications, the local environment, behavior change, indigenous perspectives (39)
Networking: with other teachers, like-minded individuals (27)	**Focus on education:: opportunities for teachers, schools, curriculum (37)**	No new information	More: success stories, time (for the overall conference and sessions/workshops), opportunities, flexibility in the day (21)
Sharing knowledge (17)	**Good range and style of presentations (31)**	Could not go to everything they wanted to (multiple sessions scheduled at the same time)	Keep running the conference (4)
Gains: inspiration, ideas, expertise, strategies, information (17)	**Event logistics/organization (24)**	Religious elements	Focus on secondary schools
Sense of making a difference	**Speakers (24)**	Some sessions not as good as others (not specified)	Have the conference for 2 days
Information: helpful, relevant, practical	**Value and variety of workshops and sessions (11)**	IT (audio/visual tech did not work properly for one presentation)	Broader range of workshops/activities
Has recommended to other people	**The sustainability journey (11)**		Cut religious elements
Engaging	**STEM links (4)**		Test the IT beforehand
	Projects		
	Quality		
	Staff		
	Case studies		
	Community focus		

Corporate Volunteering Program: Volunteer Survey Results

The corporate volunteering survey from 2016 (Survey C) had a total of 214 respondents, and our survey for program participants in the one program we attended this year (Survey F) included a total of 4. We noted expectations, positives, and negatives the participants saw as well as their suggestions for this program. (See Table 8).

For participant's expectations, there was no theme of expectations that appeared 3 or more times. Respondents commented that they wanted to *enjoy* their experience, bond with their coworkers, help out the local wildlife (penguins), and generally do something *meaningful* or useful as a result of their participation. Some respondent feedback that illustrates these expectations include a volunteer who stated that they "wanted to have fun and add value to the penguin community," another stated that they wanted "to do some work around their environment and see [penguins] possibly up close."

For positive themes, the most apparent one was an overall good response to the day with 14 appearances. One respondent stated that there was "fantastic local context/history and education on the work being done. Also, I loved the clarity and narrative of the contribution that our group specifically made. Plus a great balance of talking and doing." This is related to the second most apparent positive theme, which was that the volunteering day was meaningful and rewarding. The second most appearing positive comment was a positive program feature, the EcoCentre staff. One respondent commented that the staff running the event "did a good job of explaining the history behind the site and how to look after the area and such." There were four other positive themes that had three or more appearances: the want to do more work, the program environment, and that the program was educational.

There were *no negative themes* that had 3 or more appearances in the data. Some negatives that came out of the analysis were that some respondents did not enjoy the hard work of the activity, the food options, they did not see and penguins through the activity, and that it did not meet expectations and would not return as a result. However,

there were two themes that appeared as negatives as well as positives, which were the notion of doing hard work during the day, and that there was a sense of wanting to do more work. One comment that highlights some of these criticisms of wanting to more work was: "I had initially thought we'd achieve more on the day. While there were times the weather wasn't great, we should have done more the numbers and time we had. There was too much time standing around, and not enough time researching our helping the bay." The negative side of doing hard work was evident in this comment: "walking back and forth with bucket of sands for the whole all day is a chore, hard work. not something I would recommend for someone else to do."

There were only two suggestions that appeared in the data, which were about equipment and the format of the survey. One respondent stated: "More wheelbarrows. We could have done a lot more with instead of just buckets," in reference to moving sand from the beach out to the breakwater. The other suggestion was to change date format on the survey to dd/mm/yyyy.

Table 8: Corporate Volunteering Program Feedback

Expectations	Positives: Takeaways	Positives: Program Features	Negatives	Suggestions
To have fun	**Overall good response: fantastic, good activity, fun (14)**	**The EcoCentre staff (6)**	Hard work	More wheelbarrows to move more sand
Help the penguins	**Meaningful/rewarding (5)**	**The program environment (St Kilda pier & beach) (4)**	Wanted to do more work	Change the date format in the survey to dd/mm/yyyy
Bonding with a team/ socializing	**Wanted to do more work (4)**	**Program was educational (4)**	Would not come back	
Doing something useful/meaningful	Networking	Knew what to expect having seen the agenda	Food: options not sufficient, no coffee	
Getting fresh air	Got to help the environment	Supported by their place of work	Not seeing penguins	
	Met expectations		Did not meet expectations	
	Would come back			
	Learned new things			
	Hard work			
	Work done was valuable			

Schools Sustainability Festival: Participant Survey Results

The survey analyzed in this section was a survey for the 2016 School Sustainability Festival (Survey D) which included a total of 7 respondents. We noted expectations, positives, and negatives the participants saw as well as their suggestions for this program. (See Table 9).

There were two themes that had three or more appearances. The largest was about the takeaways that kids had from the program, with 6 appearances. Respondents felt that the *children learned much about sustainability* as a result of taking part in the festival. This is evident from some of the respondent comments, including, " kids getting the opportunity to learn from the other kids," and "listening to the student's own voices." The other most emergent theme was about the variety of workshops at the festival.

There were only two comments on negatives for this program, which were that the *noise was overwhelming*, the respondent commenting that it was overwhelming "especially when the students were running their own workshop." The other negative comment was that the *funding of the event should have covered more for the day*, specifically noting CRT teachers in the comment.

For suggestions, there was one the that had 3 appearances, which related to improvements to *how the workshops ran*. Teachers wanted the more information ahead of time and follow ups to the workshops and activities at the festival. One respondent stated that there should be "clearer information beforehand on how long the workshops will take, how much space is available, etc." and "a list of all the workshops for teachers so that we can follow up after the festival."

Table 9: School Sustainability Festival Feedback

Positives: Takeaways	Positives: Program Features	Negatives	Suggestions
Kids: Getting to meet other kids, learning aspect, sense of pride (6)	**Variety of workshops (3)**	Noise was over-whelming	More wheelbarrows to move more sand
Meaningful day	PPEC staff	Wanted to do more work	Change the date format in the survey to dd/mm/yyyy
Overall good response: great, well done	Speakers	Would not come back	
Indigenous focus	Well– organized	Food: options not sufficient, no coffee	

EcoCentre Excursions: Survey Results

The survey analyzed in this section was a survey given to schools who participated in excursions from 2015 to 2016 (Survey E), with a total of 14 respondents. We noted expectations, positives, and negatives the participants saw as well as their suggestions for this program. (See Table 10).

There were six positive themes that had three or more appearances in the data, two were takeaways and four were program features. The largest one was a program feature, which was the *program environment* (St Kilda beach and pier). These related to the beach, the plants, and the animals, especially the penguins. The second most positive program feature was that of topics that were at the excursions: waste management, taking action, and exploring nature. The most prevalent takeaway was that the *kids enjoyed the day* with 4 appearances. One respondent said that the "hands on activities kept them engaged" and that it was fun for them to experience these processes, which relates to both kids enjoying the day as a takeaway, and the hands-on aspect that was also a prevalent positive theme with 4 responses.

Negatives had few commonalities across the responses. There were none that had 3 or more responses. They included that the *worm activity was too long, that the themes presented by the Aboriginal presenters were either to complex or abstract for the children who participated to understand, and that the Elster Canal portion of the excursion was disappointing.*

There were two suggestions that appeared three or more times: improvements for the kids and more hands-on activities, both of which appeared 3 times. One respondent suggested: "More hands on activities to compliment [sic] verbal info. For example not just 1 transect of litter survey. Set up more transects away from the drain to map how far the litter is spreading." An example of a suggested improvement for the kids was: "Consistent content over all groups - we found that some groups had not covered all the

things or completed all the same activities (probably due to time constraints and the behavior of the cohort)."

Some suggestions of the program advocated for more hands on activities to complete and more kid-friendly directions and logistics for children to follow throughout the day, requesting that things across the events should be more consistent time and content wise and that live mollusks be included in the activities. This was evident in the responses of participants as some said that there should be.

> "Honestly, just have it go for longer, it was really cool learning about everything."

Table 10: Excursion Feedback

Positives: Takeaways	Positives: Program Features	Negatives	Suggestions
Kids enjoyed the day (4)	**Environment: the beach, plants, animals, (especially penguins) (8)**	Worm activity was too long	For kids: better labelling for separating rubbish, list of what to do, opportunity for questions, follow-up activity (3)
Gained knowledge (3)	Topics: waste management practices, taking action, exploring nature (6)	Aboriginal educator's stories were difficult for kids to understand	More hands-on (3)
Engaging	Hands-on: shells, plastics (4)	Elster Canal section was disappointing	More: content, time
Want to come back	Having multiple activities during the day (3)		See live mollusks
	Aboriginal educators		Focus on penguins
	PPEC staff		Stronger links between waste & impact on the bay
	Bush tucker (indigenous foods and practices)		

Alive Outside: Pamper the Penguins: Participant Feedback Results

The survey analyzed in this section was our survey for program participants (Survey F) which had a total of 4 respondents for this program. We noted expectations, positives, and negatives the participants saw as well as their suggestions for this program. (See Table 11).

