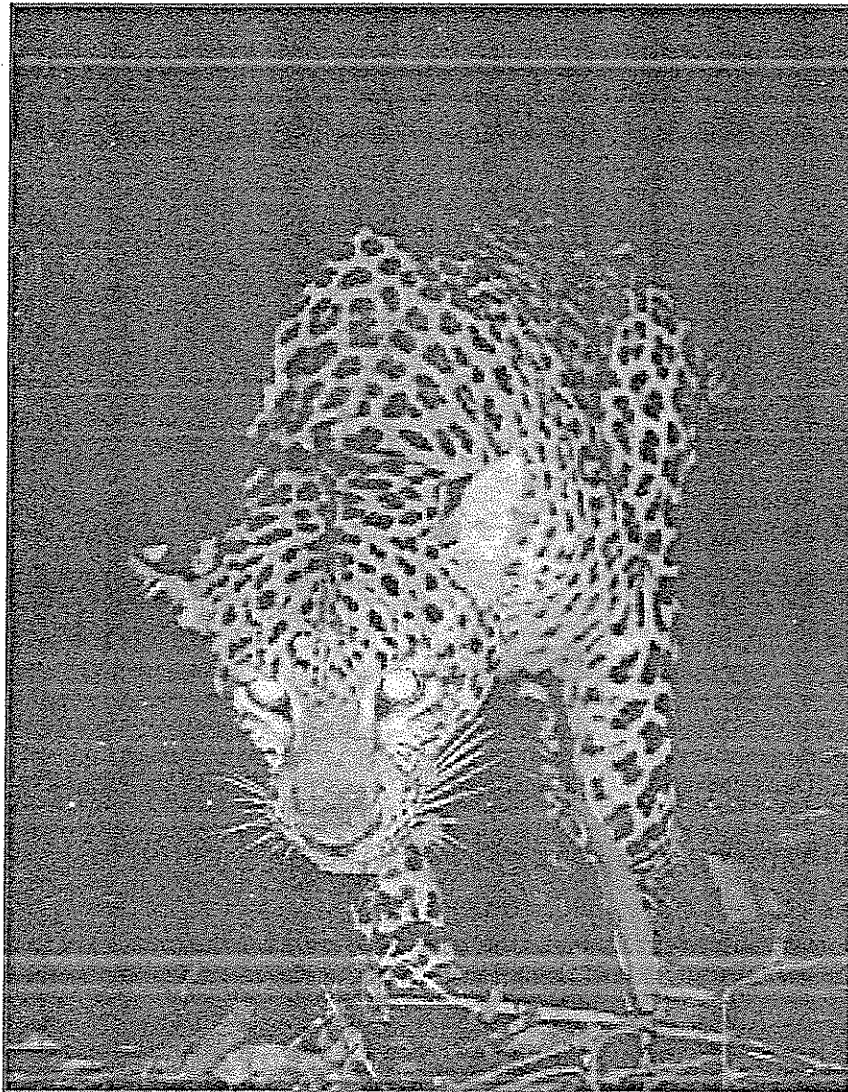


**STRATEGI DAN RENCANA AKSI KONSERVASI
MACAN TUTUL JAWA
(*Panthera pardus melas*)
2013-2023**



**Kementerian Kehutanan
2013**

I. INTRODUCTION

A. Background

Indonesia has high diversity of rare-protected species' in the world, unfortunately also has a high level of threat of extinction. In order to conserve the endangered species' with high level of extinction, encouraging conservation experts to act through efforts to prevent or at least reduce the level of threat to these species'. One of the Critically Endangered species is Javan leopard (*Panthera pardus melas* Cuvier 1809). As other protected species', the Javan leopard also facing high level of threats due to natural habitat loss, habitat fragmentation, habitat degradation and the hunting of its prey.

Protected areas which are being the habitat of endangered species like the Javan leopard need management which considered the population and their habitat. In this case, the endangered species can be indicators and targets the management of a conservation area. Java Island was once the habitat of one tiger sub-species have been declared extinct in the 1980s namely Java tiger (*Panthera tigris sondaica*). If the conservation of the Javan leopard is not conducted soon, it will most likely also will suffer an extinction similar to Javan tiger.

In 2012, the IUCN Redlist classified Javan leopard as Critically Endangered (category C2ai), and categorized as Appendix 1 in CITES. The Javan leopard has been protected by the Government of Indonesia since 1970 based on SK Mentan No. 421 / Kpts / Um / 8/1970 (written as: *Felis pardus*), then reinforced by Law No. 5 of 1990 and PP. No.7 of 1999. Assessment of Javan leopard status has been awarded by IUCN since 1978 and classified as Vulnerable, Threatened status in 1988, Indeterminate status in 1994, and Endangered in 1996 (category C2a).

Javan leopard is the top predators in the food chain, therefore has a very important role in the ecosystem. As top predators, leopards has a role to control populations of species that became prey, which is often being a pest to the crops and disease vectors. Therefore, the leopard also play an important role in maintaining healthy populations of prey species and ecosystem balance. The existence of Javan leopards in the wild is highly dependent on habitat conditions (wide and quality) and the abundance of prey animals, especially ungulates such as barking deer, deer, pigs and mouse deer, as well as primates like monkey and leaf monkey. The loss of top predators such as leopards Java in an ecosystem will affect the equilibrium of the ecosystem.

Deforestation and other development activities such as construction of roads, irrigations, voltage wires, dam construction, settlements and agricultural has caused habitat lost, shrink, degraded and fragmented. This has resulted in decreasing the population of Javan leopard regionally and local extinction in some populations. In addition, the decreasing of habitat, loss of prey and habitat fragmentation has also led to cases of leopard entering the settlements, either to find new habitats and

searching for prey. This ultimately raises conflict with humans, which is likely to increase in the last 10 years.

Real efforts are needed to preserve the Javan leopard so that the pressure and threat are not increasing. Research proved that without real effort planned and systematic in Javan leopard conservation has caused local extinction Javan leopards as many as 17 locations within 20 years (1988 to 2008) or 26% in Central Java (Gunawan, 2010). In order to conserve Javan leopard, since 2009 the government (Ministry of Forestry c.q.) together with experts, researchers and observers of leopard Java in Indonesia began to develop a strategy and action plan for the conservation of Javan leopard for the next ten years. With the strategy and action plan is expected that Javan leopard conservation efforts more planned, directed, focused and effective.

B. Objectives

The objectives of developing Javan leopard strategy and action plan are:

1. As the reference for stakeholders within government (Ministry of Forestry and Local Government), NGOs, the private sector and education institution in making decisions related to Javan leopard conservation.
2. Provide guidance to the Head of Technical Implementation Unit (UPT) in Javan leopard conservation.
3. As a tool of coordination to the development actors and conservationists as well as other stakeholders in the implementation of development and conservation of Javan leopard.

C. Scope

The scope of Javan leopard strategy and action plan 2015-2025 include information on: the current state of Javan leopard (including morphology, behavior, distribution, population, habitat, prey, threats) as well as the strategy and action plan for the conservation of Javan leopard.

II. CURRENT CONDITION OF JAVAN LEOPARD

A. Overview of the Life of Javan leopard

Leopard was known and classified as *Panthera* genus which has twenty four subspecies widely distributed across Asia and Africa. However, based on the analysis of phylogeny using DNA markers is believed there are nine subspecies of leopards in the world. Javan leopard (*Panthera pardus melas*) is genetically distinct from other sub species (Meijaard, 2004).

The body size leopard generally varies according to gender and habitat. According to Hoogerwerf (1970), the average size of male adult Javan leopard total length is 215 cm measured from snout to tip of tail, height 60-65 cm, and weighs 52 kg. While a female total length is 185 cm measured from snout to the tail, height 60-65 cm tall and weighs 39 kg.

Besides having the characteristic spotted all over skin, Javan leopard also has a variety of other colors such as black. Variations in body color does not mean black leopard is different, but actually the same subspecies. When looked at the skin closely, it is not entirely black, but there are leopard-spotted darker than the base color. In Indonesia, the Javan leopards known as macan kumbang. The color difference is encountered in many of the island of Java and in Bengal, India. Even for other *Panthera* like Jaguar (*Panthera onca*) in South America, this case also occurred. Experts say that the color difference is caused by pigments melanistic owned Javan leopards so that leopards which have dark base color (black) is said to have melanism (Figure 1).

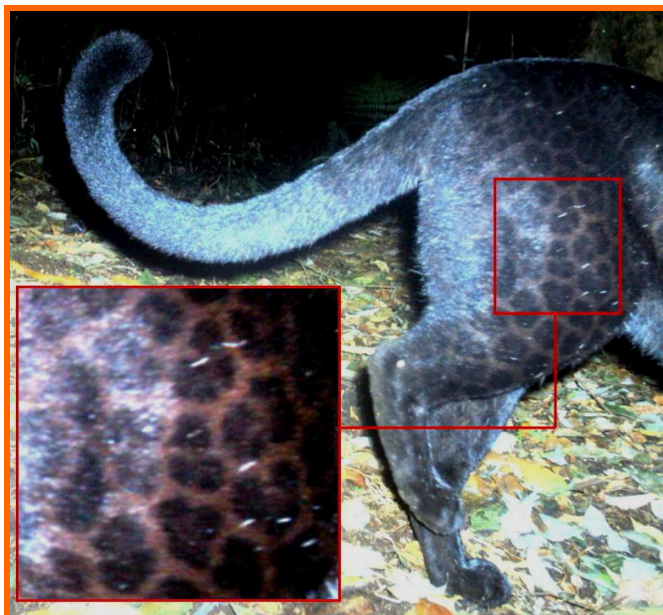


Figure 1. The pattern on the body spotted leopard melanism Java experiencing or panther (photo: CI-I camera trap)

As other wild cats, Javan leopard generally active at night (nocturnal) and also during the day (diurnal). Generally live alone (solitary), but at the same event will occur between males and adult females during the mating season. Javan leopards are a strong territorial nature. Male and female territories often overlap. Both males and females mark their territory by spraying urine to trunks along the path. Javan leopard has a territory ranging between 5-15 km². Using a radio collar, territory Javan leopard ever recorded in the Mount Salak National Park in area of 7.81 km² for adult males, and covering an area of 3.48 km² for adult females. The area of overlap for the individual male and female adult ever recorded in the Mount Salak National Park in area of 3.48 km² (Sakaguchi et al, 2003).

