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In transition towards sustainability: Bridging the business and education sectors of RCE Greater Sendai using ESD-based social learning

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Abstract: Developing human capacity within the education and business sectors in the context of education for sustainable development (ESD) is vital for the transition towards sustainability. With the Decade of Education for Sustainable Development drawing to the last third of its phase, evaluation of the progress of ESD, of how learning and education have contributed to sustainability is important. Although exemplars of ESD success stories have been provided, further identification of capacity building measures particularly at the individual, group or community level in addition to implementing effective and relevant monitoring and evaluation mechanism(s) are important. The regional centre of expertise (RCE) was set up to advance the ESD agenda at the local and regional levels by enabling a stage for multi-stakeholder engagement. One aspect of RCE Greater Sendai (RCEGS) that has been least examined is its potential for stakeholder engagement, hence capacity building through collaboration and partnership between the business and education sectors using ESD-based social learning, their networking with other sectors and the overall coordination by the RCE Steering Committee aimed at achieving sustainability in the region. Based on the results on students' prior experience in ESD activities, optimal age for ESD learning and future job choices in this paper, together with an earlier report that the levels of sustainability of the two sectoral organizations were mixed and hence needed improvement, the authors propose a conceptual framework for multi-stakeholder, ESD-based social learning within RCEGS with the hope of enabling the creation of a sustainable society. The paper argues that initially focusing on bridging the two sectors and developing

the capacity of youth with respect to the practical use of the government-mandated 'period of integrated studies' (PIS) in the Japanese primary and secondary school curriculum and also promoting networking and interactions among the actors and stakeholders in RCEGS will be good.

Keywords: sustainability; transition; business; education; ESD-based social learning; capacity building.

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1. Introduction

Humanity faces an unprecedented array of environmental problems, the chief of which is climate change. At the backdrop are a weakened and faltering global economy and a looming food, water and energy crises that threaten the current relatively stable global security. Although a principal goal of sustainability is attaining a state where the planet's resource extraction, use and the resultant pollution by particularly humans will be within its carrying capacity [1], the current state of the environment and its potential adverse impact on society brings into question the effectiveness of the present world's educational systems and business practices to meet humanity's present and changing needs [2].

The education and business sectors are both important in the transition towards sustainability. ESD-based capacity building using a more encompassing form of learning and the full engagement of the sectoral organizations and society in sustainable practices is therefore important. The contribution of education through ESD could result in improvement in the quality of life of the people, help create resilient individuals, group or society who are capable of thinking holistically, systemically and integratively, and able to adapt to adverse environmental conditions using their acquired knowledge, values and skills. Generally, business could contribute to sustainable development (SD) by using its ample financial and other resources, technologies and a skilled workforce that is knowledgeable in sustainability issues. In order to achieve this, because real-life issues and complexities that occur in everyday living are not categorized, compartmentalized or resolved through discipline-based approaches, it is imperative that society undergoes a certain competence developing stage in their lives whereby the conventional discipline-based learning process is discontinued or significantly curtailed and new, more relevant skills taught via a new learning platform [3].

ESD aims to "develop the knowledge, skills, perspectives and values that will empower learners of all ages to assume responsibility for creating and enjoying a sustainable future" [4].The UN Decade of Education for Sustainable Development (DESD) which serves as a platform for learning for SD and is to integrate the principles, values and practices of sustainable development into all aspects of education and learning has entered its third and final phase ending 2014. Consequently, evaluation of how learning and education has contributed to sustainability is increasingly important. And although exemplars in the form of capacity strategies, mechanisms, methods, practices and initiatives across various scales have been provided [5], further identification of capacity building measures aimed at the individual, group or community level in addition to implementing effective and relevant monitoring and evaluation mechanism(s) are important. The overall results achieved so far are mixed with modest accomplishments and also shortcomings.

Furthermore, the regional centre of expertise (RCE) network – which includes RCE Greater Sendai – that was set up to advance the ESD agenda at the local and regional levels during the Decade is unique in its trans-disciplinary nature of nurturing and encouraging learning processes while simultaneously enabling a stage for multi-stakeholder engagement. It however needs to strengthen or improve several aspects including collaboration, coordination, monitoring and evaluation of the ESD-based program activities involving education and learning across scales. One particular area that has been least examined for its potential regarding sustainability and social learning in RCE Greater Sendai (RCEGS) is the collaboration between the business and education sectors and their overall coordination by the RCE *"*governing body*"* with linked networks for the realization of a shift in progress due to the learning outcomes.

2.0 Conceptual Background

2.1. The sustainability challenge in the education and business sectors

The transition to sustainability from the current state faces numerous challenges. Among them are environmental, socio-cultural, economic and ethical challenges. For example, ethical sustainability challenge which is also a relational one comprises of both individual and systemic ethical challenges and are to get people to think beyond themselves, stretching individual and narrow self-interests into broader civic interests, more benevolent and democratic habits, and institutions more capable of building and rebuilding better societies [6].The recent unethical practices that has kept the global economy in recession is a case in point.

Undoubtedly however, the greatest challenge in the transition towards sustainability is the structural realignment of mankind's dominant economic development models away from energy- and material-intensive processes and an inflexible preoccupation with rapid output growth of commodities [7, 8, 9]. Based on an integrated understanding of assessing outcomes and judging value, and because this orientation radically opens up possibilities for change in the future [10], sustainability must be a pragmatic idea in order to hold any weight in reorienting the societies of the future [6]. The sustainability paradigm is then set to pragmatically address the challenge(s) by rejecting the argument that casualties in the environmental and societal realms are inevitable and acceptable consequences of economic development [2] and rather embraces a combined empirical assessment and normative claim– that the current society-nature interactions are not sustainable and that societal developmental paths should meet basic human needs, within and between generations while maintaining the planet's life-support systems and living resources [8, 11].

From the business perspective, companies face the tough challenge of unlearning their own methods of doing things at the backdrop of the challenge of a fundamental re-orientation of society using education and the economy largely steered by business; where a closed loop, 'cradle to cradle' approach to material flows rather than the linear, 'cradle to grave' resource use [8] is embraced. Some specific business sustainability challenges are 1) how to integrate externalities, 2) how to avoid/reduce negative social and environmental impacts and 3) how to identify opportunities caused by a (more) sustainable behavior, 4) a concern that "ecological modernization" is designed to maintain the economic advantages of existing global elites and blunt a more far-reaching sustainability challenge

which will include sustainability corporate social responsibility demands, 5) the structural realignment of economic development objectives, combining dematerialization and eco-efficiency with a disciplining of wealth creation incentives by social justice considerations, 6) effective integration of regulation for sustainability across policy sectors as well as political borders, 7) the routine employment (in decision making) of sustainability assessment informed by extensive stakeholder participation, 8) the ascription of rights protection to critical sustainability entitlements for all planetary citizens , and 9) the promotion of altruistic, ecologically enlightened social identities [8].

