Plastic Sea: Art Exhibition on Marine Plastic Pollution

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Abstract

This paper presents the artistic research and creation of an artwork, exhibited under the title of *Plastic Sea*. The exhibition was held July 3-11, 2021 at the Art4C Gallery and Creative Learning Space in Bangkok. The name *Plastic Sea* comes from the idea that most people are aware of marine pollution, especially plastic pollution, yet the issue has normally been ignored because the effects are not immediately experienced in a direct way. To create awareness of the problem of plastic marine pollution, this project aims to show visually the growth of plastic waste in the sea. Research on plastic marine pollution was utilized by Thai new media artist, Witaya Junma, resulting in an artwork in the form of interactive data visualization. This installation communicates straightforwardly, as it engages participants and enables them to understand the environmental effects from what they saw from their interaction with the installation. Plastic Sea was well received when it was exhibited, and the work really touched participants, making them realize just how much they use plastic waste in their daily lives.

Keywords: *Art and Technology, Eco Art, Data Visualization, Interactive Installation Art, Contemporary Art, Pollution, Thailand*

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Introduction and Materials Review

This planet is facing various environmental issues and most of them are inter-linked with one another. One of the most talked about environmental problems is, indeed, plastic waste. Although plastic has been with us for over a century and the issues involving plastic pollution have been flagged and explored since the late 1960s and early 1970s (Moore, 2021), they never get old. Recently, environmental-ists have focused on plastic marine pollution in view of its huge effect on the eco-system.[1] Having said that, some people tend to pay less attention to plastic waste issues due to convenience the plastic offers and the use of recycling technology. For that reason, this research explores this environmental concern of plastic marine pollution and find a method to create awareness using soft power,[2] in this case, a work of art.

Art and technology appear to be separate but looking back over the history of art to today, art and technology are inseparable. Artistic practice has been used as a tool for scientific experiments and science has always been a subject of fascina-tion for artists. Contemporary art,[3] as we understand today, reflects contemporary concerns and situations; it is a powerful tool for communicating social issues to society.

Marine plastic pollution no doubt comes from anthropogenic[4] behavior, hence, the problem can be addressed by raising the consciousness of human consumers about the consequences of their actions. What artistic framework should be used to achieve this? The research methodology of this project resembles the curatorial process. Once the concept is initiated, the curator/researcher then studies artists and artistic practices with the aim of developing the artwork together; after this process, the results are exhibited, some related programmes are added and feed-back is evaluated.

Plastic Sea is a creative, physical work resulting from the above research. It is an installation artwork in the form of interactive data visualization, shown as an exhibition under the same name and launched on the 3rd of July 2021, which was an 'International Plastic Bag Free Day.' On that day, the project also held a public panel discussion, and an artist and curatorial tour. Additionally, this project also included an exhibition catalogue and a video interview with the artist to further emphasize and explain the concept further. These details are discussed later in the article.

Plastic Marine Pollution in Thailand

Plastic is used in almost every part of our daily activities, and after being used plastic is discarded. Generally, public perceptions think that plastic waste either goes into the trash, then a dumpster or is recycled. Having said that, plastic waste is scattered all over the world, on all continents and usually washes down into water systems, then onwards to the ocean as the final destination. Choy (2021:120) stated that scientific research comparing plastic production to plastic from the ocean surface, shows that most plastic waste is unaccounted for, calling it 'miss-ing plastic.' Some of this missing plastic is eaten by marine creatures or broken down into microplastic[5] and nanoplastic,[6] which then potentially resurface in the food chain or in the water we consume.

In 2017, Thailand was the 6th ranked country in the world for plastic marine pollution and the 5th ranked country in terms of creating plastic waste per person. Consequently, the Thai Government, led by the Ministry of Natural Resources and Environment, initiated a road map to deal with problems on plastic waste management.. This 12-year strategic plan began in 2018 and is due to be completed in 2030. The road map is divided into two phases and the first phase covers 2020 - 2022. The first phase has 2 targets: 1) to reduce and possibly remove single use plastic; and 2) to promote a circular economy of recyclable plastic (ThaiPost, 2021). Even though this policy began later than other countries, Thailand somehow successfully removed free of charge single use plastic bags from department stores, supermarkets, and convenience stores by early 2020 and planned to reduce plastic waste by 30% by the end of the year (Buakamsri, 2020). However, the coronavirus emerged in 2019, followed by global pandemic and lockdown which unavoidably has increased the use of plastic.

