Training local government and NGO staff in Geographical Information Systems: a case study

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1. Background

A GIS training course was held for government and local NGOs in Jeneponto from April 5 to May 19, 2011. This was a joint project between VSO volunteers Matt Horritt and Alanna Minogue. Matt is working with Dinas Kehutanan dan Perkebunan (DKP) to incorporate spatial planning into forest and plantation crop management. Alanna Minogue is working with Bappeda (the local government planning and development agency) to manage water resources. Both volunteer roles involve training staff from partner organisations in using spatial data to improve planning and management of natural resources in Jeneponto.

Matt's first objective at DKP was to teach staff how to use GIS software. A training course on GIS was also specifically requested by Bappeda. There was also interest in GIS from local NGOs in the area. The volunteers therefore agreed to run a course jointly. The course outline that Matt had agreed with his partner was adapted to be relevant to a wider range of organisations.

2. Objectives

It was expected that most participants would finish the course with basic technical skills in GIS and that there would be some individuals who would be able to do some critical thinking regarding its application.

Course objectives can be divided into 3 categories: technical learning, application, and partner specific objectives. These are detailed below.

2.1. Technical objectives – basic technical skills

The main objective was to provide basic technical skills in using GIS:

- Understand what GIS is
- Learn how GIS can help in understanding and using spatial data
- Understand the different types of spatial data (point, line and polygon vector, raster)
- Use GIS to look at spatial data
- Make simple maps
- Create and edit GIS data
- Organise spatial data
- Work with topographic and satellite data
- Analyse data using GIS

A more detailed list of technical skills and learning objectives is given in Appendix 1.

2.2. Application objectives

The course was designed to allow participants to start immediately applying their technical GIS skills in their organisations. Participants were encouraged to think about how they would use GIS in their organisations. The introduction featured specific examples to Jeneponto on what could be done with GIS at varying levels of complexity. This was reiterated throughout the material and practice sessions. All examples and practice sessions made use of data available in Jeneponto.

Significant emphasis was placed on:

- The importance of metadata
- Understanding sources of data
- Checking quality of data
- Knowledge/data as the basis for decision making

2.3. *Objectives specific to DKP*

The overall aim of Matt's placement was to use spatial data to focus DKP activities to the poorest people in Jeneponto and the watershed areas most in need of rehabilitation.

Two key objectives were:

- Train staff in GPS/GIS for forest, plantation and land use mapping
- Provide technical guidance in developing and managing natural/watershed resources, with planning focussed towards poor communities

These objectives can only be realised by ensuring DKP have enough staff with skills in creating, managing and analysing spatial data related to natural resources to guide future planning activities.

There is currently little spatial data specific to forestry and plantation available in Jeneponto. The course therefore needed to train people in creating new data (from GPS survey and satellite data sources) and linking spatial data with non-spatial data already collected by DKP (e.g. inventories of approximate plantation areas per village). Analysis skills in understanding the link between spatial data sources was also needed to enable people to use this information in planning activities.

2.4. *Objectives specific to Bappeda*

Considerable interest from Bappeda to be trained in GIS prompted Alanna to integrate it into her workplan. Although spatial data is available at Bappeda, it is not currently being used despite previous training of Pak Nuzul, sub-head of the FISPRA (physical infrastructure) division, in GIS software. Printed maps are available from outsourcing work to consultants or universities. However, it is not clear whether this information is used in decision making or whether this is merely a result of mandates from provincial or national levels.

Incorporation of spatial data in planning and water resource management could have direct benefits on the quality of decisions that are made for communities and the Jeneponto region as a whole. It was hoped that all members of the FISPRA team would join the course as well as staff from other departments in Bappeda.

3. Course preparation

The course material consisted of five classes, plus an introduction session. Each class was comprised of a powerpoint presentation to explain the theory (1 hour), and a practical exercise (1 hour). An exercise related to the session's theme was also included as homework. The introduction session was conducted before the main sessions to explain what GIS is and show examples of how various organisations could use GIS in their activities. This session was also used to install the software on all computers and to sign up all participants to the following classes. Each session was limited to a maximum of 20 trainees.

Prior to preparing the course materials considerable time was spent resolving the following issues:

- The technical level at which to base the course; the volunteers agreed that the course would have to be at a fairly basic technical level based on observed capabilities.
- Incorporation of spatial data for Jenepeonto relevant to people's work activities; all examples and practical material used data available in Jeneponto despite the generally poor quality of data.
- How could participants begin to apply GIS in their organisations immediately? Each material was designed for application. For example, material 1 enabled participants to produce a map, material 2 enabled participants to create shapefiles of landuse etc.
- How to maintain interest in the course from week to week; the application in the next material was promoted at the end of the current material

Course material preparation was divided and prepared individually by the two volunteers. This was then reviewed together for clarity and completeness. The language was checked by one of the partners before the material was presented. The material had to be prepared as early as possible to allow time for these to be checked. It was much better to have the material checked by someone with some technical/computer knowledge as some terms (e.g. "click and drag") are difficult to translate.

The full training materials are accessible through appendix 2. Please note that these are specific to QGIS version 1.6, and will require adapting for other versions of QGIS.

Each class was presented four times allowing participants to choose the most appropriate time to attend. After the first session of a class, the volunteers met to review the material based on how participants found the material. Where necessary, material was modified, rewritten to be clearer, errors corrected and reprinted. For example, the exercise in material 2 was too difficult and was reduced to make it easier. Upcoming material was also altered to bring it down in scale and complexity based on the strengths and weaknesses of the previous sessions.

Both volunteers agree that while the above approach was time consuming it resulted in a course that was appropriate to the skills of the participants and a course of higher quality.

In addition to the course described above, mini-projects were planned. The aim of these projects was to train staff in the process of planning data activities, acquiring data and analysing data. For DKP the mini-project involved planning and implementing GPS survey in the field, analysing data and creating maps of land use for a small area in Jeneponto. For Bappeda the mini-project was to be focussed on using spatial data to understand watersheds.

