WHC Nomination Documentation

File name: 672.pdf UNESCO Region ASIA AND THE PACIFIC

SITE NAME ("TITLE") Ha Long Bay

DATE OF INSCRIPTION ("SUBJECT") 17/12/1994

STATE PARTY ("AUTHOR") VIETNAM

CRITERIA ("KEY WORDS") N (iii)

DECISION OF THE WORLD HERITAGE COMMITTEE:
18th Session
The Committee recalled that the Bureau at its last session referred the consideration of this nomination pending the establishment of a legal framework, a revision of the boundaries of the proposed site and the initiation of a managment programme. The Committee was satisfied to note that the Vietnamese authorities have revised the boundaries to nominate a smaller site which met natural heritage criterion (iii), introduced a reasonably satisfactory legislation and provided a boat and appointed a minimum number of staff to patrol the area.
The Committee therefore inscribed the site on the World Heritage List and recommended that the Vietnamese authorities cooperate with IUCN to:

a) review and further strengthen the legislation and its applicability to the protection of the site;
b) initiate processes to prepare a management plan, which will define, amongst others, objectives and a zoning scheme;
c) implement management activities such as purchase of basic equipment and appointing more staff to strengthen management of the site and,
d) conduct surveys to monitor the growing number of tourists visiting the area and plan regulatory measures.

BRIEF DESCRIPTION:
Ha Long Bay, located in the Gulf of Tonkin, includes some 1600 islands and islets forming a spectacular seascape of limestone pillars. Because of their precipitous nature, most of the islands are uninhabited and unaffected by man. The exceptional esthetic values of this site are complimented by its great biological interest.

1.b. State, province or region: Province: Quang Ninh

1.d Exact location: Long. 106°58’-107°22’ E ; Lat. 20°45’-20°56’

UNITED NATIONS EDUCATIONAL
SCIENTIFIC AND CULTURAL ORGANIZATION

Date Received :
Identification No. 672

CONVENTION CONCERNING THE PROTECTION
OF WORLD CULTURE AND NATURAL HERITAGE

WORLD
HERITAGE LIST

NOMINATION FORM
OF
HA LONG - VIETNAM

1. SPECIFIC LOCATION

a) Country : The Socialist Republic of Vietnam

b) Province : Quang Ninh

c) Name of property : Ha Long Bay

d) Exact location on map and geographical coordinates :

Ha Long Bay comprises a group of islands located at 106°58 - 107°22 east longitude and 20°45 - 20°56 north latitude, about 164 km northeast of Hanoi, capital of Vietnam.

e) Maps and Plans (enclosed)

2. JURIDICAL DATA :

a) **Owner** : The State of the Socialist Republic of Vietnam

b) **Legal status** : Ha Long Bay is a famous scenic spot of Vietnam known to many in the world.

- According to Decision No 313/VH VP issued on April 28, 1962 by the Minister of Culture, Ha Long is classed as a historical and cultural relic and a national scenic spot of the Socialist Republic of Vietnam.

- Each year, especially in summer, hudreds of thousands of Vietnamese and foreigners come to Ha Long as tourists or vacationers.

The beauty of Ha Long has been depicted by many well-known writers and poets in the world.

c) **Responsible National Agency :**

- The Ministry of Culture, Information and Sports

  51-53 Ngo Quyen Street, Hanoi

  Minister : Tran Hoan

- Department for Relics Conservation and Museum under the Ministry of Culture, Information, and Sports.

  51-53 Ngo Quyen Street, Hanoi

  Head of the Department : Prof. Dr. Luu Tran Tieu

- The Cultural and Information Service of Quang Ninh

  Hong Gai province capital, Quang Ninh

  Director : Nguyen Thanh Sy

- The Quang Ninh Museum

  Hong Gai provincial capital, Quang Ninh

  Director : Nguyen Cong Thai

d) **Collaborating National Agencies and Organizations**

- The People's Committee of Quang Ninh province
- The Quang Ninh Tourist Company
- The Vietnam Institute of Sciences
- The Vietnam Institute of Social Sciences.

3. IDENTIFICATION

A. History

Ha Long is large bay with a multitude of limestone rocks emerging from the Hon Gai sea and schistic islands from the Cam Pha sea. Besides, there are many earth islands formed by decayed lateritic mountains.

The geological feature of Ha Long Bay, as part of the southeast Asian region, was the outcome of the plication movement in the Caledonian period (300 million years ago) and the Hercynian period (250 million years ago).

The massive mountain-making movement and the plication movement of the geological strata given to Ha Long Bay its present geological form with 1,600 islands and islets of different sizes and shapes.

After the Hercynian episode, the geology of North Vietnam is characterized by the formation of limestone and schistic islands interspaced with deep seas.

The Indosiniad mountain-making episode dating 175 million yeras back raided the sea bed to the level of the mainland including the Southeast Asian continent of which North Vietnam is a part.

Nevertheless, Ha Long Bay is one of several areas which escaped the impact of the Indosiniad mountain-making movement and retained traits peculiar to the post Hercynian mountain-making period, i.e. the juxtaposition of rocky mountains and deep seas.

Inside many grottoes on the rock islands in the bay traces of the intrusion by the sea at different period can still be found. At the Bo Nau and Trinh Nu grottoes, for instance, marks of the sea level are visible from four to six metres above the present-day sea level. These are believed to be traces of the Interglacial Riss-urm episode, hnown as the Pleistocene (Glacial) dating about 30,000-40,000 years back which caused the rising of the sea level.

In the wurm Interglacial period, the level of all oceans lowered and seabed of Ha LOng area emergeg to link with mainland of the Red River delta. In the Plandrian period about 18,000 years ago Ha Long area was again submerged and assumed its present landscape of mountain islands scattered in the deep bay.

B. Description and Inventory

Ha Long bay is an island-studded sea area on the shore of the Tonkin Gulf. It has an area of 1,500 square kilometres and 1,600 islands and islets, 1,000 of which have names.

In the southern and southwestern parts of the bay, there are large mountain islands 100 to 200 metres above sea level. These mountain ranges are called Dau Be, Dau Go, and Bo Hon. In between are smaller rocks rising from five to ten metres above sea level. They are named safter their vague resemblance to objects or animals such as Ga Choi (Fighting Cock), Con Coc (Toad), Yen Ngua (Horse Saddle), Dau Nguoi (Human Head) and Hon Rong (Dragon), etc.

The scenery changes in the eastern part of Ha Long Bay. These medium-sized islands stand in rows like chessmen on a chessboard with almost vertical

slopes,vestiges pf fissures occurring during the mountain-making movemen-thundreds of millions of years ago.

Most noticeable of this series of islands are the grotesque figures of individual islands that look like giant scultures of nature.

Inside the limestone rocks are many pictutesque grottoes og various sizes and shapes. The Dau Go grotto, in particular, is partitioned into three parts each housing queer-looking stalacites and stalagmites. The Bo Nau Grotto, for its part, hangs with clusters of rhizome-like stalacites. The Hang Trong is accessible from two opposite openings to the east and the west. The sound of waves lapping the cliff which is audible from both openings gives the impression of continuous drum beats.

The earth islands are not many but they are home to many fishermen and farmers from time immemorial. Most noticeable are the islands of Cong Dong, Ngoc Vung, Phuong Hoang, Thuan Chau and Hon Reu.

2. Ha Long Bay, habitat of many species of tropical trees and animals

According to preliminary surveys, Ha Long boasts about 1,000 kinds of fish, 730 of which have been named. Besides precious foods such as lobsters, cuttlefish and crabs, the bay is reputed for its special seafoods like oysters and clams found in abundance near Minh Chau and Ngoc Vung islands.

The islands in Ha Long Bay, especially the earth islands, are inhabited by many species of nammuels, reptiles, and birds, notably the red-nose and red-buttock monkeys, and red-beak sand green-tail parrots.

The flora on the Ha Long islands is very diversified with double-tiered primeval forests found mostly on the islands of Ba Mun and Cat Ba.

3. During their surveys and excavations conducted in the bay area since 1937, Vietnamese and foreign archaeologists have discovered dozens of archaeological sites containing tens of thousands of artifacts.

At Giap Khau (Hon Gai) archaeologists found vestiges of the Mesolithic Age belonging to the Hoa Binh Culture dating 10,000 years back.

At Soi Nhu grotto in Cam Pha, they discovered stone tools and fossils of humans and animals of the Bac Son Culture period in the Neolitic Age.

Noteworthy is that on a hundred-square kilometre area, dozens of archaeological sites have been found such as at Tuan Chau, Ngoc Vung, Cai Dam, Dong Naim and Cat. These sites yielded many stone tools, ornaments and pottery articles having the same materials, desings and processing techniques. Hence they are grouped under the generic name of "Ha Long Culture" typical of the northeastern coast of Vietnam in the Neolithic Age.

4. Historical sites and relics :

- Van Don, in the Van Hai group of islands southeast of the bay, one of the oldest commercial ports of Vietnam.

At Van Don, archaeologist have found Vestiges of the Mesolithic Age in the Soi Nhu cave and of the Neolithic Age (Ha Long Culture). This used to be a port of Vietnam in its trade with China, Japan, and other countries in Sotheast Asia. Also found were many historical relics including tombs dating 2,000 years back, vestiges of ports, harbours, pottery, coins of many dynasties, together with architectural vestiges of religious and military constructions. C. Photographic and/or cinematographic documentation :

- A set of 50 photos placeslof interest in the Ha Long Bay.
- A video cassette about the Ha Long Bay (commentary in English)

D. Public awareness :

Ha Long has long been a household name for lovers of nature in Vietnam as well as abroad for its exquisite scenic beauty.

Each year, especially in summer, Ha Long attracts hundreds of thousands of Vietnamese and foreign tourists. In 1990-1991, an average of 1 million tourists came to spend their holidays in Ha Long each year. The landscape has been object of praiselof many Vietnamese and foreign poets.

E. Bibliography :

30 research and literary works have been made about Ha Long.

4. STATE OF PRESERVATION / CONSERVATION :

Diagnosis :

The Ha Long Bay is a major place of scenic beauty as well as a cultural relic, the hub of major transport routes, especially maritime transport. The local people practise many jobs, such as transportation, fishing, agricultural production, and tourism. Steps have been taken to open new ports, build new factories and housing blocks on the shore withen the framework of a long-term economic development programme.

History of Preservation/Conservation

The preservation of the Ha Long area began in 1955 but only on a number of important relics such as King Le Thanh Tong's handwritten poem carved on the stone wall of Bai Tho mountain in the 15 th century and a number of caves. A general plan of preservation has yet to be mapped out.

In 1962, the Ministry of Culture, on behalf of the Vietnamese government, issued Decision N°. 313 VH VP classifying the Ha Long area as a national property to be prevserved as other national relics and scenic spots.

In the years from 1964 to 1970, many archaeological relics were excavated in Ngoc Vung, Soi Nhu, Tam Hop, Xich Tho, Dong Mang, Da Bac... Togerther with the results of the archaeologicallstudies by French and Swedish scholars in the 1930's the finds are important contributions to the discovery and embellishment of this major historic and archaeological site.

In November 1980, a national seminar was held to determine the value of Ha Long in all aspects : geography, history, culture and economy. The seminar unanimously came the following conclusions :

a) Ha Long is an invaluable natural property of the country. It needs a plan for the maintenance and preservation of the primitive state of its landscapes anfd for step by step exploiting its values in service of economic and cultural development.

b) It is necessary to limit to the minimum the building of new projects in the area so as to preserve the landscapes and environment.

c) continue the programme of comprehensive research on Ha Long so as to determine the concrete objects of preservation.

B/ Persons Responsible for Preservation/Conservation

- Mr. Tran Hoan
  Minister of Culture, Information and Sports
  51-53 Ngo Quyen Street, Hanoi
- Prof. Dr. Luu Tran Tieu
  Director of the Department for Preservation and Museology, Ministry of Culture, Information and Sports.
  51 Ngo Quyen Street, Hanoi.
- Nguyen Thanh Sy
  Director of Department for Culture,
  Information and Sports of Quang Ninh province
- Nguyen Cong Thai
  Director of the Quang Ninh Museum.

D. Means for Preservation/Conservation

1) The preservation, management and exploitation of the Ha Long area has been carried out according to the ordinance on the preservation and use of historic and cultural relics and famous landscapes, promulgated on April 4, 1984 by the Vietnamese Government.

The Ministry of Culture, Information and Sports is responsible for the overall management of the project.

The People's Committee of Quang Ninh province is responsible for the administrative management in the territory under its jurisdiction.

2) Funding : The State of the Socialist Republic of Vietnam provides the necessary budget through the provincial People's Committee.

3) Means for Preservation/Conservation :

The present means and methods for preservation and conservation remain essentially traditional, i.e. with little or without machines or chemical in survey, research, preservation, and conservation.

E. Development plan for the region

Under the general development plan of both the centralland local governments, Ha Long will be preserved as a major tourist and cultural centre of Vietnam.

No major construction will be allowed in the area that might damage the landscapes and environment of Ha Long area.

5. JUSTIFICATION FOR INCLUSION ON THE WORLD HERITAGE LIST

Criteria met :

- The Ha Long Bay area is an outstanding example of orogenetic and other geological processes resulting in the formation of Vietnam's coasts and continental shelf.

- The ecosystems available in the Ha Long Bay are among the most important ones existing along the coasts of Vietnam.

- This is also an area of ecceptional natural beauty combined with many valuable cultural properties legislatively protected as part of the national heritage.

Moreover, the Ha Long Bay is an idealistic seaside resort which has so far been visited by other than Vietnamese national citizens of many other countries in the world.

Assurances of Authencity and Integrity :

- The ecosustems existing in the Ha Long Bay are highly interpendent in their natural relationships, that maintains the ecological and environmental equilibrium and the climatic peculiavity of the whole area.

- The plants and animals available in the Ha Long Bay area are indigenous species the continuity of which from history is maintained by the availability of all necessary elements in the local ecosystems.

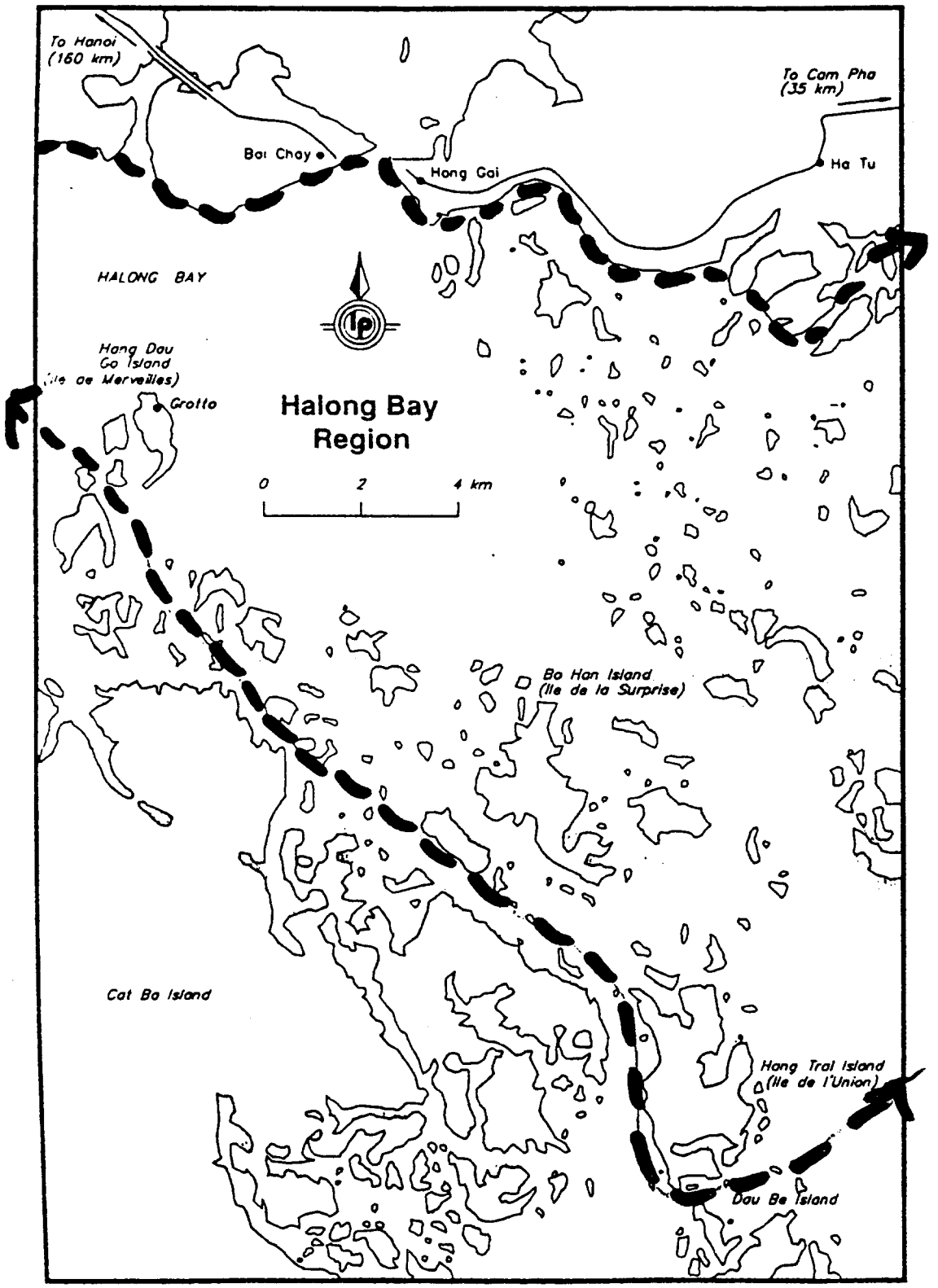
- The Ha Long Bay area is given long-term legislative protection as both natual and cultural properties of the country. Its conservation and preservation being an enormous task, it calls for an overall management and development plan with the participation of many other stats, parties in the international community in accordance with the Convention.

Signed on behalf of the
Government of the Socialist
Republic of Vietnam

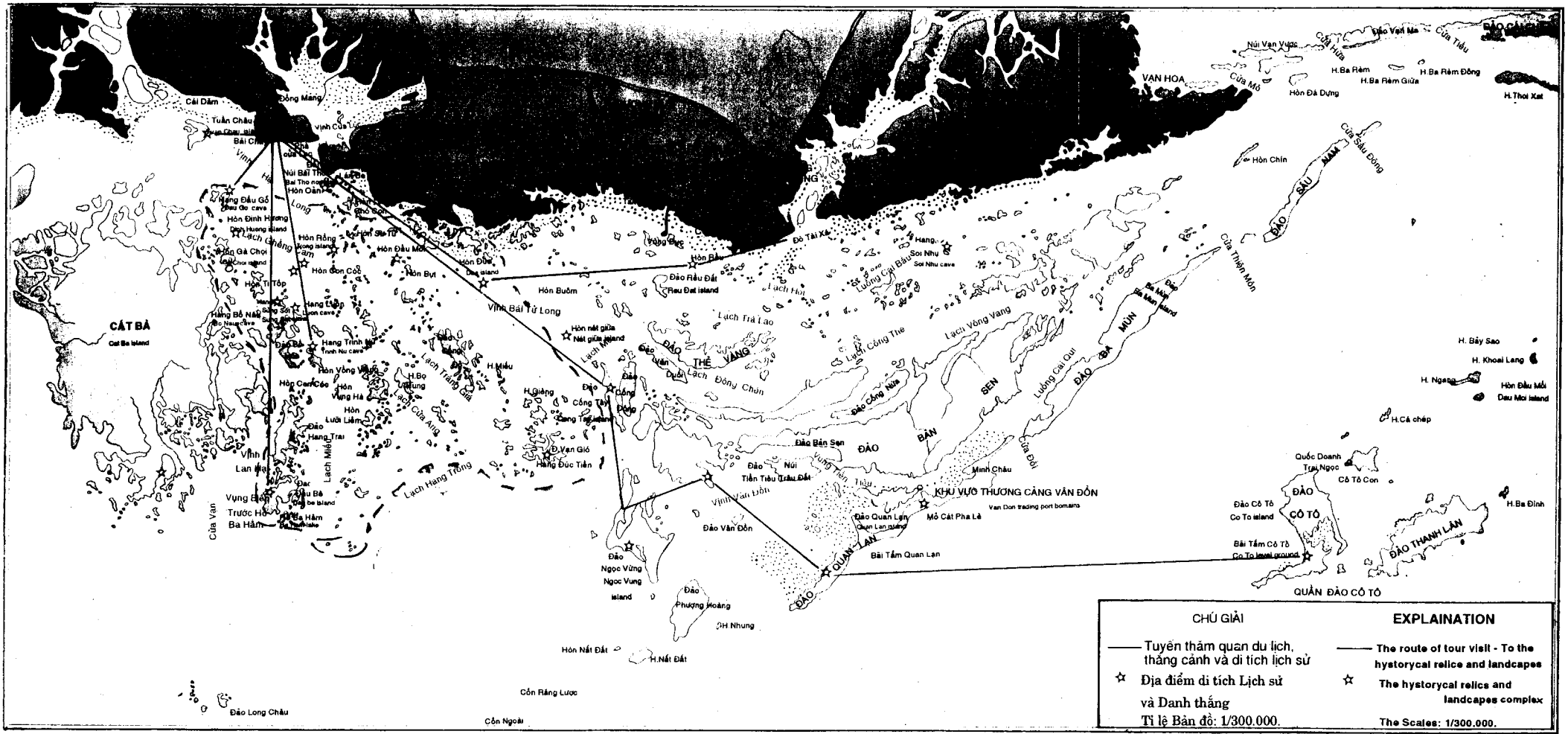
Full name : Professor Dr. DINH QUANG

Title : Vice Minister of Culture, Informations and Sports,
Vice Chairman of the Vietnam National Commission for UNESCO

Date : . 8 August, 1992


To Hanoi
(160 km)
To Cam Pha
(35 km)
Bai Chay
Hong Gai
Ha Tu
HALONG BAY
Hang Dau
Go Island
(Ile de Merveilles)
Grotto
Halong Bay
Region
0
2
4 km
Ba Han Island
(Ile de la Surprise)
Cat Ba Island
Hang Trai Island
(Ile de l'Union)
Dau Be Island

BẢN ĐỒ VỊNH HẠ LONG
HA LONG BAY MAP



CHÚ GIẢI	EXPLAINATION
—— Tuyến thăm quan du lịch, thắng cảnh và di tích lịch sử	—— The route of tour visit - To the hystorycal relice and landcapes
☆ Địa điểm di tích Lịch sử và Danh thắng	☆ The hystorycal relics and landcapes complex
Tỉ lệ Bản đồ: 1/300.000.	The Scales: 1/300.000.

THE HISTORYCAL RELICS LANDSCAPES MANAGEMENT OFFICE,QUANG NINH PUBLISHED IN 1994

BAN QUẢN LÝ DI TÍCH - THẮNG CẢNH QUẢNG NINH XUẤT BẢN 1994

QUANG NINH PEOPLE'S COMMITTEE
.***.
No : 201/QD-UB

SOCIALIST REPUBLIC OF VIETNAM
Independence-Freedom-Happiness

Quang Ninh, May 5th, 1990

DECISION BY PROVINCIAL PEOPLE'S COMMITTEE on issuing temporary regulation on controling the use of urban living quarters area.

QUANG NINH PEOPLE'S COMMITTEE

- Persuant to the laws on "organizing the people councils and people's Committees approved by National Assembly in June 30th 1989.
- Persuant to the law on land approved by National Assembly July 29th 1988.
- Persuant to Resolution by Provincial People's Council, term 8 session 3 from 18th to 20th April decided the control and use of land of urban living quarter area.

DECIDES TO

ARTICLE 1 : Issuing the temporary regulations on controling the use of urban living quarter area, subjoining to this decision.

ARTICLE 2 : The bureau chief of Provincial people's Committee, director of provincial service for Construction are responsible to organizing, directing and controling the execution of this decision.

ARTICLE 3 : The Temporary regulations on controling and using the urban living quarter area is effective upon signed.

All of previous regulations contrary to this regulations are abrogated.

ON BEHALF OF QUANG NINH PROVINCIAL PEOPLE'S COMMITTEE,
FOR PRESIDENT,
VICE PRESIDENT
NGUYEN TAT DUNG

(Signed)

QUANG NINH PEOPLE'S COMMITTEE

-***-

SOCIALIST REPUBLIC OF VIETNAM

Independence-Freedom-Happiness

Quang Ninh, May 5th, 1990

TEMPORARY REGULATIONS

on Controling and using urban living quarter area

(Subjoined to the Decision No. 201-QD/UB on stay 5th by Provincial People's Committee

CHAPTER I

GENERAL REGULATIONS

Provision 1 : Land in use for construction at town, township, district is generally called the urban living quarter area land.

Provision 2 : As other kind of land, the urban living quarter land is special property belonging to the possession of the people. The use of this land by organisations, and citizens at Quang Ninh provincial area is put under the unique control of the Quang Ninh Provincial People's Committee.

Provision 3 : Employment of urban quarter land should be national and economical. Neededly employing the land of mountains. Hills, uncultivate land and land reclaimed from the sea. Restrictly employing agricultural and forest land.

Provision 4 : All organizations and citizents only carry out their construction after having got documents listed in the Chapter II. below.

Provision 5 : Administrations at all levels, respective professional organes are responsible to control strictly the use of land at the area and to resolve lapidly favourable procedures to organs and citizens who have needs in construction according to authority and responsibility.

CHAPTER II

PROCEDURES AND FORMALITIES FOR APPROVING LOCATION OF DEMANDES OF LAND; FOR DELIVERING DECISION AND PERMISSION LICENCE FOR LAND USE ORGANIZING IN DELIVERING LAND AND PERMISSIONS LICENCE FOR LAND USE

Provision 6 : Procedures and formalities for approval using land for construction which belongings to possession of state or collective.

1. Asking for approval to location :

In the case of needs for construction the investor have to make documents to ask for approval to location. The file includes :

a) Application for approval to location which is confirmed by direct superior managing organe.

b) Schema of land area position.

c) Agreement of People's Committee of district or town which are responsible to managing that land.

d) Agreement of Agro-Sylvicultural Department if they are agricultural or forest land.

đ) Agreement of Provincial Police Department, Department of Health or Department of Culture and Information, etc... if it is a construction which is able to cause fire, explosions influencing on security or National defense or to make noise, pollution influencing on cultural architecture historical relics and beauty spots.

e) Agreement of offices which control natural resource if it is a construction for exploitation of Natural resource or if it a construction its utilization concerns the control and management of natural resource.

g) Statement by Provincial Department for Construction.

2. Asking for decision of delivering land :

The files includes :

a) Application for permission for using land.

b) Technical and economical argument which has been approved by respective authorities.

c) The map on total project area with scale of 1 : 500 agreed by the People's Committee of District and the schema of construction with scale 1: 100, or 1:200.

d) Statement by the Department for Construction.

đ) Decision by Provincial People's Committee approved constructive place (a copy).

3. Organizing to deliver and receive land :

a) Investor shows the decision by Provincial People's Committee on delivery of land to People's Committee of district which is responsible to control and manage it.

b) Organizing land ceremony will be held at field not later than 15 days after the investor finisches above cited procedures and will include these members.

- Representative of People's Committee of district or town.
- Representative of People's Committee of subdistrict or commune, township.
- Representative of Agro-sylviculture Bureau of town, district, township if it is forest or agricultural land.
- Representative of offices which make the design of construction.

Moreover, in according to the complexity of construction, representatives of Department for Construction or Department for Agro-Sylviculture will be invited.

c) After having received land, the investor with coordination of People's Committee of District or town, starts to compensate for plants, crops, architectural construction which are situated on land to their owners according to the recent laws and policy.

Provision 7 : Procedures and formalities for asking licence for construction.

1. Provincial People's Committee will give the licence for construction after the investor finished all the formalities on land shows designing file approved by authorities.

2. All the construction and constructive category of Stated and collective organizations including constructing, repairing, renovating, etc in given land area, have to ask for licences for construction. File asking permission licence for construction includes :

- Documents asked for constructing, renovating, improving the construction.

- Total project area drawn on the map of scale of 1/500 approved by People's Committee of District or Town and prelimary design with scale of 1/200.
- Technicals and economical argument approved by authority levels.

3. Provincial People's Committee commits Department for Construction to examine the investor's requirement. On the base of architectural plan of town, the department will give permission licence to investor for his construction, renovation, reparation, etc...

Provision 8 : Giving licence for delivering and using land to foreign or overseas Vietnamese investors and regulation on renting land for them, will be specially stipulated.

Provision 9 : Procedure and formality to ask licences for using land and for construction for citizens.

1. All the citizens who have requirement of land for living house or for commerce or services construction should send their applications to the local People's Committee.
2. Provincial People's Committee commits People's Committee of district, town to examine and give licence for using land and for construction to citizens on the base of general living plan approved by People's Committee.
3. Approval to application for using land must be brought into the open with social justice and democracy. It will be realized as follows :

a. Giving publicly and widely all informations about the land area decided to deliver, the content and scale for construction on it, criterion and persons examinated for land delivering, the date to receive application.

b. Receiving applications and classifying them.

c. Organizing Advisor's Council to help president of district, town to examine and decide. It includes these members.

- President of district, town (President of Council).
- Head of Bureau for Construction (Standing member).
- Representatives of Patriotic, Front, Women's Association, Workers union of district, town.
- President of People's Committee of subdistrict, commune other members may be invited.

d. Household which has approved application, pays administrative fees and money for using land within 90 days.

đ. After having paid administrative fees, money for using land and shown approved design, not later then 15 days, People's Committee of District or Town must deliver land and permission licence to citizens (Permission for using land is as the same time the licence for construction).

4. Persons, who have permission for land using, are obliged to start their compensation for plants, crops, architectural things and others situated in this area before starting to construct.

5. If there is a request for construction, renovation, improvement of construction in the land area managed legally by householders, the People's Committee of District, Town, based upon the total planned area approved by Province, give licences for construction to them.

6. If there is a request for construction inserted into the grownly living area which is for from centre of district, along interprovincial Roads and not influenced on general plan, the people's committee of district or town examines and decides to provide them with permission licence.

Provision 10 - Within 6 months after having received file for approval to places and to decision of delivering land from stated or collective organizations and application for using land and construction the offices which received these files, have to examine and resolve. In the case of impossibilities to resolve or to needs more time to investigate, they are obliged to inform the investors to know. Over the above cited time, if there are no answers by documents from files received offices, the investors will be able to start following steps.

Provision 11 - Within 12 months, if the stated or collective organisations and citizens who had the licence for land use and construction, don't start their construction or don't ask for extension of their licence, in this case, it will be unvalid. Extension of the permission licence will be provided once and its date will not last over three months.

Provision 12 - Prohibiting the stated organes, collective organisations including Army units, people's committees subdistricts and communes, from providing with land at any form.

CHAPTER VII

MEASURES TAKEN AGAINST VIOLATION IN MANAGING AND USING THE URBAN LIVING QUARTER AREA LAND

Provision 21 - Every organisations, and citizen have activities in illegal construction such as : Constructing contrary to content and purpose written in the permission licence; starting their construction of liveling the surface area without permission licence for construction will be treated by one of these ways :

1. Stopping temporarily or for ever construction.
2. Having a pecuniary penalty from 10% to 20% value of construction which has been build up at the time where a decision for treatment is published.

   Compensation for damages caused by illegal action of construction.
3. Undoing one part or all parts of construction if there is violation by organisation or individual against plan, limit of construction or there is surpassing roads, pavements, security corridors, fuel pipe system, informative cables, etc ... which cause positive effects to environment and urban landscape.
4. Taking back the decision for delivering land, permission licence for using land and construction.
5. Confiscating or requisitioning the construction.
6. If it is a grave violation, the owners will be bring to the court.
7. If stated organisations make the an illegal construction, their chiefs will be responsible for this illegal action in construction and have to pay a pecuniary penalty from 5 to 10% of the sum and to compensate for damages caused by illegal action in construction. Moreover, they will receive and administrative disciple by their superior offices.

Provision 20 - Authorities to treating illegal action :

1. For citizens who make illegal action in construction

a. People's Committees of district, town, township have right to stop provisionally illegal construction within 15 days and report it to superior to resolve.

b. Making administratively violators assent according to superior's committee.

c. People's Committees of district, town have authorities to apply these kinds of disciplines written in provision 21 to citizens for their illegal construction.

2. For stated or collective organizations which have illegal construction.

- People's Committees of district, town, township have full authorities to stop illegal construction within 30 days and report the matter to their superiors to resolve.

Provision 23 - Amy organisation or individual who exploits one's authority position to deliver permission licence for land use, for construction, to makes decision resolving illegal construction, contrary to these regulations, or to cover up organisations, individuals having illegal action in construction will be disciplined by following form

- warmed
- dismissed
- forced to lose his job
- Pecuniary penalty
- Brought to court if the consequence is grave.

CHAPTER VIII

CLAUSES FOR EXECUTION

Provision 24 - Specialized land using for constructing works of transport, irrigation, mines petrol pipe, etc. is located urban living quarter area, will be treated according to these regulations.
Specialized land located outside the urban living quarter area will be treated according to the law on land and recent regulations on land stipulated by Government and Province.

Provision 25 - Every organisation, every citizen are responsible to execute strictly these regulations which will be effective upon signed. All the precious regulations which are contrary to these regulations, are brogated.

QUANG NINH PROVINCIAL PEOPLE'S COMMITTEE

QUANG NINH PROVINCE
PEOPLE'SCOMMITTEE

No 2168/QD-UB

SOCIALIST REPUBLIC OF VIETNAM
Independence - Freedom - Happiness

Quang Ninh, 25th October 1993

THE PROVINCIAL PEOPLE'S COMMITTEE ON THE DELIVERY OF LAN FOR CONSTRUCTION

(Liveling and making ground to build the new Hongai Coal screening (for the removal of the old one situated on the bank of the Ha Long Bay).

QUANG NINH PROVINCE PEOPLE'S COMMITTEE

- Persuant to the land Lan approved by the National assembly 29/12/1987;

- Persuant to Decision 201/QD-UB dated 5/5/1990 of Quang Ninh Province People's Committee issuing temporary regulations controling the use of urban living quarter area;

- Considering the application for land of Hongai coal Company No 1453-NH/XDCB dated 4/10/1993;

- Considering the recommendation of Provincial Construction Department on total Project area No KTOO-102 dated 16/10/1993,

DECIDES TO

Provision 1 : Seliver land for Project Construction leveling and making ground to built Hongai Coal Screening factory - Hangai Coal Company.

- Area for using : 61.000m2 (sixty one thousand sqaure meters)
- Duration of using : long term
- Scope of Project and structure : as the desing approved
- Limits and height of building are in the total ground drawings accompanied

Provision 2 : Persuant to this decision and the total area approved by authorities, the investor should be responsible to carry out the followings :

- To submit the matter to District and down People's Committee for the delivery and reception of land.
- Pay money for land use and make compensation for crops and properties to clear the ground in accordance with existing regulations and policies.

Provision 3 : This decision is effective upon signed and it will be unvaild if the investor won't use the land after 12 months.

Provision 4 : The Bureau chief of Provincial People's Committee, Chairmans of the district and Town people's Committee and heads of related Offices are responsible to carry out this decision.

FOR THE QUANG NINH PROVINCIAL
PEOPLE'SCOMMITTEE

Receivers :
- As in Provision 4
- For Archives

QUANG NINH PROVINCE
PEOPLE'SCOMMITTEE

No 2358/QD-UB

SOCIALIST REPUBLIC OF VIETNAM
Independence - Freedom - Happiness

Quang Ninh, 25th October 1993

THE PROVINCIAL PEOPLE'S COMMITTEE ON delivery land for the Construction of HONGAI Coal Screening Factory in the South of Cau Trang

QUANG NINH PROVINCE PEOPLE'S COMMITTEE

- Persuant to the land Lan approved by the National assembly 29/12/1987;

- Persuant to Decision 201/QD-UB dated 5/5/1990 of Quang Ninh Province People's Committee issuing temporary regulations controling the use of urban living quarter area;

- Considering the application for land of Hongai coal Company No 1646/NL-THG dated 8/11/1993;

- Considering the recommendation of Provincial Construction Department on total Project area No 961-2MB-00 dated 12/11/1993 and agreement og Hongai own,

DECIDES TO

Provision 1 : Delivery the for Project construction - Hongai Coal screeing factory South of Cau Trang

- Area for using : 45.000 m2 (4 hecta and half)
- Duration for using : long term
- Scopre of Project structure as in the design approved

Provision 2 : Persuant to this decision and the total area approved by authorities, the investor should be responsible to carry out the followings :

- To submit the matter to District and down People's Committee for the delivery and reception of land.

- Pay money for land use and make compensation for crops and properties to clear the ground in accordance with existing regulations and policies.

Provision 3 : This decision is effective upon signed and it will be unvaild if the investor won't use the land after 12 months.

Provision 4 : The Bureau chief of Provincial People's Committee, Chairmans of the district and Town people's Committee and heads of related Offices are responsible to carry out this decision.

FOR THE QUANG NINH PROVINCIAL
PEOPLE'SCOMMITTEE

Receivers:
- As in Provision 4
- For Archives

PEOPLE'S COMMITTEE
QUANG NINH PROVINCE

No. 2735 QĐ/UB

SOCIALIST REPUBLIC OF VIET NAM
Independence Freecom Happiness

Quang Ninh December 2nd 1992

DECISION OF THE MUNICIPAL PEOPLE'S COMMITTEE ON THE ESTABLISHMENT OF A BOARD CONTROLING HISTORICAL RELICS AND BEAUTY SPOTS OF QUANG NINH

QUANG NINH MUNICIPAL PEOPLE'S COMMITTEE

- Persuant to the Law on organizing People's Committee dated June 30th 1989
- Persuant to the announcement No 258TB/TU dated October 31st 1992 concluding on the cultural and information work at present
- Considering the request of the Municipal Department of culture and information and Municipal Committee for administrative organization.

D E C I D E S :

PROVISION 1 - To establish a Board controling historical relics and beauty spots of Quang Ninh, subordinating to the Municipal Department of Culture and information.

This board is tasked to manage, repair and exploit historical relics and beauty spots in the province, hold festivals, propagate, guide and serve the tourists who visit and tour these historical places and beauty spots as well as go bating, go on holidays on the beach and in the caves.

The Board is a professional organ which is entitled to have income, legal person status, a seal, to open a bank account and which is led by a chief and a vice chief and assigned a number of professional assistants.

The Board staff is stipulated annally and in separate document.

PROVISION 2 - The Director of the Municipal Department of Culture and Information is responsible for setting forth the Board working regulations and then applied for approval by the Municipal People's Committee, and coordinating with the People's Committee of the districts and towns where situated the historical relics and beauty spots to facilitate the activities and the well accomplishment of tasks assigned to the Board.

PROVISION 3 - The Bureau Chief of Municipal People's Committee, the Head of Municipal Department for administrative orgarization, the Director of Municipal Department of Culture and Information, the Heads of related services, Chairman of distric and town people's committee carry out their work persuant to this decision.

FOR THE QUANG NINH MUNICIPAL
PEOPLE'S COMMITTEE
ACTING CHAIRMAN

- NGUYEN TAT DUNG -

RECEIVERS :

- Party standing Committee
- Municipal Committee for Propaganda/Education
- Science Committee, Municipal Department for Labour, Invalid and Social affairs, Financial Department, Commercial Department Municipal bank.

ADMINISTRATIVE COMMITTEE
HONG QUANG AREA

No 708-VX

SOCIALIST REPUBLIC OF VIETNAM
Independence - Freedom - Happiness

"Regulations concerning protection of rock mountains in Ha Long Bay, Bai Tu Long Area, Mountain Bai tho and other rocks"

Ha Long Bay, Bai Tu Long, Bai Tho Mountain and others are in Hong Quang area, not only a place where there are a lot of historical relics but also a fantastic beauty spot of Vietnam.

So, we should be responsible and liable to protect those relics and beauty spots carefully, no one is allowed to take away rocks and quarry rocks in the above areas.

To preserve historical relics and beauty spots of Vietnam, the Regional Administrative Committee decides :

1. From now on, strictly forbid rock quarrying in the mountainous area of Ha Long Bay, Bai Tu Long, Bai Tho and others mountains dotted in Hong Quang Area.

2. Quarries and Individual should be required to do the following of they want to quarry rock in those forbidden areas :

- Applying for rock quarrying with map showing areas to be asked for quarrying. The application must be sent through local People's Committee to Hong Quang Department of culture for approval.

3. Exploitation Permit will be issued by Department of Culture and made in 3 copies :

- one for the applicant

- one for Regional Administrative Committee

- one for archive.

4. At present, those quarries or individuals quarrying rock without permit as stipulated in Provision 2 should send representative to the Department of Culture to sttle the matter and apply for permit.

5. Those do differently from the stipulations will be critisized reprimanded or prosecuted according to the violations.

They may be sentenced to fine or compensation according to present law (article 29 of Decree 519/TTG dated 29/10/1957 issued by the Prime Minister Office).

Hong Quang, 30 - 5 - 1960

HONG QUANG ADMINISTRATIVE COMMITTEE

Receivers:
- Dept. of culture "for directions on procedures application for permit"
- Administrative Committee of districts, towns, Public Security Dept., quarries & enterprises "for execution"
- Prime Minister office, Ministry of Culture "for reporting"
- For Archives.

QUANG NINH PROVINCIAL
PEOPLE'S COMMITTEE

SERVICE OF CULTURE AND
INFORMATION

No. 155/HĐBT

SOCIALIST REPUBLIC OF VIET NAM
Independence Freedom Happiness

Quang Ninh June 8th 1993

DIRECTION

FOR RELIZING THE RESOLUTION No 880-QĐ/UB OF MAY 7th 1993 BY THE PROVINCIAL PEOPLE'S COMMITTEE ON PROTECTING PLACES OF INTEREST AND SCENIC BRAUTY IN HA LONG BAY AREA

*

Ha Long Bay is an invaluable heritage of our Country. It is also one of the natural wonders of the world with a great value in all its aspects. Since 1962, it was classified for protection and repairing by Ministry of Culture and is being proposed to UNESCO to integrate into the list of world cultural heritage.

In May 7th 1993, the Provincial People's Committee issued this resolution on regulations on protecting and exploiting the Ha Long Bay places of historical interest and secenic beauty

The Provincial service of Culture and Information gives this direction for realizing it as follows :

1. Protective sphere of Ha Long Bay area was fixed by the Resolution No. 313/VH of April 28th 1996 of Ministry of Culture It includes 2 protective areas :

a. Zone of absolute protection (Zone I) fixed according to the Resolution of Protection No.1030 of July 24th 1992 by Provincial People's Committee, is limited from 106°-58 to $107^{\circ}22$ East Meridians and from $20^{\circ}45$ to $20^{\circ}56$ North latitudes, concretely as follows :

. On the East of Bay : by an imaginary way which comes from the Centre of Cam Pha town through islands Cong Dong, Ngoc Vung, Ha Mai (of Cam Pha district)

. On the West of Bay : limited by Bai Chay, Tuan Chau Islands (Hongai town) and Cat Ba islands

. On South ofBay : by a chain of islands Ha Mai, Thuy Mai next to the sea

. On the North of Bay : It's line from Cai Dam beach to Cua ong Port which extens to Hongai town and Cam Pha town.

b. Zone of Protecting senic beauty and historical interest

places of Ha Long Bay area (Zone II) is an area, limited to the above absolute protective one, includes :

. On the East of Bay : All of the rest of islands of Van Don Comercial port area (Cam Pha district).

. On the West of Bay : whole Bqi Chay holiday resort which comes along the 18A road to Yen Lap Lake looking on low course o: Thanh River (Yen Hung district) and on Nam Trieu Coastal estuary and whole Cat Ba island (Haiphong City)

. On the South of Bay : limited by the sea

. On the North of Bay : Includes the population settlement on the coastal Ha Long Bay. Its limit is the road 18A coming fro Cai Dam (Hongai town) untill Cua ong - Mong Duong (Haiphong city)

2. In the zone I (according to the Resolution No1030 QĐ/UB of July 24th 1992 by Provincial People's Committee) all of basis natural relics from Ha Long wonder needs be preserved in good co ditions.

All changes and violation against places of senic beauty and historical interest will be strictly forbided.

In the caves of Ha Long Bay, it is strictly interdicted to write, paint on their walls, to build temples or shrines with superatitions purpose. The construction of depots for explosives chimicals substances, petrol and wastes in HaLong Bay area in also strictly prohibited.

For inhabitants, organes, economic units in the area of Ha Long Bay, before implementing their works on reparation, new con truction or enlargement they must have got permission from authorities.

To the area of landscape protecting zone - all construction works on Economy, Culture or national defense will be concretely examined on the base of general plans approved by Government

Individuals or economic units violate these above cited regulations will be punihed from penniary penalty to prosecuting before laws.

3. Being an unit under the service of culture the Managing Board for Quang Ninh scenic beauty has been assigned with a task of managing and protecting places of senic beauty and historical interest of Ha Long Bay. It is responsible for :

. Organizing and implementing plans for protecting and preserving beauty spots of HaLong Bay (according to the laws regulations or resolution by ...

Ministry of Culture and Information on Provincial People's Committee and Provincial Service of Culture).

- Planting signs and placard determined the limits of protection, setting up regulations for protecting works preserving and exploiting activities in the area introducing and propagqting the content and resolution by Ha Long Beauty spots Provincial people's Committee to public.
- Controling and punishing acts of violating or sabotaging Ha Long beauty spots.

For the grave violation, making files and passing them to Provincial People's Committee for publishing it according to the laws.

-Compiling and sprinting books, materials on places of scenic beauty and historieal interest and presenting them after their contents approved by Services of Culture and by Socio-cultural Department of Provincial Committee.

+ Directly carrying but projects on reparation, exploitation and services for Ha Long beauty spots after their contents approved by Provincial People's Committee and Ministry of Culture.

In the process of implementing industries for managing and protecting the Ha Long beauty spot areq, the managing board should coordinate stricly with other localities and respective branches on this way :

- Regularly taking concerted action with security and army forces, police at the province and at Hon Gai, Câm pha, Yên Hung districts, with control branch, court for protection, control and resolving the relics violations.
- Regularly coordinating with newspapers, broadeasting station, Television, for presenting and propagandizing about the Ha Long Bay value.
- Coordinating with police at river and qt sea for checking safety of communication means aiming receiving and accampying guests who visit Ha Long Bay.
- Coordinatingwith other tourist services units(stated or non state(to form a line of visiting places in the Bay and presenting them to visitors.

4.Having the key position,the Services of Culture and Information will do researches and build projects,plans for repairing,embellishing places of interest and scenic beauty in Bay and report them to Ministry of Culture and Information for approval.

5: The Service of Culture and Information in coordinating with the Services of finances issues Ha Long Bay visiting tickets

for Vietnamese and foreign visitors. They include :

- Tickets for a visit to Ha Long area in general for Vietnamese and foreign visitors.
- Tickets for a visit to famous caves and historical places in the Bay (After they will have been embellished).

The managing Board of historical places and scenic beauty of Ha Long is the unit which has right to confer permission for Ha Long Bay visit, to sell visiting tickets through registering the boats or, ships or visitors who visit the Ha Long Bay.

Money collected from tourist services will be used for the activities of embellishing and repairing Ha Long Bay visiting area and for persons, units who participate in them.

6. Organes, units, social organizations and individuals at home and abroad have desires to organize cultural activities, filming, taking photos in the bay area during a certain time have to get permission from Services of Culture, respect regulations for this area and pay fees according to each activity.

7. Ha Long Bay is invaluable property of our country extendin on large area that causes difficulties for its protection. So that, every organization, unit, individuals specially who live in this area have responsabilities in keeping and protecting Ha Long heritag area. Concretely as follows:

+ understanding and relizing well all laws, resolutions, regulations by State, Provincial People's Committee or by Ha Long Bay managing board.

+ Actively these above propagating regulations to other for understanding and relizing them. Discovering and stoping all sabotage activities (Conscious or unconscious against places of historical interest and scenic beauty of Ha Long Bay. In the case of discovering serious sabotage, it should report immediately the organes for managing Ha Long Bay area to resolve.

The acts of tolerating, covering up or helping for these acts will be considered breaches of laws and will be punished.

All units, individuals or collectives having good results in protecting of Ha Long Bay will be recompensed according to the regulations by State or Province.

Quang Ninh Service of Culture
and Information
Director
NGUYEN THANH SI

MINISTRY OF CULTURE

No.313 - VH/VP

THE DEMOCRATIC REPUBLIC OF VIETNAM

Independence-Freedom-Happiness

DECISION

on classification of historical and scenic sites in north Vietnam

---

THE MINISTRY OFCULTURE

- Pursuant to Decision No.519-TTG issued by the Prime Minister on October 29, 1957 on the preservation of historical relics,

- Based on reports and proposals of the Department of Museum on the classification of historical and scenic sites,

- In order to meet the urgent demand in management of the national cultural heritage, and to avoid causing hindrances to projects of socialist construction in North Vietnam.

DECIDES

Article 1 : To officially classify for the first phase 62 historical relics and landscapes in provinces, cities and regions which need preservation and protection according to State law (enclosed list).

Article 2 : The zone for protection at each relic or site is listed either as "inviolable zone" or "protection zone".

- An inviolable zone is the centre of the historical or scenic site. In principle, nobody has the right to encroach upon, cause damage to or take any other action that impairs the historic, architectural values of the historical and scenic sites.

- A protection zone is an area adjacent to the historic or scenic site. Any organization or individuals who wants to use it must ask for permission from provincial cultural service which then will submit the proposal to the Ministry of Culture for approval.

Article 3 : All the above-said classified historical sites are placed under the management of the local cultural services and professional guidance from the Department of Museum according to Decision No. 519-TTg issued by the Prime Minister on October 29, 1957.

Article 4 : Protection of historical relics and scenic sites is the common responsibility of the administration at all levels. The administrative committees at all levels have the responsibility to provide guidance for the cultural services and the concerned protection organizations in working out plans for protecting and managing the classified relics and sites in service of the popular masses.

Article 5 : The temporary classification of historical relics and scenic sites according to Circular No.1060-VPNG issued by the Ministry of Culture remains valid.

Article 6 : All provisions in previous circulars and instructions on the classification of historical relics and scenic sites which contravene this decision are repealed.

Article 7 : The heads of offices of the Ministry of Culture, the administrative committees at various levels, the cultural services of provinces, cities and the Department of Museum are responsible for implementing this decision.

Hanoi, April 28, 1962
Minister of Culture

Hoang Minh Giam

(Signed and sealed)

Ministry of Culture
Department of Museum

No. 209 -BT/BT

Copied from the original

To :

- The administrative committees at all levels for "implementat:
- The cultural services of provinces and cities for "implementation".

Hanoi May 19, 1962

Department of Museum
on behalf of the Department Director

Phan Vu Hoa

Deputy Director

LIST OF CLASSIFIED RELICS AND SCENIC SITES

(Issued in conjunction with Decision No. 313-VH/VP dated April 28, 1962 by the Ministry of Culture)

Hanoi

1 - Co Loa Citadel (Spiral-Shaped Citadel) located in Quyet Tam and Viet Hung communes, Dong Anh district

2 - The One Pillar Pagoda (or Dien Huu Pagoda) and Chua Mot Cot street, Ba Dinh precinct

3 - The Temple of Literature (Van Mieu) at Quoc Tu Giam street, Dong Da precinct

4 - The Temple of the Prostrate Elephants (Den Voi Phuc), in Thu Le village, Tu Liem district

5 - Lang Pagoda, at Thanh Nien street, Ba Dinh precinct

6 - Tran Quoc Pagoda at Thanh Nien street, Ba Dinh precinct

7 - Quan Thanh Temple at Thanh Nien street, Ba Dinh precinct

8 - The Temple of the Two Ladies (Den Hai Ba) at Dong Nhan street, Hai Ba precinct

9 - Lien Phai pagoda at Bach Mai street, Hai Ba precinct

10- Hoang Cao Khai compound in Thai Ha hamlet, Dong Da precinct

11 -Dong Da area in Thai Ha hamlet, Dong Da precinct

12- Kim Lien pagoda (or Nghi Tam pagoda) in Quang An commune, Tu Liem district

Haiphong city :

13 - Hang Kenh rock mountain area in Minh Duc commune, Thuy Nguyen district

14 - Kenh communal house Nhan Tho communal house) at Le Chan street.

Hong Quang

15 - The Ha Long Bay scenic site near Hon Gai, Bai Chay and Cam Pha townships

16 - Tran King's temples and tombs in An Sinh village, Dong Trieu district

Son Tay

17 - Thay pagoda and the Saigon, Hoang Xa and Phuong Cach rock mountain range in Quoc Oai district

18 - Tay Phuong pagoda in Thach Xa commune, Thach That district

19 - Cu Quyen communal house in Chu Minh commune, Quang Oai district

Nghe An

56 - Dung Quyet mountain and the Phuong Hoang and Trung Do area in Vinh town

57 - Lam Thanh mountain in Hung Nguyen district

58 - Thien Nhan mountain and Luc Nien citadel respectively in Huong Son district (Ha Tinh province) and Nam Dan district (Nghe An province).

The Thai-Meo autonomous zone

59 - Son La prison in Son La district

60 - The Dien Bien Phu battlefied area in Dien Bien district

Lang Son

61 - Chi Lang mountain area in On Chau district

62 - Tam Thanh mountain area and To Thi rock in Lang Son township.

Hanoi, April 28, 1962

Minister of Culture

Hoang Minh Giam

The Ministry of Culture
The Department of Museum

Copied from the original

Hanoi, May 19, 1962

The Department of Museum

On behalf of the Director of the Department of Museum

Deputy Director

Phan Vu Hoa

PEOPLE'S COMMITTEE
QUANG NINH PROVINCE

SOCIALIST REPUBLIC OF VIETNAM
Independence Freedom Happiness

No: 134 - QD/UB

Quang Ninh, March 30 th 1981

REGULATING

The management of historical relics
and Beauty spots of Ha Long Bay
(issued along with Decision No 133 dated March 27 th 1981
by People's Committee of Quang Ninh Province)

Quang Ninh Municipal People' Committee

- Provisions 36 and 46 of the Constitution of Socialist Republic of Vietnam announced December 1980 stipulating the Protection and improvement of life environment, the historical and cultural relics, public art work, beauty spots which were made better and protected.

STIPULATES

Provision 1

The forests, mountains, historical relics, caves, beauty spots in Ha Long Bay (Bai tu Long included) and other beautiful landscapes and relics such as Yen tu should be preserved and protected - No one could cut the trees, destroy mountains and caves. No casual writing and drawing is allowed on the caves or historical relict. The sea water in the Bay must be protected and ensured of hygienic conditions, wastes and dirty things shouldn't be dumped into the sea.

Provision 2

Pine Forests along road 18 from the East (Uong bi) along Bach Dang River to Mong Duong(Cam Pha Town), Van Don and isle districts of Cam Pha should be preserved. It is forbidden to cut trees and burn forests to make farmland and build houses in pine forests those families lived these formerly should protect their surroundings and are responsible to discover and report to state organs about the people who destroy and burn forests to make farmland for timely prevention. The organs, enterprises, farms, afforestation yards, situated in these areas should be responsible to protect and set forth specific regulations for their employees so that there will be no violations detrimental to surrounding environment. Those houses with construction permits should be build according to planning and required pattern for good view.

Provision 3

Coal exploitation sites should do their work tidily without casually piling up and dumping coal. Those families using coal for cooking should also be tidy to ensure public hygiene.

Provison 4

Road building sites should carry out their work in accordance with technical requirements, build speedily each project, road section, and shouldn't dump earth or stones on both edges of the road.

Provision 5

Construction sides should avoid laveling hills, mountain. If leveling is required, there should be desing to prevent landslide.

Provision 6

Irrigation work in the area should be done tidily, and correction work must be done upon completion, as well as work of grass and tree planting to preserve and make better the natural landscapes.

Provision 7

Army units situated in these areas (on the ground and the sea as well) should educate their sodiers so that they are concious of their responsibility to protect forests, mountains, caves, beauty spots and historical relics and to observe strictly the above regulations.

Provision 8

Units and persons with merits in observing these regulations will be awarded properly and those violation these regulations will be punished according to the present law.

Provision 9

These Regulations are effective since announcement.

