



CITIZEN SCIENCE INITIATIVES IN SOUTHEAST AND EAST ASIA

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Citizen Science in Southeast and East Asia
Prevent and Reduce Urban Pollution from Toxic Chemicals



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Introduction

Roughly 70% of the world's urban population lives in developing countries. And in these areas, communities are disproportionately exposed to toxic chemicals, with marginalized and vulnerable groups, such as pregnant women and children at greater risk. Toxic chemicals have been linked to disturbed immune response and other serious illnesses (Vrijheid et al. 2016).

The International Pollutants Elimination Network–Southeast and East Asia (IPEN-SEA) held a virtual regional conference last November 2020 focusing on citizen science and its role in preventing and reducing urban pollution from toxic chemicals. The virtual conference was co-organized by EcoWaste Coalition Philippines, EARTH Thailand, and Nexus3 Indonesia and supported by the Stockholm Environment Institute (SEI) and IPEN.

Resource speakers shared inspiring citizen science initiatives in the region that addressed pollution in urban areas related to sustainable development goals 3 (good health and well-being), 5 (gender equality), 6 (clean water and sanitation), 11 (sustainable cities and communities), 12 (sustainable production and consumption), and, 17 (partnerships). This e-book features ten (10) citizen science initiatives conducted in Southeast and East Asia. Five of the initiatives were presented during

What is Citizen Science?

Citizen science can be a hot topic within research circles, especially when defining what it is. It also goes by many names, which can also confuse an already hard-to-define subject: community science, civic science, participatory monitoring, participatory action research, community-based monitoring, and volunteer monitoring. There has been some debate about its name and definition. The consensus is that citizen science refers to non-professional scientists taking on scientific research and monitoring tasks.

According to Dr. Rachel Pateman, Researcher at the Stockholm Environment Institute based in the United Kingdom, there is a wide range of approaches towards conducting citizen science. In her presentation at the IPEN-SEA Virtual Conference 2020, she also emphasized how citizen science can contribute towards the Sustainable Development Goals, including applications in urban environments.

One common definition is categorizing projects as contributory, collaborative, or co-created, depending on the stages of the scientific process that the citizens conducting the project are engaged in.

Contributory projects are those where citizen scientists are only involved in collecting data submitted to project leaders for analysis and interpretation and disseminating results. These are also known as top-down projects because professional scientists or project leaders often define the research questions and methods. In these projects, citizen participation is either active or passive, depending on the data collection methods used.

More active methods include those where the participants are, for example, making observations of species or collecting

during IPEN-SEA virtual regional conference. The other five were just recently completed with SEI's generous support and amid the still raging pandemic.

These stories show that:

1. Ordinary citizens can play an integral part in conducting scientific projects.
2. That citizen-sourced data can be a reliable and relevant basis for policy action.
3. That communities who have a stake in determining and ensuring their safety also take a more significant part in stewarding their future.

We hope you find inspiration in these stories, dear readers!

water samples. On the other hand, passive participation can consist of situations where data is collected via mobile phones, sensors, or other methods without the participants' active engagement.

Meanwhile, collaborative projects involve citizens more in the scientific process, including participation in data analysis or the presentation and communication of findings to the public.

Lastly, co-created projects are those that take a more grassroots approach to conduct the scientific process. Co-created projects are more of a 'bottom-up' method. Citizens are involved in all the scientific process stages, but most notable in the design phase, where they take active roles in setting research questions and methodology. These projects are often conducted on a local scale to address local needs. The resources required for in-depth engagement also precludes working on these types of projects on a larger scale.

A variant of the co-created project is the citizen-led project. There is minimal to no involvement of professional scientists.

These approaches aim to involve citizens in the conduct of research that could benefit their communities. Their lived experience of events and situations gives them a unique insight into what interventions are needed to rectify the environmental issues they face in their homes or workplaces. Involving citizens also respects native, on-the-ground knowledge that residents might have, which visiting teams of scientists may not be aware of.

Dr. Nina Iszatt of the Norwegian Institute on Public Health in her presentation at the IPEN-SEA Virtual Conference 2020, emphasized that strongly participatory citizen science efforts generate data that can increase the negotiation power of people fighting pollution. Data generated within a framework that puts communities at the center contributes to combining knowledge and action for social change.



