Robotics4EU

Boosting Wider Adoption of Robotics in Europe

STING Pollinator

Citizen Survey Results

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Introduction

This report presents the results of a collaboration between the STING Pollinator project (IT) and the EU-funded project Robotics4EU under grant agreement No 101017283. The collaboration is part of a European wide citizen consultation on validating different robotics business ideas from a societal perspective. In total 11 robotics applications participated in the activity and took part in exploring how citizens can be engaged and give input to the development of new robotic applications.

The assessment of each of the 11 robotic solutions was performed in an online, informed survey style consultation. Here respondents were guided through the survey via an online platform providing them with informative text, pictures or video material and questions about the specific robotic solution. The platform then collected the answers from each of the individual respondents which were further analysed by the Robotics4EU project.

What is the Robotics4EU project?

The citizen consultation presented in this report is part of Robotics4EU, a 3-year project funded under the European Union's Horizon 2020 research and innovation program. The project aims to ensure a more widespread adoption of robots within the areas of healthcare, inspection and maintenance of infrastructure, agri-food, and agile production. To achieve this, the project is advocating for implementation of responsible robotics principles and raising awareness about non-technological aspects of robotics by organising community building and co-creation events bringing together the robotics community and citizens.

Why involve citizens' perspectives in the development of robots?

The collaboration between robotics developers and citizens rests on the core democratic notion that technology with the potential to have a significant impact on how we shape our future society, should not only be discussed by stakeholders, policy makers, experts, or businesses, it should also include opinions of the broader public who most likely will be directly or indirectly impacted by the changes the technology may impose over time.

There are several ways in which robot manufacturers can benefit from engaging citizens in their development processes. While citizens may not possess the technical knowledge required to build a robot, they are experts of the social worlds that new technologies will inhabit, change, or at the very least affect in some way or another. This type of expertise is equally important as professional expertise because it is what ultimately decides whether or not society will accept a new technology. Inviting citizens 'behind the stage' can help make sure that the manufacturers' solutions are aligned with society's expectations and needs. The citizens bring an 'outsider' perspective that can be an effective tool to detect and identify concerns and potential problems that would perhaps otherwise emerge only when the robot is fully developed and on the market. Thus, by adopting inclusive approaches from early in the development process, robot manufacturers will be better equipped to make informed decisions about their products and avoid costly mistakes that may ultimately render their solutions(s) unfit for society.

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STING Pollinator

“The Robot who wants to be a pollinator” is part of the European Initiative on Pollinators, within the STING project (Science and Technology for Pollinating Insects) by the European Commission.

The robot has been programmed to monitor biodiversity by observing insects and flowers in the field via cameras and sensors. The robot is in the very early stages of development and is what we call a prototype. Currently the robot gets assigned a farmer as its host. The farmer then places the robot in the field where he/she thinks it’s worth monitoring biodiversity. But in the future the robot is supposed to navigate by itself in the field.

The results of the robot’s monitoring can be used to give researchers insights into the current level of biodiversity in certain areas without them having to spend several days in the field. These results can then be transferred to the farmers helping them to identify how they can improve biodiversity in their fields.

The robot is a rover equipped with two different cameras. One camera is capturing the landscape around the robot and streaming the video to YouTube. The other camera is pointing at flowers, monitoring the visiting insects, and recognizing pre-categorized pollinators through an autonomous insects monitoring system.

The robot will spend all day observing the flowers blooming in the field, and with its camera it captures all the insects visiting the flowers.

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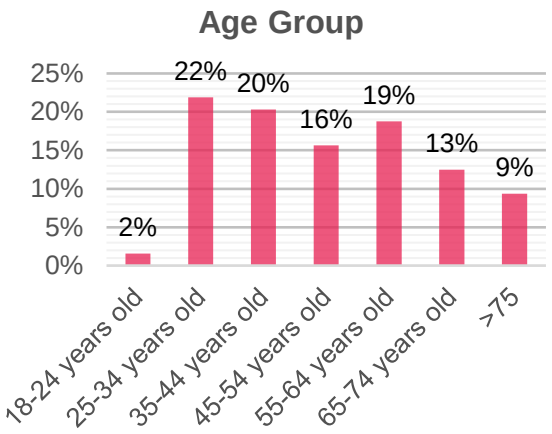
Demographics