CHAIRMAN OF QUANG NINH PEOPLE'S COMMITTEE

PHAM HOANH
(Signed)

INLUSTRATION ON
THE CONTENTS AND PROGAMMES OF ARRANGEMENT
ALONG THE BANK OF HALONG BAY

(From Isle Hoang Tan to Cua ông, Campha)

The coastal area from Hoang Tan to Yen cu - Dai dan is at present a shallow sea area being reclaimed from the sea. In Binh Huong area, the area reclaimed from the sea amounted to 2,000ha and in future the same area of 2,000ha will be reclaimed from the sea. This area is going to be rice area. In the master plan, the area around Hoang Tan isle will be a tourism spot situated West of Ha Long Bay with the capacity of 1,000 beds. Here we will have hotels, tourist villa groups, and Park areas. Yen Lap lake will be a tourist point and at the same time a 110 million cubic meter water supply source serving Yen Hung area.

. The Yen cu quarry which have been quarried for many years will be reorganized in order to ged rid of the existing disorder quarrying. Here situate small sized cement enterprises and others in such fields as fish sauce, building material, sea food processing. These enterprises will be gradually moved in order to prevent polution of the sea.

. The present tourist ship station and Bai Chay bus station will be moved away and replaced by hotels.

. The coal delivery station in Ferry landing area will be removed as planned when railways crossing Hongai Township are removed and upon the completion of the new coal screening factory.

. Ben Doan storage area will be removed to build public and tourist facilities.

. We have planned to remove Hongai central coal screening factory and a new one is being built in the area south of Cau Trang Ha Tu. The above-said removal will be possible upon the completion of new coal screening factory (as well as the removal of Pho Moi coal area, central coal area).

. Coc Nam coal habour will be removed to build tourist project.

. We have already had plan to build (in Kinh Liem Cot 8

area), public and tourist facilities by reclaiming from the sea. The area here amounts to 200ha.

. Along the coast from Ha Tu to Cam Pha, the coastal area are separated from urban areas, so the existing projects don't effect the Bay area.

. From Cam Pha to Cua ông, because of the coal exploiting activities in Đeo Nai, Coc 6, Cao Son mines, this area has been poluted in many years. In future, the area to be urbanized will be separated from coal exploiting points, and projects of reclaiming from the sea are being carried out in the area from the ship station to Cao Son.

. Cua Ong coal screening factory and Cua Ong harbour are in the industrial production line of this region. Their removal are impossible. In the master plan, they will remain there during the time of coal production.

. In the insular Cam Pha District, we are building tourist facilities, it is forbidden to develop industry here.

QUANG NINH INSTITUTE FOR PLANNING
AND CONSTRUCTION

ADDITINAL NOTES

ON THE PROJECTS BEING CARRIED OUT AS PLANNED AND THE DOCUMENTS - APPLIED

. Persuant to the overall plan of Ha Long town (Hongai and Cam pha area). The industrial activities being removed from the town and the coastal area (the Bay banks) will be as follows :

1. The old coal screening factory situated in the center will be removed upon completion of the new one South of Cau Trang (Ha Tu).

2. Ha Long shipyard will be removed from the Bay Bank in Cai Dam - Bai Chay - Hongai area.

3. The coal dumping areas such as Pho Moi and Central will be removed upon the completion of Cau Trang coal screening factory

4. Hongai harbour will be forbidden from use upon the completion and exploitation of Cai Lan Harbour.

The development activities along Ha Long Bay, Bai Tu Long will be reserved for tourism industry. In the planning Project such items as water supply and drainage, environment hygien and beauty scenery protection are mentioned. The State of Vietnam has issued law on Environment Protection. The building along the Bay should observe strictly the provisions of Laws. Besides the above legal document, there are also land law. Decision 210 dated 5.5.90 of Quang Ninh province People's Committee on the management of building urban resident quarters, Decree 385 of the Government on the construction management.

THE QUANG NINH INSTITUTE OF
PLANNING AND CONSTRUCTION

PEOPLE'S COMMITTEE
QUANG NINH PROVINCE

THE SOCIALIST REPUBLIC OF VIETNAM
Independence-Freedom-Happiness

No. 1030 QĐ/UB

Quang Ninh, July 24, 1992

PROVINCIAL PEOPLE'S COMMITTEE'S DECISION
on
Protection of Ha Long's natural scenery

The People's Committee of Quang Ninh province

- Pursuant to the decree on the protection and use of historical, cultural relics and places of scenic beauty promulgated by the President of the State Council on April 4, 1984.

- Pursuant to the delineation of the zone of protection for Ha Long's natural scenery worked out by the Ministry of Culture (now Ministry of Culture and Information).

- Considering the proposal of the Culture and Information Service of Quang Ninh province.

DECIDES :

Article 1 : The absolute protection zone of Ha Long stretches from 106°58' to 107°22' East longitude and from 20°45' to 20°56' North latitude.

The actual boundary is defined as follows :

- On the East of the Bay is an imaginary road from the centre of Cam Pha town through Cong Dong, Ngoc Vung and Ha Mai islands (Cam Pha district).

- On theWest of the Bay : the shore of Bai Chay, Tuan Chau island (Hong Gai town) and the northern bank of Cat Ba island (Haiphong city).

- On the South of the Bay : Ha Mai, Thuong Mai island bordering on the open sea.

- On the North of the Bay : the shoreline from Cai Da to Cua Ong contiguous to Hong Gai and Cam Pha towns.

In the protection zone, it is strictly forbidden to quarry rocks and mountains or caves in any form, cut or burn trees on the islands, use dynamite to fish in streams, establish landing places, build houses or other constructions without permit, or hunt birds and animals.

It is strictly forbidden the wanton writing or painting statue installing, building of stone steps and embankments, defecating in caves, building of storages for explosive, chemicals, gasoline and waste materials in Ha Long Bay, unwarranted changing of the natural scenery of the caves and any other places in the Bay.

Article 2 : All collective organizations, offices, units, enterprises and people have the responsibility to protect Ha Long's scenic beauty. Any organization or individual who violate the above regulations shall, depending on the seriousness of the offence, be dealt with according to the law in force.

Article 3 : The province's People's Committee shall entrust the protection and management of this zone of scenic beauty to the Culture and Information Service in coordination with concerned branches and the People's Committee of Hong Gai and Cam Pha towns.

All previous regulations and documents concerning the building and exploitation of Ha Long contrary to the Decree on protection and use of relics promulgated by the State on April 4, 1984 and this decision are now abrogated.

Article 4 : The head of office of the province's People's Committee, the Director of the Culture and

Information Service, the heads of concerned services and the Chairmen of the People's Committees of Hong Gai , Cam Pha town, Cam Pha district shall be responsible for enactment of this decision.

On behalf of the Quang Ninh People's Committe
For the Chairman
Vice Chairman

(Signed)

Nguyen Thi Hong Cuong

To : - The province's Party Standing Committee
- The province's People's Committee Standing Committee
- The Ministry of Culture and Information
- As in Article 4
- File VX-VP/UB

C.22

WORLD HERITAGE NOMINATION - IUCN SUMMARY

671: HA LONG BAY (VIETNAM)

Summary prepared by WCMC/IUCN (January 1992) based on the nomination submitted by the Government of the Socialist Republic of Viet Nam. This original and all documents presented in support of this nomination will be available for consultation at the meetings of the Bureau and the Committee.

---

1. LOCATION

A group of offshore islands, some 164km east of Hanoi, in Tonkin Gulf.

2. JURIDICAL DATA

Established as a historical and cultural relict and national scenic spot by the Minister of Culture in 1962. Land tenure is held by the Provincial Government.

3. IDENTIFICATION

Ha Long is a large bay with a multitude of limestone rocks and a limited number of earth islands formed from decayed lateritic mountains. In total, there are 1,600 islands and islets, of which 1,000 have been named. Larger islands rising to 100-200m are found in the south, interspersed with smaller islets of 5-10m height interspersed. To the east of the Bay medium size islands feature almost vertical slopes. Numerous caves and grottoes are found, with stalactites and stalagmites. The earth islands are inhabited. There is a diverse flora throughout Ha Long, and primary tropical forest is found, mostly on the islands of Ba Mun and Cat Ba. Results from preliminary surveys indicate the presence of about 1,000 fish species. Mammals, reptiles and birds are found on the islands, especially those derived from laterite.

Numerous archaeological sites have been found and there is evidence to suggest occupation by the Hoa Binh Culture, some 10,000 years before present. Archaeological sites at Tuan Chau, Ngoc Vung, Cai Dam, Dong Naim and Cat have revealed so many artifacts that they have been grouped under the term 'Ha Long Culture', typical of the northeastern coast of Viet Nam in the Neolithic Age. During prehistoric times, Ha Long was a significant port, located on the trade routes between China, Japan, and other countries in South East Asia.

4. STATE OF PRESERVATION/CONSERVATION

The Ministry of Culture, Information and Sports is responsible for the overall management of Ha Long, although the People's Committee of Quang Ninh Province has the immediate responsibility for the administration and management of territory within its jurisdiction. Despite development in the region, Ha Long itself will be protected as a major tourist and cultural centre.

5. JUSTIFICATION FOR INCLUSION ON THE WORLD HERITAGE LIST

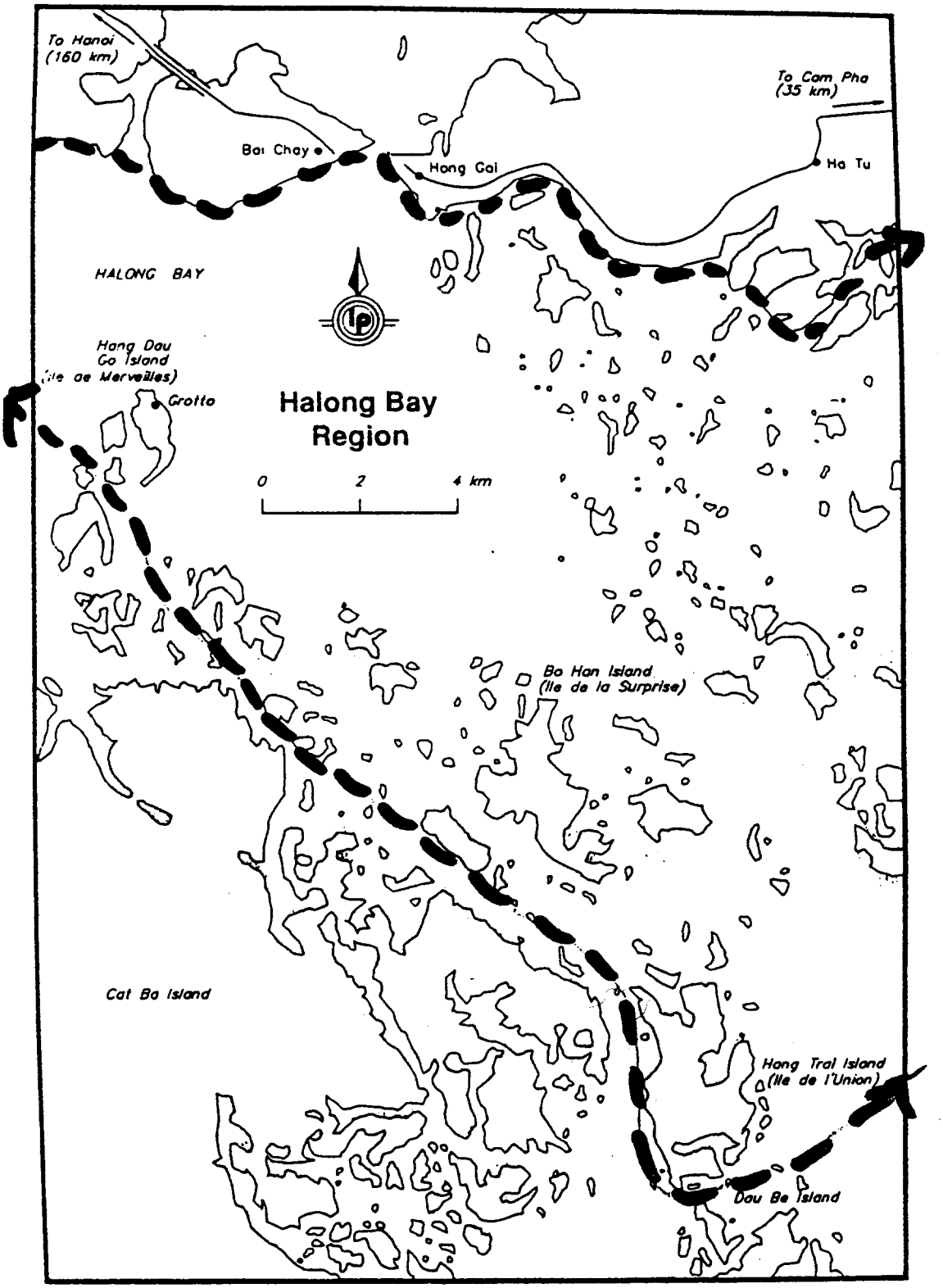
The Ha Long Bay area nomination, as presented by the Government of the Socialist Republic of Viet Nam provides the following justification for designation as a World Heritage property, although the precise criteria are not specified.

Natural property

(ii) **Outstanding examples representing significant ongoing geological processes, and biological evolution.** Ha Long's spectacular combination of seascape and islands is the direct result of orogenic processes. The area is biologically rich, especially in marine species.

Cultural property

Criterion not specified. Ha Long Bay area contains numerous sites of archaeological interest, indicating occupation from as long ago as 10,000 years. Ha Long was a significant trading area in prehistoric times.


To Hanoi
(160 km)
To Cam Pha
(35 km)
Bai Chay
Hong Gai
Ha Tu
HALONG BAY
Hong Dau
Go Island
(Ile de Merveilles)
Grotto
Halong Bay
Region
0
2
4 km
Bo Han Island
(Ile de la Surprise)
Cat Ba Island
Hong Trai Island
(Ile de l'Union)
Dou Be Island

WORLD HERITAGE NOMINATION - IUCN TECHNICAL EVALUATION

671: HA-LONG (VIET NAM)

---

1. DOCUMENTATION

i) IUCN/WCMC Data Sheet (1 reference)

ii) Additional Literature Consulted: Cheung, C., 1992. Report on a Visit to the Coasts of Vietnam. WWF, 27 p. and maps.

iii) Consultations: 9 external reviewers, Vietnamese Government officials.

iv) Field Visit: March/April 1993. Jim Thorsell.

2. COMPARISON WITH OTHER AREAS

Several similar sites with limestone outcropping can be found in south-east Asia. The closest rival in terms of scenic appeal and protection is in Thailand's Phang Nga Bay near Krabi. Other examples are found at El Nido in Palawan and in North Korea but these are smaller and unprotected. The limestone pillars of Guilin in China are not in a marine setting, nor are those at Wulingyuan (inscribed in 1992). The unusual seascape of Ha-Long Bay is certainly the most extensive in size and contains the greatest number of islands. If the adjacent islands within the Cat Ba National Park are included it would also have the distinction of being the only place where an endemic monkey, the white-headed langur, can be found.

3. INTEGRITY

Because of their precipitous nature, most of the islands in Ha-Long Bay are uninhabited and unaffected by man. The exception are several of the flat "earth islands" which are settled. The main threats are primarily focussed on the marine environment and include the heavy siltation which has smothered many of the Bay's corals. Pollution from the industrial developments along the coast, especially around Hon Gay harbour, which is a major transhipment point for coal, is another threat. Overfishing is reflected in fishery statistics which have shown a 50% drop in production over the past 5 years.

With one million tourists visiting the area every year there will certainly be impacts from this type of use but no documentation is available on the subject. IUCN has prepared a project proposal to address the tourism issue that has been sent to the Vietnamese authorities for their consideration.

The final questions relating to integrity are the legislative basis for protection and the lack of field management. An english version of the law and the regulations for the Bay has been requested but is still not available. Indications are, however, that Ministry of Culture legislation may not provide adequate measures and that it could be reinforced with under the Council of Ministers Decision 194/CT which provides for protection of coastal areas (Ministry of Forestry). It was also observed that the local authorities have no presence in the area, no boats to access the site, no detailed resource inventories and no management plan.

4. ADDITIONAL COMMENTS

The boundaries as presented in the nomination need some adjustment to better encompass the features of World Heritage quality. a 4-5 km buffer zone away from the industrial activities along the coast should be excluded from the nomination. Added to the site should be the islets adjacent to Cat Ba Island which form part of the National Park but are found in the adjacent province of Haiphong. The terrestrial part of Cat Ba should not be included as it has been too modified. The modified site boundary would be triangular (approximately 30 km on each side) and would approximately encompass the islands between Hang Ban Go to Dan Cong Dong to Ho Ba Ham. The adjusted limits of the site would need some form of legal designation, the boundaries would need to be marked and a management plan for the area prepared.

5. EVALUATION

The limestone pillars in the sea at Ha-Long Bay are a unique natural feature of great scenic beauty and biological interest. Their proper protection and inscription on the World Heritage List under natural criterion (iii) are clearly merited. The following actions, however, need to be taken in order to insure a more coherent nomination with strengthened integrity:

- assessment of the adequacy of the legal basis; and

- adjustments in the boundary delimitation as noted above.

After this it will be necessary to urgently address the issues relating to tourism, to prepare a management plan and institute management activities in the site.

6. RECOMMENDATIONS

The Bureau should defer a decision but encourage the Vietnamese authorities to consider the above prerequisites for an acceptable nomination.

COUNTRY Viet Nam

NAME Ha Long Bay

IUCN MANAGEMENT CATEGORY VIII (Multiple Use Area)

BIOGEOGRAPHICAL PROVINCE 4.10.04 (Thailandian Monsoon Forest)

GEOGRAPHICAL LOCATION A group of offshore islands, some 164km south-east of Hanoi, in Tonkin Gulf. 106°58'-107°22'E, 20°45'-20°56'N

DATE AND HISTORY OF ESTABLISHMENT 28 April 1962. Established as a historical and cultural relict and national scenic spot under Decision No. 313/VH VP, issued by the Minister of Culture.

AREA 150,000ha

LAND TENURE Government

ALTITUDE Sea level to 100-200m

PHYSICAL FEATURES Ha Long is a large bay with a multitude of limestone rocks emerging from the Hon Gai sea, schistic islands from the Cam Pha sea and a limited number of earth islands formed from decayed lateritic mountains. In total, there are 1,600 islands and islets, of which 1,000 have been named. Larger islands, rising to 100-200m, are found in the south, with smaller islets of only 5-10m height interspersed. To the east of the Bay medium size islands feature almost vertical slopes. Numerous caves and grottoes are found, with stalactites and stalagmites. The earth islands are inhabited.

CLIMATE No specific information available.

VEGETATION There is a diverse flora throughout Ha Long, and primary tropical forest is found, mostly on the islands of Ba Mun and Cat Ba.

FAUNA Results from preliminary surveys indicate the presence of about 1,000 fish species. Mammals, reptiles and birds are found on the islands, especially the earth type.

CULTURAL HERITAGE Numerous archaeological sites have been found and at Giap Khau (Hon Gai) there is evidence to suggest occupation by the Hoa Binh Culture, some 10,000 years ago present. Archaeological sites at Tuan Chau, Ngoc Vung, Cai Dam, Dong Naim and Cat have revealed so many artifacts that they have been grouped under the term 'Ha Long Culture', typical of the northeastern coast of Viet Nam in the Neolithic Age. During prehistoric times, Ha Long was a significant port, located on the trade routes between China, Japan, and other countries in South East Asia.

LOCAL HUMAN POPULATION An unspecified population makes its living in and around Ha Long, which is a major centre for fishing, agriculture and maritime transport. Steps have been taken to open new ports, factories and housing on the shore in line with a long term economic development programme.

VISITORS AND VISITOR FACILITIES Ha Long is extremely popular with both Vietnamese and international tourists. During 1990-1991, some one million visitors came to the Bay.

SCIENTIFIC RESEARCH AND FACILITIES No information

CONSERVATION VALUE The principal conservation values appear to be scenic, landscape values; geological interest; biological diversity, especially in marine species; and archaeological remains.

CONSERVATION MANAGEMENT The Ministry of Culture, Information and Sports is responsible for the overall management of Ha Long, although the People's Committee of Quang Ninh Province has the immediate responsibility for the administration and management of territory within its jurisdiction. Despite development in the region, it appears that Ha Long itself will be protected as a major tourist and cultural centre.

MANAGEMENT CONSTRAINTS No information

STAFF No information

BUDGET The national government provides a budget to the provincial People's Committee; more specific data are not available.

LOCAL ADDRESSES Ministry of Culture, Information and Sport, 51-53 Ngo Quyen Street, Hanoi

REFERENCES

Anon. (1992). Nomination form of Ha Long - Vietnam. Minister of Culture, Information and Sports. 6 pp. Unpublished.

DESIGNATION POUR LA LISTE DU PATRIMOINE MONDIAL - RESUME UICN

671: BAIE DE HA LONG (VIET NAM)

Résumé préparé par le CMSC/UICN (janvier 1992) d'après la désignation d'origine soumise par le gouvernement de la République socialiste du Viet Nam. L'original et tous les documents présentés à l'appui de cette désignation seront disponibles pour consultation aux réunions du Bureau et du Comité.

---

1. SITUATION

Groupe d'îles proches de la côte à environ 164km à l'est de Hanoï, dans le golfe du Tonkin.

2. DONNEES JURIDIQUES

Classé vestige historique et culturel et région panoramique nationale par le ministère de la Culture, en 1962, le site est propriété du gouvernement provincial.

3. IDENTIFICATION

Ha long est une grande baie avec une multitude de rocs calcaires et un petit nombre d'îles de terre formées par des montagnes latéritiques décomposées. Au total, il y a 1,600 îles et îlots dont 1,000 ont un nom. C'est dans le sud que l'on trouve les îles les plus grandes, s'élevant à 100-200m et parsemées d'îlots se 5 à 10m de haut. A l'est de la baie, des îles de taille moyenne ont des pentes quasi verticales. Il y a de nombreuses grottes et cavernes avec des stalactites et stalagmites. Les îles de terre sont habitées. La flore est très diverse partout dans le site de Ha long et l'on trouve des forêts tropicales primaires essentiellement sur les îles de Ba Mun et Cat Ba. Les résultats d'études préliminaires indiquent la présence d'au moins 1,000 espèces de poissons. Sur les îles - en particulier celles d'origine latéritique - on trouve des mammifères, des reptiles et des oiseaux.

On a découvert de nombreux sites archéologiques et des traces d'occupation par la culture Hoa Binh, il y a environ 10,000 ans. Les sites archéologiques de Tuan Chau, Ngoc Vung, Cai Dam, Dong Naim et Cat ont révélé tant d'objets qu'on les a regroupés sous le terme de 'Culture de Ha Long', typique de la côte nord-est du Viet Nam au Néolithique. Durant la Préhistoire, Ha Long fut un port important, situé sur les routes commerciales entre la Chine, le Japon et d'autres pays d'Asie du Sud-Est.

4. ETAT DE PRESERVATION/CONSERVATION

Le ministère de la Culture, de l'Information et des Sports est responsable de la gestion globale de Ha Long bien que le Comité populaire de la province de Quang Ninh soit directement responsable de l'administration et de l'aménagement des territoires se trouvant sous sa juridiction. Malgré le développement de la région, Ha Long sera préservé en tant que centre touristique et culturel important.

5. RAISONS JUSTIFIANT L'INSCRIPTION A LA LISTE DU PATRIMOINE MONDIAL

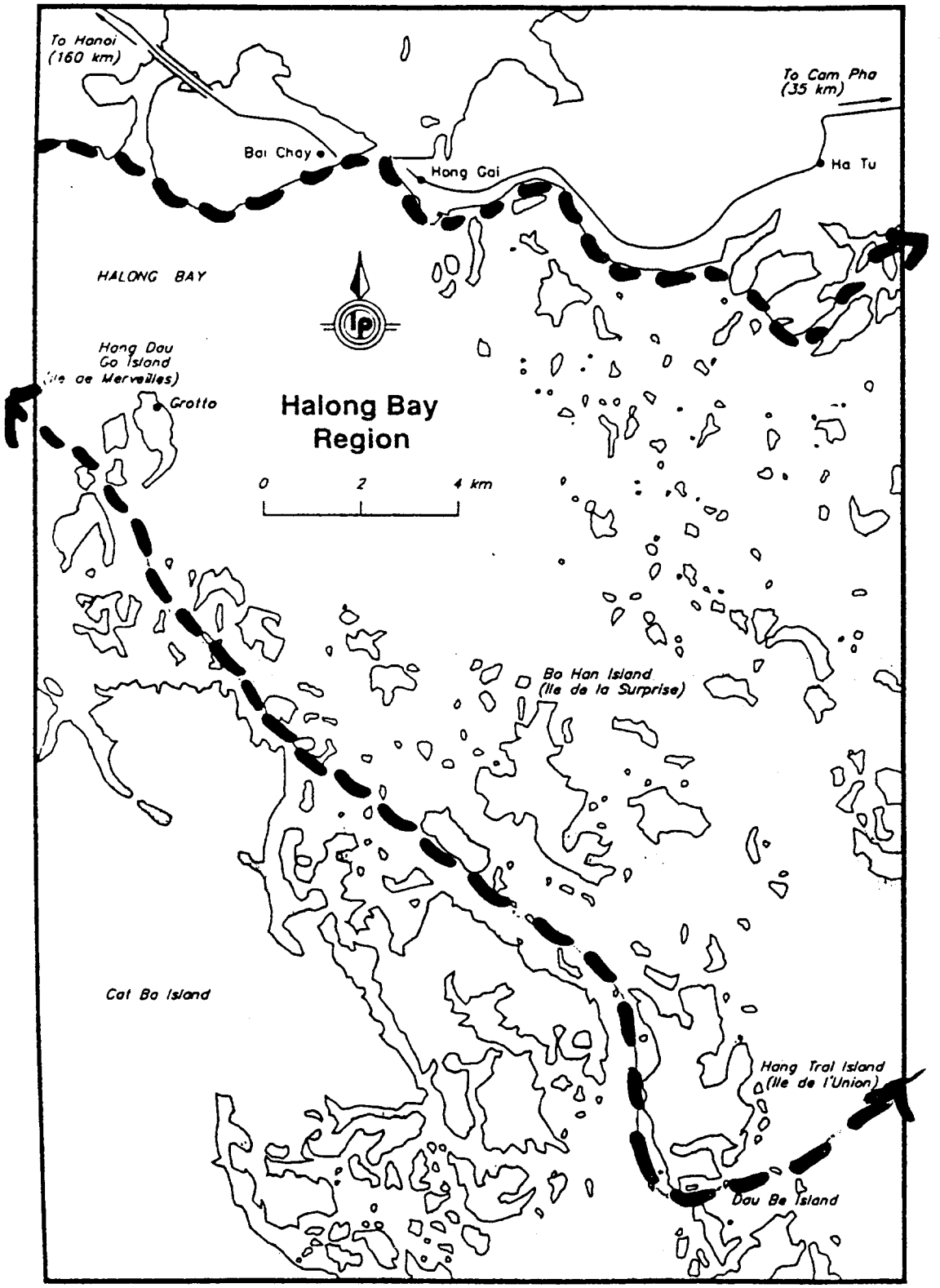
Pour justifier la désignation de la Baie de Ha Long pour la Liste du patrimoine mondial, le gouvernement de la République socialiste du Viet Nam donne les raisons suivantes, sans toutefois préciser les critères spécifiques:

Bien naturel:

(ii) **Exemples éminemment représentatifs d'importants processus géologiques en cours et de l'évolution biologique.** A Ha Long, l'association spectaculaire de paysages marins et d'îles est le résultat direct de l'orogénèse. Le site est biologiquement riche, notamment en espèces marines.

Bien culturel:

Critère non précisé. La région de la Baie de Ha Long contient de nombreux sites archéologiques indiquant une occupation qui remonte à 10,000 ans. A la Préhistoire, Ha Long fut une région commerciale importante.


To Hanoi
(160 km)
To Cam Pha
(35 km)
Bai Chay
Hong Gai
Ha Tu
HALONG BAY
Hong Dau
Go Island
(Ile de Merveilles)
Grotto
Halong Bay
Region
0
2
4 km
Ba Han Island
(Ile de la Surprise)
Cat Ba Island
Hang Trai Island
(Ile de l'Union)
Dau Be Island

DESIGNATION POUR LE PATRIMOINE MONDIAL - EVALUATION TECHNIQUE UICN

671: BAIE DE HA-LONG (VIET NAM)

---

1. DOCUMENTATION

i) Fiches de données UICN/CMSC (1 référence)

ii) Littérature consultée: Chung, C., 1992. Report on a Visit to the Coasts of Vietnam. WWF, 27p. et cartes.

iii) Consultations: 9 examinateurs indépendants; représentants du gouvernement du Viet Nam.

iv) Visite du site: mars/avril 1993. Jim Thorsell.

2. COMPARAISON AVEC D'AUTRES AIRES

En Asie du Sud-Est, on trouve plusieurs sites semblables avec des reliefs de calcaire. Le rival le plus proche de Ha-Long, en terme d'attrait panoramique et de protection, se trouve en Thaïlande, dans la baie Phang Nga, près de Krabi. Il y a d'autres exemples: El Nido à Palawan et en Corée du Nord mais les sites sont plus petits et sans protection. Les piliers de calcaire de Guilin, en Chine ne sont pas dans un paysage marin, pas plus que ceux de Wulingyuan (inscrits en 1992). Le paysage marin inhabituel de la baie de Ha-Long est certainement le plus vaste et contient le plus grand nombre d'îles. Si les îles voisines du parc national de Cat Ba étaient incluses, il se distinguerait aussi par le fait que ce serait le seul où l'on trouve une espèce endémique de singe, le langur à tête blanche.

3. INTEGRITE

En raison du relief vertigineux, la plupart des îles de la baie de Ha-Long sont inhabitée, non perturbées par l'homme. Seules, plusieurs "îles de terre" plates sont occupées. Les menaces principales pèsent sur l'environnement marin. Il s'agit notamment de la forte sédimentation qui a étouffé bien des coraux de la baie, de la pollution causée par le développement industriel le long de la côte et, en particulier le port de Hon Gay, principal point de tranbordement du charbon. La surpêche se reflète dans les statistiques de la pêche qui présentent une baisse de production de 50% en cinq ans.

Un million de touristes visitent la région chaque année. On peut donc imaginer que ce type d'activité puisse avoir un certain impact mais aucune documentation n'est disponible à ce sujet. L'UICN a préparé un projet concernant la question du tourisme qui a été envoyé aux autorités vietnamiennes.

La dernière question concernant l'intégrité est le fondement juridique de la protection et l'absence de gestion sur le terrain. La version anglaise de la loi et des règlements applicables à la Baie qui a été demandée n'est pas encore à disposition. Il semblerait cependant que la loi du ministère de la Culture ne contienne pas les mesures adéquates et qu'elle puisse être renforcée par la Décision 194/CT du Conseil des ministres qui prévoit la protection des zones côtières (ministère des Forêts). Il a également été noté que les autorités locales ne sont pas représentées, n'ont pas de bateau pour accéder au site et ne disposent ni d'inventaire détaillé des ressources, ni d'un plan d'aménagement.

4. COMMENTAIRES ADDITIONNELS

Les limites décrites dans le texte de la désignation doivent être ajustées pour mieux comprendre les caractéristiques ayant valeur de bien du patrimoine mondial. Une zone tampon de 4 à 5km, loin des activités industrielles du littoral devrait être exclue du site désigné. Il faudrait ajouter au site les îlots voisins de l'île de Cat Ba qui font partie du parc national mais se trouvent dans la province voisine de Haiphong. La partie terrestre de Cat Ba ne devrait pas être incluse car elle a été trop modifiée. Les limites modifiées traceraient un triangle d'environ 30km de côté et comprendraient approximativement les îles situées entre Hang Ban Go, Dan Cong Dong et Ho Ba Ham. Les limites ajustées devront recevoir une reconnaissance juridique et être marquées. Enfin, il faudrait préparer un plan d'aménagement pour le site.

5. EVALUATION

Les piliers de calcaire sortant de la mer dans la baie de Ha-Long sont une caractéristique naturelle unique de très grande beauté et de très grand intérêt biologique. Ils méritent, de toute évidence, d'être correctement protégés et inscrits à la Liste du patrimoine mondial au titre du critère naturel (iii). Toutefois, il convient de prendre les mesures suivantes afin de garantir une désignation cohérente à l'intégrité renforcée:

- évaluation du fondement juridique;
- ajustement des limites comme mentionné ci-dessus.

Après cela, il faudra s'attaquer, de toute urgence, à la question du tourisme, préparer un plan d'aménagement et mettre en place des activités de gestion dans le site.

6. RECOMMANDATIONS

Le Bureau devrait reporter sa décision mais encourager les autorités vietnamiennes à examiner les conditions préalables susmentionnées pour une désignation acceptable.

File Name: 672Bis.pdf **UNESCO Region:** ASIA AND THE PACIFIC

SITE NAME: **Ha Long Bay**

DATE OF INSCRIPTION: 2nd December 2000

STATE PARTY: VIET NAM

CRITERIA: N (i) (iii)

DECISION OF THE WORLD HERITAGE COMMITTEE:

Criterion (i): The site is the most extensive and best known example of marine invaded tower karst and one of the most important areas of fengcong and fenglin karst in the world. The size of the area provides sufficient integrity for these large scale geomorphic processes to operate unhindered.

The nomination under criterion (i) was supported by a number of Committee members, who wondered why this criterion was not taken into account originally. The Delegate of Hungary also noted the environmental impact assessment referred to under the item "state of conservation of properties" discussed during the twenty-fourth extraordinary session of the Bureau.

BRIEF DESCRIPTIONS

Ha Long Bay, located in the Gulf of Tonkin, includes some 1600 islands and islets forming a spectacular seascape of limestone pillars. Because of their precipitous nature, most of the islands are uninhabited and unaffected by man. The exceptional esthetic values of this site are complimented by its great biological interest.

1.b State, Province or Region: Gulf of Tonkin

1.d Exact location:

UNITED NATIONS
EDUCATIONAL, SCIENTIFIC AND CULTURAL
ORGANIZATION

Date Received:
Indentification No:

CONVENTION CONCERNING
THE PROTECTION
OF THE WORLD CULTURAL AND NATURAL HERITAGE

WORLD HERITAGE LIST

NOMINATION FORM
OF HA LONG BAY- VIETNAM
(PROPOSAL FOR RE-NOMINATION)

SECTION 1: IDENTIFICATION OF THE PROPERTY.

a) Country:

The Socialist Republic of Vietnam.

b) Province:

Quang Ninh

c) Name of property:

Ha Long Bay (World Heritage Area inscripted under Criteria (iii) in 1994).

d) Exact Location and geographical co-ordinates:

Ha Long Bay is part of the Province of Quang Ninh and is located in the north-east corner of Viet Nam adjacent to the coastline between Hoanh Bo district and Cua Ong.

Its exact geographical co-ordinates are from latitude 20° 43′ 12″ to 20° 56′ 14″ and from longitude 106° 59′ 35″ to 107° 20′ 31″ at the extremities of the proposed area for inscription.

e) Maps and/or plans showing boundary of area proposed for inscription and of any buffer zone:

i) Scale 1:50,000 geographical relief map (1.2m x 1.6m) to professional cartographic standard showing the boundaries of the existing World Heritage Area and buffer zone in their correct locations and incorporating a list of all the 775 islands within the WHA.
ii) Scale 1:100,00 tourist map of Ha Long Bay (55cm x 79cm) simplified to show relief with a 1:22,500 insert of Ha Long City and the UNESCO World Heritage map overleaf.

f) Area of site proposed for inscription and proposed buffer zone (if any):

The area proposed for inscription covers 434 sq. km. and follows the boundary of the existing World Heritage Area inscripted in 1996 under Criterion (iii). The existing buffer zone established at the same time as the WHA covers a further 1,119 sq. km.

SECTION 2. JUSTIFICATION FOR INSCRIPTION.

a) Statement of significance:

IMPORTANCE OF THE KARST GEOMORPHOLOGY:

A karst landscape is defined as one that has distinctive landforms because it has developed on rock that has efficient underground drainage, most commonly cavernous limestone. It is one of the most extreme forms of landscape development, characterised by high and spectacular relief. The specific landforms are closely related to climate and climatic history and therefore provide a vital geomorphic record of that aspect of the earth's development. The particular climatic conditions necessary for the full development of karst to maturity are mainly found in the tropical zones of South East Asia which, therefore, has the world's most important and extensive regions of mature karst of which Ha Long Bay is one of the finest examples.

A highly significant feature of Ha Long Bay is its invasion by the sea. As a result, the geomorphology of its limestone landforms is, at least in part, the consequence of marine erosion. Many features, such as the very narrow aretes of Ha Long Bay, are atypical of subaerial fengcong karst formation and are therefore of great value in understanding the complex geomorphologic interaction that takes place with the intervention of marine invasion.

This additional element of marine invasion elevates the significance of Ha Long Bay above similar areas to a position of geomorphologic uniqueness in the world.

There is no doubt that Ha Long Bay is of international significance as a limestone karst landscape that is fundamentally important to the science of geomorphology. It contains the full range of fengcong and fenglin landforms as well as a large suite of active caves and ancient cave remnants whose clastic and calcite deposits record a long history of landscape evolution that has yet to be elucidated.

ANCILLARY VALUES OF THE SITE:

Biodiversity:

Biodiversity is normally a significant feature of karst regions where the individual hills and caves create isolated ecosystems sheltered from external evolutionary pressures. This must apply to a greater degree in Ha Long Bay, where the numerous small islands present totally isolated environments although, so far, little research into their characteristics and life forms has been undertaken. The stable climate and an average sea water temperature of 19° to 25° provides favourable conditions for a proliferation of life forms. Flooded salt-water forests, coral reefs and tropical rain forests are some of the different environments to be found in and around the Bay.

Coral reefs abound in the Bay at an average depth of 4m to 6m and are made up of 163 different species. On average, coral covers 30% of the sea floor of the Bay, but can be up to

70% or even 80% in some area. They are home to 107 varieties of fish. Flooded forests are home to 37 species of birds, 81 species of bottom dwelling creatures and 90 species of fish.

Culture and History:

Many of the Bay's caves that have large, open entrances have been utilised and occupied by past cultures. Known archeological remains date from the late Pleistocene Soi Nhu culture, from the mid-Holocene Ha Long culture and from more recent periods. Much investigation remains to be undertaken, but so far caves have yielded evidence of occupation and manufacturing of implements as well as extraction of minerals and other commercial uses.

Scenic Value:

The striking beauty of Ha Long Bay is beyond question as demonstrated by its thriving tourist industry. In 1994, the Bay's superlative natural phenomena and magnificent scenery led to its inscription on the World Heritage List as a site of exceptional natural beauty.

b) Possible comparative analysis (including state of conservation of similar sites).

There are no known detailed comparative studies of similar sites available at the time.

The world's finest example of fenglin tower karst is in the Yangshou region of the Li River basin in Guangxi, southern China. If the height, steepness and number of limestone towers are broadly compared, those of Ha Long Bay are probably second only to those of Yangshou in the entire world. However, the element of marine invasion in Ha Long Bay's geomorphology further distinguishes it. Whilst there are other areas of tower karst which have been subjected to invasion by the sea, notably on the west coast of Thailand, none is as extensive as Ha Long Bay. It may therefore justifiably be described as being of unique geomorphologic significance in global terms.

c) Authenticity/Integrity:

AUTHENTICITY:

In the past, some islands have suffered limited damage in the form of 'improvements' to make the islands more accessible by excavation and construction of paths. Following the establishment of the Ha Long Bay Management Department such practice is now fully controlled. Tourist access is currently limited to five caves and is facilitated with only the necessary minimum of impact on the natural environment. With the foregoing exceptions, the entire area nominated for inscription is in a wholly natural state.

INTEGRITY:

Mature karst landscape is the product of a complex chain of processes; an evolutionary sequence for which very thick limestone, a warm wet climate and slow tectonic uplift are necessary pre-requisites. Only when all three of these elements are present in a particular sequence can mature karst landforms develop. To demonstrate full integrity, karst landscape

must include the full range of landforms including the mature elements of fengcong, fenglin and karst plain that are the products of natural, non-uniform processes denuding a mass of limestone. (Waltham, 1998, p.9)

The mature karst landscape of Ha Long Bay has evolved by normal subaerial erosion of the limestone that was subsequently modified by the action of the sea. The hundreds of rocky islands within the proposed boundaries are the individual towers of a classic fenglin landscape where the intervening karst plains have been submerged by the sea. The clusters of limestone hills on the larger islands are fine examples of fengcong karst with some peaks reaching heights in excess of 200m. Their profiles are characteristic steep cones that have not been subjected to lateral undercutting except on their seaward margins.

The proposed area for inscription therefore contains all the interrelated and interdependent elements of a mature karst landscape that has been subjected to marine invasion in their natural relationships.

d) Criterion under which inscription is proposed.

It is proposed that Ha Long Bay be inscribed on the World Heritage List under Criterion (i) as an area of significant on-going geological processes and geomorphic features in addition to its existing listing under Criterion (iii) as an area of exceptional natural beauty and aesthetic importance.

Ha Long Bay is an outstanding example of a major stage in the earth's geological history. It encompasses all the most significant geomorphic features and processes in the development of limestone karst scenery. The additional element of the continuing process of marine intrusion adds greatly to its unique scientific and historical importance.

Ha Long Bay is the most extensive and complete example of its type in the world and *is*, therefore, of outstanding universal significance. Its magnificent landscape must be carefully researched, managed and preserved for the benefit of present and future generations

SECTION 3: DESCRIPTION.

a) Description of property:

The area proposed for inscription covers 434 sq. km in the heart of Ha Long Bay and encloses 775 islands. It includes nearly all the small limestone islands of the most significant landscape value and greatest scientific importance. The smaller islands are fenglin towers of 50m to 100m high with height to width ratios up to about 6. Many have vertical walls on all or most sides: these continue to evolve by rock falls and large slab failures. Very old cave remnants are preserved within many of the towers and many have foot caves that are relics of their undercutting at various levels.

The larger islands contain the conical hills of fengcong karst, the summits of which average 100m above sea level with some exceeding 200m. Apart from at their marine margins, vertical cliffs are minor components of the fengcong hills, as they have not been subjected to lateral undercutting. They also contain remnants of old cave passages.

Marine invasion of Ha Long Bay has added an extra element to the normal process of lateral undercutting of the limestone towers and islands. The most conspicuous feature is the main notch cut into the entire rocky coastline. Its deepest zone is generally between normal high and low tides, with a lesser undercut extending a metre higher, perhaps the effect of high wave action and Spring high tides. Other notches at higher levels were cut during times of higher sea levels and are no longer active.

Notches are a feature of limestone cliffs worldwide, but those of Ha Long Bay are exceptionally well developed and, at many sites, extend into arches and caves. This process of undercutting and subsequent erosion maintains the steep faces of the fenglin karst towers and thereby perpetuates the spectacular nature of the landscape.

A distinctive feature of Ha Long Bay is the abundance of lakes within the larger limestone islands: Dau Be Island, for example, has six enclosed lakes. All these island lakes occupy drowned dolines within the fengcong karst. Their depth profiles have not yet been surveyed: most appear to be deep, but some have shallow planation surfaces just below water level. Nearly all seem to be tidal. Seawater moves freely through the limestone, at some sites through sea-level caves that are traversable by boat, but elsewhere through inaccessible fissures. On Cong Do Island a freshwater lake appears to survive on a doline floor of clastic sediment but details of its geomorphology are unknown.

Most of the Bay is less than 10m deep: many of the areas of shallow sea between the islands appear to be submerged karst plains. However, the bedrock geology of the Bay has not yet been investigated and there is doubt about the composition of the two largest island-free areas in the centres of Ha Long and Bay Tu Long Bays.

All the limestone surfaces on the Ha Long Bay islands are fretted by dissolution. The outcrops, therefore, evolve into complex and irregular shapes with very sharp edges on the pinnacles, blades and ridges of remnant rock creating an inhospitable terrain. Deep and jagged open fissures carry rainwater into the cave systems beneath.

There is no continuous soil cover. Largely organic soil accumulates in some limestone fissures providing a rooting medium for the ubiquitous scrub vegetation: conspicuous larger plants include *Panadannus* and *Dracena* (Dragon's Skeleton). Many walls and slopes of the more massive limestone beds are scored by rillenkarren that may be many metres long.

All the limestone surfaces are black due to their invasion by blue-green algae; these live in the surface crust of the limestone and aid its pitting by biogenic dissolution. The algae extend down into the tidal area; marine algal forms are probably equally widespread but have not yet been documented.

Limestone caves are an important feature of Ha Long Bay. Three main types can be identified:

i) Old phreatic caves; these were the underground channels that drained surface water through fissures in the limestone and were enlarged by dissolution. Subsequent lowering of the water table and ground surface has left them dry and sometimes exposed by erosion. Others lie preserved but hidden within the limestone hills. Phreatic caves are distinguishable by their sloping passages and considerable vertical range. Active phreatic caves must exist within the deeper limestone, but none has yet been discovered.

ii) Old karstic foot caves formed by lateral undercutting at base level. They may be quite small notches at the base of limestone cliffs or may extend back into larger cave systems within the limestone. They are distinguished by their passages being close to the horizontal and often cutting across rather than following, the geological structure. There are no active foot caves at Ha Long Bay because the sites of their development have been invaded by the sea to become marine caves.

iii) Marine notch caves, formed at sea level where rock structures are powerfully eroded and eventually reduced to a wave cut platform. This process is continuing today. Dissolution of the limestone allows cliff notches to be readily deepened and extended into caves. Many extend right through the limestone hills into drowned dolines, which are now tidal lakes or bays. A distinguishing feature of marine notch caves is their absolutely smooth and horizontal ceilings cut right through the limestone. The flat ceilings of Ha Long Bay's marine notch caves are above present high water levels and many are draped with stalactites. They are old erosion surfaces created largely by dissolution in the Pleistocene era when sea levels were higher.

Further, more detailed, description of the evolution and present status of the limestone karst landforms and caves of Ha Long Bay can be found in Waltham, 1998 (pp. 10-34).

b) History and Development:

i) GEOLOGICAL HISTORY:

The complex geographical and geomorphic history of Ha Long Bay is summarised in tabular form in tables 1 and 2. For greater detail see Waltham, 1998 and Than, T.D., 1998.

TABLE 1: THE GEOLOGICAL HISTORY OF HA LONG BAY.

Era	Period		Events
Cenozoic	Anthro-pogene	Holocene	Marine transgression, after the world's deglaciation, overruns the coastal areas to form the modern Ha Long Bay. This is mainly a land environment with a developing karst landscape and river systems. Systems of caves are formed at heights of 10-15m, 20-30m, and 40-60m
		Pleistocene	A marine transgression forms the ancient Ha Long Bay. Previously the sea level had been 100-200m lower than today and well outside the modern coastline during the cold stages of the Ice Ages.
	Neogene		Tectonic downwarpings of Cua Luc and Ha Long Bays. Anpi Orogeny earth movements on the Dong Trieu Arc.
	Paleogene		The East Ocean is formed. River erosion and alluvial deposition forms a large peneplain.
Mesozoic	Cretaceous Jurassic		A continental environment with orogenic movements of the land. Erosion processes are strong.
	Triassic		A land environment, where tectonic downwarping creates a coal swamp basin, is followed by strong movements of the Indonesian orogeny.
Paleozoic	Permian		Downwarping disturbs the coastline creating a land environment.
	Carboniferous		A shallow, warm sea enlarges from the west, rich in sea creatures including coral, foraminfera, brachiopods and crinoids. Limestone, over a thousand metres thick, is formed.
	Devonian		Ha Long Bay is a land area. Nearby, the Quan Lan archipeligo, Trang Kehn, Do Son and Cat Ba were downwarpings invaded by the sea.
	Silurian Ordovician		Open sea with deep water in the Katazia geosyncline. The sea extends to the west, but the East Ocean is a landmass.
	Cambrian		Land.
Proterozoic and Archean			Unknown.

TABLE 2 — THE DEVELOPMENT OF HA LONG BAY IN THE HOLOCENE PERIOD

Epoch		Stage	Years before present	Ha Long Bay	Cua Luc Bay	Bach Dang River	Archeological and historic events
Holocene	Late	6	1,000	The Bay enlarges: its fresh water mixes with salt water and fresh marine notches develop. Coral grows and the coast erodes.	The Bay becomes an estuary and mangrove swamps are reduced by erosion.	An estuary	The third anti-Yuan resistance. The first Bach Dang naval battle is fought.
		5	2,000	The Bay is narrow and accumulates a mud floor. Mangrove swamps form at the shores.	An estuary with mangrove forests.	The coastal downwarpings cause mangroves to grow.	
	Middle	4	3,000	The Bay enlarges, developing notches at 3.0 to 3.5m.	A marine bay.	A marine bay - coastal downwarping.	The Dong Son Culture. Vestiges of Phuong Nam (Uong Bi) and Viet Khe (Thuy Nguyen).
		3	4,000	The sea retreats and the land expands. Mangrove swamps form.	A freshwater lake.	Continental swamps along the coast.	Vestiges of Trang Kehn (Phung Nguyen Culture) Ha Long Culture
		2	7,000	Marine transgression. The Bay is at its largest area. Coral develops.	A marine bay is at its largest area.	A marine bay. Coastal downwarping	Pre-Ha Long Culture
	Early	1	11,000	Marine transgression as the sea level rises from 120m deep outside the mouth of the Bay.	Continental lake	Continental deltas, lakes and bogs.	Hoa Binh and Bac Son Cultures
Pleistocene	Late						

ii) HISTORICAL INTERACTION WITH HUMANKIND:

Ha Long Bay may have been inhabited from the Old Stone Age: an ancient settlement and tool factory in Tan Mai village has yielded artifacts which seem to be from that period but these discoveries have not yet been authenticated. However, there are several confirmed New Stone Age settlements in and around the Bay, denoting continuous settlement for at least the last ten thousand years. Human remains and artifacts found in caves and grottos indicate their use as habitations between five and ten thousand years ago. One of the grottos has given its name to these people of the Soi Nhu, where remains of the Pre-Ha Long Culture have been found. Several sites used by peoples of the later Neolithic Ha Long Culture suggest that the Bay was being used for shelter and for the exploitation of its mineral and food resources. Bronze implements show the later development of this culture and the beginnings of wider trade routes.

Ha Long Bay's favourable geographical location, equable climate and rich marine and arable food potential was exploited by the Chinese during their ten centuries of domination of Viet Nam. By the time of the country's liberation from oppressive Chinese rule in 939 AD, Ha Long Bay had developed as a significant trading gateway, its port rivalling those of China. Under later dynasties, trade protection measures were introduced and its significance diminished.

The Ha Long Bay area became an important centre for Buddhism in the 13th and 14th centuries and many important remains of religious significance have been found on several sites.

Mineral extraction, particularly coal, become significant under French rule and has continued after independence. In 1883, French warships entered Ha Long Bay and took control of the mining areas of Hong Gai. French coal companies, finding abundant, high-quality anthracite deposits, duly exploited them and the people who worked in the mines. These oppressive conditions made Hong Gai a fertile recruiting ground for the communist ideology when it entered Viet Nam in the early part of the twentieth century. Hong Gai became a centre for resistance against French rule. An infamous massacre by the French at Hong Gai in 1946 sparked off nationwide resistance and nine years of violence leading ultimately to the victory at Dien Bien Phu.

In the following years of starvation and deprivation during the struggle against American forces, the Ha Long tradition of resistance continued in the Bay and on the islands. In 1964, a series of heavy bombing raids completely destroyed Hong Gai and caused severe damage elsewhere in the area. After liberation and 'doi moi', the economic reform programme, the Ha Long Bay area has seen economic growth, the development of democratic institutions and stable government. The rich resources of the area, its agriculture, marine products, minerals, natural scenic beauty and the industriousness and ingenuity of its people are again being successfully exploited.

This long tradition of fortitude and fierce loyalty to Ha Long Bay has created great civic pride and a strong desire for the beauty of the Bay to be recognised by, and shared with, the world community through its position as a World Heritage Area.

iii) MYTH AND CULTURE;

Ha Long Bay has great significance in Viet Nam's mythology. Its name, although acquired as recently as the nineteenth century, has its roots deep in legend. When literally translated, it means 'Bay of Descending Dragons" and refers to the Mother Dragon and her Child Dragons creating the islands of the Bay to frustrate and defeat foreign aggressors in ancient times. So the story has it, the Dragons remain at the Bay to awaken if the Vietnamese are again imperilled.

Since then, Ha Long Bay has been a source of inspiration for poets, musicians, painters, film makers, etc., not only from Viet Nam, but from countries all over the world.

c) **Form and date of most recent records of site:**

i) "Limestone Karst of Ha Long Bay" - Geomorphic research study and report (Waltham, 1998)

ii) "Strategic Planning and Management of the Ha Long Bay Management World Heritage Centre" - Management development study and report (Muldoon,1998)

iii) "Geological History of Ha Long Bay" - Geological research study (Tran Duc Than, 1998)

iv) "Report of matters relating to the management and preservation of the World Heritage Ha Long Bay in 1998" - Report to the Director of the World Heritage Centre, UNESCO (Ha Long Bay Management Department)

v) "Explanation Report on Bai Chay Construction Project" - Report to the World Heritage Centre, UNESCO (Ha Long Management Department, 1998)

vi) "The Study on Environmental Management for Ha Long Bay in the Socialist Republic of Vietnam: Inception Report" - Environmental study and report (Nippon Koei Co. Ltd./Metocean Co. Ltd., 1999)

vii) "Ha Long Bay - The Art Documentary"- Promotional video (Ha Long Bay Management Department, 1998)

viii) "Quang Ninh, Ha Long" - Promotional multimedia CD-ROM (Quang Ninh Tourism Department, 1999)

d) Present state of conservation:

In general terms, Ha Long Bay is in a sound state of conservation. Its scenic beauty, geology, biodiversity and cultural heritage have all been preserved more or less intact. Where, in the past, inadvertent damage has been caused it has been minimal and has been rectified wherever possible. A recent specialist research report on the geomorphology of the area found no indications of significant unnatural degradation (Waltham, 1998). The geomorphic evolution of the landscape is, of course, on going and it is our generation's responsibility to ensure that the process continues to be entirely natural.

e) Policies and programmes related to the presentation and promotion of the property:

It is the Department's policy to promote the attributes and values of the World Heritage Area widely within the local community and beyond. Its aim is to raise public awareness of the issues and regulations involved in the conservation and proper management of Ha Long Bay and to promote responsible attitudes towards its safekeeping for future generations.

To this end, the Department promotes the property:

to the local community, by: -

Educational activities in schools.
Local publicity and information.

to tourists, by: -

Information, education and the promotion of responsible behaviour by the tourist guides.
Guide books.

to the wider community, by: -

Programmes and interviews on television and radio.
Articles and news item in newspapers and magazines.
Research data and facilities made available to the scientific community.
Communications via specialist journals and, later this year, an Internet web site.
Publicity material such as CD-RM, videos, tapes, books, slides and postcards.

SECTION 4: MANAGEMENT.

a) Ownership:

The Government of the Socialist Republic of Viet Nam.

b) Legal Status:

The legal instruments and legislative framework that currently exists to support the management of Ha Long Bay include:

- The International Convention on Preserving Natural Heritage Sites and the World's Cultures.
- Regulations on the protection and use of historical remains, the culture and landscape of 25th April, 1984.
- The Environmental Protection Law, December 1993, and its associated regulation.
- Provisional Management Regulation for Ha Long Bay (in conjunction with Decision 2522 of November 1995): regulatory document. Quang Ninh Provincial People's Committee.
- "On the Establishment of the Management Department of Ha Long Bay": decision document (no: 2796 QD/UB, December 9th, 1995). Quang Ninh Provincial People's Committee.
- Ministry of Science, Technology and Environment, 19th December, 1996: circular guidance letter about the protection of Ha Long Bay.
- "On the regulation of the function, tasks and organisation of the Management Department of Ha Long Bay ": decision document (no: 419 QD/UB, *March* 2nd, 1999). Quang Ninh Provincial People's Committee

In particular, Article 3 of the Provisional Management Regulation (Decision No. 2522) provides for "entrusting the Management Department of Ha Long Bay with all necessary functions, tasks and conditions to organise and develop the state management activities on Ha Long Bay..."

c) Protective measures and means of implementing them:

The Ha Long Bay Management Department was established and given powers to protect the Bay by a directive issued in conjunction with Decision 2522 of the

Quang Ninh People's Committee on the 4th of December, 1995. The measures necessary to carry out this responsibility are described in detail in "The Provisional Management Regulation for Ha Long Bay" (appended) Briefly, the document defines the scope of the Department's responsibilities for the preservation of the Bay's geomorphology, environment, biodiversity and archeological remains. It places limits on acceptable activities in the existing WHA, its buffer zone and the surrounding area and provides legal sanctions against non-compliance. Further interpretation of the above document was given in a Quang Ninh People's Committee Decision document of January 13th, 1996 which more clearly defined the duties of the duties of the Department and, in particular, its central co-ordinating role. This has since been revoked by a further document (Decision document no: 419 QD/UB, March 2nd, 1999) which, whilst reiterating much of the former, adds a significant clause enabling the Department to retain the entire receipts of excursion ticket sales for investment in management and preservation.

