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**INDONESIAN
RHINO
CONSERVATION
STRATEGY**

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Directorate General of Forest Protection and Nature Conservation (PHPA), Ministry of Forestry, Indonesia
Gedung Manggala Wanabakti, Jl. Gatot Subroto,
Jakarta 10270, INDONESIA.
Tel/Fax 62-021-5734818

Indonesian Rhino Foundation (Yayasan Mitra Rhino)
Jl. Ir. H. Juanda 15, Bogor, INDONESIA
Fax 62-0251-313985

IUCN - World Conservation Union, Species Survival Commission (Asian Rhino Specialist Group).
Rue Mauverney 28, CH-1196 Gland,
SWITZERLAND.
Tel 41-229990001, Fax 41-229990002

World Wide Fund for Nature (WWF), Indonesia Programme.
Jl. Pela 3, Gandaria Utara, PO Box 29 JKSKM,
Jakarta Selatan, INDONESIA.
Tel 62-021-7203095. Fax 62-021-7395907, Telex
46243 PACTOK IA

Editorial committee: Nico van Strien (Editor); Abdul Bari; Jim Doherty; Frans van Dongen; Tom Foose; Steve Hage; Chris Hails; Mohd Khan; Sukianto Lusli; George Rabb; Widodo Sukohadi Ramono; John Sale; Charles Santiapillai; Effendy Sumardja; Sutisna Wartaputra; Chris Wemmer.

Final editing: Sutisna Wartaputra; Komar Sumarna; Widodo Sukohadi Ramono; Hadi S. Alikodra; Haerudin R. Sadjudin; Marcellus Adi C.T.R.; Nico van Strien.



DEPARTEMEN KEHUTANAN
DIREKTORAT JENDERAL PERLINDUNGAN HUTAN
DAN PELESTARIAN ALAM

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Dalam rangka melaksanakan konservasi badak di Indonesia maka "INDONESIAN RHINO CONSERVATION STRATEGY" yang disusun oleh Direktorat Jenderal Perlindungan Hutan dan Pelestarian Alam bekerja sama dengan IUCN, WWF dan Yayasan Mitra Rhino dapat dijadikan acuan untuk konservasi badak di Indonesia.

Demikian surat pengesahan ini dibuat untuk dipergunakan seperlunya.

Jakarta, 26 Mei 1993



Direktur Jenderal Perlindungan
Hutan dan Pelestarian Alam

[Handwritten Signature]
Ir. Sutisna Wartaputra
NIP. 080013257



MINISTRY OF FORESTRY
DIRECTORATE GENERAL OF FOREST PROTECTION
AND NATURE CONSERVATION

LETTER OF ENDORSEMENT

NUMBER: 1503/DJ-VI/PA/93

In order to implement the conservation of the rhinoceros in Indonesia, the "INDONESIAN RHINO CONSERVATION STRATEGY" which was developed by the Directorate General of Forest Protection and Nature Conservation in cooperation with IUCN, WWF and the Indonesian Rhino Foundation (YMR), is to be used as a model for the conservation of rhinoceros in Indonesia.

This letter of endorsement can be used as needed.



Jakarta, 26 Mei 1993

Sutisna
Ir. Sutisna Wartaputra
Director General of Forest
Protection and Nature Conservation
Ministry of Forestry RI.

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INTRODUCTION

Indonesia covers only 1,3 percent of the Earth's land surface, yet it harbours 10 percent of all flowering plants, 12 percent of the world's mammals, 16 percent of the world's reptiles and amphibians, 17 percent of all birds and more than a quarter of all marine and freshwater fish.

This richness can be attributed to the fact that Indonesia spans two major biogeographical realms, Indomalaya and Australia and can be divided into seven distinct biogeographic regions. The 17,000 islands of the archipelago support a wide range and variety of habitats from lowland rain forests and mangroves to savanna grasslands, swamp forests, limestone hills, montane forests, alpine meadows and snow-topped mountains. These varied habitats support a rich flora and fauna.

These habitats and species are now threatened by developments in logging, mining, shifting agriculture and other changing land uses as Indonesia's economy expands to meet the needs of its increasing population. Lowland habitats and wetlands are particularly threatened since these are the areas most accessible for agricultural developments.

Recognizing the need to conserve its rich biological resources, the government of Indonesia has made a commitment to protect 10 percent of the land area and eventually 20 million hectares of coastal and marine habitats as conservation areas. Although in-situ conservation must be the first priority, the protected area network alone will not be sufficient to secure all of Indonesia's biodiversity for future generations.

The Biodiversity Action Plan for Indonesia sets out a strategy for action under four main headings : in-situ conservation in terrestrial parks and protected areas; in-situ conservation outside the protected area network (production forests, wetlands, agricultural lands); in-situ conservation of coastal and marine resources; and ex-situ conservation.

Much loss of biodiversity in Indonesia, as elsewhere, is due to economic policy distortions that encourage rapid exploitation of biological resources rather than sustainable use. Slowing the rate of biodiversity loss will require policy and institutional reform as well as institutional strengthening for effective action in all four areas.

The active participation and support of local communities will also be essential for in-situ conservation for they are the de facto managers of forest, wetland and marine resources. The plan calls for greater collaboration between government agencies and local communities and NGOs to work together as partners in biodiversity conservation.

Two endangered species of Indonesian rhinos, the Javan Rhino (*Rhinoceros sondaicus* Desmarest, 1822) and the Sumatran Rhino (*Dicerorhinus sumatrensis* Fischer, 1814) are recognized as "key species" in biodiversity conservation. Their conservation will help to protect other wildlife and a range of habitats in lowland to montane areas in Java, Sumatra

and Kalimantan. The Javan Rhino is of particular significance, because the sole surviving population is the "flag ship" of the Ujung Kulon National Park.

The government of Indonesia is signatory to the Convention on Biological Diversity and the Convention on Trade in Endangered Species of Fauna and Flora (CITES). The Indonesian Rhino Conservation Strategy was developed by the national conservation authority of the Republic of Indonesia, the Directorate General of Forest Protection and Nature Conservation (PHPA) in the Ministry of Forestry. It is based on the Action Plan of the Asian Rhino Specialist Group of the IUCN-The World Conservation Union.

The Action Plan and Conservation Strategy have been recommended and endorsed by the government of Indonesia, the IUCN, and the World Wide Fund for Nature (WWF). The Indonesian Rhino Conservation Strategy will also contribute significantly to the high priority placed on rhino conservation by the United Nations Environment Programme and CITES. It outlines immediate and attainable priorities for conservation action and suggestions for further studies on policy and funding mechanism to strengthen the Indonesian Rhino Conservation Strategy.

BACKGROUND

As recognized by the recent UNEP/CITES initiatives and the intensifying IUCN and WWF programs, there is a global crisis for the conservation of rhinos. All five species are threatened with extinction.

Fewer than 12,000 rhino of all kinds survive on the planet. The situation is even more severe when it is observed that half (6,000) of these 12,000 rhino are of the Southern White Rhino (*Ceratotherium simum simum*), which is currently the most secure, but still very vulnerable, species.

Recently, the decline has been most spectacular for the African Black Rhino (*Diceros bicornis*), whose population (now 2,500) has decreased 95 % in the last 20 and perhaps 30 % in the last 3 years. It is fortunate that relatively secure and reproductively prosperous nuclei of both Black and White Rhino exist in a few sanctuaries in Africa and in captivity outside Africa.

In comparison, the two species of South East Asian Rhino (*Dicerorhinus sumatrensis*) the Sumatran Rhino, and (*Rhinoceros sondaicus*) the Javan Rhino, are the rarest of rhinos and among the most threatened mammals in the world. Fewer than 1,000 Sumatran Rhino survive, distributed over at least 35 localities in Indonesia and Malaysia. Fewer than 100 Javan rhino exist, mostly in a single protected area in Indonesia (Ujung Kulon National Park) with a remnant population recently rediscovered in Vietnam.

Both the Javan Rhino and the Sumatran Rhino are threatened with extinction, in Indonesia and world wide. The current populations are small, scattered and most are threatened by illegal hunting and loss of habitat. Even without any further losses, the present populations are so small that they are vulnerable to environment catastrophes and demographic and genetic flaws typical of small populations.

The Javan Rhino formerly occurred through most of South-East Asia, but has disappeared from almost all of its former range in Assam, Burma (Myanmar), Thailand, Malaysia and Sumatra, and is currently restricted to Java, with scattered populations still surviving in Cambodia, Laos and Vietnam. The cause of decline is mainly attributable to the excessive demand for rhino horn and other rhino products for Chinese and allied medicinal practices.

The animals on Java are restricted to the Ujung Kulon National Park, where, as a result of strict protection, the population increased from about 25 animals in 1967 to about 50 in 1993. The status of the species in the Indochinese countries is not yet adequately known.

The Sumatran Rhino occurs more widely than the Javan Rhino, in highly scattered and fragmented populations. Little is known about the current status of the population restricted to northern Burma. Most animals probably occur in Sumatra and peninsular Malaysia. On Sumatra there are perhaps a few hundred animals, with viable populations possibly surviving in Gunung Leuser, Kerinci Seblat, North Aceh (Gunung Abongabong and Lesten-

III. AIMS

To meet the objective, the strategy aims at establishing large and safe populations of both species throughout their natural range.

To establish such populations the following actions have to be considered:

- (1) Rigorous protection of existing wild rhino populations and their natural habitat,
- (2) Expansion of existing wild populations, by natural population growth and, where appropriate, with animals translocated from elsewhere,
- (3) Re-establishing rhino populations in suitable areas within the natural range with animals derived from the wild or from captive stock.
- (4) Strengthening of captive breeding programmes to develop into a significant source of animals for re-introductions,
- (5) Strengthening of the general conservation base through public awareness and education in combination with good legislation and strict enforcement by a dedicated force.
- (6) Acquisition of the knowledge needed for monitoring, management and preservation of rhino populations and their habitat,
- (7) Providing training for those involved in development and implementation of the programmes.

A. Preservation of large wild populations.

Small and isolated populations are very vulnerable to accidental loss or poaching, to localized catastrophes like floods, fires, cyclones, and they can also suffer declining vigour or vitality through steady loss of genetic diversity.

To maintain adaptability, resilience and genetic vitality, a minimum population of 100 to 500 animals, depending on the reproductive pattern of the species, is necessary for survival of the population for 10 or more generations, or, in the case of the Rhino, for the next century. In all the main areas of the species natural range in Indonesia, i.e. Java and Sumatra for the Javan Rhino and Sumatra and Borneo for the Sumatran Rhino, populations of at least several hundreds of animals must be maintained.

Currently all existing populations, with the possible exception of the Sumatran Rhino in Kerinci Seblat, are far below this minimum level.

It should be stressed that the figures given above are minimum requirements, only providing for the preservation of the steady state. For survival and development of the species over an evolutionary significant timescale, and for further evolution of rhino lineages, entirely different conditions will be necessary in the more distant future.

B. Expansion of existing wild populations.

Large herbivores, such as Rhinos, living in a habitat that has abundant, but low-grade and very diverse fodder, must be able to utilize a large area throughout their lifetime. Also their social life and behavioural patterns lead to wide spacing of individual animals over large areas. Each rhino therefore needs 5 to 10 square kilometres or more of natural tropical forest, depending mainly on the nature of the terrain.

The possibilities for the expansion of the existing populations to the levels required for continued survival depends primarily on the amount of habitat available. Some conservation areas, like Gunung Leuser and Kerinci Seblat, are large enough to have rhino populations of the required size. In these areas, good protection of the rhinos against poaching will allow the population to expand naturally. The process could be speeded up by the release of rhinos from elsewhere in parts of these reserves where rhino have been exterminated.

In other areas, such as Ujung Kulon and Barisan Selatan, the available safe habitat is more limited and consequently the rhino populations these areas can support will be of limited size. In such areas any further loss of habitat should be prevented. In some areas additional land could be added to increase the size, or the habitat could be manipulated so that more rhinos could be supported.

In some areas the rhino population and the amount of available habitat are so small that there is no realistic hope for continued survival in that particular place. Such animals could be used to supplement other populations, in the wild or in captivity.

C. Re-introduction within the natural range.

Where rhinos have been exterminated from large areas of their natural range, as is the case with the Javan rhino in Sumatra and through most of mainland Southeast Asia, and with the Sumatran rhino in Kalimantan and throughout the mainland, except Malaysia and possibly Myanmar, re-introduction could be attempted. For the Javan rhino this is the only way that could lead to a significant expansion of the world population, because the possibilities for expansion in Ujung Kulon are very limited.

Re-introduction can be useful for strengthening previously depleted populations and for the re-establishment of rhinos in areas where they are exterminated.

Re-introduction has to be very carefully planned to maximize the chances for success, because, aside from the considerable costs involved, it is not without risks for the animals involved and will always entail a loss of animals from the parent population. Only animals that are in a hopeless situation and cannot be conserved in the wild, or animals from healthy and safe populations that are able to sustain the loss of a number of animals, should be used for re-introduction programmes. In the future progeny from captive breeding programmes could also be used.