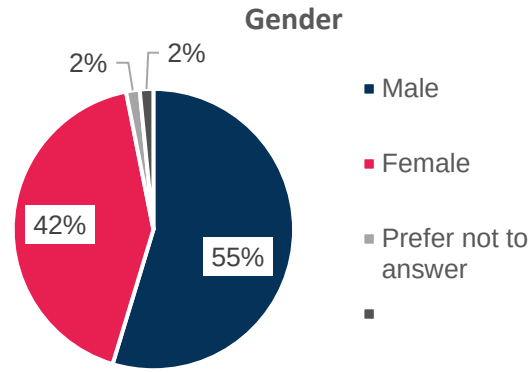
A total of 65 respondents answered the survey. The largest age group were respondents between ages 25-34, accounting for 22% of the total answers. Following this group, ages 35-44 were the second largest, accounting for 20% of the total answers. The rest of the groups saw the following distribution: Ages 45-54 years old accounted for 16%, ages 55-64 for 19% and 65-74 came to 13%. The categories with the fewest answers were ages 75 or older with 9% and 18-24 with only 2%.

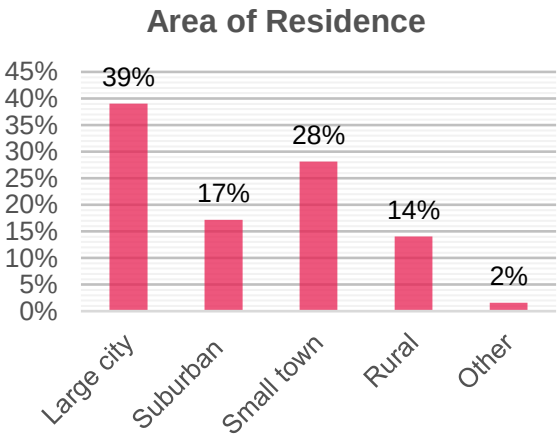
Gender distribution was divided between 54% male and 42% female, while 1% chose not to answer.

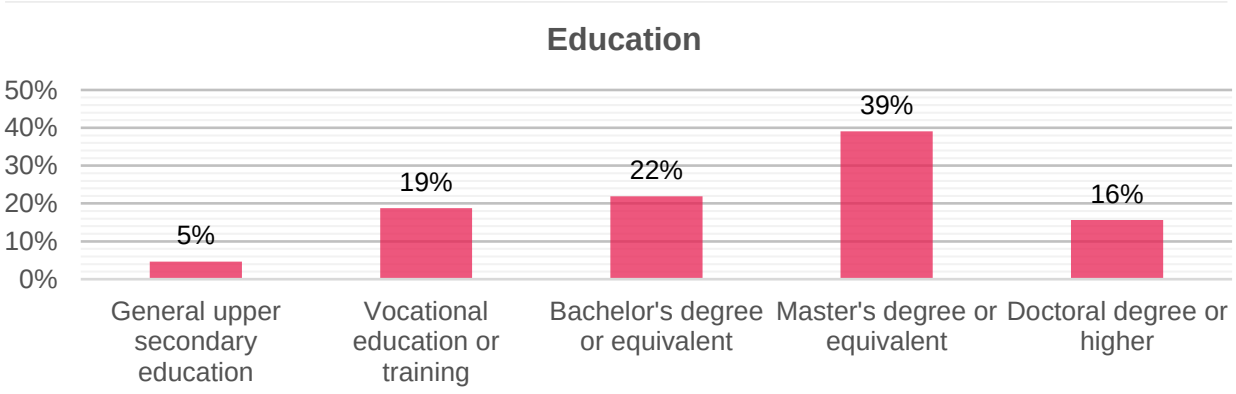
Looking at the distribution of areas of residence, the largest represented group of respondents were from large cities, accounting for 39%. Following this group 28% answered that they lived in small towns. 17% answered that they lived in suburban areas while 14% answered that they lived in a rural area.

The respondents that answered this survey were generally highly educated with 39% answering that they held a Master's degree or equivalent and 22% answering that they held a bachelors' degree or equivalent. 16% answered that they held a doctoral degree or higher.









