# BULETIN GIS


**JAWATANKUASA PEMETAAN DAN DATA SPATIAL NEGARA**

**BIL. 1** **2006** **ISSN 1394 - 5505**

# PENDAHULUAN

Jemaah Menteri berasaskan Kertas Kabinet No.243/385/65 bertajuk *National Mapping Malaysia* telah meluluskan jawatan dan terma-terma rujukan *"Surveyor-General Malaya and Singapore"* sebagai Pengarah Pemetaan Negara Malaysia dan mengesahkan keanggotaan serta terma-terma rujukan Jawatankuasa Pemetaan Negara pada 31 Mac 1965.

Cabutan para-para 2(b), 2(c) dan 2(d) daripada kertas kabinet tersebut mengenai keanggotaan dan terma-terma rujukannya adalah seperti berikut:

*"2(b) National Mapping Committee*

*That a National Mapping Committee be appointed to comprise the following:*

*i. Director of National Mapping*
*ii. Director of Lands & Surveys, Sabah;*
*iii. Director of Lands & Surveys Sarawak;*
*iv. Representative of the Ministry of Defence;*
*v. Representative of the Ministry of Rural Development (now substituted by the Ministry of Natural Resources and Environment);*
*vi. Assistant Director of Survey, FARELF*

*2(c) The terms of reference of the National Mapping Committee to be as follows:*

*i. to advise the Director of National Mapping on matters relating to mapping policy;*
*ii. to advise the Director of National Mapping on mapping priorities.*

*2(d) That the Committee be empowered to appoint a Secretary and to co-opt persons who would be required to assist the Committee,"*

Seterusnya pada 22 Januari 1997, Jemaah Menteri telah meluluskan pindaan terhadap nama, keanggotaan dan bidang-bidang rujukan Jawatankuasa Pemetaan Negara kepada Jawatankuasa Pemetaan dan Data Spatial Negara (JPDSN), bagi mencerminkan peranannya yang diperluaskan ke bidang data pemetaan berdigit. Keanggotaan JPDSN pada masa kini adalah terdiri daripada agensi-agensi seperti berikut:

1 . Jabatan Ukur dan Pemetaan Malaysia
2 . Jabatan Tanah dan Ukur Sabah
3 . Jabatan Tanah dan Survei Sarawak
4 . Wakil Kementerian Pertahanan
5 . Jabatan Mineral dan Geosains Malaysia
6 . Jabatan Perhutanan Semenanjung Malaysia
7 . Jabatan Pertanian Semenanjung Malaysia
8 . Jabatan Perhutanan Sabah
9 . Pusat Infrastruktur Data Geospatial Negara (MaCGDI) *(co-opted)*
10. Jabatan Pertanian Sabah
11. Jabatan Pertanian Sarawak
12. Pusat Remote Sensing Negara (MACRES)
13. Universiti Teknologi Malaysia
14. Universiti Teknologi MARA *(co-opted)*
15. Universiti Sains Malaysia *(co-opted)*
16. Jabatan Laut Sarawak *(co-opted)*
17. Jabatan Perhutanan Sarawak
18. Jabatan Perancangan Bandar dan Desa

Buletin GIS ini yang diterbitkan dua kali setahun adalah merupakan salah satu aktiviti oleh Jawatankuasa Pemetaan dan Data Spatial Negara, sebagai salah satu media pendidikan dan penyebaran maklumat dalam mendidik masyarakat memanfaatkan maklumat spatial dalam pembangunan negara. Walau bagaimanapun, sebarang kandungan artikel-artikel adalah tanggungjawab penulis sepenuhnya dan bukan melambangkan pandangan penerbit.

**Ketua Rekabentuk/Pencetak**

Jabatan Ukur dan Pemetaan Malaysia
Jalan Semarak
50578, Kuala Lumpur


## *Kandungan*

# *MESSAGE FROM THE CHIEF EDITOR*

The honourable Prime Minister mentioned recently that Malaysia will remain a poor country if we do not become fully digital. I couldn't agree more.

About 2 decades ago when computers were introduced into the administration, the object then was to have a "paperless office". However, after all these years, the "paperless office" still remains only a dream. On the contrary, we are using much more papers than we should have without the computers.

One glaring example is the printing of maps for both the military and civilian users. Each completed map is printed with a minimum of 3,000 copies and kept in the map store. Demands from the military and the public will probably reduce the stock to about half or so depending on the area. Whenever a map sheet is revised the older version will be destroyed and each year tons of these printed maps were shredded and incinerated, which is a wanton waste of resources. Just imagine, if all these maps were replaced and made available only in digital form, we could have easily save millions of Ringgit each year.

Further more the military, who is the biggest consumer of printed maps, is currently in the process of upgrading their hardware systems to be operational in a digital battleground environment. These systems require digital maps to function and will subsequently reduce the need for printed maps.

In the public domain, we are seeing more and more online or web maps being published to meet the needs of the general populace. The demand for digital mapping data is increasing as users are acquiring modern communication gadgets such as 3G handphone, PDA, in-car navigation system, GPS car-tracking system etc. not to mention the demand by the vast GIS industry.

With such demands mounting in the marketplace, it is time for mapping agencies to seriously consider the shift from printed hardcopy map to digital map. Serious consideration should also be given to improve the diversity of mapping products. Although the military's requirement is a major concern in the production of topographic maps, the needs of the private sector should not be neglected altogether. More emphasis should be placed on the requirements of the private sector and making products that meet their needs should become a primary objective of mapping agencies.

Relevant research should be carried out to identify current and future market needs and to develop new product specifications that can meet these requirements. Such a step will ensure the relevancy of mapping agencies in the century to come and as well promote the growth of the GIS industry.

Thank you.

# THE AUTOMATED PROCESS OF DIGITAL TERRAIN MODELLING ON MT. EVEREST

By
Hazri Hassan
Department of Survey and Mapping Malaysia
*hazri@jupem.gov.my*

## 1. Overview

Nowadays the automatic generation of Digital Terrain Model (DTM) has become common among photogrammetrists. A wide variety of approaches has been developed and presented in the literature. DTM generation packages not only available in digital photogrammetric applications but also in Remote Sensing, GIS and all engineering application.

There are many terms that describe the terrain surface and DTM normally known as a terrain without structures and vegetation. For terrain that covers all elevation is known as Digital Surface Model (DSM).

The main purpose of generating DTM is to generate contour lines, shading, perspective 3D views and orthophoto production. DTM data also can be used to compute mass volume such as cut and fill in the construction industry. With the visualization of DTM surface it will make the design and planning work easier.

DTM data can be derived from many sources such as:

- Field survey (GPS survey and cadastral
- Photogrammetry
- Radar
- Laser
- Remote Sensing
- Digitized from existing maps

Mountainous terrain and area coverage greatly influence the way of data capture. For this paper it will concentrate mainly on photogrammetry data souce on **Mt. Everest.**

The main problem in all automatic DTM generation is the recognition and avoidance of objects above the terrain surface like houses or trees. In photogrammetric mapping, DTM generated based on image pyramid are commonly used. In this method, DTM are generated based on resolution levels of the images from coarse-to-fine meaning starting with a horizontal plane as approximation for the highest level of the pyramid. This approach was implemented in MATCH-T.

There are two types of image matching techniques namely area based and feature based. Area based matching techniques computing correlations between grey values patches of images concerns two or more conjugate windows, each referring to its local pixel coordinate system which is transformed onto each other for best fit. Best fit is defined by maximum cross correlation or least square minimum of the grey value differences which is known as least squares matching. The matching process creates a template of a point from one image and overlays it onto the second image. There, it will be shifted until the square-root of square-sum of gradient residuals converges to a minimum. The accuracy of the matching depends on pixel size, image texture and terrain roughness.

For feature based matching technique establishing correspondences between extracted features of image by an interest operator (for example the Förstner operator) which can pin-point well defined features. The actual matching establishes the correspondence of identical features in different images. The method is quite robust and the matching precision depends on pixel size and image texture. Combination of both techniques can be considered usiang least square matching technique.

There are two data structures used for generating DTM either as regular grid or Triangulated Irregular Network (TIN). Both techniques have advantages and disadvantages depending on the project area environment.

## 2. Digital Terrain Model (DTM) approach

In this section, I will discuss the approach taken to fulfil the DTM requirement. See **figure 1** DTM process workflow and final analysis of alternative parameter settings.

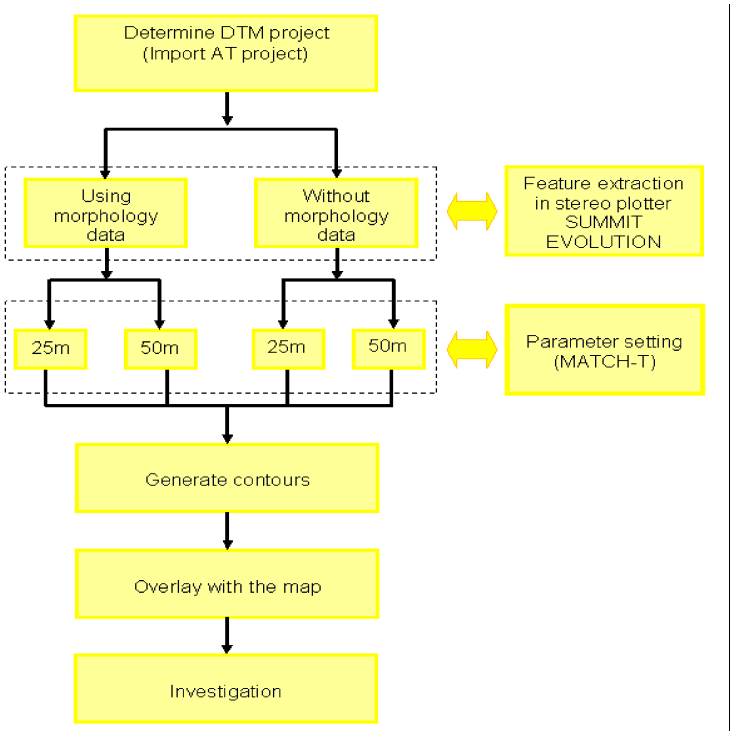


**Figure 1: DTM process workflow and final analysis of alternative parameter settings**

### 2.1. Creating DTM project

DTM project was already created in MATCH-AT process. There is a tool in MATCH-AT to export the project file to DATEM Summit Evolution a digital photogrammetric workstation. By importing existing project file means skipping the process of image orientation because this process have been done earlier in MATCH-AT.

### 2.2. Feature Extraction

Feature extraction task become easier because all image open in DATEM Summit Evolution is already oriented and can be viewed in stereo vision. For this project, feature extraction is a must due to topography area with very steep mountainous and some of the places cover with cloud and snow. For this task only two type of feature extraction is used such as:

- breakline
- exclusion area
- spot height

Break lines are 3D polylines, on which the terrain curvature (slope change) is greater than some threshold value. For this project appropriate breakline are essential in conjunction with contour lines maps or as vectorized information within DTM. This is because contour lines may not sufficiently represent all surface shapes example certain edges.

Exclusion area is an area that is selected to be removed from the DTM measurement. For this project only a few exclusion area has been digitized. One of the exclusion areas is to remove the cloud near to Mount Everest because image matching will measure the cloud as the highest point. The rest of the exclusion areas were focus on the lake and flat area.

A few spot heights were measured at summit peaks. Actually, it is good to have the spot height points especially in mountainous area. The spot height can be used to check the height of certain mountain summit.

In this project it only focuses on the breaklines, the exclusion areas and the spot heights. Here the Datem Summit Evolution was hook to the AutoCAD application. In AutoCAD, 3 layers were created such as exclusion area, breakline and spot height. Activate the interest layer before start digitizing. The digitizing used 3D polyline to capture the feature. When all feature is collected then exports it to wnp file. Used this file in generating automatic DTM using MATCH-T as geomorphology dataset. See **figure 2** below, the digitized of breaklines, exclusion areas and spot heights.

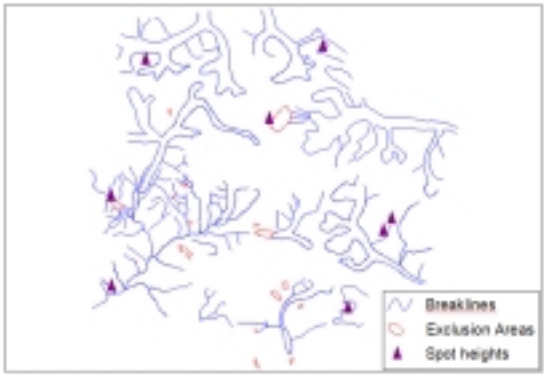


**Figure 2: View of the digitized of breaklines, exclusion areas and spot heights**

### 2.3. Parameter setting

For this project only 4 set of setting is used such as

- DTM with grid width 25m without geomorphology (DTM25)
- DTM with grid width 50m without geomorphology (DTM50)
- DTM with grid width 25m with geomorphology (DTM25Br)
- DTM with grid width 50m with geomorphology (DTM50Br)

Terrain type was set as mountainous since the project area is a mountainous. By selecting this parameter mean densification of the pixel will be dense. See **figure 3:** Different densification base on terrain type.

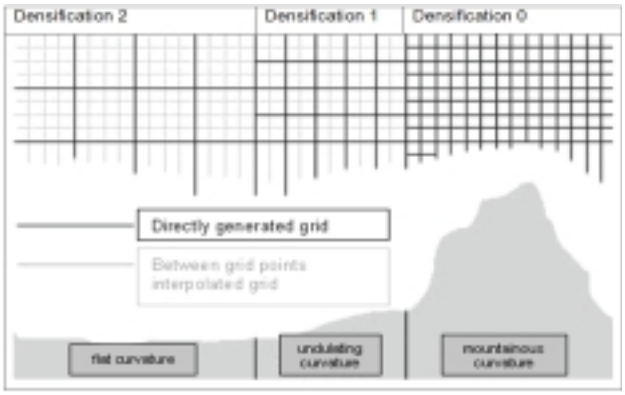


**Figure 3: Different densification base on terrain type**

To determine a grid width are based on the formula given in the manual as below:

**Grid width = 30 * pixel size * scale factor**
**= 30 * 14ì m * 50**
**= 30 * (14/1000)m * 50**
**= 21 m**

From the computation result showed that the minimum grid width is 21m. Written in the manual was larger of distance only used for flat area. Consideration taken by choosing round number near to minimum grid width as 25m and the second setting was double the grid width. So, for this project grid width 25m and 50m was selected for the investigation. For this investigation regular fixed grid width was used in grid density because the area covers only one terrain type. **Table 1** below is a summary of the parameter used.

| | |
|---|---|
| Grid width | 25m and 50m |
| Densification | 0 (Mountainous) See figure 3 |
| Number of DEM levels | 10 (base on image pyramid) |
| Refraction correction | On |
| Earth curvature correction | On |

**Table 1: Summary of the general parameter used**

### 2.4. Generating Contour lines

In this project, ER Mapper was used to generate contour lines although it can be done in AutoCAD or INPHO product (GVE). The reason to used ER Mapper because the contour lines produce by this application can be exported to shape file. With this shape file, the contour can be easily overlaid with the maps in any GIS application. For this case GIS application used was Geomedia Professional.

In ER Mapper, the first step in generating the contour is by reading the ASCII file with grid point produced from MATCH-T. Set all the coordinate system used while importing this ASCII file. From this it will create a DTM surface (sunshading). Using this DTM surface created then used the automatic contour tool to generate contour line. After obtaining this contour line then export it to shape file.

### 2.5. Overlay with the maps

Using Geomedia Professional the contour line in shape can be read directly without importing this file. In this application just create a new connection to the contour shape file as a read only because cartography enhancement to the contour line was not include in the task unless to create new maps again. After having the connection then add this contour layer in the maps legend. Using this maps legend it can be witch on and off for the purpose of the investigation.

### 2.6. Result

For this investigation 4 set of result was created based on the parameters setting such as:

- DTM25
- DTM50
- DTM25Br
- DTM50Br

## 3. Investigation

Using 4 dataset result a few comparison have been made. Below are explanations of all comparison. Result of all this comparison based on consideration the digital scan map as references. As written in chapter 2, this map was produce using photogrammetry method although there is some cartography enhancement it still being used to measure all the GCPs as this is the only source we have.

### 3.1. Comparison result on time taken

DTM file was generated using MATCH-T module. Using this application only data file with extension XYZ was created. See **table 2** and **figure 4** below the different in time taken in generating DTM file size using different grid parameter and with or without geomorphology for whole models. From this table showed that the smaller grid width will take longer time. The time becoming shorter when geomorphology data was include in the process. This is because less mass points created due to the exclusion areas and breaklines. Factor of time is useful for map production.

| File created | DTM 25 | DTM 50 | DTM25Br | DTM50Br |
|---|---|---|---|---|
| XYZ data file<br>(ascii file created from MATCH-T) | 18h 45m | 16h 52m | 16h 12m | 14h 15m |

**Table 2: Different in time taken for whole models**

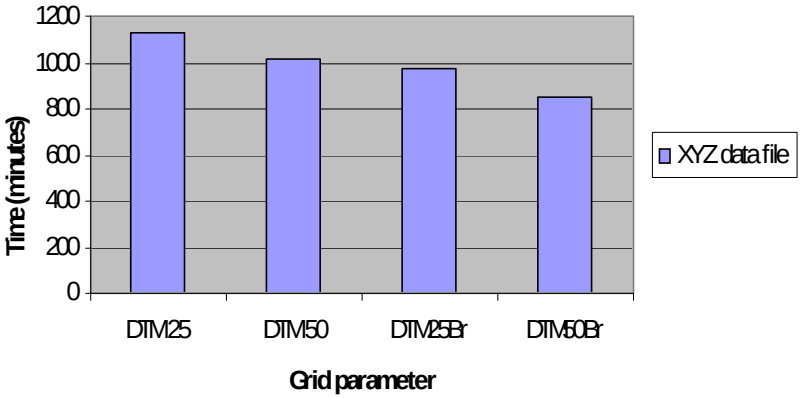


**Figure 4: Different in time taken for whole models**

### 3.2. Comparison result on DTM file size

File size is important in determining data storage although now days the capacity of internal/ external hardisk can go up to terra byte. **Table 3** and **figure 5** below showed the different file size created in this project using different parameter for whole models. From this table showed that the smaller grid width will take bigger file size. This is because more mass point created in smaller grid parameter. This mass points reduced when this grid parameter include with the morphology data. Factor of file size is useful to determine hardware used in map production.

| File created | DTM 25 | DTM 50 | DTM25Br | DTM50Br |
|---|---|---|---|---|
| XYZ data file (ascii file created from MATCH-T) | 49.3 M Byte | 43.1 M Byte | 44.9 M Byte | 39.5 M Byte |

**Table 3: Different in file size for whole models**

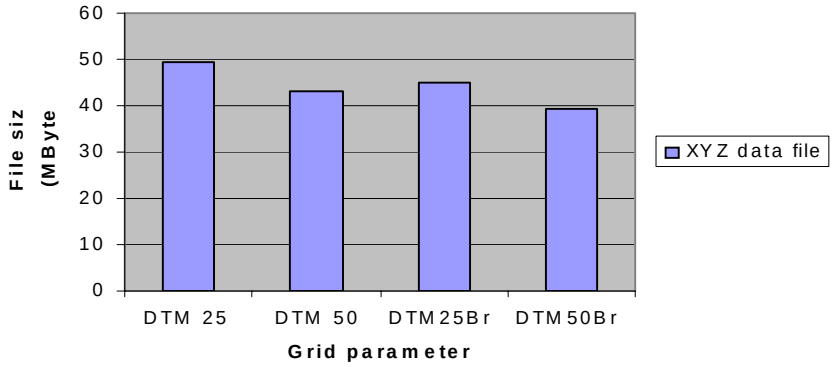


**Figure 5: Different in file size for whole models**

### 3.3. Comparison DTM result on model 5409_5410 (Mt Everest)

This comparison is to determine which is the suitable parameter based on single model. This comparison was using single model of 5409_5410. This model was choosen due to Mt. Everest is part of the model area. This comparison will discuss on:

- errors appear in DTM generation,
- different planimetry position and height

**Figure 6 (a), (b), (c)** and **(d)** showed errors appear in DTM surface generation. These DTM surfaces were generated using ER Mapper. The pseudo colour set in the image was determining the height. The reddest colour will be the highest point meanwhile the darkest blue will be the lowest ground.

In **figure 6 (a)** and **(b)** showed DTM generation without geomorphology data. As in this figure it clearly showed that there were no error.

In **figure 6 (c)** and **(d)** showed DTM generation with geomorphology data and clearly showed that is some unusual errors appear in DTM25Br but not in DTM50Br. The errors were marked with black round circle.

If the comparison is done only using DTM surface is clearly showed that without morphology data is better but this was not sufficient to conclude the overall DTM generation quality. Some investigation should be done more such as the contour value, contour shape and also points position.