The expectations for the Alive Outside were primarily focused on seeing and learning about the penguins located on the breakwater. One respondent stated that the thing they most wanted to get out of the day was "to learn about the penguins and the environment." Other participant expectations included wanting to help the environment, contributing more to the local community, and having fun outside.

There were several positives, while only one negative emerged from the program. Some of the positives of the participant experience were physically helping the environment and seeing penguins (matching expectations) as well as learning new things as a result of participating. One respondent stated that the program "did a good job of explaining the history behind the site and how to look after the area and such".

There was only one negative amongst responders, with the participant stating they disliked the "prickly bush." Suggestions included picking up more litter, more information on penguins, and more hands-on activities. None of these appeared more than three times, but all relate to a sense of wanting more out of the program. One respondent said: "Honestly, just have it go for longer, it was really cool learning about everything"

Table 11: Alive Outside: Pamper the Penguins Feedback

Expectations	Positives: Takeaways	Positives: Program Features	Negatives	Suggestions
See and learn about penguins	Helped the environment	Great program	Prickly bush	Pick up more litter
Help the environment	Seeing penguins			More information on penguins
Have fun	Fun experience			More hands-on activities
Contribute more to the community	Learning new things			

Table 12: Year 11 Biology Excursion

Expectations	Positives: Takeaways	Positives: Program Features	Negatives	Suggestions
Learn about ecosystems/ classification (10)	Overall good response: fun day, good experience	Educational (5)	Too much standing around	More: hands-on, things to touch, engagement (10)
Fun	Ability to explore ecosystems	Interesting facts and information	Too much walking	Less standing (3)
Seeing animals	Hands-on	Collecting mollusks	Too much talking	Research in a team
				Bring fold-out chairs
				Shorter periods (1 hour was too long)
				Do more experiments

Year 11 Biology Excursion

The survey analyzed in this section was our survey for program participants. We noted expectations, positives, and negatives the participants saw as well as their suggestions for this program. (See Table 12).

Expectations for program participants for the Year 11 Biology Excursion include one major theme of *learning about ecosystems/classification*, in which a respondent stated this directly. This appeared 10 times in the data.

There were several positives noted from the excursion and only one derived negative. The main positive was that the experience was educational. One respondent stated the program presented interesting facts and "taught them about classification of living things." Other positives taken away from the event was that it gave to participants *the ability to explore ecosystems, presented interesting facts and information, allowed them to collect and touch live mollusks, and was an overall fun and good experience*.

A negative highlighted from the program participants was that there was "*too much standing around*" than they would have liked during the program. There were a few suggestions that were presented by program participants. The largest suggestion for this program was a theme of "more", which appeared 10 times in the data. "More" relates to hands-on and engaging activities.

Common Themes that Emerged Across Programs

The data was overwhelmingly positive. Respondents were generally satisfied across all program types (Table 13). Specific negatives were localized to specific programs, with only two themes that emerged across all the programs. The challenge with analyzing the data was the varying respondent pools for each survey. For Corporate Volunteering, all the expectations were from the surveys that we gave, a pool of only four responses. The other categories compile data from both our survey and the EcoCentre's survey. The same issue was encountered for Alive Outside: Pamper the Penguins, which only had four responses. This made it difficult to determine what was truly a common response or theme. If two respondents mentioned the same positive in the survey with four responses, then that would be half of that data set. However, if two respondents mentioned the same positive in the survey with 84 responses, then it would not have been considered significant. The excursions data from the EcoCentre was from surveys given to teachers whose students participated in the excursions, but the data from the Year 11 Biology Excursion was from surveys given to the students who participated in the excursion, so the data for these excursions could not be combined as it reflects two different pools of respondents.

Three themes emerged across program expectations. A theme of respondents wanting to *have fun* was prevalent. People also wanted to *do meaningful work* with the EcoCentre, as they hoped to *make an impact* on the local community or in regards to sustainability in general. Lastly, there was an overall desire *to learn from the programs* that was common across respondents. These expectations were mostly geared towards programs that pertained to hands on activities were individuals would be making a real life contribution. They expected to not only have fun (as many of these activities took place on the break water) but as a result of these activities taking place in a real world setting, their expectations were geared more towards those practical educational topics and real life impacts that they would create as a result.

Overall six main positive themes were derived from the analysis cross programs, divided up into the program takeaways and the program features. There were three takeaways: *networking, overall good response, and meaningful/rewarding.* Respondents valued the ability to network with their peers, community members, or professionals. It made responders feel more connected to their communities and allowed them to expand socially. Many participants felt that they made a positive impact on their environment and local communities, while learning something new in the process. In respect to kids who participated, teachers felt that the children got something valuable out of the experience that they will carry over to their studies or daily lives. These types of responses most closely associated with activities took place along the breakwater, and generally involved a conservations aspects. These were felt in some degree during the conference style programs, but in situations where people directly interacted with the concepts they were learning about, they generally felt they took away more from their experience than in a more passive situations.

For program features, the three themes that appeared were general *program content, the PPEC staff, and the educational focus.* General program content was a consistent theme across all program types. Attendees of sessions often would commend the EcoCentre on its workshops and event logistics, especially the hands on and active learning components that engaged them. Indigenous cultural aspects of programming, including speakers and local perspectives, were focused on by respondents as a plus. Respondents also positively commented about the EcoCentre staff across programming. Participants enjoyed the insight and leadership the staff brought to their respective programs, and often commented that individual EcoCentre staff members were informative and engaging presenters. For the educational focus, respondents valued the learning involved with their activities. Whether the learning was localized to that of the Port Phillip area or learning about the human impact on biodiversity, respondents lauded this as a highlight of their experience. Many of the returning members across programs suggested this was one of the reasons for returning, as they enjoyed learning new skills, biology, or history of the local area.

The conference style programs tended to have more themes related to program features than takeaways, as those programs had speakers and presentations that didn't always involve a hands-on experience for the attendees. The Steps to Sustainability conference target audience is adults, whereas the Schools Sustainability Festivals is geared towards students, combining both hands-on aspects for the children with conference style logistics, which the teachers who were the respondents commented on.

There were overall two negative themes derived from the analysis. A negative that was consistent across programming was the *time allotted for each program or activity*. There were two aspects to this, either responders indicating that an activity in a certain program was too long to keep their interest, or the program was too short to be engaging. Mostly, they felt as if the time was not used efficiently for each program. The other negative theme that emerged across the analysis was the discomfort of individuals during activities. Many people negatively reflected on the durations of standing in one place for too long or physical walking between activity sites. Respondents also often found that the duration of talking acerbated some of these, thus decreasing comfort levels. Another component of the overall discomfort was the *religious focus* of some programming. This occurred when churches sponsored particular programs and respondents felt as it was out of place in this type of setting. This type of programming was common between both hands on activities and conference style events. Especially for efficiency of time, both program types were criticized for how time was used for speakers or activities. Comfortability varied as there were specific aspects that were unique to hands-on program types (standing/walking) and for conference style programing, topics such as religion mentioned above factored into this theme.

There were three suggestion themes that were found across the programs. One pertained to potential *future topics for EcoCentre events*. Many respondents suggested that the EcoCentre should focus on themes such as climate change and SMART schools in terms of their future activities. However, another major suggestion was that the EcoCentre should continue on its current course of programming options and topics, such as the heavy

emphasis on microplastics and community involvement in baykeeping. The last theme of suggestions was that the EcoCentre should continue to focus on and *emphasize hands-on activities in their programming options*. As stated in the positives, education with a hands on focus was a major selling point during activities and a primary reason many people returned to programming. Respondents recommended that active learning be a major component of the current and future activities. Suggestions most often came from questions about future topics that the respondents wanted to see at events, so specific suggestions were related to whichever program the respondent had attended.

Table 13: Themes across all programs

Expectations	Positives: Takeaways	Positives: Program Features	Negatives	Suggestions
To have fun	Networking	General program content: speakers, workshops, event logistics, projects, activities, aboriginal/indigenous aspects, hands-on activities	Time: not enough, not used effectively	Future topics
Do something meaningful	Overall good response: engaging, would come back, had fun	PPEC staff	Discomfort: too much walking, too much standing, religious elements, work level at the program	Do more of what they're doing
To learn	Meaningful/rewarding: helped the environment, kids got something out of it, learned new things	Educational focus		Emphasis on hands-on activities

Objective 2: Results for the EcoCentre's Stakeholder Analysis

This section details the results of the analysis of the EcoCentre's stakeholders from the past three years of operation. A content analysis of the questions asked during interviews with the EcoCentre's stakeholders follows, along with the analysis of the flow map, and the presentation and analysis of the stakeholder diagram. A knowledge flow map was produced presenting the knowledge flow between the EcoCentre and its stakeholders. For the description of the attributes of the knowledge flow map, and the stakeholder diagram, refer back to the methods section for relevant definitions. There are further analyses of the stakeholder knowledge flow map in the supplemental materials along with the results of a second knowledge flow map showing the flows of knowledge between the EcoCentre's stakeholders.

