Global Survey of Precious Plastic Projects: A Summary of Findings

Dr. Wouter Spekkink (Erasmus University Rotterdam[1])

Dr. Malte Rödl (Sustainable Consumption Institute, University of Manchester)

Prof Martin Charter (The Centre for Sustainable Design, Business School for the Creative Industries, University for the Creative Arts)

July 2020

---

[1] At the time of the study, Wouter Spekkink was a Research Associate at the Sustainable Consumption Institute of the University of Manchester

INTRODUCTION

Rationale

In the summer of 2019 Wouter Spekkink and Malte Rödl of the University of Manchester, in collaboration with Martin Charter of The Centre for Sustainable Design ® at the University for the Creative Arts (UCA) and Joseph Klatt of the Precious Plastic team, carried out a survey among members of the Precious Plastic community. The aim of the survey is to explore the ways in which Precious Plastic projects are organized and how they interact and overlap with each other and with organizations outside the community. This means that the focus of the survey was first and foremost on the characteristics of Precious Plastic projects that people in the community have undertaken, rather than the characteristics of those people themselves. In the report, we occasionally refer to *projects* as well as *workspaces*. With *projects* we refer to the activities that (groups of) people in the Precious Plastic community undertake as part of their engagement with the Precious Plastic concept. This includes everything from building Precious Plastic recycling machines to doing the actual recycling and selling recycled products. With *workspaces* we refer to the spaces in which these activities take place.

Background

In recent years, we have witnessed various initiatives that encourage the reuse, recycling and reduced use of resources and products. It has become commonplace to frame such initiatives as efforts to transform our linear 'take, make and waste' economies into circular economies in which loops are closed at various stages of product life cycles (see figure 1). Alongside policy- and/or business-driven initiatives, we find citizen-driven initiatives that have developed 'from the grassroots'. Precious Plastic is an important example of this.

The original version of the Precious Plastic concept was developed in 2012 by Dave Hakkens as part of his graduation project at the Design Academy in Eindhoven (Hakkens October 2017). He noticed at the time that our societies produce large amounts of plastic each year, but that only about 10% of that plastic is recycled. He wanted to design small-scale plastic recycling machines that people can use to recycle plastics themselves, locally. Dave initially designed three types of machines: an extrusion machine, an injection machine and a compression machine (see figure 2 for more recent versions of these machines). Dave presented his machines during his graduation show in 2013. From the very beginning, he took an open source approach to his work, sharing technical drawings online to encourage others to build the machines themselves. Initially, only a handful of people made use of the designs to build their own machines.

Dave decided that the concept needed to be further developed in order to get more people mobilized. In 2015 Dave won an award that he used to gather team around him. With this team, Dave started working on version 2 of his Precious Plastic concept.
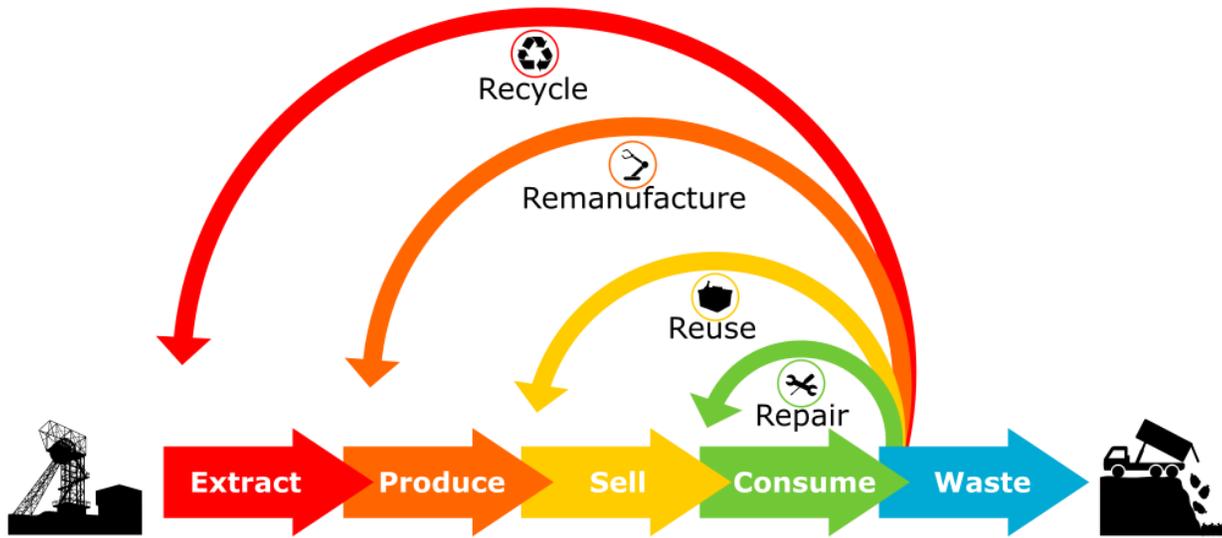

Figure 1. Recycling (the red loop) and remanufacturing (the orange loop) as part of the transition from a linear to a circular economy.

For version 2 (launched in March 2016), the team added a shredder machine to their range of designs. They also further improved the designs of the other machines and developed ideas on products that could be developed with recycled plastics. These activities proceeded largely as a process of trial and error. The team shared the knowledge and experience they gained via instruction videos and an improved the website (they were joined by a third team member who improved the website and undertook other knowledge dissemination activities). These efforts to disseminate their knowledge and experience contributed to a broader uptake of the Precious Plastic concept, and Precious Plastic machines started popping up in various countries across the globe.

In 2017, version 3 of the concept was launched (Hakkens September 2017). Before starting the development of the new version, the team invited people to support Precious Plastic in one of two ways: (1) to donate money to the project[2], or (2) to come to the central team's workspace to help develop the new version of the Precious Plastic concept hands-on. Several people came over to help in the workspace, growing the size of the team to 10. In addition to developing further improvements of the Precious Plastic machines, various new aspects were introduced in version 3 of the Precious Plastic concept. The team came up with an open source design for a Precious Plastic workspace that can be established anywhere in the world. To facilitate collaboration between people that wanted to engage in Precious Plastic projects, the team added an online map to their website that highlighted people engaged in Precious Plastic projects, as well as people looking for a project to join. The team engaged in numerous experiments to explore techniques to work with recycled plastic as a raw material for products. This was again a process of trial and error through which the team accumulated knowledge and experience that they subsequently shared with the community as technique instruction videos. A new section was introduced to the website as well, where community members can share their own instruction videos. Finally, the team started their online Bazar[3], where people can buy or sell machines, machine parts and products.

---

[2] Between February and October 2017, the team raised €44.500 from single donations, monthly Patreon donations and collaborations. In the same period, the expenses of the team were €48.200 (Hakkens October 2017).
[3] https://bazar.preciousplastic.com/

Figure 2. The Precious Plastic recycling machines in 2019 (until version 3, the Precious Plastic concept mostly revolved around these machines). The photo was created by Dutch Design week[4], titled Dave Hakkens – Precious Plastic. For explanations of how these machines work, see https://preciousplastic.com/solutions/machines/basic.html.

In September 2018, the Precious Plastic team started working on version 4 of the concept (Hakkens 2020). This version was made possible by, among other things, a €300.000 award, the availability of a free space for a year (provided by the local municipality), and was developed by a group of over 112 volunteers. This new version revolves around the development of the so-called Precious Plastic universe. As part of this new version, the team developed improved versions of some of their existing types of machine, also adding a design for a sheet press. The improved versions of the machines are of a semi-industrial scale, based on the anticipation of the team that people in the Precious Plastic community will focus more on specialization (building and operating one larger, more complex machine) and collaboration across different types of workspaces in the future. The team also developed new ideas and techniques for product design, expanding the range of types of products to items that can be used in the construction of larger products. This includes sheets, beams, connector parts and bricks. The team developed three tools that people in the

---

[4] This photo was made available through the Creative Commons license: https://creativecommons.org/licenses/by-nc/2.0/.

community can use to develop business plans and, using these same tools, and developed 5 example business plans for workshops with different specializations. Closely related to this is the introduction of starter kits that are tuned towards the different specializations that people in the community may adopt. These starter kits include blueprints for machines, floor plans for different kinds of workspaces, instruction videos, graphic materials, and other things. The team also overhauled their online infrastructure: upgrading the website; the online bazar; and the online community platform. The online community platform, for example, now allows people to share their 'how-to' videos. The online map was improved to make it easier to distinguish between and find different kinds of workspaces. An Academy section was added as a gathering place for knowledge relevant to the Precious Plastic universe. The overhauled platform also makes it easier to set up and promote meetings and events with other people in the community. While developing version 4, the team also engaged in various research projects, for example to improve their capabilities to sort different types of plastics and to find alternatives for plastic as a raw material for products.

At the time of writing this report, version 4 of the Precious Plastic concept is being rolled out. The version was still in development at the time that we organized the survey that this report is based on. More details on the history of Precious Plastic and the characteristics of the 4 versions of the Precious Plastic concept can be found on the Precious Plastic website (https://preciousplastic.com/) and on the davehakkens Youtube channel (https://www.youtube.com/user/hakopdetak).

Methods

The survey was developed by Wouter Spekkink and Malte Rödl. Martin Charter, who coordinated and carried out two similar surveys among another grassroots community (the Repair Café community; see Charter & Keiller 2014; 2016) also provided advice and experience on a regular basis. Joseph Klatt of the Precious Plastic team provided input on questions to be addressed in the survey and provided advice on and assistance in the distribution of the survey. A small amount of financial support for these activities was provided by the Sustainable Consumption Institute of the University of Manchester. We carried out a pilot survey in the fall of 2018 to gather feedback on the questions and the length of the survey. The University of Manchester ethical review committee granted approval for this study. We distributed the survey in two rounds: We initially distributed the survey via the social media platforms of the Precious Plastic team, which includes their online Forum, their Facebook page, and their Instagram page. In this first round we received 12 responses and we therefore decided to try another strategy for distributing the survey in a second round: We used the online map[5] of the precious plastic community to identify self-reported operational workspaces, which gave us a list of 276[6]

---

[5] See: https://community.preciousplastic.com/map.
[6] In January 2020, over 400 workshops are reported to be on the map.

workspaces[7]. We tried to find contact details of all these workspaces and, when available, we used these contact details to send out invitations for participation in the survey. We were able to send an invitation to 216 workshops. In total, we received 48 responses. In the discussion of results, we occasionally refer to "our sample", this refers to all initiatives from which we have received a response.

In this report, the responses to all questions of the survey are visualized and briefly discussed. In the figure captions we clarify what type of question is being visualized, which can be one of the following:

- Single choice: Only one answer category could be chosen by the respondent. We visualized the responses to these questions with bar charts.
- Multiple choice: Multiple answer categories could be chosen by the respondent (the answers are not mutually exclusive categories). We visualized the responses to these questions with bar charts.
- Ranking: The respondent could pick answers from a list of options, and rank these in order of importance. It was also possible to exclude options from the ranking. Our visualizations of the responses to these questions have two main parts. In the right part of the figure you will see how often a certain option was ranked in certain position. In the left part of the figure you will see what percentages of our respondents did not rank the option at all. Our visualizations also show the overall ranking that emerges from the aggregated responses to our survey: The option that received the highest overall ranking appears at the top, the option with the second highest overall ranking appears below that, and so on.
- Numerical question: In one question respondents were allowed to enter numbers. In the report we visualize the responses to this question with histograms.
- Likert scale: The respondent was asked to respond to statements with answer categories that range from, for example, "strongly disagree" to "strongly agree". In our visualizations of the responses to these questions, we typically visualized 'negative' answers to the left, 'positive' answers to the right, and (where applicable) 'neutral' answers in the middle. Our visualizations also show the ranking of the statements according to how often they received 'positive'/'negative' responses overall. Thus, the statement that received the most 'positive' responses appears at the top.

- Nominal Likert-style: Two questions in the survey were formatted to look like a Likert scale question, but use nominal answers categories (with no logical order), rather than ordinal categories.

RESULTS

Locations of workspaces

The first set of questions in our survey addressed basic characteristics of the Precious Plastic workspaces and projects from our respondents, such as their location, venues, and number of people involved. Looking at the locations of the Precious Plastic workspaces we see that these are spread across the globe. This shows that efforts to make the Precious Plastic concept implementable in any part of the world has paid off. Among our respondents, we see a slightly stronger presence of respondents in Great Britain, Germany, the United States and the Netherlands, but given the relatively low total number of responses; these responses should be taken as indicative and not be taken as statistically significant.

Please note that in figure 2 we use country codes to refer to countries. For those unfamiliar with country codes, please consult https://countrycode.org/.
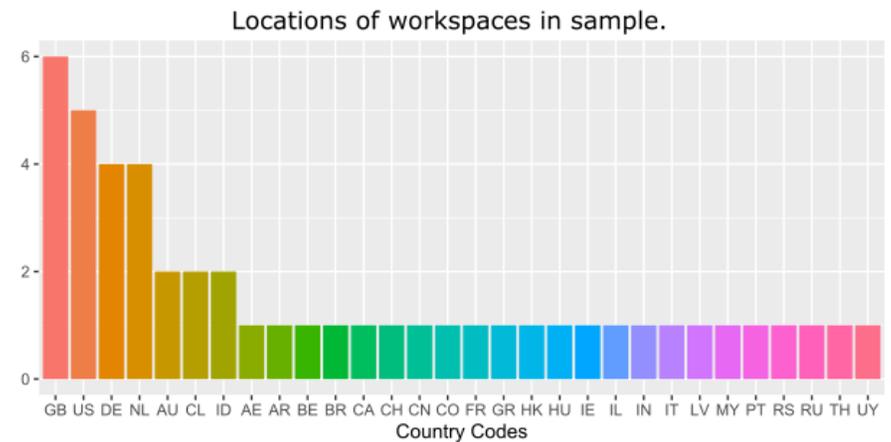
Figure 3. Locations of Precious Plastic workspaces included in the survey (single choice).

