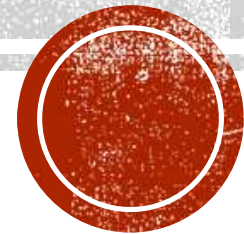


THE ROLE OF GEOLOGY IN URBAN AND REGIONAL PLANNING



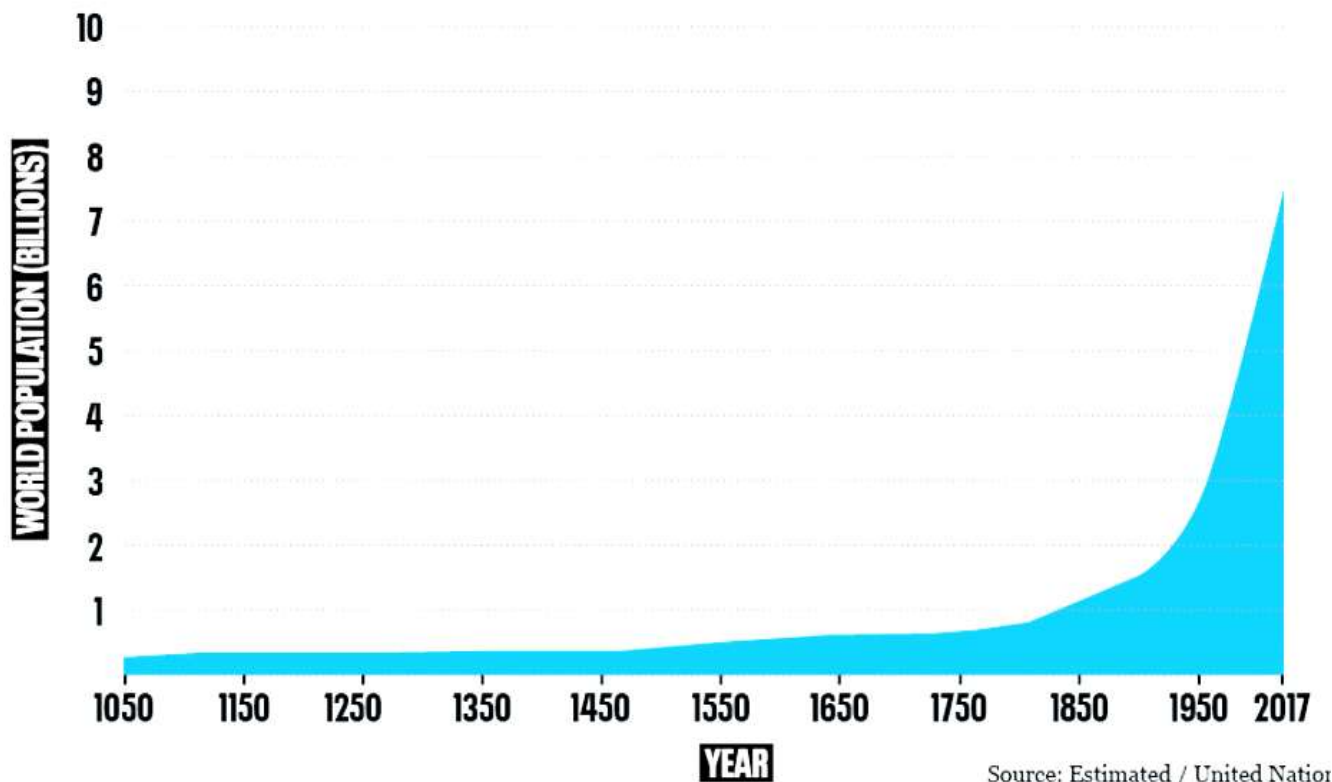
Arham Muchtar Achmad Bahar
Geoscience Department
Faculty of Earth Science



THE MYSTERY OF EASTER ISLAND

- "Why didn't they look around, realize what they were doing, and stop before it was too late? What were they thinking when they cut down the last palm tree?"

WORLD POPULATION GROWTH



- <https://populationmatters.org/the-facts/the-numbers?gclid=EAIaIQobChMInpev79266wIVSH8rCh0G Aw9EAAAYASAAEgLp-fD BwE>
- 200,000 years to reach one billion and only 200 years to reach seven billion. We are still adding an extra 80 million each year and are headed towards 10 billion by mid-century.
- We are consuming more resources than our planet can regenerate, with devastating consequences.
- Humans are directly responsible for the **sixth mass extinction** and the climate crisis, the most serious environmental threats our planet has ever faced.

“All our environmental problems become easier to solve with fewer people, and harder — and ultimately impossible — to solve with ever more people.” – Sir David Attenborough

IMPORTANCE OF URBAN PLANNING OR REGIONAL PLANNING

- Importance of urban planning or town planning are as follows:
 1. Organised and planned development of cities
 2. Offers a better quality of life
 3. Aids economic growth and economic development
 4. Takes into account the environmental considerations
 5. Makes cities resilient
 6. Better infrastructure & sustainable form of development
 7. Easy access to educational and health facilities
 8. A good and efficient public transport system
 9. An efficient & reliable waste management system
 10. More jobs and other economic opportunities

URBAN AND REGIONAL PLANNING

- Urban and regional planning can be defined as a technical and political process concerned with the welfare of people, control of the use of land, design of the urban and regional planning environment including transportation and communication networks, and protection and enhancement of the natural environment.

WHAT IS GEOLOGY? WHO NEEDS GEOLOGY?