Printing of the training materials was extremely time consuming and quite stressful for the volunteers. While Alanna had access to two printers of reasonable quality, Matt could not guarantee access to a printer, as many printers used in DKP are privately owned, broken, or of poor quality. Printing enough material for 20-50 attendees generally took the whole day on the slow inkjet printers available. No secretarial support from Bappeda or DKP was offered. Supply of paper and ink was also an issue. DKP paid for some for their attendees, VSO subsidised printing for Bappeda. The volunteers had to pay for some paper.

Supplying the training materials as soft copies only was considered, in order to save time, paper and ink. The volunteers' previous training experience suggested that it is

extremely difficult for trainees to switch between instructions and other software on computer, and that printed materials were necessary.

The material was presented in Indonesian language, which the volunteers had been learning for 6-9 months. Participants had very little English. This presented a number of challenges:

- Volunteers' technical vocabulary was limited
- Volunteers had no experience of presenting in Indonesian
- Volunteers had little experience of explaining technical subjects in Indonesian

We adopted a number of strategies to deal with these issues:

- Material was written directly in Indonesian, which allowed the volunteers to make the best use of their limited vocabulary. Writing in English and translating is problematic as it tends to introduce many unfamiliar words.
- Powerpoint presentations were written with more words than usual, so volunteers could look up the correct word during preparation and not worry about forgetting it.
- A technical vocabulary sheet was prepared for use during the course (see appendix 3), as an aid to remembering useful but unusual words (e.g. for symbol, shape, width).
- When explaining things in the practical sessions, sketches and diagrams were very useful for explaining concepts when language failed (this is often a better way of explaining anyway).

5. Software package

An open source GIS software (QuantumGIS version 1.6) was chosen for the course, based on the following criteria:

- There is no "standard" software package in use in Indonesian government. Many people use ArcMap and ArcView 3.
- ArcMap was seen as too complex for a basic course. Some simple tasks become quite complex because of the need to use ArcCatalog. No current ArcGIS/ArcMap licences are available; people using this software are generally using illegal copies (as is the general practice in Indonesia).
- ArcView 3 is simpler and much more intuitive to use, but is old software, and lacks some basic features required for working in Jeneponto (working with data in different coordinate systems for example).
- Both volunteers were expert in use of Quantum GIS, and had a network of colleagues in the UK who could help with specific problems and queries.
- Quantum GIS is relatively easy to use for a beginner, but still has many powerful features for spatial data analysis.

There are some drawbacks of using Quantum GIS:

- No training materials in Indonesian language are available

- Much functionality lies in plugins, which normally are downloaded via the internet; this is not possible in offices with no internet connection (although plugins can often be copied over from other computers successfully)

- There are problems with the rendering engine displaying data on some computers (this seems to be related to using illegal/non-standard versions of Windows).

- There are often significant changes between versions, and new versions are released more frequently than for commercial software. This makes some parts of the training materials obsolete very quickly. At the time of writing, the current release s version 1.7, which is significantly different in the way it handles non-spatial joins for example.

6. Course Scheduling

Scheduling the course proved difficult. Partners were consulted about timing, and insisted on afternoon and evening sessions. People are often away from Jeneponto for a whole week for meetings etc., so we decided to repeat each class the week after it was first delivered. With an afternoon and evening sessions, this meant each class was delivered 4 times.

The sessions needed to fit around sholat asar and maghrib (afternoon and evening prayers) at approximately 3 and 6:30pm. Partners initially suggested 7pm for evening sessions, apparently forgetting that sholat times change with sunset. Evening sessions had to be hastily rescheduled for 7:30pm. Attendees at afternoon sessions would often arrive and then leave immediately to pray. People attending the first introduction session were also asked about timing, and agreed to the proposed times, despite the evident difficulty of attending these times.

As the request for evening training came from Bappeda, Alanna volunteered to run the evening sessions, and Matt the afternoon ones.

Given that each class was presented four times, over a two week period, we decided that people who did not attend one session would not be able to attend the following sessions. This was explained carefully a number of times in the introduction and first sessions. The majority of people understood this, and if they did not attend a session did not try to attend the remainder. Nevertheless some trainees (including Matt's partner) did miss sessions and asked for one on one training to catch up. We tried to be as fair as possible in this and not offer one-to-one training as we could not offer it to all trainees. However one very competent member of DKP staff helped by offering to go through the material with him; this also developed her training skills.

7. Running the course

Before each material, the volunteers would meet to discuss training, plan printing and review who attended previous sessions. We would draw up attendance sheets for trainees to sign, which allowed us to keep track of who was attending the training, and check that everyone had attended all previous sessions.

The volunteer running the session would generally turn up 15-30 minutes ahead of the start time, to set up and sort any problems with the room. Trainees coming on time was rare; most would attend around 30 minutes late. Trainees were often slower than expected in completing the practical exercise, so the whole process would often take 3 hours or more rather than the scheduled 2. For evening sessions that meant a very late finish.

After the sessions the volunteer would meet again to discuss how well the material went and how it could be improved. With delivering the material, preparation, meetings, printing etc, the course took about 50% of each volunteers time each week.

8. Course Cost

The cost of the course is estimated at IRP250 000 (approx GBP20) for paper and ink.

DKP bought paper/ink as a contribution for their staff. Bappeda's share was covered by VSO.

9. Facilities and equipment

Despite Bappeda being part of Kantor Bupati, the main government office in Jeneponto, they were unable or unwilling to provide a room with enough furniture for training, so all training was held in DKP's meeting room. This often did not have enough furniture, only had two power outlets, and was generally dirty. Problems with power outlets were solved by asking each trainee to bring an extension cable.

No help was offered in opening or locking up the meeting room, which meant it was left for the volunteers to locate and return keys, arrange furniture etc. For the evening course this may have been a security issue for Alanna, but was supported by Matt who lived near by. The reason offered for this lack of support was that the Dinas could not task someone with helping because the course was outside normal working hours. Nevertheless both partners expected volunteers to work the unsociable hours.