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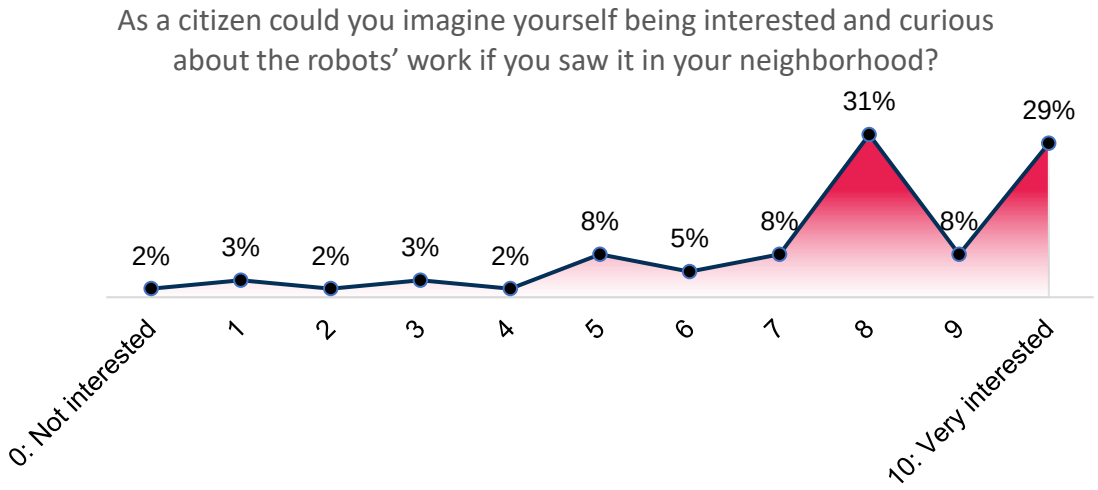
The survey received answers from at least 9 different countries, with Denmark coming in at the top with 39% of the total answers. Following this, France accounted for 17%, followed by Lithuania with 10% and Norway with 6%. 17% of respondents chose not to disclose from which country they came. Citizens from both Central and Eastern Europe, Northern Europe, Southern Europe, and Western Europe have answered the survey indicating a diversity across Europe.

These specific demographics may influence the answers and tendencies described in the report. However, when reading through the responses it is important to be aware that these results are not statistically representative, but indications of people's individual opinions which can be used as valuable input to the further work of the company's robotic solution.

Survey Results

Question 1: As a citizen could you imagine yourself being interested and curious about the robots' work if you saw it in your neighborhood?

Respondents were asked to rate the first question on an 11-point scale from 0-10 with 0 being 'Not interested' and 10 being 'Very interested'. Here, the responses were generally very positive, with respondents answering mainly in the high end of the scale, as can be seen in the figure below:



Several respondents also used the option to elaborate on their answer. Here, one respondent mentioned how the robot might be used to increase general interest in nature and biodiversity, by stating that:

> *"In my opinion, it would also attract the attention of people usually uninterested in nature and insects, who could become curious and enthusiastic through the robot".*

More respondents mention that the robot has the potential to engage citizens that might not normally be interested in these specific areas by bringing knowledge about nature and insects to local environments.

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Furthermore, this type of technology has the potential to assist humans in fighting the climate problems that we face, as one respondent argues:

"With the general climate problem we face, any help is beneficial and technology is in many ways superior to humans in e.g. endurance, sensitivity".

The quote above show how fighting climate change and generating knowledge and focus on biodiversity can be aided using unyielding and highly specialised and sensitive robotic technology.

Question 2: How would you like to communicate with the robot? E.g., if you were to suggest a new place it could monitor or explore

Secondly, respondents were asked to consider how they would prefer to communicate with the robot, for example if they were to suggest a new area that the robot could monitor. Respondents were asked to choose the 3 options that they preferred, in no particular order.

Here, the most chosen answer was the option to communicate with the robot via an app or a website, which received 32% of the total votes. As many are already familiar with using apps and/or websites for similar interaction with different technologies, this answer is not surprising. Furthermore, it might also be because many always have their phone at hand - also when walking in nature - making it an obvious tool for suggesting new places for a robot focusing on biodiversity to explore.

Following the option to communicate with the robot via an app or website, the second most chosen option was 'I would prefer to be in contact with a person responsible for the robot' with 26%. Having someone with knowledge and expertise act as the arbitrator between the robot and interested citizens could help engage more people as it might make it easier for them to partake in the projects that the robot is undertaking. One respondent mentioned that:

"Straightforward communication could easily take place via tablet, but there may be situations that require human interaction".