D. Captive breeding programmes.

Captive breeding programmes, if successful, should be a source of animals for supplementation or re-introduction programmes, and would provide a last resort refuge for the species should conservation in the wild fail. Considering the long time span needed for such programmes to produce tangible results and the possible difficulties of re-introducing captive-born rhinos to the conditions of life in the wild, captive breeding programmes can only be supplementary to other rhino conservation programmes.

A captive breeding programme provides a sensible destination for animals that cannot be saved in their original homes or that cannot be moved to a safer place. Such animals would be lost for the world population anyway.

E. Public awareness and law enforcement.

Conservation of nature cannot be successful without understanding of the need for, and the acceptance of the costs of, conservation at all levels of the society. But awareness and understanding alone are not sufficient. Good and fair conservation legislation, a proper demarcation of the boundaries of land set aside for nature, and a dedicated, well-trained and well-equipped force to serve the common interest, are equally important.

Public awareness and understanding should be developed through a variety of formal and informal education programmes, but an earnest, professional force that carries out the government's programmes with zeal and dedication will also have a significant, beneficial impact on public opinion.

For rhinos, which are not only suffering a loss of living space, but which are also threatened by trade in their horns and other parts, general conservation enforcement will have to be supplemented by special programmes to curtail the trade in rhino products and to provide specific protection in the field.

F. Research and training.

Wildlife management programmes should be based on accurate data on the composition of the populations and on a good understanding of the species' biology and their roles in the natural ecosystem. Therefore research on the rhinos' ecology and behaviour in the wild, and regular surveys to monitor the status of the rhino populations, are of utmost importance for the success of all other programmes.

Monitoring of rhino populations should be an ongoing process and it will be necessary to improve monitoring techniques, both for specific scientific purposes and for the regular and continuous monitoring of the rhino populations. Recruitment of an adequate number of

suitable personnel and training in surveying techniques and appropriate census methods will be needed.

Research on rhino reproduction, genetics and physiology carried out on the captive population will deepen our understanding of rhinos, their role in the forest ecosystem, and will aid in developing proper husbandry techniques. Exchange of expertise in these fields is important for all involved.

IV. PRIORITIES

A. Short-term.

- (1) Maintain and protect the Indonesian Rhino sanctuaries (in-situ conservation).
- (2) Develop and establish a specialist task force within PHPA (Indonesian Rhino Unit).
- (3) Start a public education and awareness programme aimed at all levels of the society.
- (4) Strengthen efforts to stop the illegal trade in rhino products.
- (5) Reinforce the captive breeding population of Sumatran Rhino.

B. Long-term.

- (1) Expand the number of Indonesian Rhino populations and sanctuaries through translocation and re-introduction.
- (2) Develop and use captive breeding populations for re-introduction and as an insurance (ex-situ conservation).
- (3) Provide knowledgeable, well-trained personnel to manage and protect rhino populations.

ACTION PLANS

The recommendations are expressed in Action Plans that provide both a review and specific prescriptions for action.

The Action Plans presented below are based on the draft Indonesian Conservation Strategy and on the recommendations made during the Workshop on Indonesian Rhino Conservation, Bogor, 3-5 Oct 1991.

For practical reasons separate, but overlapping, Action Plans for the two species are presented.

On the basis of these Action Plans, Five-year Development and Investment Plans for the conservation of the Javan and the Sumatran Rhino should be developed.

It is essential that these Action Plans receive the maximum possible financial and practical support from the Indonesian Government and from international conservation and development assistance agencies.

JAVAN RHINO ACTION PLAN

I. CONSERVATION OF THE JAVAN RHINO IN UJUNG KULON

The Ujung Kulon National Park is the only place, except for a small population just outside the Nam Bai Cat Tien National Park in Vietnam, where the Javan Rhino is known to survive. The Ujung Kulon peninsula is a long established conservation area and its topography makes protection of the rhinos comparatively easy. The area is too small for a large population of Javan rhinos and it cannot be expanded.

Since it is the only source of animals for the establishment of other populations, protection of this unique resource has the highest priority. Immediate actions should be directed towards achieving the best possible protection for this population.

A. Strengthening of Park management and administration unit.

It is recommended that the management structure of the Park be re-examined and that a strategic planning exercise be carried out to ensure the effective deployment of staff. Special attention should be paid to:

- (1) The location of the Park Headquarters.
- (2) Implementation of activities in the Park.
- (3) Time demands on the Park Superintendent.
- (4) The need for an Operations Manager.

B. Park protection and intensive patrolling.

A good patrolling system to prevent poaching and to monitor the rhino population should be developed. Guards should be trained in monitoring techniques.

C. Law enforcement.

Regulations should be amended or developed to empower Park guards to enforce the law when apprehending offenders. Serious consideration should be given to provision of fire arms to make this possible. The establishment of an efficient communications network both within the park and its head office, and between head office and Jakarta, is essential for good and efficient management of the Park.

H. Research programme for Ujung Kulon.

1. Population survey and trend of Javan Rhino in Ujung Kulon National Park.

For the future management of the Javan rhino population in Ujung Kulon and for the preparation for the translocation of rhinos from Ujung Kulon it is of vital importance to know the composition of the rhino population and to be able to monitor the population trend.

Before any translocation programme can commence the current status of the Ujung Kulon rhino population must be known. Current data on the rhino population in Ujung Kulon are not sufficiently accurate and consistent to form a basis for an evaluation of the effects of removal of rhinos for a translocation programme.

Therefore the new survey technique being carried out in Ujung Kulon with automatic photo registration should be continued and expanded, until a satisfactory result has been obtained. The current census programme could be speeded up and refined by the use of more equipment and by using other census techniques in conjunction with the photo registration¹.

For the continuity of the population monitoring a standardized census should be done yearly by the Park Staff. The census techniques to be used should be simple, accurate and consistent, aiming at continuity of existing methods to enable long-term comparison of data, while incorporating new techniques to improve accuracy with time.

Guards should be trained to carry out the censuses and staff at Headquarters should be trained in the evaluation of the results.

2. Research on biology and ecology of Javan Rhino in Ujung Kulon.

Research on the ecology of the Javan rhino will provide the baseline information for management decisions and for the preparation of the education and awareness programmes. It will also enhance the profile, credibility and importance of the Park.

Based on a thorough review of available information and identification of needs, baseline studies on the Javan Rhino and its habitats should be undertaken to give a comprehensive picture of the ecology of the species. The following is a non-exclusive list of some priorities :

(1) Habitat preferences and carrying capacity.

¹ The photo registration programme has recently been completed and the results have been communicated to PHPA.

- (2) Feeding studies (available resources and opportunities for supplementation of preferred habitat).
- (3) Population structure and dynamics.
- (4) Competition and social interactions.
- (5) Sociobiology (daily range through radio-tracking, effective sex-ratio, breeding behaviour, etc.).
- (6) Monitoring the distribution of vegetation types and changes over time.
- (7) Studies on other important plant and animal species.
- (8) Study of the competitive interactions (if any) between the Javan Rhino and the banteng.

The mechanism for this research should be a Rhino Research Coordination Desk, established as part of the Rhino Unit based in PHPA, which would draw upon personnel and expertise both from Indonesia and from overseas. One of the tasks of such a desk could be the production of a comprehensive annual report on research activities in Ujung Kulon and in other rhino areas, in conjunction with the education and awareness programme.

For aspects of Javan Rhino biology relevant to Population Viability Analysis (PVA) see appendix 2

II. TRANSLOCATION OF JAVAN RHINO TO ESTABLISH A SECOND POPULATION

The recommendations are based on PHPA's decision that the first additional population will be established through translocation to a secure natural habitat within the species' former range.

No analysis has been carried out of the relative merits of captive breeding versus translocation as the optimum means for establishing the second Javan Rhino population (see the 1989 PVA report).

A. Preconditions.

These preconditions relate to information required before making a final decision to proceed with a translocation programme. They refer to the situation in the source site, as well as those in the receiving site.

Both the receiving site and source population should be fully secured as National Parks with well established boundaries. Specifically, Way Kambas should be legally gazetted as a National Park. Park staff should receive adequate resources to carry out their duties.

The behaviour, diet and habitat of the Javan Rhino in Ujung Kulon, and the habitat in the proposed release site should be studied in depth before any rhinos are moved.

Genetic management of the translocated population should be planned carefully to ensure that sufficient founders are represented (if necessary through staggered releases).

1. Source population - Ujung Kulon.

A thorough investigation into the source population's size and structure, the habitat and food sources of the rhinos, based on a literature review and field surveys, and an evaluation of the potential risks of removal of animals should precede any translocation operation. The research should be supervised by an expert panel and be completed as soon as possible. For details see appendix 3.

The expert panel should also consider the recommend number of rhinos, specified to gender and age, that should remain in UK to ensure the survival there.

2. Potential areas for translocation.

Potential areas for the first translocated population and other sites for subsequent translocation were evaluated according to criteria of suitability and security. For details see appendix 4

In comparison to the other sites reviewed, Way Kambas emerged as the best site for the first translocation. Way Kambas has the potential to hold more rhinos than Ujung Kulon, is relatively accessible for transporting rhinos, and its current level of protection and potential for future improvements are better than any of the other sites. Barisan Selatan, Berbak, and Seberida were considered as possible sites for re-introductions in the future.

Based on the information available Way Kambas is the best site for the first translocation of Javan rhinos, pending the results of necessary feasibility studies. It is recommended that steps be taken immediately to prepare Way Kambas as a potential site for translocation. These include a detailed study of the suitability of Way Kambas and a survey of for evidence of an existing Sumatran rhino population.

3. Feasibility study on suitability of habitat at re-introduction area/site.

Suitability of an area for re-introduction of Javan rhinos should be evaluated in a feasibility study. The feasibility study should investigate the suitability of the area both from a biological and a managerial perspective. The area should not only be able to provide sufficient food, water, wallows, etc for a large population of rhinos, but it should also have management structures that ensure the safety of the rhinos and their habitat.

A list of requirements for a release area is provided in appendix 5

4. Develop the management structures for a second population.

Increased protection should be put in place for Way Kambas as a matter of priority on the basis of a well developed coherent management plan that included buffer zone development.

Increased protection should begin for other potential re-introduction sites, particularly Berbak and Barisan Selatan, and surveys should be carried out to assess the possible survival of Javan rhinos in these and other areas on Sumatra.

B. Javan Rhino capture management programme.

Translocation and re-introduction of rhinos is a costly and risky undertaking. The entire capture and translocation operation needs to be supervised by the most experienced personnel.

Once the preconditions for the extraction from the source population have been met and the preparations needed for the release have been done, a capture programme can be started. Capture should be selective, to attain a balanced sex-ratio in the founder population and to avoid the unnecessary harassment of unsuitable animals. Unwanted animals should be equipped with telemetry devices and be released immediately at the capture site.

The animals that are to be moved should be closely supervised by experienced personnel and all necessary personnel and equipment should be available at all times. The animals should be carefully conditioned before being transported and the duration of the transport should be as short as possible. In the receiving site appropriate enclosures and all necessary personnel and equipment should be prepared beforehand.

Animals should only be released after a sufficient acclimatization in the new area and they should be closely monitored by radiotelemetry after release.

It should be noted that acclimatization hasn't proven necessary in the Nepalese translocation of Indian rhinos. A long period of acclimatization would require more expenses and personnel and would have a taming effect on the rhinos, making them more vulnerable for poaching. It is probably best to keep the period between capture and release as short as possible, to avoid complicating situations. Information on the behaviour of the rhinos during capture, transport and after release in the Nepalese translocation would be very useful to decide on the best strategy.

For detailed recommendations see appendix 6

SUMATRAN RHINO ACTION PLAN

I. IN-SITU CONSERVATION OF SUMATRAN RHINO

The Sumatran rhino survives in Sumatra in a few viable, though depleted, populations in relatively secure habitats in conservation areas. There are also small scattered populations in other areas of Sumatra and possibly Kalimantan.

The priorities are primarily the protection of the larger wild populations to enable natural recovery and expansion of range. The smaller populations should be dealt with varying to circumstances. Some could be given increased protection in the wild, others could be utilized in translocation and captive breeding programmes.

A. Protection of large populations of wild rhino in natural habitat.

The recommended populations as specified in the 1989 IUCN/SSC Asian Rhino Action Plan are realistic and form the basis for the ensuing recommendations. The recommended objectives are for 700-1000 rhinos in Sumatra and in Kalimantan, with at least three populations in Sumatra of more than 100 animals, and possibly at least one large population in Kalimantan.

In Sumatra large wild populations are currently known or inferred in:

- (1) Kerinci - Seblat National Park (no comprehensive census done).
- (2) Gunung Leuser National Park (well-known and being monitored).
- (3) Barisan Selatan National Park (no comprehensive census done).

