PROCEEDINGS

VNM

ASEAN Regional Centre
for Biodiversity Conservation

Proceedings of the Participatory 3-D Modelling Exercise held in Pu Mat National Park

16-26 November 2001
Nghe An, Vietnam

A joint cooperation project between ASEAN and the European Union

Biodiversity Conservation: Our Way of Life, Our Future.

ASEAN Regional Centre for Biodiversity Conservation

Proceedings of the Participatory 3-D Modelling Exercise held in Pu Mat National Park, Nghe An, Vietnam

November 16-26, 2001

Nghe An
Vietnam

By Giacomo Rambaldi and Le Van Lanh



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List of Acronyms

ARCBC	ASEAN Regional Centre for Biodiversity Conservation
ASEAN	Association of South-East Asian Nations
CEN	Conservation Education Network
CETD	Center for Environment, Tourism and Development
CRES	Center for Resources and Environmental Studies
DENR	Department of Environment and Natural Resources
EU	European Union
EC	European Commission
FPD	Forest Protection Department
FPE	Foundation for the Philippine Environment
GEF	Global Environment Facility
GIS	Geographic Information Systems
IUCN	The World Conservation Union
M&E	Monitoring and Evaluation
NEA	National Environment Agency
NBRU	National Biodiversity Reference Unit
NCCST	National Centre for Natural Science and Technology
NGO	Non-Governmental Organizations
PARC	Protected Areas Resources Conservation (PARC) Project
PAWB	Protected Areas and Wildlife Bureau
P3DM	Participatory 3-D Modelling
SFNC	Social Forestry and Nature Conservation Project
VNPPA	Vietnam National Parks and Protected Areas Association
WWF	World Wide Fund for Nature

Summary of Activities

Date	Activities
Thursday, November 15, 2001	• Arrival of Participants from the Philippines and from places outside Hanoi. Gathering at Baoson Hotel.
Friday, November 16, 2001	• 7:30 reporting of all participants at the Baoson Hotel and travel to Pu Mat Nature Reserve.
Saturday, November 17, 2001	• Registration of Participants and distribution of training kits. Introduction to ARCBC and to SFNC. • Opening remarks by Mr. Hoang Hoa Que, Director of Pu Mat National Park. • Introduction to the SFNC Project by Mr. Dinh Van Cuong, National Co-director of the Social Forestry and Nature Conservation (SFNC). • Presentation of ARCBC by Mr. Norman Ramirez (ARCBC). • Introduction of the training exercise by Mr. Le Van Lanh, Secretary General of Vietnam National Parks and Protected Areas Association (VNPPA). • Orientation on Participatory 3-D Modeling (technical and organizational aspects) by Mr. Giacomo Rambaldi.
Sunday, November 18, 2001	• Presentation of the reserve. Field visit (morning). • Orientation on Participatory 3-D Modeling (technical and organizational aspects).
Monday, November 19, 2001	• P3DM Exercise – Orientation of Participants (students) and Trainees - Manufacturing of the blank model.
Tuesday, November 20, 2001	• P3DM Exercise - Manufacturing of the blank model.
Wednesday, November 21, 2001	• P3DM Exercise - Manufacturing of the blank model.
Thursday, November 22, 2001	• P3DM Exercise - Orientation of Participants (key informants) and Trainees - Transposing mental maps by representatives from the Ethnic Minority Groups living inside the park and in the buffer zone.
Friday, November 23, 2001	• P3DM Exercise - Transposing mental maps. Presentation of *Attendance Certificates* to key informants (1st group).
Saturday, November 24, 2001	• P3DM Exercise – Transposing mental maps.
Sunday, November 25, 2001	• P3DM Exercise – Transposing mental maps by villagers (2nd group). Presentation of Attendance Certificates to villagers (2nd group). Started placing reference grid. Oriented trainees on the matter. • P3DM Exercise - Orientation of Trainees - Extracting Information. • Facilitated Participants' Assessment of the Training.
Monday, November 26, 2001	• Visit to the Core Area of the National Park. • Afternoon: Closing ceremony and presentation of Training

Date	Activities
2001	Certificates to the trainees. • Evening: Public Closing Ceremony.
Tuesday, November 27, 2001	• Travel to Hanoi. • Met NBRU Coordinator at NEA and delivered de-briefing on Pu Mat activity. • Visited the EU Delegation. Met Mr. Franklin (Desk officer) and delivered de-briefing on Pu Mat activity.
Wednesday, November 28, 2001	• Departure from Hanoi: participants from the Philippines and from locations outside Hanoi.

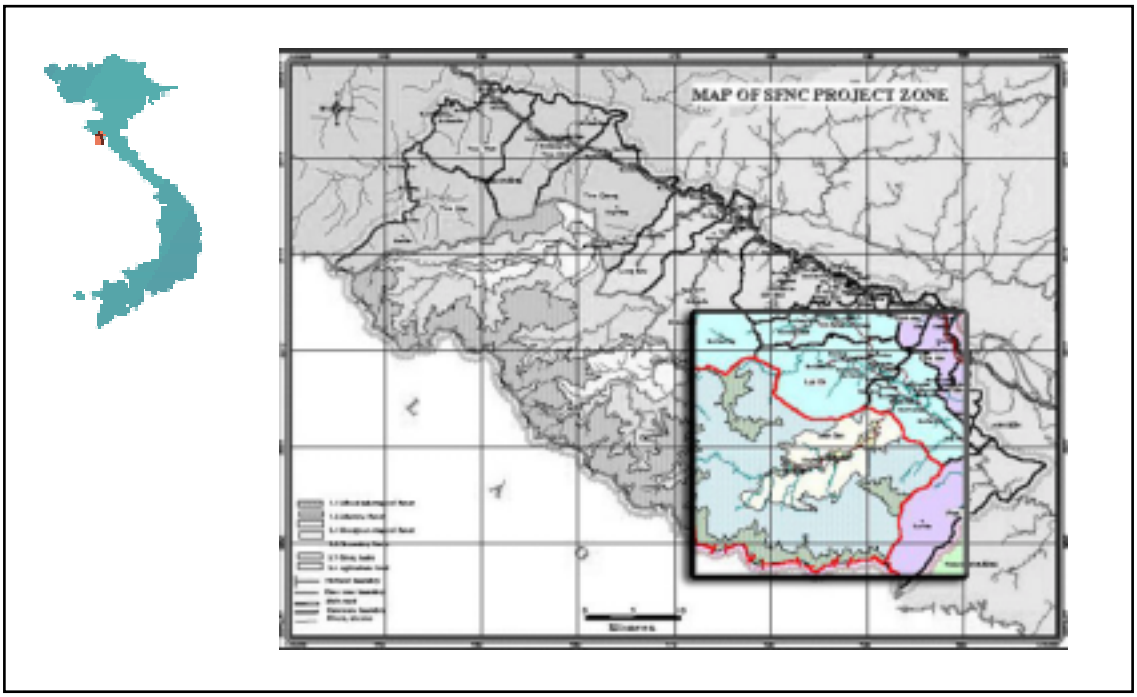
1 ABSTRACT

1.1 Objectives of the Mission in Vietnam:

- Facilitate a Participatory 3-D Modelling Exercise at Pu Mat National Park and train participants from different Vietnamese and Philippine institutions.
- Update the list of inputs needed for conducting a P3DM exercise in Vietnam.
- Analyse the cost involved in the conduct of the exercise (without training component) and determine reference parameters.