Interview Data Analysis

Each table in this section corresponds to one of four research questions that the interview data was coded for: 1) What do stakeholders value the most about the Port Phillip EcoCentre? 2) What does the EcoCentre do best? 3) Where can the EcoCentre improve? 4) What is the most important thing that the EcoCentre should be doing? The top row in each table lists the common themes that appeared for each research question with a count of how many times a theme appeared across all twelve interviews below. Bolded themes are the top themes by count for each research question.

What do stakeholders value about the EcoCentre?

The most emergent theme for what stakeholders valued the most about the EcoCentre was their unique focus. There was no single second most mentioned theme, instead a six-way tie for second, indicating a range of qualities that stakeholders value about the EcoCentre. Unique focus, noted in Table 14, relates to the focus of work that they do and the uniqueness of the organization as a whole. In the interview with Environment Education Victoria, when asked about what the most important thing the EcoCentre should be doing, they mentioned: "What they are doing is great, they're very focused on building that capacity at the local level...There are various organizations that might be doing things, but I think they're quite unique in terms of that really local level sort of focus that they have," which is something that they value about the EcoCentre. All organizations mentioned something that they value about the EcoCentre in their interviews. Sustainability Victoria touched upon the most different areas that they value. They said: "I can't imagine us in the short-term not having a relationship with the EcoCentre. They're such a vital stakeholder...across a range of our programs," when asked about the future of their relationship with the EcoCentre, which shows just how important the EcoCentre is to their operations. The second most mentioned theme of values is tied across six different areas: expertise, the PPEC staff, community engagement, integrity, shared goals, and quality of work. This range of values really highlights the scope of all the things the EcoCentre does as an organization. Dolphin Research Institute brought up expertise, the PPEC staff, and shared goals when asked about what they value most about the partnership with the EcoCentre. Their answer was: "The expertise. Just the thought that [Neil's] been doing this for such a long time and validates the methods that he's developed. I think that's very, very important for us. I think it's also … I value the fact that we're opposite ends of the bay, but we are coming together, doing something…" The unique focus was the most prevalent themes from the analysis of what stakeholder's value, followed by a range of other aspects that are valued about the EcoCentre.

Table 14: Interview Responses to Research Question: What do Stakeholders Value About the PPEC?

Expertise	5
PPEC staff	5
Community engagement	5
Unique focus	7
Physical space	4
Impact	3
Projects or programs	4
Integrity	5
Shared goals	5
Advocacy effort	2
Key stakeholder	1
Networking	3
Grant work	3
Valuable	1
Quality of work	5
PPEC name/brand	1

What does the EcoCentre do best?

The community engagement, collaborative ability, and networking were the primary themes derived from the analysis of what the stakeholders view that the PPEC does best. These themes are derived from information found in Table 15. According to their stakeholders, the most important thing that the EcoCentre does best that was brought up the most was their unique focus. This encompasses their public outreach, and citizen science research. When asked for examples about the EcoCentre's impact, the City of Port Phillip brought up "The numbers of volunteers...that come through their doors and participate in their programs is very significant...they touch a lot of people's lives," and gave a more specific example about the education programs that the city funds the EcoCentre to do: "Those kids are really inspired by the participation in the programs that they deliver". This also touches upon the second most apparent theme which was the organization's collaborative ability. Stakeholders often thought the EcoCentre did a commendable job on sharing knowledge and data from their various initiatives and experts. They were seen as a valuable resource to stakeholders in completing their work. Environment Education Victoria described the EcoCentre as a "hub", saying: "Its that real hub, place where the local community can come engage with people at the EcoCentre, engage in the programs that they run, as well as the facilities that they have...There's those opportunities for the community to engage with the infrastructure as well as the specific programs." The third most mentioned was networking. The EcoCentre often serves as the link for larger organizations to the local community, who may not have the opportunity to engage directly with them. It allows them to tap into the community's potential and connect their organizations to a network that would further their own cause in the sustainability field. There are other themes that emerged that overlap with Table 14, the major of those the quality of their work (an aspect that also ended up under the Table 14). Stakeholders commended the EcoCentre on the overall quality of the work they produced through their various education efforts, as well as their citizen science initiatives. The other overlapping themes between what stakeholders value and what they do well are the uniqueness of the organization, networking, grant work, and the PPEC staff. This overlap gives the sense that stakeholders value what the EcoCentre does well. This derived information bolsters the concept that the EcoCentre is best at their community engagement, ability to effectively collaborate, networking capacity, as well as overall quality and usefulness of their work as a valued aspect of their organization and what they do best.

Table 15: Interview Responses to Research Question: What does the PPEC do best?

Unique organization	2
Collaboration	**7**
Community engagement	**8**
Quality work	**5**
Accessibility	2
Caliber of staff	3
Education focus	2
Networking	**6**
Central resource (The Hub)	**2**
Empowers the movement (The Journey)	2
Looking after the environment	2
Provides an arms length view	1
Grant work	3

Where can the EcoCentre Improve?

The two most common suggested areas of improvement, based on stakeholder feedback were that the organization should keep on its current path and that they could improve on some aspect of communication (see Table 16). Many stakeholders noted that the EcoCentre is doing a fantastic job in how the currently are function structurally (six in total) and in their commitment to their values and goals. In the interview with Lord Mayor's Charitable Foundation, they mentioned that the EcoCentre is specialized in its focus when asked if there were other organizations that could be functioning better than the EcoCentre. They said: "I think they do it pretty well. In terms of that grassroots, volunteer-based stuff, they do it pretty well." The other major suggestion was that the EcoCentre could improve on their communication with other organizations. One of the EcoCentre's funders, Helen Macpherson Smith Trust, commented directly on this communication point: "Communication, proactively keeping funders informed I think is something a lot of organizations, including EcoCentre, can benefit from," There was a lot of emphasis on open communication. Even if the stakeholder cannot engage fully, or attend something they were invited to, knowing where those opportunities are is still important, especially for funders. This information support the two found themes from analyzing stakeholder interviews, that the PPEC should focus on the efforts that they currently perform and that their communication should improve.

Table 16: Interview Responses to Research Question: Where can the EcoCentre Improve?

Connect more people	1
Branding/ higher profile	1
Focus on climate change	1
Focus on terrestrial activities	1
Keep doing what they're doing	6
Collect feedback	1
Should be able to judge what a school needs and wants	1
Communication	2
Forward planning for staff	1

What is the most important thing that the PPEC should be doing?

This section details what stakeholders viewed as the most important thing that the EcoCentre should be doing, which resulted in two suggestions, being that they should continue what they are currently doing and expand their projects/programs These themes were derived from the coded responses in Table 17. When directly asked what they believed was the most important think that the EcoCentre can be doing, the City of Stonnington answered: "I think what they are doing now is pretty great. They are definitely on a good track, and education is the key to change. They are doing that quite well. Their education field is amazing, hitting most sustainability issues as well."

This touches upon the idea that they should keep doing what they are doing, and highlights what the EcoCentre does for the city. This was the most common theme that appeared for this question: the EcoCentre should keep doing what they're already doing. This was also the most common theme that emerged for the question of Where can the EcoCentre improve? (Table 16). There are other overlapping themes between Table 16 and Table 17, which are organizational branding, focus on climate change, and focus on terrestrial activities. This shows a relationship between improvements that the EcoCentre can make are also things that they should be doing. The second most prevalent comment stakeholders regarding this research question is that the EcoCentre should expand their projects and programs. Some stakeholders felt that the EcoCentre should create more programming around other issue not related to the bay, such as focus on terrestrial ecosystems or climate change education, or expand their programs into other schools. Worcester Polytechnic Institute, who does joint projects with a group of students working with the EcoCentre as the sponsor, plans on doing more projects with the EcoCentre in the future. The themes of continuing on their current path as well as expanding their programming options were the most prevalent and apparent from the analysis of what stakeholders believed they should be doing next.
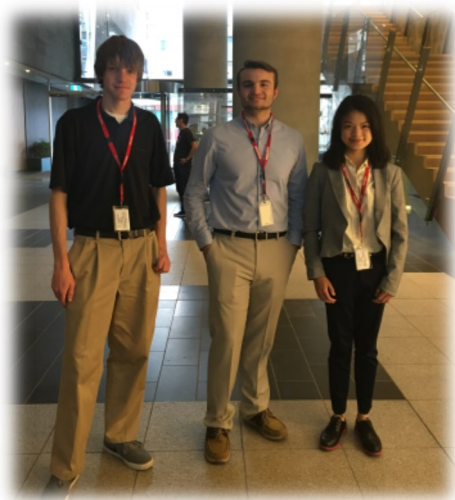

Table 17: Interview Responses to Research Questions: What is the most important thing that the PPEC should be doing?

