

## **2 ENVIRONMENTAL CONDITION IN VIETNAM**

### **2.1 Climate**

Vietnam is located in the tropical monsoon area of Southeast Asia and in one of five major typhoon areas in the world. Rainfall amount is abundant with an average annual rainfall of 1,800 to 2,000 mm, even exceeding 3,200 mm in the central mountain area as indicated in Figure 2.1.1. Due to typhoons and the rainy season, complicated topography and serious deforestation, floods and landslides are a constant threat to life, agriculture and transport. This is particularly remarkable in the Red River Delta and in the central region.

The northern part (North Mountain/Midland and the Red River Delta) is directly affected by two monsoon systems, the northeast (October-March) and the southwest monsoon (April to September). Northeasterly winds bring dry and cold weather while southwesterly winds cause both high humidity and temperature. During the latter period, storms typically occur as these coincide with the rainy season. The average monthly rainfall in the north ranges approximately between 200-300 mm with the highest and lowest rainfall occurring during the months of July/August and January, respectively (see Table 2.1.1).

The climate in northern central Vietnam (North Central Coast from Thanh Hoa to Thua Thien Hue) is transitional as this region is located between the northern and southern climatic zones which are segregated by the Hai Van mountain pass. The rainy season coincides with the northeasterly (September-December) winds and the dry season with southwesterly winds. The average annual rainfall in this region ranges between 1,500-3,000 mm, of which about 80% precipitates during the rainy months (see Table 2.1.1). The climate in the southern central region (South Central Coast and Central Highland), from the province of Quang Nam-Danang to Binh Thuan, is also transitional as it is influenced by the northern and southern monsoon climates.

In the southern part of Vietnam (Southeast Area and the Mekong River Delta), rainy season occurs from May to October, while the dry season is from November to April. The average monthly precipitation recorded from two main weather stations in the region (Ho Chi Minh City and Ca Mau) is around 190 mm with the highest peak slightly exceeding 400 mm and 500 mm during month of June in Ho Chi Minh City and Ca Mau, respectively (see Table 2.1.1). The average annual rainfall in southern Vietnam ranges between 1,900-2,600 mm, about 90% of which fall during the rainy season.

