

## CULTURE LANDSCAPE AND GIS DATABASE CONSTRUCTION ON THE STONE CULTURE IN TAKASAGO CITY, JAPAN

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### ABSTRACT:

Takasago City has formed the culture which took "stone" as the keyword. This region was used as "the stonecutting field" from ancient times. The stone culture roots on the area concerned in the region. The stone landscape has been made. There is a special historic landmark on this region in order to represent for "*Ishi no Houden*", a kind of megalith monument. This study is the position research of historic landmark and cultural assets mainly on these stones. And, time series research of the culture landscape. It has been made that the composition of the space is made into the data to be a purpose. This presents the utilization of database and data for maintaining future culture landscape. This research used the GIS on basic data. The GIS data visually grasped time series transition of the landscape element. In addition, GPS and GLONASS were used. Position grasp of stone cultural assets was advanced. 3-D measure result by the aerial survey was also used. From this, the construction of the total database was advanced. In the future, the utilization to "maintenance of landscape and cultural assets" and "the conservation plan", "landscape simulation", "master plan of the area concerned" which utilized the digital characteristic, etc. can be expected.

### 1. INTRODUCTION

The cultural landscape has been specified by the Law for Protection of Cultural Properties of Japan. In the law, it has been specified with "The life of regional people has been constructed by landscape. The landscape is a result of lacking for the understanding of our life, which it is not possible." There is variously intangible and tangible on landscape factor. In mixing them, it is constituted. Especially, the cultural landscape can be called cultivating intangible and tangible with the human life.

There are various viewpoints, when the landscape is considered. The landscape can be largely classified into two. In "the panoramic view landscape", another, one is "the surround landscape".

The panoramic view landscape is secondary space. The surround landscape is third space (Shiota, 1967; The environmental impact assessment technology review meeting edition, 2002). The panoramic view landscape is "It is viewed". In short, it seems to be "the scene which becomes a picture". This can be called a landscape understood. For example, the human may be easy to recognize it like "a place of scenic beauty". By facing, the surround landscape can be called "the landscape of the range in which the hand reaches". In short, it is shown as "landscape of belongings" and "familiar scene". This surround landscape seems to be the object which is always easy to change, because it exists familiarly. Therefore, surround landscape factor is also high on disappearing possibility in features this. This is easy to receive the change which is various

from any fact with the human life. And, the element of the cultural landscape is abounding for this (Japan wildlife research center, 2005). Therefore, we regard these as there being the necessity of making the existence value into the data.

The panoramic view landscape is being tried on the extraction and data (Natori et al, 2005; Fukui et al, 2008; Ishii et al, 1990). There is "examination on confirmation of the place as a viewpoint and extraction of the landscape element (Fukui et al., 2007; Fujiwara, 2006)" and "database construction of the landscape element (Fukui et al., 2008)" on the surround landscape. However, it can be called being very difficult. It is because the effect of the human recognition is strong. It is complicated that the cultural landscape recognition promotes the data.

This study did the research mainly on historic landmark and cultural assets in order to promote the data on the landscape. Then, it has been made that the composition of the space is made into the data to be a purpose. This will present database construction for maintaining the cultural landscape in the approximate region and the utilization in future.

### 2. STUDY AREA

Figure 1 shows the position of the case study.

The research ground is a central part in the Takasago City, Hyogo prefecture. The landscape of the Takasago City is a local city mainly on "stone", because it is old. It can be called "Stone landscape". Since ancient times, this city has been cultivated as

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"quarry" in the long history. This city, "stone culture" roots in the city, and it exists as a part of the life. The stone existence forms the landscape of this region. This can be called a cultural landscape by the stone.

There is a historic landmark represented for "Ishi no Houden" of the *Oh'shiko* shrine even in the inside of the landscape of this stone. Here is the characteristic region where the characteristic historic landmark by the stone is viewed in great numbers. And, the stone quarried here is called "Tatsuyama ishi stone", and in ancient times, it is utilized in "stone coffin" of ancient tomb. After modern times, this stone has been utilized in the stone milestone and cornerstone of the house, "the view stone in the garden", etc. This has formed the culture which adhered to the life. Like this, the circumference on the *Ishi no Houden* of the historic landmark is a region with the good stone material. Here is the region where the quarrying of "Tatsuyama ishi stone" continues from ancient times to the present. And, here is a region with the day-to-day variation.

In this study, the research was done centre in respect of this *Ishi no Houden*. The research ground set bind, research ground in the unit at small boundary in respect of the marginal part.