How projects are founded

Our results show that most of the Precious Plastic projects included in our sample are founded a motivated individual, or by an informal group of motivated individuals. Four of the answers provided in the 'other' category would also be classified by us in one of these two categories. Thus, most of the projects included in our sample started as informal initiatives.

Question: How was your Precious Plastic project founded?
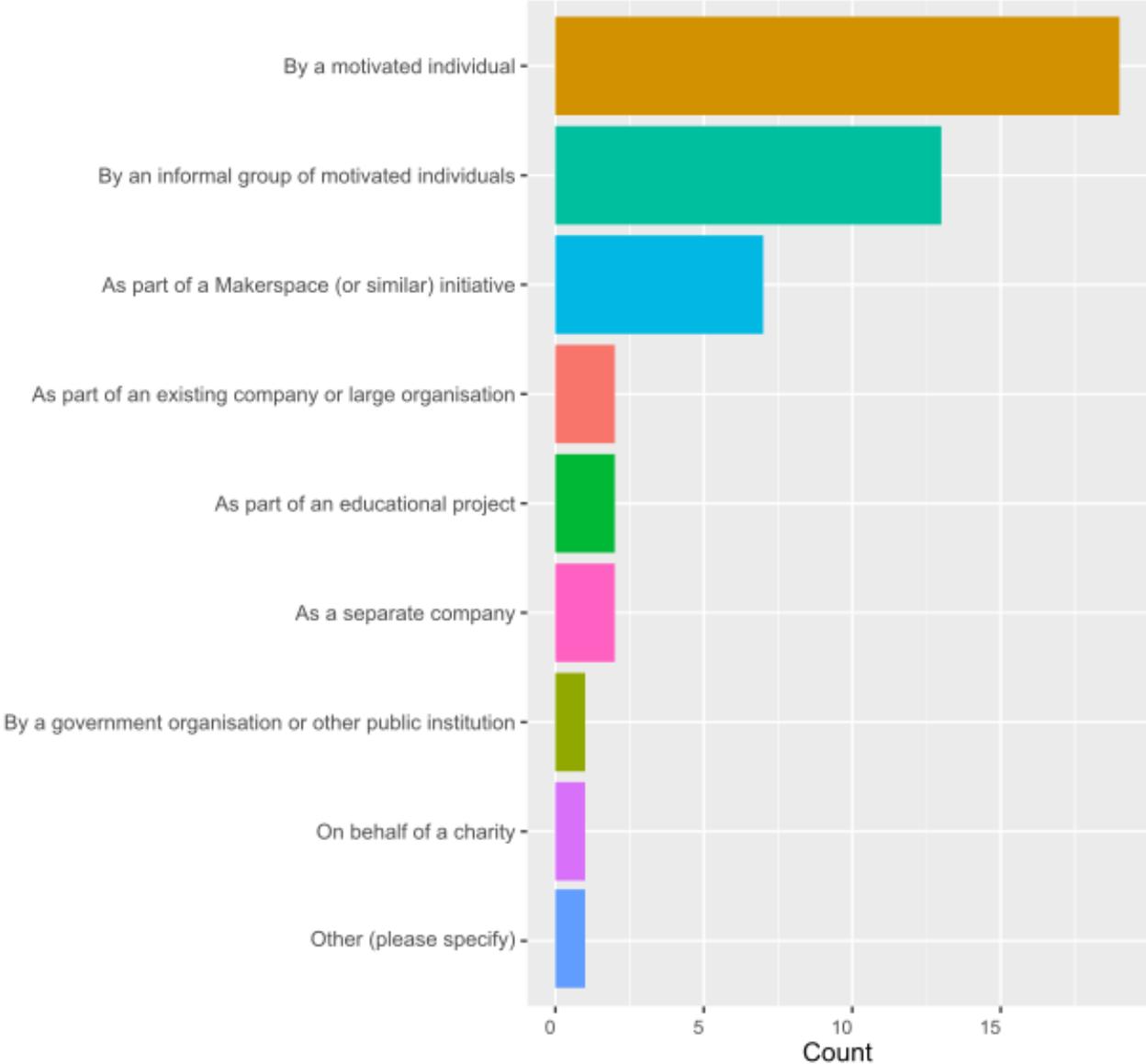
Figure 4. How Precious Plastic projects are founded (single choice).

Workspace locations

Most of the workspaces in our sample are set up at the respondent's home, which also suggests that they are more informal in nature. It also shows that the Precious Plastic concept has in fact enabled people to recycle their plastics at home, which is one of the main ambitions with which Dave Hakkens started his graduation project in `.

In addition to workspaces that are set up at home, we also see a relatively large number of projects that are set up in a Makerspace or Hackerspace.

Examples of locations mentioned in the 'other' category are an artist collective workspace, a factory building, a borrowed empty space, a container, the workspace of a local parish, and a refugee camp.

Question: Where did you set up your Precious Plastic workspace?
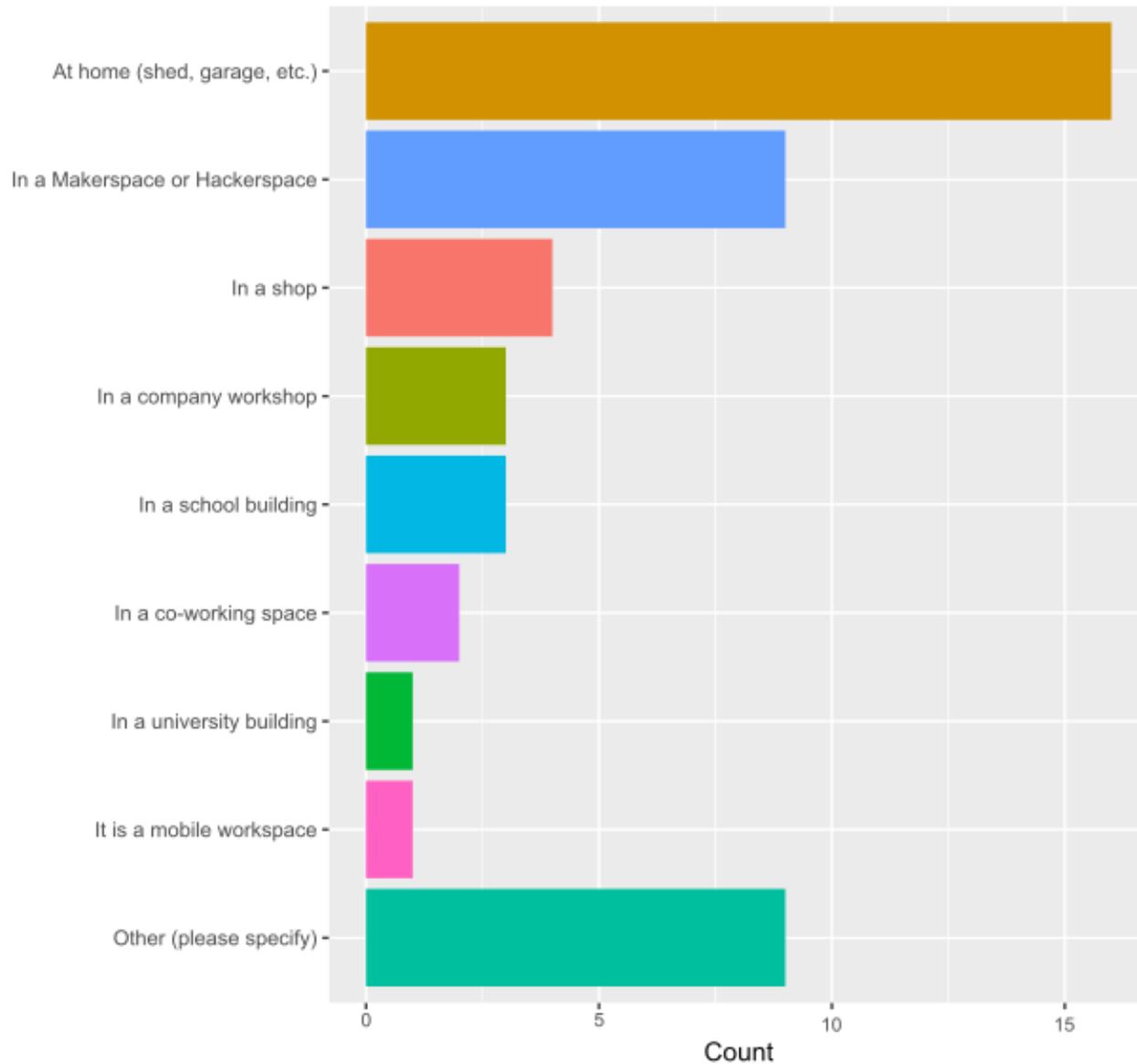
Figure 5. Workspace locations (single choice).

Statements about workspaces and projects

We asked our respondents to indicate, for several statements on a variety of topics, whether or not they applied to their workspace and/or project.
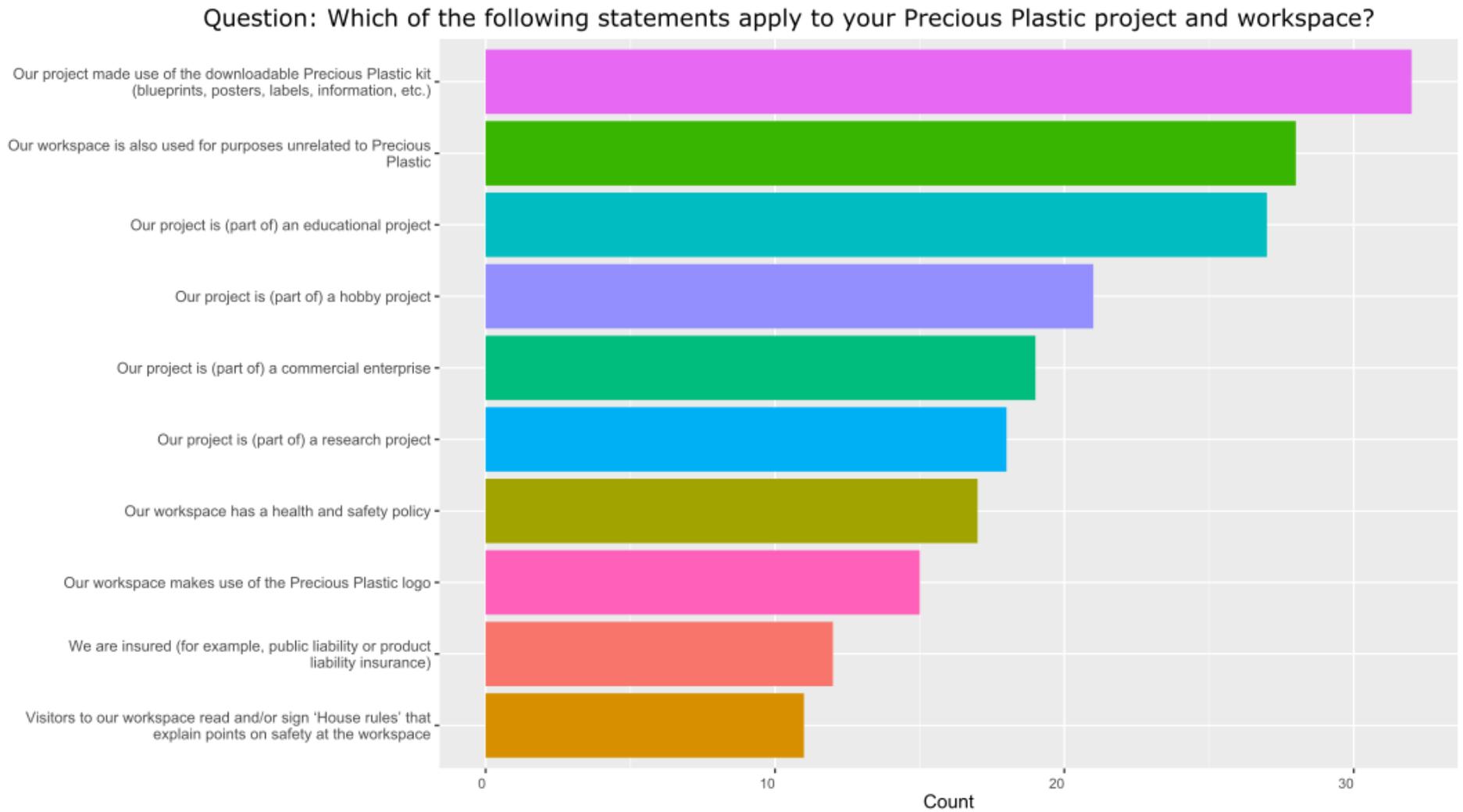
Figure 6. Statements about Precious Plastic workspaces and projects (multiple choice).

From the responses we can learn a few things: most, but not all, of the respondents have made use of the downloadable Precious Plastic starter kit; and relatively few make use of the Precious Plastic logo. The majority of our respondents also use their Precious Plastic workspace for other purposes, that is, dedicated Precious Plastic spaces are rare in our sample. Indeed, these 'other purposes' are likely to vary quite a bit within our sample, given that the workspaces vary from sheds / garages, to Makerspaces to educational facilities. We also see that a large amount of the initiatives in our sample are (part of) an educational initiative, and there are also quite a few that are (part of) a research project.

Another thing that stands out to us is that relatively few of the projects in our sample make use of insurance, although there a few more that do have a health and safety policy.

We also see that less than half of the respondents indicated that they run their project as a commercial enterprise. Upon further inspection we also learn that it is not uncommon for respondents to indicate that their project is both (part of) a commercial project and (part of) an educational or research project (in fact, there are only two respondents who characterize their project as a purely commercial project). In other words, It seems that these different purposes of Precious Plastic projects often overlap (see tables 1 and 2).

		(Part of) educational project	
		No	Yes
(Part of) commercial enterprise	No	16	13
	Yes	5	14

Table 1. Commercial enterprises may also be educational.