Be that as it may, marine plastic pollution does not only come from the excessive consumption of plastic, but also from improper waste management systems leading to mismanaged plastic waste. Greenpeace Thailand (2021) criticized the above road map as follows:

- The government took action on this issue as a result of the ranking, not from their own survey; and
- The road map is only one of rhetorical symbols government wants to show to international organizations
- The road map does not include environmental-friendly ways on how to get rid of plastic waste i.e. government incinerates plastic waste which creates CO_2.
- Producer responsibility is not discussed in detail in the road map.
- This road map should include tax incentives or some benefits for involvement in the project.
- There is not much research on overall plastic waste in Thailand even though 'Material Flow of Plastic' was researched.

All in all, it can be agreed that the problem of plastic waste in Thailand remains serious in 2020 and 2021 as everyone is unintentionally using more plastic, especially for food deliveries, medical supplies and everyday life. The issue is not only about plastic consumption but also about how the government handles waste systems.

Contemporary Ecological Art in Thailand

Environmental art[7] was established in the 1960s in association with environmental activist movements. Presently, people are more familiar with the term 'eco' or 'ecological' in creative practice contexts. Eco art, short for ecological art, is an off-shoot of environmental art. Eco art, as we understand the term today, seems to have developed together with digital awareness in society.

> Today, this impressive list of functions is being extended to attend to the current and future conditions of the planet's waters, soils, atmosphere, and living populations. Some of the creators of these works of art follow the scrupulous scientific methods

of ecology; others who behave as advocates, critics, and protestors are proponents of environmentalism. Both explore the fundamental relationships that form the basis of eco art. (Weintraub, 2012:19)

Kumjim (2018:78) noted in his writing that Thai contemporary art contexts in the twenty-first century is shifted through "consumer technology, global politics and transnational trade." Concerning eco-creative practices in Thailand, eco-designs are more realized than eco-art (although they sometimes overlap). With international trends and a general upsurge in environmental awareness, eco-design has been utilized for good causes. Into the bargain, since eco-design has become 'trendy,' value has been added in terms of price and brand reputation. As for Thai eco-art, it seems to be more project-based rather than based on artistic practices.

Baan Noorg Collaborative Art and Culture was founded by two artists: Jiradej & Pornpilai Meemalai (or their collaborative name 'jinandyin'). The project is based in Ratchaburi province which is a two-hour drive from Bangkok. Since 2011, jiandyin has been operating this non-profit artist-run initiative in collaboration with local communities and internationally. Their projects promote community development, environmental awareness and connect cultural communities. *Baan Noorg Collaborative Art and Culture* also provides residency programmes, internship programmes, and a research publication from time to time (Baan Noorg Collaborative Art and Culture).

In Northern Thailand, in Chiang Mai Province, *Land Foundation* was initiated in 1998 and established in 2001 by two internationally known artists: Rirkrit Tiranvanija and Kamin Lertchaiprasert. Although the project has been run by artists and focused on their artistic activities, the *Land Foundation* is also involved with the local community. The project studies and supports local farmers on sustainable agricultural development. "The land was to be cultivated as an open space, though with certain intentions towards community, towards discussions and towards experimentation in other fields of thoughts" (The Land Foundation). Also in Chiang Mai, in February 2020, an exhibition called *Art for Air* was organized in collaboration between the Breath Council and the Chiang Mai Arts and Cultural Center. It was an exhibition that brought up recent environmental issues, such as air pollution. PM 2.5 air pollution has been major issue in Thailand every winter over the past few years, especially in the North of Thailand. Art for Air included over sixty artists and art collectives, which exhibited all over the city at art and cultural facilities, well as in other public spaces. The main ambition of this exhibition was to use creativity and artistic practices to raise awareness on the issue, and to find ways to solve this problem.

Still, there are few artists whose practices are grounded on environmental issues. For instance, Ruangsak Anuwatwimon, whose works focus on environmental matters or how human behavior affects the ecosystem. In 2011, there was widespread flooding in Thailand. Anuwatwimon collected flood water, and exhibited it in tubes in his exhibition, *Did we learn something from this yet?* (2011). On top of that, One of this most well-known works is *The Ash Heart Project* (2010) in which the artist collected 270 different specimens that died by humans actions. He cremated and

molded them into shape of human's hearts. His works are poetically and conceptually fabricated to convey environmental messages in sophisticated ways. Another artist who calls herself as 'social activist artist,' Wishulada Panthanuvong or WISHULADA (her proprietary brand name) is an upcoming artist whose principle is: 'from trash to treasure.' Her artistic medium is based on recycled and upcycled materials. She works range from small merchandise to massive site-specific installations, all made from different types of waste. The basic concept of her work is based on environmental concerns.

It can be said that eco-art is not practiced much in Thailand, or that Thai environmental art or eco-art fits into a different context from Western art history. Organizations and movements based on environmental awareness in Thailand have been operating for decades but they unknown until recently. Possibly, in a few years, Thai contemporary art on ecology might grow and develop a clearer direction.