Male Javan leopards roam looking for a partner in their territory. Females Javan leopards generally have 2-6 cubs in each birth with gestation period of approximately 110 days. Javan leopard becomes an adult at the age of 3-4 years. Javan leopard cubs will remain with their female parent until the age of 18-24 months. Javan leopards can live up to 21-23 years in captivity, but no information about wild leopards.



Figure 2. Javan leopard (*Panthera pardus*) which has melanism or locally named as macan kumbang (left) and normal spotted leopard (right) in Mount Salak National Park (photo: CI-I camera trap)

B. Distribution and Population

B1. Distribution

Leopard is having the most extensive distribution area among other wild cat species (Guggisberg 1975; Lekagul and McNeely, 1977). From Africa (beyond the Sahara Central), leopard spread to Asia Minor, Afghanistan, Turkey, Iran, India, Ceylon, Java, China including northern China (Manchuria), until Amar Ussuri (Grzimek, 1975; Nowak, 1997; Sanderson, 1972). To the north of the leopard distributed to the Russian Far East. In Indonesia, the leopard is still found throughout Java, although in small amounts, but this island is one of the most populous island in the world (IUCN - The World Conservation Union, 1996).

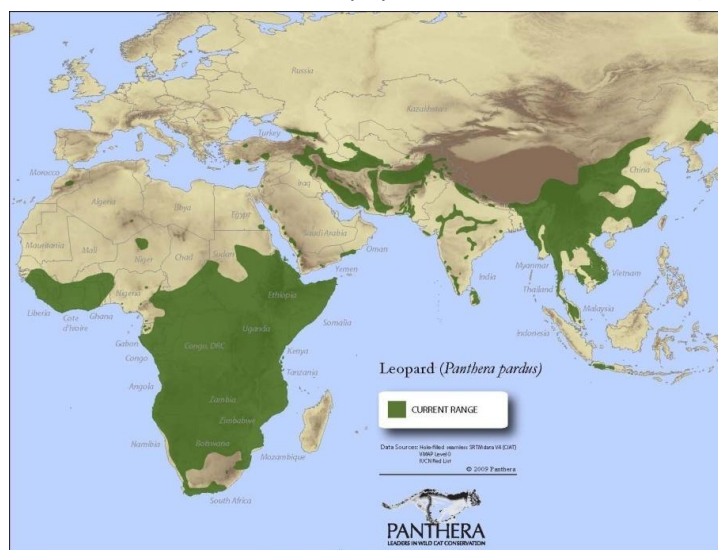


Figure 3. Map of the distribution of leopards in the world

(<https://www.google.com/www.panthera.org>)

Javan leopard is widely distributed from western tip of Java (Ujung Kulon National Park) to the eastern tip of the island of Java (Alas Purwo National Park). Besides, this species also reported present in Kangean island and Nusakambangan. They present not only in protected areas such as National Parks, Nature Reserves and Wildlife, but also reported present in non-protected forest as well as production forest managed by Perum Perhutani. However, lost connectivity between many habitat is seriously occurred, especially in Central Java and Yogyakarta Provinces so as to form a non equilibrium meta population which are susceptible to local extinction (Gunawan, 2010).

Nowadays, the existence of Javan leopard is already known based on camera trap research, footprint, feces, scratches on the tree, as well as information from company and communities around forest areas, among others: in Banten Province, Ujung Kulon, Mount Salak National Park, and protected forest of Mount Karang -Akasari in Pandenglang (Figure 4). In West Java, in Gunung Gede Pangrango, mostly in Mount Salak National Park, Mount Ciremai National Park, Mount Simpang Nature Reserve, Mount Tilu Nature Reserve, Mount Tangkuban Perahu Nature Reserve, Mount Burangrang Nature Reserve, Mount Guntur / Crater Kamojang Nature Reserve, Mount Sawal, Cikepuh Wildlife Reserve, Kareumbi-Masigit, Mount Masigit protected forest, Gunung Malabar protected forest, Gunung Wayang Windu protected forest, Mount Limbung protected forest (Ario, 2010) (Figure 5).

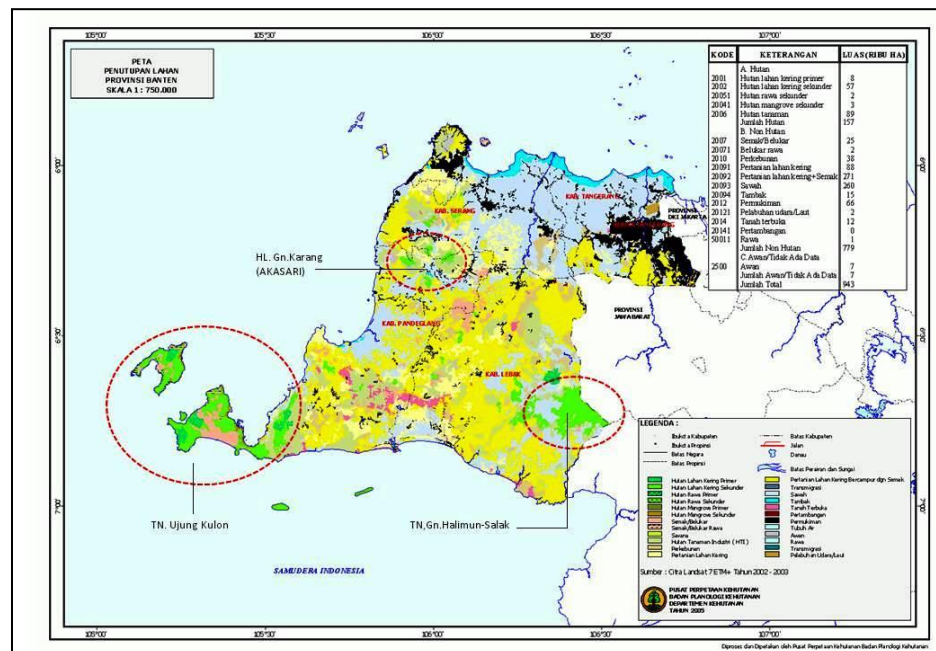
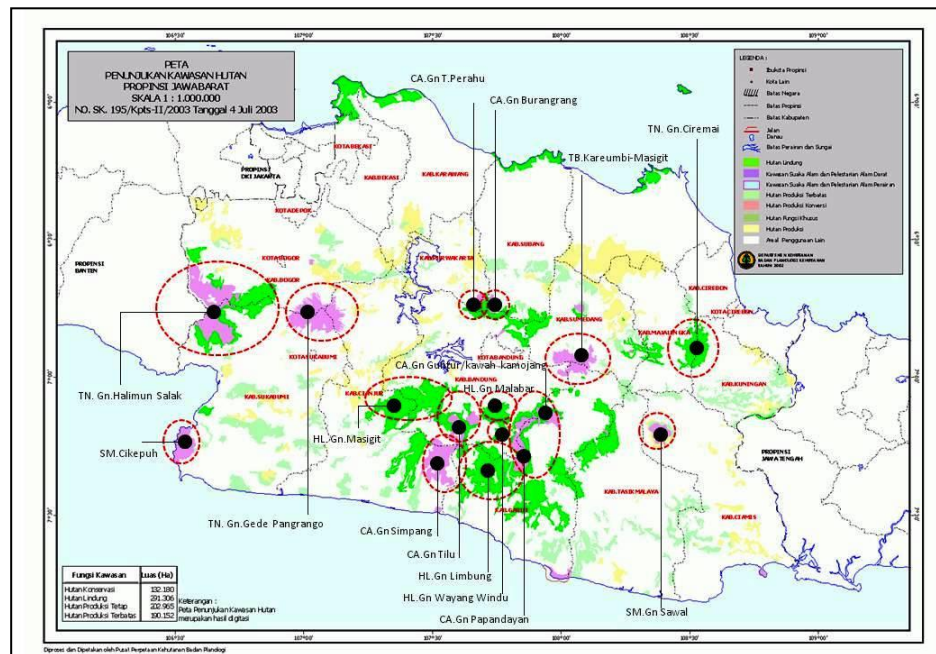


Figure 4. Map of the indicative distribution Javan leopards in Banten Province.

Gunawan et al. (2013) identified the distribution of Javan leopard in West Java and Banten in 76 locations. Generally, mountains in West Java and Banten still inhabited by Javan leopard. In addition to the mountains that have been mentioned by Ario (2010), Gunawan et al. (2013) also recorded leopards present on Mount Cakrabuana (KPH Majalengka), Mount Galunggung and Mount Papandayan (KPH Garut), Mount Jubleg (KPH South Bandung), Mount Manglayang and Mount Tampomas (KPH Sumedang), Mount Sanggabuana (KPH Bogor), Gunung Kalong (KPH Indramayu). Besides present in

protected forests, Javan leopard are also present in production forest such as in KPH Kuningan (BKPH Garawangi), KPH Ciamis (BKPH Banjar North, South and Pangandaran), KPH Tasikmalaya ((BKPH Karangnunggal and Taraju), KPH Sukabumi (BKPH Cikawung Gede West), KPH Cianjur (BKPH Cibarengkok), KPH South Bandung (Part Forest Tambakruyung) and KPH Sumedang (BKPH Cadas Ngampar).