Problems arose later in the course when the DKP meeting room was taken over for other meetings during the day, without consulting the volunteers. This meant afternoon sessions had to be moved to another room, which was too small. It also meant that arranging furniture etc for the evening session took much longer.

An LCD projector was available, but was of poor quality and had compatibility problems with Alanna's laptop. Most trainees had access to a laptop. Those that did not were able to share. Many people used netbooks, which makes using GIS software more difficult because of the small screen.

10. Attendance

The training course was completed by 25 people from 6 organisations in Jeneponto. 36% of the succesful participants were female, coming from 3 organisations (DKP and local NGOs LSM Turbin and Pattiro JEKA). As expected, the largest number of participants was from DKP (13). The number of participants from Bappeda was disappointingly low with only 2 of the 5 initial participants completing the course.
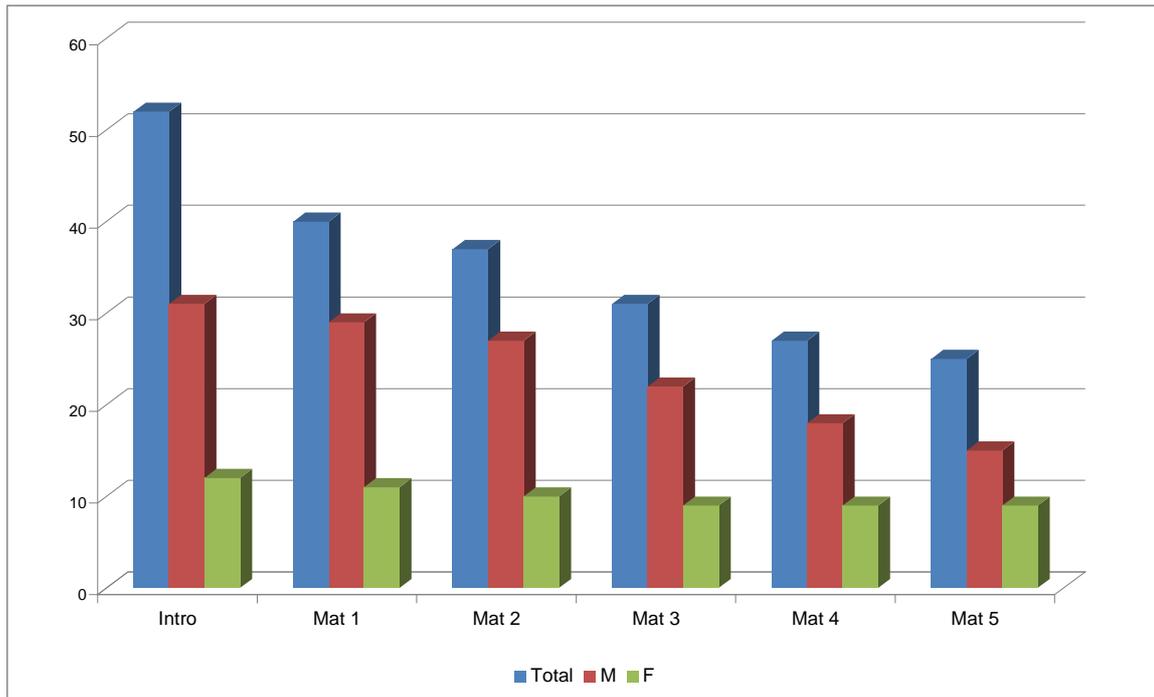
Figure 1: Male and female attendance for the 6 sessions.

Figure 1 shows how attendance dropped throughout the course. Initial interest was shown by 52 individuals from 16 organisations. Success rate of participants is calculated from material 1 (40 participants) giving a 62% success rate. It is interesting to note that female attendance remained steady with only 1 drop-out.

Afternoon and evening attendance overall was approximately equal at 48% and 52% respectively. However, there was a large spike in attendance of the evening classes for material 2 and 3 (see figure 2 below). The reason for this is unknown. Females tended to join the afternoon sessions with the exception of 2. We note here that these two females lived close to the office and are single.
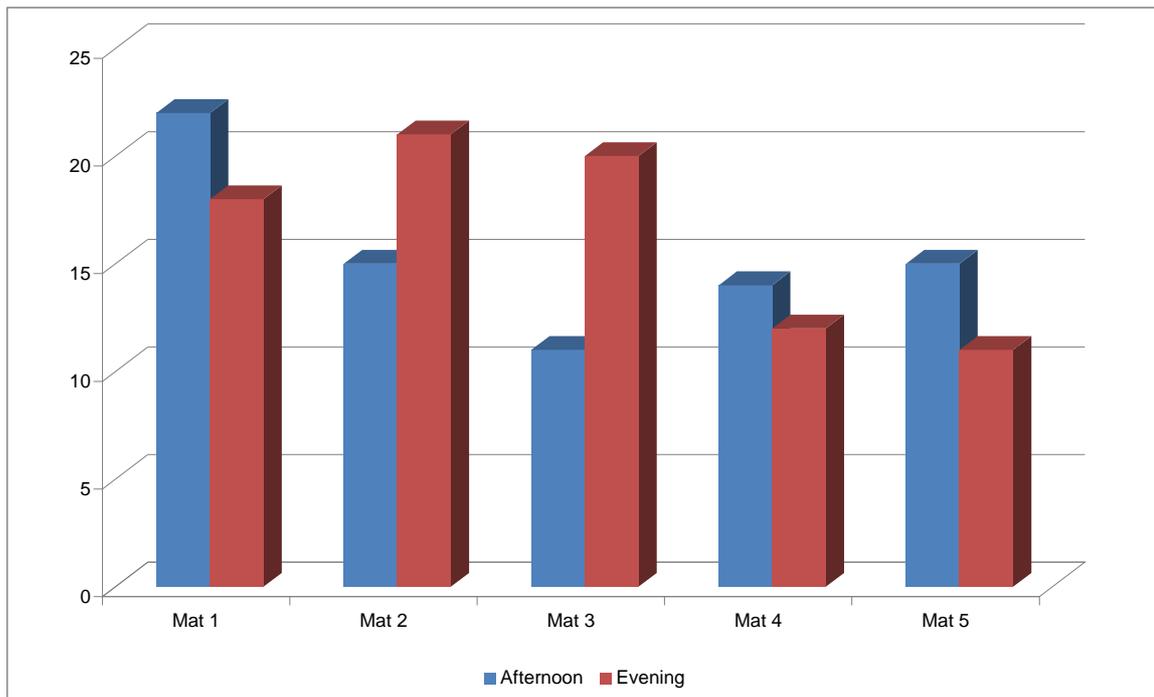
Figure 2: Afternoon and evening attendance.

