

INTEGRATED SPATIAL INFORMATION SYSTEM ON SOCIAL ARCHAEOLOGY IN NORTHEAST THAILAND

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KEY WORDS: Archaeology, Human Settlement, Integration, Web-based, Analog, Temporal

ABSTRACT:

We have been developing a GIS-based information system on social archaeology in Northeast Thailand since 2000, and we opened the contents to the public through a web page in early 2003 as a result of the first stage of our activity. Our system, the EcoNETVIS, is comprised of legacy information, such as paper-based topographic maps, aerial photographs of the 1950s, scenic photographs, and academic descriptions. They are mostly from the lifetime research results of Srisakra Vallibhotama, since our activity started with the aim of archiving and conserving his academic materials. To archive them properly was an urgent issue, as much of his unpublished knowledge and related materials would otherwise eventually become useless. Practical collaboration was needed to work out an effective solution. Our collaborative activity moved up to the next stage after two of us from the fields of social archaeology strongly recognized the efficiency of developing the spatial information system and its influence in academic and educational activities. It is, of course, very time-consuming to construct an exhaustive database that integrates information on social archaeology with geo-references, since data must be processed manually. The spatial resolution of our system would be much coarser than that of remote sensing. Nevertheless, the two fields can be linked together by use of geo-references, and close overlay will provide fresh viewpoints for social and human scientists.

1. INTRODUCTION

Social and human scientists have created rich academic descriptions of the past with fragmentary images, such as aerial photographs, sketches, and scenic photographs, but without accurate geo-references. Many senior scientists in these fields, especially leading scientists, are not sufficiently familiar with rapidly improving information technology, and the major medium through which they generally publish their academic findings is print.

Thus, their published findings are accessible to junior scientists and the public, but other, unpublished findings and related materials for study remain fragmentary and without a universal reference. The value of these materials can be maintained only by the scientist himself, and they will eventually become useless, regardless of their importance or researchers' passion. This represents an immeasurable loss to society. There is thus an urgent need to help assemble the lifetime research results and sometimes fragmentary findings of social scientists.

A sense of crisis motivated us to start our present project, which aims to develop an integrated spatial information system on social archaeology in Northeast Thailand. Academic findings and related materials of Srisakra Vallibhotama are the major contents of the system.

2. ECONETVIS

2.1 Background

Srisakra's academic activity covers the whole of Thailand and extends to neighboring countries. But we had to narrow our target area down to smaller region to develop a practical system for both users and collaborators. On the other hand, Nagata has been developing a spatial information system on rural socio-economy, the NETVIS, which covers the whole of Northeast

Thailand (Nagata, 1996). Thus, we started our collaboration with the first priority of concentrating on Northeast Thailand (Nagata *et al.*, 2002). Our project for the Northeast Thailand Village Information System: Ecohistory is abbreviated as EcoNETVIS.

2.2 Materials

The major materials we have been integrating into the spatial information system are aerial photographs, topographic maps, scenic photographs, and academic descriptions. Simply listing these major contents may suggest that integrating these materials is an activity without hardship. But compared with the state-of-the-art satellite imagery, these are quite imprecise, since accurate geo-references are included only in topographic maps. It is very time-consuming to check the geo-references of each entry.

2.2.1 Topographic Maps: The base maps of our system are topographic maps drawn on a scale of 1 to 50:000. Several series are available from different editorial years, of which the series of the 1950s is particularly important. These reveal many features of rural environments in the days before the rapid modernization of rural areas began. Some maps from Srisakra's collection include more exclusive information, as he marked many study sites during his research activities.

As of April 2004, about 70 maps of the 1950s, which cover about 20 percent of the region, and about 240 maps of the 1980s or later, which cover about 90 percent of the region, are incorporated digitally into the system. The horizontal datum of these maps is based on the Indian Datum 1960.

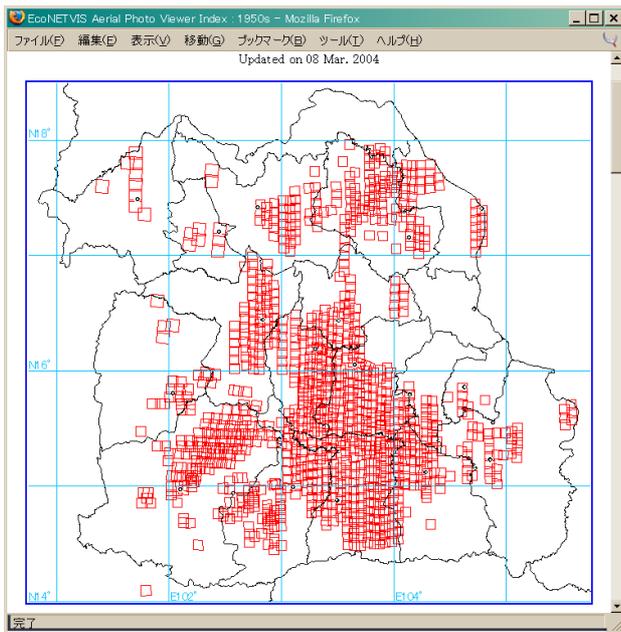


Figure 1. Index map of aerial photographs

2.2.2 Aerial Photographs: Aerial Photographs of the 1950s are also important base images of the system. Checking the geo-references of these old aerial photographs is also time-consuming, as they do not include accurate geo-reference information. A sequential indexing number and visual information such as the texture of land surface, roads, and streams are keys to identify the location.