Keep doing what they are doing	5
Expanding programs and projects	3
Helping the community	2
Not try to do too many things at once	2
Being a voice for change	2
Clearer communication	2
Branding (elevator pitch problem)	2
Maintain relationships	1
Become more business-like	1
Joint advocacy	1
Focus on climate change	1
Focus on microplastics	1
Focus on terrestrial activities	2

Analysis of the Knowledge Flow Map

This knowledge flow map consists of 155 of the 163 identified EcoCentre stakeholders (for a full list of the stakeholders mapped examine Part F in the supplemental material file). Eight stakeholders were left off of the map due to the lack of any knowledge flows between themselves and the EcoCentre: Animal Liberation Victoria, Earthsong, Glen Eira Environment Group, Indigenous Flora and Fauna Association, Landcare Australia, Mammal Survey Group of Victoria, Mary and Basil Community Garden, and St Kilda Community Garden Club. The remaining stakeholders were represented using the mapping software Gephi to create the layout. A force atlas algorithm was run to arrange the map such that the most well connected stakeholders are closer to the central node (the EcoCentre), while the less connected stakeholders are pushed further away from the EcoCentre. The force atlas algorithm used a combination of the number of connections and the weight of the connections with weight corresponding to the strength of the connection (a value of one for individual change, two for collective change, and three for systemic change). The mapping software was unable to show parallel knowledge flows, instead laying flows on top of each other such that only a single knowledge flow was visible at a time. This fact led to the primary use of the map's filters to highlight specific types of knowledge flows between the EcoCentre and its stakeholders. These filters were able to filter by organizations type, type of knowledge flow, amount of effort spent on maintaining the relationship, number of connections, and more. For this analysis the primary filter used was based on the type of knowledge, as this provided the most amount of easily visible and readable information at a time. For a view of the entire knowledge map with no filters active, see Figure 12.
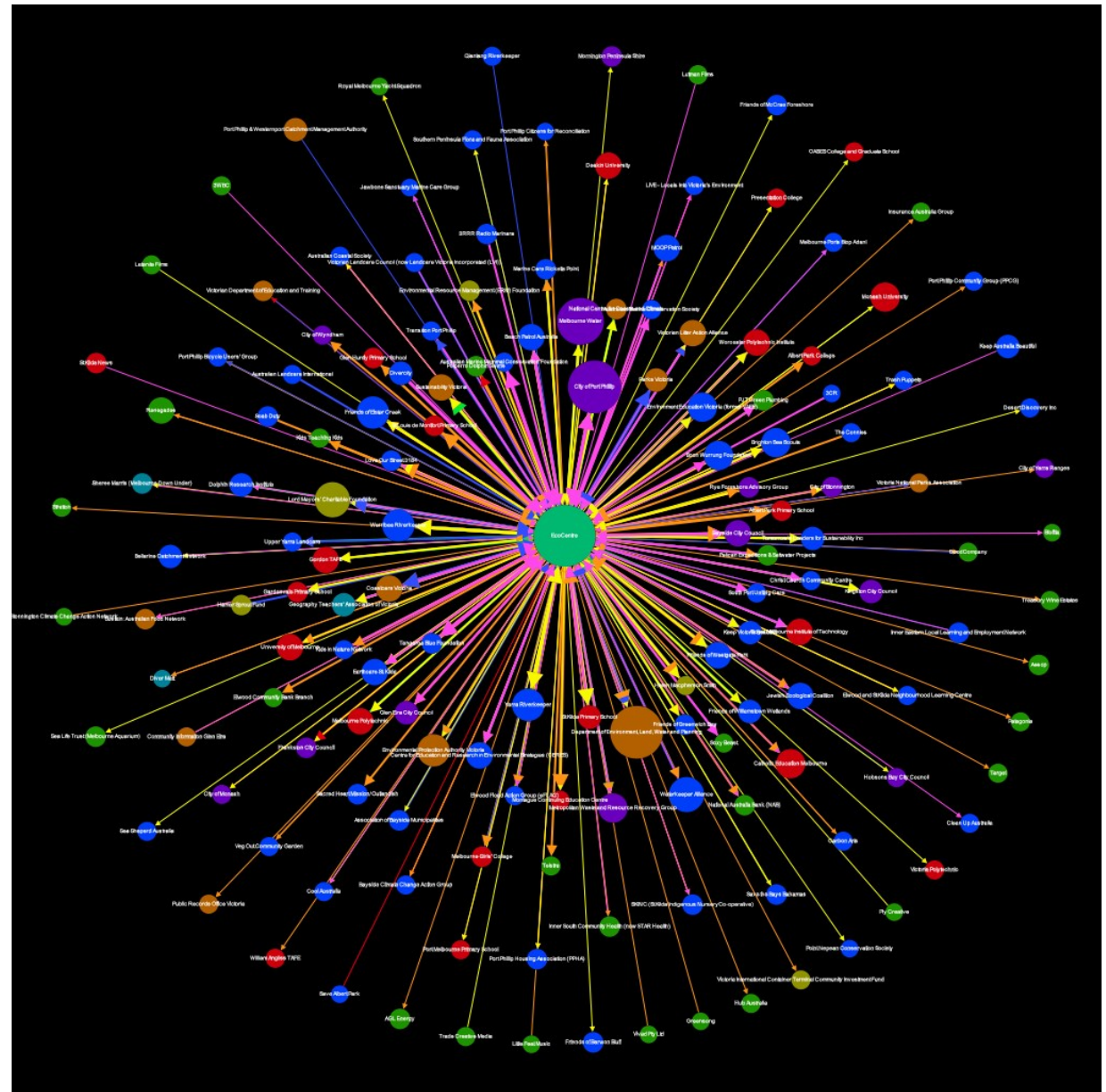

Figure 12: Knowledge flow map showing all connections between the EcoCentre and its stakeholders

The most common types of knowledge flow were consulting and event/project cooperation (see Table 18).

With a total of 91 knowledge flows, the EcoCentre's deepest flow of knowledge came in the form of Event/Project Cooperation where the EcoCentre created many more flows than they received, however they cooperated on their majority of event flows. As many of the EcoCentre's activities correspond to running programs or events this is not surprising. Furthermore, in the greater sustainability movement this also makes sense because cooperation between sectors and organizations is a theme in the current environmental governance movement. Even though expected, this still shows that the EcoCentre's largest focus is on hosting or contributing to educational events, and sustainability projects. Examples of event/project cooperation flows out of the EcoCentre were when the EcoCentre delivered a program for a sponsor such as Lord Mayor's Charitable Foundation, or hosted corporate volunteers at businesses such as AGL Energy. A flow into the EcoCentre represented another organization, such as The Connies providing their services at EcoCentre run events or projects. A mutual flow in this case was a co-hosted event or project such as projects conducted with Sustainability Victoria. Consulting was the second most common type of knowledge flow recorded on the map with 76 flows being of this type. This translates into over one in five knowledge flows being of this type. The most common direction of a consulting flow, by a factor of 4, was a directional flow from the EcoCentre to another organization. This showed that the EcoCentre is a large scale consultant for over a fifth of all of their stakeholders. Consulting in this case represented the EcoCentre giving advice, expertise, mentoring, or methodical knowhow (both paid and unpaid) to another organization. Together these two types of knowledge flows accounted for 136 knowledge flows, or over a third of all flows. This shows that the greatest role of the EcoCentre amongst their stakeholders is to either assist with or provide events and projects, or to provide consulting to their stakeholders.

Table 18: Summary of knowledge flows into and out of the EcoCentre

Knowledge Type:	Total Flows with EcoCentre:	Flows Into the EcoCentre:	Flows out of the EcoCentre:	Mutual Flows
Event/ Project Cooperation	91	6	38	47
Consulting	76	11	51	14
Publicity	60	30	15	15
Sustainability Networking	48	23	12	13
Political Advocacy and Development	33	3	16	14
Scientific Research	26	14	9	3
Total:	**334**	**87**	**141**	**106**

Which types of knowledge flows are concerning?

The two main types of knowledge flows that are concerning for the EcoCentre are publicity, and scientific research.

Publicity is a very important knowledge flow for an organization that seeks to maximize their reach and influence, however the EcoCentre was lacking in mutual or directional flows from the EcoCentre. The flows of publicity for the EcoCentre mostly originated from other organizations, showing that the EcoCentre received more publicity for their actions than they gave to other organizations. These flows of publicity come from whenever another organization mentioned what the EcoCentre was doing via social media, in the news, on the radio, or in other courses of their activities. The EcoCentre had a substantial network regarding publicity during the last strategic period, but there is room for improvement in this area. 30 of the 60 flows of publicity were directional into the EcoCentre, if these organizations are already publicizing the EcoCentre's work it may be easy to even this number out through sharing these other organization's activities to turn these into mutual flows. By even just publicizing these other organizations through social media creating mutual flows would help to encourage greater publication of each other's work further strengthening the relationship. This can also be applied to organizations that the EcoCentre is not currently exchanging publicity with. By spreading word about some of their less connected stakeholders' projects, it would be possible that they may receive some publicity from these stakeholders in return thus further strengthening these relationships without expending much effort. It is because of this imbalance of publicity knowledge flows that the flow of this type of knowledge is concerning.