A key element of education reorientation in schools is innovation within the curriculum and a major challenge facing nations therefore is whether their educators should teach about sustainability or to change the goals and methods of education to achieve sustainability.

2.2. Education and learning for sustainability in schools and companies

Effective strategies for addressing sustainability challenges from the local to global level are needed, and there is broad consensus that education – including all its components – must be the driving force [11]. Human resources are therefore the key agents to achieving sustainable development through appropriate development of human capacity using a broad range of educational means such as formal and non-formal education, training and public awareness raising [12]. In that regard, the realization of a shortfall in human capacity for sustainable development by many governmental, non-governmental and international institutions has led to the call for the development and enhancement of ESD. In fact all sectors were encouraged by the Chapter 36 of Agenda 21 to provide training for their leaders and workers in sustainability management [13].

ESD expresses a complex of concepts, theoretical constructs, policy prescripts and practical methods and tools that convert education and learning to the socio-economic and ecological dimensions of sustainable development [14]. ESD is also about development of knowledge, skills understanding and values that result in the empowerment of the recipients and consequently enables their participation in decisions about changes in lifestyles and behaviors that will improve the quality of life now and sustain the planet for future generation. ESD might then be seen as the total sum of diverse ways to become a ‘learning society’ in which people learn from and with one another and collectively become more resilient to deal with sustainability challenges – induced insecurity, complexity and risks. It provides the opportunity to address sustainability challenges by integrating the principles, values and practices of sustainable development directly into education. As a lifelong learning process, that is holistic and interdisciplinary in nature [2, 12], ESD is also values-driven, locally relevant and built on principles of critical thinking and problem-solving. Foster [15] argues that sustainable development is inherently a learning process of making the emergent future ecologically sound and humanly habitable, as it emerges through the continuous responsive learning rather than depending solely on learning. He describes learning as a collaborative and reflective process, the extension of this into an inter-generational dimension, and the idea of environmental limits. A crucial point about effective learning therefore is that not only can it have tangible and immediately useful outcomes in terms of knowledge, understanding, skills, social action, etc, but it can also reinforce the capability and motivation for further learning both individually and socially [16].

ESD is important for business as it helps in improving business practices and assists the process towards sustainability. For example, ESD was considered by company workers from the

automobile/computer manufacturing, meat/drink processing, retail and service (and educators) in particularly South Miyagi of Japan as the most important component of environmental pollution prevention and one of the most important for its control [17,18]. The level of knowledge of ESD could therefore be used as one of the indicators of sustainability capacity in organizations. Moreover, it provides opportunities for increased engagement between the private sector, civil society, governments, employees and trade unions – through multi-stakeholder partnerships. ESD also helps in preparing a skilled, informed and responsible workforce and employees and it raises the awareness of all stakeholders such as customers, suppliers and employees about sustainability issues and challenges. Although an environmental or sustainability report is the foundation for information disclosure on a company's environmental activities and the environmental management system (EMS) implemented by firms aimed at continuous improvement of the environmental performance of companies towards sustainability [19, 12], reorienting education and training in companies by incorporating ESD into these two tools could be effective in enhancing sustainability knowledge and skills within a company [17].

Characteristics that promote ESD in schools include policy mandates that allow the implementation of the whole-school management system, flexibility of teachers to innovate within the curriculum and reorient teaching towards more locally-relevant and practical solutions to sustainability problems, coherence of the ESD concept with other educational policies already in place, links with other relevant institutions including the NGOs, universities and research organizations, companies and sister schools, continuous professional development of teachers (CPD), means of assessing the effectiveness of the ESD-related activities (see also [1]).

There are however, challenges that face the implementation of ESD program. They include 1) the ability to orientate present and future human behavior toward sustainability, 2) use of critical, values-driven, systems thinking, interdisciplinary, multi-method, holistic, participatory approaches to solve problems and make decisions that are locally relevant [20], 3) use of appropriate indicators and methods for monitoring and evaluation, 4) support for ESD-related research, 5) focused capacity building, 6) coordination and involvement of the media, 7) regional unevenness of ESD implementation, 8) awareness and understanding of ESD in the wider educational community and in the general public, 9) the reorientation of curricula and the availability of sufficient funds for ESD programs (20 and the references therein), 10) lack of ESD resource personnel and ESD-competent teachers, and 11) low level of political support.

One aspect of ESD that should be considered is the need to recognize ESD as a multi-stakeholder endeavor and also the competencies it enables students to acquire to shape their future within the framework of sustainability, without being yet another addition to the education agenda or curriculum.

2.3. *Social learning: capacity building through ESD-based social learning*

Learning is known to have different meanings depending on whether it refers to processes involving individuals, collective agents, or wider social systems. In this regard, Lee [21] distinguished nine types of learning according to whether the learner is an individual or a group and with regard to how the decision processes function to produce results from which to learn.

Learning processes of individuals play a fundamental role, because individuals constitute and shape the larger social aggregates. Learning processes on the level of social aggregates are important since

social systems embed and influence individuals. Mastering the challenges of sustainability therefore requires individual learning as well as learning processes on different levels of human systems that range from groups and organizations to human societies, and mankind as a whole. Therefore, sustainability learning needs to be understood as a multi-level concept, comprising individual, group, organizational and societal learning as well as learning processes of human systems with strong emphasis on the role of transdisciplinarity [16,11].