EARTH collaborated with the "Bucket Brigade" air monitoring expert from 2003-2006, and organized a field training on how to get air samples using the bucket tool.

Increasing Transparency in Industrial Pollution Management in Thailand

Between 2003-2006, the Campaign for Alternative Industry Network (CAIN), the former name of the Ecological Alert and Recovery – Thailand (EARTH), an environmental non-government organization based in Thailand, conducted an air monitoring project in the petroleum refining and petrochemical industrial area in the central region of Rayong Province of Thailand. Their goal is to expose unsustainable and harmful industries and discover real answers as to what people living close to petrochemical plants breathe in every day.

To achieve this, EARTH collaborated with a "Bucket Brigade" air monitoring expert from California, U.S.A., and Greenpeace Southeast Asia to grasp the air samples by the bucket tool for chemical analysis. In the process, they organized air monitoring training for staff and active citizens in the affected communities. They also conducted field and desk research about the environmental and health impact on the residents. All the collected air samples were then carefully analyzed by the specialized laboratory in the U.S. for the presence of toxic chemicals and particulates. The laboratory results shocked the research team. "Our team found that the air samples contained numerous toxic and cancer-causing substances. The fact effectively uncovered the situation of the extremely dangerous levels of hazardous air pollution present in residential areas. Most of the findings include the chemical *benzene*, a known agent that causes human cancer.



A neighborhood in Rayong Province in Thailand where people live and breathe near petrochemical industries.



EARTH provided environmental monitoring training and conducted back-up research and action research to advance citizen science.

EARTH also detected *vinyl chloride* in the two samples, which exceeded the air screening level by as much as 86 times. Some of the other known probable human cancer-causing agents detected were *1,2-dichloroethane (EDC)* and *chloroform*. Based on the results, there were 20 different toxic chemicals in the five air samples and 6 to 12 volatile organic compounds (VOCs) and sulfur compounds in each sample.

Actions and Policy Advocacy for Quality Air

EARTH and the affected communities started community outreach and policy advocacy when they got the research results. They produced monitoring reports and submitted them to the government. They also made educational materials that give the communities a better understanding of how the compounds affect different parts of the body. They also organized a press conference and presented their research results to the public. EARTH and the communities used the research results to negotiate with the polluters and regulators and demand air emissions improvement.

"In October 2006, Thailand's Pollution Control Department conducted their own volatile organic compound monitoring. Later on, the government issued a notification on the annual screening level of 9 highly toxic compounds. This is the first time in Thailand that we have this kind of notification by the government to keep on monitoring volatile organic compounds," said Director Penchom Saetang. EARTH continuously monitored the air quality in this area until 2009. Finally, they succeeded in establishing the official air monitoring system and the volatile organic compounds (VOCs) management in the central Rayong. Later, the official VOC management project expanded into other industrial areas.

Expanding Citizen Science Projects

EARTH has expanded its citizen science project and established the Citizen Science in Protecting Environment and Health in 2015. "We have now expanded our work to more areas involving more citizen science volunteers. We have strengthened people's participation in environmental and health protection. We have also shown how citizen science plays an important role in promoting sustainable development goals," shared Director Penchom Saetang.

Find out more about EARTH's citizen science initiative [here](#).



Nexus3 Foundation monitored mercury concentration at several points in their partner hospitals.

Monitoring Indoor Mercury Vapor in Hospitals in Denpasar City, Indonesia

According to the World Health Organization, exposure and mercury consumption that exceeds the safe limit damages the nervous system, brain, reproductive, digestive, and immune systems. In Denpasar, Bali, Indonesia, mercury-containing devices are still widely used in healthcare facilities. Mercury can be released into the environment due to breakage or leakage of devices or evaporate when formed or cast as dental fillings.

Continuous exposure to mercury vapor for long periods can be harmful to health workers, dentists, patients, and visitors. Nexus Foundation for Environmental Health and Development or Nexus3 Foundation (previously known as BaliFokus Foundation) is a non-government organization that works with stakeholders to safeguard the public, especially vulnerable populations, from impacts of development to their health and environment towards a toxic-free and just, sustainable future.