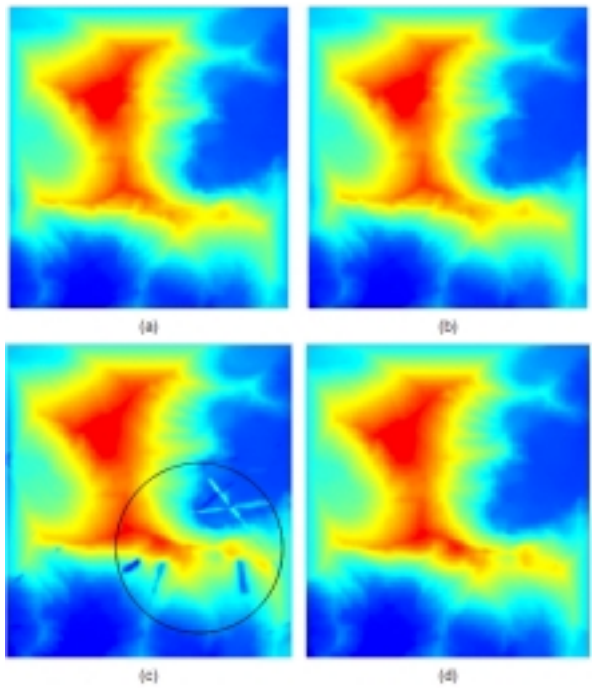


**Figure 6: Errors in DTM surface generation single model (model 5409_5410)**
**(a) DTM25, (b) DTM50, (c) DTM25Br and (d) DTM50Br**

Now the investigation is to find out the reason what caused the unusual errors in figure 6 (c) using parameter DTM25Br. The first attempt is to check the neighbouring of model the 5409_5410 such as 5408_5409 (left) and 5410_5411 (right) using parameter DTM25Br. See **figure 7** (a) and (b) errors in DTM surface generation with neighbouring of model 5409_5410 below. From this figure the unusual errors shape cross is not happen in **figure 7 (a)** models 5408_5409 but there were new errors arising. For model 5410_5411 in the **figure 7 (b)** errors shape cross still exist.

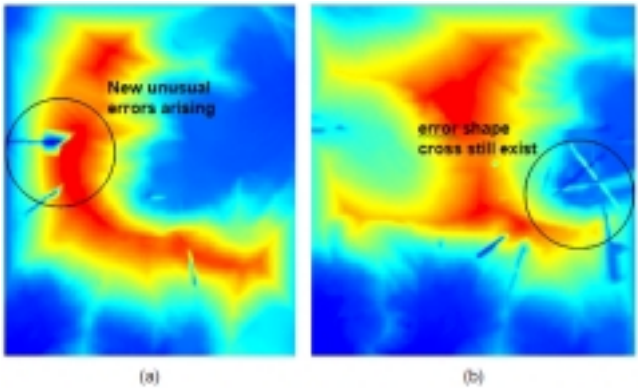


**Figure 7: Errors in DTM surface generation with neighbouring of model 5409_5410**
**(a)5408_5409 (left) and (b) 5410_5411(right)**

For the second attempt was checking the breaklines created near to this model 5409_5410 using stereo views. In my point of view this kind of errors was assume not being detected when using parameter DTM50Br because the breaklines is too small (short) and drop through in grid mask. The breaklines must intersect with the grid mask. See **figure 8** explanations of different between two mask window sizes.

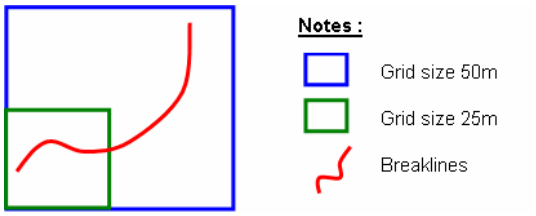


**Figure 8: Explanations of different between two mask window sizes**

Another problem is due to the breaklines that incidentally crosses or touching with the other breaklines. Now after removing the break line that snapping each others, the errors have disappeared. Now, every breakline in this project area was being check again to make sure this kind of errors would not appear again.

By having these errors it will affect in contour generation. See also **figure 9** errors in generating contour based on **figure 6 (c)** errors in DTM surface generation using parameter DTM50Br

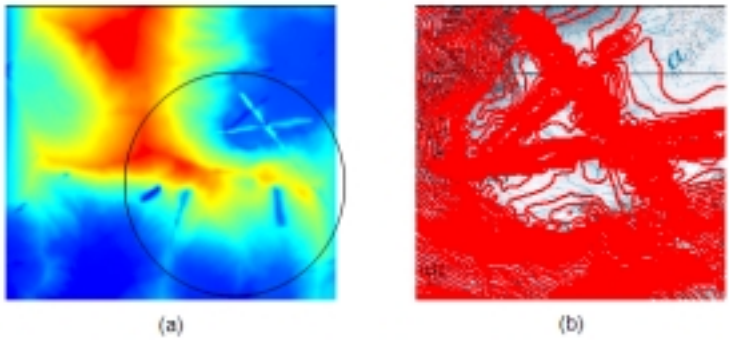


**Figure 9: Errors in generating contour based on parameters DTM25Br**
**(a)Errors in DTM surface generation**
**(b)Area in the circle when generating contour lines**

For the comparison on the planimetry position and the height of Mt Everest will be showed in **figure 10 (a), (b), (c)** and **(d).** In **figure 10 (a)** The highest point is no longer Mount Everest due to automatic DTM measurement capture cloud height but the contour line value at Mt Everest is 8440m. In **figure 10 (b)** the result is almost the same with DTM using parameter DTM25. Both **figure 10 (a)** and **(b)** have a contour value 8840m near to Mt. Everest point. This clear showed that automatic DTM measurement is working well as the right height appear to Mt. Everest point.

In **figure 10 (c)** The result is very good after removing the cloud area using exclusion area. As seen in this figure the Mount Everest point is shift around 52m to the south. In **figure 10 (d)** the result is almost the same with DTM25Br but the height of Mount Everest clear showed dropping down because there was no contour value 8840m. In this case Mt. Everest height was lower than 8840 and this result was totally wrong as the mountain peak was measure precisely with field survey. This problem occurs because the automatic DTM measurement cannot match height point of the Mt. Everest.


**Figure 10: Result on plainimetry and height value on Mount Everest using single model (model 5409_5410)**
**(a) DTM25**
**(b) DTM50**
**(c) DTM25Br**
**(d) DTM50Br**

This problem will never happen if there were spot height at the peak of the Mt. Everest. In this investigation, the next attempt was adding the spot height of the Mt. Everest in the morphology data. Now the problem was solved. Result of the new contour lines using morphology data that inclusive of the Mt. Everest spot height can be viewed in **figure 11** before and after adding spot height on Mt. Everest using parameter DTM50Br.

From this result also clearly can view the position shifted. In this case the shift is nearly 100m. Compare with the result using DTM25Br the shift only 52m. The problems of the position shifting due to the orientation model in the AT process earlier was not good. This problem will occur later on in the DTM merge process. See the discussion in next section.

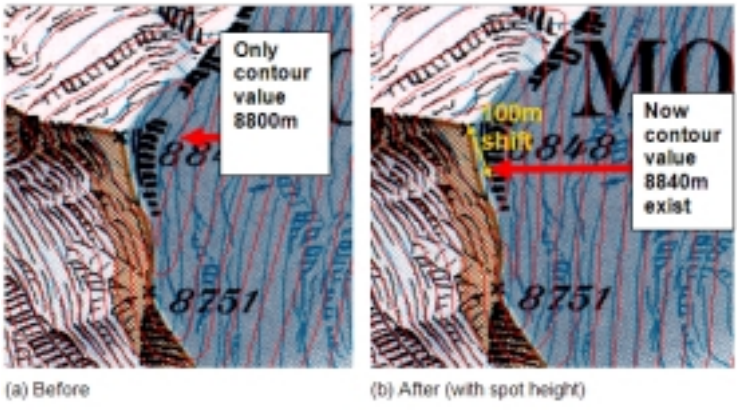


**Figure 11: Adding spot height on Mt. Everest using parameter DTM50Br**

### 3.4. Comparison with DTM merge

To proceed with generating contour, orthophoto or visualisation for the whole project area, these DTM files need to be merged. Using DTMMerge module in MACTH-AT all these DTM files merged automatically. From this Scop file with extension DTM and ascii file with extension dat was created.

The first attempt the whole models were merged automatically. See result in **table 5** and **figure 9** the different in file size after merging whole models. As in table the file size become smaller after the merging this is due to overlapping area. Overlapping area to large as the models overlap near Mt. Everest is almost 80%.

| File created | DTM25 | DTM50 | DTM25Br | DTM50 |
|---|---|---|---|---|
| XYZ merge file (SCOP) | 2.4 MByte | 2.2 MByte | 2.4 MByte | 2.2 MByte |
| XYZ merge file (ASCII) | 14.5 MByte | 10.9 MByte | 13.1 MByte | 9.7 MByte |

**Table 4: Different in file size after merging whole models**

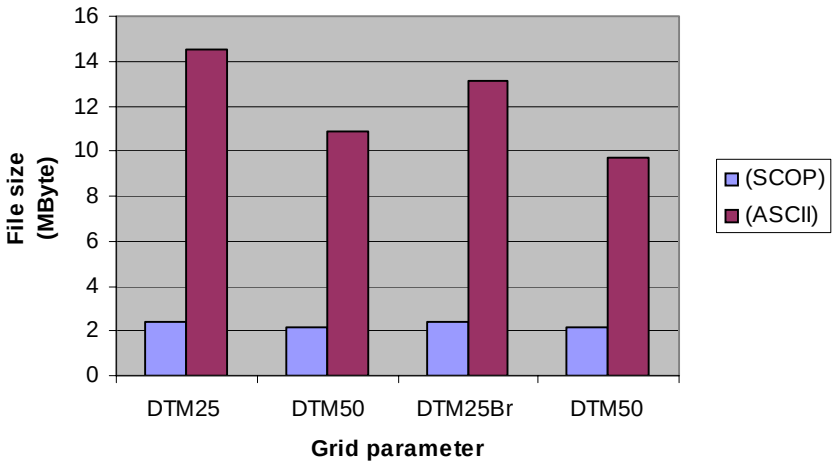


**Figure 12: Different in file size after merging whole models**

Using this result the contour created was not very good. See **figure 13** DTM merge errors using the whole models. Errors were marked with round black circle. These errors were due to models orientation. As in the AT process all the GCPs was set to be fixed to the mountain peaks. By fixing these GCPs all the errors went to X, Y, Z, ù, ö, ê.

This can be compare by single model that have been done earlier. For single model it was very good for DTM25 and DTM50 accept for DTM25Br and DTM50Br. Now is different in the other way around. From this result it shows important of the morphological data to improve the DTM quality. See again **Figure 6** errors in single model.

To remove this error in DTM25 and DTM50 is by reducing the overlapping area between models. This can be done either by using AutoCAD or any CAD application. What is required to be done is to generate the mass point neighbouring models in AutoCAD then delete the overlapping area. Although this is not the best way to solve the problem but to run again the AT process going to take more time and morphology data needed to be captured again.

For this case DTM with morphological data is already good, see the comparison of the contour shape using the DTM merge in paragraph 3.5.

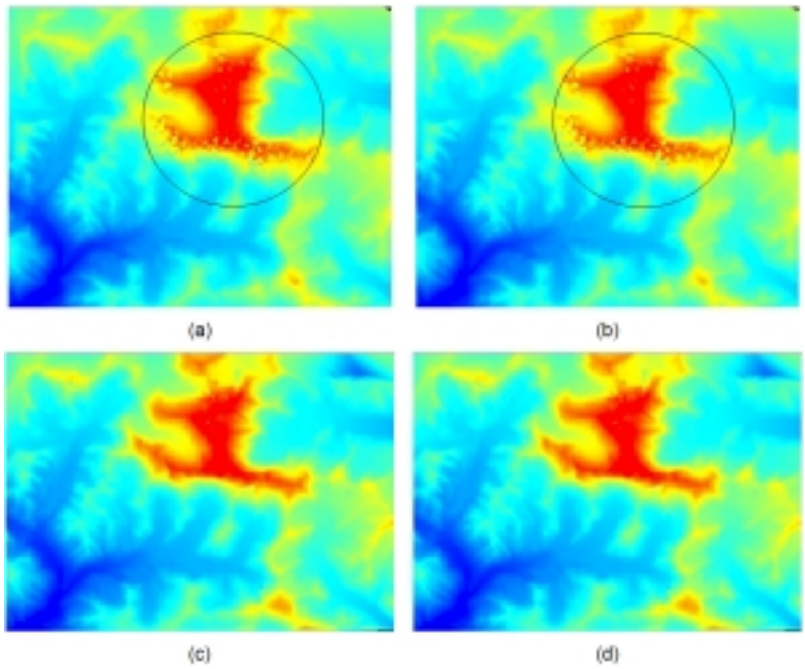


**Figure 13: DTM merge errors using the whole models (a) DTM25, (b) DTM50, (c) DTM25Br and (d) DTM50Br**

### 3.5. Comparison result on contour shape

For this task the generated contour line was overlaid with the maps using Geomedia Professional. Only to comparison is done here between DTM50 and DTM50Br. As showed in **figure 14** and **figure 15**.

In **figure 14**, there were a lot of contour errors especially in high place. The errors spot was really on the range of the mountain as big yellow spot in the maps. For the lower ground the contours lines was almost the same shape with the maps. This means automatic DTM not facing a big problem in the lower.

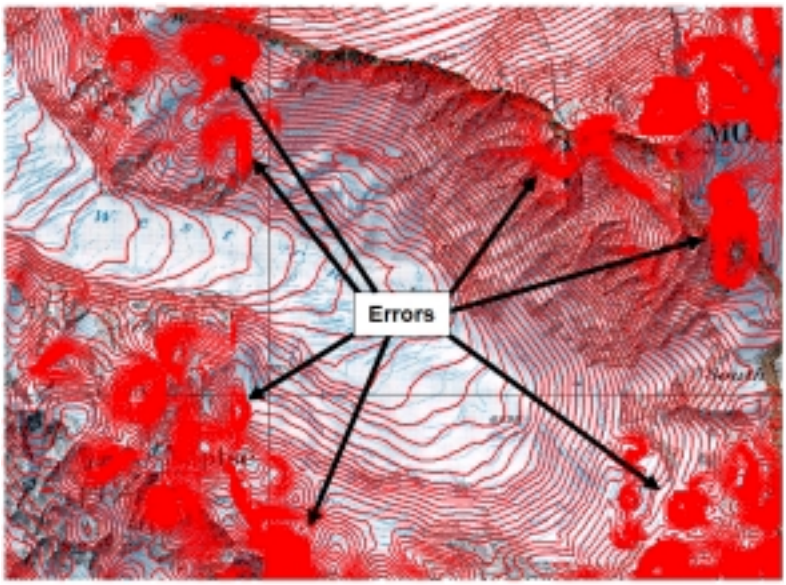


**Figure 14: Contour using parameter DTM50**

In **figure 15** there were significant differences between **figure 14** especially the errors. In this figure 4.15 the parameter used is DTM50Br. Using this geomorphologic data many errors have been remove. As from this result, it shows that geomorphologic data plays a key role in providing a quality DTM and the contour generation.

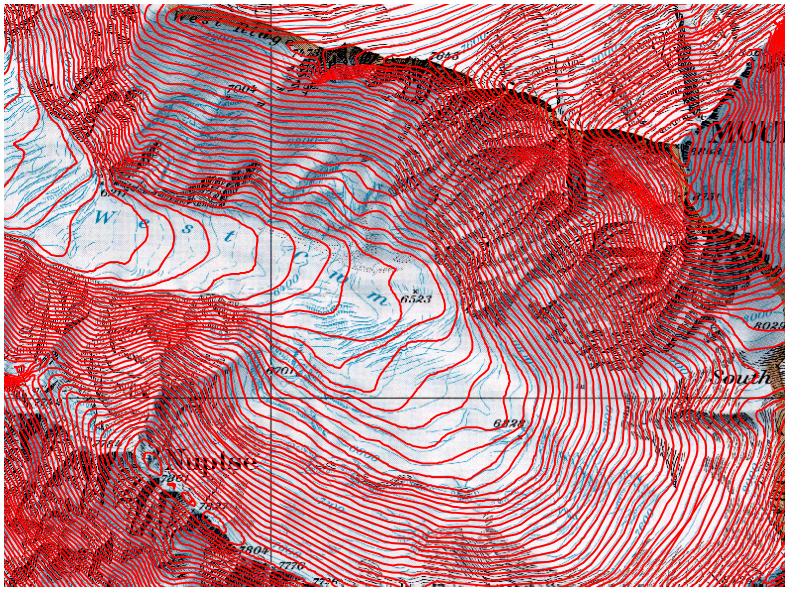

**Figure 15: Contour using parameter DTM50Br**

## 4. Experience of Automation and quality of the result

Using the MATCH-T to generate DTM automatically is working well but with some problems. Geomorphologic data must be collected manually since there were no automatic functions in it. Collecting this geomorphologic data really time consuming especially for non experience users. This will also contribute errors in it.

## 5. Conclusion

AT process is a key process in photogrammetry. DTM generating process really depends on the good AT. By having a very good triangulation control, the problems in DTM generating process can be reduced as we know that automatic DTM generation of hilly terrain area is difficult especially in area with large variable in height and snow covered slopes.

In conclusion, DTM must be generated with the morphology data. Without morphology data the result clearly shows lots of errors. The morphology data must consist of the breakline, exclusion area and the spot heights. In the investigation by having the exclusion area it automatically remove the cloud area to ensure that Mt. Everest is the highest point. Spot height is also important. By having this information the height is fixed at 8848m exactly.

The DTM merge process clearly showed there were bad orientations for each models as the models cannot merge properly with neighbour's models. The orientation of the models were based on the AT process. As mention earlier, the AT result was not good and due to time constrain the DTM process was proceeded. Problems of the DTM merge was solve by reducing the overlapping area between models.

Factor of time is important. As in the investigation, smaller grid width will take longer time. The time became shorter when geomorphology data was include in the process. This was because less mass points created due to the exclusion areas and breaklines.

# THE SENSITIVITY OF AHP WEIGHTINGS AS APPLIED IN GIS/MCE LAND SUITABILITY MODEL

By
Mohd Sanusi S. Ahamad[1], Wan Muhd Aminuddin Wan Hussin[2] and Shamshad Ahmad[3]

Geomatic Engineering Unit, School of Civil Engineering, Engineering Campus,
Universiti Sains Malaysia, 14300 Nibong Tebal, Pulau Pinang.
Tel: 04-5937788
Fax: 04-5941009
E-mail: [1]cesanusi@eng.usm.my, [2]cewan@eng.usm.my, [3]ceshams@eng.usm.my

**Abstract**

*This paper demonstrates an approach in testing the sensitivity of GIS based land suitability analysis model that uses multiple criteria evaluation (MCE) technique. The sensitivity test was carried out to study the effect of spatial location of feasible area if changes were made to the decision maker's preferences (weightings) in evaluating residential land suitability criteria. The approach was applied to a case study involving residential land use allocation. The hypothetical problem of determining the best 2000 hectares of area for residential purposes in Pulau Pinang was presented. The GIS/MCE procedures was carried out on a PC-based GIS system. The assumption here is that the weight derived from hierarchical comparison in normal Analytic Hierarchy Process (AHP) is influenced by the preferences given to a particular criterion factor. The sensitivity test was evaluated based on five preference factors thought to influence the weightings i.e. 1) proximity factor; 2) utility factor; 3) transportation factor; 4) development cost; and 5) without development cost. A more generalised picture on the sensitivity of the feasible area was analysed by multiplying the weights with the criterion maps to produce weighted standardised criterion map layers which form the basis of the weighted linear combination approach in GIS based multiple criteria evaluation (MCE). An image cross-classification process (a multiple overlay) was performed to test the spatial similarity by showing the location of all combinations of the categories in the original images. This determines the amount of changes in the spatial location of the feasible area resulting from the changes in criterion preferences. It indicates the sensitivity of decision maker's preferences in the weighted linear combination process of MCE. The result of the sensitivity described 56% similarity in location of feasible area when the preferences in criterion judgement were different. It represents an area of average suitability in each criterion preference. The variation made in criterion preferences affects only the areas of high suitability for that individual preference. The spatial pattern of the uncommon areas is concentrated near the different individual preference criteria. Similarly, the criterion preference to development cost distributes high weightings to cost-influenced factors, for example the provision of transports and utilities. Therefore, criterion judgements that made preferences to development costs give strong preferences to social economical factors. The weighting judgement takes into account the benefits of transport facilities and public utilities to the community. In terms of spatial location, when the preference does not consider land development cost the feasible areas are found scattered throughout out the study area. On the other hand, the feasible areas that give preference to development cost are concentrated on the highly developed part of the study area. If physical factors were strongly preferred, then the feasible area will be evenly distributed within the study area. The result has indicated that the feasible area in MCE technique is sensitive to the preferences made on the criterion judgement. Therefore, a decision maker must assure that the judgement made in the multiple criterion evaluation (MCE) reflect the preference and objective.*

## 1.0 INTRODUCTION

The hierarchies of land suitability model for land use allocation can be broken into 4 levels: purpose/ objective, major land use requirements, land quality, and diagnostic criterion. This breakdown is similar to that used by Food and Agricultural Organisation (FAO, 1993). Land use requirements (LUR) are the conditions of land necessary or desirable for the successful and sustained practice of a given land use type (FAO, 1993). LUR can be assembled into understandable groups for example, cost requirements, management requirements, and conservation/ environmental requirements. A land quality is a complex attribute of land that acts in a manner distinct from the actions of other land qualities in its influence upon

the suitability of land for a specified kind of use. Examples of land qualities include land availability, topographic suitability, and availability of utility.

