

Study on risk governance and policy of air pollutant in Taiwan

- Investigation on the practice of citizen science making regulation progress: A case of government and civil micro-monitoring

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Based on the fruitful results of "study of risk governance and institution for air pollution in Taiwan", it is found that an innovative institution is of necessity regarding Taiwan's air pollution regulations. As far as the regulations are concerned, the emission standard and the total quantity controls are the two main measures in place to tackle air pollution. However, neither of them can effectively achieve the synergy of "cross-boundary governance" from the collaboration of the regulated area and its administrative area. As for the sources of pollution, both industrial and traffic emissions are deeply rooted in Taiwan's existing industrial structure and the people's daily activities, which reflects the need for industrial transformation. Lastly, in terms of regulatory science, many Taiwanese people have become keenly aware that the air pollution has exerted negative influence on daily life, which can be seen by putting up banners, demanding for testing and prevention measures and launching campaigns for attention. The participation of the citizens can be demonstrating their knowledge in this field, and the variance between that and the experts' and officials' understanding of the issue is looming large.

At present, the context of the environmental movement in Taiwan has shifted from the victims' narrative of their experience to "epistemology by the citizens" (Chou, 2015). If the previous research results are to be extended and deepened, the focus should be on producing and applying knowledge to address the fundamental problems of the controls on air pollution in Taiwan. To this end, the practical experience of the citizen science from the international community is of significant reference value. Citizen science stemmed from the relationship transition between citizens in the modern society and the science (Irwin, 1995:1-17). It is considered that both the broadest sense of "citizen participation in science" from early days to the rise of community environment monitoring in the U.S. and Canada (Ottinger, 2012: 251-254, Conrad and Hilchey, 2011: 274-275) are seen as ways to initiative the regulatory

innovation. Although "citizen science" does not replace the experts-led approach of regulatory science adopted by the government at the moment, it does motivate the regulators to fill in the gap of some kinds of science, which can promote the open discussion of knowledge and the access to information, etc. The practical experience of citizen science based on social movement (Ottinger, 2017: 3-7) can be gained from the case of the air quality control area in San Francisco bay area, where the design, execution, supervision and information interpretation process of monitoring mechanisms for hazardous air pollutants were strengthened (Ottinger, 2016: 7-9).

The development of air pollution monitoring activities by the communities in the central and southern Taiwan are based on the past campaigns against air pollution. Compared with the citizen science practices in the United States, the actions in Taiwan is similar but not exactly the same. In Taiwan, such practices have prompted the government to discuss the definition of risk criteria of regulatory science with the society, to remedy the systemic vulnerability of conventional monitoring scheme as a response to the concept of co-production of knowledge of risk governance (Tu and Shih, 2016). Therefore, this study, through observation and analysis of Taiwan citizens' campaigns against air pollution, aims to explore the characteristics of "the development of citizen science in Taiwan". Moreover, the study is an in-depth analysis of the possibility to promote cooperation between the government and the citizen science for developing "consulting/functional control" model (Conrad and Hilchey, 2011:274-275), echoing with the upcoming "micro monitoring of air quality programme" to be launched by the environmental protection agency. The study is carried out in hopes of providing recommendations to solve the key issues such as "cross boundary governance", "knowledge gap" and "industrial transformation" in air pollution governance.