UNIVERSITY OF OSLO
Faculty of Social Sciences
Department of Sociology and Human Geography

Exam in: SGO1910/SGO4030 Geographical Information Systems (10 credits)
Date of exam: December 1st 2005
Time of exam: 14.30 – 17.30
The exam paper consists of 5 pages (this included)
Attachments: None
No aids allowed

Make sure that the exam paper is complete before you start.

You will find a Norwegian version of the questions on page 3.

Short answers

Describe the following GIS terms in no more than 4 sentences.

1. *Universal Transverse Mercator projection*

2. *SQL (Structured or Standard Query Language)*

3. *Secondary geographic data capture*

4. *Continuous fields*

5. *Spatial sampling*

Essay Questions

(Note: Please read background information (last page) before answering the questions)

The Norwegian Ministry of Foreign Affairs has contracted you to provide GIS consultancy services to the small Polynesian island of Niue on climate change adaptation, as part of Norway's foreign development aid. You have two specific tasks.

1) Your first task is to convince the Premier of Niue, Hon. Mititaiagimene Young Viviani, and his three cabinet ministers that GIS is an ideal tool for planning the

relocation of the population inland as well as for developing the tourism sector of the economy.

a) You must write a short memo to the Premier explaining what GIS is, and why it can be useful for settlement planning and tourism development, particularly in the context of an uncertain and changing climate. You should inform him about the type of investment they will have to make, and the limitations of GIS.

2) Your second task is to develop a GIS that can be used to successfully relocate the 2,166 residents away from the coast. (As you see from the map that you downloaded from the Internet (below), most of the villages are currently located along the coast.) The Niue Government would like all 14 villages to be relocated at least 3 km away from the coast, to accommodate potential sea level rise and stronger tropical storms. The new villages cannot be located inside of, or within a distance of 1 km of the Huvalu Forest Conservation Area. Also, the new villages must be located within 500 meters of an existing road. Finally, to encourage tourism development, each new village should be located within 2 km of one of the island's 10 scenic points (this does not include the sites within the Huvalu Forest Conservation Area).

Note: The following four questions can be combined into one essay.

a) What types of GIS data do you need to carry out the relocation of residences and why? Describe whether each theme/data type is likely to be a point, line, polygon, or raster file.

b) Outline the procedures for siting the new villages. What types of GIS spatial analysis would you perform to take into account the considerations described above?

c) What factors are likely to be important to relocation plans that are **not** included in GIS data?

Map of Niue

Norwegian version of the questions

Kortsvar

Beskriv de følgende GIS-begrepene med inntil 4 setninger.

1. *Universal Transverse Mercator projection*

2. *SQL (Structured or Standard Query Language)*

3. *Secondary geographic data capture*

4. *Continuous fields*

5. *Spatial sampling*

Essay-spørsmål
(Merk: Les bakgrunnsinformasjonen (siste side) før du begynner å besvare spørsmålene)

Utenriksdepartementet i Norge har inngått en avtale med deg om å være konsulent i GIS for den lille polynesiske øya Niue. Oppdraget er en del av norsk utviklingshjelp, og skal handle om tilpasning til klimaendringer. Du har to oppgaver:

1) Din første oppgave er å overbevise presidenten av Niue, Hon. Mititaiagimene Young Viviani og hans tre ministere at GIS er et ideelt redskap for å planlegge relokaliseringen av befolkningen til innlandet, samt utvikling av turistnæringen.

> a) Du må skrive et kort notat til presidenten der du forklarer hva GIS er og hvorfor det kan være nyttig for planlegging av bosetting og utvikling av turisme, spesielt i en kontekst med et klima som er usikkert og i endring. Du bør informere han om hva slags investeringer de må gjøre og om GIS sine begrensninger.