As of April 2004, about 1,060 aerial photographs of the 1950s are incorporated into the system based on the geo-references, as shown in Figure 1. Though the total coverage is roughly one-third of the region, this includes almost all of the academically important areas.

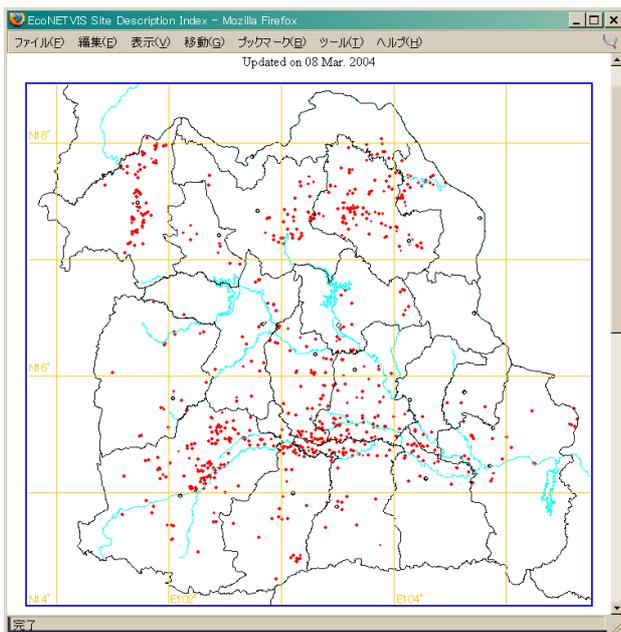


Figure 2. Index map of site descriptions

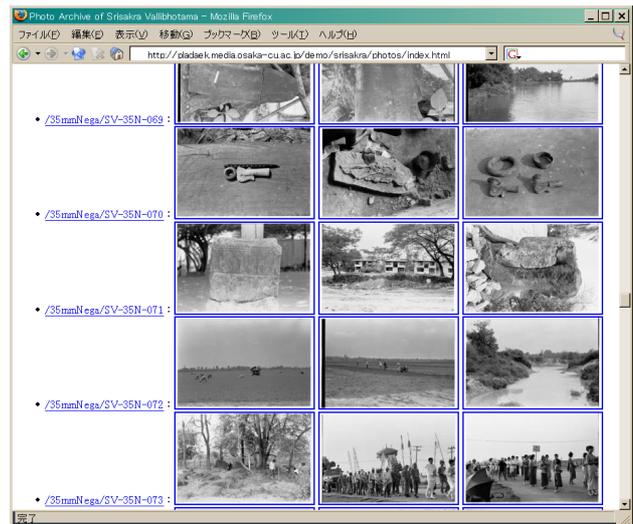


Figure 3. Sample images from scenic photographs

2.2.3 Academic Descriptions: Academic descriptions are mostly from the lifetime research results of Srisakra, and are the most important contents of the system.

As of April 2004, about 1,000 sites with his descriptions are ready for browsing, as shown in Figure 2. Each description is associated with a point geo-reference.

2.2.4 Scenic Photographs: Scenic photographs are another important type of material and a very personal record. Only the photographer himself can clearly remember the scene and describe the information in it. Furthermore, some of Srisakra's photographs are unique records of relics, some of which have since been stolen or severely damaged.

As of April 2004, about 3,000 frames have been scanned digitally without any information which may identify the geo-references. Figure 3 shows sample images. Integration of them is still in progress.

2.3 Outline of the Current System

An important goal of the project is to allow public access to the information system through the Internet. A rough diagram of the current system is shown in Figure 4. Major contents, *i.e.*, site descriptions and image files, are linked together by geo-

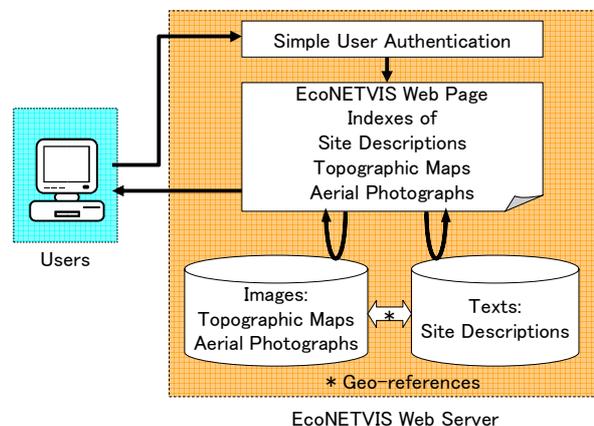


Figure 4. Diagram of the current EcoNETVIS

references in the web server.