11. Course evaluation

Participants were invited to evaluate the course through an anonymous questionnaire handed out during session 4 for return during session 5. This assessed their understanding of the material presented in the course as well as the quality of the teaching and materials provided. They were able to choose from 3 answers: bad, ok, and good. Where responses were not filled in an assumption of bad was made. 24 of the 25 participants filled in the questionnaire. Responses from Matt's partner are still pending as he failed to complete the final exercise.

A second questionnaire (open answer) was used to obtain information about the reasons why participants wished to take the course and what they hoped to use GIS for in their organisations. This questionnaire was not anonymous so that we could use the information to identify further training needs in partner organisations. 17 of the 25 participants filled out the questionnaire. Both questionnaires have been provided in appendix 4.

Competence of participants was evaluated by the volunteers based on observation.

11.1. Participant responses to anonymous questionnaire

Table 1 summarises the results from the anonymous questionnaire. The score indicates, on average, how satisfied trainees as a group were with each aspect of the course. If all trainees responded with OK, a score of 24 would result; all scores are above 24, so all aspects could be graded OK or better.

The three lowest scores (possible areas for improvement) were:

- Save maps as images
- Vector and raster data
- Use raster data

Question/learning outcome	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Score
Understand how to organise GIS data	1	2	2	1	2	2	2	1	1	2	1	2	1	1	2	1	1	1	1	1	1	1	1	1	32
Save maps as images		1	2	1	1	2	2	1	1		0	2	1	2	2	1	1	1	1	1	1	1	0	0	25
Use raster data	2	2	2	1	1	1	1	2	1	1	0	1	1	2	2	1	1	1	1	1	2	1	0	0	28
Overlay data	1	2		1	2	1	2	1	1	2	2	2	1	1	2	2	0	1	1	1	2		1	1	30
Add attribute data from other sources	1	1	2	1	2	2	2	2	1	1	2	1	1	2	2	0	2	0	1	1	2	1	0	0	30
Attribute table		1	2	1	2	2	2	2	1	1	2	1	1	2	2	1	1	1	1	1	2		2	2	33
Use Symbology	1	2	2	2	2	2	2	1	2	1	2	2	2	2	2	1	1	1	1	1	2	2	2	2	40
Create and edit new vector data	2	2	1	1	1	1	2	1	2	1		1	1	2	1	2	1	1	1	1	1	1	1	1	29
Identify Tool	0	1	1	1	2	2	2	1	2	1	2	1	2	2	1	1	1	1	1	1	1	1	1	1	30
Coordinate systems	1	2	2	2	1	2	2	2	2	1	2	2	2	2	2	0	1	1	1	1	2	1	1	0	35
Use GIS to look at existing data	1	2	2	2	1		2	2	2	1	2	2	2	2	2	1	0	1	1	1	2	1	1	1	34
Vector and raster data	0	2	1	1	1	1	2	1			2	1	2	2	1	1	1	1	1	1	1	1	1	1	26
Understand what GIS is	1	2	2	1	2	2	2	1	1	1	2	2	2	2	2	1	2	2	1	1	1	2	1	1	37
Spoken material	1	1	2	1	1	1	2	0	2		2	1	2	2	1	1	1	1	1	1	2	2	1	1	30
Written material	1	2	2	2	2	1	2	1	2	1	2	2	2	2	1	1	0	2	1	1	1	2	0	0	33
Speed of the course	1	1	2	1	1	1	2	1	2	1	2	1	1	2	2	2	1	1	1	1	1	2	0	0	30
Schedule	1	2	2	1	2	1	2	2	2	1	2	2	2	2	2	2	2	2	1	1	2	2	2	1	41

Scoring:
Bad   0   Total score is sum of scores from each trainee
OK   1   No score indicates trainee did not respond
Good   2

Table 1: Responses from the anonymous questionnaire for the 24 trainees who completed in (columns 1-24). For full questions see appendix 4.

These results are not consistent with the volunteers assessment of which aspects of the course went badly, as creating and editing vector data was the topic that trainees had most trouble with, and we would have expected a much lower score for this. This indicates, perhaps, that questionnaires of this type are not ideal tools for course evaluation.

An open question on what else participants would like to learn was also asked. The responses have been combined with those from the final question in the second questionnaire as the question was essentially the same.

11.2. Participant responses to open questions

The anonymous questionnaire included a question "What else did you wish to learn from the GIS course?", with the following responses:

- Identify and organise program for activities for organisation
- Link data from other sources (this was already included in the course)
- Enter data from GPS (5 participants)
- How to open Google maps in QGIS
- Make a new map (3 participants, this was already included in the course)
- Enter new data in GIS (this was already included in the course)
- Repeat the course to be better (2 participants)
- Make map for villages (2 participants)

Trainees asking for topics that were already included in the course indicates a limited understanding of the material.

The questions and responses to the open, non-anonymous questionnaire are listed below. Responses are grouped by organisation where applicable.

Have you already taken a GIS course?

Two participants had taken a GIS course previously: Ilham Natsir from DKP and Nuzul from Bappeda.

Have other staff in your organisation already taken a GIS course?