		(Part of) research project	
		No	Yes
(Part of) commercial enterprise	No	21	8
	Yes	9	10

Table 2. Commercial enterprises may also be research projects

Using a similar approach, we also find that association between the orientation of the project (e.g., commercial, educational, research) and whether or not the project makes use of insurance; all types of projects appear to be as likely to have an insurance as they are to not have insurance.

For the respondents that indicate that their project is (part of) a commercial enterprise, we also asked how much revenue their project makes (see figure 7).

12

Revenue of projects

Of those that answered the question on revenue of their project (only respondents that indicated their project is commercial in nature), most indicate that they make some profit, but generally not enough for a living wage (a wage that is high enough to maintain a normal standard of living). Only one respondent indicated that (s)he earns a living wage, and another respondent indicated that (s)he is able to cover the costs of the project with the revenue they make.

There are also 5 respondents who indicate they do not make any revenue yet. Overall, this suggests to us that most of the projects that are run as (part of) a commercial enterprise are still in an early stage of development.

Indeed, here it is also relevant to remember that only two of the projects in our sample were characterized as being purely commercial.
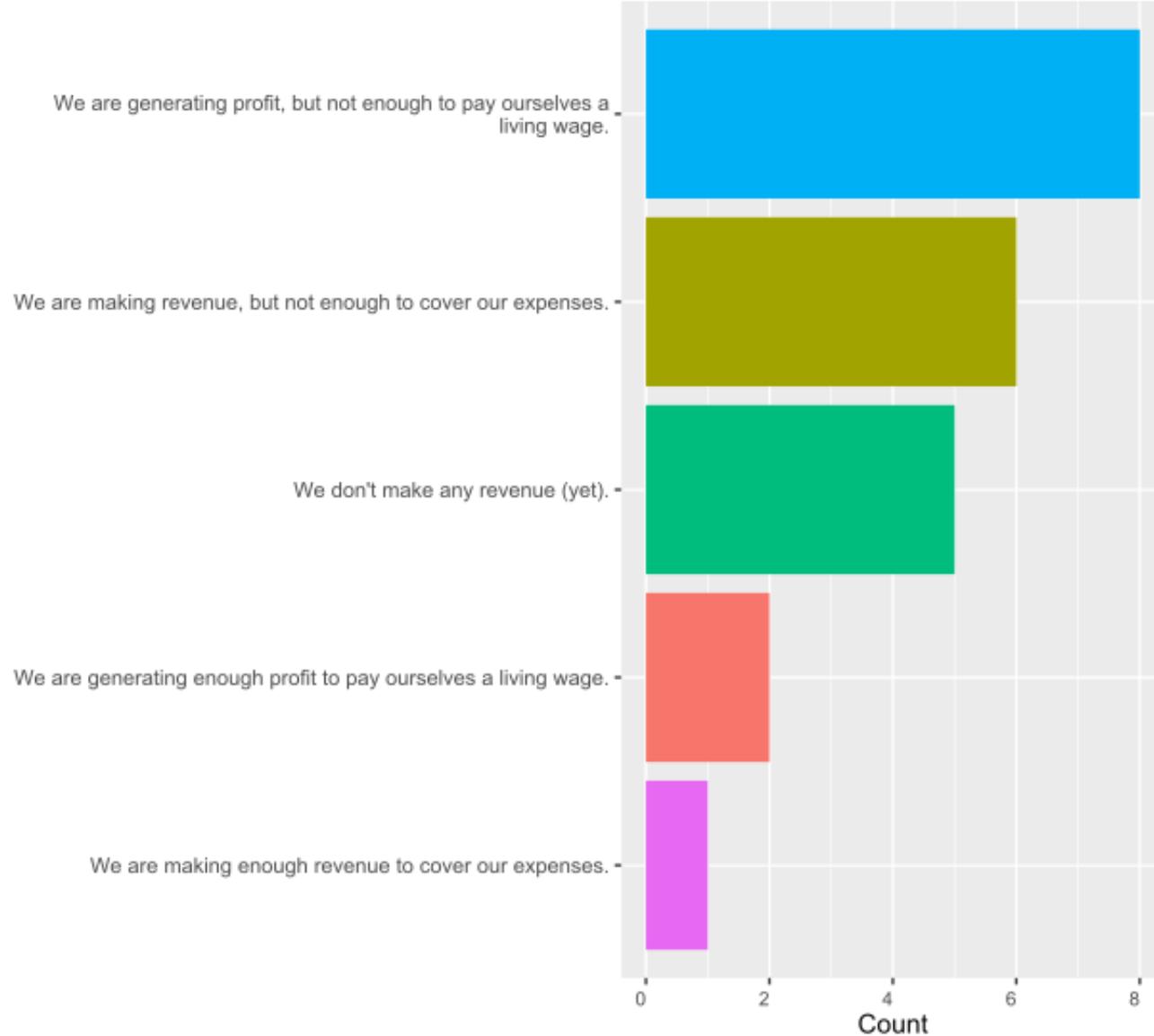
Figure 7. Revenue of Precious Plastic projects (single choice).

Legal structure of projects

Even though most of the projects in our sample were started informally, the majority do have a legal status. Typically, projects are organized as a cooperative, association, non-profit, or something similar, but we also see projects being organized as commercial companies, or as projects within larger initiatives.

Alongside these, we have 15 projects in our sample that had no legal status at the time of filling out the survey.

In the other category we find one initiative that exists as part of a university and is therefore likely to benefit from legal arrangements that the university has made.

We also found that it is more likely for projects to have adopted legal structure if they are situated in a country in the global north.

Question: What is the legal structure of your Precious Plastic project?
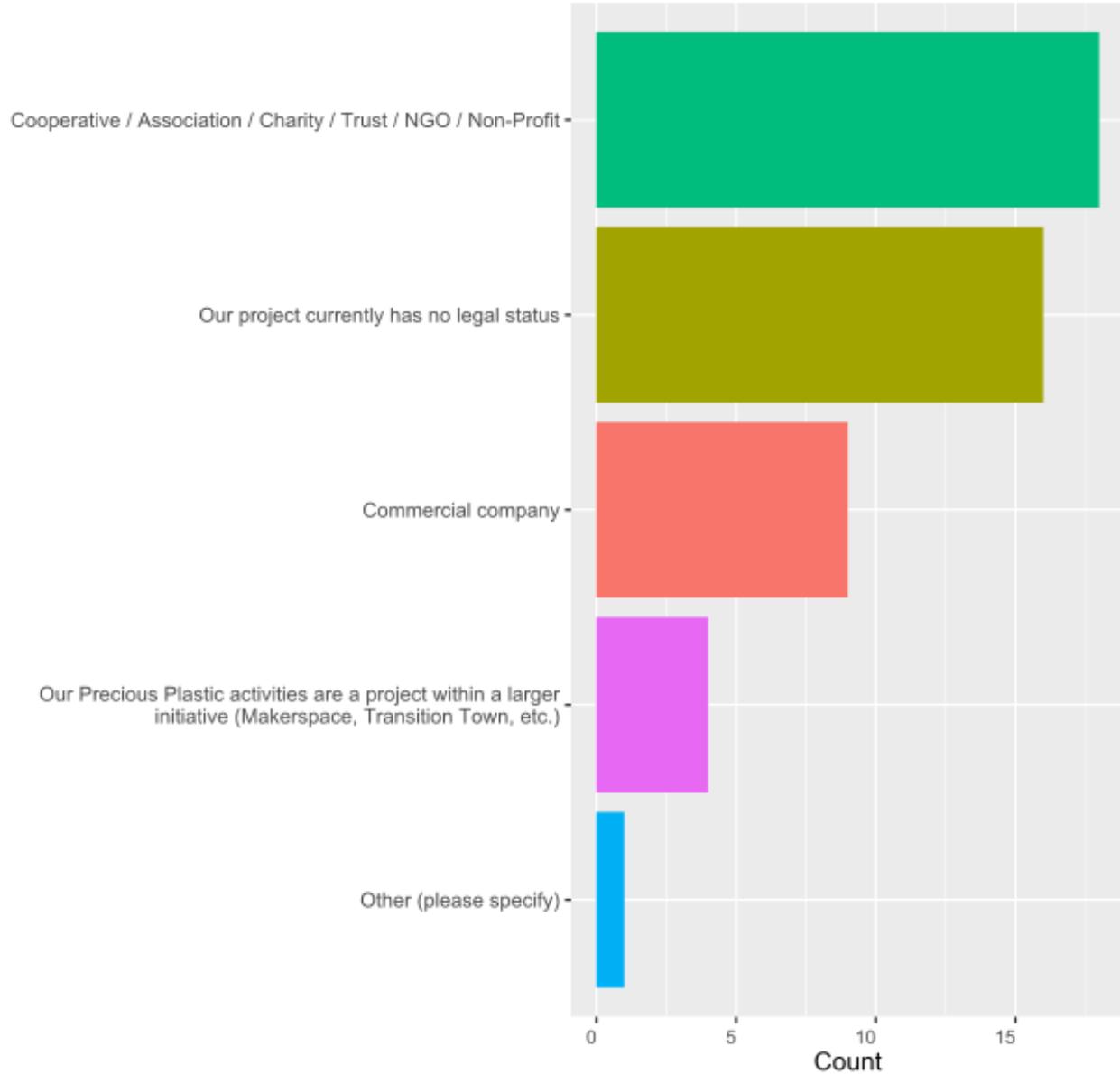
Figure 8. Legal structures of Precious Plastic projects (single choice).

14

People active in projects

We asked our respondents how many full-time staff, part-time staff and volunteers are active in their project. We show the answers to these questions in histograms.

Most of the projects in our sample have a combination of volunteers and paid staff (part-time, full-time, or both). The number of volunteers typically falls within the 1-10 range and is generally combined with a smaller number of paid staff.
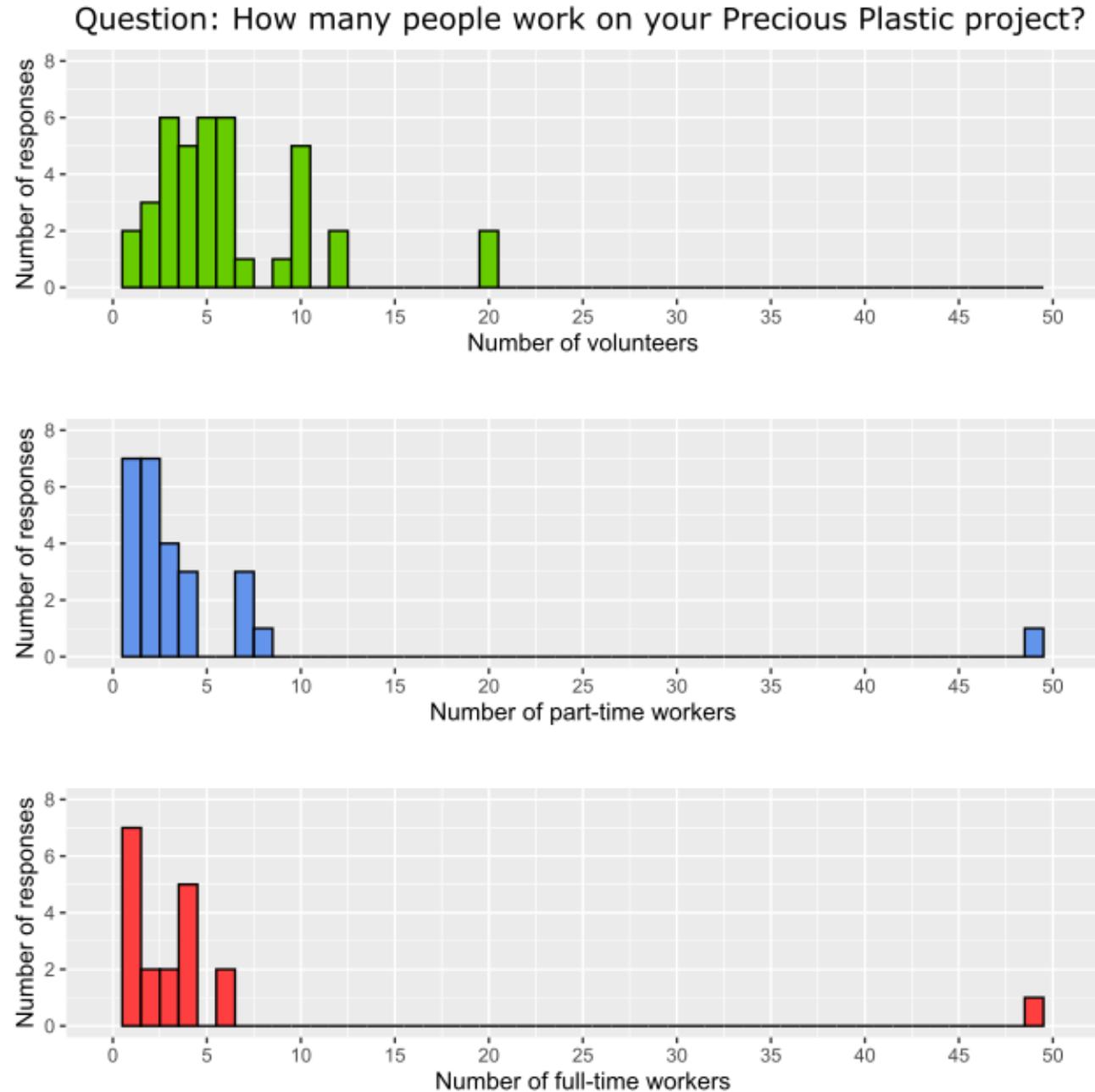
Figure 9. People active in project (numerical question).

15

Time spent on projects

If we look at the amount of time that the teams of our respondents spend on their Precious Plastic project, we see that it is most commonly the case that the team works on the project a few times a week, or on a weekly basis. Only 7 of the respondents report that their team engages with the project on a daily basis.

We also have a few respondents that spend time on the project on an irregular basis, or only on a monthly basis.