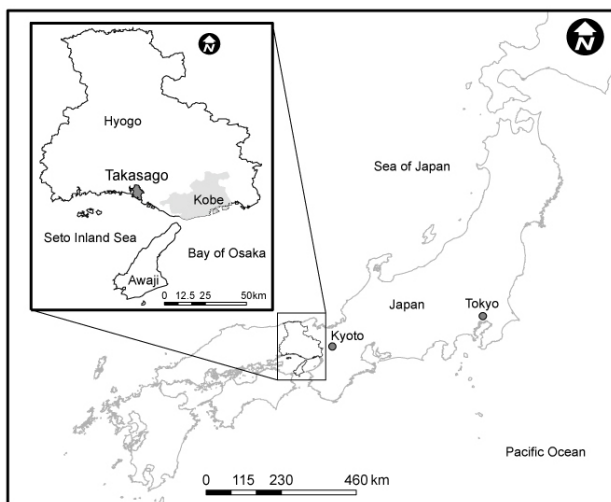


Figure 1. Study area / Takasago City, Japan

### 3. RESEARCH AND EXTRACTION

The research method did existing material and collection of topographic map, arrangement, field survey by the research person.

For a grasp of the basic information, landform construction of the research scope by geographic information system was carried out. In the construction of the research district, the suitable time correction was done using "Digital map 2500 data" (Geographic survey institute, 2002) and "Digital map 50m grid data" (Geographic survey institute, 2000).

The research of the landscape element is based on the researcher with a technical knowledge. The research extracted the landscape element from the existing material. In addition, the research did the field confirmation, using satellite positioning system receiver, mobile GIS. By adding, the research ground was surveyed in detail, as long as it is possible. The field survey did 2 days in August, 2009. The researchers are the description 6 persons.

For the acquisition on the position information of the landscape element, GPS and GLONASS were used. The data was made to

be the database construction on GIS. On the result of catching in the time series, the research data was divided. And, the visualization was done in respect of it.

By adding, using helicopter wave form digitizing radar and multi camera system, the 3-D aerial survey was done. The data constructed the grid data by 50cm. The measure result was made to be the visualization using GIS. Synthetically comprehended database was constructed.

Hardware and software utilized in databases and analysis, field survey are as follows.

The GPS receiver used GARMIN vista HCx. The GIS used Arc Map (Arc Info 9.1, Arc View 9.2) by ESRI Co. The mobile GIS utilized Arc Pad 7.01 by ESRI Co. and GMS-2 of Topcon Co. of the GPS, GLONASS receiving. 3-D measured data utilized SAKURA by *Nakanihon* air service.

### 4. SURVEY RESULT AND DATABASE CONSTRUCTION

Table 1 is a survey result of landscape number of element. Table 2 is a part of the database. Figure 2, 3 are landscape element position point data and 3-D data by GPS and GIS.

Photograph 1-3 are parts of the landscape resources.

The panoramic view landscape view points were the 20 sites, as it was shown in Table 1. This is because it went with that this research ground is located on the upland in the plain. And, being the space looked over, can call the circumference a factor. That upland itself is a quarry too. It can be said that these are easy to be recognized as a familiar existence. The surround landscapes were the 94 places, and there were 114 for totals.

As a landscape element, the surround landscape was made to be the division of "nature" and "humanity". In the detail, it was divided into the item of "community facilities", "culture and history", "biological", "green tract of land", and "topography".

The landscape resources number confirmed 25 places on the result in the natural division. In the humanity division, 69 elements were confirmed. The quarry which was the characteristic landscape resources was abounding with 16 places. The content was "quarry itself" or "the near viewpoint field". This can be called the landscape resources in which "quarry" exists in belongings.

Table 1. The number of the landscape resources.

	division	landscape element	category	landscape resources
panoramic view landscape	synthetic landscape	overlook		20
surround landscape	natural landscape	topography	lakes and marshes	2
			rivers	3
		green tract of land	farmland (paddy field, etc.)	13
			secondary forest	1
	biological	plants and animals	6	
	humanity landscape	culture and history	place of residence (townscape, etc.)	19
			historic landmark (small shrine, etc.)	10
			shrine and Buddhist temple	10
			quarry landscape	16
		Community facilities	river facilities	7
alternating current facilities			3	
	road	1		
	park and green field	3		

On panoramic view landscape, they are not landscape resources number but viewpoint experience.

Table 2. Example of the database.

category	detail	latitude	longitu de	period	note
Overlook	Summit	34.46.601	134.47.820		The beautiful landscape in the hilly area.
Overlook	Summit area	34.46.917	134.47.514		The sea can be looked over.
Farmland	Paddy field	34.47.295	134.47.216		The good landscape.
Place of residence	Building	34.46.946	134.47.260	Showa period	The one-storied house.
Historic landmark	Ancient tomb	34.46.679	134.47.776	Ancient times.	Tatshuyama No.5.
Quarry landscape	quarry	34.46.678	134.48.303		The quarry landscape.

There is 114 for such databases.

It is effective to detail the age in the inside which utilizes GIS (Table 2). However, it is not done to detailed time series in this research.

This is because measurements in the age in the stone, etc. were difficult in the visual observation. And, it is also abounding the result which it can not present clearly. Therefore, the accuracy of the data was considered, and only it was presented the result to of surely prove. In future detailed confirmation on the age research is necessary. By piling up the data, it becomes possible that the visualization confirms in detail. The utilization is possible as a material of future landscape research.

Figure 2 visualized point information of the landscape resources element confirmed in the research.

From this figure, it can be visually confirmed.