In Central Java Province, Javan leopard present in Pringombo Nature Reserve (Banjarnegara regency), teak forests BKPH Subah (Batang regency), Serang (Purbalingga regency) and East Nusa Kambangan Nature Reserve (Cilacap regency), in Randublatung, Pati, Kendal, Semarang, Telawa, Mount Muria and Mount Lawu (Hoogerwerf, 1970). Anonymous (1987) recorded Javan leopard present in Central Java and Yogyakarta in the following areas: Nusa Kambangan island, Batang, Banjarnegara, Kendal, Cepu, Sragen, Kebasen, Notog, Jatilawang, Mount Slamet, Mount Muria, Gunung Kidul, Mount Merapi and Kulon Progo. Furthermore Gunawan (2009) reported that based on indicative distribution of the presence of Javan leopards in 20 territories Forest Management Unit Perum Perhutani Unit I Central Java, among others KPH East Banyumas, West Banyumas, South Kedu, North Kedu, Surakarta, Semarang, Telawa, Gundi, Purwodadi, Blora, Randublatung, Cepu, Kebonharjo, Mantingan, Pati, Kendal, East Pekalongan, Pemalang, Pekalongan West, and Balapulang (Figure 6).

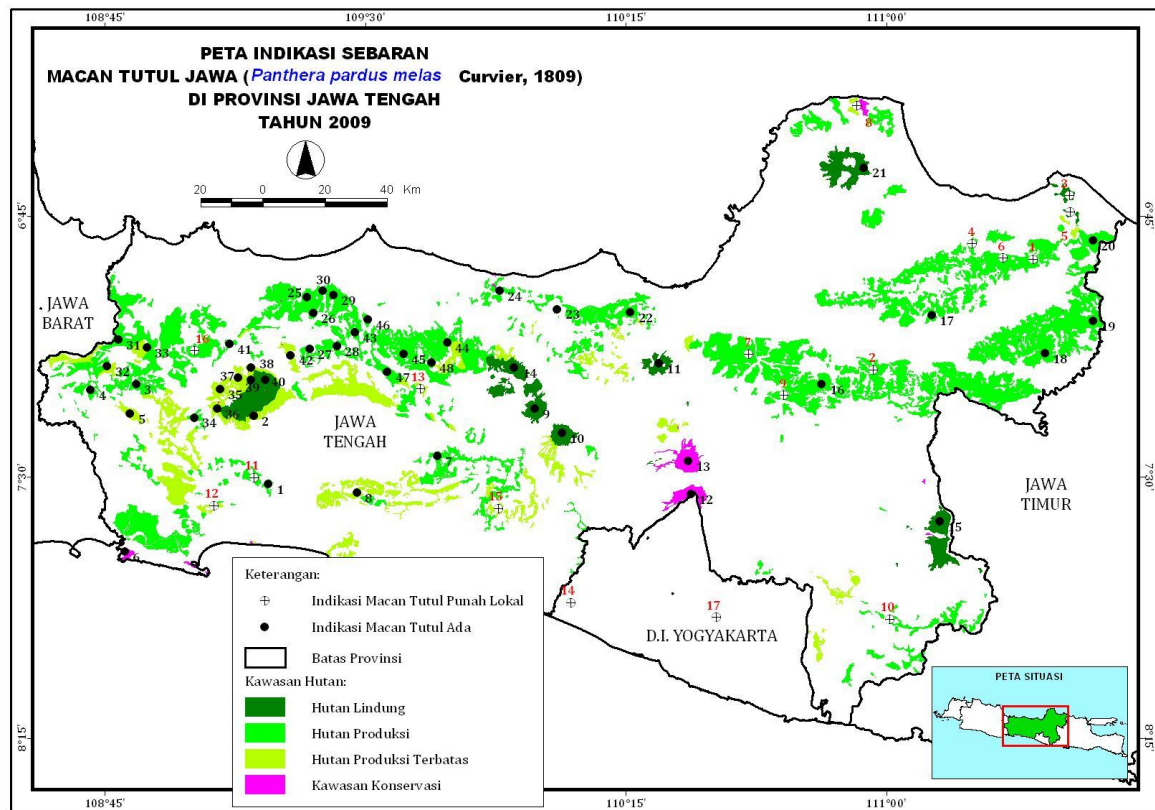


Figure 6. Map of indicative distribution of Javan leopard in Central Java province (Gunawan, 2010).

According to the data collected by Peduli Karnivora Jawa (PKJ), the present of leopards in East Java Java reported in TN Alas Purwo, TN. Meru Betiri, TN. Glaze, TN. Bromo-Tengger-Semeru, CA Kawah Ijen, SM Plateau Yang, Mount Arjuna, Gunung Kawi-Kelud, Tuban, Ponorogo, Padangan, Saradan, Jember, Blitar, Jatirogo, Madium and Gundih (Figure 7).

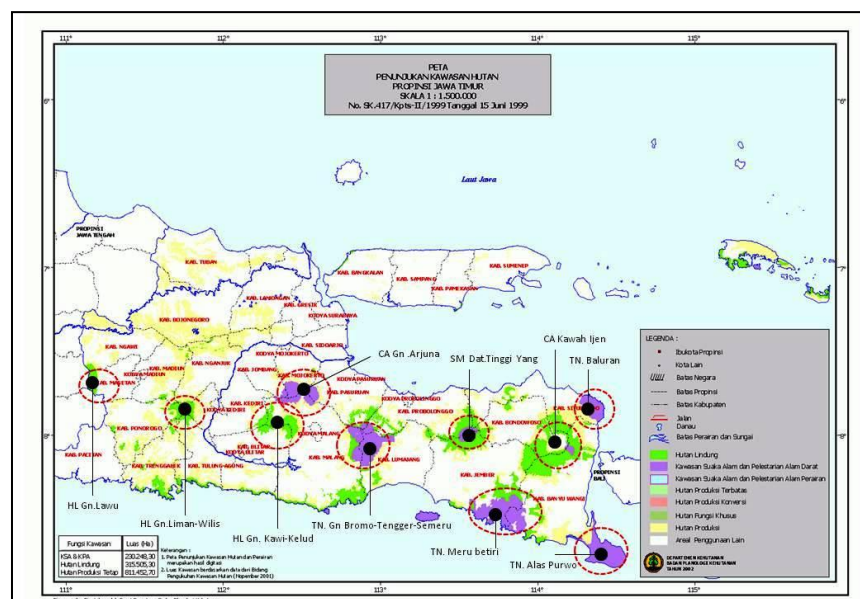


Figure 7. Map of indicative distribution of Javan leopard in East Java province

B.2. Population

Population of Javan leopard across Java is not well known. Only several forest patches which already available, however the research was done using different method. These data also collected in different time. As data collected in 1992, assumed the population throughout the island of Java, for example, one individual per 10 km² in an undisturbed habitat and one individual per 5 km² of habitat has been disturbed. By using these assumptions, it is estimated based on the area of habitat remaining, approximately 350-700 individuals Javan leopards living in conservation areas across the island of Java (Santiapillai & Ramono, 1992).

Based on the results of studies using camera traps, density of Javan leopard in some locations in Gunung Gede Pangrango National Park and Mountain Salak National Park. Density in Bodogol area (Gede Pangrango National Park) is one individual per 6 km² (Ario, 2006). In Mount Salak National Park, based on calculation category primary and secondary forest area is one individual per 6.67 km² (Syahrial and Sakaguchi, 2003). In the forest area of Mount Salak is one individual per 6.5 km² (Ario, 2007). The density of leopards in the area of Gunung Gede Pangrango National Park is one individual per 7.7 km² (Ario et al, 2009). For comparison, the density of leopard in Sri Lanka is one individual (adult) per 20-30 km² (Eiseberg and Lockhart, 1972), one individual per 25 km² in Thailand (Rabinowitz, 1989).

Meanwhile Gunawan (2010) did a population estimate of Javan leopard in Central Java and Yogyakarta using a combination of extrapolation based on male territory of 600 ha per individual and spatial modeling habitat use, vulnerability to habitat and habitat suitability. Using this method, population estimated between 240-400 individuals. Meanwhile, based on inventory survey, approximate 234-383 individuals estimated live in the entire region of Central Java and Yogyakarta Province.

Based on the estimation of remaining natural forest in Java, which is 13.68% or an area of 327,733.03 hectares (3277.33 km², there are protected areas such as National Parks, Nature Reserves, Wildlife, Hunting Park and Forest Park. By extrapolation, can be expected that initial estimate Javan leopard populations across the island of Java nowadays is ranged from 491.3 to 546.2 individuals. The facts demonstrate that population has been declining within last 15 years. The decrease is in line with the shrinking of natural forest which is being the main habitat and accompanied the shrinking of prey and the increasing of poaching activities (Ario, 2010). Various scientific studies collected from various researchers, activists, and observers Javan leopard, population estimation data obtained Javan leopards presented in Table 1.