Comments such as this goes to show that even though it can be made easy to communicate directly with the robot, human interaction might sometimes be necessary as well.

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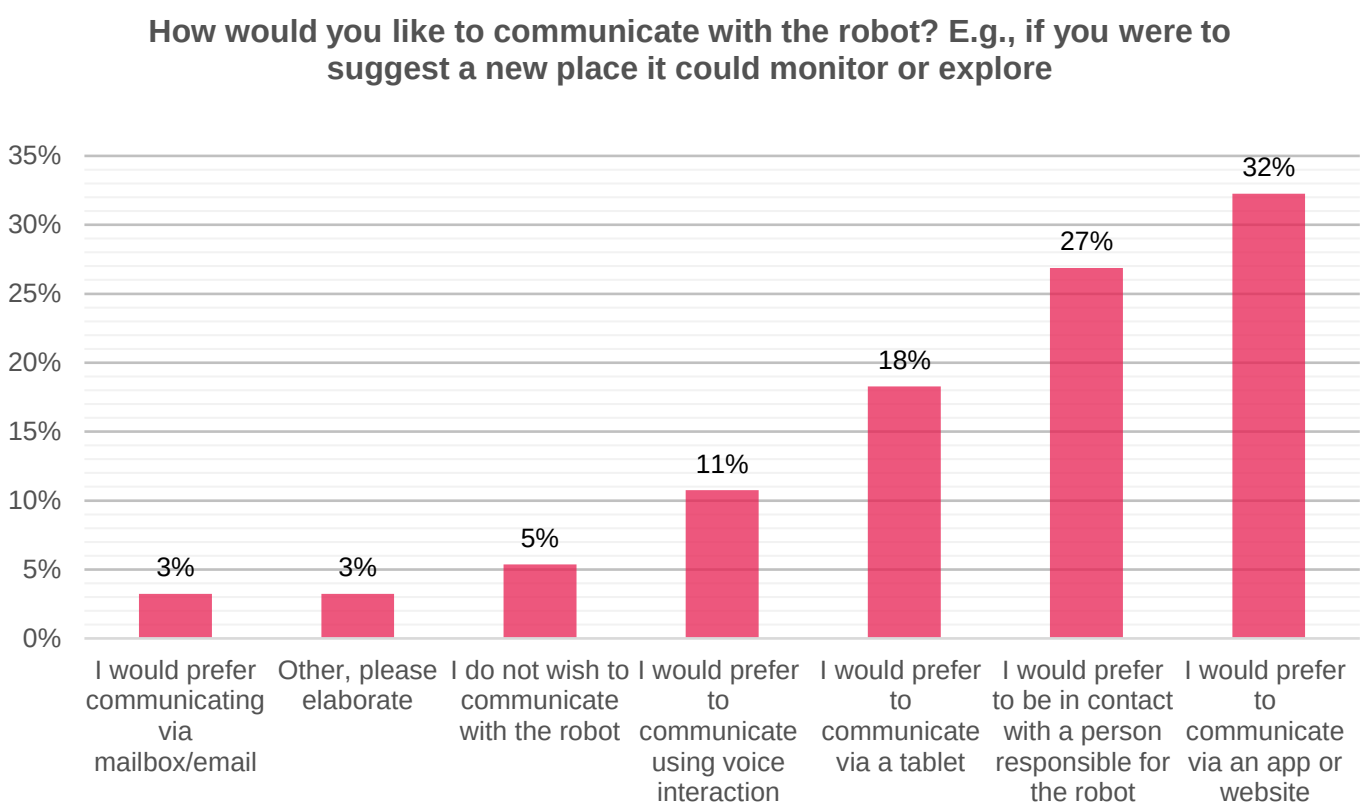
The answer “I would prefer to communicate via a tablet’ was the third most popular answer with 18% of the total votes. For a full overview of the distribution of answers, see the figure below:



A few respondents mentioned worries towards communicating with the robot. One such worry was how the robot should prioritise between the many different inputs given to it. For example, how can the robot choose between different options if several citizens each suggest a myriad of different places that the robot should go and investigate the biodiversity. Another respondent questioned how the robot will be able to know where to go when instructed. Perhaps, the robot might need to have some sort of database of known locations or access to online map services that charts the local area that the robot is able to work in.

