An alternative tools for seismic vulnerability assessment by using Google Earth and Free GIS/Database

Participatory Seismic Vulnerability / Disaster Risk Estimation and GIS Mapping

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Problems solved:

+ System Design
- Selection and Setting up the selected Free GIS engines and Free Database engine and their connection.

+ Making Base Map
-Combining high resolution partial satellite images downloaded from Google Earth.
-Geo-referencing & rectifying.

+ Data Creation
- Participatory Mapping ← Check sheet developed in each country
(If not, EMS98, GESI etc.)

+ Data Compile
-Digitizing point, line & polygon data (Vector Layer) on QGIS.
-Store the digitized data (Vector Layer) to PostgreSQL through PostGIS.
-Import the existing digital information
(Hazard Map by Kathmandu_Valley Project)

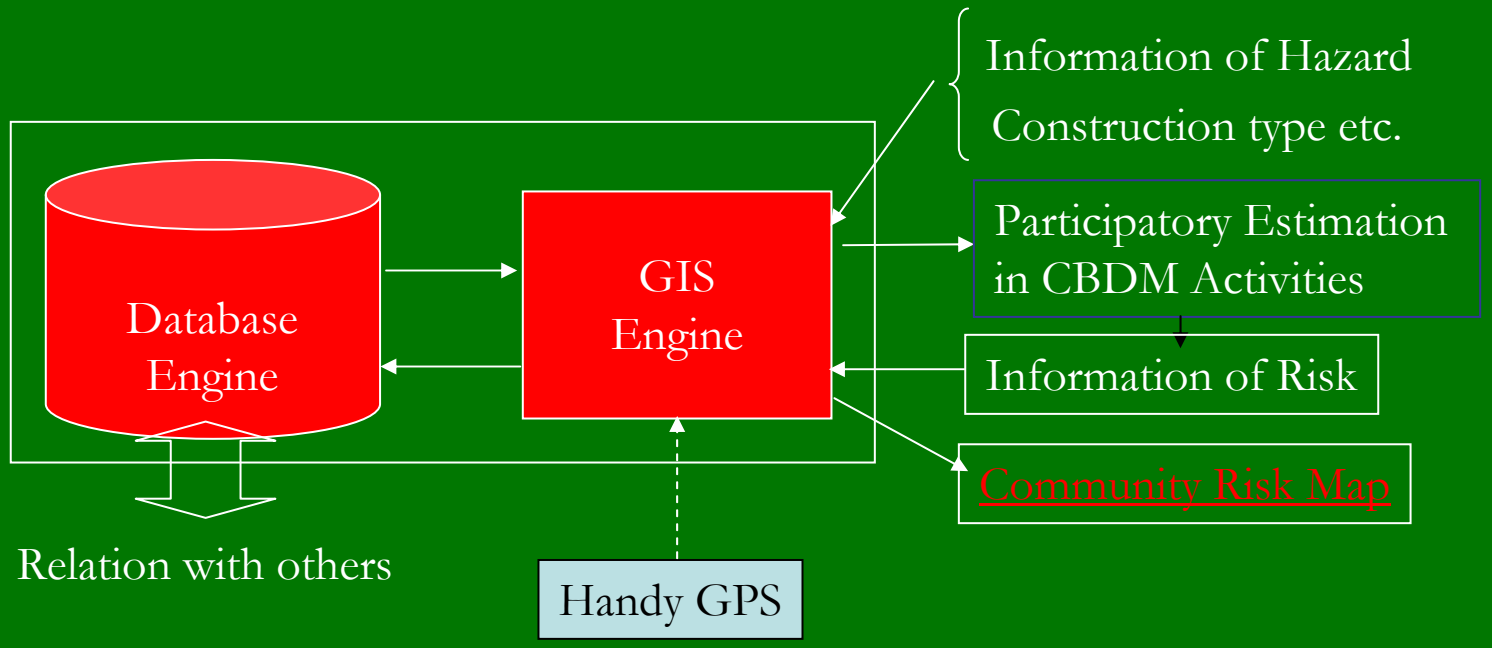
System Design

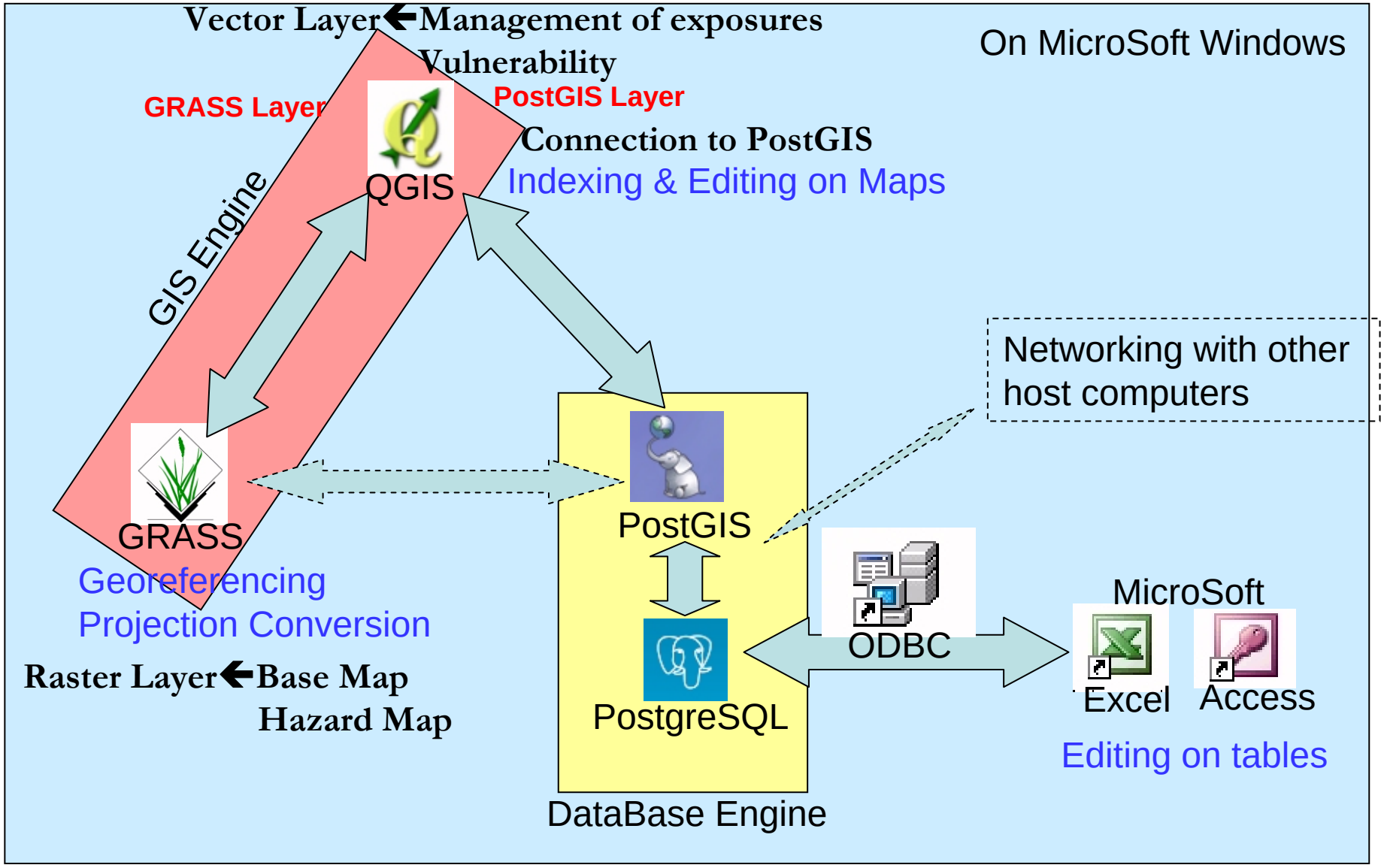
For simplicity and flexibility:

Free GIS engine (QGIS+GRASS) is used only for mapping, indexing and data management.

Free Database engine (PostGIS+PostgreSQL) is used only for data storage and management.

Estimation is done as an exterior process separated from GIS-Database.





Out line of the Management System composed of the selected Freesoftwares.

+ Making Base Map

Combining high resolution partial satellite images downloaded from Google Earth.
Geo-referencing & rectifying.

Problem:

+ Satellite Images retrieved from Google Earth legally cover just small area if resolution is enough high. Their resolution is not enough high if their coverage is enough. However, Base Map must cover whole target area with enough high resolution.
+ Satellite Images retrieved from Google Earth is not Geo-referenced.
+ Satellite Images retrieved from Google Earth is deformed. Latitude and longitude lines is not completely straight. The way of deformation is changed by panning images.