Figure 2.1.1 Distribution of Annual Rainfall in Vietnam

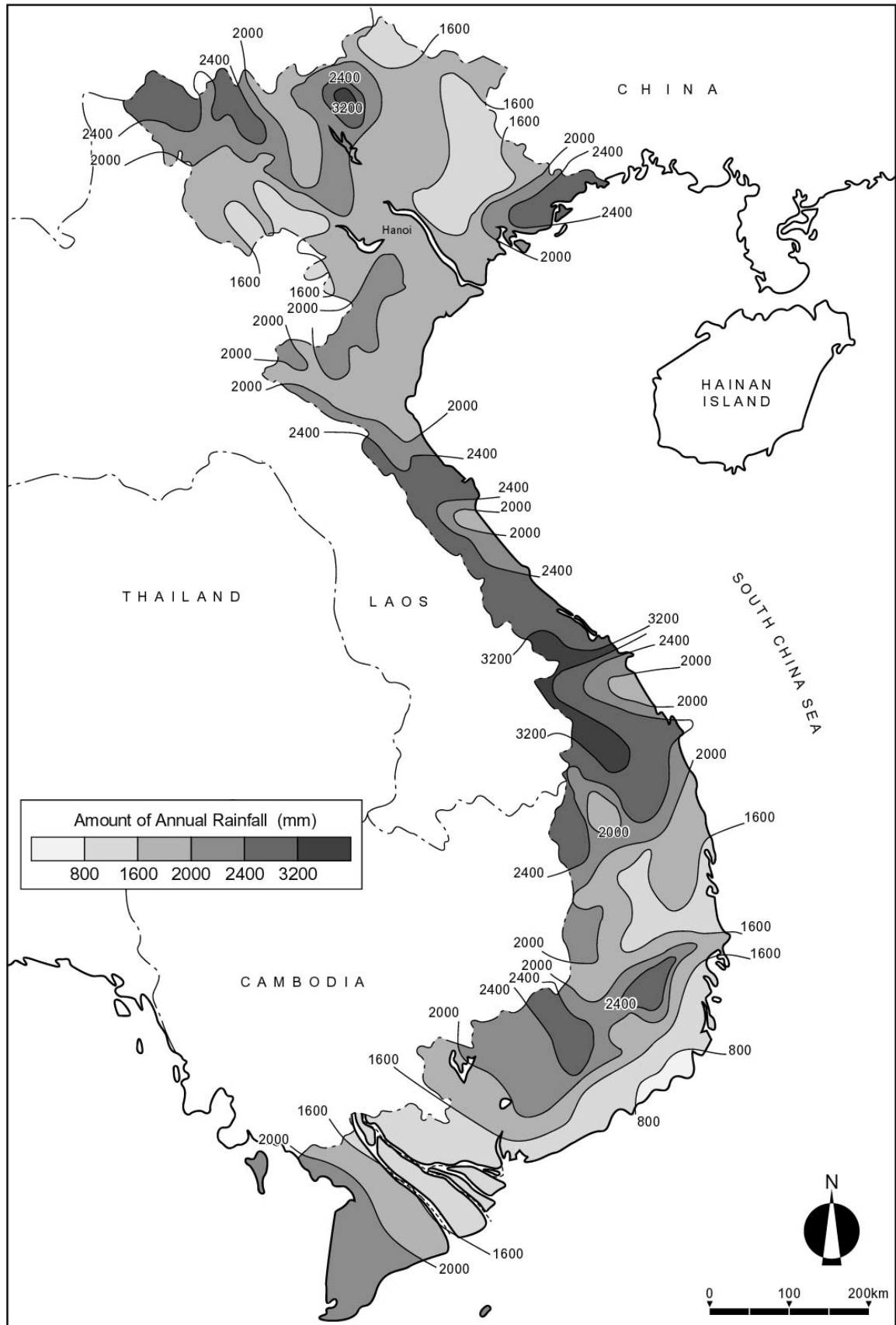
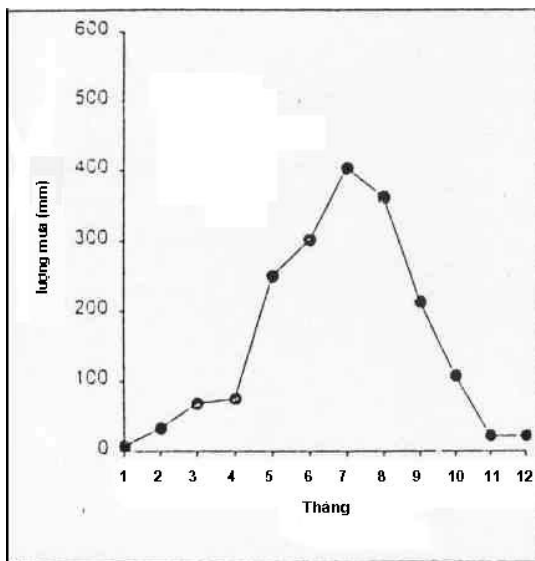
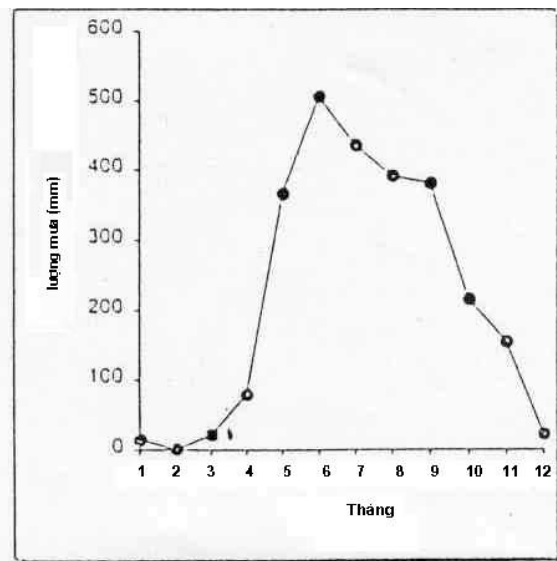