Data Visualization in Artistic Practice

Generally, data visualization is used in the context of computational statistics to illustrate data and information in graphic form instead of just using a statistical table (Unwin, Chun-houh and Wolfgang K., 2008:6). It is a new term but in practice, data visualization is an old practice that goes back to ancient Egypt (Friendly, 2008:18). In our digital age, data visualization is used more and more, especially in social media and digital news.

While data visualization appears in reference to graphic, design and computer science, there are some artists who employ data visualization in their artistic practices. Artists who bring data visualization into their artworks usually involve technology, interdisciplinary and digital media. Here are samples of artistic projects which have relevance to data visualization:

- The *Room of Change* by Giorgia Lupi was a part of the XXII Triennale di Milano, *Broken Nature: Design Takes on Human Survival*, March 1 – September 1, 2019. The exhibition notes on "restorative design and studies the state of the threads that connect humans to their natural environments - some frayed, others altogether severed." As for this artwork, *The Room of Change*, presents how the world has changed over past centuries, the present, and likely the future. Data in this work comes from different sources, perspectives and areas, some seem not relatable, but they actually do. This data visualization was installed as a wallpaper with materials of "long hand-crafted data-tapestry" (Lupi), perceivable through colors and shapes. Giorgia Lupi called herself an "information designer" which is an interesting term and quite straightforward. She started out designing data and information as illustrations which later morphed into various forms, including installations and exhibitions. Her works are very structural, well-planned, and beautifully crafted.

- The *Weather Score Project* by Nathalie Miebach takes on weather data and works with composers to make "sculptural musical score." Basically, Meibach underlines the weather data of the storms which she collects herself, then she

compares the data collected to an online database. Her translation process is creative and unusual, she interprets her data as weaving a basket to create a basket form. She also translates some data for colorful beads and numbers and assembles them together as a sculpture. Additionally, she uses weather data to compose a music score, then collaborates with other musicians and composers. With the *Weather Score Project* she made weather which was invisible to become tactile and audible (Miebach, 2011). It is an ongoing project, started in 2009; since then, she has also created new pieces, collaborating and performing in many contexts. Apart from this project, Meibach also does 2D-framed artwork from data translation, braiding colorful wickers. Her works put forward scientific facts in an emotional way.

- *Tele-present Wind* by David Bowen was first installed at Laboratoria Art & Science, Moscow in 2010, and again in 2018 at Azkuna Zentroa, Bilbao. The actual work was presented in a white cube gallery and connected with a data monitor and collected from distant locations. The gallery space was filled with dried plant stalks fitted with electronic devices, with no strong wind inside the exhibition space, the plant stalks rustled as if they were moved by the wind. The movement of the dried plant stalks in fact came from real-time data, based on the wind outside (Bowen). The synchronisation of this work was pretty intense to the viewers, as they experienced plant stalks swaying at the same pace with a little bit of noise to enjoy as well.

- *Flight Patterns* by Aaron Koblin was developed from an experimental project *Celestial Mechanics* with Koblin's colleagues; Scott Hessels and Gabriel Dunne in 2005 - 2009. For this work, he created an animated film from the data of flight patterns, collected from air traffic over 24-hour time period in North America; some 140,000 airplanes routes were collected. He transmutes and visualized in color and form. He uses different colors to insinuate 573 different airplanes types. Apart from animation, *Flight Patterns* was made in affiliation with Google Maps and produce in limited edition prints. Koblin stated in a TED talk in 2011 that "data can actually make us more human." Human activities are connected to data all the time, without anyone realizing it.

- *Death Data* by Witaya Junma was created in 2016 and was his first experimental project using data visualization. It was quite new for the art scene in Thailand at that time because artists were not using digital and technology in artistic practice then. This work takes the real-time data of people who were killed in traffic accidents from the Accident Data Center for Road Safety Culture (Thai RSC)[www.thairsc.com]. On the website, data shows the number of daily traffic accident reports; injuries and deaths. For this work, Junma used on mortality data from the website in his artwork - a match was lit every time the death data rose. The visuals of this work are very powerful, when data is shown purely as a number, viewers do not feel as sympathetic but when they see a match that represents a life burned, then they know that there is no resurrection.

To conclude, data visualization as artwork has really only been practiced for less than two decades. All data visualization artworks mentioned above interact with other disciplines, especially science. What's more, these works are collaborative, some artists work with engineers, some work with musicians, some work with textile workers and so on.