A land suitability criteria is a variable, which may be land quality, a land characteristic or a function of several land characteristics, that has an influence on the output from, or the required inputs to, a specific kind of land use, and which serves as a basis for assessing the suitability of a given type of land for that use (FAO, 1993). For every criterion, there will be a critical value or set of critical values that are used to defined suitability class limits, for example land slope of less than 10% may be define as most suitable limit for residential development.

The factors and ratings affecting the suitability of sites for a specific land use are usually different but the major requirements are in most cases, common to all land uses. In this paper, the major land use requirements are simply grouped into 2 classes: those related to development costs and effective land utilisation. Land utilisation will normally consist of technical specifications in a given physical, economic, and social setting.

## 2.0 FORMULATION OF LAND SUITABILITY MODEL

The land use suitability model was formulated based upon a specified guideline and with regards to data availability. The task involved identifying the locational requirements of the particular land use. One reasonable approach to structure the problem is to organise it into a hierarchical order. This means identifying the elements of the problem, decomposing the elements into homogenous sets, and arranging these sets in different level of abstraction. The hierarchies will be developed deductively where one begins from general principles (or objective) to particular instances (or available data). The best example of applying hierarchies in land suitability problem will be the Analytical Hierarchical Process (AHP)

### 2.1 The Analytical Hierarchical Process (AHP)

The Analytic Hierarchy Process (or AHP) was developed Saaty (1980) to improved decision-making for problems involving prioritisation of potential alternate solutions through evaluation of a set of criteria. Site suitability analysis when presented in AHP involves a two-stage evaluation process: (1) determining a measure of the relative importance of the criterion, and (2) determining a measure of the relative weight of the alternatives. These criteria may be divided into sub-criteria and so on, thus forming a hierarchical decision tree. Once the hierarchical problem definition has been established, these criteria are weighted individually at every level relative to each other. The assignment of weights in the evaluation criteria can be determined in various ways. One of the common methods applied in GIS is the eigenvector method, developed by the Analytic Hierarchy Process (AHP) methodology. The method involves pairwise comparisons of the criterion factor. The comparisons concern the relative importance of the two criteria involved in determining suitability for a certain objective based on a 9-point continuous scale of AHP

### 2.2 The AHP Based GIS Multiple Criteria Suitability Model

Multiple criteria evaluation (MCE) in a raster based GIS can be seen as a process for combining spatial data according to their importance in making a given decision. The procedure starts with the establishment of criterion maps. This is basically a process of preparing the spatial data that is relevant to the site selection process. The criterion map could either be a factor or a constraint to the MCE process. The creation of factor maps will involve some GIS analytical function. It could either be buffer zone construction (proximity), cost distance analysis, or surface analysis (DEMs and slopes). The constraint map on the other hand is simply expressed in the form of a Boolean (logical) map. In order to ensure that the criterion maps are comparable in MCE process, a standardisation procedure has to be with taken. It is standardised to a consistent numeric range, for example; 0 to 255. This is achieved by undertaking a linear re-scaling of values using the minimum and maximum values as the scaling end points. The high end values will indicate more suitable areas.

Next is the application of weights for each factor map that that has been determined from the AHP-pairwise comparison matrix. Once the weights were established, GIS overlay process can be used to combine the factors and constraints in the form of a weighted linear combination. It is a process of multiplying each factor maps by its weight, adding the results and then successively multiplying the results by each of the constraints. The result is then summed up producing a suitability map as shown by the formula;

$$\text{Suitability Map} = \text{Ó}\ [\ \text{factor map}\ (c_n)\ *\ \text{weight}(w_n) * \text{constraint}(b_{0/1})]$$

where,

$c_n$ = standardised raster cell,
$w_n$ = weight derived from AHP pairwise, comparison, and
$b_{0/1}$ = Boolean map with values 0 or 1.

Since the weights in the factor map sum to 1.0, the final resulting suitability maps will have an attribute range of values that matches the standardised factor maps that were used, for example; 0 to 255. If the process involved a constraint map, then the suitability map will be multiplied by each of the constraints to zero out the unsuitable area.

The final step in the AHP based GIS/MCE technique is to decide particular cells that meet a particular site area target. The GIS system uses the choice heuristic method in selecting the best areas for a particular site. This method will rank order the cells and choose as many of the highest ranks as will be required to meet the area target. The ranked map can then be classified to extract the highest ranks to meet the area goal of the site selection A complete GIS/MCE process as embedded in GIS raster based system is depicted in the flowchart as shown in Figure 1.0.

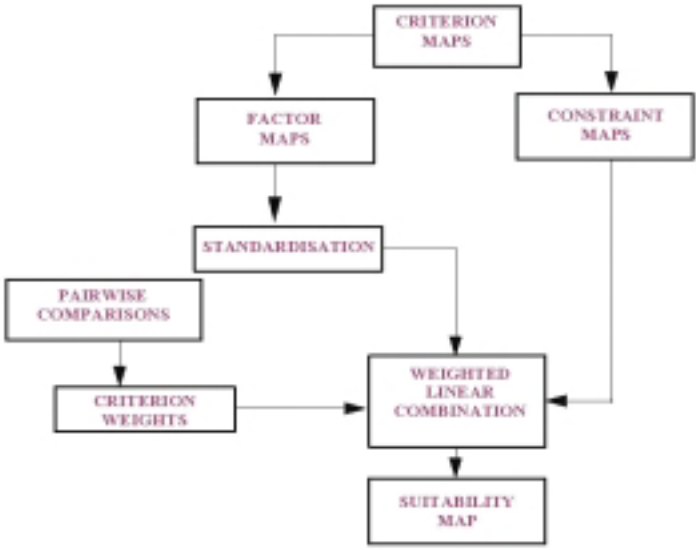


Figure 1. AHP based GIS/MCE Model

## 3.0 ANALYSIS AND RESULTS

In the case study, the formation of main criterion factors and sub-criterion factors, uses the Saaty's normal AHP technique. The assumption is that the weightings derived from hierarchical comparison in normal AHP would be influenced by the preferences given to a particular criterion factor. Therefore a sensitivity test was carry out on the criterion preferences. It was evaluated based on five preference factors thought to influence weightings. The factors considered were preferences given to: 1) proximity factor; 2) utility factor; 3) transportation factor; 4) development cost; and 5) without development cost.

Five separate hierarchical pairwise comparison of main criterion factors was made for each preference to analyse the sensitivity of the weights obtained. The pairwise comparisons of sub-criterion factors were carried out independently and given same judgements for all the preferences. To reflect the preferences towards a certain factor, a definite to very strong preferences (scale 5 - 9) was given to that factor in their pairwise comparison.

In the case of preference to development cost, a definite and very strong preferences were given to utility and transport factor because they could influence the cost of residential land development. For preference without development cost, a definite to strong preferences (scale 5 - 8) was given to soil, topography, and land use factor (physical criteria) and weak to moderate (scale 2- 4) preferences assigned to transport, utility, and proximity factor.

### 3.1 The Sensitivity Tests Result

The results of the sensitivity tests for five separate pairwise comparisons are shown in Table 3.1. For sub-criterion factor, a similar pairwise comparison judgement was used as an input to the main criterion factor. The sub-criterion factors taken into consideration are the proximity, transportation, and utility as described in Table 3.2. The weight analysis was performed in EXPERT CHOICE and the weighting results for each criterion preference are shown in Table 3.3.

**Table 3.1a: Pairwise comparison with preference to proximity factor**

| | Soils | Proximity | Transport | Topography | Utility | Geology |
|---|---|---|---|---|---|---|
| **Land use** | 2.0 | (7.0) | (4.0) | (2.0) | (4.0) | 2.0 |
| **Soils** | | (8.0) | (5.0) | (2.0) | (5.0) | 2.0 |
| **Proximity** | | | 5.0 | 7.0 | 5.0 | 9.0 |
| **Transport** | | | | 6.0 | 1.0 | 6.0 |
| **Topography** | | | | | (6.0) | 4.0 |
| **Utiltity** | | | | | | 6.0 |

*** Row element is _ times more than column element unless enclosed in ( ), when column element is_times greater than row element**

**Table 3.1b: Pairwise comparison with preference to transportation factor**

| | Soils | Proximity | Transport | Topography | Utility | Geology |
|---|---|---|---|---|---|---|
| **Land use** | 2.0 | (4.0) | (7.0) | (2.0) | (4.0) | 3.0 |
| **Soils** | | (5.0) | (8.0) | (2.0) | (5.0) | 3.0 |
| **Proximity** | | | (6.0) | 3.0 | 1.0 | 6.0 |
| **Transport** | | | | 7.0 | 6.0 | 9.0 |
| **Topography** | | | | | (3.0) | 4.0 |
| **Utiltity** | | | | | | 6.0 |

**Table 3.1d: Pairwise comparison with preference to development cost**

| | Soils | Proximity | Transport | Topography | Utility | Geology |
|---|---|---|---|---|---|---|
| **Land use** | 1.0 | 1.0 | (8.0) | 1.0 | (8.0) | 2.0 |
| **Soils** | | 1.0 | (9.0) | 1.0 | (9.0) | 2.0 |
| **Proximity** | | | (9.0) | 1.0 | (9.0) | 2.0 |
| **Transport** | | | | 8.0 | 1.0 | 9.0 |
| **Topography** | | | | | (8.0) | 2.0 |
| **Utiltity** | | | | | | 9.0 |

*** Row element is _ times more than column element unless enclosed in ( ), when column element is_times greater than row element**

**Table 3.1e: Pairwise comparison without preference to development cost**

| | Soils | Proximity | Transport | Topography | Utility | Geology |
|---|---|---|---|---|---|---|
| **Land use** | 2.0 | 5.0 | 7.0 | (2.0) | 7.0 | 3.0 |
| **Soils** | | 4.0 | 6.0 | (3.0) | 7.0 | 2.0 |
| **Proximity** | | | 3.0 | (6.0) | 3.0 | (2.0) |
| **Transport** | | | | (8.0) | 1.0 | (5.0) |
| **Topography** | | | | | 8.0 | 4.0 |
| **Utiltity** | | | | | | (5.0) |

**Table 3.2a: Pairwise comparison of sub-criterion to proximity factor**

| Proximity to | Public facility | Existing residential area |
|---|---|---|
| **Urban centre** | 2.0 | 2.0 |
| **Public facility** | | 2.0 |

**Table 3.2b: Pairwise comparison of sub-criterion to transportation factor**

| Transportation | Expressway | Highway | Secondary road |
|---|---|---|---|
| **Primary road** | 2.0 | 2.0 | 2.0 |
| **Expressway** | | 1.0 | 1.0 |
| **Highway** | | | 1.0 |

**Table 3.2c: Pairwise comparison of sub-criterion to utility factor**

| Utilities | Water supply | Telecommunication | Sewer | Drainage |
|---|---|---|---|---|
| **Power supply** | 2.0 | 2.0 | 2.0 | 2.0 |
| **Hydrology** | | 1.0 | 1.0 | 1.0 |
| **Telecommunication** | | | 1.0 | 1.0 |
| **Sewage** | | | | 1.0 |

**Table 3.3: Criterion weightings from different preferences**

| | Proximity | Transport | Utility | With development cost | Without development cost |
|---|---|---|---|---|---|
| *Land use distribution* | 0.048 | 0.052 | 0.053 | 0.050 | 0.247 |
| *Soil property* | 0.036 | 0.040 | 0.036 | 0.049 | 0.171 |
| *Geological property* | 0.026 | 0.024 | 0.028 | 0.030 | 0.106 |
| *Topographical property* | 0.061 | 0.070 | 0.073 | 0.050 | 0.36 |
| **Proximity** | | | | | |
| *Urban centre* | 0.232 | 0.077 | 0.075 | 0.024 | 0.030 |
| *Existing residential area* | 0.092 | 0.030 | 0.030 | 0.010 | 0.012 |
| *Public* facility | 0.146 | 0.048 | 0.048 | 0.015 | 0.019 |
| **Transportation** | | | | | |
| *Expressway* | 0.042 | 0.117 | 0.036 | 0.077 | 0.007 |
| *Highway* | 0.042 | 0.117 | 0.036 | 0.077 | 0.007 |
| *Primary road* | 0.071 | 0.199 | 0.060 | 0.154 | 0.011 |
| *Secondary road* | 0.025 | 0.071 | 0.021 | 0.077 | 0.004 |
| **Utility** | | | | | |
| *Hydrology* | 0.027 | 0.023 | 0.076 | 0.064 | 0.004 |
| *Power supply* | 0.063 | 0.054 | 0.170 | 0.129 | 0.010 |
| *Telecommunication* | 0.019 | 0.017 | 0.054 | 0.064 | 0.004 |
| *Drainage* | 0.038 | 0.033 | 0.106 | 0.064 | 0.004 |
| *Sewage* | 0.032 | 0.028 | 0.092 | 0.064 | 0.005 |

### 3.2 Discussion

The result shows that weights derived from the criterion judgement in hierarchical structure do reflect the preferences given to the criteria. A graph in Figure 2.0 shows the weight distributions of criterion factors for five different preferences.

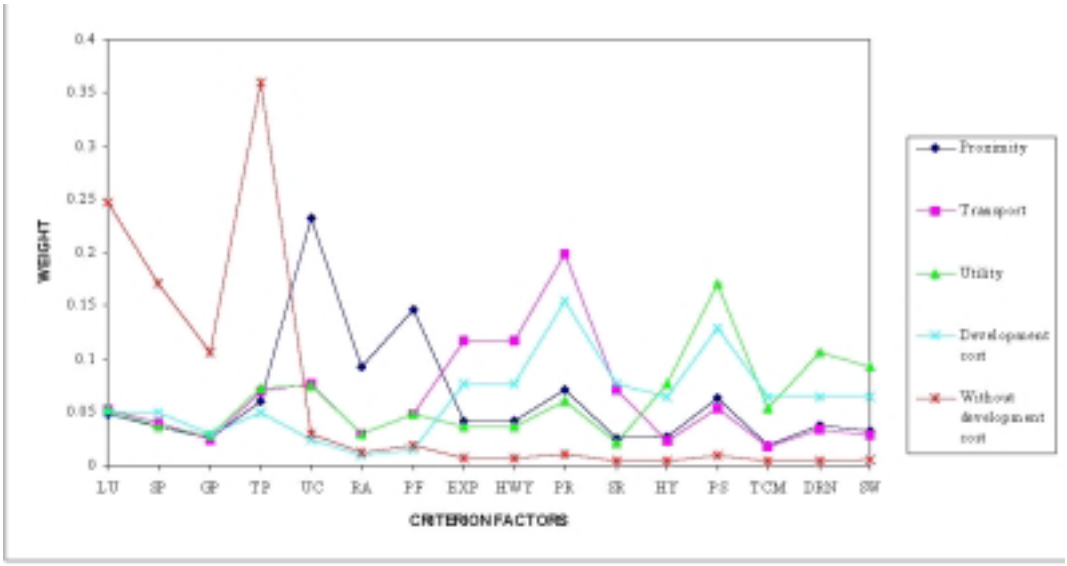


**Figure 2.0: A weight distribution graph for various preference factor**

There is a similar pattern in the weighting distribution of physical factors (LU, SP, GP, and TP) for preferences given to proximity, transport, utility, and development cost. This is due to the assignment of equal to moderate scale in their criterion judgement. The very strong preference scale given to proximity (UC, RA, and PF), transport (EXP, HWY, PR, and SR) and utility factor (HY, PS, TCM, DRN, and SW) in the criterion judgement is being reflected by the high distribution of weights in their sub-criterion factors respectively. The criterion judgement with preference to development without cost factor has a high distribution of weights among the physical factors (LU, SP, GP, and TP) and an even distribution of weights of less than 0.05 to the other criterion factors.

The weight distribution graph shows the sensitivity of the weights for some criterion factors when applying different criterion preferences. This result is quite as expected as indicated in the graph but to what extent does the sensitivity of the weights affect the location of feasible area in the suitability analysis?. A more generalised picture of the sensitivity can be analysed if these weights are multiplied by the criterion maps to produce weighted standardised criterion map layers. These standardised maps are then summed to produce a single map of attribute (criterion) scores. This process provides the basis for the weighted linear combination approach in multiple criteria evaluation (MCE) described in the next section.

## 4.0 SPATIAL COMPARISONS OF FEASIBLE AREAS

The last test on sensitivity of feasible area in MCE technique was based on the decision maker's preferences on criterion judgement. The weighted linear combination process was performed using the criterion weights derived from Table 3.3. Five different sets of feasible areas was obtained from the different criterion preferences which are shown in Figure 3.0. In order to determine their spatial similarity, an image cross-classification process was performed using the statistical module in IDRISI. This is a multiple overlay process where the result shows the location of all combinations of the categories in the original images. The cross-classification was first performed on the feasibility maps resulting from preferences to proximity, transport, and utility. The resulting map was then cross-classified with feasibility map of preference to development cost. The last cross-classification was between feasibility map showing preference to development cost and without preference to development cost. The objective of the cross-classification analysis is to determine the amount of changes in the spatial location of the feasible as the result of changes in criterion preferences. This results determines the sensitivity of decision maker's preferences in the weighted linear combination process of MCE. The result of the cross-classification maps are shown in Figure 3.1.