In Kalimantan the presence of Sumatran rhino needs confirmation, but potential rhino areas are:

- (4) Kayang Mentarang.
- (5) Ulu Sembakung.

For the protection of large wild populations these areas should receive highest priority, but other areas that are potentially suitable for populations of 100 animals or more should also be protected.

Coordinated surveys in Kalimantan and East Malaysia should be conducted to determine where and approximately how many rhinos exist in the wild

B. Improved management structures for key areas.

Management structures should be upgraded in all areas listed above to provide maximum protection to the Sumatran rhino populations and their habitat. Especially important is the gazetting as National Parks, with well-defined boundaries, of the major rhino areas and possible receiving sites, as soon as possible.

It is recommended that policies of integrated conservation and development are developed and implemented in and around all National Parks. Besides its major role in development, planning, and management of protected areas, PHPA should also accept joint responsibility for regulation of buffer zone activities and land use around protected areas.

C. Law enforcement and anti-poaching.

For the continued survival of the Sumatran rhino in the wild, protection from poaching is of vital importance. This can only be achieved by continued presence in the field of dedicated rhino monitoring and anti-poaching units, in the major rhino areas: Kerinci - Seblat N.P., Gunung Leuser N.P, and Bukit Barisan Selatan N.P.

For work in other rhino areas and to support and guide the field teams in the National Parks, two special mobile units should be formed. These mobile units will conduct surveys, train the rhino monitoring and anti-poaching units, assist in research programmes and coordinate local activities.

The whole operation will be guided by a Rhino Desk Officer, who will coordinate all operations, liaise with other departments and provide guidelines for the various field activities. The specific Javan Rhino conservation activities should also be the Desk Officer's responsibility.

It is important that the teams conduct their tasks in close cooperation with the existing staff and assist them in their programmes.

D. Rhino protection and anti-poaching units.

1. Tasks.

To prevent poaching and to monitor rhino populations in key areas for rhino populations. In some areas, emphasis will be primarily in prevention of poaching (anti-poaching units), and in other areas on monitoring (monitoring units). The teams must be flexible in undertaking the tasks assigned.

2. Prevention of poaching.

The methods employed in poaching prevention are primarily field patrols to look for traps and other signs of poachers, to destroy these traps, and to gather evidence to identify and arrest the people involved.

Park guards and all rhino units should have the power to arrest the poachers. They must also be adequately equipped to deal with armed poachers.

The patrols will be required to develop good relations with local people, to obtain information and assistance in the prevention of poaching, and to increase awareness of the plight of the rhino and the importance of its conservation. They should also try to establish the identity of contact persons and the routes used for the horn trade, and relay such information to the appropriate authorities. Monetary rewards to individuals who identify poachers should be considered.

3. Monitoring of the rhino population.

Appropriate and consistent field techniques are needed for population estimates. Such methods include: track counts, sighting counts, dropping counts, and the utilization of wallows and saltlicks. Detailed procedures for all these techniques should be worked out and developed by the staff of the Rhino Desk Officer. This should be documented in a standard field guide. The members of team should receive on-the-job training from the mobile units and the Rhino Desk Officer.

4. Qualification of personnel.

The people selected for the anti-poaching and monitoring units should be recruited in part from people in the locality of the key areas. All members should have considerable knowledge of the rain forest but in each team one person should have power to apprehend poachers. Each team should consist of four to five people one of which should be the team leader with appropriate rank and skills.

Salaries and other benefits should be adequate to attract well-qualified people. A bonus system for good performance should be considered.

5. Requirements for key areas.

Details on the number and type of units required for the key Sumatran rhino areas are provided in appendix 7

E. Mobile units.

1. Tasks.

- (1) Training and technical support to park units.
- (2) Supervision of park units.
- (3) Providing advice on, and assistance with, special operations like translocation, research programmes, etc.
- (4) Law enforcement, especially in connection with rhino poaching activities.
- (5) Surveying and evaluation of new areas.
- (6) Reporting direct to Rhino Desk Officer and regional offices.
- (7) Coordinating their activities with local authorities.

2. Qualifications of personnel.

The team should be composed of experienced persons, whose combined experiences and skills allow the team to do the tasks specified. Especially important are a wildlife or nature conservation background, research experience, administrative experience and leadership. Ideally a team should be composed of an experienced team-leader with a nature conservation background, a wildlife ecologist and a person with an administrative or legal background.

3. Location and equipment of mobile units.

One unit should be established to serve the central and southern parts of Sumatra, including Kerinci - Seblat, Bukit Barisan Selatan and Berbak. This unit should have its home base in Sungai Penuh.

The second mobile unit should be established to serve the northern part of Sumatra, including Gunung Leuser. This unit should have its home base in Medan.

The teams should be provided with office space, preferably in the same building as the monitoring units of Gunung Leuser and Kerinci Seblat. They should also have a 4-WD vehicle with two-way radios and a lap top computer with printer.

F. Rhino Desk Officer.

The desk officer should be a very experienced person with a strong background in nature conservation and/or wildlife ecology. His rank should be director or equivalent.

This should be a permanent post and continuity should be maintained were possible. He should report directly to the Director General PHPA and should coordinate his activities with the other directorates and other agencies involved in the rhino conservation activities.

Considering the complexity of the task, the desk officer should have two assistants, and sufficient secretarial support. One of the assistants should have a scientific background, the other an administrative background.

One of the tasks of the desk office should be to design protocols and standard operational procedures for the various tasks of the mobile and monitoring and anti-poaching units.

The Desk Officer should be housed at PHPA headquarters and receive full office and secretarial support. Sufficient provisions should be made for frequent field visits.

The Desk Officer should also be responsible for the Javan Rhino conservation activities.

G. External technical support.

Especially in the initial phase of the development of the rhino units, external technical support could be useful for the training of the units and for the development of the scientific and monitoring programmes.

The exchange of officers and team members between the Malaysian and Indonesian rhino protection groups is highly recommended.

H. Control of trade in rhino products.

The field teams and the desk officer should associate and coordinate closely with the existing Forestry Security Coordination Teams (TKPH), both at regional and national level. Procedures should be developed and implemented to ensure that appropriate action be taken upon information received from the field. Possibly special investigation techniques and procedures should be developed together with the other agencies involved.

The control of the trade in rhino products and the prosecution of offenders should be regarded as a high priority issue of national interest and PHPA should seek support from the highest levels of government.

I. Education and awareness programme.

This should be done concurrently with the Education and Awareness programmes described in detail in the Javan Rhino Action Plan. The Rhino Protection Units and the Mobile Units will play an important role in the education of the peoples living around rhino areas.

Staff involved in education and awareness programmes need special interpretive training on:

- (1) How to interact with people, individually and during meetings and gatherings.
- (2) Ideas on what to say and how (values, natural history, economic and social context, etc of rhinos).

J. Population assessment.

Conservation programmes should be based on reliable data on the status of the populations and species, especially when dealing with critically endangered animals. To provide such data, a continuous monitoring programme for Sumatran rhinos should be initiated in all reserves. Reliable censusing methodology should be developed and personnel should be trained in censusing techniques and in the evaluation of the results.

K. Research and monitoring of Sumatran Rhino in the key areas.

Scientific research is an essential ingredient in the conservation of endangered species, bio-diversity, and protected areas. Detailed investigations on the ecology and behaviour of the Sumatran rhino are considered essential for the long-term conservation and management of the species.

The Rhino Desk Officer should identify field and captive research priorities, especially ecology and behaviour, relevant to Sumatran rhino conservation.

L. Alternative conservation sites.

Three types of conservation areas can be considered for inclusion in the Sumatran Rhino Conservation Strategy:

(1) Protected Areas:

Objective: Maintenance and restoration of viable wild populations of Sumatran rhinos and the environmental conditions to which they are adapted.

Operation: Minimal management intervention, annual census desired, area is secured and protected. The goal is a self-sustaining population of wild animals.

Population: 1500+ animals in 4 Indonesian sites.

(2) Rhino Sanctuaries:

Objective: A natural or artificially enclosed area within a protected area stocked at a population level which does not seriously degrade the habitat; by definition such a sanctuary does not allow immigration or dispersal. The specific goal of rhino sanctuaries is the production of stock for re-introduction to protected areas. As an innovation of captive management, the method is untested and will require detailed planning to minimize the impacts of confinement on the behaviour of animals born under these conditions.

Operation: The rhino population is managed by a resident staff, the goal being minimal impact of the animals on the habitat and minimal requirements for husbandry and intervention, such as supplemental feeding.

Population: 150 animals total is targeted for 3 sites (50 each); the initial founding population goal will be 10 animals per area.

(3) Zoos:

Objective: Populations contained in small intensively managed areas, where daily maintenance and welfare is provided. The specific goals of zoo populations are captive breeding, which through proper genetic and demographic management may generate stock for re-introduction. Research and public education are equally important goals.

Operation: Intensive daily management with full time staffing of animal caretakers, biologist and veterinarian.

Population: an ultimate global population of 150 animals derived from 18-20 founders, 15 of which are already in captivity.

- Recommended objectives for each kind of conservation area:

	# Sites	Ultimate Pop	Initial Pop.
Large Wild Areas	4+	1500+	Existing
Wild Sanctuaries	3	150	10 each (30 total)
Captivity	Indonesia & Elsewhere	150	18-20

It is recommended that all three approaches are included in the conservation strategy, with priority given to rhino populations in protected areas and zoos. The success in achieving rhino conservation objectives of each approach should be evaluated.

II. RESCUE OF 'DOOMED' SUMATRAN RHINOS

Capture of so-called 'doomed' rhinos for translocation and captive breeding should only be done after the situation has been critically and independently reviewed by a team of investigators. The viability of the population, the security of the habitat and the various options for preservation should be evaluated using defined criteria.

The use of the term 'doomed', and its definition in the Asian Rhino Action Plan have been criticized and replacements have been proposed, but the term is quite appropriate as long as it is understood to mean 'condemned to ..'(loose its home, be left unprotected from poachers, be kept in isolation, etc).

A. Population viability assessment.

The viability of a relict population, that may qualify for the 'doomed' status, should be assessed based on a reliable estimate of numbers and range. Also the location of the population with respect to other populations, the possibilities for the animals to migrate to safer areas, the likelihood for supplementation from other populations, and the kind of population (e.g. low-land, high mountain, etc) should be taken into consideration. A thorough evaluation report should be made available for each case.

Detailed guidelines and criteria for the assessment of the viability of relict populations will be needed and it is recommended that a set of guidelines and criteria is produced as soon as possible.

B. Habitat security.

Together with the assessment of the viability of the rhino population, the security of the habitat should be evaluated and reported on. Current and planned land-use, possibilities for conservation of the area, isolation from other rhino areas, poaching and disturbance, and other conservation values of the area should be considered. As with the viability assessment, guidelines and objective criteria should be established.

C. Capture and release protocol.

The following recommendations for the capture of 'doomed' Sumatran rhinos are based on the assumption that for the establishment of a new population, wild or captive alike, 3 males and 7 females (3.7 animals in zoo terminology) would be minimal.

To be able to continue the current efforts with captive breeding of Sumatran rhino it is recommended to allow the Sumatran Rhino Trust (SRT) to proceed with its catching operations until the 4 male commitment for the USA is met, after which capture for captive breeding should be stopped.

Because of the number of females already in captivity, it is recommended that any second female caught goes to reinforce an existing secure population, through release into the wild directly from the capture pen.

It should be noted that we do not know enough yet about 'existing secure populations' and how they are being protected to have any certainty that 'doomed' rhinos added to these populations will be safe and will not disrupt the current populations.

After the SRT commitments are met, all male and female rhinos rescued from 'doomed' populations should be used to reinforce existing secure populations, until a new population site is made ready for release.

Any and all opportunities to telemeterize captured and released rhinos should be explored.

When a new release facility is ready, priority should go to animals for the new population. The release target is 3 males and 7 females, with excess numbers of either sex to go to reinforce existing populations, preferably to intensively managed rhino sanctuaries.

Selective trapping of Sumatran rhino is usually not possible, especially not in highly disturbed habitats where the rhinos are not using their traditional ranges and routes. Pit-trapping seems under most circumstances the best technique. On capture every animal must be checked for injury and disease. Every effort must be made to minimize capture and handling stress, using drug therapy as necessary.

D. Translocation.

The Sumatran rhinos from Borneo are considered subspecifically distinct from those of Sumatra and Peninsular Malaysia. But the rhinos from Sumatra and Peninsular Malaysia may also show certain differences between each other, and it is not certain how these differences reflect specific adaptations. Mixing of distinct populations through translocation and re-introductions should be avoided until the genetic relationships between the various populations have been clarified. Therefore it is important to determine the taxonomic status of rhinos originating from Borneo, Sumatra and Peninsular Malaysia, through morphological research and genetic typing.

