CHAPTER V

CONCLUSION

It is a known fact that the physical environment is among one of the most significant determinants for development planning programme. Such a requirement posses two management challenges to the geological studies, namely, the acquisition and mobilization of geological information from various sources, and the creation of a comprehensive data base for further multipurpose usage. Both cases, however, require that the geological information should be prepared and presented in the forms and formats with the capacity to bridge the communication gap or to strengthen the communication with other disciplines which will in return encourage its multipurpose usage.

In previous chapters, detailed environmental geology have been described and presented aspect by aspect so far as the scope of the present investigation is concerned. Additional attempt has been made in this chapter to synthesize and integrate every possible aspect of environmental geology earlier analyzed for 3 different development planning purposes, notably, residential, heavy industrial, and agricultural options. The final evaluation of each option is expressed in terms of the land-capability rating essentially based on the suitability of various parameters of environmental geology. Besides, precautionary measures on the environmental sensitive resources and values including any other

restrictions for development have been identified and taken into account in the evaluation procedure.

No attempt has been made in the present investigation for detailed evaluation of specific development project in the area. However, the data base on numerous aspects of environmental geology available in this study will, without any doubt, beneficial for any other detailed studies.

In order to evaluate the development potential of the area for residential, heavy industrial, and agricultural purposes on the basis of efficient use of land and resources as well as taking the environmental values into consideration, the land-capability rating system is employed. Primarily, the studied area is broken down into 4-square kilometer grid cell for the application of weight-rating values. The capability values and weights for each parameter of environmental geology for different development purposes, namely, residential, heavy industrial and agricultural options are assigned according to the degree of importance and relevancy. Special emphases are given upon only those aspects of environmental geology which will have different values on the weight-rating system of the area concerned.

It is decided that the concerned parameters of environmental geology would have no more than 5 categories and that a rating or capability value of 1 would indicate low capability and a rating of 5 would indicate a high capability. The rating of the same parameter would vary according to the different in possible land use of various

development potentials. Considering each development option, some parameters are important than the others. It is, therefore, decided that each parameter would be assigned a weight of from 1 to 10. As same as the capability values of the parameter of environmental geology, the weight of the same parameter also varies according to the different option of development. The weight rating for a single parameter for a single cell could then be obtained by multiplication and could range from 1 to 50. Then, the weight ratings of each 4 square kilometers-grid cell are totalized. Finally, for each option of development potential, the weight rating is classified into 5 classes of capability for development rating, namely, most suitable, second most suitable, third most suitable, fourth most suitable and least suitable.

For the residential development planning, the environmental geology parameters concerned are water supply, infrastructures (road, highway, railway, and electricity), existing land use and land cover, slope, foundation, construction materials and others (pollution, hazards), in their decreasing order of weight. Each parameter of specific weight is further subdivided into different subclasses of different capability values. Finally, the weighted capability values of each 4 square-kilometer grid cell area are evaluated on the bases of the environmental factors summarized and presented in Table 5.1.

With regard to the heavy industrial development potential, the parameters on environmental geology are infrastructures (road, highway, railway, seaport, electricity, natural gas pipeline), water supply,

Table 5.1 Weighted capability values of environmental factors for residential land-use potential.

	Environmental factor	subclass	weight	capability value	weighted capability value
I.	Water supply	within 1 kms	10	5	50
	(nearnees to water	between 1-2 kms		4	40
	pipeline, reservoir and	between 2-3 kms		3	30
	potential reservoir,	between 3-5 kms		2	20
	main stream)	5+ kms		1	10
II	Infrastructure				
	A) access road and	within 2 kms	4	5	20
	highway	between 2-5 kms		4	16
		between 5-10 kms		3	12
		between 10-20 kms		2	8
		20+ kms		1	4
	B) railway	within 5 kms	2	5	10
		between 5-10 kms		4	8
		between 10-20 kms		3	6
		between 20-50 kms		2	4
		50+ kms		1	2
	C) electricity	within 5 kms	4	5	20
		between 5-10 kms		4	16
		between 10-20 kms		3	12
		between 20-50 kms		2	8
		50+ kms		1	4

Table 5.1 (cont.)