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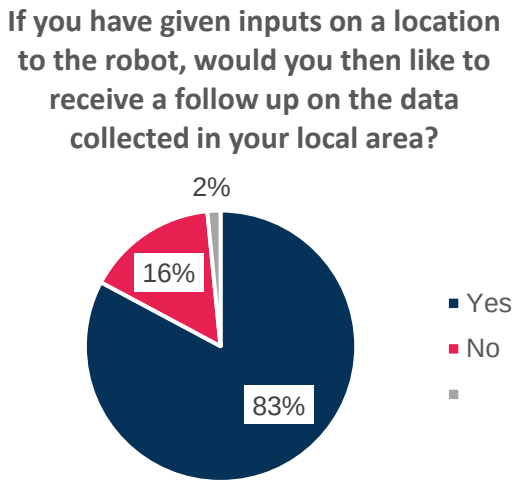
Question 3: If you have given inputs on a location to the robot, would you then like to receive a follow up on the data collected in your local area?

When asked about continuous inclusion regarding the findings and data collected by the robot, respondents were very positive with 82% answering that they would like to receive this kind of follow up information about their local areas.

For example, respondents mention that: *"It would be interesting to know the results of the monitoring of the recommended location"* and that if they themselves have suggested an area for the robot to inspect it is because they think that it would also be worthwhile to know the results, one respondent stated that: *"If I have suggested a location, it is because I think there might be interesting sightings"*. These answers give here provides an indication towards the potential of this specific type of robotic solution, namely that it can help spark an interest in the local biodiversity and nature of citizens.



Furthermore, the distribution of answers suggests that people who find themselves interested enough to engage with the robot and suggest places that it could potentially explore are also people who will then want to be engaged further and receive follow-ups on the data collected and the findings made by the robot. One participant mentioned that: *"[it] could be interesting to find out if the proposed site had a high biodiversity"* whilst another mentioned that naturally it could be very interesting, but it should also be something that can be customized, i.e., it was also very important for users to get the possibility of *"[...] having a choice about the areas I want to follow".* It is clear from the responses that they have a desire to be engaged with follow-up information, but they want the choice to limit this information to that which they find most important and relevant.

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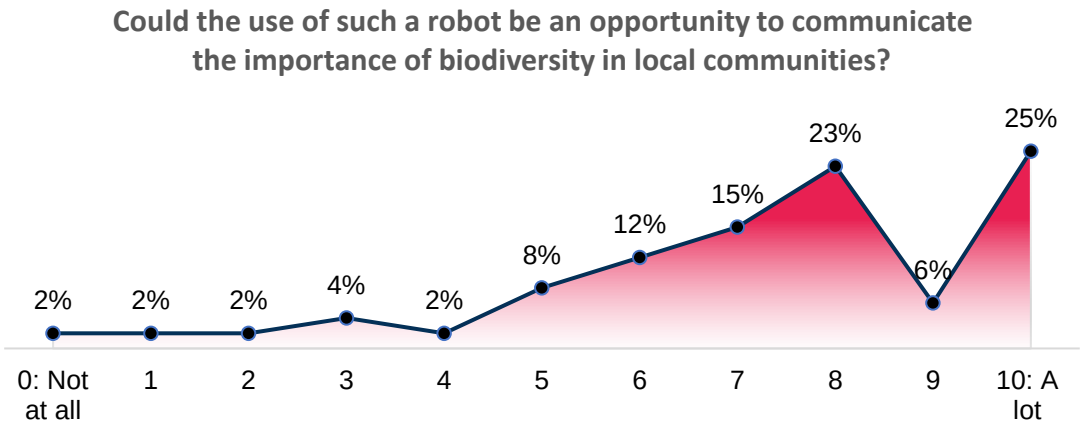
Question 4: Could the use of such a robot be an opportunity to communicate the importance of biodiversity in local communities? For example: Do you think having a robot monitoring biodiversity in your neighborhood would engage you to learn more about the topic of biodiversity?