1.2 P3DM Location Map

Eastern portion of the Pu Mat National Park, Nghe An Province, Vietnam



1.3 Reference Material

All trainees were supplied with **Training Kits** containing the following:

- Complete list of participants (Vietnamese and English);
- Training Programme (Vietnamese and English);
- One copy of the Manual on Participatory 3-D Modelling for NRM;
- ARCBC's Brochure (website);
- "Quick Reference Guide" (1:10:000 and 1:5000), plastic laminated;
- "Directional North Arrow", plastic laminated;
- Printout of PowerPoint Presentation: "Introduction to P3DM";
- Profile of the Pu Mat Nature Reserve;
- Paper: Participatory 3-D Modelling: Bridging the Gap between Communities and GIS Technology;
- Paper: Extraction of Information from 3-D Models;
- Supply List (English and Vietnamese);
- Paper: What 3-D Mapmakers should know about Corrugated Carton Board;
- Sample base map with matching transparent plastic sheet;
- Samples of push and map pins.
- Kits of numbers and letters to be used for referencing,

1.4 P3DM Training Exercise (Fact Sheet)

Key Reference Data

Organizing Institutions	National Environment Agency (NEA), Vietnam National Protected Areas Association (VNPPA), Social Forestry and Nature Conservation of Nghe An Project (SFNC) and ASEAN Regional Centre for Biodiversity Conservation (ARCBC).
Sponsors	Social Forestry and Nature Conservation (SFNC) of Nghe An Project, ASEAN Regional Centre for Biodiversity Conservation (ARCBC).
Funding Agencies	Ministry of Agriculture and Rural Development (MARD), Department of Environment and Natural Resources (DENR) on behalf of ASEAN, and European Commission (EC)
Duration of the actual exercise (inclusive travel):	12 days
Venue	Pu Mat National Park Office, Con Cuong, Nghe An Province, Vietnam.
Dates	November 15-28, 2001 (inclusive travel and other training related activities)
Duration of the actual 3-D modeling exercise	November 18-25, 2001
Duration of the exercise including preparatory work:	3.5 months (scattered inputs)
Participants	
Village informants (details in Annex 3)	76
Students and teachers (Lower Secondary School of Con Cuong District)	30
Trainees	
Various institutions/projects/NGOs	27
Pu Mat National Park staff	6
SFNC Project staff	10
Translators	3
Number of trainers/facilitators	5
The model (for additional information see Annex 2)	
Horizontal scale:	1:10,000
Vertical scale:	1:7,500
Contour interval:	20 m
Final size of the model: two units 1.4mx 2.5m	2.8 m x 2.5 m
Area covered (on the ground)	70,000 ha (700 sq. km)
Province:	Nghe An
Districts:	Con Cuong and Anh Son
Communes	Mon Son, Luc Da, Yen Khe, Chau Khe, Chi Khe and Tam Hop
Currency Equivalent (as of November 2001) Currency Unit – Dong (D)	D1.00 = $0.00006 $1.00 = D15,000
Cost of information generated (*physical 3D and digital formats*) at 1:10,000 scale	4.16 $/sq. km or 0.04 $/hectare

1.5 Training Outreach

A number of institutions, projects and NGOs attended the training.

Contact details are found in Annex 1 and at the following Internet address http://www.arcbc.org.ph/training/vietnam/vnm_p3dm_participants.htm :

Trainees

- **Government Agencies**
  - Forest Protection Department (FPD)
  - National Environment Agency (NEA)
  - Protected Areas and Wildlife Bureau (PAWB) (PHL)
- **National Parks**
  - Bach Ma National Park
  - Ba Be National Park
  - Cuc Phuong National Park
  - Tam Dao National Park
  - Pu Mat National Park
- **Non-Government Organizations (NGOs)**
  - Vietnam National Protected Areas Association (VNPPA)
  - Conservation Education Network (CEN)
  - Center for Environment, Tourism and Development (CETD)
  - Foundation for the Philippine Environment (FPE), PHL
- **Projects**
  - GTZ-funded Song Da Social Forestry Project
  - GEF/UNDP funded Protected Areas Resources Conservation (PARC) Project
  - EU-funded SFNC project: 10 staff
- **Academe**
  - Hanoi University of Sciences, Faculty of Biology
  - Hanoi University of Sciences, Faculty of Geography
  - National Centre for Natural Science and Technology (NCCST), Geographic Institute
  - Hanoi National Economic University, Faculty of Economy and Municipal Environmental Management
  - Center for Resources and Environmental Studies (CRES)
  - Institute of Water Resource Planning
  - Human Geography Research Center
- **Key informants**
  - Representatives from Ethnic Minority Groups (Thai and Dan Lai and Kinh Peoples) from the Commune of Monson, including the villages of Khe Bong, Co Phat, Con, Thai Son, Xieng, Lang Yen, Bac Son, Cua Rao, Lang Cang, Nam Son, Tann Son, Khe Lo and Thai Hoa.

1.6 Trainers and Resource Speakers

Sessions	Resource Speakers (listed in chronological order)
Presentation of ARCBC structures and functions	Mr. Norman Emmanuel Ramirez, Training Expert II at the ASEAN Regional Center for Biodiversity Conservation (ARCBC)
Facilitation Techniques and Participatory 3-D Modeling	Mr. Giacomo Rambaldi, Information Communication Advisor, ASEAN Regional Centre for Biodiversity Conservation (ARCBC)
Preparation of colours	Mr. Pham Luc, Painter, Development & Mutual Aid Centre for Economic and National Culture Hanoi, Vietnam
Transposition of data from the base map onto the 3-D model (e.g. Protected Area Boundary)	Mr. Fernando Ramirez, Area Coordinator – Luzon, Foundation for the Philippine Environment, Philippines
GIS applications including extraction of the information from the 3-D model and on-screen digitizing	Ms. Jasmin Callosa-Tarr, ASEAN GIS Specialist, ASEAN Regional Centre for Biodiversity Conservation (ARCBC)

2 INTRODUCTORY AND ANCILLARY ACTIVITIES

2.1 Production of an Educational Video on Participatory 3-D Modelling

With the objective of providing additional information on the 3-D modelling technique, the ARCBC project management decided to produce an educational video. During the preparatory activities, which were done ahead of the Pu Mat exercise, ARCBC and SFNC agreed on sharing the cost of production: SFNC shouldered the cost for hiring the NGHEAN Broadcasting and Television Station to film the exercise. ARCBC will now take care of composing and editing the 3-hour video containing 307 scenes. The video (25 minutes) will be produced in English and Vietnamese and will serve as a Companion CD to the 2nd edition of the P3DM manual and be an integral part of the information media devised by ARCBC for disseminating the technique.

2.2 Introductory Presentations Delivered at the Opening Ceremony[1]

Mr. Hoang Hoa Que, Director of Pu Mat National Park gave the opening speech of the training course.

Mr. Dinh Van Cuong, National Co-Director of the Social Forestry and Nature Conservation (SFNC) Project in Nghe Anh Province introduced the development and activities of the project since its establishment. He shared that the Government has been involved in the project activities at different levels including ministerial, provincial, district and local. The project has four main components, which are (i) highland agriculture; (ii) nature conservation; (iii) forestry development and (iv) training, monitoring and evaluating.

The project site harbors three forest enterprises located in (i) Anh Son, (ii) Tuong Duong and (iii) Con Cuong. The enterprises are active participants in project implementation particularly in the sector of agro-forestry. Their presence also represents a source of income for residents in the area.

Different minority groups including Tay Phoong, Man Thanh, Dan Lai, Kho Mu, H'Mong, Thai and Kinh Peoples inhabit the project area. The total population of approximately 10,000 resides in 16 communes and 110 villages.

The Pu Mat National Park encompasses portions of three districts, namely of Anh Son, Tuong Duong and Con Cuong in Nghe Anh Province. The core zone covers 91,113 ha and the buffer zone approximately 86,000 ha.

Mr. Le Van Lanh, Secretary General of the Vietnam National Parks and Protected Areas Association (VNPPA), introduced the subject of the training exercise - Participatory 3-Dimensional Modeling (P3DM) - and explained that the method has been successfully applied in the Philippines and Thailand in the context of protected area management and land use planning. Mr Lanh recalled the recent proclamation of Pu Mat as a National Park and the importance for Pu Mat to host this first major P3DM exercise.

Mr. Hoang Hoa Que introduced the participants to the history and development of Pu Mat National Park. He explained that the park is managed by a Management Board and through three operative sections including (i) Administration, (ii) Science and International Cooperation and (iii) Forest Protection. The latter runs seven forest protection stations located at the periphery of the core zone. The park employs a total of sixty-two permanent staff.

