# Developing a Method of Assessment for Events considering Sustainability

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**Abstract** "ISO20121" which aimed at the promoting of sustainability in the field of event is now under standardization.
Sustainability can be interpreted from the view of economical, environmental and social aspects with triple bottom line.
In general, economic ripple effects have been measured in the field of events. Environmental aspects are considered in a number of recent events, especially in large-scale events. And the environmental impact assessment for the events has been implemented. At present, several large-scale events are evaluated environmental performance to carry out carbon offsetting. However, these assessment are applied separately. Thus it is needed to develop an assessment tool to assess environmental, economic and social aspects at the same time.
In this study, a method is developed for sustainability assessment in event LCA, which covers the three aspects of triple bottom line. And we adopted the emission of CO2 , economic ripple effects and the increment of employment as indicators for environment, economy and society respectively.

## 1 Back ground

"ISO20121" promoting the sustainable management of event is now under standardization. Sustainability can be expressed from the view of three aspects of economy, environment and society as triple bottom line.
Generally, economic ripple effects have been widely applied to evaluate events.
And environmental aspects have been paid attention in a number of events currently. However these assessments are independent from economic assessment.
It is needed to develop a tool assessing environmental, economic and social aspects at the same time.
And in the event evaluation a lot of time and labor are needed to process so much data in a short period. Therefore, the developments of the database and the evaluation tools are needed that can efficiently calculate the results evaluated.

And, it is expected an index using the result of the environment, economy, and the social aspects that can show the change and compare the evaluation results each other for various scale of events.

## 2 Purpose of Research

In this study, we develop a methodology of sustainability assessment in event LCA that covers the three aspects of triple bottom line. And we adopted CO2 emission, economic ripple effects and the employment effect as indicators for environment, economy and society respectively.

## 3 Method

### *3.1 Execution procedure and results of calculation of the database*

Figure 1 showed the execution procedure of the present study. First, databases are made for environmental impact, economic ripple effect, and employment effect.

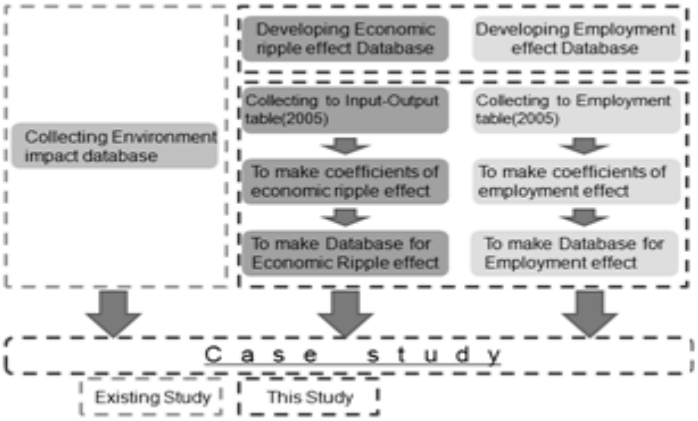


Fig.1: Execution Procedure of Research

### 3.1.1 Environmental impact basic unit

The environmental impact basic units are collected from 3EID in 2005. And the environmental impact basic unit is shown by expression (1).

$$\text{Environmental impact basic units} = d \times (I\text{-}A)^{-1} \quad (1)$$

d:direct,(I-A)-1: Matrix inverse coefficient

Tab.1: Environmental impact result

| sector name | environmental impact basic unit(t-CO2/MY) |
|---|---|
| rice | 0.002 |
| straw | 0.003 |
| potetoes | 0.002 |
| beans | 0.002 |
| vegitables | 0.003 |
| fruit | 0.002 |
| sugar raw material cro | 0.002 |
| crops for beverage | 0.003 |

### 3.1.2 Economic ripple effect database

Coefficients for the economic ripple effect is made from I/O table and the employment table in 2005. And, the database as demand for each section generated by one unit is made for coefficients above. The economic ripple effect for unit requirement is shown by expression (2). And Table 2 shows the result of data base (estimate value).
The results showed the economic ripple effect is high in the service industry.

