Integrated site investigation procedure for environment protection toward sustainable development

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Abstract. The spatial configuration of cities and their relationship to the urban environment has recently been the subject of empirical, theoretical and policy research. An awareness of environmental issues can assist policy makers, planners, developers and others to recognize the constraints imposed upon development due the physical environment especially in areas, which are susceptible to erosion, flooding and landslide. This paper highlights the key requirements for considering an assessment to protect our urban environment by incorporating three main factor i.e. policy practice, planning process and engineering investigation. Base on this three main factor the framework of the assessment is carried out. The assessment can be divided into three different categories, namely as investigation for planning, investigation for urban development and specialized investigation and mitigation. The minimum requirements for the planning and urban development investigation are listed. These guidelines suggest the level at which the various types of investigation should be carried out as well as the range of application, the scope and methodology to be used for different investigation. It is hoped that this procedure will provide guidance in the establishment and protection of urban ecosystem toward sustainable development.

1. Introduction
Sensible planning of land use and decisions on planning applications depends on sound information. Much of these concern economic, social and environmental issues. Whilst the physical and mechanical characteristics of ground material are relevant to many land uses, there is often a limited appreciation of this amongst decision makers. In order to satisfy the public’s demand for safe land, application, planning and balance urban growth, appropriate geological information are need to be integrated into the planning process. Procedure should be drawn up to ensure that the recently instituted legislative measures are implemented and enforced, accordingly.

2. The legal basic of planning
The planning process in Malaysia is dictated primarily by the Town and Country Planning Act (1976). It is supported complemented by other legislation such as Road, Drainage and Building Act 1974 (A133). There are two levels of planning, land use planning and regulation and control of development. The development planning system was introduced in accordance with the Town and Country Planning Act 1976 (A172) and provides for two tiers of planning, namely Structure Plan (Section 7(3)) and Local Plan (Section 12). The process of regulation and control of development involves consultation and input from several technical departments, prior to the provision of concession of land conversion or planning permission [Act A172 Section 18 and 19(1)]. The development only can be carrying out after it has been granted under Section 22 or extended under
Section 24(3). The respective involved in the consultation departments the local authority before
permission is granted include the Town and Country Planning Department (TCPD), the Public Works
Department (PWD) and the Drainage and Irrigation Department (DID).

Act A133 is used for Building Plan Approval during the development control process. It includes
provisions for the giving of notices, the depositions of plans and information concerning the building
development and the inspection of the works. Local Authority is required by statute to administer and
enforce the Building Regulation. The basic purpose of this Act 133 is to ensure a high standard of
health and safety for persons in or near, buildings and of others who might be affected by building or
matters connected with buildings. In Selangor, Malaysia, the Building Plan Approval is also include
the approval of earthwork condition Section 4(70(a)) & 4(70(b)) and Earthworks By-Laws 1992 for
Selangor Local Authority. As far as ground engineering is concerned, the main regulation governing it
is based on Earthworks By-Laws 1992, where erosion and sedimentation covered under Section
2(6)(a); slope stabilization is under Section 2(6)(e)(ix); foundation is under Section 2(8), 2(9), 2(12)
and 2(11); and structural stability is under Section 85A in Act A133.

3. Land Use Planning Issues in Malaysia related to Prevention of Geological Hazard

In 1990’s, the basic geological information utilized in suitability analysis that constrained to urban
development is only relate to the physical features of the area, such as existing landforms with respect
to the ruggedness of the terrain, slope analysis and mitigation of cut slope and surface erosion [1-4]
The use of geological information first time establish in the preparation of Cyberjaya master plan [5,6].
There are several of standards for regulation and control of development as example site gradient
and land use zone; availability of access road and road reserves, engineering controls for flood prone
areas, drainage requirements for low areas and availability of adequate water supply. Unfortunately
no proper geological inputs and standards were put forward to the Town and Country Planning
Department of Peninsular Malaysia [1]. Earthworks By-Laws 1992 for Selangor State in (Section
4(70(a)) & 4(70(b)) Act A133 described that site investigation and soil investigation need to be
considered as part of regulation and control of development. Without specified requirement for the
level of site investigation, the best method of construction for sustainable development cannot be
implemented [7, 8]. Currently, Section 2(8) and Section 4 Earthworks By-Laws 1992, recommend
only detail site investigation on foundation which related to the piling condition, capacity of end
bearing loads; type of piling according to engineering characteristic of the soil. Other information
such as vulnerability of areas to land degradation during development, the stability of each involved in
the development and the level of detail requirements for each earthwork are neglected.