Question: How often does your team spend time on your Precious Plastic project?
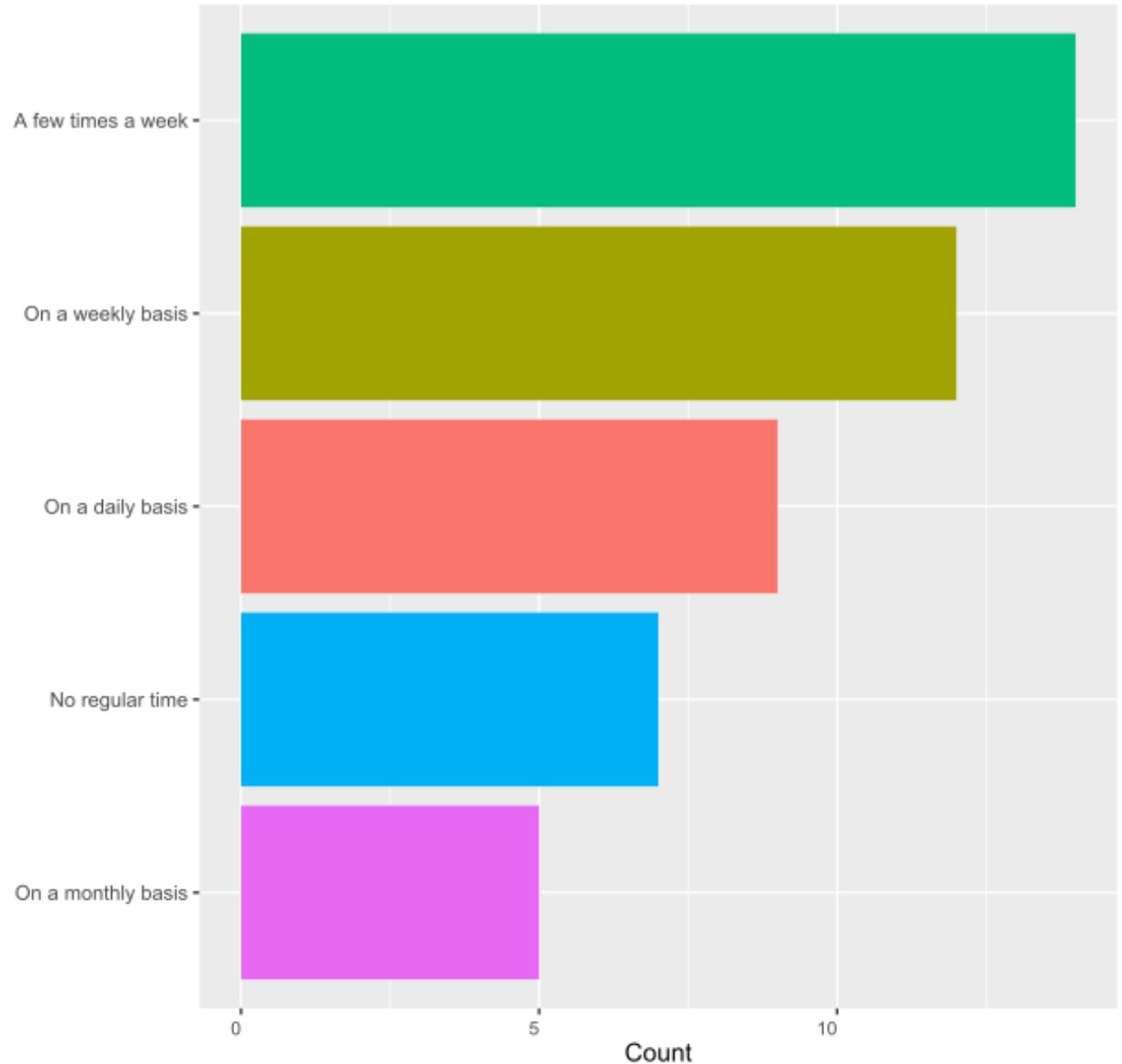
Figure 10. Time spent on Precious Plastic project (single choice).

How projects are managed

Most Precious Plastic projects in our sample are led by a single person, with a slightly smaller number being led informally by multiple people. Alongside these, we see a handful of projects that have steering committees, coordinating committees or a board of directors or trustees. We investigated if the leadership structure is related to other characteristics we measured, such as the legal structure of the project, or the location of the workspace. We find no such associations in our sample of data. In future studies, we believe it will be interesting to see what drives people in the community to opt for formal versus informal approaches to managing their project.

In the 'other' category we found two examples of projects that were run as a company led by two directors. There is one response in the 'other' category that states that their project is led by a single faculty at a university with support from students.
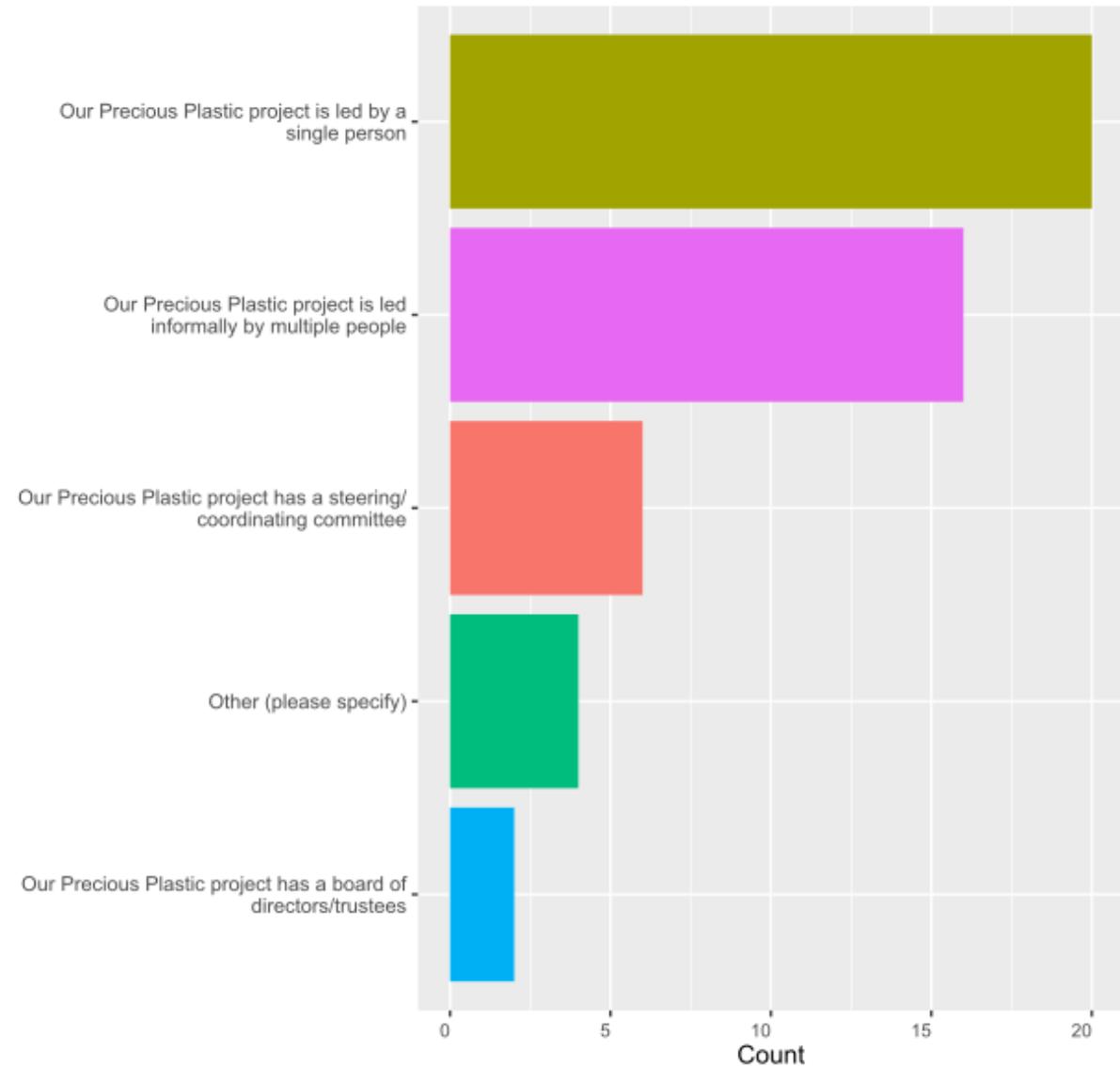
Figure 11. How Precious Plastic projects are managed (multiple choice).

17

Goals of projects

We showed our respondents a list of possible goals that Precious Plastic projects might have and asked them to rank goals relevant to their project. We chose this approach over, for example, asking respondents to simply indicate the importance of different types of goals, because the ranking forces the respondents to prioritize certain types of goals over others. An inherent limitation of our approach is that it is impossible for a respondent to give two goals equal importance, even if they feel that is the case.

Question: Please rank the following possible goals of your Precious Plastic project from most important (top) to least important (bottom). Select only those relevant to your project.
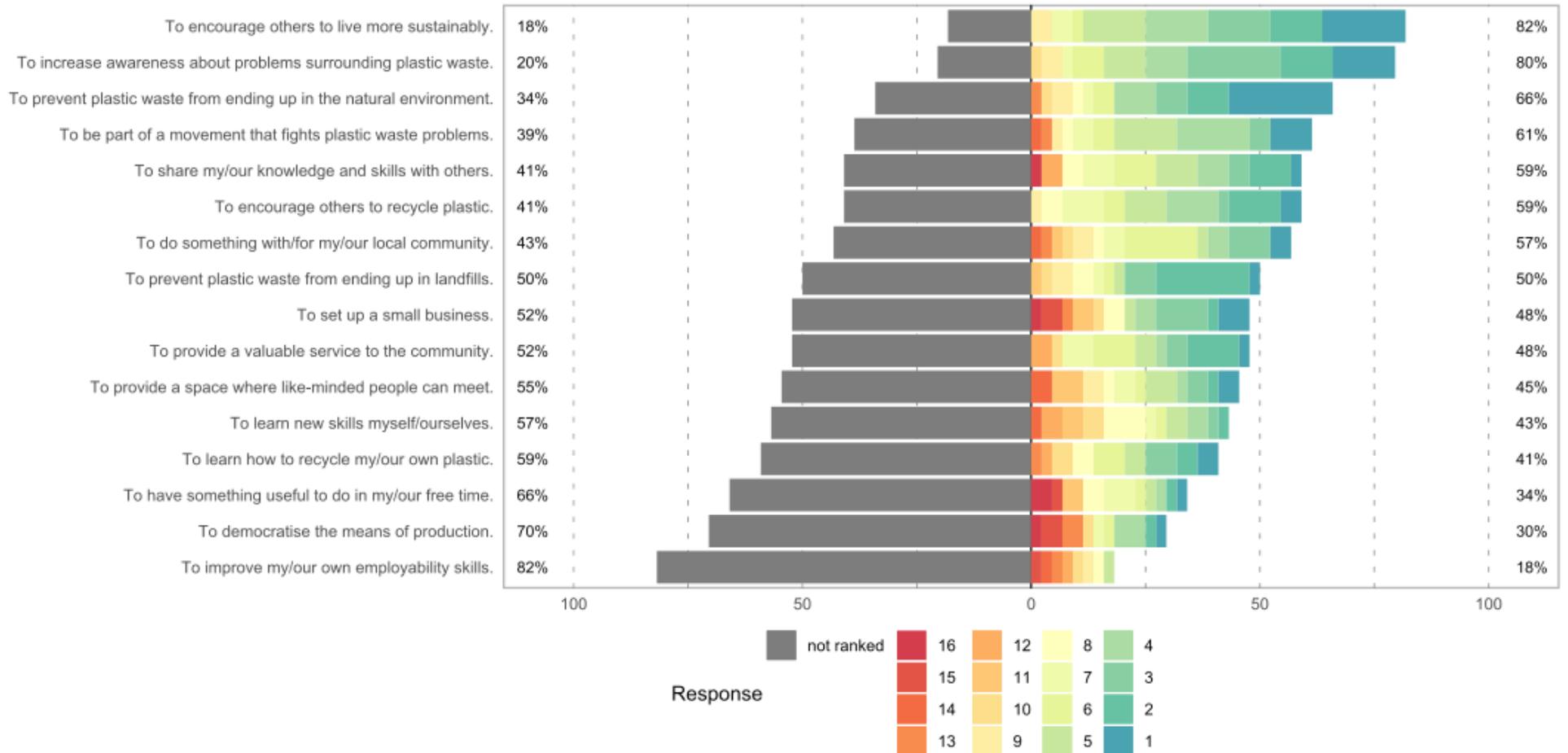
Figure 12. How our respondents rank possible goals for their precious plastic projects (ranking).

The overview of the overall ranking of goals primarily reveals diversity in the ways in which our respondents rank the goals of their project. For example, we observe that almost all goals were ranked in first place by at least one respondent (see figure 12). This suggests that the underlying motivations with which people get engaged with the Precious Plastic concept are diverse as well.

Despite these differences, there are a few things that stand out. For example, the three goals that rank highest in the overall ranking are environmental goals. These goals are also more likely to end up in first rank than the other goals included in our list. This suggests that environmental goals are of high importance in many of the Precious Plastic projects in our sample. It is also clear that some goals were not included in the ranking of most respondents, such as the goal to improve employability skills, to democratize the means of production, and to have something useful to do in free time. We also see that setting up a small business features as a goal in the ranking of about half of our respondents. However, there is a strong variety in how important this goal is for the respondents that included it in their ranking.

Funding of projects

The majority of the Precious Plastic projects in our sample are at least partly self-funded. Other important sources of income are selling recycled products (and in a few cases machines), donations, and grants and subsidies.

We also wish to note that we did not distinguish between funding in the start-up stages (for example, funding to set up the project and to acquire machines or machine parts) and funding obtained when the project is up and running. We expect that different kinds of funding are relevant in these different stages (for example, grants are likely to be more important in the start-up stage and selling items is likely to be more important once the project is up and running); but our data did not capture that distinction.