Protection was extended by a "Circular Letter about the Protection of Ha Long Bay" published by the Ministry of Science, Technology and the Environment on the 19th December, 1996. It lays down regulations about the conduct of activities in the Bay, drawing attention to existing legal instruments including the Sea Products Development and Protection Law, The Environment Protection Law and the Regulation of Navigation Law. It strengthened legal sanctions under the Government's Decree 26/CP of the 26th April 1996 which related to breaches of the law on Environmental Protection. It concluded by jointly charging the following organisations with the responsibility for ensuring the effective implementation of these measures: the Provincial Environmental Bureau, the Quang Ninh Science, Technology and Environment Department, the relevant office of Ha Long City, The Management Department of Ha Long Bay, the Hai Phong Science and Technology Office and the Environment Department of the Cat Ba National Park.

The above documents require the Management Department of Ha Long Bay to detect infringements of the regulations by individuals or organisations and then either to pass the matter to a higher authority or to resolve it, according to the level of violation. They also allow for a variety of sanctions to be applied in the event of infringements ranging from fines to an extended term of imprisonment. In addition, convicted offenders are liable to pay compensation for damage and to suffer confiscation of property. Organisations and individuals that assist in the detection of offences or in other activities which aid the protection and preservation of the Bay's assets are to be recognised and officially commended.

The day-to-day implementation of these measures is undertaken by the Ha Long Bay Management Department's Checking Team which co-ordinates the protection activities of the Tourism Department, Ha Long City's People's Committee, the Transport Department, the Water Police and the Science, Technology and the Environment Department of the Quang Ninh People's Committee.

d) Agency/agencies with management authority:

- The Ministry of Culture and Information of the Viet Nam Government is responsible for the overall management of Ha Long Bay.
- The National Committee of UNESCO of Viet Nam is responsible for international aspects of management activities in Ha Long Bay.
- The People's Committee of Quang Ninh Province has direct responsibility for the administration and management of territory within its jurisdiction, which includes Ha Long Bay.
- The Ha Long Bay Management Department is responsible for the management of the existing World Heritage Area of Ha Long Bay.

e) Level at which management is exercised and name and address of responsible person for contact purposes:

(i) NATIONAL LEVEL:

The Ministry of Culture and Information,
51-53, Ngo Quyen Street,
Ha Noi,
Viet Nam.

Responsible Person:
Mr. Nguyen Khoa Diem.
(Minister of Culture and Information)

(ii) REGIONAL/LOCAL LEVEL:

The People's Committee of Quang Ninh Province,
Ha Long City,
Quang Ninh Province,
Viet Nam.

Responsible Person:
Mr. Ha Van Hien.
(Chairman of the Quang Ninh People's Committee)

(iii) ON-SITE LEVEL:

The Management Department of Ha Long Bay,
86, Le Thanh Tong Road,
Ha Long City,
Quang Ninh Province,
Viet Nam.

Responsible Person:

Nguyen Van Tuan.
(Director of the Management Department of Ha Long Bay)

f) Agreed plans relating to the property:

A number of strategies and plans that were already in existence affected, to some extent, the use and management of the Ha Long Bay area. These included:

- Master Plan for Quang Ninh Province
- Master Plan for Ha Long City
- Master Plan for Tourist development in Ha Long Bay and Cat Ba National Park
- Master Plan for the Baco Bo Economic Focus Zones
- Seaport Development Plans

However, the Government of Viet Nam and the People's Committee of Quang Ninh Province are developing a comprehensive strategic Master Plan for the Development and Preservation of Ha Long Bay for the year 2020 which subsumes all the relevant content of the above documents. Its main features are:

- evaluating the site value, its human resource and its present condition
- generating a strategic preservation plan to include effective environmental protection measures
- developing a strategic approach to the practical issues involved in investment in capital projects, tourism, aquaculture, agriculture, and maritime transport
- clearly delineating all relevant management and development policies and the organisation of fiscal resources.

At present, this is a draft plan at an advanced stage of development. When the planning framework is fully worked out, it will be submitted to the Government and the Prime Minister of Viet Nam for ratification at the end of the current year.

An Environmental Management Study is also currently underway in a joint project between Viet Nam and Japan and is expected to be completed in 1999.

g) Sources and level of finance:

The Department's main source of income is from the sales of excursion tickets to visiting tourists. Under an agreement unique in Viet Nam, the Department can retain the full income from this source for an initial period of 11 years to spend upon the management and development of the Bay. In 1998 this amounted to 4.8bn. VND and, in the first six months of 1999, has already brought in 4.8bn. VND. (The disproportionately large increase in income is mainly the effect of a

substantial rise in ticket prices during 1998). Currently, ticket prices discriminate between Vietnamese nationals and foreign tourists, substantially in favour of the former. A policy decision at a national level will equalise prices at an intermediate level from July 1999. It is difficult to evaluate the impact of this policy on ticket sales and the resulting level of income for the Department. However, it is estimated that income from ticket sales for 1999 will be below initial projections but significantly above that of 1998, assuming that tourist numbers continue to follow the pattern of recent years. (Table 4 following shows the distribution of past and predicted future income against need)

A breakdown of past, and projected future, distribution of fee income is shown below:

Table 3: DISTRIBUTION OF FEE INCOME FROM 1996 PROJECTED TO 2003 (USD)

Year	Administration		Training		Investment in Property		Total	
	Necessary	Actual	Necessary	Actual	Necessary	Actual	Necessary	Actual
1996	120.000	50.000	20.000	24.000	100.000	10.000	240.000	65.000
1997	150.000	120.000	30.000	24.000	150.000	50.000	330.000	194.000
1998	220.000	150.000	30.000	15.000	200.000	150.000	450.000	315.000
1999	300.000	220.000	40.000	22.000	700.000	400.000	1,040.000	642.000
2000	400.000	300.000	50.000	20.000	800.000	500.000	1,250.000	820.000
2001	500.000	350.000	60.000	30.000	1,000.000	600.000	1,560.000	980.000
2002	600.000	400.000	60.000	30.000	1,000.000	700.000	1,660.000	1,130.000
2003	700.000	500.000	60.000	30.000	1,000.000	800.000	1,760.000	1,330.000
Total	2,999.000	2,090.000	350.000	176.000	4,950.000	3,210.000	8,290.000	5,476.000

The salaries of 14 senior managers are paid by the People's Committee of Quang Ninh Province which also provides capital items for the administrative functions of the Department. The direct cash payments currently amount to 800m. VND in a full year. The cash equivalent value of capital resources provided on the basis of need, within available funds, is not available.

h) Sources of expertise and training in conservation and management techniques:

A report commissioned by the Department from the Great Barrier Reef Marine Park Authority in Australia (Muldoon, 1998), makes detailed recommendations about the training and development needs of the Department's staff (pp. 19-20). It lists the following as possible sources of expertise in training and management techniques:

- UNESCO
- existing staff trained by UNESCO
- Great Barrier Reef Marine Park Authority, (Australia)
- James Cook University, (Australia)
- ASEAN countries with WHAs or marine protected area programmes
- Australian Institute of Marine Science
- National Resource Information Centre, (Australia)
- AIT, Bangkok
- Hai Phong Institute of Oceanography
- Local training providers

To properly strategically manage and conserve the property, an extensive training and capacity building programme for staff will be needed. (Muldoon, 1998, pp. 20-30) At present, the Department does not have the fiscal resources to initiate such a programme. It will, therefore, be necessary to seek financial assistance from other organisations and funding agencies both in Viet Nam and abroad.

i) Visitor Facilities and statistics:

i) VISITOR FACILITIES:

Ha Long Bay offers an equable climate enabling all year round swimming on the sandy beaches of Bai Chay and some of the islands. There are plenty of opportunities for sightseeing, not only of the stunning scenery but also of the many historical and cultural sites in and around the Bay. As Bai Chay is already an established tourist resort, water and land transport are readily available and prices for services and facilities are very reasonable. It is a safe area for tourists and security is good. Specific facilities include:

- adequate state, joint venture and smaller private hotels offering several thousand bed spaces for tourists. Further international four and five star hotels with supporting infrastructure are planned and are currently seeking joint venture capital investment

- restaurants of all types abounding in Ha Long City offering a wide range of food at moderate prices. Seafood in the area is abundant and the best in Vietnam

- several tourist agencies offering a selection of inbound, outbound and local tours as well as air travel booking facilities

- good road access, improving with the continuing upgrading of the main highway linking Ha Long City with Ha Noi. The journey time for the 170km between the two centres is now reduced to three hours. Water, rail and helicopter travel is also available to the Bay and a project to plan airport facilities is under way

- 130 boats, of capacities ranging between 20 to 100 passengers, offering tours around the Bay and its islands and caves. Visitors can choose the duration of their tour, which can be for up to twelve hours. High-speed boats and water sports are also available.

- foreign exchange and a full range of retail outlets are available

- a 50 bed international hospital that has been planned and approved and is awaiting joint venture capital

ii) VISITOR STATISTICS:

There has been an annual increase in the number of tourists visiting Ha Long Bay in each of the previous three years: 320,000 in 1996, 350,000 in 1997 and a larger rise to 480,000 in 1998. The split between tourists from inside and outside Viet Nam was approximately half and half in each year. Original predictions for the current year would see total numbers rising to 550,000. However, the Government's decision to abolish the price differential between Vietnamese and foreign tourists is likely to have a negative impact on total visitor numbers at first. Whilst a moderate increase may deter a number of Vietnamese families from visiting the World Heritage Area it is unlikely to have any effect on foreign tourists for whom the ticket price is an insignificant amount within their holiday budget. It is probable that the ratio of foreign tourists to those from within Vietnam will change in favour of the former and that total visitor numbers will show a small reduction on the 1998 figures.

j) Property management plan and statement of objectives:

The Property Management Plan seeks to raise the value of the property by careful management and appropriate development. Its objective is to strategically plan

the exploitation of the Bay's resources for the next decade within a framework designed to preserve its character.

The management of the property is currently the subject of a major planning exercise being undertaken by the Ministry of Culture and Information, the People's Committee of Quang Ninh Province and the Management Department of Ha Long Bay. This important project seeks to integrate the future management of Ha Long Bay World Heritage Area with the existing plans for the economic, urban and industrial development of the area. It is now at an advanced stage of development and is expected to be ready for ratification by the Government of Viet Nam later this year. A copy of the document at its present stage of planning is appended.

k) Staffing levels (professional, technical, maintenance):

The staff of the Ha Long Bay Management Department is divided into teams as follows:

i) CHECKING TEAM: 4 staff

This team supervises the work of the tourist guides with regard to their responsibilities in the day-to-day management and protection of those parts of the World Heritage Area that are open to tourists. Those areas of the WHA that are not open to tourists are patrolled by staff from other organisations (Tourism, Ha Long People's Committee, Transport, Police and the Ministry of Science, Technology and the Environment). The checking team is responsible for the oversight and co-ordination of checks on any activities that may affect the values of the WHA, implementing and enforcing regulations and detecting violations by providing a day-to-day 'on water' presence.

ii) PROFESSIONAL STUDY TEAM 56 staff

This team has two main groups. Six members of staff are involved in activities concerning the study of the landscape, geological, biological and historical aspects of Ha Long Bay. They develop educational and extension materials and regulations for managing the WHA and, through the team of fifty tourist guides, present and promote its values.

iii) CAVE MANAGEMENT TEAM. 88 staff

These members of staff are responsible for the presentation and protection of the caves and grottoes of the WHA. They provide guide and retail services and sell tickets for cave entry.

iv) ADMINISTRATION/ORGANISATION CENTRE UNIT 7 staff.

This unit is responsible for administrative and staffing matters as well as maintaining documents and records and computer databases.

v) ACCOUNTING 5 staff.

This unit is responsible for managing the department's finances.

vi) An additional Service and Transport Unit is currently at the planning stage and is expected to be introduced in the near future.

A Director and two Deputy Heads of Department manage the work of the department.

The total number of staff employed in the Department is 163, of which 12 are at the professional level, 60 at the technical level and the remaining 91 are manual staff. Not included in these figures is a voluntary consultant from England who is currently attached to the Department.

SECTION 5: FACTORS AFFECTING THE SITE.

a) Development pressures:

i) SHIPPING:

Ha Long City and Cua Ong are significant ports of long standing. The new port of Cai Lan in the Cua Luc estuary is already under construction and is designed for an annual capacity of over 3m tonnes of freight, on the scale of the existing large port of Hai Phong. Large ships already cross Ha Long Bay to reach the ports, passing through channels that thread a path between the limestone islands of the World Heritage Area. Their visual impact is acceptable. Inadvertent pollution from fuel oils has a negligible impact on the geomorphology of the site, but ballast water must be dumped well outside the Bay to prevent pollution.

ii) MINING:

Coal mining is a major industry on the mainland immediately inshore of Ha Long Bay yielding 3m tonnes a year from open cast pits. Tip heaps are large but well controlled and have no visual impact on the Bay. Rock waste and coal fragments enter the Bay at unknown rates, but probably no greater than the rate of natural sediment transport which would occur if no mining took place. Coal barges, which are generally sheeted, transport coal through the Bay: pollution from them is minimal although some may occur at loading points. The coal mining operations have a negligible impact on the geomorphic value of the Bay but lead to visual, atmospheric and water pollution to the detriment of its ancillary values.

iii) LIMESTONE QUARRYING:

There is no present or perceived future threat from the quarrying of limestone within the Bay: adequate resources exist elsewhere.

iv) URBAN DEVELOPMENT:

Ha Long City is an expanding area with a total population approaching 200,000. Much of the rubbish and sewerage that it generates reaches the Bay at present. Whilst current levels of pollution are not a threat to the geomorphology, they are having a negative impact on the environment and biodiversity of the Bay. Improvements to the urban infrastructure are in progress. The presence of a World Heritage Area adds to civic pride and is an incentive to further improvements.

v) FISHING:

Ha Long Bay is the centre of a valuable fishing industry, almost exclusively in-shore and reliant upon small boats. Though obviously a major influence on the marine fauna of Ha Long Bay, it has no impact on its geomorphology. Fish and oyster farms also have no impact: however, a large fish farm which was

inappropriately located in one of the Ho Ba Ham lakes on Dau Be Island has now been removed without trace. Removal of coral to sell in the tourist market has been greatly reduced.

vi) FORESTRY:

Irresponsible felling of trees on mountains around the Bay has led to soil erosion and partial denudation of some slopes. The eroded soil is washed down by heavy rainfall in the rainy season and enters the Bay, increasing the level of water-borne sediment. Its subsequent deposition may have an effect upon the water currents in the Bay. The removal of salt water trees such as mangroves to facilitate shrimp and crab feeding and harvesting weakens flood protection banks and endangers low-lying land thereby damaging the environment.

b) Environmental pressures:

Environmental threats to the geomorphology of Ha Long Bay are not significant. Water and air pollution are not at levels that would have any impact and significant climate change is not foreseen. However, environmental factors can have a marked effect upon the ancillary attributes of the WHA by endangering its biodiversity and making it less attractive.

Water pollution from urban and commercial sources is recognised as a serious problem. Improvements are being made; Quang Ninh People's Committee is planning new treatment infrastructure to ensure that water entering the Bay meets appropriate environmental standards. There are also plans to move mining activities further away from the Bay. Tighter controls on waste disposal are being introduced which will compel polluters to rectify the problem they have caused.

Changing patterns of water currents (ref: Section 4 a) vi) above) may lower the Bay's capacity to carry water-borne sediments to deeper water. The pattern of currents, their dynamics and their complex interaction with the rate and location of sediment deposition have not been researched, but any inadvertent interference with their operation must be regarded as a potential threat to the Bay's ecology.

c) Natural disasters and preparedness:

Ha Long Bay is subject to few natural disasters. During the summer rainy seasons violent storms occur, usually between two and five each year. Whilst these can, and often do, result in loss of life and damage to property, they have no effect on the geomorphology of the Bay.

Comprehensive emergency procedures are in place. Following warnings from weather monitoring stations, co-ordinated procedures of evacuation to safe locations are followed. All staff are fully briefed and rehearsed to enable them to cope effectively with such contingencies.

d) Visitor/tourism pressures:

Significant hotel and tourist infrastructure development within the immediate Bay area is not foreseen. Additional hotel development in Bai Chay should present no threat to Ha Long Bay. If properly controlled, tourist boat traffic could increase with no detriment to the environment: the tourist carrying capacity of Ha Long Bay is substantially greater than its current load. At present, tourist use is limited to a relatively small area within the heart of the WHA. As numbers increase, the sphere of operation can be widened. Even if they were to increase to the point where the 1553 sq. km of the WHA and its buffer zone were saturated, further substantial capacity exists in the surrounding area.

Long-term plans envisage tourism climbing to the three million mark - a six-fold increase on present figures. Properly controlled and managed, this would have no detrimental effect on Ha Long Bay's geomorphology. However, an increase on this scale would be certain to affect the environment and could have a detrimental effect on the ancillary attributes of the property. Planning tools are being developed to ensure that tourist expansion development is co-ordinated and integrated with environmental protection measures. A key factor will be the development of more sophisticated and sensitive indicators and monitoring techniques.

The current research being undertaken into the environmental management of Ha Long Bay referred to in Section 6 a) below will be concerned with the construction of a water simulation model and with regulatory systems for effective environmental management of the Bay.

e) Number of inhabitants within site and buffer zone:

In the World Heritage Area, 1,011 people live permanently on boats on the Bay. Several thousands more live partly on the Bay and partly in four small fishing villages for part of the year. It is difficult to provide an accurate figure for this group due to its migratory nature. Well over 10,000 people live in the buffer zone, mainly on the mainland in the southern parts of Bai Chay and Hong Gai.

f) Other:

The construction of a road bridge to link the tourist area of Bai Chay with Hong Gai across the Cua Luc Strait has now become a high priority for completion within the next few years. At present the means of crossing for road traffic and pedestrian is by large vehicle ferries and small boats. This causes serious congestion on land and water as Cua Luc Strait is also a thoroughfare for marine traffic. The effect is of significant water, atmospheric, noise and visual pollution and a potential for collision, which could cause serious damage to the Ha Long Bay environment.

The proposed bridge will be sited about 3.5km away from the World Heritage Area and will be designed to harmonise with the natural beauty of the area.

SECTION 6: MONITORING.

a) Key indicators for measuring state of conservation:

At present the Department's principle monitoring tool is the reports of tourist guides. Aware of the inadequacies of this method, the Department is seeking to develop more appropriate and sensitive indicators to monitor the geomorphology and environmental situation of Ha Long Bay. The protection of the unique environment of Ha Long Bay is the subject of a major study which is being carried out in a collaborative venture by the JICA organisation of the Japanese Government and The Viet Nam Ministry of Technology, Science and the Environment together with the Quang Ninh People's Committee. The inception report was published in February of the current year and is available for inspection. The final report is expected in October, 1999. The report will generate a comprehensive environmental management plan that will be reflected in all future related development plans in the area. It will also provide appropriate simulation models that can be used to generate sensitive indicators for monitoring the condition of the environment of the World Heritage Area.

b) Administrative arrangements for monitoring property:

The departmental checking team is responsible for monitoring the condition of the Bay and has four speedboats, six mobile telephones and an underwater camera at its disposal.

The tourist guides monitor conditions in the Bay and on its islands on a day-to-day basis and enforce regulations relating to permitted and prohibited activities. They report back to group leaders. Violations and infringements are followed up by the checking team and appropriate action taken. The information generated in this way is used to complete a condition statement for UNESCO, the most recent of which is appended.

c) Results of previous reporting exercises:

The main points of the most recent condition report to UNESCO (appended) are as follows:

- more effective controls and checking methods have improved the preservation of the Bay's environment; fewer serious and minor violations of regulations have occurred.

- minor repairs and restorations have improved the attractiveness of some parts of the Bay.

- community awareness of regulations and the work of the Department has risen.

- the department's understanding of property management has improved.
- organisational development has enabled the Department to respond more flexibly and is therefore better able to carry out its functions.
- there has been more international involvement in the preservation and development of the World heritage Area.

SECTION 7: DOCUMENTATION.

a) Photographs, slides and, where available, film/video:

A list of items under this heading is currently being compiled and will follow.

b) Copies of site management plans and extracts of other plans relevant to the site:

The management and development of the site are being considered as part of a major planning exercise (See Section 4 j) previous and "The Preservation Plan for, and General Development of, the Natural Values of the World Heritage Area of Ha Long Bay up to 2020" as appended). The strategic management capacity of the Management Department of Ha Long Bay has recently been informed by a comprehensive study and report (Muldoon, 1998) the recommendations of which are currently being implemented.

c) Bibliography:

Management Department of Ha Long Bay, "Explanatory Report on Bai Chay Construction Project." Report to UNESCO, 1998.

Management Department of Ha Long Bay, "Halong Bay. The World Heritage." Publicity booklet, 1998.

Management Department of Ha Long Bay, "Report of matters relating to the management and preservation of The World Heritage Ha Long Bay in 1998." Condition report to UNESCO, 1998.

Management Department of Ha Long Bay, "Request for financial support for research into the biodiversity of Halong Bay World Heritage Area." Letter to UNESCO, 1998.
Management Department of Ha Long Bay, 1998.

Nippon Koei Co., Ltd., and Metocean Co., Ltd.: "The Study on Environmental Management." Inception report on the environmental management of Ha Long Bay to the Quang Ninh Provincial People's Committee Ministry of Science, Technology and the Environment, the People's Committee of Quang Ninh Province and the Japan International Cooperation Agency, February, 1999, Viet Nam and Japan.

Muldoon, J., "Strategic Planning and Management of the Ha Long Bay World Heritage Area." Strategic planning and management capacity analysis and report to the Quang Ninh Provincial People's Committee, October 27th, 1998.

Quang Ninh Provincial People's Committee, "On the Establishment of the Management Department of Ha Long Bay". Decision document no: 2796 QD/UB, December 9th, 1995.

Quang Ninh Provincial People's Committee, "On the regulation of the function, tasks and organisation of the Management Department of Ha Long Bay ". Decision document no: 419 QD/UB, March 2nd, 1999.

Quang Ninh Provincial People's Committee, "The Provisional Management Regulation for Ha Long Bay". Regulatory document issued in conjunction with Decision document no: 2522, November 4th, 1995.

Thanh, T. D., "Geological History of Ha Long Bay". Geological research study and report to the Management Department of Ha Long Bay, 1998.

The National Assembly of the Socialist Republic of Viet Nam, "Vietnamese Maritime Code", promulgated on June 30th, 1990.

The Socialist Government of Viet Nam, extract from "Regulations for the Implementation of the Environmental Protection Law". Decree issued October 18th, 1994.

The Socialist Government of Viet Nam, extract from "Regulations on the protection and use of historical remains, the culture and landscape". Decree issued on 4th April, 1984.

The Socialist Government of Viet Nam, extract from "The Environmental Protection Law", promulgated on December 27th, 1993.

The Socialist Government of Viet Nam, extract from "Regulation to admonish persons violating the administration of the Environmental Protection Law". Decision 26/CP issued April 26th, 1996

The Socialist Government of Viet Nam, Ministry of Science, Technology and the Environment, "Circular Letter of Guidance about the Protection of Ha Long Bay", regulatory document issued in conjunction with an address on 19th December, 1996, Ha Noi.

UNESCO, "Convention concerning the protection of the world cultural and natural heritage". Adopted by the General Conference 16th December, 1972, Paris.

UNESCO, "Nomination of properties for inclusion on the World Heritage List". Explanatory notes.

UNESCO, "Operational Guidelines for the Implementation of the World Heritage Convention". Document ref: WHC-97/2, February, 1997.

Waltham, T., "Limestone karst of Ha Long Bay, Vietnam." Geomorphic research study and report to the Management Department of Ha Long Bay, 1998.

d) **Address where inventory, records and archives are held:**

i) Prior to 1962 when The Socialist Government of Vietnam delineated a large area of Ha Long Bay as an area of special protection, few records were kept. Any documents relating to that period may be lodged with The Ministry of Culture and Information
at
51-53, Ngo Quyen Street,
Ha Noi,
Viet Nam.

ii) After 1962, the Provincial People's Committee of Quang Ninh assumed responsibility for the protection of the designated area. Records relating to this period will be lodged with The People's Committee of Quang Ninh Province
at
Ha Long City,
Quang Ninh Province,
Viet Nam.

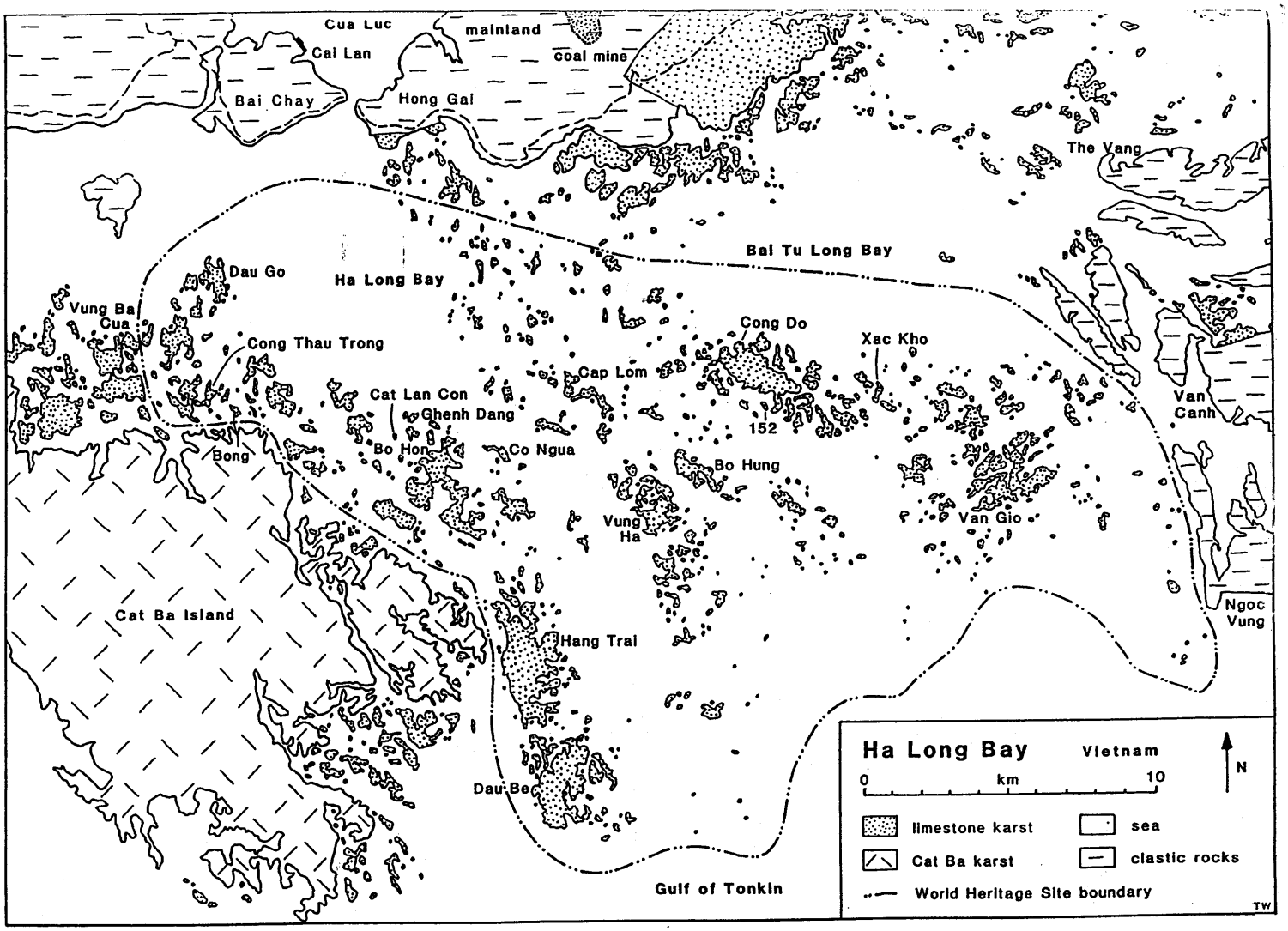
iii) Following the inscription of Ha Long Bay on the World Heritage List in 1994, the Management Department of Ha Long Bay was set up in 1995. Records from that date onwards are lodged with The Management Department of Ha Long Bay at
86, Le Thanh Tong Road,
Ha Long City,
Quang Ninh Province,
Viet Nam

Signed on behalf of the
GOVERNMENT OF THE SOCIALIST REPUBLIC OF VIET NAM

Full name: **Prof. Dr. LUU TRAN TIEU**
Title: Vice- Minster of Culture and Information, and
Vice-Chairman of the VietNam NATCOM
Date: July. 12 / 1999.

Map 1: Location Map – Ha Long Bay

Map 2: Site Map – Ha Long Bay



Carte 2: Carte du site – Baie d'Ha Long

NATIONAL CENTRE FOR NATURAL SCIENCE AND TECHNOLOGY OF VIETNAM
HAI PHONG INSTITUTE OF OCEANOLOGY

GEOLOGICAL HISTORY OF HA LONG BAY

by
Tran Duc Thanh

1998

National Centre for Natural Science and Technology of Vietnam
Hai Phong Institute of Oceanology

Geological History of Ha Long Bay

by
Tran Duc Thanh
1998

Introduction

Ha Long Bay was recognized as a World Natural Heritage site for its values in many aspects, of which the most outstanding are its landscape and its geology. Over hundreds of millions of years, nature has created and formed Ha Long Bay, a site that is famous for all Vietnamese people. To create the marvel of Ha Long Bay, there has been a combination of factors that occurred over this long period of geological time. Consequently, Ha Long Bay attracts visitors not only by the delightful scenery of its many islands, but also with regard to its geology and geomorphology.

To appreciate the values of this Natural Heritage Site, it is important to understand the geological history of Ha Long Bay. To serve this aim, this document summarises the results of the geological research and study that have been published. Some paragraphs in this document are not as fully explored as they could be, due to a lack of available material, and not all the judgements have been evaluated by experts. However, the information is continually updated, and we hope that this document will be of some use for people who wish to understand Ha Long Bay more thoroughly. The author wishes to thank Mr Nguyen Van Tuan, Head of The Management Department of Ha Long Bay World Heritage Site, who suggested, encouraged and helped the author to complete this document, and also Dr Tony Waltham, geologist from Nottingham Trent University in UK, who assisted in preparing the text in the English language.

Chapter I

Stratigraphical background

The sequence of sediments records the evidence of geological events by its characteristic colour, material components, structure, texture and preserved fossils and by the spatial relationships between the formations. Only the Cat Ba and Quang Hanh carbonate formations and unconsolidated Anthropogene sediments are known at outcrop within Ha Long Bay. However, the shore of the bay and the buffer zones include the Duyen Hai structural zone, where many other sediment formations provide a continuation of the geological history of Ha Long Bay.

Paleozoic group

Co To Formation (O_3 - S_1 ct)

The Co To is the oldest group of rocks known in the coastal zone of northeast Vietnam. It is made of detrital clastic sediment dominated by acidic volcanic tuff material, and it has the structure of a flysch with a thickness of over 2500m. Rocks of the Co To Formation are found on the islands of Co To, Thanh Lan, Chang Tay and Con Ngua. Volcanic fragments form 75% of the sediment; the remainder is terrestrial weathering debris and chemical deposits. In the sandstones, the main grains are lithic fragments, quartz, potassium feldspar and plagioclase, with minor muscovite, biotite, zircon and tourmaline. Clay minerals form 60-90% of the finer volcanic material, and hydromica is the main component; quartz forms 20%. The cyclic bedding is notable; in each cycle there are 2 or 3 sedimentary components, generally with the coarsest bed at the bottom, and the finest bed at the top. Each cycle has a thickness from centimeters to meters.

The sedimentary rocks of the Co To Formation contain many fossils of graptolites, a simple pelagic animal from deep sea environments. The common species are *Spirograptus turriculatus, Pristiograptus cf. regularis, Monograptus sp., Campograptus comminis* and *Demirastrites triangulatus*. All the rock textures and structures, oblique bedding, lenses, pebble beds and the variations in the sediments, demonstrate sedimentation in currents of water around some small islands. The relation between the upper and lower layers of the Co To Formation is not clear.

Duong Dong Formation (D_{1-2} dd)

The Duong Dong Formation dates from the early and middle Devonian. It occurs widely in the northeast (forming Ngoc Vung and Van Canh islands) and in the southwest of Ha Long Bay (north of Thuy Nguyen and south of Dong Trieu). The thickness is 450-550 m. The main rocks are quartzitic sandstone with light grey interbedded siltstones. Fossils of brachiopads, corals and crinoids indicate its deposition in a coastal environment; notable species are *Euryspirifer tonkinensis, Indospirifer kwangsiensis, Atripa ex gr. reticularis, Camarotaoechia sp., Acrospirifer sp., Desquamata ex gr. desquamata, Syringopora ex gr. eifeliensis* and *Aulacella zhamoida.* Its basal relationships are not clear, but its top is transitional to the Lo Son Formation.

Lo Son Formation (D_2 ls)

The Lo Son Formation is middle Devonian age, and its thickness is 300 m. Its outcrops are on the Tra Ban and Cai Lim islands, some small islands at the northeast margin of Bai Tu Long Bay, and north of Thuy Nguyen and Trang Kenh along the Da Bac River. The unit consists of limestone with chemical and biological origins; it is massively bedded, dark grey and light grey, with many clay lime layers, and siliceous beds near the base. It contains a diversity of corals, including *Stringocephalus burtini, Amphipora ramosa, Amphipora minima, Scohopora denticulata, Stachyodes costulata* and *Dendrostella trigeme.* Some chemical analyses (Ngo Quang Toan, 1993) showed contents of $CaCo_3$ = 54.28%, Al_2O_3 = 0.42% ; SiO_2 = 0.4%, MgO = 0.85%.

Do Son Formation (D_3 ds)

The Do Son Formation is late Devonian, is 350 m thick and occurs on Do Son, Dong Kho, Quan Lan and Tra Ban islands. The main rock types are quartzitic sandstone, which is violet grey, red grey, yellow grey and pale grey, with layers of pebble beds and siltstones. On Do Son, the unit is divided into 3 sub-formations. Its fossils include fish of the *Bothriolepsis* group, plants, brachiopods, and bivalve molluscs. This unit was formed in a coastal environment with tidal estuaries in a hot and dry climate. Its boundary relationships are not clear.

Pho Han Formation (D_3 - C_1ph)

The thickness of the Pho Han Formation is 400-650 m, occurring on Cat Ba, Thuy Nguyen and Nui Voi (Hai Phong) islands. It consists of carbonate sediments alternated with clastic beds, divisable into 3 sub-formations. The lower sub-formation includes thick limestone beds, some lime-bouder beds, and thinly bedded limestone, grey and dark grey in places. The middle sub-formation includes black limestone, siliceous limestone and argilites; some beds are lenticular. Limestone of the middle sub-formation contains 97-98% calcite and 2-3% organic clay. The siliceous limestone has 65-68% calcite and 30-33% silica. The upper sub-formation includes argilite and siliceous beds, both grey and weathering to yellow and red-grey, and dark grey siliceous bedded limestone. The Pho Han Formation contains a great diversity of fossil corals, brachiopads and foraminifera. Its basal relationships are not clear, and its top is covered unconformably by the Cat Ba Formation.

Cat Ba Formation (C_1 cb)

Carbonate sediments of biogenic and chemical origins have a thickness of 400-500 m. They occur on Cat Ba islands, in many parts of the World Heritage Site of Ha Long Bay and Bai Tu Long Bay and at sites in the north of Thuy Nguyen. The rocks are very uniform, bedded limestones, with some siliceous nodules.

The thickness of the lower sub-formation is 200m, including black and dark grey limestones, thinly and thickly bedded, alternating with thin layers and nodules of chert, with some thin beds of calcareous clay. The limestones are very fine grained, patchily recrystallized into nodules; bed thicknesses are 200-400 mm and also around 1 m. Calcite forms 96-100%, quartz and plagioclase form 1-2% and clay forms 2-3%. Chert nodules are fractured, dark grey and less than 50 mm thick.

The thickness of the upper sub-formation is 250 m; the rocks are similar including limestone and oolitic limestone that are black, dark grey and light grey, bedding both thinly and thickly. The fine grained limestones have 98-100% calcite with 1-2% quartz, but in some places the dolomite content rises to over 50%.

Typical limestone of the Cat Ba Formation has a density of 2.64 g/cm^3, a porosity of 2.6% and an unconfined compressive strength of 104.6 MPa (1046 kg/cm^2).

The abundant fossils include many foraminifera, notably *Tournayella lebottomaevae, Carbonella spectabilis, Carbonella cf. discoidea, Planoendothyra sp., Archaeosphera sp., Parathurammina sp.* and *Septabrunsiian sp.*, and also brachiopods, corals and crinoids. The Cat Ba Formation lies uncomformably on the Pho Han Formation and is transitional to the Quang Hanh Formation.

Quang Hanh Formation (C_2 - P qh)

The limestones of the Quang Hanh Formation, along with those of the Cat Ba Formation, form the islands of Ha Long Bay. The Quang Hanh Formation also has outcrops on Cat Ba, Quang Hanh and Deo But islands, and the small limestone islands of Bai Tu Long BAy. The thickness of the formation is 750 m, including limestone with biogenic and chemical origins; it is thickly bedded and massive, and is grey or light grey and fine grained.

The lower sub-formation includes 400 m of light grey limestones, that are thickly bedded and massive. The clean limestones are nearly 100% moicro-crystalline calcite, but are locally dolomitized with 0-19% MgO.

The thickness of the upper sub-formation is 350 m, including light grey limestone, thick bedding to massive, that alternates with thin siliceous limestone beds in the lower part, and with oolitic limestones in the upper part. The micro-granular limestone has 99-100% calcite and 1% quartz.

The main fossils are diverse foramminifera, besides corals and brachiopodas. The Quang Hanh Formation is transitional above the Cat Ba Formation, and is overlain uncomformably by the Bai Chay Formation.

Bai Chay Formation (P_2 bc)

With small outcrops on the south of Son Duong, Bai Chay, Giap Khau and southwest of Ha Tu, the Bai Chay Formation consisys of siliceous shales, interbedded with thin layers of grey sandstone, limestone lenses and black carbonaceous clay. Thickness of the formation is 300-320 m. The main fossils include *Neoendothyra, Nankinella, Orthoceras, Spiriferina*

and Productus, which are all species of a coastal environment. The Bai Chay Formation lies uncomformably on the Quang Hanh Formation, and its upper boundary is not seen.

Mesozoic group

Hon Gai Formation (T_3^{n-r} hg)

The coal measure rocks of the Hon Gai Formation are of Triassic age; they occur around Ha Long City and on Cai Bau, Vang Danh, Mao Khe, Tuan Chau and Hoang Tan islands with a total thickness of 2000-2500 m. The lower sub-formation are conglomerates, gritstones, sandstones and thin lenses of coal, lying angularly on the Permian rocks, with a thickness of 200-500 m. The upper sub-formation are terrigenous sandstones, conglomerates, siltstones and shales with thick coal seams. Its thickness of 600-800 m includes 60 coal seams with total resources of 3 billion tons. Some coal seams have thicknesses of tens of meters; some groups of seams are 60 m thick, in which pure coal totals 40m. The coal is of good quality, with 7000-8400 Kcal/kg, 1.2-1.5% ash, 5-10% volatiles and 0.2-1.2% sulphur. Mean rock density in the Hon Gai Formation is 2.6-2.7 g/cm^3, and unconfined compressive strenghts range from 37.2 MPa (372 kg/cm^2) for the shale to 118.8 MPa (1188 kg/cm^2) for the sandstone. There are over 150 species of treea nd fern fossils; the most common are *Daeneopsis fecunda, Bernoullia zeilleri, Asterotheca cottoni, Clathropteris meniscioides, Dictyophyllum nathorstii, Geoppertella microloba, Pecopteris tomquinensis, Taeniopleris Jourdyi, Pterophyllum contiguum, Otozamites indosinensis* and *Cladophlebis shensienis*. A common bivalve is *Gervillia inflata.*

The Quang Ninh coal basin extends for 150 km from Pha Lai to Cai Bau, including two structures containing coal. The northern structure of Bao Dai - Yen Tu, is a syncline complex 30 km long and 4.0-5.5 km wide, with topographic relief of over 1000 m. The southern structure is the Hon Gai coal basin, separated from Bao Dai - Yen Tu by an uplifted block of Paleozoic and Mesozoic rocks. The Hon Gai coal basin is a graben, where the paleo-environment was a continental lake, stretching from Mao Khe to Cai Bau. It was created by tectonics and is bordered by east-west faults. At Mao Khe, the coal measures have a monocline structure, dipping north at 25-45°. In the centre, the coal seams are folded south-north, across the

length of the basin. At Cam Pha, folding of the seams is very complex, with dips of 45-60° in many directions.

Cenozoic Group

Dong Ho Formation (N_1 dh)

This Miocene formation includes oil shales, and occurs around Cua Luc Bay at Tieu Giao, Dong Ho, Xich Tho and Troi. It is separated into two parts identifiable by their fossils.

The lower part is 60 m thick, and includes pebble beds alternating with sandstone and shale that is rich in oil, along with coal seams. The grey sediments include the plant fossils that are weakly coalized. They are separated into four beds, with grey conglomerate at the base, overlain by grey sandstones, then siltstones, oil shales rich in plant fossils, and dark grey sandstone at the top.

In the upper part are fine sediments 70-90 m thick, that formed in a deep lake; they are pink, brown pink and violet. The main clay sediment is argilite with thin layer of sandstone and siltstones and lenses of fine quartz conglomerate. The main beds are a pink and brown quartz sandstone, followed by a thick clay used for brick manufacture, overlain by sandstone and red-brown siltstones.

The common tree fossils are *Larus, Cinnamomum, Diospyros brachysepala* and *Arundodo*, and the main ferns are *Gleichenia* and *Pecopteris totangenis*; they are flora typical of a warm bog.

Tieu Giao formation (N_2 tg)

These fine grained Pliocene sediments occur around Tieu Giao, north of Cua Luc Bay. A lower bed 15 m thick consists of sandstone and grey siltstones, with a bedding thickness of 200-500 mm; interbedded clays have traces of leaves, fruits and nuts, and also fresh water shells. An upper bed 100-180 m thick consists of cycles of fine quartz conglomerates and grey sandstones.

Plant fossils of the Tieu Giao Formation include species that grew around water and in bogs. They form three assemblages: 1 - *Quercus nerrifolia - Acer trilobatum - Zelcova ungeri*; 2 - *Phragmites oeningensis* -

Typha latissima; 3 - *Fagus antipofii - Phoebe pseudolancealata.* Common freshwater gasteropods are are *Viviparus, Anodonta, Unio, Tulotoma* and *Cerathium.*

The Tieu Giao sediments lie conformably on the Dong Ho formation. They were deposited in grabens, and are bordered by faults that have been active in Neotectonic times.

Anthropogene (Quaternary)

Vinh Phuc formation (QIII vp)

In late Pleistocene times, deltaic sediments included material with marine (m), fluvial (am) and alluvial origins (a). The alluvial sediments are the youngest; they are mottled brown, red and pale grey due to strong weathering in the continential environment. The thickness of the sediment formation is 1-10m, and their age is 50-20 thousand years.

The marine sediments are sands with pebble components that create narrow terraces, at altitudes of 10-15m on the sides of Quang Yen, Yen Lap, Cat Ba and Cua Luc. In the Ao Coi marine terrace, at the same height, the sediment contains many fragments of coral and molluscs. Fluvial and marine sediments occur on the sides of valleys at Cua Luc, Yen Lap, Quang Yen, Gia Luan and Trung Trang (Cat Ba). At Gia Luan, a thin surface layer of brown fine sand, is followed by a brown-red mottled clay mixed with sand; an adjacent bed is of pebbles mixed with dark grey clay. Late Pleistocene alluvial sediment forms small mounds 3-4m high beneath Holocene sediment in the tidal zone at Yen Lap, Dai Dan and Hoang Tan. On mounds beyond the tidal zone, there are many archaeological relics of past cultures. Analysis of pollen and siliceous algae have confirmed the continental origin of this sediment.

Hai Hung formation (QIV^{1-2} hh)

Sediments of the Hai Hung Formation are common in the northern plains; they date from 11-3 thousand years ago in the Early and Middle Holocene. In and around Ha Long Bay, Hai Hung sediments have marine, saltmarsh and lake origins, with a thickness generally of 1-7m.

Typical marine sequences of sand alternated with clay form the sea beds, littoral dunes on some islands, and outcrops along the edge of the

mainland at heights of 4-7m. The sands are coloured red-brown, yellow, grey and white. There are thin layers in the tidal zone, and coral reef limestones on some island coasts.

The saltmarsh sediments are dark grey and green-grey fine silts and clays with many relict mangrove tree roots, that are either rotten or undamaged; the thickness of the sediment is 1-3m. These occur widely in the tidal zones of the Bay, reaching to 0.5-2.0m deep.

Lake sediments are restricted to small soites at Yen Lap and Hoang Tan; they are green, fine clays 0.5-1.0m thick, with siliceous freshwater algae and continental pollen.

Thai Binh formation (QIV^3 tb)

Sediment of the Thai Binh formation is of late Holocene age; they are the youngest sediments in the Ha Long Bay area. They were formed on the surfaces of deltas, inside the tidal zone and on the floor of the Bay. They originated in marine, saltmarsh and deltaic environments with thicknesses of 1-5m.

The marine sediments include many sand-pebble beds on marine terraces at heights of 2.0-3.5m, on the mainland slopes, on some islands, and as beaches and sand spits; they are also common as fine sands and silts in today's lower tidal zones and as thin layers alternating with the saltmarsh sediments. Some small beaches on islands in the southern Bay have sands that are entirely shell fragments of coral, bivalves and foraminifera. The saltmarsh sediments are 0.6-1.2m thick as layers of dark grey and gree-grey silt and clay beneath the modern low tide zone; they are recorded in the Hoang Tan and Dai Dan areas, Cua Luc Bay, the north of Cat Ba, the coast from Hon Gai to Cam Pha and on some small islands. They contain many relics of mangrove, with the sulphide minerals of pyrite (FeS_2) and pyrrhotite (FeS).

Tidal mud flats of alluvial sediment reworked by tidal currents occur along the western sides of Ha Long Bay and Cua Luc Bay and on the southwest of Cat Ba Island.

Ha Long Bay seabed sediment (QIV)

The Holocene seabed sediments of Ha Long Bay are little known due to the lack of documented boreholes and gravity sampling. They include some coarse sands, fine silts and muds. Fine silt covering most of the bay floor has an average diameter (Md) of 0.021-0.049 mm. Silty mud in some level areas has an Md of 0.007-0.008mm, and silty muds inthe south of the bay and in deeper trenches has an Md of 0.053-0.083mm. Typically the sediments are grey-green, but there are some thin yellow layers in the south of Bay, caused alluvium from the southwest, and there are dark grey layers containing coal material near Ha Long City. The sediments' main mineral components include quartz, feldspar, mica and chlorite, with less than 1% of heavy mineral components including leucoxene, tourmaline, zircon, limonite, ilmenite and hematite. The content of soluble Fe^{2+} is 0.24-1.45% and soluble Fe^{3+} is 0.14-0.81%; the ratio of Fe^{3+}/Fe^{2+} is 0.5-0.8, typical of a reducing geochemical environment. The sulphur content is 0.15-0.25%.

The origin of the sediments of the Ha Long Bay seafloor is interesting and needs to be studied in greater depth.

Chapter 2

Ha Long Bay before the Anthropogene

The Precambrian - the earliest part of geological time

The age of the Earth is at least 5 billion years, and the oldest rocks yet found and dated by radioactive decay of their uranium are 3.8 billion years old. For a long time the surface of Earth was a sea of hot lava. When this cooled it created a thin surface of solid rock, and was soon partly covered by oceanic waters and an atmosphere. After this initial Archean era, the Proterozoic era (2.6 billion years to 570 million years ago) saw primitive life appear. The crust of the planet slowly evolved until masses of light granitic rocks formed the continents, while heavier basaltic rocks formed the ocean floors between them. Seas formed where the oceanic waters had shallow overlaps onto the edges of the continental blocks.

In Vietnam, rocks of the Precambrian (the Archean and Proterozoic combined) are limited to the central areas between the Hong and Chay Rivers, Fansipan, eastern Nghe An and the upper basin of the Ma River. Around Ha Long Bay, there are no Precambrian rocks at the surface, and we await further investigation of the deep structure of the Bay area.

The Paleozoic Era and the marine trangression

A deep and large sea area

In the early Paleozoic (570 - 410 million years ago) the climate of the region was hot and dry, and the geological history of Ha Long Bay related to the development of the Katazia oceanic trough. This ocean extended along the edge of the Chinese continental block (now at Phuc Kien and Quang Dong) to the northeastern interior of Vietnam. In the early Cambrian (570 - 500 million years ago), the site of Ha Long Bay was an erosional zone on the continent, until it was flooded by the sea's expansion from the west. In the late Cambrian there was sea at Ha Long Bay for the first time, and this sea lasted for most of the next 100 million years. The sea floor accumulated 2000 m of bedded sediments of the Co To Formation, which contain graptolite fossils and are now exposed at Tan Mai and on Co To island. At first the sea was very deep and accummulated clay, silt and sand,

but it then became shallower and accummulated silt, sand, pebbles and volcanic ash debris.

The first orogeny

In the early Paleozoic, the deep Katazia sea that covered Ha Long Bay was a part of the Pacific Ocean rim. At the end of the Silurian period, this marine trough closed and the Caledonian orogenic uplift changed the deep sea into a complex chain of fold mountains. From then, the Ha Long Bay area was a mountain zone for over 70 million years, when it was a site of strong erosion and denudation in hot and dry conditions. Ha Long was a part of the large Katazia continent, occupying the Chinese continental and its eastern shelf seas of today. Sediments were produced by the erosion process, and were transported to accumulate in the central mountain depression of Tra Ban, and to form the Dong Kho islands, in eastern Bai Tu Long, and Thuy Nguyen, Kien An and Do Son in the west.

After further orogenic movements, the sea trangressed in some places, but Ha Long Bay was still a continental land mass. In the middle Devonian, there was more marine trangression that created thin beds of limestone with marine fossils, notably corals, at Tra Ban and Trang Kenh. On Do Son Island, there are many fossils of brachiopods, bivalve molluscs and bog plants. At Ca Giap the violet sandstone, with siltstone layers, shows that the environment 340 million years ago was one of the tidal zone with sediment from the adjacent Ha Long continent.

Warm seas and the formation of the limestone

At the end of the Devonian, the Ha Long area were continuially uplifted in the Hercynian orogeny , so that the marine environment disappeared. But then the system of warm, shallow seas re-established and lasted through the Carboniferous and most of the Permian, over the times 340 - 240 million years ago. This shallow sea expanded onto the land in the north and middle of Vietnam. The shallow seas existed for 100 million years, during which two limestone formations accumulated by chemicial and biological processes; these are the Cat Ba Formation of the early Carboniferous and the Quang Hanh Formation of the middle Carboniferous to early Permian. The Cat Ba Formation is 450 m thick, including black and grey bedded limestones alternating with chert layers. The Quang Hanh Formation is 750 m of light grey massive limestone. These two formations

form the hundreds of islands of Ha Long Bay, Cat Ba Island, the buffer zones of the World Heritage Site and the seashores of Hon Gai and Cam Pha. There are many fossil remains of corals, brachiopods and crinoids that are a feature of the warm sea environment with a high salinity and a depth not more than 50 m. These two limestones with a thickness of 1200 m provide the characteristic landscapes of Ha Long Bay.

In order to accumulate thick limestones in the shallow seas, the sea bed subsided slowly throughout the hundred million years, balancing the rate of chemical sedimentation of the limestones. For a hundred million years, the sea maintained a stable environment of shallow, warm salt water, covering Ha Long Bay and a large part of Vietnam that exists today. The Carboniferous (340 - 285 million years ago) was a warm period all over the planet, when huge bogs created the great coal basins in Europe and America. But in Ha Long Bay, limestone sediments were deposited in a shallow sea. In the middle Permian, there was an uplift that caused marine retreat in the Ha Long area. Then the sea trangressed again from the west, creating the 300 - 320 m of Bai Chay Formation; these are thinly bedded siltstones alternating with grey sandstones, limestone lenses and black carbonaceous clay containing foraminifera, gastropods and brachiopods, and they now occur at Son Duong, Giap Khau and southwest Ha Tu.

Mesozoic Era - a continental phase and the second orogeny

Although there were some tectonic moverments within the Mesozoic era, the Ha Long Bay area remained as a land region for the period 240 - 67 million years ago. During that time, the Indosinian orogenic movements folded the rocks of Ha Long Bay. In the late Mesozoic there were only minor uplift movements on the stable continental block.

The coal measure swamps of the Triassic

In the Triassic (240 - 195 million years ago), Ha Long Bay was a continental region subjected to weathering and denudation processes. To the south-west, the An Chau depression was a coastal environment with carbonate sedimentation alternating with acid and basic volcanics, totalling 1000 m. At the end of the Triassic, the strong Indosinian orogeny affected all the Dong Duong area as the geosynclinal ocean closed. Associated movements disturbed the Ha Long Bay area, where fault block movements created a graben depression from Cai Bau to Cam Pha, Hon Gai, Uong Bi

and Mao Khe. The Hon Gai Formation of coal measures accumulated in this graben. The lower part is 1300-1500 m thick, including conglomerate, sandstone, siltstone, mudstone, cannel coal and some workable coal seams. The upper part is 600-800 m thick, and includes sandstone, alternating with green-grey siltstone, carbonaceous siltstone and coal that accumulated in a marginal continential environment. The anthracite coal seams are of good quality and total about 3 billion tons, with some seams that are tens of metres thick. These coals were created in the great wet forests of tree ferns, that each grew for centuries and were then covered by sediment. Many fossils remain in the rocks. The Triassic had a hot and dry climate over much of planet Earth, but it was hot and wet in the Ha Long region.

The hot and dry continent of the Jurassic and Cretaceous

In Jurassic times (195-137 M years ago) and then in the Cretaceous (137-67 M years ago), the Ha Long area remained a continental environment affected orogenic movements comparable with the Yen Son in China and the Kimmeridgian in Euroupe. Ha Long Bay was in the mountain zone, subject to erosion and denudation. In the north, at Binh Lieu, Ba Che (Quang Ninh), Dinh Lap (Lang Son) and Son Dong (Ha Bac), depressions were created between large mountains and were filled with 1000-2000 m of red and violet sediments of the Ha Coi Formation (J_{1-2} hc); the components are conglomerates, sandstones, pyroclastics and rhyolite lavas that were formed in the late Jurassic and early Cretaceous. This is the era of the great reptiles on land, in water and in the air, and many fossils have been found in the Ha Lao area. The Jurassic is a period of worldwide expanding seas, but seas were limited in Vietnam. Throughout the Cretaceous the climate was hot and dry, so that the sediments around Ha Long are violet and red colours. By the end of the Cretaceous, continential conditions dominated on the Dong Duong area.

The Cenozoic era and the formation of Ha Long depression

The Cenozoic era started 67 million years ago and continues to now. In the history of Earth, the Cenozoic is a time of mammals and angiosperms. The era includes the Paleogene (67-26 M years ago), the Neogene (26-2 M years ago) and the Quartemery or Anthropogene (the last 2 million years). The geological history of Ha Long area in the Anthropogene is described more fully below. The Paleogene and Neogene are also known together as the Tertiary.

Alpine earth movements and formation of the Ha Long depression

In the Mesozoic period, the Ha Long area was in a high mountain continental environment influenced by orogenic movements. At the start of the Paleogene, the slow tectonic uplift reduced. Erosional processes weakened as the terraine became lower. After millions of years of denudation, the terraine was an almost flat plain. Then tectonic activity returned as grabens broke the plain into blocks with different altitudes.