Scientific research is a valuable tool for creating data to support legislation and advocacy efforts. In this case, a flow of scientific research knowledge is defined by a flow of collected data or research from one organization to another. The EcoCentre has surprisingly few flows in this knowledge type, with only 26 out of 334 knowledge flows being scientific research. The research flows that the EcoCentre

does have are in general stronger flows than other types of knowledge. However, the majority of research is only carried out with a select group of stakeholders producing a lower number of knowledge flows. This select group consisted of universities and TAFEs, and riverkeepers/ waterkeepers. Each of these organizations provided important research to the EcoCentre, which was extremely beneficial, however, if ties were severed with one of these organizations, a serious loss in research flowing to the EcoCentre would result. This overdependence on only a few organizations for scientific research increases the potential for a gap in the knowledge flow if one of these relationships was to be lost. The ensuing hole where there is a lack of data would be hard to fill given the already relatively small amount of research entering the EcoCentre, producing a shortage of research. This shortage of scientific research flows, especially in their diversity, is why this type of knowledge flow is concerning.

Also concerning is the imbalance of flows for three stakeholders that could be considered to be black holes. Black holes on this knowledge flow map were organizations that received a great deal of knowledge from the EcoCentre, yet provided very little knowledge in return. The following organizations met the definition of black holes: Department of Environment, Land, Water, and Planning, Environmental Protection Authority, and Kingston City Council. The Department of Environment, Land, Water, and Planning, had two regular strength directional connections, one deep, and one opportunistic coming from the EcoCentre, with only one regular strength mutual and one opportunistic flow in return. This showed a very large amount of information coming from the EcoCentre with very little returning. This is due to the Department's status as a large government agency, the target of advocacy and research from the EcoCentre, two categories of knowledge that are not produced by the department. The department instead relies on other organizations (such as the EcoCentre) for these types of knowledge. Though explainable due to the department's status as a government organization, this organization was still the largest black hole on this map. Similarly, the other two listed organizations were also one government agency, and one city council, both of which were more in the position of sponsoring events, or receiving

flows of knowledge such as research or advocacy that they were unable to return. These relationships can be strengthened or made less disproportionate if these organizations were to provide greater amounts of publicity or networking knowledge, types of knowledge that these larger organizations could easily provide. See Figure 13 for a view of the flows into and out of DELWP, one example of a black hole.
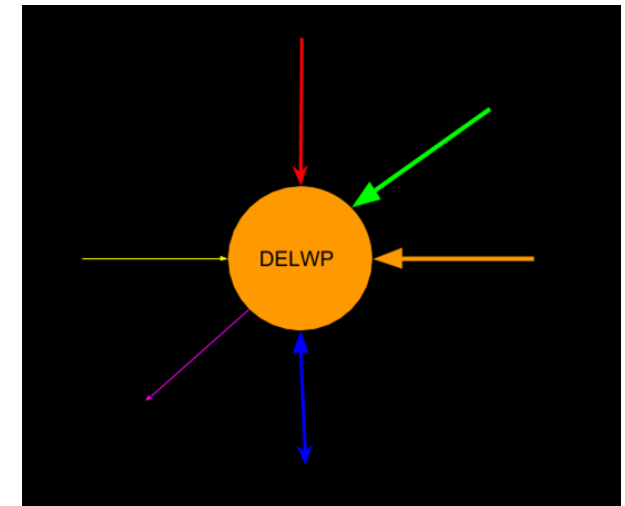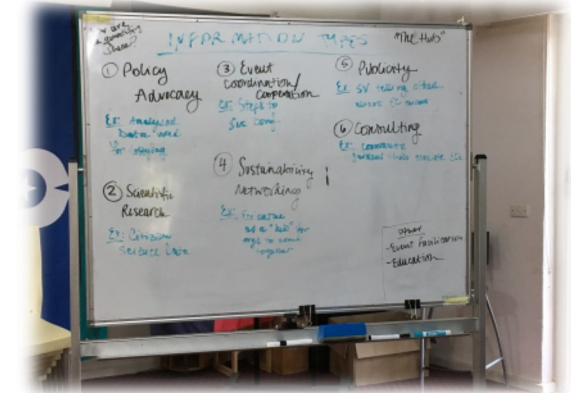

Figure 13: View of DELWP, an example of a black hole

Which stakeholders are the most well connected?

The stakeholders that are most well connected to the EcoCentre are those stakeholders that are closest to the EcoCentre towards the center of the knowledge flow map (see Figure 14).

This innermost circle consists of the stakeholders that have a combination of strong relationships (regular or deep relationships) and a larger number of knowledge flows. This is the definition of connection, an organization with a greater number of stronger knowledge flows with the EcoCentre is more well connected than an organization with only a few weaker knowledge flows. Examples of the organizations in this well connected category included the City of Port Phillip, Yarra Riverkeeper, Love Our Street 3184, Boon Wurrung Foundation, Bayside City Council, St Kilda Primary School, South Port Uniting Care, and the Department of Environment, Land, Water, and Planning (DELWP). Some of these organizations such as the City of Port Phillip, and DELWP, were already recognized by the EcoCentre to be some of their key stakeholders as they work with them often and have several deep knowledge flows. It makes sense that the EcoCentre is very well connected with these key stakeholders, however, some of the other organizations in this inner group were not already seen as major stakeholders. Stakeholders such as Love Our Street, and South Port Uniting Care work with the EcoCentre, but not nearly as often as the City of Port Phillip or DELWP, yet these smaller stakeholders are just as well connected in knowledge flows as the known key stakeholders. It is important that the EcoCentre identify all of its major stakeholders in terms of information flow, and work to maintain these relationships to keep these important knowledge flows. This includes not only the larger well connected stakeholders, but also the less well known or influential well connected stakeholders such as Love Our Street, and South Port Uniting Care.

Figure 14: Zoomed in view of the center of the knowledge flow map

Is the EcoCentre really a networking hub?

Sustainability Networking is a major component to what the EcoCentre provides to stakeholders as was described in the interviews with several stakeholders. While the feedback from the interviews suggests that the EcoCentre is a networking hub, the data from the knowledge flow map does not support this to as great an extent. With only 48 flows in total, sustainability networking was only the fourth most common type of knowledge flow. Furthermore, only 25, about half, of the networking knowledge flows either originated at the EcoCentre, or were mutual flows with other organizations. This is far from a sufficient amount to describe the EcoCentre as a networking hub. This may be a result of several aspects. The first possibility is that the EcoCentre really is not a large networking hub, that the numbers from the map really do tell the entire story. This is unlikely to be true as many of the stakeholders interviewed praised the EcoCentre for their networking. It is unlikely that the group of stakeholders interviewed were this skewed compared to the numbers suggested by the map. The more likely explanation is that the EcoCentre is a networking hub, but unofficially. The networking on this map is only networking done more officially during the EcoCentre's activities, this does not include using the contacts of individual EcoCentre staff. Given the individual expertise of the EcoCentre's staff it is likely that a large number of stakeholders may use the staff for networking, but not officially the EcoCentre. This is likely what is then occurring, the EcoCentre is more of an unofficial networking hub through its staff which is why these connections are not shown on the map.

What is the relationship between position on the knowledge flow map, and the types of knowledge flows with the EcoCentre?

There was a strong relationship between the position of a stakeholder and the types of knowledge connecting with the EcoCentre, with the outer stakeholders being most often connected with knowledge flows in consulting or event/ project cooperation, with different types of knowledge flows becoming more common as the stakeholder had a stronger connection with the EcoCentre.

For stakeholders that were located in the outer rim of the circle, the two most common knowledge flow types were events, and consulting, with very few in these outer sections being involved in any other type of knowledge. There were a few exceptions to this, mostly with a few organizations involved in publicity. In terms of direction of flow, for flows of events and consulting knowledge the direction to these organizations in this outer rim were much more often to be the destinations of knowledge from the EcoCentre, rather than themselves sending knowledge. Opposite of events and consulting, flows of publicity in this outer rim corresponded almost entirely to organizations providing publicity to the EcoCentre. It is also worth noting that over half of the stakeholders classified as businesses are located in this outermost rim, which corresponds to many of these businesses being corporate volunteers (having a single events knowledge flow originating at the EcoCentre). These three types of knowledge flows were also responsible for the majority of knowledge flows in the more middle stakeholders, often having a combination of flows from events and/or consulting along with others with addition of some sustainability networking, and/or political advocacy and development knowledge flows.