Nexus3 Foundation aimed to monitor the mercury concentration of their hospital partners from the Mercury-free Healthcare Sector and Sustainable Medical Waste Management Program. They also monitored the effectiveness of the mercury-containing medical devices elimination program while also conducting a baseline study on the mercury concentration in indoor air at the partner hospitals. Lastly, Nexus3 Foundation provided recommendations on improving each hospital's action plan to reduce and eliminate the use and purchase of mercury-containing medical devices.

Krishna Zaki, Program Manager of Nexus3 Foundation, said that they applied citizen science to ensure their success. "We think that our target groups lack awareness about the harms of the use and exposure to mercury-containing medical devices. Second, there is still widespread use of mercury-containing medical devices in various healthcare facilities in Denpasar. And third, we believe that healthcare workers are most at risk of being exposed to harms of these mercury-containing devices."



One of the challenges Nexus3 Foundation faced was that some health workers lacked awareness about the harms of mercury-containing medical devices.

Nexus3 Foundation used Lumex RA-915+, a portable mercury analyzer, to measure mercury vapor concentration in the air, including ambient air, natural gas, and industrial emissions. Nexus3 Foundation used the equipment in hospitals with the following criteria: dental clinic, nurse station, equipment workshop/storage, hospital facilities, and public places (waiting room).

However, they still faced lots of challenges, especially in handling the portable mercury analyzer. It is worth noting that even the health workers lack awareness about the harms of the use of mercury-containing medical devices and their reluctance to switch to non-mercury medical devices due to accuracy concerns.

Through the citizen science initiative, Nexus3 conducted monitoring of 103 sample points in 10 hospitals in Denpasar. From the 103 sample points monitored, approximately 90.29% of mercury concentration measurement results were below the threshold limit of 1,000 ng/m³, and 8.74% of measurement results were ranges between 1,000 to 10,000 ng/m³ (alert level). One sample point or approximately 0.97% of measurement results was above 10,000 ng/m³. The sample point is in Sanglah Hospital's Calibration Room, which was detected with 17,280 ng/m³, or about 17 times from the safe limit. This finding was caused by the recalibration and repair of broken mercury sphygmomanometers conducted in that room.

They also created awareness of the harms of mercury exposure from broken or leaking mercury-containing medical devices. Their partner hospital's management was encouraged to develop an action plan to reduce and eliminate the use/purchase of mercury-containing medical devices in each hospital. The more important result is that the Ministry of Health issued a policy to withdraw mercury-containing medical devices, including mercury dental amalgam fillings.

Find out more about Nexus3 Foundation's citizen science initiative [here](#).



CAP team conducted several public awareness campaigns to increase understanding on the harmful effects of lead in children and how these are present in several urban playgrounds across Penang and Kedah, Malaysia.

Monitoring Lead in Public Playground Equipment in Urban Areas in Penang and Kedah, Malaysia

The Consumers' Association of Penang, or CAP, applied the citizen science approach to generate data on lead concentrations of paints in playground equipment and to raise public awareness about the presence of lead paint hazards in children's playgrounds.

"Over the years, we found lead to be present in a wide range of products such as paints, cosmetics, and foods. That is why we decided to test paint chips from playground equipment for the amount of lead present," said Hatijah Hashim of CAP. Lead has a detrimental effect on children.

In 2019, CAP visited ten playgrounds in the states of Penang and Kedah in Malaysia. Their team gathered chipping paint from 17 playground equipment and have observed and documented the whole process. Using handheld XRF Olympus Delta Set equipment and working with EARTH Foundation in Thailand, they analyzed the results.

Results showed that 13 out of 17 samples contained an excessive amount of lead. The highest detected lead level was 620,000 parts per million in a piece of yellow multi-layered playground equipment in Georgetown, Penang, Malaysia.

CAP then raised awareness of these shocking results and warned people and their children on the lead presence in Penang's playgrounds. CAP organized a lot of advocacy work, media coverage, and even outreach to other civil society groups.