Research Methodology and Making of *Plastic Sea*

Plastic Sea is an artistic research project, which has its physical outcome as an artwork presented in an art exhibition. For this research, a researcher is not creating an artwork or being an artist, instead, the researcher plays the role of a curator. Hence, research methodology is equivalent to the curatorial process. In the curatorial practice of this interdisciplinary project, Plastic Sea involved a small team made up of environmental researchers as advisors, the artist creating the artwork in collaboration with a designer and an engineer. Other staff from FAAMAI and Art4C teams assisted with administration, management, publications and publicity.

Method of Curatorial Practice

Merriam-Webster Online Dictionary defines a curator as "one who has the care and superintendence of something especially; one in charge of a museum, zoo, or other place of exhibit." The term has its root in Latin, curare (to take care of) and cura (care, heed, attention, anxiety, grief). Originally from around 15 - 16th centuries, curators were first established as custodians of collections. Since then, the context of art and culture has evolved, so has curatorial practice. Curators in contemporary artwork with the content of artworks, usually to select and interpret works of art, most of the time to put artworks into an art exhibition or as we call 'to curate.' For this exhibition, a curator did not select an artwork; instead, the curator worked as a researcher to select the artistic practice, then curated from an initial concept. The curator developed the idea with the artist, commissioned him to produce work, which was later exhibited.

As with research, there is no single way to curate. The curatorial process can start from any point – from artworks, to historical context, to current issues and so on.

There are two objectives of *Plastic Sea* exhibition:
1) to promote environmental awareness through art and technology; and
2) to create an interdisciplinary contemporary artwork reflecting social issues.

Plastic Sea commenced with material reviews in two parts:
1. Research on environmental issues was initially conducted from meetings and discussions with researchers from the Environmental Research Institute, Chulalongkorn University. They worked as project advisors, and the resulting collaboration focused on the issue of marine plastic pollution. Frankly, at first, plastic was not the first priority, possibly because these issues have been surveyed and voiced so often, people have tended to pay less and less attention. Some may believe plastic is no longer problematic because it is recyclable. Whereas, in fact, the recycling process produces other types of pollution and not all types of plastic can be recycled. Moreover, plastic is in almost everything we touch, in every part of our everyday life. For instance, every time we do laundry, we wash away thousands of nano and micro plastic particles into the water system. Micro and nano plas-

tic eventually affect the whole ecosystem. Environmental issues cannot be fixed completely, but if everyone helps bit by bit, then the world would not be so bad. Consequently, the research was directed towards the issue of plastic in a way that would be concrete, seeable, and that people experienced directly - which is plastic marine pollution. Materials reviews included news, journals, books, websites and extensive discussions with advisors.

2. Research on contemporary art practices considered two subtexts: 1) eco-art; and 2) art and technology. The research or curatorial process at this point surveyed which Thai artists and their artistic practices would be suitable for the project. The research carried on with revising notes from previous exhibitions; artists' studios were visited, and research conducted through exhibition catalogues and online archives. The research was analyzed to determine which artistic practices would work best with the issue and satisfy the funding objectives: interdisciplinary and innovation. Another aspect to consider was that the research would try to reduce the amount of plastic used during the creation of the artwork. A short-list of artistic practices was made and Junma was selected on account of the interactiveness of his works and his experience with data visualization. Data visualization was also explored further to verify if his artistic practice would be befitting of the artistic research's objectives.
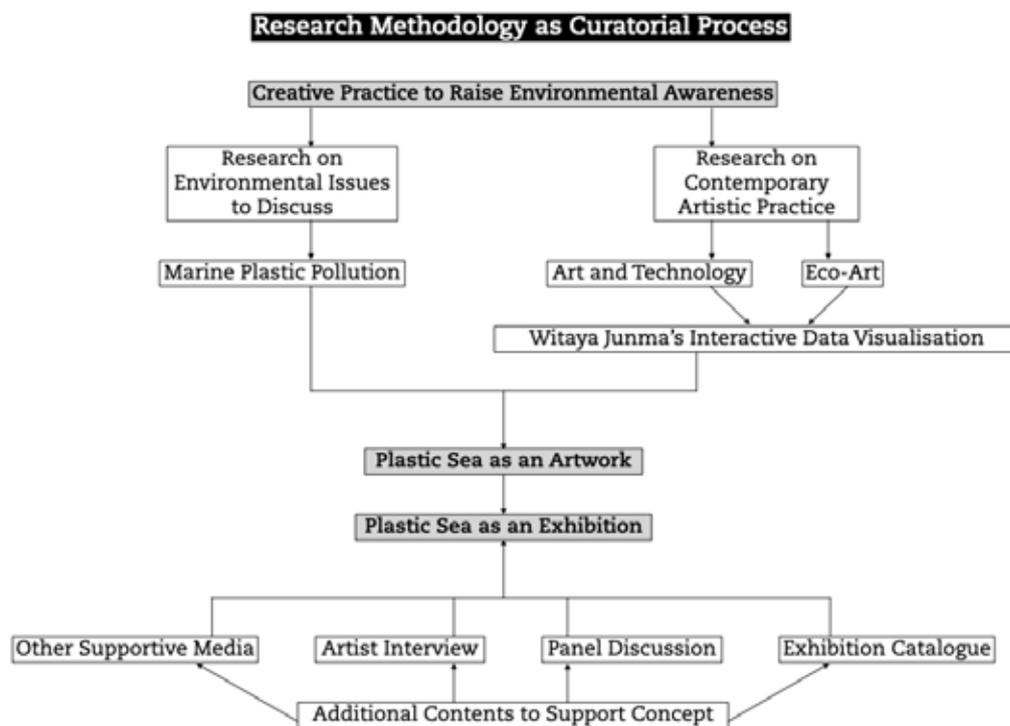