He further expanded on the diversity and rarity of species found in the park, on its beautiful landscape and suggested possible developments in the ecotourism sector.

[1] Section prepared by Mr. Le van Lanh

He also described the cultural significance of the area due to the various ethnic minorities still maintaining their traditions.

Mr. Norman Emmanuel Ramirez, Training Expert II at the ASEAN Regional Center for Biodiversity Conservation (ARCBC), delivered a PowerPoint presentation describing the activities of ARCBC.

2.3 Summary of the Orientation on P3DM and Follow-up Q&A Session

Mr. Giacomo Rambaldi, ARCBC Information, Communication and Technology Specialist emphasized the contribution of VNPPA, NEA, SFNC and Pu Mat National Park in organizing the training course. He also introduced the general concepts of P3DM and its applications in the context of natural resources management.

A Question and Answer session followed:

Mr. Andrew Johns, SFNC's Consultant, informed the participants that the SFNC was in the process of interpreting a set of satellite images covering the entire project area. He questioned the usefulness of conducting a similar exercise through community mapping.

Mr. Rambaldi answered that the outputs of the two exercises would yield information which may be comparable, but the objectives are totally different. Community mapping focuses on experiential learning and leads to increased awareness of all participants. Thus it would bring people – having different cultural and educational backgrounds - together and lead to a change in perspective on "whose knowledge counts" and "who decides on what is important". This is not the case in a satellite interpretation process, which is usually done in isolation and far from the community, and where scientists or technicians filter what they see through their own perspective. Mr. Rambaldi also stressed that satellite images do not show "values" attached by people to resources, nor features which are hidden to the satellite eye. He further emphasized that during the training course the trainees should learn how to interact with local community members and pay due respect to their knowledge.

One participant questioned the "quality" of the spatial data that villagers could produce because of their general low level of literacy. Mr. Rambaldi explained that villagers usually know the ins-and-outs of the environment they depend on and that the method (i.e. P3DM) would facilitate the collation of very accurate, scaled and geo-referenced data, all based exclusively on the cognitive (mental) maps of the participants. He further elaborated on the fact that P3DM is a multi-disciplinary exercise requiring the collaboration of people (acting as facilitators) having different backgrounds like community work, environment and cartography.

2.4 Field Visits

The project organized two field visits. The first one took place on 18 November 2001 and allowed the trainees to familiarize themselves with the land use and vegetation cover in the buffer zone of the park. The visit included a 200-ha plot of *Lagerstroemia calyculata* in Quang Thing Village, Tam Binh Commune, Tuong Duong District, the Town of Hoa Binh and Cay Me Village. The second visit occurred on November 26 2001. Participants were led into the core zone up to the Kem Waterfall, a location well displayed on the 3-D model.

2.5 Orientation Activities

On 18 November 2001, Mr. Rambaldi delivered a PowerPoint presentation describing all preparatory activities leading to the actual P3DM exercise. He focused in particular on procurement, preparation of base maps and logistics.

In the Question and Answer session that followed, Mr. Rambaldi expanded on the relationship between the selected scales (horizontal and vertical), the contour intervals and the procurement of some inputs like carton board.

Thereafter the trainees started assembling the maps and gluing these on the base tables. Landmarks like mountain or hilltops were identified and marked.

2.6 The Closing Ceremony

On 25 November 2001, the closing ceremony was held at the Park museum and was attended by SFNC Project Co-director Mr. Andrew Weir, VNPPA President Dr. Nguyen Duc Khang, the park authorities, trainers, trainees, and a representative from the local farmers' community.

Mr. Chom summarized the flow of events of the training course activities, the outputs, the course evaluation produced by the trainees and praised the Pu Mat National Park for their efforts in organizing the event. He further recommended that the SFNC Project allocate funds for the completion of the model.

Mr. Giacomo Rambaldi praised the commitment and interest shown by all participants and highlighted the efficient cooperation among ARCBC, NEA, VNPPA, SFNC and Pu Mat National Park in organizing the event.

Mr. Andrew Weir highly appreciated the successful result of the 3-D modeling exercise. He emphasized that the process proved to be effective in "bringing people together" and inducing collaboration among different stakeholders in the management of resources in Pu Mat National Park.

Mr. Nguyen Duc Khang acknowledged the contribution of all organizations and expressed his wish to replicate the exercise in other National Parks in Vietnam.

A representative of the trainees, Mr. Tao (Cuc Phuong National Park), elaborated on how similar models made for other protected areas could be fruitfully utilized to improve the efficiency of protected area management, particularly in protection and law enforcement.

The farmers' representative expressed his satisfaction on the opportunity given to local people to participate in the exercise. He acknowledged the usefulness of the model in gaining a comprehensive perspective of land and forest and in managing the resources in the areas they live in. He said he would inform his community of what all farmers had done in the course.

Mr. Hoang Hoa Que, Director of Pu Mat National Park, acknowledged the support provided by ARCBC, NEA, VNPPA and SFNC project to build the model. He expressed his hope to continue receiving SFNC's assistance in completing the exercise.

At the end of the ceremony Mr. Andrew Weir, Nguyen Duc Khang and Giacomo Rambaldi distributed certificates to all participants.

During the training course, all activities were video recorded by Nghe An Television.

In the evening the park organized a concert to mark the success of the training course and celebrate Vietnam Forestry Day.

3 THE P3DM EXERCISE

3.1 Assembling the Blank Model

On 19 November 2001, after an initial orientation on the forthcoming activities, the trainees, supported by park and SFNC staff, students and teachers from local schools, ventured into the various phases of the exercise including (i) assembling a large

carbon paper and fixing it below the base map; and (ii) hammering nails[2] through the tables to identify the selected landmarks. Trainees split in several working groups, each one assigned to a portion of the model made out of two units measuring 2.5-m by 1.4-m each. The groups consisted of (i) those tracing the contours on 3-mm thick carton board, (ii) those cutting out the single contour layers and (iii) those gluing and pasting the layers one on top of the other paying attention to properly locate them (using different landmarks including the reference nails).

On 20 November 2001 trainees continued their work. Mr. Le Van Lanh oriented a second batch of students and teachers on the activity, who later took part in tracing contours, assembling the model and consolidating the various layers with the use of crepe paper.

While working, the participants proposed some innovations (see box), all of which proved to contribute to the quality of the job.

Box 1 Introduction of additional tools

- Coping saw (for cutting contour layers).
- Binder clips (for joining base map, carbon paper and carton board sheet).
- Pliers and hammer.
- Plumb line weight.

The blank relief models (two units) were completed in the evening.

The second resource person**, Mr. Pham Luc** (Artist), prepared a vast array of colors to serve as coding means for the transposing phase. Each color had to match an existing color-coded yarn. Mr. Pham Luc prepared several color tables for his forthcoming lecture.

Mr. Rambaldi facilitated a recap of the entire process, discussed the various phases of the construction of the two models, and solicited observations made and lessons learned by the participants.

Box 2 Lesson learned

In reviewing the exercise the participants recalled the importance of the following:

- Correct and complete procurement of supplies.
- Properly prepared base map, including many elevation labels to facilitate tracing.
- Correct positioning of the contour layers making regular use of reference marks (e.g. nails).

In a follow-up focus group discussion, the park rangers and some SFNC project staff expressed their doubts about the capability of villagers (key informants) to locate features on the models. This was based on the assumption that the relatively low literacy of the informants would prevent them from internalizing (decoding) the model, thus from locating and displaying data. Mr. Rambaldi facilitated the discussion and recalled the attention of the audience to the fact that they themselves were able to pinpoint several features on the blank relief models. “Why shouldn’t residents in the area be capable of doing the same?“ Mr. Rambaldi advised the trainees to be prepared to step down from the teaching pulpit, become careful listeners, and to accept the existence of a variety of perspectives for every single item. “You will be surprised by how much villagers know about their territory. Don’t worry, it will be a great opportunity for all of us to learn”, he concluded.

