



**Northwest
Pacific
Action Plan**

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Northwest Pacific Action Plan

Pollution Monitoring Regional Activity Centre

The Eighteenth NOWPAP POMRAC Focal Points Meeting

Vladivostok, Russian Federation, 7-8 December, 2021

On-line meeting

**Using artificial intelligence to detect, identify and count elements of
marine debris in pollution monitoring in the NOWPAP region**

Workplan and budget

1. Background

In the biennium 2020-2021, NOWPAP member States updated the NOWPAP Regional Action Plan on Marine Debris (RAP MALI), which was adopted in 2008. The main purpose of the update was to add new issues of concern regarding marine microplastics and plastic debris, which have become serious emerging issues with the highest priority in the world.

The plan pays great attention to combating pollution of the marine environment from coastal sources. According to recent studies, river runoff makes the greatest contribution to sea pollution. During floods, garbage is released into the sea. Urban and recreational areas remain another significant source of pollution. However, the exact determination of the source of pollution remains a very difficult task. In ports, individual accumulations of marine debris can be repeatedly transferred from one berth to another, which makes it even more difficult to identify the source of pollution.

Currently, it is planned to regularly scan the pollution of large areas of the marine area with the help of unmanned aerial vehicles (UAVs). In the presence of technology for automated identification of the composition and quantitative assessment of fragments of marine debris of various sizes, it is necessary to determine the source of pollution with a high degree of reliability. The task is to organize monitoring of pollution of the water surface in ports with plastic garbage and to trace the sources of such pollution.

2. Purpose

The purpose of this activity is to develop a method for determining the composition and quantity of marine debris in the coastal and port area in the form of plastic waste using artificial intelligence (AI).

3. Tasks

1. Choose the ten most common types of garbage items (plastic bottles of various capacities and shapes, plastic bags).
2. Make the necessary number of different photos according to a technique that allows you to fix the special signs of MALI. This means the production of photographs for each type of garbage at certain working distances, under different working angles and at different times of the day (different illumination).
3. By of ultra-precise technologies, to determine the characteristic features of the shape of objects (image analysis and extraction of useful information, signs).
4. Extract the signs using filters. Combine features as data elements that will be processed by a neural network and combine all images belonging to the same type of garbage (for example, plastic bottles with a capacity of 0.5 liters) in different angles and at different light levels.
5. Choose the architecture of convolutional neural networks using deep learning.
6. Create a database of images and train a neural network using a number of techniques using image analysis. Output the result as consolidating all the techniques.

7. Choose the most preferred method with the highest confidence weighting factor.
8. Conduct verification experiments using artificial intelligence with a known type and number of items.
9. Using artificial intelligence, count the number of items of known types, remember the current combination of garbage, so as not to confuse it with other garbage spots in the future.
10. Conduct research in practice in the Golden Horn Bay.
11. Based on the results of the work performed, submit.

4. Expected results

It is expected that ML identification and quantification of pollution will contribute to more effective identification of pollution sources and justification of legal actions to reduce marine pollution.

5. Budget

Task budget	(US dollars)
- Collecting and analyzing images of ML objects and extracting useful information	2,000
- Compile an image database and train the AI using a number of promising methods	1,800
- Determination of the optimal approach of using AI in solving the task. Conducting verification experiments	3,000
Conducting research in practice, publishing a summary report, including a review of the methodology.	3,000
Total	9,800