Social learning has been used to refer to all kinds of processes of learning and change. As a consequence, its meaning has become somewhat vague. It entails developing new relational capacities, both between social agents, in the form of learning how to collaborate and understand others' roles and capacities differently [22]. According to Reed et al. [23], social learning is the change in understanding that goes beyond the individual to become situated within wider social units or communities of practice through social interactions between actors within social networks. At the center of social learning are multi-party processes that are influenced by the context in which they are embedded and produce outcomes that may lead to changes in the context and thus to a cyclic and iterative process of change. This context of social learning includes the governance structure and the environment in which the interrelations and interactions take place among actors [24]. Social learning could therefore act as an approach for the understanding and management of environmental/sustainability issues, [24, 25]. For example, social learners gain adaptive capacity and skills that can lead to sustained processes of attitudinal and behavioral change through interactions [26]. They can also build up experience needed to cope with uncertainty and change (27) in their environment. Lately, the concept of social learning has coincided with the thrust for public participation and the growing importance given to sustainable development.

According to Tabara and Pahl-Wostl [24], social learning in the domain of sustainability entails a completely new way of thinking and that sustainability learning is different from social learning insofar as not all of the outcomes of social learning processes necessarily improve what is considered as essential for the long-term sustainability of say, social-ecological systems, namely the co-adaptive systemic capacity of agents to anticipate and deal with the unintended, undesired, and irreversible negative effects of development. Milbrath [28] contended that for social learning to move towards sustainability, it must include 1) an understanding by people of the critical roles played by values and beliefs in the shaping of reality, 2) people should appreciate the complexity and interconnectivity of ecosystems and their implications for social action; 3) they should think in holistic, systemic, and integrative manner; 4) they should avoid interfering with nature's systems and cycles and recognize the limits to growth; and 5) they should empathize with and extend our compassion to people of other lands, other species, and future generations to preserve the integrity of the ecosphere and the survival of all. The main difference therefore between sustainability learning and social learning according to Tabara and Pahl-Wostl [24], is the content of what is learned and the criteria used to assess such content.

A ESD-based social learning (ESDBSL) process therefore could be denoted as a form of social learning that operates in the context of the thrusts, strategies and principles of ESD, i.e. an understanding of sustainability that social interactions between actors within social networks become situated within the communities of practice.

A couple of isolated literature that could be seen in the context of ESD-based social learning have been reported in Japan. Yoshizumi and Miyaguchi [29] reported of a local implementation of the

principles of ESD that involved the collaboration between an NGO called Learning and Ecological Activities Foundation for Children (LEAF) and schools and businesses. LEAF initiated a series of environmental learning activities that specifically facilitated 90 private sector corporations in developing and implementing seminars and environmental learning programs for elementary and junior high school students. As the corporations participated in the theme projects in the process, these corporate employees at various levels were also afforded the opportunity to learn about environmental issues. Oikawa [30] reported of a collaboration of students and teachers of Omose Elementary of Japan and their counterparts Lincoln Elementary of USA through the sharing of the results of their pair environmental projects using computers. In the course of the project, Omose Elementary made other local linkages with Miyagi University of Education, Japan, the local education administration, schools, other institutions and the community. The report by Hirayama [31] indicated an increasing trend of major manufacturing companies in Japan distributing environmental education and awareness materials to the community either by giving text prints or through their websites or providing facilities for visits and dispatching their employees as visiting teachers. In their paper, Ofei-Manu and Shimano (20), describe the social learning processes of a socio-ecological system in Osaki-Tajiri, a focal point for ESD in RCEGS in Miyagi, Japan. With the main objective as capacity building through learning for sustainable/wise use of the wetlands-paddies goods and services, the stakeholders' ESD-linked social learning processes were underpinned by their interrelations with each other through knowledge transfer, co-production and exchange, adaptive learning and awareness creation. It was further underpinned by their interactions with the biophysical/ecological components and as a consequence, produced outcomes including value and attitudinal change toward the natural environment, effective governance to maintain the integrity of the wetland-paddies, and a reoriented method of agriculture.

2.4. *Regional Centre of Expertise Greater Sendai*

Society in its entirety encompasses diverse stakeholders and various levels of interactions between these stakeholders thus bringing about an environment that facilitates the lifelong learning development process of the human resource. An ideal regional centre of expertise (RCE) acting as a microcosm of the region/area – RCEs could vary in size, affiliations and functions, etc. – should be able to identify local concerns and address them in an integrated manner. An RCE is not a physical centre but an institutional mechanism to facilitate capacity development for sustainable development [32]. The RCEs are to serve as frameworks for production, harnessing, exchange and integration of knowledge and information through close co-operation with different institutions that include all/most stakeholders in the region and also joint development of innovative programs towards ESD. In addition to redefining existing environmental activities in alignment with the principles of ESD at the regional and local levels, RCEs can facilitate the duplication and dissemination of good ESD practices [20]. The RCE has also evolved as a concept. Originally, it was supposed to serve "the purposes of knowledge management, knowledge transfer and delivery of ESD to the community" [32]. Recently, at one end of the spectrum is the representation of RCE as a "hub", a meeting point, a clearing house and a platform for information exchange and sharing. At the other end of the spectrum is the interpretation of an RCE as a "community of practice", an institutional mechanism for "social learning" and a learning network [32].

In search of a strategy that would help translate the ESD agenda at the local level, the United Nations University-Institute of Advanced Studies (UNU-IAS) has championed the establishment of RCEs and supported them around the globe. The RCE Greater Sendai (hereafter RCEGS) in Miyagi, Japan was one of the pioneers and has been coordinating ESD practices under its umbrella through collaboration and partnerships among many stakeholders, and Miyagi University of Education has served as the secretariat of RCEGS since its establishment in 2005. The RCEGS's objectives and focal points of activities each including several actors have been location-specific and are described in Ofei-Manu and Shimano [20] and Ofei-Manu and Shimano [1].

One aspect however, with the potential for capacity building that has been the least examined in RCEGS is the collaboration and partnership between the business and education sectors. This is at the backdrop that collaboration is one of the identified core elements of the RCE in addition to governance and sustainability of the RCE, research and development, and transformative education. The other aspect is the overall facilitation/coordination of the actors and multi-stakeholders within or between the focal points by the RCE Steering Committee aimed at enabling the creation of a sustainable society in the region. Results on a related study indicated that the degrees of sustainability of organizations in the education and business sectors were mixed and hence needed improvement [1]. The study therefore sought to explore how to bridge the two sectors in the context of sustainability transition and develop or improve the capacity of the youth (and the company workers) in the region using existing structures in both sectors.

3.0. Materials and Methods

The study was conducted within RCE Greater Sendai in Miyagi Prefecture of the Tohoku region of Japan. Students and teachers were sampled from 15 schools in and around Zao-Shiroishi, Murata, Kakuda City, Natori City and Sendai City using survey questionnaires.