3.2 Transposing Cognitive Maps

On 21 November 2001, the first group of villagers reported to the venue early in the morning. With the assistance of local interpreters, Mr. Rambaldi welcomed the informants and delivered an orientation on the forthcoming activities and the process of transposing cognitive maps on the relief models by using colour-coded yarns, paint

[2] Note: the more nails (landmarks) are inserted, the more precisely geo-referenced the model will be.

and pins. Participants were invited to review the draft legend (map key) and to suggest changes or integrations[3]. Without encountering any difficulty, the farmers were able to locate themselves vis-à-vis the model and started - with great enthusiasm – to locate watercourses, name peaks, outline roads and trails and pinpoint the location of their villages and homes. The facilitators managed to assist the informants in processing and displaying their knowledge (mental maps) in an organized and logical manner[4]. Once the participants had sufficiently assimilated the model landscape they started identifying land cover and use through colour-coded yarns. During the work, the two tables were regularly combined to check whether the information displayed would match on the edges of the two halves of the model.

During the entire morning of the following day the first group of informants continued transposing the mental maps on the models. In the early afternoon, Artist Pham Luc delivered a presentation on how to prepare colors using color powder. Thereafter the local farmers went ahead with the exercise. Animated discussions among informants led to the identification of the single polygons (land use and cover) and to the subsequent application of the corresponding color-coded paints.

The key informants identified the following:

Table 1 Features identified by the Informants and used as map key (legend)

Features		
Polygons (paints)		
Bamboo forest	Limestone karst (rock)	Reforestation area
Conifer forest	Mixed broadleaves and conifer forest	Resettlement area
Crops on terraces	Mixed tree & bamboo forest	Shifting cultivation
Crops (seasonal) other than rice	Orchard	Stone field
Evergreen broadleaves forest	Paddy field	Sugarcane
Forest over limestone	Planted bamboo forest	Tea plantation
Grassland	Production Forest	
Points (pins)		
Border Police Station	Health Station	Scientific Research Point
Cave	Household (single)	Sport playing field
Commune People's Committee HQs	Households (10)	Sighting places[5] of wild animals: Saola (deer) Elephant, Bear, Gayal, Tiger and Monkey.
Docking site on river	Market	
Extension Station	Pagoda or Temple	
Ranger Stations	Place of historical interest	Tree Nursery
Graveyard (cemetery)	School	Waterfall
Lines/ polygons (yarns)		
Bridge	National boundary	Trail/foot path
Buffer zone boundary	Nature Park boundary	
Rough Road	Water Course	

Farmers also provided information on sightings of wildlife[6] species. Consistency in the use of color-coded pins emerged as a clear necessity for displaying data (see Box).

Once the land cover and vegetation were displayed by the use of colour paints, the informants were assisted in locating point features like households, social infrastructure and others. The outlining of trails (footpaths) followed, developing the first ever trail map of the area.

[3] By the end of the exercise the initial legend had expanded substantially to include a series of features, defined by the villagers themselves. NOTE: The complete model displays a total of 55 different features including lines, polygons and points.

[4] Displayed data have to be properly coded so later users can decode, interpret and understand these by using the map key (legend).

[5] Sensitive information (will not be displayed in public).

[6] This information concerns some rare endangered species and has to be considered "sensitive".

In the afternoon, the second group of key informants joined the exercise. Informants from the two groups were shown a slide show of the entire exercise including the construction of the model and the work done by the first group. A farmer from the first group was given the floor to introduce the second group to the forthcoming task. In the SFNC project context this event had a great significance, since it was the first time for a simple villager to speak in front of a relatively large audience and to act as resource person. He proudly introduced the output of the work done by the first 36 informants and introduced the newcomers to the details of the forthcoming activity. Once his presentation was completed, the organizers gave attendance certificates to the informants of the first group.

Box 3 Consistency, a key requirement

White flat head pins were used to inscribe the name of the species and to locate a sighting. Some trainees started using blue flat pins to do the same process. "Why use a blue pin? Is there any difference between an elephant when symbolized by a white or blue pin? If no difference exists, then be consistent in using white pins!"

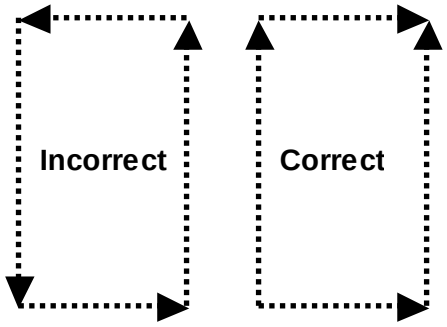
The two groups spent some time working together to validate the information already displayed on the relief model. Thereafter the first group left and the remaining 36 informants took over. Benefiting from the acquired experience the trainees continued the facilitation of the exercise jointly with the resource persons.

The two model units were regularly combined to check if the displayed information matched. Once completed on 24 November, the relief model was brought outside the museum to take group pictures[7]. All participants (key informants and trainees) were given Attendance or Training Certificates by the organizers. A farmer from the second group was requested to deliver a speech during the closing ceremony on 26 November 2001. Mr. Rambaldi invited all participants to use the model – to be stored at the Pu Mat National Park museum – to discuss issues related to the territory. The Director of the park informed the villagers that they would have access to the model whenever they liked and were welcome to come and update it.

3.3 Transferring Data from/to the 3D Model

On 25 November, Mr. Rambaldi oriented the trainees on the follow-up activity, namely on how to transfer data between model and base map and vice versa. This process is done by using a scaled grid placed at a desired interval, usually corresponding to 10 cm (1 km on the ground) for models done at 1:10,000 scale.

Box 4 Path for marking intervals



Interestingly, a heated discussion[8] emerged on how to measure intervals while placing the grid (see **Box 4**). After reaching a consensus, the grid was placed on top of the model.

Mr. Fernando Ramirez, an experienced 3D mapmaker, explained the details of the process of transposing data (Core and Buffer Zone Boundaries) from the base map onto the model.

[7] All key informants were given a copy of the group picture and a certificate of attendance.

[8] All learning acquired during the exercise will be incorporated in the second edition of the Manual on Participatory 3-D Modeling.

The activity yielded some interesting findings (see **Box 5**) based on discrepancies that emerged during the process. In some cases the boundary – which was supposed to run along the mountain ridge – turned out to be displaced by 100-200 meters (1-2 cm on the 1:10,000 scale model).

The main purpose of the activity was to train participants in transferring data from the base map to the model and vice versa, using simple tools like a matching grid referenced by the use of letters and numbers placed on the X and Y axes.

3.4 Data Extraction

On 25 November 2001, Ms. Jasmin Callosa-Tarr delivered a presentation on how to extract data from the model by using:

- Transparent plastic sheets superimposed on the existing grid; and
- An innovative technique based on high definition digital photography.

The latter represents a substantial improvement in extracting and processing data from a 3-D model into a digital environment. The exercise deserves some detailed description.

3.5 Extraction of Data using Digital Photography

3.5.1 Background

The technique used in the past, which makes use of transparent plastic sheets, generates numerous errors due to the fact that the plastic sheets are not placed on a plane surface, but adhere to the grid which follows to a major extent the relief of the model. Attempts made in placing the grid above the model on a plane surface by using Plexiglas or a wooden frame, and later on extracting the information by the combined use of a laser pen fixed together with color-coded markers, proved to be tedious and damaged the eyes of those involved in data extraction.

Digital photography combined with on-screen digitizing was therefore identified as a possible way forward. The technique has been successfully tested during the P3DM exercise in Pu Mat.