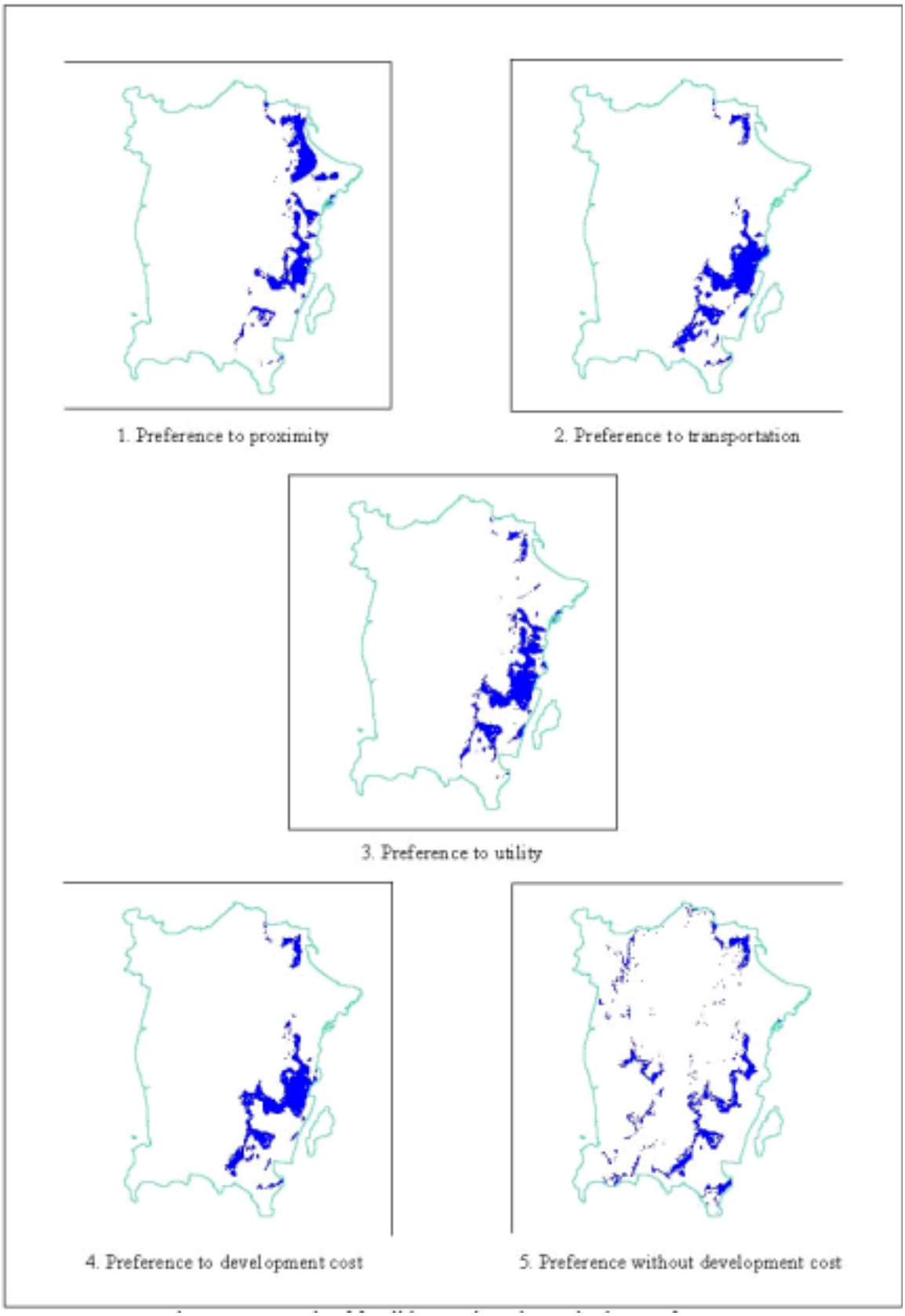


**Figure 3.0: Result of feasible area based on criterion preferences**

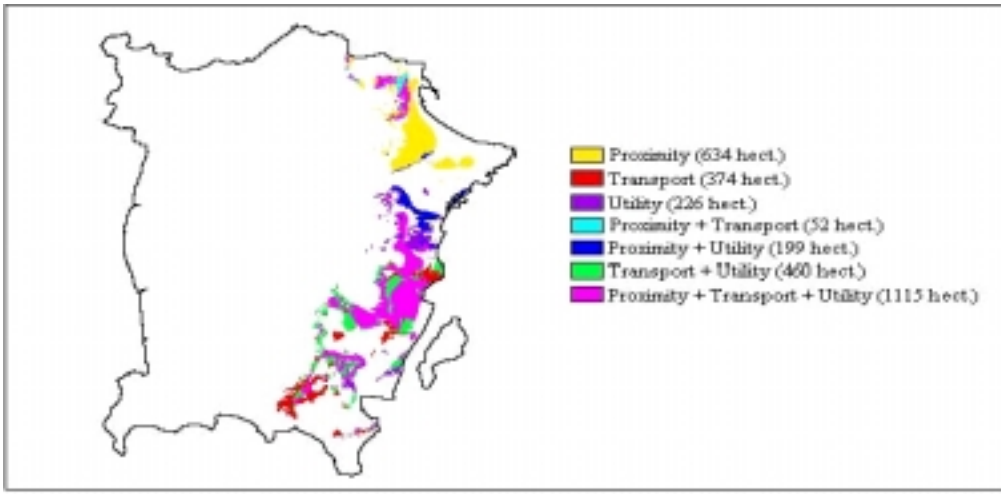


**Figure 3.1a: Cross-classification of feasible area between preferences to proximity, transportation, and utility**

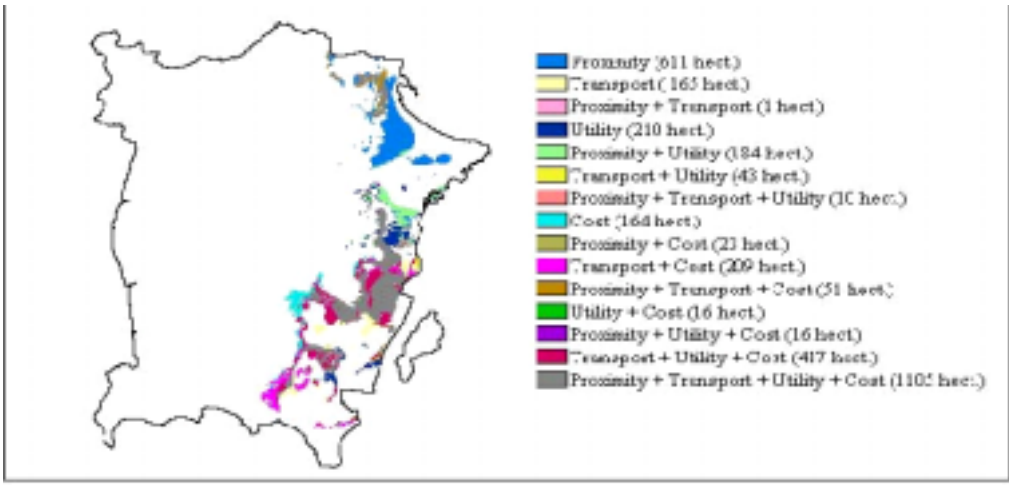


**Figure 3.1b: Cross-classification of feasible area between preferences to proximity, transportation, utility, and development cost**

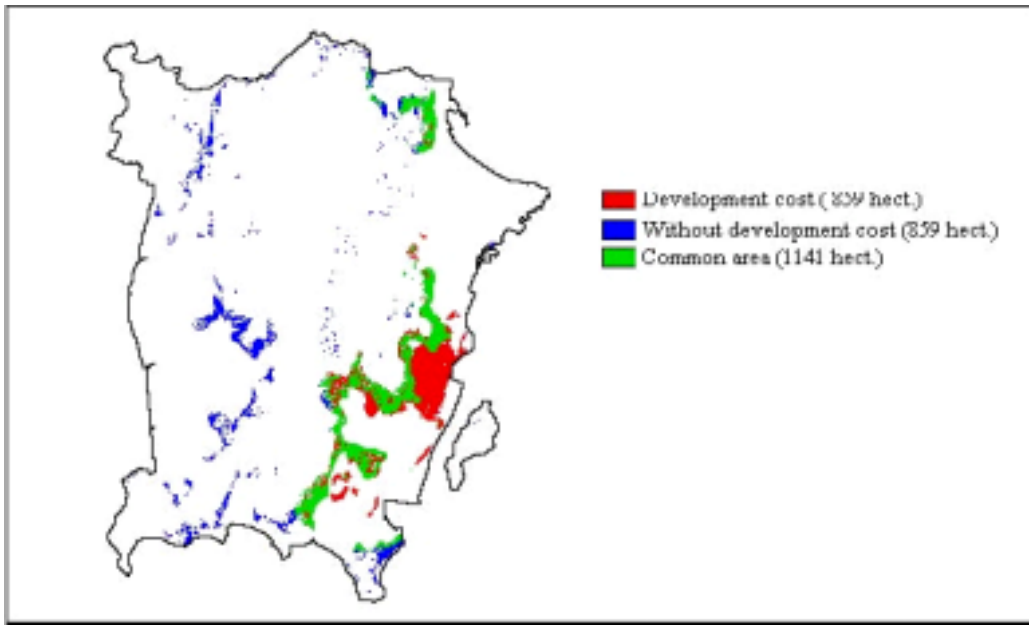


**Figure 3.1c: Cross-clasification of feasible area between preferences to development cost and without development cost.**

### 4.1 Discussion

The first cross-classification map (Figure 3.1a) shows a 56% similarity in location of feasible area. A total amount of 1115 hectares of the feasible area is common even when the preferences in criterion judgement were different. The range of suitability value on the common area obtained from statistical summary using the available analytical module was between 218 to 223. This represents an area of average suitability in each criterion preference. The result shows that the variation made in criterion preferences affects only the areas of high suitability for that individual preference. The spatial pattern of the uncommon areas is concentrated near the different individual preference criteria.

The second cross-classification combines the four criterion preferences; proximity, transportation, utility, and development cost (Figure 3.1b). The result produced a common area of 1105 hectares representing 55% of the feasible area. The common area has high range suitability value (223 to 225). This shows that criterion preference to development cost distributes high weightings to cost-influenced factors, for example the provision of transports and utilities. Therefore, it can be said that criterion judgements that made preferences to development costs give strong preferences to social economical factors. The weighting judgement takes into account the benefits of transport facilities and public utilities to the community.

The last cross-classification determined the amount of feasible area that was common between criterion preferences that consider development cost with that do not consider development cost (Figure 3.1c). The cross-tabulation result shows that 57% of this area (1141 hectares) is common, having a range of suitability value between 198 to 224. In terms of spatial location, the feasible areas where the preference does not consider land development cost are found scattered throughout out the study area. On the hand, the feasible areas that give preference to development cost are located in the north-east and south-east part of the study area only. The difference in spatial location shows that the feasible area will only concentrate on the highly developed part of the study area if the criterion judgement has strong preference to development cost. If physical factors were strongly preferred, then the feasible area for residential land use will be evenly distributed within the study area.

The cross-classification analyses in this section have shown that more than 45% of the feasible area changed in their spatial location when different criterion preferences were made in the weighting judgement. This shows that the outcome of the feasible area in MCE technique is sensitive to the preferences made on the criterion judgement. Therefore, a decision maker must assure that the judgement made in the multiple criterion evaluation (MCE) reflect his preference and objective.

## 5.0 CONCLUSION

From the sensitivity tests, the results show that the location of feasible areas from the MCE model is sensitive to the structure of the criteria and to the decision maker's preference criteria. The hierarchical criteria evaluation in normal AHP allows the formation of sub-criteria as required in suitability analysis but the resulting weight does not reflect the criterion judgement.

Based on these findings, it is proposed that the application of a hierarchical structure with some changes in weighting synthesis. The 'bottom up approach' can introduced for separate evaluation of sub-criterion weights and the initial formation of sub-criterion maps. This will maintains the consistency in criterion judgement and the end result will reflects the criterion judgement given.

In the case of decision makers' preferences, it is proposed that preferences which reflect the objectives of the evaluation, for example in the residential land use allocation, the preferences should be given to criterion factors that can minimise the land developments cost. The result has indicated that the feasible area in MCE technique is sensitive to the preferences made on the criterion judgement. Therefore, a decision maker must assure that the judgement made in the multiple criterion evaluation (MCE) reflect the preference and objective.

## REFERENCE


1. Mohd Sanusi S.A. (1999). Multiple Criteria and Multiple Objective Decision Making Using GIS For Land Selection Process. Buletin Tahunan Institut Jurutera Malaysia Perak. PP 46-50.

2. Mohd Sanusi S.A., and Hasania A.R., (2000). GIS based Multiple Criteria Evaluation for Site Suitability Analysis. National Civil Engineering Conference '99, USM, 24 –26 January

3. Mohd Sanusi S.A., and Wan Aminuddin, W.H., (2000). Optimal Decision Model for Spatial Land Use Allocation. 4th Annual Seminar on Geoinformation Engineering, UPM, 6 –7 Nov.

4. Mohd Sanusi S.A., & W.M.A., Wan Hussin. (2002). Solving Region Contiguity and Compactness Problem in GIS Based Suitability Analysis. International Symposium and Exhibition on Geoinformation 2002. Kuala Lumpur, October 22-24.

5. Mohd Sanusi S.A.,. W.M.A., Wan Hussin and Shamshad Ahmad (2003). Comparison of Normal AHP and Mulatiplicative AHP for Criterion Weighting in GIS Based Suitability Analysis. International Symposium and Exhibition on Geoinformation 2003. Shah Alam, October 13-14.

6. Lootsma, F.A., 1992, *The REMBRANDT system for multi-criteria decision analysis via pairwise comparisons or direct rating*, Report 92-05, Faculty of Technical Mathematics and Informatics, Delft University of Technology, Delft, Netherlands.

7. Olson, D.L., Fliedner, G., and Currie, K., 1995, Comparison of the REMBRANDT system with analytic hierarchy process. *European Journal of Operational Research*, 82, 522-539.

8. Otto, L., and Larson, R.F., 1983, *Statistics: Tool for the social sciences* (Boston: Duxbury Press).

9. Saaty, T.L., 1980, *The Analytic Hierarchy Process* (New York: McGraw Hill)

10. Saaty, T.L., 1987, The analytic hierarchy process - What it is and how it is used. *Mathematical Modelling,* 9( 3-5), 161-176.

11. Saaty, T.L., 1994, *Fundamentals of Decision Making and Priority Theory with Analytic Hierarchy Process* (Pittsburgh: RWS Publications).

12. Voogd, H., 1983, *Multiple Criteria Evaluation for Urban and Regional Planning* (London: Pion Ltd.).

# OPTIMIZATION AND MAXIMIZATION OF ENERGY YIELD IN LOW WIND SPEED REGIONS - A CASE STUDY IN MALAYSIA

By
W. M. A. Wan Hussin[1], M.A. Bawadi[2], A. Shamshad[3] and T. A. Majid

School of Civil Engineering, University of Science Malaysia, Malaysia
Tel: +60-12-5810048
Fax: 60-4-5941009
E-Mail: [1] cewan@eng.usm.my, [2] mhbawadi@yahoo.com, [3] ceshams@eng.usm.my

**Abstract**

*This study was carried out to optimally maximize annual energy output by minimizing the different kinds of losses in low wind locations through the designs of suitable wind turbines layout at the selected site. The site for placement of wind turbines requires detailed topography and roughness information. The method consists of positioning wind turbines so as to maximize the energy absorbed or equivalently minimize the loss of energy due to wake effects. In this work, the cut-in wind speed as an important parameter to evaluate wind turbine in the low wind speed region is studied.*

*Key words: energy conversion, optimization, cut-in and rated wind speeds, site selection, wind farm suitability map.*

## 1.0 INTRODUCTION

The sea surface roughness is quite well known for open ocean condition [Hojstrup, 1994], but on land it is somewhat different if hilly areas and other land features are present. The coastal areas are the most suitable locations for turbine installation to generate energy as the mean wind speed is higher than those inland [Barthelmie, 1996]. Roughness features in the surrounding areas of wind farm also affect the wind speed in the wind farm. The wind energy production capacity depends on the total number of turbines installed in the wind farm.

The wind energy conversion system (WECS) design parameters optimization depends on the level of the analysis. Power curve defines general analysis as cut-in, rated, cut-out wind speed and rated power. For pitch-controlled turbine where the output power is variable in only one range wind speed, the power curve can be used as a simple model of the WECS analysis. The cut-out wind should be neglected because it has a minor effect, and the remaining three parameters can be considered [Gary, 2001]. The complex design parameters such as hub height, the turbine diameter, rotor speed, aerodynamic shape of blades and rated power, etc. can be considered in the more specific analysis. The energy output and the cost of the machine are affected by these parameters [Pallabazer, 2003]. The optimization of the energy output is possible with suitable site analysis [Thomsen et al, 2001, Cavallo, 1997 and Fuglsang et al, 2001]. Energy output estimation for wind turbines of different power ranges has been carried out by several authors [Celik, 2003, Chang et. al, 2003]. Most authors have used the relation between site effectiveness and turbine efficiency with wind speed and also with tip speed ratio, to evaluate the wind turbine generation at the site [Pallapazzer, 1995, Chang et. al, 2003, Thomsen et al, 2001]. The optimization of wind machine at the site has been carried out by [Kiranoudis et. al 2001] for wide range of site characteristics using commercial available wind turbines. The results of various wind farm analysis studied using different models and programs were presented by taking into consideration the different types of topography and wake effects and the mathematical models used for the estimation of the output energy [Baban et. al, 2001; Taylor, 1998].

This study attempts to locate the preliminary sites for wind farms by using geographic information system (GIS). The criteria for wind farm suitability have been identified. Based on these criteria, different spatial data layers such as slope, roads, urban centers, railways, rivers water bodies and transmission lines, etc. were created. Three different approaches have been used to discriminate the suitable areas for wind farm. In the first approach, it is assumed that all the maps are equally important. The second approach incorporates the criteria maps with weights assigned to individual maps according to their

importance. In the third approach, besides the weights of individual maps, the input maps have been divided into four classes. The output consists of classes varying from highly suitable location to not suitable sites. These maps can help the decision makers to locate the final wind farm sites.

Further, the emphasis in the present work is on how to maximize the output energy from low wind speed regions like Malaysia. The analysis started with the selection of suitable areas for wind farming, selection of the most suitable turbines for these regions and the design of the suitable layout of wind turbines. The evaluation of wind turbines has been carried out by concentrating on the relationship between site effectiveness, turbine efficiency and capacity factor with cut-in wind speed.

## 2. 0 STUDY AREA

The study area consists of a part of Mersing in the state of Johor, Malaysia (latitude 2º 16' - 2º 26', departure 103º 48' - 103º 56') and facing the South China Sea. The average wind speed in Mersing is about 3.31 m/s. The highest wind speed frequency in the area is in the southwest direction. The land use map of the area is shown in Fig. 1. The area mainly has oil palm plantation, primary forest, secondary jungles and swamp areas. The average elevation of the area is about 100m (Fig. 2).

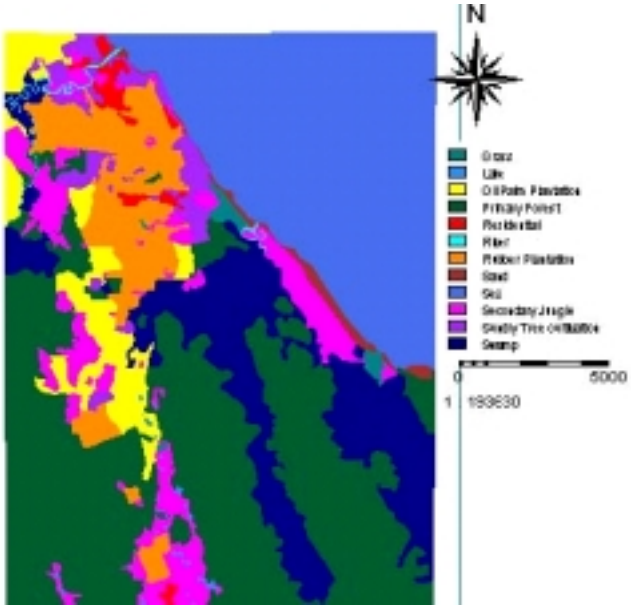


**Fig. 1. Landuse map of the study area**

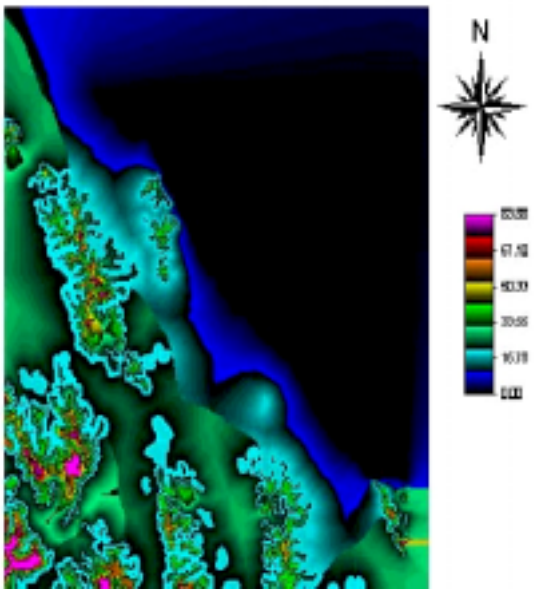


**Fig. 2. Digital elevation model of the study area**

## 3. 0 THE WIND TURBINES USED

The technical data of 10 wind turbines used in the present study is given in Table 1. The wind turbines were selected from amongst many different commercial available machines in the world. The turbine models have been chosen based on the different ranges of parameters. All chosen turbines are small in size, suitable for low energy needs in remote areas such as homes, small industrial projects, telecommunication system or traffic signals and agriculture projects.

**Table 1: Technical data for different models of wind turbines**

| | $P_r$ kw | $v_{ci}$ m/s | $v_r$ m/s | $v_{co}$ m/s | $v_{op}$ m/s | $D$ m | $\eta_r$ | $\eta_{max}$ |
|---|---|---|---|---|---|---|---|---|
| Enercon E-30 | 300 | 2.5 | 12.0 | 28.0 | 4.33 | 30.0 | 0.401 | 0.774 |
| Bergey XL 50 | 50 | 2.0 | 11.0 | None | 5.50 | 14.0 | 0.400 | 0.871 |
| BWC EXCEL 10 | 10 | 3.0 | 13.8 | None | 4.60 | 6.7 | 0.176 | 0.327 |
| Pitchwind PW30/14 | 30 | 3.0 | 10.0 | 30.0 | 5.19 | 14.0 | 0.320 | 0.451 |
| Pitchwind PW25/14 | 25 | 3.0 | 9.5 | 30.0 | 5.19 | 14.0 | 0.311 | 0.421 |
| Pitchwind PW20/14 | 20 | 3.0 | 9.0 | 30.0 | 5.19 | 14.0 | 0.293 | 0.380 |
| Proven WT15000 | 15 | 2.5 | 12.0 | 30.0 | 4.33 | 9.0 | 0.223 | 0.430 |
| Proven WT6000 | 6 | 2.5 | 12.0 | 30.0 | 4.33 | 5.5 | 0.240 | 0.461 |
| Proven WT2500 | 2.5 | 2.5 | 10.0 | 30.0 | 4.33 | 3.5 | 0.424 | 0.696 |
| Proven WT6000 | 0.6 | 2.5 | 10.0 | 30.0 | 4.33 | 2.55 | 0.192 | 0.315 |

## 4.0 ENERGY CONVERSION

The site effectiveness analysis using the different wind turbines was carried out in the selected preliminary site at Mersing. Fig. 3 shows that the plot of å versus $v_{ci}$ at constant $v_r$, for all the models. The function of site effectiveness with cut-in speed shows that the turbines have the decreasing values of site effectiveness with increasing cut-in wind speed. Therefore, the turbines with high cut-in speed are not suitable in this region.