Preferences for the suggested ESD approaches for implementation in the organizations were sought from respondents. The suggested approaches were categorized as: a) sustainability awareness creation by the use of the media (internet, newspapers, and voluntary in-school activities, b) reoriented field-based and classroom-based sustainability education in the present curriculum, c) company visits and on-the-job training/internship and d) sustainability practices in the school premises and environs [see details in 1]. Students were also asked what jobs they would like to do in the future. Analyses were done and the statistical representation was mainly descriptive.

4.0. Results

4.1. Enhancing capacity at the grassroots using ESD-based social learning through collaboration between the education and business sectors in RCEGS: (1) ESD-related activities students participated in

Education is considered as one of the primary tools for capacity building in most national policy strategies to achieve sustainability. Hence it is important that sectoral education initiatives and programs of RCEs be more closely linked to national sustainability goals and priorities. Table 1 is a list of several pro-sustainability activities that students said they participated in. The idea was to

ascertain which activity students have already engaged in and hence might have some knowledge of and/or experience in, and as a result, ask them and their teachers to suggest which approach they considered more effective in delivering ESD. Such information on grassroots ESD activities could also be useful for the curriculum developers or policy makers for possible incorporation into the formal curriculum in the future. It also provides some basic but useful information for particularly school management and teachers about the level of students' experience in ESD activities in the area for its subsequent implementation.

Results showed a significant engagement in sustainability practices in the school environs, engagement with nature and the use of computers to access environmental sustainability information. Visits by students to companies to learn about their operations were low and doing internships in environmental sustainability in the company was much lower. This suggests little engagement of the two sectors and as a result, the need to enhance this education-business relationship.

Table1. Activities students participated in for environmental sustainability-related education or ESD (%)

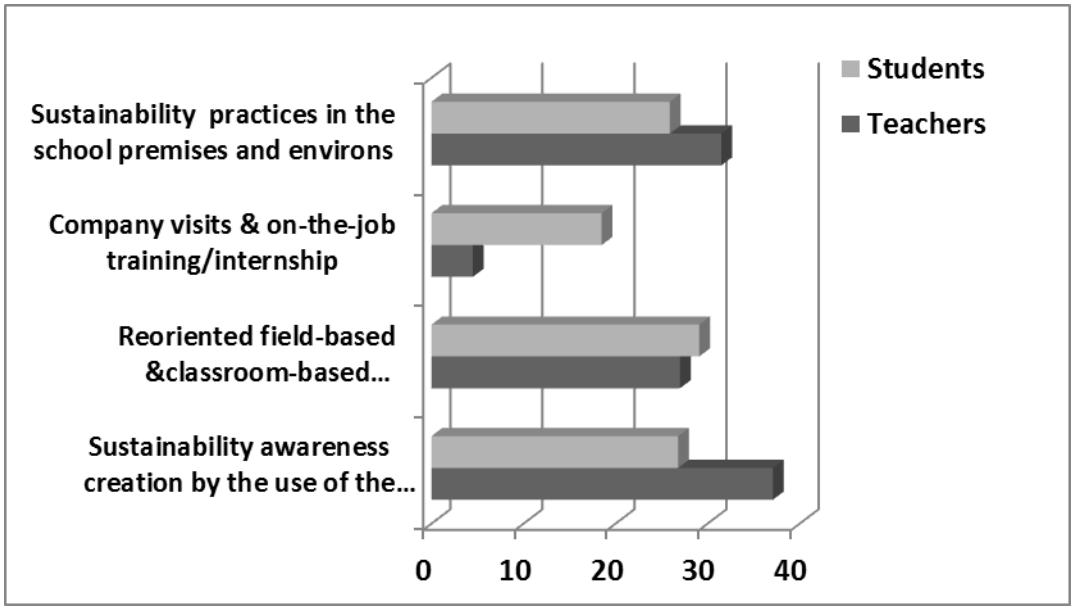
Activity	Students n = 316
a) Visiting nature conservation museums	32.0
b) Preservation of local natural areas	37.7
c) Classroom-based school activity related to environmental sustainability	27.5
d) Participation in environmental club or other voluntary activities	4.2
e) Visit to a company to learn about its entire operations	14.9
f) Receiving short-term on-the-job training in environmental sustainability related to the company	3.5
g) Use of computers and the internet to learn and share environmental sustainability information	32.0
h) Engaging in sustainable practices in your school (e.g. separating garbage for recycling, water & energy reduction, cleaning the school and its environs)	62.0
i) Use of festivals, fairs, drama, documentaries, movies etc. to develop sustainability awareness and knowledge	19.6

(2) *Company visits and on-the-job training (internship) as opportunities for social learning*

Figure 1 shows that students' and teachers' preferences for the suggested ESD approaches were different. Though company visits by students and on-the-job training or internship approach was the least preferred for both groups, students were more eager to engage in this collaboration than their teachers. The two or three day on-the-job training or internship – locally known as *shokuba taiken* and *shokugyo taiken* for junior high and senior high schools respectively, –is an annual requirement for students in the second grade of both level of schools. Usually with the guidance of the teacher, students would freely choose a local workplace they would like to do their internship and "apply" directly on

the telephone. The workplaces usually differ widely from public institutions to private companies. The elementary school children usually pay brief visits (called *shigoto taiken* in Japanese) to such places.

Figure 1. Respondents' preferences for the suggested ESD approaches (%)



Company visits and *shokuba/shokugyo/shigoto taiken* are component activities of "period of integrated study" (PIS) or *Sogotekina Gakushu no Jikan* (in Japanese). It is a national education policy which is mandatory for all elementary, junior high and high schools. It is supposed to cover about 100 hours per year of the school calendar or a study period of 2-3 hours a week and was introduced into the curriculum of schools in 2002.The main objective is to raise the skills of students to solve problems they might face in the future by adopting participatory approaches of learning. It is to provide students with a comprehensive, interdisciplinary perspective on international understanding, information technology, environment, welfare, health and human rights [33, 34]. The important aspects of PIS include the following: i) teachers have to play the role as facilitators; ii) they must acquire the information about human resources in which local persons can be made use of as guest teachers from the local communities; iii) students must go outside of schools to discover methods to solve problems, and iv) schools and communities should combine and enhance their ties through PIS [33]. The main obstacle is the lack of any concrete guidelines on what to include and how to operate, etc. The advantage however is the flexibility it gives the school authorities and teachers to be creative and innovate within the curriculum.