Figure 1. Diagram of research methodology as curatorial process.

After finalizing the content framework and the artistic practice, the next task was the creation of the artwork. At this stage, the curatorial process was about brainstorming ideas with the artist on what the artwork would be. Creative procedure was mostly up to the artist with the curator advising on how the work would interact with audiences, content presentation, and what aspects of the artwork should be highlighted and so on.

Making an Artwork and an Art Exhibition

Devolving research into practice, the team posited a question: How to make the artwork powerful and impactful? Firstly, further artistic research made on the data that would be used as the main content of the artwork, led to a decision to use available data rather than collect new data sets. Then the research team came across a website operated by the Department of Marine and Coastal Resources that showed data on marine pollution. It was like hitting a jackpot, as the data was what this research had set out to find. Data on the website[8] included top ten types of waste found in the sea during 2006 – 2015. The advisors then gathered the data, updated and translated it, ready to be put into the artwork. This research studied only six types of wastes, each of which was made from plastic.

Following procedure is designing the artwork. This part was primary an artistic practice that curator took a role to support and advice. The original intention (which was not a research objective) was to create zero waste from the making this artwork and exhibition but that part was not successful. Nonetheless, the artwork was made ready-to-exhibit; therefore, showing it again would not produce any more waste and everything in the exhibition was designed to be reusable.

For *Plastic Sea,* the artist worked on sketches with the curator and came up the idea of a vortex machine filled with water. The water would swirl strongly or weakly according to the data. Developing ideas and sketches into a concrete artwork, the artist and curator collaborated with a company called MakerStation, which helped with the design, programming, and engineering. The name *Plastic Sea* also came naturally during the artwork fabrication process; it was agreed that the title was straightforward and communicated the idea of plastic marine pollution well.

Figure 2. Inside the Vortex Machine of Plastic Sea, Production by MakerStation, Image Courtesy of MakerStation.

The image in figure 2 shows part of the process of creating Plastic Sea. Wood was used instead of plastic or other toxic materials wherever possible. The main part of the artwork that enabled participants to interact is the vortex machine, into which capsules filled with six types of plastic waste, one type per capsule, were launched. At the top of vortex machine, is a sensor which 'reads' the information. Imagine a tollway pass through; the artwork operates in a similar fashion. Once the capsule is launched into the machine, the water swirls around, forming a whirlpool, according to the data and the percentage of that type of plastic waste in specific year (the year is singled out randomly).

Figure 3. Two sequential close-ups of capsules containing a plastic straw and cigarette butts as the machine operates, Image Courtesy of Witaya Junma.

The initial sketch included six types of plastic waste from the data: plastic bags, plastic caps, plastic straws, plastic food containers, cigarette butts, and Styrofoam food containers (Styrofoam contains plastic) attached to the sensor and launched directly into the vortex machine. However, for technical reasons we had to develop capsules, which contain six types of plastic collected from the artist and his friends' daily plastic usage - the same plastic waste found in the sea.

Figure 4. Interaction with Plastic Sea, Image Courtesy of FAAMAI Digital Arts Hub.

Plastic Sea's system operates the following processes:

1. Data designated to be put in the artwork showed the percentage of a particular plastic in the capsule and the year the data was collected. The image above shows the interaction of participants with the artwork. To conclude, here is how Plastic Sea works as an interactive data visualization artwork.
2. The participant picks one out of 6 plastic capsules from the stand;
3. He/she then launches that capsule it on the vortex machine, and repeats one capsule at a time;
4. The water starts swirling, and the intensity of the whirlpool is synchronised with the percentage of that type of plastic in the designated year. The year data shown is programmed to appear at random; and
5. Once the whirlpool stops, the participant can interact with the same capsule, and another year will appear at random; or the participant can interact with another capsule.