Low resolution Satellite Images downloaded from Google Earth (Not Georeferenced)

High Resolution Partial Satellite Images downloaded from Google Earth (Not Georeferenced)

Therefore, it is necessary to merge the images with high resolution covering small area.
But:

Latitude and longitude lines are straight only at and around the center of images.
Yellow lines show the deformation in exaggerated way.
This deformation may cause loss or duplication of dwellings on merged image.

A systematic procedure to overcome these problems is established.

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凡例

- Dwellings
- Open_Space
- Roads
  - Road_Category
    - 1
    - 2
- Buildings
- sur_kv
  - int
  - 5.750000
  - 8.600000
- Duwakot_base_map

Base Map with high resolution that covers the target area imported to QGIS.

Geo-referenced

Map View

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Scale 1: 9060

85.41135,27.69753

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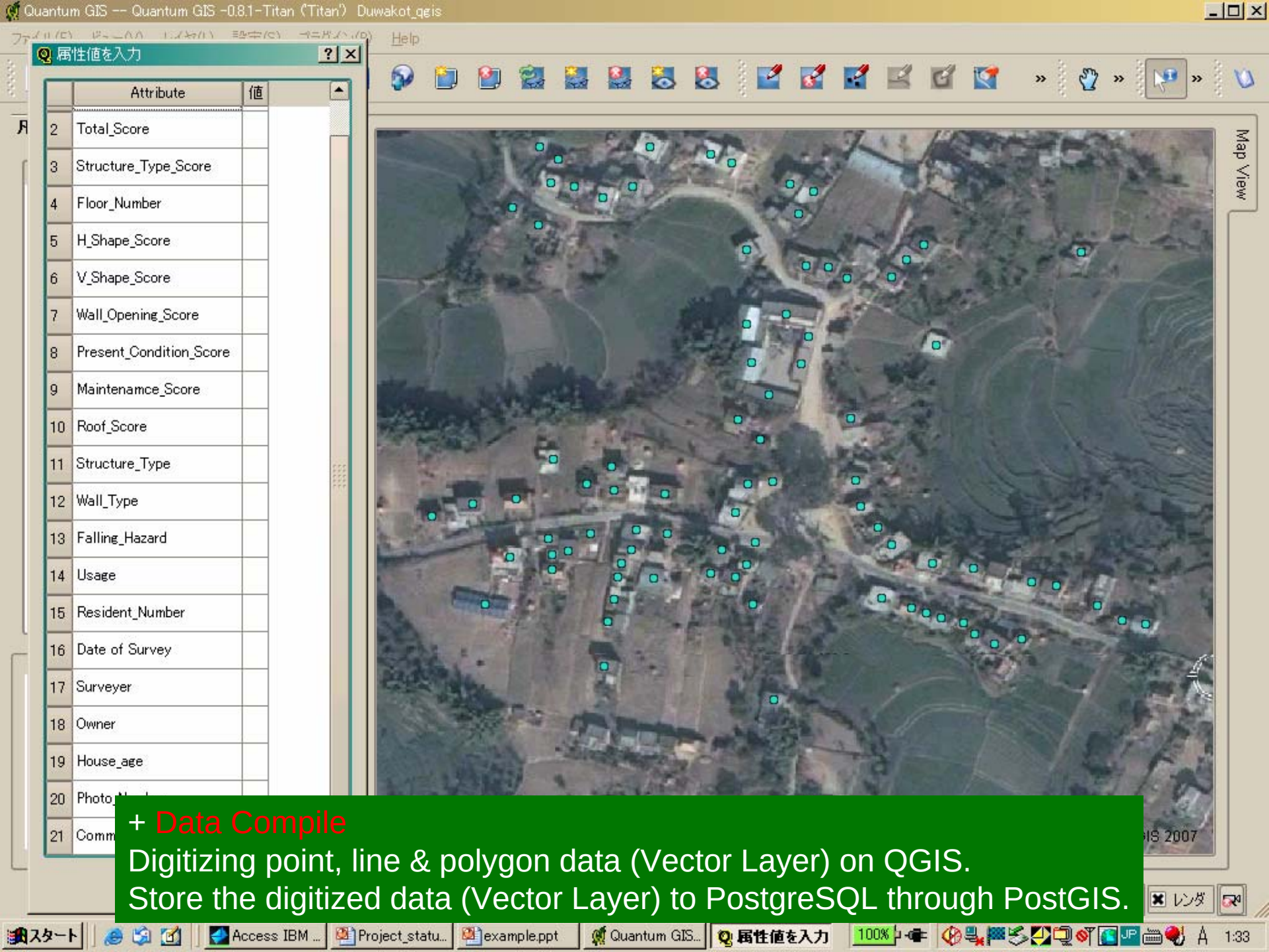
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3 Structure_Type_Score
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5 H_Shape_Score
6 V_Shape_Score
7 Wall_Opening_Score