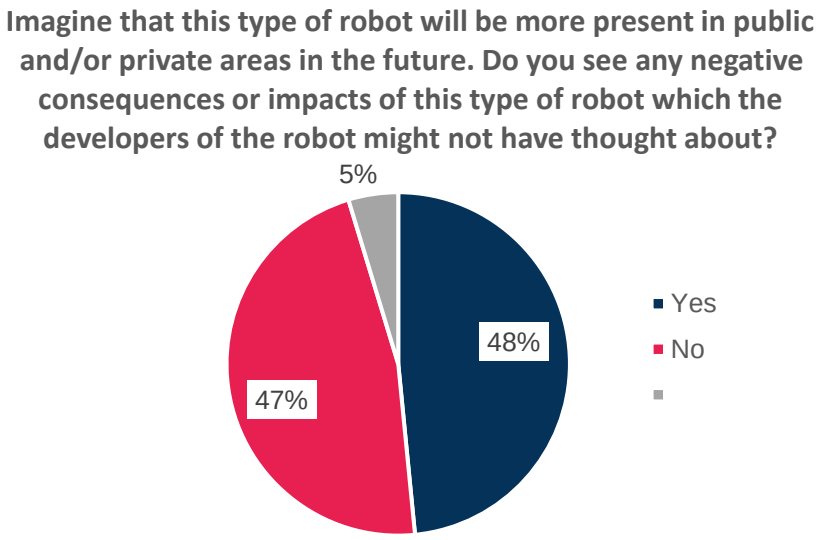
Here respondents were asked to place their answer on an 11-point scale from 0-10. It was clear that respondents were overwhelmingly positive towards this idea as most of the answers were placed in the high end of the scale. See the figure below:



The distribution of answers to this question comfirms the previous indications, namely that respondents see a great potential in robotic soltuions such as STING.

Question 5: Imagine that this type of robot will be more present in public and/or private areas in the future. Do you see any negative consequences or impacts of this type of robot which the developers of the robot might not have thought about?

Even though there is a very positive attitude towards this robot in general, respondents still think that there might also be some negative consequences that could follow if these kinds of solutions are expected to become widely integrated into society.



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When asked whether there might be any negative consequences or impacts that robot developers might not have thought about, 48% answered 'Yes' while 46% answered 'No'.

For this question, a lot of respondents chose to elaborate on the reasons for their answers. The worries mentioned here can be divided into 3 different main categories.

1. Collection of data:

As with many other technologies that utilise camera equipment, respondents worry about how, why, and who collects the data that the robot is going to be gathering as it is working. This particular worry was expressed by a respondent stating that:

"It might autonomously take a position that could be considered invasion of privacy. Is the area going to be labelled as CCTV area or similar?"

Here, the worry is that by using this type of technology we might inadvertently create a society with unnecessary surveillance and monitoring of individuals without their consent. This type of worry was expressed by multiple respondents as one also states that: *"Monitoring of private individuals"* is something that might be a potential negative consequence and therefore something that should be taken very seriously.

2. Impact on nature:

Even though the aim of the robot is to monitor biodiversity and insect life, some respondents worry about the negative consequences of doing exactly this. As mentioned by one respondent:

"The robot can be a disturbance to the insects it is trying to detect, which in turn can distort the results of the detection and have a negative impact on biodiversity"

Others mention that it might scare birds or other animals away - subsequently impacting the biodiversity and skewing the results that the robot is trying to monitor. The general worry is that placing a robot such as this will interfere with the species in the area - both large and small.

A focus group interview conducted among the participants of the Robotex International festival reveals that people are used to different machines in agriculture. *"On the field, you're actually used to maybe a little more robust machines anyway. There, this one doesn't scare you anymore, one way or another, they don't cause so much uncertainty and generally don't cause as much emotion"*

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3. Vandalism:

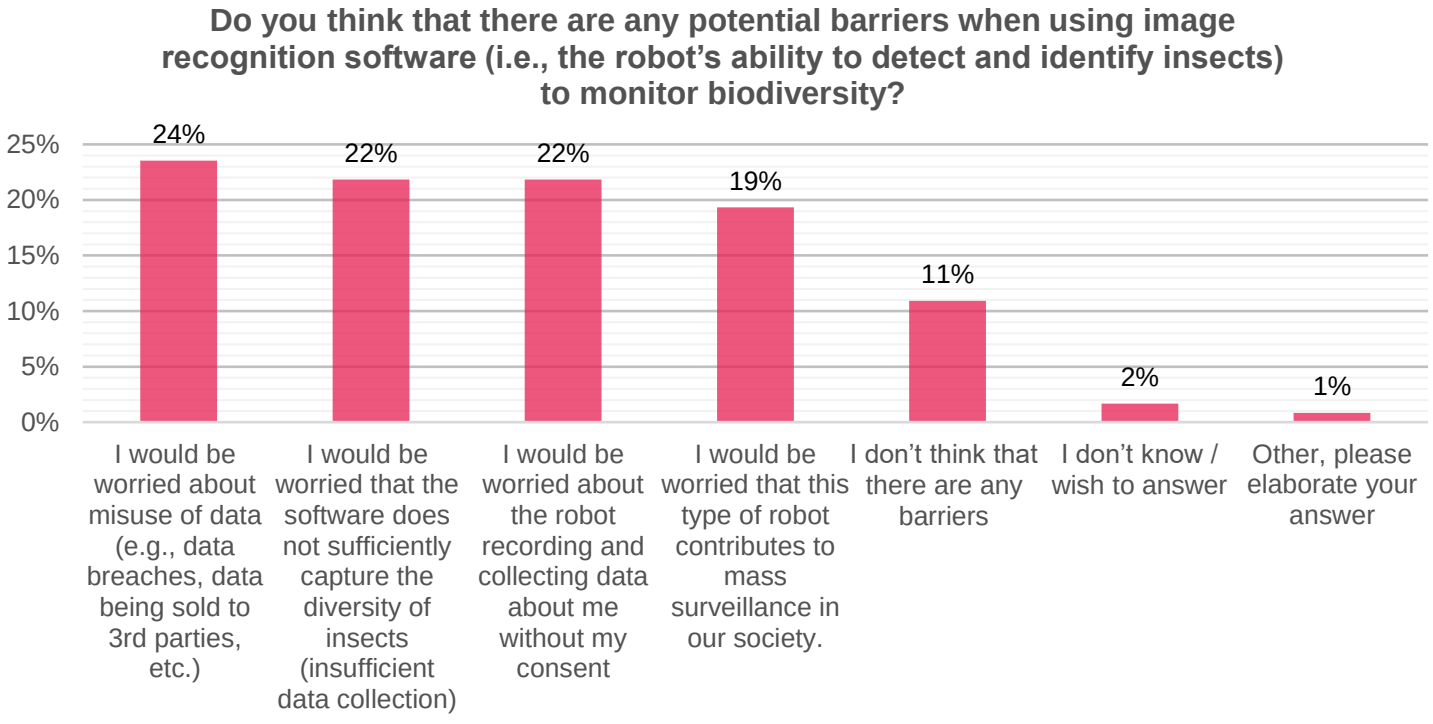
Other respondents worried about potential vandalism towards the robot. This worry is not concerned with how the robot functions or collects data, but rather a worry *about* the robot itself and how it might be treated by people. One respondent mentioned the possibility of equipping the robot with a hidden GPS to prevent theft and/or destruction of the robot. However, while some were concerned about vandalism, others did not see any problems, arguing that we are increasingly becoming used to the presence of robots in our everyday lives.

A focus group interview conducted among the participants of the Robotex International festival also indicated that "It seems so delicate, yes. Even the wind can take it away."

Question 6: Do you think that there are any potential barriers when using image recognition software (i.e., the robot's ability to detect and identify insects) to monitor biodiversity?

Here, respondents were asked to consider what barriers they might see towards utilising image recognition software to monitor biodiversity. Respondents were able to select multiple answers in a non-prioritized order.

An interesting finding here is that almost every answer received the same amount of attention from the respondents, which indicates that there are many equally important barriers that will have to be considered when developing robotic technology that makes use of image recognition software and will be used in public areas, see the distribution below:



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Once again, it can be argued that there is a general fear of this kind of robotic technology contributing to a society where mass monitoring becomes widespread. One respondent argues that if such technology is to be used in public spaces, then:

"The software and hardware should be open source. The data collected should be publicly available and easy to access."