This was the local expression of the great Alpine orogeny, which affected the entire Alpine-Himalayan belt when the Tethys Ocean closed as the southern continents collided with the Asia-Europe continental mass. The Alpine orogeny formed the highest mountain belt in Viet Nam and the Dong Trieu arcs with the summit at Yen Tu, 1068 m high. The main earth movements were 30-10 million years ago (in the Oligocene and late Miocene) and included reactivation of the deep fault system in the Red River valley and at Tien Yen and Cao Bang. The block movements of this stage formed many graben depressions, including one at Hanoi one in the centre of the North Delta that pre-dates the Red River delta.

At Ha Long, the graben depressions were complicated by thrust faulting in the Neogene. The Cua Luc Bay depression, north of the Hon Gai - Bai Chay uplifted blocks, is a small bay with a water depth of 14 m. Around the rim of the bay are Neogene rocks of the Dong Ho formation, 100-150 m of conglomerate, sandstone, siltstone and oil-bearing shale. The Tieu Giao formation is 150 m of clastic sediments in the north of Ha Long city. The Neogene clay at Gieng Day is well known as a resource for brick manufactures. The depression of Cua Luc contains shales with oil, and it is possible that resources of gas await discovery in the depression.

The Ha Long Bay depression lay between the Bai Chay - Hon Gai and the Cat Ba uplifted blocks, and it sunk later than Cua Luc depression. However, the Tertiary rocks on the floor of the bay are not seen due to the cover of moderm marine mud. Structures within the bay depression are only known by geomorphological interpretation; they include a narrow depression that is almost north-south. Most of the present Ha Long Bay is being slowly uplifted. Along the Dong Trieu fault system, recent seismic movements included the three earthquakes at Bac Giang (1961), Yen The (1987) and Cam Pha (1988); these had Richter magnitudes of 4 to 6.

In the middle of the Neogene, the tectonic movements gradually weakened. Denudation was also reduced, but included the karstic evolution of the limestone by dissolutional processes. A new planation level was formed, and now stands at 100-250 m on the islands and the continental shores of Ha Long Bay. Tectonic movements continued throughout the Anthropogene.

Formation of the East Sea (South China Sea)

Oceans and seas existed in the early history of Ha Long Bay, but they were barely related to the formation of the East Sea. This formed in the Alpine earth movements about 28-30 million years ago on the eastern margin of the Pacific Ocean. It is separated from the deep ocean by the volcanic island arcs of the Phillipines and Indonesia and the deepest ocean sea trench in the world. At first the East Sea was narrow but at the beginning of the Neogene, 26 million years ago, it spread over the whole continental shelf of Viet Nam. Perhaps in the Miocene, the East Sea was the site of the oil formation in Dong Ho (Hoanh Bo), before it narrowed. The East Sea first developed in the west, before Ha Long Bay was recognisable, but its development and geological history influenced Ha Long Bay, its climate and its hydrography.

Chapter 3

Ha Long Bay in the Anthropogene

The Anthropogene (or Quaternary) period has lasted a short time compared with other periods in geological history; it started about two million years ago, and it continues to the present time and into the future. It is called the Anthropogene because it is the period when human beings appeared on Earth and gradually became an important agent in natural processes. The largest subdivision of the Anthropogenee is the Pleistocene period of cyclic worldwide cooling, which caused the glaciations of the higher latitudes. These glacial expansions caused the world's sea levels temporarily to decline by about 100 m. In the Anthropogene there were at least four glacial stages betwee stages of hotter climate when the sea levels were a little higher than they are today; they then created widespread continental terraces. The last 10,000 years, of warmer climates after the Pleistocene, are known as the Holocene.

The Pleistocene - continental environents

The Pleistocene is defined by the periods of worldwide cooling that caused the Ice Ages; it started about 2 million years ago and ended 10,000 years ago. These were also the times of the Old Stone Age and development of the ancient peoples of the Atlanthoropites, Australipithes, Pithecanthropites, Sinanotropithes and Neandertalensis. During the glacial epansions, sea level decreased by over one hundred metres, exposing new areaes of land. Outside the glacial regions, world climates cooled, often accompanied by increased rainfalls.

Karstic landforms

Due to the low sea levels during the Ice Ages, all of Vietnam and much of the Gulf of Tonkin was a land region during the Pleistocene; people could walk on foot from Vietnam to the islands of the southern East Sea. Sometimes the sea transgressed along the river valleys. Within this background, Ha Long Bay was formed during the Pleistocene. Prior to this, and especially since the middle Neogene, karstic erosion by dissolution of the limstone developed the landscapes of Ha Long Bay and neighbouring areas. The climate included a high rainfall; river systems, that are still recognisable by their seabed channels, were part of the karstic erosion

processes, and created the cone and tower karst with valleys, caves, sinkholes and underground streams. Karstic plains and upland blocks were carved by the erosion in a continental environment. That was a basic factor in the formation of Ha Long Bay before the sea trangressed across the area. The sea bed of Ha Long Bay is a kind of plain with inherited relief, modified by later marine erosion. Sediment has accumulated on the karst plains that have formed the seabed since the Holocene transgression.

Except for the islands, the underwater bedrock outcrops and the systems of underwater channels and depressions, the seabed plain of Ha Long Bay can be divided into three large and sloping surfaces.

- The seabed at depths of 2-5 m: forming most of the seabed of the Bay, mainly in the west, the center and the northeast of the bay, and developed in the middle and late Holocene 4,000-3,000 years ago on the inherited surface of the alluvial plain of the late Pleistocene; this plain continued to develop on the older karstic surface of the middle and late Pleistocene.

- The seabed at depths of 6-11 m: forming the southeastern part of the World Heritage area and southeastern edge of Cat Ba island; its age is early to middle Holocene, and it also developed on the karstic surface of the middle and late Pleistocene.

- The seabed at depths of 12-20 m: forming zones around Dau Be and Hang Trai Islands; its age is early Holocene, and it developed on karstic surfaces formed throughout the Pleistocene.

The limestone islands in the present bay are mountains that stood above the karst plain that was submerged by the Holocene transgression. The limestone pinnacles on the cliffs are a special phenomenon of the karst. They are bounded by the fractures within the rock, and were carved and fretted by the high rainfall.

The old system of rivers

On the continental Pleistocene plain, the dense system of rivers created valleys that now lie on the seabed of Ha Long Bay are still maintained between banks of silt in the shallow zones and by the scouring erosion of strong tidal currents.

In the Pleistocene, when the water level was lower than it is at present by more than one hundred metres, rivers and streams drained from the land in the northeast to the center of Ha Long Bay, where they joined rivers from Cua Luc and Yen Lap; the main river then flowed to Lach Van, after joining the Bach Dang River. The old Bach Dang River took the water from the old Red River on the Red River plain (at 107°50'E, 108°56'N) before its flow was redirected to further west in the Gulf of Tonkin.

Six levels may be recognised in the old river channels on the seabed of Ha Long Bay; these lie at depths of 1.5-2.0m, 3.0-3.5m, 6-7m, 12-13m, 20-22m and 35-40m. The first and second levels have V-shaped profiles due to their deep and youthful erosion. The third and fourth levels have U-shaped profiles where their rivers had carved wider valleys with flat floors before they were submerged by the sea. High rainfalls in the Pleistocene ensured rapid excavation of these valleys; today the rainfall in the hills to the northeast is 2000-2800 mm/year, higher than in most other parts of Vietnam. Large cobbles in the old river sediment in Tien Yen and Ha Coi areas is one result of the torrential river flows.

The cave systems

The Pleistocene was the main time when the well-known caves within Ha Long Bay were formed. They mainly lie at altitudes of 10-15m; 20-30m and 40-60m. Each erosion level may indicate an age, after which the caves were uplifted by tectonic movements. The cave systems in Ha Long Bay may be correlated to the river and marine terraces at the same heights at Mong Cai and Quang Yen, and to the summit levels on the limestone hills and islands in the bay. Except the highest top on Cat Ba island at 322m, most summits are at 100-250m, and predate the Pleistocene. Summits at 80-100m and 40-60m are early and middle Pleistocene, and those at 10-15m are late Pleistocene. All the summit surfaces are vestiges of old karstic plains that have been raised by tectonic movements. The base levels of erosion are and were at the contemporary local groundwater levels.

Karstic erosion began when rainwater flowed into the limestone's fractures that had been created by tectonic movements. Chemical corrosion by the rainwater gradually enlarged the fractures, ultimately into caves; the deeper and larger caves were formed by the larger underground streams in the limestone mountains. In general, the strong limestones, with large

fractures and thick beds, of the Quang Hanh formation have developed in them caves that are longer and larger than those the Cat Ba formation.

Cave development has continued whenever the limestone has been exposed to erosion. Many caves formed in the cool and wet stages of the middle and late Pleistocene. Stalactites are younger than caves that contain them, and some developed in the warm Holocene period.

The process of dissolving limestone to form caves and redepositing it to form stalactites is showed by the chemical equation:

$$CaCO_3 + CO_2 + H_2O = Ca^{2+} + 2HCO_3$$

This equation works in both directions. Removal of the limestone takes place when it is dissolved in water that is enriched in carbon dioxide that it has gathered from plant-rich soil atmosphere (to create weak carbonic acid). The opposite, the precipitation of dissolved $CaCO_3$ to form stalactites and stalagmites occurs when carbon dioxide is lost from the water as it achieves equilibrium with cave air. In the glacial times of the Pleistocene, the climate of the Ha Long area was cool and rainy, so it was good for dissolving limestone to create caves.

The old Ha Long Bay

There are different opinions on the numbers and the scales of the marine trangressions on to the northern shores in Pleistocene times. They are mostly based on relationships to the worldwide glaciations, and cannot account for tectonic movements in the area. The earliest known marine trangression was in the late Pleistocene, when alluvial, marine and transitional sediments of the Vinh Phuc Formation were deposited along the coastal zone of Hai Phong, Quang Yen and Uong Bi.

Marine terraces (formed when the sea was relatively higher) are known at a height of 10 -15m at Do Son, Uong Bi, Quang Yen, Ha Long City and Cat Ba Island. On Cat Ba, the Ao Coi terrace has a height of 10m formed by sandy sediment containing pieces of coral and shellfish. This is evidence of the marine origin of the terrace, whose age is confirmed as 18,500 ± 250 years in Phan Thiet province. Therefore, the sea certainly spreaded over Ha Long Bay about 20-30 thousand years ago and formed the old bay. Perhaps, this was the first Ha Long Bay, created by the trangression from the east, that was larger and more open than the present

Ha Long Bay. However, the marine terraces and old shorelines may have such heights because they have been raised by local tectonic uplift. During the cold stages that occupied much of the Pleistocene, glaciers expanded, and consequently coastlines retreated as sea levels temporarily lowered by 100 - 120m. At these times, the coast lay far outside Ha Long Bay.

Holocene development of Ha Long Bay

The Holocene began 11,000 years ago and has lasted until now. It was the time that *Homo sapiens* evolved on Earth, through the archeological cultures of the New Stone Age, the Bronze Age and the Iron Age. In the Holocene, the climate of the world was warmer, much of the Pleistocene ice had thawed and the sea level was raised on a globe scale in the Holocene (or Flandrian) transgression. The Holocene is divided on climatic grounds into three stages: the early (11-7 thousand years ago), the middle (7-3 thousand years ago) and the late (3 thousand years ago to the present day).

Stages of development

Based on the processes of the rising eustatic sea level due to climate, the modern tectonic movements and the sedimentary process, the geological history of Ha Long Bay in the Holocene may be divided into six stages.

Stage 1 (11,000 - 7000 years ago):

sea level was rising, but Ha Long Bay was still land

The Holocene or Flandrian transgression followed the glacial stage when the sea-level for at least 17,000 years had been 100-120 m lower than at present, and the continental shoreline had been outside the Gulf of Tonkin. Sea level rose by over 10 mm/year, and 8000 years ago, the coast was close outside Lan Ha Bay, in the Dau Be zone in the south of Ha Long Bay, and outside the estuary of the Bach Dang river. Ha Long Bay is basically a continental plain that has been invaded and submerged by the sea. West of Ha Long Bay the estuary of the Bach Dang river had alluvial flats, lakes and bogs. To the north, Cua Luc was a fresh water lake, that became brackish due to the tidal currents flowing in from the sea.

The environment was a coastal karstic plain with a climate changing from cold to warm, making changes for the old inhabitants' styles of living.

In the beginning, groups of people in Hoa Binh - Bac Son lived in caves that were located in hills including Dong Dang, Ha Lung, Hang Doi (Hoanh Bo - Quang Ninh) and in Hang Duc, Eo Bua, Ang Giua, Dong Cau (Cat Ba, Hai Phong), Hang Ma and Soi Nhu (Quang Ninh) islands. The earliest absolute age confirmed by the radiocarbon dating is at Soi Nhu (14,125 ± 180 years), and the youngest is at Ha Lung (6,480 ± 60 years). The people made their living by collecting and gathering food from the natural world, and they lived in Hoa Binh - Bac Son from the Middle Stone Age to the early New Stone Age. Theircave sites have yielded many kinds of oysters and freshwater snails (Melania, Antimelania, etc.) and rare shells of sea snails.

Stage 2 (7000-4000 years ago):

a marine trangression, and Ha Long Bay was formed

This was the stage when the Holocene trangression submerged Ha Long Bay and its neighbouring zones, and the line of the seashore was almost that of the modern Ha Long Bay. This was the final result of a long geological evolution with a combination of many factors and events. The most important factor was the formation of the limstone over 1000 metres thick in the Carboniferous and Permian eras (340 - 240 million years ago), the Ha Long downwarping in the Neogene (about 26 - 10 million years ago), the erosional evolution of the karstic plain in the Pleistocene (2 million - 11 thousand years ago) and the global marine trangression when the warmer climate thawed the ice in the Holocene.

In the first phase, about 7000 - 5600 years ago, the coastline moved continuously towards the continent and closer to the foot of the mountains and hills (that later became the bay's islands). Ha Long was a marine bay, and Cua Luc and the Bach Dang River were on its margins. Cua Luc Bay linked to Ha Long Bay by two channels around Bai Chay island. Meanwhile, the Hai Phong and Quang Yen zones were open sea, so waves acted strongly from the southwest. Clean and clear sea water housed splendid coral reefs along the coastline, not only in the southwest of Cat Ba, Dau Be and Hang Trai, but also common at the northern margin of the bank in Ha Long Bay bordering the north and northwest of Cat Ba Island. At that time, coral reefs also developed on Do Son Island.

In the later stages, sea level was lower and it made the sea water less pure and less salty, so that coral reefs north of Cat Ba died and were

covered by mud. After rising to a maximum, the sea level stabilised to make the chemical erosion notches in the limestone cliffs. Shore areas were raised to create the widespread accumulative estuarine and marine terraces, 5-6 m high on average. On some cliffs, Ostrea shells prove the height of the old sea level raised by recent tectonic activity, and the uplift rate is higher than the eustatic movement rates due to climatic change. Tectonic uplift has been about 2mm/year. Analysis of the estuary denudation, indicates that the tidal range at this time was from 2.5 to 3.0 m, with a smaller range than the 1.0 metre at the present time.

During the second phase, there was a relatively low sea level about 5600-4000 years ago. The areas of Quang Yen, Yen Lap, the northwest of Cat Ba and the northern end of Cua Luc Bay had sedimention amid thick mangrove bogs. An old system of littoral dunes at heights of 4.5-7.0 m lie across Hoang Tan, Quang Yen and Thuy Nguyen. Sediment from winds and waves more than in the west covered Ha Long Bay, which was rather narrow and had been under the influence of impure currents along the shores from the West, so that the coral reefs died.

When the sea submerged the margin of Ha Long Bay, the weather was warmer. New groups of people lived on the beaches, at the foot of the hills, and on the sides of mountains at Cai Beo (Cat Ba), Thoi Gieng, Thon Nam and Doc Go Mung (in Quang Ninh). They made their living by sea-fishing in the estuaries of rivers and in the Bay protected from winds and waves, where varied marine life was rich. These were the cultural groups previous to the Hoa Binh, of the same age as the different peoples in Da But (Thanh Hoa), Quynh Van (Nghe An) and Bau Du (Quang Nam - Da Nang); this group's age is confirmed as 5,645 ± 115 years. Many early fishing villages stood on the sea terraces, but their vestiges have been washed away and eroded by winds and waves.

Stage 3 (4000-3000 years ago):

the sea retreated from Ha Long Bay, and the Ha Long culture developed

In the final stage of the middle Holocene there was a relatively low sea level around northern Vietnam as well as in Ha Long. Eustatic sea level changed at due to climate at a rate of only 0.3 mm/year, but tectonic uplift of fault blocks was 2.4 mm/year. The increased relief caused lateritic weathering of the old sediment surfaces, and much of Ha Long Bay was

saltmarsh around the margins. The bog sediments were freshwater in the stages which have been discovered and studied from bore holes in Dinh Vu, Cat Hai, Hon Xoai and Cai Vieng. They were sand and mud sediments containing vegetation humus without trace of mangrove or marine fauna. Micro-algate analysis showed that continental species were common, but ocean ones were very rare; this means that the environment was less under the influence of the sea.

The major change. in the environment in Ha Long Bay and the neighbouring zones had a great significance on the people's development within the famous Ha Long Culture. This was in the New Stone Age, with relics including hatchets, axes ground over their whole body, stepped hatchets, shoulder axes and grinders with grooves that were discovered first by J.G.Anderson, the archeologist, in 1939 in the marine terrace on Ngoc Vung Island. Up to now, there are over 20 sites belong to this Culture in the Ha Long area. They are found on the sides of hills, in sand hills, in littoral dunes along shores, on terraces at heights of 3.5-4.0 m and in caves. Typical Ha Long cultural remains are in Flower Garden, Coc Tam, Ngoc Vung and Xich Tho. The most remote sites of this culture are on the west of Hoang Tan Island.

The rich development of the Ha Long Culture on the bay's islands has been dated to the period of emergence of Ha Long Bay 3000-4000 years ago. In this culture, there is a combination of the autochthonous features that pre-date the Ha Long age and features of the New Stone Age on the seashore of Fujien and Guangdong in China. Many relics of the culture were destroyed or submerged in the sea bed, but the evidence indicates that the Ha Long Culture people made their living not only by fishing but also by agriculture. In Trang Kenh (Thuy Nguyen, Hai Phong) there is a site in the estuary of the Bach Dang River and close to the sea, where relics of water rice belong to the Phung Nguyen Culture with an absolute age of 3406 - 100 years, which is contemporary with the Ha Long Culture. It has been shown that conditions of the past environment were suitable for the development of agricultural economies, yet today this place is not good for agriculture because of salts, sulphates and flooding.

\Stage 4 (2000-3000 years ago):

the sea advances and Ha Long Bay is enlarged again

At the start of the late Holocene, sea level rose to reform Ha Long Bay from the marshes and channels of the previuos stage. Compared with before, Ha Long Bay is narrower. In the west of the bay, the areas north of Cat Ba, Hoang Tan and Yen Lap have enlarged low tidal flats and mangrove swamps around the islands. At the edge of the mainland and islands, a marine terrace lies at a height of 3.0-3.5 m. Dissolution of the limestone by the sea water made a system of notches at the same height, where there are also many traces of Ostrea. On the margins of islands in the south and east, coral reefs continued to develop, and remains survive on the terrace edges. In the west of the bay, there was a freshwater current from the Red River; this banked up sand to form the system of littoral dunes 3 m high from Minh Duc (Thuy Nguyen, Hai Phong) to Hoang Tan. Fine mud was deposited further from the shore and acummulated in the centre of the Bay. The people of the Ha Long culture left the islands during this trangression.

Stage 5 (1000-2000 years ago):

Ha Long Bay was narrower and developed a mangrove forest

In the middle of the late Holocene, Ha Long Bay continued to exist but it was narrower due to rapid and extensive development of mangrove swamps in the western and northern edges of the bay. Mangrove forests developed to their maximum area, in the whole estuary of the Bach Dang River, in Yen Lap and Tuan Chau, around Cua Luc Bay, north of Cat Ba and at the edge of terraces from Ha Long to Cam Pha. Meanwhile, the eustatic rise of sea level had increased to 0.6 mm/year. Due to a large supply of alluvial sediment, the ground of the marine mangrove swamps accumulated layers of mud in the high tidal zone, above the mean sea level. The blue grey sediment layers in the bogs formed at this time with a thickness of 0.6-1.2 m on the tidal flats.

This was a time when the bay received silt carried by currents from the Red and Bach Dang Rivers, notably in the tidal mangrove swamps north of Cat Ba, Tuan Chau and Yen Lap. At the end of the stage, the Bach Dang River formed littoral dunes 2.5 m high around Cat Ba Island from Phu

Long to Cat Hai, Dinh Vu and Trang Cat. At the time, these littoral dunes covered the old marine flats in the estuary of the Bach Dang River. This new deposition adjacent to Cat Ba Island prevented further eastwards progress of the silt, so that the water in Ha Long Bay became pure, clear and non-turbid, though some mud settled on its floor. This is why the sea water in the bay today is often pure and blue all round the year, while its seabed is mainly of fine smooth mud.

From this stage there are few historical and archeological materials in Ha Long Bay; it was a stage of mangrove bogs at the edges of terraces within the bay. Remains of cultures who were accustomed to a life in the marine swamps have been found in the estuary of the Bach Dang River, west of Ha Long Bay. Fishermen's graves were discovered in Phuong Nam village (Uong Bi town) and Viet Khe hamlet (Thuy Nguyen district). These graves were interred in bogs that show the environment and life style of the people. The age of the graves is 2000-2300 years by radiocarbon dating. The mangrove bogs along the shores of Ha Long Bay formed a little later. Perhaps here there were people similar to those at Phuong Nam and Viet Khe.

Stage 6 (1000 years ago):

Ha Long Bay is enlarged

In the last thousand years, world sea levels have gradually risen by about 0.5-1.0 mm/year. Therefore, submergence was active not only in the small areas of tectonic downwarping, but also at the margins of weaken uplift tectonics where there was minimal alluviation. The modern geology of Ha Long Bay was closely related to the estuary of the Bach Dang River. Until about 500-700 years ago, sediments accumulated in the estuary so that the Do Son archipelago became the Doson peninsula, bordering the Kien Thuy plain (Hai Phong). Again, silt-bearing currents along to the southwestern part of Ha Long Bay were limited. Man made the system of large dikes in Ha Nam and Cat Hai to prevent sediment reaching Ha Long Bay.

Then, about 500 years ago, the estuary of the Bach Dang River changed from that of a plain river zone (solar) to that of a funnel figure river zone (lunar), so that less silt from the estuary was carried to Ha Long Bay. Therefore, the water within Ha Long Bay was purer, bluer and saltier

than in the last stage and coral developed again on the suitable hard seabeds around the mud area. Due to the lack of alluviation, bank erosion happened for a long times in Ha Long Bay with diurnal tidals of 4 - 4,5m. With only small waves, the tidal currents were strong and eroded of the marine sand terraces. The mangrove swamps were also eroded rather slowly (less than 2 mm/year) but were gradually washed away over a remarkable area. South of Hoang Tan, north of Cat Ba, around Tuan Chau Island and on many small terraces at the island margins, one can see where the mangrove forests were eroded away.

The powerful actions of the tidal currents scoured the beds of the old rivers to maintain deep channels across the bay. Chemical erosion of the limestone by the sea water was more forcful than in earlier stages, creating notches at heights of 2.0-3.5 m in the sides of the cliffs and leaving rock roofs overhanging the sea; this enhanced the spectaccular appearence of the flooded karstic relief. The limestone dissolution also formed caves that pass right through some islands. The marine corrosion of the limstone needs a large content of carbon diopxide dissolved in the seawater; this was derived from a large volume of floating plants which respire and release CO_2 in the evenings.

Within the last thousand years was the beginning of Ly royal dynasty in Vietnam. This was the time of construction of the dike systems to prevent flooding from the Song Hong plain, in response to rising sea-level. The Ly and then the Tran dynasties were prosperous times. Van Don in Ngoc Vung Island and Quan Lan were ports with many foreign traders' ships coming to exchange goods and products. It is difficult to imagine in today's conditions that there was a prosperous Van Don trading port comparable to Pho Hien; Hoi An was the previous one. Meanwhile Ha Long Bay - Bai Tu Long was a zone with many inhabitants and a properous economy developing on the mainland, which was enlarged by retreat of the sea. Then, the sea trangressd, flooding and eroding the coastline; many sites in Quang Ninh have the name "Cai" which notes places with large and deep tidal inlets, including Cai Vieng, Cai Lim and Cai Lan.

The relation between rising eustatic sea levels and modern tectonic movements in the formation of Ha Long Bay

We may conclude that Ha Long Bay was formed in the Holocene largely by marine trangressions that were eustatic; these were worldwide

phenomena due to climate changes. These sea level rises were greater than the regional uplift due to modern tectonics, and were also much greater than rates of modern alluviation that could raise the coastal zones.

Data has been gathered all around the world to show that eustatic sea levels have risen steadily during the late Pleistocene and throughout the Holocene; this was a consequence of the melting and retreat of the great continental ice sheets of the last Ice Age. About 20,000 years age, world sea levels were about 120 m below their present level. When the glaciers melted the sea level rise was rapid until it was close to the modern level about 8000 years ago. Since then, there have been many minor fluctuations which are not easily correlated between different coastal regions because local tectonic movements created additional local variations.

Evidence surveyed by scientists at the Hai Phong Institute of Oceanology confirm the recent pattern of oscillating sea levels within Ha Long Bay and neighbouring zones. Old marine terraces, estuary features and sea level notches in cliffs are at heights of 4.0-6.0 m and 3.0-3.5 m are due to tectonic uplift movements, and are not due to eustatic sea levels being higher. About 5600 years ago, a marine trangression caused expansion of Ha Long Bay, but the sea level was actually 5-7 m lower than at present.

The Holocene tectonics of Ha Long Bay and its adjacent areas were influenced by the narrow belt of the inherited Tertiary Ha Long downwarping. Ha Long can be divided into three tectonic belts:

1. An uplift zone in the Holocene was also rising in the Pleistocene and has caves at levels of 10-15 m, 20-30 m and 40-60 m in the linstone. Marine notches and terraces occur at 4-6 m and 3.0-3.5 m high. Before the middle Holocene, the eustatic trangression rose quickly, causing the margin of the belt to spread out. Eustatic sea level rose by 1.25 mm/year and tectonic uplift was at 2.14 mm/year, since the middle of the Holocene 5600 years ago. The relative land level rise was therefore 0.89 mm/year, so that the coast and shore zone has risen compared with the sea level to an average of 5 m.

2. A zone of stability and very weaken Holocene uplift included most of the coastal area and the shallow bay 2-5 m deep. In this zone, about 3000-4000 and 1000-2000 years ago eustatic sea levels rose at the same

rate as the tectonic uplift; then about 1000 years ago, the sea trangressed because the eustatic rise was faster than the tectonic movement. The raised sea level continued to erode the old terraces.

3. The Holocene zone of subsidence was a narrow one with arcuate shape at the outside of Ha Long Bay. Sea caves and marine notches are common, and the sea has influenced the area continuously since the middle Holocene.

Chapter 4

Ha Long Bay in the future

Human changes to the geological environment

In the final stage of Ha Long Bay's evolution, man's acitivities and economics have taken part in the geological processes, and have had major influences on the geographical environment. Each year from 1993 to 1995, 28 million tons of waste have empting into the Bay due to the process of exploiting the coal resources of the adjacent mainland; this has narrowed the tidal area along the shore of the bay. The area of waste ground along the shore of Ha Long Bay was only 29,920 m^2 in 1969, but in 1993 it was up to 120,000 m^2. In the process of exploiting and transporting coal, dispersed mud and coal has accumulated on the floor of the bay, creating a polluted environment and changing the composition of the seabed sediments. The content of coal material in the bed sediment is locally 0.6-2.0% within the Bay, and is up to 3% ouside Cua Luc. Where coal material is on the seabed, the environment is not pure and corals do not grow. The cutting of the forest as a fuel source for making bricks, as well as to exploit the coal, has caused dirty water to enter Ha Long Bay. The volume of solid wastes entering Ha Long Bay is 18,000 m^3/year. Domestic wastewater from the towns is 66,000 m^3/day, mining wastewater is 7 million tons/year, and there are other wastes, especially oil, from the ports. Other negative activities include cutting trees from mangrove forests and quarrying rock for construction materials in the hills north and west of the bay. Coral was also collected to make art products and souvenirs, and this had a bad effect on the natural balance and ecosystem of the Bay. In only a short time, man's activities have changed completely the land and seabed surfaces which nature had created through millions of years.

A plan for the future

Ha Long Bay's future depends on both the processes of natural evolution and man's behaviour. The natural worldwide rising sea level, because of Earth's warmer climate, is an important factor in the development of Ha Long Bay. Current predictions are that, due to the greenhouse effect, world sea level may rise over 0.1-0.5 m within the next 25 years, 0.2-1.4 m within the next 50 years, and 0.5-3.5 m within the next 100 years. World sea level has risen 1.0-1.5 mm/year in the last century; at Hon Dau (Do Son), the sea level had been rising 2.24 mm/year for 32 years over 1957-1989. In addition,

negative changes often occur in coastal zones, including erosion and sedimentation. In the Ha Long Bay processes include erosion of banks where the seashore is lost and continuing reduction of the mangrove forests. If the sea level rises as quickly as the prediction, marine notches in the limestone cliffs of the islands will be flooded and lost from sight, so that the value of the lanscapes within Ha Long Bay will be reduced by making the profiles of the islands more monotonous. The range of trees along the edges of the islands will be blighted by direct salt intrusion or by waves throwing up seawater spray. Limiting the greenhouse effect and the changes in world climate due to cutting forests, by eliminating industrial gases, especially CO_2 from fossil fuels such as coal and oil, is mankinds' general responsiblity. If cutting of forests in the upper catchments and in the mangrove swamps is not reduced, and if the exploitation of the coal and clay resources is not limited and planned reasonably, Ha Long Bay in the future will suffer. Its bed will accumulate mud and coal dust, its water will be polluted, and the sea creatures will die. If Ha Long Bay is protected better, its natural landscapes and water quality can be maintained; because this is a bay, there are less waves, currents and winds to circulate clean water.

Reponsibility for history

The geographical environment is the foundation of nature and the ecosystem. Diversity of landscapes is a basic factor in high biodiversity. The modern geographical environment of Ha Long Bay is a result of natural evolution over hundreds of millions of years. Ha Long Bay is a karstic limestone landscape that has been flooded by the sea. That is very simple, but to form Ha Long Bay an ancient sea accumulated limestone layers over a thousand metres thick 340-240 million years ago, karstic erosion lasted 26 million years in the continental environment of the Neogene and Anthropogene eras, and a worldwide marine trangression was due to Earth's warmer climate and the thawing of the icecaps over 10,000 year ago. This does not include many other interactive factors combining process of climatic, tectonic and organic changes.

Ha Long Bay is very beautiful and mysterious, with unparalleled scenic and geological values created from hundreds of millions of years of evolution - which can be destroyed in just a few generations. To build a Pyramid, man only needed half a century. To build the Great Wall of China, man need half a thousand years. But to form Ha Long Bay, Nature needed half a billion

years. Man could restore a capital city or an ancient town, but could not restore a natural landscape that has been ravaged. Therefore we must be responsible for the protection of our natural heritage in Ha Long Bay for future generations.

Table 1: **INTERNATIONAL GEOGRAPHICAL AGE SCALE**

ERA	PERIOD	EPOCH	LANDMARK TIME (million years)	LASTING SPACE (Million years)
Cenozoic KZ	Antropogene (Quaternary) - Q -	Holocene		2
		Pleixtocene	2	
	Neogene - N	Pliocene		24
		Miocene	26	
	Paleogene - P -	Oligocene		
		Eocene	67	41
		Paleocene		
Mezozoic MZ	Cretaceous - K -	Late		70
		Early	137	
	Jurassic - J	Late		58
		Middle		
		Early	195	
Paleozoi PZ	Triasssic - T	Late		45
		Middle		
		Early	240	
	Permian - P	Late		45
		Early	285	
	Carboniferous - C	Late		55
		Middle		
		Early	340	
	Devonian - D	Late		70
		Middle		
		Early	410	
	Silurian - S	Late		30
		Early	440	
	Ocdovician - O	Late		60
		Middle		
		Early	500	

		Cambrian	Late Middle Early	570	70
	Proterozoi PR			2600	≈2000
	Archean AR				

Table 2: **THE AGE SCALE OF ANTROPOGEN ERA (QUATERNARY)**

Epoch	**Glaciation and inter - glation**	**Human beings**	**Cultures**
Holocene (Modern) (Q_{IV}) (0 - 11 thousand years)		Homo sapiens	The Iron Age The Bronze Age The New Stone Age.
Late Q_{III} (300 - 11 thousand years)	Glaciation Vurma Interglation Ris - Vurma	Neandectan People	The Middle Stone Age The Old Stone Rear-Age
MIDDLE Q_{III} (700 - 300 Thousand years)	Glaciation Ris Interglaciation Minden - Ris	Atlantrop people Sinantrop people	The Middle Stone Age
	Glaciation Minden - Ris	Pitecantrop people	

EARLY **Q_I** (2,000 - 700 thousand years)	Interglaciation Gun - Minden Glaciation Gun Glaciation Donau	Ape - men Australopitec	The Early Stone Age

Table 3: **THE GEOLOGICAL HISTORY OF HA LONG BAY**

Era	Period		Events
Cenozoic	Anthropogene	Holocene	Marine trangression, after world's de-glaciation, overran the coastal areas to form the modern Ha Long Bay. Mainly a land environment, with development of karst landscapes and river systems. Systems of caves formed at heights of 10-15 m, 20-30 m and 40-60 m. A marine trangression formed the ancient Ha Long Bay, after sea-level was 100-120 m lower than now and well outside the modern coast during the cold stages of the "Ice Ages".
		Pleistocene	
	Neogene		Tectonic downwarpings of Cua Luc Bay and Ha Long Bay. Anpi Orogeny earth movements on Dong Trieu Arc. The East Ocean formed. River erosion and alluvial deposition formed a large peneplain.
	Paleogene		
Mesozoic	Cretaceous		Continental environment with orogenic movements of the land. Erosion processes are strong.
	Jurassic		
	Triassic		A land environment, where tectonic downwarping created a coal swamp basin, then the strong movements of the Indosinian orogeny.
Paleozoic	Permian		Downwarping disturbed the coastline, then becoming a land environment. À shallow warm sea enlarged from the west, rich in sea creatures, including coral, foraminifera, brachiopods and crinoids. Limestone was formed over a thousand metres thick.
	Carboniferous		
	Devonian		Ha Long Bay is a land area. Nearby the Quan Lan archipelago, Trang Kenh, Do Son and Cat Ba were downwarpings invaded by the sea.
	Silurian		Open sea with deep water in the Katazia geosyncline. The sea exrended to the west, but the East Ocean was a landmass.
	Ordovician		
	Cambrian		Land
Proterozoic and Archean			not known

Table 4: **THE DEVELOPMENT OF HA LONG BAY IN THE HOLOCENE**

Epoch	Stage	Years before present		Ha Long Bay	Cua Luc Bay	Bach Dang River	Archeological and historical events
Holocene	Late	6	1000	The Bay enlarged; its water was mixed salt and fresh; marine notches developed; coral grew; coast erosion.	The Bay became a estuary; mangrove swamps are reduced by erosion.	A estuary. A estuary.	The third anti-Yuan resistance. The first Bach Dang naval battle.
		5	2000	The Bay is narrow and accumulates a mud floor; mangrove swamps form at the shores.	A estuary with mangrove forests.	The coastal downwarpings cause mangroves.	
	Middle	4	3000	The Bay enlarged, developing notches at 3.0 -3.5 m.	A marine bay.	A marine bay - coastal downwarpings.	Dong Son Culture. Vestiges of Phuong Nam (Uong Bi), Viet Khe (Thuy Nguyen)>
		3	4000	Sea retreats, land expands, mangrove swamps form.	Freshwater lake.	Continental swamps along the coast.	Vestiges of Trang Kenh (Phung Nguyen Culture) Ha Long Culture.
		2	7000	Marine trangression; the Bay was at its largest area; coral developed.	A marine bay was at its largest area.	A marine bay, coastal downwarping	Pre-Ha Long Culture
	Early	1	11,000	Marine trangression as sea level rises from 120 m deep outside the mouth of the Bay. Dominantly continent.	Continental lake.	Continental deltas, lakes and bogs.	Hoa Binh and Bac Son Cultures.
Pleistocene	Late						

Limestone karst

of

Ha Long Bay

Vietnam

An assessment of the karst geomorphology of the World Heritage Site

for

The World Conservation Union
and
The Management Department of Ha Long Bay

by

Tony Waltham

Engineering Geology Report # 806
Nottingham Trent University, UK

October 1998

Summary

Limestone karst of Ha Long Bay

- Ha Long Bay is a magnificent limestone landscape of fengcong and fenglin karst that has been invaded by the sea.
- The scientific value of the Ha Long Bay World Heritage Site should be recognised; the site is internationally important for its limestone karst geomorphology.
- The numerous islands within Ha Long Bay contain landforms, caves and cave deposits that provide evidence of a long history of erosion and landscape evolution.
- Continued coal mining and the current expansion of the port structures adjacent to and within Ha Long Bay present no significant threat to the values of the site geomorphology, as long as they are managed sensitively.
- There is a continuing need for careful control of development within Ha Long Bay by a managenment structure which gives due respect to the important environmental values of the site.
- The scientific data base on Ha Long Bay is currently small, and the site warrants a programme of research and documentation.

Contents

Limestone karst of Ha Long Bay

Ha Long Bay is distingushed by the hundreds of small limestone islands which rise steeply or vertically from its shallow waters. Its dramatic and beautiful landscape is deservedly famous as one of the world's outstanding natural sights, but it is also a geomorphological feature of international significance.

The bay lies on the northeastern coast of Vietnam, immediately east of the Red River delta (Figure 1). It is bounded on the north by the mainland hills either side of Halong City (also known as Hong Gai), to the south by the open waters of the Gulf of Tonkin, and to the west by Cat Ba Island; its eastern boundary is loosely defined where a scatter of small limestone islands continues in an arm of the bay between the mainland and the complex of larger sandstone islands around and including Tra Ban Island. Within these boundaries, Ha Long Bay has an area of about 1500 km^2, and contains nearly 2000 limestone islands. An eastern section of more open water between the limestone islands is also known as Bai Tu Long Bay (Figure 2).

The World Heritage Site

In 1962, the natural scenic beauty of Ha Long Bay was officially recognised as important to the nation of Vietnam. In December 1994, Ha Long was added to the UNESCO list of World Heritage Sites in recognition of the exceptional values of its landscape. The World Heritage Site covers 434 km^2 in the heart of the bay (Figure 2), and encloses 775 islands; it thereby includes nearly all the small limestone islands of the highest landscape value and scientific importance.

The following report is based on eight days of field observations in September 1998 together with data extracted from the limited amount of published and unpublished material available on the geology and geomorphology of the bay. Included comments on the geomorphological history should be regarded as preliminary deductions; these will be subject to debate and modification when further field data have been gathered.

Locality names are translated into English, except for the cave names which are left in Vietnamese. The key terms are:

dao = large island,
hon = small island, or rocky tower (nearly all the bay islands),
hang = cave that is a tunnel or long passage,
dong = cave that is essentially a single or multiple chamber.

All islands and caves referred to in this text are located on the Figures 2 and 11.

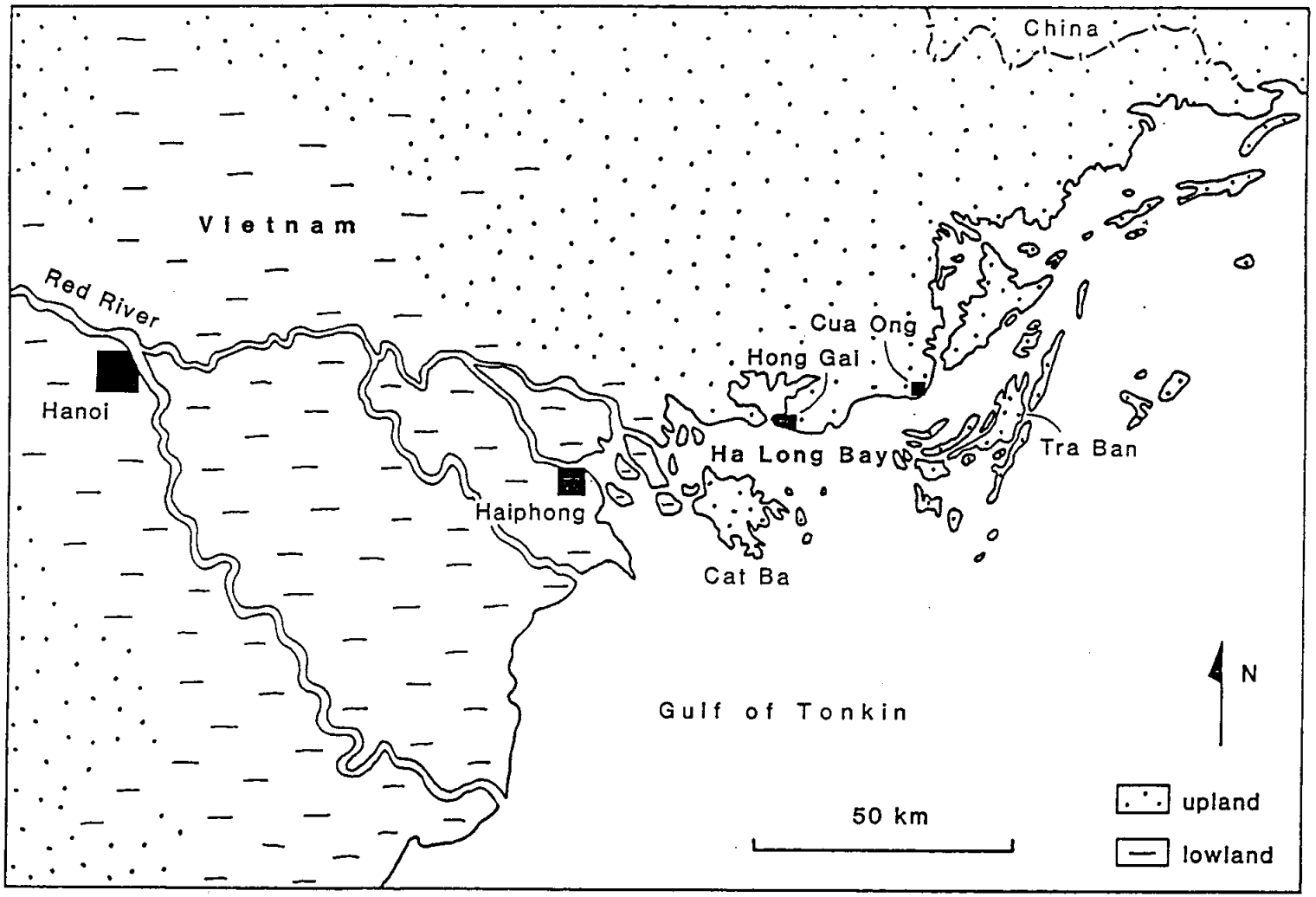


Figure 1. Outline map of northern Vietnam showing the relationship of Ha Long Bay to the Red River delta area.

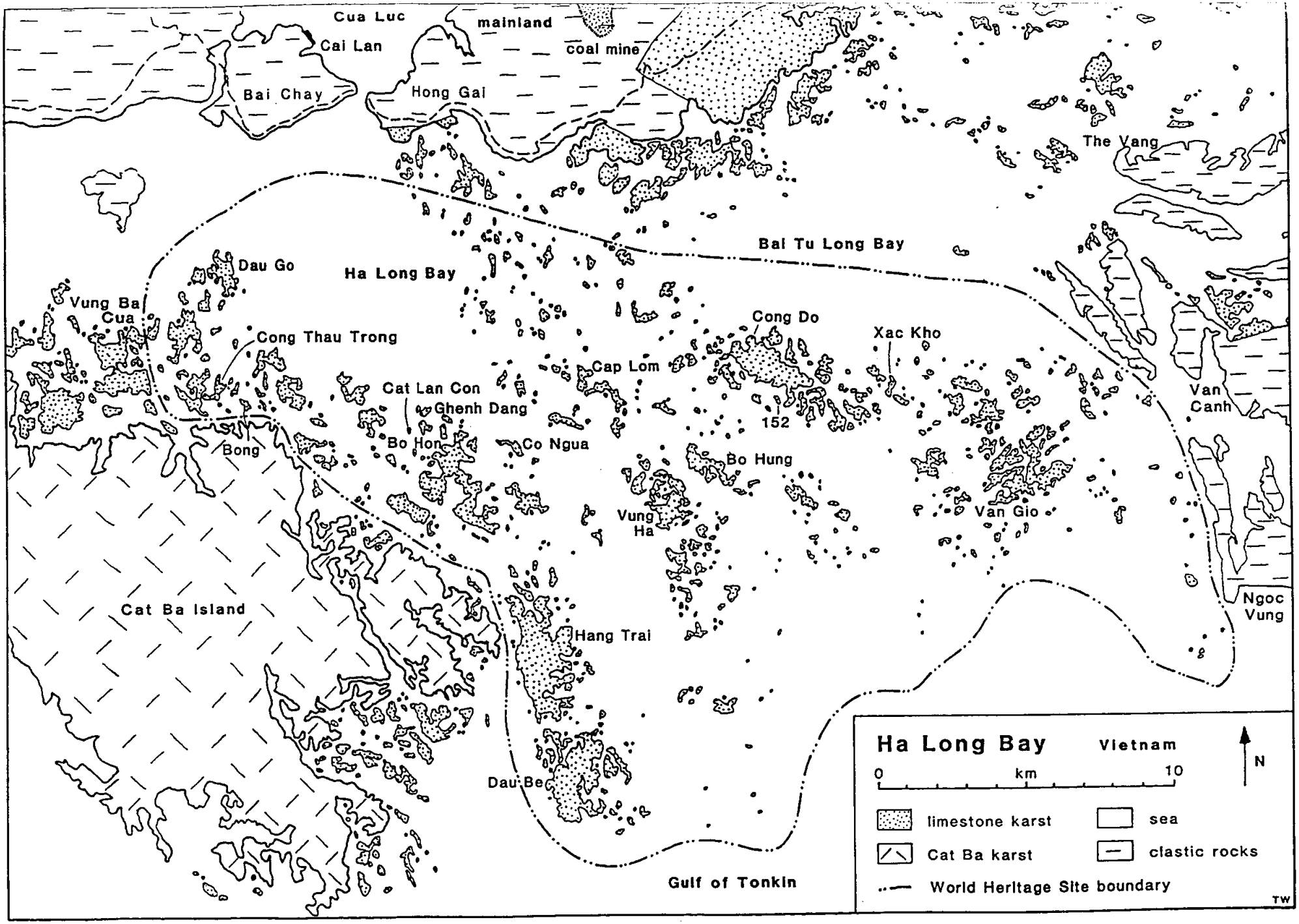


Figure 2. The World Heritage Site of Ha Long Bay; location of named sites (except caves which are on Figure 11).

Geomorphology of the limestone karst

A karst landscape is defined as one that has distinctive landforms because it is developed on a rock which has efficient underground drainage. Karst is therefore developed most widely on cavernous limestone. The resultant landscapes tend to have high and spectacular relief, and the specific landforms are largely related to climate and climatic history, where the most mature are developed within the tropical regions.

Karst geomorphology in the Vietnam environment

The evolution of a limestone terraine into a mature karst landscape is a long and complex process involving limestone dissolution (both at the soil-rock interface and also underground) and mechanical undercutting (both on steep slopes and within caves). The complete cycle can only evolve in a thick limestone sequence in a warm and wet climatic environment, where the dramatic landforms of cone and tower karst may then develop. These conditions do exist in Vietnam, and Ha Long Bay is the finest of many excellent examples of mature karst within the nation.

The sequence of stages in the evolution of a karst landscape are outlined in Figure 3. This is a very simplified version of a complex chain of processes, but it demonstrates the broad relationships between the different types of landscape seen in Ha Long Bay and other karst regions. The full evolutionary sequence can only develop in a region which has:

1 very thick limestone,
2 warm and wet climates,
and 3 slow overall tectonic uplift.

These conditions are best developed in the tropical zones of Southeast Asia, which therefore has the world's most important and most extensive regions of mature karst.

In other conditions, karst landscapes do not develop to full maturity. If the limestone is not very thick, the entire sequence is eroded away to expose underlying non-carbonates before the karst has matured. Overall surface lowering continues throughout the evolution, so that a limestone thickness of about 1000 m is generally required to allow maturity to the tower karst of stage 7 (which is the type present in Ha Long Bay). In colder and/or drier climates, frost shattering, reduced dissolution and Pleistocene glacial interruptions lead to the development of alpine karst, where doline fields are the common link to the stages in tropical karst (Figure 3); periglacial conditions favour the development of fluvial karst with dry valleys and dolines. Impure limestones and very thick derived soils both lead to slope degradation so that more rounded forms of cone karst develop.

Slow tectonic uplift is essential to the evolution from stage 6 to 7. The uplift rate has to be matched by the rate of dissolutional lowering of the limestone plains; then the plain is slowly lowered. This progresses faster than subaerial denudation of the limestone towers, which therefore slowly rise with the tectonic uplift. If uplift is too fast, the landscape is rejuvenated and returns to a fencong karst of stages 3 or 4. If upift is too slow, lateral planation erodes the towers so that they degrade and diminish as they advance to stages 8 and

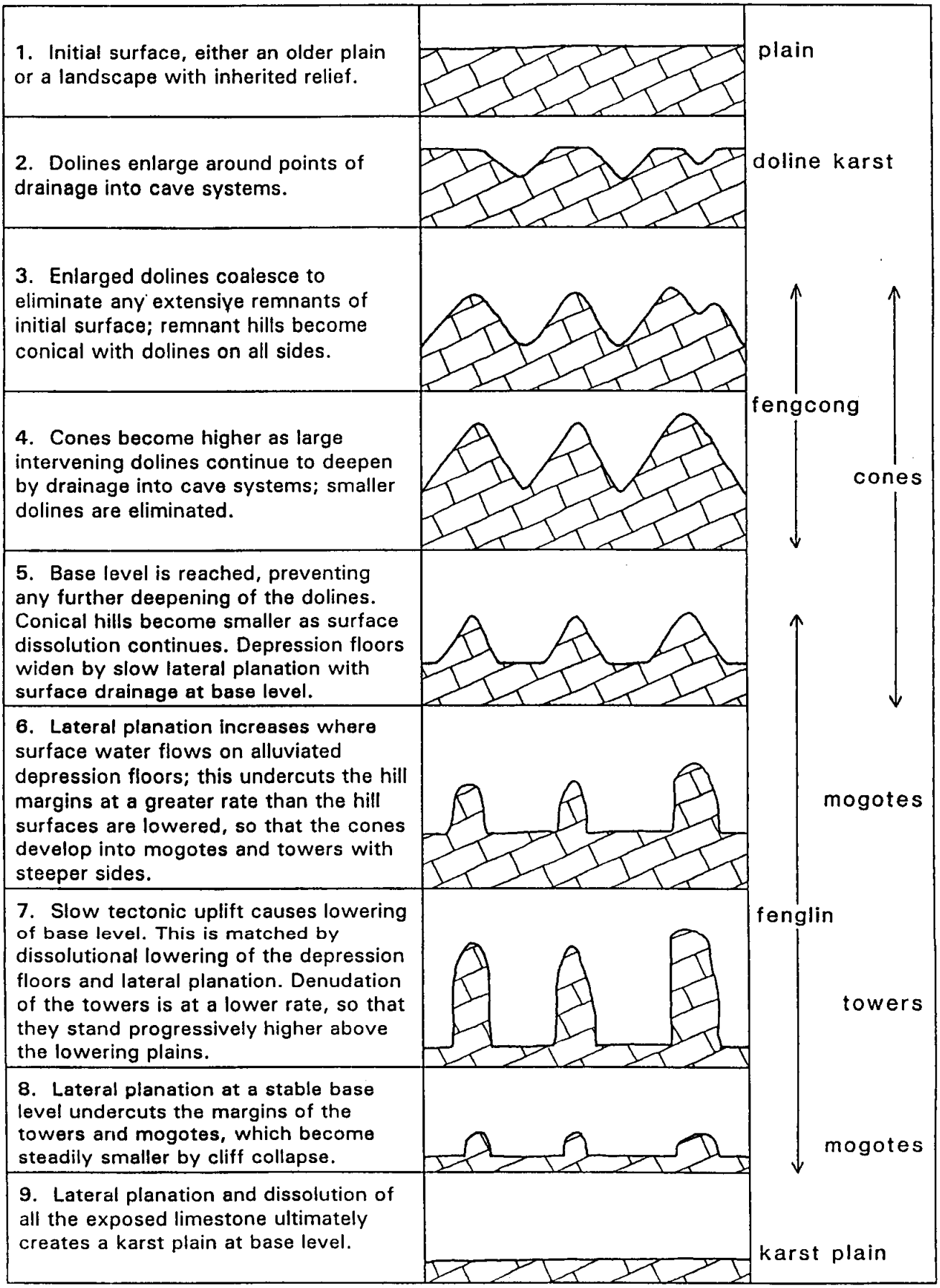


Figure 3. Schematic outline of the evolution of a limestone landscape into a mature fenglin karst.

then 9. Lateral planation and plain lowering is normally most effective beneath an alluvial cover; this has to be continually replenished by clastic sediment carried in and through by drainage from adjacent hills of non-carbonate rocks. The extreme forms of tower karst can only develop where all these conditions are met. Irregular uplift rates cause cyclic development, and create fencong karsts with peaks rising to different levels.

Mature karst landscapes are defined and described by a combination of two terminologies. Western geologists describe the shapes of the limestone hills. Cones have slopes between 30° and 60°, while mogotes and towers have steeper slopes; mogotes have heights roughly equal to their widths, and towers are higher (Figure 3). Dolines are closed depressions which drain into caves. Chinese geologists describe the grouping of hills with respect to intervening flatlands. Fengcong means peak cluster, where the hills are adjacent to each other and are generally conical. Fenglin means peak forest, where hills are isolated and generally have their sides undercut by lateral planation so that they are steepened into towers. Relationships between Western and Chinese terminologies are shown in Figure 3.

Karst landforms of Ha Long Bay

The strong pure limestones of Ha Long Bay have been eroded into a mature landscape of fengcong and fenglin karst. This evolved by normal subaerial erosion of the limestone, but was then invaded and slightly modified by the sea at a late stage.

The bay area contains landscape elements of fengcong, fenglin and karst plain. These are not separate evolutionary stages but are the products of natural non-uniform processes denuding a large mass of limestone.

The hundreds of rocky islands which form the most beautiful and famous landscapes in the bay are individual towers in a classic fenglin landscape where the intervening plains have been submerged by the sea (Figures 6 and 7). Most towers reach heights of 50 to 100 m, with height/width ratios up to about 6. Many towers have vertical walls on all or most sides; these continue to evolve by rockfalls and large slab failures. A large slab peeled off Bong Island in 1997 to create a new vertical face; the main failure surface was on vertical fractures, part of which had been opened to form a cave subsequently partly refilled with large stalactites, and the fallen block of around 500 m^3 now lies in the sea where it is being eroded by dissolution and wave action. Many of the towers have very old cave remnants preserved within them, and many have foot caves that are relicts of their undercutting at various levels.