As a result of the campaign, the Landscape Department of the Penang Island City Council approached CAP to discuss a way forward. In their November 2019 meeting, the department had several queries on new procurement, abatement measures during removal of lead paint, and scrapped paint waste disposal. CAP worked with their partner



CAP team monitored lead presence in public playground equipment in several playgrounds in Penang and Kedah, Malaysia.

IPEN or the International Pollutants Elimination Network on recommendations on the steps to be taken and recommended to government authorities.

Campaign Outcomes

Even with the slow formulation of lead paint regulation/standards, CAP has been successful in its citizen science project to raise awareness of the issue. Malaysia has a mandatory safety standard of maximum acceptable migration of lead in paint of not more than 90ppm for children's toys, age 14 and below, and is now working on a lead paint standard.

Find out more about CAP's citizen science initiative [here](#).



EcoWaste Coalition has raised consumer and regulatory awareness based on the data generated. They have also notified government regulators and encouraged them to act in banning mercury-added skin whitening products.

Tracking Illegal Trade of Mercury-Added Skin Whitening Cosmetics in Key Cities in the Philippines

In the Philippines, skin whitening is a big business. The manufacture, sale, and use of skin bleaching, lightening, or whitening products is common in many countries from Southeast and East Asia. But everyone is aware that mercury, a dangerous chemical to the body, is used in skin-lightening cosmetics to inhibit or prevent melanin production. Mercury and mercury compounds in cosmetic product formulations are not allowed under the ASEAN Cosmetic Directive.

EcoWaste Coalition, a non-profit environmental health network of over 140 public interest groups, looked into the trafficking of illegal skin whitening products that use mercury in key cities in the Philippines.

Mercury is a chemical element that can pollute the household environment, contaminate the natural environment, get into wastewater, and eventually pollute the food supply. Through the citizen science approach, they conducted a study and found mercury-added skin whitening products being sold in 50 cities across the country. From the study, out of the 355 samples screened for mercury, 316 samples representing 67 brands had mercury above the trace amount limit of 1 ppm. EcoWaste conducted several periodic test buys and took discreet photos of the prohibited products. They have also raised awareness of chemicals and wastes on the manufacture and sale of skin whitening cosmetics with mercury content.



EWC has raised consumer and regulatory awareness based on the data generated. They have also notified government regulators and encouraged them to act in banning mercury-added skin whitening products.



"Our advocacy has provided opportunities for members, volunteers, and staff to get more knowledge and understanding on the issues with mercury-added skin whitening products. We have provided evidence of the availability of the illegal trading of these skin whitening products to justify law enforcement and regulatory measures," said Thony Dizon, Chemical Safety Campaigner of EcoWaste Coalition.

Successes

Because of their efforts, they have increased public awareness of the issue. From 2010-2018, the Philippine Food and Drug Authority banned over 135 skin whitening creams with mercury content above 1ppm. Their campaign and advocacy efforts have led to government units confiscating non-compliant products and adopting measures to ban mercury-containing cosmetics. Quezon City, one of the biggest cities in the Philippines, adopted an ordinance prohibiting the distribution and sale of mercury-laden cosmetics through the EcoWaste Coalition citizen science campaign.

Through their continuous efforts, EcoWaste also elevated the illegal trade of mercury-added cosmetics as a public health issue through various media stories and products. Recently, their study was featured in Bloomberg Businessweek's "No One Knows How Many of the World's Skin-Lightening." They were able to forge constructive relationships with other stakeholders, including dermatology professionals, toxicologists, and the cosmetic industry association.

"Our continuing efforts should also help our government and people in meeting the requirements of the Minamata Convention on Mercury and our country's National Action Plan for the Phase-Out of Mercury-Added Products and the Management of Associated Mercury-Containing Wastes," said Thony Dizon.

Find out more about EcoWaste Coalition's citizen science initiative [here](#).