The component activities within PIS particularly, company visits and internship need to be streamlined to maximize the impact/outcome of the collaboration. The streamlining could be done at the school level by the school authorities or better still with backing from the prefectural/school board of education for legitimacy and wider implementation.

The need for collaboration between the business and education sectors is further evidenced by the result on students' preferences for jobs they would like to do in the future as shown in Figure 2. For all school levels, the order of preference for the top three jobs was generally similar: service, information technology and manufacturing (also biosciences for elementary schools). The service sector, particularly food and retail and hospitality sub-sectors, make significant impacts on the environment. Furthermore, though some operational impacts of some companies on the environment are more than others, their interconnections – e.g. a bank providing loan for a manufacturing company without the appropriate environmental impact assessment plan for its operations – make all the actors involved in the endeavor/project in part equally liable for what happens in the production chain.

Though this relationship between businesses and schools where students do internship and visit companies and other businesses already existed before the advent of ESD, redefining the aims of the collaboration and re-orienting the content, methods and activities towards ESD will be appropriate. For effective collaboration between these two sectors the larger goals of sustainability in RCEGS must be perceived by both.

Figure 2. Business sectors in which students wish to work in future (%)
[SHS (n=126; JHS, n= 144; Elem, n= 78)]

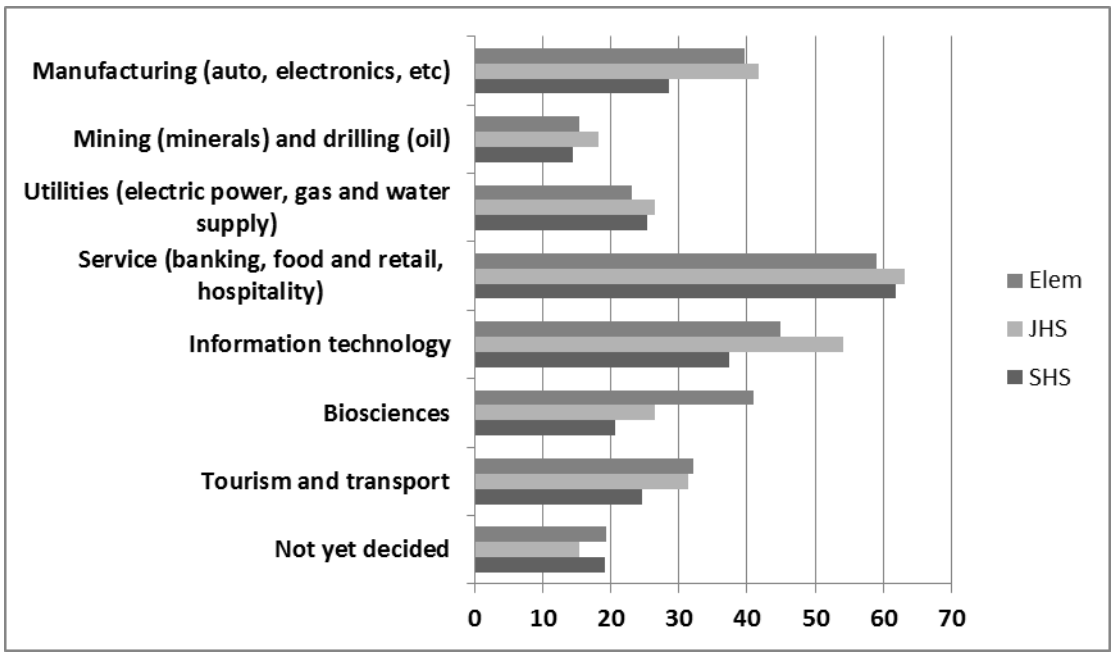
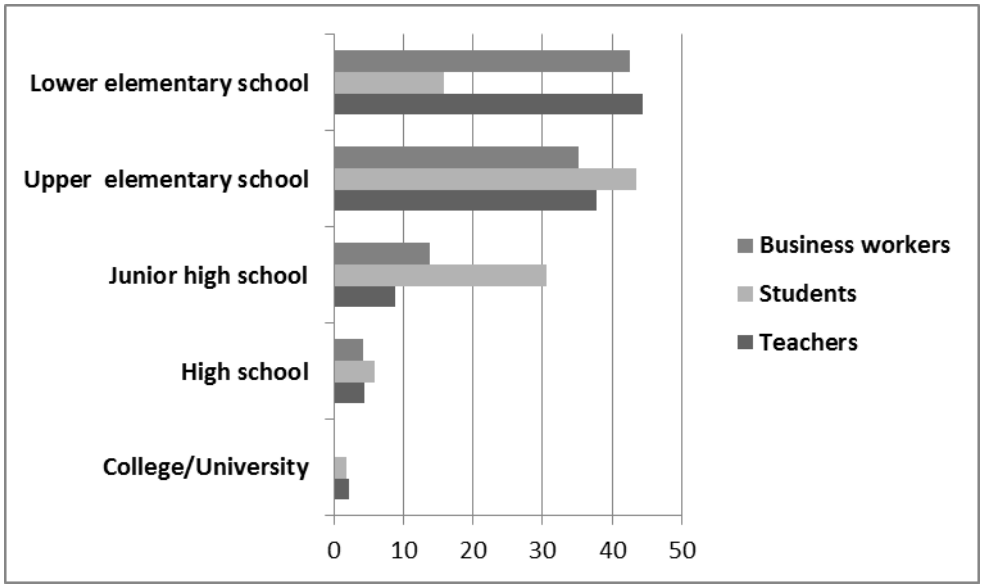


Figure 3 is the summary of the views of respondents – comprising 94 company workers, 94 teachers and 371 students from elementary to high schools – regarding the most appropriate stage for learning ESD. High school was considered too late. The result indicates an opportunity to enhance ESD capacity building at the secondary school level and even further down the educational ladder.