The vast majority of knowledge flows in networking, advocacy, and scientific research were located amongst the inner group of stakeholders, those with the closest connections to the EcoCentre. This was especially true for scientific research which had its flows located almost entirely in the very inner group of stakeholders. This showed that these types of knowledge almost exclusively end or originate with the EcoCentre's closest stakeholders. These inner stakeholders often had a variety of connections with the EcoCentre, including regular and deep connections of all types of knowledge flows. This serves to highlight the importance of these innermost stakeholders in the flow of all types of knowledge, and the potential loss that would occur if one of these stakeholders was to be lost.

For a general overview of the layout of the knowledge flows with stakeholders see Figure 15 (this is a general representation not to exact scale, being cumulative going towards the center where all knowledge flows are present). For the images of the actual knowledge flow map filtered by each type of knowledge flow refer to Figure 16.
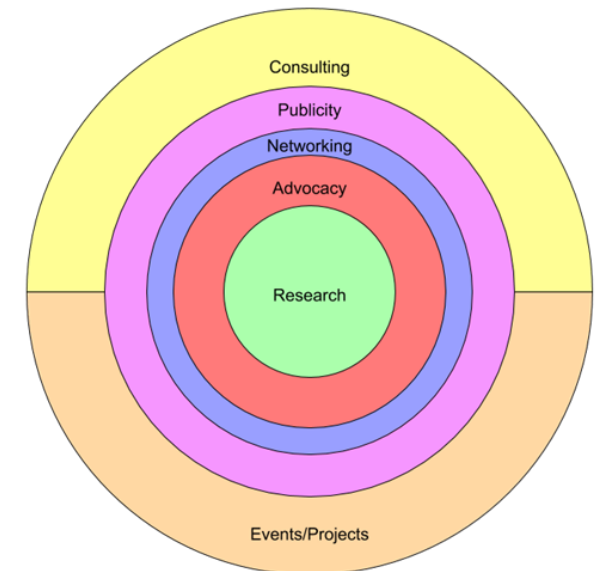

Figure 15: General layout of knowledge flows based on distance from the center
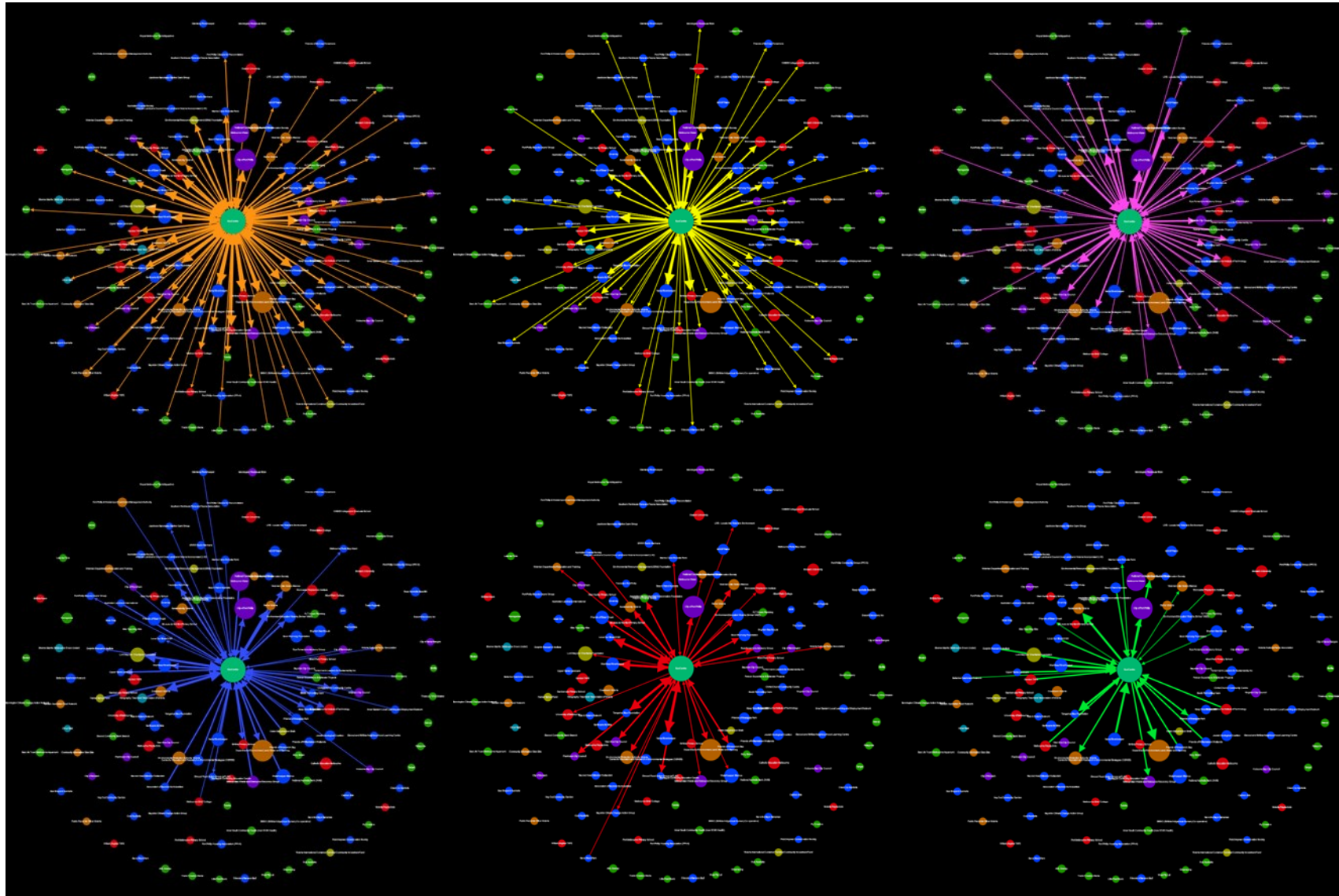
Figure 16: Knowledge flow, filtered. Top row, left to right: event/project cooperation, consulting, and publicity. Bottom row, left to right: sustainability networking, policy advocacy and development, and scientific research.

Change

Effort (hours/year)

	39 or Under	40 - 60	61+
Systemic	**Most Significant** -Prioritize Effort- (A) Association of Bayside Municipalities, Australian Coastal Society, Bayside City Council, CERES, City of Monash, City of Stonnington, eFLAG, Frankston City Council, Gordon TAFE, Hobsons Bay City Council, Kids in Nature Network, Love Our Street 3184, National Centre for Coasts and Climate, Polperro Dolphin Swims, RMIT, Save Albert Park, St Kilda Primary School, Sustain: Australian Food Network, SV, Tangaroa Blue Foundation, University of Melbourne, VLAA	**Most Significant** -Maintain, Reduce Effort if Possible- (D) Boon Wurrung Foundation, Catholic Education Melbourne, Environment Education Victoria, Environmental Protection Authority Victoria, Metropolitan Waste and Resource Recovery Group, Lord Mayors' Charitable Foundation, Waterkeeper Alliance, Werribee Riverkeeper, Yarra Riverkeeper	**Most Significant** (G) -Maintain, Reduce Cost- City of Port Phillip, Department of Environment, Land, Water and Planning, Melbourne Water
Collective	**Significant** -Prioritize Effort- (B) Albert Park Primary School, Animal Liberation Victoria, Bayside Climate Change Action Group, Beach Patrol Australia, City of Wyndham, Clean Up Australia, DRI, Earthcare St Kilda, ESNLC, HMS Trust, Jewish Ecological Coalition, Kingston City Council, LIVE, Parks Victoria, Pelican Expeditions & Saltwater Projects, Presentation College, Scab Duty, Sea Life Trust (Melbourne Aquarium), SKINC, St Louis de Montfort Primary School, Target, Transition Port Phillip, Tomorrow's Leaders for Sustainability Inc, WPI	**Significant** -Maintain, Work To Reduce Effort- (E) Brighton Sea Scouts, Friends of Elster Creek	**Significant** (H) -Consider, But Costly, Must Reduce Effort-
Individual	**Less Significant** -Show Consideration- (C) Aesop, AGL Energy, Albert Park College, AMMCF, Carbon Arts, City of Yarra Ranges, Coastcare Vic., Community Information Glen Eira, Deakin Uni., Diver Matt, ERM Foundation, Friends of Greenwich Bay, Friends of Westgate Park, Gardenvale Primary School, GTAV, Glen Eira City Council, Glen Huntly Primary School, GoodCompany, Greensong, Hub Australia, STAR Health, Insurance Australia Group, Kids Teaching Kids, Little Feet Music, Marine Care Ricketts Point, Melbourne Girls' College, Melbourne Polytechnic, Montague Continuing Education Centre, MOOP Patrol, Mornington Peninsula Shire, NAB, OASES College and Grad. School, Patagonia, PJT Green Plumbing, Port Melbourne Primary School, Port Phillip BUG, PPCfR, PPCG, PPHA, Public Records Office Vic., RMYS, Rye Foreshore Advisory Group, Sacred Heart Mission/ Outlandish, Melbourne Down Under, South Port Uniting Care, SCAN, Stratton, Telstra, The Connies, Trash Puppets, Treasury Wine Estates, Upper Yarra Landcare, Veg Out Community Garden, VICT Community Investment Fund, Vivad Pty Ltd, William Angliss TAFE	**Less Significant** -Consider, Do Not Focus- (F)	**Less Significant** (I) -Extremely Costly, Prioritize Elsewhere-

Figure 17: Stakeholder diagram comparing amount of effort with level of change created by each stakeholder.