Access to the top page is gained via a unit of user authentication. This is because we need to respect the original copyright of topographic maps and aerial photographs. In this sense, our EcoNETVIS web page is not actually freely accessible; however, it is almost so, since we announced the password to the Thai public in February 2003.

We started the release without considering various sensitive issues, and some of these remain to be resolved. Access control and spillage control of image files, of which we do not hold the original copyright, are incomplete. Once a user downloads an image, the image is out of our control.

Another issue concerns the huge size of images. We store image files with enough resolution to allow printing of a replica, so that the size of a topographic map is around 250 MB in TIFF format. At present, in addition to the original files, we prepare the image files in FlashPix format, which have an average size of about 10 MB and are far lighter than original. A FlashPix file server has a function to trim an image file before transmitting it to fit the designated size, *i.e.*, the resolution size of the user's display. So far, this method has proven feasible. However, a rapid explosion of traffic in the Internet has greatly reduced access speed. In daytime, data transmission is often terminated by a timeout signal. At the same time, professional users are not satisfied with a piece of an image. They are eager to browse both an overview and a detailed picture. Furthermore, we face a serious technical problem with the FlashPix format, since no organization or company will maintain the FlashPix file server software now that the nucleus company of this format has disbanded.

2.4 Improvements

We plan to introduce a different method of access as shown in Figure 5. Any user can download any image file with full size and full details, but this PFZ format file is locked. To browse even a rough image, a user has to access the web server to verify the user's identity and thereafter receives the key to open the file. Access functions, such as maximum resolution of browsing, exporting to another file, and printing out, can be flexibly controlled per file per user at the server.

This method has the potential to solve the two issues mentioned in the previous subsection. As lock information is embedded in

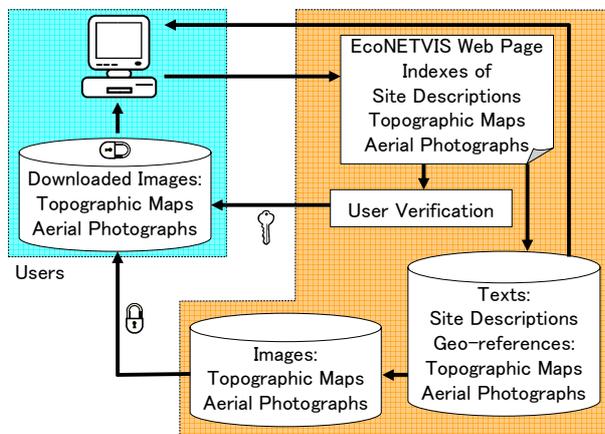


Figure 5. Diagram of the new system under construction

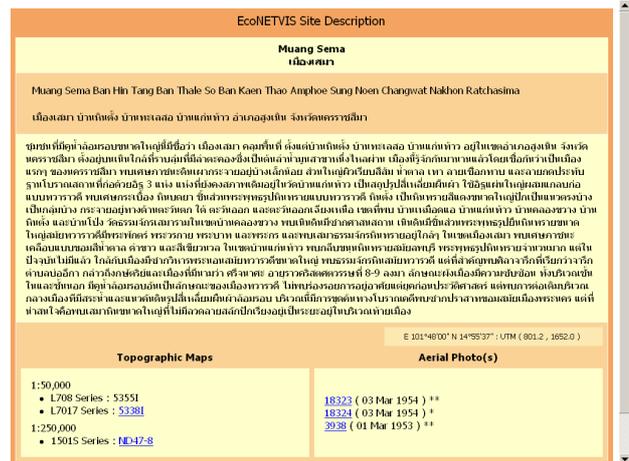


Figure 6. Site description

each downloaded file, users can obtain PFZ format image files by any convenient means. They can download as a background job, or as a midnight job, to avoid the traffic jam in the Internet line. Even more, this method allows offline distribution with CD or DVD media.

An inconvenience that this method might cause to users is that they cannot browse details of the image offline. Nevertheless, we believe that this method offers more advantages than disadvantages.

2.5 Examples

The following are some example pages from the current system. After a user chooses a site from a text-based index or by clicking the index map, a detailed site description appears with information on the corresponding topographic maps and aerial photographs, as shown in Figure 6. Based on the geo-references, links are also provided, if related images are available. From links on the description page, the user can see trimmed images of an aerial photograph and a topographic map with the specified site at the center of the image, as shown in Figure 7 and Figure 8 respectively.