In the 'other' category we find, among other things, a project that is funded by a university from research funding and a project that is funded from events and projects.
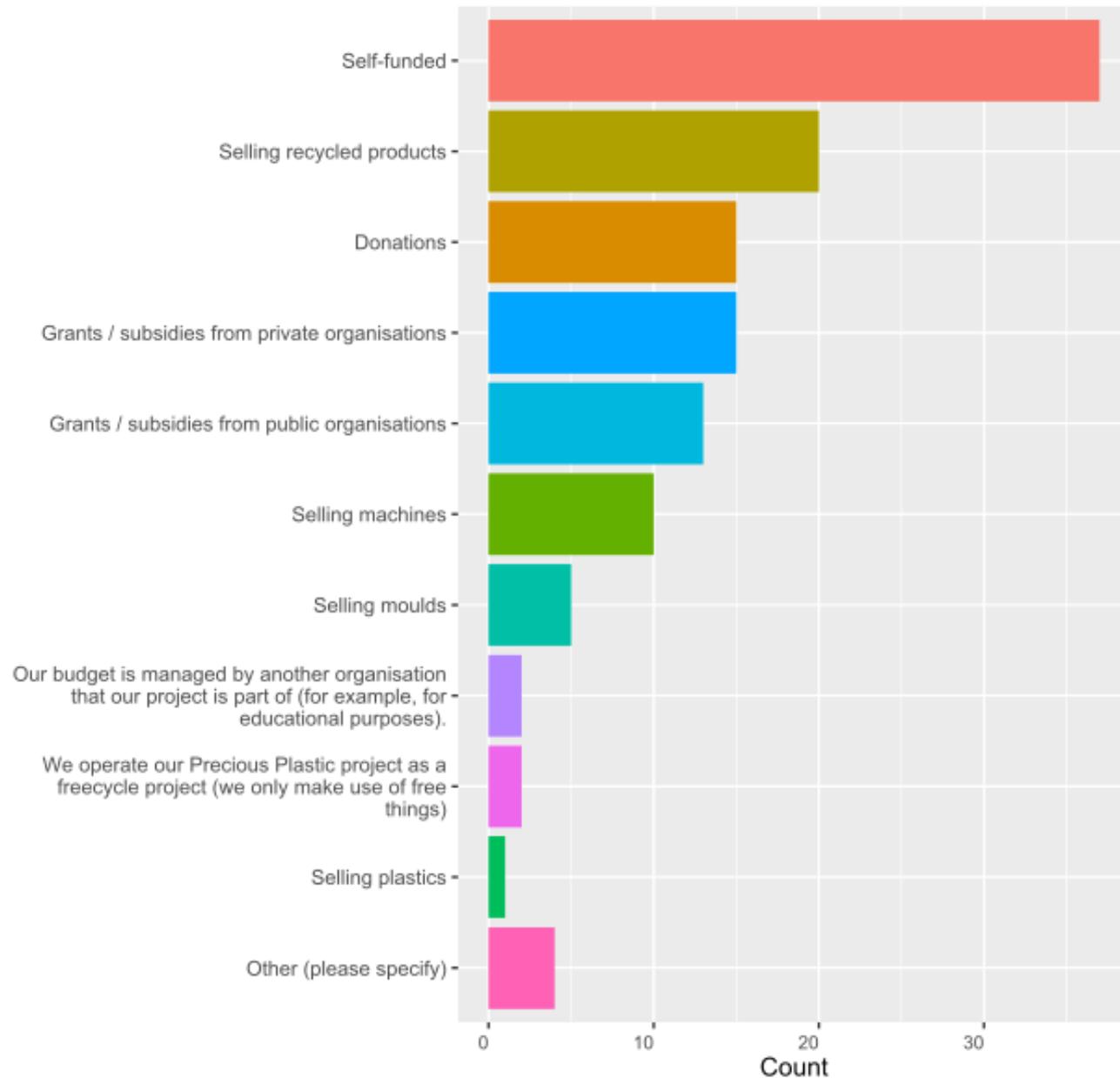
Figure 13. How Precious Plastic projects are funded (multiple choice).

20

Activities carried out as part of projects

Unsurprisingly, most projects in our sample involve recycling plastic as an activity, either to make new products, or to produce resources for new products (or both). A large amount of the projects in our sample also involve training and education, which corresponds to our earlier observation that many projects are (part of) educational projects (see figure 6). Training and education are mostly focused on environmental issues (also see figure 12), but social issues and technical skills are topics as well.

Building plastic recycling machines is also a common activity, and we see that over 20 of our respondents also report designing their own version of machines as an activity. Selling recycling machines is an activity that occurs relatively rarely in our sample.

In the 'other' category a few respondents report, for example, activities related to research & development, the organization of thematic events, community building and lobbying activities.
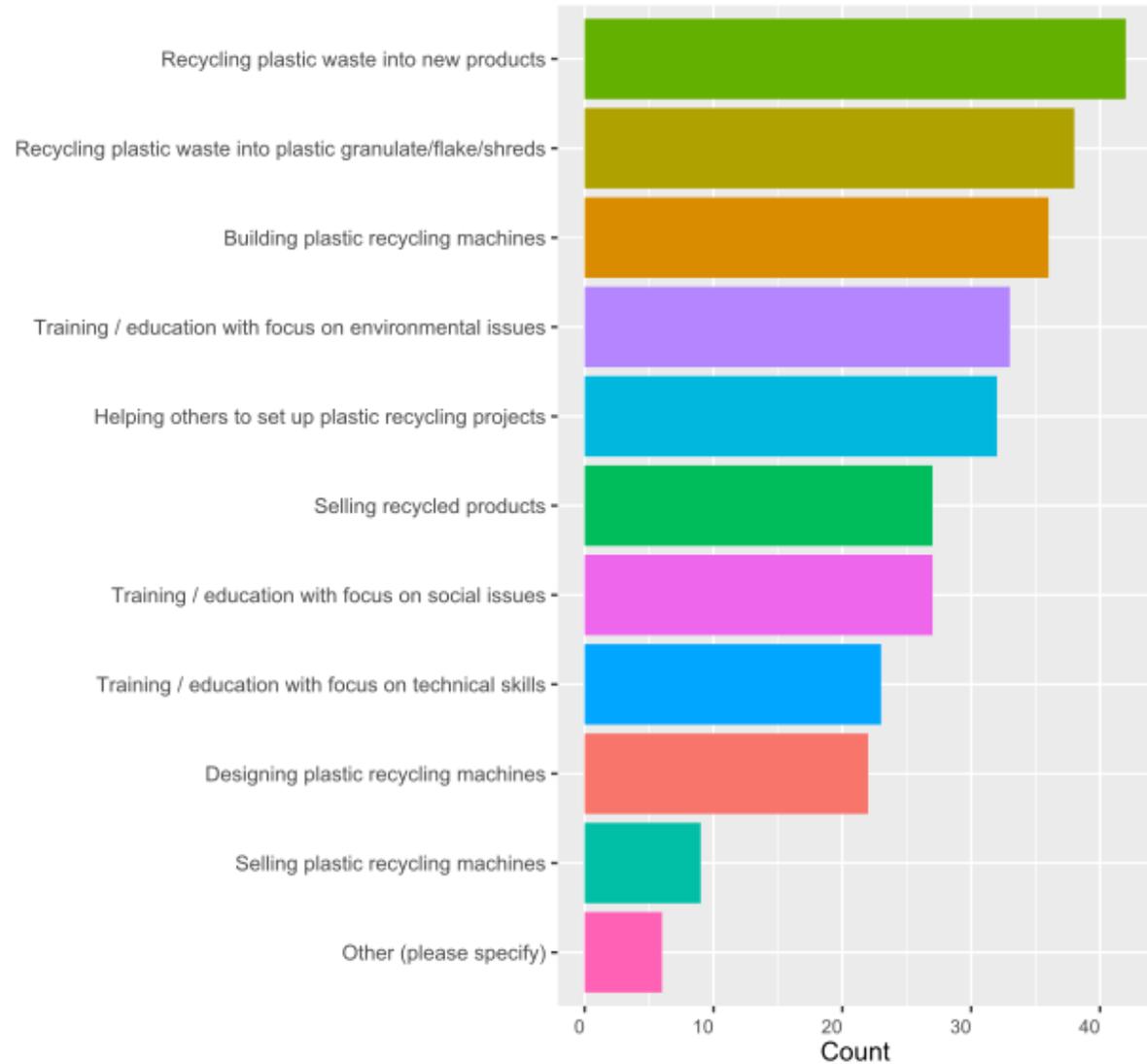
Figure 14. Activities carried out as part of Precious Plastic projects (multiple choice).

Machines present in workspaces

We asked our respondents to indicate what machines they have in their Precious Plastic workspace, and to what extent these were acquired or built and/or customized by themselves. We listed the machines for which, at the time of the survey, the Precious Plastic team had made available designs, but we also allowed our respondents to list other machines that they had acquired or built, which 14 out of 47 did.

Figure 15. Machines used in Precious Plastic workspaces (nominal Likert-style).

For example, several of our respondents had either acquired or built a sheet press, a heat press, a 3D printer, an and/or an oven. In the overview of answers, we see that it is quite common for our respondents to customize their machines, and occasionally they even make their own designs. We get an even better picture of this if we aggregate the answers over all types of machines, as we did in figure 15. This picture shows that it is more common for our respondents to customize their machines than it is to build them exactly according to instructions. 19 out of our 48 respondents indicate that they have either heavily customized or designed at least one of the four machines.

Question: What recycling machines does your Precious Plastic workspace include?
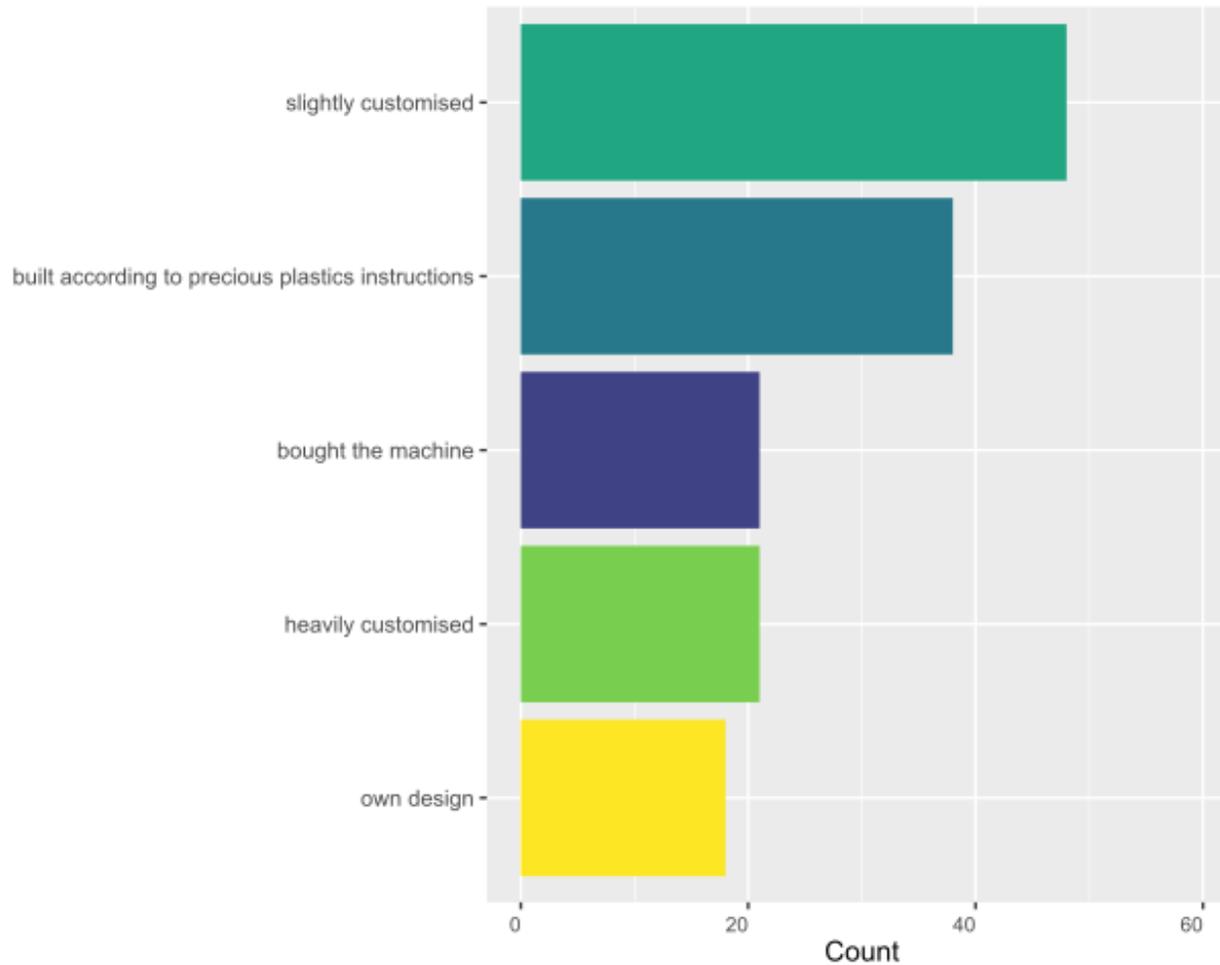
Figure 16. How machines are acquired and customized (multiple choice).

How recyclable plastics are collected

Many of the Precious Plastic projects in our sample collect recyclable plastic by going out in the local community themselves, or by obtaining plastics from local businesses. We also see a fair amount that collect plastic via bins or bags at the workshop, or by working together with waste pickers.

Examples of methods that people mentioned in the 'other' category are: collecting plastic from their own homes and friends' homes, setting up customized collection bins for different kinds of plastic in their town, public school drives, and asking students to bring plastic from home.

Figure 17. How recyclable plastics are collected (multiple choice).