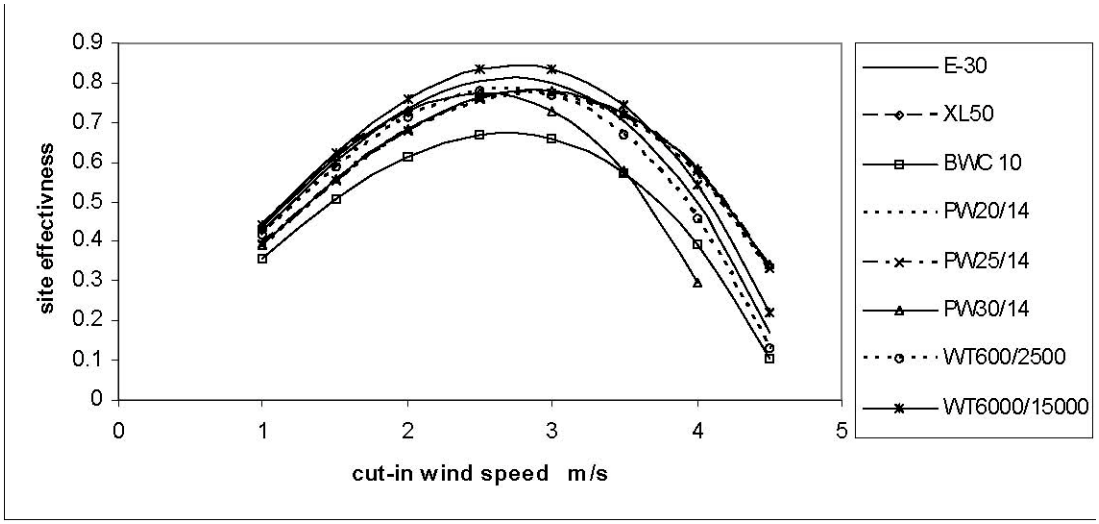


**Fig. 3. Site effectiveness versus cut-in, at constant rated wind speed at Mersing site**

Four different models of turbines having different cut-in and rated wind speeds were tested for the variation of capacity factor ($C_F$) and $v_{ci}$. Fig. 4 shows that the curve skewed downward to the right side. It reveales that the machines having higher cut-in wind speed are not suitable to be sited at this particular location.

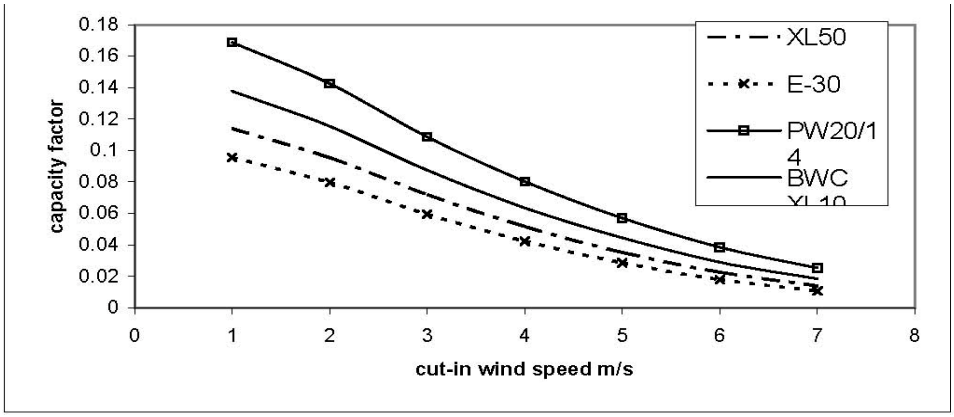


**Fig. 4. Relation between $C_F$ and $v_{ci}$ at Mersing site**

Fig. 5 shows that the turbines with low cut-in wind speeds have higher values of energy efficiency. Therefore, the cut-in speed is an important factor for determining the WECS efficiency and not only the size and the rated power capacity of the turbine. The energy efficiency of small wind turbine (PW20/14) with the 20kW is low because the cut-in speed is 3 m/s and the other turbines ranging between 2m/s – 2.5m/s. With the low cut-in wind speed, this turbine is suitable for low wind speed regions like Mersing.

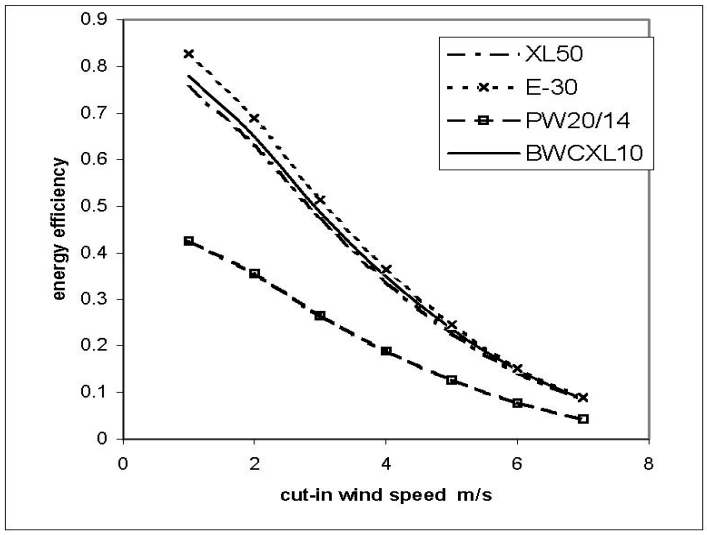


**Fig. 6. Energy efficiency as a function of $v_{ci}$ at Mersing site**

## 5.0 DESIGN OF PROPOSED SITE FOR WIND TURBINES

The identification of suitable sites and potential wind farm areas are essential in wind energy research and development. This must be exploited only in suitable areas from economic point of view. In this type of evaluation, many variables are involved. It is also important to develop site specific criteria based on the available literatures which are accepted nationally. There are a number of constraint factors which should be taken onto account when planning wind farms and these include the wind speed, proximity to residential areas, noise, topography, ecology, proximity to agricultural land and conservation areas, the distance from electricity grid lines, adjacent terrain, vegetation covers and types, etc. The study can be carried out by giving equal weight to all the data layers. Since all the variables may not be equally important, they may also be weighted according to their relative importance for the optimum generation of wind power.

The wind farm suitability map (Fig. 7) based on index overlay with multi-class map has been classified under three categories namely highly suitable, suitable and not suitable areas. The highly suitable areas are near the sea where the slope is less than 20%. The spatial patterns on the suitability map show the influence of urban areas, single dwellings and the electric grid lines. The suitability maps created based on the assignment of different weights with multi-class maps are not very much different from the first one and this suggests that the similar patterns exist.

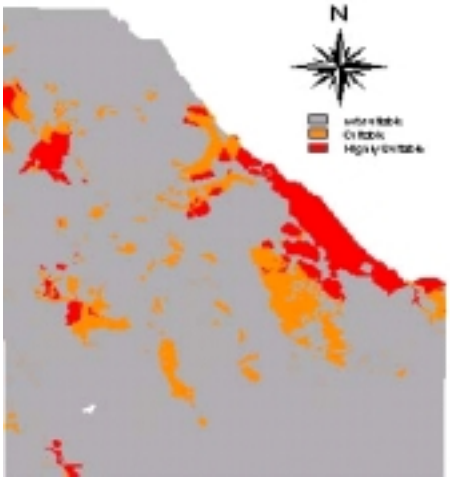


**Fig. 7. Wind farm site selection suitability map by index overlay with multi-class maps**

## 6.0 TOPOGRAPHIC EFFECTS

If a wind farm site is situated on an open level ground with a uniform roughness, then the wind speed characteristics will be the same all over the site [Neff and Meroney, 1998]. However, the wind speed on real sites is usually affected by the roughness changes and its height variations. In order to calculate the energy yield of a wind farm, it is therefore necessary to calculate the wind speed variation across the wind farm site.

Wind turbines are often sited on top of hills to take advantage of higher wind speeds that generally prevail there, but this makes the prediction of the wind speeds at a prospective wind turbine site more difficult [Morfiadakis et al, 1996]. For a smooth hill that does not promote separated flow, there will be an increase in wind speed close to the ground due to the shape of the hill [Neff and Meroney, 1998], because of the possibility that the ratio of wind speed between 2 heights could be close to or less than 1. The use of the power law is preferred to represent the variation of wind speeds (roughness height is only valid for ratios greater than 1). The more suitable areas for wind farm are those near the sea and areas with high altitude [Baban et. al, 2001; Tylor, 1998]. With these two main criteria, the site of wind machine should be selected.

The proposed site selected is in Mersing has an area of 3 x 4 km$^2$ (Fig. 8). Three layouts in the site have been selected for wind turbines (A) and (C) at 100m and (B) at 200m above sea level. The variation of heights and surface roughness of the terrain affect the wind speeds across the wind farm [Finardi et. al, 1998] and therefore topographic data will usually be needed. The height of the terrain is most commonly specified using contours of constant height at typically 20 intervals.

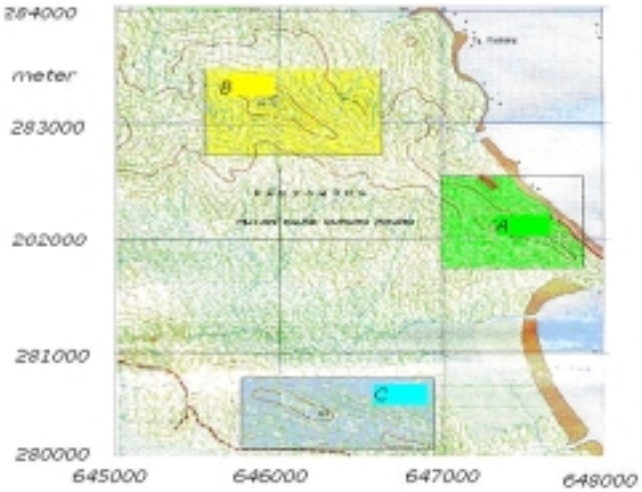


**Fig. 8. Wind farm site with three proposed layouts of wind turbines**

This data was digitized directly from a map. Equatorial forest and palm trees with different heights are the typical coverage within the area, mostly flat nearer the coast but influenced by many roughness features like trees. Within this area, the proposed sites are selected on undulating ground with elevations varying from 20 to 240 m (Fig 8).

The wind flow in the study area (3 x 4 km) is presented in the Fig. 9. This figure clearly shows that at site B (200 m) is subjected to intensive wind speeds from all directions and more suitable for wind turbine installation. The mean wind speed at the site from different directions also shows that the wind speeds at the height terrain (100 m and 200 m) are high.

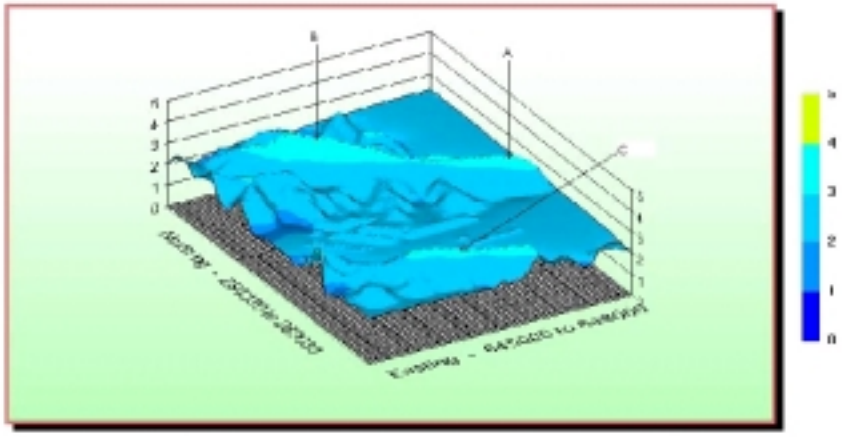

**Fig. 9. Wind speed at the site (m/s)**

## 7.0 AVAILABLE POWER DENSITY

The wind power density (W/m$^2$) from different directions in the proposed wind farm site is shown in Fig. 10. The high terrain (200 m, place B) presents the maximum values between 80-90 w/m$^2$. Places A and C (100 m) have values between 40 – 50 w/m$^2$. The minimum values (10 –20 w/m$^2$) are shown in the low height areas.

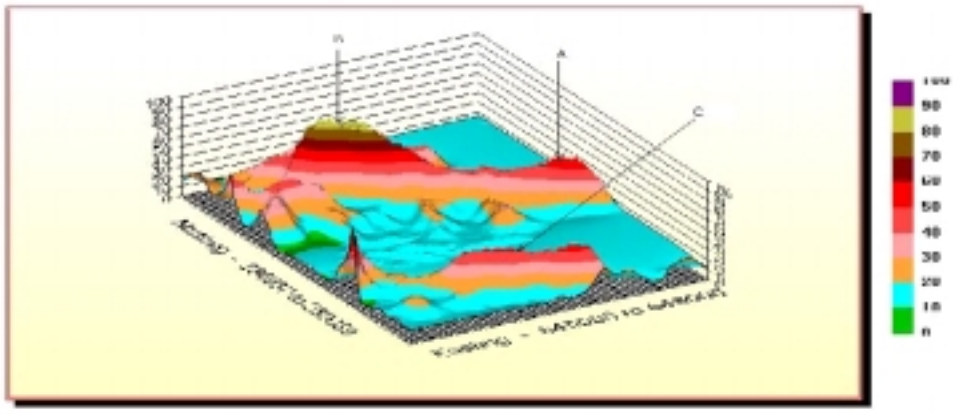

**Fig. 10. Power density w/m$^2$**

## 8.0 ENERGY PRODUCTION

Fig. 11 shows that the mean energy yield is higher at high elevation areas and varies from 0.20 to 0.25 GWh/y, while the minimum values (<0.05 GWh/y) are in the low elevation areas. The places with 100 m elevations have the energy yield between 0.1 and 0.15 GWh/y. The mean values of energy yields between 0.05 and 0.1 (in red colour).

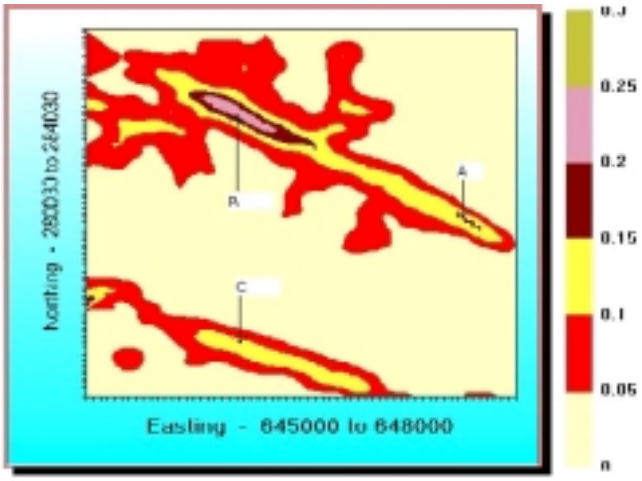


**Fig.11. Turbines energy yield (GWh/yr)**

## 9.0 TURBINE ENERGY YIELD

The topographic, turbine, wind and wake data are brought together to calculate the energy yield of a wind farm as the sum of individual calculations around the site. The procedure for obtaining the yield for each turbine requires the wind frequency information for the wind speed and direction. For each turbine, it is necessary to obtain the turbine geometric data, the height wind speed factor (wind speed at the turbine hub height relative to the wind speed at the anemometer location) and the topographic wind speed factor (hub height wind speed at the turbine location with the wind speed at hub height at the anemometer location).
The analysis was carried out to estimate the possibility of generating the energy at the proposed site. The output energy from wind turbine was estimated using Enercon (E-30) wind turbine. The annual yield of a wind farm is calculated by combining the information from the 4 sources, namely, topographic wind speed variation, wind turbine data (geometry, power and thrust), wind distribution and profile data and wakes representation.

Tables 2, 3 and 4 show the basic and net energy yields of wind turbines in the three layouts A, B and C. In layout A (Table 2) where the site is located at 100 meters, the topography has negative effects and thus reduced the energy of four turbines (2, 3, 4 and 5) from –11.10 to –27.16 %. The energy yield from these turbines is decreased and is less than the basic energy yield. The topography effect on turbine 1 has positive change (5.56 %) and this has increased the total energy yield from 133.4 MWh to 140.7 MWh. The wake losses have small values for all turbines (< 1%) and the very low loss on the turbine 1 (-0.08 %). The topographic affects in the layout A is –16.25 % and the wake loss is –0.54 %. These negative values of topography and wake lead to the decrease in the energy production at the site.

Layout B (Table 3) located in terrain at height 200 m shows that the general effect of topography is positive (19.82 %) and the wake loss is low (-0.60 %). The total energy production increased from 667.0 MWh to 795.1 MWh for all turbines. Three turbines (2, 3 and 4) located on the top points at height 200m have the positive effects (32.91 %, 49.77 % and 36.83 % of the basic values), respectively. The other two turbines (1 and 5) have the negative values (-0.25 % and -20.16 %). The total wake loss on the layout B is lees than 1 % of the total basic energy values.

Layout C (Table4) shows that the total net energy production is affected negatively by the topography, where the basic energy yield is 0.6671 and the net energy yield is 0.5823, the lost values is about (-12.22 %) by topography effects and (-0.55 %) by the wake loss. All turbines are under the topographic effects with different values and under wake losses. The comparison between three layouts shows that layout B which is the higher terrain site shows that the effect of topography is positive and the wake loss is low.

Table 2 Basic and net energy in layout A.

| Turbine | Basic energ MWh | Topographic Effects % change | Wake losses %loss | net energy MWh |
|---|---|---|---|---|
| 1 | 133.4 | 5.56 | -0.08 | 140.6 |
| 2 | 133.4 | -11.10 | -0.76 | 117.7 |
| 3 | 133.4 | -23.05 | -0.79 | 101.9 |
| 4 | 133.4 | -25.5 | -0.54 | 98.9 |
| 5 | 133.4 | -27.16 | -0.68 | 96.5 |
| Total | 667.0 | -16.25 | -0.54 | 555.6 |

Table 3 Basic and net energy in layout B.

| Turbine | Basic Yield MWh | Topographic Effects % change | Wake losses %loss | Total Yield MWh |
|---|---|---|---|---|
| 1 | 133.4 | -0.25 | -0.14 | 133.0 |
| 2 | 133.4 | 32.91 | -0.54 | 176.5 |
| 3 | 133.4 | 49.77 | -0.66 | 198.6 |
| 4 | 133.4 | 36.83 | -0.84 | 181.1 |
| 5 | 133.4 | -20.16 | -0.78 | 105.9 |
| Total | 667.0 | 19.82 | -0.6 | 795.1 |

Table 4 Basic and net energy in layout C.

| Turbine | Basic Yield MWh | Topographic Effects % change | Wake losses %loss | Total Yield MWh |
|---|---|---|---|---|
| 1 | 133.4 | -20.39 | -0.55 | 105.6 |
| 2 | 133.4 | -9.26 | -0.88 | 120.0 |
| 3 | 133.4 | -12.80 | -0.62 | 115.6 |
| 4 | 133.4 | -11.39 | -0.60 | 117.5 |
| 5 | 133.4 | -7.26 | -0.14 | 123.6 |
| Total | 667.0 | -12.22 | -0.55 | 582.3 |

## 10.0 WIND FARM OPTIMIZATION

The optimization model is based on the wind farm layout, wind rose data, wind flow at the site and the turbine data. The optimization model is used to maximize the energy yield from the optimum layout. The turbine separation is the important factor in reducing the losses of wind speed and energy. The minimum distance between turbines is 10 diameter times.

The optimization process is required to repeatedly restart the calculation. The number of calculations is the maximum number made after each restart. A small number of restarts are often sufficient to get fairly close to the optimum, and are recommended as a first step in optimization. A larger number would probably be made to fine tune the optimum (randomization can, but would not normally, be used when fine tuning). These options are presented in Table 5 [Manual of WindFarm 3.1 Software].

**Table 5. The optimizations options for identified new optimum layout**

| | |
|---|---|
| **GENERAL DATA** | |
| Run type | Maximum energy yield |
| Fixed cost (%) | N/A |
| Minimum No of turbines | N/A |
| No of fixed turbines | 5 |
| Region limits W, S, E, N | 645000 280030 648000 284030 |
| **CALCULATION CONTROL** | |
| Calculation type | Simple and fast |
| Number of calculation | 1000 |
| Number of restarts | 100 |
| Calculation tolerance | 5.0e-006 |
| Restart tolerance | 5.0e-006 |
| Random movement limit | 150 |
| Random limit reduction | 5 |
| **CONSTRAINTS** | |
| Turbine separation | 10 |
| Turbine margin | 0.2 |
| House separation | 500 |
| House margin | 20 |
| Maximum gradient (%) | Not applied |
| Gradient margin (%) | N/A |
| **NOISE CONSTRAINTS** | |
| Noise model | Broadband |
| Noise limit | 30 |
| Noise margin | 0 |
| Sound power level | 100 |
| Attenuation | 0.005 |
| Tonal penalty | None |
| Reference condition used | |
| Wind speed for calculation | 3.31 |
| Height for calculation | 50 |
| Wind profile exponent | 0.13 |

The basic energy (without topographic and wake effects) and net (includes these effects) in the optimum layout is presented in Table 6. By comparing Table 6 with that of Tables 2, 3 and 4, it reveals that the difference between basic and net energy is higher for all turbines. Table 6 presents the basic and total energy yield from individual wind turbine with the topography and wake effects in the optimum layout.