4. Development of Integrated Site Investigation Procedure

The assessment of integrated site investigation procedure can be divided into three different
categories, namely as investigation for planning, investigation for urban development and specialized
investigation and mitigation (Figure 1).

4.1 Investigation for planning

Investigation of this nature provides the broadest level of detail on the geotechnical conditions of a
site. This is the first steps in evaluating a particular area for town planning purpose which consist of
regional engineering geological mapping or a feasibility study for development of particular site where
regional engineering geological mapping has not ready been done. Investigation for planning will be
used for assessment of the area greater than 1,000 ha. Investigation for planning consists of the
planning of future development axes of urban areas; assessment of the natural resources of areas
earmarked for future development, to reserve and prevent the sterilization of these resources;
identification of geological constraints at an early stage in the planned development; and the provision
of information for an environmental impact assessment of urban development, which will assist in
identifying geological sensitive areas. All the information in this first stage procedure will be used for
deciding and formulate the objective and references to cumulative land use development.
4.2 Investigation for Urban Development

Typically this type of investigation is required for an area more a less than 10,000 ha in size. Assessment from investigation for planning will be used to evaluate the feasibility of utilising the area for urban development. The purpose of this investigation is to determine and map the detailed engineering geological and geotechnical conditions of the terrain in order to delineate and define areas of geotechnical constraint and also for application of development control and approval from local authorities. Urban development investigation are subdivided into two types, based on the size of the area considered, as the approach and execution of engineering geological and geotechnical investigation of small areas differ significantly from those of larger areas. Urban development investigation sites is carried out to enable classification of the site in terms of the recommended foundation solution and earthworks procedures base on Malaysia Act i.e., Act 172 1976 and Act 133 1974. This type of investigation mainly for zoning of plots or stands for layout plan and earthwork plan for preparation of development control report. Layout plan, earthwork plan and development control report should be accompanied by a map demarcating the ground condition into zones according to Development Control Report Guideline from Malaysia Town and Country Planning Department (TCPD). In this layout plan, earthwork plan and development control report also provides all relevant additional site conditions such as problem soils, possible slope instability base on cut slope, geohazard prone area base on simulation of soil and rock properties, topography, land use and policy practice accordingly to Malaysia planning process.

4.3 Specialized Investigation and Mitigation

These investigations are more specialised and detailed in nature. This investigation is main for site investigation for civil engineering construction and environmental engineering evaluation. This investigation is the last stage of the assessment that will provide a consultant and contractor more detail about the ground base on the zoning and earth work plan.
5. Advantage of the Procedure
Presented with this integrated site investigation procedure on the urban environment protection is able to make the engineering geological input and geotechnical input to the town planning process with an overall view to ensure the planning of future developments that are inherently safe from a geologist point of view. Five aims are listed which are to identify and eliminate potentially disastrous or dangerous geotechnical situations arising; to identify and try to improve inefficient land-use proposals; to provide an engineering geological/geotechnical advisory service to planners and developers; to advise Local Authorities on the geotechnical suitability of land for avoiding geo-hazard problems; to advise Local Authorities on the geological and geotechnical lease or clause conditions required in legal for site investigation assessment.

6. Concluding Remark
Planning may be seen as an exercise in decision making in the use of land. If it has a single major weakness, it is that decisions are based on monetary term. Although one can establish lots of environment information but, the implications to be drawn may are based can one’s opinion. Planning recommendations and decisions reflects the values both of planners, engineer and engineering geologist in which they operate.

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