	Environmental factor	subclass	weight	capability value	weighted capability value
III	Existing land use and land cover	urban land	6	5	30
		range land		4	24
		agriculture land		3	18
		forest land		2	12
		wet and barren land		1	6
IV	Slope	0-2 %	5	5	25
		2-5 %		4	20
		5-10 %		3	15
		10-20 %		2	10
		20+ %		1	5
V	Foundation	Alluvial fan, terrace & valley-fill dep.	4	5	20
		Beach & dune dep.		4	16
		Floodplain dep.		3	12
		Residual/land-slide & talus dep.		2	8
		Tidal flat/ estuarine & marsh dep.		1	4

Table 5.1 (cont.)

	Environmental factor	subclass			weight	capability value	weighted capability value
VI	Construction materials	within	5	kms	2	5	10
		between	5-10	kms		4	8
		between	10-20	kms		3	6
		between	20-50	kms		2	4
			50+	kms		1	2
VII	Others						
	A) pollution	within	1	kms	5	1	5
	(industries)	between	1-2	kms		2	10
		between	2-3	kms		3	15
		between	3-5	kms		4	20
			5+	kms		5	25
	B) hazards (flood)	within	1	kms	2	1	2
	(nearnees to the	between	1-2	kms		2	4
	main stream)	between	2-3	kms		3	6
		between	3-5	kms		4	8
			5+	kms		5	10

existing land use and land cover, slope, foundation, construction materials, and others (marine geological condition, potential source for fresh water pollution, wind, hazards). Each of the environmental geological parameter is further divided into different subclasses of different capability values. Finally, the weighted capability values of each 4 square-kilometer grid cell area throughout the studied area are evaluated based on the environmental factors summarized and presented in Table 5.2.

Last, the development potential for agricultural purpose is evaluated using the following parameters, namely, water supply, slope, surficial deposits, existing land use and land cover, infrastructure (road, highway, railway) in their decreasing order of weight. Each environmental factor is further divided into different subclasses of different capability values according to the suitability. Finally, the weighted capability values in each 4 square-kilometer grid cell area throughout the studied area are evaluated on the basis of the land use potential criteria summarized and presented in Table 5.3.

Besides, the environmentally sensitive resources and other restrictions to general development planning, namely, existing and potential reservoir sites, forest land, recreational potential areas, and Royal Thai Navy reserved areas previously identified have been carefully located in the development potential maps of the studied area. These include beach resorts, island resorts, archaeological sites, ancient royal palace, private parks and lodging, golf courses, wild-life

Table 5.2 Weighted capability values of environmental factors for heavy industrial land-use potential

Environmental factor	subclass	weight	capability value	weighted capability value
I Infrastructure				
A) access road & highway	within 2 kms	6	5	30
	between 2-5 kms		4	24
	between 5-10 kms		3	18
	between 10-20 kms		2	12
	20+ kms		1	6
B) railway	within 5 kms	5	5	25
	between 5-10 kms		4	20
	between 10-20 kms		3	15
	between 20-50 kms		2	10
	50+ kms		1	5
C) seaport	within 5 kms	4	5	20
	between 5-10 kms		4	16
	between 10-20 kms		3	12
	between 20-50 kms		2	8
	50+ kms		1	4
D) electricity	within 5 kms	8	5	40
	between 5-10 kms		4	32
	between 10-20 kms		3	24
	between 20-50 kms		2	16
	50+ kms		1	8

Table 5.2 (cont.)

	Environmental factor	subclass	weight	capability value	weighted capability value
	E) natural gas pipeline	within 2 kms	8	5	40
		between 2-5 kms		4	32
		between 5-10 kms		3	24
		between 10-20 kms		2	16
		20+ kms		1	8
II	Water supply (nearness to reservoir and potential reservoir, water pipeline)	within 5 kms	8	5	40
		between 5-10 kms		4	32
		between 10-20 kms		3	24
		between 20-50 kms		2	16
		50+ kms		1	8
III	Existing land use & land cover	rangeland	6	5	30
		agriculture land		4	24
		wet & barren land		3	18
		urban land		2	12
		forest land		1	6
IV	Slope	0-2 %	5	5	25
		2-5 %		4	20
		5-10 %		3	15
		10-20 %		2	10
		20+ %		1	5

Table 5.2 (cont.)