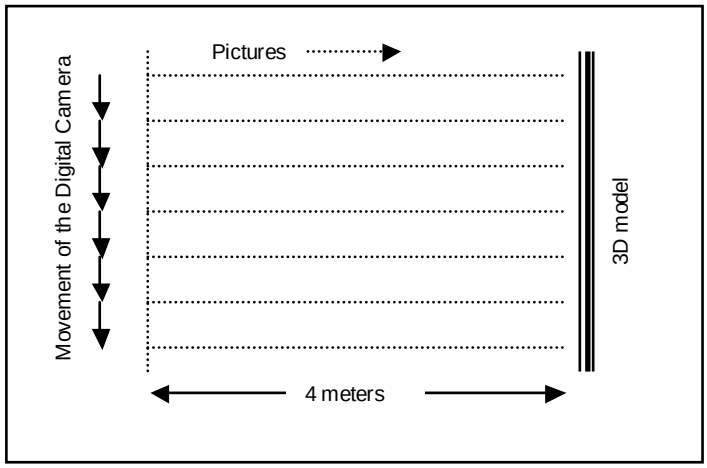
Box 5 Lessons learned in transferring data

Problem: Incorrect placement of some layers while assembling the model caused the ultimate displacement of features at higher elevations (e.g. mountain peak).

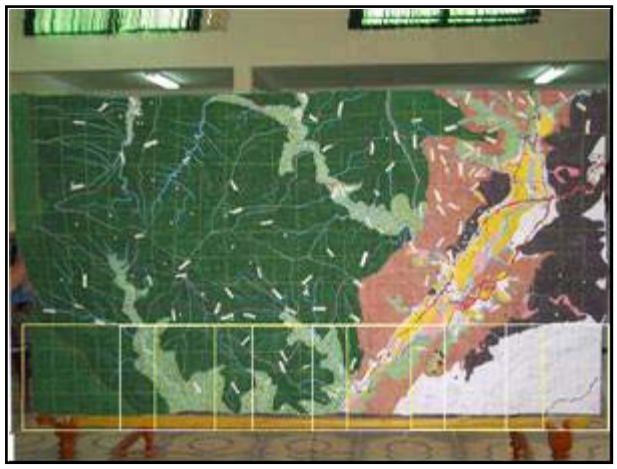
- One cause for this has been the running out of reference marks (reference nails) while assembling the model once higher elevations were reached. This problem was solved in some areas of the models by using side guides. A definitive solution to this problem could be the procurement of nails or steel bars that are sufficiently long to serve as reference even for higher elevations. In other words, a nail, which is 15 cm long, will serve (if working at a 1:7,500 scale) as a reference for gradients of 1000 meters or less, depending on the thickness of the base table. Therefore for gradients of 2000, meters the procurement should include thin steel bars to be cut at the desired length to be progressively hammered through the table and serve as guidance up to the top of the mountain.
- A second reason for the displacement has been – according to SFNC project staff – the small scale used for digitizing the boundary line. This originated, according to the GIS OIC, from some discrepancies in combining the data sets (contour map produced at 1:10,000 and boundary outlining composed at a smaller scale).
- A third reason for the displacement lies in the placement of the grid, which adheres to the relief of the model (error already anticipated by the facilitators). It was suggested that a wooden frame be constructed to allow the grid to be placed horizontally above the model and to later use a plumb line weight to transfer the coordinates from the base map to the model.

3.5.2 Implementation Details

To reduce radial[9] and relief[10] displacements, Parallel Camera Movement shooting[11] is recommended. This technique involves moving the camera at a set distance from an object, such as the 3-D Model, to capture it in sections.



A high-resolution digital camera (PowerShot G2 in our case) is placed on a tripod. The 3-D model is tilted vertically at a 4-meter distance. Lines perpendicular to the model's horizontal plane are drawn on the floor at 40 cm intervals. A reference line is drawn at the end of the orthogonal lines to serve as guide in moving the camera from one position to the following one.



The focal length setting is adjusted to capture an area of approximately 40 cm x 50 cm. The camera is set to the maximum resolution (e.g. 2272 x 1704 pixels) and compression capacity. This setting will provide high quality images of approximately 2 MB each. The number of images that can be stored on the Compact Flashcard (CF card) depends on its storage capacity. A standard CF-32M card can contain up to 14 images shot at these high quality settings. To cover the entire area of a model measuring 2.5 x 1.2 meters it is necessary to shoot at least 24 pictures. Intermediate downloads to a separate storage device may therefore be necessary.

The camera is positioned by the use of a plumb line exactly above the intersection of the orthogonal and the reference lines. The height of the camera above ground is chosen and has to be constant throughout the first passage.

[9] Radial displacement is characteristic of vertical photographs where the only place on a photograph where there is no distortion is the photographic center. Distortion then increases radially outward from the center in proportion to the distance from the center.

[10] Relief displacement is characteristic of vertical photography where objects in the photograph appear relatively larger then other objects because they are closer to the camera due to a higher elevation.

[11] A second technique is called "Panning". This technique, typically used to shoot sceneries, involves the camera remaining in one spot and being panned up or down or left to right to shoot the desired images.

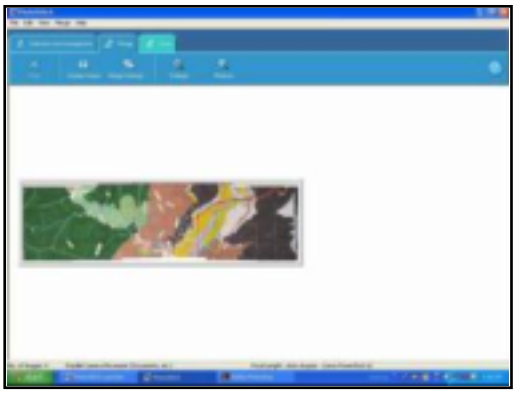
Once all images are taken and safely stored on a computer, they are merged by the use of appropriate software. One application bundled with the Canon PowerShot G2 Camera is PhotoStitch©. This application merges images in horizontal or vertical sequences or stitches together images that have been shot in sections like in the case of a 3-D model. PhotoStitch produces seamless images, employing a variety of merging techniques to achieve high-quality results. It automatically compensates for differences in brightness and color arising from variations in exposure values.

The first step is to open the images selected for merging in PhotoStitch and arrange them into the correct sequential order.

The second step is to choose the merge settings depending on the adopted shooting technique

After clicking the [Start] button images are merged one pair at a time.

The process is completed in a matter of seconds and the results are visible on the screen.



After clicking the [Save] button a "Save As dialog box" will lead the user to the [Crop] option which allows for viewing a rectangular selection of the image and for cropping uneven edges.

The image(s) are now in raster[12] image format ready for digital extraction, correction and geo-referencing. This requires their conversion to vector[13] format through onscreen digitizing or heads-up digitizing.

[12] A **raster image** file is generally defined to be a rectangular array of regularly sampled values, known as pixels. Each pixel (picture element) has one or more numbers associated with it, generally specifying a colour, which the pixel should be displayed in.

[13] **Vector Images** are generated through a sequence of commands or mathematical statements that place lines and shapes in a given two-dimensional or three-dimensional space. In physics, a vector is a representation of both a quantity and a direction. In vector graphics, the file is created and saved as a sequence of vector statements. At some point, a vector image is converted into a raster graphics image, which maps bits directly to a display space (and is sometimes called a *bitmap*). The vector image can be converted to a raster image file prior to its display so that it can be ported between systems.

This technique is now becoming the most popular means of creating GIS spatially organized data as opposed to tablet digitizing. On-screen digitizing captures data from digital images or scanned maps by using the mouse instead of the cursor. This allows for creating map layers by adding labels during tracing. While the features are still manually traced, on-screen digitizing grants - provided images are scanned or taken at high resolution - a higher level of accuracy because the operator can use the zoom facility.

On-screen digitizing allows for editing features when enough information is available from the image.

4 GROUP DYNAMICS

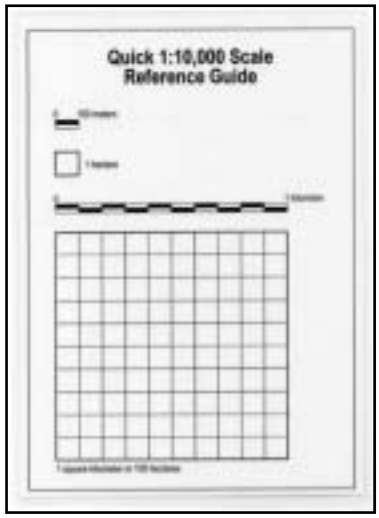
Careful attention was paid to group dynamics during the exercise. The trainees, coming from different institutions, easily became familiar with one another and generally worked as a team. The diverse educational background of the group (including cartographers, GIS technicians, biologists, socials scientists and park management staff) positively contributed to the outcome of the exercise. In fact, any P3DM exercise is meant to be facilitated by a multi-disciplinary group including at least 3 disciplines: cartography/GIS, community work and environment.