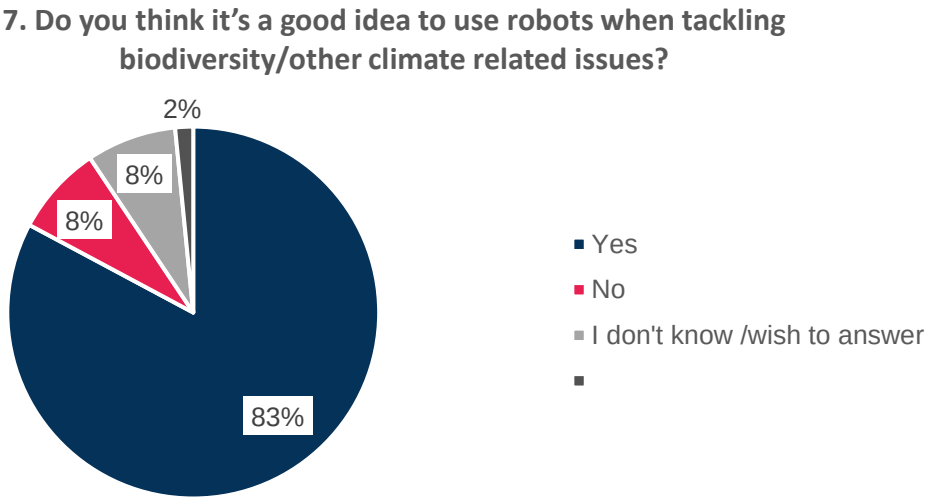
This sentiment echoes the often-mentioned call for transparency of technological solutions, a type of argument that is often used in discussions on new robotic technology as an arbiter for increasing trust resting on the notion that the more can be known about a certain thing and how it works, the more likely people will be to accept and trust it.

Apart from the worry concerning surveillance and monitoring in public spaces, there was some concern about the robot's ability to sufficiently capture the necessary and relevant data. Here, one respondent mentioned the physical dimensions of the robot as something to be considered. Namely, that the area the robot is currently able to investigate might be too narrowly defined and that for example increasing by the height the robot might be able to discover and monitor even more interesting biodiversity.

Another worry is whether the software is adequately able to detect specific types of insects without mistaking them for other, similar looking insects and that this might cause problems regarding data collection and analyses.

Question 7: Do you think it's a good idea to use robots when tackling biodiversity/other climate related issues?

The final question sought to uncover the feelings that respondents have towards the use of robotics in matters concerning climate and biodiversity. Respondents had the option to answer either, 'Yes', 'No' or 'I don't know' as well as an option to elaborate on their answer. The answers to this question were overwhelmingly positive with 83% of the respondents answering 'Yes'. 8% answered 'No' and 'I don't know'.[1]



[1] The remaining 2% did not answer.

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Some respondents also used this opportunity to elaborate on why they either thought it to be a good idea or not to utilise robots for this kind of purpose. Respondents highlighted several possible upshots of a wider adoption of the STING robot.

One respondent mentions that even though technology might not be the answer to everything, robots can play an important part in addressing climate issues:

> *"I don't believe in techosolutionism [sic][2], but I do think that robots and AI, used intelligently, can multiply our positive impacts on global issues"*

Others mention the vast amount of data that can effectively be collected and processed by robots and the fact that robots can potentially work 24 hours a day and can be more enduring than humans. Furthermore, there seems to be a general optimism towards the endeavour and even though the solution or others like it will not be able to solve all the many problems related to climate, nature, and biodiversity, they can be very excellent starting points.

Conclusion

In summary, the responses suggest that there is a good level of interest among citizens. Respondents noted that the presence of robots in the community could increase interest in nature and biodiversity, and that the technology could assist in fighting climate change. The use of robotic technology was seen as a beneficial way to engage citizens and bring knowledge about important environmental issues to local environments. Respondents also indicated that they were interested in receiving follow-up information about data collected in their local area. Additionally, the majority of respondents see a great potential in robotic solutions to communicate the importance of biodiversity in local communities and to engage with the topic of biodiversity and nature in a meaningful way. However, there were also some concerns about the potential negative consequences of using robots in public areas, such as data collection and privacy concerns, impact on nature and biodiversity, and potential vandalism. Therefore, it is important for developers and policymakers to consider these potential negative consequences when incorporating robots into society to ensure that they are used in a responsible and effective way.

[2] Techno-solutionism is often referred to as the belief that all problems can be solved by technology, or that applying technological solutions will change society for the better.

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consortium

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