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Multi Stakeholder Governance for Sustainable Ocean Environment

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Abstract

Corporation of the marine has various stakeholders over many countries. Oceans are obliged to govern sustainable global commons. Corporations must improve communication with many stakeholders to achieve sustainable oceans. This article proposes a sustainable scheme of ocean governance by which stakeholders voluntarily contribute efforts to communicate with corporations. And corporations apply incentive schemes for every stakeholder. It is demonstrated that this scheme enhances sustainability of oceans by reducing social welfare losses. The following two points are argued. First, the digital industrial revolution grows market transactions and reduces overproduction of corporation. Second, raising standards and enforcing legislative requirements for corporations improve sustainability of oceans.

Keywords: Altruistic coefficients; Digital industrial revolution; Global commons; Positive and negative stakeholders; Risk coefficients

Introduction

Oceans provide global commons where many corporations and individuals obtain various benefits and costs by performing production and consumption. Social welfare of economic and social activities in oceans could be calculated in global perspective. Social welfare should include the total welfare of stakeholders related with the activities. Overuse of marine resources is possible to lower the social welfare of global commons. Because sustainable frameworks of marine resources aim to improve social welfare, they are needed to solve environmental problems of oceans securely. Enlarging global economies grow impacts on environment of oceans by increasing international transportation of goods and services. Sustainable governance of oceans requires cooperative schemes among various organizations and individuals. In the cooperative scheme the corporation should share incentives to achieve sustainability of oceans with every stakeholder.

The scheme is designed for the corporation to fucus on social welfare of oceans evaluated by all stakeholders. Considering relations between the corporation and stakeholders with market economies, stakeholders are classified into inside, outside and external stakeholders. Inside stakeholders share benefits with the corporation without markets such as main banks, traditional fishery household and workers in shipping industry. Outside stakeholders including NPOs are relate to the corporation on basing of contracts of market mechanisms. Digital industrial revolution increases digital market transactions including travelers. External stakeholders have not any transaction or contract with the corpo ration in markets and societies. However, they are afraid of suffering climate change problems occurred in the marine.

Main results of this article are summarized as follows. The risk management of oceans requires corporation to evaluate properly issues in larger ranges beyond the market mechanism. The social cost of sustainable oceans could be calculated not only by surveying market transactions but also by exploring social welfare losses[1] [1]. The hidden risks behind economic activities could be exhibited partially by evaluations of many stakeholders without the market transactions. To mitigate risks on oceans, sustainable governance needs a cooperative system with many stakeholders. A theory of multi stakeholders clues the sustainability problems of oceans. This article investigates how structural changes of stakeholder make effect on improving sustainable schemes of oceans.

[1]Cassier et al. [1] discusses that economic and social system in "post-growth economies" becomes more cooperatively to achieve social and environmental needs.

[2]This article supposes that corporation provides production x to increase public goods of marine environments. The evaluation of x is different by depending on stakeholders. For example, reconstruction of harbor is supported by inside stakeholders of trade industries but is not approved by external stakeholders in ecologist to preserve marine environment. The discussions in this article assume that stakeholders evaluate public goods differently by depending own views.