Tabel 1. Population estimate of Javan Leopard

No.	Location	Population Estimate	Source	Method
	Western Java			
1	Gunung Gede Pangrango National Park	21,8-25,9	1	Camera trap-CMR
2	Gunung Halimun-Salak National Park	41,7-58,2	2	Camera trap-CMR
3	Mount Salak	16,2	3	Camera trap-CMR
4	Pembarisan Hills	15	5	Tracking and Interview
5	Mount Ciremai	25	5	Camera trap-CMR
6	Mount Ciremai National Park	1	4	Camera trap-CMR

No.	Location	Population Estimate	Source	Method
7	West Pangandaran Production Forest	15	5	Tracking and Interview
CENTRAL JAVA				
1	Rembang Teak Plantation	10	5	Tracking and Interview
2	Grobogan-Blora Teak Plantation	15	5	Tracking and Interview
3	Mount Muria (KPH Pati)	20	5	Tracking and Interview
		11-19	6	Extrapolation and Spatial Modelling
4	Pati-Blora Teak Plantation	10	5	Jejak dan wawancara
5	KPH Telawa	7-11	6	Extrapolation and Spatial Modelling
6	KPH Purwodadi	2-4	6	Extrapolation and Spatial Modelling
7	KPH Randublatung	3-5	6	Extrapolation and Spatial Modelling
8	KPH Cepu	3-4	6	Extrapolation and Spatial Modelling
9	KPH Kebonharjo	5-9	6	Extrapolation and Spatial Modelling
10	RPH Brondong, Pedagung dan Paninggaran (KPH Pekalongan Timur)	42-68	6	Extrapolation and Spatial Modelling
11	RPH Winduaji, Jolotigo, Lemah Abang (KPH Pekalongan Timur), RPH Winduasri, Indrajaya, Cikuning (KPH Pekalongan Barat)	27-45	6	Extrapolation and Spatial Modelling
12	RPH Kalibakung dan RPH Mogan (KPH Pekalongan Barat)	4-5	6	Extrapolation and Spatial Modelling
13	Mount Lawu (KPH Surakarta)	10-17	6	Extrapolation and Spatial Modelling
14	Mount Merapi – Merbabu	10	5	Tracking and Interview
	• Mount Merapi National Park	6-11	6	Extrapolation and Spatial Modelling
	• Mount Merbabu National Park	5-8	6	Extrapolation and Spatial Modelling
15	Gunung Kidul (DIY)	10	5	Tracking and Interview
16	Mount Ungaran (KPH Kedu Utara)	15	5	Tracking and Interview
		5-8	6	Extrapolation and Spatial Modelling
17	Kendal Teak Plantation	15	5	Tracking and Interview
		17-28	6	Extrapolation and Spatial Modelling
18	Mount Sindoro (KPH Kedu Utara)	6-11	6	Extrapolation and Spatial Modelling
19	Mount Sumbing (KPH Kedu Utara)	8-13	6	Extrapolation and Spatial Modelling
20	KPH Banyumas Timur (RPH Kebasen; RPH Mandirancan)	1-2	6	Extrapolation and Spatial Modelling
21	Mount Slamet (KPH Pekalongan Barat dan KPH Banyumas Timur)	24-40	6	Extrapolation and Spatial Modelling
22	Dieng Mountain	30	5	Tracking and Interview
23	Mount Prahua (KPH Kedu Utara)	2-4	6	Extrapolation and Spatial Modelling
24	Kulonprogo Production Forest (DIY)	10	5	Tracking and Interview
25	South Kedu Production Forest	15	5	Tracking and Interview
		8-13	6	Extrapolation and Spatial Modelling
26	Pemalang – Tegal Teak Plantation	10	5	Tracking and Interview
	KPH Pemalang	36-61	6	Extrapolation and Spatial Modelling
27	KPH Banyumas Barat (Cilacap) exclude	10	5	Tracking and Interview

No.	Location	Population Estimate	Source	Method
	Nusakambangan	8-11	6	Extrapolation and Spatial Modelling
28	Brebes Production Forest	10	5	Tracking and Interview
29	Nusakambangan (All island)	20	5	Tracking and Interview
	Nusakambangan (Only in Nature Reserve)	3-5	6	Tracking
JAWA BAGIAN TIMUR				
1	Alas Purwo National Park	25	5	Tracking and Interview
2	Meru Betiri National Park	35	5	Tracking and Interview
3	Mount Raung - Gn Ijen - Meleman - TN Baluran	65	5	Tracking and Interview
4	Hyang Plateu (Gn.Argopuro)	45	5	Tracking and Interview
5	Mount Lamongan	10	5	Tracking and Interview
6	Mount Semeru	30	5	Tracking and Interview
7	Mount Arjuno	25	5	Tracking and Interview
8	Southern Malang Forest Patch	10	5	Tracking and Interview
9	Mount Liman - Mount Wilis	15	5	Tracking and Interview
10	Bojonegoro - Madiun – Nganjuk Teak Plantation	20	5	Tracking and Interview
11	South Trenggalek Forest Patch	10	5	Tracking and Interview
12	Mount Lawu	35	5	Tracking and Interview

Source:

- 1) CI-TNGGP (2009)
- 2) JICA-BCI-TNGHS (2003)
- 3) CI –TNGHS (2007)
- 4) CI - TNGC (2013)
- 5) PKJ (Peduli Karnivor Jawa) (2005)
- 6) Gunawan (2010)

C. Habitat and Prey

C.1. Habitat

Leopard occupy various habitat types with a high tolerance to variations in climate and prey (Guggisberg 1975; Lekagul and McNeely, 1977). Leopard is a highly adaptable species. They are found in every type of forest, savanna, grasslands, shrubs, semi-desert, cloudy tropical rain forest, rugged mountains, dry deciduous forests, coniferous forests around the settlement (Cat Specialist Group, 2002). In Asia there are many types of environments and leopards are found in almost all types of environment. Javan leopards can live from lowland forests to mountain forests reach a height of more than 2,000 meters above sea level. Inhabit in the forest zones in Java, either primary, secondary, even some who live in production forests (plantations). Javan leopard more tolerant than a tiger at extreme temperatures and dry environment (Santiapillai and Ramono 1992).

C.2. Prey

Leopards generally ungulate prey animals, such as deer, barking deer, mouse deer and pig. Bailey (1993) found the average interval between predatory ungulates ranges from 7-13 days and the average daily consumption of adult male leopard is 3.5 kg and 2.8 kg for female. According to Katembo and Punga (1996) leopard's diet composition consisted of 53.5% and 25.4% ungulate primates with an average

weight of 24.6 kg. According to Karanth and Melvin (1995) leopard prey balanced between ungulates and primates that is 89-98%.

Javan leopard prey among others: wild pig, barking deer, deer, monkeys, porcupines, leaf monkeys and birds (Anonymous, 1978). According to Bartels (1929) in Hoogerwerf (1970) Javan leopard prey on badgers, civet and gibbon. Javan leopard prey from small to medium such as barking deer, long-tailed macaque, wild pig, mouse deer and Javan gibbon (Santiapillai and Ramono, 1992). According to Seidensticker and Suyono (1980), in Betiri Meru National Park, East Java, Java leopard prey include wild pig (65%), mouse deer (5.9%), pangolin (5.9%), civet (3, 9%), hedgehog (3.9%), bats (3.9%), flying squirrel (3.9%), squirrel (3.9%) and barking deer (2%). Meanwhile, according to Sakaguchi et al. (2003), there are 10 species of Javan leopard prey in Mount Salak National Park based on an analysis of dirt which are barking deer, wild pig, porcupine, and Javan langur. Species of prey which are dominant in Bodogol, Gede Pangrango National Park include wild pig (*Sus scrofa*), mouse deer (*Tragulus javanicus*) and civet (*Paradoxurus hermaphroditus*) (Ario, 2006).

Gunawan et al. (2012) presented a list of animals that are being potential prey of Javan leopards that were identified in West Java and Banten Province.

Table 2. List of primary prey and potential secondary prey of Javan leopard in West Java and Banten.

No.	Local Name	Scientific Name
POTENTIAL PREY		
1.	Monyet ekor panjang	<i>Macaca fascicularis</i> (Raffles, 1821)
2.	Lutung jawa	<i>Trachypitecus auratus</i> (É. Geoffroy, 1812)
3.	Surili	<i>Presbytis comata</i> (Desmarest, 1822)
4.	Owa	<i>Hylobates moloch</i> (Audebert, 1798)
5.	Oces	<i>Nycticebus coucang</i> (Boddaert, 1785)
6.	Rusa	<i>Cervus timorensis russa</i> (Müller & Schlegel, 1844)
7.	Mencek	<i>Muntiacus muntjak</i> (Zimmermann, 1780)
8.	Babi Hutan	<i>Sus scrofa</i> (Linnaeus, 1758)
9.	Kancil	<i>Tragulus javanicus</i> (Osbeck, 1765)
10.	Banteng	<i>Bos javanicus</i> (d'Alton, 1823)
SECONDARY POTENTIAL PREY		
1.	Luwak	<i>Paradoxurus hermaphroditus</i> (Pallas, 1777).
2.	Garangan	<i>Herpestes javanicus</i> (É. Geoffroy Saint-Hilaire, 1818)
3.	Musang	<i>Viverricula indica</i> (Desmarest, 1804)
4.	Trenggiling	<i>Manis javanica</i> (Desmarest, 1822)
5.	Sero	<i>Prionodon linsang</i> (Horsfield, 1822)
6.	Landak	<i>Hystrix javanica</i> (F. Cuvier, 1823)
7.	Ajag	<i>Cuon alpinus</i> (Pallas, 1811)
8.	Kucing Hutan	<i>Prionailurus bengalensis</i> (Kerr, 1792)
9.	Ayam Hutan	<i>Gallus gallus</i> (Brisson, 1766)
10.	Merak	<i>Pavo muticus</i> (Linnaeus, 1766)
11.	Sigung, teledu	<i>Mydaus javanensis</i> (Desmarest, 1820)

No.	Local Name	Scientific Name
12.	Cukbo, Walangkopo	<i>Petaurista elegans</i> (Müller, 1840)
13.	Careuh besar	<i>Viverricula malaccensis</i> (Gmelin, 1788)
14.	Careuh kecil	<i>Mustela nudipes</i> (Desmarest, 1822)
15.	Tando	<i>Cyanocephalus variegatus</i> (Simpson, 1945)
16.	Encang-encang	<i>Iomys horsfieldii</i> (Waterhouse, 1838)
17.	Biawak	<i>Varanus salvator</i> (Merrem, 1820)
18.	Jelarang	<i>Ratufa bicolor</i> (Sparrman, 1778)
19.	Bajing	<i>Callosciurus notatus</i> (Boddaert, 1785)
20.	Tupai, Kekes	<i>Tupaia javanica</i> (Horsfield, 1822)

Source : Gunawan *et al.* (2012)

Gunawan et al. (2009) identified 18 species' of prey in in Central Java. Gunawan et al. (2009) also found that the Javan leopards have a preference towards certain animals as prey. In KPH Kendal, primary prey os barking deer, long-tailed macaque, leaf monkey, wild pig and even dog. Things diverge is in RPH Jatisari Utara, dog is being the most preference prey of Javan leopard. This is due to many people in the area are working on forest land for cultivation and using dogs as guardians of the wild boar attack.