- Geology is the study of the Earth, the **materials** of which it is made, **the structure** of those materials, **the processes** acting upon them, **organisms** that have inhabited our planet, and how they **change over time**.
- Geology, the scientific study of Earth, **benefits you and every one else on this planet**. The clothes you wear, the radio you listen to, the food you eat, the car you drive exist because of what geologist have discovered about Earth. **Earth can be a killer**. You might have survived an earthquake, flood, or other natural disaster thanks to action taken base on what geologist have learned about these hazards.

THE WAYS GEOLOGY CAN BENEFIT PEOPLE?

1. Supplying thing We Need
2. Protecting the Environment
3. Avoiding Geologic Hazards
4. Understanding Our Surrounding

GEOLGY CONTRIBUTION

Geology can contribute significantly to the solution of many of the urban problems, as follows:

- Selection of the most environmentally favourable urban settlements.
- Selection of the most suitable areas for town development.
- As a contribution to achieve the most economical and environmentally conservative solution for the Urban Plan.
- Specific assistance during the development, design and construction stages of the town.

GEOLOGIST AND PLANNERS

- **Good urban and regional planning must involve a close interaction between planners and geologists.**
- **The complex geologic controls on an area must not be ignored, rather they must be evaluated and incorporated into the overall plan.**
- **Good cities don't happen by accident, they are the result of good city plans; these plans are only as valuable as the land beneath them dictates.**

URBAN GEOLOGY

- Urban geology is the application of geological principles and knowledge to the solution of construction, and now environmental problems in or near urban areas (Karroiv and White 1998).
- Traditional approaches to urban geology have focused **mostly on the engineering behavior of the various geological materials below cities.**
- Provision of adequate **construction materials**, sufficient **drinking water**, **waste disposal**, **soil** and **landscape degradation**, and the increasing vulnerability of densely populated urban areas to **geological hazards** and **environmental disasters.**

SPATIAL DATA FOR URBAN PLANNING

An approach to presentation of maps for urban planning purposes could suggest these categories:

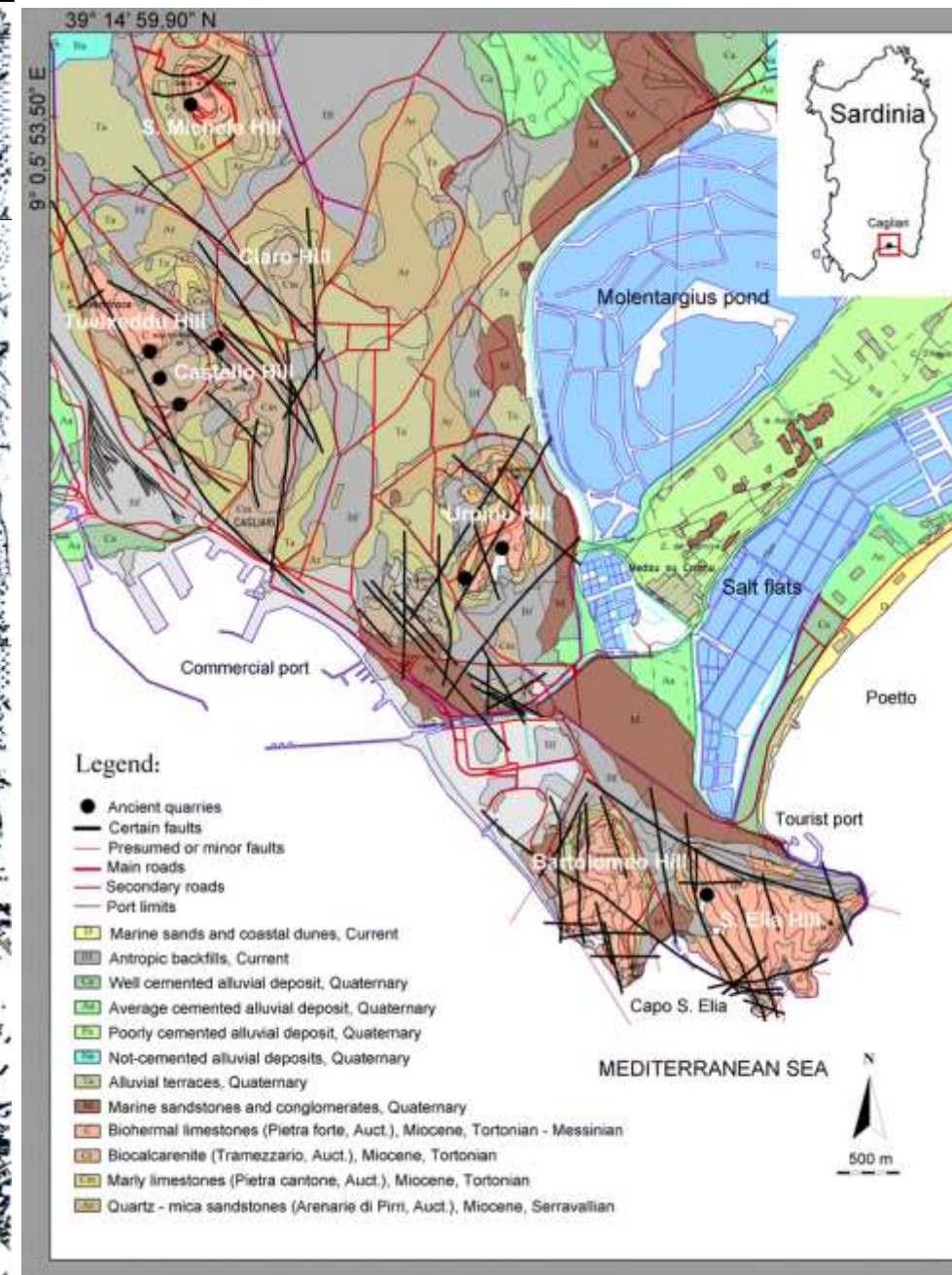
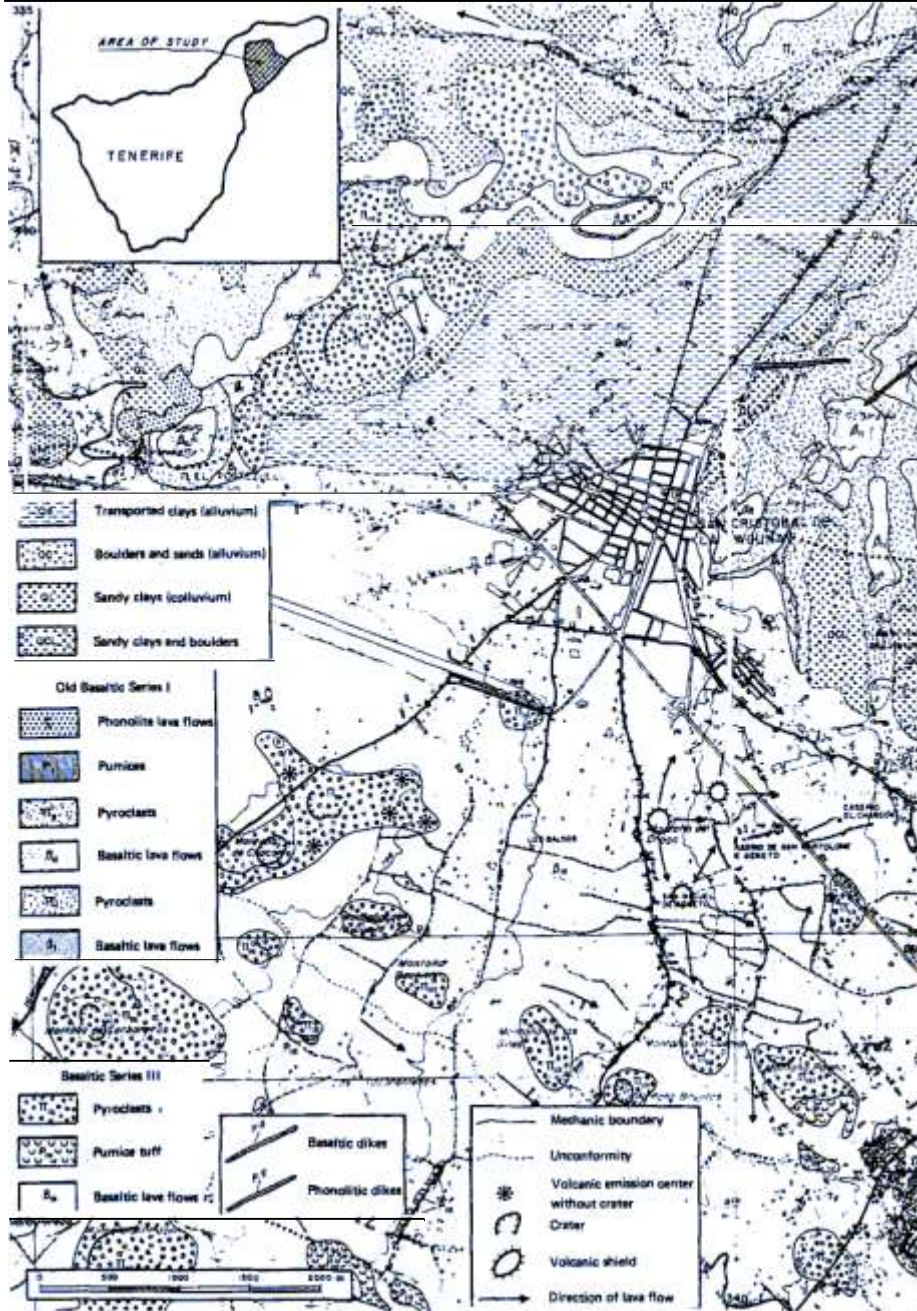
- Basic maps
- Engineering geological maps
- Influence factor maps
- Urban suitability maps
- Land system maps.

BASIC MAPS

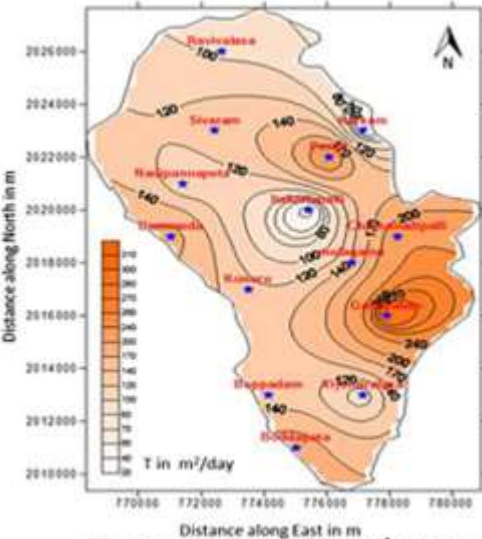
- Geological map
- Geomorphological map (terrain map)
- Hydrogeological map

After these basic investigations, the following, engineering geological problems should be considered:

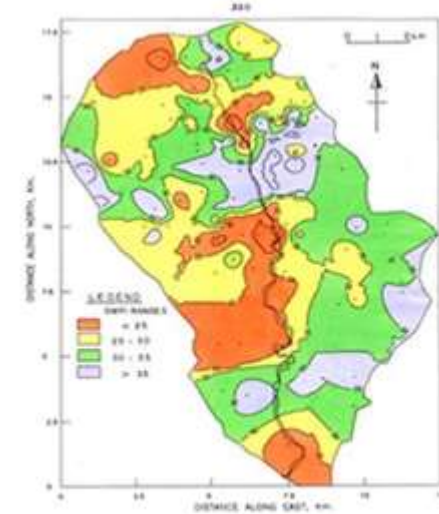
- Foundations
- Ground stability
- Excavations
- Natural resources
- Water supply
- Waste disposal.