Sustainable Ocean Communities

Tanaka [2] provides a theoretical model for the risk governance of global communities. To proceed theoretical analysis, we introduce the following assumptions for the theoretical investigation. Corporation provides x units of public goods or services for oceans with n stakeholders[2]. At the same time, the corporation compensates or brings a payment $t_i(\geq 0)$ for any stakeholder $i(=1,...,n)$. The payments are indicated by variables, such as the transaction or contract payments and wages for employees or taxes or fees for governmental agents. The total payment is denoted by $t=\Sigma_{i=1}^{n} t_i$. The corporation performs activities for profit and takes private net profit $\pi(x)$ by providing public goods. It is assumed normally that $\pi'(x)>0$ and $\pi''(x)<0$ are obtained. The stakeholders are exemplified by employees, shareholders, costumers, residents, travelers, corporations of supply chains, and agents of government. They obtain various interests with the corporation in many situations. The concern interest between corporation and i is exhibited by evaluation of stakeholder $V_i(x,t_i), i=1,...,n$. Evaluation function V_i is assumed to increase with t_i for all i. Any payment t_i is assumed to bring inequality $\frac{\partial V_i}{\partial t_i}\geq 0 \text{ for } i=1,\cdots n$. Regarding performance x, stakeholder i (=1,...,n) is classified into positive stakeholder who is defined by $\frac{\partial V_i}{\partial x}\geq 0$ and negative stakeholders who is defined by $\frac{\partial V_i}{\partial x}<0$, according to relation with the corporation. Positive stakeholders partially share profits with the corporation. But negative stakeholders bring net welfare losses from increasing production of the corporation.

Tanaka [3] assumes that the digital industrial revolution has brought unbalanced development of information industries. Stakeholders are divided into three groups: inside, outside and external stakeholders. The inside stakeholders such as regular employees and affiliated organizations obtain common interest with the corporation and are denoted by i (=1,...,n_0). The outside stakeholders represented by irregular employees and occasional customers make competitive transaction in the markets and are written by i (=n_0+1,...,n_1). The external stakeholders are excluded from economic relations with the corporation and suffers sometimes external diseconomies from activities of the corporation and are written by i(=n_1+1,...,n). Many residents in oceans become external stakeholders by economical externality of the corporation. Baecker [4] argues that the digital industrial revolution has brought a serious problem of disruption in the communities. By following the definition in Tanaka [3], inside stakeholders are assumed to be positive stakeholders and outside and external stakeholders are supposed to be negative stakeholders.

Tanaka [2,5] argues that the corporation should perform cooperation with stakeholders in a scheme of voluntary contribution and legislative schemes of societies. The previous papers assume that concept of altruistic coefficient for all stakeholders indicate to improve communication of the corporation on ocean communities[3]. Tanaka [6] does not use a single altruistic concept but distinguishes altruistic propensities for each type to define transaction cost regarding three types of stakeholders. For inside stakeholders, rising scale of production is expected to increase shareholder value of the corporation. They could share benefits from rising shareholder value. It is assumed that the altruistic coefficient exhibits how the corporation promotes communication with inside and outside stakeholders. However, the corporation does not improve effectively voluntary communication with external stakeholders.

Issues of asymmetric information bring many problems in communication between the corporation and stakeholders. Inside stakeholders are supposed to construct heigh sensitive communication with the corporation by performing long term transaction or contract. However, outside stakeholders have relations with the corporation by shorter term contract than inside stakeholders. On the other hand, outside stakeholders could be connected more widely and freely with the corporation than inside stakeholders. Outside stakeholder i is willing to provide effort y_i to improve communication with the corporation. By assuming that stakeholder i makes effort y_i on communication, digital industrial revolution takes the corporation to enhance cooperation on communities with innovative spending of information and communication technologies. The value of information rises as many stakeholders provide information. Investment on intelligence and communication is expected to bring network effects in economies and societies[4]. The total efforts of communication are assumed present network effects that is denoted by $y=\Sigma_{i=1}^{n} y_i$. For outside stakeholders the corporation obtains altruistic coefficient defined by $\gamma(y)$. The network of information means that rising effort y efficiently improves the communication between the corporation and many outside stakeholders. $\gamma(y)$ is supposed to be satisfied with the inequalities, $1>\gamma(y)>0$, $\gamma'(y)>0$ and $\gamma''(y)<0$. However, inside stakeholders do not depend mainly on the digital network of communication but direct and internal communication with the corporation. Inside and external stakeholders are assumed to be excluded from communication network developed by outside stakeholders. The corporation shares more benefits with inside stakeholders than with outside and external stakeholders. By raising production x the corporation needs to increase cooperation with inside stakeholders. Altruistic coefficient between the corporation and inside stakeholders $\beta(x)$ is assumed to increase with social benefit provided by the corporation[5]. This assumption is expressed mathematically by $\beta'(x)>0$ and $\beta''(x)<0$.