Interaction with *Plastic Sea* is simple but what is communicated to the participant operates at a deeper level. Launching a capsule into the vortex machine signifies the act of trashing the water; the participant may have never thrown trash directly into the sea, but producing waste unintentionally creates marine pollution as some of the waste ends up in the sea anyway because of poor waste management.

Figure 5. Close-up of cabinet components, Image Courtesy of Witaya Junma.

Apart for the main component of the work, *Plastic Sea* employs another part of the installation to make the content even stronger, creating a more compelling visual effect i.e. the two cabinets contained plastic waste and sea water. Junma collected plastic waste that was produced not deliberately but rather from everyday activities, such as toothbrushes, bubble wrap, plastic cutlery, hairbands and so on. He put them another type of capsule with sea water. When those capsules are displayed in the cabinets; the context of plastic waste has shifted to be decorated objects.

Plastic Sea: Art Exhibition on Plastic Marine Pollution
Plastic Sea is an interactive data visualization artwork that is not site-specific, but

it needs to be exhibited in a dark room. The exhibition was at the CU Art4C Gallery and Creative Learning Space, which is the faculty's project space, and is situated in an old community in central Bangkok. Below is an installation photograph of the exhibition. There is a vortex machine in the middle, and a capsule stand next to it as well as cabinets displaying plastic waste on the left and right of the installation. Not shown here, but additional information was provided via wall-texts and a short video clip about this work shown at the other side of the room.

Figure 6. Installation shot of Plastic Sea, exhibited on the 2nd Floor of CU Art4C Gallery, Image Courtesy of Witaya Junma.

Putting the work up for an exhibition went through the usual routine, and as mentioned earlier, attempts were made to create as little waste as possible. All publicity materials were sent out online. Teasers were produced and launched prior to the exhibition.

Figure 7. Publicity poster of Plastic Sea Exhibition, Image Courtesy of FAAMAI Digital Arts Hub.

The exhibition was launched on the 3rd of July 2021 which was an International Plastic Bag Free Day, to underline the concept. Typically, the opening reception would be filled with people, public panel discussions would be held, curator and artist tours offered and so on. However, due to the COVID-19 pandemic and semi-lockdown in Thailand, the opening reception was cancelled, and guests were invited to make a viewing booking (a limited number of participants were allowed per showing). Therefore, the curatorial process extended to other elements and activities that could support the idea of the main exhibition, as follows:

• Exhibition catalogue[9] was made to accompany the exhibition. The catalogue included a forward by the Dean, comments from the environmental advisors, a curatorial statement, artist's statement, artist's bio, curator's bio, credits and some images of the artwork. Limited numbers were printed on eco-friendly materials.
• On the opening date, the exhibition held a curatorial tour but it was not recorded; however, an interview[10] with the artist was produced and is now part of the exhibition's digital archive.
• Panel discussion[11] was carefully arranged. It was broadcasted live on Facebook without an on-site audience. The discussion topic was 'What can data on plastic pollution in the ocean tell us? Speakers included Pornsri Suthanaruk, (Deputy General Director of Department of Marine and Coastal Resources), Wannasingh Prasertkul (Environmental Activist and Influencer) and the artist, Witaya Junma. The discussion was moderated by Chanat Wutwikaikan (Environmental MC and Influencer).

Figure 8. Panel discussion on plastic marine pollution in Thailand, Image Courtesy of Pornrak Chowvanayotin.

The Plastic Sea exhibition was held for nine days, on 3 - 11 July 2021. The reception was well received despite the adverse circumstances of yet another wave the COVID virus pandemic, which hit Bangkok very hard just a few days prior to the exhibition opening. Apart from environmental advisors, artist, and MakerStation, this artistic research and exhibition received great support from the FAAMAI and Art4C teams. The project is scheduled to be shown on Google Art and Culture by the end of this year.

Findings and Conclusion

From questionnaire collected, positive feedback from participants indicated that the Plastic Sea exhibition was considered successful. All of the participants were satisfied with the artwork and they agreed this work showed interesting facts about plastic marine pollution they had not been not aware of. On top of that, after experiencing the exhibition, the participants felt the need minimize their use of plastic in their daily lives. Furthermore, the exhibition showed how perception, in this case, perception of data, can be changed or altered by colors and shapes:

> Human mind is very visual; data visualization is an ancient need… Data visualization is a field that has input from many disciplines. Psychology studies data perception, or the impact of some elements on perception, such as colors and shapes. (Aparicio and Carlos, 2014:7)

Some comments apparently show that participants were left with a sense of 'awe' from their interaction with the artwork. Yes, from a curatorial and artistic practice perspective, this work aimed to create awareness using visual impact of a whirlpool and the interaction of trashing the ocean but the 'awe' audiences experienced was unexpected but welcome nonetheless as an additional positive outcome for this research project. Kosara (2007) pointed out that data-based visualizations can range from pragmatic visualization, which is the most utilitarian but least sublime, to artistic visualization which is the most sublime but least utilitarian. Artistic research such as Plastic Sea shows that interactive data visualization like Plastic Sea can be sublime in relation to the 'awe' effect and informative as well.