Economic Ripple effect
＝direct effect＋The first indirect effect
＋The second direct effect

$$\left.\begin{aligned} &\text{Direct effect} = F \\ &\text{The first indirect effect} = (I-A)^{-1} \times F \\ &\text{The second indirect effect} = [I-(I-M)A]^{-1} \times (I-M) \times F \end{aligned}\right\} \quad (2)$$

F: Amount of the final demand,[I-(I-M)A]-1: Matrix inverse coefficient,(I-M): Domestic rate of self-sufficiency

Tab.2: Economic ripple effect database result

| sector name | economic ripple effect basic unit(MY/MY) |
|---|---|
| rice | 3.227 |
| straw | 3.801 |
| potetoes | 3.205 |
| beans | 3.467 |
| vegitables | 3.358 |
| fruit | 3.263 |
| sugar raw material cro | 3.366 |
| crops for beverage | 3.403 |

**3.1.3 Coefficients for the employment effect**

Coefficients for the employment effect are made from I/O table and the employment table in 2005.
And, the database as demand for each section generated by one unit is made for coefficients above. The employment effect for unit requirement is shown by expression (3). And it shows in Table 3 as a result of data base (estimate value).
The results showed the value in the manufacturing industry is high in employment effect.

$$\text{Employment effect} = L[I-(I-M)A]^{-1}(I-M)F \quad (3)$$

L:Employment coefficient,$[I-(I-M)A]^{-1}$:Matrix inverse coefficient, (I-M): Domestic rate of self-sufficiency, F:Final demand amount, Employment coefficient : employment/Interior production value

Tab.3: Employment database result

| sector name | employment effect basic unit(people/MY) |
|---|---|
| rice | 0.121 |
| straw | 0.220 |
| potetoes | 0.127 |
| beans | 0.203 |
| vegitables | 0.163 |
| fruit | 0.185 |
| sugar raw material cro | 0.157 |
| crops for beverage | 0.212 |

### *3.2 Case study of Event*

The case study for events were performed based on the database made. Moreover, evaluations are made for the event with different elements of the scale, the number of visitors, and the place held.

The evaluation of the event is executed by using economic effect data base, employment effect data base, and the collected environmental impact for unit requirement in the present study.

For environmental aspect, environmental assessment is performed, for economic aspect, economic ripple effect analysis is performed and for social aspect, employment effect assessment is performed.

### *3.3 Development of Eco-efficiency Index*

The eco-efficiency index for the event is made. The eco-efficiency is defined environment impact divided by economic ripple effect. The expression is shown in (4). The eco-efficiency index is defined as an economic effect (million yen) divided by the environmental impact amount (CO2-t)

$$\text{Eco-efficiency} = \text{economic ripple effect (1million yen)} / \text{environmental load amount } (CO_2\text{-t}) \quad (4)$$

# 4 Scope of Evaluation

## *4.1 Object of Evaluation*

The Eco-efficiency index of the event is calculated. The event with a different feature is elected to compare it, and the evaluation event and the outline are shown in Table 4.

Tab.4: Event assessed outline

| Event name | place | visitor | assessed |
|---|---|---|---|
| G P N seminar | Yokohama Media and Communications Center | 117 | Event prepared・ Holding period・ After Hold |
| YOKOHAMA International Festival | Pacifico YOKOHAMA | 63,000 | Event prepared・ Holding period・ After Hold |

The events in Table 3 are held in 2008.
The data of the event calculated in Tokyo City University Itsubo laboratory was used for evaluation .

## *4.2 System boundary*

The system boundary includes all the processes from the event preparation stage., event opening, until the withdrawal after the event for the evaluation.

## 5 Resul

### *5.1 Eco-efficiency result*

The seminar event was evaluated based on the data base that was collected and made.
Figure 2 shows the result.
Utility occupies the most part for the CO2 emission, the hall charge occupies the most part for economic ripple effect, distributed material occupies the most part of employment effect.
Utility is composed of the lighting, air-conditioning, distributed material is composed of pamphlets.
Because utility produces the electric power by using the fossil fuel, the amount of the CO2 exhaust is large.
Because the facilities rental is high, the hall charge has a major impact on the overall economy.
As for pamphlets, because the type of business related to the pamphlet making is so many, the effect of employment is large.