Question: How do you feel? Why?

The management of the Pu Mat National Park sent 10 staff to attend the training. Interestingly – before staring the actual exercise - most of them expressed some doubts about the capacity of the villagers to fruitfully relate to the 3-D model and to compose its landscape based simply on cognitive maps.

Questions on "how can we correct their errors" surfaced during two focus group discussions, organised in anticipation of the arrival of the key informants. The meetings were held to prepare the park staff to accepting different perspectives and the fact that there is more than one *locus* of knowledge.

"Do's and Don'ts" of facilitation were discussed enhancing the importance of "broadening the perspective" or "enhancing analytical skills" of key informants, rather than "correcting their mistakes". The "Inverted Map" exercise was done to encourage the acceptance of existing diverse frame of minds, and the necessity of "thinking outside the box".



After being oriented on the mechanics of the 3-D modelling exercise and on the use of the coding means, key informants quickly familiarized themselves with the topography of the model, and pinpointed the location of their houses and other landmarks. In learning by doing and through concrete sensorial experiences they rapidly internalized the area represented by the model. The use of the Quick Reference Scale 1:10,000 (an innovative tool) proved to be extremely useful in the process. By sharing this experiential learning process, the park staff rapidly appreciated how familiar and spatially conscious community members were.

The villagers took the lead in generating data and the park staff acted with increasing skills as facilitator.

It is worth recalling that the park management drafted the initial map key (legend) and that at the beginning of the activity key informants were invited to review it and suggest changes or integrations and improved definitions. By the end of the exercise the initial legend had expanded to a total of 55 features (lines, polygons and points) a number of which were added by the villagers themselves. Some of the items listed on the draft legend were removed. Most importantly the villagers worked on improving the definitions of the various features to assure their better understanding by all those participating

Interpersonal dynamics, final workshop assessments and the closing remarks made by the trainees, all clearly indicate that the park and SFNC project staffs finally valued collective community knowledge as a valid and substantial asset to be considered as a key component for the management of the park and its buffer zones.

In addition to this, the exercise was the first occasion for most key informants to visit the Protected Area Office Compound, which is located at a considerable distance from the park. Some participants had to travel for two days to reach the venue. It was the first time for them to be "actors on the scene" and play the role of "resource persons".

All these human interaction dynamics are likely to represent stepping-stones for improved relationships and mutual trust between park/project staff and communities residing within the core area and buffer zone.

As Mr. Andrew Weir (EU Co-director, SFNC) spelled out in his closing remarks, "Participatory 3-D Modelling has proven to be – among others - an efficient means for bringing people together".

5 COST BREAKDOWN AND FLOW OF ACTIVITIES

The table below summarizes the costs involved in the conduct of the exercise without the training component. The facilitation cost has not been computed because it varies depending on the resource persons involved. In any case one exercise involving 70-100 key informants needs a team of at least three facilitators, having complementary backgrounds (Community work, Environment and Cartography/GIS).

Table 2 Cost breakdown – Pu Mat 3-D Modelling Exercise

Cost Item (P3DM exercise, Pu Mat National Park, Nghe An, Vietnam) 70,000 ha at 1:10,000 scale - Year 2001	P3DM exercise (USD)
Supplies (including preparation of base maps: editing and attributing only)	1,090.00
Laptop and Digital Camera (high resolution)[14]	
Transport, 2-day accommodation, food and pocket money for key informants (76 villagers)	800.00
Three days of food for students and teachers (30):	100.00
Interpreters (2) English-Vietnamese and Vietnamese-Thai	500.00
Facilitation (not included)	
Preparatory activities (procurement, preparation of logistics, meetings, community organizing, etc.)[15]	
On-screen digitizing and printing of thematic maps (10-14 working days)	400
TOTAL	2,490.00

[14] Element of cost not included in the computation because the item is already available as a "Project asset".

[15] Element of cost not included in the computation because the activity was conducted by the Project staff (recurrent cost) as part of routine activities.

Based on this calculation the information generated in both physical (3-D) and digital formats for a total area of 700 sq. km at 1:10,000 scale cost – in a Vietnam environment - USD 4.16 USD/km^2 or USD 0.04/hectare.

The Figure below portrays the sequencing and timing of the main activities. This pattern has been recurrent in organizing and conducting similar exercises in the Philippines.

Figure 1 Flow Diagram –Main Activities

Activity (scattered inputs)	Month				
	1	2	3	4	5
Planning and local consultations with stakeholders					
Clearances from local authorities (if necessary)					
Community mobilization					
Procurement of inputs (including base maps)					
Organization of logistics					
Conduct of the exercise including extraction of data					
Digitizing of data					
Feedback to stakeholders					

Legend

Scattered inputs Continuous inputs

6 COURSE EVALUATION

At the end of the exercise the trainees were asked to evaluate the course and make their recommendations for improving the technique. The box below summarises the individual comments.

Box 4 Trainees' Comments

- The training course has been successfully completed; there were many interesting discussions. I prefer the participatory way information was supplied the most.
- This is a perfect and systematic training course, with good organization, accommodation and food. At the end of the course, trainees and local communities learned the method of manufacturing 3D model, and they understand that this is a good activity to conserve natural resources.
- Well-prepared representation and good facilities.
- Good organization, Thank you for the valuable information and detailed methods provided by the organizers for the trainees.
- Clear instructions; trainees benefited from the method of manufacturing the 3D model and getting important information from the participants. The documents of the training kits should be translated into Vietnamese.
- There should be a larger base table in order to have enough space for the title and legend.
- The P3D modelling training course is very helpful and should be replicated in other protected areas.
- Good content, but organization should be better.
- The coordinates should be positioned more accurately.
- There have been many errors in extracting information and manufacturing the model.
- There is a need to clarify which members of the community should take part in providing information.
- How can we verify the information provided by the participants?
- In manufacturing the P3D model, all participants should be careful to limit errors.
- Why can't we put the nails for grid lines prior to preparing the table?
- Should we use markers for drawing small lines on the model?
- To avoid errors that may occur and to save time, there should be a special method for cutting.
- The base map has to have higher accuracy.
- All digital methods should be fully practiced.
- Carton needs to be replaced by another material that doesn't change its shape. There must be an edge around the model table.
- The implementation is clear and simple. The course needs more discussion about the accuracy of the supplied information, how to reduce the errors. Can crepe paper be replaced by another type?
- The pins symbolizing animals should be miniatures of the same.
- There should be a workshop on extracting information from the community prior to carrying out the activity.
- There should be standards for colour coding to be applied to other models.
- Information and status of each grid square should be carefully checked to properly complete the model and update into the digital map.
- The legend should be prepared with the participation of the communities.
- The land use map should be added.
- More GIS and software training courses are needed.
- The reproduction of the terrain by the use of carton sheets creates "terraces" which could mislead the interpretation.
- There is a need to use a frame to allow the grid lines to form a planimetric plane.