What products are made for

Many of our respondents develop their products for artistic purposes and/or for personal use. A smaller amount of our respondents sells their products, either through web shops or local shops. The number of respondents that sell their products in the online bazar of the Precious Plastic community is quite small.

We find a relatively large number of responses in the 'other' category here. These include the development of prototypes by students in a design university (and other educational purposes), selling on festivals, the creation of souvenirs for children that attend workshops, the development of raw material for 3D printing, the creation of bird houses that are then placed in public space and giving products away for free. Several respondents indicate that their products are still in development or proof of concept stage.

Question: What do you do with the products/things you make with the recycled plastic?
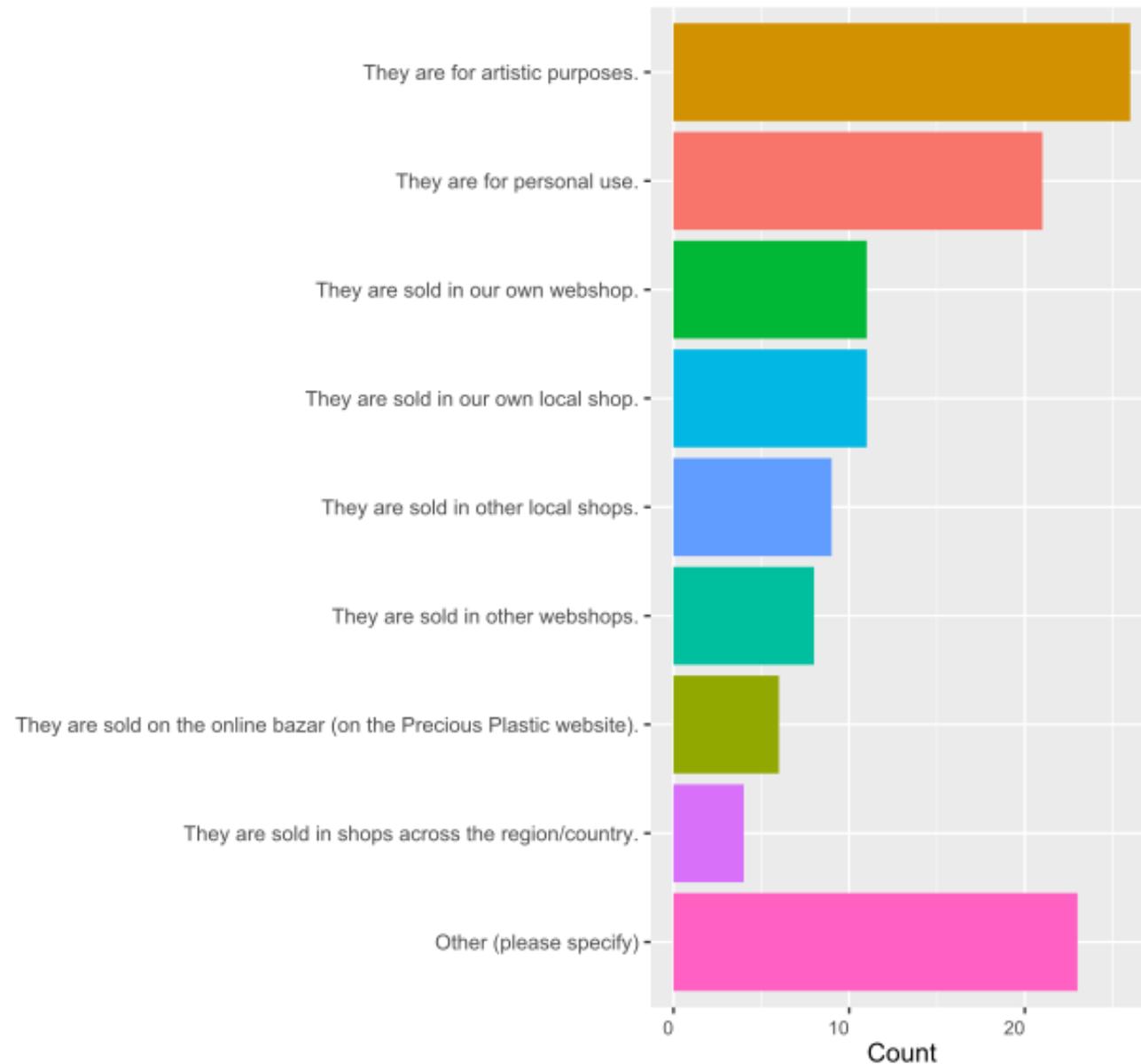
Figure 18. What happens with Precious Plastic products (multiple choice).

Community outreach

We asked our respondents how they reach out to their local community. The results show that the use of social media and word of mouth are most frequently used, followed by promotion at public events, websites, and local online social networks and communities. Most of the respondents never use any of the other channels that we listed. In the 'other' category we find various examples of offline social networking, spreading ideas through like-minded organizations, organizing trash cleanups, specialized marketing and school visits.
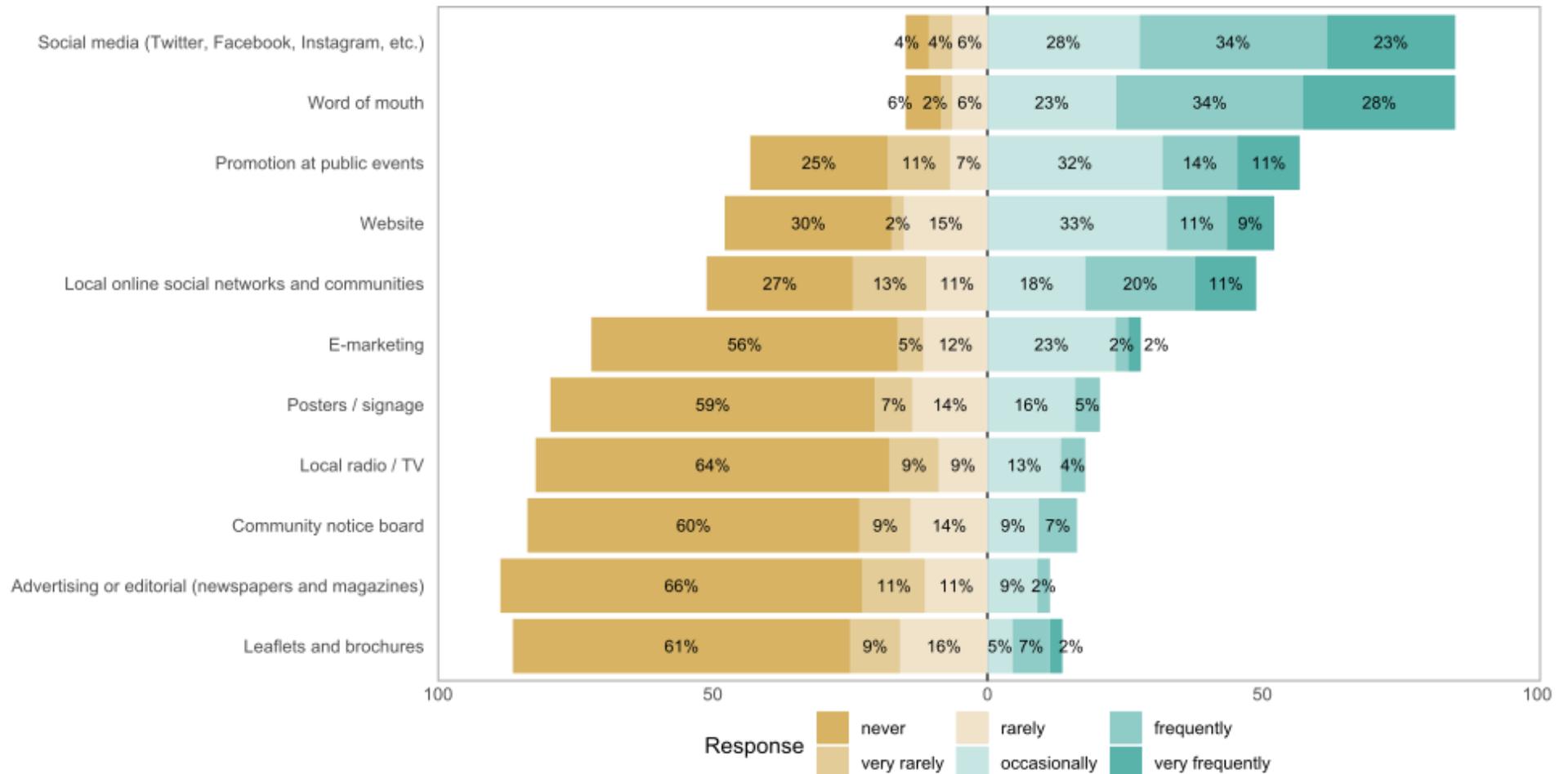

Figure 19. Community outreach by Precious Plastic projects (Likert scale).

Difficulties experienced

Most of our respondents indicate that they have no difficulties or only minor difficulties with most of the potential difficulties that we listed. The biggest difficulties are experienced in investing enough time and money in their project. There is also a fair number of respondents (nearly half) that experience moderate or serious difficulties with the sourcing of machine parts and/or finding staff/volunteers. In the 'other' category, our respondents mentioned difficulties such as the fact that the blueprints of machines are based on measurement standards of Western Europe (causing parts to fit poorly), keeping a non-profit organization running while incurring costs for rent, generating sustainable funding, developing suitable products (products for which there is a demand), and organizing the workspace.
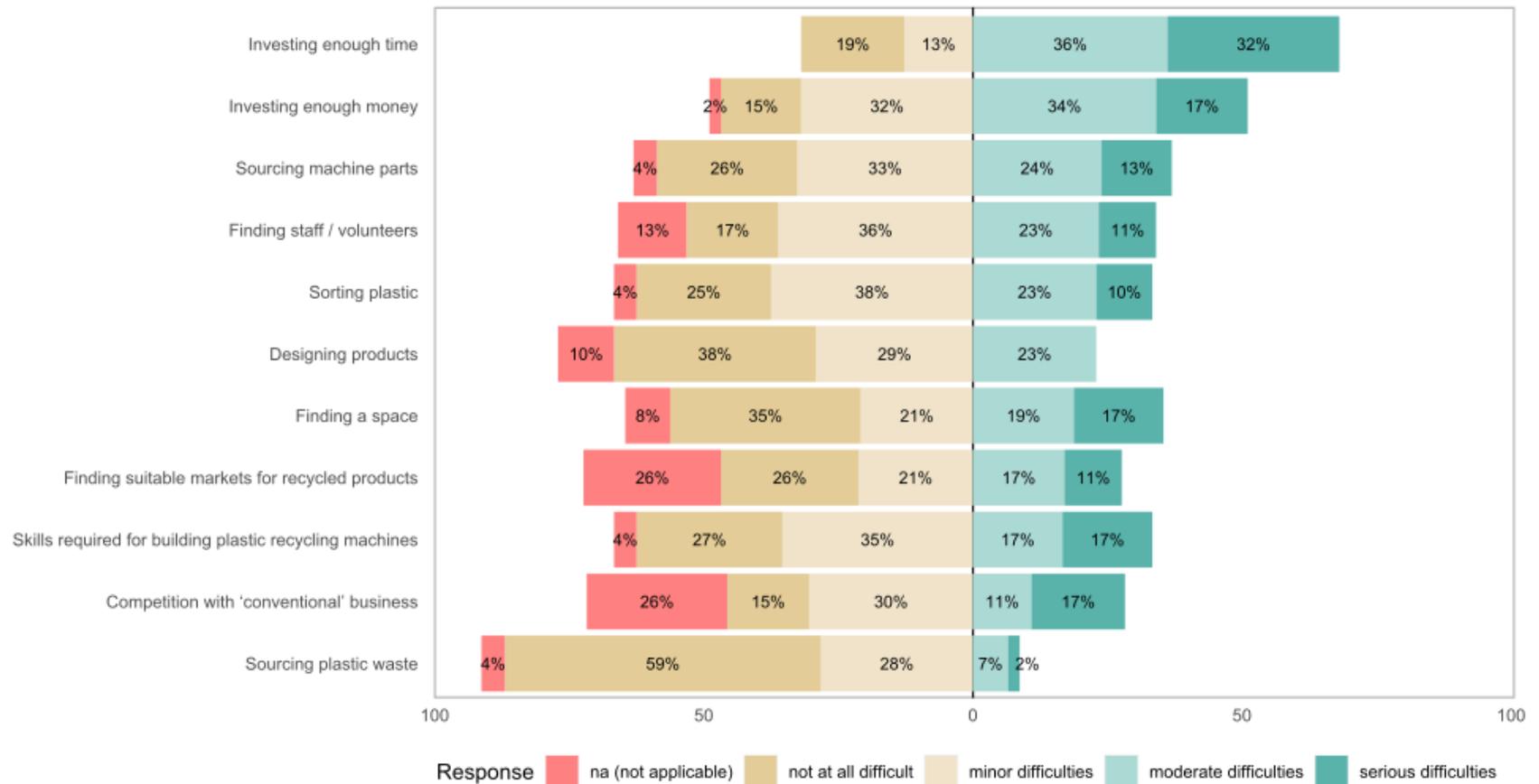

Figure 20. Difficulties experienced in Precious Plastic workspaces (Likert scale).