[3]Many corporations are assumed to provide voluntarily global public good. Many researchers such as Bergstrom et al. [10], Bernhheim [11], Roberts [12] and Sugden [13] explore altruistic motivation in voluntary provision of public good. The concept of altruistic coefficient refers discussions of Andreoni [14].

[4]Fifkin [15] examines revolutionary changes of global networking industries brought by developing technologies of internet and communication.

[5]Oskam [16] shows an example of sharing economy developed by digital technologies.

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We explore the legislative schemes to create sustainable ocean. Incentive schemes for sustainable ocean bear the critical part of this theoretical analysis. Legislations, regulations and voluntary contributions of corporative governance are facilitated to improve the sustainability of oceans. Inside or outside stakeholder i is assumed to evaluate transaction or bargaining with the corporation with a base value α_i [6]. However, external stakeholders are influenced by activities of the corporation but are not connected efficiently with its social communication network. The gap $\alpha_i - V_i(x,t_i)$ for each i in the communication mechanism is an index to achieve sustainable communities. To decline the gap, the corporation is enforced to integrate the evaluation of external stakeholders into corporate performance by using incentive schemes. Although the incentive scheme is utilized to improve sustainability of communities for all stakeholders, sustainable initiatives for external stakeholders are expressed mathematically as follows. Legislations or social contracts take α_i as an evaluation of legislated target or voluntary standard of stakeholder i. It is simply assumed that the targeted value is presented by a greater value than the evaluated value of status quo. This assumption is written by inequality mathematically, $\alpha_i \geq V_i(x,t_i)$. As the gap between the target α_i and the evaluated value $V_i(x,t_i)$ increases, i should bear greater punishment, such as taxes and costs brought by rising requirements. The punishment function $\phi_i(\alpha_i - V_i(x,t_i))$ is assumed to be an increasing cost curve regarding $\alpha_i - V_i(x,t_i)$. The relation is stated rigorously by $\phi_i' > 0, \phi_i'' > 0$. The implication of incentive scheme is explained by the following legislative initiative. When the standard of CO_2 emission enhances, the relating stakeholder k such as international organization raises α_k^0 to α_k^1. The rising standard exhibited by change from α_k^0 to α_k^1 increases marginal penalty from $\phi_k'\left(\alpha_k^0 - V_k(x,t_k)\right)$ to $\phi_k'\left(\alpha_k^1 - V_k(x,t_k)\right)$. The following section explores how initiatives changing standards contribute sustainable oceans.

Sustainable Initiative for Oceans

The previous section provides sustainable scheme of oceans where the corporation exhibits different altruistic coefficients for the three types of stakeholders. To explore sustainable investment strategies, Tanaka [7] presents social net benefits of the corporation by the following equation (1). It is assumed in this article that corporation has object equation (1) to provide production as global public goods.

$$NB = \pi(x) + \beta(x)\sum_{i=1}^{n_0}\{V_i(x,t_i) - y_i\} + \gamma(y)\sum_{i=n_0+1}^{n_1}\{V_i(x,t_i) - y_i\} - t - \sum_{i=1}^{n}\phi_i\{\alpha_i - V_i(x,t_i)\} \quad (1)$$

Inside stakeholders increase provision of public goods with conventional and institutional relationships. Equation (1) presents influence of inside stakeholders on provision of public goods by $\beta(x)$. When the corporation manufactures products, the second term on the right side of equation (1) indicates related benefits in shipping industry and trade insurance as inside stakeholders. The third term on the right side of equation (1) implies that development of digital technologies enlarges and brings new types of digital market transaction. Equation (1) implies that the third term does not include the altruistic coefficients of external stakeholders. The corporation does not have enough communications to evaluate external stakeholders properly in informal negotiations and market transactions. The objective function of the corporation (1) includes evaluations of external stakeholders by designing legislative scheme in the fourth and fifth terms of right side. Equation (1) describes the diverse communication gaps among three types of stakeholders with the corporation.