3-D measured data of Figure 3 are minute data of the 50cm grid data. That this observes the shape of the minute landform comes out. That the position is easy to grasp and confirms it, when it is superimposed on landscape element got by the reconnaissance, comes out.

On the size of the data, the data increases very much, even if it is small area in the 50cm grid data. This load of the hardware is amplified, and a processing capacity takes time. Therefore, it was also able to be confirmed that the data like the 50m grid data was easy to conjugate, when data is widely necessary. Therefore, it was able to be confirmed that the data like the 50m grid data was easy to utilize, when data is widely necessary (panoramic view landscape).

The detailed data was also able to confirm conjugating, when the landscape element in belongings is confirmed (surround landscape). The necessary data in the landscape for the analysis is the necessity of choosing the situation of the data by necessarily responding.

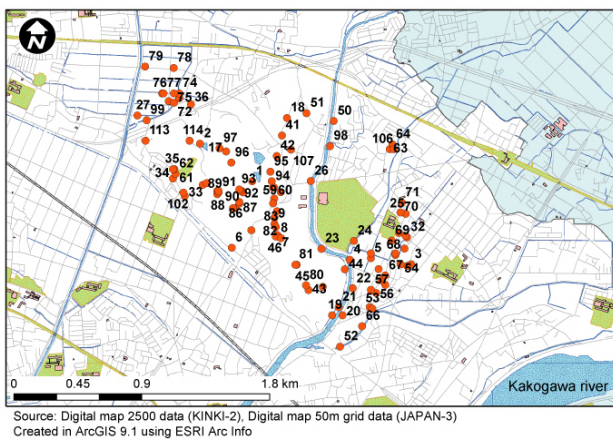


Figure 2. Landscape element point data using GIS

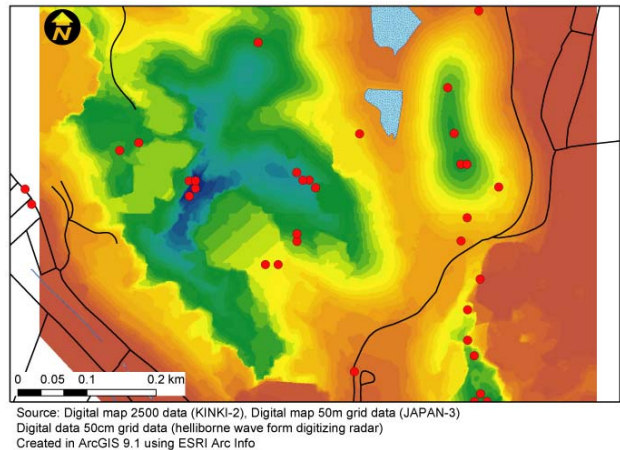


Figure 3. 3-D data using GIS. The solid line is road. The point is landscape element



Photograph 1. Panoramic view landscape



Photograph 2. Quarry



Photograph 3. Japanese traditional building



Photograph 4. Stone gateway to a Shinto shrine

## 5. CONCLUSIONS

This research extracted the landscape element center in respect of the cultural stone landscape. Then, the database of point data information was constructed, when the GIS was promoted. The point data information is easy to do handling and arrangement of the data. This will be easy to be utilized for the landscape monitoring in this region with the change in future.

Especially, the area concerned is a quarry since ancient times, and it is produced at present too. Therefore, it is necessary to advance the monitoring on the change of the quarry. Though point data information is easy to conjugate, it is insufficient only in point data information. The landscape itself becomes easy to be caught by adding plane data information. It becomes that it can grasp quarrying area information according to plane data information and that it can visually confirm the variation of the landscape element. The research of the change of the periodic landscape element is the necessity, when the change of the shape with the quarrying of the area concerned is considered. There is the necessity of storing the time base into data base in order to deal with the change. On the cultural landscape with the change, the periodic research is indispensable without limiting to this research. The necessity of making into archives in the time series is considered the data.

In this research, it is a result by the research person with a technical knowledge on the landscape. However, there is very much the high possibility of overlooking resources in the region. Extraction of the landscape element of the cultural landscape is also necessary on extracting from the inhabitant who makes the life to be the region and district. The extraction by the population question survey seems to be also the necessity. Traditional events and function, etc. are intangible. This is the culture which rooted in the region. Therefore, it can be called an element of the cultural landscape. It is necessary to also extract this element. It seems that this can contribute to future archives.

It is possible that the cultural landscape with the change leaves the landscape element as digital archives using GIS. The record saving is possible for it. It becomes also possible a simulation to future change. And, it is also similar on the restoration.

It is possible that the shape sees that 3-D measured data shown in this investigation are utilized in detail. Such as visible range and direction, this can be also extracted. It can be called constructing the restoration of previous landform.

In the future, the restoration of land shape in a past of this region itself is advanced. By adding, the transition of the landscape will be constructed using the GIS.

By promoting this, the utilization to "extraction of the landscape preservation area", urban planning master plan (for

example, development into home lot and road construction), and environmental assessment is considered. And, it is possible to also indicate the role as a landscape guideline. The landscape digital archives may be various.

## 6. ACKNOWLEDGMENT

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