27

Interactions within the Precious Plastic community

Most of our respondents indicate that they provide some kind of support to other nearby Precious Plastic projects (volunteers, advice, equipment), that they share knowledge and experience via the online platform of Precious Plastic, or other online platforms and social media and/or that they are member of a network of Precious Plastic projects and workspaces. This shows that interactions between individual Precious Plastic projects/workspaces are quite common. In the 'other' category, our respondents mentioned the use of social media and the organization of free meetings and workshops for people that want to start their own workspaces.
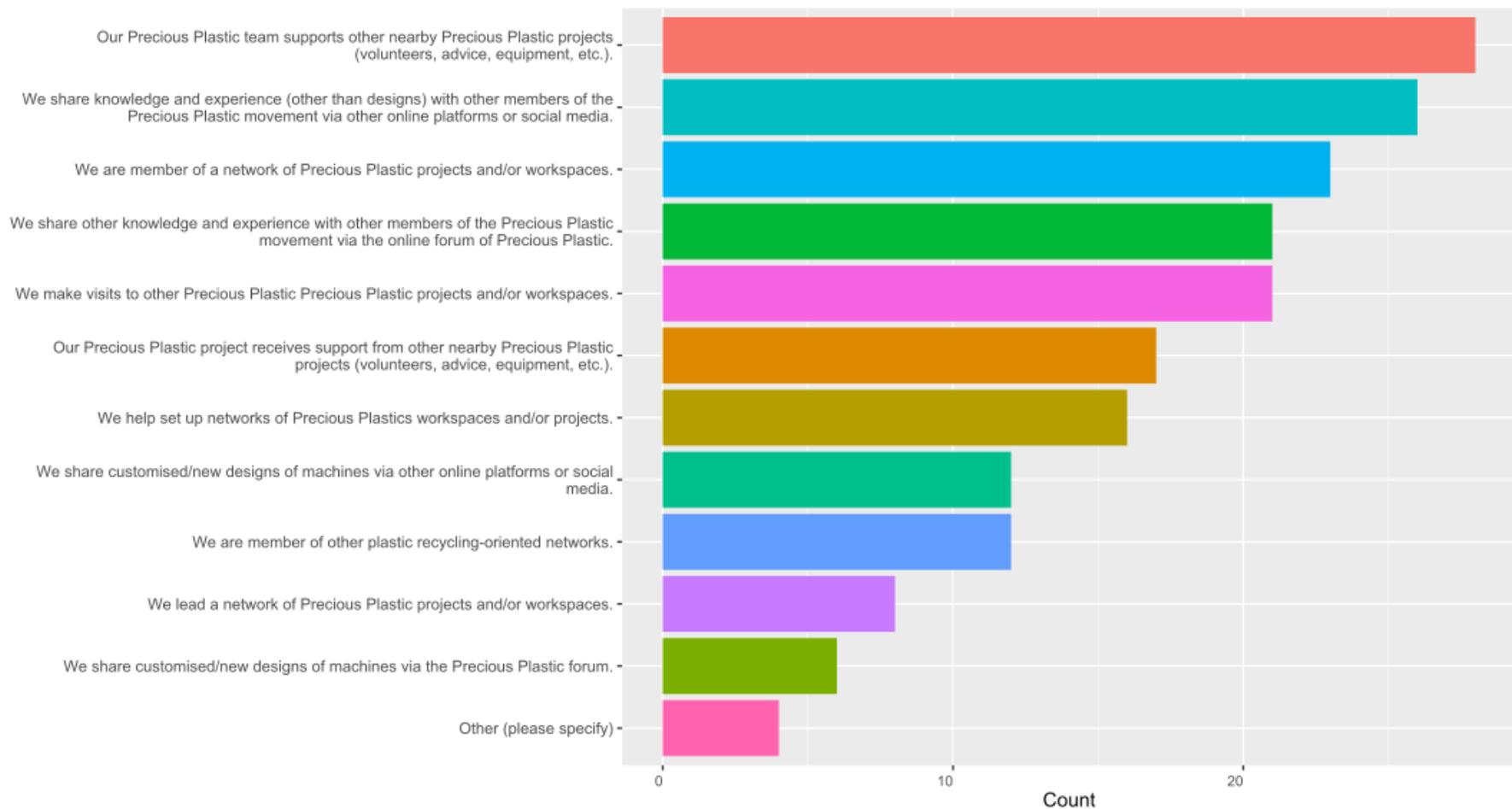

Figure 21. Interactions in the Precious Plastic community (multiple choice).

Overlap with other organizations

The Precious Plastic projects in our sample overlap with other organizations in several ways. For example, it is common for members of the projects to volunteer at other local environmental organizations and local community groups. It is also common that they are members of local Makerspaces and/or that they are employed at (other) commercial businesses or educational institutes. A number of our respondents indicate that they organize joint events with other (environmental) initiatives.
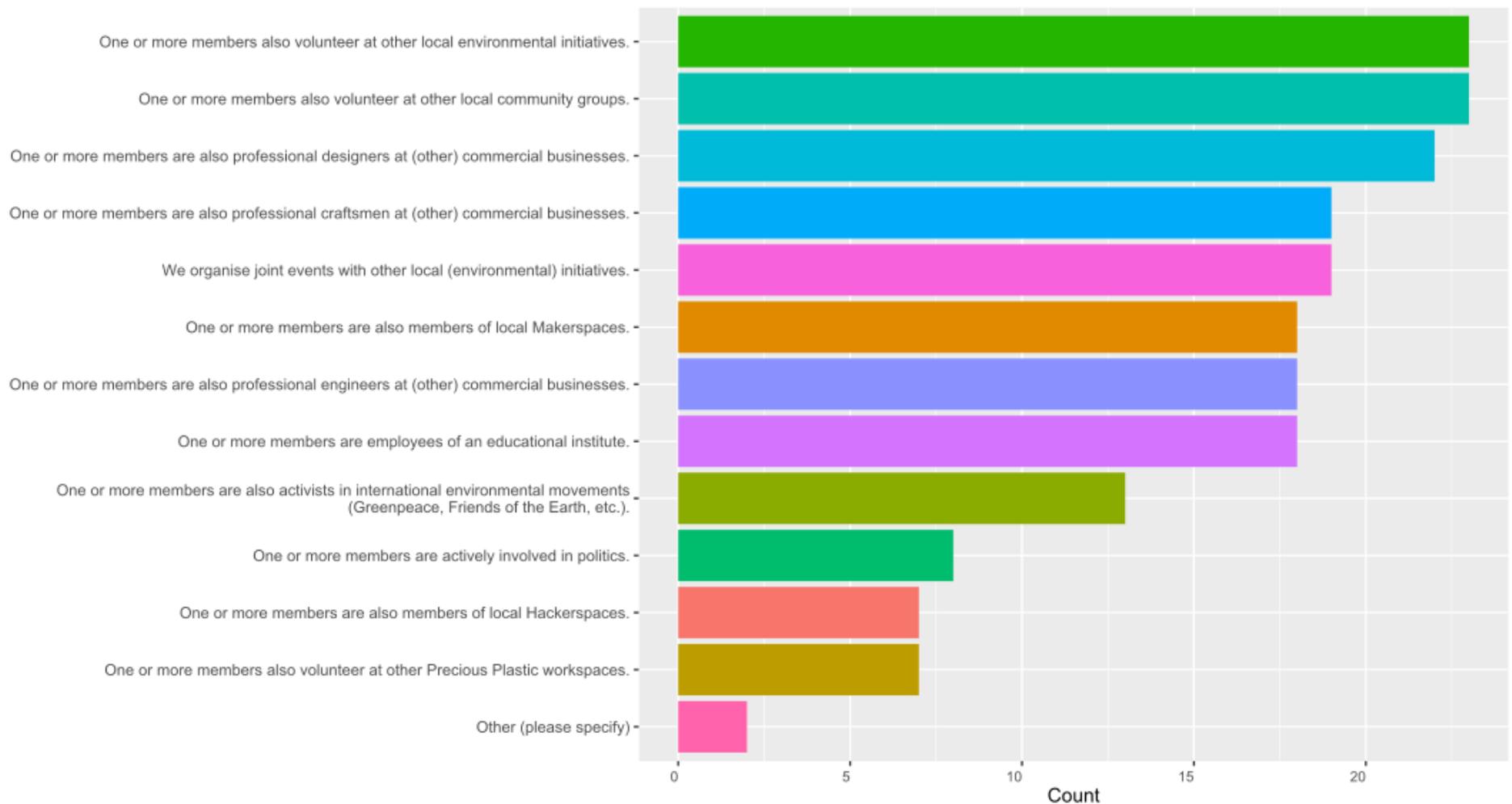

Figure 22. Overlap with other organizations (multiple choice).

Role of the Precious Plastic team for individual projects

We asked our respondents to respond to several statements about the role that the central Precious Plastic team (Dave Hakkens and his team) plays for individual projects. Most of our respondents indicate that they operate fully independently in most of their activities, that is, they do not depend on ongoing interaction with the central Precious Plastic team. However, many respondents also indicate that their project would not have existed without the activities of the central team, and that central team is an important source of inspiration for the goals of their own project. The existence of a central team has also made it easier for most to spread awareness of plastic recycling in their local community.
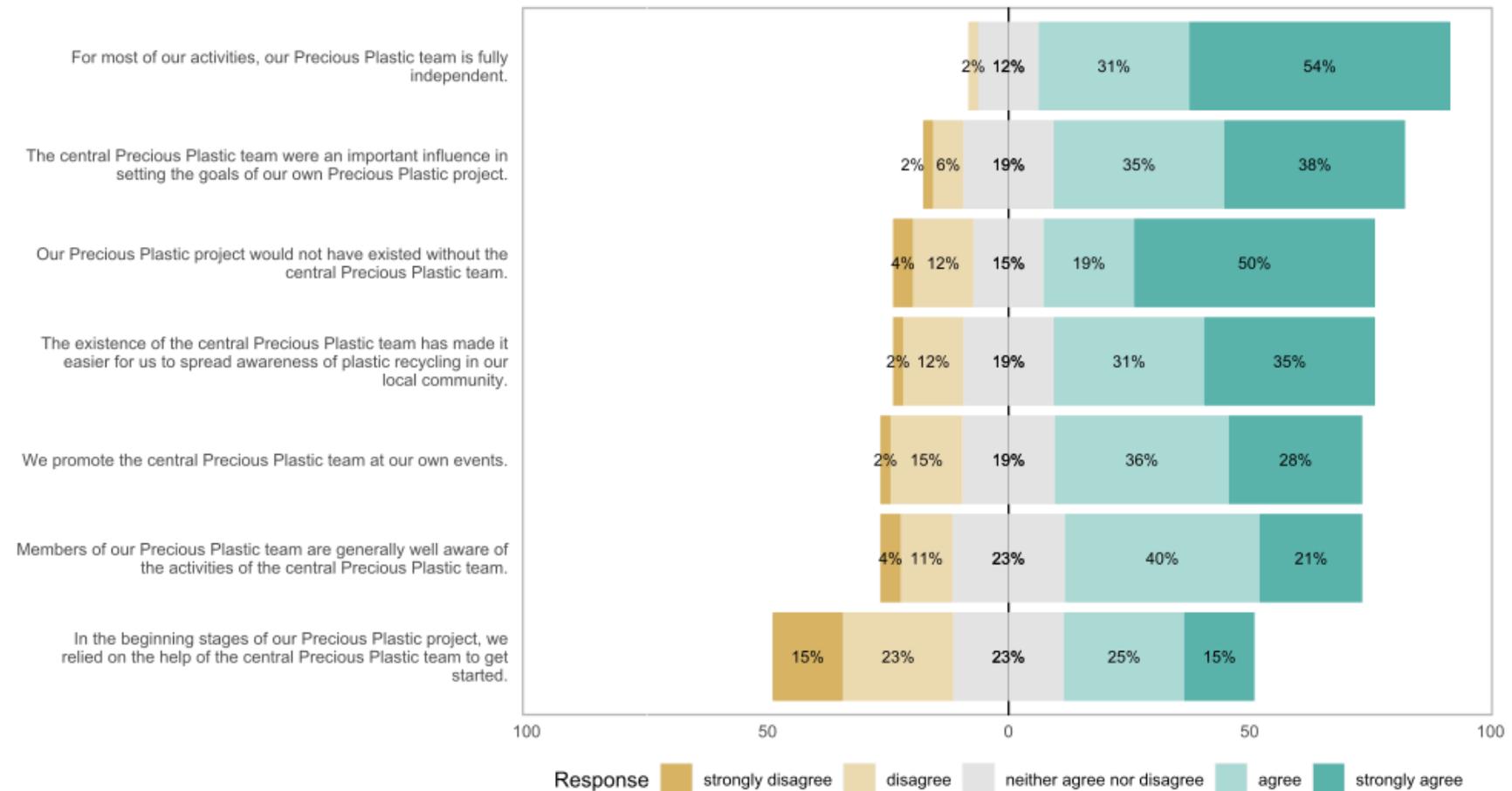

Figure 23. How our respondents view the role of the central Precious Plastic team (Likert-scale).

We also see that our respondents tend to promote the activities of the central Precious Plastic team as well as their own activities, and that their project members are generally aware of the activities of the central team. However, less than half of our respondents indicate that they relied on the help of the central Precious Plastic team in the beginning stages of their individual projects.