Clusters of limestone hills form the larger islands within Ha Long Bay, and represent fine examples of fengcong karst (Figure 8). Summits are generally at around 100 m above sea level, and the highest peaks reach heights of over 200 m. Their profiles are mostly very steep cones; except around their marine margins, vertical cliffs are only minor components, as they have not been subject to lateral undercutting where their internal dolines do not reach down to base level. These conical hills also contain remnants of old cave passages (Figure 4). Some of the fengcong hills have individual slopes or sides which are formed on steep bedding planes within the limestone; beyond these sites the geological structure has very little

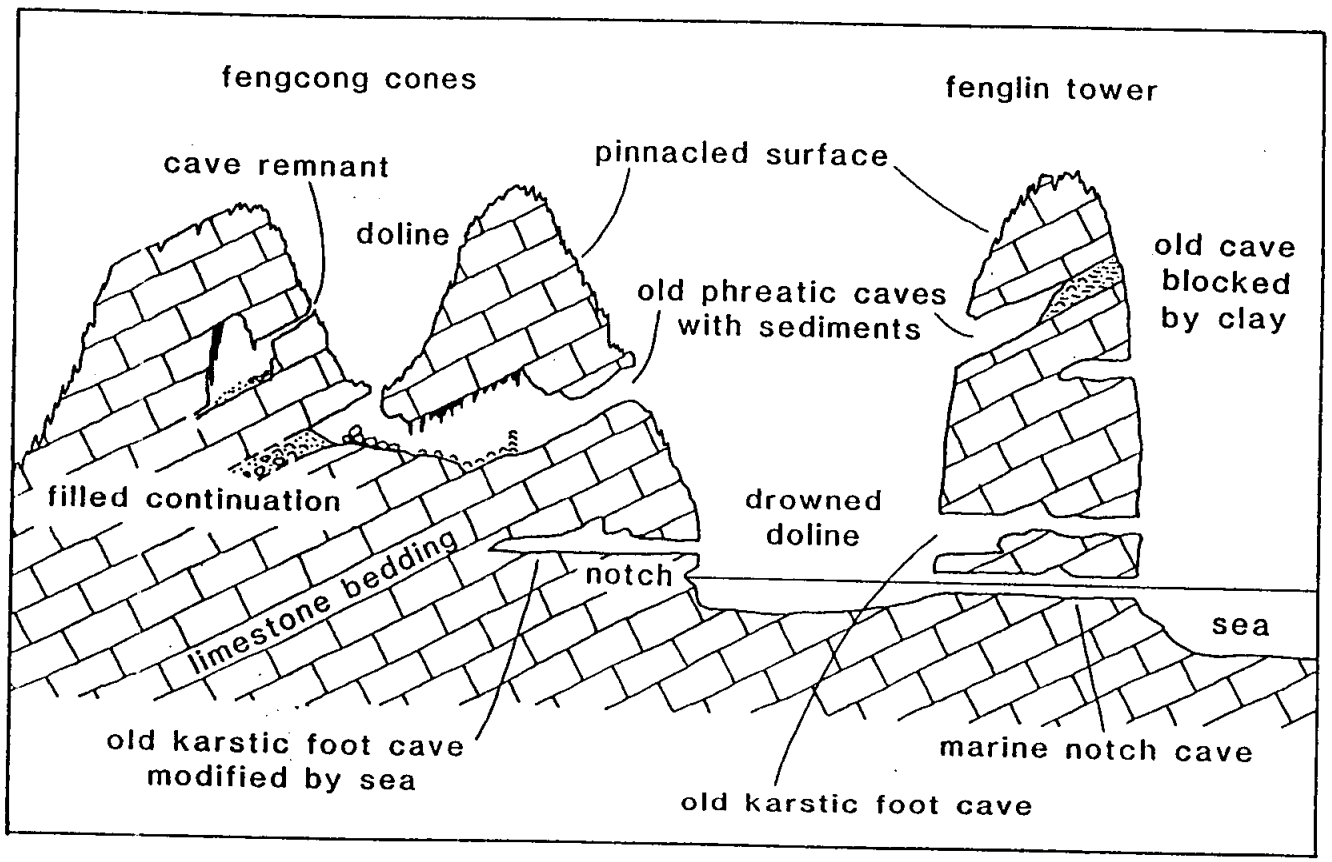


Figure 4. The main types of landforms and caves in the Ha Long Bay karst.

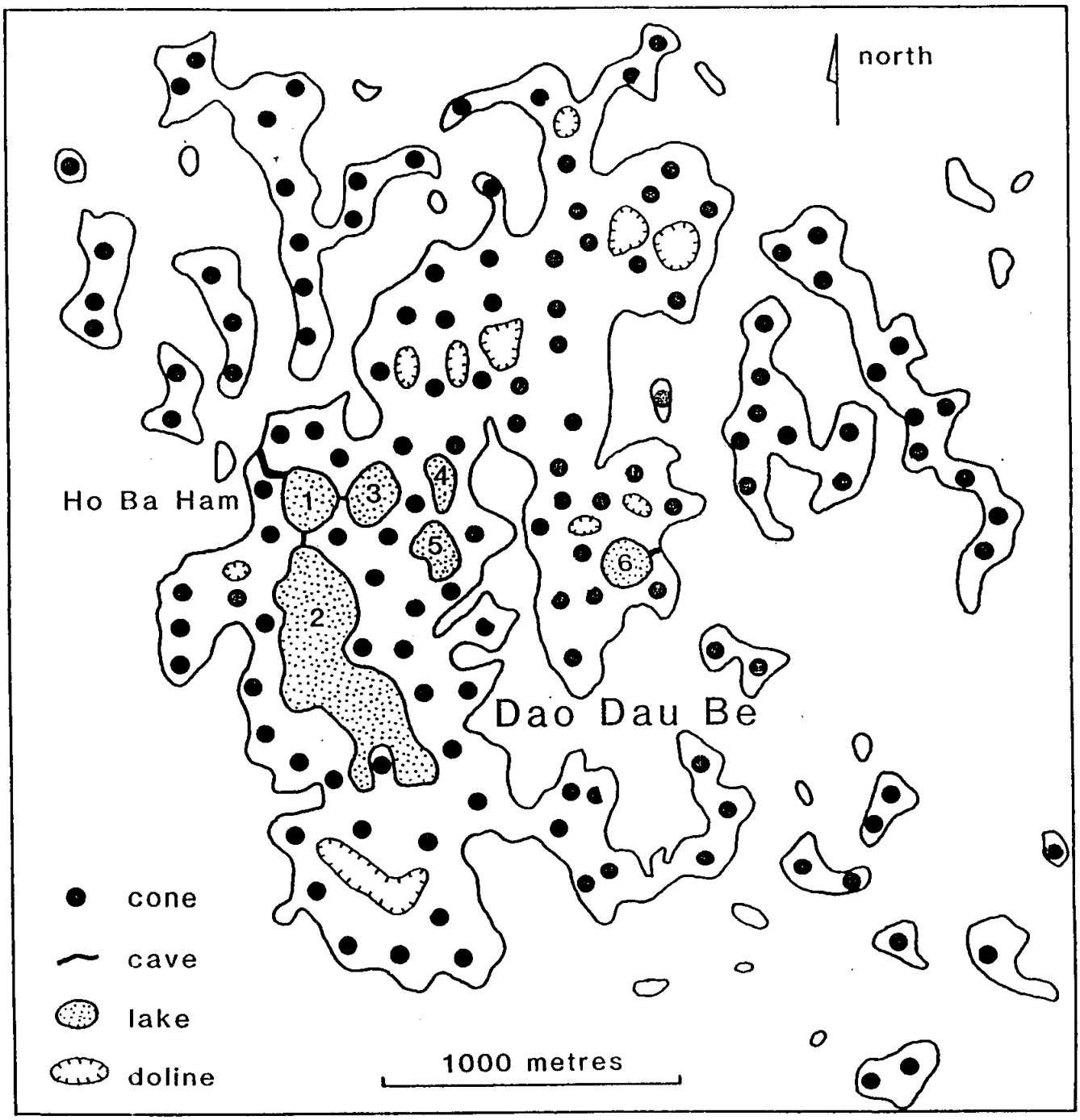


Figure 5. The conical hills of the fengcong karst which forms Dau Be Island, with the flooded dolines that are now tidal lakes connected by sea-level caves.

influence on the limestone hill profiles. Linear valleys which may be aligned on faults are also conspicuous by their absence.

A distinctive feature of Ha Long Bay is the abundance of lakes which lie inside the limestone islands. Dau Be Island, at the mouth of the bay, has six enclosed lakes, including those of Ho Ba Ham (Figure 5). All these island lakes occupy drowned dolines within the fencong karst (Figure 9). Their depth profiles have not yet been surveyed; most appear to be deep, but some have shallow areas over planation surfaces just below their water level. All those observed are tidal. Sea water moves freely through the limestone, at some sites through sea-level caves which are traversable by boat (see below), but at other sites through inaccessible fissure networks. One freshwater lake has been reported, on the eastern part of Cong Do Island; it probably survives on a doline floor of clastic sediment, but details of its geomorphology are unknown.

Many of the areas of shallow sea between the limestone islands appear to be karst plains which have been submerged by the sea; most of the bay is less than 10 m deep. Clastic sediments cover much of the sea floor; most are probably of marine origin, though remnants of subaerial sediments from original karst plains may survive in the buried sequences. The bedrock geology of the bay floor has not been investigated, and there is doubt about the nature of the two largest areas of island-free bay waters, in the centres of both Ha Long and Bai Tu Long Bays. These could be mature tower-free karst plains, or they could be lowlands with cores of clastic rocks in fault blocks; the multiple fault boundaries of the coal measure rocks on the adjacent mainland suggests that this is possible.

The juxtaposition of fengcong, fenglin and plain elements in the karst landscape is normal. Marginal karst plains are created where drainage from adjacent non-carbonate hills provides the most corrosive water; this increases dissolution of the limestone and also accelerates lateral planation around the active alluvial zone. The drowned plains across the inner parts of the bay are sited where drainage from the Red River and the mainland flowed onto the limestone. The patches of fengcong karst which now form the larger islands probably originated as areas of slightly higher ground or fewer dolines in the initial surface from which the modern karst evolved.

All the limestone surfaces on the Ha Long Bay islands are fretted by dissolution. The outcrops therefore evolve into complex and irregular shapes (Figure 10), distinguished by very sharp edges on the pinnacles, ridges and blades of remnant rock. These microlandforms on the metre scale all have surfaces of sharp karren ridges, runnels and pits on the centimetre scale. This creates an inhospitable terrain which is very difficult to cross. Jagged open fissures continue to depth and carry the rainwater into the cave systems beneath. There is no continuous soil cover. Largely organic soil accumulates in some limestone fissures, where it provides a rooting medium for the ubiquitous scrub vegetation; conspicuous larger plants include *Pandannus* and *Dracaena* (Dragon's skeleton). Rounded sub-soil karren forms have not been observed. Many walls and slopes in the more massive limestone beds are scored by rillenkarren that may be many metres long. All limestone surfaces are black due to their invasion by blue-green algae; these live in the surface crust of the limestone and aid its pitting by biogenic dissolution.

Marine erosion of the limestone

Marine invasion of the Ha Long Bay karst has added an extra element of lateral undercutting of the limestone islands. The most conspicuous feature is the main marine notch cut into all the rocky coastline (Figure 9). Its deepest zone is generally nearly 3 m high, occupying the levels between normal high and low tides. It is a complex feature, commonly with a shoulder at its mid-height and a lesser undercut extending another metre higher; the latter may represent erosion by high wave action and at spring high tides. Further notches at higher levels were cut at times of higher sea level and are no longer active. Features below low tide level have not been observed, but there is no evidence of any wide wave-cut platforms.

Across the bay, there is no variation in the size of the notches which relates to exposure to the larger waves that derive from the open sea. This indicates that the notches have been cut largely by dissolution of the limestone. Sea water is normally saturated with respect to calcium carbonate, and limestone dissolution is therefore dependant on aggressive micro-environments created by algae in the surface layers of the limestone. The dark crusts with blue-green algae, that are ubiquitous on the subaerial limestone outcrops, do extend down the cliffs into the tidal range; marine algal forms are probably equally widespread, but have not yet been documented. Limestone dissolution is also enhanced at sea level by the mixing of sea water and fresh water within the fissure systems of the islands. Notches are a feature of limestone coastal cliffs worldwide, but those of Ha Long Bay are exceptionally well developed, and at many sites extend back into arches and caves (see below).

Undercutting in the marine notches is presently the major process in the erosion and retreat of the limestone cliff faces. Marine erosion has not only added the notches to the profiles of the limestone islands, but it also maintains the steep faces of the fenglin karst towers, and thereby perpetuates the spectacular nature of the karst landscape.

Many of the bay islands have narrow peninsulas formed by high limestone ridges that are bounded by cliffs; these separate and overlook bays which are much wider than the intervening land fragments, as at the northern ends of Dau Be Island (Figure 5). Ridges that link chains of peaks are created in fencong karst where there are favourable patterns of large dolines. Under normal weathering conditions, these degrade into lower cols, eventually to leave isolated karst peaks. The very narrow limestone aretes of Ha Long Bay are not typical of subaerial fengcong karst. They are a consequence of more rapid lateral expansion of the intervening depressions, and appear to be a feature of marine erosion. Their presence indicates a significant component of marine action in the evolution of the Ha Long Bay geomorphology.

A few natural beaches have stabilised in the lea of some of the small islands; these are composed entirely of calcite shell sand. In the western part of the bay, north of Cat Ba Island, some islands contain small bays that are filled with sands and muds deposited in the outer zone of the Red River delta; mangrove swamps have developed on sediment surfaces which lie in the upper half of the intertidal zone, and small quartz sand beaches have formed between these and the limestone cliffs.

Figure 6. A small limestone tower on the east side of Bo Hon Island is a fine example of a fenglin karst tower, subsequently undercut by marine erosion, which carved the prominent notch and helped cause the recent rockfall from the right hand side.

Figure 7. View from above Titop beach on Cat Lan Con Island, past smaller island towers to the conical hills of Bo Hon Island.

Figure 8. Conical hills of the fengong karst forming Island #396 and Bo Hon Island, seen from the mouth of Bo Nau Cave.

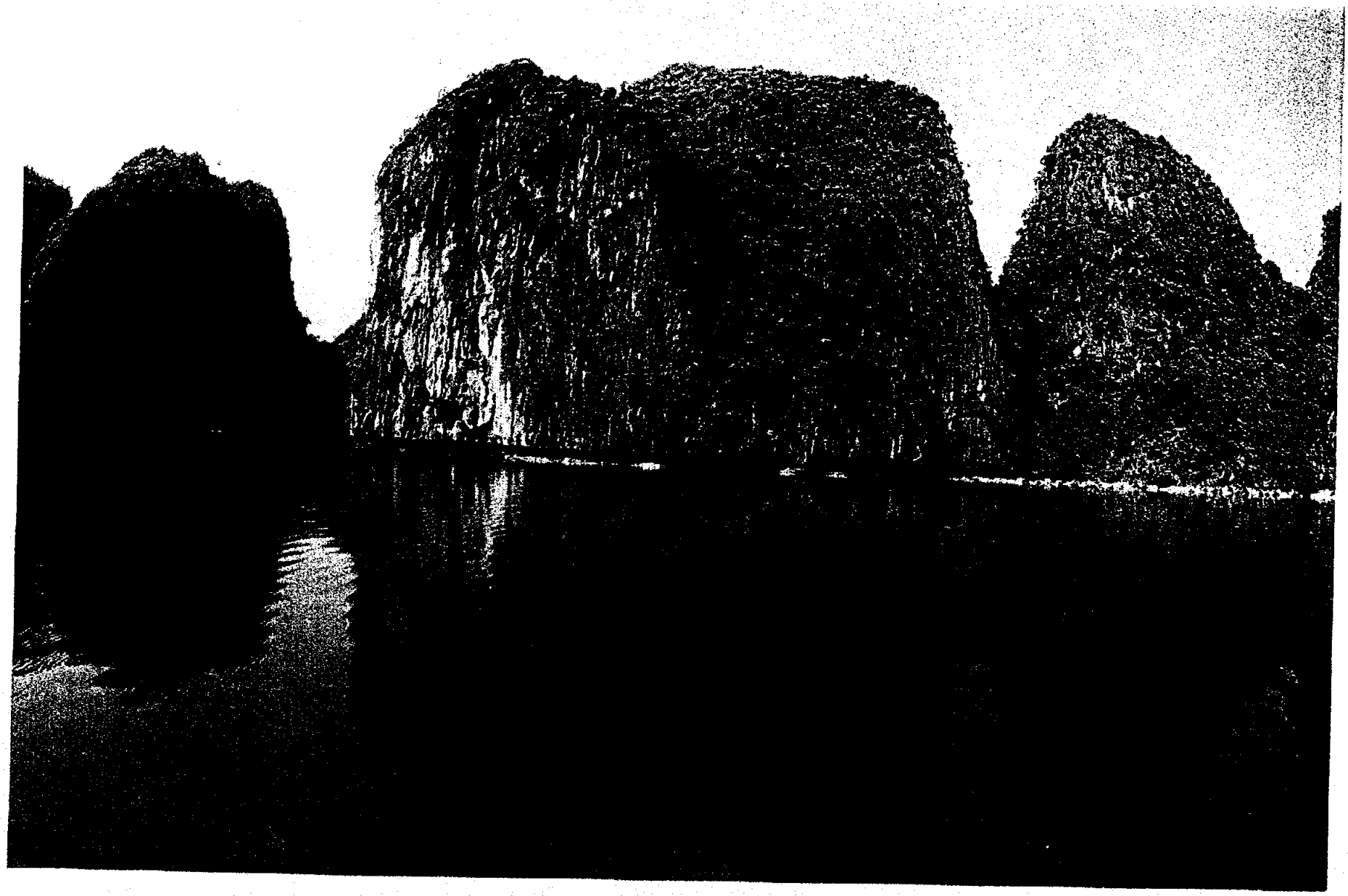


Figure 9. Limestone hills with cliffs undercut by a deep dissolution notch at sea level; these form the perimeter of the tidal lake in Bo Hon Island, which is reached only through the marine notch cave of Hang Luon, through the base of the hill on the left.

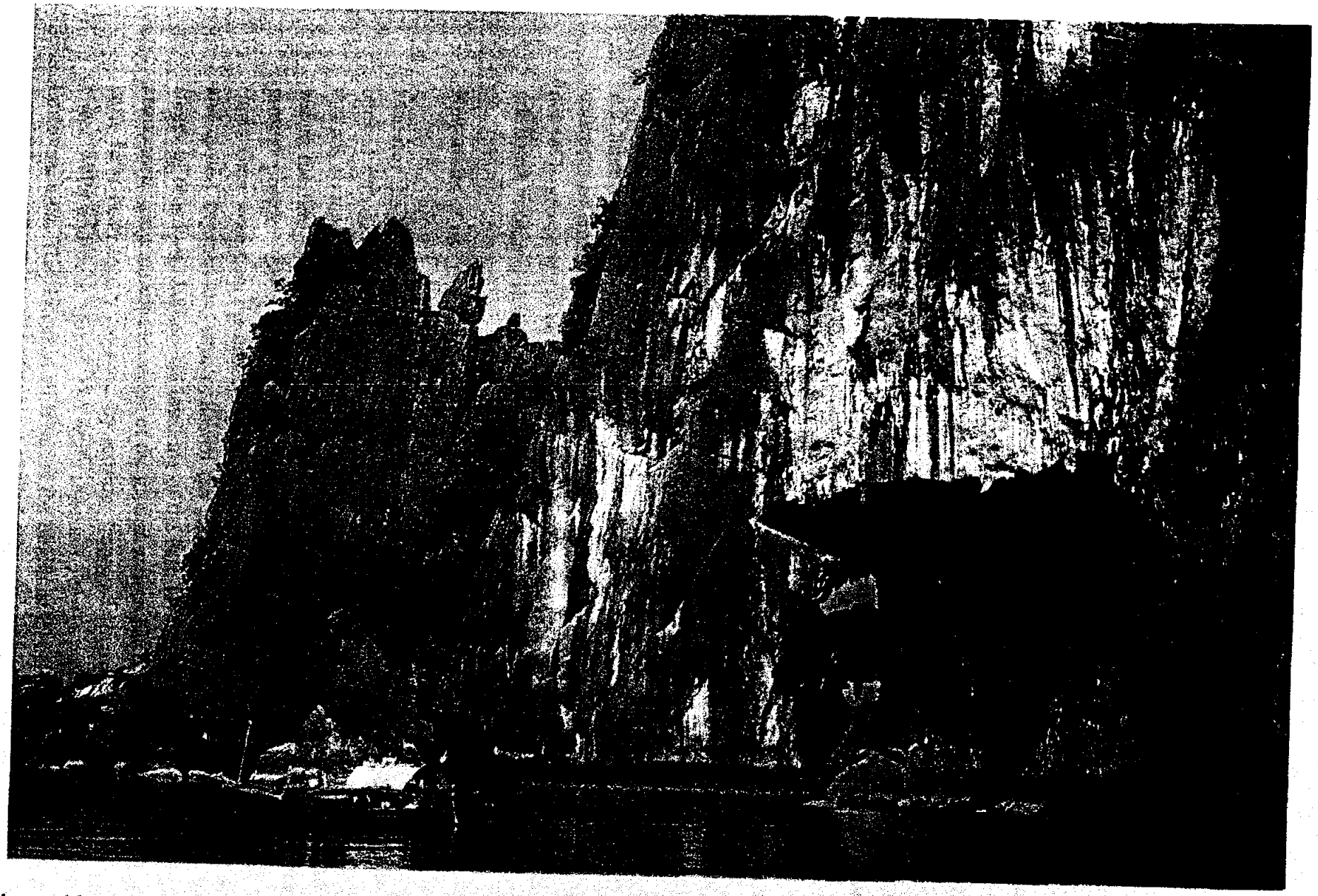


Figure 10. Nearly vertical cliffs on Ghenh Dang Island rise to a pinnacled crest; their limestone has long karren grooves etched into them by rainfall dissolution, and the island is breached by a fragment of old cave passage containing stalagmite false floors.

The limestone caves

The limestone islands of Ha Long Bay are entirely drained underground through infinitely complex systems of narrow fissures and through more open cave passages. There are no surface streams; all direct rainfall sinks rapidly into the open fissures. Enriched with biogenic carbon dioxide, this water continues to enlarge the fissures and so form new caves by dissolution of the limestone.

The lower part of the limestone is flooded by sea water which flows freely through the open fissure systems in the bases of all the islands. Secondary permeability of the karst limestone is so high that water tables in the islands are essentially horizontal, at sea level. The main groundwater movement is generated by tidal flow, which flushes salt water through the islands twice a day. This overshadows the small flows of rainfall input, and there is no evidence of lenses of fresh water existing in the limestone islands (the one reported fresh water lake must be perched on a geological structure as yet unknown). Caves are currently forming in the zone of active salt water flow, but dissolution rates and saturation indices have not yet been investigated.

Within Ha Long Bay, the main accessible caves are the older passages that survive from the times when the karst was evolving through its various stages of fengcong and fenglin. Three main types of caves can be recognised in the limestone islands:

1 remnants of old phreatic caves,
2 old karstic foot caves,
and 3 marine notch caves.

All three types are shown diagramatically in Figure 4; not shown in this figure are the networks of small fissure systems that are the main sites of present-day dissolution but are not yet large enough to be entered. The main caves recorded during preparation of this report are listed in their different groups in Table 1.

Remnants of old phreatic caves

Many of the bay islands contain fragments of large or small cave passages that are partly choked with debris, mud or stalagmite. These are clearly remnants of very old cave systems, that are no longer parts of the active karst drainage of the limestone. They were formed deep within the limestone long ago, when the ground surface was hundreds of metres above its present position. Most of these caves were phreatic, formed below the water table of the time. They were then the underground channels that carried drainage from the deep dolines and closed depressions, which allowed the karst landscape to mature through its various stages of fengcong. Subsequent lowering of the base level water table has left them dry and abandoned. Simultaneous lowering of the ground surface has cut into these old cave systems; parts have been totally removed by erosion, truncated fragments are now exposed in the tower walls and cone slopes, and other remnants remain preserved but hidden inside the limestone hills. They occur at all levels in the limestone islands, and are distinguished from the other cave types by their sloping passages and considerable vertical range. Active phreatic

1. Old phreatic caves	2. Karstic foot caves	3. Marine notch caves
Hang Sung Sot Dong Tam Cung Dong Lau Dai Dong Thien Cung Hang Dau Go Dong Huang Long Dong Thien Long	Hang Trinh Nu *in* Hon Xac Kho *in* Hon #152 *in* Hon Vung Ba Cua Hang Bo Nau Hang Tien Ong Hang Trong	Ho Ba Ham Hang Luon *in* Hon Vung Ha *in* Hon Bo Hung *in* Dao Cong Do
Tourist caves	**Archaeological caves**	**Bat caves**
Dong Thien Cung Hang Dau Go Hang Sung Sot Dong Tam Cung Hang Bo Nau	Dong Huang Long Hang Tien Ong *in* Hon Vung Ba Cua	Hang Sung Sot Hang Trinh Nu *in* Hon Vung Ba Cua Dong Huang Long Hang Bo Nau Hang Dau Go

Table 1. Known caves in Ha Long Bay, grouped in the upper row by their geomorphological origins, and in the lower row by their use and other values. Other caves are recorded, but were not inspected during this assessment; more caves are known only as entrances, but have not yet been explored.

caves must exist within the deeper limestone, but none has yet been found.

Hang Sung Sot is a large fragment of very old cave passage in Bo Hon Island (Figure 12). From the entrance chambers that are truncated at a balcony high in the cliffs, a passage more than 10 m high and wide descends gently to the south (Figure 13) and then rises to a massive choke of boulders and stalagmites; a small exit above this emerges in a chaos of fretted limestone under a canopy of vegetation. The main cave has various levels of flowstone and false floors, and ways may exist through the boulder floors into lower passages. There is some active stalagmite growth, and one dry basin is floored with cave pearls. In the large entrance chambers, the roof profile has been modified by collapse up to major bedding planes; these dip west at about 30°, but the main passage further into the cave is not controlled by the geological structure. Daylight reaches far into the cave, but the northern aspect prevents the intrusion of direct sunlight, and there are no phytokarren.

Dong Tam Cung is a large phreatic fissure cave developed in the bedding of the limestone which dips at 50°. Massive flowstone and stalactite development has divided the single fissure cave into three chambers, obliquely above each other, over a height range of about 20 m. There appears to have been only a single phase of cave enlargement, followed by draining as the base level and water table were lowered past it, followed by a single phase of calcite deposition (which continues today on a reduced scale). The cave is now accessible where its upper end is truncated by the receding cliff face of its host tower.

Dong Lau Dai is a cave with a complex of over 300 m of passages opening to the south side of Co Ngua Island (Figure 14). The main chamber has an entrance passage open to the cliff, while its southwestern end appears to be a choke of boulders, mud and stalagmite which is also truncated by the cliff. The passages to the north are on three levels, developed on separate bedding planes and each aligned along the strike where the dip is about 10° southwest; the levels may be sequential, but could be contemporary within an inclined phreatic maze. The cave has thick deposits of mud and large stalagmite formations, but stratified calcite floors have not been observed.

Dong Thien Cung and Hang Dau Go are two remnants of the same old cave system that both survive in the northern part of Dau Go Island at between 20 and 50 m above sea level (Figure 16). Thien Cung has one large chamber more than 100 m long, blocked at its ends and almost subdivided into smaller chambers by massive walls of stalactites and stalagmites. Flowstone and gour deposits cover part of its floor and also form remnants of false floors at higher levels; the whole cave is very beautiful. The roof is a spectacular series of phreatic domes. Both the accessible entrances are narrow fissures to the eastern slope of the island, and a large entrance also opens into the western slope. Low level passages (not marked on Figure 16) represent a later phase of development and are extensively choked with stratified mud. Hang Dau Go is a single large tunnel (Figure 15) descending along a major set of fractures to a massive choke. A high-level side chamber contains stratified sediments which have been excavated in the distant past; the style of the diggings suggests the extraction of nitrates. There are further cave entrances visible in the cliffs of the island, including that of Dong Thien Long, which indicate that there may be further remnants of an extensive cave system preserved within the limestone.

Dong Huang Long is a short cave entered at beach level on Cap Lom Island. A chamber over 12 m high has remnants of calcite false floors high on its walls, and a soaring shaft breaks through its roof. Two passages end in chokes; a small passage at the top of the steep ramp of terraced stalagmite and gours in the main chamber extends to the lip of a shaft. A small stream of clean water emerging half way up the calcite ramp and flowing over the clean flowstone has the largest flow (about 1 litre per second) of any invading vadose drainage yet observed in the Ha Long Bay caves; this is indicative of the ongoing process of vadose cave development.

Truncated fragments of many other very old caves are exposed in the island cliffs. They occur at various altitudes up to 50 m above sea level. Some are partly filled with calcite and clastic sediments, and flowstone false floors are common; others remain as open tunnels.

The sea cliff on the south side of Cong Thau Trong Island exposes a vertical section through a breccia pipe. This consists of a column of limestone blocks which have fallen progressively from the roof of a cave, so that the void has migrated upwards. The original cave lies below sea level; a small void remains on top of the pipe beneath an arched roof.

Old karstic foot caves

Foot caves are a ubiquitous feature of karst landscapes which have reached a stage of widespread lateral undercutting at base level. They may be quite small notches at the foot of limestone cliffs, or they may extend back into maze caves or into stream caves draining from larger cave systems within the limestone. They are distinguished by the main elements of their passages being close to horizontal, and they are commonly related to rock or sediment terraces that were a function of base level erosion or deposition. Remnants of foot caves may be confused with elements of old phreatic caves which are horizontal solely because they have been formed along the bedding in horizontal limestones or along the strike in dipping limestones; many essentially horizontal foot caves may be seen to cut across geological structure. There are no active foot caves in Ha Long Bay, because the sites of their development have now been invaded by the sea to become the marine caves.

Hang Trinh Nu is one of the larger foot caves in Ha Long Bay (Figure 17). It extends beneath a conical hill and right through a peninsula on Bo Hon Island, between the entrance and the bay overlook exit that are about 80 m apart. The main passages are all at the one level, with their ceilings at about 12 m above sea level. Floor heights vary, due to accumulation of stalagmite in the narrowest section, and due to apparent undermining by a lower level in the southern daylight chamber. Two large shafts rise into darkness from the roof of the same chamber. Notches are cut into the walls at various levels and are partly filled by stratified calcite and clay; they are evidence of multiple stages in the cave's development.

An unnamed foot cave extends for 40 m right through the small island of Xac Kho (Figure 18). The main tunnel is at its widest about 6 m above sea level; at the same level it extends into smaller side chambers and a passage which rises gently along a bedding plane. Both the latter and a section with a tubular profile 8 m in diameter may represent relics of

an earlier phreatic cave.

A foot cave on Island #152 has a single, horizontal passage with an elliptical profile 5 m high and over 15 m wide. It extends 100 m to a choke of flowstone and gour dams, and may continue further. Phreatic roof domes rising up to 4 m show that it was not entirely cut by lateral planation; these are relics of phreatic enlargement, as are typical of foot caves. Hang Bo Nau is a horizontal cave about 70 m long, containing old stalagmite deposits; it is notable for the way that its passage clearly cuts across the 25° dip of the limestone bedding.

Vung Ba Cua Island has a remnant of large old phreatic cave that completely breaches the narrow limestone ridge linking to its northeastern peninsula. Almost below it, a foot cave extends in 50 m at just above sea level; its roof is a calcite false floor, and there appears to be another foot cave passage at a level about 8 m higher. Thick clay in the lower passage has been worked for pottery; the cave does lie in Ha Long Bay's western zone of invaded more by clastic sediment from the Red River delta.

Remnants of marine oyster beds survive cemented to the walls of some of the old foot caves, including Hang Trinh Nu, Hang Tien Ong and Dong Huang Long. They date from times when the caves were temporarily invaded by high sea levels. A concentration of the oyster beds at around 6 m above sea level may correlate with terraces at that altitude around the Red River delta, which are ascribed to mid-Holocene times.

Marine notch caves

The ultimate zone of lateral undercutting is sea level, where rock structures are powerfully eroded and eventually reduced to a wave-cut platform - the ultimate planation surface. All rocks are eroded by wave action to create cliff notches, and small sea caves are selectively formed on structural weaknesses. Limestone is even more susceptible to sea level erosion, due to its dissolution by the sea water. Since their invasion by the sea, the karstic hills and towers of Ha Long Bay have been modified by marine erosion; the process continues today. Dissolution of the limestone allows the cliff notches readily to be deepened and extended into caves; many of these sea-level extend right through the limestone hills, into drowned dolines which are now tidal lakes or adjacent bays. A distinguishing feature of these marine notch caves is an absolutely smooth and horizontal ceiling cut through the limestone. Many of these caves also have phreatic roof domes recessed into their otherwise flat ceilings, and it is likely that part of their development was as subaerial foot caves, with components inherited from even older phreatic caves.

One of the most unusual and distinctive features of Ha Long Bay is the Ho Ba Ham group of hidden lakes and their connecting caves in Dau Be Island (Figure 5). From the island's perimeter cliff a cave extends about 150 m to Lake #1; it is 10 m wide at water level, and curves so that the centre is almost dark and requires some care when passing through in a boat. At low tide there is a minimum of 1.5 m of airspace, over water that is at least 2 m deep. The second cave, through to Lake #2, is of similar cross section but only about 60 m long. A cave through to Lake #3 is smaller, and may only be traversed by a canoe; it is not known what links there are to Lakes #4 and #5. In the two larger caves, most

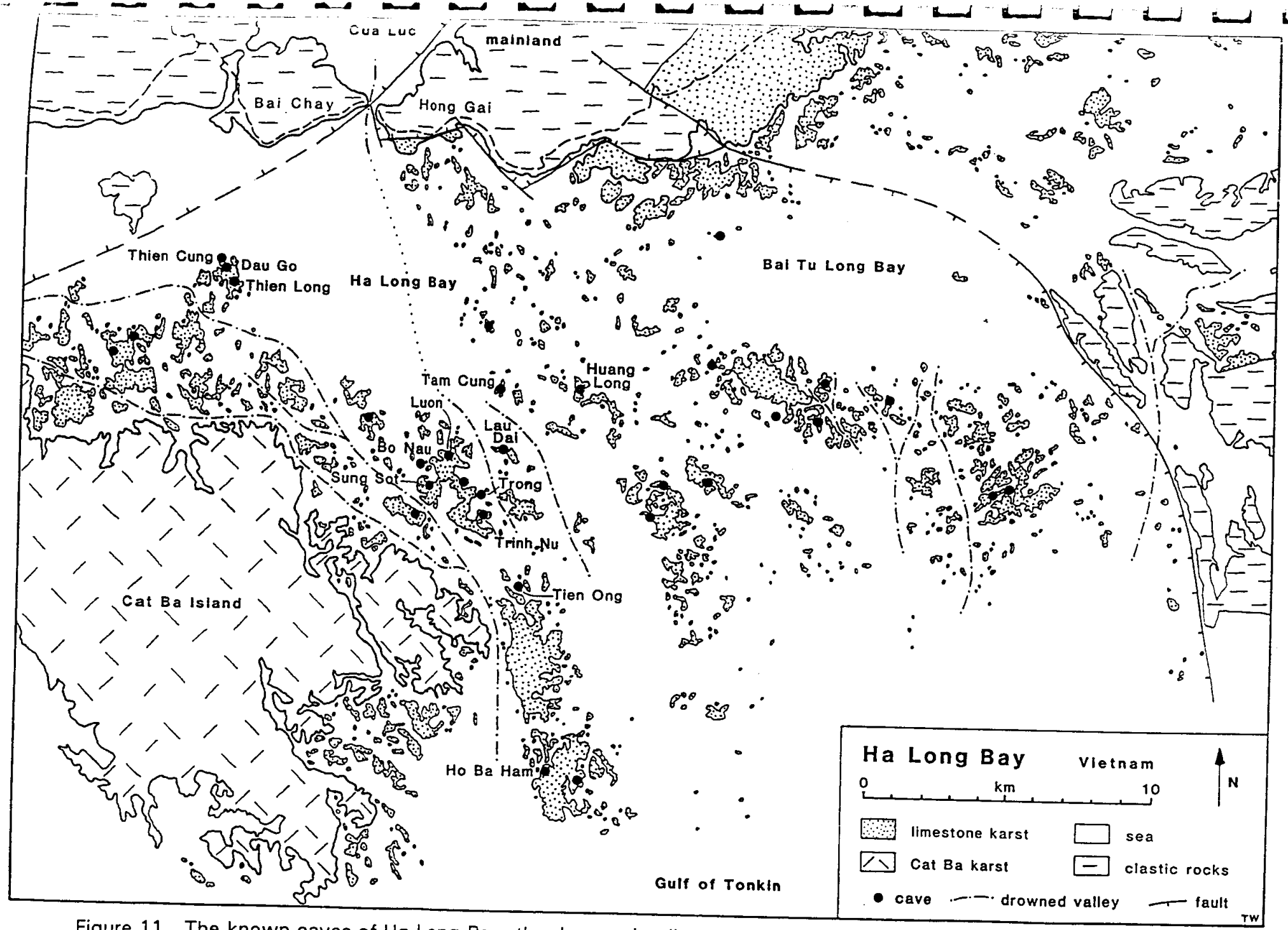


Figure 11. The known caves of Ha Long Bay, the drowned valleys (from available map data), and the boundary faults.

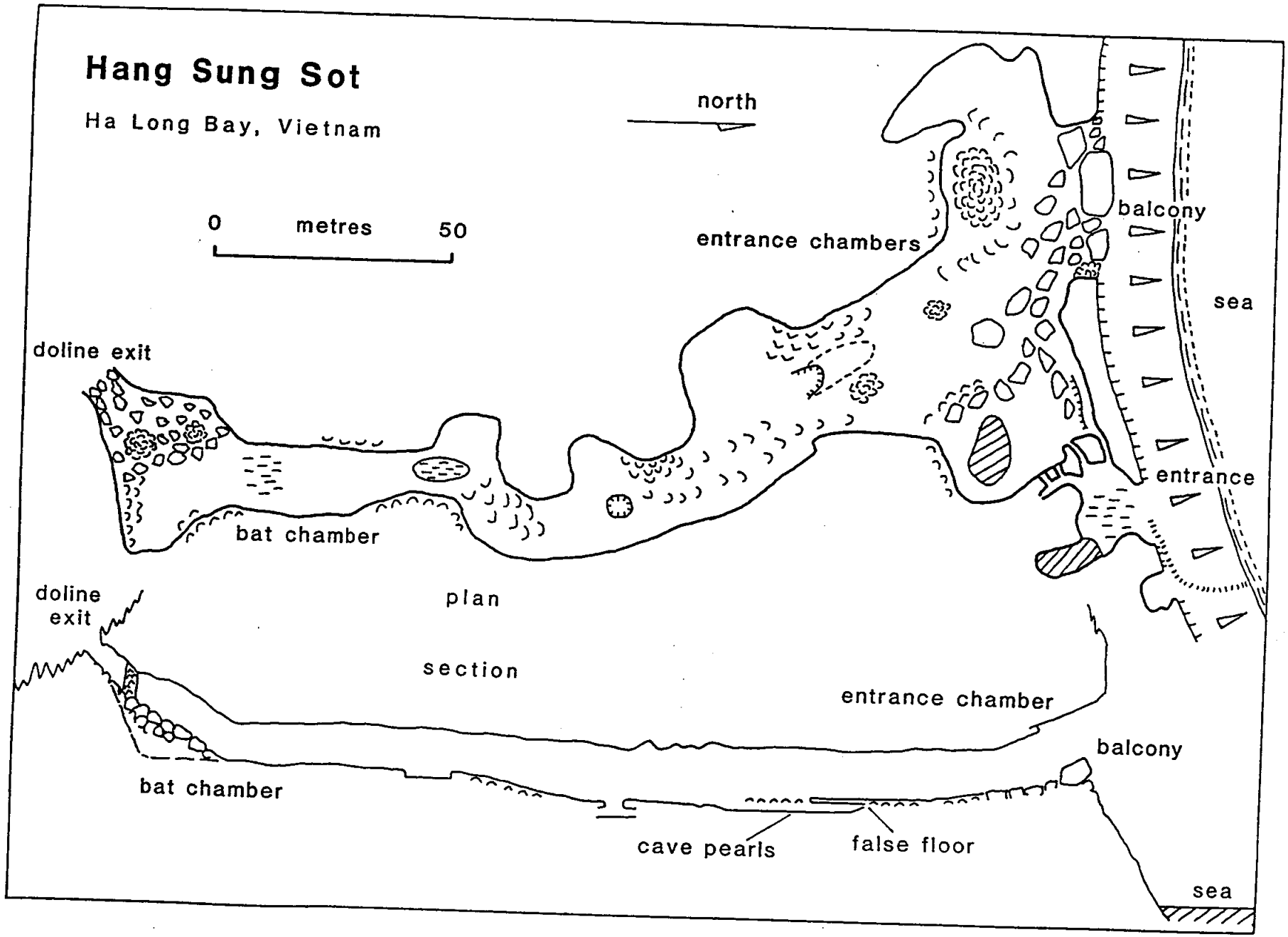


Figure 12. Sketch survey of the old phreatic cave of Hang Sung Sot, on Bo Hon Island; key to the symbols is in Figure 20.

Figure 13. Looking into the entrance chambers of Hang Sung Sot from the fallen roof blocks in the cliff face balcony opening.

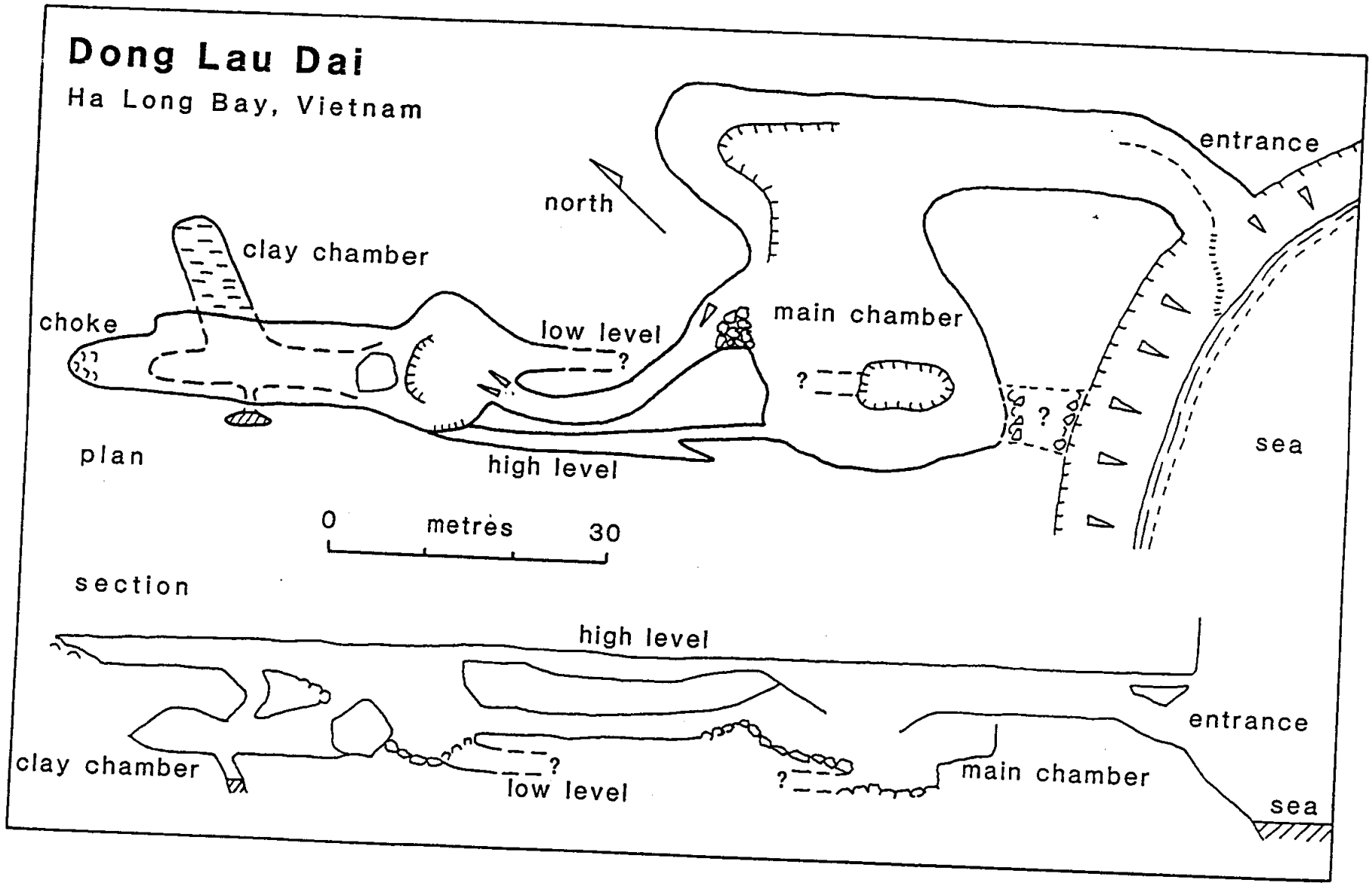


Figure 14. Sketch survey of the old phreatic cave of Dong Lau Dai, on Co Ngua Island; key to the symbols is in Figure 20.

Figure 15. Looking along the single large passage in Hang Dau Go; plants cover the old calcite formations in the daylight zone.

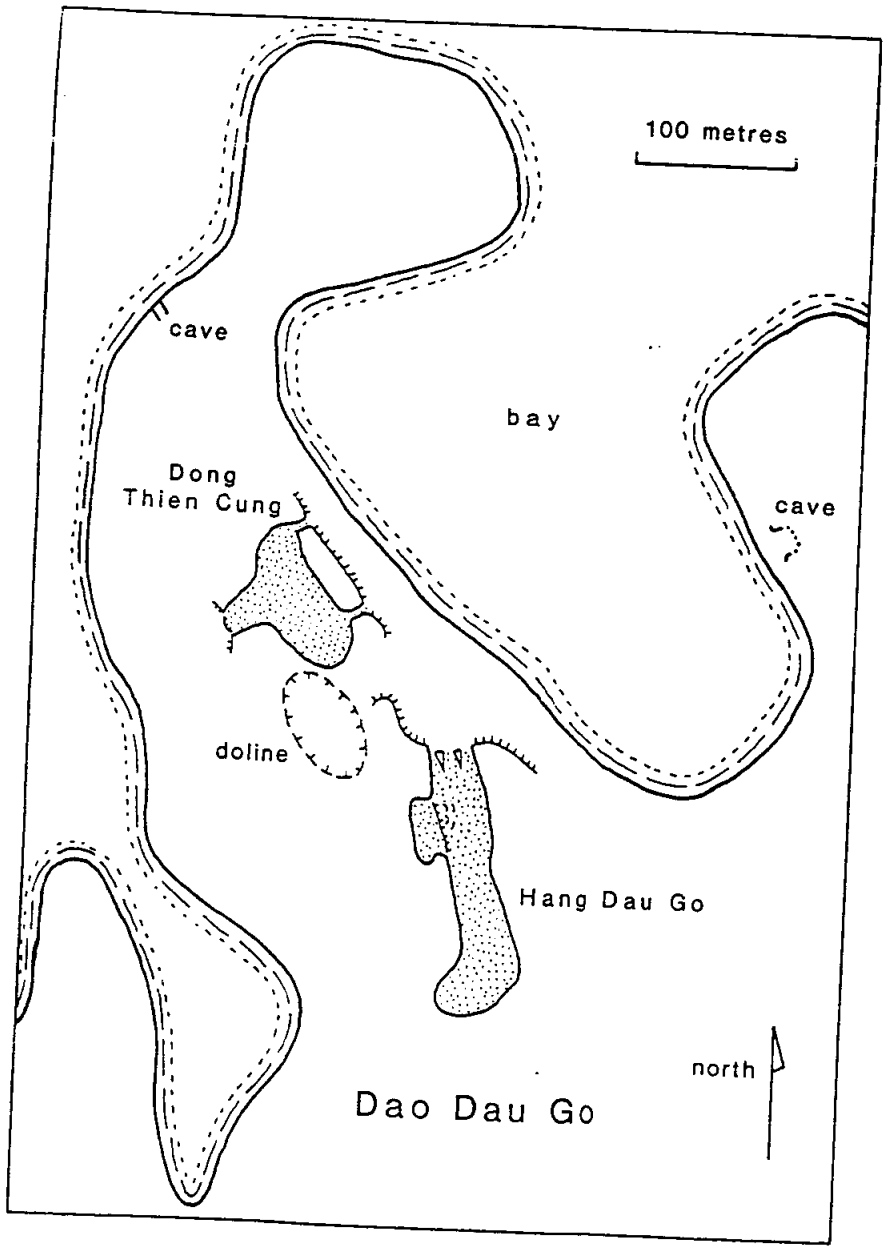


Figure 16. Outline map of the known cave remnants at the northern end of Dau Go Island.

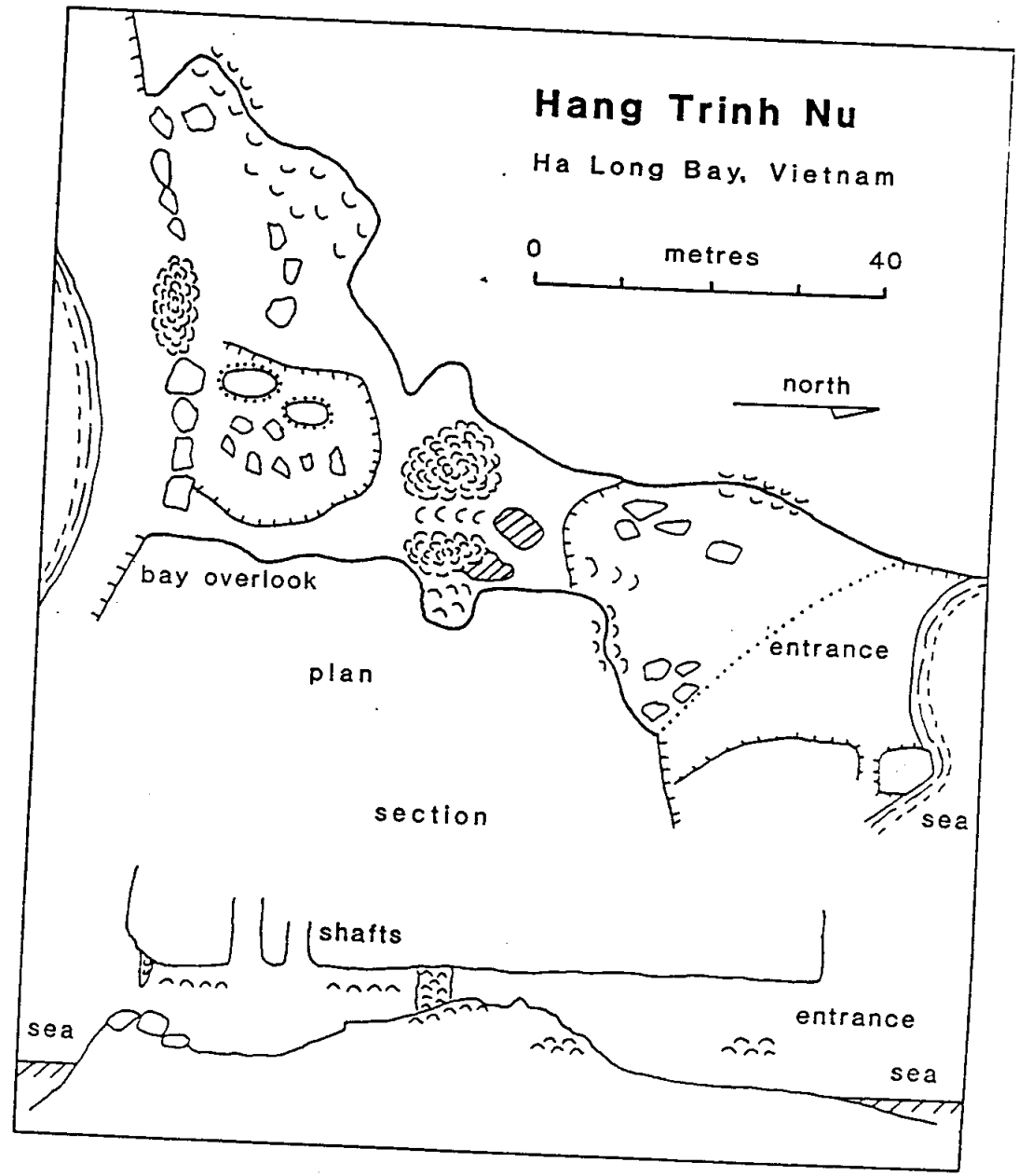


Figure 17. Sketch survey of the karstic foot cave of Hang Trinh Nu, on Bo Hon Island; key to the symbols is in Figure 20.

Figure 18. The old karstic foot cave which passes through a narrow limestone ridge in Xac Kho Island, just above sea level.

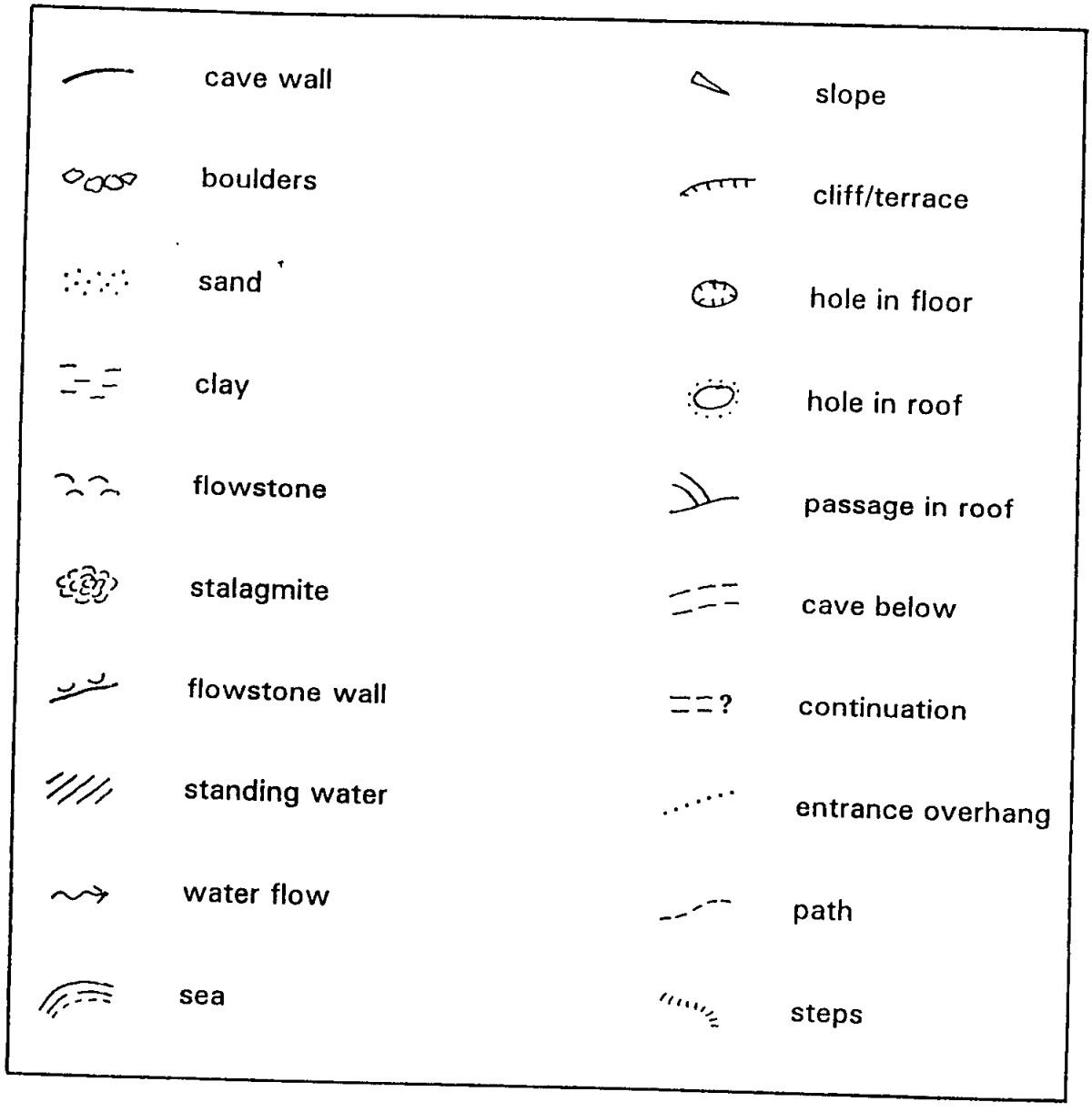


Figure 20. Key to symbols used on the cave surveys.

of the ceiling profile is a perfectly flat surface cut into the limestone; these smooth surfaces can only represent corrosion levels. Bulbous stalactites up to 1 m in diameter hang from the cave roofs; they have not been eroded or planed in the style of the rock ceilings; though some are active with dripwater, their size suggests the antiquity of both them and their host caves.