Figure 3. Respondents view on the most appropriate learning stage for ESD in schools (%)



(3) ***The ESD context/structure, processes and outcome(s) in RCEGS***

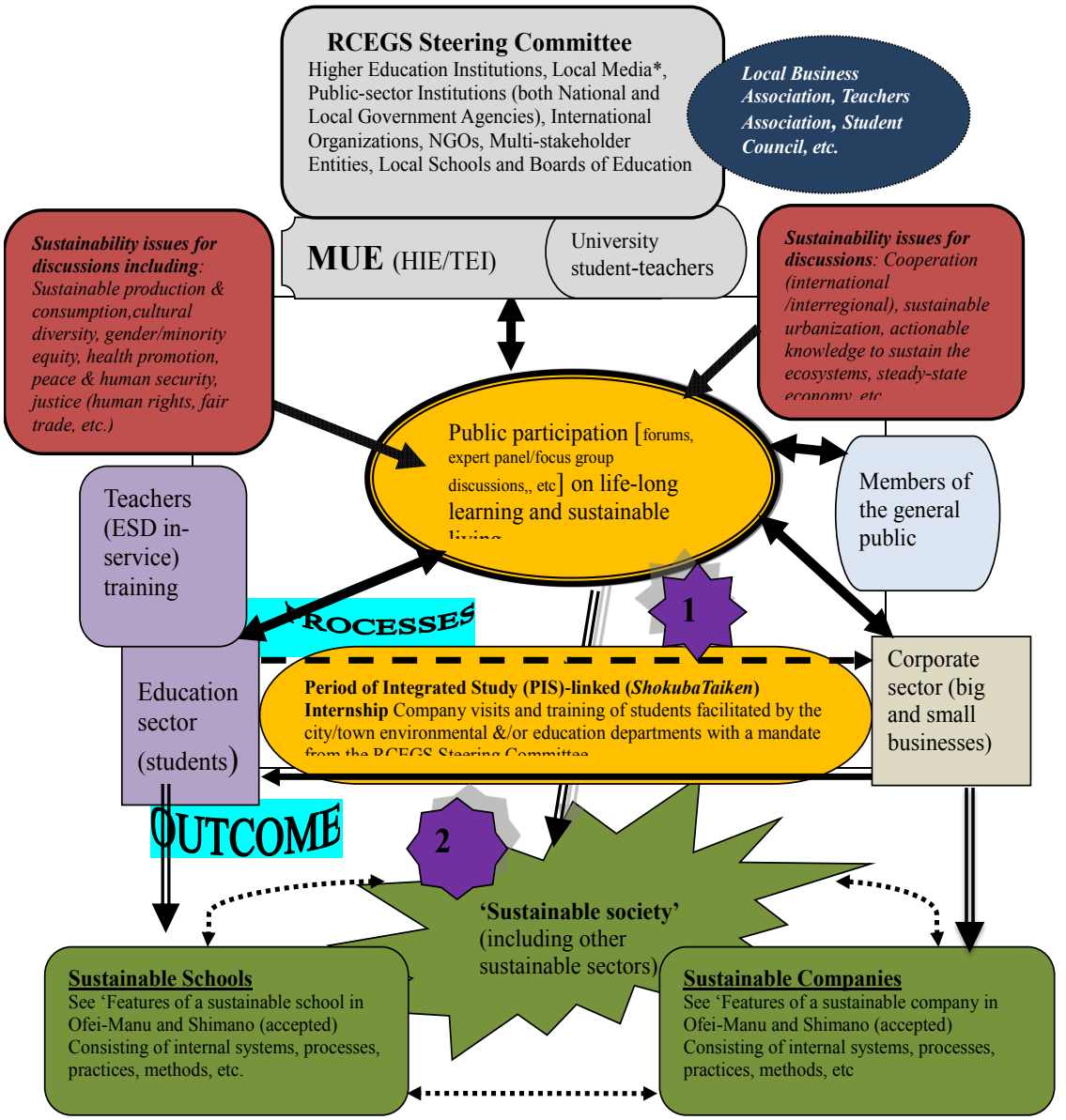
Figure 4 represents a conceptual framework for ESD-based social learning involving the education and business sectors and other multi-stakeholders and actors in RCEGS. It comprises the context of sustainability transition through coordination and linkages facilitated by the governing body (Steering Committee), using and improving the existing sectoral structures through collaborative learning between the 2 sectors and also with other sectors, a series of processes formed by interrelationships and interactions among the actors/stakeholders and in the end a sustainability outcome. The Steering Committee[1] is mandated to oversee the program activities within RCEGS. Currently, they include higher education institutions, the local media, public-sector institutions (national and local government agencies), international organizations, NGOs, multi-stakeholder entities, local schools and boards of education (36).

Based on figures I, 2 and 3, students in elementary, junior high and high schools in general are good targets for ESD capacity building by the business sector. ESDBSL processes between the schools and companies (Figure 4) might involve the sharing of the company's current pro-sustainability production strategies, processes and systems as well as the unsustainable aspects with the students during company visits/internships. The firms can provide study materials and other incentives like giving prizes and/or awards for pro-sustainability activities and behaviors. They can also offer reverse visits using company resource persons as guest teachers on sustainability/environmental topics like energy, green economy, etc. to the schools. Recognizing the current generation of children and youth as the future custodians of the environment as well as managers and employees of such companies, businesses need to adjust to the recent introduction/changes in the educational curriculum and their related objectives in the schools to provide relevant sustainability-related training and materials for the students –not only with the intensions of boosting their corporate image and providing a form of sales promotion [31]. The business sector would thus be better placed to foresee the future of their industry in relation to the environment and affect policy particularly by contributing to the environmental sustainability curriculum development and also training/teaching accordingly. Students, some of whose parents work in these businesses, could impact the business workers through interactions and

particularly asking pertinent and sometimes uncomfortable questions to set them (the adults) thinking. With approval from RCEGS Steering Committee, this program activity could be facilitated by the city or town environment and education departments.

The ESDBSL processes between the education and business sectors could be integrated into the education and learning processes of the entire RCEGS through public participation in the form of forums, expert panel discussions, symposia, lectures, focus groups, study groups, fairs, festivals, camping trips, etc. (Figure 4). Here, members of the public and of the other sectoral organizations could participate. Public participation (PP) as a tool has been applied as a social learning process and communication platform to create awareness among stakeholders in different contexts, including that of resource use. Public participation (PP) can also be seen as a form of learning in which multiple processes interact at different scales of action. Experts from the local universities and research institutions and NGOs could be solicited to offer their expertise on such platform. Other actors and stakeholders in the process include the local media to help disseminate the knowledge created, national and local public-sector institutions and government agencies to offer the needed logistics and backing from the policy point of view, international organizations to link up the local activities/programs with those at the regional/global level (20), local school boards of education to offer the necessary mandate for implementation at the local level, etc. Examples of locally-relevant sustainability topics for discussion include climate change, ocean acidification, sustainable urbanization, actionable knowledge to sustain the ecosystems, food and water security, steady-state economy, sustainable production & consumption,cultural diversity, health promotion, peace & human security, governance and justice (Figure 4).

