

## Developing integrated modelling and mapping techniques for calculating plastic leakage to the waterway for the national action plan

*Aprilia Nidia Rinasti*\*<sup>1</sup>, *Angsana Chaksan*<sup>1</sup>, *Indradhi Faisal Ibrahim*<sup>1</sup>, *Khin San Hlaing*<sup>1</sup>, *Kavinda Gunasekara*<sup>1</sup>, *Makoto Tsukiji*<sup>2</sup>, *Ohnmar May Tin Hlaing*<sup>3</sup>, *Thammarat Koottatep*<sup>1</sup>

<sup>1</sup> *Asian Institute of Technology*

<sup>2</sup> *Institute for Global Environmental Strategies*

<sup>3</sup> *Environment Quality Management*

In support on the shaping the national plastic action plans in the ASEAN member states, plastic leakage modelling was compiled to give the baseline data in delivering the city regulation regarding the plastic waste. The critical elements in this working phase are delivering the current management systematically, assisting the survey-based condition judgment, and holistic calculations in spatial context. In this work, deliver as leakage modelling, included all of the material flow analysis, survey results, and spatial analysis. The spatial analysis related to plastic leakage included proximity analysis, hydrological analysis, and weighting calculations. The mapping including global-scale data in socio-economic context, optical and thematic remote sensing, and geo-coded features, which define under the process with the expected outcomes with map of hotspot. The multiple data input and different outcomes from each stage were compiled in model builder to create the designated toolbox for leakage modelling. The result was also compiled with satellite imagery to check the validity of the leakage. The result was shown that different cities applied different number of leakages. A capital city with millions of inhabitants can leak up to 70 ton per year in the main river, while small town with major water infrastructure might leak up to 45 ton per year. In similar condition, small town with lesser waterway access might leak 1.8 ton per year. Plastic accumulation places were counted more than 200 accumulated plastics in the whole cities, implored the plastic exposed in the open environment roughly estimated 220.38 L, where the measurement improved by using the assumption of general water gallons. Designated area needs to pay more attention to open land, new developed area, outskirts area, and connected area to the neighbouring cities – referred as the vulnerable areas. The vulnerable areas of leakage indicate the collaboration with the neighbouring cities is required.

**Keywords:** Plastic waste, Material flow analysis, Hydrology, Mobile app, Socio-economic.