8 Present_Condition_Score
9 Maintenamce_Score
10 Roof_Score
11 Structure_Type
12 Wall_Type
13 Falling_Hazard
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15 Resident_Number
16 Date of Survey
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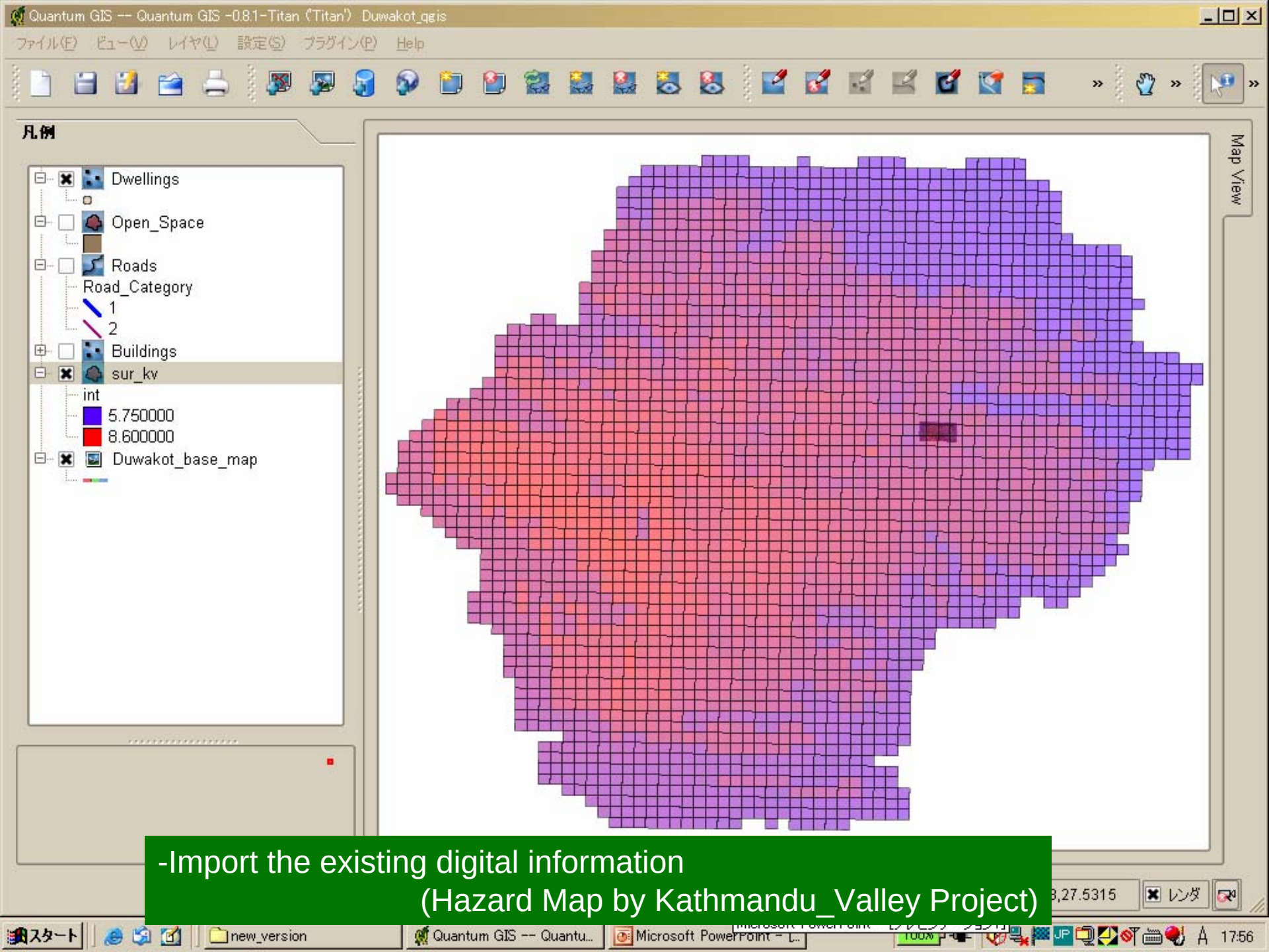
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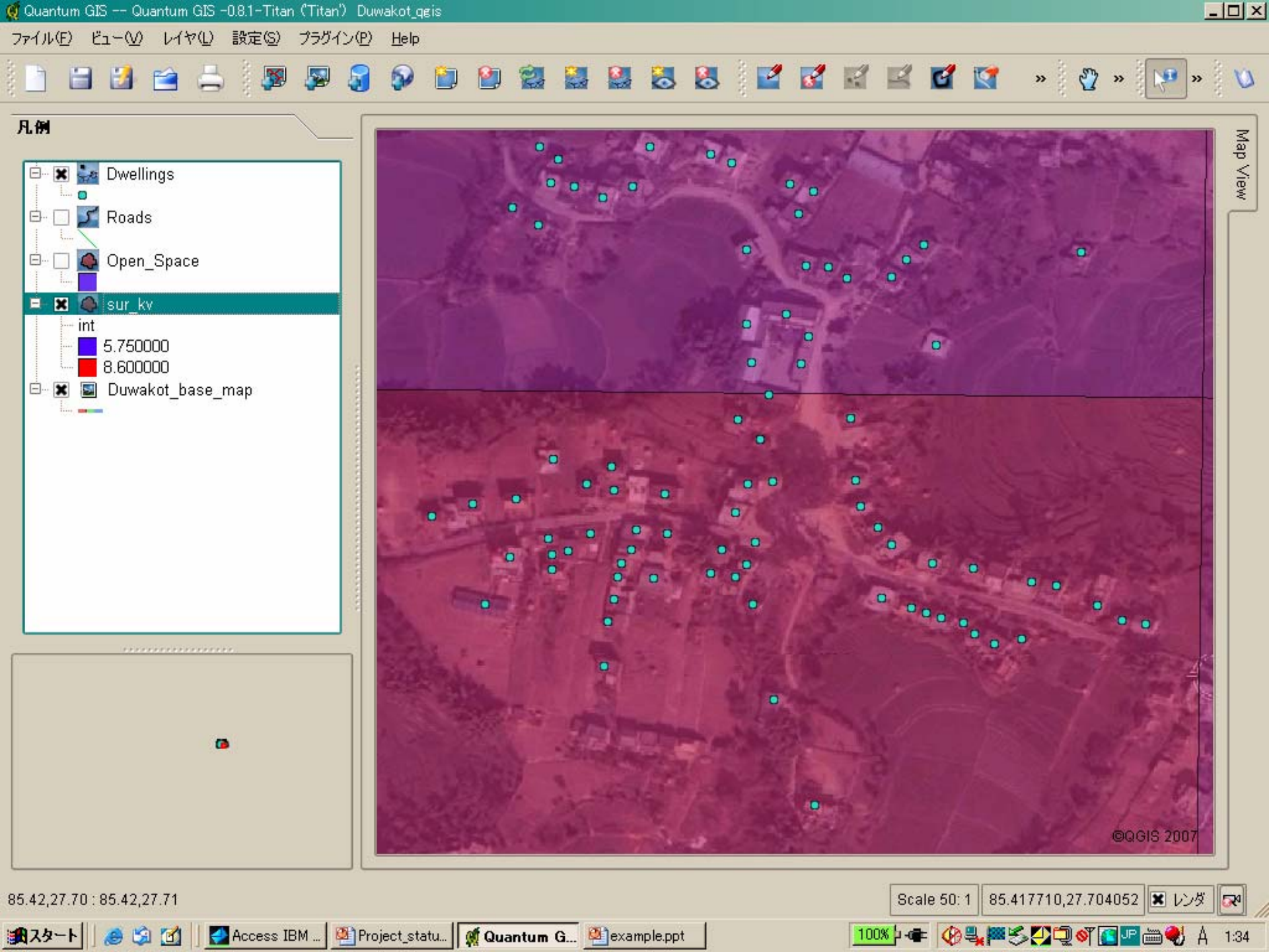
Quantum GIS -- Quantum GIS -0.8.1-Titan ('Titan') Duwakot_qgis
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Duwakot_base_map
Map View
©QGIS 2007
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