2) Din andre oppgave er å utvikle et GIS som på en god måte kan brukes til å relokalisere de 2166 innbyggerne bort fra kysten (som du ser på kartet som du har lastet ned fra internett (nedenfor), bor mesteparten av befolkningen fortsatt ved kysten). Regjeringen på Niue ønsker at alle de 14 landsbyene skal flyttes minst 3 kilometer bort fra kysten, slik at de skal være trygge mot en mulig heving av havnivået og sterkere tropiske stormer. De nye landsbyene kan ikke lokaliseres inne i, eller nærmere enn 1 kilometer fra Huvalu Forest Conservation Area. De nye landsbyene kan heller ikke være lokalisert lenger unna enn 500 meter fra en eksisterende vei. I tillegg kan ikke hver ny landsby være lokalisert lenger unna enn 2 km fra en av øyas 10 turistattraksjoner (dette inkluderer ikke attraksjonene inne i Huvalu Forest Conservation Area). Dette er ønskelig for å fremme økt turisme.

Merk: De følgende fire spørsmålene kan skrives som ett essay.

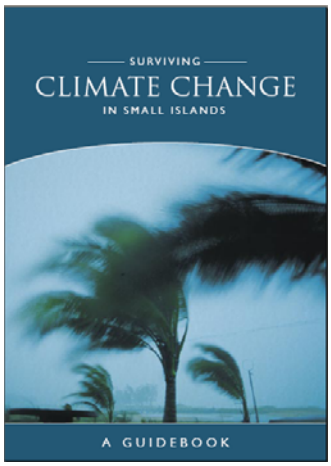
a) Hva slags GIS-data trenger du for å kunne utføre relokaliseringen av bosettinger, og hvorfor? Gjøre rede for om hvert tema/type data bør være et punkt, linje, polygon eller raster-fil.

b) Beskriv prosedyrene for å finne en lokalisering for de nye landsbyene. Hva slags romlig analyse vil du bruke for å kunne ta hensyn til de kriteriene som er beskrevet over?

c) Hva slags faktorer kan være viktige for relokaliseringsplaner, og er ikke inkludert i GIS-data?

Kart over Niue

Background information for essay question:



> The guidebook to Surviving Climate Change in Small Islands advises small islands to "*Promote increased use of geographical information systems (GIS) and remote-sensing/ spatial planning applications to assist in visualising climate impacts.*"

The island of Niue in the South Pacific is considered one of the smallest sovereign countries in the world. Formerly known as Savage Island, Niue was granted independence from New Zealand in 1974. The island, located east of Tonga at 19 02 S, 169 52 W, is only 264 square kilometers in area. It has 64 kilometers of coastline. There are steep limestone cliffs along coast and a central plateau. A huge pristine tropical rainforest that occupies 20% of Niue's land area – most of this is within the Huvalu Conservation Area. The highest point on the island is 68 m. The population of the island has dropped from a peak of 5,200 in 1966 to about 2,166 in 2005, with substantial emigration to New Zealand, 2,400 km to the southwest. The population lives in only 14 widely dispersed villages. The rest of the island comprises virgin rainforest and farmland.

The economy suffers from the typical Pacific island problems of geographic isolation, few resources, and a small population. Government expenditures regularly exceed revenues, and the shortfall is made up by critically needed grants from New Zealand that are used to pay wages to public employees. Niue has cut government expenditures by reducing the public service by almost half. The average gross domestic product is US$3,600. The agricultural sector consists mainly of subsistence gardening, although some cash crops are grown for export. Industry consists primarily of small factories to process passion fruit, lime oil, honey, and coconut cream. The sale of postage stamps to foreign collectors is an important source of revenue. The island in recent years has suffered a serious loss of population because of migration of Niueans to New Zealand. Efforts to increase GDP include the promotion of tourism. There are currently 90 hotel rooms on Niue. There are a total of 234 km of roads (86 km are paved), and one airport. There is no port, and all boat dockings are offshore, outside of the coral reef.

The government of Niue is very concerned about climate change. The potential impacts of climate change include the destruction of the surrounding coral reefs, sea level rise, and an increase in extreme events. The island was "mightily wacked" by tropical cyclone Heta in January 2004 and is still recovering from the devastation. The government is now planning to relocate much of the population inland.