D. Threats

D.1. Threats to Habitat

Habitat lost is the main threat for Javan leopard. The forests in Java Island is generally being the main habitat. From time to time, forest area tends to decrease. It is caused by logging, fires, encroachment, conversion for development such as roads, irrigation, electricity, residential and other non-forestry development resulting in changes in the pattern and significant landscape composition. If forests destruction in Java still ongoing, conservation area will be the last habitat for Javan leopard. As an illustration, condition of forests on the island of Java in 2006 and conservation land on the island of Java by 2008, shown in Tables 3 and 4.

Tabel 3. Land cover and Forest Area in Java

Province	Land Cover Area (Ha)	Forest Area (Ha)	Percentage (%)
Jakarta	65.925,02	1.052,20	1,6
Banten	907.041,58	266.659,36	29,4
West Java	3.654.611,67	1.008.135,48	27,6
Central Java	3.394.483,27	467.038,30	13,7
Jogjakarta	316.946,94	23.715,70	7,5
East Java	4.675.490,26	629.383,62	13,5
	13.014.498,74	2.395.984,66	

Source : Ministry of Environment of Republic Indonesia dan SEAMEO Biotrop (2006)

Tabel 4. Conservation Area in Java until 2008.

Province	Nature Reserve (Ha)	Wildlife Reserve (Ha)	Nature Tourism Park (Ha)	Hunting Park (Ha)	National Park (Ha)	Forest Park (Ha)	TOTAL (Ha)
Jakarta	18	115,02	99,82	-	-	-	232,84
Banten	4.232,85	-	623,15	-	167.956	-	172.812,
West Java	45.980,23	13.617,50	3.456,56	12.420,70	151.775	631,81	227.881,8
Central Java	3.141,60	103,90	247,20	-	10.344,03	231,30	14.068,03
Jogjakarta	14,85	796,60	0,04	-	1.790,97	617,00	3.219,46
East Java	11.666,85	17.976,60	297,50	-	176.696,20	27.828,30	234.465,45
							652.679,58

Sumber: Direktorat Jenderal Perlindungan Hutan dan Konservasi Alam (2008)

Degradation of natural forests in Java resulted shrinking habitat of the leopard so that the habitat and population of Javan leopards condition is increasingly threatened. Even in some locations the population is extinct, as happened in some places in Central Java (Table 5). The main cause is the loss of habitat, decreased quality of habitat and fragmentation of habitat as a result of population growth, infrastructure development and exacerbated by the economic crisis and the euphoria of regional autonomy that forced massive encroachment in 1998 and some years later. The other problem is the lack of habitat management studies due to the lack of communication in between Javan leopard researchers and observers. So information network among stakeholders to improve the management of Javan leopard and its habitat is needed (Gunawan et al., 2009).

Tabel 5. Location where Javan leopard population has locally extinct di Central Java

Location	Forest Type	Landuse	Extinction Estimate	Source
1. KPH Blora RPH Krocok, BKPH Ngapus, KPH Blora	Teak forest	HP	2002*	Wakil KKPH/KSKPH Blora (Pers. Comm., 2009) Gunawan (1988)
2. RPH Segorogunung, BKPH Segorogunung, KPH Gundih BKPH Monggot dan BKPH Panunggalan, KPH Gundih	Teak forest	HP	2006*	KSS Perencanaan KPH Gundih (Pers. Comm., 2009) Gunawan (1988)
3. Gunung Lasem, KPH Mantingan	Teak forest	HP	2003*	Wakil KKPH Mantingan (Pers. Comm., 2009)
4. BKPH Barisan, KPH Pati	Teak forest	HP	Akhir 1990an	Gunawan (1988)
5. RPH Pasedan, BKPH Medang, RPH Mantingan	Teak forest	HP	2002	Wakil KKPH Mantingan (Pers. Comm., 2009)
6. Gunung Surojoyo, RPH Ngiri, KPH Mantingan	Teak forest	HP	2002	Wakil KKPH Mantingan (Pers. Comm., 2009)
7. KPH Semarang Resort KSDA Manggal; Gunung Pati; Ngalian (Tugu)	Teak forest	HP	Akhir 1990-an	Hoogerwerf (1970) Gunawan (1988)
8. Resort KSDA Gunung Clering, Pati Barat	Nature forest	Cagar Alam	2000 an	Gunawan (1988)
9. BH Sragen, KPH Telawa	Teak forest	HP	2000-2005	Direktorat Jenderal PHPA (1987)
10. RPH Pagersari, BKPH Baturetno (Kab. Wonogiri), KPH Surakarta	Teak forest	HP	2002-2003	BKSDA (pers comm 2008)
11. Notog (RPH Sidamulih), BKPH Kebasen, KPH Banyumas Timur	Teak	HP	2000	Direktorat Jenderal PHPA (1987); Gunawan (1988)
12. BKPH Jatilawang, KPH Banyumas Timur	Pine forest	HP	2000	Direktorat Jenderal PHPA (1987); Gunawan

Location	Forest Type	Landuse	Extinction Estimate	Source
				(1988)
13. Karangobar, KPH Banyumas Timur	Pine forest	HP	1990-1995 2001*	KBKPH Banjarnegara (Pers. Comm, 2009)
14. Kulonprogo, KPH Kedu Selatan Kokap, Kuonprogo, Dishut DIY**	Teak forest	HP	Akhir 1990an	Direktorat Jenderal PHPA (1987); Gunawan (1988)
15. RPH Bruno, BKPH Purwareja, KPH Kedu Selatan	Teak forest	HP	1995-2000	KSS Perencanaan KPH Kedu Selatan (Pers. Comm, 2009)
16. KPH Balapulang	Teak forest	HP	2000	Kasi PSDAH KPH Balapulang (Pers. Comm., 2009); Gunawan (1988)
17. RPH Gubug rubuh, RPH Giring (BDH Playen); RPH Candi (BDH Karangmojo); RPH Kedungmangu (BDH Paliyan) Gunung Kidul, Dinas Kehutanan DIY**	Mixed plantation forest	HP	2000*	Direktorat Jenderal PHPA (1987); Gunawan (1988)

Source : Gunawan (2010)

Explanation :

*) Based on information provided by Didik Raharyono, Director of Peduli Karnivora Jawa (PKJ)

**) No. 14 dan 17 located in Jogjakarta Province

KPH : Kesatuan Pemangkuan Hutan Perhutani

BH : Bagian Hutan (Management Unit under KPH Perhutani)

BKPH : Bagian Kesatuan Pemangkuan Hutan (Management Unit under BH)

RPH : Resort Polisi Hutan (Management Unit under BKPH)

Leopard habitat in Java mostly in production forest areas vulnerable to degradation of quality. This is mainly caused by clear cut system and and protection of High Conservation Value Forest is not determined yet in Production Forest in Java. According to Gunawan et al. 2009, generally, wildlife in the production forest face variety of threats, among others:

1. Uncertainty of important components of habitat such as shelter, hunting area, save place for nursing and others while clear cutting conducted.
2. Disruption from human activity, such as logging, crop maintenance, inter-crop cultivation activities from local people, looking for firewood, grassing for livestock and searching for medicinal plants in the forest.
3. Prone to interference fragmentation such as the manufacture of road networks, electricity networks, settlements and encroachment.
4. Threats from hunting, because forest area managed by Perum Perhutani usually being the most favorite area for hunting.
5. Lack of protection because there is no allocation of special zones for wildlife reserves and there is no specific budget allocation for the wildlife, no staff for managing wildlife conservation in their concession area.
6. Competition habitat space with local villager intercropping, because space for prey mostly used for agricultural crops, even in locations of 30-40 years teak.

To deal with development of degraded habitats, Gunawan (2010; 2013) has created a map of the leopard habitat vulnerability in area of West Java, Banten and Central Java province. By knowing the habitats vulnerable to the threat, it can be determined the protection, threat prevention and habitat development.