E. Management for release.

Recommendations for the management for release of animals, either wild or captive bred, are described in appendix 6

F. Potential new rhino sanctuaries.

Recovery of the species through restocking could be attempted in:

- (1) Kutai Reserve, Kalimantan: translocation from small isolated populations in Kalimantan is the preferred method.
- (2) A contiguous area in Sumatra consisting of Bukit Rimbang Baling, now a game reserve in Riau, proposed as a wildlife reserve (about 1,360 sq km), and a protection forest area, West Sumatra/Riau Boundary, 1400 sq km, a protection forest.
- (3) Mahato-Kumu, Protection Forest, Riau, 3500 sq km, where an Intensively Managed Wild Rhino Sanctuary could be established (the area was trapped for the rhinos now in the UK, but animals still survived there when the project was terminated - This raises questions about the 'viability' of the rhino population).

G. Release area requirements.

Before a translocation facility is established the suitability of the area and the habitat should be evaluated. For a list of requirements see appendix 5.

III. SUMATRAN RHINO CAPTIVE BREEDING PROGRAMME

It is recommended that the number of animals removed from isolated populations in the wild for captive breeding be limited to 18-20 animals. Every effort should be made to acquire these animals in the near future to avoid disparities in age and sex ratio².

	Males	Females	Total
Total Goal	8	10-12	18-20
In Captivity	5	10	15
To Be Captured	3	1-3	4-6

A. Management plan for captive breeding in the participating zoos.

Although the current lack of success of the captive breeding programme can be attributed to an age and sex imbalance in the captive population, the scattering of the small number of captive Sumatran rhinos over a large number of facilities spanning much of the globe does not favour the exchange of animals for breeding purposes.

Once the SRT commitment is met, all participating facilities, in Indonesia and abroad, should develop a stringent management programme involving all animals and including exchanges of animals to form compatible pairs and to maintain genetic variability. Exchanges of animals for breeding purposes should not mix stock from Sumatra, Borneo and Peninsular Malaysia.

PHPA, as the ultimate owner of the animals, should make sure that all facilities participate fully and should not hesitate to use their powers to withdraw animals from uncooperative facilities.

High standards of husbandry and management for the existing captive population of Sumatran rhinos are vital for achieving the goals and for the acceptance of captive breeding as a genuine conservation tool. The rarity of this animal makes it particularly important that the world zoo community develop and implement the best possible management strategy.

² These figures reflect the 1991 situation. Currently there are 24 Sumatran rhinos in captivity, 9 males and 17 females. No births have occurred.

The current population consists of 25 animals which are distributed among four different countries (Indonesia, Malaysia, United Kingdom and United States). This makes it especially critical that communication and information-sharing between various holding institutions be improved. At present, there is great variation in the protocols being employed. Standardization and improvement of management and husbandry techniques is therefore a high priority.

The minimum recommended standards for housing, diet, veterinary care, social management, research and reporting are described in appendix 8.

B. Research and study on captive Sumatran Rhinos.

Collaboration and communication between those involved in the management and breeding of captive Sumatran rhinos and those involved in field studies and surveys of this species in its natural habitat are of great importance. Both groups should work closely together and the captive population should be used to supplement work being conducted in the field. Captive studies would therefore include work on rhino behaviour, infant development, reproduction, genetics, physiology, and health. Each topic area is considered in more detail in appendix 9.

IV. PRIORITY ACTIONS

A. Priority funding requisites.

- (1) Appointment of Rhino Programme Coordinator.
- (2) Protection, and monitoring of wild rhinoceros populations in existing strongholds; and surveying sites suspected to harbour populations.
- (3) Training of field personnel and development of reliable censusing methodology.
- (4) Conducting a feasibility study of potential sites (specifically Way Kambas) for the re-introduction of the Javan Rhino, and developing a translocation work plan.

B. Priorities without or with minimal funding requisites.

- (1) Establishment of the Advisory Board to facilitate implementation of recommendations.
- (2) Gazetting of protected areas as National Parks with well defined boundaries.
- (3) Identification a priority site with an existing Sumatran population to receive additional rhinoceros from isolated populations, and development of a translocation work plan.
- (4) Secure tissue samples and necessary legal documents for the exportation of Sumatran rhino tissues for genetic analysis.

V. FUNDING

An overall programmatic budget for the Indonesian Rhino Conservation Strategy, as identified during the Workshop and described in this document, is needed, with further prioritizing of the actions recommended.

Commitment to the strategy by the Indonesian Government is essential to raising funds for additions to the existing Rhino conservation programmes.

Components of such a budget for Sumatran Rhino include:

- (1) Monitoring and protection of the rhinos
- (2) Field research studies
- (3) Community relations, development, and education
- (4) Strengthening of management and protection in the parks
- (5) Survey of Kalimantan (for Sumatran rhino only)
- (6) Translocation and identification and establishment of new sanctuaries within park areas
- (7) Project administration and management
- (8) Training
- (9) Captive breeding in Indonesia (for Sumatran rhino only)
- (10) Providing for the sustainability of the programme (building ongoing capacity as fund raising and marketing proceeds)

An evaluation should be made of what parts of the extended strategic plan are presently being covered or could be from PHPA and other Indonesian government sources, and from other existing sources (World Bank Forestry II and III, Indonesian Rhino Foundation, BII, WWF, Minnesota, New Zealand, Zoos, etc.), and what remains to be covered from new sources. The objectives of the rhino plan will have to be "packaged" in relation to the general programmes and plans of PHPA and other government agencies, and tailored in such a way to tie in as well as possible to Government of Indonesia budgeting procedures and Bappenas priorities.

A. New sources of funding.

Potential new sources of funding are:

- (1) Global Environmental Facility (GEF) funds (World Bank, UNEP, UNDP). Possibly as much as half of \$20 million of the biodiversity grants for Indonesia might go to support of Kerinci and surrounding areas.
- (2) Asian Development Bank (requires special programme approach)
- (3) U.S.Aid (requires special programme approach)
- (4) Other Foreign Govt. Aid programmes (in particular EEC)
- (5) Private Sector. Oil companies and other corporations will be interested to give major support. (Kaltim Primacoal is already providing funds for Kutai).

Packaging of proposals is very important in relation to the interests and programmes of the potential donor. It is important to be able to document in-country commitments of resources when requesting counterpart funding from outside donors. It is also important to build in evaluation and accountability procedures to persuade donors of the sufficiency of the programme. It is recommended that the budget in all instances recognize the difference between the immediate needs (one-off costs) and those that would have to be addressed for long term pursuit of the strategic plan by the Indonesian government. Sustainability of the programme is paramount following the immediate, crisis responses.

B. Design of fund-raising programme.

Two persons may be needed for the ongoing work on fund-raising and marketing: a person familiar with the Indonesian governmental system and processes and in assembling proposals for conservation purposes, and an experienced wildlife biologist/conservationist. A full-time Rhino Programme Coordinator could design the fund-raising programme, with assistance from the WWF-Indonesia Programme Representative. An on-going advisory body should steer the process.

Up to a year might be required to draft the fund-raising programme and the budgets. Such instruments as the Heritage Species prototype proposal is a valuable example of an overall marketing and fund-raising programme.

C. Coordination of externally funded programmes.

A good coordination between externally funded rhino conservation programmes, and other conservation programmes in rhino areas, is essential. All programme executors should be required to liaise closely with the Rhino Desk Officer, and the Indonesian Government should not approve programmes that concern rhino conservation, directly or indirectly, without the consent of the Rhino Desk Officer.

VI. EVALUATION AND MONITORING OF IMPLEMENTATION

The setting up of a body entitled "The Advisory Board of the Indonesian Rhinoceros Foundation" is highly recommended.

The recommended composition of the Board is as follows:

- (1) Director of Conservation, PHPA
- (2) Director of Species Conservation, PHPA
- (3) Director of Education and Interpretation, PHPA
- (4) Rhino Desk Officer, PHPA
- (5) PHPA field officer concerned with Javan rhino
- (6) PHPA field officer concerned with Sumatran rhino
- (7) University expert on rhino biology
- (8) L.I.P.I. expert on rhino biology
- (9) Rhino expert from another agency/Ministry of Forestry
- (10) Representative / interpretation expert from WWF Indonesia programme
- (11) Field biologist from Asian Rhino Specialist Group
- (12) International rhino biologist from outside ARSG
- (13) Conservation plan evaluator
- (14) Population biologist from the captive breeding community.

It should be noted that large committees are often not very effective and it should be considered to reduce the number of members or to form a small executive committee from among the membership. The executive committee would maintain the contacts with the other members, the working-groups, programme executors and coordinators etc, and prepare the board meetings.

It is emphasized that, as far as possible, individual membership of the Board should be constant and frequent changes of personnel are undesirable. Individuals selected to represent international agencies should be readily available for travel to Indonesia and have appropriate funding available for this purpose.

It is recommended that the Advisory Board should meet routinely every 2.5 years in Indonesia. Every second meeting (i.e. at 5-yearly intervals) should undertake a major review of all projects and programmes, including translocation of the Javan rhino, and captive breeding and translocation / re-introduction of Sumatran rhino. In addition to its routing meetings, the Board is authorized to appoint ad hoc working groups, as necessary, to address specific problems. Such groups may include appropriate members of the Board, as well as invited experts with knowledge of the specific problems under consideration.

The responsibilities of the Board shall be the giving of advice to PHPA on, and the periodic evaluation of, the following matters (either directly or via one of the working groups):

- (1) Overall organization and management pertaining to the conservation of both Javan and Sumatran rhinos.

- (2) Personnel, expertise, training in relation to rhino management.
- (3) Law enforcement and protection of rhinos.
- (4) Extension and public awareness.
- (5) Fund raising.
- (6) Partnership evaluation
- (7) Implementation of management plans for the Javan rhino including:
 - (a) management of Ujung Kulon N.P., including protection and data gathering.
 - (b) identification of reception sites for translocation.
 - (c) preparation of reception sites (strengthening protection, staff training, rhino reception/release facilities) as per translocation timetable (d) below.
 - (d) timing of initial and subsequent translocation.
 - (e) number and sex/age composition of animals for each translocation
 - (f) specific review and evaluation of translocation programme after 4.5 years and formulation of ongoing recommendations.
- (8) in-situ programme for Sumatran rhino, including management of key protected areas.
- (9) ex-situ management for Sumatran rhino, both within Indonesia and overseas.
- (10) technical problems concerning capture and translocation
- (11) emergency monitoring and unforeseen problems brought to the attention of the Board by PHPA or other concerned parties.

2. NOTES ON JAVAN RHINO BIOLOGY AND POPULATION VIABILITY ANALYSIS.

Based on a review of evolutionary relationships, general habitat preferences, feeding behaviour, social structure and size relationships between the species, the Javan and Sumatran rhinos are more likely to share ecological characteristics with black rhinos than with Indian and white rhinos.

The ecological similarities between Javan rhinos and black rhinos has implications for assumptions made on unknown parameters used in the PVA model:

- (1) Javan rhinos are likely to be monomorphic which implies no sex-specific differences in mortality as opposed to what was included in the PVA model at the June 1989 meeting.
- (2) Home range sizes in male and female Javan rhinos are likely to be similar, as in the case of the black rhinos, hence the opportunity for one male to monopolize several females for breeding is reduced for Javan rhinos. For the purposes of the PVA we should assume that any one male will have the opportunity to breed with 2 or 3 females and that any female will breed with 2 or 3 males. Again for model purposes, this is more analogous to a facultatively monogamous breeding situation than was used in the June 1989 PVA.
- (3) The June 1989 PVA assumed high levels of juvenile mortality, based partly on Indian rhino data. It is likely that juvenile mortality will be lower in Javan rhinos due to lack of predation on infants by tigers.

Six general types of catastrophes can be considered for inclusion in the PVA: volcanic eruption, forest fires, drought, disease, accidental poisonings, and poaching.

- (1) Volcano - for the purposes of the PVA the probability of this event was assumed to be zero.
- (2) Forest fires - fire, while a possible event, was determined to be of no possible impact to the population for the PVA.
- (3) Drought - again, for the purposes of the PVA, assumed to have zero impact.
- (4) Disease - the 1982 disease event was associated with a year of high rainfall. It is possible that the disease was spread as animals congregated in higher densities than normal. At one extreme the PVA should model a disease event at the frequency of exceptionally wet years. At the other extreme, the PVA should model disease events at a frequency of one per 60 years, the actual rate observed since 1930. Disease severity should be examined at 10 percent mortality (the known rate in 1982) and 20 percent mortality (a possible high range for the 1982 disease event).
- (5) Poaching - two approaches for investigating poaching were suggested. One, using data on actual rates of poaching since 1929, model a frequency and severity equal to the value obtained by looking at the total number poached over the years versus the total number available to be poached. Second, model the population under the assumption of absolute protection and a poaching level of zero.

Some worst-case scenarios should be included in the PVA analysis to help develop a strategy of least regrets. The PVA process should be used to examine various scenarios from worst-case to optimistic.