Evaluation of Stakeholders Based on Level of Effort and Type of Change

We determined the level of significance of each of the EcoCentre's stakeholders based on the type of change they produced from the partnerships and their level of effort of maintaining the partnerships. The following analyses are given, from top to bottom, from left to right, according to the labels on the boxes of the chart (see Figure 17).

The most significant stakeholders are the ones that fall inside box A of the chart (see Figure 17) because these stakeholders produce a great amount of change with a relatively small cost. These stakeholders included Sustainability Victoria, St. Kilda Primary School, Tangaroa Blue Foundation, Love Our Street, and University of Melbourne. These are the stakeholders that the EcoCentre should prioritize their effort on expanding their relationships with to further create more impact on the society. Some of the stakeholders, which fall inside box B, included City of Stonnington, Dolphin Research Institute, Helen Macpherson Smith Trust, and Worcester Polytechnic Institute. These stakeholders, though not producing as much change as the first group, still produce very important change. It's because of this still high reward for a low cost relationship, that these stakeholders should still be prioritized though not to the extent of those in this column producing systemic change. For the stakeholders which fall in box C of the chart in Figure 17, these were less significant than those prior categories, but still valuable for their low cost, and included Friends of Westgate Park, Deakin University, and Port Phillip Bicycle Users' Group. The EcoCentre should still consider strengthening their relationships with these organizations as they also play an important role in the sustainability movement.

Moving to the middle column, in general these sections are similar to the low-effort column, however are more costly to maintain, and thus generally steps should be taken to try to lower the required effort. The stakeholders, which fall inside box D in Figure 17, included the Boon Wurrung Foundation, Environment Education Victoria and Environmental Protection Authority Victoria and are still some of the most significant stakeholders. These are

important relationships that still need to be maintained as they produce very important systemic change, yet steps should be taken to reduce the effort expended. For those stakeholders in this column that produced collective change, including Brighton Sea Scouts and Friends of Elster Creek, these relationships are also very valuable and need to be maintained, but costs should be reduced if possible.

In the rightmost column of the chart, these relationships are all costly to maintain. For the relationships with the City of Port Phillip, Department of Environment, Land, Water and Planning, and Melbourne Water they are also considered as most significant, falling in box G of the chart as shown in Figure 17. The EcoCentre need to maintain these partnerships, but need to greatly reduce the effort as these partnerships can create a great deal of change, but are very costly.

Recommendations to Improve Programming and Partnership Effectiveness

Recommendations from Program Content Analysis

From the content analysis of past EcoCentre program survey data and current surveys, five recommendations can be made regarding future programming experiences. The first two recommendations involve the actual logistics of program data gathering. The most significant recommendation for program analysis is to make the surveys consistent. Throughout the analysis, we repeatedly ran into the issue of surveys not having similar questions or content across them, with different expectations or data requirements. This created issues in separating content into individual research questions and pinpointing basic themes across program type. To resolve this issue, the creation of a consistent survey platform with similar questions across

different programs will make it possible to analyze and compare data from future participants. We also recommend basing the questions on surveys around qualitative metrics. Basing the survey questions around qualitative responses will allow for the coding of information easier, as numeric responses are not easily factored into these types of studies. These kinds of questions can also reveal what a participant is feeling about a certain program easier than a numeric response, often with open response sections that details the exact experience. Another major recommendation is the need to collect data from multi-session programs. Currently, all data received for the data analysis and housed on EcoCentre premises is for one-off program types. This did not allow us to analyze the difference between the program types in the context of the EcoCentre. We recommend that surveys or data be collected from programs of this nature in order to allow for a content analysis and to see if either program type is more effective in the EcoCentre programming. However, despite these points on data collection, the largest recommendation we were able to find from the content analysis was that the EcoCentre should stay on their current course. Many respondents praised the EcoCentre for their educational focus in programming, networking abilities amongst the community, and the staff at the EcoCentre. Many felt they had no need to make any large improvement to how they operate programming, as most respondents enjoyed their time participating in activities and only minor complaints arose from each, such as being uncomfortable at events due to the amount of time standing, religious affiliation at the Steps to Sustainability conference, or the physicality involved with Corporate Volunteering. For program development, we recommend a focus on hands-on and active learning, especially for children. Based on results from program feedback, program models that emphasized learning outside, with practical hands on skills resonated the most with participants. By focusing on these activities, it may keep children more engaged and render an even more positive response to programs. For adults, keeping engagement is also key. Programs with more interaction or opportunities for participation could be beneficial for adult retention and again, an even more positive response. The EcoCentre should continue to focus on these strengths of programming,

education, and networking, and continue operating the programs in the same manner with tweaks to their data collection methods.

Recommendations from Stakeholder Interviews

After coding the interview notes and transcripts, we can make recommendations to the EcoCentre about where they can improve and what is the most important thing the EcoCentre can do based on what stakeholders value most about the EcoCentre and what they are already doing well.

The biggest area for improvement that we recommend is having better communication. Better communication refers to keeping funders informed on projects. During the interview process, funders expressed that they were not kept up to date regarding EcoCentre programming or activities, thus did not know what the organization was doing or completing. Upon closer inspection, it was found that some funders were left off of the newsletter alias that would have kept them up to date on current activities. We recommend that the EcoCentre tries to keep all of their stakeholders (especially funders) up to date with their newsletter and communicate with the more frequently pertaining to EcoCentre activities.

The three most important things that the EcoCentre can do are to expand upon projects and programs, create more of a brand name, and continue their current work. Expanding projects and programs refers to three areas: continuing current relationships, expanding existing programs and projects with other groups they are not currently partnered with, and implementing programs or projects with other focuses. Continuing their current relationships with partners they already do projects and programs with could involve, for example, having more projects lined up for future WPI students like ourselves, or for continuing to apply for grants either with other organizations or to current funders. For projects or programs they could do with groups they are not currently aligned with could mean having other schools for excursions, or getting involved with different schools in the area. Implementing programs or projects with other focuses

such as climate change or more of a terrestrial focus on the land around the bay would be beneficial for organizational expansion. Another recommendation is to create more of a brand name. When stakeholders were asked to describe the EcoCentre, there were varying answers, and some even said it was difficult to do. It has been brought up before by EcoCentre staff about having an "elevator pitch" problem, so we recommend taking the time to address this, and create a solid, recognizable, brand. The last, and most important, thing that we recommend that the EcoCentre can do is to continue what they are doing. The work that they are doing is valued by their stakeholders, and is what they do best.

Recommendations from the Stakeholder Knowledge Flow Map

The first recommendation from the knowledge flow map is in regard to the most common types of knowledge flows that the EcoCentre is involved in, event/project cooperation, and consulting. Because these knowledge flows combined make up well over a third of all knowledge flows on the map, this shows what the EcoCentre's stakeholders are most dependent on for the EcoCentre. It is because of this importance that we recommend that the EcoCentre continues to ensure that they maintain, as one of their focuses, the deliverance of projects and events, and consulting to their stakeholders. This will ensure that this large amount of flows of knowledge will be continued and strengthened.

Publicity as a form of knowledge is one of the most important for expanding an organization's reach, yet it is a type of knowledge flow which the EcoCentre is currently receiving more knowledge than producing. The EcoCentre had a substantial network regarding publicity during the last strategic period, but there is room for improvement in this area. We recommend attempting to both publicize the activities of those organizations currently publicizing the EcoCentre's activities to strengthen those relationships, and building more publicity knowledge flows with organizations on the outer edges of their network to build stronger ties for a low cost that could lead to more cooperation in the future.

This could be potentially done through implementation of a clear social media strategy to maximize the EcoCentre's ability to publicize both its own actions, and the actions of its stakeholders to further strengthen the flow of publicity knowledge. It is worth noting that implementing a strategy such as this would require a large amount of time, time that may the EcoCentre's staff may not have readily available.