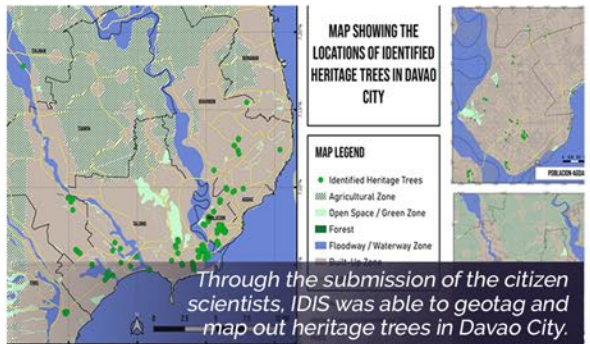
Thirty-eight (38) citizen scientists voluntarily signed up to geotag and profile trees within Davao City.

Davao Citizen Science Heritage Trees Project

Rapid urbanization in Davao City, Philippines, has affected the urban environment resulting in poor air quality, increased heat island effect, and other environmental hazards.

From 2013 until early 2020, the Interfacing Development Interventions for Sustainability (IDIS), Inc., and other environmental groups, publicly campaigned against cutting trees in Davao City's center, continuously being affected by the implementation of urban infrastructure projects and the national government's Build-Build-Build Program. They also lobbied for the passage and implementation of local environmental policies.

To create awareness and appreciation of the importance and benefits of trees in urban areas, IDIS applied the citizen science strategy. IDIS trained citizen science volunteers who then surveyed and geo-tagged 266 out of 288 trees located in Davao's City center, highly urbanized and built-up areas. Surveyed trees were assessed according to various parameters such as carbon absorption and sequestration through a given formula and based on the trees' actual measurements (trunk diameter, height, age). The citizen scientists found that most trees are within Davao City's business districts. Further, only 33 percent of these trees were native and have proven to be effective in the trees' capability to remove carbon dioxide as a pollutant from the atmosphere. The researchers also utilized available methods for approximating CO₂ sequestration rate. The overall calculations showed an estimate of 1,934,300 or 1.934 tonnes of carbon dioxide sequestered by selected trees within 30-60 years.



Through the submission of the citizen scientists, IDIS was able to geotag and map out heritage trees in Davao City.



#SaveHeritageTrees
Mapping the Heritage Trees in Davao City
through Citizen Science

Research Presentation

via  [zoom](#)  **LIVE** on IDIS Page



bit.ly/SaveHeritageTreesDC2020
December 8, 2020 | 9:00 am-12:00nn

IDIS actively used social media to reach a wider audience.

Aside from the citizen scientists, IDIS' technical research team was composed of professional scientists and experts in forestry, biology, environmental science, management, and Geographic Information System (GIS). They developed the technical guidelines and provided inputs to the volunteers during their orientation and training. IDIS also coordinated with the City Mayor's Office and the City Environment and Natural Resources Office (CENRO), responsible for maintaining and managing the city parks. Volunteers were allowed to survey trees inside the parks despite the closures and pandemic quarantine protocols.

To reach a wider audience for their campaign, IDIS actively utilized social media. They also developed and distributed publicity materials, reports, and outputs to key stakeholders. Their project contributed to increased awareness and appreciation of the local citizens and policymakers on the importance and benefits of trees in the urban areas.

Find out more about IDIS' citizen science initiative **here**.



CGFED's citizen science volunteers were trained then interviewed and surveyed 120 people living, studying, and working in Nghia Tan Ward, Hanoi, Vietnam

Research on the Community's Awareness on the Use and Address of Municipal Plastic Waste in Hanoi, VietNam

A study published in 2015 ranked Vietnam as 20th in the world in terms of municipal plastic wastes with 3.27 million tons generated per year, ranking among the top countries with inadequate treatment. Municipal solid waste (MSW) is a solid waste generated from households, public areas, commercial areas, construction buildings, medical facilities, production facilities, and waste treatment areas. In contrast, domestic solid waste (DSW) refers to solid waste generated at the household level.

The Research Center for Gender, Family, and Environment or CGFED conducted a study in Nghia Tan Ward, Cau Giay District, Hanoi, Vietnam, to assess the MPW treatment system's current situation and determine the practices of the use and handling of MPW among populations in Hanoi. Using a citizen science approach, CGFED wanted to create awareness of the negative impacts of MWP and the importance of the 3Rs in dealing with environmental issues.

