



Education for sustainable development for Tokyo Bay: Developing a practice framework of university-based coastal ESD

Midori Kawabe^{*}, Hiroshi Kohno, Takashi Ishimaru, Osamu Baba¹, Naho Horimoto, Reiko Ikeda, Jota Kanda, Takafumi Kudo, Masaji Matsuyama, Masato Moteki, Yayoi Oshima, Tsuyoshi Sasaki

Tokyo University of Marine Science and Technology, Konan 4-5-7, Minato City, Tokyo 108-8477, Japan

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ABSTRACT

This paper reviews the initial phase of a coastal education for sustainable development program for Edomae, the innermost reaches of Tokyo Bay. The program has been steered by a working group of Tokyo University of Marine Science and Technology faculty members from different academic backgrounds. Although the process began with conventional educational ideas, the ESD practice framework evolved to include more interactive activities. The overall goal is to pursue discussions of a plan for the sustainable use of Tokyo Bay in the coastal communities through a university–community partnership by developing Edomae ESD leaders in the coastal community.

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1. Introduction

Sustainable development was the central concept of the United Nations Conference on Environment and Development (UNCED) in 1992, and Chapter 36 of its action plan, Agenda 21, specifically emphasized the importance of education in promoting sustainable development and improving the capacity for people in all areas [1]. In 2002, 10 years after UNCED, the United Nations named 2005–2014 the “Decade of Education for Sustainable Development” (DESD) [2]. Table 1 presents the 10 essential ESD elements as defined by the United Nations Educational, Scientific and Cultural Organization’s (UNESCO) International Implementation Scheme (IIS) of DESD [3]. No universal models of ESD exist, however, so reorientation and reshaping of the conventional curriculum are emphasized as the key to ESD promotion [4].

In the coastal context, ESD is relevant to capacity-building for integrated coastal zone management (ICM). ICM is defined as “a process that unites government and the community, science and management, sectoral and public interests in preparing and implementing an integrated plan for the protection and development of coastal ecosystems and resources” [5]. Chapter 17 of Agenda 21 requested that coastal states commit themselves to the

integrated management of coastal areas for sustainable development [6], and the ICM concept rapidly spread in the 1990s as a means to achieve sustainability in coastal areas. The promotion of ICM was re-endorsed by the World Summit on Sustainable Development in 2002 [7].

Along with the increasing recognition of ICM, the importance of education as part of capacity-building has been documented, and the conceptual framework has been well developed [8]. Although ICM education is expected to take place at all levels of any relevant sectors [6], tertiary education marine affairs programs bear much of the responsibility [9]. Much of the focus has been on the knowledge, skills, and attitudes that ICM professionals are expected to have [10] and on the curriculum that develops such professionals [9,11].

What should a university-based coastal ESD program be like? Since the primary mission of a university is higher education, the program should involve students. At the same time, promoting democratic processes is a central ESD concept [3] and involving stakeholders is a key element, so a program should not be confined to the university. It should be open and connected to the coastal community to promote interactive processes with people from different backgrounds.

With these challenges in mind, the Edomae ESD program was launched in October 2006. The ultimate goal is to discuss a plan for the sustainable use of Tokyo Bay. The Edomae ESD program has been steered by a working group of volunteer faculty members of the Department of Marine Science, Tokyo University

^{*}Corresponding author. Tel./fax: +81 3 5463 0574.

E-mail address: kawabe@kaiyodai.ac.jp (M. Kawabe).

¹ The following authors are in alphabetical order.

Table 1

Summary of the Edomae ESD in comparison with the essential elements of ESD of IIS by UNESCO (2005) [3].

UNESCO ESD	Edomae ESD
(1) Is based on the principles and values that underlie sustainable development.	Pursues discussions of a plan for the sustainable use of Tokyo Bay.
(2) Deals with the well-being of all three pillars of sustainability: environmental prudence, social equity, and economic efficiency.	Deals with environmental and resource issues concerning Tokyo Bay, including water quality and fishing resources, as well as use conflicts among a variety of sectors.
(3) Promotes life-long learning.	Promotes education in the coastal communities.
(4) Is locally relevant and culturally appropriate.	Takes root in the coastal communities that rely on the ecosystem services of Tokyo Bay.
(5) Is based on local needs, perceptions, and conditions, but acknowledges that fulfilling local needs often has international effects and consequences.	Is based on the local needs to retrieve the link between people and the bay that was almost lost because of the industrialization over the past 40 years.
(6) Engages formal, nonformal, and informal education.	Attempts to involve community members, schools, and the university curriculum.
(7) Accommodates the evolving nature of the concept of sustainability.	Has developed its practice framework to be more practical and interactive to achieve the sustainable use of Tokyo Bay.
(8) Addresses content, taking into account context, global issues, and local priorities.	Deals with Tokyo Bay, which is a local coastal water, but similar issues are shared by many coastal communities.
(9) Builds capacity for community-based decision-making, social tolerance, environmental stewardship, an adaptable workforce, and quality of life.	Builds capacity in the coastal community for sustainable use of Tokyo Bay and for integrated coastal zone management in the future.
(10) Is interdisciplinary.	Involves the communication of people from a variety of backgrounds both in the university and the community.

of Marine Science and Technology (TUMSAT). This paper, through a review of the program's initiation phase (Phase I: August 2006–March 2007), examines the development of the practice framework in preparation for launching the next phase.