Of all of the types of knowledge flow, the weakest in terms of numbers was research. For an organization such as the EcoCentre that works to create and maintain citizen science networks, having only 26 out of 334 knowledge flows in this category was concerning. Further concerning about the flows of scientific research was the dependence on a small list of organizations for their scientific research. Each of these organizations provided important research to the EcoCentre, which was extremely beneficial, however, if ties were severed with one of these organizations, a serious loss in research flowing to the EcoCentre would result. Further loss of research would only further diminish this citizen science aspect. In order to prevent such a decrease from occurring, we recommend that the EcoCentre, while ensuring to maintain these current valuable research connections, look towards other stakeholders for more opportunities to exchange scientific knowledge. Expanding other relationships, or building new research partnerships with organizations, would help ensure that the EcoCentre maintains a varied network with the ability to cover the loss of research knowledge should the EcoCentre lose one of its research connected stakeholders. This will allow the EcoCentre to maintain, and hopefully expand, its ability to conduct, collect, and forward citizen science to larger organizations with the ability to create systemic change.

As identified in the results section, the knowledge flow map showed the existence of three organizations that could be considered to be black holes: The Department of Environment, Land, Water, and Planning (DELWP), the Environmental Protection Authority (EPA), and the Kingston City Council. These organizations each received a great deal in knowledge from the EcoCentre, however provided very little in return, classifying them as black holes. These organizations are larger government entities, and thus work in less of a cooperative way with community organizations such as the EcoCentre, but instead oversea various activities playing more of a managerial role. This

means that there is less likely to be flows of knowledge such as in research or consulting back to community organizations originating from these government organizations. These factors, and the unlikeliness of these groups advocating to community organizations, are the reason behind the generally one sided flows between themselves and the EcoCentre. Thus there is an explanation to why these organizations are black holes, however we do still recommend that the EcoCentre should seek to receive more knowledge in other areas, such as publicity or networking, from these organizations to help even the flow of knowledge. Possibly requesting that these organizations publicize the EcoCentre's activities related to the organization would be one way to increase the flow of knowledge back to the EcoCentre. This would make these relationships more worthwhile and stronger in terms of knowledge flows, increasing their value to both sides.

Another recommendation from the knowledge flow map is in regards to strengthening the relationships with several very well connected stakeholders that the EcoCentre does not currently focus their effort on. These well connected organizations were all located near the center of the map closest to the EcoCentre. While many of these well connected organizations such as the City of Port Phillip and Environment Education Victoria interacted with the EcoCentre often enough to be seen as some of their major stakeholders, other organizations such as Love Our Street 3184, Australian Marine Mammal Conservation Foundation, and Rye Foreshore Advisory Group, among others, were very well connected with knowledge flows, however may not have been seen as key stakeholders. We recommend that the EcoCentre examine this map, in particular focusing on these well connected, but less recognized, stakeholders, to determine whether these organizations are actually deserving of more attention and influence from the EcoCentre than they are currently receiving. If these organizations are in fact key stakeholders, we Recommend that the EcoCentre focus on maintaining, and strengthening, these valuable relationships.

Finally we have one final recommendation for the EcoCentre from the examination of the EcoCentre's networking knowledge flows. As discussed in the results it is likely that the EcoCentre is a networking hub for the sustainability movement, however it may be beneficial to make this position more official. Either hosting occasional networking events in the same manner that other organizations do, or formalizing the networking activities that the EcoCentre's staff carry out would both help to make this position clear. With this clear position the EcoCentre would be able to advertise themselves as a networking hub with the support of an updated flow map showing this, furthering to strengthen the EcoCentre's relationships with their stakeholders.

Recommendations from the Stakeholder Diagram

Examining the stakeholder diagram also provided insights leading to several recommendations that we can make to the EcoCentre. These recommendations generally correspond to the position of each stakeholder in one of the nine sections of the diagram.

The EcoCentre should prioritize their effort on maintaining their relationships with those stakeholders that fall into box A of the chart in Figure 1. These stakeholders are the most valuable as they have a low cost for a high return. For example, Sustainability Victoria, St. Kilda Primary School, CERES, and Tangaroa Blue are some of these stakeholders that the EcoCentre should maintain their relationships with to create a greater impact.

The EcoCentre should also focus on maintaining their relationships with those stakeholders that fall into box B of the chart in Figure 1. These stakeholders are also very valuable as they have a fair amount of return. For example, Helen Macpherson Smith Trust and Worcester Polytechnic Institute are two of these stakeholders that the EcoCentre should maintain working with to continue creating a great amount of impact.

The EcoCentre should consider on working more often alongside with the stakeholders that fall into box C of the chart in Figure 1. They are less significant than the other stakeholders, yet are still valuable to the environmental cause. Considering these stakeholders will help the EcoCentre extend their impact area on the society. Friends of Westgate Park, National Australia Bank, and Melbourne Polytechnic are some of the stakeholders in this category.

Moreover, the EcoCentre should continue on nurturing their relationships with the stakeholders that fall into box D of the chart in Figure 1. These stakeholders require a fair amount of effort to maintain to create a high return, and they include Environment Education Victoria and Lord Mayors' Charitable Foundation. Although the EcoCentre should maintain these relationships, it will be more beneficial for them if they reduce the effort on maintaining these relationships and put the resources into other areas.

References

1. Agrawal, A., Lemos, M. (2006). Environmental governance. *Annual Review of Environment and Resources, 297.*

2. Anheier, H. K. (2005). Part I: Introduction, chapter 3: Concepts. *Nonprofit organizations: Theory, management, policy (eBook ed., pp. 47-49). New York, New York: Routledge.*

3. Hansen, B.H., Kautz, K. (2004). Knowledge mapping: A technique for identifying knowledge flows in software organisations. *European Conference on Software Process Improvement, 3281, 126-137. https://doi.org/10.1007/978-3-540-30181-3_12*

4. United nations sustainable development goals. (2017). Retrieved from http://www.un.org/sustainabledevelopment/sustainable-development-goals/

5. United Nations (2009) *Environmental Governance* United Nations Environment Programmme

6. Armitage, D., de Loe, R., & Plummer, R. (2012). Environmental governance and its implications for conservation practice. *Conservation Letters, 5(4), 245. 10.1111/j.1755-263X.2012.00238.x*

7. Bradley, B. (1998). The importance of the civic sector. *National Civic Review, 87(2), 157. 10.1002/ncr.87205*

8. Lefroy, K., & Tsarenko, Y. (2013). From receiving to achieving: The role of relationship and dependence for nonprofit organisations in corporate partnerships. *European Journal of Marketing, 47(10), 1641. https://doi.org/10.1108/EJM-06-2011-0338*

9. James, E. (2003). Commercialism and the mission of nonprofits. *Society, 40(4), 29. 10.1007/s12115-003-1015-y*

10. Checco, L. (2009). The most important part of your strategic plan. Retrieved from https://www.guidestar.org/Articles.aspx?path=/rxa/news/articles/2009/most-important-part-of-your-strategic-plan.aspx

11. Balanced Scorecard Institute. (2018). Strategic planning basics. Retrieved from http://www.balancedscorecard.org/BSC-Basics/Strategic-Planning-Basics

12. Najam, A., Papa, M., & Taiyab, N. (2006). *Global environmental governance: A reform agenda. International Institute for Sustainable Development.*

13. Dolnicar, S., Irvine, H., & Lazarevski, K. (2008). Mission or money? competitive challenges facing public sector nonprofit organisations in an institutional environment. *International Journal of Nonprofit and Voluntary Sector Marketing, 13(2), 107.10.1002/nvsm.311*

14. Tyler, M. C. (2005). Benchmarking in the non‐profit sector in australia. *Benchmarking: An International Journal, 12(3), 219. https://doi.org/10.1108/14635770510600348*

15. Guay, T., Doh, J. P., & Sinclair, G. (2004). Non-governmental organizations, shareholder activism, and socially responsible investments: Ethical, strategic, and governance implications. *Journal of Business Ethics, 52(1), 125.*

16. Sanchez, Ron. (2005). "Tacit Knowledge" versus "Explicit Knowledge" Approaches to Knowledge Management Practice. Department of Industrial Economics and Strategy, Copenhagen Business School, IVS/CBS Working Papers.

17. The United States Agency for International Development (USAID). (2003). *Knowledge mapping 101: Knowledge for development seminar USAID. https://pdf.usaid.gov/pdf_docs/PNADK308.pdf*

18. Rosales-Carreon, J., Garcia-Diaz, C. (2015). Exploring Transitions Toward Sustainable Construction: The Case of Near-Zero Energy Buildings in the Netherlands. *Journal of Artificial Societies and Social Simulation 18 (1) 10 DOI: 10.18564/jasss.2625*

19. Eppler, M.J. (2008). A process-based classification of knowledge maps and application examples. *Journal of Artificial Societies and Social Simulation, 15(1), 59. 10.1002/kpm.299*

20. Developing a social network map to frame adaptation action in the guadiana river basin (spain). (2015). Retrieved from https://www.weadapt.org/knowledge-base/climate-adaptation-training/social-network-mapping-in-the-guadiana-river-basin

Supplemental materials for this project can be found at wp.wpi.edu/Melbourne

The knowledge map tool can be also be found on this site.

Acknowledgements