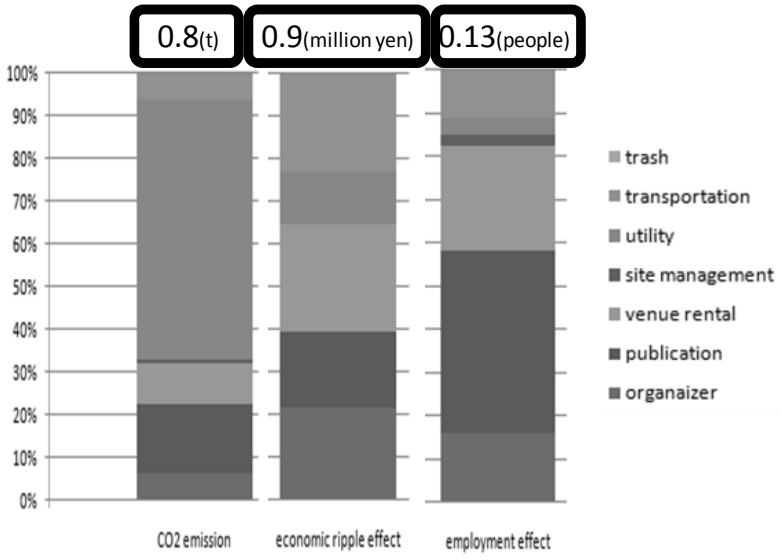


Fig.2: Seminar event assessed result

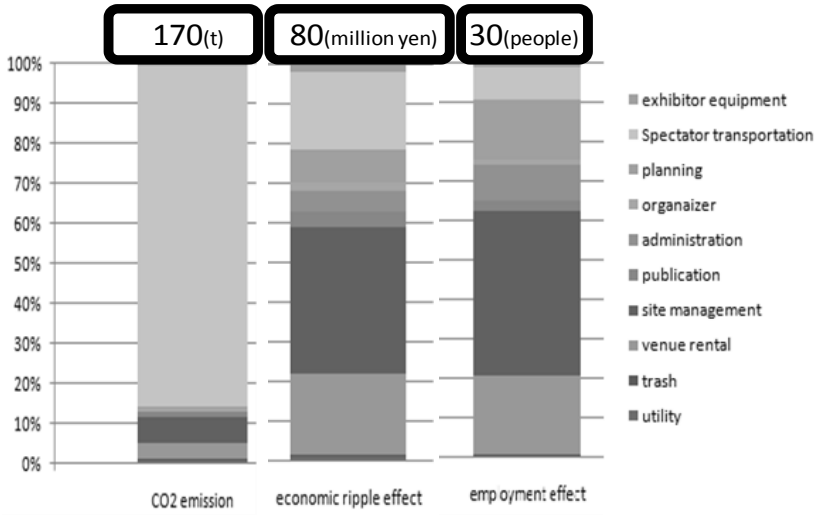


Fig.3: Festival event assessed result

### *5.2 Eco-efficiency result*

The environmental efficiency was calculated from the result of an amount of CO2 emission and an economic ripple effect as shown in Tab .5

Tab.5: Results of Eco Efficiency

| | CO2 | economic ripple effect | eco-efficiency |
|---|---|---|---|
| seminer | 0.80 | 0.90 | 1.13 |
| festival | 170.00 | 80.00 | 0.47 |

Tab.6: Eco-efficiency detail

| Items | Eco-efficiency |
|---|---|
| utility | 0.55 |
| trash | 0.68 |
| venue rental | 2.49 |
| site management | 2.45 |
| publication | 1.44 |
| administration | 6.13 |
| organaizer | 1.17 |
| planning | 9.52 |
| Spectator transportation | 0.10 |
| exhibitor equipment | 1.26 |

The result shows, the value of the eco-efficiency became high in the organizer's section including publication, administration, organizer and planning, where a lot of staff labors cost high, while the value of the eco-efficiency of the utility section became a low result.

## 6 Conclusion

In this study, it aimed at the Developing a Method of Assessment for Events evaluation.
The event was evaluated as development and a verification of the data base to execute the evaluation efficiently.
Moreover, the environmental efficiency index was developed, that was able use as a means of the interpretation of the result for the event and the comparison with other research was executed based on the evaluation result.
In the future the evaluation approach along ISO20121 is developed, and the technique on each side will be examined closely.
For example the economic ripple effect analysis has a lot of the calculation method and the idea , the development of the data base that considers the best economic ripple effect analysis in the event will be executed.
The one that relates to events other than the side considered this time is included in the evaluation.
And, the evaluation of the event should executed by using a lot of data in a short term.
Still a lot of time and the labor are needed only even as for work to cross the data base to the amount of money and the physical superiority data.
Therefore, it is necessary to make the characterization tool that can efficiently calculate the evaluation result.
And, it is hoped to develop the unified index newly by using the result of the environment, economy, and the social column to see the yearly change of the evaluation result.

## 7 References

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