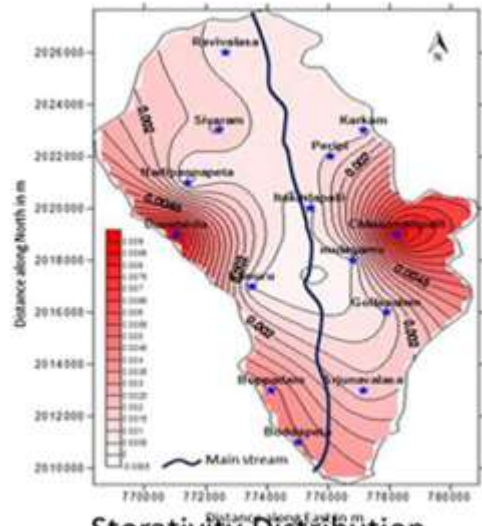
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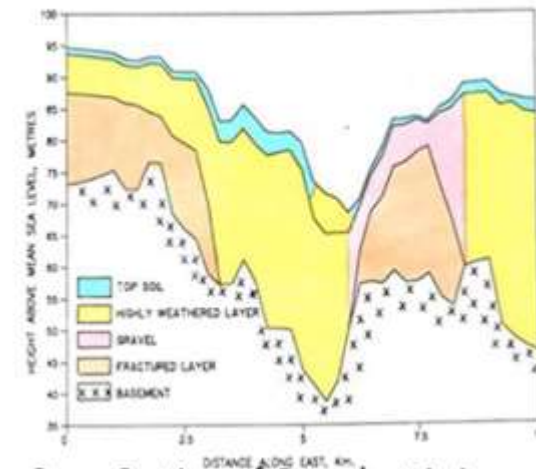
Transmissivity Distribution