It is recommended that the PVA simulation should be run at a range of possible carrying capacities for the Ujung Kulon population (50, 70, 100, and 200).

There are no strong indications that competition with banteng is a significant factor in Javan rhino ecology, but further studies on this issue are recommended.

3. RESEARCH PREREQUISITES FOR SOURCE POPULATION - UJUNG KULON.

Before attempts to capture and translocate Javan rhinos from Ujung Kulon are started, a comprehensive literature study and field survey should be carried out including:

- (1) A population survey to assess:
 - (a) Numbers in Ujung Kulon.
 - (b) Age structure of population in Ujung Kulon.
 - (c) Sex ratio.
 - (d) Home-range (this would require a high density of cameras in a portion of the park and kept in place for a longer period of time, preferably in combination with track studies).
- (2) A vegetational survey in both receiving and source sites to determine comparability of habitat.
- (3) A study on possible competitive interactions between rhinos and banteng in Ujung Kulon to assess potential impact of removals.
- (4) A thorough literature review on other experiences with rhino translocation to help determine optimal/minimal numbers for successful release.
- (5) Modelling work, using PVA, to determine the potential effect of removals on the source population and the likelihood of success of translocated populations of various sizes (for example: extractions of minimal number required for re-establishment (3.7 ?), 1.5x, 2x minimal number, sex-ratio variations, etc, from populations of 56, 70, 90 and 120).

The studies listed above should be started as soon as possible. An ad-hoc advisory panel should be established to review the results of the photo-survey project and the other field surveys in Ujung Kulon, the literature review of rhino translocation, and the results of modelling exercises, to make recommendations on optimal numbers of rhinos to be removed from Ujung Kulon and under what timetable. The panel should comprise the following expertise:

- (1) Rhino biologists.
- (2) Translocation experts (India/Nepal).
- (3) Population biologists with expertise in computer modelling.
- (4) Site managers for Ujung Kulon and Way Kambas.

4. POTENTIAL AREAS FOR TRANSLOCATION.

Potential areas for the first translocated population and other sites for subsequent translocation were evaluated according to the following criteria:

- (1) Is the site within the natural historic range of the Javan rhino?
- (2) Is the site likely to contain appropriate habitat?
- (3) Does the site have a year-round supply of water?
- (4) Is the site protectable from the point of view of both habitat and rhinos?
- (5) Is the site large enough to sustain a potentially viable population (> 100 animals)?
- (6) Is there evidence that Javan rhino currently occur in the site?
- (7) What is the ease of translocating animals to the site?
- (8) What is the degree of separation of the release site from the source population?
- (9) What is the present management capacity in the site?
- (10) What is the potential management capacity (including the ability to attract outside funding)?
- (11) What is the degree of local government commitment to the conservation of the site?
- (12) How much potential is there to develop eco-tourism at the site?
- (13) What is the potential for local community education and extension?

The considerations (1) - (5) are considered absolute requirements for any translocation site.

The sites considered are:

- (1) Gunung Honje
- (2) Pulau Panaitan
- (3) Way Kambas
- (4) Barisan-Selatan
- (5) Berbak

The scoring for some of these sites is given in the table below. Pulau Panaitan was ruled out of consideration because it failed to meet three of the absolute criteria (outside historic natural range, no year-round water supply, and not large enough to sustain a viable population).

Gunung Honje was not selected because it was considered that its suitable habitat could be repopulated with natural migration and increased protection. Also, it would not provide the added benefits of a second distinct population, free from the effects of catastrophes acting on Ujung Kulon.

	Pulau Panaitan	Way Kambas	Berbak	Barisan Selatan
Natural range	N	Y	Y	?
Suitable habitat	Y	Y	Y	Y
Year-round water	N	Y	Y	Y
Protectable	Y	Y	Y	?
Viable population	N	Y	Y	?
Evidence of Javan Rhino	N	?	?	?
Ease of transport	3	2	2	1
Separation	2	3	3	3
Present Management	1	2	1	0
Potential Management	2	3	2	2
Local Government support	3	3	2	1
Tourism	3	3	2	1
Education/Extension	1	3	2	1

In cases where a numerical score is given: zero is the worst score and three is the best. Scoring is relative between the sites and not an absolute score on an objective basis.

5. RELEASE AREA HABITAT REQUIREMENTS.

Areas for the release of Javan and Sumatran rhinos to establish additional populations should meet the following criteria:

- (1) Preferably within the historic range of the species.
- (2) Size: should be large enough for minimum 100 animals carrying capacity, (assume 15 sq. km per rhino). The establishment of small numbers of translocated animals in an area where no MVP is possible, can be accepted for the purpose of testing management procedures. However, this small area approach may lead to problems of animals wandering out.
- (3) Food resources meeting diet requirements.
- (4) Assessment of area as suitable habitat: NB Ujung Kulon may not be typical of historic Javan range. The Viet Nam range may provide a useful guide.
- (5) Carrying capacity estimates for area.
- (6) Adequate water, wallows, saltlicks.
- (7) Low human population densities adjacent to release area.
- (8) Assessment of predation risk on young.
- (9) Status of re-introduction area. Minimum legal status is National Park or Nature Reserve with level of protection of a National Park.
- (10) Integrity of release area: absence of livestock, and to avoid disease transmission, no hunting, logging, firewood collection.
- (11) Security of area must reach pre-determined levels before any deliberate capture starts or any isolated animal moved there.
- (12) Extension efforts with local communities must be well established, with re-introduction project providing employment if possible.
- (13) Assessment of threats to the release area through e.g. loss of habitat to forestry, pollution from outside, etc.
- (14) Release site must have good communications and access.

6. CAPTURE MANAGEMENT PLAN FOR RHINO TRANSLOCATION SCHEMES.

6.1. Catching effort.

Assume that for a successful re-establishment 3 males and 7 females (3.7) are minimal.

(1) Javan Rhino:

Catching effort in Ujung Kulon is directed to 3.7. Individuals in excess of 3 males or 7 females are released in Ujung Kulon, following exhaustive taking of samples and fitting radio-collars.

(2) Sumatran Rhino:

Catching depends on the need to rescue 'doomed' rhinos. After the commitments for the captive breeding programme are met the animals are released in secure rhino reserves or sanctuaries.

6.2. Capture methods.

There are very few options, as immobilization is not feasible for either species. Animals must catch itself, either by surface trap or pit. Latter is preferred for Sumatran rhino as it is very highly strung on capture, but tames within 12 hours.

Ujung Kulon photo-trapping is seen potentially to allow very selective pit-trapping for desired sex/age. This in contrast to the Sumatran rhino which in disturbed habitat may rarely use specific trails. In undisturbed habitat, a Sumatran rhino patrols each path every 4-5 weeks, a common capture time. On capture every animal must be checked for injury and disease. Every effort must be made to minimize capture and handling stress, using drug therapy as necessary.

6.3. Biomedical monitoring

A veterinary protocol should be developed to capture as much biomedical information as possible from wild rhinos captured for translocation. This is imperative to establish norms for future reference regarding health problems. The protocol should include

- (1) internal (blood and faecal) and external parasite screening,
- (2) blood norms (hematocyte, packed blood volume, etc), and
- (3) blood and tissue samples for genetic analysis.

All arrangements for the analysis should be in place, so the materials are not lost, misplaced, spoiled or otherwise wasted. The work should preferably be done in Indonesia and a qualified vet should confirm the adequacy of the facilities and personnel in advance.

A computerized database should be established in Indonesia, and duplicate files and records should be stored in a second location.

6.4. Management for Release.

All rhinos, irrespective of origin, type and size of movement and destination will be held in a pen at the release site. This is to allow (1) recovery from travel, and (2) development of site fidelity. Each will then be released singly into a "5-acre" enclosure, bounded by a solar electric fence, with cut line kept clear. This will allow the rhino to feed to some extent on natural vegetation and be monitored closely. At some stage after release from enclosure, all installations can be removed and used at a new site.

The use of electric fencing to confine rhinos needs more thought and study. Its use on all sides of rhino enclosures may frighten the animals and result in injury.

Only one rhino will be released at each site. The aim is to develop a patchwork of well-spaced animals with release area attachment.

Any captive bred rhino returning to the wild will follow the same procedures, hopefully using great experience in Indonesia by then. Management will be modified as necessary, but much more detailed protocols as regards the learning processes of the animals will be necessary. The likely time scale allows no greater specification.

Good communications between each field site and park/project headquarters is essential.

6.5. Monitoring of translocated animals.

Observation and monitoring is an essential component of any translocation. Apart from collecting data, it is useful to allow intervention so that acclimatization and release are as soft as possible.

Minimally the following attributes should be monitored both pre- and post-release;

- (1) Location, every released animal must be radio-collared.
- (2) Feeding observations.
- (3) Sexual/reproductive activity.
- (4) Behavioral interactions/social behaviour.
- (5) Ranging behaviour.
- (6) Condition and health by visual observation.
- (7) Use of habitat.

Monitoring will require at each release area full-time researchers, who are pre-trained and experienced.

6.6. Timing and Scheduling.

Given the realities of forest habitat dynamics on Sumatra the following sequence must start as soon as possible:

Javan Rhino:

- (1) Decide to establish second population
- (2) Identify location of release area
- (3) Carry out feasibility study
- (4) Implement pre-requisites identified in feasibility study
- (5) Schedule capture to start according to number (4)

Goal: In 3 years have pre-requisites implemented, hence be ready to translocate.

Sumatran Rhino:

- (1) Identify and develop site for releasing isolated Sumatran rhinos through reinforcement.
- (2) Continue with capture until commitments to SRT met.
- (3) Investigate potential rhino areas on Kalimantan.
- (4) Identify and develop sites for development of new population(s) for Sumatran.

Goal: In one year finish the capture for captive breeding and have the first release site ready. In 5 years have at least one site ready for re-introduction, through translocation. Plans for Kalimantan will have to wait the outcome of the surveys.

6.7. Duration.

It is very difficult to be precise but the establishment of a new population is a lengthy process requiring a commitment for 10 years or longer.

Phase I: High intensity management, monitoring and security: this will last until the first calves are conceived and born in new location. Estimated duration minimal 4 years.

Phase II: Will follow from phase I and will last until the first calves are born to animals themselves born at the new location. i.e. these will be the first calves to grow up learning from forest-born mothers. Estimated duration minimal 6 years, but more likely considerably longer.

6.8. Staffing and Management.

A number of key skills will be needed on site:

- (1) Experience in rhino husbandry, including veterinary aspects.
- (2) Good security: hand-picked and armed guards.
- (3) Researchers trained in radio-tracking.
- (4) Field manager in charge of all aspects.

At headquarters, a Rhino Management Committee should be created to meet frequently and solve problems that may arise. It should include the Rhino Desk Officer, someone from the Indonesian Rhino Conservation Trust, and some outside expert and technical advice.

7. RHINO PROTECTION UNITS REQUIRED FOR THE KEY AREAS ON SUMATRA.

7.1. Equipment for rhino units.

All the teams will require to be well equipped for field work. The standard equipment will be: tents, compass, short range radios, maps, notebooks, rucksacks, firearms if required, uniforms.

7.2. Units needed for Bukit Barisan Selatan National Park.

Current situation:

The current major threats are of habitat loss through encroachment. Poaching is presently a lesser threat. Surveys and monitoring units will provide sufficient protection at this present time. Staffing levels are adequate but access to large parts of the park is difficult.

Requirements:

One monitoring unit initially should be established. The establishment of further units will be decided upon based on the observations of the founder unit.

Special equipment that will be required includes:

- 4-5 Horses
- 3 Motor bikes
- 1 Seaworthy boat
- 2 Perahu with outboards

7.3. Units needed for Kerinci - Seblat National Park.

Current situation:

There is information that indicates that poaching is widespread, within and immediately outside the park. Currently the park is understaffed and new teams will have to be recruited.

Requirements:

Initially one monitoring team will be established based in Sungai Penuh to cover the central rhino area. Two anti-poaching units will be established, one in Bengkulu and one in the Kerinci area. It is expected that a further two teams will be added within two years and possibly two more later.

Special equipment needed for the three initial teams:

- 3 Four W. Drive
 - 3 Motorbikes
 - 3 Guard posts with radio communications.
- Additional Shelters close to areas vulnerable to poaching.

7.4. Units needed for Gunung Leuser National Park.

Current situation:

Currently the levels of poaching are high and may threaten the viability of this population. The current staffing levels are such that additional staff will have to be recruited.

Requirements:

Three anti-poaching teams should be established immediately. The areas that should be covered by each group are: Mamas/Kompas, the Kapi area, and the Sikundur/Langkat.

Special equipment needed for the three teams:

2 4 WD Vehicles with radio communications

3 Motor bikes

1 Motor boat for lower Alas river.

7.5. Units in Kalimantan.

A survey should be carried out to establish the status of the rhino population. It is recommended that there is a provision in the future for a permanent survey and protection team. If there are any firm indications of the existence of rhinos, then the teams should be immediately put in place.