There are similar marine caves at many other sites in Ha Long Bay. Hang Luon extends 50 m through to an enclosed tidal lake (Figure 9). An unnamed cave extends about the same length into Lake #6 on the east side of Dau Be Island (Figure 5), and notch caves link adjacent bays on the west side of Vung Ha Island and on the south side of Bo Hung Island. A cave into the eastern tip of Cong Do Island carries sea water in and out of a drowned doline lake; its passage is about 4 m high and wide, and it is a very fine stream cave in clean rock, unusual only that its flow reverses with the ebb and flow of the tide. These caves range in width from 8 m to 20 m. They have phreatic domes in their ceilings, and parts of them are breaking upwards in fractured limestone to create low stable arch profiles. They all have some sections of roof that are bevelled flat, but these corrosion levels are all a few metres above present high tide levels. Hang Luon has a massive stalactite hanging 2 m down from a flat roof, and the stalactite is truncated at the modern high tide level. Most of these marine cave tunnels pass directly beneath limestone hills, and show no relationship to the peaks and cols of the surface profile above them.

The flat ceilings in the marine caves are above present high water levels, and many of them are draped with stalactites. They are clearly old erosion surfaces, created largely by dissolution in times past when sea levels were higher in the Pleistocene. Many of the caves have phreatic roof domes that are relics of their early origins as foot caves, and it appears that their modification by marine erosion is also largely a feature of erosion in the past, though further erosional modification does continue today.

Evolution of the landscape

While the processes of landscape evolution in Ha Long Bay may be broadly appreciated from a short visit, there are as yet no absolute dates measured for any of the area's sediments or geomorphic features. Comments on the time scale of the processes must therefore be regarded as tentative.

Karstic evolution of the limestone must have continued through much of Neogene time (20M to 2M years ago), as mature fengcong and fenglin landforms can only evolve through millions of years of erosion and surface lowering. In panoramic views across the bay islands (Figure 7) there is generally little suggestion of any concordance of summit heights that could relate to intermediate Neogene erosion levels. Remnants of old phreatic caves survive at various levels within the bay islands, but their altitudes are not easily related to their ages.

The Cong Thau Trong breccia pipe is a feature of a collapsing cave at a lower level. Active phreatic caves must exist in the limestone that is as yet unseen below sea level; the development and enlargement of new caves is a continuing process beneath an evolving karst landscape.

The topography of the bay's sea floor is only known from the limited available map data, but it appears that most of it has very little relief, and the great proportion lies at depths of less than 10 m. This morphology is compatable with an origin as a subaerial karst plain, which has been subsequently drowned by the sea. The extent of karstic foot caves into the limestone hills at the edge of this plain (and therefore now below sea level) is unknown.

The major impact on Ha Long Bay of the worldwide climatic oscillations during the Pleistocene (Anthropogene) was the periodic lowering of sea level. During cooler stages, water was locked into the icecaps of higher latitudes, and sea level temporarily declined by about 100 metres. This happened at least four times, and between these events sea levels were close to those of the present day. When the sea level was low, the whole of Ha Long Bay was dry land. Subaerial karst processes continued on the limestone basins and plains between the cone clusters and towers. Allogenic drainage from the north fed rivers across the bay area. These excavated valleys are now drowned (Figure 11), but none reached contemporary sea level until they were far to the south of the modern bay site. Limited available mapping of the bay's sea floor indicates that, though these drowned valleys reach depths of 20-30 m below present sea level, they are discontinuous and do not continue to deepen to the south (downstream). They may represent segments of valleys that lay between caves carrying their rivers through intervening limestone ridges. Alternatively, the sea floor bedrock topography may be masked by extensive accumulations of clastic sediment. The main open part of Ha Long Bay has a floor of thick sediment; large ships to and from Cua Luc have to follow a channel that was excavated through this, but is now kept clear by natural scour.

Low sea levels existed only during the cold stages of the Pleistocene, and these probably account for a total of less than 200 000 years (out of nearly two million years of Pleistocene time). Karstic evolution in these short interludes would have been rejuvenated, so that dolines would have been deepened, while the cones and towers would have been degraded; the overall effects on the landscape would have been small - except for valley modifications which are now unseen below sea level.

Many of the caves now at or just above sea level were occupied as shelters during the Soi Nhu cultural period, between 18 000 and 12 000 years ago, when sea levels were low during the Devensian glacial stage. The cave dwellers left behind vast banks of freshwater and terrestrial gasteropod shells (dominated by *Melania* sp) which testify to the remoteness of the contemporary sea; some of these shell banks have subsequently been cemented to the cave walls by calcite deposition.

Marine undercutting of the limestone islands at sea level is a conspicuous feature of Ha Long Bay. Its extent is more than could have been created solely in the Holocene; the many limestone ridges that have been reduced to narrow aretes by coastal retreat are indicative of a long period of marine erosion. Much of the marine morphology of the limestone islands dates from the warmer phases of the Pleistocene when sea levels were close to that of today. The complex marine cliff notches and the multiple levels of dissolution features in the associated notch caves further indicate that sea level erosion has been active over a long period of time, when sea levels have not been absolutely constant.

The marine invasion of the Ha Long Bay karst is ultimately attributable to tectonic subsidence of the region. The exposure and subsequent drowning through each climatic cycle of the Pleistocene were mere interludes in the geomorphic evolution of the site. The critical tectonic subsidence may have been in the late Neogene or in the early Pleistocene; there is as yet no firm evidence to ascribe a reliable date to the event.

Geology of Ha Long Bay

The islands of Ha Long Bay are all cut in a folded sequence of Carboniferous and Permian limestones that reaches to more than 1000 m thick. These pale grey limestones are strong, fine-grained materials ideal for the development of karstic landforms. Beds vary from 500 mm to 5 m thick, and fracture spacing is normally between 1 and 10 m. Very thin shale partings occur on many of the bedding planes, but thick shale beds have not been observed. Chert horizons and nodules are minor features, and patchy dolomitisation has been observed at only a few localities.

Across most of the bay, the limestones dip to the west, but the structure appears to be compilcated by north-south faults which have not yet been mapped in detail. Cat Ba Island is distinguished by limestone hills with lower slope angles than are typical of the bay islands. It appears to be formed largely in a more thinly bedded series of Carboniferous limestones underlying those of the bay; the boundary of the underlying bedded limestone and the overlying massive limestone is exposed dipping at about 20° north across the southern part of Vung Ba Cua Island. At the eastern boundary of the limestone islands, the limestone dips away from the Devonian sandstones which form Ngoc Vung Island; there is no intervening outcrop of underlying thinly bedded limestones, and the boundary is probably along a major cross fault which is recognisable on the mainland (Figure 11). The limestone may be thickened by overthrusting, which has been observed in one island cliff. The small areas of karst landscape on Van Canh and other of the eastern islands are formed on Devonian limestones that occur within the mainly clastic sequence.

The mainland north of Ha Long Bay is formed largely of Triassic coal measures. These are complexly folded and contain anthracite seams up to 50 m thick, which are mined in large open pits. The coal measures are confined between major east-west faults and are also broken into blocks by subsiduary cross-cutting faults. Their boundary with the limestone is almost along the coast, and structural relationships suggest that this is also faulted. It appears that the block patterns within the coal measures probably continue into the limestones of Ha Long Bay, but these have not yet been recognised by detailed mapping. The geological structure of the Ha Long Bay limestones appears to be very complex, and some of the drowned valleys between islands are probably fault-guided. Bedding is close to horizontal in the eastern part of the bay (around Cong Do and Van Gio Islands), but elsewhere dips at any angle, and small overfolds occur in the western part of the bay. The structure has little influence on the karst geomorphology, as slope profiles on the islands are largely independant of the limestone dips.

Significance and value of the site

The remit of this report was to summarise and assess the geomophological aspects of the Ha Long Bay World Heritage Site.

Importance of the karst geomorphology

The geomorhology of Ha Long Bay may be described as unique. Fenglin tower karst, of the type present in much of Ha Long Bay, is the most extreme form of limestone landscape development. The world's type site, and its finest example, is in the Yangshuo region of the Li River basin, in Guangxi, southern China. If these karst landscapes may be broadly compared in terms of the height, steepness and number of their limestone towers, Ha Long Bay is probably second to Yangshuo in the entire world.

In addition, Ha Long Bay has been invaded by the sea, so that the geomorphology of its limestone islands are at least in part the consequence of marine erosion. The marine invasion distinguishes Ha Long Bay from the Yangshuo area, and adds another component to its geomorphological significance. There are other areas of tower karst invaded by the sea, notably on the west coast of Thailand, but none is as extensive as Ha Long Bay.

There is no doubt that Ha Long Bay is of international significance as a limestone karst landscape which is fundamentally important to the science of geomorhology. It contains the full range of fengcong and fenglin landforms, and also has a large suite of active caves and ancient cave remnants, whose clastic and calcite deposits record a long history of landscape evolution, not yet elucidated in detail.

Ancillary values of the site

Other values of Ha Long Bay are outside the specific remit of this report, but their existence should be noted, as they are elements which are characteristic of a limestone karst and do contribute to the overall site value.

Biodiversity is normally significant in karst regions where the individual limestone hills and caves create isolated ecosystems protected from external evolutionary pressures. This must apply to Ha Long Bay, where the small islands present totally isolated environments. Sung Sot Cave has already been recognised as a significant snail site. Bats have been observed roosting in a number of caves (Table 1), but neither cave swiftlets nor their nests have yet been recorded.

Many of the bay's caves that have large open entrances have been utilised or occupied in the past; known archaeological resources (Table 1) date from the late Pleistocene Soi Nhu culture, from the mid-Holocene Ha Long culture and from historical times. Vung Ba Cua Island has two unnamed caves of note; one in the northeastern isthmus contains pottery relics and also diggings which appear to have been the source of the clay material for their manufacture; a cave at sea level on the west coast of the island has figures painted with red ochre on its roof; both sites probably post-date the Ha Long culture. Dau Go Cave has

diggings which appear to have been to extract nitrates from the cave sediments.

The scenic values of Ha Long Bay are beyond question and are demonstrated by the scale of the local tourism industry. The large numbers of rocky islands rising almost vertically from the calm waters of the bay do create singularly beautiful panoramas.

Threats to the environment

Ha Long Bay is like any other accessible and populated region in that there are multiple pressures on land use and resource exploitation. Conflicts are inevitable and the aims of good nature conservation have to be placed in their proper local context.

Large scale threats

Ha Long City and Cua Ong are significant ports of long standing. The new port of Cai Lan, in the Cua Luc estuary, is already under construction; this is designed for an annual capacity of over 3 m tonnes of freight, to make it a major feature in Vietnam's infrastructure on the scale of the existing port at Haiphong. Large ships already cross the bay to reach the ports; the main channels thread between the limestone islands across the centre of the World Heritage Site. The visual impact of the large ships is acceptable, even if only because it is unusual. Inadvertant pollution from fuel oils has negligible impact on geomorphological values of the site (though ballast water should be dumped far outside the bay). Any removal of islands to improve the shipping lanes would be inappropriate and should be resisted.

Coal mining is a major industry on the mainland immediately inshore of Ha Long Bay, where large opencast pits yield over 3 m tonnes of coal per year. The pits are vast operations creating ten times as much rock debris as coal. Tip heaps are proportionately large but are well controlled; they are advancing over hill country and farm land, but have no impact on the bay. From the pits and coal washing plants, rock waste and coal fragments enter the bay at unknown rates; however, these are probably no greater than rates of natural sediment transport that would occur from the hills were they not mined. Most of the coal is transported through Ha Long Bay in barges destined for Haiphong or transfer to ocean-going ships. Coal barges were observed to be generally sheeted; pollution from them appears to be minimal, but quantities of coal may enter the bay at ship loading points. The mines are barely visible from the bay. The coal mining operations have negligible impact on the geomorphological values of the Ha Long Bay karst.

There is no perceived threat from quarrying of the limestone within the bay; resources are available elsewhere, and there is no need to exploit the limestone in the bay.

Hotel and tourist infrastructure development on a large scale within the bay would not be appropriate; this is not foreseen. Additional hotel developmemt in Bai Chay should present no threat to the bay, and the traffic in tourist boats could increase with no detriment to the environment if properly controlled.

Rubbish and sewage are inevitable byproducts of the urban areas of Ha Long City, with their total population approaching 200 000. Much of the waste now reaches the bay, and

remedies to this depend on improvements to the urban infrastructure. These are in progress, and are in a state of continuing evolution. Every improvement will benefit the bay, but the pressure and action for such can only derive through the city management; the presence of the World Heritage Site can only act as an added incentive.

Small scale threats

Ha Long Bay is the centre of a valuable fishing indutry, which is reliant almost entirely on small boats. Though this may have considerable impact on the marine fauna of the bay, it has no impact on the limestone geomorphology. Fish farms, oyster farms and clusters of fishing boats sheltered among the islands cause no geological harm; scenic values are generally enhanced by the interaction of natural and human aspects. A large fish farm that was in Ho Ba Ham Lake #2, in 1995, has been removed and has left no trace. Extraction of coral for sale in tourist markets has been greatly reduced, and should be totally stopped.

Mangrove swamps are a feature only in the peripheral buffer zones of the World Heritage Site. They are reported to have suffered depletion through over-extraction. They are beyond the scope of this report, but may warrant appropriate investigation.

Many of the caves in the limestone islands have attracted "improvements" and development to make them more accessible for visitors. Some sites have been damaged by excavation and path construction. Tourist visits are now restricted to just five caves (Table 1). Thien Cung has been equipped with good paths and lights, and is designed to be the main cave attraction. The unnatural coloured lights mimic the inappropriate fittings in Chinese tourist caves, in the belief that this is what visitors want to see. Natural white lights are more appropriate in a World Heritage Site; visitors will ultimately appreciate the natural environment of the caves if it is presented to them constructively. The other four caves are being kept in a more natural state with white lights and minimal pathway fittings. With the exception of the coloured light installation, the caves within the World Heritage Site now appear to be well managed, in a manner that creates minimal impact on geomorphological site values and yet allows appropriate visitor access and tourism utilisation.

The bay's traffic in tourist boats is increasing rapidly; it is a long way from causing significant impact on the site's geomorphology, but its expansion warrants monitoring and appropriate control where necessary.

An ongoing problem in Ha Long Bay is the accumulation of litter. This is generated by all users of the bay. Fishermen, bargees, tourist boat staff and local visitors alike dump rubbish wherever convenient, including over the boatside into the bay. Sea-borne flotsam is derived partly from land sites and partly from boats; it is all then washed into backwaters and onto the few beaches, where it is an unsightly and growing problem. It is not harming the geomorphological site values, but it is inappropriate to a World Heritage Site. Despite the prohibition of littering by the Vietnamese Law on Environment Protection, litter prevention and rubbish removal are not always part of the way-of-life in Vietnam; Lau Dai Cave was first entered only two years ago, but a tragic amount of empty bottles and food wrappings already spoil what was a pristine site. Unsightly litter will only be eliminated when public

awareness campaigns have modified local practise; such campaigns are the responsibility of national and local government, but the bay's management team should encourage their progress. It would be a good start to totally ban the overboard disposal of rubbish, which is the current practice of the tourist boats, and is within reach of management influence.

Future actions

The immediate future of the Ha Long Bay World Heritage Site can be viewed within the two fields of conservation and appreciation.

There are no apparent threats to the geomorphological values of Ha Long Bay; these are the most fundamental to the site, because they represent the justification for its conservation. The mainland coal mining industry and the port development should be able to co-exist alongside the World Heritage Site. The mining directly employs thousands of people, and will be a major element in the local economy for many years to come; the new port facilities are a significant factor in Vietnam's infrastructure expansion. Under sensitive and appropriate management, neither presents any threat to the geomorphology of the World Heritage Site. Biological values of the site could perhaps be damaged by the pollution that is almost inevitable with major new industrial development; that aspect is beyond the remit of this report. The primary value of Ha Long Bay is in its magnificent limestone karst landforms, and these would not appear to be threatened by proposed and likely developments for the adjacent mainland areas. Planning control should ensure that future site use does not become inappropriate, and should continue to maintain and clean up the facilities and environment of the bay.

There is a notable shortage of scientific data recorded for Ha Long Bay. Such a significant scientific site warrants proper documentation. Only then can its values be fully appreciated. The database for the important karst geomorphology currently consists of little more than topographic maps. It is recommended that a programme of scientific study of the bay is instigated and funded. In the first stage a competent team of cave scientists and surveyors should produce an atlas of maps and documentation of the many caves within the bay. The cave maps should then be a basis for a geomorphological study with dating of sampled materials to allow construction of a chronology for the erosional evolution of the site. With this data to hand, Ha Long Bay will be more fully understood and appreciated, and will thereby be worthy of its World Heritage status.

Acknowledgements

This report was prepared for the Management Department of Ha Long Bay (MDHLB) at the request of the World Conservation Union (IUCN), and was funded by UNESCO. The author is grateful to Nguyen Van Tuan of MDHLB and Hans Friederich of IUCN for their kind hospitality and extensive cooperation in Ha Long and in Hanoi. Fieldwork in Ha Long Bay was carried out with very considerable and kind assistance from Dr Tran Duc Thanh (of the Haiphong Institute of Oceanology), interpreter Mrs Hua, boat driver Mr Long and various other staff members of the MDHLB. A better understanding of Ha Long Bay was gained by helpful discussions with Tony Whitten, Jaap Vermeulen and Ian Glover. To all these, the author extends his warmest thanks and appreciation.

Dr Tony Waltham

Civil Engineering Department
Trent University
Nottingham NG1 4BU, UK

email:tony.waltham@ntu.ac.uk
fax:+44 115 948 6450
phone:+44 115 848 2133

Engineering Geology Report # 806
October 1998

BRIEF REPORT

ON

THE PRESERVATION PLAN FOR, AND GENERAL DEVELOPMENT OF, THE NATURAL VALUES OF THE WORLD HERITAGE AREA OF HA LONG BAY UP TO 2020

Halong, June 25,1999.
(Second Edition)

Contents

PROJECT TARGETS

- To comply with the laws on the management and protection of the heritage in accordance with the International Treaty on Heritage Protection - this is considered to be an important basic principle.
- To work towards sustainable development in conjunction with other specialised plans in the Master Plan for the Development of Halong Bay this is also an important basic principle.
- Working out the Master Plan to protect, regenerate and exploit the sites of the Halong islands correctly as well as financing loans in stages for financial mobilisation and investment.

CONCRETE TASKS

- To specify the **extent and boundary of the preservation areas** according to their different levels of protection.
- To collect primary exploratory documents, position maps with appropriate scales and other research documents for the basic valuation, classification and identification of the potential of the heritage and to map out the Master Plan for preservation and exploitation
- **Overall evaluation** of positive and negative impacts affecting Halong Bay
- To set up the concrete details of research, preservation, regeneration, exploitation and bring into full play the value of Halong Bay to 2020.
- To set up concrete plans to implement the Articles stated in the International Treaty on Natural and Cultural Heritage Reservation signed and pledged by the Vietnamese government.
- To specify the implementation stages with feasibility studies, financial requirements, mobilisation sources, and management structure and to build up a highly efficient management organisation.

FOCUS OF RESEARCH

- ❖ Socio-economic development
- ❖ The feasibility and continuity of other specialised plans to bring them into full play
- ❖ To apply sustainable development of the environment, combining preservation with development, modernisation, education and research to preserve the heritage for the nation.

METHODS

- A continuous accumulation of all new knowledge and information
- Using methods and experience of management from foreign countries
- Interpretation plan, marketing of heritage and a sense of place

SCOPE OF RESEARCH

The National Preservation Area, as recognised by the Ministry of Culture and Information, has an area of 1553 km^2 which is divided into 3 different areas:

Primary research area:

- The more than 700 islands of Halong Bay as recognised by UNESCO
- The buffer area as recognised by UNESCO including the areas making a direct impact on the Heritage Area
- From the border of the buffer zone to the National Protection Area

Secondary research area:

- Cat Ba island and the northern section of national highway No 18

OBJECTIVES OF RESEARCH

In accordance with the definition by the international treaty with UNESCO, 'The Convention Concerning the Protection of the World Cultural and Natural Heritage',

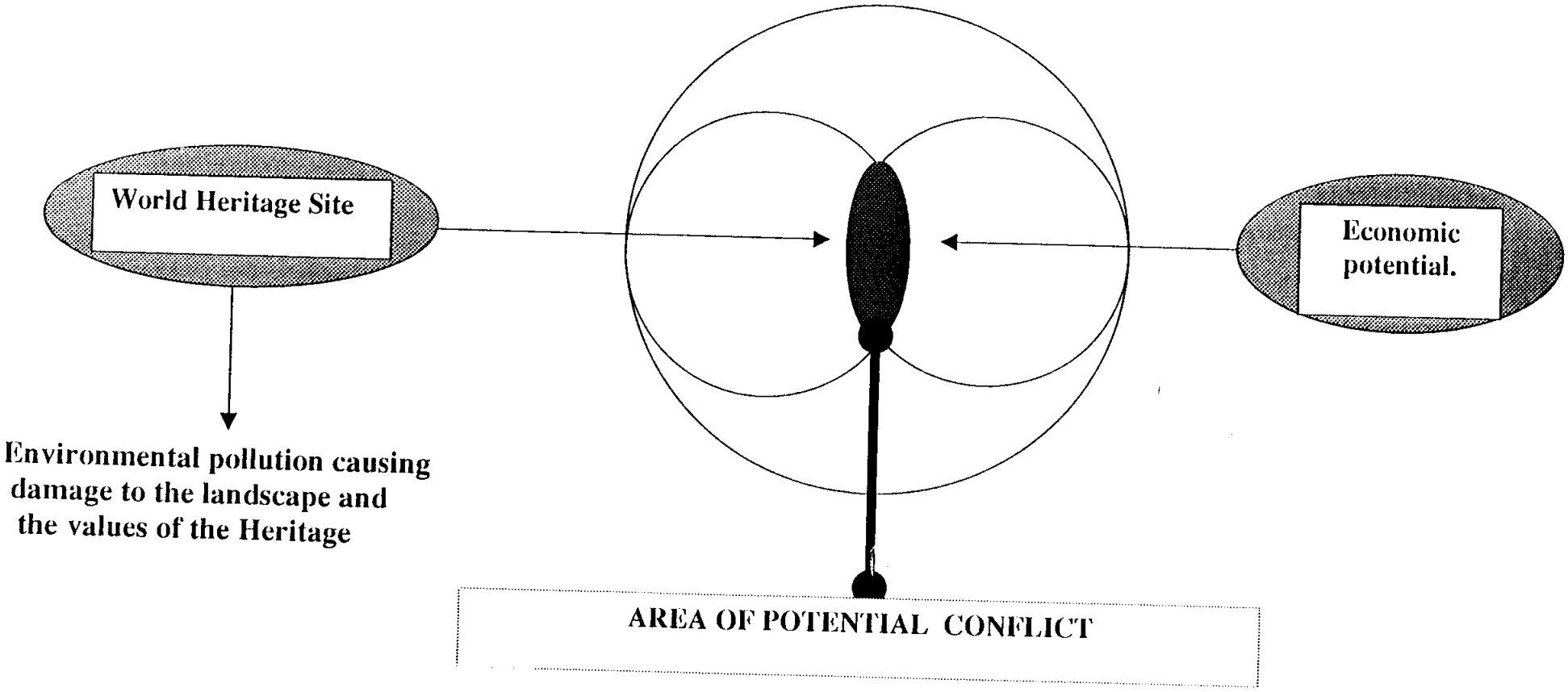
Article 2: Natural heritage shall be considered as:

"natural features consisting of physical and biological formations or groups of such formations which are of outstanding universal value from the aesthetic or scientific point of view;

geological and physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation;

natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation or natural beauty."

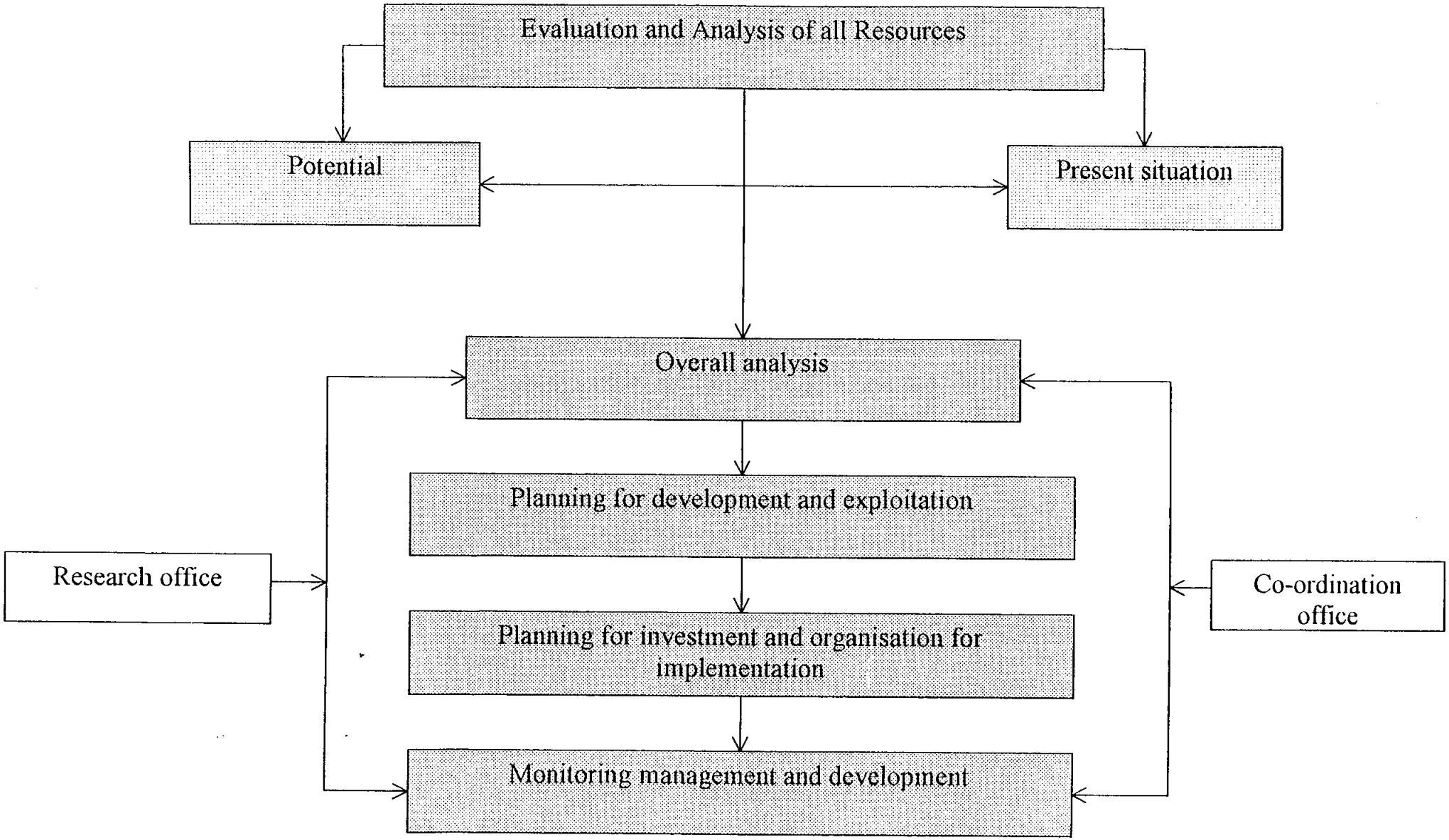
NECESSARY CONDITIONS FOR THE PLAN



Choosing, and cooperating in, a good model

STRENGTHEN DEVELOPMENT

THE CONTENT OF RESEARCH



HALONG BAY HERITAGE IN THE HISTORICAL CULTURAL HERITAGE SYSTEM.

- The north of Vietnam stretches from the ancient capital of the North to the Traco area, the northernmost point of Vietnam, a richly endowed corridor of historic and cultural heritage.

- This area of heritage stretches from Hanoi to Bac Ninh with a number of typical pagodas, shrines and examples of old Buddhist architecture which was at its peak of development during the Ly-Tran dynasty. These can be found in Ha Noi, Soc Son with Lang Giong, Kim Lien, Chan Quoc and Dau pagodas and pen-shaped pagodas and also in the natural landscape along the Tam Dao ranges

- Con Son and Kiep Bac are considered as a famous heritage named after the great poet of Viet Nam, Nguyen Trai, and is regarded as a mid-point of transformation on the cultural plane in the rice civilisation of the coastal area. This was a fishing civilisation but was most important for the development of the pagoda system of Yen Tu on to the natural landscape. There are remains of about 4,000, of which two-thirds are concentrated in the north of Viet Nam. Quang Ninh has 20 examples.

- Being concerned for the natural heritage we should see historical heritage as the main path marking the heroes of history and Empire and their resistance to foreign aggessors commemorated by Cua Ong Chapel and the Temple of Tra Co.

- The most famous example of this Heritage is the beautiful landscape of water and limestone islands of Ha Long which stretches from Cat Ba to Cua Ong. The centre is Ha Long Bay World Heritage Area which, like Hue, is recognised for its beauty all over the world

EXISTING POTENTIAL OF SOCIO-ECONOMIC DEVELOPMENT IN QUANG NINH PROVINCE AND HALONG CITY AS WELL AS IN HALONG BAY

Quang Ninh Province

- Existing situation
- Is one point of the triangle of development of the North

- The growth capacity of average GDP from 1996 - 1998 was 11.1%
  + in 1997, the agriculture, forestry and fishery sector was up 5.8 %
  + in 1997, the industrial and construction sector was up 14%
  + in 1998, commerce and service industries were increasing by about 14%

- GDP structure has clearly changed from 1991 to 1998
  + agriculture, forestry and fishery are down to 18% from 24.4%
  + industry and construction is up to 34.5% from 30.8%
  + commercial and service industries are up to 48% from 42.8%

- Average GDP per capita in 1998 was 310 USD, equal to 1.7 times that of 1991
- Budget revenue in the area in 1998 was 1860 billion VND which was 8 times greater compared to 1991

The province can, by itself, balance expenditure and revenue for the state budget as well as accumulating capital in investment and development (10.5% GDP)

- The infrastructure was concentrated on regeneration and new construction.
  + All inter-province and inter-commune road surfaces are constructed of asphalt and concrete.
  + By 1998, a modern communication system had reached 3 telephones per 100 people
  + 73.2% of the households in rural areas are using electricity.
  + At present, a water supply project for Halong City and Cam Pha is being implemented

QUANG NINH DEVELOPMENT POINT OF VIEW

- A huge area of opportunity in the north of Vietnam, a dynamic coastal economic development area.
- Bringing into full play the strength of tourism as well as strengthening industry and services.
- Closely co-ordinating economic growth with socio-cultural development.
- Creating development conditions in other areas surrounding to the province.
- Closely co-ordinating economic development whilst sustaining security.

Key development targets (According to the unfinished document from the Province)

- Growth rate: 1998- 2000: 11.5%
  2001- 2010: 12.68%

- Raising the accumulated development rate up to 30% GDP by the year 2010.
- Economic structure 2010:
  + the agriculture, forestry and fishery sector will be up to 6.88%
  + the industry and construction sector will be up to 42.95%
  + commerce and services up to 50.17 %

- Average GDP/capital
  + 2.4 to 2.5 times higher after the first 10 years
  + 2.8 to 3.0 times higher in the following 10 years

- Making significant changes in the development of education, medicine and culture
- Upgrading education, eliminating hunger, eradicating poverty and extending broadcasting by TV and radio.

HALONG CITY

- is a northern economic development point, located on the industrial pavement of National Highway No.18
- is the economic, cultural and political centre of the of Quang Ninh Province
- is a zone rich in natural resources

A) Existing socio-economic development:

Average GDP: 420 USD per capita

GDP structure:

+ agriculture, forestry and fishery: 5%, accounting for 5.7% of agriculture, forestry and fishery in the province
+ industry and construction: 48% accounting for 30% of GDP of industry and construction in the province
+ commerce and services: 47% accounting for 21.7% GDP of commerce and services in the province

B) Development targets:

- Growth rate: 1998-2000: 12.0%
  2001-2010: 13.2%

- Economic structure for 2010:
  + agriculture, forestry and fishery : 1.9%
  + industry and construction : 46.1%
  + commerce and service : 52.0%

HALONG BAY

Is located in an urban area with increasing potential for industry, tourism and services

Has the Cai Lan deep-sea port being developed into the major port for export with a capacity of 22 million tonnes per year by the year 2010.

Has the biggest geomorphological museum in Vietnam with attractive natural resources favourable to tourism and aquaculture

(1) Aesthetic value:

- The aesthetics of Ha Long Bay do not lie only in the shape of its mountains and the colour of the sky but are also hidden in its legends.
- Dozens of grottoes rich in variety of scale and shapes
- The feet of the stone islands creating strange pictures
- The huge and marvellous natural architecture
- Flora on stone islands
- Changing natural wonder
- Impression of being in a world of life and creation
- Changing vistas based on seasons

(2) Geological value:

- Is an area of limestone karst scenery
- At present, Halong has preserved thousands of stone islands
- Is made up of sea water, sand, mangroves and standing stone islands
- The oldest geological feature of the northern Vietnamese landscape.
- Is a precious geological museum from the Hersinian era
- Testifies to the encroachment of sea water in different ages

(3) Biological value:

- Halong is a thriving area of rich in diverse species of fish and shrimps
- Over a thousand varieties of fish of which seven hundred have been identified
- A major concentration of all kinds of Vietnamese sea fish, but with distinctive, easy to identify colouration.
- The number and quantity of all kinds of fish are similar
- Seafood products account for 40% of the total production of northern Vietnam. Halong is reputed to have many pearl oysters not found in large numbers in other areas.
- Sea flora including all kind of cellular plants (about 540,000 species of algae)
- Animals such as monkeys and mouse bats.

(4) Cultural and historical values

Historical value:
Relics of ancient cultures in Ha Long from the Middle Stone Age to the end of the New Stone Age.
Archaeological remains of the Middle Stone Age have been found in Giap Khau in Hong Gai.
Archaeological remains of the New Stone Age have been found in Xich Tho in Hoanh Bo, Dong Mang in Bai Chay, Ba Chay village on Ba Chay island, Tuan Chau and Soi Nhu.

Cultural value:
- Has the most ancient commercial port of Vietnam at Van Don
- Old ports at Cai Lang, Cong Cai, Con Quy, Cong Ong, Cong Ba, Cong Yen and Cong Hep (on Ngoc Vung island)
- The longest ancient ports on Cong Dong and Thua Cong islands
- Am pagoda (4 pagodas) and The Tower (Ngon Thap)
- Van Don is an urban harbour founded early in Vietnam's history.

Historical heritage:
+ Two poems: Bai Tho mountain (Poem mountain)
+ Remains of Van Don commercial trade
+ Remains of Revolution and Ho Chi Minh on Rong island, Titop, Tuan Chau, Dau Go

Table of General Appreciation of the Natural Heritage Value of Halong Bay
(According to Goals Achievement Matrix)

	Islands	Aesthetic	Geomorphic	Biological	History	Economic	Total value
1	Dau Go island, Thien Cung Grotto, Dau Go cave and Thien Long Grotto	***	***	*	**	***	12
2	Bo Hon island, Titop beach, Trinh Nu grotto, Luon grotto, Sung Sot cave and Bo Nau cave	***	***	**	*	**	11
3	Cong Do island, Dau Tar and Pep islands	**	***	**	*		6
4	Dau Be island, Ba Ham island and the 3 Tar Ado	**	***	**		*	8
5	Hang Tar island, Tine Ong, Cua Van and Cua Gui caves	*	***	*		*	6
6	Cong Dong, Van Go islands and Kay Is island	*	***	*	*	*	7
7	Ngoc Vung and Phuong Hoang islands	**	***	***	***	*	13
8	Vung Ha island and Bo Hung island	**	***				5
9	Quan Lan, Ba Mun islands	**	***	***	***	**	13
10	Poem Mountain and nearby islands	*	***	*	***	***	11
11	The Vang, Dong Chen and Ra Ban islands	*	***				4
12	Islands near Bai Tu Long gulf, Rue At island, Soi Nhu Cave and Con Ong islands	**	***		***	**	10
13	Coot island	*	***	*	*	***	8
14	Tuan Chi island	***	***	**		***	11
15	Cat Ba island	***	***	***	***	***	15
16	Total Value of each appreciation	28	45	21	15	23	

ASSESSMENT OF CURRENT ENVIRONMENTAL IMPACT ON THE HERITAGE

Current survey of environmental situation

- technical, labour force, legal system and legislative problems

Environmental management issues

- badly defined assignment of responsibility
- inadequate survey of the environment
- shortage of skilled workers
- poor technology and equipment
- lack of financial resources and limited local budget
- poor knowledge of local people

Impact on the environment

- impact of solid waste on the environment from shipping, the sea products exploitation business and coal mining exploitation affects **the atmosphere**
- impact of waste water from households, industry, commerce, tourism, markets, offices, schools, husbandry, planting and solid landfill affects **the water environment**
- the water quality in Halong Bay. The quality of water is in good condition with slightly polluted and polluted water area limited to areas of marine transport or those in which untreated water is discharged to the sea

The impact of solid and industrial waste on Halong Bay

- will degrade the quality of the environment
- will degrade the quality of water in Halong Bay causing damage to marine products

Positive and negative effects and values of the main industrial sectors

	Unit/Potential	Economic Effect		Natural Heritage and Culture Value		Affected Environment		General	
		2000	2010	2000	2010	2000	2010	2000	2010
1	Construction Material	10	7			-3	-2	7	5
2	Coal mining industry	9	6			-5	-3	4	3
3	Tourist and Tourism Services	8	8	10	10	-3	-2	15	16
4	Ports and Port Services	9	10			-3	-2	6	8
5	Export Processing Zone and Industrial Zone	6	10			-3	-3	3	7
6	Sea Exploitation	6	7			-2	-1	4	6

6.4.1 Prior to 1995:

There was only a management group which co-ordinated the work of 5 provincial preservation staff to manage the cultural and natural heritage of Halong. At this stage, its main task was mainly preservation as well as prevention and handling of violations, but it also undertook limited, small scale excavations of a number of historic sites.

6.4.2 from 1995 until now:

After the inscription of Halong Bay by UNESCO in 1995 the Halong Bay Management Board was established. Its success during the past years has been to raise the awareness of all departments, levels and communities towards the protection of the values of the World Heritage Area.

(1) Preliminary suggestions:

- To submit administrative policies to enhance the quality of the management of the natural heritage area. In particular, we have already suggested to the province and authority levels to set up and publish regulations concerning Halong Bay management reorganisation

+ to regulate the price of excursion tickets
+ to regulate transportation tickets
+ to regulate the control and management of tourist activities on the Bay
+ to assign responsibility for the collection of solid waste in Halong Bay

(2) Supervisory activities:

- The purpose of supervisory activities on Halong Bay is to protect its environmental and bio-chemical value and to deal with violations of protection regulations. The Management Department of Halong Bay has been successful in this. For example, we have detected and dealt with many cases of coral exploitation and sales on the Bay.
- Besides this, we also raise the awareness of the community, especially fishermen, about the need for protection of natural sites and their environment as well as the values of the project.

(3) Advertisement Activities

- Over the past few years, the promotion of the values of Halong Bay have intensified, using a variety of outlets, media and techniques.

(4) Cave Management Activities

- The seven places which have been put into operation to serve the needs of visitors are: Thien Cung, Dau Go, Me Cung, Tam Cung, Bo Nau and Luon grottos and Titop beach. Protection measures also being carried out in other caves in order to maintain their condition.

(5) Professional Tasks

- The scientific studies underway on Halong Bay include the completion of the scientific investigation of the value of its topography to be submitted to UNESCO for recognition as well as supplementary scientific studies of the caves and islands of Halong Bay

(6) Investment in, and Reinstatement of, the Natural Beauty of Halong Bay

- We have already carried out a number of projects to reinstate caves and islands. There are two large projects in Thien Cung and Dau Go as well as Titop beach, with a total investment capital of 4 billion VND. Up to now, the results of the investment has been shown its feasibility, having reached 3.5 billion VND within 8 months. Three further investment projects are in progress in 1999 to upgrade and reinstate caves and islands; Dau Go and Sung Sot caves, and the Soi Sinh island park project.

Regular Activities:

We carry out investment in maintenance work very carefully, complying with all regulations on major construction and those concerning the preservation of the natural and cultural values of the heritage.

The effectiveness of management and exploitation activities over the past few years has shown the Halong Bay picture becoming more and more attractive. The number of tourists is on the increase, raising capital for the state budget and creating condition to solve the difficulty regarding the financing of continuous maintenance and improvement of the heritage

Existing Concerns:

- the huge effects of urbanisation
- management of tourist boats
- introduction of more tourist guides
- investigative activities on Halong Bay
- management capacity
- co-ordination with other branches and local levels, which is infrequent

OVERALL PLAN FOR PRESERVATION OF THE NATURAL HERITAGE

Aims

The preservation of the original natural ecological system and natural scenery, including its features and geomorphic structure, the flora and fauna ecosystems on the islands and seabed as well as the environment around the heritage and buffer zone. Preservation should be based on sustainable economic development.

Article 18: regulation on upgrading cultural and historic sites and natural wonders: "to guarantee the original condition and enhance the condition of the historic sites".

Targets

To guarantee to maintain the value of the heritage in accordance with the International Treaty on the Natural Heritage.

To clearly define all available methods of preservation of the heritage as well as working with other economic branches regarding the management of protection activities.

Methods:

- classification of areas
- to present the criteria for protection separately; e.g. status quo, testing etc.
- to develop master and detailed plans of preservation for each area as well as specific preservation methods for major items

OVERALL PLAN FOR PRESERVATION OF THE NATURAL HERITAGE

Contents:

- to clearly define the boundaries of the protected areas and of the absolute protection area in accordance with the International Protection Area as determined by the decision of the Ministry of Culture and Information in 1992.
- to determine the sources of negative and positive effects and to detail protection measures for Halong Bay
- to determine the value of the island system, grottoes, natural formations and other elements such as the flora and fauna systems, the number of islands and caves in protected areas and the value of cultural, historic, archaeological and related elements as well as the nature of the geomorphic, hydrologic, weather and atmospheric systems of the surface, sea and seabed.
- to determine the objectives and extent of investment requirements and to identify potential sources of investment for the upgrading of Halong Bay as well drawing up the plans for all the upgrading, construction and development programmes in relation to the stages from 1999 to 2005 and 2005 to 2010

Classification of Levels of Preservation:

Section 1: Absolute Protection Area: The World Heritage Area of 434 km^2, including 775 islands.

The special preservation area is bisected by two shipping lanes, the Vang and the Hon Mot.

- Cultural and historic preservation areas
- Ecological preservation areas; tidal, sea water forest, coral and National Parks.

- the principles of upgrading and maintaining Halong Bay
- the prevention and control of economic activities
- the strict management of tourist activities

PRINCIPLES OF MAINTAINING AND UPGRADING THE NATURAL HERITAGE OF HALONG BAY

- to define the methods for protecting the heritage, or important parts of the heritage.
- to regard the islands, caves and grottos, as well as the flora and fauna systems living on the islands, as main elements forming the heritage. It is, therefore, essential to preserve existing conditions and to create a favourable environment for the flora and fauna ecosystems to develop. The hunting of animals or cutting of trees is strictly prohibited.
- in the case of the discovery of a danger of slides or potential collapse, highly aesthetic grottos and caves will need to be strengthened or rebuilt.
- to strictly control the quality of the water and the flora-fauna system living under the water to allow the seasonal and sustainable harvesting of sea products with proper equipment and to control the quality and quantity of the exploitation of sea creatures.
- to detect and eliminate the sources of environment pollution such as waste from coal exploitation or waste water from households and from sea going boats.
- construction activities in the buffer zone of the heritage area, especially in inland areas, must obey the principles that follow:

- No damage to or destruction of the natural beauty: architectural style must harmonise with natural wonders.
- No obstacles to the view from inland to Halong Bay and vice versa; the beautiful sight of the inland can be seen from the Bay.
- If existing construction sites on the islands are unsuitable they must be removed and the heritage returned to its original condition.

- any damage to the fabric of the heritage area must be restored and anything which does not harmonise with the beauty of the environment must be removed to return it to the natural state.

Section 2: Active Management Section

* The buffer Zone of the World Heritage Site: 434 sq. km.

+ Developing the cave tours for visitors:
+ Organising tourist services and entertainment activities.
+ Preserving the coral reef zone.
+ Defining the areas for fishing activities and the feeding of oysters
+ Maintaining the Hon Net port for use up to the year 2000.
+ Firmly controlling development plans to enlarge urban areas and to expand port and tourist activities.

Section 3: Development Zones

* The industrial development zones:

+ Zone for coal mining and steel making in Cam Pha.
+ Zone for construction materials and electricity generation in Hoanh Bo.

Port development areas

+ Commercial Ports in Cai Lan and Cua Ong.
+ Specialised Ports in Nam Cau Trang, Hon Net and Cua Ong.
+ Tourist Ports in Hong Gai, Vung Duc and Hung Thang.

* Tourist Development areas in Hung Thang, Bai Chay, Hon Gai, Vung Duc (Cam Pha) and Halong Bay.

* Zones for exploitation of marine products.

* Zones for urban infrastructure development.

+ New urban development land from infill areas in Hung Thang, Hon Gai and Cam Pha.
+ Infrastructure for technical services.
+ Tourist services along the coast.

PLANNING FOR THE DEVELOPMENT AND EXPLOITATION OF THE WHA OF HALONG BAY.

Principle: Any development must not change or damage the natural environment of the WHA. Any exploitation activities must adhere to the specific requirements of the World Heritage Committee.

Aims: To increase knowledge of the diverse values of the WHA and to increase the duration of tourist residency in Ha Long. To co-ordinate tourism, preservation and economic development in order to increase income and to use the extra resources to preserve the Bay.

Obstacles:

- Halong Bay has 1,969 colourful islands, each one with special features. Although their names and location are on the map, tourists only get an impression of a world of islands. It is difficult for them to know their names and their characteristics when they are on the Bay. Therefore, to help them to know the names, the introduction of information signs in the WHA is necessary.

- The way to increase the WHA's economic value, apart from financial profits, is also to gain profit by increasing awareness of the values of the area in the community.

- At present, tourist excursions to the WHA are only to visit the landscape, which can be dull and monotonous, and do not exploit the potential value of the islands.

- The average duration of tourist excursions on Ha Long Bay is about 2 to 3 hours. We should diversify the range of tourist products, and develop opportunities for tourists to stay overnight on the Bay.

- Tourist facilities on the seashore and on the boats are of poor quality.

>>> In order to solve the above problems, it is necessary to plan activities in the area in order to increase the value of the WHA. We must have suitable and effective plans to exploit the potential of each island's individual values to make economic and social profits and increase awareness of the values of the WHA.

PRESERVATION PROPOSALS FOR SPECIAL FEATURES

1. Classic mountains:

- To protect plants and animals (where present). To bring about measures to assess the structure of each island in order to assess the danger of collapse from natural causes such as waves and storms and by the use of explosives.
- To reduce wave erosion to lengthen the life of islands that are likely to collapse (identified by examination of their geological structure. Researchers will propose detailed measures.
- The exploitation of rock for any reason is prohibited.
- The cutting of plants on mountains or the destruction or capture of animals on the mountains or islands is to be prohibited
- To have measures for protecting the environment around mountains.
- To study the flooded dolines on offshore islands where tourist boats have access.

2. Caves:

- Measures to preserve caves must comply with the principles of preservation and development of the WHA as required by Ministry of Culture and Information, especially in relation to the retention of their natural beauty.
- Facilities for tourists who are visiting the landscape should ensure that capacity of caves to impress by their natural beauty is retained. Consideration of the use of artificial light must include the use of the primitive and natural light.
- To ensure the security of visitors, precautionary measures for accident prevention in case of fire, explosion, collapse or other causes must be in place.
- Care must be taken in developing paths and steps for tourists in order to avoid slippery surfaces as well as presenting a natural appearance.
- The building of suitable structures, harmonising with other caves, to create viewpoints at open cave entrances combined with sign systems to explain the caves' history, using telescopic lens and infra-red technology to enable tourists to see at night.

3. Beach:

- To retain the primitive beauty of beaches, by avoiding any permanent buildings on the beach, including those for tourist services. Any structures must be of local, even primitive, design if built on the beach. The building of service kiosks is to be limited.
- In arranging for boats to gain access to the islands, the landscape must be protected absolutely. Tourist services should be provided on the boats.
- The building of fresh water storage tanks must combine both technical and aesthetic considerations.

4. Forest:

- There are small distinct forests, where rare animals breed, which are enclosed on islands where lakes of water have been created and where access to the interior lakes is through caves.
- The cutting of plants and modifications to ecosystems in the forest are not allowed. Planting, combined with natural propagation, should aim to present both a museum and a breeding site for rare species for future preservation.

5. Land mountains where people live:

- Subjects for preservation on islands may be defined as follows:

  + Natural landscapes (plants, hill, mountain, beach, dolines, etc.).

  + Archaeological relics.

  + Old architecture and buildings.

  + Natural caves and beaches.

  + Spiritual culture (festival, legends, traditional games, poetry, music etc.).

- The above subjects must have specific measures for their conservation in accordance with development conditions.
- To build an architectural and natural landscape which is appropriate to each distinctive island and is attractive to tourists.
- To produce scientific reports and to recognise cultural and history remains to enable them to be protected according to the protection laws and to develop Viet Nam's historical remains and natural landscape, as well as their restoration.
- To maintain spiritual culture such as festivals, legends and martial arts. This range of activities needs a plan for their identification, collection, recording and cataloguing in order to both preserve and exploit them for tourists.

6. Objectives for the Preservation of Ecosystems.

- Need to survey, and plan the conservation of, each distinctive variety of flora and fauna.
- To ensure appropriate breeding and propagation conditions to maintain species of rare animals and plants.
- To limit and exploit selectively species of marine products within the preservation area.
- To protect the coral reef and the beauty of the marine landscape in order to plan for its exploitation as an under water tourist attraction and for its study.

To build an aquarium museum which can study and preserve sea creatures as well as being a tourist attraction.

SOLUTIONS TO PRESERVATION PROPOSALS

a) **Protection of mangrove forests:**

- To return the 60% of the area of mangrove forest which has been destroyed to its original natural state.
- To prohibit the disposal of ore and coal waste products in the area.
- To control any changes to the agricultural area along the seashore.
- To prohibit the exploitation of wood for burning.
- To limit infilling for building, especially in the mangrove forest.

b) **Protection of coral reefs:**

- To prohibit the collection of coral to sell to tourists.
- To guarantee the purity of the water.
- To prohibit fishing by using explosives.

c) **Protection of forests:**

- To have a maximum limit to the building of reservoirs for water storage.
- To prohibit the cutting of plants which would affect the ecosystem.
- To combine breeding to maintain the natural population levels with making a breeding museum.
- To investigate, and to selectively exploit, plants for domestic use.
- To ensure that the breeding quality of species does not decrease.
- To arrange a variety of ecosystem tours; climbing, surveying caves, visiting islands, picnicking, scuba diving, etc.
- To make various tourist experiences available, such as helicopter, seaplane, scuba equipment, etc.

d) **Protecting animals and plants:**

- To prohibit the hunting of rare animals.
- To prohibit the cutting of plants in forests and primitive forest areas leading to denudation and loss of rare plants.

e) **Education promotion and awareness of environmental protection:**

- To fine those who behave in ways which cause damage to the environment.

f) **Preservation of the aquatic environment and the atmosphere:**

- To eradicate pollution sources from waste water and rubbish dumps.
- To collect litter.
- To examine and control the system at the head of waste pipes to ensure that environmental standards are met.
- There should be a system of collecting waste water along seashore to prevent its discharge into the sea.

g) Measures for control of the aquatic environment and atmosphere.

- To have water storage or facilities to dispose of waste water on boats.
- To build public W.C.s along the seashore for fishing people.
- Boats are to collect waste water.
- To organise a regular survey of the levels of pollution in the Bay.
- To collect waste floating on the water around the Bay.
- To educate and encourage people to collect waste from the sea.

h) Preservation of islands, caves and grottoes:

- To use modern techniques to reconstruct islands that have been partially damaged or are in danger of collapse.
- To use natural light by cutting back bushes and opening holes and to limit the use of coloured and white artificial light. To use focused rays and floodlights and to use light to introduce tourists to the legends of the caves.
- To build observation points with opportunities for wide views, with binoculars etc., for viewing from mountain tops.
- To create small, architecturally designed points where tourists can both relax and make use of tourist services. These buildings should use simple, traditional materials such as rice thatch, leaf, bamboo, stone etc.
- To use varied materials for paths, such as smooth stone, artificial wood, sand etc. and often change their location.
- To use various access facilities for boats such as bridges (buoyed pontoons of wood, bamboo etc.) and facilities such as parascending, cable car, various types of high speed jet ski, bamboo boats and rafts, sailboats and ships.

k) The preservation of islands where people live:

- Nui Got area and Mang island II: to maintain the ecosystem, making replicas of extinct animals outside rest places. Rest places, viewpoints, kiosks and cafes must be built in a natural architectural style with local materials.
- On beaches: where to organise festivals, entertainments, swimming and traditional games on the sand.
- To restore, and preserve for display, the Quan Lan meeting place and the Van Don commercial port as examples of Viet Nam's early history by using museum techniques such as replicas and living museums.
- The fishing villages will be combined with tourist services.
- To recreate old manufacturing methods and pre-urbanisation styles of living for tourists to visit in Tan Phong, Dong Nam, Yen Hai; Son Hao, Tien Hai and Ninh Hai Villages.
- Tourist services areas such as hotels and other forms of accommodation must be low-rise. The incidence of low building must fit in with their natural surrounding by using local materials, decoration by bamboo, wood, brick, natural rock, sand, shingle, artificial coral and animals.
- To produce construction plans and management regulations for this area.

FORECAST NUMBERS OF TOURISTS VISITING HALONG BAY

The numbers of tourists visiting Quang Ninh which were mentioned in the "Scientific report for the tourism development project in the comprehensive plan of economic and social development in Halong Bay" were adjusted to provide the forecast for 2000 to reflect changes in economic conditions because the rate of increase of numbers of tourists did not rise as forecast.

The numbers of tourists visiting Halong were revised in accordance with the real rate of those visiting Quang Ninh in the last few years, an increase of 75%.

The year 2000:

- Total tourists: 450,000 people per year, a gain of 3.1% in tourists within the whole country. The numbers of visitors to Halong will be 335,000 people per year, included in a gain of 75% in the total tourists to visit the whole province. The duration of tourists' visits to Quang Ninh will increase by 1.9% days.
- The number of international tourists will be 310,000 people per year, a gain of 6% in foreigners visiting Viet Nam. The number of foreigners visiting Halong will be 250,000 people, included in an increase of 80% in the numbers of foreigners visiting the Quang Ninh province.

The year 2005:

- Total tourists: 1,000,000 people per year, a gain of 4.5% in tourists within the whole country. The numbers of visitors to Halong will be 600,000 people per year, included in a gain of 75% in the total tourists to visit the whole province. The duration of tourists' visits to Quang Ninh will increase by 2.7% days.
- The number of international tourists will be 650,000 people per year, a gain of 7.6% in foreigners visiting Viet Nam. The number of foreigners visiting Halong will be 520,000 people.

- **The year 2010:**
- Total tourists: 2,500,000 people per year, a gain of 8.5% in tourists within the whole country. The numbers of visitors to Halong will be 1,800,000 people per year, included in a gain of 75% in the total tourists to visit the whole province. The duration of tourists' visits to Quang Ninh will increase by 4.5% days.
- The number of international tourists will be 1,400,000 people per year, a gain of 9% in foreigners visiting Viet Nam. The number of foreigners visiting Halong will be 1,100,000 people.

PROPOSALS FOR TYPES OF TOURISM

- **Landscape tourism:** caves and beaches. It is forecast that 50% of the numbers of tourists in Halong will visit this.
- **Entertainment:** swimming, parascending, boat racing, skiboarding, climbing, fishing etc. It is forecast that 45% of the numbers of tourists in Halong will use these.
- **Scuba diving and exploring:** it is forecast that 5% of the numbers of tourists in Halong will visit this.
- **Visiting and studying science:** oceanographic, geological and coral reef museums. It is forecast that 45% of the numbers of tourists in Halong will visit these.
- **Ecosystem tourism:** the rare animals' park and the primitive forest. It is forecast that 10% of the numbers of tourists in Halong will visit these.
- **Archaeological and cultural tourism:** the old living villages, cultural history parks, festivals and relics. It is forecast that 10% of the numbers of tourists in Halong will visit these.