Groundwater Potential Index



Storativity Distribution

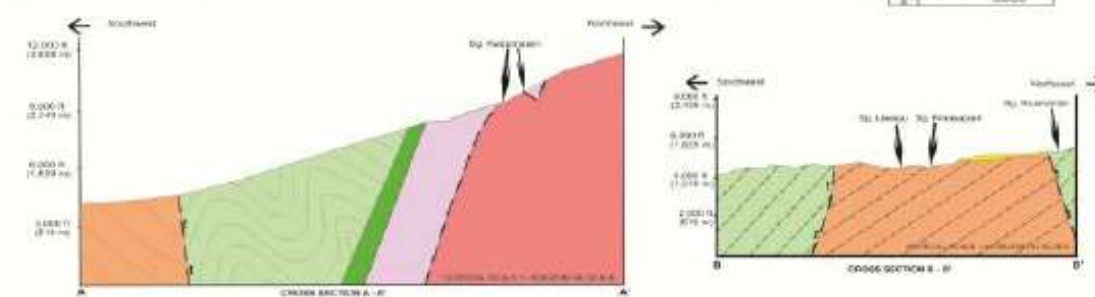
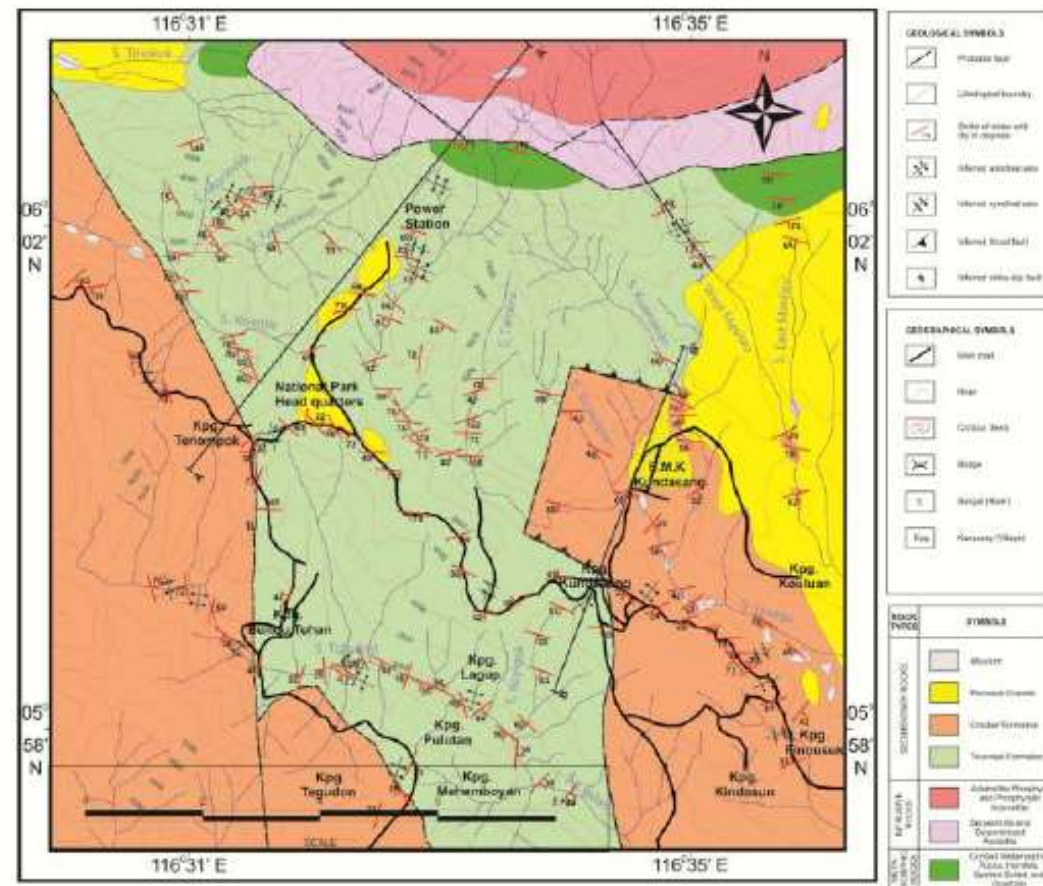
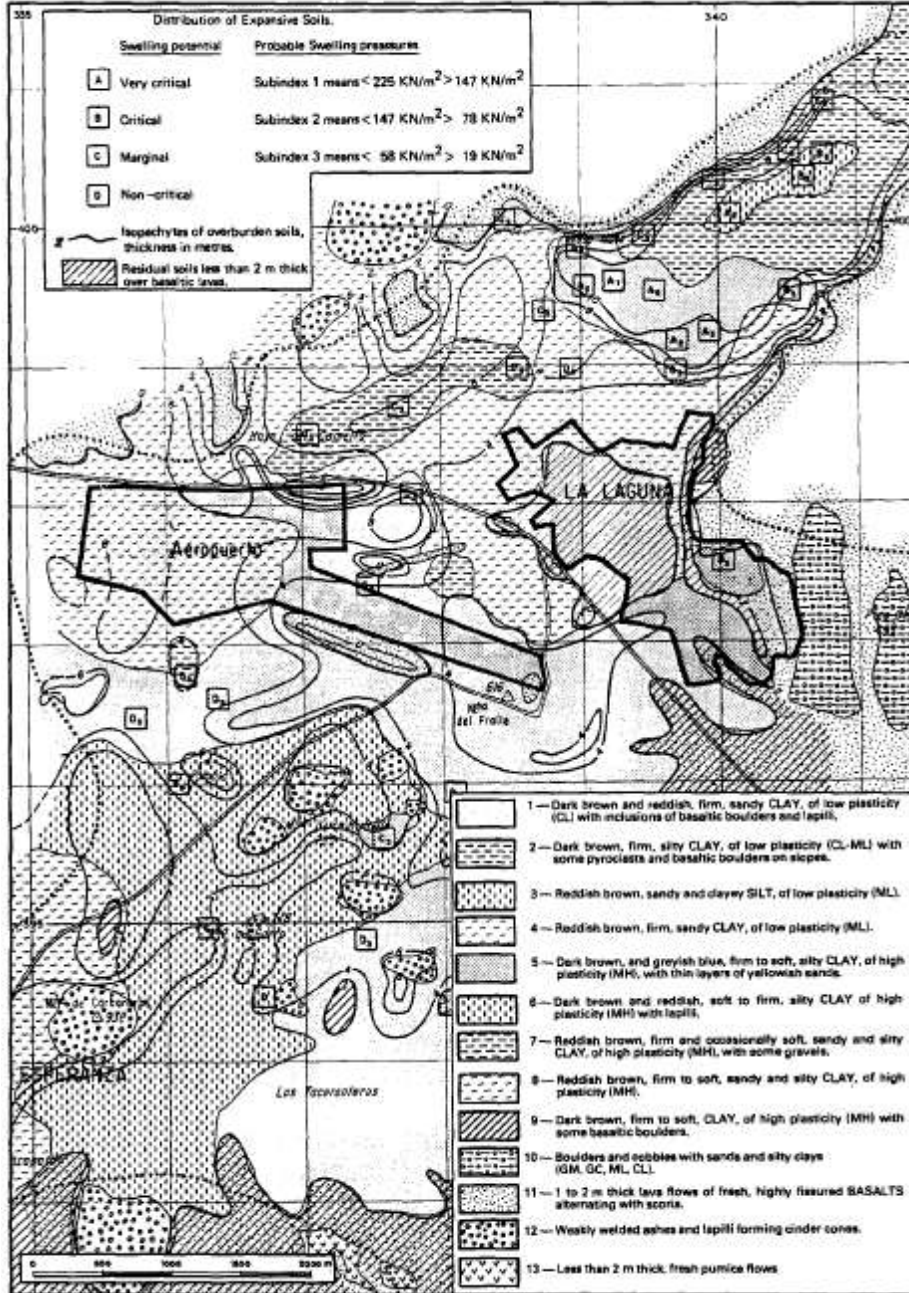


Cross Section of Geo electric Layers

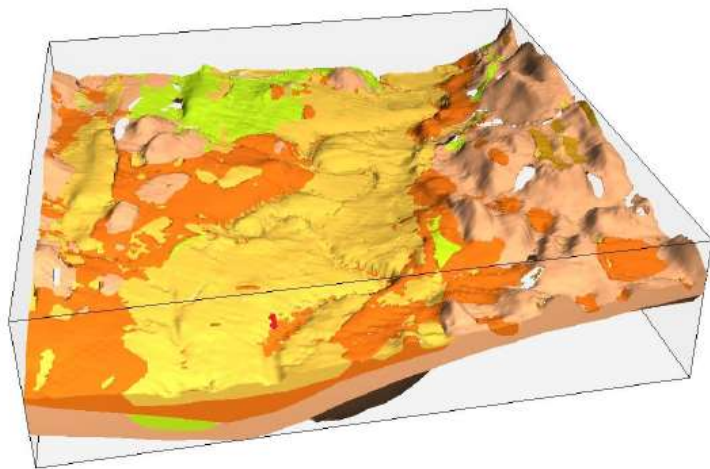
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ENGINEERING GEOLOGICAL MAP