Figure 4. A conceptual framework for ESD-based social learning involving the education and business sectors and other stakeholders/actors in RCE Greater Sendai.



[It comprises the context of sustainable transition provided by the governing body, the structures in the sectors, the *learning* processes 'activated' through interactions and interrelationships (stakeholder participation, partnerships, collaboration, co-production and sharing of knowledge, etc.) among the target sectoral multi-stakeholders & actors and the outcome(s). The outcome(s) might be sustainability-literate individuals/groups with pro-sustainability values and behavior, 'sustainable organization(s)'or a 'sustainable society'. "Area 1"indicates the region where the learning processes occur and "Area 2"indicates the region of outcome(s).The single pointed "spotted" arrow depicts sustainability issues to be discussed and learned during the interactions/ The single pointed horizontal broken arrow and the single pointed horizontal unbroken arrow in opposite directions depict students' cognitive and experiential learning (from company workers) and workers learning through interaction/questioning (from students), respectively. Double pointed thick, dark arrows depict the bi-directional /dual nature of the learning [processes] among these actors/stakeholders. Single pointed "stripped" arrows depict the outcome(s) of the processes which is sustainability].

Promoting public participation through ESDBSL processes can be influenced by many activities/roles that the Steering Committee must consider integrating into the learning process. They include:

- the Steering Committee's management of boundaries to determine who is and who is not involved in the process,
- the extent to which boundary and bridging organizations are able to collaborate to incorporate their particular experiences and create collective action to build the capacity to adapt to change,
- the leadership required to steer and coordinate the process,
- the type of negotiation strategies used,
- the ground rules established to facilitate interactions,
- clarity about the role and purpose of stakeholder involvement,
- the internal structure and the latitude given to democratic debate and the structural capacity for interactions among social networks,
- the influence exerted by the existing culture on the framing and definition of the issues at stake,
- the processes in establishing managing systems of knowledge and making sense of information,
- building trust,
- and the facilitation and allocation of resources needed to move the process forward [24,26, 37, 38].

Identifiable learning processes during the collaboration between the business and education sectors and also during PP include knowledge transfer and exchange, hence co-production of knowledge along with experiential and cognitive learning, awareness creation, adaptive learning and co-management [20]. There could be opportunities for questioning during the interactions (e.g. product impact on the environment) and giving/seeking of clarification (e.g. from the corporate sector regarding a product or service/ or *vice versa*). The platform could be used to begin creating an 'equitable partnership between the combined expertise of communities, professions and governments' [39]. Grassroots form of governance through consumer advocacy, "watch dogs" over several local issues, citizen science etc. could emerge.

Teachers play a crucial role in the eventual success of ESD and particularly building capacity of the students. Student teachers in Miyagi University of Education for example are currently receiving ESD training both on campus [40] and on the field [20], though the content and structure ought to be streamlined. Provision of in-service ESD training to teachers is also important as a report indicated [35] that 67.0% of teachers within RCEGS did not even know that the Center for EE in Miyagi University of Education served as teachers' resource center for environmental education.

The outcomes refer on the one hand to the ability to have implemented measures to deal with sustainability problems, but on the other to the capacity of the stakeholder group to deal with problems as well. With the overarching outcome as achieving sustainability (as individuals, groups or the society), other constituent outcomes include acquisition of actionable knowledge and values to make informed decisions, a genuine participation of stakeholders due to an increased concern for the environment, a sense of inclusiveness and collective ownership of the natural capital and other forms of capital in the region, information flow among stakeholders, the building of relationships and trust between knowledge producers and users, a sense of self-efficacy on the parts of both the local people and local authorities and policy makers [20]. Reed et al. [23] argue that social learning, stakeholder participation and collaboration are to be considered as different concepts, a dissent from several authors cited in their paper. They also argue that social learning, though could be a process or an outcome is often mistaken for or defined in relation to its outcomes. They then posited that to be called social learning, a learning process must: 1) demonstrate that a change in understanding has taken place in the individuals involved; 2) demonstrate that this change goes beyond the individual and becomes situated within wider social units or communities of practice; and 3) occur through social interactions

and processes between actors within a social network. The participation of other actors and multi-stakeholders from other sectors in RCEGS might help transfer knowledge and skills to other communities of practice through mechanisms including job transfers among workers, particularly teachers [20].

The collaboration between RCE and business so far is little and corporate support for RCEs, particularly funding has generally been weak. This collaboration, if successful is capable of being self-sustaining as the firms can provide the necessary funds. And given the current poor funding and hence the relatively weak financial standing of RCEs in general [35], this development will be good.

5.0. Discussion and Recommendations

Halog and Manik [41] argued that four aspects have to converge to make the notion of sustainable development useful and operational to most of stakeholders. These are 1) science and technology to support it; 2) right policies and regulatory frameworks should be well-formulated; 3) businesses should be actively involved; and 4) public stakeholders must understand and support it either by incorporating their voices in the process and showing the results in understandable interactive manner. Furthermore, recently, the idea that governments only are the decision-making authority has been replaced by multiscale, polycentric style of governance that acknowledges that a large number of stakeholders in different institutional settings contribute to the overall management of a resource or an issue that affects them directly Instead of the previous hierarchical model, a generally nonhierarchical mode of governance is promoted in which multistakeholders collaborate in the production of knowledge, formulation and implementation of decisions on locally-relevant issues, etc [26]. The sustainability transition could be realized by blending the grassroots bottom-up with the mostly policy-oriented top-down governance approaches.

This study attempted to look at how business should be actively involved in a regional centre of expertise by especially improving the learning collaboration between it and the public represented by the youth in schools. Building ESD capacity of the youth by strengthening the dialog between the corporate world and the human capacity that will potentially run the companies in the future is essential. The capabilities and actions from the business sector are necessary because with ample cognitive resources, technologies and skills, corporations can become familiar with contributing positively to the sustainable transition [42]. Having education and training as an important aspect of its management initiative, regardless of its motivation a corporation has to organize, structure and embed sustainability related actions into its management systems, namely activities, strategies and routines. It should be acknowledged that business has of late been present in several public activities, particularly fairs organized under the auspices of RCEGS or the Environmental Bureau of Sendai City. This could be used as the starting point for developing from.