Citizen science volunteers were trained then interviewed and surveyed 120 people living, studying, and working in Nghia Tan Ward, Hanoi City. They targeted different groups to understand the different levels in the use, collection, and disposal of plastic waste. CGFED and the volunteers found out that the most concerning issue was that students and youth between 18-30-year-old were the least active in classifying waste.



After the interviews, CGFED's citizen science volunteers had a peer-to-peer communication and sharing on plastic wastes.



The citizen science volunteers also had group meetings for processing of data.

They also found out that there was a lack of citizen participation in sorting waste at its source. Fortunately, most survey participants shared good opinions about collecting and gathering plastic waste at one location and collecting for resale or donation.

After CGFED had the survey results, they used social media to attract people through publishing posts that provide knowledge on plastic waste. They also organized events to enhance public awareness of climate change and sharing the project's results.

They organized a movie screening event for "The Inconvenient Truth", a documentary that provides much information about climate change. CGFED also organized a workshop entitled "Plastic waste-from in-house to outland." Through this workshop, they shared the project's results regarding the plastic waste issue. CGFED also created a video that they distributed heavily on social media.

CGFED is proud that the student volunteers and the youth they targeted in the survey improved their research capacity and knowledge about plastic waste, researching, and organizing skills. They also became the core group that advocates for reducing plastic usage and environmental protection.

Find out more about CGFED's citizen science initiative [here](#).



The reality in Surabaya River – it is polluted by tons of wastes, mostly, plastics.

Microplastics Detectives of Surabaya River, Indonesia

Surabaya River in Surabaya City, East Java, is one of the important rivers in Indonesia. It sustains the health and wellbeing of three million people of Surabaya for their drinking water supply. However, during the 2020 Surabaya River Expedition, Ecological Observation and Wetlands Conservation (ECOTON) found several data gaps between the regulation and reality of the Surabaya waste management and river regulation.

Despite the City regulations, Surabaya River's reality is that it is very polluted and has tons of plastic wastes.

To address this issue, ECOTON used the citizen science approach and developed a project called "River Citizen Science: Microplastics Detectives of Surabaya River". The project utilized citizen science to increase the capacity of the youth to understand the toxic properties of plastic waste in the river and its impact on fish and human health.

ECOTON used five steps to investigate the microplastics presence in Surabaya River. ECOTON briefed and introduced volunteers on how to take samples from the river using the research equipment such as Plankton Net and Microplastic Net. The youth volunteers were also briefed on the research methodologies. They were also taught how to place and label the samples in the glass bottle. Using microscopes, the youth volunteers were also taught how to examine the samples in



Youth doing their "Microplastic Detective" investigations in Surabaya River. They use net and microplastic nets.



The students/youth "detectives" were briefed by facilitators before they conducted their investigation. Because the project was implemented during the pandemic, all are obliged to observe strict health protocols such as wearing masks and face shields.

ECOTON laboratory and how to identify microplastics from river plankton. Through "River Citizen Science: Microplastics Detectives of Surabaya River", ECOTON was able to increase the youth's understanding and ability to make informed decisions on environmental issues and instill in them their commitment to take responsible action in caring for the environment, including reducing plastic wastes in their daily life.

To date, ECOTON was able to partner with ten schools and two colleges/universities in Surabaya City: Hang Tuah University – Surabaya and Diponegoro University – Semarang. Through the youth's participation as "detectives", they found out from their research investigations and laboratory tests that the percentage of microplastic was higher than the plankton presence in the water samples. The youth gained more understanding and knowledge of their environment from their "detective investigation" work and experience with ECOTON. They shared investigation results with their friends and family and were empowered to write letters for the local newspapers. They even joined advocacy campaigns to call for the government's change in policy and prioritize environmental protection.

Lessons Learned

ECOTON realized that support from the schools is a vital component of the project's success. The students were very participative because their schools mandated it. More than anything, ECOTON learned from the youth that field exploration is an effective method of environmental education. The students said the actual visit, observation, and investigation of Surabaya River allowed them to feel and see the river's concerning realities. ECOTON learned that students prefer to take lessons from nature than just discuss theories inside their classrooms.

Find out more about ECOTON's citizen science initiative [here](#).



CAP's citizen scientists and laboratory staff getting water samples from Korok River.