	Environmental factor	subclass	weight	capability value	weighted capability value
V	Foundation (& stability)	Alluvial fan, terrace & valley-fill dep.	3	5	15
		Beach & dune dep.		4	12
		Floodplain & channel dep.		3	9
		Residual/land-slide & talus dep.		2	6
		Tidal flat/ estuarine & marsh dep.		1	3
VI	Construction materials	within 5 kms	3	5	15
		between 5-10 kms		4	12
		between 10-20 kms		3	9
		between 20-50 kms		2	6
		50+ kms		1	3
VII	Others				
	A) Marine geological condition (relevant to waste disposal)	very high	6	5	30
		high		4	24
		moderate		3	18
		low		2	12
		very low		1	6

Table 5.2 (cont.)

Environmental factor	subclass	weight	capability value	weighted capability value
B) Potential source for fresh water pollution	very high	5	1	5
	high		2	10
	moderate		3	15
	low		4	20
	very low		5	25
C) Wind (relevant to pollution-nearness to the coastline)	within 2 kms	4	1	4
	between 2-5 kms		2	8
	between 5-10 kms		3	12
	between 10-20 kms		4	16
	20+ kms		5	20
D) hazard (flood-nearness to the main stream)	within 1 kms	2	1	2
	between 1-2 kms		2	4
	between 2-3 kms		3	6
	between 3-5 kms		4	8
	5+ kms		5	10

Table 5.3 Weighted capability values of environmental factors for agricultural land-use potential

	Environmental factor	subclass	weight	capability value	weighted capability value
I	Water supply (nearness to main stream, reservoir and potential reservoir)	within 1 kms	10	5	50
		between 1-2 kms		4	40
		between 2-3 kms		3	30
		between 3-5 kms		2	20
		5+ kms		1	10
II	Slope	0-2 %	8	5	40
		2-5 %		4	32
		5-10 %		3	24
		10-20 %		2	16
		20+ %		1	8
III	Surficial deposits	Floodplain & channel deposit	7	5	35
		Alluvial fan/ terrace & valley fill deposit		4	32
		Residual/land-slide & Talus deposit		3	24
		Beach & dune deposit		2	16
		Tidal flat/ estuarine & marsh deposit		1	8

Table 5.3 (cont.)

	Environmental factor	subclass	weight	capability value	weighted capability value
IV	Existing land use and land cover	Agricultural land	7	5	35
		Rangeland		4	28
		Wet & barren land		3	21
		Urban land		2	14
		Forest land		1	7
V	Infrastructure				
	A) access road & highway	within 2 kms	4	5	20
		between 2-5 kms		4	16
		between 5-10 kms		3	12
		between 10-20 kms		2	8
		20+ kms		1	4
	B) railway	within 5 kms	3	5	15
		between 5-10 kms		4	12
		between 10-20 kms		3	9
		between 20-50 kms		2	6
		50+ kms		1	3

management areas, waterfalls, boy-scout camp, water-related sport clubs, marine aquarium, etc. Precautionary measures must be given to the negative impact from every development project on these values and resources.

It is, however, noted that emphasis of the present investigation has been laid upon developing the appropriate methodology to transfer and portray geological data and information for planning and decision making purposes. The usage of weight-rating system in evaluating the land capability for 3 different purposes are very arbitrary. The adoption of various weights and capability values for each environmental geological factor primarily aims at demonstrating the evaluation processes in more quantitative terms. It is also realized that the most efficient value judgement system must be based upon wisedom of numerous expertises in specific field concerned.

Finally, the development potential for residential, heavy industrial and agricultural purposed of the studied area including environmentally sensitive area have been evaluated and presented as a series of maps (Plates 5.1, 5.2 and 5.3). These maps would allow that preliminary assessment on development planning particularly regarding residential, heavy industrial and agricultural purposes to be carried out easily.

In order to make the findings of the present investigation most effective and practical for actual planning and decision making purposes, it is recommended that additional study to verify the weight-rating system and to incoporate other relevant factors into consideration are essentially required. Furthermore, detailed site selection analysis, environmental impact assessment, as well as the public hearing activities should be carried out.