**Table 6. Basic and net energy yield in the optimum layout**

| Turbine | Basic yield MWh | Topography effects % change | Wake losses % loss | Total yield MWh |
|---|---|---|---|---|
| 1 | 133.4 | 34.02 | -0.01 | 178.8 |
| 2 | 133.4 | 62.27 | -0.16 | 216.2 |
| 3 | 133.4 | 107.84 | -0.58 | 275.7 |
| 4 | 133.4 | 100.28 | -1.14 | 264.2 |
| 5 | 133.4 | 9.62 | -0.64 | 145.3 |
| Total | 667.0 | 62.81 | -0.55 | 1080.1 |

## 11.0 CONCLUSION

The possibility of generating electricity from wind in Mersing is acceptable. It will fulfill the local demands in the rural areas or for small industrial projects. Turbines with higher cut-in wind speeds are not suitable to be used in this low wind area. Thus the design of wind turbine should be made carefully for such sites. Wind turbine with special design (tower length, bald number and rotor diameter) closed with location condition and small cut-in wind speeds between 2 m/s and 2.5 m/s, makes Mersing site more suitable. The capacity factor does not show acceptable values in the site. The PW20/14 turbine has the higher values of $C_F$ while BWCEXCEL10 has the minimum values. The in-depth study and analysis of the topography of the site which include roughness, terrain and its surrounding areas are necessary as this provide a good support towards increasing the total output energy.

GIS can therefore help wind farm developers, land use planners and politicians in selecting suitable sites for wind farming. For this purpose, the systems have been developed within ILWIS which illustrates the potential of the analytical tools. Since the study of wind farm site selection is quite subjective in nature, a decision support system should be integrated to achieve better results. The various maps, which are developed along with the suitability maps, can help the decision makers in the final selection of the wind farm location and to carry out the detail analysis of the performance of the wind turbines.

The feature data nearby the site namely the existence of residential areas (outside the recommended limiting distance), major and minor roads, and the tree coverage, are various. The effects of these features may provide more influence to the wind flow and the generation of electricity as compared to the terrain heights. With the help of GIS software, the estimation of the best location for the wind machine installation using DEM and the feature analysis model leads to the good optimized results of output energy. The use of GIS and 1:25,000 topographic maps therefore provide a better understanding for the analysis and the estimation of energy from such sites. The roughness and the height contours also helped to determine the optimum wind speed and the output energy from the wind farm through GIS. This study can be useful to the energy planners in designing and selecting the size of wind turbine.

The optimization and maximization of energy yield from the optimal layout requires various studies on the technical improvement as well as the meteorological analysis that include terrain, topography and turbulence nearby wind farms. The analysis of the topography and the terrain produced good results in the optimization of energy yield in low wind speed areas. In the optimal layout, the installation of wind turbines may be carefully selected at points with low topographic effects and low wake changes. The distance between turbines has to be far enough to reduce the ambient wake. This ambient wake increases when the distance between turbines is short and if many turbines were put in many rows. In the design of wind farm for low wind speed locations, one row of turbines is more suitable. The energy yield increases from 794.5 MWh to 1080.1MWh in optimum layout. This increase is related to the positive change of topography from 19.82 in layout B to 62.81 % in optimum layout and corresponds to a wake reduction from –0.6 to –0.55. The increase of energy yield is about 36.84 %. The difference between the basic and net energy yield in the optimum layout is about 413.1MWh (62 %) for all the 5 turbines.

## REFERENCES


1. Baban, S. M. J. and Parry, T. (2001). Developing and applying a GIS-assisted approach to locating wind farms in the UK. *Renewable energy* (24): 59-71.

2. Barthelmie R. J. and Palutikof J. P. (1996). Coastal wind speed modeling for wind energy applications. *Journal of Wind Engineering and Industrial aerodynamics* (62): 213 – 236.

3. Cavallo, A. J. (1998). Wind turbine cost of electricity and capacity factor. *Solar Energy* (119): 312–31.

4. Celik A. N. (2003). Energy output estimation for small-scale wind power generators using Wiebull representative wind data. *Journal of Wind Engineering and Industrial Aerodynamics*. (28): 851-871.

5. Chang, T. J., Wu, Y.T., Hsu, H. Y., Chu, C. R. and Liao, C. M. (2003). Assessment of wind characteristics and wind turbine characteristics in Taiwan. *Renewable Energy* (28): 851-871.

6. Finardi S., Tinareli G., Faggian P. and Brusasca G. (1998). Evaluation of different wind field modeling technique for wind energy applications over complex topography. *Journal of Wind Engineering and Industrial aerodynamics*. 74(76): 283 – 294.

7. Fuglsang, P. and Thomsen, K. (2001). Site-specific design optimization of 1.5–2:9 MW wind turbines. *Solar Energy* (123): 296–303.

8. Gary, L. Johnson. (2001). *Electronic edition.* Wind energy systems [online], [Accessed 2004]. Available from World Wide Web:

9. Kiranoudis, C. T., Voros, N. G. and Maroulis Z. B. (2001). Short-cut design of wind farm. *Energy Policy* (29): 567-578.

10. Morfiadakis, E. E., Glinou, G. L. and Koulouvari M. J. (1996). The suitability of the von Karman spectrum for the structure of turbulence in complex terrain wind farm. *Journal of Wind Engineering and Industrial Aerodynamics.* (62): 237-257.

11. Neff, D. E. and Meroney, R. N. (1998). Wind-tunnel modeling of hill and vegetation influence on wind power availability. *Journal of Wind Engineering and Industrial Aerodynamics.* (74-76): 335-343.

12. Pallabazzer, R. (2003). Previsional estimation of the energy output of wind generators. *Renewable Energy* (29): 413 – 420.

13. Pallabazzer R. (1995). Evaluation of wind –generator potentiality. *Solar Energy* 55(1): 49-59.

14. Thomsen, K., Fuglsang, P. and Schepers, G. (2001). Potential for site-specific design on MW sized wind turbines. *Solar Energy Engineering*. (123): 304–309.

# SESI KE 23 *United Nations Group of Expert on Geographical Names* (UNGEGN)

Oleh
Ahmad Fauzi Bin Nordin
Pengarah Ukur Bahagian Pemetaan, JUPEM
*fauzi@jupem.gov.my*

Mohamad Kamali Bin Adimin
Pengarah Ukur Seksyen Kartografi, JUPEM
*kamali@jupem.gov.my*

## TUJUAN KERTAS DAN LATAR BELAKANG

Kertas ini bertujuan untuk menengahkan program dan aktiviti UNGEGN dan melaporkan hasil Sesi Ke 23 *UNGEGN* yang telah diadakan pada 28 Mac hingga 4 April 2006 di Vienna International Center, Austria. Di bahagian akhir kertas ini dikemukakan beberapa syor yang dirasakan wajar untuk kebaikan negara.

UNGEGN telah ditubuhkan bagi memenuhi Resolusi 715A (xxvii) pada 23 April 1959 dan Resolusi 1314 (XLIV) pada 31 Mei 1968 *the United Nations Economic and Sosial Council (ECOSOC).* Keputusan penubuhannya telah diambil pada mesyuarat ECOSOC yang ke 1854 pada 4 Mei 1973, untuk mengadakan langkah standardisasi ke atas nama-nama geografi di peringkat kebangsaan dan antarabangsa. Tujuan, prinsip-prinsip, fungsi serta komposisi UNGEGN secara terperinci boleh dirujuk di laman web *http://www.unstats.un.org/unsd/geoinfo/ungegnmandate.htm.*

## BAHAGIAN DAN KUMPULAN KERJA DI BAWAH UNGEGN

Kumpulan-kumpulan pakar telah dibentuk daripada beberapa Bahagian Linguistik / Geografi yang telah ditubuhkan di Persidangan Standardisasi Nama-Nama Geografi Bangsa-bangsa Bersatu. Bahagian-bahagian *(Divisions)* yang mengandungi kumpulan pakar linguistik/geografi tersebut adalah:-

*i. Africa Central Division*
*ii. East African Division*
*iii. South Africa Division*
*iv. West African Division*
*v. Arabic Division*
*vi. East Asia other than China*
*vii. Asia South-East and South West Pacific Division*
*viii. Asia South-West division (Other than Arabic)*
*ix. Baltic Division*
*x. Celtic Division*
*xi. China Division*
*xii. Dutch And German Speaking Division*
*xiii. East Central and South-East Europe Division*
*xiv. Eastern Europe, Northern and Central Asia Division*
*xv. East Mediterranean Division (Other than Arabic)*
*xvi. French-Speaking Division*
*xvii. India Division*
*xviii. Latin America Division*
*xix. Norden Division*
*xx. Romano-H ellenic Division*
*xxi. United Kingdom Division*
*xxii. USA/Canada Division*

Di bawah payung UNGEGN ini beberapa Kumpulan Kerja *(Working Group)* juga telah ditubuhkan bagi menangani isu-isu berkaitan yang merentasi Bahagian-bahagian (Divisions) di bawahnya. Antara kumpulan-kumpulan kerja tersebut ialah bagi:-

*i. Country Names*
*ii. Toponymic Data Files and Gazetteers*
*iii. Toponymic Terminology*
*iv. Publicity and Funding*
*v. Romanization Systems*
*vi. Training Courses in Toponymy*
*vii. Evaluation and Implementation*
*viii. Exonyms*
*ix. Pronunciation*
*x. Promotion of Indigenous and Minority Group Names*

Setiap Kumpulan Kerja telah dan sedang menjalankan beberapa aktiviti termasuk projek dan penerbitan garis panduan yang berkaitan dengan bidang masing-masing.

**PROGRAM – PROGRAM UNGEGN**

UNGEGN berdasarkan tanggung jawab yang telah diberikan telah merangka program - program utamanya seperti berikut:-

- Menggalakkan penubuhan pihak berkuasa di setiap Negara yang bertanggungjawab terhadap standardisasi nama-nama tempat dan *feature*s di peringkat kebangsaan.

- Menyediakan dan menggalakkan program-program latihan kepada Negara-negara yang berhasrat untuk membentuk pihak berkuasa di peringkat kebangsaan yang bertanggungjawab terhadap penamaan nama-nama tempat serta mengadakan daftar berkaitan dengannya.

- Mempromosi penggunaan nama – nama standard dalam sesuatu negara di atas peta dan dokumen-dokumen lain.

- Menggalakkan penyebaran nama – nama tempat yang standard melalui penerbitan Gazetir Kebangsaan.

- Mempromosi pembangunan *national automated data processing* dan pertukaran teknologi di antara negara-negara.

- Menggalakkan kerjasama antara negara di dalam standardisasi nama tempat dan *features* yang merentasi sempadan antarabangsa.

- Mempromosi penggunaan terminologi standard berkaitan nama-nama tempat dan f*eatures.*

**DELEGASI MALAYSIA DI SESI UNGEGN KE 23**

Dalam Sesi ke 23 UNGEGN baru-baru ini, Malaysia yang menganggotai *Asia South-East and Pacific-West Division* telah diwakili oleh:-

i. Y.Bhg. Dato' Hamid Bin Ali
Ketua Pengarah Ukur dan Pemetaan Malaysia

ii. En. Ahmad Fauzi Bin Nordin
Pengarah Ukur Bahagian Pemetaan, JUPEM

iii. En. Mohamad Kamali Bin Adimin
Pengarah Ukur Seksyen Kartografi, JUPEM

**Antara delegasi dari 22 Bahagian dan 10 Kumpulan Kerja semasa perasmian Sesi Ke 23 UNGEGN**

**PROGRAM**

**Kehadiran**

Sesi Ke 23 UNGEGN kali ini telah dihadiri oleh 250 peserta dari 67 negara mewakili 22 Bahagian kumpulan pakar linguistik / geografi selain 25 pemerhati dari pelbagai organisasi seluruh dunia. Sesi ini dipengerusikan oleh *UNGEGN Chairperson* sekarang iaitu Ms Helen Kerfoot dari Kanada.

**Agenda**

Seperti biasa, *provisional agenda* bagi sesuatu Sesi UNGEGN telah diedarkan kepada Bahagian, Kumpulan Kerja serta pakar-pakar negara anggota lebih awal sebelum sesi tersebut berlangsung. Secara umumnya agenda ini dibahagikan kepada item-item yang telah ditetapkan. Manakala laporan-laporan dan perbincangan adalah merujuk kepada kertas kerja–kertas kerja *(working paper)* yang disediakan oleh Bahagian, Kumpulan Kerja, *Liaison Officers* serta Negara-negara anggota bagi item-item yang berkaitan.

**Perasmian Sesi Ke 23 UNGEGN dan Perutusan *UNGEGN Chairperson***

Sesi Ke 23 UNGEGN telah dirasmikan oleh Mr. Paul Cheung, *Director of the UN Statistics Division (DESA)*. Antara intisari penting yang beliau sampaikan ialah mengenai isu-isu standardisasi serta kepentingan nama-nama geografi terhadap GIS, pemetaan dan kutipan data perangkaan. Beliau juga menyatakan komitmennya mengenai bantuan dan sokongan DESA untuk aktiviti penerbitan dan latihan berkaitan nama-nama geografi.

Ms Helen Kerfoot selaku UNGEGN Chairperson pula menyatakan mengenai kepentingan nama-nama geografi sebagai salah satu elemen utama *cultural identity t*erutamanya nama-nama yang mempunyai *georeference* yang betul yang boleh digunakan untuk kemudahan bantuan perikemanusiaan bagi mangsa-mangsa sesuatu tragedi. Bagi maksud ini beliau juga mengambil kesempatan untuk mengedarkan maklumat terkini mengenai senarai pihak berkuasa kebangsaan bagi nama geografi untuk mudah dihubungi.

**Laporan Sesi Ke 23 UNGEGN**

Di hari terakhir Sesi UNGEGN ini satu laporan telah dikeluarkan terhadap aturcara serta hasil perbincangan dari 132 kertas kerja yang telah dibentangkan. Laporan mengandungi 147 perkara ini antara lain mengandungi perkara-perkara berikut:

i. Rujukan utama

ii. Kehadiran
iii. Upacara perasmian
iv. Penerimaan agenda
v. Laporan *Chairperson*
vi. Laporan Bahagian
vii. Laporan *Liaison Officer*
viii. Laporan Kumpulan Kerja
*ix. Adoption of the report*

Kertas-kertas kerja yang dibentangkan antaranya adalah mengenai polisi, laporan projek serta isu-isu pelaksanaan yang berkaitan dengan:

- Teminologi toponimi
- Kursus dan latihan bengkel
- *Toponymic data files and gazetteer*
- *Romanization system*
- *Country names*
- Dana dan publisiti
- Penilaian dan pelaksanaan
- *Exonyms*
- *Pronunciation*
- *Promotion of indigenous and minority group names*

**Laporan Aktiviti Malaysia**

Di dalam Sesi Ke 23 UNGEGN ini Malaysia mengemukakan *Country Report* mengenai aktiviti nama geografi melalui kertas CRP 17 item *5* di bawah *Report of Division* yang antara lain melaporkan mengenai:

i. Latar belakang penubuhan, fungsi serta struktur organisasi Jawatankuasa Kebangsaan Nama Geografi.

ii. Perancangan serta aktiviti berkaitan nama geografi:

- Penerbitan dokumen Garispanduan Penentuan Nama Geografi.
- Pembangunan Pangkalan Data Nama Geografi dan *Web Gazetteer.*
- Penganjuran kursus dan bengkel.

**Mesyuarat Bahagian dan Kumpulan Kerja**

Sempena Sesi Ke 23 UNGEGN ini juga, kebanyakan Bahagian dan Kumpulan Kerja telah mengambil kesempatan untuk mengadakan mesyuarat bagi membincangkan beberapa keputusan yang telah diambil samada di peringkat UNGEGN pusat, ataupun Kumpulan Kerja disamping membuat perancangan kerja dan aktiviti masing-masing. Dalam hal ini delegasi Malaysia telah menyertai Mesyuarat *Asia South-East and Pacific South-West Division* pada 30 Mac 2006 di Vienna *International Center*. Antara keputusan mesyuarat tersebut adalah berkaitan:-

i. Penerbitan Gazetir dan peta bagi kawasan *Asia South-East and Pacific South-West Division.*

ii. Persetujuan bagi mengadakan Mesyuarat Bahagian akan datang di Jakarta pada Ogos 2006 bersempena dengan *TechnoMap Exhibition.*

iii. Persetujuan untuk menetapkan tempoh perkhidmatan Pengerusi *Asia South-East and Pacific South-West Division,* iaitu mengikut tarikh dan tempoh dari satu Mesyuarat UNGEGN ke Mesyuarat UNGEGN selanjutnya. Ini kerana dengan tiadanya tempoh tetap perlantikan seperti mana amalan sekarang, ianya akan menjejaskan urusan Bahagian tersebut.

iv. Persetujuan untuk mengaktifkan lagi usaha menganjurkan latihan di peringkat Bahagian dengan memohon kerjasama dari pihak Sekretariat UNGEGN dan *Asia Pacific Institute of Toponymy.*

**Ketua Pengarah Ukur dan Pemetaan JUPEM mengetuai delegasi Malaysia di Sesi UNGEGN Ke 23**

**PEMERHATIAN**

Melalui penglibatan delegasi Malaysia sepanjang Sesi UNGEGN ini, berikut adalah pemerhatian serta perkara-perkara yang dapat diambil manfaat terutamanya oleh JKNG Malaysia:

- Penilaian dapat dibuat ke atas kemajuan yang dicapai oleh Jawatankuasa Kebangsaan Bagi Nama Geografi (JKNG) Malaysia berasaskan laporan terkini *UNGEGN Chairperson* terhadap kemajuan Negara-negara yang telah menubuhkan Pihak Berkuasa Kebangsaan Berkaitan Nama Geografi (PBKNG) serta *Country Report* yang dikemukakan oleh Negara-negara ahli.

- Berdasarkan laporan-laporan dari setiap Bahagian, Kumpulan Kerja dan Liaison Officer UNGEGN pula, Malaysia yang menjadi anggota *Asia South-East and Pacific South-West Division* UNGEGN, dapat sama-sama menilai projek dan usaha – usaha di peringkat Bahagian dan Kebangsaan berbanding dengan Bahagian lain. Antara usaha dan projek yang boleh dipelajari serta dijadikan tanda aras ialah:-

  i. *Standard Terminology* berkaitan nama geografi.

  ii. Aktiviti toponimi dan isu-isu berkaitan (beberapa kertas kerja berkaitan dibentangkan).

  iii. Penerbitan video promosi berkaitan kepentingan nama geografi (contohnya kertas kerja 15 dari *South Africa Division).*

  iv. Polisi-polisi dan garis panduan berkaitan penamaan tempat (contohnya kertas kerja 20 dari *United States / Canada Division).*

  v. Usaha sama penerbitan peta menggunakan nama-nama tempat standard dan rasmi negara-negara anggota meliputi kawasan di mana Bahagian UNGEGN tersebut terlibat (beberapa kertas kerja dibentangkan termasuk dari *Asia South-East and Pacific South-West Division*).

  vi. Pembiayaan bersama aktiviti serta projek-projek di peringkat Bahagian (Kertas 21 dari *French – Speaking Division).*

  vii. Pembangunan dan pengemaskinian pangkalan data *exonyms* (Kertas kerja 21 dari *French – Speaking Division).*

viii. Penerbitan nama-nama geografi dan gazetir secara atas talian (beberapa kertas kerja dibentangkan).

ix. Penentuan nama tempat / objek yang standard bagi penduduk berbilang bangsa dalam bahasa tertentu (contohnya kertas kerja 25 dari *United Kingdom – "Standardisation of Welsh Names in Wales and Gaelic Names in the Gaelic - Speaking Areas in Scotland* dan kertas kerja 87 dari *Asia South-East and South West Pacific Division).*

x. Mempromosi serta menentukan nama tempat dan objek dari kumpulan minoriti dan peribumi (kertas kerja 68 dari *Dutch and German - Speaking Division).*

xi. Pewujudan infrastruktur secara *regional* bagi nama-nama geografi; contohnya, *"A Europe-Wide Geographical Names Data Infrastructure" (Kertas kerja 68 dari Dutch and German - Speaking Division).*

xii. Isu-isu berkaitan *romanization* bagi negara-negara yang menggunakan lebih dari satu *character* di dalam pangkalan data dan peta mereka (contohnya *arabic* dan *roman)* serta usaha-usaha untuk mengatasinya (kertas kerja 80 dari Eastern Europe, Northern *and Central Asia Division* dan kertas kerja 85 dari *East Central and South East Europe Division).* Perbincangan juga berdasarkan kertas 98 dari Kumpulan Kerja *Romanization System* yang mana maklumat terperinci darinya boleh diperolehi di laman web *http://eki.ee/wgr/.*

xiii. Penganjuran kursus dan bengkel toponimi dan koleksi penerbitan manual – manual kursus berkaitan (beberapa kertas kerja berkaitan dibentangkan).

xiv. Penyediaan kemudahan *audio file* bagi sebutan nama tempat / objek dengan betul (kertas kerja 6 - "*A Basic Model for Pronunciation Guides* " dari Israel).

xv. Penyediaan nama geografi dalam pelbagai bahasa dan skrip (kertas kerja 53 *Liaison Officer* dari *Scientific Committee on Antartic Research –SCAR).*

xvi. Penamaan nama geografi di bawah permukaan laut *(undersea)* dan rujukan *Limits of Oceans and Seas* (kertas kerja 91 *Liaison Officer* dari *International Hydrographic Organization).*

xvii. Dokumen-dokumen standard ISO yang boleh dirujuk di dalam penetapan standard berkaitan nama geografi berdasarkan taklimat yang disampaikan oleh *Liaison Officer* dari *ISO/TC211 – Geographic Information Standard seperti:*

- *19136 – Geography Markup Language*
- *19139 – XML Schema Implementation*
- *19142 – Web Feature Services*

xviii. Pendedahan beberapa negara tentang bagaimana pembangunan bandar yang pesat menyebabkan pertambahan nama-nama tempat dan objek yang perlu dikemaskini di dalam pangkalan data dan peta berkaitan. Sebagai contoh sebanyak lebih kurang 2000 nama – nama baru perbandaran berlaku setiap tahun di Cina dan perlu tindakan pengemaskinian yang lebih agresif.

ixx. Usaha Negara Jepun di dalam membangunkan *Historical Data Base* yang mampu mengumpulkan perubahan nama geografi sejak 100 tahun yang lalu

di peringkat daerah (kertas kerja 56 dari Asia East Division – Other than China).

xx. Pameran contoh *2001 Gazetteer of Austria* yang berasaskan banci kebangsaannya.

xxi. Usaha membantu Bangsa - bangsa Bersatu mendokumentasikan nama rasmi terkini Negara-negara (Contoh kertas kerja 40 dari Kumpulan Kerja *Country Names* dan kertas kerja 8 dari *Commission for Standardisation of Geographical Names Outside Poland*).

xxii. Seperti juga kelulusan resolusi yang dibuat di the *8th UN Conference on the Standardisation of the Geographical Names* Tahun 2002, *Convenor* Kumpulan Kerja Publisiti dan Pembiayaan memaklumkan cadangan pembiayaan kursus dan penerbitan berkaitan nama geografi bagi tahun 2008 dan 2009 oleh Bangsa - bangsa Bersatu bergantung kepada keputusan/resolusi di persidangan ke 9, pada tahun 2007 nanti.

xxiii. Pelaksanaan *Commemorative Naming berasaskan Resolusi 2 the 8th UN Conference on the Standardisation of the Geographical Names* di Kanada (kertas kerja 35 dari *USA/Canada Division*) dan di Helsinki, Finland (kertas kerja 45 dari Norden Division).