River Pollution in Kampung Selamat, Tasek Gelugor, Penang, Malaysia

In Penang, Malaysia, communities in Kampung Selamat, Tasek Gelugor depend heavily on the Sungai Kereh river as a water supply for their farming community, especially rice crop production and as farm animals' water source. However, due to river pollution, rice production and fish caught in the river declined.

The Consumers' Association of Penang (CAP) investigated the urban pollution issue and found out that the rivers Kereh and Korok, serving the communities of Kampung Selamat, Tasek Gelugor has been polluted by effluents from pig farms. Pig farms in the community operate without adequate waste treatment and there was a lack of enforcement to regulate and monitor these practices.

From CAP's citizen science investigation, they found out that one pig produces more than 40 liters of waste discharged per day. Because most pig farms in Kampung Selamat lack proper waste treatment plants, the direct discharge turned the 13-kilometer river into black colour, with foul stench surrounding the communities.

CAP and the citizen scientists planned, mapped out sites for conducting water sampling, contracted potential laboratories to conduct water sampling and analysis, and guided laboratory staff during water sampling activity. When the results were out, CAP produced a video and brochure which can be seen on YouTube and Facebook for wider outreach.



CAP's citizen scientists and laboratory getting water samples from the Kereh River.



The rivers are almost black and have a foul stench that can be smelled from inside the houses in the surrounding communities.

CAP's advocacy campaigns led to the government announcement of having a closed-door modern pig farming system with zero discharge waste management system and good husbandry practice. The pig farmers are now required to upgrade and apply for an operating license under the Penang Pig Breeding Licensing Regulations 2020. CAP also involved community representatives in meetings and field visits organized by the task force initiated by the Ministry of Environment and Water.

CAP's consistent and continuous advocacy, together with concerned citizens and different non-government organizations, has resulted in the Malaysian government looking into the problem. In 2021, the Penang Pig Farming Enactment 2016 has finally taken effect. The community in Kampung Selamat who was involved in the citizen science project, monitor the conditions of the river and activities of the pig farms and report for any violations of the law.

According to CAP, if not for the community's actions and highlights in social and mainstream media, they doubt that this action would be taken by the State government which has been delaying the implementation and enforcement of this enactment for many years.

Find out more about CAP's citizen science initiative [here](#).



Nexus3 Foundation involved waste bank workers as citizen scientists. The waste bank workers sort plastics per code.

Investigation of Plastic Types in Households and Waste Banks

Plastic is one of the major solid waste issues in any part of the world. Although it is widespread, each one of these plastics is different from the others.

As their citizen science activity, Nexus Foundation for Environmental Health and Development or Nexus3 Foundation investigated the type of plastics found in households, recycling facilities, and illegal dumping sites in a municipality in Bali, Indonesia. Through their citizen science approach, Nexus3 involved workers from Waste Bank, students from Bangli Senior High School, a community group called "The Transformers", and officials from Bangli Environmental Agency.

Nexus3 Foundation aimed to identify the types of plastics found in the waste bank in Bangli regency, Bali, Indonesia. They also sought to increase the citizen groups' knowledge on the kinds of plastic found in waste banks through a plastic identification toolkit. Finally, Nexus3 wanted to raise awareness of plastic pollution and its negative impact on human health and the environment.

They coordinated with the environmental agency to ensure that the local government in Bangli Regency was involved from the start of the citizen science activity. According to their staff, citizens' participation is essential to tackle plastic pollution and experience firsthand identifying plastic types.



Some of the plastic wastes that the citizen scientists identified using the plastic identification toolkit.



High School students from Bangli Senior High School experimented with the plastic toolkit.

The environmental agency officer also mentioned that the government has limitations on managing plastic waste in the region, especially when it comes to governance authority, limited financing resources, lack of resource persons, and facilities and infrastructure. Nexus3 Foundation briefed the citizen scientists as to use the plastic identification tool. The tool can quickly identify the plastic content and types of plastic wastes they collected. The Waste Bank officer/workers said that the device made it easier for them to sort the plastic wastes correctly. "Sometimes, an item has a plastic code, but often the information is incorrect."