Three organisations were identified as having individuals already using GIS: DKP, Agriculture Office and Bappeda.

Does your organisation already use GIS?

The majority of responses indicated that GIS was not being used for one of the following reasons:

- Individuals have not yet been trained on using GIS
- There are no activities related to GIS in the office
- The organisation does not understand how to apply GIS in their work or how it will make it easier (Spatial planning and waste management office)
- DKP and Bappeda both had conflicting responses that it was and wasn't being used in the office. Both volunteers feel that it is likely that GIS was used in the past but perhaps not currently.

Why did you want to learn GIS?

DKP:

- Make use of information easier – forest areas are planned, accurate and correct
- GIS can support all fundamental programs and help to manage data
- Can make maps using GIS

- New skills to support work
- To make mapping of plantation and landuse easier
- Better allocation of limited resources
- Consistency of information
- To make better decisions based on data

Bappeda
- To use it in the office
- To better understand GIS and know how to use the software

Agriculture Office

Want to know the extent that GIS can be used in the office and to learn more

Pattiro Jeka (local NGO)
- To increase knowledge and experience- know about mapping
- Because it is strongly linked to work as a facilitator in the field (communities and villages)

Balai Ketahanan Pangan dan Pelaksana Penyuluhan (Office for food security and information)

To use GIS to identify work areas/locations

Tata Ruang dan Kebersihan (Office for spatial planning and cleanliness)

To increase knowledge because it is important and for experience

What activities can GIS be used for at your organisation?

KDP
- Mapping kawasan hutan [areas assigned for forest development]
- 5 year activity program for reforestation/critical land rehabilitation
- Organising data on potential crops
- Inventory survey and mapping activities
- Classification map of forests
- Delineate areas for activities
- Analysing condition to determine areas and use for projects
- Fixing locations and development of plantation crops
- Helping farmers choose suitable plantation crops
- Survey and mapping of land and plantation
- Support all Dinas activities
- Land rehabilitation activities (forest)
- Conservation activities and agriculture in watersheds
- Report on monitoring and evaluation in Kabupaten Jeneponto

Bappeda
- Identify uses in projects
- Planning infrastructure and providing spatial data

Agriculture Office

Making commodity maps and choosing commodities to plant

Pattiro Jeka
- Collect data and map community health facilities

- Map government offices etc in Jeneponto that give public services
- To map locations and how close they are to health facilities
- Improve individual capacity

Strategic planning office
- Identify potential areas in villages and districts
- Make a scale for priorities based on potential

Tata Ruang dan Kebersihan
- Local spatial planning
- To determine landuse in Kabupaten Jeneponto

What else did you want to learn in the GIS course or in future courses?

Many of these responses corresponded to those in the open question of the first questionnaire. Additional responses included:
- New database for Jeneponto
- Various references to the mini project and taking GPS data, photos etc in the field
- Application for backing up data in the office
- Learn a different GIS software package

12. Evaluation of participants

Participants were evaluated based on observations during the practical exercise during class 5. A scaling system was used to rank participants. This is merely indicative as the scoring system is highly subjective. 40% of participants were good or very good, which is a better success than expected.

# Participants	Score	Description
3	Below average	Still very much confused about GIS and performing basic tasks in QGIS
12	Average	Still confused by some of the basic tasks but with some knowledge of GIS
5	Good	Able to do most tasks
5	Very good	Able to do all tasks and perform some higher level thinking

Table 2: Participant skills as evaluated by volunteers

13. Lessons learned and questions raised

Throughout the course the volunteers noted observations, questions and thoughts based on how the course went and how participants learnt. These may help in planning future training activities in Jeneponto and elsewhere, and are recorded below.

13.1. Course sessions

Sessions scheduled to last 2 hours will take more like 3. Accounting for late attendees will make training sessions 3 ½ hours long.

Exercises in the evening take longer, perhaps because people are more tired.

Participants often forget training appointments, or come to sessions they have not signed up to. This might be an issue if the number places are limited.

Number of participants will decrease through a long course.

Participants will tend to talk throughout the sessions while trainers are talking. Trainers need to make it very clear that they won't teach when others are talking if they want attention of the whole class. This takes time but eventually will work.

Homework was generally not completed despite repeating that the course sessions weren't enough time for them to fully grasp how to use GIS and that practise at home was needed.

It is difficult to teach more than 10 people. Ideally class sizes would be limited to about 6. 20 people is really too many for a single trainer.

13.2. Course material

Information should be limited to the basics during sessions to ensure that they really grasp the material being presented. Participants will ask when they want to know how to do something in particular.

As most technical information on GIS software is only available in English, the information being presented may be the only source for learners. Providing detailed information is necessary.

Use examples with caution as participants will generally follow examples provided. For example, file names used in the exercises/examples will be used by participants.

People find working with colours and linestyles etc. relatively easy.

Participants find coordinate systems and creating vector data difficult. Despite checking of coordinate system being the first item in all exercises, people still do not know they have to do this by the end of the course.

13.3. Cultural considerations

Mornings are generally the busiest times in offices so this is not a good time to schedule courses.

Jeneponto is a Muslim society so scheduling needs to be arranged around afternoon and evening prayers.

Start times are generally considered to be a guideline and some people would join sessions late (30-40 minutes sometimes). Some people attended on time which we were impressed with.

Training is of lower priority than all other obligations. For example, inter Dinas football competition was of higher priority than attending GIS training although there was no indication from partners/participants that this would be in conflict with the GIS scheduling.

There is little culture or training and learning and many people have not been on any technical training course before.

The level of scientific knowledge is generally low.

Females will generally not attend evening sessions so this needs to be considered during course scheduling. Females will generally not attend individually.

Most staff attending the course are relatively junior (i.e. below head of section level), and these people will not be the ones making high level decisions. This raises the question of how knowledge of spatial data will impact on the way government works?

13.4. Background of participants – how basic do we have to go?

GIS training generally assumes a prior level of competence in computer skills, understanding maps, maths etc, but some of these are lacking:

Some participants struggle to open and save data to files. Even the more competent trainees have problems in working with folder structures in an organised way.