The study also examined how the adaptive capacity of the general public through public participation of multi-stakeholders and actors in the RCEGS could be enhanced.

In spite of the considerably strong presentation in the economy and other aspects in the locality, the business community [including manufacturing companies, advertising agencies, financial and development institutions] is visibly not represented on the Steering Committee (Figure 4). Teachers in the primary and secondary schools are also not “independently” represented either by say, the teacher

union/association. And students are not represented as well even though there are student councils from elementary to high schools. This issue of representation should be addressed.

The interest of teachers regarding visits to companies and internship is key for the success of the collaboration and hence ought to be enhanced. In an earlier report regarding which seven activities teachers and students considered the most effective in implementing ESD in RCEGS, for teachers 'company visits/internship' came next to last while for students, it came a close third after 'field-based school curriculum' and 'engaging in sustainable practices in schools'[35].

The present support by the media for RCEGS to attain its DESD goals needs significant strengthening. Currently only one newspaper has committed itself to the ESD cause in the region since RCEGS was inaugurated more than six years ago. The level of awareness of RCEGS in the region is also only satisfactory and RCEGS should do more to communicate its existence and activities to the general public. A survey in 2006 [35] on awareness of RCEGS among respondents in the education and corporate sectors was significantly low. Another survey made three years later (unpublished) in similar locations showed little progress.

The 'regional' governance structure of the Steering Committee should have a strong influence on the nature of multiparty/stakeholder cooperation and ESD-based learning processes in RCEGS. For example, its role as the governing authority and taking local ownership of the ESD concept and its implementation in consultation with the local/municipal authorities is important. It should try and do away with invisible competition/struggle (43) between the education and the environmental ministries and also the environmental bureaus of cities and towns and the corresponding boards of education when it comes to ESD implementation especially in schools. Influence of bureaucratic systems, and poor public access to information which can impede social learning [37, 38, 44,] should be drastically reduced.

Japan has been global forerunner and supporter of ESD programs from the beginning, with a national ESD strategy in place. According to the UNDESD Japan Report on Japan's effort from the outset of the UN Decade of ESD to 2009, an ESD implementation system has been established comprising 11 ministries and agencies, a representation from the legislature and a consortium of NGOs. Also, based on the Action Plan, the government has been facilitating discussions on measures for implementing ESD by holding roundtable interagency meetings as forums for exchanges of opinions among politicians, academic experts, educators, and related persons from NPOs and enterprises [45]. Furthermore, one of the goals for the second half of the Decade is fostering closer alliances and the report states the following:

> *"The government will promote ESD in primary and secondary schools and introduce it into teacher training courses and training programs for teachers when they renew teaching licenses. It will also take steps to promote joint community-school ESD initiatives, including school and community support headquarters and stakeholder conferences. ……. At the community level, the government will support partnerships among and initiatives by individuals and organizations in the community, such as forums to promote ESD. It will also bolster ESD programs as well as the ESD promotion mechanism at public halls, civic centers, children's centers, libraries, museums, and other social education facilities. Steps will be taken to train and deploy coordinators to promote ESD in the community*" (45).

In relation to the above, the education–business sector ESD collaboration could be streamlined and probably brought to the mainstream by strengthening it at the national [policy] level. The PIS, though government-mandated, is flexible and the choice of activities including company visits and internship mainly depend on the school or local boards of education. Here, the ESD-related agencies from the national level (like ESD-J, a consortium of NGOs in Japan) to the local level could 'lobby' the relevant authorities for priority and more time to be given to the ESD-related activities in PIS as a report by Ofei-Manu and Skerratt (35) showed that only 41% of students responded in the affirmative when asked whether PIS discussed sustainability/environmental issues adequately. This company-school partnership could also be considered in the government's public-private partnership (PPP) programs, i.e. collaboration between public bodies, such as local authorities or institutions, and private companies.

6.0. Conclusion

The sustainability concept is fraught with challenges and so is its education/learning aspect. However, the importance of grassroots capacity building using education in an RCE cannot be overemphasized. The RCE, with most of the subcomponents of its core elements capable of serving as levers for capacity building (i.e. institutional mandates, visions and goals, management structure, involvement of leadership, engagement of actors, R&D, knowledge sharing, strategies for collaboration, etc. (46)), can act as an umbrella facilitating capacity development through partnerships between the formal and non-formal education sectors, particularly the business and education sectors and provide research, learning and other opportunities for all existing components of society.

Companies and schools worldwide while underpinned by different philosophies are inherently linked by the human factor. That is, peoples' attitude towards capacity-building through continuous learning and application of the acquired knowledge will eventually determine the sustainability of a company, school and ultimately the society. Companies need to bear in mind they ought to prepare pro-sustainability business leaders of the future who also double as the future custodians of the planet. It is hoped that through the process of ESD-based social learning, citizens will acquire the competencies they need in order to secure their roles as positive, productive members of society and of the world at large, thus fulfilling the main objective of ESD. In the end, the community is empowered leading to the creation of a sustainable society.

Notes

The Steering Committee is mandated to oversee the program activities in GSRCE within its bounds. Currently, they include Higher Education Institution [(1) Miyagi University of Education UNU-RCE Promotion Committee (1) Miyagi University of Education, Environmental Education Centre (EEC)] Local Media (2) *Kahoku Shimpo*(local newspaper)] Public-sector Institutions (National and Local Government Agencies) (3) Tohoku Office of Japan International Co-operation Agency (JICA)(4) Tohoku Office of the Ministry of the Environment(5) Environment Bureau of the City of Sendai(6) Environmental Policy Division of Miyagi Prefecture, (7) City of Kesennuma (Environment and Health Division), (8) Tajiri Town Office International Organization [(9) UNU-IAS]; NGOs [(10) Tohoku Global Seminar (11) Japanese Association for Wild Geese Protection (JAWGP)] Multi-stakeholder Entity (12) Forum for Environmental Education and Learning in Sendai, City of Trees ("FEEL Sendai"), Local Schools and Board of Education (13) Kesennuma Omose Elementary School(14) Kesennuma City Board of Education(15) Tajiri High School (Mochizuki, 2006) (Mochizuki, 2006).

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