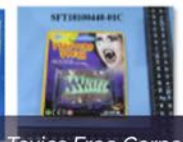
The six groups of citizen scientists involved in the project found interesting results from their research. Through the plastic identification toolkit, Nexus3 Foundation and the citizen scientists identified the plastic content of plastic waste in the waste bank.

One example that they tested was plastic bottled water. The statement stated that it was made of Polypropylene or PP type. But when it was scanned using the tool, it contained Polylactic Acid or PLA. PLA is one of the most common and cost-efficient plastics available in the market. This plastic type determines the 'reusability' and 'recyclability' of plastic wastes and their quality and value in solid waste management.

The results show that in the waste bank, mostly 70% type of plastic is PET, such as single-use plastic bottled. Plastic cup identified as PP was also found in the waste bank. This plastics type is very commonly found in waste banks because of higher economic value. Meanwhile, the plastic identification tool had the drawback that it can only scan particular colors such as transparent. Thus, the solid-colored plastic was hardly identified by the toolkit. Nexus3 Foundation was happy with the results of their citizen science activity. Participants became aware of the types of plastic and its contents in an object they use every day. They also become aware of the types of plastics that have high value and are safe.

Find out more about Nexus3's citizen science initiative [here](#).

Products Have Been Tested



Toxics Free Corps tested several consumer products available on e-commerce platforms because more and more people were shopping online.

Detoxifying E-Commerce in China

Many cities in China suffer from haze, resulting from the mixture of air pollutants from many emission sources. Since the pollution is visible, many people have reacted to it. The government responded by allotting resources to control the haze.

However, less known to people is an invisible type of pollution, toxic chemicals in people's water, food, and consumer products. Because people don't see this and don't know this, they don't react.

To raise people's awareness and push for changes, Toxics Free Corps, also known as Shenzhen Zero Waste, launched a campaign in 2017 for toxics-free consumer products. In 2019, Toxics Free Corps (TFC) zeroed in on consumer products available on e-commerce platforms because more and more people were shopping online. They wanted to determine if these consumer products meet China's product standards. Using the citizen science approach, TFC bought different products sold on e-commerce platforms and tested their chemical content. They focused on food, food packages, toys, stationery, and cosmetics. Their actions vary for each product. But generally, before ordering products online, TFC determines the quantity to be tested and the sampling approach. They would then check the China Compulsory Certification (CCC) information on the web page. Toys need this certification to prove their quality.



Some of the products that Toxics-Free Corps tested. Sea crab showed an excessive amount of cadmium, while the rubber duck contained an excessive number of phthalates.



Toxics Free Corps conducted the "Rubber Duck Campaign" to conduct several testing of different consumer products sold on e-commerce platforms in China.

prove their quality. After receiving the products, they check the CCC on the package or label and send some samples to the lab. When they get an adverse testing result, TFC will send the report and an advice email to the corresponding platform, inform the National Platform of Consumer Dispute Resolution about the unqualified product, and write a report summarizing the process and result. TFC then holds a press event to report its findings.

Typically, the e-commerce platform would force its suppliers to stop selling unqualified products. The Local Market Supervision and Administration would go to the related manufacturer, take samples and send for testing, and then impose a fine or shut down the production line and ask the manufacturer to adjust itself to abide by the law. If the Local Market Supervision and Administration did not do anything, TFC would apply for administrative review. If it still did not work, TFC will think of filing a lawsuit and raise the concern to other government bodies.

TFC has conducted four big campaigns and was successful despite challenges. "We faced a lot of challenges in our citizen science approach. E-commerce platforms hold too much PR power and are not required to take responsibility. It is also hard to raise special funds for this specific campaign," shared HE Linghui of Toxic Free Corps.

Despite the challenges, TFC was successful in its campaigns. They have made all the e-commerce platforms withdraw all unqualified products. Still, they plan to pursue other strategies to create toxics-free e-commerce. They will introduce a Retailer Report Card and adjust it to suit China's condition. They plan to build an alert system called RAPEX or Rapid Alert System for non-food consumer products. And influence chemical management policies, especially related to priority control of chemicals in commercial products.

Find out more about Toxic Free Corps' citizen science initiative [here](#).