* The forecasted rate of tourists visiting the above attractions, based on the calculations of figures over the last few years, are that 70% of tourists will come to visit and swim, 10% to study and 20% for other purposes.

Tourists can experience various types in one tour which will increase the duration of their holiday in Ha Long.

The specialised areas for tourism:

1. The tourism services centred on the seashore, including the Hon Reu animal park.
2. The international entertainment centre on Tuan Chau Island, including the beach, hotel, golf, park, tourist village and harbour.
3. Viewing areas: caves, the ecosystem along the seashore, the distinctive features, the 'replicas' islands, the relaxing areas and the observation points.
4. The cave parks: the natural cave, mystery cave, the nine-level cave, the cave of heaven, beaches, the tourist services sailboat centre, the through caves and the fishing lake.
5. The marine dolines of Ba Ham Lake and Hang Trai: visiting, exploring under sea, scuba diving and water caves.
6. Lan Ha park: quiet park, staying on the sea, beach, the oyster feeding area, National Park visits and entertainment.
7. The Cong Do entertainment park on the sea: cave parks, parascending, skiboarding and sailboats.
8. Coral park: scuba diving and swimming.
9. Nature trails on Hon Xep: visiting, going for picnics, tourist services. The sport tourism area on Cong Dong island: boat rides, fishing, hunting and climbing.
10. The sun paradise at Ngoc Vung and Phuong Hoang: primitive beach, the oyster feeding and marine products area, camping and primitive tourism.
11. The ecosystem tourism area on Ra Ban island, Dong Chen and Van Canh: natural animals and plants, climbing, camping, rebuilding the primitive forest, cable car and monorail, the festival on the sea and the fishing village.
12. Cultural history park (Quan Lan): visiting the remains, the beach, the old commercial port, pagoda, the old villages, bungalows.
13. The primitive forest park at Ba Mun: visiting to see the wild animals and plants.
14. The old village: visiting the archaeological sites and replicas of the old Viet people through reality and imagination.
15. Cat Ba National Park.

PROPOSALS FOR TOURIST TOURS

*** Proposals for new tours:**

- The anticipated tours are:

+ Tour 1: from Bai Chay to the cave park.
+ Tour 2: from Hon Gai (or from Vung Duc) to the nature trail.
+ Tour 3: Hon Gai to the cultural history park.
+ Tour 4: Vung Duc to the ecosystem tourism area.
+ Tour 5: Bai Chay to Van Canh park.
+ Tour 6: Bai Chay to Lan Ha park and the marine doline.
+ Tour 7: Vung Duc to the primitive forest park.
+ Tour 8: Bai Chay to the international tourism area.
+ Tour 9: Hon Gai to the sport park on the sea.
+ Tour 10: Vung Duc to the old living village.

Besides the above, there will also be combined tours.

*** Building the sign systems as well as symbols on the islands and on the beach**

- To define the diverse values of the islands through scientific study and making a scientific record of each group in the WHA.
- To determine the signs, introductions and information about the values of the islands for tourists. To propose the methods and contents of these signs as well as their locations according to tourists' needs and knowledge.
- To build pontoon bridge systems to caves and the beaches in accordance with the landscape, avoiding making an impression on, or causing damage to, the environment and natural beauty. These should combine the pontoon, the path up and the introduction signs.
- All study projects must be carried out by separate programmes, not as a part of this plan.

PLAN FOR DEVELOPMENT OF TECHNICAL INFRASTRUCTURE SYSTEM.

1. Water supply:

* Standard: (2010)

- For citizens: 150L per person per day and night.
- For hotels: 250L per person per day and night.
- For hotels on tourist boats: 60L per person per day and night.
- For visitors on the caves and islands: 30L per person per day and night.

* Total water needs: 1306 m^3 per day and night.

* Methods of water supply:

+ Tuan Chau island: the requirement of 1000m^3 of water to be taken from the land.
+ Other areas: drilling of water wells and the creation of rainwater lakes.
+ Tourist hotel boats on the sea will use water tanks.
+ The tourism points on the islands and caves will use rainwater tanks and fresh water taken from the land.
+ In the future we will explore the use of sea water filtering equipment.

2. Electrical supply:

Standard electrical supply:

+ For hotels on the land: about 3 to 4kw/1B.

+ For hotels on the sea: about 2kw/1B.

+ For use in grottoes to provide light in caves and paths for visitors: about 0.8W/1m^2.

+ For tourist service sites: estimated 5W/m^2.

Plan for providing electrical supply:

* For the tourist areas on the land and Tuan Chau island:

+ Using the national electricity network.

* The offshore tourist areas:

+ The landscape park: using a diesel generator with capacity of 5 to 40kVA. (two generators for each cave; one operational machine and one for back-up)

+ The grotto park: extra power to provide more light for the grottoes.

+ The floating hotels will have an arrangement of diesel generators in each boat's bilges; 2 x 20kVA for one boat (each boat has 5 rooms).

+ The sea valley: using diesel generators and electricity from wind and solar powered batteries to generate 2 to 3kVA.

+ The Lan Ha park: using a diesel engine in the boats' bilges; 2 x 20kVA for one boat.

+ The Quan Lan cultural and historical relics park: using a diesel generator source and electricity from wind and solar powered batteries to generate a capacity of 2 x 100 kVA.

WASTE WATER OUTFLOW AND ENVIRONMENTAL HYGIENE.

1 - In the urban area on shore:

A - Waste water outflow:

- The old urban area has a public waste water outflow system which includes a drainage and well system to separate waste water and pump it to the purification works.

- The new urban area has a separate waste water outflow system. Waste water is taken to one of six waste water treatment works at Gieng Day, Deo Sen, Ha Tu, Cam Pha, Cam Phu and Cua Ong. The waste water is treated microbiologically to a standard level of Bod5=10 - 20 MG/L.

B - Solid waste: the treatment areas remain in Deo Sen, Ha Khau, and Quang Hanh.

2 - On the islands and sea:

a - Standard of waste water outflow:

The standard of waste water outflow is to be 85% of that required for water supply.

b - Predicted amount of waste water from function areas: 1130 m^3.

c - Plan to collect waste water:

- In the International Resort at Tuan Chau the amount of waste water will be 850m^3/NGD

By use of a completely separate drainage system, waste water will be treated microbiologically to level standard; altrenatively, all waste water will be directed to the pumping station then pumped to the city's general waste water treatment area in Gieng Day.

- In other areas, the total amount of waste water will be 280m^3/NGD. Waste water will be collected by boat, taken to the mainland and purified to a high level at treatment works.

d - Collection of solid waste: the level of hard waste in 2010 will be 1 kg per person per day.

- The total amount of solid waste is expected to be about 6.87 tonnes per day.

*** Treatment plans:**

- On Tuan Chau island, the waste will be collected and transferred to the city's waste treatment area on the mainland.

- The amount of waste on the tourist boats and islands will be 2.9 tons per day. Waste will be collected by boat and transferred to the mainland for treatment.

PREDICTED EFFECT OF THE IMPLEMENTION OF THE PLAN ON THE BAY'S ENVIRONMENT

Effect on water environment

- The new tours will attract more visitors to the Bay. It will also create more waste water outflow to the Bay. Waste water must, therefore, be collected and treated on land before it is discharged into the Bay.

- The tourist line will be open and the boats taking visitors to the islands for excursions will also create additional waste water; the outflow to the Bay will therefore be a considerable amount.

> The best system for tourist boats is to retain waste water in a tank and later to pump it into the public waste water drain system. Alternatively, the larger boats can use an onboard treatment system.

> People living on the Bay must have public toilets near their anchorage as well as improved education.

> A waste water collection boat will remove waste water from the tourist islands.

Effects upon the atmospheric environment

Tourism is now a high-benefit economic activity: an "industry without smoke". When this Plan is implemented the main effects upon the atmospheric environment will be dirty smoke and harmful gases such as No2, Co, Co2, So2, and Bp. They will be caused by the growing amount of motorised transport in the Halong Bay area and on the land needed to meet the travel needs of tourists.

As the frequency and operational times of sea transport are low and the area for operation is large, the concentration of smoke and pollution from this form of transport has little effect upon the atmospheric environment.

The economic operations on the other side of Halong Bay also have little effect upon the atmospheric conditions in the Halong Bay area and its surrounding areas. In the areas immediately bordering on the Bay air pollution may happen but, because of the prevailing wind direction, it doesn't directly affect the atmospheric environment of Halong Bay itself.

Effect upon ecosystems:

Halong's ecosystems are easily affected. In future, when this Plan is implemented, the tourist operations will have a negative impact unless necessary and suitable preventative measures are taken.

Effects from solid waste: This includes all waste from shipping cargoes, waste water from cleaning boats on the port or near shore, and mishaps when transferring goods at sea etc.

- The material washed down as a result of deforestation will increase levels of sediment in shallows near the shore thereby destroying reef coral and sea grass.

- The domestic waste from tourist operations includes box litter, plastic bags, food and human waste.

Proposals for some control measures for this problem:

- All waste in boats is be collected by boat driver, then put into a box at the port.

- To educate and encourage tourists to take waste back themselves. In addition, to extend the Management Department of Halong Bay's capacity to collect hard waste.

- The Management Department of Halong Bay is responsible for the collection of all floating waste from tourists on the sea or on the land.

Object: to protect the value of the site absolutely:

Method:

*** Ensuring water quality:**

+ by predicting future pollution loads.
+ by defining water quality.
+ by complying with all water quality conservation criteria.
+ by decreasing pollution loads within the area and inland.
+ by limiting development operations.
+ by decreasing all environmental impacts to a minimum.

*** Conserving the natural ecosystems and sea landscape of the WHA:**

+ by preventing, or controlling, all economic operations.
+ by managing the operation of tourism.
+ by conserving water quality.
+ by carrying out surveys.
+ by inspection and treatment.

*** Managing the disposal of solid waste:**

+ by improving the hygiene of the present collection system
+ by separating out all sanitary waste in order to protect the environment.
+ by improving promotion activities and public awareness.
+ by establishing a good tax system.

ENVIRONMENTAL PROTECTION MEASURES IN MINING EXPLOITATION

1 - Mining Situation:

a - Capacity:

- In 1998: 10.1 million tonnes.
- In 2000: 10 millions tonnes.
- In 2010: 13 to 14 million tonnes.

b - Area of exploitation:

- At present: 2 main mines in Hong Gai and Cam Pha.
- In future: centred on Cam Pha.

c - Coal transfer port:

- At present: 4 main ports (Cua Ong, Hong Gai, Cot 5 and Vung Duc).
- It is estimated that, by the year 2000, Hong Gai and Vung Duc ports will change into tourist and cargo ports.

2 - The environmental protection solutions:

- Reduce levels of pollution.
- Comply with the laws of environmental protection.
- Require reforestation.

Monitoring activities:

+ Forbid any mining activity in environmentally sensitive areas.
+ Strictly limit the disposal of wastes in areas sensitive to erosion.
+ Minimise the disturbance to flat land.

ENVIRONMENTAL PROTECTION MEASURES IN TOURISM

1 - The numbers of visitors:

- In 1998: 310,000 to 400,000 people per year.
- In 2000: 600,000 people per year (of which 450,000 will be foreigners).

2 - The environmental protection and management measures:

- Planning the proper use of land by sustainable development to protect natural resources.
- Arranging for the collection of solid waste through various management organisations in each area, tourist services and the sanitary company, private boat owners and The Management Department of Halong Bay in association with the sanitary company.
- The Management Department of Halong Bay will inspect the Bay and boat teams

ENVIRONMENTAL PROTECTION MEASURES IN ACQUACULTURE

1. Current exploitation situation:

A) At present:

- The area is about 14,500 ha.
    + the ideal model is that households do it themselves.
    + method: blocking the cave entrances with nets, underwater cages and small boats that float on the Bay.

B) Future design:

- Reform the current areas.
- Plan to introduce aquaculture into the Mong Duong river.

2 - Environmental protection measures:

Guidelines for the development of aquaculture, reduction of coal mining and encouragement of off-shore fishing.

- Defining the aquaculture exploitation zone.
- Designation of aquaculture zone.
    + Exploitation zone: outside buffer zone.
    + Limited protection exploiting zone: inside buffer zone.
    + Exploiting prohibited zone: absolute protection zone.
- Investment in big boats:
    + Treating the waste from the shore marine produce bases.
    + Stopping any fishing by electricity, explosives, etc.
    + Banning all exploitation of coral and aquaculture in the marine biological protection zone

THE MANAGEMENT OF HOUSEHOLD SOLID WASTE DISPOSAL

- Improve the household solid waste disposal system, particularly the present method of collection.
- Carry out the sanitary disposal of household solid waste.
- Promotion and education to raise public awareness.
- Continue cleansing activities in the sea.
- Complete and implement the tax system.

NATURAL RESOURCE MANAGEMENT

1 - Natural environmental management:

A) Conservation:

- Conserving the current resources.
- Conserving conditions of habitation.

B) Regeneration:

- Reforesting in empty land areas.
- Reforesting in mud lake with mangroves.

2 - The management and protection of the landscape.

- Preventing any artificial changes to landscape resources.
- Protecting landscape features.

IMPLEMENTATION OF MANAGEMENT MEASURES

A. Unified management of the environment of Halong Bay.

Management of branches based on general targets such as the sustainable and reasonable development of the environment of Halong Bay.

- Absolutely protect and reasonably exploit the natural heritage (including the natural heritage recognised by UNESCO).
- Gain knowledge of suitable environmental protection targets for sustainable economic growth.
- Manage the environment effectively.

B - Define the preservation programme and bring the effectiveness of the heritage into full play.

- Continue to define scientific details of the islands and caves and plan to transfer the information to the other organisations.
- Define the outstanding function zone for each island and beach to plan for its reasonable exploitation and conservation. The aim is to protect the full value of the heritage absolutely whilst serving the tourist strategy effectively.

C. Status and policy:

1) A tight collaborative association between branches involved in environmental management under a unified status.

- Environmental policy, the law of landscape and relic protection and the international convention on heritage protection.
- Network of effective environmental management.
- Defining The Management Department of Halong Bay as the only organisation which directly manages the heritage. All actions that have a direct impact on the heritage must be approved and agreed by the MDHLB.
- Improving the skill of specialist staff involved in heritage conservation as well as supporting the provision of equipment necessary for conservation and the early establishment of agency research into the heritage.
- Establishing an inter-branch administrative organisation based on the inter-branches settlement.

2) Defining the function of heritage management and its relationship to the other parts of the network of state management through decentralisation and microeconomic state management..

3) Continuing to use the effectiveness policy; "the heritage serves the heritage".

4) Producing draft regulations for the "Management, Protection and Development of Halong Heritage" for ministries, branches and Quang Ninh Province's People's Committee to discuss, approve and publish.

- Encouraging policy as well as providing the environmental protection and the heritage protection budgets.
- Participation of the community in the preservation and development of heritage value in Interpretation Plans.

IMPLEMENTATION PROGRAMS

Conservation Programmes

Producing the regulations and document systems.

Discovering, maintaining and monitoring the heritage.

Exploitation programme

1 - The period from 1999 to 2005:

Total costs during this period will be about 261 billion dong (VND), of which it is estimated that private investment capital will amount to 231 billion VND (building international entertainment tourist zone) and the funds of the heritage management department will provide 30 billion VND for investment in the exploitation of Halong Bay.

Including:

* International entertainment tourist zone.
* Van Canh park.
* Grottoes park.
* Coral park.
* Sun paradise zone.
* Historical and cultural park.
* Biological tourism area.
* Marine doline and mangrove zone.
* Exploitation of the height and space value of Bai Tho Mountain.

2 - The period from 2006 to 2010:

Continuing with a high level of investment in the function zones.

Total costs during this period will be about 216 billion VND of which the Heritage Management Department will contribute about 30 to 35 billion VND and including the private investment capital in the international entertainment tourist zone and water sports area.

* International entertainment tourist zone.
* Van Canh park.
* Grottoes park.
* Lan Ha park.
* Marine doline and mangrove zone.
* Marine entertainment park.
* Rock park.
* Sun paradise zone.
* Historical and cultural park.
* Primitive villages.
* Exploitation of the height and space value of Bai Tho Mountain.

3 - The period after 2010:

Completing function zones:

Total costs of about 644 billion VND of which capital investment in the international entertainment tourist zone will be about 560 - 620 billion VND with the remainder from the Management Department funded from the accrued profit from other exploitation activities.

* International entertainment tourist zone.
* Van Canh park.
* Marine entertainment park
* Coral park
* Biological tourist zone
* Primitive forest park zone

Total projected capital investment in these function zones is estimated to be about 1520 billion VND

Unified management participation programme

Participation with other branches in a programme of effective heritage management

Programme of promoting awareness about the value of heritage conservation.

Marketing: to get the attention of visitors in order to introduce the heritage values, to research the heritage and to attract capital investment to Halong Bay.

Education: to promote public awareness of heritage protection.

Scientific research: to carry out and encourage scientific research to continue defining and developing the heritage value.

Means of organisation: to establish and implement an organisational mechanism in order to strengthen awareness of heritage value conservation,.

Community role: to establish and maintain activities to enable the role of the community to be brought into full play in support of the conservation of heritage value.

CONCLUSION

1) Policy and the direction of development of the WHA: The preservation and development of the general values of the WHA are not influenced by the economic and national defence development plans of local government. The social and economic development plan must guarantee the best possible conditions for the preservation of the natural landscape and the resolution of sources of environmental pollution during the period of development.

There needs to be an awareness that the human, urban, natural landscape and ecosystem elements of the environment of Ha Long must be a unified and perfected structure.

2) The preservation of the WHA Halong Bay must be considered as the primary strategy in the permanent development of tourism and the economy of the north-east of coastal area.

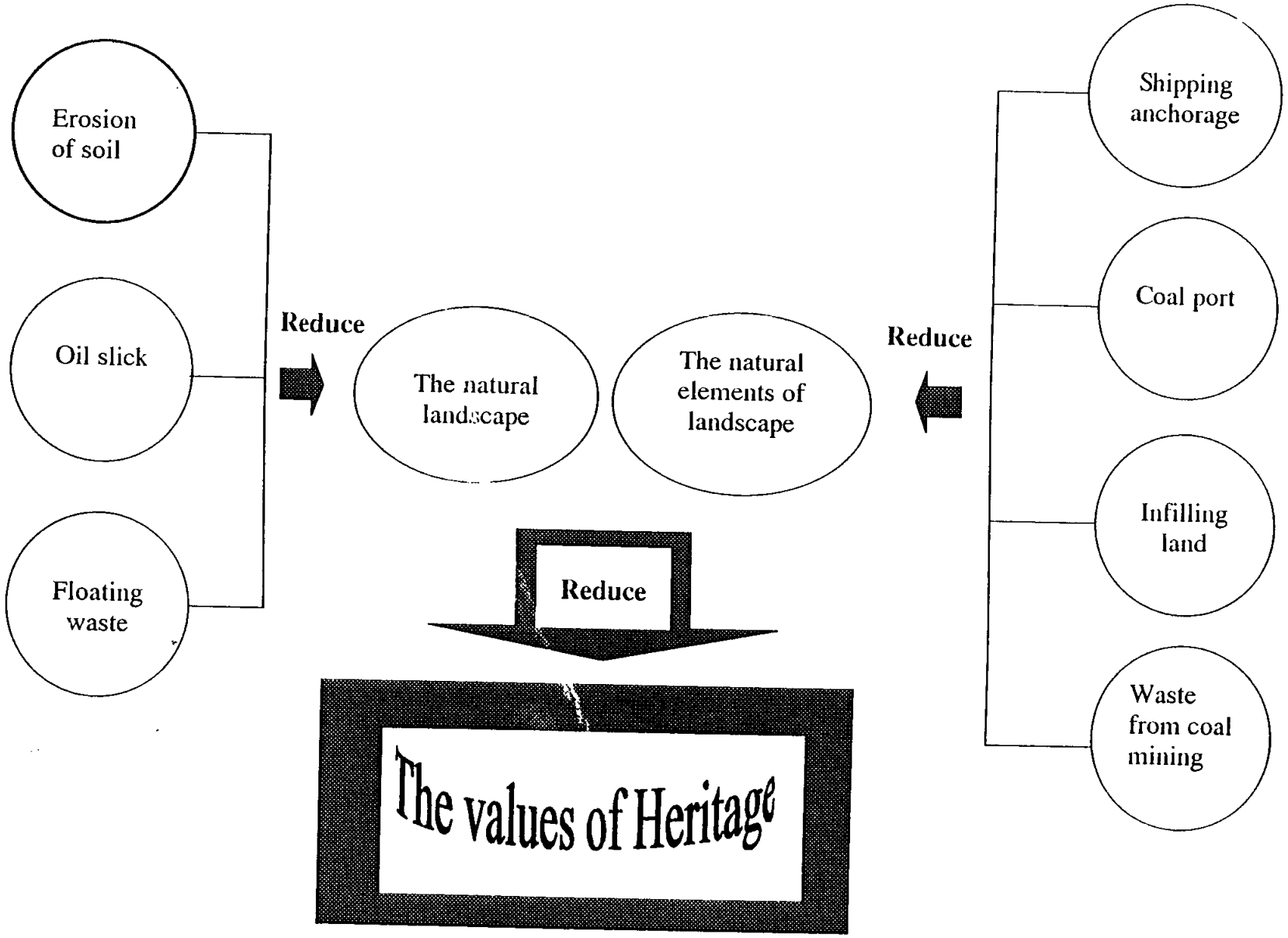
3) Defining the responsibilities of the organisations operating on the Bay and closely co-ordinating the activities of environmental management organisations in order to effectively solve the current problems within the area.

4) To establish and enhance the staff structure for the management of the WHA to have the capacity and power to preserve and develop the values of the WHA. These activities must be based on the technical directions of the professional consultant organisation and the state management offices, as well as the general regulations of the appropriate legal framework.

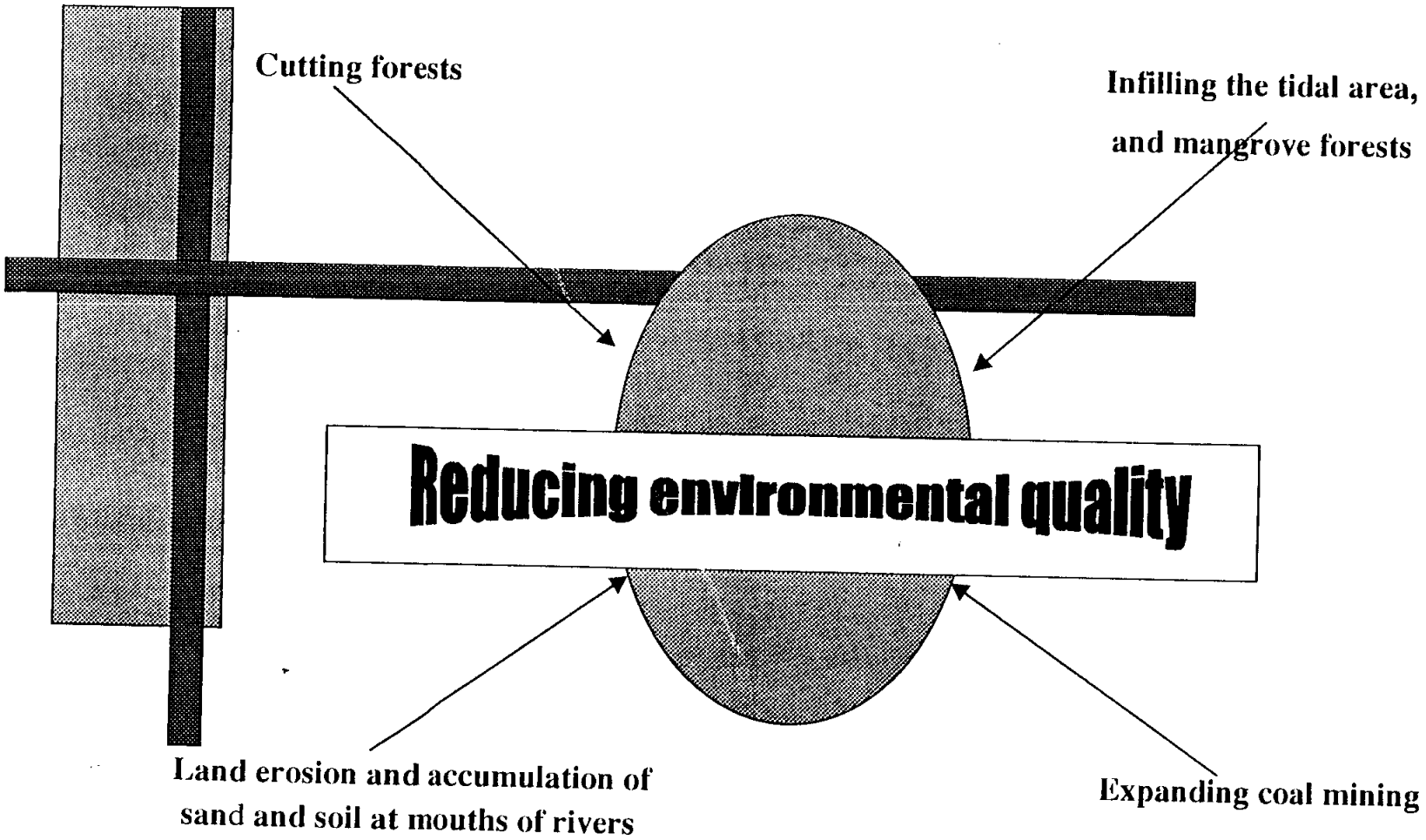
5) To co-ordinate with the management of tourism organisations to produce a comprehensive range of tourism products in order to attract tourists. To use the income from tourism to invest in preservation activities which will reduce the budget and encourage economic development, increasing income for future budgets.

6) To be responsible for the creation and compilation of a general regulation for the management of the environment of the heritage to include the role of preservation activities.

SERVATION PLAN FOR EXPLOITATING AND DEVELOPING VALUES OF THE WORLD NATURAL HERITAGE - HALONG BAY



PRESERVATION PLAN FOR EXPLOITATING AND DEVELOPING THE VALUES OF THE WORLD HERITAGE AREA OF HALONG BAY



ECONOMY AND INVESTMENT

Cost analysis:

Preservation expenses: 10 to 20% of receipts and a part of income taxes from the tourist services within the WHA (about 25 billion in the years from 2000 to 2005).

The initial investment expenses for the investment programme of tourism exploitation is to increase the WHA's value by 1,520 billion, including the income of 1,210 billion from Tuan Chau island.

The related expenses of the environmental management organisations in Ha Long Bay will be determined in the relevant specific plans.

The contingency expenses for pollution prevention could come from a contingency fund, pollution tax, preservation expenses or WHA insurance.

Anticipated results of plans:

Anticipated results of conservation:

- Preserving the unique and outstanding landscape for Viet Nam and for the World.
- Maintenance of documents for studying scientific history, archaeology, geology, oceanography.
- Maintenance of the unique value of Halong which will encourage the development of different parts of the economy, especially tourism.

Anticipated outcomes of the exploitation of tourism:

- The development of the economy;
- Stimulation of related fields of the economy.
- Job creation and raising people's standard of living.
- Distributing financial resources for the preservation of WHA.

Anticipated outcomes of the management programme:

- The resolution of conflicts in an arena of vigorous economic development..
- Developing potential to its maximum.
- Guaranteed permanent development.

Anticipated outcomes of the promotion programme for the WHA and increasing the awareness of community to have an impact on the potential preservation and development of the general value of the WHA.

- The attraction of tourists and investors.
- The protection of the WHA from negative influences.
- The promotion of positive actions for the benefit of the WHA.
- Continuation of the policy of "heritage protects heritage" and co-ordination of the environmental protection organisations.
- A national plan of support for a programme to preserve traditional cultures
- The marketing of heritage.

DIVIDING INVESTMENT STAGES AND IMPLEMENTING THEM

The investment programme will be divided into 3 stages:

2000 to 2005, 2006 to 2010 and 2010 to 2020.

The implementation and the considerations:

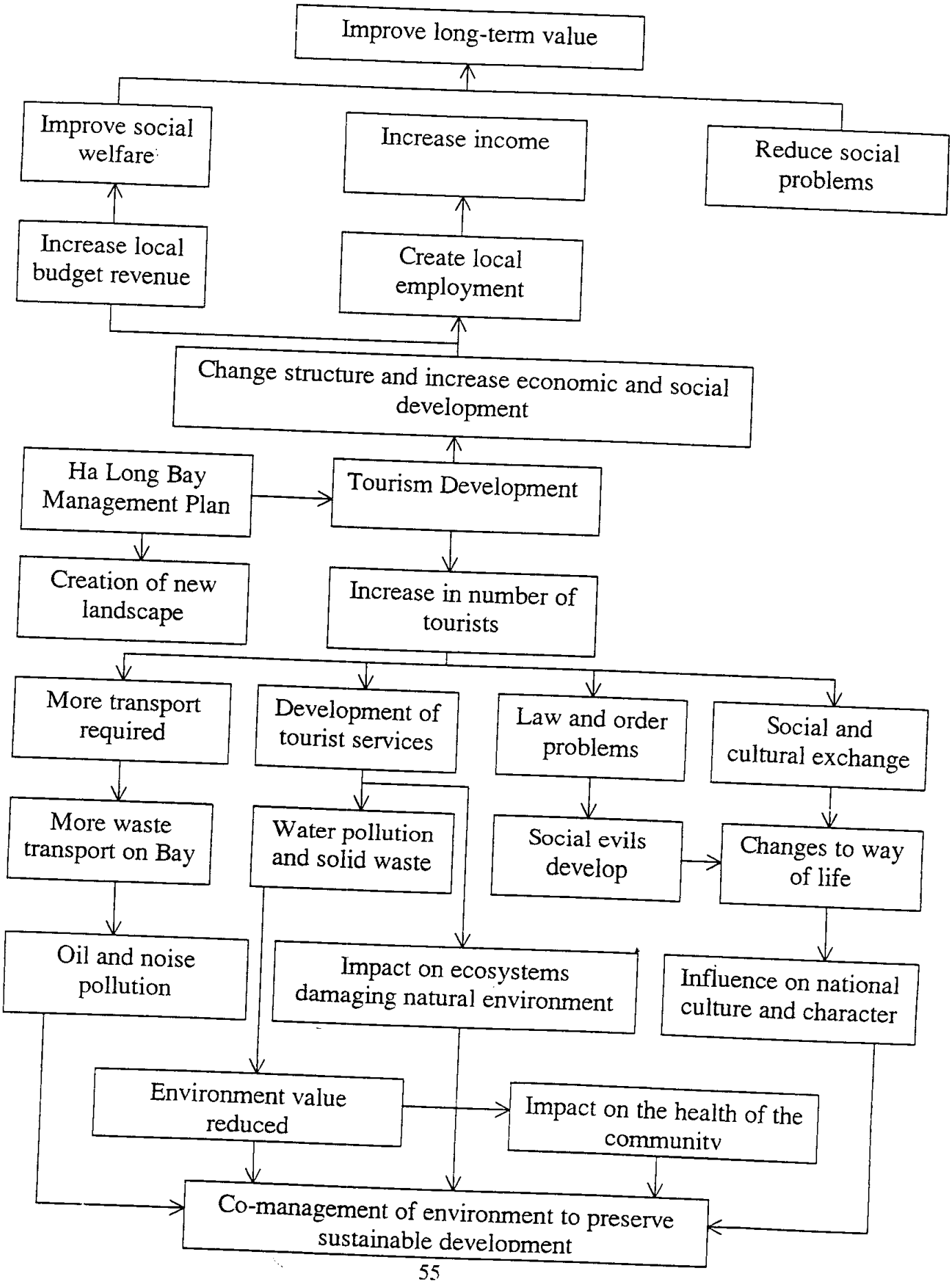
Integrating the individual projects into the general model after improvement and careful consideration.

Choosing sound investment partners for the implementation of the project.

Estimating the duration of project implementation, especially in the sensitive area, in order to control directly.

Co-management control measures are to be carried out by the monitoring and control centre.

OVERALL IMPACT OF MASTER PLAN FOR THE DEVELOPMENT OF HA LONG BAY



THE IMPACT OF THE ECOSYSTEM AREA PLAN ON HA LONG BAY

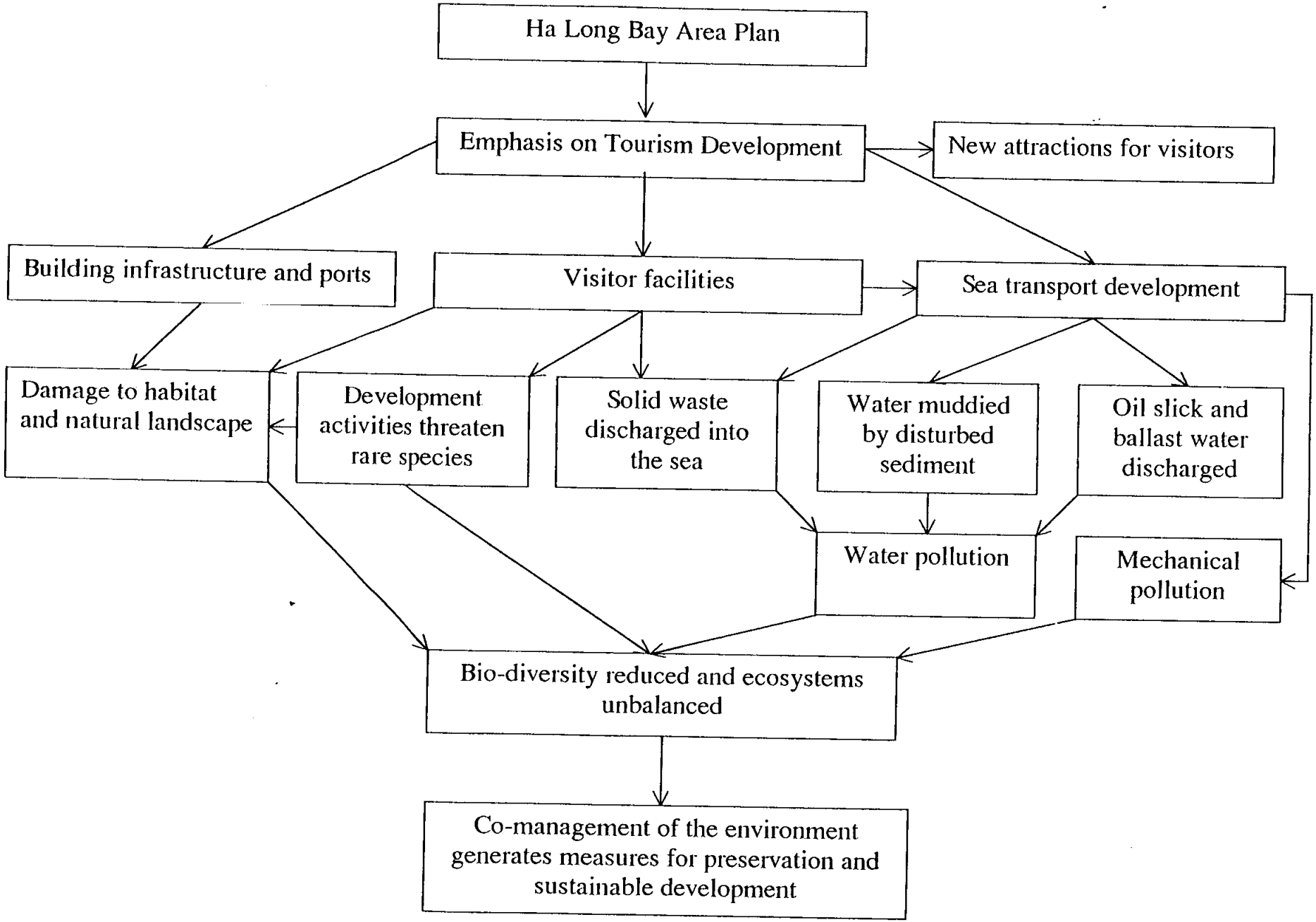


DIAGRAM SHOWING POSITION AND AREAS FOR STUDY

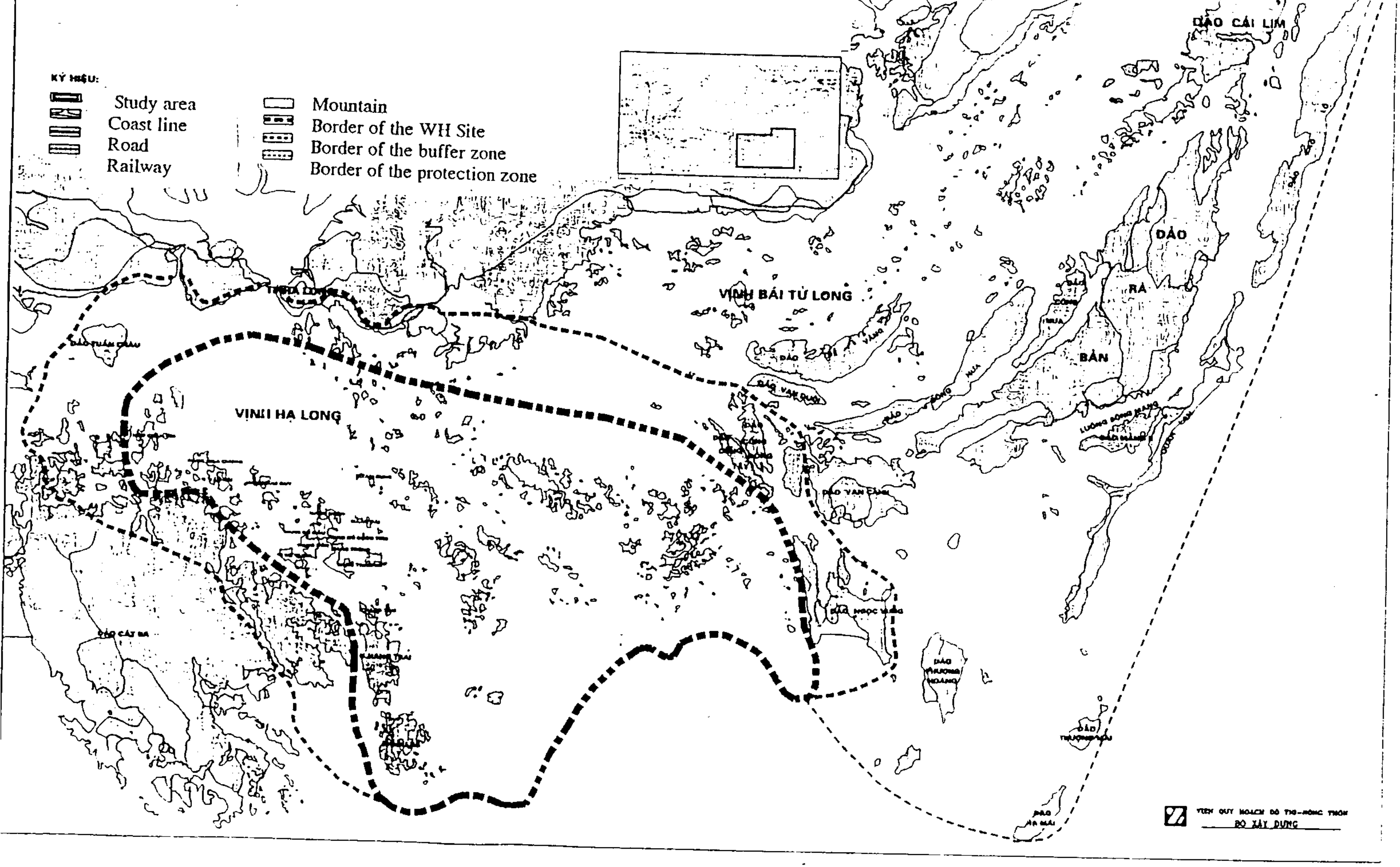


DIAGRAM TO SHOW POTENTIAL RESOURCES

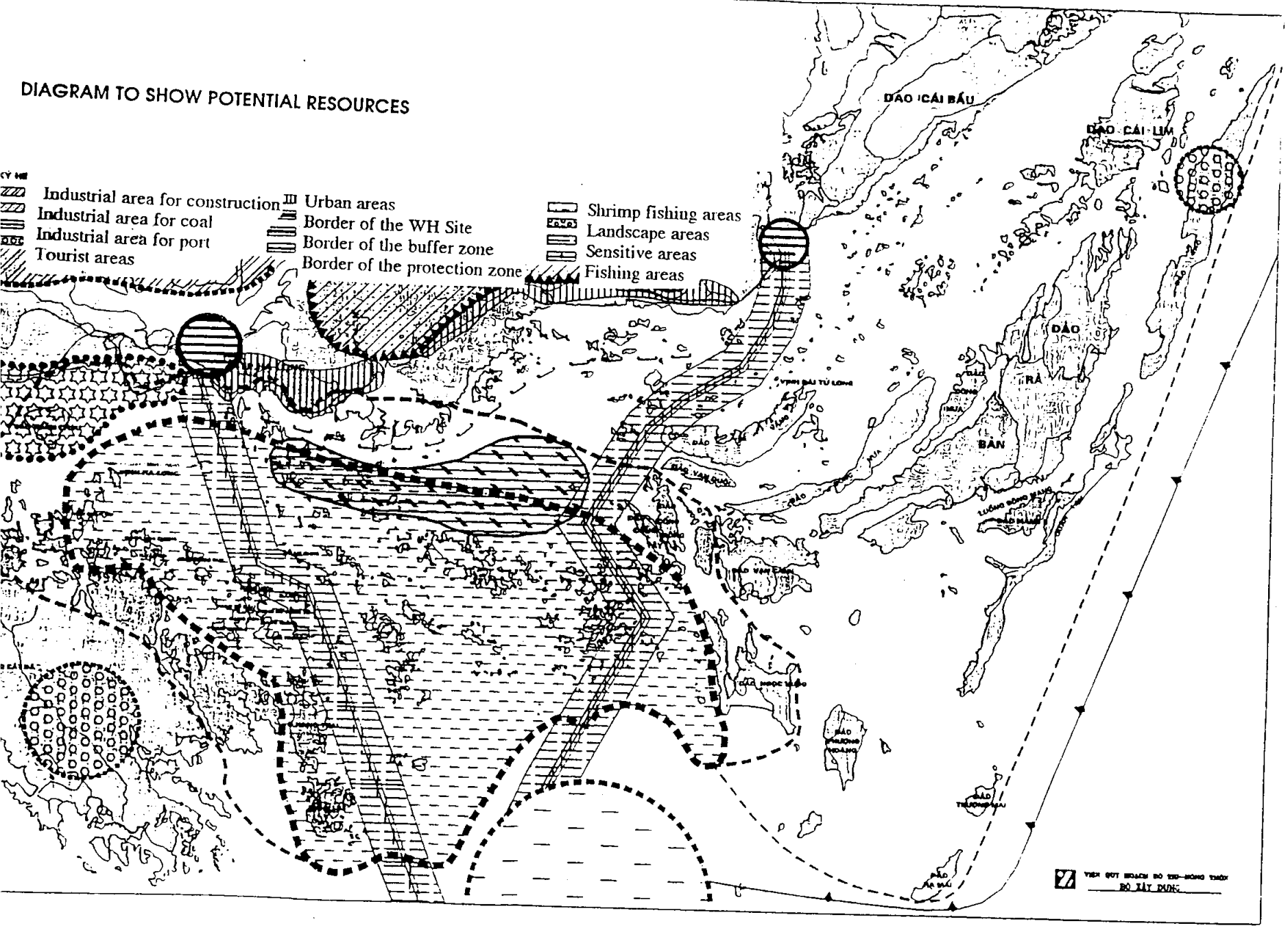
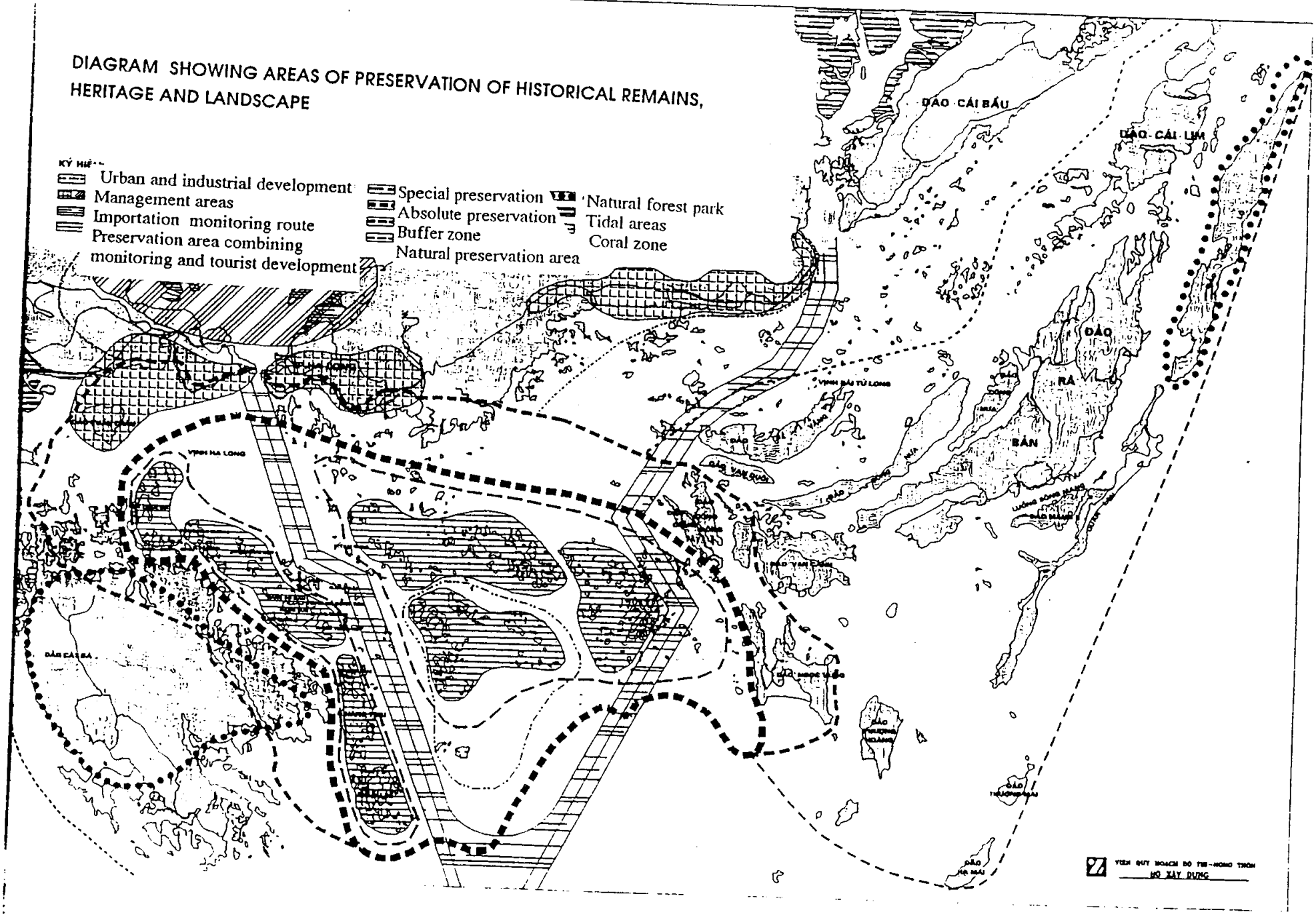
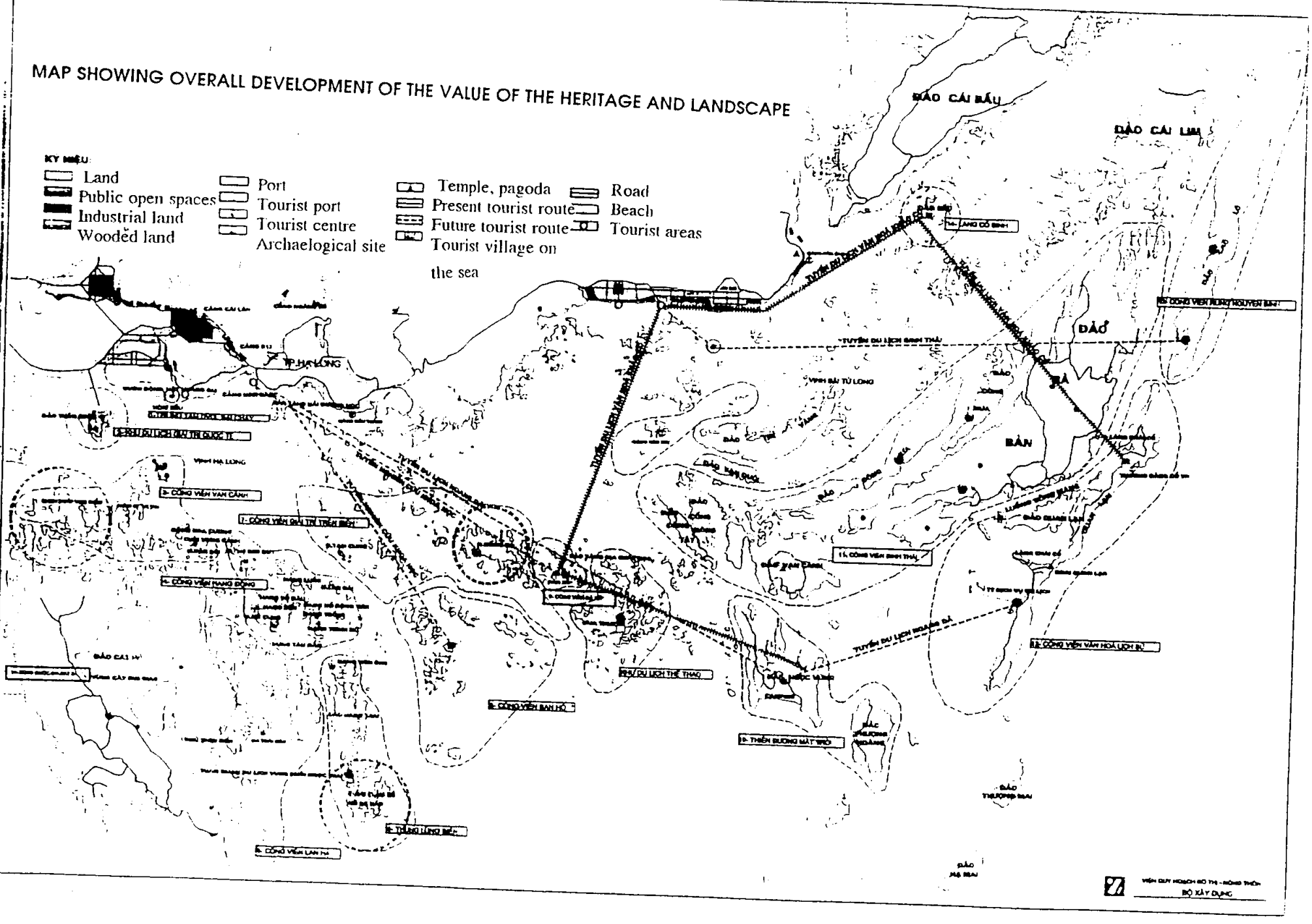


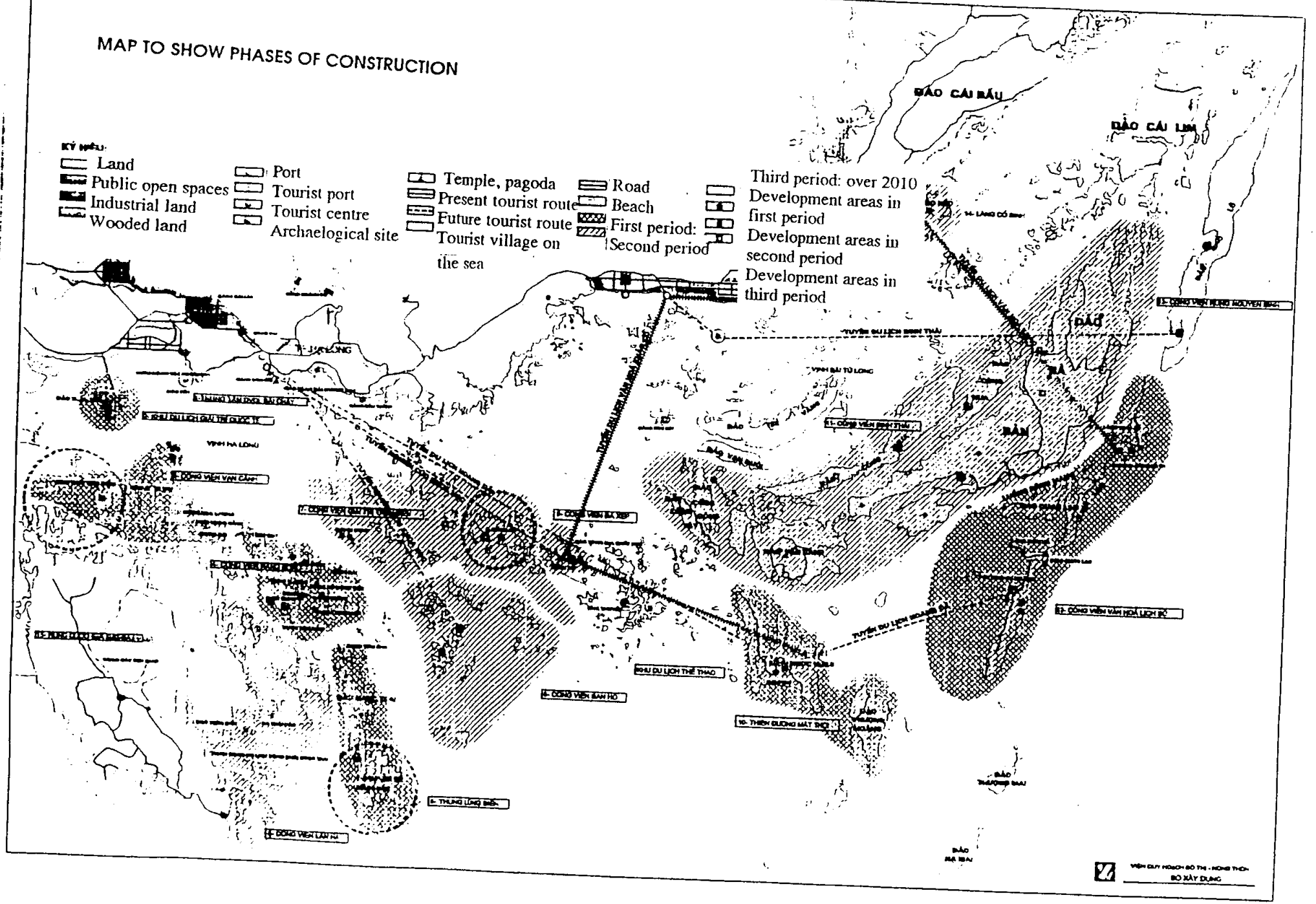
DIAGRAM SHOWING AREAS OF PRESERVATION OF HISTORICAL REMAINS, HERITAGE AND LANDSCAPE



MAP SHOWING OVERALL DEVELOPMENT OF THE VALUE OF THE HERITAGE AND LANDSCAPE



MAP TO SHOW PHASES OF CONSTRUCTION



THE QN PROVINCIAL
PEOPLE'S COMMITTEE
******

THE SOCIALIST REPUBLIC OF VIET NAM
Independence - Freedom - Happiness
----------o0o----------

No: 2796 QD/UB

Quang Ninh, December 9th, 1995.

THE DECISION OF THE PROVINCIAL PEOPLE'S COMMITTEE

"On the establishment of the Management Department of Ha Long Bay "

- Pursuant to the laws on the organization of The People's Council and The Provincial People's Committee dated June 21st 1994.

- Pursuant to the report No 797 TB/TU of The QN Provincial Standing Committee.

- Upon the proposal of The Culture and Information Department and the Provincial Personnel and Organization Department.

DECIDES

ARTICLE 1: - The setting up of **The Management Department of Ha Long Bay** which is to be directly responsible to The QN Provincial People's Committee. The head office is to be located in Ha Long City in the QN province.

ARTICLE 2: - The Management Department of Ha Long Bay is the state management body of Ha Long Bay and particularly of the important World Heritage Area as recognized by UNESCO. It is to help The Provincial People's Committee to manage Ha Long Bay in accordance with decision No 2522 QD/UB on November 4th 1995.