- Special engineering geologic maps may be available to show not only the scientific information compiled about the area
- Detailed of engineering geologic maps
- Soil maps are another tool available to the geologist, yielding information on nearly every aspect of the upper subsurface:
 - Drainage, physical and Chemical characteristics,



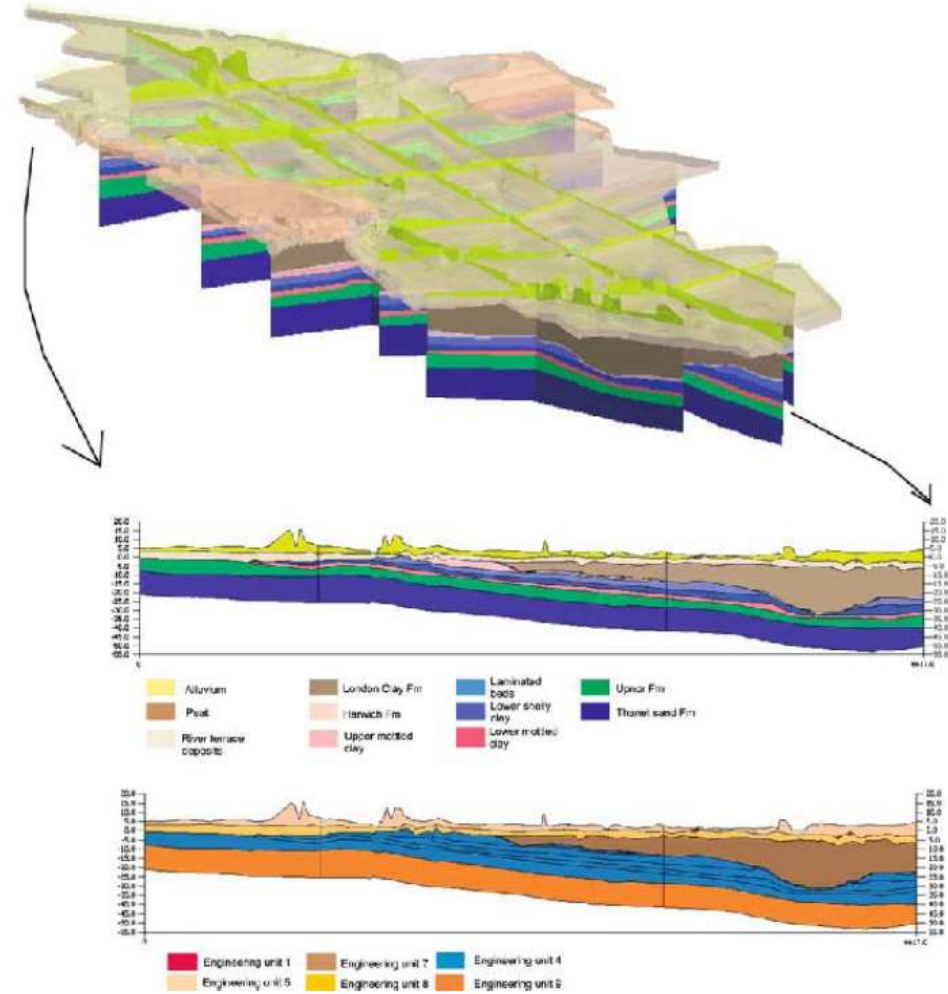
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Plasticity

Key

- Very high to extremely high liquid limit: Peat
- Intermediate to high liquid limit: Paisley Formation
- Low to intermediate plasticity: Wilderness Formation
- Sometimes intermediate to high plasticity: Made ground, Gourcock and Law Formations
- Sometimes low to intermediate plasticity: Ross Formation (silt)
- Fine-grained deposits of unknown plasticity Broomhouse (fine) and Bellhouse Formations
- Not plastic: Killearn, Bridgetone, Ross (most), Broomhouse (coarse) Formations :