Many participants lack basic maths skills, so concepts such as scale, angles etc may not be understood.

Many participants have poor map reading skills. For example, many people do not recognise contours. Maps are generally not used in office or field work, so opportunities for people to get accustomed to using them are rare.

Although participants were keen to learn GIS, some of them still did not grasp what is was even after the introduction sessions. This may be related to the issue of the use of maps noted above.

This raises a question as to how much background has to be provided before running a technical course like this. The volunteers assumed that trainees would have the relevant background skills to complete the course, as all were graduates, and some had postgraduate qualifications. Despite this, some skills were lacking, and training in basic computer skills, mathematics and statistics, geography etc may be required for trainees to get the most out of a technical course like this. It would, however, be extremely difficult to get people to sign up for training like this, as it is seen as something that people should or do know already.

13.5. Entering the unknown

Technical skills and backgrounds of participants will generally be unknown prior to the beginning of a course. These were found to vary from being unable to save files to folders to having already taken a GIS course. Ideally we would have split classes up into different ability levels, had some basic computer skills training classes. In practice this would be difficult to get participants out to a particular course and could be embarrassing within the hierarchical structure. Teaching basic computer skills is also something that the volunteers have no experience of.

Weaker participants at the beginning of the course sometimes turn out to be the strongest and end up helping other participants. This shows how difficult it can be to assess trainees competence.

Younger people tend to pick up things quicker than the more senior participants. This leads to some concern over how to incorporate GIS into the hierarchical structure as program activities come from the top-down.

Ideally helpers would be identified to assist during the course but this is difficult during a first time course as we have not yet identified those who have the ability and motivation. In practice people did ask for and offer help from/to colleagues.

Matt's counterpart Ritha Dillah was able to assist during some of the practice sessions as well as teach one of the classes. She is particularly motivated and works with Matt daily which made this possible.

13.6. Learning abilities – cause and effect

The volunteers found it hard to find a balance between learning by repetition and allowing trainees to discover for themselves how to use the software and understand spatial data. Even learning by repetition, one of the more basic teaching techniques, did not seem to work, and people would still have problems with basic things (knowing to check the coordinate system, how to open an attribute table) even at exercise 5. This made it difficult to build up knowledge as the course progressed, as much time was spent in later sessions going over basic topics from earlier, leaving less time to cover the higher order learning objectives.

Participants struggled with making the link between following the instructions and what the impact of that was, For example, participants would complete the steps to link non-spatial and spatial data but many would not realise that the two were now linked even after specific instructions to go and look at the new data which had been joined.

Attendees have difficulty reading and following instructions, and understanding the difference between theory, practice and examples. Some have problems turning pages, finding information in appendixes etc.

Trainees could not follow step-by-step instructions in the practical classes even when clearly laid out. Many would complete some of the earlier stages, then become distracted and not complete the rest. Some would also skip stages they did not understand, rather than asking, making the rest of the exercise much more difficult. The trainers explained how to follow the instructions, and the importance of completing each step before going on to the next, at the start of each class. Despite this, people still had problems completing the material in a systematic way. This was a big factor in the exercises taking a lot longer than expected.

Attendees easily forgot lessons from one session to the next, and did not practise in between formal training sessions (e.g. with the homework exercises).

We were happy to see that some people noticed that some training data was incorrect (administrative data acquired from Bappeda was missing one district).

13.7. Software

Some people do not want to use QGIS, and would rather use ArcView or ArcGIS/ArcMap, as this is seen as being the "official" software. There is less advantage in using open source software than initially thought, as commercial software is openly available as illegal copies. Nevertheless, the volunteers were happy with the choice of software as QGIS is intuitive to use.

13.8. Follow-up

It is important in training like this to make sure trainees have access to support if they want to go on to use GIS in their work. A GIS Seminar series was therefore set up to give people an opportunity to meet, discuss GIS and ask other staff and volunteers for help. While support for DKP and Bappeda staff can be provided by the volunteers, the GIS Seminar offers an opportunity for people from other organisations to get support.

The Seminars run once every two weeks, with a presentation about an aspect of GIS and a question and answer session where people can seek solutions to problems. In the future presentations from other organisations like the university in Makassar may be possible.

The chief problem with setting up the GIS Seminar is getting people to organise it. The volunteers felt strongly that it should be run by and for local staff, with volunteers available to help. This is seen as a more sustainable way to ensure people have support in the future after the volunteers leave. So far there has been little enthusiasm from people to organise the meetings, so the system is being reviewed.

13.9. Volunteer reflections

Both volunteers feel the course was successful in terms of the number of participants from various organisations over such a sustained period of time. Opening up the course to a wider range of participants will hopefully ensure some sustainability in the use of GIS in Jeneponto. The GIS seminar should support this.

By the end of the course, competence of participants was good, with 10 participants able to indicate some higher level thinking and application uses, and 12 participants with basic technical skills. The responses to the open ended questions were very encouraging as the majority of participants were able to directly relate how they could use GIS in their organisations. While this was one of our main objectives we were uncertain whether participants would actually be able to make this connection.

A serious concern is the lack of activities which involve or could involve GIS at each organisation. This seems to be a critical factor in using GIS within an organisation, but is made difficult for the volunteers because they do not know what their partner organisations actually do.

The number of female participants was encouraging (36%). A significant proportion of civil servants in Jeneponto are women (approaching 50%, although accurate figures are not available), but the majority of these do not have technical skills or roles. There was however a general lack of interest among females as shown by the members of Bappeda staff.

Language was less of a problem than we initially thought, and the strategies explained in section 3 worked well. Participants often helped with supplying the correct words based on hand gestures.

The course was quite stressful for both volunteers as it was extremely time consuming. Alanna worked 2 evening courses which was tiring. The staggered classes offered more possibilities for participants to join but also meant that the volunteers had to be prepared for 2 sets of course material (printing and preparation) each week. This needs to be taken into consideration when planning future training.