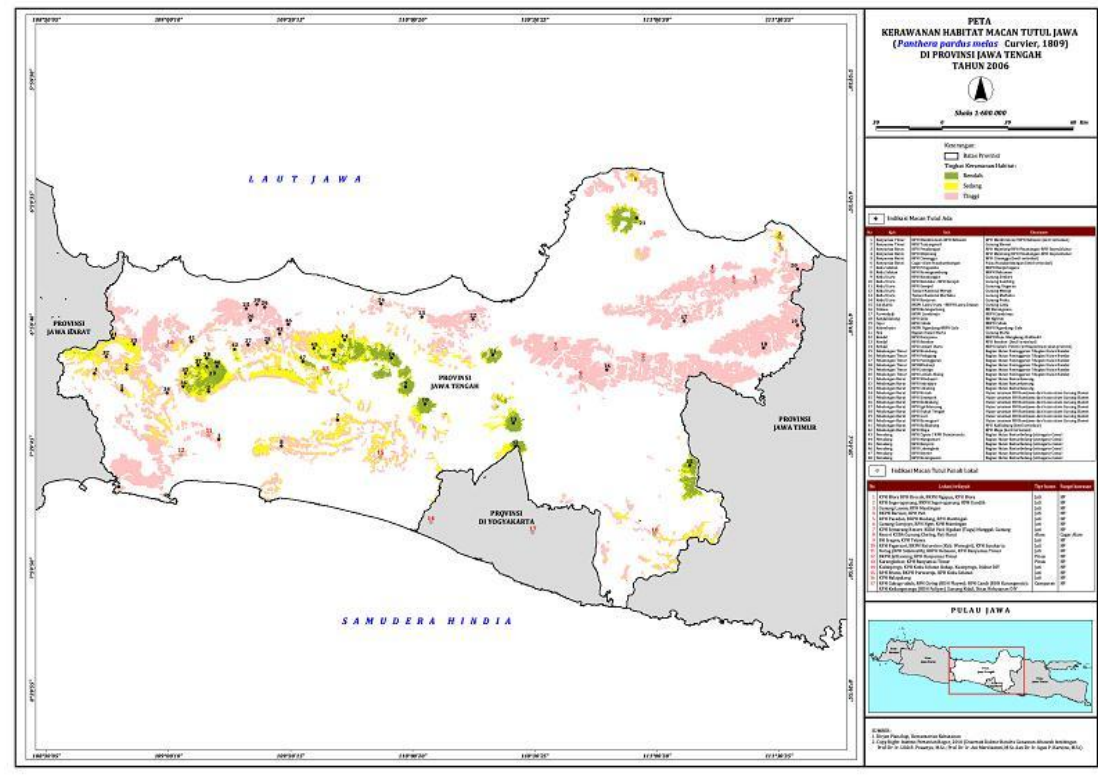


Figure 8. Map of leopard habitat vulnerability in Central java Province

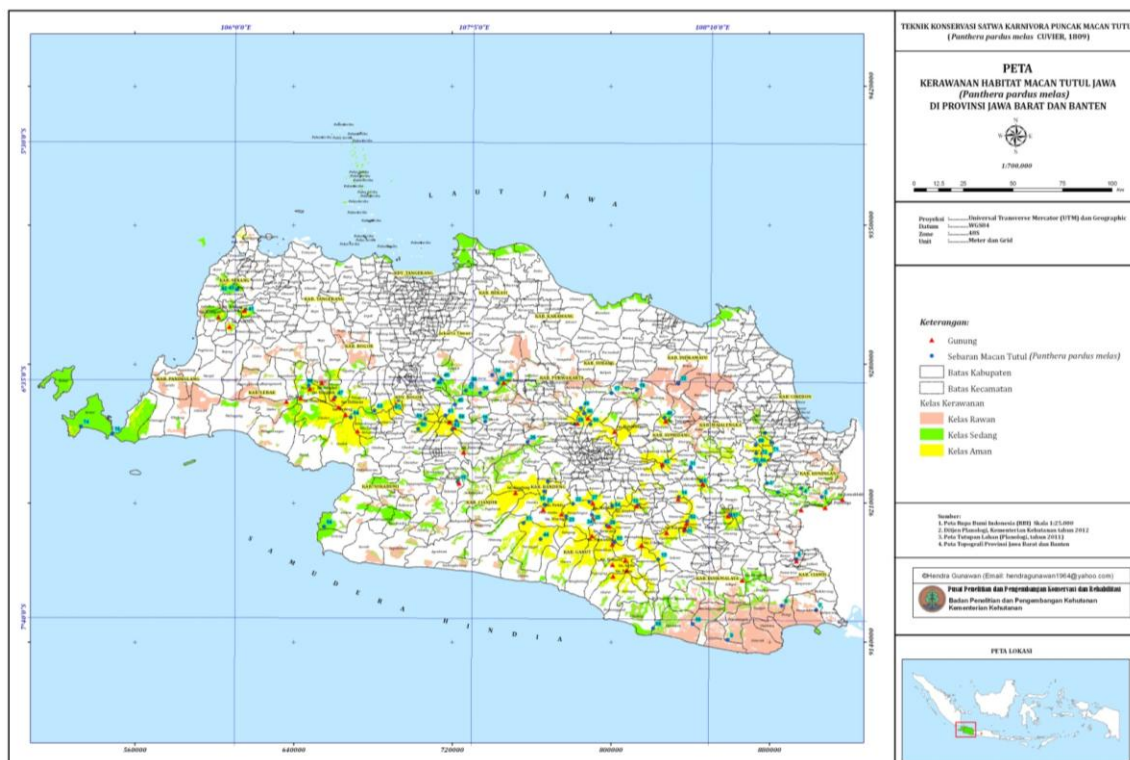


Figure 8. Map of leopard habitat vulnerability in West Java and Banten Province

D.2. Human-Leopard Conflict

Population growth requires land for providing the basic needs of human being and an increase in local and national economic growth. Land requirement for development activities sometimes done by converting forest which being the primary habitat of Javan leopards. Forest conversion to be plantations, agriculture, settlements, roads, irrigation and electricity networks cause the leopard is getting closer and directly adjacent to human activity. This in turn led to increased conflict between humans and Javan leopard.

Conflicts between human and leopard takes the form of a leopard attack to people, livestock predation and insecurity or anxiety in the local community. As it consequent, Javan leopard considered a common enemy that must be fought in many communities in Java. This is already happening in some areas where people who feel harmed by the presence of a leopard hunt or capture using traps or snares which often causes death Javan leopards. Cases of leopards into the village and captured is often the case, both in East Java, Central Java and West Java and Banten. The absence of conflict management protocols lead to unresolved conflict and tend to recur and cause more Javan leopards killed.

Based on the records compiled Peduli Karnivora Jawa (PKJ), leopard often appear near settlement in Mount Lawu, Mount Wilis, Mount Arjuno, Mount Argopuro, Mount Kawi, Mount Raung, Mount Panataran, Mount Ijen, Alas Purwo National Park, Baluran National Park and Meru Betiri National Park; whereas in Central Java also recorded in Menoreh Hills, Mount Merapi, Mount Merbabu, North Kendeng Hills, Mount Muria, Mount Ungaran, Dieng Mountains, and Mount Slamet. Leopards often encountered in the production forests and plantations, and sometimes young male get lost when searching of new territory.



Figure 10. Killed leopard caused by conflict with human (Doc. PKJ)

Cases of interference or conflict between human and leopard in West Java and Banten recorded by Gunawan et al. (2012) as shown in Figure 11 and 12. Generally, leopard conflict tend to rise in the last decade.



Figure 11. Record of leopard entering settlements in West Java and Banten Province during 2001-2012 (Gunawan *et al.*, 2012).

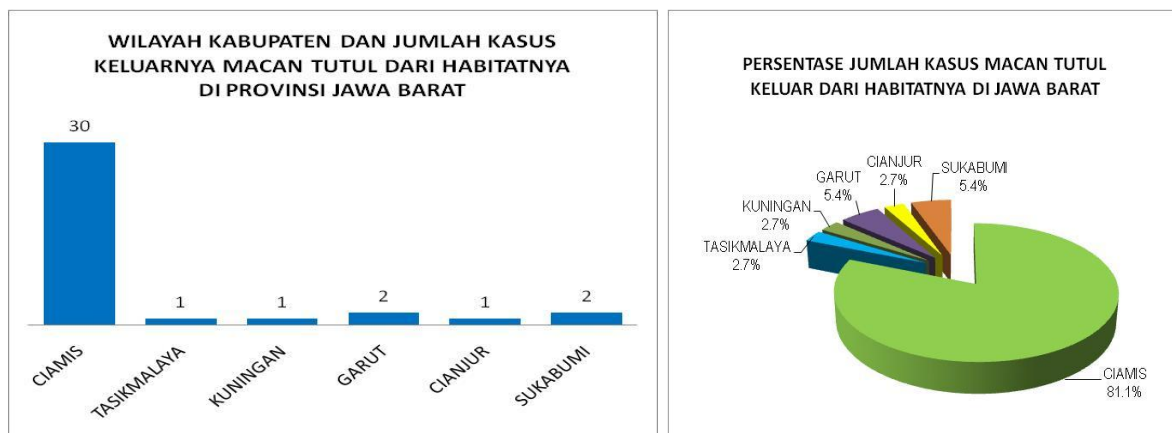


Figure 12. Record of leopard entering settlements per regency in West Java Province during 2001-2012 (Gunawan *et al.*, 2012)



Figure 13. Record of human-leopard conflict in Ciamis Regency around Mount Sawal during 2001-2011 (Gunawan *et al.*, 2013)

Javan leopard conflicts with humans most prominent occurred around Mount Sawal Wildlife Reserve (Gunawan et al., 2013). It can be a lesson learnt about human-leopard conflict management. Javan leopard conflict still continues to occur, throughout the year 2013 recorded six cases of conflict with humans Javan leopard (Table 6)