Table 2.1.1  
 Monthly Rainfall in Vietnam, 1994

| Ecological Zones<br>Name of Stations | Rainfall Amount |    |    |     |     |     |     |     |     |     |     |     | Y    |
|--------------------------------------|-----------------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
|                                      | 1               | 2  | 3  | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  |      |
| <b>North Mont./Midl.</b>             |                 |    |    |     |     |     |     |     |     |     |     |     |      |
| Lai Chua                             | 5               | 24 | 70 | 141 | 261 | 469 | 552 | 353 | 184 | 140 | 13  | 19  | 2258 |
| Son La                               | 3               | 17 | 71 | 107 | 225 | 279 | 329 | 261 | 172 | 60  | 18  | 27  | 1569 |
| Tuyen Quang                          | 22              | 62 | 63 | 36  | 334 | 167 | 279 | 294 | 138 | 134 | 7   | 21  | 1557 |
| Hon Gai                              | 3               | 27 | 67 | 15  | 178 | 262 | 453 | 541 | 358 | 94  | 49  | 20  | 2067 |
| <b>Red River Delta</b>               |                 |    |    |     |     |     |     |     |     |     |     |     |      |
| Hanoi                                | 7               | 44 | 80 | 59  | 332 | 318 | 327 | 489 | 288 | 217 | 19  | 40  | 2190 |
| Nam Dinh                             | 6               | 22 | 85 | 59  | 387 | 319 | 205 | 400 | 607 | 79  | 40  | 22  | 2231 |
| <b>North Central Coast</b>           |                 |    |    |     |     |     |     |     |     |     |     |     |      |
| Vinh                                 | 22              | 39 | 49 | 54  | 150 | 100 | 176 | 265 | 492 | 147 | 145 | 123 | 1762 |
| Hue                                  | 76              | 25 | 39 | 31  | 51  | 73  | 20  | 67  | 217 | 608 | 455 | 475 | 2137 |
| <b>South Central Coast</b>           |                 |    |    |     |     |     |     |     |     |     |     |     |      |
| Da Nang                              | 25              | 40 | 22 | 16  | 34  | 144 | 31  | 110 | 336 | 711 | 222 | 288 | 1979 |
| Quy Nhon                             | 23              | 5  | 17 | 8   | 67  | 32  | 19  | 81  | 254 | 307 | 250 | 372 | 1435 |
| Nha Trang                            | 6               | 2  | 13 | 2   | 49  | 154 | 26  | 62  | 150 | 325 | 248 | 209 | 1246 |
| <b>Central Highlands</b>             |                 |    |    |     |     |     |     |     |     |     |     |     |      |
| Plei Ku                              | 0               | 9  | 19 | 64  | 178 | 201 | 590 | 370 | 427 | 245 | 55  | 44  | 2202 |
| Da Lat                               | 2               | 3  | 80 | 95  | 163 | 171 | 245 | 94  | 315 | 292 | 54  | 103 | 1617 |
| <b>South-East Area</b>               |                 |    |    |     |     |     |     |     |     |     |     |     |      |
| Ho Chi Minh City                     | 1               | 1  | 55 | 36  | 122 | 407 | 242 | 269 | 331 | 394 | 56  | 23  | 1937 |
| <b>Mekong Delta</b>                  |                 |    |    |     |     |     |     |     |     |     |     |     |      |
| Ca Mau                               | 14              | 1  | 21 | 79  | 366 | 506 | 435 | 391 | 381 | 216 | 155 | 62  | 2627 |



Annual average rainfall in Northern Vietnam  
 (only data from north mountain/midland ecological zone)



Annual average rainfall in Southern Vietnam  
 (only data from Mekong Delta ecological zone)

Vietnam is annually hit by a number of typhoons. Figure 2.1.2 shows the extent to which the entire coast of the country suffers from such storms. The highest frequency of typhoons occurs in the northern half of the country. From 1911 to the present, the average number of typhoons has ranged from 1.32-1.42 annually in the Northern Region and mainly taken place between July and October.

The North Central Coast suffers the largest number of typhoons, accounting for about 37% of all typhoons annually occurring in Vietnam. The majority of typhoons hit the coast at the onset of rainy season (August-October). Most of the typhoons that usually hit this region are strong. In addition to the heavy rains and floods they bring, typhoons and low pressure systems cause landslides in mountain areas submerging the plains and cause seawater to encroach on inland areas, damaging transport system (railway, road, port and air port), agricultural land and livelihood.

The South Central Coast is also affected by severe typhoons, but at an average of only 0.82 per annum. The typhoon season in this region as well as in the rest of the South is between October and November.

In the Southern Region, the occurrence of typhoons is not so frequent and average only 0.15 a year. Thunderstorms and convection clouds of intertropical convergence zone (ICTZ) are main causes of rainfall.

It should be recognized that severe meteorological and natural phenomena (typhoon, storm, heavy rain, earthquake, etc.) can not be prevented. But it is possible to minimize the damages from natural disasters. The transport sector in particular must take the following measures:

- 1) Technical improvement of 2 or 3 days on weather forecast, improvement of observation network with meteorological radars and rain gauges and technical development of short-range forecast using radar and rainfall data.
- 2) Establishment of meteorological communication network between the transport sector and agencies handling disaster prevention.
- 3) Preparation of a hazard map of dangerous areas and establishment of a monitoring system
- 4) Technical improvement of civil engineering skills for quick resumption of transport after the disaster.
- 5) Enhancement of communication network on the information of weather forecast and natural disaster using mass communications

Figure 2.1.2  
Tropical Storms (Typhoons) and Low Pressure in Vietnam