Possible future roles for the central Precious Plastic team and local Precious Plastic initiatives

We asked our respondents to think about the future development of the Precious Plastic community, and the possible role division between the central Precious Plastic team (Dave Hakkens and his team) and local Precious Plastic initiatives. For nearly all of the activities that we listed, most of our respondents indicated that they see a role for both. However, in figure 23 we also see that for several tasks a fair number of respondents indicate that they see these as part of the role of the central team, including the further improvement of the online community platform, the further improvement of the bazar's functionality and promotion of the bazar to wider audiences, further guidance in how to t start individual Precious Plastic projects, further improving the infrastructure for knowledge sharing and further improving blueprints and instructions for machines.
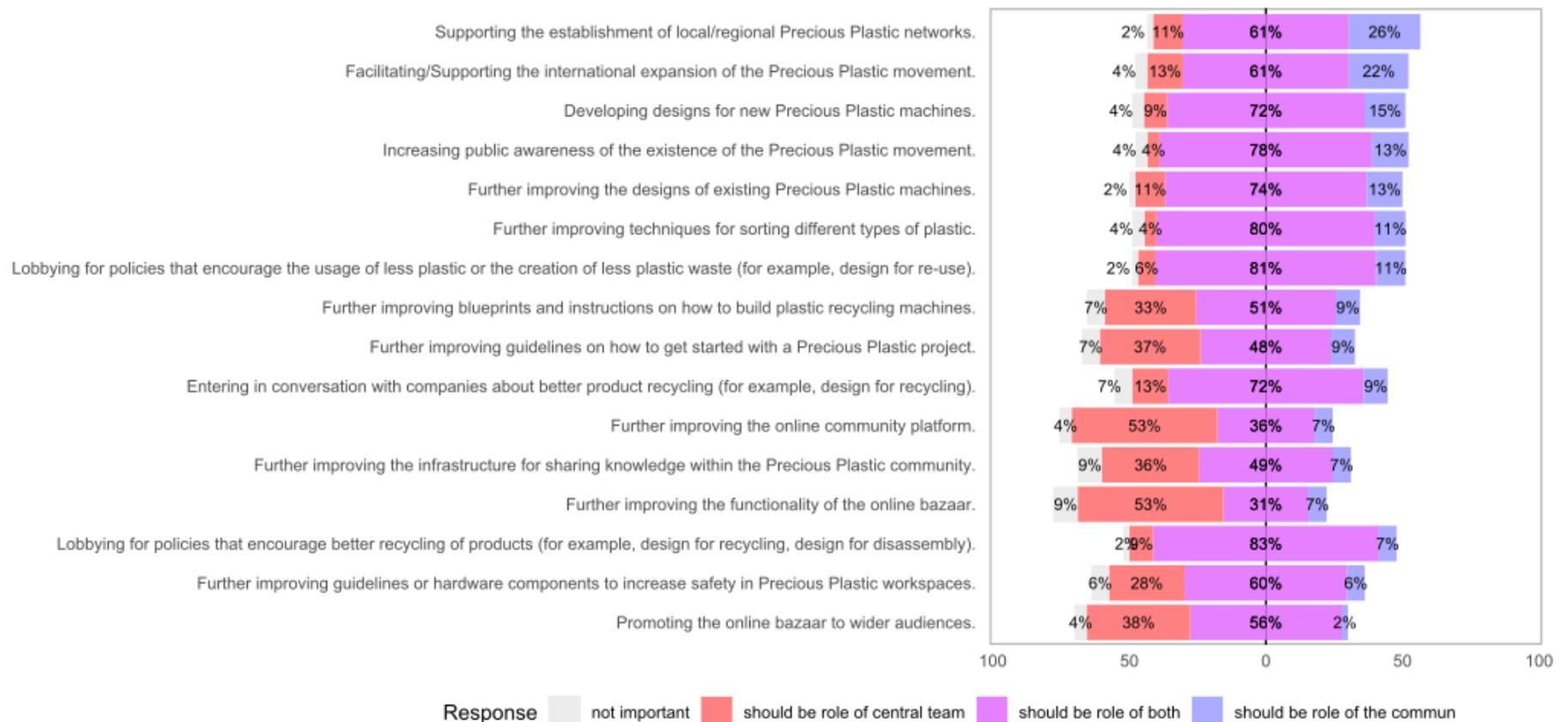

Figure 23. Future roles for Precious Plastic team and the community (nominal Likert-style).

Some respondents also suggested additional tasks, namely the creation of an independent wiki-like knowledge base for community-generated knowledge. Providing this platform should be the role of the central team, according to our respondents. In addition, members of the central team could function as spokespersons for the network, and present monthly news on the evolution of the network to the community. One of our respondents also sees a role for both the central team and local projects in implementing and promoting "non-exploitative production relations", something that sounds akin to promoting social entrepreneurship. In addition, one of our respondents sees a role for both the central team and local projects in developing sustainable business models that are profitable without having to rely on voluntary workers.

The future of individual projects

We asked our respondents to think about the future of their own projects and the importance of various activities in the future. Most of the activities that we listed are considered important by at least half of our respondents.
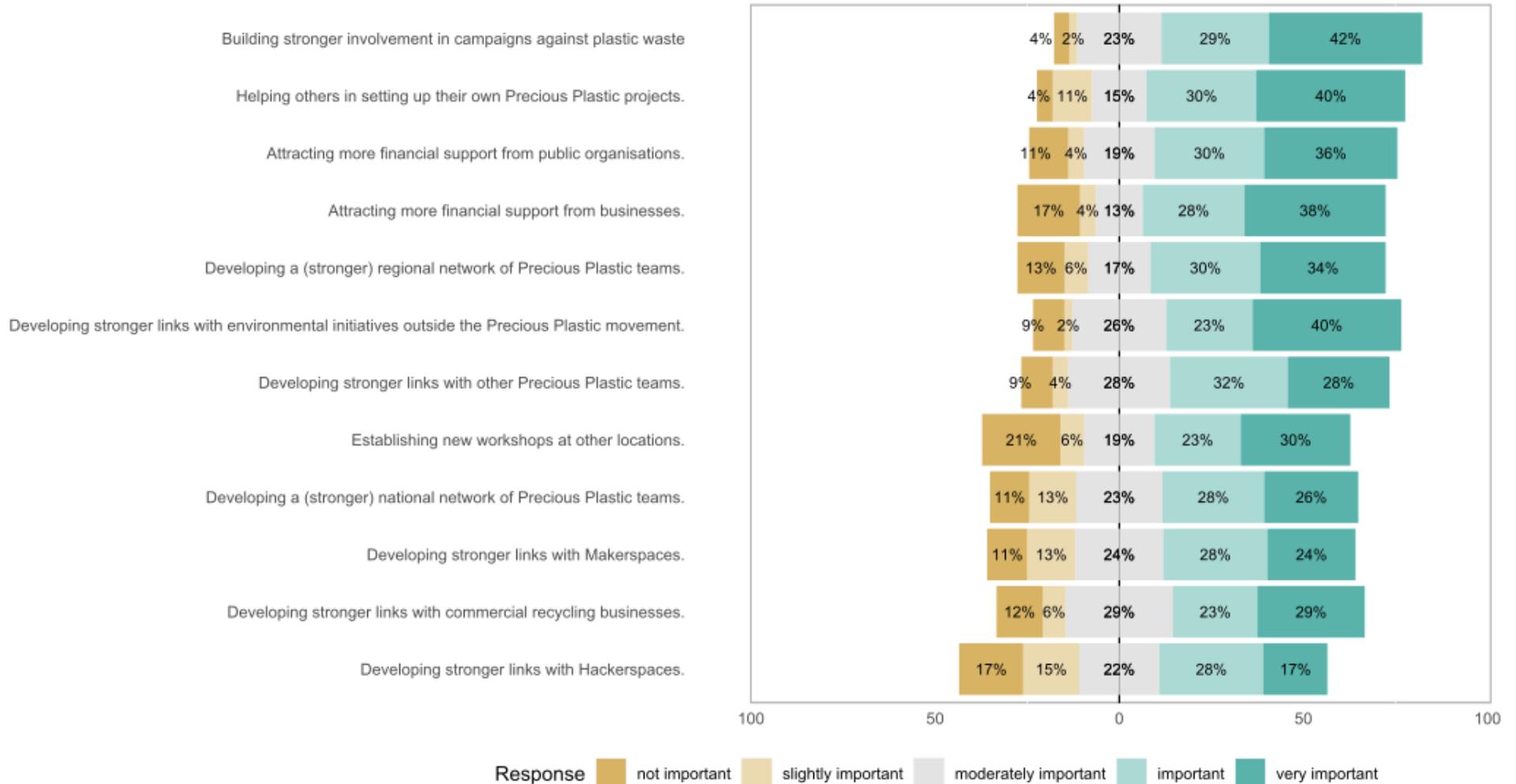

Figure 24. The future of Precious Plastic projects (Likert-scale).

If we rank these activities in the overall importance assigned to them (see figure 24), we see that the top activity relates to the environmental motivations underlying Precious Plastic initiatives (also see figure 12). The second ranking goal relates to helping the further growth of the community. In third and fourth place with see activities related to raising funds, and the remaining activities revolve mostly around different types of networking.

CLOSING OBSERVATIONS

Having briefly discussed the results of the survey, we have a few closing observations based on the results.

Unfortunately, we were only able to gather a small number of responses, although the size of our sample is decent considering the relatively small amount of Precious Plastic workspaces that self-identified as operational at the time of the survey. Even in our small sample, we see a remarkable variety in the characteristics of the projects of our respondents. For example, even though the majority of the initiatives in our sample appear to be informally organized initiatives that are set up at home, we also find initiatives that are run as small commercial businesses, educational projects, artist projects and non-profit organizations. Most of the initiatives are staffed with volunteers, but we also see initiatives that make use of paid staff. The motivations underlying the initiatives vary as well, while environmental motivations are most common. In addition, even from our small sample it is clear that the Precious Plastic community is truly an international community: our sample includes 47 initiatives from 29 different countries, which is a remarkable achievement, given that Dave Hakkens started designing his first machines only 8 years ago.

This shows that the Precious Plastic concept has been highly successful at what the literature on grassroots innovations refers to as 'replication', which involves the reproduction of initiatives in different parts of the world (Seyfang & Longhurst 2016). Moreover, based on our results we hypothesize that this success was achieved partly thanks to the relative ease with which the Precious Plastic concept is integrated into different kinds of initiatives. Already when compiling our list of workspaces to approach we were struck by the diversity in the types of projects that we encountered. We also think the success is due to a highly committed central team that has quickly increased its numbers over its short existence. The team has been quite successful in attracting funding for their activities, but arguably the most important resources have been the time and energy that the members of the Precious Plastic team (by now over 100 people strong) have voluntarily invested in the development of the community. A great deal of this time and energy is devoted on making it easier and more attractive for people around the world to 'jump onboard'. Finally, the open source model that was part of the Precious Plastic concept from the very beginning is likely to have contributed to a relatively quick spread of the concept. Throughout the years, Dave Hakkens and his team have engaged in countless experiments that have contributed to the development and improvement of, among other things, recycling machines, products, and business models. This knowledge and experience has been turned into open source designs and techniques that are freely shared with the community, so that they do not have to figure out all these things by themselves. This significantly lowers the barrier to getting started with the local recycling of plastics. Finally, the vision that underlies the Precious Plastic enterprise as a whole and which started with Dave Hakkens graduation project is in itself a powerful and appealing vision. This

vision includes recasting something that is commonly seen as 'waste' into a precious material, and empowering people take this up anywhere in the world by adopting an open source approach and by developing designs that 'travel' relatively easily.

There are also clear signs in the observations on our sample that many Precious Plastic initiatives are still in their early stages. Most of the businesses in our sample, for example, do not generate enough revenue to pay for a living wage, although we should also note again that only 2 out of our 49 respondents characterize their project as purely commercial. Several of our respondents also indicated that they are still developing their projects and/or products and are not yet fully up and running. We do not believe the Precious Plastic community is alone in this. We see several other signs of the emergence of a broader movement of makers, modifiers and fixers that are taking the responsibility for moving towards circular economies into their own hands. This movement represents a practical approach to environmentalism[8], in which people go beyond campaigning to make a difference in the world, and literally bring alternatives into practice. Here one can also think of various repair movements that have emerged over the years, community farms and an increasing amount of people that acquire machines (for example, 3D-printers) that they use to create their own products that they would previously more likely get from stores.

Unsurprisingly, the Precious Plastic community is also a creative community. This is demonstrated, for example, by the fact that it is very common for our respondents to customize their machines, and that 7 respondents have indicated that they design their own machines. This also means that the Precious Plastic community at large is likely to be a very rich source of knowledge about different types and varieties of plastic recycling machines. We believe there is scope for tapping into this knowledge in more systematic ways than how it was done until recently. The new opportunities that Precious Plastics revised online platform brings for sharing knowledge within the community (introduced as part of version 4) looks like a promising step in that direction. This can become a new way in which the central Precious Plastic team plays the role of intermediary (Hargrieves et al 2013), by learning lessons from the innovations and practical solutions developed by the numerous Precious Plastic initiatives that have been started across the globe, and using these to improve the Precious Plastic concept in ways that benefit the community as whole.

We also believe that this role as a knowledge broker, as well as other roles that can possibly associated with grassroots intermediaries will continue to be important as the community keeps growing. The Precious Plastic community is truly 'glocal' community, by which we mean to say that it largely consist of small local initiatives that, at the same time, form a (largely virtual) global community. Especially the latter aspect of the community, for the time being, will benefit from ongoing efforts of the Precious Plastic team to further develop their virtual platform. Until now, this role has

---

[8] The people that make up this movement are not necessarily environmentalists first and foremost, but their practices often have clear environmental implications.

also been made possible by financial support from the community and from funding awards. We hope this support will continue in the years to come.

ACKNOWLEDGEMENTS

REFERENCES

Charter, M. & Keiller, S. (2014). Grasroots Innovation and the Circular Economy: A Global Survey of Repair Cafés and Hackerspaces. University for the Creative Arts. Available from: https://tinyurl.com/yykk8qcu

Charter, M. & Keiller, S. (2016). The Second Global Survey of Repair Cafés: A Summary of Findings. University for the Creative Arts. Available from: https://tinyurl.com/y4rdouqp.

Hakkens, D. [davehakkens]. (2 February 2017). Precious Plastic - The Story Behind [Video]. Youtube. URL: https://www.youtube.com/watch?v=EPA2l1bi2pQ

Hakkens, D. [davehakkens]. (16 October 2017). Precious Plastic 3 - Fully explained [Video]. Youtube. URL: https://www.youtube.com/watch?v=_zpGnThAM80&t=38s

Hakkens, D. [davehakkens] (7 January 2020). Precious Plastic 4 – Fully explained [Video]. Youtube. URL: https://www.youtube.com/watch?v=thhHoPJ6Y14&t=1153s

Hargreaves, T., Hielscher, S., Seyfang, G., & Smith, A. (2013). Grassroots innovations in community energy: The role of intermediaries in niche development. Global Environmental Change, 23(5), 868–880.

Seyfang, G., & Longhurst, N. (2016). What influences the diffusion of grassroots innovations for sustainability? Investigating community currency niches. Technology Analysis & Strategic Management, 28(1), 1–23