Table 6. Human-leopard conflict in 2013

No.	Date	Location	Conflict Form	Action	After Conflict Management
1.	11 January 2013	Cikeusik, Kanekes Village, Kecamatan Leuwidamar, Lebak Regency, Banten	Snared by pig snare	Released after 2 days	Unknown
2.	21 August 2013	Dusun Kopeng, Kepuharjo Village, Kecamatan Cangkringan, Sleman Regency Jogjakarta	Attacking livestock	No action taken	Unknown
3.	2 October 2013	Dusun Sumber, Sentul Village, Kecamatan Sumbersuko, Lumajang Regency	Entering Settlement	Tried to catch the leopard but failed	Immobilization failed, the leopard attack human. Finally the leopard was shot to die
4.	26 September 2013	Plot 28A primary forest in Kuningan Regency, West Java	Snared by pig snare	Evacuated by Balai Konservasi Sumber Daya Alam (BKSDA) Jawa Tengah Seksi Konservasi Wilayah II Cilacap-Pemalang	Rehabilitated in Serulingmas Zoo in Banjarnegara Regency but dead on 18 October 2013
5.	12 October 2013	Forest Block Cijengkol, Girimukti Village, Kecamatan Ciemas, Sukabumi Regency	Entering chicken farm	Trapped and Evacuated	Translocated in Taman Safari Bogor
6.	18 October 2013	Tempur Village, Kecamatan Keling, Jepara Regency, Central Java	Entering chicken farm	No action taken	Unknown

Gunawan et al. (2013) concluded that the conflict occurred because the leopard is triggered by three main causes: (1) search of new territory by a young male individual newly weaned by its mother; (2) decrease the carrying capacity of the habitat so that leopards need to expand the range area to be able to obtain prey; (3) following the prey moving out of the forest area in the forest because there is no or lack of feed. The first cause is the most common, because mostly conflict Javan leopard which caught are young males between 2,5 - 3,5 years old. Young males must seek new territories outside the territory of their father.

D.3. Hunting and Illegal Trafficking

Direct threats to the survival and existence of Javan leopard is hunting. Hunting is threatening not only to the Javan leopard, but also to the prey. Indeed, until now there is no accurate data on hunting and trafficking, as is generally done illegally. But sometimes the cases of hunting leopards can quickly known by officer based on information from villagers. Some examples of dead Javan leopard caused by hunting is shown in Figure 14.



Figure 14. Javan leopard hunting still be the main threat (Doc ASTI & Halimun Salak NP)

E. Ex-Situ Conservation

The population of Javan leopard ex-situ very useful as breeding stock when the extinction of the species in its natural habitat. So far, for the management outside of Java leopard habitat (ex situ), the government only allows maintenance and breeding (captive breeding) conducted by conservation organizations, such as zoos, safari parks, wildlife parks and animal rescue center. Up to December 2011 the number of Javan leopards found in ex-situ conservation organization in Indonesia as many as 31 individuals (Table 7). The absence of Javan leopard studbook keeper national and international cause data Javan leopards that were in ex-situ conservation institutions outside Indonesia is unknown.



Gambar 15. Javan leopard in Taman Safari Cisarua Bogor

Table 7. List of Javan leopard in ex-situ conservation organization in Indonesia (December 2011).

No	Lokasi	Jantan	Betina	Total
1	Ragunan Zoo, Jakarta	-	1	1
2	Taman Sari Zoo, Bandung	1	1	2
3	Surabaya Zoo	-	1	1
4	CV. Andy Antique	2	1	3
5	Bali Zoo	2	-	2
6	Seruling Mas Zoo	-	1	1
7	Taman Safari I Cisarua Bogor	11	8	19
8	Taman Safari III Gianyar Bali	1	1	2
	Total	17	14	31

F. Conservation Organizations

So far Indonesian government has been working with Non Governmental Organization (NGO) national and international (Table 8) in conducting the study and management of Javan leopards. The contribution of NGOs is particularly useful in the study population and ecology well as help the community assistance around the forest.

IUCN-Red List of Threatened Animals, Javan leopard categorized as Critically Endangered species and Appendix I in CITES. In Indonesia, Java leopard is also classified as a protected species by Law No. 5 of 1990 and PP. no.7 1999. Actual conservation efforts are needed to prevent from extinction. As a form of concern in West Java Provincial Government, Javan leopard designated as identity west Java province by West Java Governor's Decree on 27 June 20, 2005.

as

Table 8. Conservation Area of Javan leopard dan NGO involved (2013)

No.	Lokasi	Institusi/Organisasi
1	Gunung Gede Pangrango NP	Balai Besar TNGGP CI Indonesia
2	Gunung Halimun-Salak NP	Balai TNGHS, JICA, BCI, CI Indonesia
3	Gunung Ciremai NP	Balai TN Gunung Ciremai, Peduli Karnivor Jawa (PKJ), CI Indonesia,
4	Meru Betiri NP	Balai TN Meru Betiri
5	Conservation Area in Central Java	Peduli Karnivor Jawa (PKJ), Kompleet – Purwokerto, BKSDA DI. Jogjakarta, Kampung (Komunitas Peduli Gn. Ungaran), Pemuda Pecinta Alam Gunungkidul (PPA-GK)
6	Conservation Area in East Java	Peduli Karnivor Jawa (PKJ), Kappala-Jember, Balai Besar KSDA Jatim, PIPA Forda Besuki, Muria Research Center – Kudus

Javan leopard conservation efforts need knowledge as well as science and technology support. Therefore, the role of research institutions and universities is essential to produce science and technology related to Javan leopard conservation. Until now, the results of research on leopard Java is still very limited, there are only a few theses, two master theses and only one doctoral dissertation. While the scientific publication of Javan leopards are also fewer. In connection with the participation and role of research institutions and universities should be encouraged again in supporting the implementation of Javan leopard Strategy and Action Plan. Research and Development Center for Conservation and Rehabilitation as the only government research institute that has authority fauna and

flora conservation research in Indonesia has included a leopard Java as one of the target species studied in the Integrated Research Plan from 2009 to 2019.

There is a lack of the role of the private sector in the conservation of Javan leopard. Attention to the Javan leopard conservation done by local NGOs, national and international. Perum Perhutani is a representative of the business community who have actively conserve Javan leopard as one of the programs in the certification of sustainable forest management (SFM). In some KPH, Javan leopards is being key species in develop high conservation value forest (High Conservation Value Forest), for example in KPH Kendal, KPH KPH Kebonharjo and Cianjur.

III. STRATEGY AND ACTION PLAN

The vision of Javan leopard conservation is to actualize a harmonious relationship between human and Javan leopard in the balance ecosystem and beneficially each other. The mission will include: (1) improving population management of Javan leopard, (2) improving habitat management of Javan leopard, (3) increasing the capacity of the Ministry of Forestry and partners (4) improving ex-situ conservation program, (5) providing information to public, and (6) sustainable conservation financing. The targets generally want to be achieved in Javan leopard conservation are: (1) population and habitat of Javan leopard will not declining and where possible increase according to the carrying capacity of habitat until 2023, (2) public support for Javan leopard conservation and their habitat can be increased, and (3) the central government and local governments where having Javan leopard habitat use Javan leopard strategy and action plan document in designing and establishing spatial planning and regional development.

Based on discussions during the preparation of the strategy document and action plan for the conservation of Javan leopard, an outline obtained six conditions are expected to be achieved within the next 10 years (2015-2025) the following description of the strategy and action plan that will be carried out for each condition. As for the targets to be achieved presented in Table 9.

A. Strategy and Action Plan of Javan Leopard Population Management

A.1. The expected conditions

Data and information about the population and distribution of leopards Java is insufficient. Therefore study on population in all natural habitat using scientific methods, programmed, planned and integrated sustainably. This scientific approach is that the data and information obtained trustworthy and accountable. Therefore, the role of research institutions (such as Center for Conservation and Rehabilitation as well as LIPI) and universities as authoritative science and technology is necessary. Besides, the involvement of local NGOs, national and international are also important in the collection of data and information. Comprehensive information of Javan leopard ecology is expected to be a strong grounding in the determination of policy measures and operational Javan leopard conservation.

Information of the status of the population (abundance and distribution) is very important to create a conservation plan and determine the level of conservation management required. Information about Javan leopard population abundance in all priority conservation area Javan leopards is targeted to be collected in 2022. It is also expected distribution Javan leopards across Java have been able to be mapped accurately so that it can become the reference by stakeholders in the implementation Strategy and Action Plan and will be used in the implementation of other development activities related forest areas such as spatial planning. Thus the population of Javan leopards can be maintained or even improved.

A.2. Action plan

To realize the expected conditions of Javan leopard population management, studies population density and distribution of Javan leopard and provide GIS-based map. Mapping populations also covers information that provides an overview meta population pattern contain connectivity between populations so threat caused by isolation and fragmentation can be predicted in every population. Thus it can be defined which populations should be priority to be managed more intensively. For priority populations, can be taking actions such as creating corridors to provide connectivity between populations, reintroduction or translocation to help improve its genetic diversity and to improve reproduction rate.

In order status assessment Javan leopards in their natural habitat accurately, planned, systematic and comparable, the needed scientific population survey methods and standards. The study should covers the abundance, distribution and population demographics, as well as conditions of vulnerability to the threats and interference that can cause population decline, such as hunting, illegal trafficking and other threats. Besides the inventory and monitoring of populations through surveys, patrol and law enforcement also need to be done, particularly in areas that have been assigned as priority Javan leopard conservation area.

Javan leopard population in the wild is expected to be stable in dynamic equilibrium in accordance with the carrying capacity of the habitat. Therefore some efforts to manage populations may be necessary, for example to the population declined need to increase the carrying capacity to the limit. Empty habitat but still possible for supporting to the sustainability of leopard, can be restored through reintroduction or translocation programs. While habitat that known being overpopulated needs to be controlled in a way reduces the population by translocating to other habitats. To achieve this, the necessary involvement of relevant institutions, among others such as research institutes (Research Ministry of Forestry, LIPI and universities), UPT PHKA (BKSDA and national parks), Perum Perhutani, NGOs, local governments, conservation organizations and other private sectors.