17. Partner support

Support from partners was disappointing. Counterparts provided some feedback after the first session, and offered to check presentations for language, but were unavailable for this after sessions 2/3. Ritha Dillah was far more helpful and reliable in checking language.

Bappeda sent information on the course to many government offices in Jeneponto, which increased attendance. No *surats* (official letters) were sent out, but despite this people still attended the course.

There was very little partner support in setting up rooms, furniture etc, and no offer of help in printing material. They were oblivious to security issues of Alanna having to lock

up alone and late at night. Further support from partners would have alleviated much of the stress of the course.

18. VSO support

VSO helped with printing costs, as Bappeda were unable to find money for paper and ink.

Materials from a GIS course supported by VSO on Flores in 2008 were consulted prior to creating course materials. However, it was considered to be extremely high level in relation to observed technical capabilities of staff in Jeneponto. The volunteers agreed that the course would have to be at a more basic technical level. The Flores course material was used to check some technical language, however.

19. Outcomes for DKP

13 people attended from DKP, of whom 5 were assessed by the volunteers as being good (3) or very good (2). Unfortunately it was discovered later than one of the people assessed as good is *honorer* (not full time/permanent staff), and has no tasks in the office. There is therefore doubt whether DKP will be able to make use of people with new skills, as currently skilled people are underused.

The GIS course was followed by a mini project, with the aim of using GPS to survey land use in the field, and analysis of the results using GIS. The 13 trainees were invited to the following activities with outcomes:

1. Planning meeting to choose location, plan times and roles/responsibilities for the mini project, and organise resources. No one attended the first meeting due to rain (it was held indoors). All 13 attended the rescheduled meeting.

2. Survey planning meeting, with 8/13 in attendance. No printer available (despite its importance being noted in the first meeting), so making adequate maps for use in the field was difficult. Trainees allocated themselves to 4 teams and chose areas to work in.

3. Survey in the field, with 7/13 in attendance. Trainees should have had a clear idea of what they needed to survey from the planning meeting. Trainees claimed to have finished their survey at lunchtime, and returned to the office.

4. Analysis of results, with 6/13 in attendance. The trainees learned how to transfer results from GPS units to the GIS software. The trainees had not collected half the data required, and one team (lead by Matt's counterpart) surveyed the wrong area. No maps were produced.

After the success of the GIS course, the results of the mini project were disappointing, with trainees showing they were still not capable of working diligently or planning tasks in a systematic way. Further activities in the field were planned, but nobody from the office could attend as they had other tasks. The outlook for successful fieldwork being carried out in Jeneponto is therefore not good.

20. Outcomes for Bappeda

Alanna is rather disappointed with Bappeda on a number of levels, the first being the level of support provided as noted above. Second is the low number of participants (2)

considering Bappeda specifically requested this course. A significant time was spent speaking to FISPRA (physical infrastructure section) and other divisions about how GIS could be used in their work.

Based on the responses to the open answer questions and Bappeda's inability to specifically relate the uses of GIS to their work, it is possible that the request for the GIS course was personally motivated by Nuzul to increase his individual capacity rather than that of the organisation.

The GIS course did provide an opportunity to recruit people for a team to carry out rapid hydrological assessment of watershed condition in Jeneponto, one of her placement objectives. Most of the team are not, however, from Bappeda.

21. Conclusions

The main outcomes and conclusions are:

- GIS training was successful, and was worth the hard work put in by volunteers, despite the lack of support from partners.
- Significant planning and preparation is required to deliver a course like this.
- Outcomes for DKP were better than those for Bappeda when considering the volunteers' placement objectives.
- It is still uncertain whether government in Jeneponto is ready to make use of the newly acquired skills.

Appendix 1: GIS course synopsis

Learning Objectives
By the end of the course, successful trainees will be able to:
- Understand what is GIS
- Use GIS to look at spatial data
- Understand how GIS can help in Dinas tasks
- Make simple maps
- Enter and edit spatial data
- Organise GIS data
- Work with satellite data
- Work with topography data
- Analyse GIS data

Session	Presentation	Practical	Lead by
Introduction	What is GIS, and how can it help you?	Sign up for other talks/practicals	ATM
Talk 1	Introduction to spatial data	Make a labelled map of administrative areas in Jeneponto.	MSH
Talk 2	Working with vector data I	Make a map of land use areas.	ATM
Talk 3	Working with vector data II	Make a map showing Kecamatan and numbers of poor families.	MSH
Talk 4	Working with raster data	Use topographic raster data to find villages above 600m elevation	ATM
Talk 5	Organising GIS data and creating print quality maps	Create a finished map of land use and administrative boundaries	MSH
Mini project		Mapping land use types for one village using GPS and GIS	MSH/ATM
ATM – Alanna Minogue, Bappeda MSH – Matt Horritt, DKP			

Introduction: What is GIS, and how can GIS help you?

Examples of GIS applications: making non-interactive/paper maps; making interactive maps (virtual maps); analysing spatial social data; analysing spatial environmental data; analysing satellite data.

What is GIS? Data, software, methods, ways of thinking about spatial data.

How the course is run

Talk 1: Introduction to spatial data

Coordinate systems: how to represent position in maps.

Vector data: points, lines and polygons; attribute data.

Raster data: satellite images, DEM

Shapefile format: shp, shx, dbf and prj/qpj
Symbology: colour, styles for points, lines and polygons.
Labelling

Talk 2: Working with vector data I
Creating new vector data
Editing vector data
Editing attributes
Using different symbologies using attribute data

Talk 3: Working with vector data II
Producing data overlays
Spatial query
Linking other data to the attribute table

Talk 4: Working with raster data
Raster data: images, topography, land use
Georeferencing: world files, resolution
Data formats: geotiff, ascii raster, jpgw, tifw etc.
Colour scales
Types of satellite data: visible, infrared, radar
Examples of satellite images
Ways of using satellite data: manual interpretation

Talk 5: Working with and storing GIS data in a structured way
Procedure for making and storing data, such as: planning, acquiring and evaluating data, metadata and data storage, entering, editing, QA, using, updating. Transfer data between computers.
Making paper/non-interactive maps.