In conclusion, this artistic research, *Plastic Sea,* an exhibition on plastic marine pollution fulfilled its research objectives. It raised awareness of the environmental issue of plastic marine pollution for those who interacted with the artwork and created an interdisciplinary link between art and technology. This artwork also shows that dealing with contemporary social issues through art may start out small but be elevated and disseminated quickly. Comments from people who experienced the Plastic Sea exhibition indicated that they would make the effort to create a better living environment.

Funding

Endnotes

1 A community of organisms interacting with each other and their physical environment.

2 A term coined by Joseph S. Nye, Jr. referring to the ability of a country to persuade others to do what it wants without force or coercion.

3 Art of the present day and of the relatively recent past, of an innovatory or avant-garde nature. (Tate Term).

4 An human activity that causes damage to the environment.

5 A fragment of any type of plastic polluting the environment, measuring less than 5mm in length.

6 Tiny particles resulting from the degradation of plastics, ranging in size from 1 to 1,000 nanometres.

7 Environmental art is art that addresses social and political issues relating to the natural and urban environment.

8 http://tcc.dmcr.go.th/thaicoastalcleanup/report.

9 https://www.faa.chula.ac.th/uploads/tiny_uploads/Plastic_Sea_Catalogue.pdf

10 https://youtu.be/qE03wx-lA64.

11 https://youtu.be/UR0W7xsMOs0.

References

Aparicio, Manuela and Carlos J. Costa. "Data Visualization." *Communication Design Quarterly* 3.1 (November 2014):7-11.

Baan Noorg Collaborative Arts & Culture. "Baan Noorg Collaborative Arts & Culture." N.d. www.baannoorg.org/ (accessed April 30, 2021).

Barnett, Heather, Richard Bright, Sheena Calvert, Nathan Cohen and Adrian Holme. *The Art of Science.* London: Welbeck Publishing Group, 2021.

Bowen, David. "Tele-present Wind." David Bowen. N.d. www.dwbowen.com/telepresent-wind (accessed April 10, 2021).

Buakamsri, Tara. "**ความท้าทายและวิกฤตมลพิษพลาสติกของประเทศไทย**." Greenpeace Thailand. November 7, 2020. Accessed April 30, 2021. www.greenpeace.org/thailand/story/18232/plastic-challenge-to-combat-plastic-pollution-in-thailand/.

Buck, Louisa and Daniel McClean. *Commissioning Contemporary Art: A Handbook for Curators Collectors and Artists.* New York: Thames and Hudson, 2012.

Choy, Anela. "The Journey of Marine Plastic." In *30 Second Oceans: 50 Key Ideas About the Sea's Importance to Life on Earth*, edited by Yueng-Djern Lenn and Mattias Green. London: Ivy Press, 2021..

Friendly, Michael. "A Brief History of Data Visualization." In *Handbook of Data Visualization,* edited by Antony Unwin, Chun-houh Chen and Wolfgang K. Härdle, Berlin: Springer-Verlag, 2008, 15-56.

Greenpeace Thailand. "**บทวิพากษ์** Roadmap **การจัดการขยะพลาสติก** (**พ.ศ**.2561-2573)." Greenpeace Thailand. September 9, 2021. www.greenpeace.org/static/planet4-thailand-stateless/2021/09/13b660f1-**บทวิพากษ์**-roadmap-**การจัดการขยะพลาสติก**.pdf (accessed September 10, 2021).

Heartney, Eleanor. "How the Ecological Art Practices of Today Were Born in 1970s Feminism." Art in America. May 22, 2020. www.artnews.com/art-in-america/features/ecofeminism-women-in-environmental-art-1202688298/ (accessed April 30, 2021).

Knoll, Andrew H. *A Brief History of Earth*. New York: Harper Collins Publishers, 2021.

Koblin, Aaron. "Flight Patterns." 2009. www.aaronkoblin.com/project/flight-patterns/ (accessed April 10, 2021).

Koblin, Aaron. "Visualizing Ourselves … with Crowd-Sourced Data" TED 2011. March 2011. www.ted.com/talks/aaron_koblin_visualizing_ourselves_with_crowd_sourced_data (accessed April 10, 2021).