By differentiating equation (1) with x, optimal condition of social credit for the corporation is written by equation (2). Equation (2) makes clear initiative conditions for sustainable marine environment. The right side of equation (2) presents separately the first and third terms with inside stakeholders and the second and fourth terms with outside and external stakeholders. According to classifications of positive and negative stakeholders, the right side of equation (2) exhibits negative for the first and third terms and positive for the second and fourth terms. In absolute values equation (2) indicates that raising first and third values increase social welfare. For example, initiatives of sustainability to raise altruistic coefficients of inside stakeholders enhance social welfare. And raising standard α_i of inside stakeholder i enhances the marginal evaluation of i's performance. Tanaka [2] refers $\frac{d\phi_i}{d(\alpha_i - V_i)}$ as risk coefficient. The third term in right side of equation (2) brings the risk coefficient of industrial corporations including manufacturing to take active options to raise economic performances. Considering that inside stakeholder is positive stakeholder, raising its risk coefficient declines the right side of equation (2). Initiatives to enhance risk coefficient of inside stakeholders have been a pillar to promote economic performance.

$$\frac{d\pi}{dx} = \sum_{i=1}^{n_0}\left\{\frac{d\beta(x)}{dx}(V_i(x,t_i) - y_i) + \beta(x)\frac{\partial V_i(x,t_i)}{\partial x}\right\} - \gamma(y)\sum_{i=n_0+1}^{n_1}\frac{\partial V_i(x,t_i)}{\partial x} - \sum_{i=1}^{n_0}\frac{d\phi_i}{d(\alpha_i - V_i)}\frac{\partial V_i(x,t_i)}{\partial x} - \sum_{i=n_0+1}^{n}\frac{d\phi_i}{d(\alpha_i - V_i)}\frac{\partial V_i(x,t_i)}{\partial x} \quad (2)$$

When absolute value of the second term in the right side of equation (2) increases, the marginal social cost declines. Rising $\gamma(y)$ indicates enlargement of market brought by innovation of digital technologies. The fourth term in the right side exhibits negative marginal evaluations by outside and external stakeholders. Legislative reforms to improve the communications between outside and external stakeholders and the corporation enhance the right side of equation (2) and promotes net social welfare.

Figure 1 illustrates the sustainable scheme of oceans. Curve AE presents marginal net profit indicated by the left side of equation (2). Curve 0B expresses social cost defined by $-\sum_{i=1}^{n}\frac{\partial V_i(x,t_i)}{\partial x}$. It is assumed that estimated social marginal cost curves 0D and 0E presented by the right side of equation (2) are lower than social cost curve 0B. The previous reasoning demonstrates that digital industrial revolution and sustainable scheme move estimated social cost curve 0D to curve 0C. Over production x** declines to x*. The social welfare lose reduces area of triangle FLK to triangle FHG.

[6]This article investigates mathematically how cords improve sustainability of oceans. Pistor [17] presents research how the law creates wealth and inequality.