Practical 1: Introduction to GIS software
The objective of the practical is to make a labelled map of administrative boundaries in Jeneponto.

- Loading data
- Zoom, pan, select layers, scale, measuring shapes
- Loading data in other coordinate systems
- Interpreting and changing symbology
- Creating labels
- Saving data and project
- Print and store maps

Practical 2: Create and edit vector data
The objective of this practical is to make a map of a village showing GPS points and land use areas.

- Create new vector layers
- Enter vector data based on raster maps or GPS
- Transfer data from GPS to computer
- Edit vector data
- Enter attribute data
- Use colours and styles based on attribute data

Latihan praktis 3: Working with attribute data

The objective of this practical is to make a map showing Kecamatan with numbers of poor families.

- Edit and analyse attribute data
- Query attribute data and organise contents
- Make spatial queries
- Link attribute data to other data sources

Practical 4: Working with raster data

The objective of this practical is to show and estimate areas of forest in Jeneponto.

- Load and show raster data from satellite, topograhic maps, elevation etc.
- Change the way raster data is displayed, colour scales etc.
- Make spatial queries with raster data

Practical 5: Organising spatial data

The objective of this practical is to create a finished map for printing, including scale, north arrow, data source notes etc.

Practical 6: Mini-project

The objective of this practical is to make a map and estimate areas of land use for a small area in Jeneponto.

The mini-project will last for 2-3 days. Trainees will plan field data collection activities, take GPS data and analyse the data with GIS software. The aim is to give practical experience that can be used in land use mapping activities in the future.

Appendix 2: Course material

Appendix 3: Technical vocabulary

Bahasa Indonesia	English
Sketsa	Sketch
Latar belakang	Background
Latar depan	Foreground
Gelap	Dark
Terang	Light
Seragam	Uniform, similar
Garis batas	Outline
Tebal	Thick
Tipis	Thin
Citra	Image
Arah mata angin	North arrow
Cocok	Agree, fit
Kisi-kisi	Grid
Geser	Pull, drag, slide
Ukuran	Measurement, size
Ulangi	Repeat, re-do
Ganti	Swap
Ubah	Change
Gerakkan	Move
Persegi	Square (for km^2 etc)
Huruf	Font
Corak	Style, pattern
Isi	Contents, filling
Lapis(an)	Layer
Layar	Screen
Perbesar	Enlarge, zoom
Perkecil	Reduce, zoom out
Klik dobel	Double click
Hapus	Delete
Masukkan	Enter
Rata-rata	Average
Plus	Plus
Minus	Minus
Kali	Times/multiply
Bagi	Divide
Soroti	Highlight
Bentuk	Shape
Garis	Line
Titik	Point
Jarak	Distance
Sudut	Angle
Kutub	Pole (N/S)
Lambang	Symbol

Appendix 4: Course evaluation questionnaires

Hal	Buruk	Sedang	Mantap
Mengerti bagaimana menyusunkan file data GIS Struktur folder, nama file sesuai, metadata			
Membuat peta-peta sebagai citra/pdf Pakai *Print Composer*, memasukkan citra di dalam aplikasi lain			
Menggunakan data raster Sebagai peta dasar, pakai data raster sebagai latar belakang, membuat vektor baru dari data raster, penggunaan skala warna			
Tindih/Overlay data Bagaimana pilih symbology sesuai untuk memperlihatkan berberapa sumber data dengan cara yang jelas			
Memasukkan data atribut dari sumber lain Pakai hubungan data dari Excel			
Tabel atribut Apa tabel atribut, bagaimana memasukkan data, mengedit data			
Menggunakan *Symbology* Pakai warna, corak dan label untuk mengkomunikasikan informasi, *Single Symbol, Unique Value, Colormap, Greyscale* dll.			
Membuat dan edit vektor data yang baru Bikin titik, garis dan poligon, bagaimana membuat shapefile, membuat obyek baru, memasukkan data di dalam tabel atribut			
Alat Pengidentifikasian Bagaimana lihat data atribut dan area, kepanjangan dll, dari sumber vektor			
Sistem Koordinat Mengerti bagaimana pakai sumber data dalam sistem koordinat berbeda, opsi dalam "Settings"->"Project properties", kenapa sistem koordinat berbeda digunakan			
Pakai GIS untuk lihat data spasial yang sudah ada Buka data, perbesar, perkecil, aktifkan dan matikan data, pakai alat pengidentifikasian			
Data vektor dan raster Apa berbeda antara vektor dan raster, vektor ada daftar koordinat titik, raster ada sistem kisi-kisi, contoh-contoh penggunaan vektor dan raster			
Mengerti apa GIS dan untuk apa GIS dipakai			
Bahan Lisan Apakah instruktor bicara dengan cara jelas, dan apakah materi dapat dipahami?			
Bahan dicetak Apakah ini jelas dan dapat dipahami?			
Kecepatan kursus Apakah kursus cukup panjang, dengan cukup waktu untuk mengerti isi?			
Jadwal Apakah waktu-waktu materi mudah diikut?			
Apakah hal lain Anda mau belajar dalam kursus seperti ini?			
Hal lain yang Anda mau catat			

NAMA:	26

DINAS/BADAN/PERUSAHAAN:

Apakah Anda sudah dilatih di GIS sebelum kursus ini?

Ada orang lain di Dinas/Kantor Anda yang sudah dilatih GIS?

Apakah Dinas/Kantor Anda sudah menggunakan GIS? Jika Anda jawab "tidak", kenapa tidak?

Kenapa mau Anda belajar GIS?

Kegiatan apa akan GIS dukung di Dinas/Kantor Anda?

Tolong tulis apapun keperluan pelatihan yang Anda mungkin mau pada akan datang.