2. Background: Edomae now and then

Tokyo Bay is located in the center of the southeast coast of Honshu, the main island of Japan, and faces the western region of the North Pacific Ocean. The maximum meridional and zonal widths of the bay are 50 and 30 km, respectively. The entire coastline is 650 km long, and the area is about 960 km² (Fig. 1). Surrounded by the Tokyo Metropolitan Area, the bay may hold the most concentrated human population of any waterway in the world; the population density in the bay catchment is 3301 people km⁻² [12].

The bay was originally rich in tidal flats and shallow waters, which were primarily associated with Edomae, or the innermost western reaches of the bay. The cognomen of Edomae dates back to the Edo Period (1603–1867), when the central government was first setup in the city of Edo or present-day Tokyo. Since then, Edomae has provided its coastal communities with abundant seafood. Many types of commercial fisheries were conducted there for a variety of species of seaweed, bivalves, crustaceans, and fish. The production of Nori (laver; *Porphyra* spp.) ranked the highest in Japan before the Second World War in both volume and value [13].

In the wake of the rapid industrialization of Japan after 1955, however, the Edomae environment was drastically transformed [14]. One of the early impacts of industrialization was chronic water pollution primarily caused by industrial discharge; several fishing grounds for fish and shellfish and laver farming were damaged by 1960 [15]. Laver and shellfish fishermen adapted by expanding their fishing grounds offshore to avoid the contaminated areas. Ongoing coastal development, however, forced most Edomae fishermen to renounce their fishing rights in the 1960s. Industrial pollution was attenuated after the oil crisis in 1973, but the filling of coastal land has continued as sewage and incinerator plants, ports, and transportation facilities have been constructed [16] (Fig. 1).

Although more than 90% of the coastline has been modified through land reclamation during the past 40 years of large-scale development, Edomae still provides a variety of coastal ecosystem services [17]. Sanbanze tidal flats, a limited area of natural tidal flats, serves as a nursery for various species of fish [18] and shellfish [19]. Some Edomae fishermen, together with other fisheries cooperatives in the neighboring prefectures of Kanagawa and Chiba, share the fishing grounds in Tokyo Bay and catch Manago (conger eel; *Conger myriaster*), Suzuki (Japanese sea bass; *Lateolabrax japonicus*), Asari (Manila clam; *Ruditapes japonicus*), and other commercial species of fish under a permit from the prefectural governor. Artificial tidal flats provide residents with places for recreation and relaxation, and offshore demersal fish (e.g., flatfish; Pleuronectidae) and pelagic fish (e.g., Suzuki) attract anglers.

The major current concern for the Edomae environment has changed from the pressures of industrialization to eutrophication caused by discharges from the more than 26 million people that inhabit the basin. The vicious cycle of eutrophication and chronic organic contamination, including red tides, anoxia, and fish and shellfish die-off, continues [14]. The organic level is highest in Edomae where large river estuaries and industrial facilities are concentrated [20]. Another concern for Edomae is the uncoordinated heavy use of the coastal area by different sectors, including developers, fishermen, and recreationalists.

In the absence of any central coastal zone management programs, substantial anthropogenic influence has been exerted on the bay's environment and resources. Japan's national government began to incorporate an environmental perspective into its policy-making in the late 1990s, which was followed by the stipulation of ICM implementation in The Marine Basic Law in 2007. These changes in coastal administration should help to avoid further degradation of the coastal environment. Before launching ICM programs, however, several issues must be thoroughly discussed and incorporated into the coastal policy, including involving citizens in policy decisions and incorporating coastal fishermen into the coastal managerial framework [21].

3. Edomae ESD program Phase I: calling for collaboration and setting program goals

3.1. Step 0: kick-off

Tokyo Bay has been a familiar research field for TUMSAT because the campus is located on the coast of Edomae. Many TUMSAT researchers and postgraduate students have studied the natural and social aspects of the bay, including the water currents, water quality, fish and shellfish, plankton, fisheries, and recreational activities. In recent years, TUMSAT has been offering annual public programs that include biosurvey cruises for high-school students and extension lectures for local residents. Through these activities, several faculty members have shared a concern that

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