8. PRESCRIPTIONS FOR SUMATRAN RHINO HUSBANDRY.

8.1. Night stall/holding facilities:

- (1) Minimum size is 5m x 6m.
- (2) All facilities should not have less than 3 interconnected stalls for each pair of rhinos.
- (3) Walls between stalls should be solid to provide a visual barrier (e.g., concrete, wood).
- (4) Minimum height of the wall should be 1.67m. It is best to allow more space above barrier for increased ventilation and acoustic and olfactory communication between animals.
- (5) Stalls should have concrete floors that are easy to clean and have proper drainage. A trough outside the night stall may be included for the collection of urine samples. Some animals have developed foot problems on hard concrete floors. Rubber mats and proper bedding should therefore be provided as necessary. Dirt is not an acceptable substrate.
- (6) A concrete trough should be provided as a source of fresh drinking water. To discourage climbing, the trough should be positioned near the ground and not be located in a corner.
- (7) Clean, piped water should be available for drinking and cleaning purposes.
- (8) A power source for lights over the stall and electrical outlets should be provided.
- (9) Adequate ventilation should be provided in all indoor facilities.
- (10) A keeper and food storage/preparation area should be located in the night stall/holding area.
- (11) Vehicle access should be provided to both the night stall and outdoor enclosure areas to help facilitate any crating and transport of animals.
- (12) Night stalls should also include a crush to facilitate veterinary care and research. Recommended size is 2m long x 1m wide.
- (13) Heated floors or radiant heaters should be utilized in colder climates.

8.2. Outdoor yards.

- (1) A minimum of two yards should be provided for each pair of rhinos.
- (2) The minimum size of each yard should be 18m x 18m and the yards should be interconnected to facilitate movement of animals between yards. (i.e., to allow for breeding introductions and separation of females and calves from other rhinos.
- (3) Sufficient shade should be provided. It is recommended that a minimum of 50% of the yard should be shaded at any given time.
- (4) Mud wallows/pools should be available. In addition, these should be located in a shaded area of the enclosure. Mud wallows should be filled in regularly as a sanitary measure.
- (5) Minimum height of the perimeter wall should be 1.75m.
- (6) Whenever dry moats are used, the gradient should never exceed 30%.
- (7) Use of electric fencing to contain animals is not recommended.

- (8) Turf is ideal for ground cover, but it is recognized that it will be difficult to maintain due to the foraging, wallowing and trampling activities of the animals.
- (9) Trees should be planted either in or near the enclosure to provide shade.
- (10) Vertical and horizontal posts should be provided for the animals to rub against.

8.3. Diet.

- (1) A minimum of 33% of the diet should consist of leaves, although forage in excess of 60% is recommended. Other available foods (fruits, vegetables and browse/legume hay) should be supplied to meet the animals' daily requirements.
- (2) All diets should be supplemented with 2kg of concentrates (pellets) per day.
- (3) All diets should also be supplemented with mineral mix/salt/vitamins.
- (4) Clean drinking water should be provided ad libitum.

8.4. Social management.

- (1) Sumatran rhinos are not social, and adult animals should therefore not be maintained in the same enclosure on a regular basis.
- (2) To facilitate breeding, all institutions holding adult rhinos should maintain a minimum of a pair. All adult animals should be in a breeding situation.
- (3) Adult males and females should be introduced daily to increase the chances that conception will occur. A minimum of 8 hours per day is recommended.
- (4) Adult rhinos can be aggressive. When animals are paired, they should be observed continuously for at least 30 minutes following the initial introduction. Some aggression is to be considered a normal part of courtship behaviour. However, each institution should use its own discretion when deciding when to separate animals.

8.5. Veterinary care.

- (1) Any facility housing Sumatran rhinos should employ a veterinarian (full or part time) who has rhino health care experience.
- (2) A physical examination should be performed on each animal upon arrival at a zoo facility. An evaluation for endoparasites should be conducted at this time.
- (3) Routine faecal examinations should occur every 1 - 2 months. Routine deworming should occur every 3 - 4 months.
- (4) Physiometric measurements should be collected including the total body length, shoulder height, girth and body weight whenever possible.
- (5) Foot baths should be placed at all entrances to rhino enclosures.
- (6) All surfaces of the night stall should be cleaned thoroughly on a daily basis.
- (7) Foods, especially fresh vegetables, fruits and browse, should be thoroughly cleaned and disinfected whenever possible (to prevent possible Salmonella infections).

8.6. Standardized daily reports.

- (1) All holding institutions should maintain standardized daily reports on each of their animals. Such reports should include the following information:
 - (a) Types and amount of food fed.
 - (b) Types and amount of food eaten.
 - (c) Faeces - condition, amount and number of defecations/day.
 - (d) Significant behavioral changes - vocalization, spraying, pacing, aggression, lethargy, etc.
 - (e) Weather condition, ambient temperature and relative humidity.
 - (f) Identity of person preparing the report.
 - (g) date of report.
 - (h) Physical condition of each animal (injuries, skin condition, foot condition, etc.).
 - (i) Veterinary diagnosis and treatment, including administration of drugs and dosages.
 - (j) Any important events related to management (e.g., movement of animals between enclosures, pairings, changes in diet, etc.).
- (2) Daily reports should be sent to all personnel with primary responsibility for the welfare of the animals (e.g., curators, veterinarians, directors).
- (3) A logbook containing duplicates of the daily reports should be kept at the rhino enclosure (e.g. in the keeper's area).

8.7. Annual report.

- (1) Each institution holding Sumatran rhinos should submit an annual report to the International Studbook Keeper no later than 1 June of each year (Dr. Tom Foose, International Rhino Foundation, The Wilds, 85 E. Gat St., Suite 603, Columbus, OH 43215, USA. Tel: +1-614-228-0402. Fax: +1-614-228-7210). The reports will be published with the studbook. The reports should include the following information:
 - (a) Any changes in the composition of the collection (e.g., births, deaths, acquisitions, removals).
 - (b) Descriptions of ongoing research, if needed.
 - (c) Any progress in meeting the recommendations agreed upon by the management committee (see above).
 - (d) Veterinary matters (diseases encountered, treatments, etc.)
 - (e) Listing of publications, if any.

The first annual report should include a description of current facilities, collections, management protocols, etc.

9. RESEARCH ON CAPTIVE SUMATRAN RHINOS.

9.1. Veterinary research.

Collection of baseline data on pathology and physiological norms is strongly encouraged. An autopsy should be performed to determine the cause of death. At this time, the following tissue samples (2-4 cm in size) should be collected and stored in formalin: liver, kidney, spleen, and whole reproductive tracts (male and female) and eyes.

9.2. Behaviourial research.

A minimum of 1 personnel (keeper) should spend 1 hour/day observing and recording the behaviour of captive animals. The following behaviours should be recorded on a continuous basis: vocalization, urine spraying, chasing, aggression (pushing, shoving, slashing with lower canine) and mounting. The data should be collected at the same time daily (e.g. 8-9 AM). Each time a behaviour occurs, the time (to the closest minute) and identity of the animal exhibiting the behaviour should be recorded. The date and amount of time the animals were observed should also be recorded. It would also be useful to record the ambient temperature and weather conditions (sunny, raining, etc.). Descriptive notes should be taken on any new or unusual behaviours. Each data sheet should also note whether a pair was together or apart.

9.3. Nutritional research.

- (1) Institutions holding Sumatran rhinos are encouraged to collaborate with Dr. Ellen Dierenfeld at New York Zoological Society on the further analysis and development of diets.
- (2) Whenever possible, blood should be collected for analysis of Vitamin E levels.

9.4. Reproductive research.

- (1) Research should be conducted to document the reproductive physiology of the Sumatran rhino.
- (2) Collection, evaluation and storage of semen should be carried out collaboratively between the Surabaya Zoo and the Faculty of Veterinary Medicine, Bogor Agricultural University or by any facility involved with reproductive studies.
- (3) Institutions holding Sumatran rhinos should collaborate with Dr. Nancy Czekala (San Diego Zoo) and Dr. Ellen Shaw (London Zoological Society) in their studies of hormone metabolites in urine samples.
- (4) Of interest is the use of faeces to determine the sex of Sumatran rhinos. The ability to differentiate between males and females in captivity through faecal analysis could be extremely helpful to those working with this species in the field.

9.5. Genetic research.

- (1) Ongoing and proposed research on taxonomic issues should continue. Resolution of subspecies questions is a high priority and has important implications for the development of a global management plan for the Sumatran rhino.
- (2) In a case of an autopsy, the following tissue samples (2-4 cm in size) should be collected and frozen for genetic analysis: liver, kidney, spleen.
- (3) Hair samples should also be collected, sealed in plastic bags and stored at room temperature (i.e., if a freezer is not available).

The procedures and arrangements should be worked out. The veterinarian in charge should be thoroughly familiar with the procedures and requirements for bleeding and preparing the blood for analysis.

9.6. Other.

- (1) Field workers have identified a need to record foot print patterns of animals and how they change with age. Such information could be used to aid census efforts in the wild.
- (2) Captive animals should also be used to work out additional technological and practical problems facing field researchers. For example, there is a need to develop a method to attach radio-telemetry equipment to Sumatran and Javan rhinos. Captive Sumatran rhinos should be used to help develop this technology.

10. EXISTING DIRECT AND INDIRECT COMMITMENTS WITH RELEVANCE TO RHINO CONSERVATION IN INDONESIA (EXCLUDING INDONESIAN GOVERNMENT COMMITMENTS).

- (1) WWF Project in Kerinci - Seblat public awareness: \$100,000.
- (2) WWF-Ujung Kulon: \$60,000 annually.
- (3) WWF: Gunung Leuser, Sumatra: Community Studies, Bohorok Visitor Centre: \$80,000.
- (4) New Zealand Government: Ujung Kulon, \$250,000.
- (5) Minnesota Zoo: Ujung Kulon protection, \$25,000 annually.
- (6) CUSO: Ujung Kulon Community Education and Park Interpretation. \$20,000.
- (7) WWF/Ford Foundation: Kayan Mentarang, Kalimantan: \$250,000.
- (8) Bank International Indonesia: Kerinci, Barisan Selatan, Ujung Kulon: \$150,000.
- (9) World Bank: Forestry II, (10 sites, but only 3 are for rhino conservation areas): Barisan Selatan, Kutai, and Way Kambas: \$300,000.
- (10) Sumatran Rhino Trust: Sumatran Rhino Field Protection: \$40,000.
- (11) Global Environment Facility (GEF): Kerinci Seblat: 10 Million US\$ (possibly).
- (12) World Bank Forestry I: Gunung Leuser Conservation, \$1 million.
- (13) Asian Wetland Bureau: Berbak Reserve (possible rhino re-introduction site). \$40,000.
- (14) Kaltim Primaco (International Corporation): Kutai Action Plan, \$130,000.

11. POPULATION STATUS OF INDONESIAN RHINO

11.1. The Javan Rhino

The principle surviving population of the Javan Rhino is located on the Ujung Kulon peninsula, which forms the westernmost extremity of the island of Java. An estimated 50 animals now live in the area. The species was once widespread throughout the Oriental Realm from Bengal eastward to include Burma (Myanmar), Thailand, Cambodia, Laos, Vietnam and southward to the Malay Peninsula and the islands of Sumatra and Java.

About 150 years ago the species occurred as three discrete populations. The first, belonging to the subspecies *inermis* (now almost certainly extinct) was found from Bengal to Assam and eastward to Burma. The second subspecies *annamiticus* occurred in Vietnam, Laos, Cambodia, and the easternmost part of Thailand. The third subspecies, the nominate form *sondaicus*, was found from Tenasserim, through the Kra Isthmus into the Peninsula and Sumatra and in the western half of Java.

All these populations have disappeared, except for in Ujung Kulon and some scattered remnants surviving in Indochina. The Javan Rhino has the distinction of being the rarest large mammals in the world.

The world Population estimates are given in Table 1, and the past and present distributions are shown in Figure 1.

The 50 or so Javan Rhinos in Ujung Kulon are in a National Park and the population size is probably limited to the effective carrying capacity of the area (Table 2). A major danger to these animals comes from diseases, which could potentially wipe out the entire population. In 1981-1982, this threat became a reality when an unknown disease actually killed at least five rhinos in Ujung Kulon. In addition, any such small population of rhinos faces a permanent threat from poachers. There are no Javan Rhinos in captivity.

It is suggested that the situation facing this species be looked at very closely, to see if recommendations to translocate some animals into other areas, such as Way Kambas or southern part of Bukit Barisan Selatan National Park in Sumatra, should not be seriously considered. A single small population is always extremely vulnerable.

It must be kept in mind that the Ujung Kulon peninsula is located on the Sundaic edge volcanic line and that during the Krakatau eruption in 1883, the entire peninsula was affected by tidal waves and ash rains which destroyed much of its terrestrial life.