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INFLUENCE FACTOR MAPS

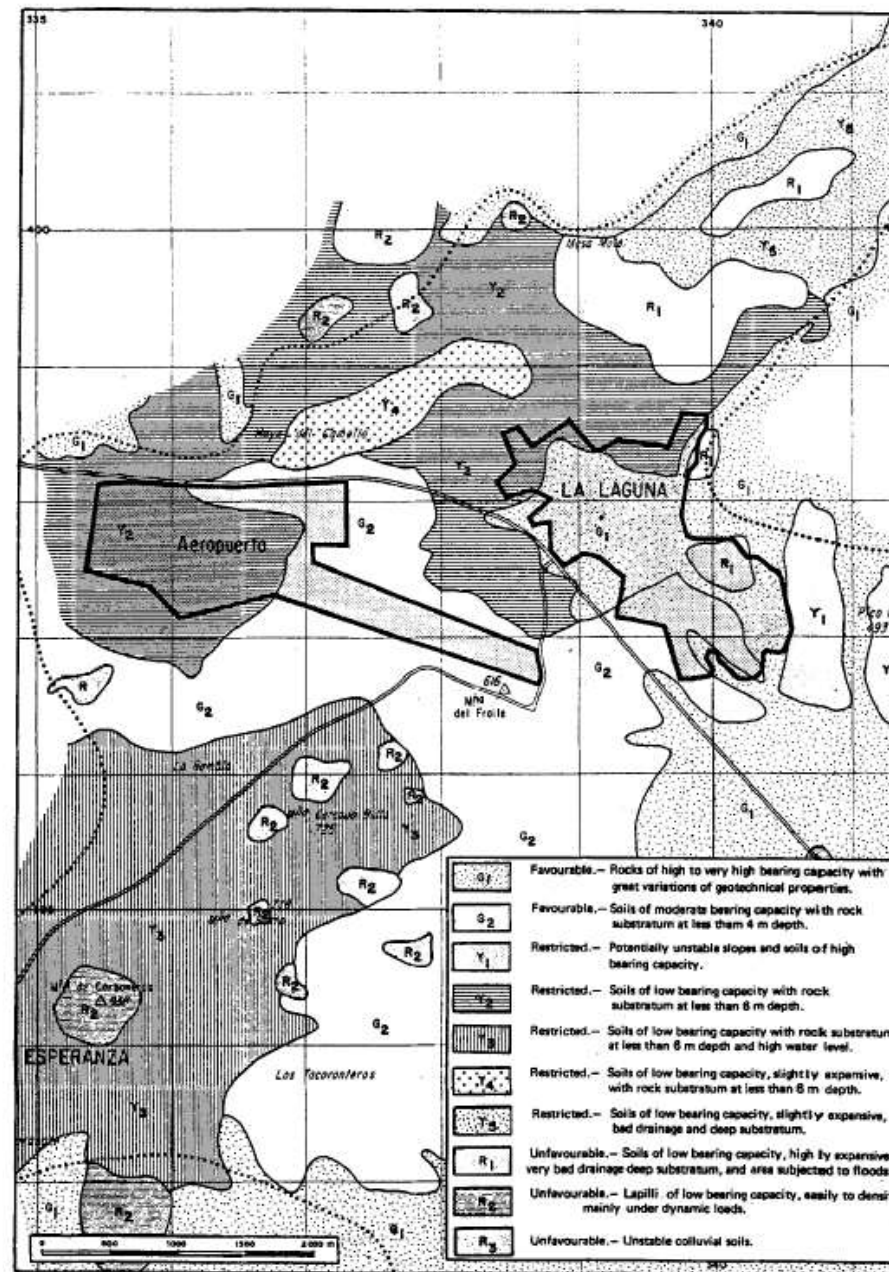
The number and type of influence factors to be included, nor how they should be presented for urban planning purposes, the inclusion of the following is suggested:

- Slope
- Foundation conditions
- Groundwater conditions
- Construction materials
- Slope stability
- Waste disposal
- Mineral resources
- Geological hazards.

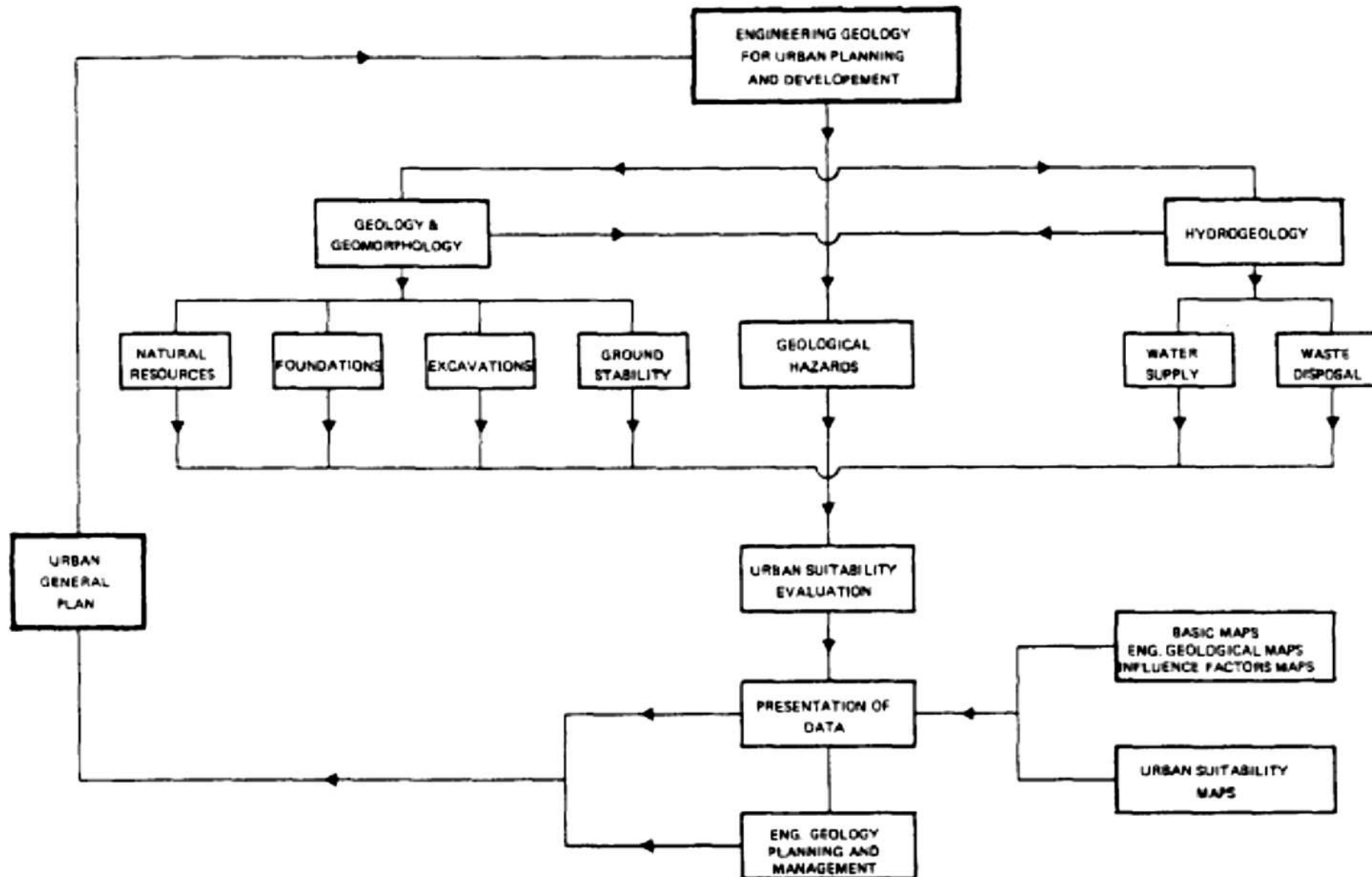
URBAN SUITABILITY MAP

- Slope steepness evaluation map
- Engineering, geological evaluation map
- Waste disposal
- Ground water pollution evaluation map

The objective is to give a quick idea of the most suitable or unsuitable areas for different factors.