Annex 1 List of participants

List of trainees from various institutions

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Mr. Nguyen Duc Khanh Researcher Center for Resources and Environmental Study (CRES) 19, Le Thanh Tong Street Hanoi, Vietnam Tel.: +84 (04) 8262932/091 +84 (04) 3341174 Fax: +84 (04) 8262/932 Email: cres@hn.vnn.vn	Mr. Pham Vam Nam Technical Officer Ba Be National Park Bac Kan, Vietnam Tel.: +84 (0281)-94014/26 Fax: +84 (0281)-94011
Mr. Christian Villum Sloth Forestry Specialist Food and Agriculture Organization 3 Nguyen Gia Thieu, Hanoi, Vietnam Tel.: +84 (04) 9424208 Email: sloth@un.org.vn Email: chr_sloth@hotmail.com	Mr. Tran Trong Anh Tuan Officer, Nature Conservation Division National Environment Agency (NEA) MOSTE 67, Nguyen Du, Hanoi, Vietnam Tel.: +84 (04) 8223191 Fax: +84 (04) 8223189 E-mail: baoton@hn.vnn.vn

Mr. Hoang Duc Thach Farmer Na Khieng, Khang Ninh, Ba Be Bac Kan, Vietnam	Mr. Luu Canh Trung Officer Tam Dao National Park Tam Duong; Vinh Phuc, Vietnam Tel.: +84 (0211) 853257 Fax: +84 (0211) 853104
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Ms. Dau Thi Le Hieu Officer Conservation Education Network-CEN 114, Hoang Quoc Viet St., Cau Giay, Hanoi, Vietnam Tel.: +84 (04) 7 560 233 E-mail: Cen-cetd@hn.vnn.vn	Mr. Phung Dinh Toan Song Da Forestry Project 1A, Nguyen Cong Tru Hanoi, Vietnam Tel.: +84 (04) 8214768/71 Fax: +84 (04) 8214765 E-mail: SFDPSL@netnam.org.vn GTZSFDP@netnam.org.vn
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List of Trainees from Pu Mat National Park

Mr. Lu Van Chom Acting Head of Scientific Division	Mr. Le Xuan Linh Forest Protection Division
Mrs. Vi Thi Ngan Officer of Scientific Division	Mr. Nguyen Quoc Minh Officer of Forest Protection Division
Mr. Nguyen Van Sinh Officer of Scientific Division	Mr. Tran Ngoc Anh Officer of Forest Protection Division
Mr. Lam Ngoc Ha Officer of Forest Protection Division	Mr. Dang Van Lieu Officer of Forest Protection Division
Mr. Le Anh Tuan Officer of Administration Division	Mr.Nguyen Van Quang Officer of Forest Protection Division
Contact address:	Con Cuong, Nghe An, Viet Nam Tel.: +84 (038) 873395 Fax.: +84 (038) 873290

List of Trainees from SFNC Project

Mr. Mguyen Minh Thang Forstry Expert	Mr. Ho Sy Phuong GIS Expert
Mr. Le Dai Thang GIS Expert	Mr. Nguyen Van Luan Environmental Expert
Mr. Nguyen Thai Tu Cuong Officer	Ms. Phan Thi Thuy Monitor
Contact address:	52 Le Hong Phong Vinh, Nghe An, Viet Nam Tel:. +84 (038) 832064 Fax:. +84 (038) 832015 Email: sfnc@hn.vnn.vn

Resource Persons (Trainers)

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Mr. Le Van Lanh Secretary General Vietnam National Parks and Protected Areas Association (VNPPA) 114 Hoang Quoc Viet St. Cau Giay, Hanoi, Vietnam Tel.: +84 (04) 7560 233 E-mail: lanh-cetd@netnam.org.vn	

Annex 2 3D Model Summary Sheet

Participatory 3D Model - Data Input Form	Description
Title of Model	Participatory 3-D Model of the Pu Mat National Park and its Buffer Zone (eastern portion)
Project/Programme framework	Social Forestry and Nature Conservation (SFNC) Project in Nghe An Province (ALA/VIE/94/24).
Country	Vietnam
Province(s)	Nghe An
Districts	Con Cuong and Anh Son
Primary Objectives of the Exercise	Improve relationships and foster reciprocating respect between National Park staff and local communities. Induce a paradigm shift on "Who Knows" and "Whose Knowledge Counts"; provide stakeholders with a comprehensive, user-friendly research, planning and management instrument.
Secondary Objectives of the Exercise	Enhance stakeholders' awareness on the spatial distribution of various issues related to resource use and tenure.
Background	The wider objective of SFNC is to reduce the destruction and degradation of forest resources in the Pu Mat Nature Reserve area, including its buffer zone. The project aims to improve the living standard of the people in the area and thereby reduce the need for unsustainable usage of the forest resources in the Pu Mat National Park. Some 160 Dan Lai households live within the core zone and are subject of an on-going resettlement initiative.
Method	Participatory 3-D Modeling and GIS.
Date	November 16-27, 2001
Results	Park and project staffs have realized the deep knowledge of community members of the environment they are living in. The 3-D model resulting from the collation of cognitive maps of 76 key informants displays the following: 23 different land use and covers; 23 different point form information; 9 different types of linear data. High-resolution images were taken and are ready for on-screen digitizing. The SFNC project plans to complete the model of the entire protected area, including its buffer zones involving local residents.
Stakeholders and key informants	Men and women (few) from ethnic minority groups (Dan Lai, Thai and Kinh Peoples) from the following Communes: Mon Son, Luc Da, Yen Khe, Chau Khe, Chi Khe and Tam Hop and protected area staff.
Local Organization (contact person, address, e-mail and URL)	Social Forestry and Nature Conservation in Nghe An Province sfnc@hn.vnn.vn
National Organization (contact person, address, e-mail and URL)	National Environment Agency (NEA) and Vietnam National Parks and Protected Areas Association. Contact Person Mr. Le Van Lanh: lanh_cetd@netnam.ong.vn

Participatory 3D Model - Data Input Form	Description
External Organization (contact person, address, e-mail and URL)	Asean Regional Centre for Biodiversity Conservation. Contact person Giacomo Rambaldi: grambaldi@iapad.org
Funding Agency (name and URL)	European Commission
Horizontal Scale of 3-D model (1:X,000)	1:10,000
Vertical Scale of 3-D model (1:X,000)	1:7,500
Size of model (m x m)	2.8 m x 2.4 m
Area covered by the model (km2)	700
Corner coordinates of the 3-D model	
North West corner (Latitude)	19° 0' 36"
North West corner (Longitude)	104° 43' 48"
North East Corner (Latitude)	19° 0' 36"
North East Corner (Longitude)	105°
South West Corner (Longitude)	104° 43' 48"
South West Corner (Latitude)	18° 46' 48"
South East Corner (Longitude)	105°
South East Corner (Latitude)	18° 46' 48"

Annex 3 List of key informants

Name/Commune	Village
Mon Son Commune	
Vi Van Cuong	Thai Son
Vi Van Hai	Thai Son
Lo Van Doan	Thai Son
Luong Thanh Phong	Thai Son
La Quang Vinh	Co Phat
La Van Linh	Co Phat
La Van Ky	Co Phat
Le Van Bao	Khe Bong
La Van Hong	Khe Bong
La Van Hanh	Khe Bong
Le Van Viet	Con
La Van Dinh	Con
Vi Van Thanh	Xieng
Vi Van La	Xieng
Ha Van Ty	Xieng
Vi Van Hoa	Lang Yen
Vi Van Hoa	Lang Yen
Lo Van Hoi	Bac Son
Lo Van Dan	Bac Son
Vi Van Vinh	Bac Son
Ngo Dang Tien	Cua Rao
Le Huu Hung	Cua Rao
Dau Trong Quy	Cua Rao
Ha Van Bang	Lang Cang
Luong Van Tinh	Lang Cang
Vi Van Long	Lang Cang
Ha Van Viet	Commune PC staff
Phan Van Nam	Commune PC staff
Ha Van Quan	Nam Son
Ha Van Thuan	Nam Son
Ha Van Thang	Nam Son
Ngan Van Tho	Thai Son
Ngan Van Hinh	Thai Son
Ha Van Can	Thai Son
Ngan Van Quyet	Khe Lo
Vi Thi Hoe	Khe Lo
Ngan Van Tan	Khe Lo
Vi Viet Mien	Thai Hoa
Lo Van Mao	Thai Hoa
Lo Van Ha	Thai Hoa
Luc Da Commune	
Lo Van Cuong	Luc Son
Ngan Van Doan	Yen Hoa
Ngan Van Diep	Xang
Ngan Van Thang	Moi
La Van Te	Moi
La Thanh Mau	Tan Hop
Lo Van Hiep	Met
Nguyen Canh Ty	Commune's guard force
Yen Khe Commune	
Phay Van Bay	Trung Huong
Lo Thi Khuyen	Trung Huong
Quang Van Binh	Trung Chinh
Lo Van Thuan	Trung Chinh
Phan Sy Trung	Cay Thi
Chau Khe Commune	
Le Anh Lan	Trung Yen
Vi Quang Vinh	Bu
Le Duc Manh	Bu
Le Duc Canh	Bu
Vi Thanh Ban	Bu
Lo Van Minh	Na
Vi Van Hieng	Na
Lo Quyet Thang	Na
Luong Van Minh	Diem
Vi Van Thang	Diem
Vi Van Dong	Diem
Chi Khe Commune	
Vi Van Duyen	Chan Nan
Ngan Thanh Chien	Chan Nan
Vi Van Pan	Son Khe
Vi Van Tien	Lien Dinh
Lo Duong Lap	Lien Dinh
Vi Van Mai	Lien Dinh
Tam Hop Commune	
Vieng Van Nam	Phong
Lo Van Hong	Phong
Vieng Van Do	Phong
Vieng Van Thien	Xop Nam
Lu Van Son	Xop Nam
Nguyen Trong Do	Anh Son Forest Enteprise