In addition, thematic mapping indexes are provided. Figure 9 is an example showing the distribution of sites that include the keyword "moat", a typical characteristic of ancient villages in this region, in their description either in Thai or English. Of

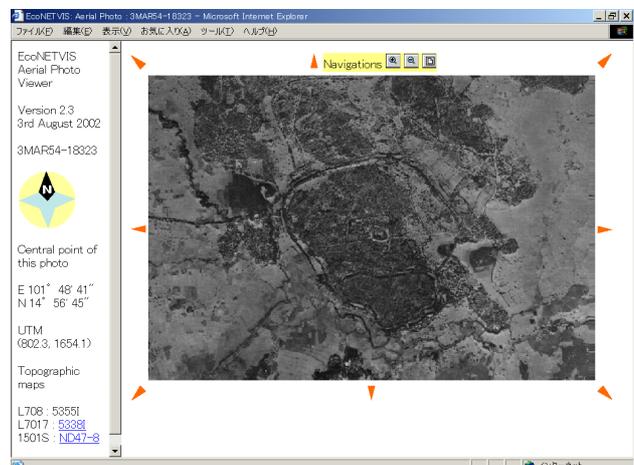


Figure 7. Aerial Photographs

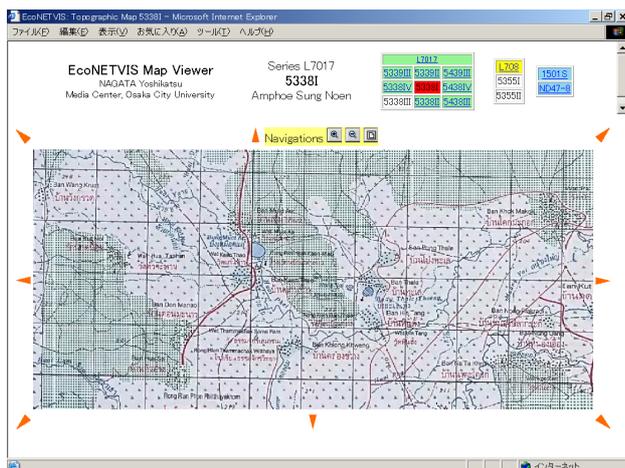


Figure 8. Topographic Map

course, these maps provide click and link.

3. DISCUSSIONS

Our activity is thus practical but not at all model-making or theoretical. Applied technology will plug up holes in modern technology, and both will make progress. Collaboration between distant fields of science will provide fresh viewpoints for both fields.

Our trial created a big sensation when we held an open seminar to introduce it to the public at the end of the three-year first phase. It elicited both negative and positive opinions. We understand that some of negative views are based on academically and nationalistically sensitive considerations, and we should not ignore these negative opinions. At the same time, the support and understanding of some forward-looking scientists has encouraged us to extend our activities. Two of us from the fields of social archaeology strongly recognized the efficiency of developing the spatial information system and its influence in academic and educational activities.

Our project is now in the second phase, and we are seeking a sustainable way of collaboration, since long-term, continuous collaboration is a key to establishing a unique information system, which we hope will gradually gain wider acceptance by the public.

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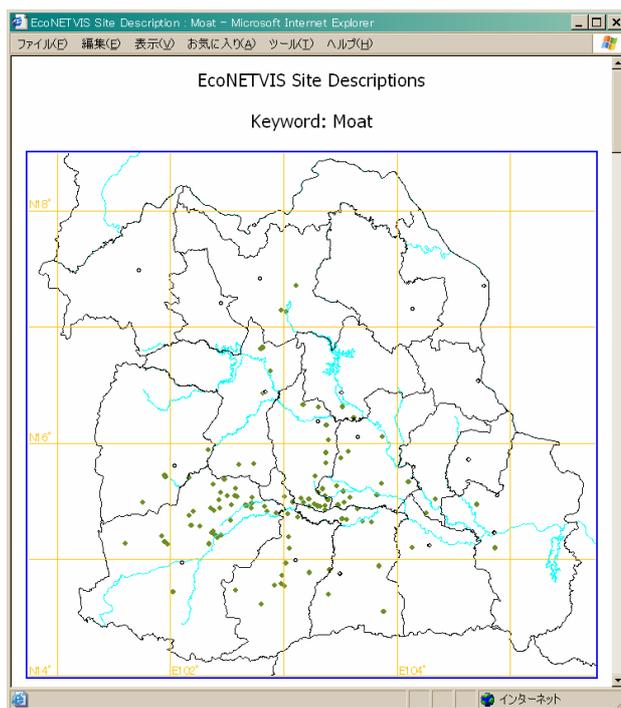


Figure 9. Distribution of sites including the keyword “moat”