A second approach is that the Indonesian authorities should also consider bringing some animals into a captive breeding project to be based at least partly in Indonesia. Both options would reduce and fragment rhino populations in the wild.

When populations become small and fragmented, they become vulnerable to extinction for genetic and demographic reasons, in addition to the direct threats of habitat disturbance and poaching. Moreover, the smaller the population, the greater these genetic and demographic threats become.

As a consequence, it becomes essential to maintain some Minimum Viable Population (MVP) size or sizes to preserve the species against the genetic and demographic problems. MVPs also imply minimum areas necessary to accommodate populations of the specified sizes. Determination of what MVP and area are required is a central problem for the emerging science of conservation biology.

Thus, all goals, objectives and recommendations are oriented to the maintenance or attainment of genetically and demographically viable populations of Javan rhino.

11.2. The Sumatran Rhino

The Sumatran Rhino was found from the foothills of the Himalayas in Bhutan and eastern India, through Burma (Myanmar), Thailand, and Malay Peninsula, and on the islands of Sumatra and Borneo. There have also been unconfirmed reports of the species in Cambodia, Laos and Vietnam. The past and present distribution are shown in Figure 2 and population estimates in Indonesia are given in Table 3.

In general this species has survived much better in its native habitats than the Javan Rhino. This may be partly because it mainly inhabits the mountains and forest of higher elevations which were less effected by development and logging. In contrast the Javan Rhino is a species of the coastal plains and river valleys.

At present the species survives in pockets in Burma, Thailand, the Malay Peninsula, Sumatra and Borneo. Little is known of its status in Burma which holds the subspecies *lasiotis*. The nominate subspecies *sumatrensis* is now represented by animals in Thailand, Peninsula Malaysia and in Sumatra.

There has been little recent news of animals in Thailand and its continuing occurrence there is now doubt. In the Peninsula there are an estimated 100 animals in several isolated pockets of which perhaps only two are in protected areas of sufficient size to guarantee long term viability. All these animals have to be closely protected.

The largest number of the subspecies *sumatrensis* now survives on the island of Sumatra and it is possible that several hundred animals still exist. However, the island is now in a phase of intense development resulting from Indonesia's transmigration programme and the habitat available to the species is being rapidly reduced.

In addition the sheer size of the island, compared to the available staff for protecting the species, makes adequate protection almost impossible. Even in areas where there is a strong

presence of protection staff, poaching is active. This is evidenced by the fact that in a project to capture animals for captive breeding programme in an area where numerous wildlife staff are positioned, animals are being caught with fresh snare wounds on their legs.

The rhinos in Sumatra are too widespread and in too many pockets for all of them to be protected adequately in the ranges where they still survive. As a result, they are subject to heavy poaching pressure both from hunters with firearms and from trappers who use wire snares and other traps that maim and kill animals. The total world population is now thought to be between 500 and 900 animals (see Table 4) and the annual loss may be as much as 10 percent of that population. Presently, there are 27 (?) animals in captivity.

The subspecies *harrissoni* is possibly the most endangered of the subspecies and now exist in a few rapidly dwindling pockets in eastern Sabah. There may be less than thirty animals still surviving in the state and the rate of poaching is believed to be high. Recently it was discovered that a small group of this subspecies survives in the upper Limbang catchment in Sarawak.

Efforts are now being made to monitor this group and protect them from poachers. It is also possible that populations remain in eastern Kalimantan.

An extensive international cooperative programme for the conservation of this species is already being implemented. There are on-going efforts to establish captive breeding centres for the species in Indonesia and in Malaysia (both the Peninsula and in Sabah) where the active trapping of animals has been stopped after the targets were met. Captive breeding is also being planned in the United State and the United Kingdom, using animals of Indonesian origin.

All of these efforts are components of global captive propagation programme being developed for this species under the general guidelines of the Singapore Proposals adopted by the Asian Rhino Specialist Group (ARSG) and IUCN in 1984 and in accordance with the specific provisions of the national plans and bilateral agreements that have been formulated.

A major guideline of note is that no mixing of animals from the four major regions of their range (Burma, Peninsula, Sumatra, and Borneo) be undertaken until there has been adequate genetic investigation of any significant differences between these geographically disjunct populations.

Table 3. POPULATION ESTIMATES OF THE SUMATRAN RHINOCEROS IN INDONESIA

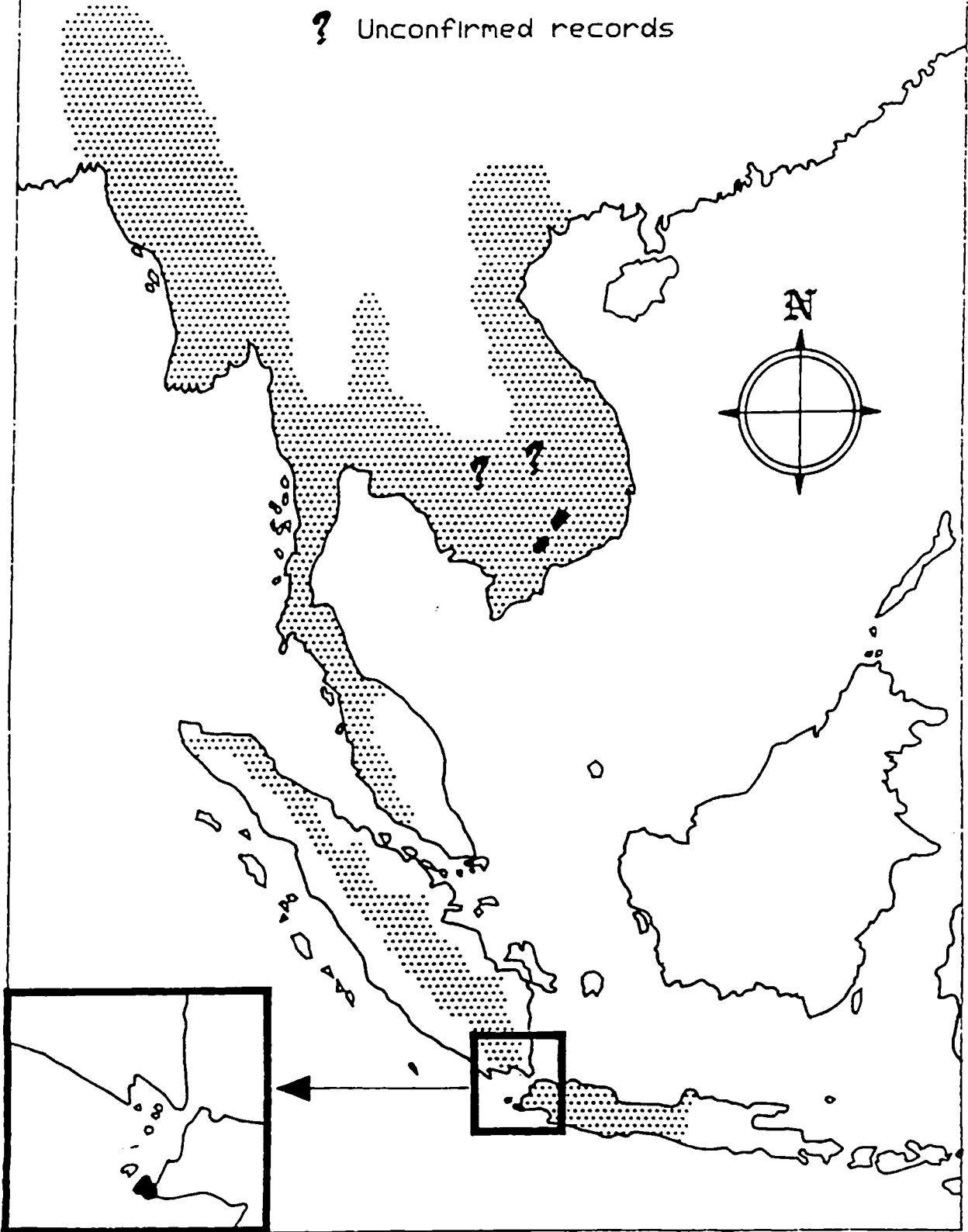
Island	Location	No of Rhino	Habitat Availability		Protection Status	Potential Carrying Capacity
			Presently (Km ²)	Potentially (Km ²)		
Kalimantan	near Sabah border	Perhaps survives	?	?	Unclear	?
Sumatra	Gunung Leuser	130-200	1,400	8,000	National Park but disturbance & poaching	140-800
Sumatra	Gunung Patah	Numbers unknown	400	500	No information	40-50
Sumatra	Kerinci-Seblat	250-500	5,000	10,000	Little protection proposed National Park	500-1000
Sumatra	Gunung Abong-abong and Lesten-Lukup	15-25	?	?	Not protected	?
Sumatra	Berbak	Perhaps	?	?	Nature reserve	? extinct
Sumatra	Torgamba	Very few	?	?	Being deforested	?
Sumatra	Barisan Selatan	25-60	700	3,600	National Park, deforestation occurring	70-360
TOTAL		420-785				750-2150

Table 4. WORLD POPULATION ESTIMATES OF THE SUMATRAN RHINO

Country	Location	No of Rhino	Habitat Availability		Protection Status	Potential Carrying Capacity
			Presently (Km ²)	Potentially (Km ²)		
Burma	Schwe-u-daung	Perhaps survives	207	?	Game sanctuary	?
	Tamanthi	Perhaps survives	2,150	?	Game sanctuary	?
Indonesia (Kalimantan)	Lassai tract	6-7	?	?	Unknown	?
	Near Sabah border	Perhaps survives	?	?	Unclear	?
Indonesia (Sumatra)	Gunung Leuser	130-200	1,400	8,000	National Park but disturbance & poaching	140-800
	Gunung Patah	Numbers Unknown	400	500	No information	40-50
	Kerinci Seblat	250-500	5,000	10,000	Little protection proposed National Park	500-1,000
	Gunung Abong-abong and Lesten-Lukup	15-25	?	?	Not protected	?
	Berbak	Perhaps extinct	?	?	Nature reserve	?
	Torgamba	Very few	?	?	Being deforested	?
	Barisan Selatan	25-60	700	3,600	National Park deforestation occurring	70-360
Malaysia (Peninsula)	Endau Rompin	10-25	1,600	1000-1600	Reserve, National Park proposed	110-160
	Taman Negara	22-36	4,400	4,400	National Park	220-440
	Sungai Dusun	3-4	40	140+	State Wildlife Reserve	15
	Gunung Belumut	3-5	230	230	Wildlife Reserve proposed	23
	Mersing Coast	5-6	?	Probably none	Being deforested	0
	Sungai Depak	2-4	?	Probably none	Being deforested	0
	Sungai Yong	3-5	?	Probably none	No information	0
	Kuala Balah	2-4	?	Probably none	Being deforested	0
	Bukit Gebok	2	?	None	Being deforested	0
	Krau reserve	1	500	500	Insecure	50
	Sungai Lepar	2	1,000	0	Unprotected and being deforested	0
	Ulu Alok	1	?	?	No information	?
	Ulu Selama	6-7	?	?	Unprotected	?
	Ulu Belum	2-4	?	?	Insecure	?
Malaysia (Sabah)	Bubu Forest	2	?	?	No information	?
	Kedah 1	?	?	?	Insecure	?
	Tabin Reserve	20+	1,200	1,200	Perhaps protectable	120
	Kretam/Dent Peninsula	8	1,000	0	Being converted to agriculture	0
	Danum Valley	10	2,000	2,000	Perhaps protectable	200
	Limbang	5-15	600	600	Protection proposed	60
Thailand	Phu Khieo	Perhaps survives	1,560	?	Protected area	?
	Tenasserim Range	6-15	?	?	Insecure	?
	Khoi Soi Dao Reserve	Perhaps survives	745	?	Protected area	?
TOTAL		536-962				1,548-3,278