Annex 4 Updated List of Supplies (with October/November 2001 units costs)[16]

QTY	Unit of measure	Article Specification	Dong	Unit Cost estimate (USD)	Cost estimate (USD)
150	Sheet	Single-wall corrugated carton (1.4m x 2.5m) sheets. Inner and outer liner 175 g/m2, B flute 175 g/m2	19,500	1.30	195.00
1	Set	Editing and attributing contour lines (700 sq km, 1:10,000 scale; 20 m contour interval)	5,000,000	333.33	333.33
4	pc	Plotting base map on A0 paper (2 copies each)	400,000	26.67	106.67
24	Kg	Office Glue (water based)	18,000	1.20	28.80
18	pcs	Scissors (small)	4,000	0.27	4.80
10	pcs	Scissors (for hair cutting)	8,000	0.53	5.33
2	Box	Carbon paper (hand writing)	40,000	2.67	5.33
40	Rims	Crepe paper (white)	7,500	0.50	20.00
3	pcs	Blade cutter	6,500	0.43	1.30
20	Box	Blades for above cutters	7,000	0.47	9.33
2	Unit	Base table (1.4m x 2.5m x 0.6m) plywood (1/4") with reinforcements	400,000	26.67	53.33
4	pcs	Painting brush # 0	4,000	0.27	1.07
20	pcs	Painting Brush # 2	1,000	0.07	1.33
20	pcs	Painting Brush # 7	1,500	0.10	2.00
20	pcs	Painting Brush # 12	3,000	0.20	4.00
20	pcs	Painting Brush # 10	2,000	0.13	2.67
2	pcs	Brush 63,5 mm	4,000	0.27	0.53
20	pcs	Brush 25 mm	1,000	0.07	1.33
50	pcs	Plastic jars (1 litre capacity)	1,500	0.10	5.00
10	pcs	Plastic jar (3 litre capacity)	5,000	0.33	3.33
8	pcs	Bucket (1 litre capacity)	3,000	0.20	1.60
1	pcs	Bucket (10 litre)	7,000	0.47	0.47
0.5	Kg	Powder Colour (red)	100,000	6.67	3.33
2	Kg	Powder Colour (yellow-lemon)	35,000	2.33	4.67
1	Kg	Powder Colour (yellow-orange)	35,000	2.33	2.33
1	Kg	Powder Colour (blue)	35,000	2.33	2.33
3	Kg	Powder Colour (white)	15,000	1.00	3.00
1	Kg	Powder Colour (black)	15,000	1.00	1.00
4	Kg	Powder Colour (green)	35,000	2.33	9.33
1	Kg	Powder Colour (brown)	15,000	1.00	1.00
1	Kg	Powder Colour (light brown)	15,000	1.00	1.00
4	Kg	Glue powder	40,000	2.67	10.67
2	Lit	Alcohol	10,000	0.67	1.33
1	pc	Hand mixer	50,000	3.33	3.33
40	pc	Weights (….)		0.00	0.00
8	pc	Plastic-laminated Reference Scale Chart	5,000	0.33	2.67
4	Box (100 pc)	Push Pins (white)	15,000	1.00	4.00
2	Box (100 pc)	Push Pins (yellow, blue, black, green, red)	15,000	1.00	2.00
Bag (1000	2 pc)	Map pins (13 mm long; 4 mm head; white)	75,000	5.00	10.00
Bag (1000	1 pc)	Map pins (13 mm long; 4 mm head; yellow, blue, black, red, violet, white, orange)	75,000	5.00	5.00
Bag (1000	0 pc)	Map pins (13 mm long; 6 mm head, white)	105,000	7.00	0.00
1	Bag (100 pc)	Push Pins (flat head; white)	75,000	5.00	5.00

[16] Exchange rate 15,000 Dong/USD. Units costs are applicable to Vietnam Setting, Hanoi in Particular

QTY	Unit of measure	Article Specification	Dong	Unit Cost estimate (USD)	Cost estimate (USD)
1	Bag (100 pc)	Map pins (13 mm long; 10 mm head; white)	75,000	5.00	5.00
4	Bag (50 pc)	Map pins (13 mm long; 10 mm head; yellow, red, green, blue)	33,500	2.23	8.93
1	Kg	Hand-knitting yarn no. 8; 18 colours	60,000	4.00	4.00
4	Rolls	Film Kodak ASA 200 (36P)	36,000	2.40	9.60
1	pc	Stapler	29,000	1.93	1.93
1	Box	Staple wire #35	2,000	0.13	0.13
3	pcs	Scotch tape (2')	5,000	0.33	1.00
3	pcs	Packing tape (2')	5,000	0.33	1.00
10	pcs	Masking tape (2")	14,000	0.93	9.33
1	Roll	Cotton yarn (fine); yellow	12,000	0.80	0.80
6	pc	Colour marker, black, blue and red	20,000	1.33	8.00
36	pcs	Pencil mongol # 2	2,500	0.17	6.00
1	pcs	Pencil sharpener	65,000	4.33	4.33
5	Box	Dressmaker pins	10,000	0.67	3.33
200	pcs	Attendance certificates	1,000	0.07	13.33
1	pcs	Labels (stratacolor paper)	25,000	1.67	1.67
2	pcs	Scaled ruler	125,000	8.33	16.67
3	pcs	Measuring tape (3 meter long)	15,000	1.00	3.00
1	pc	Banner	480,000	32.00	32.00
1	No.	Laminated plate (legend)	2,000	0.13	0.13
1	No.	Laminated plate (commemorative)	2,000	0.13	0.13
8	No.	Laminated north arrow	2,000	0.13	1.07
4	Series	Numbers (1 to 35) Font 72		0.00	0.00
4	Series	Letters (Alphabet) Font 72		0.00	0.00
1	No.	Logbook	24,000	1.60	1.60
1	No.	Compass	20,000	1.33	1.33
1	Kg	Nails (5")	8,000	0.53	0.53
1	Kg	Nails (2.5")	8,000	0.53	0.53
1	Kg	Nails (0.5")	10,000	0.67	0.67
2	Set	Overhead projection markers (six colours)	70,000	4.67	9.33
1	Bag	Cotton (absorbent)	5,000	0.33	0.33
50	m	Transparent plastic sheet (1.2 m wide)	7,500	0.50	25.00
1	pc	Hammer	9,000	0.60	0.60
1	pc	Pliers	20,000	1.33	1.33
4	pc	Coping saw	200,000	13.33	53.33
5	pc	Blade for coping saw (wood)	5,000	0.33	1.67
5	pc	Blade for coping saw (steel)	5,000	0.33	1.67
24	pc	Double clip (25 mm)	1,000	0.07	1.60
2	pc	Plumb line weight	10,000	0.67	1.33
		TOTAL			**1,090.83**