- Melalui Sesi Ke 23 UNGEGN ini delegasi Malaysia juga mendapat maklumat mengenai pihak-pihak yang boleh dihubungi berdasarkan senarai PBKNG di negara lain bagi memudahkan perkongsian kepakaran dalam aktiviti atau projek-projek yang bersamaan.

**SYOR**

Berdasarkan pemerhatian delegasi Malaysia dalam menyertai perbincangan di Sesi Ke 23 UNGEGN ini, berikut adalah beberapa syor yang dirasakan boleh memberi manfaat kepada Malaysia:-

- **Kemudahan Untuk Menamakan Semula Nama-nama Tempat dan Objek**

  Memberi pertimbangan supaya diadakan kemudahan untuk membuat penamaan semula nama-nama tempat serta objek tertentu dalam amalan kerja pihak – pihak yang berkaitan di mana perubahan boleh dibuat kepada pangkalan data – pangkalan data yang terlibat. Disamping itu juga pangkalan data - pangkalan data tersebut seharusnya memberi ruang untuk menyimpan nama altenatif sesuatu tempat supaya dapat mengambil kira faktor sejarah yang boleh dirujuk bagi tujuan menjamin kedaulatan Negara.

- **Mengadakan Daftar *Exonyms* Standard Bagi Nama - nama Negara Luar**

  Jawatankuasa Kerja Garis Panduan Nama - nama Geografi perlu membantu Jawatankuasa Teknikal Kebangsaan Bagi Nama – nama Geografi untuk menyediakan daftar *exonyms* bagi Negara- negara luar berdasarkan Perkara 21 Garis Panduan Penamaan Nama-nama Geografi keluaran Jawatankuasa Kebangsaan Bagi Nama-nama Geografi (JKNG) dan panduan yang dikeluarkan oleh UNGEGN.

- **Penyediaan Laman Web JKNG**

  Bagi tujuan untuk mendedahkan pentingnya peranan serta aktiviti yang perlu dilaksanakan oleh setiap peringkat yang terlibat dengan JKNG samaada di peringkat Kebangsaan, Negeri mahupun Kumpulan - Kumpulan Kerjanya, adalah dicadangkan supaya satu laman web khas JKNG yang dirangkaikan kepada laman web UNGEGN dibangunkan.

Dalam hal ini JUPEM selaku Sekretariat dan peneraju JKNG wajar membangun serta mengemaskini laman web tersebut dan ianya bolehlah diletakkan di bawah JUPEM Geoportal. Dengan adanya kemudahan laman web ini penyaluran maklumat serta aktiviti di peringkat Kumpulan-Kumpulan Kerja, Negeri, serta Kebangsaan dapat diwujudkan. Selain itu, kemudahan yang sama juga boleh dijadikan saluran untuk berkongsi kepakaran mengenai aktiviti yang sama yang dijalankan oleh Negara – negara, Bahagian – Bahagian serta Kumpulan – kumpulan Kerja yang terlibat di bawah UNGEGN.

- **Menganjurkan Latihan**

  Sebagai anggota *Asia South-East and South West-Pacific Division*, Malaysia boleh mengambil manfaat dengan merancang untuk mengadakan kursus dan bengkel dengan kerjasama dan bantuan dari pakar-pakar yang terlibat di bawah Kumpulan Kerja Latihan Berkaitan Toponimi UNGEGN. Penganjuran kursus dan bengkel ini boleh memberi peluang kepada lebih ramai pegawai dan kakitangan yang terlibat dengan aktiviti berkaitan toponimi di negara ini menerima latihan dari pakar-pakar luar negara dengan bantuan UNGEGN. Penganjuran kursus dan bengkel ini boleh ditawarkan juga kepada peserta- peserta dari negara-negara anggota *Asia South-East and Pacific South-West, UNGEGN*. Penganjuran kursus dan bengkel ini dipercayai akan dapat melancarkan lagi tugas-tugas JKNG berkaitan toponimi.

- **Menyediakan Penerbitan Multimedia Mengenai Kepentingan Nama-nama Geografi**

  Bagi tujuan memberi pendedahan kepada pihak-pihak yang terlibat dengan penyediaan standard nama-nama geografi terutamanya di peringkat kumpulan kerja dan negeri-negeri, adalah dicadangkan supaya penerbitan multimedia mengenainya disediakan. Kertas CRP 12 dari Kumpulan Kerja Publisiti dan Pembiayaan, UNGEGN yang memberikan contoh penerbitan yang dibuat oleh *South African Geographical Names Council (SAGNC),* boleh digunakan sebagai panduan.

- **Mengadakan A*udio File* Untuk Kemudahan Sebutan (pronunciation) Bagi Sesuatu Nama Tempat dan Objek.**

  Memandangkan terdapatnya sesetengah nama tempat di negara ini diambil dari suku kaum tertentu terutamanya di Sabah dan sarawak yang sebutannya tidak diketahui secara tepat, maka adalah dicadangkan supaya disamping simbol-simbol vokal, diftong dan konsonan, diadakan juga kemudahan *audio file* yang mana jika perkataan bagi nama tempat atau objek tersebut dipilih serta dipaparkan di komputer maka sebutan asal nama tempat tersebut dapat diperdengarkan.

- **Memastikan Nama-nama Geografi Baru Dikemaskini Mengikut Proses Yang Sistematik dan Betul**

  JKNG melalui Jawatankuasa Teknikal Nama Geografi Negeri (JTNGN) perlu memastikan supaya nama-nama tempat baru di negeri-negeri dikemaskini melalui proses dan mekanisma yang sistematik. Dalam hal ini Pihak Berkuasa Tempatan di setiap negeri yang terlibat dengan penamaan tempat hendaklah mengemukakan nama-nama tempat baru yang dicadangkan kepada JTNGN terlebih dahulu. Pihak JTNGN pula sebelum mengemukakan cadangan nama tersebut kepada Jawatankuasa Negeri bagi Nama Geografi (JNNG) yang berkuasa untuk meluluskan nama-nama tempat baru di negerinya, hendaklah menyemak nama-nama tempat baru yang dicadangkan berdasarkan Garis Panduan Penentuan Nama Geografi yang telah dikeluarkan oleh JKNG.

  Setelah JNNG meluluskan nama – nama tempat baru yang dicadangkan maka JTNGN hendaklah bertindak untuk memasukkannya ke dalam Pangkalan Data Nama

Geografi di peringkat Negeri. Pangkalan Data Nama Geografi ini yang dibangunkan oleh pihak *Malaysian Center for Geospatial Data Infrastructure (MaCGDI)* yang diletakkan di Clearinghousenya di setiap negeri sepatutnya menyediakan kemudahan untuk nama-nama tersebut dikemaskini secara atas talian. Hanya setelah langkah-langkah yang sama seperti di atas dilakukan di setiap negeri, barulah Pangkalan Data Nama Geografi Kebangsaan yang ditugaskan kepada MaCGDI untuk menyelenggaranya dapat diterbitkan kepada orang awam secara atas talian melalui *Malaysian Geospatial Data Infrastructure (MyGDI)*. Selain Garis Panduan Penentuan nama Geografi terbitan JKNG, *Manual for the National Standardisation of Geographical Names* yang diterbitkan oleh UNGEGN pada Februari 2006 boleh dijadikan bahan rujukan.

- **JUPEM Menggunakan Mekanisma dan Kemudahan Yang Disediakan untuk Mengemaskini Peta-Peta Terbitannya**

  Jika proses yang ditetapkan melalui mekanisma di atas dapat berjalan lancar, JUPEM pula selaku agensi yang bertanggungjawab untuk mengemaskini peta-peta terbitannya akan lebih mudah menjalankan tugasnya. Dengan nama-nama tempat yang telah melalui proses di atas dan disahkan / diluluskan oleh JNNG berkaitan dan disimpan di dalam Pangkalan Data Nama Georafi di peringkat Negeri serta Kebangsaan bersama petanya yang berkaitan maka nama-nama tempat yang standard akan dapat digunakan dalam semua terbitan JUPEM samada yang berupa peta mahupun bukan peta.

- **Sumbangan Berbentuk Artikel Untuk Buletin UNGEGN**

  Bagi mewujudkan budaya perkongsian maklumat dan kepakaran di kalangan negara anggota di bawah UNGEGN, JKNG dicadangkan turut menyumbangkan bahan-bahan ilmiah dalam bentuk laporan projek atau aktiviti – aktiviti berkaitan nama geografi untuk buletin terbitan UNGEGN.

- **Projek-projek lain mengikut keutamaan**

  Usaha-usaha berkaitan yang telah dijalankan oleh negara-negara tertentu wajar dipantau secara berterusan dan tindakan diambil untuk melaksanakan usaha-usaha yang sama mengikut kemampuan, kesesuaian serta keutamaannya supaya ia dapat mendatangkan manfaat kepada negara.

**KESIMPULAN**

Secara keseluruhannya Sesi Ke 23 UNGEGN kali ini telah berlangsung dengan jayanya walaupun agenda yang dijalankan agak begitu padat. Penyelarasan serta keputusan-keputusan penting telah dapat dicapai di kalangan anggota Bahagian, Kumpulan Kerja dan *Liaison agencies*. Pembentangan laporan aktiviti dan projek-projek yang sama tetapi dijalankan dengan pendekatan yang berbeza sangat memberi faedah kepada semua delegasi untuk saling berkongsi pengalaman.

Di akhir Sesi, persetujuan telah dicapai untuk melakukan perubahan perancangan masa depan standardisasi nama geogafi yang lebih berkesan. Selain dari itu, adalah menjadi harapan anggota UNGEGN untuk mampu menyahut seruan dari pihak *UN Office for the Coordination of Humanitarian Affairs (OCHA)* supaya pangkalan data toponimi global dan gazetir mampu menangani keperluan bantuan kemanusiaan terhadap mangsa-mangsa tragedi di seluruh dunia.

Penggunaan nama tempat yang betul akan memberi kesan dan faedah di peringkat tempatan, kebangsaan dan antarabangsa dalam pelbagai urusan termasuklah perdagangan, statistik, perancangan pembangunan bandar dan desa, pengurusan alam sekitar, bantuan menyelamat mangsa bencana alam termasuk operasi mencari, penerbitan peta, pelancongan sehinggalah untuk tujuan komunikasi.

# MESYUARAT KE-57
# JAWATANKUASA PEMETAAN DAN DATA SPATIAL NEGARA (JPDSN)

Oleh
Hisham bin Husain
Seksyen Perkhidmatan Pemetaan
Jabatan Ukur dan Pemetaan Malaysia

Jawatankuasa Pemetaan dan Data Spatial Negara (JPDSN) telah mengadakan mesyuarat tahunan kali ke-57 bertempat di Miri, Sarawak pada 13 hingga 14 Mac 2006. Mesyuarat yang dipengerusikan oleh Y. Bhg. Datuk Hamid bin Ali, Ketua Pengarah Ukur dan Pemetaan Malaysia, telah dihadiri oleh ahli-ahlinya dari seluruh negara yang terdiri daripada 38 wakil pelbagai Jabatan/Agensi Kerajaan serta Insititusi Pengajian Tinggi.


**Y. Bhg. Datuk Hamid bin Ali selaku Pengerusi sedang mempengerusikan Mesyuarat Ke-57 JPDSN di Hotel Mega, Miri, Sarawak**

**Mesyuarat JPDSN ini yang dijalankan sepenuhnya secara 'paperless' telah dihadiri oleh ahli-ahli seramai 38 orang yang terdiri daripada wakil Jabatan-Jabatan/Agensi-Agensi Kerajaan dan Institusi-Institusi Pengajian Tinggi**

Dalam ucapan pembukaannya, Y. Bhg. Datuk Hamid bin Ali menjelaskan bahawa JPDSN dapat mempertemukan ahli-ahlinya bagi berbincang, mengkaji serta merangka aktiviti dan program yang berkaitan dengan pemetaan dan data spatial yang dapat mewujudkan kerjasama yang lebih akrab kea rah menjayakan sebarang usaha yang akan menjadi pemangkin kepada pembangunan sosio-ekonomi dan pengurusan sumber negara yang terancang. Beliau juga mengingatkan kepada ahli-ahli JPDSN dan ahli Jawatankuasa Teknikal (JT) JPDSN supaya memainkan peranan lebih aktif dalam menangani segala permalsahan yang timbul hasil daripada perlaksanaan projek dan program JPDSN bagi menghasilkan produk data spatial yang boleh dimanfaatkan oleh pengguna.

Seterusnya Y. Bhg. Datuk Pengerusi menyorot kembali beberapa kejayaan dan program berkaitan pemetaan dan data spatial dalam tahun 2005 yang dijayakan oleh ahli-ahli JPDSN. Antaranya ialah projek-projek JUPEM seperti CATMAPS (*Computer Assisted Topographic Mapping System*); pewujudan RTK (*Real Time Kinematic*) Net melalui MyRTKNet; penerbitan Peta Geoid Malaysia melalui MyGEOID; penubuhan Seksyen Pemetaan Utiliti di JUPEM; penentuan persempadanan Maritim Malaysia; pelaksanaan Pemetaan Siri Baru; penerbitan Peta Daerah; penubuhan Seksyen Pemetaan Utiliti; pembangunan pangkalan data profil pulau-pulau; semakan kualiti peta; dan pengeluaran Garis Panduan Penentuan Nama Geografi.

Selanjutnya Y. Bhg. Datuk Pengerusi mengingatkan bahawa JUPEM khasnya dan JPDSN amnya, mempunyai tanggungjawab dalam merangka aktiviti pemetaan bagi memastikan keperluan komuniti pengguna dapat dipenuhi. Setiap Jabatan/Agensi pemetaan perlu memberi perhatian

untuk meningkatkan usaha supaya dapat menjanakan idea yang inovatif bagi menghasilkan produk dan mengadakan proses-proses yang lebih efisien bagi meningkatkan mutu perkhidmatan. Perkara yang perlu diingati ialah kejayaan sebenar strategi, program dan aktiviti adalah bergantung kepada kepuasan pelanggan dan *stakeholders*.

Akhir sekali, Y. Bhg. Datuk Pengerusi menyarankan agar semua Jabatan dan Agensi pemetaan mendapatkan maklumbalas secara berterusan daripada pelanggan, menyelaraskan tindakan dan perkhidmatan di kalangan ahli-ahli JPDSN serta menjalankan penilaian secara berterusan terhadap kualiti perkhidmatan dan produk masing-masing.

Antara agenda mesyuarat ini adalah pembentangan laporan Jawatankuasa-jawatankuasa Teknikal dan Kumpulan Kerja Geodetik, pembentangan laporan aktiviti-aktiviti Jabatan/Agensi dan pembentangan kertas-kertas kerja. Antara kertas kerja yang telah dibentangkan di dalam mesyuarat tersebut adalah seperti berikut :-

i. Garis Panduan Pemetaan Utiliti Bawah Tanah (*Standard Guideline For Underground Utility Mapping*); dan
ii. Spesifikasi Peta Utiliti Bercetak Bagi Siri MY901U (Semenanjung)dan MY911U (Sabah, Sarawak dan Wilayah Persekutuan Labuan) Skala 1:500


***Y. Bhg. Dato' Pengerusi JPDSN bergambar bersama-sama ahli-ahli JPDSN sebagai mengakhiri Mesyuarat Ke-57 JPDSN***

Bersempena dengan mesyuarat ini, ahli-ahli JPDSN telah dibawa menghadiri Majlis Perasmian Stesen Tolok Air Pasang Surut (STAPS) Miri di Marina Park, Miri pada 14 Mac 2006. Majlis ini telah dirasmikan oleh Y. Bhg. Tuan Haji Mohd. Ibrahim bin Abu Bakar, Timbalan Ketua Setiausaha II, Kementerian Sumber Asli dan Alam Sekitar (NRE) yang mewakili Ketua Setiausaha NRE. Antara lain ucapan perasmian, beliau menekankan kepentingan kewujudan prasarana geodetik khasnya dan pemetaan amnya di dalam menggerakkan kemajuan ekonomi dan keselamatan Negara.

STAPS ini dibina bagi menggantikan STAPS Miri di Jeti Long yang telah rosak akibat dilanggar oleh kapal. Sehubungan dengan itu STAPS baru dibina dengan kos RM1,088,339.00 dan telah mula beroperasi pada 10 Februari 2006. Sesi lawatan ke bangunan STAPS telah dilakukan, di sini semua ahli JPDSN dapat melihat kaedah-kaedah yang digunakan di dalam menyediakan maklumat air pasang surut dengan cerapan di tolok air pasang surut serta penerangan mengenai pemprosesan, pelarasan dan penentuan aras purata laut untuk seluruh Semenanjung, Sabah dan Sarawak bagi tujuan pemetaan, geodetik dan saintifik.

Hasil daripada mesyuarat JPDSN Ke 57 ini, dapat dirumuskan bahawa JPDSN berfungsi sebagai satu platfom yang efektif bagi merancang dan menjalankan aktiviti pemetaan dan data spatial negara. Ahli-ahli JPDSN boleh berkongsi pengalaman dan pengetahuan antara satu sama lain dengan kerjasama yang lebih erat serta komited untuk menjayakan sebarang aktiviti yang akan menjadi pemangkin kepada perancangan pembangunan dan pengurusan sumber negara. Perkembangan pesat dalam bidang teknologi terkini dan juga kehendak pengguna yang pelbagai dalam bidang pemetaan menjadikan peranan aktif semua ahli JPDSN sangat relevan dan amat diperlukan.

Bersempena dengan mesyuarat ini, ahli-ahli JPDSN telah dibawa menghadiri Majlis Perasmian Stesen Tolok Air Pasang Surut (STAPS) Miri di Marina Park, Miri pada 14 Mac 2006. Majlis ini telah dirasmikan oleh Y. Bhg. Tuan Haji Mohd. Ibrahim bin Abu Bakar, Timbalan Ketua Setiausaha II, Kementerian Sumber Asli dan Alam Sekitar (NRE) yang mewakili Ketua Setiausaha NRE. Antara lain ucapan perasmian, beliau menekankan kepentingan kewujudan prasarana geodetik khasnya dan pemetaan amnya di dalam menggerakkan kemajuan ekonomi dan keselamatan Negara.