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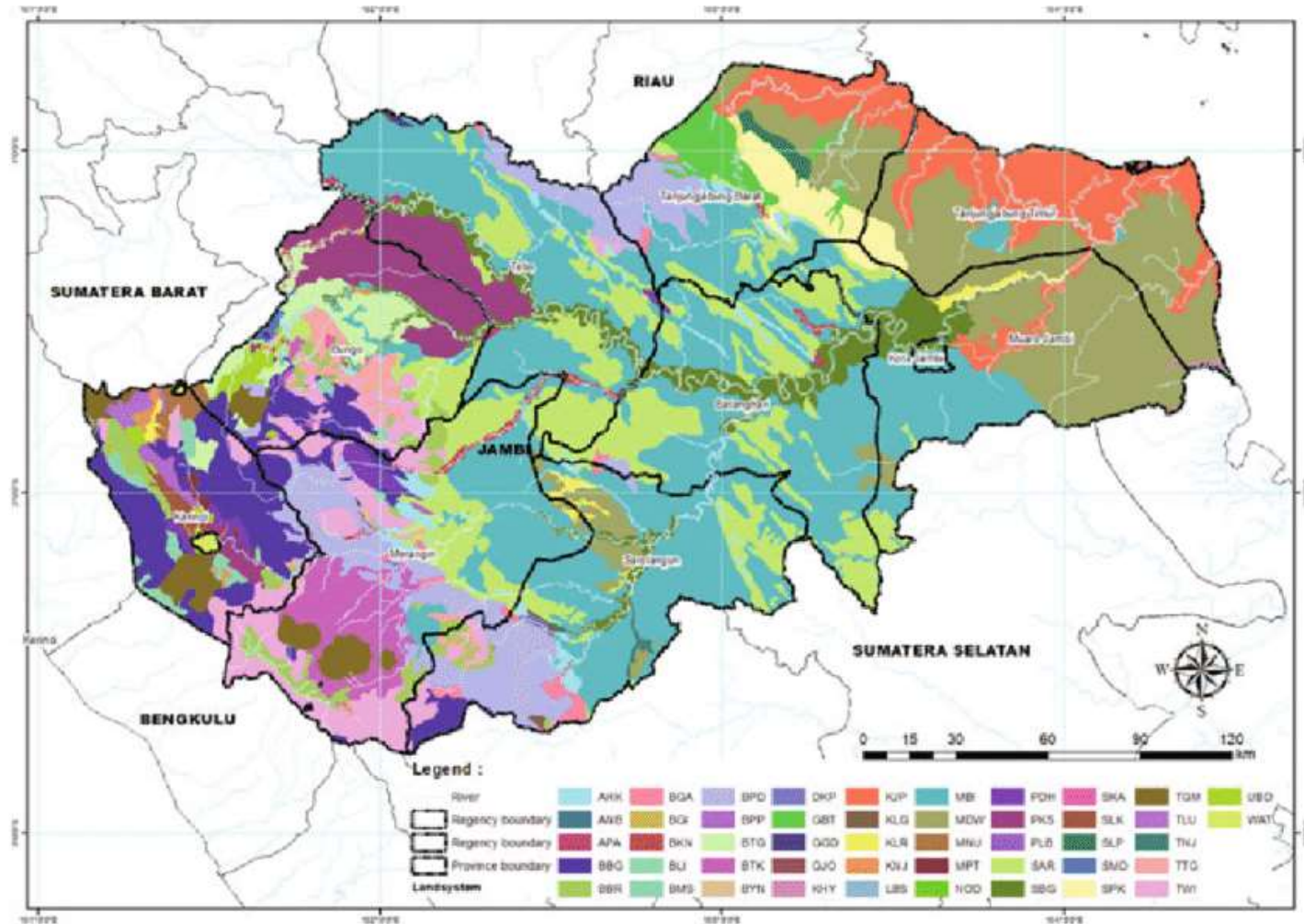


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LAND SYSTEM

- A land system is an area of land, distinct from surrounding terrain, within which particular classes of land features are consistently associated and are expressed as a recurring sequence of particular land components.
- These land components generally occur in similar proportions and have similar interrelations in each occurrence of a particular land system. Land systems are usually mapped at 1:100 000 or 1:50 000.
- A land zone is a broad area of land consisting of land systems that are related in terms of one or more of the independent land characteristics — land form, geological material and climate. Soils and native vegetation are listed in broad terms, but they are not used as differentiating criteria. Land zones are best mapped at 1:50 000 or 1:250 000

LAND SYSTEM MAP



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CONCLUSIONS

Geology can provide essential information for urban planning and development as follows:

- **Recognition of the problem**
- **Evaluation of the problem**
- **Anticipation of a general behaviour of the materials in relation to the engineering properties**
- **Prediction of general problems affecting the same engineering geological unit**
- **Zoning the area in different ranges of urban suitability or risk**
- **Planning and development according to the characteristics of each zone**
- **Recommendation for detailed studies in order to apply remedial measures and/or avoid or restrict development in appropriate areas.**



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