Kosara, Robert. "Visualization Criticism - The Missing Link Between Information Visualization and Art." Proceedings of the 11*th International Conference Information Visualization* (IV'07), Zurich, Switzerland. 2007.

Kumjim, Prapon. "Thai Identities as Scened in Twenty-first Century Contemporary Thai Media Art." *Journal of Urban Culture Research* 16 (2018):64-80.

The Land Foundation. N.d. https://www.thelandfoundation.org/ (accessed April 30, 2021).

Lobelle, Delphine. "Rubber Ducks & Shipping Litter." In *30 Second Oceans: 50 Key Ideas About the Sea's Importance to Life on Earth,* edited by Yueng-Djern Lenn and Mattias Green. London: Ivy Press, 2021.

Lupi, Giorgia. "The Room of Change." GIORGIALUPI. Accessed April 10, 2021. http://giorgialupi.com/the-room-of-change.

Martini, Kim. "Picking Up Our Plastic Trash." In *30 Second Oceans: 50 Key Ideas About the Sea's Importance to Life on Earth,* edited by Yueng-Djern Lenn and Mattias Green, 122. London: Ivy Press, 2021.

McCandless, David. "The Beauty of Data Visualization." TEDGlobal 2010. July 2010. www.ted.com/talks/david_mccandless_the_beauty_of_data_visualization?referrer=playlist-art_from_data&language=en (accessed April 10, 2021).

Merriam-Webster.com Dictionary, s.v. "curator." www.merriam-webster.com/dictionary/curator (accessed April 10, 2021).

Merton, Amber. "What Is Eco Art?" PlushBeds. June 6, 2016. www.plushbeds.com/blogs/green-sleep/what-is-eco-art (accessed April 10, 2021).

Miebach, Nathalie. "Art Made of Storm." TEDGlobal 2011. July 2011. www.ted.com/talks/nathalie_miebach_art_made_of_storms?referrer=playlist-art_from_data#t-2243 (accessed April 10, 2021).

Moore, Charles. "Plastic Pollution." Encyclopedia Britannica. June 18, 2021. www.britannica.com/science/plastic-pollution (accessed September 10, 2021).

Ostendorf, Yasmine. "The Top 10 Most Pioneering Art/Sustainability Initiatives in Thailand." Artists & Climate Change. May 21, 2018. https://artistsandclimatechange.com/2018/05/21/top-10-most-pioneering-art-sustainability-initiatives-in-thailand/ (accessed April 30, 2021).

Punyauppa-path, Sukrita and Prasongsom Punyauppa-path. "Microplastics: Origin, Environmental Impact, Environmental Contamination and Management Methods." *Journal of Environmental Management* 15, no. 2 (2019):88-105. (accessed April 30, 2021). doi:10.14456/jem.2019.13.

Sovhyra, Tetiana. "Technology Singularity in Culture: The Urgency of the Problem in the COVID-19 Pandemic." *Journal of Urban Culture Research* 22 (2021):37-49.

Tate.org. "Art Term: Contemporary Art." N.d. www.tate.org.uk/art/art-terms/c/contemporary-art (accessed April 30, 2021).

Tate.org. "Art Term: Environmental Art." Tate. N.d. www.tate.org.uk/art/art-terms/e/environmental-art (accessed April 30, 2021).

Thai Health Watch. "เมื่อ'ขยะพลาสติก'กำลังกลับมา." Thai Health Watch 2021. www.prd.go.th/th/file/get/file/202107314c79a6fead89b92db35a6803c9114cf0195710.pdf (accessed September 10, 2021).

ThaiPost. "แผนไทยไร้ขยะพลาสติก" อีกหลายสิ่งที่ต้องเติมเต็ม." ThaiPost. February 23, 2021. www.thaipost.net/main/detail/93964 (accessed September 10, 2021).

Unwin, Antony, Chun-houh Chen, and Wolfgang K. Härdle. "Introduction." In *Handbook of Data Visualization,* edited by Antony Unwin, Chun-houh Chen and Wolfgang K. Härdle. Berlin: Springer-Verlag, 2008, 3-12.

Veal, Clare. "Bringing The Land Foundation Back to Earth: A New Model for the Critical Analysis of Relational Art." *Journal of Aesthetics & Culture* 6 (April 17, 2014). www.tandfonline.com/doi/pdf/10.3402/jac.v6.23701.

Weintraub, Linda. *To Life!: Eco Art in Pursuit of a Sustainable Planet.* London: University of California Press, 2012.

Weis, Judith S. *Marine Pollution: What Everyone Needs to Know.* New York: Oxford University Press, 2015.