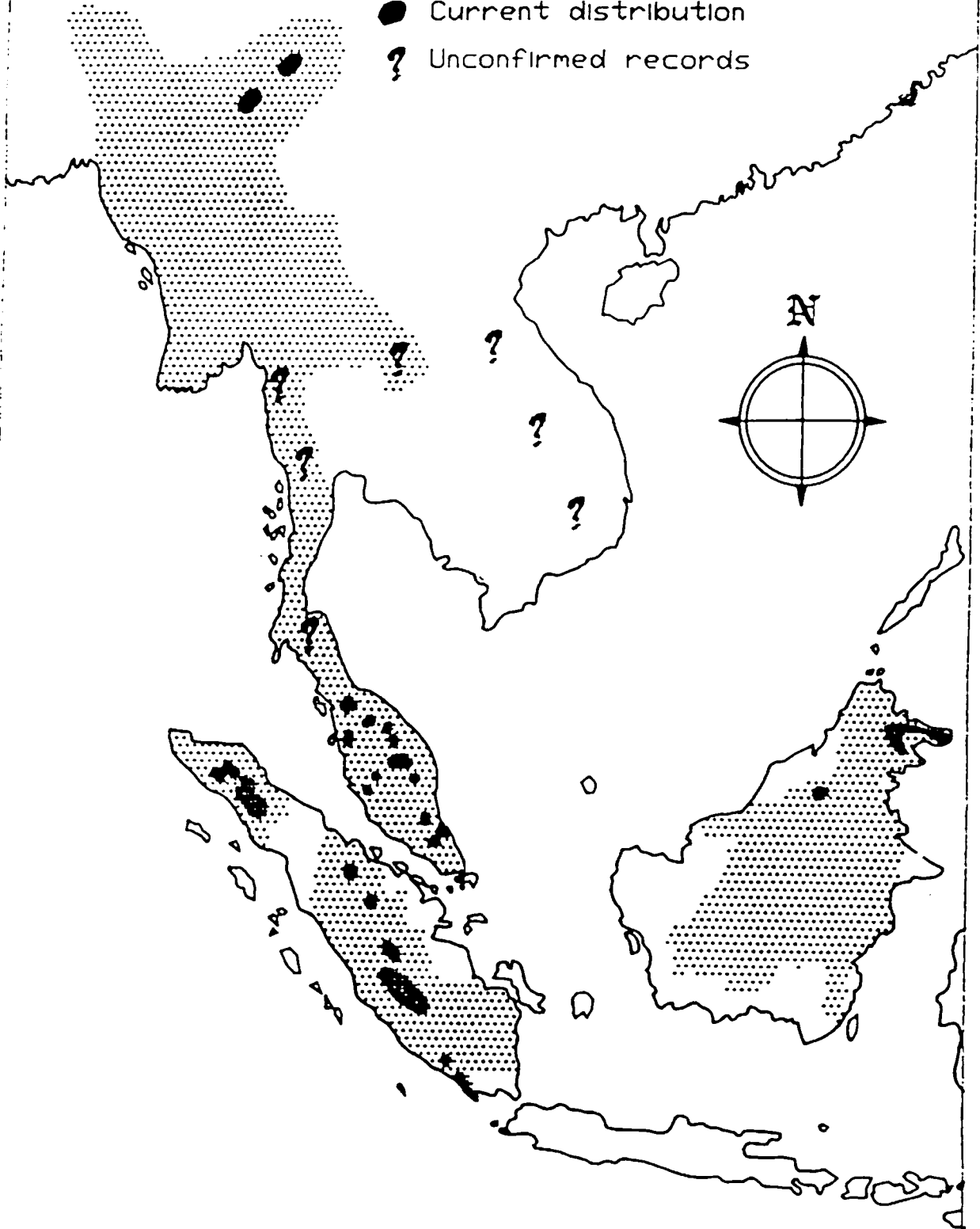
JAVAN RHINOCEROS - RHINOCEROS SONDAICUS

- Maximum known distribution
- Current distribution
- ? Unconfirmed records



SUMATRAN RHINOCEROS - DICERORHINUS SUMATRENSIS

- Maximum known distribution
- Current distribution
- Unconfirmed records



CONSERVATION STRATEGY

Conservation and preservation of nature has been established in Government policy for many years in Indonesia. With the growing world-wide concern for conservation of nature, formulated into The World Conservation Strategy, Indonesia adopted it into its recent Conservation Strategy, in which conservation is based on the protection of life support system, preservation of genetic resources and sustainable-use of living natural resources.

Act No. 4/1982 on the Management of the Living Environment and Act No. 5/1990 on Conservation of Living Natural Resources and their Ecosystems provide a strong commitment to the conservation of nature.

As instrumental inputs to the development of conservation management of the country, the Act and Conservation Strategy direct the development of the Indonesian Rhino Conservation Strategy. The Rhino Conservation Strategy was formulated at the Indonesian Rhino Conservation Workshop of PHPA-IUCN-WWF held in 1991 and was subsequently endorsed by the Government of Indonesia as a document to guide conservation of Indonesian rhinos.

I. OBJECTIVE

To create conditions conducive to the long-term survival of viable populations of the Javan Rhino (*Rhinoceros sondaicus*) and the Sumatran Rhino (*Dicerorhinus sumatrensis*) in the wild in Indonesia.

II. CURRENT STATUS

Both the Javan Rhino and the Sumatran Rhino are threatened with extinction, in Indonesia and world-wide. The current populations are small, scattered and most are threatened by illegal hunting and loss of habitat. Even without any further losses, the present populations are so small that they are vulnerable to environmental catastrophes and demographic and genetic flaws typical of small populations.

The disappearance of more and more of the remaining populations and eventually the extinction of the species is inevitable unless specific actions are carried out to restore the populations to adequate levels and to safeguard the rhinos and their habitats.

Indonesia harbours virtually the whole remaining world population of the Javan Rhino in the Ujung Kulon National Park, and the largest remaining populations of the Sumatran Rhino in two National Parks in Sumatra, possibly comprising 70 percent or more of the total world population. The responsibility for the global survival of these two unique species therefore rests principally in the hands of the Indonesian State.

III. AIMS

To meet the objective, the strategy aims at establishing large and safe populations of both species throughout their natural range.

To establish such populations the following actions have to be considered:

- (1) Rigorous protection of existing wild rhino populations and their natural habitat,
- (2) Expansion of existing wild populations, by natural population growth and, where appropriate, with animals translocated from elsewhere,
- (3) Re-establishing rhino populations in suitable areas within the natural range with animals derived from the wild or from captive stock.
- (4) Strengthening of captive breeding programmes to develop into a significant source of animals for re-introductions,
- (5) Strengthening of the general conservation base through public awareness and education in combination with good legislation and strict enforcement by a dedicated force.
- (6) Acquisition of the knowledge needed for monitoring, management and preservation of rhino populations and their habitat,
- (7) Providing training for those involved in development and implementation of the programmes.

A. Preservation of large wild populations.

Small and isolated populations are very vulnerable to accidental loss or poaching, to localized catastrophes like floods, fires, cyclones, and they can also suffer declining vigour or vitality through steady loss of genetic diversity.

To maintain adaptability, resilience and genetic vitality, a minimum population of 100 to 500 animals, depending on the reproductive pattern of the species, is necessary for survival of the population for 10 or more generations, or, in the case of the Rhino, for the next century. In all the main areas of the species natural range in Indonesia, i.e. Java and Sumatra for the Javan Rhino and Sumatra and Borneo for the Sumatran Rhino, populations of at least several hundreds of animals must be maintained.

Currently all existing populations, with the possible exception of the Sumatran Rhino in Kerinci Seblat, are far below this minimum level.

It should be stressed that the figures given above are minimum requirements, only providing for the preservation of the steady state. For survival and development of the species over an evolutionary significant timescale, and for further evolution of rhino lineages, entirely different conditions will be necessary in the more distant future.

F. Wildlife tourism.

Tourism will enable the Park to realize certain economic benefits.

For the development of tourism it is necessary to conduct an evaluation of how tourism can be managed within the constraints of the long-term interests of the conservation of the species and habitat within the park.

G. Development of Gunung Honje as Javan Rhino habitat extension.

The size of the rhino population in Ujung Kulon is limited by the comparatively small size of the National Park. Some habitat could be made available by the expansion of the rhino population into the Gunung Honje part of the Park, part of which is suitable for rhinos.

The Gunung Honje area is under heavy pressure from the communities living around the Park and buffer zone development and other programmes will be needed for the consolidation of the conservation status of this area.

Park boundaries should be resurveyed and clearly delineated around Gunung Honje and the degree of protection provided by the Park guards should be increased.

A survey and evaluation of the Gunung Honje area should be conducted to assess its potential and needs for the re-establishment of rhino habitat.

"Traditional use" zones within the Park boundary and in the vicinity of villages should be identified. These zones would be for the controlled use of minor forest products (non-timber) by the villagers.

Agricultural extension work should be carried out in the villages of the buffer zone surrounding the park. This work should promote the establishment of intensive, settled and profitable agriculture. Full use must be made of the environmental services provided by the Park.

Families living inside the park boundary should be identified. Their situation can be reconciled either by relocation and compensation, or by re-aligning the park boundary. Arbitration can be carried out on a case-by-case basis.

It is recommended that Gunung Honje be re-populated by rhinos through natural migration and increased protection, rather than by a managed translocation.

H. Research programme for Ujung Kulon.

1. Population survey and trend of Javan Rhino in Ujung Kulon National Park.

For the future management of the Javan rhino population in Ujung Kulon and for the preparation for the translocation of rhinos from Ujung Kulon it is of vital importance to know the composition of the rhino population and to be able to monitor the population trend.

Before any translocation programme can commence the current status of the Ujung Kulon rhino population must be known. Current data on the rhino population in Ujung Kulon are not sufficiently accurate and consistent to form a basis for an evaluation of the effects of removal of rhinos for a translocation programme.

Therefore the new survey technique being carried out in Ujung Kulon with automatic photo registration should be continued and expanded, until a satisfactory result has been obtained. The current census programme could be speeded up and refined by the use of more equipment and by using other census techniques in conjunction with the photo registration¹.

For the continuity of the population monitoring a standardized census should be done yearly by the Park Staff. The census techniques to be used should be simple, accurate and consistent, aiming at continuity of existing methods to enable long-term comparison of data, while incorporating new techniques to improve accuracy with time.

Guards should be trained to carry out the censuses and staff at Headquarters should be trained in the evaluation of the results.

2. Research on biology and ecology of Javan Rhino in Ujung Kulon.

Research on the ecology of the Javan rhino will provide the baseline information for management decisions and for the preparation of the education and awareness programmes. It will also enhance the profile, credibility and importance of the Park.

Based on a thorough review of available information and identification of needs, baseline studies on the Javan Rhino and its habitats should be undertaken to give a comprehensive picture of the ecology of the species. The following is a non-exclusive list of some priorities :

- (1) Habitat preferences and carrying capacity.

¹ The photo registration programme has recently been completed and the results have been communicated to PHPA.

JAVAN RHINO ACTION PLAN

I. CONSERVATION OF THE JAVAN RHINO IN UJUNG KULON

The Ujung Kulon National Park is the only place, except for a small population just outside the Nam Bai Cat Tien National Park in Vietnam, where the Javan Rhino is known to survive. The Ujung Kulon peninsula is a long established conservation area and its topography makes protection of the rhinos comparatively easy. The area is too small for a large population of Javan rhinos and it cannot be expanded.

Since it is the only source of animals for the establishment of other populations, protection of this unique resource has the highest priority. Immediate actions should be directed towards achieving the best possible protection for this population.

A. Strengthening of Park management and administration unit.

It is recommended that the management structure of the Park be re-examined and that a strategic planning exercise be carried out to ensure the effective deployment of staff. Special attention should be paid to:

- (1) The location of the Park Headquarters.
- (2) Implementation of activities in the Park.
- (3) Time demands on the Park Superintendent.
- (4) The need for an Operations Manager.

B. Park protection and intensive patrolling.

A good patrolling system to prevent poaching and to monitor the rhino population should be developed. Guards should be trained in monitoring techniques.

C. Law enforcement.

Regulations should be amended or developed to empower Park guards to enforce the law when apprehending offenders. Serious consideration should be given to provision of fire arms to make this possible. The establishment of an efficient communications network both within the park and its head office, and between head office and Jakarta, is essential for good and efficient management of the Park.

D. Education and awareness programme.

Education (formal or informal, but involving schools and children) and awareness (informal, aimed at the broad public, mainly adult) campaigns are a vital part of the Park work and implementation should begin at a very early stage.

Specific education programmes should be developed for:

- (1) School level (village, public and private schools)
- (2) Park level. Interpretive plans need to be designed for each rhino area.
- (3) Zoos and Safari parks.

Park interpreters need to be given support and training to provide information to villagers and park visitors.

Conservation awareness programmes should be developed for all levels of society:

- (1) Central Government level especially aimed at the legislature and the law-enforcement authorities.
- (2) Regional Government level with specific reference to:
 - (a) Obtaining the support of the Bupati of Pandeglang.
 - (b) Providing an information kit for the use by the Park Superintendent when meeting with other government departments such as agriculture, fisheries, etc.
- (3) Local communities. Develop support materials for use with local communities and conduct an awareness programme in conjunction with law enforcement and buffer-zone activities.
- (4) Tourists. Develop an interpretation programme for tourists. This should be broad-based but have rhino conservation as a major component. It should also:
 - (a) Be bilingual (Bahasa Indonesia and English).
 - (b) Be integrated with a system of bilingual guides.
 - (c) Be pro-actively distributed to the tourism servicing industry.
- (5) Private sector. Prepare information materials to attract funding from the private sector.

E. Rhino units.

The rhino protection units will primarily operate in Sumatra for the protection of the Sumatran rhino (see Sumatran Rhino Action Plan). Special rhino units are not necessary in Ujung Kulon, but the regular guards should receive training in rhino protection and monitoring.