This department shall be responsible for carrying out scientific studies and protecting, repairing and exploiting Ha Long Bay. It will also be responsible for the management, inspection and regulation of the activities of tourist guides and excursion vessels on Ha Long Bay.

ARTICLE 3: - The Management Department of Ha Long Bay is a regulatory body, enjoying juridical status and having its own seal and account.

- The senior posts are the Head of the Department and Deputy Head of Department.

- The state budget shall pay for the members of staff and their salary fund in accordance with the plans of The Provincial People's Committee. Initially, the Head

of the Provincial Personnel and Organisation Department and the Head of the Management Department of Ha Long Bay shall be responsible for choosing a number of suitable experienced specialists from the QN Historical Relics and Landscape Department or other offices to join the Management Department of Ha Long Bay in order to commence operations on January 1st, 1996.

ARTICLE 4: - The Head of the Management Department of Ha Long Bay and the Provincial Personnel and Organisation Department are responsible for drawing up staff contracts and working regulations, which are to be submitted to the Provincial People's Committee for ratification.

ARTICLE 5: - All senior managers of the Provincial People's Committee: the Chairman of The Provincial Personnel and Organisation Department and the Culture and Information Department, the Heads of others branches, the Chairmen of the Municipal People's Committees in districts, towns and cities directly responsible to the province and the Head of the Management Department of Ha Long Bay are responsible for implementing this decision.

ON BEHALF OF
THE QN PROVINCIAL PEOPLE' S COMMITTEE
Chairman

HA VAN HIEN

THE QN PROVINCIAL
PEOPLE'S COMMITTEE
******

THE SOCIALIST REPUBLIC OF VIET NAM
Independence - Freedom - Happiness
----------o0o----------

No: 419 QD/UB

Quang Ninh, March 2nd, 1999.

THE DECISION OF THE PROVINCIAL PEOPLE'S COMMITTEE

"On the regulation of the function, tasks and organisation of the Management Department of Ha Long Bay "

THE QN PROVINCIAL PEOPLE'S COMMITTEE.

- Pursuant to the laws on the organization of The People's council and The Provincial People's committee (as revised) dated June 21st 1994.

- Pursuant to the Official Dispatch No 6166 QD/UB of The Provincial People's committee "On the establishment of The Management Department of Ha Long Bay ".

- At the proposal of The Management Department of Ha Long Bay and The provincial State Personnel and Organisation Department.

DECIDES

ARTICLE 1: - The Management Department of Ha Long Bay (HLBMD), established by The Quang Ninh Provincial Peoples Committee (QNPPC), is responsible for assisting The QNPPC in the state management, preservation, exploitation and maintenance of Ha Long Bay's assets, including the WHA World Natural Heritage Site as recognized by UNESCO as well as receiving Ministry of Culture and Information and the VN National Commission for UNESCO's directions on professional issues.

The Management Department of Ha Long Bay is responsible for the following tasks:

1. Proposing, making submissions to and giving assistance to The PPC to make regulations and organising teams, groups and individuals to implement decisions and plans, as well as management, preservation and maintenance measures concerned with Ha Long Bay's assets.

2 - Preparing development, investment, and preservation projects for submission to QN People's Committee for approval. QNPPC will entrust HLBMD to organise and monitor the implementation of specific cave restoration and renovation. projects.

3 - Establishing relationships with other related organizations to check on any activities that might affect the landscape, environment and biodiversity; implementing and enforcing regulations and detecting violations within Ha Long Bay.

4 - Establishing relationships with other organizations: the Police, Tourism, The Scientific, Technological and Environmental branch, Transport, Construction, Marine, Agriculture and Rural Development, Forestry Control, The People's committee of Van Don and Yen Hung districts, Cam Pha town and Ha Long City to establish projects and regulations and to monitor the developing manufacturing economy as well as social and transport facilities on Ha Long Bay to protect its environment and public order.

5 - Presentation and promotion of the natural and cultural assets of Ha Long Bay as well as the regulations for protection, plans, policies, management measures, preservation and the use of resources of Ha Long Bay.

Using suitable and appropraite measures to increase community awareness and improve responsible attitudes towards the protection of WHA Ha Long Bay.

6 - Making use of central and local organizations to study the scientific aspects of Ha Long Bay, making a scientific record on its natural and cultural values which will be an important basis for programme planning, implementing management and preservation measures and maintaining its assets as well as increasing promotional activities on Ha Long Bay.

7 - Selling tickets for excursions in Ha Long Bay and having effective and legitimate plans for using the full income from sales of tickets.

8 - Organizing service activities and participating in tourist transport activities on Ha Long Bay as well as providing tourist guide services.

9 - Assessing the development of economic and social projects related and directly affecting Ha Long Bay.

10- Developing the necessary organisational structure and equipment for the maintenance of the marine environment and water quality, for the protection of biodiversity and the landscape.

11- Establishing good relationships with international organisations and other countries, promoting the values of Ha Long Bay; raising staff member's skills and capacities; attracting investment from international organisations, encouraging foreigners to visit the site and making it more attractive to visitors.

ARTICLE 2: - The organizational structure of the Management department of Ha Long Bay includes:

1. The Director of the Department, and Deputy Heads of the Department.

2. The following management arrangements give assistance to the Director of the Department in implementing the state management functions:

+ Professional, promotion and tourist guide service Centre.

+ Accounting Centre.

+ Administration/Organization Centre.

+ Checking Team.

The terms and conditions of the above activities are entrusted to the Director of the Department.

3. The Management Department will direct the following operations:

a- The statutory Cave Management Team that has income from ticket sales. It was established by the Provincial People's Committee's Decision No. 3290/QD-UB December 11th, 1996.

b- The statutory professional, promotion and tourist guide service Centre has income from service activities, arranges its own budget, and has its own printed matter and accountant, managed in accordance with HLBMD's regulations.

- Title of the Team's leaders: a Head of Team and a Deputy Head of Team.

- Title of Centre's leaders: a Manager and a Vice-Manager.

ARTICLE 3: The salary norm of state staff and HLBMD's operational expenses will be entrusted by Provincial People's Committee in its annual plans.

This decision shall come in to effect from the date of signing.

ARTICLE 5: This decision shall be valid from the date of signing; previous regulations contrary to this Decision will be revoked.

All senior managers of the Provincial People's Committee; the Head of Administrative Centre, the Chairman of The Provincial Personnel and Organisation department, the Directors of the Finance and Pricing Department, the Planning and Investment Department, the Labour, War Invalids and Social Department, chairmen of the People's Committees of districts, towns and cities directly responsible to the province, the Heads of other offices concerned and the Head of the Management Department of Ha Long Bay are directed to implement this decision.

ON BEHALF OF
THE QN PROVINCIAL PEOPLE' S COMMITTEE

Chairman

HA VAN HIEN

CIRCULAR LETTER OF GUIDANCE
ABOUT THE PROTECTION OF HA LONG BAY

----------*********----------

(Ministry of Science, Technology and Environment address on 19th Dec 96)

Ha Long Bay is a well-known site in Vietnam recognised by the United Nations Education, Science and Cultural Organisation as a World Heritage Area. It has an increasing population, with rapid industrial and urban development, communications, tourism and seafood exploitation.

- According to the Environment Protection Law on 27th Sep 93; Government Decree N^0 175/CP on 18 October 1994 about the guidance concerning Environment Protection Law.

- According to Article 3 of Resolution N^0 483 TTg of the Prime Minister about Investment for Construction of Cai Lan port.

- According to the Resolution on 17 September 1994 of UNESCO which recognised Ha Long Bay as a World Heritage Area.

After agreement with the Quang Ninh People's Committee, Hai Phong People's Committee, and relevant offices of the Ministry of Science, Technical and Environment, the regulations to govern conduct to protect Ha Long Bay's environment are as follows:

I - GENERAL REGULATION:

1. This Circular Letter regulates and protects Ha Long Bay's environment by requiring action to keep the Bay zone fresh and clean, preserve its natural scenery, history and culture and prevent pollution within Ha Long Bay.

2. In this Circular Letter, Ha Long Bay includes an area of absolute protection together with a buffer zone and its surroundings:

2.1 - The absolute protection area has been zoned by UNESCO and the Government of Vietnam and has been marked by three points on Congtay Island, Daugo Island and Baham Lake.

2.2 - The buffer zone is the area surrounding the area of absolute protection to the West-North west. It has been confirmed as following the coast along to Highway 18 from the petrol store B12 (Caidam - Baichay) to milestone 11 (Campha Town). The buffer zone's width is 5 - 7 km from the Core Zone border to the sea. The North

borders the hot water spring of Hon Buom; the west is a part of Ha Long Bay and is marked by longitude 107^0 11' 30" E; the south west border with Quai Xanh island; the south marked by north latitude 204^0; the east border with Phuong Hoang island; the north east borders with Van Duoi island. The east and south east border with NatDat.

2.3 - The surrounding area is the land and sea that surrounds the buffer zone including the border area with Cat Ba National Park.

3. The environment of Ha Long Bay which has been protected in this Circular Letter includes the sea, the air above sea, the islands, sediment, ecosystems, the land and aquatic fauna and flora, historical sites and the natural scenery belonging to the Core Zone, the buffer zone and their surroundings.

4. Any group or individual involved in maritime traffic, tourism construction, mineral exploitation, fishing, aquaculture etc. within the restricted area of Ha Long Bay must comply with the environment preservation regulations in this Circular Letter.

5. The State Management Offices are responsible for implementing Ha Long Bay's environment protection regulations to the extent of their jurisdiction.

II - CONCRETE REGULATIONS:

A - The Core Zone:

6. To prohibit organisations or individuals exploiting resources and minerals, cutting trees, hunting animals on the islands and caves or changing the natural scenery.

Organisations and individuals are responsible for the absolute protection of the islands and caves, mountains, stalactites and coral. They must not write, paint, or deface, nor construct stairs or stone jetties, erect statues anywhere, dispose of, or bury, rubbish or do anything that would change the natural scenery of the caves and islands.

7. Organisations and individuals engaged in fishing or aquaculture have to observe the regulations of the Sea Products Development and Protection Law that have been passed by the State Office of Environment Protection.

8. Tourists and ship owners are not allowed to dispose of waste into The World Heritage Area. Waste must be retained on board and brought back to the mainland for disposal. The competent Offices of State Management must approve tourist activities and tourism development projects.

9. Organisations and individuals are not allowed to construct maritime transport facilities such as transit sheds, landing stages etc., or facilities for entertainment and leisure. In the Core Zone, constructions that are no longer of use, detract from the scenery or cause pollution must be removed to restore the natural environment. Any

embellishment of caves and scenery or the construction of buildings in the Core Zone for management and control purposes must be approved by the competent State Office.

Ports for tour ships visiting Ha Long Bay must comply with environmental hygiene requirements and observe the Environmental Protection Regulations.

Ports used for ships visiting Ha Long Bay and its caves must be approved to operate by the competent State Office.

Ship owners must ensure environmental hygiene by recovering and retaining waste before leaving port.

10. Any means of transport passing the Core Zone on the sea or in the air must have equipment to prevent environmental pollution, such as waste water tanks and containers for waste oil, waste water and rubbish and must ensure that this equipment is effective in preventing environmental damage caused by the disposal of waste within the Core Zone.

11. Any means of transport passing the Core Zone must observe the Navigation Law regulations that have been passed by the State Management Office for Environment Protection.

In emergencies, i.e. avoiding storms etc., ships are permitted to anchor in defined areas of the Core Zone. They must have effective safety procedures as well as plans for dealing with storms and accidents and for giving emergency aid in the event of environmental mishap.

B - The Buffer zone and the surrounding:

12. Maritime transport activities in the Buffer zone and its surrounding area must observe the Navigation Law regulations concerning the prevention of environmental pollution. Ships must anchor in specific locations and maintain environmental hygiene in those areas.

13. Any kind of metal, glass or plastic waste from maritime traffic or tourist activities must be collected and taken to the mainland for disposal. Disposal of waste water from ships in the buffer zone and its surrounding area can only be undertaken if it meets Vietnamese environmental standards.

14. Buildings and factories, new developments and extensions must be planned and assessed to prepare an evaluation of their effect upon the environment which must be reported to The State Management Office of Environmental Protection for revision in accordance with the Environment Protection Law regulations. The Government degree 175/CP on 18th October 1994 gives guidance about the implementation of the relevant Environment Protection Law.

15. Buildings and factories must have waste water purifying facilities that meet Vietnamese environmental standards to treat waste before its disposed in the buffer zone and its surroundings. Solid waste must be collected and treated as stipulated by the Environmental Protection Law.

16. Forests and mangrove forests in the buffer zone and the surrounding area must be planned and protected as stipulated by The Environmental Protection Law, Forest Protection and Development Law. Felling and replanting of forests must be carried out in accordance with correct procedures and must be authorised by the competent State Office.

17. Development, mining, manufacturing, transport and storage organisations must assess the environmental effects of their activities and report them to the State Management Office of Environment Protection for in accordance with the stipulations of The Environmental Protection Law. The Government Decree 175/ CP on 18th October 1994 gives guidance about implementing the Environmental Protection Law and associated legal documents regarding environmental protection.

Waste water from mining and coal-selecting activities must be treated to comply with Vietnamese environmental standard before disposal in the buffer zone and its surroundings. Collection and disposal of solid waste such as soil, stone, mud etc. must be in dumps which have been approved by the competent State Office as meeting Vietnamese environmental standards so that the environment or the air and water resources in the area will not be affected.

Mineral extraction works must plan, and take responsibility, for restoration of any damage caused to the environment and scenery causing by soil removal, mine backfilling or any other mineral extraction activities.

18 - Fishing and aquaculture activities must be approved by the competent State Office. Indiscriminate exploitation, or using indiscriminate means of fishing, is prohibited. The competent State Office must approve fishing and aquaculture zones.

19 - Cities and villages in the buffer zone and surroundings must comply with plans approved by the competent State Office.

Planning of, and extensions to, cities and villages must observe the regulations of The Environmental Protection Law and not cause damage to the Bay's scenery.

The waste of cities and villages must be collected and taken to dumping grounds for disposal in dumps that have been planned and designed to meet environment standards. Waste must not be discarded into the sea. Ha Long City should plan a

purification system to treat waste water before its disposal into the buffer zone and its surroundings.

Excavating soil, barrage making, banking up on coastal land for the building of houses, hotels or other constructions must observe the plans that have been approved by the competent State Office.

20 - Constructions in the buffer zone and its surroundings must follow the designs and plans that have been approved by the competent State Office. The environmental effects must be evaluated and reported to the State Management Office of Environmental Protection for revision in accordance with the Environmental Protection Law. The Government's decree 175/CP on 18th October, 1994 gives guidance about the implementation of the Environmental Protection Law and other documents relevant to environmental protection.

21 - Constructions in the buffer zone and its surroundings must be designed and planned to minimise the level of environmental damage, especially in sensitive environmental areas. After the construction is finished the owner must collect all unwanted building materials and not cause environmental pollution by disposing of them irresponsibly.

22 - Manufacturing and other establishments that are causing environment pollution by their activities must devise a method of waste treatment in accordance with the requirements of the State Management Office of Environmental Protection. If a system is not in place after the expiry of a suitable period of time, establishments may petition the competent State Office against the halting, or removal of, their operations.

23 - Marine companies and organisations must build management systems, provide waste collection facilities and a means of treating water mixed with oil from ships entering and leaving port. They must ensure procedures and equipment are in place to deal with environmental pollution incidents and with oil pollution of the harbour, coal port, fishing port and Cai Lan Port.

III - INSPECTION, RECOGNITION, CONVICTING OFFENDERS AND FINANCIAL CONTRIBUTIONS:

24 — An inspection group, or an inspector with a major environmental protection organisation, can inspect activities in the World Heritage Area, the buffer zone and its surrounding area as stipulated by the Environment Protection Law and other relevant legal documents.

Bay, and the collection of data and statistics to evaluate the value and potential of its ecosystems, resources, historical and cultural value.

The Management Department of Ha Long Bay, combined with the other offices concerned, is to organise and manage anchorages and waste collection in areas bordering the World Heritage Area and maritime transport lanes.

34 — The Environmental Bureau, Quang Ninh Science, Technology and Environment Office, the relevant offices of Ha Long City, Quang Ninh Tourism Office, The Management Department of Ha Long Bay, Hai Phong Science and Technology Office and the Office of the Environment of Cat Ba Nation Park are to combine with other offices concerned with organising the implementation of this Circular Letter.

35 - If any difficulties arise in the implementation process, they should be reported to the Science Technology and Environment Bureau for resolution.

36 - This Circular Letter comes into force 30 days after the date of signing.

Minister

The Science, Technology & Environment

THE PROVISIONAL MANAGEMENT REGULATION FOR HA LONG BAY

(To promulgate in conjunction with Decision N° 2522 dated November 4th, 1995 by The Quang Ninh Provincial People's Committee).

CHAPTER I

THE GENERAL REGULATIONS.

ARTICLE 1: This regulation stipulates the management of Ha Long Bay. It was delineated as a protected area by the Socialist Republic of Vietnam and inscribed on the World Heritage List in 1994 by UNESCO in order to protect, maintain and develop the permanent values of Ha Long Bay.

ARTICLE 2: All the terms of this regulation fully apply to everyone; any organisation or individual involved in the protection and exploitation of the bay's potential for social and economic purposes. All organisations and individuals must strictly adhere to the laws of protection of the Socialist Republic of Vietnam's historical, cultural relics and landscape, and the detailed stipulations of this Regulation.

ARTICLE 3: This Regulation entrusts the Management Department of Ha Long Bay with all necessary functions, tasks and conditions to organise and develop the state management activities on Ha Long Bay. It is also entrusted to help the Provincial People's Committee to examine and consider the implementation of the Regulation and the gradual repair and improvement of Ha Long Bay in accordance with both short and long term social - economic development strategies.

CHAPTER II

THE PROTECTION OF THE HA LONG BAY HERITAGE

ARTICLE 4: The scope of protection of Ha Long Bay

a) The absolute protection zone: (The Core Zone)

The scope has been defined and inscribed on the World Heritage List with the names as follows:

- Dau Go island in the West.

- Cong Tay island in the East.

- Ba Ham lake in the South.

b) The buffer zone of the Core Zone is defined by the Bay's shore along the highway N° 18 from the oil-gasoline storage B12 (Cai Dam - Bai Chay) to milestone 11 (Cam Pha town). It varies in width from about 5 - 7 km to about 1 — 2km from the Core Zone's boundary.

c) On the map, the remainder of the buffer zone is defined as follows:

- A section of the western part of the Bay which has previously been designated a protected area by The Socialist Republic of Viet Nam (SRV).

- The South West is the part which is adjoins the Pacific Ocean.

- The whole of the Eastern section has been designated a protected area by SRV (Bai Tu Long).

The area of the buffer zone (The National Protection area) is 1,200 km^2.

ARTICLE 5: The protective terms:

a) For the core zone, any damaging activities are strictly forbidden, such as the destruction or private ownership of the landscape causing losses to the natural assets of Ha Long Bay. Any form of damage to the islands, mountains or caves and grottos are strictly prohibited. Any acts of tree cutting, the hunting of animals or birds, the stealing of ornamental trees or stalactites etc. on the rocks, mountains or grottos, or the exploitation of material on Ha Long Bay are banned. Also prohibited are any acts of using explosives or other means of catching sea products that might damage the environment, and opening ports or building stores, houses, dwellings tombstones, pagodas or temples etc. without regulation in the Ha Long area.

Any acts of writing or drawing, or building stone steps or banks that may change the natural scenery of Ha Long Bay are absolutely banned. Moreover, strictly prohibited are any religious activities, such as the erection of statues or altars that may cause the environmental pollution of the grottos, rocks, mountains or beaches, and ill-mannered and impolite behaviour on excursions or in the beauty spots on the Bay.

The establishment of ship yards, unlawful anchorages, the grounding of vessels for self-repair at random along the seashore are strictly banned. Within the Core Zone of the Bay, ships and boats are only permitted to drop anchor or to load commodities in the proper places.

For all construction projects or social cultural and economic development projects (such as maritime communication, trading ports, sea product cultivation, tourist services etc.) within the scope of the Core Zone of Ha Long Bay, approval is absolutely necessary. The Management Department of Ha Long Bay must approve the investor when setting up the technical and economic aspects of the development and must have the permission of a competent body before drawing up projects.

The guesthouses of any economic sectors within Bai Chay and Hong Gai and their neighbouring areas are not allowed to causing pollution by discharging sewage waste into Ha Long Bay. All ships and boats travelling on the Bay must comply with environmental protection measures. They must have waste storage facilities to ensure that waste is disposed of in the right place and must inform everyone about the protection and management regulations of Ha Long Bay.

b) For the buffer zone of the Core Zone.

Any economic construction projects (state or private), civil projects, houses of inhabitants, bases of tourist, cultural and sporting services (such as beaches, guest houses, tourist ports, pleasure craft, swimming spot) that operate in the buffer zone need to take technical measures to treat waste and reduce pollution that could directly or indirectly influence the ecological and environmental balance of the Bay area. Any construction work in this area must follow an appropriate architectural design to improve the aesthetic value of Ha Long Bay.

Any unregulated actions of house construction, erecting tombstones or illegal provision of private tourist services at any grottos or on islands and mountains within the buffer zone are strictly prohibited.

Any major economic or industrial construction project within the buffer zone (such as ports, store houses, loading yards, factories, floating hotels etc.) which may have a direct effect on the Core Zone of Ha Long Bay must be approved by the appropriate authorities and be in accordance with the overall scheme. It must also include measures to preserve environmental and natural sights.

c) For the remaining buffer zone (National Protection Zone). The Management Department of Ha Long Bay should co-ordinate with the local authorities and relevant branches to implement these measures of management and protection in accordance with the decrees and regulations on protection and preservation of the natural beauty and relics under the current laws of the SRV.

ARTICLE 6: Preservation responsibility - violating settlements.

a) The Provincial Management Department is a state management body which is permanently responsible for co-ordinating with other relevant departments and local authorities to enforce these regulations to control, discover and settle violations that could cause direct or indirect losses to heritage values.

b) The Municipal People's Committee of Ha Long City, districts, towns and other Information and Cultural branches, Communication Transport, Tourism, Port-supplying services, Construction, Science, Technology and Environment as well as the protective law bodies of the province shall be responsible for closely co-ordinating to carry out the management of all the following aspects effectively: social security,

cultural and tourist management activities, marine transport safety and environmental protection on Ha Long Bay.

c) In the event of the environmental assets of Ha Long Bay being threatened by the influence of nature or man, which may change the structure, variety, cause pollution or an imbalance in its ecology, etc., The Management Department of Ha Long Bay shall be responsible for preventing harm and alerting the authoritative bodies in order to enable them to take appropriate measures to limit losses to the site.

d) Any acts of organisations or individuals in Viet Nam or abroad causing direct or indirect losses to the natural assets of Ha Long Bay will be punished by fine or imprisonment and must pay compensation for material losses, depending on the level of violation.

CHAPTER III

PROVISIONS ON THE PRESERVATION OF HERITAGE AND THEIR INTRODUCTION

ARTICLE 7: The responsibility of The Management Department of Ha Long Bay.

a) To co-ordinate with other specialist branches to create an overall plan for the protection and improvement of the wonder of Ha Long Bay, and to implement a programme of inspection and evaluation to define its natural assets.

b) To initiate the development and realisation of the necessary measures to manage and protect Ha Long Bay after the competent bodies have approved these.

c) To introduce an extensive programme of promotion and publicity in the home country and abroad about the beauty of Ha Long and to ensure that this Management Regulation is widely distributed.

CHAPTER IV

UTILIZATION AND EXPLOITATION

ARTICLE 8: Excursions and tourist activities in Ha Long Bay: Any organisations and individuals exploiting the potential of Ha Long Bay must comply with all conditions according to the regulation and to be approved by the competent body.

a) It is necessary to pay fees to visit Ha Long Bay. The fee level is determined by The Provincial People's Committee on the basis of proposals of the Financial and Pricing Department and The Management Department of Ha Long Bay.

b) The Management Department of Ha Long Bay shall be responsible for the collection of the excursion fee. It should also co-ordinate with the Financial and Pricing Department, Quang Ninh Tax Bureau, The Tourism Company, The Culture and Information Department to develop management methods and present proposals to The Provincial People's Committee to enable it to make decisions.

c) The excursion fee resources collected in Ha Long Bay should paid in to the state budget and will be reinvested in annually approved plans.

ARTICLE 9:

a) Any business organisations that have been permitted to provide services for tourists at locations in Ha Long Bay must fully comply with the regulations on management and protection of the Heritage area. Any organisations or individuals collecting excursion or entry fees from tourists at grottos, mountains and beaches in Ha Long Bay without the permission of a competent body is strictly prohibited.

b) The Management Department of Ha Long Bay shall be mainly responsible for inspecting and supervising all activities of any tourist service organisation in the Heritage area. It is responsible for the detection of violations and either their referral to a higher authority or their resolution according to current laws and to publish the determinations widely to the general public.

ARTICLE 10:

All means of sea transport as well as ships and boats taking customers to visit Ha Long Bay must guarantee full technical standards of marine transport safety, risk insurance, and the means of communication according to the laws of Marine Transport, Tourism, Culture, Science and Technology and Environment Departments, as well as properly implementing the tourist transport fees.

ARTICLE 11:

Any domestic or foreign offices, social-economic organisations, organisations or individuals wishing to arrange cultural, artistic or sporting activities in Ha Long Bay must have the permission of The Management Department of Ha Long Bay.

CHAPTER V

IMPLEMENTATION PROVISIONS

ARTICLE 12:

1 - Any domestic or foreign organisations such as: collectives, offices, units, enterprises or individuals earning their living, which operate for the economy and to provide social activities, entertainment, excursions, etc. in the Ha Long Bay area must have a high regard for compliance with The Management Regulations of Ha Long Bay. If any organisations or individuals violate the above terms they will be punished according to current laws, depending on the nature of the offence.

Any offices, units, or individuals that have contributed to the protection and management of Ha Long Bay will be commended and rewarded according to the state regulations.

2 - All previous provisions contrary to this regulation will be revoked. This regulation has effect from the date of signing. In the implementation process, any

unsuitable provisions can be adjusted, amended and corrected by The Provincial People's Committee.

Chairman of The Quang Ninh

Provincial People's Committee.

HA VAN HIEN

REGULATION STIPULATING PENALTIES FOR VIOLATIONS OF THE LAW OF ENVIRONMENTAL PROTECTION

Decision No: 26/CD, April 26th, 1996. (extract)

CHAPTER I

General Regulation.

Article 1. Principles of penalties for violations of the Law of Environmental Protection.

1) Any violation, or accidental violation, of the State Management Regulations (hereinafter called violations of the Law of Environmental Protection) by organisations, Government Departments or individuals which have not previously been subject to the courts under Vietnamese law, will henceforth be liable to prosecution and possible financial penalty.

2) Organisations and individuals violating the Law of Environmental Protection will henceforth be liable to prosecution and possible financial penalty as regulated by this Decision.

3) Foreign organisations or individuals violating the Law of Environmental Protection in the territory of the Socialist Government of Viet Nam, or its economic zones or territorial waters, and are not subject to other international conventions, will henceforth be liable to prosecution and possible financial penalty.

4) A single violation the Law of Environmental Protection will only be subject to a single penalty at any one time.

A single individual who violates the Law of Environmental Protection on more than one occasion will be subject to a penalty for each offence.

Members of a group which violates the Law of Environmental Protection will each be subject to an individual penalty.

CHAPTER II

Administration and levels of penalties for violations of the Law of Environmental Protection.

Article 7: Violation of the law of protection of bio-diversity and the preservation of nature.

1. A fine of between 500,000 VND and 1,500,000 VND will be levied in the case of one of the following violations:

a) The exploitation of marine resources out of season, or outside stipulated areas, or by using indiscriminate tools and/or equipment, thereby causing damage to bio-diversity;

b) Utilisation or exploitation of the natural preservation area without the permission of the authorised agency(ies);

c) Utilisation or exploitation of the natural preservation area without written authorisation.

2. A fine of between 2,000,000 VND and 6,000,000 VND will be levied in the case of one of the following violations:

a) The exploitation of marine resources causing damage to bio-diversity or imbalance to the eco-system or similar repeated offences;

b) Utilisation or exploitation of the natural preservation area without written authorisation or failing to comply with the conditions of authorisation or similar repeated offences.

3. A fine of between 20,000,000 VND and 30,000,000 VND will be levied for violations stipulated in paragraph 2. of this Article in cases where the level of violation is more serious.

4. Additional, or other, penalties to be levied for violations stipulated in this Article will be as follows:

a) Confiscation of illegally acquired materials or products, or tools and/or equipment used in the course of their illegal exploitation as stipulated in paragraphs 1. and 2. of this Article;

b) Suspension of authorisation for a period of six months for violations as stipulated in paragraphs 1. c) and 2. b) of this Article.

Article 12: Environmental protection offences committed in the course of exploration or drilling for, or exploitation or transport of oil.

1. A fine of between 2,000,000 VND and 8,000,000 VND will be levied in the case of one of the following violations:

a) Failing to take adequate precautions to prevent oil spillage, fire and/or explosion, or oil overflow.

b) Failing to provide adequate equipment to prevent oil spillage, fire and/or explosion, or oil overflow.

3. A fine of between 30,000,000 VND and 50,000,000 VND will be levied in the case of causing oil spillage, fire and/or explosion, or oil overflow.

4. A fine of between 50,000,000 VND and 100,000,000 VND will be levied for violations as stipulated in paragraph 1. a) and paragraph 2 of this Article in cases where the level of violation is more serious.

5. Additional, or other, penalties to be levied for violations stipulated in this Article will be as follows:

Enforcement of the regulations regarding violations of the regulations as stipulated in paragraphs 1. and 2. of this Article.

Enforcement of the application of measures to remedy and pay compensation for damage arising from violations as stipulated in paragraph 3. of this Article.

Article 15. Violations committed during the handling or transporting of waste water and rubbish.

1. A caution or a fine of between 100,000 VND and 500,000 VND will be levied in the case of one of the following violations:

a) Failing to transport rubbish or other environmental pollutants in accordance with the regulations on environmental protection:

b) Failing to treat rubbish and waste products before discharge into the environment in accordance with the regulations on environmental protection.

2. A fine of between 500,000 VND and 2,000,000 VND will be levied for a repeated violation as stipulated in paragraph 1. a) of this Article.

3. A fine of between 2,000,000 VND and 8,000,000 VND will be levied for violations as stipulated in paragraph 1. b) of this Article in cases where the level of violation is more serious.

4. Additional, or other, penalties to be levied for violations stipulated in this Article will be as follows:

a) Suspension of environmental authorisation for a period of six months for violations as stipulated in paragraphs 1. and 2. of this Article.

b) Enforcement of cessation of the violation and the application of measures to remedy, and pay compensation for, damage arising from violations as stipulated in paragraphs 1., 2. and 3. of this Article.

For, and on behalf of, the Government,

Prime Minister,

Signed: Vo Van Kiet.

WORLD HERITAGE RENOMINATION – IUCN TECHNICAL EVALUATION

HA LONG BAY (VIETNAM)

1. DOCUMENTATION

i) **IUCN/WCMC Data Sheet:** (2 references).

ii) **Additional Literature Consulted:** Nguyen Thi Son. 1997. **How can Tourism and National Parks Exist Symbiotically? Cat Ba Island, Vietnam**; Tran Duc Thanh. 1998. **Geological History of Ha Long Bay**; Vermeulen, J. and T. Whitten. 1998. **Land and Freshwater Molluscs of the karst regions ENE of Haiphong and the Cuc Phong National Park, northern Vietnam**. unpublished report; Vermeulen, J. and T. Whitten. 1999. **Biodiversity and Cultural Property in the Management of Limestone Resources**; Vietnam National Commission for UNESCO. 2000. **Draft feasibility report for a project to develop Ha Long Bay as an ecomuseum**; Waltham, T. 1998. **Limestone Karst of Ha Long Bay, Vietnam, Engineering Geology Report**; Watson, J. *et. al.* 1997. **Guidelines for Cave and Karst Protection**, IUCN.

iii) **Consultations:** 3 external reviewers, Senior officers of UNESCO (Vietnam), Vietnam National Committee for UNESCO, Department of Conservation and Museology, Fauna and Flora International, World Bank, and Quang Ninh Provincial People's Committee. Park staff and Senior Officials from the Management Department of Ha Long Bay.

iv) **Field Visit:** Elery Hamilton-Smith, March, 2000. Field visits prior to initial listing in 1994: Jim Thorsell, March/April 1993, and Jacques Lecoup, November, 1994.

2. SUMMARY OF NATURAL VALUES

Ha Long Bay is located within the Quang Ninh Province of Vietnam. Situated in the Gulf of Tonkin the site includes some 1600 islands and islets forming a spectacular seascape of limestone pillars. Because of their precipitous nature, most of the islands are uninhabited and relatively unaffected by human influence.

In recognition of its remarkable scenic quality, Ha Long Bay was inscribed as a natural World Heritage site in 1994 under criterion (iii). The inscribed site covers an area of 434sq. kms and this renomination seeks to have the current World Heritage site inscribed under criterion (i) in addition to the existing listing under criterion (iii).

The values of Ha Long Bay, which resulted in its 1994 inscription under criterion (iii), are well documented and will not be elaborated here.

The geomorphology of Ha Long Bay is known as a drowned karst landscape due to the exceptional combination of its limestone karst features which have been subject to repeated regression and transgression of the sea over geological time. The limestones of Ha Long Bay have been eroded into a mature landscape of fengcong (clusters of conical peaks) and fenglin (isolated tower features) karst features, modified by sea invasion at a later stage.

The smaller islands are fenglin towers of 50m to 100m high with height to width ratios up to about 6. Many have vertical walls on all or most sides and these continue to evolve by rock falls and large slab failures. The larger islands contain the conical hills of fengcong karst, the summits of which average 100m above sea level with some exceeding 200m.

Marine invasion of Ha Long Bay has added an extra element to the normal process of lateral undercutting of the limestone towers and islands. The most conspicuous feature being the main notch cut into the entire rocky coastline. Notches are a feature of limestone cliffs worldwide, but those of Ha Long Bay are exceptionally well developed and, at many sites, extend into arches and caves. This process of undercutting and subsequent erosion

maintain the steep faces of the fenglin karst towers and thereby perpetuates the spectacular nature of the landscape.

A distinctive feature of Ha Long Bay is the abundance of lakes within the larger limestone islands: Dau Be Island, for example, has six enclosed lakes.

Extensive limestone caves represent another important feature of Ha Long Bay, with three main types able to be identified: old phreatic caves formed below the water table of the time; old karstic foot caves formed by lateral undercutting of cliffs at base level; and marine notch caves formed at sea level where rock structures are powerfully eroded and eventually reduced to a wave cut platform.

In summary, Ha Long Bay possesses a tremendous diversity of caves and other landforms which derive from the unusual geomorphological process of marine invaded tower karst. These areas provide a unique and extensive reservoir of data for the future understanding of geoclimatic history and the nature of karst processes in a complex environment.

3. COMPARISON WITH OTHER AREAS

The geomorphological values of Ha Long Bay are the key values to be compared with other sites in assessing the merits of this renomination under criterion (i).

The eastern Adriatic, Greek and Aegean coasts of Turkey provide other outstanding examples of tower karst although not of drowned tower karst, which is a style of karst landscape found mainly in the tropics and subtropics.

Ha Long Bay in not unique in SE Asia for being a drowned tower karst – other sites where such a phenomenon occurs include the Mergui archipelago off the Andaman coast of Burma; in northern Malaysia (notably Langkawi); in Thailand at Koh Maeku in Ang Thong National Park, and Changwat Surat Thani and, most impressively, in the area of Phangnga and Ao Luk on the Andaman coast of peninsular Thailand. Other karst areas include Ninh Binh in Vietnam, Yangshou and Wulingyuan in China, however, the great extent of the Ha Long Bay tower karst and the richness of its forms (both current and 'fossil' forms) set it apart from all comparable areas of drowned tower karst in SE Asia.

Apart from Ha Long Bay there are no equivalent sites on the World Heritage List, either in terms of steep tower karst in general or drowned tower karst in particular.

In summary Ha Long Bay is considered one of the most extensive and best-developed areas of tower karst in the world. What distinguishes this site from others is the process of marine invasion and, whilst the phenomenon of drowned tropical tower karst is known elsewhere in the world, Ha Long Bay provides by far the best example in the world.

4. INTEGRITY

The Bureau's attention is drawn to the State of Conservation (SOC) Report submitted by IUCN to the World Heritage Centre which reports on a range of integrity issues for the Ha Long Bay World Heritage site.

Systematic management of the area has been instituted only since inscription as a World Heritage site and, while progress has been made, there is a continuing task to improve the integrity and quality of the environment. While the marine environment faces continuing challenges addressed in the SOC Report, the site's scenic features, geomorphology and cultural heritage are all relatively intact. Although some minor threats to the quality of the area exist at present, including problems of littering, these do not prejudice the inscription of the site on the basis of its geological values.

Protective legislation at both national and provincial levels is adequate and will be further strengthened by the new national legislation for protection of natural and cultural heritage which is currently being prepared. However, legislation relating to development projects is not so clear and a number of proposed new developments could jeopardise long-term integrity of the site.

In addition, there are significant problems occurring below sea level. These have damaging geomorphic impacts, including the deposition of silt and other solid waste, pollution of the water and the introduction of invasive species.

Cat Ba Island and the islands of Bai Tu Long Bay provide extensive opportunities for the progressive expansion of the tourism industry and the necessary development of the aquaculture industry. Thus, with the current boundaries, these areas not only provide a buffer zone for the World Heritage area, but serve valuable complementary functions in their own right. There has been considerable research, policy development and action aimed at developing an appropriate balance between conservation and development throughout the region as a whole. Accordingly, the relevant government authorities may care to investigate and consider the potential value of seeking biosphere reserve status for the whole of the defined National Protection Area.

The renomination site meets all related "conditions of integrity" as described in the Operational Guidelines paragraph 44(b).

5. OTHER COMMENTS

The quality of tourism management is steadily improving. In particular, the sensitivity, aesthetic quality and attention to public safety of infrastructure such as pathways, steps and board walks is of a high standard. Every effort is being made to ensure that tourism is in keeping with the primary mandate for conservation.

The proposed recognition of the geomorphic values at World Heritage level should imply the highest standard of management and presentation of the site to visitors. Consistent with this a programme of measures to increase the understanding and appreciation of geomorphological processes and the management requirements for karst landforms should be put in place. There is also a clear need to build the capacity of staff in relation to cave and karst interpretation.

6. APPLICATION OF WORLD HERITAGE CRITERIA

This site was renominated under criterion (i). It has already been inscribed on the World Heritage List under criterion (iii).

The comparative assessment shows that Ha Long Bay is the most extensive and best example of marine invaded tower karst known and one of the most important areas of fengcong and fenglin karst in the world.

Although the site contains geomorphological features duplicated elsewhere, it demonstrates these better than any other area in the world. Furthermore, its size and area provide sufficient integrity for these large scale geomorphic processes to operate unhindered. Although the site has a long history of human use, it is not seriously degraded and retains a high level of naturalness. Finally, the site exhibits a wide range of diversity of natural features.

Ha Long Bay is considered to possess outstanding universal value as the most complete and extensive example of its type in the world.

7. RECOMMENDATION

The Bureau recommended to the Committee that Ha Long Bay be **inscribed** on the World Heritage List under natural criterion (i) in addition to the site's existing 1994 listing under criterion (iii). The Bureau noted that the site is the most extensive and best known example of marine invaded tower karst and one of the most important areas of fengcong and fenglin karst in the world. The size of the area provides sufficient integrity for these large-scale geomorphic processes to operate unhindered.

The Bureau commended the Ha Long Bay Management Department on the improvement in management of the renominated area.

The Bureau encouraged the State Party to expedite a programme to increase visitor understanding of cave and karst geomorphological processes and to improve staff capacity in these areas.

Map 1: Location Map – Ha Long Bay

Map 2: Site Map – Ha Long Bay

CANDIDATURE AU PATRIMOINE MONDIAL - ÉVALUATION TECHNIQUE UICN

BAIE D'HA LONG (VIET NAM)

1. DOCUMENTATION

i) **Fiches techniques UICN/WCMC** (2 références)

ii) **Littérature consultée:** Nguyen Thi Son. 1997. **How can Tourism and National Parks Exist Symbiotically? Cat Ba Island, Vietnam**; Tran Duc Thanh. 1998. **Geological History of Ha Long Bay**; Vermeulen, J. and T. Whitten. 1998. **Land and Freshwater Molluscs of the karst regions ENE of Haiphong and the Cuc Phong National Park, northern Vietnam**. unpublished report; Vermeulen, J. and T. Whitten. 1999. **Biodiversity and Cultural Property in the Management of Limestone Resources**; Vietnam National Commission for UNESCO. 2000. **Draft feasibility report for a project to develop Ha Long Bay as an ecomuseum**; Waltham, T. 1998. **Limestone Karst of Ha Long Bay, Vietnam, Engineering Geology Report**; Watson, J. *et. al.* 1997. **Guidelines for Cave and Karst Protection**, IUCN.

iii) **Consultations:** 3 évaluateurs indépendants, hauts fonctionnaires de l'UNESCO (Viet Nam); Comité national du Viet Nam pour l'UNESCO, Département de conservation et de muséologie, Fauna and Flora International, Banque mondiale, et Comité populaire de la province de Quang Ninh. Personnel du parc et hauts fonctionnaires du Département de gestion de la baie d'Ha Long.

iv) **Visite du site:** Elery Hamilton-Smith, mars 2000. Visites du site avant l'inscription, en 1994: Jim Thorsell, mars-avril 1993; Jacques Lecoup, novembre 1994.

2. RÉSUMÉ DES CARACTÉRISTIQUES NATURELLES

La baie d'Ha Long est située dans le golfe du Tonkin, dans la province de Quang Ninh, au Viet Nam et comprend quelque 1600 îles et îlots qui forment un paysage marin spectaculaire de piliers calcaires. En raison de leur relief escarpé, la plupart des îles sont inhabitées et relativement non perturbées par les activités humaines.

La baie d'Ha Long a été inscrite en 1994 sur la Liste du patrimoine mondial pour ses qualités panoramiques remarquables, en vertu du critère naturel (iii). Le site inscrit couvre une superficie de 434 km^2 et la présente proposition vise à l'inscrire au titre du critère (i) également.

Les caractéristiques de la baie d'Ha Long qui ont justifié l'inscription du site, en 1994, au titre du critère (iii), sont bien documentées et ne feront donc pas l'objet d'une nouvelle description.

La baie d'Ha Long présente un paysage karstique immergé résultant de l'association exceptionnelle d'éléments karstiques soumis, au cours des temps géologiques, aux mouvements répétés de régression et de progression de la mer. L'érosion a sculpté les roches calcaires de la baie d'Ha Long et a créé un paysage de reliefs karstiques appelés «fengcong» (groupes de pitons de forme conique) et «fenglin» (tourelles isolées), parvenu au terme de leur développement et que la mer a modifiés par la suite en les recouvrant.

Les plus petites îles sont des fenglin atteignant 50 à 100 m de haut (une hauteur jusqu'à six fois supérieure à leur largeur). Bon nombre d'entre elles ont des parois verticales sur tous les côtés ou presque, et continuent de se transformer sous l'effet des chutes de pierres et de gros blocs. Les plus grandes îles présentent des pitons coniques de karst à fengcong, dont les sommets se trouvent, en moyenne, à 100 m au-dessus du niveau de la mer et parfois à plus de 200 m.

La mer, en envahissant la baie d'Ha Long a eu un autre effet important venu s'ajouter au processus normal d'affouillement latéral des tourelles et des îles calcaires. L'encoche principale creusée sur toute la longueur du littoral rocheux en est l'expression la plus remarquable. Les encoches sont communes aux falaises calcaires du monde entier, mais celles de la baie d'Ha Long sont exceptionnellement prononcées et, en bien des endroits, forment des arches et des

grottes. Le processus d'affouillement puis d'érosion conserve aux tourelles karstiques leurs parois abruptes et, de ce fait, perpétue la nature spectaculaire du paysage.

La baie d'Ha Long se distingue notamment par l'abondance de lacs sur les grandes îles calcaires: l'île de Dau Be, par exemple, possède six lacs fermés.

Les nombreuses grottes calcaires sont une autre caractéristique importante de la baie d'Ha Long. Elles se divisent en trois grands types: les grottes phréatiques anciennes, formées sous la nappe phréatique de l'époque; les grottes karstiques anciennes formées au pied des falaises par l'affouillement latéral; et les encoches marines formées au niveau de la mer, par un processus puissant d'érosion de la paroi rocheuse réduite finalement à une plate forme sculptée par les vagues.

En résumé, on trouve dans la baie d'Ha Long une diversité formidable de grottes et autres formes de relief qui résultent du processus géomorphologique inhabituel de karst à tourelles envahi par la mer. Ce site constitue un réservoir vaste et exceptionnel de données qui serviront à mieux comprendre l'histoire géoclimatique et la nature des phénomènes karstiques dans un environnement complexe.

3. COMPARAISON AVEC D'AUTRES AIRES PROTÉGÉES

Pour évaluer la pertinence de cette nouvelle proposition d'inscription au titre du critère (i), il convient de comparer les caractéristiques géomorphologiques de la baie d'Ha Long avec celles d'autres sites.

La côte orientale de la mer Adriatique, les côtes de Grèce et la côte turque de la mer Égée offrent d'autres exemples saisissants de karst à tourelles mais non de karst à tourelles immergé qui est un type de paysage surtout caractéristique des régions tropicales et subtropicales.

Le karst à tourelles immergé de la baie d'Ha Long n'est pas unique en Asie du Sud-Est: le phénomène se produit aussi, par exemple, dans l'archipel de Mergui (Myanmar), face aux îles Andaman; dans le nord de la Malaisie (particulièrement Langkawi); en Thaïlande, à Kok Maeku dans le Parc national Ang Thong, et à Changwat Surat Thani et surtout dans la région de Phang Nga et d'Ao Luk - le site le plus impressionnant -, sur la côte thaïlandaise de la mer d'Andaman. Au nombre des autres régions karstiques figurent aussi Ninh Binh, au Viet Nam, ainsi que Yangshou et Wulingyuan, en Chine. Toutefois, l'étendue du karst à tourelles de la baie d'Ha Long et la richesse de ses formes (autant les formes actuelles que les formes «fossiles») confèrent au site une place à part parmi toutes les régions comparables de karst à tourelles immergé d'Asie du Sud-Est.

Outre la baie d'Ha Long, aucun autre site comparable ne figure sur la Liste du patrimoine mondial, qu'il s'agisse en général de karst à tourelles escarpées ou, plus particulièrement, de karst à tourelles immergé.

En résumé, la baie d'Ha Long est considérée comme l'une des régions de karst à tourelles les plus vastes et les mieux développées au monde. Ce qui distingue ce site des autres est le processus d'envahissement par la mer et, si le phénomène de karst tropical à tourelles immergé n'est pas réservé à la baie d'Ha Long, celle-ci en est, de loin, le meilleur exemple au monde.

4. INTÉGRITÉ

Le Bureau est invité à prêter attention au Rapport sur l'état de conservation présenté par l'UICN au Centre du patrimoine mondial, qui fait état de plusieurs questions relatives à l'intégrité du Bien du patrimoine mondial de la baie d'Ha Long.

Ce n'est que depuis l'inscription de la baie d'Ha Long sur la Liste du patrimoine mondial que ce site fait l'objet d'une gestion systématique et malgré les progrès accomplis, des améliorations au chapitre de l'intégrité et de la qualité de l'environnement sont encore souhaitables. Le milieu marin fait face à de constants défis relatés dans le rapport sur l'état de conservation. En revanche, les qualités panoramiques du bien, de même que la géomorphologie et les valeurs de patrimoine culturel sont relativement intactes. Certes, quelques menaces d'importance mineure pèsent sur la qualité de la région, entre autres des problèmes de gestion des déchets, mais ces menaces ne remettent pas en question l'inscription du site sur la base de sa valeur géologique.

La législation sur la protection du site, aux niveaux national et provincial, est adéquate et sera encore renforcée par une nouvelle loi nationale sur la protection du patrimoine naturel et culturel, qui est en cours d'élaboration. Cependant, la

législation sur les projets de développement n'est pas tout à fait claire, si bien qu'un certain nombre de nouveaux projets de développement pourraient compromettre l'intégrité du site à long terme.

En outre, au-dessous du niveau de la mer, de graves problèmes se posent qui ont des effets délétères sur la géomorphologie: dépôts de sédiments et autres déchets solides, pollution de l'eau et introduction d'espèces envahissantes.

L'île de Cat Ba et les îles de la baie de Bai Tu Long offrent des possibilités considérables d'expansion progressive de l'industrie du tourisme et de développement nécessaire de l'aquaculture. Ainsi, étant donné les limites actuelles du site, ces régions constituent non seulement une zone tampon pour le bien du patrimoine mondial, mais remplissent des fonctions complémentaires. Des travaux de recherche importants ont été menés, des politiques élaborées et des mesures prises pour assurer un équilibre adéquat entre la conservation et le développement de la région dans son entier. En conséquence, les autorités publiques compétentes souhaiteront peut-être examiner la possibilité d'obtenir le statut de réserve de biosphère pour l'ensemble de l'Aire protégée nationale définie.

Le site proposé pour une nouvelle inscription remplit toutes les «conditions d'intégrité» décrites au paragraphe 44 b) des Orientations.

5. AUTRES COMMENTAIRES

La qualité de la gestion du tourisme connaît une amélioration continue. En particulier, la sensibilité, la qualité esthétique et l'attention accordée à la sécurité du public dans les infrastructures telles que les sentiers, les escaliers et les chemins de bois répondent à des normes élevées. Aucun effort n'est épargné pour faire en sorte que les activités touristiques restent en harmonie avec les objectifs primordiaux de conservation du site.

Si les qualités géomorphologiques du site sont reconnues pour leur valeur de patrimoine mondial, cette reconnaissance devrait s'accompagner des normes les plus élevées en matière de gestion et de présentation du site aux visiteurs. Un programme conséquent de mesures visant à améliorer la compréhension et l'appréciation des processus géomorphologiques ainsi que la gestion des reliefs karstiques devra être mis en place. Il est aussi manifestement nécessaire de renforcer les capacités du personnel en ce qui concerne l'interprétation des grottes et des caractéristiques karstiques.

6. APPLICATION DES CRITÈRES DU PATRIMOINE MONDIAL

Ce bien fait l'objet d'une nouvelle proposition d'inscription au titre du critère (i). Il est déjà inscrit sur la Liste du patrimoine mondial en vertu du critère (iii).

L'évaluation comparative montre que la baie d'Ha Long est le meilleur exemple connu et le plus étendu de karst à tourelles envahi par la mer, de même que l'un des sites les plus importants au monde de karst à fengcong et à fenglin.

Bien que les caractéristiques géomorphologiques du site se retrouvent ailleurs dans le monde, c'est dans la baie d'Ha Long qu'elles sont le mieux mises en lumière. De plus, la superficie et l'emplacement du bien permettent une intégrité telle que ces processus géomorphologiques à grande échelle peuvent s'y poursuivre sans entrave. En dépit d'une longue histoire d'utilisation par l'homme, cette région n'a pas été gravement dégradée et conserve, en grande partie, ses qualités naturelles. Enfin, la baie d'Ha Long présente un vaste éventail de caractéristiques naturelles.

Il est considéré que la baie d'Ha Long possède une valeur universelle exceptionnelle, car c'est l'exemple le plus complet du genre et le plus vaste au monde.

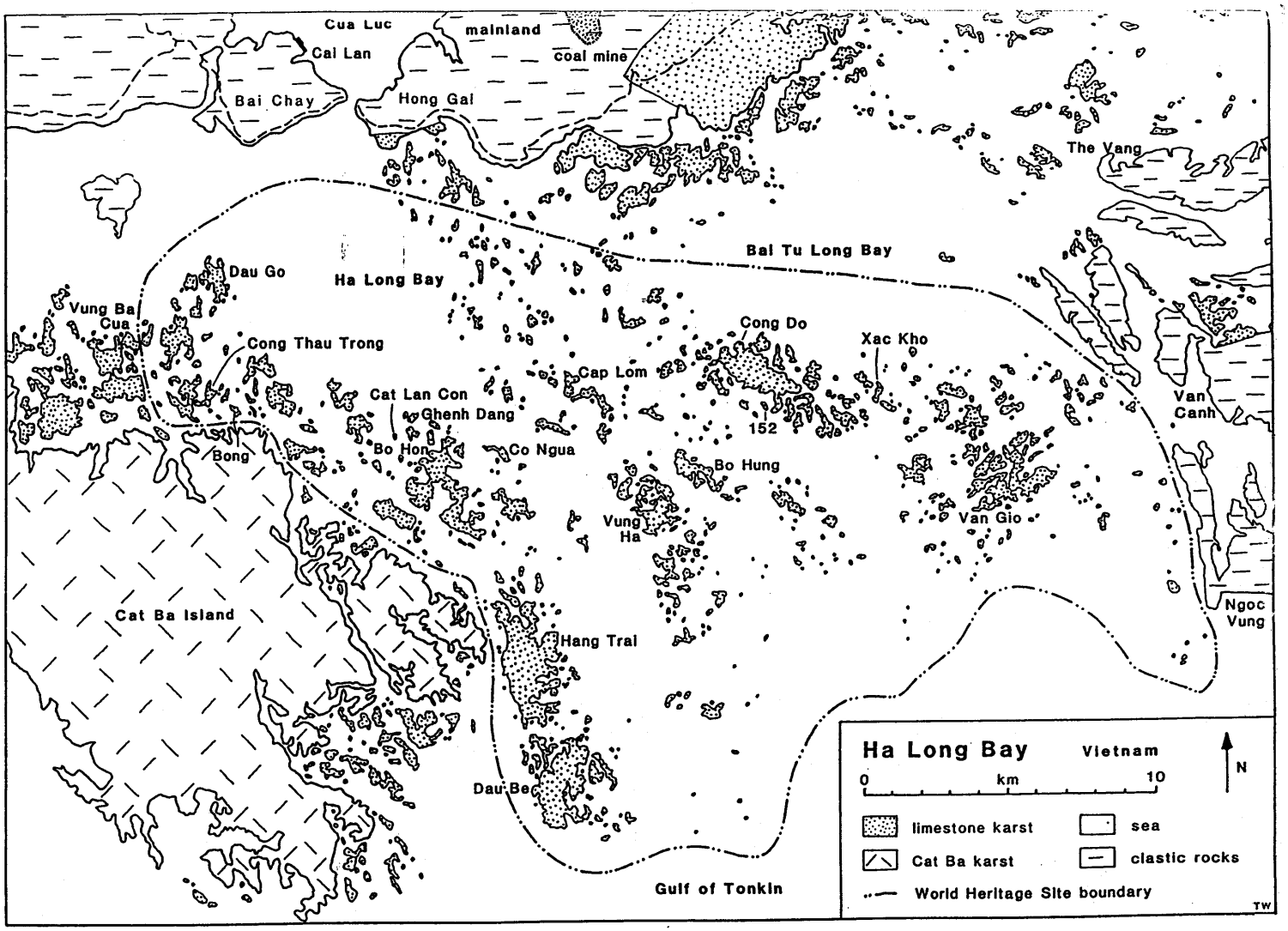
7. RECOMMANDATION

Le Bureau recommande au Comité **d'inscrire** la baie d'Ha Long sur la Liste du patrimoine mondial au titre du critère naturel (i) en plus de son inscription, effective depuis 1994, au titre du critère (iii). Le Bureau a noté que la baie d'Ha Long est le meilleur exemple connu et le plus étendu de karst à tourelles envahi par la mer, de même que l'un des sites les plus importants au monde de karst à fengcong et à fenglin. La superficie du bien permettent une intégrité telle que ces processus géomorphologiques à grande échelle peuvent s'y poursuivre sans entrave.

Le Bureau félicite les autorités responsables de la gestion de la baie d'Ha Long pour l'amélioration notable de la gestion du bien faisant l'objet de cette nouvelle proposition.

Le Bureau encourage l'État partie à accélérer la mise en place d'un programme pour expliquer aux visiteurs les processus géomorphologiques du karst et des grottes et renforcer les capacités du personnel dans ces domaines.

Carte 1: Localisation – Baie d'Ha Long



Carte 2: Carte du site – Baie d'Ha Long