***Stesen Tolok Air Pasang Surut (STAPS) Miri di Marina Park, Miri, Sarawak mula beroperasi pada 10 Februari 2006***

***Y. Bhg. Tuan Haji Ibrahim bin Abu Bakar, Timbalan Ketua Setiausaha II, NRE menyempurnakan perasmian STAPS Miri pada 14 Mac 2006***

STAPS ini dibina bagi menggantikan STAPS Miri di Jeti Long yang telah rosak akibat dilanggar oleh kapal. Sehubungan dengan itu STAPS baru dibina dengan kos RM1,088,339.00 dan telah mula beroperasi pada 10 Februari 2006. Sesi lawatan ke bangunan STAPS telah dilakukan, di sini semua ahli JPDSN dapat melihat kaedah-kaedah yang digunakan di dalam menyediakan maklumat air pasang surut dengan cerapan di tolok air pasang surut serta penerangan mengenai pemprosesan, pelarasan dan penentuan aras purata laut untuk seluruh Semenanjung, Sabah dan Sarawak bagi tujuan pemetaan, geodetik dan saintifik.

Hasil daripada mesyuarat JPDSN Ke 57 ini, dapat dirumuskan bahawa JPDSN berfungsi sebagai satu platfom yang efektif bagi merancang dan menjalankan aktiviti pemetaan dan data spatial Negara. Ahli-ahli JPDSN boleh berkongsi pengalaman dan pengetahuan antara satu sama lain dengan kerjasama yang lebih erat serta komited untuk menjayakan sebarang aktiviti yang akan menjadi pemangkin kepada perancangan pembangunan dan pengurusan sumber Negara. Perkembangan pesat dalam bidang teknologi terkini dan juga kehendak pengguna yang pelbagai dalam bidang pemetaan menjadikan peranan aktif semua ahli JPDSN sangat relevan dan amat diperlukan.

# PAMERAN MaCGDI DI PROGRAM PUSAT SAINS NEGARA DI DESA SEK. MEN. KEB. ANJUNG BATU, MERSING, JOHOR 27-30 MAC 2006

Oleh
Norazmel bin Abd. Karim
Pusat Infrastruktur Data Geospatial Negara (MaCGDI)


Program Pusat Sains Negara Di Desa dirasmikan oleh EXCO Negeri Johor

Program Pusat Sains Negara Di Desa Peringkat Negeri Johor 2006 ini telah dianjurkan oleh Pusat Sains Negara di Sekolah Menengah Kebangsaan Anjung Batu Mersing pada 27 hingga 30 Mac 2006.

Program PSN Di Desa ini bertujuan untuk menyemai kesedaran terhadap bidang sains dan teknologi kepada segenap lapisan masyarakat sama ada di bandar mahupun di desa terutamanya generasi muda yang tinggal jauh di desa. Program sebegini amat penting dalam usaha kerajaan menggalakkan pembelajaran sains dan teknologi serta menerokai hubungan diantara sains dan teknologi dengan kehidupan seharian.

MaCGDI sebagai peneraju di dalam bidang Sistem Maklumat Geografi (GIS) telah dijemput untuk turut sama menyertai di dalam program PSN Di Desa ini sebagai usaha dan kesinambungan aktiviti penggalakkan sains dan pembangunan teknologi GIS di Malaysia. Melalui program seperti ini, MaCGDI secara tidak langsungnya, dapat memperkenalkan produk-produk MaCGDI kepada pengguna, dan memupuk minat dan menanamkan kesedaran terhadap sains dan teknologi berkaitan dengan Sistem Maklumat Geografi (GIS).


Program Pusan Sains Negara Di Desa ini telah dirasmikan oleh EXCO Pendidikan Negeri Johor dan seterusnya mengadakan lawatan ke setiap sudut-sudut pameran bagi melihat sains dan teknologi dipersembahkan di setiap sudut pameran. Secara keseluruhannya, sambutan adalah sungguh menggalakkan dimana dengan kehadiran para peserta mengadakan lawatan ke sudut pameran MaCGDI. Sesuai dengan Program PSN Di Desa, kumpulan sasar adalah terdiri daripada golongan pelajar, guru-guru dan masyarakat di desa khasnya, agensi kerajaan dan juga swasta.

Program PSN Di Desa bertemakan “Bioteknologi Untuk Manfaat Masyarakat Desa”, menggalakkan penguasaan ilmu dan kemahiran yang tinggi disamping penyelidikan dan pembangunan R&D bagi hala tuju negara ke arah menjadi sebuah negara maju menjelang 2020.

## SUASANA DI BOOTH MACGDI

| TARIKH | TAJUK | LOKASI | PENGANJUR | TALIAN PERTANYAAN |
|---|---|---|---|---|
| 23 Januari 2006 | Kursus Penyebaran dan Keselamatan Data Geospatial (Sesi 1) | INSTUN Behrang, Perak | MaCGDI | Cik Zafirah Bt. Mohd. Mansor<br>Tel : +03 88861157<br>Fax : + 603 88894851<br>E-mail : zafirah@macgdi.gov.my |
| 25 - 27 Januari 2006 | Kursus Perisisan GIS-MapInfo (Asas) | INSTUN | MaCGDI | Cik Zafirah Bt. Mohd. Mansor<br>Tel : +03 88861157<br>Fax : + 603 88894851<br>E-mail : zafirah@macgdi.gov.my |
| 9 - 10 Mac 2006 | The Sixth International Conference on ASIA GIS (ASIA GIS 2006) | UTM Skudai, Johor | Asia Geographic Information System Association (AGISA) | Prof. Dr. Ahris Yaakup (b-haris@utm.my)<br>Mrs. Haibenarisal Bajuri (asia_gis2006@yahoo.com)<br>Tel : (+607) 5537360/ (+607) 5516584<br>Fax : (+607) 5537360/ (+607) 5566155 |
| 13 Mac 2006 | Mesyuarat Jawatankuasa Pemetaan dan Data Spatial Negara (JPDSN) ke 57 | Hotel Mega Miri, Sarawak | Bahagian Pemetaan, JUPEM | Encik Teng Chee Boo<br>Tel : +603 26924034<br>Fax : +603 26970140<br>E-mail : cbteng@jupem.gov.my |
| 27 - 30 Mac 2006 | Program Pameran Pusat Sains Negara di Johor | Sekolah Menengah Kebangsaan Anjung Batu, Mersing, Johor | MaCGDI | Encik Abdul Manan bin Abdullah<br>Tel : +603 88861209<br>Fax : +603 88894851<br>E-mail : manan@macgdi.gov.my |
| 30-31 Mac 2006 | Bengkel Penentuan Harga Data Geospatial | Rumah Penginapan Kerajaan, Port Dickson | MaCGDI | Tn. Hj. Mazlan bin Ashaari<br>Tel : +603 88861253<br>Fax : +603 88894851<br>E-mail : mazlan@macgdi.gov.my |
| 2 – 5 Mei 2006 | Workshop: Towards 3D Positioning: MyRTKnet and MyGEOID | Cinta Sayang Golf and Country Club Resort, Sungai Petani | ISM, UTM, JUPEM, LJT | Dr. Azhari bin Mohamed/<br>Miss Rajeswary<br>Tel : +603 79551773/ 79569728<br>Fax : +603 79550253<br>E-mail : lsdiv@ism.org.my |
| 3 - 4 Mei 2006 | Map Malaysia 2006 | Palace of the Golden Horses, Kuala Lumpur | GIS Department, MaCGDI | Map Malaysia 2006 Secretariat<br>GIS Development Tvt Ltd, G-4, Sector - 39, Noida (U.P), India<br>Tel : +91 120 2502180 to 87<br>Fax: +91 120 2500811<br>E-mail : info@mapmalaysia.org<br>Laman web : www.mapmalaysia.org |
| 5 - 6 Jun 2006 | Bengkel Penentuan Harga Data Geospatial | Hotel Vistana Kuantan, Pahang | MaCGDI | Tn. Hj. Mazlan bin Ashaari<br>Tel : +603 88861253<br>Fax : +603 88894851<br>E-mail : mazlan@macgdi.gov.my |
| 5 - 9 Jun 2006 | Kursus Pendek GIS Tahap 2 | INSTUN | MaCGDI | Cik Zafirah Bt. Mohd. Mansor<br>Tel : +03 88861157<br>Fax : + 603 88894851<br>E-mail : zafirah@macgdi.gov.my |

| TARIKH | TAJUK | LOKASI | PENGANJUR | TALIAN PERTANYAAN |
|---|---|---|---|---|
| 5 - 9 Jun 2006 | Kursus Pendek Penawanan Data | INSTUN | MaCGDI | Cik Zafirah Bt. Mohd. Mansor<br>Tel : +03 88861157<br>Fax : + 603 88894851<br>E-mail : zafirah@macgdi.gov.my |
| 12 - 16 Jun 2006 | Kursus Pendek GIS Tahap 2 | INSTUN | MaCGDI | Cik Zafirah Bt. Mohd. Mansor<br>Tel : +03 88861157<br>Fax : + 603 88894851<br>E-mail : zafirah@macgdi.gov.my |
| 14 - 16 Jun 2006 | 8th Surveyor's Congress | Istana Hotel, Kuala Lumpur | ISM | ISM Secretariat<br>The Institution of Surveyors, Malaysia<br>Tel : +603 79551733/ 79569728/ 79548358<br>Fax : +603 79550253<br>E-mail : secretariat@ism.org.my<br>Laman Web : www.ism.org.my |
| 19 - 23 Jun 2006 | Kursus Pendek GIS Tahap 2 | INSTUN | MaCGDI | Cik Zafirah Bt. Mohd. Mansor<br>Tel : +03 88861157<br>Fax : + 603 88894851<br>E-mail : zafirah@macgdi.gov.my |
| 20 Jun 2006 | Bengkel Penentuan Harga Data Geospatial | Hotel Promenade, Kota Kinabalu, Sabah | MaCGDI | Tn. Hj. Mazlan bin Ashaari<br>Tel : +603 88861253<br>Fax : +603 88894851<br>E-mail : mazlan@macgdi.gov.my |
| 28 Jun 2006 | Seminar Berkaitan Aktiviti Standard dalam Sistem Maklumat Geografi (GIS) | Primula Beach Resort, Kuala Terengganu | MaCGDI | Tn. Hj. Mazlan bin Ashaari<br>Tel : +603 88861253<br>Fax : +603 88894851<br>E-mail : mazlan@macgdi.gov.my |
| 29 Jun 2006 | Mesyuarat Jawatankuasa Teknikal Framework Bil. 1 tahun 2006 | Primula Beach Resort, Kuala Terengganu | MaCGDI | Dr. Zainal bin Majeed<br>Tel : +603 88861250<br>Fax : +603 88894851<br>E-mail : @macgdi.gov.my |
| 10 - 14 Julai 2006 | Kursus Pendek Penawanan Data | INSTUN | MaCGDI | Cik Zafirah Bt. Mohd. Mansor<br>Tel : +03 88861157<br>Fax : + 603 88894851<br>E-mail : zafirah@macgdi.gov.my |
| 13 - 14 Julai 2006 | Persidangan/ Konvensyen NGIS 2006 | PWTC, Kuala Lumpur | MaCGDI | Encik Abdul Manan bin Abdullah<br>Tel : +603 88861209<br>Fax : +603 88894851<br>E-mail : manan@macgdi.gov.my |
| 25 - 26 Julai 2006 | Persidangan Ukur dan Pemetaan | Palace of the Golden Horses, Kuala Lumpur | JUPEM | Encik Teng Chee Boo<br>Tel : +603 26924034<br>Fax : +603 26970140<br>E-mail : cbteng@jupem.gov.my |
| 7 - 8 Ogos 2006 | International Workshop on 3D Geoinformation 2006 (3DGeoInfo'06) | The Legend Hotel Kuala Lumpur | UTM | Dr. Alias Abdul Rahman<br>Dept. of Geoinformatics<br>Universiti Teknologi Malaysia<br>Tel : +60 (0) 7 5530563<br>Fax : +60 (0) 7 5566163<br>E-mail : alias@fksg.utm.my or 3dgeoinfo06@utm.my |
| 7 - 10 Ogos 2006 | Program Pameran bersama Pusat Sains Negara (PSN) di Pahang | Rompin, Pahang | MaCGDI | Encik Abdul Manan bin Abdullah<br>Tel : +603 88861209<br>Fax : +603 8889485<br>E-mail : manan@macgdi.gov.my |

| TARIKH | TAJUK | LOKASI | PENGANJUR | TALIAN PERTANYAAN |
|---|---|---|---|---|
| Ogos 2006 | Bengkel Pangkalan Data Nama Geografi | Melaka | MaCGDI | Encik Abdul Manan bin Abdullah<br>Tel : +603 888611209<br>Fax : +603 88894851<br>E-mail : manan@macgdi.gov.my |
| 6 – 8 September 2006 | 13th ESRI South Asia User Conference | Sheraton Subang Hotel & Towers, Malaysia | ESRI South Asia | Yvonne Tan<br>Tel : +603 78749930<br>Fax : +603 78749932<br>E-mail : Yvonne@esrisa.com.my<br>Laman web : www.esrisa.com.my |
| 11 - 15 September 2006 | Kursus Pendek Penawanan Data | INSTUN, Behrang, Perak | MaCGDI | Cik Zafirah Bt. Mohd. Mansor<br>Tel : +03 88861157<br>Fax : + 603 88894851<br>E-mail : zafirah@macgdi.gov.my |
| 18 - 20 September 2006 | The International Symposium and Exhibition On Geoinformation (ISG 2006) | Subang, Sheraton Hotel | ISM/UiTM | Prof. Dr. Juazer Rizal Abdul Hamid<br>Tel : +603 55444460<br>Fax : +603 55444545<br>E-mail : drjuazer@yahoo.org.my |
| September 2006 | Program Pameran bersama Pusat Sains Negara (PSN) di Kedah | Akan ditentukan | MaCGDI | Encik Abdul Manan bin Abdullah<br>Tel : +603 88861209<br>Fax : +603 88894851<br>E-mail : manan@macgdi.gov.my |
| September 2006 | Mesyuarat Penasihat Teknikal Pembangunan dan Perlaksanaan MyGDI | Akan ditentukan | MaCGDI | Tn. Hj. Mazlan bin Ashaari<br>Tel : +603 88861253<br>Fax : +603 88894851<br>E-mail : mazlan@macgdi.gov.my |
| 6 November 2006 | Kursus Penyebaran dan Keselamatan Data Geospatial (Sesi 2) | INSTUN, Behrang, Perak | MaCGDI | Cik Zafirah Bt. Mohd. Mansor<br>Tel : +03 88861157<br>Fax : + 603 88894851<br>E-mail : zafirah@macgdi.gov.my |
| 8 - 10 November 2006 | Kursus Perisian GIS-MapInfo (Asas) | INSTUN, Behrang, Perak | MaCGDI | Cik Zafirah Bt. Mohd. Mansor<br>Tel : +03 88861157<br>Fax : + 603 88894851<br>E-mail : zafirah@macgdi.gov.my |
| 13 November 2005 | Kursus Penyebaran dan Keselamatan Data Geospatial (Sesi 3) | INSTUN, Behrang, Perak | MaCGDI | Cik Zafirah Bt. Mohd. Mansor<br>Tel : +03 88861157<br>Fax : + 603 88894851<br>E-mail : zafirah@macgdi.gov.my |
| 15 - 17 November 2006 | Kursus Perisian GIS-MapInfo (Asas) | INSTUN, Behrang, Perak | MaCGDI | Cik Zafirah Bt. Mohd. Mansor<br>Tel : +03 88861157<br>Fax : + 603 88894851<br>E-mail : zafirah@macgdi.gov.my |
| 20 - 21 November 2006 | *Sectoral Based Workshop* (Session 1) | INSTUN, Behrang, Perak | MaCGDI | Cik Zafirah Bt. Mohd. Mansor<br>Tel : +03 88861157<br>Fax : + 603 88894851<br>E-mail : zafirah@macgdi.gov.my |
| November 2006 | Program GIS Week bersama UTM Skudai | UTM Skudai, Johor | MaCGDI dan UTM | Encik Abdul Manan bin Abdullah<br>Tel : +603 888611209<br>Fax : +603 88894851<br>E-mail : manan@macgdi.gov.my |

| TARIKH | TAJUK | LOKASI | PENGANJUR | TALIAN PERTANYAAN |
|---|---|---|---|---|
| November 2006 | Seminar Sehari MyGDI di Negeri Sarawak | Akan ditentukan | MaCGDI | Encik Abdul Manan bin Abdullah<br>Tel : +603 888611209<br>Fax : +603 88894851<br>E-mail : manan@macgdi.gov.my |
| November 2006 | Bengkel Pangkalan Data Nama Geografi | Kuantan, Pahang | MaCGDI | Encik Abdul Manan bin Abdullah<br>Tel : +603 888611209<br>Fax : +603 88894851<br>E-mail : manan@macgdi.gov.my |
| 4 - 6 Disember 2006 | Kursus Perisian GIS-MapInfo (Lanjutan) | INSTUN, Behrang, Perak | MaCGDI | Cik Zafirah Bt. Mohd. Mansor<br>Tel : +03 88861157<br>Fax : + 603 88894851<br>E-mail : zafirah@macgdi.gov.my |
| 18 - 20 Disember 2006 | Kursus Perisian GIS-MapInfo (Lanjutan) | INSTUN, Behrang, Perak | MaCGDI | Cik Zafirah Bt. Mohd. Mansor<br>Tel : +03 88861157<br>Fax : + 603 88894851<br>E-mail : zafirah@macgdi.gov.my |
| 20 - 22 Disember 2006 | *Sectoral Based Workshop* (Session 2) | INSTUN, Behrang, Perak | MaCGDI | Cik Zafirah Bt. Mohd. Mansor<br>Tel : +03 88861157<br>Fax : + 603 88894851<br>E-mail : zafirah@macgdi.gov.my |
| Disember 2006 | *'Awareness Campaign'* Untuk Pengurusan Atasan – Luncheon Talk, Seminar, Courtesy Call, "Ad-Hoc".- Agensi Persekutuan dan Negeri | Dewan Serbaguna, NRE, Putrajaya | MaCGDI | Encik Abdul Manan bin Abdullah<br>Tel : +603 88861209<br>Fax : +603 88894851<br>E-mail : manan@macgdi.gov.my |
| 2006 | Taklimat Garis Panduan Penentuan Nama Geografi dan Pangkalan Data Nama Geografi | Kota Kinabalu, Sabah | JUPEM | Encik Chan Keat Lim<br>Tel : +603 26170613<br>Fax : +603 26970140<br>E-mail : klchan@jupem.gov.my |
| 2006 | Program Pameran bersama Pusat Sains Negara (PSN) diPerak | Akan ditentukan | MaCGDI | Encik Abdul Manan bin Abdullah<br>Tel : +603 88861209<br>Fax : +603 88894851<br>E-mail : manan@macgdi.gov.my |
| 2006 | Program Pameran bersama Pusat Sains Negara (PSN) di Sarawak | Akan ditentukan | MaCGDI | Encik Abdul Manan bin Abdullah<br>Tel : +603 88861209<br>Fax : +603 8889485<br>E-mail : manan@macgdi.gov.my |

# SUMBANGAN ARTIKEL/ CALL FOR PAPER

Buletin GIS diterbitkan dua (2) kali setahun oleh Jawatankuasa Pemetaan dan Data Spatial Negara. Sidang Pengarang amat mengalu-alukan sumbangan sama ada berbentuk artikel atau laporan bergambar mengenai perkembangan Sistem Maklumat Geografi di Agensi Kerajaan, Badan Berkanun dan Institusi Pengajian Tinggi.

**Panduan Untuk Penulis**

1. Manuskrip boleh ditulis dalam Bahasa Malaysia atau Bahasa Inggeris

2. Setiap artikel yang mempunyai abstrak mestilah condong *(italic)*

3. Format manuskrip adalah seperti berikut:

| | |
|---|---|
| Jenis huruf | : Arial |
| Saiz huruf bagi tajuk | : 12 |
| Saiz huruf artikel | : 10 |
| Saiz huruf rujukan/*references* | : 8 |
| Langkau | : *Single* |
| Margin | : Atas, bawah, kiri dan kanan= 2.5cm |
| Justifikasi teks | : Kiri |
| Satu *'column'* setiap muka surat | |

4. Sumbangan hendaklah dikemukakan dalam bentuk *softcopy* dalam format Microsoft Word. Semua imej grafik hendaklah dibekalkan secara berasingan dalam format .tif atau .jpg dengan resolusi 150 dpi dan ke atas.

5. Segala pertanyaan dan sumbangan bolehlah dikemukakan kepada:

Ketua Editor
Buletin GIS
Bahagian Pemetaan
Jabatan Ukur dan Pemetaan Malaysia
Tingkat 3, Bangunan Ukur
Jalan Semarak
50578 Kuala Lumpur
Tel: 03-26170600 / 03-26170800
Fax: 03-26970140
E-mel: cbteng@jupem.gov.my
Laman web: http://www.jupem.gov.my