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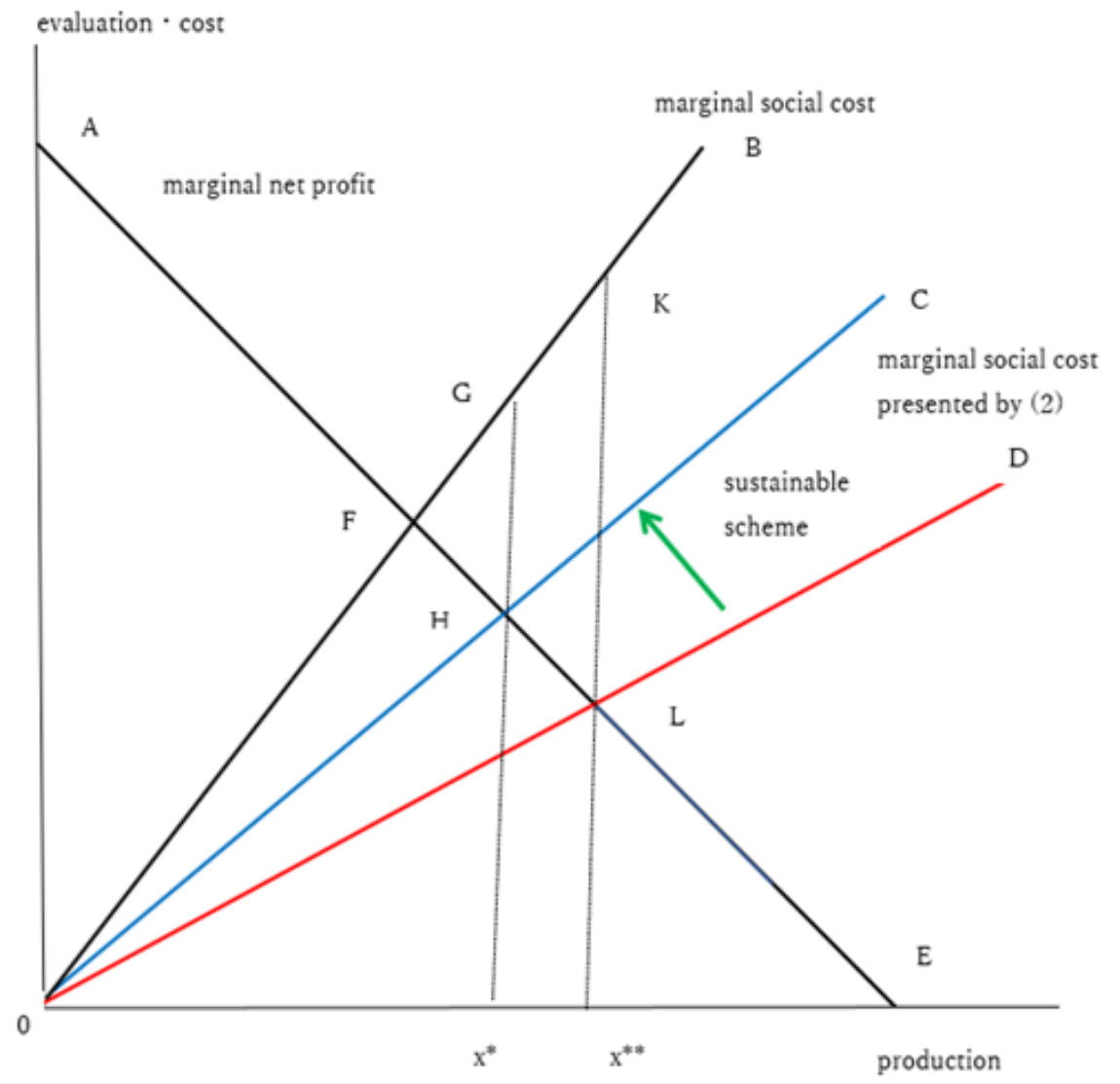

Source: Tanaka [9].

Figure 1: Social welfare and sustainable scheme of oceans.

Conclusion

Glasbergen et al. [8] fucuses on cooperative governance from views such as fisheries and refers to 'multi-stakeholder global network' in chapter 12. Tanaka [9] theoretically argues that digitalization of global economies changes structures of marine stakeholders. In particular, raising influence of outside stakeholders reforms governance of marine communities. Tanaka [6] explores that green bond markets develop contributions of outside stakeholders to improve the environment of oceans by promoting investments on green energies, infrastructures and transportation. Tanaka [7] discusses that sustainable investment strategies are based on a theory of multi stakeholder governance.

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