B. Strategy and Action Plan of Habitat Management

B.1. The expected conditions

The decline area of Javan leopard habitat indicate the competition in using space between leopards and human are increasing. Without proper planning and without coherence between stakeholders, use of space development could threaten the sustainability of Javan leopard. The concept of sustainable development, not only requires the use of natural resources in a sustainable manner but also the utilization of space wisely. Therefore, the policy of spatial require attention in the conservation of Javan leopard. This is because experience has shown that local extinction Javan leopards are not only caused by habitat lost but also by habitat fragmentation. The spatial use which is considering the integrity of ecosystems within the landscape scale has led Javan leopard habitat fragmented and isolated due to conversion of forests to road construction, irrigation, electricity networks, farms and plantations and settlements.

Javan leopard habitat does not recognize administrative boundaries, therefore leopard conservation need to involve the coordination and involvement of all regions and across sectors. Coordination and integration of all stakeholders will determine the success of conservation efforts Javan leopards. The principle of compactness and sustainability of forests should be a reference to any change in the spatial including forest conversion. So that forest fragmentation can be avoided and reduce the influence of edge effects that indirectly reduce the effective habitat of wildlife.

On the other side, the main conservation areas which are generally dispersed should be connected each other while maintaining production forests or protected forests near protected areas. In this case the production forests and protected forests are not only acts as a wildlife corridor track but also an expansion of the existing wildlife habitat within the conservation area. In other words, sustainability leopard will not be successful if only to maintain existing conservation areas but also should keep production forest and protected forest in the vicinity. Therefore the role of Perhutani as the management authority of production forest and protected areas is Java is very crucial. Likewise, large plantation which are located near protected areas and be a liaison between forest patches, has an equally important role in the conservation of Javan leopard.

Considering many Javan leopard use production forests and protected areas managed by Perum Perhutani, policy from the central government and Perum Perhutani to protect the Javan leopard outside the conservation area is needed. One of the policies that have been implemented but still needs improvement is the determination of habitats of leopards Java as High Conservation Value Forest.

B.2. Action plan

To realize the expected conditions of Javan leopard habitat management strategies, which is to conserve the remaining Javan leopard habitat, then need some action, among others create distribution maps and habitat suitability for Javan leopards. Distribution maps and habitat suitability will be used to estimate the abundance of the population carrying capacity of the habitat. Thus it can be determined the next step in the conservation of Javan leopard which is habitat management. Based on the habitat suitability map can be specified priority areas to be developed or managed more intensively. Habitat suitability assessment and prioritization done in landscapes ignoring the administrative boundaries (Figure 16). From map of habitat suitability, information can be determined which locations and what activities should be done for the development of Javan leopard habitat.

Efforts to improve the habitat of leopards Java in locations that have become priority among others by improving patrol in the area, creating corridors between forest patches, improved quality of habitat to increase the carrying capacity through restoration and rehabilitation and pursue expansion of habitat to maintain forest cover production and protected forest around conservation areas.

Establish cooperation and coordination with local governments in developing regulation of spatial plan of regional development by integrating a Java leopard conservation as consideration. Support from local governments not only enough with the spatial arrangement but also by issuing various policies and local regulations that directly or indirectly improving sustainability of Javan leopard.

With all these efforts, Javan leopard habitat will be expected well managed both quality and quantity, in the conservation area as well as in production forests and protected forests. It is necessary for the role and involvement of all stakeholders as UPT PHKA, Perum Perhutani, NGOs, research institutions, local governments, universities and other sectors.

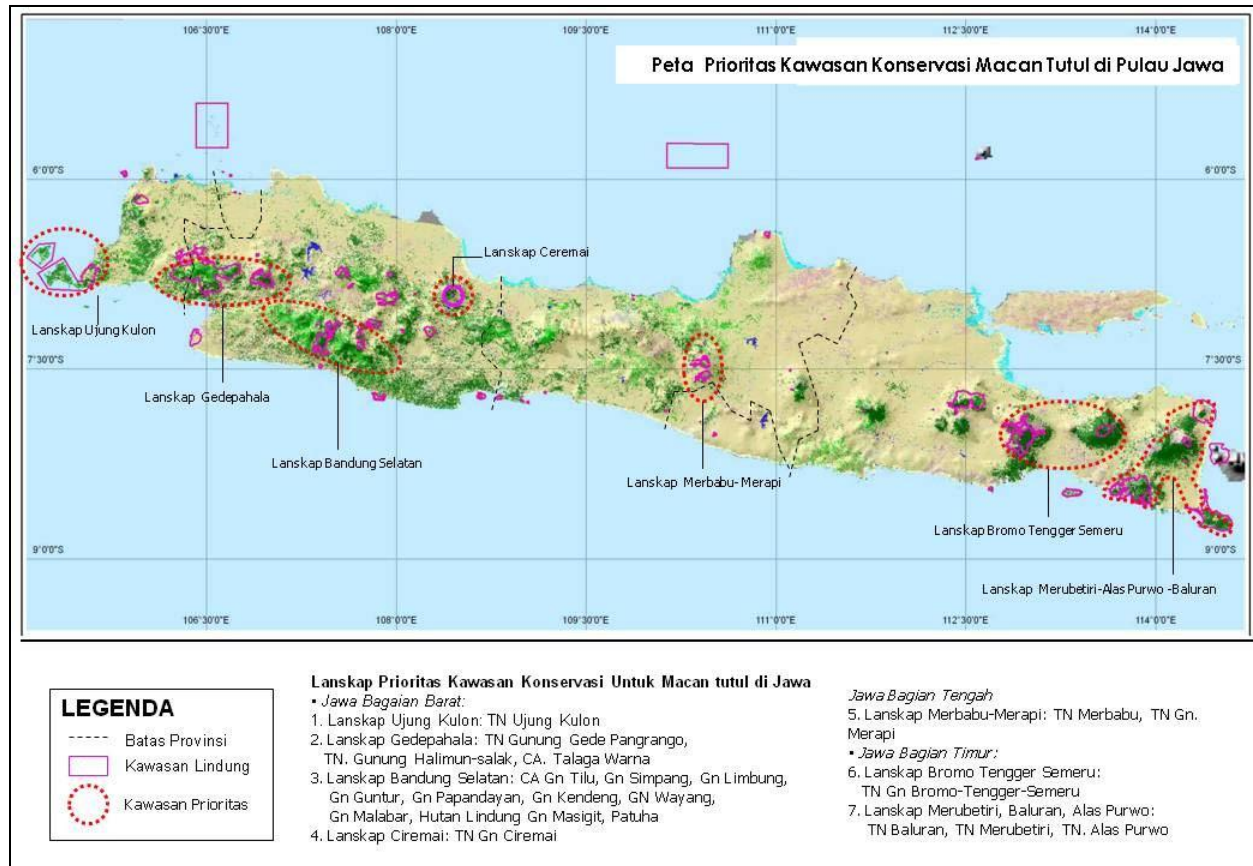


Figure 16. Map of priority area of habitat protection of Javan leopard conservation in conservation area

C. Strategy and Action Plan for Capacity Building in the Ministry of Forestry and Partners in Javan leopard Conservation

C.1. The expected conditions

Capacity building of human resources for the stakeholders who are concerned with the conservation of Javan leopard plays a very important in order to achieve the expected target condition. Therefore, human resources capacity building Forestry Ministry and its partners need to be improved, especially regarding knowledge and skills in methodology, evaluation, monitoring and implementation of population management and habitat development. The field officer as PEH (Pengendali Ekosistem Hutan), rangers, public relations and government's partners such as conservation cadre of Ministry of Forestry, nature lovers, environmentalists and local NGO should be a priority to be the priority community need to be engaged.

On the other side, at the local level and national levels of management also need to be periodically upgraded and given a refresh with the latest science and knowledge in the field of conservation of Javan

leopard. The role of research institutes, education and training institute as well as universities are very important in improving capacity of stakeholders which involved in the conservation of Javan leopard.

Local communities, as party who are directly impacted and involved in Javan leopards conservation need to gain understanding, knowledge and awareness of the importance of Javan leopards and conservation, in general. Therefore, the results of research and studies on about leopard Java needs to be disseminated in an easily understandable to all society. Posters, leaflets, radio broadcasts, television and film screenings counseling are methods can be used to increase the capacity and public awareness in Javan leopard conservation.

Adequacy of human resource is expected to implement all the action plans that have been established, so that establishment of infrastructure and increasing the capacity of the Ministry of Forestry in the monitoring and evaluation of conservation of Javan leopards will be supported by all stakeholders.

C.2. Action plan

To realize the expected condition which is increasing the capacity of the Ministry of Forestry and partners, can be conducted by preparing various regulatory documents, guidelines and protocols related to the Javan leopard conservation in the wild. Guidelines for habitat and population survey methods, guidelines for evaluation and monitoring of habitats and populations, population management guidelines and habitat development guidelines should be devised. Likewise with the reintroduction and translocation protocols, leopard handling protocol and conflict mitigation as well as standard operational procedure in law enforcement against poaching and illegal trade must be issued immediately. Training modules for field workers such as PEH, rangers and other officers need to be developed and disseminated.

Finally, conditions are expected will be achieved if all rules, guidelines, protocols and modules can be disseminated and applied in the field by forestry officers and partners who are directly involved in the conservation of Javan leopard. In this case the training for people involved in the conservation of Javan leopards should be carried out continuously. Training can be done through the Center for Education and Training for Human Resources (PUSDIKLAT SDM) Ministry of Forestry as well as independently by the relevant institutions. Implementation of guiding and protocol documents must be followed by law enforcement.

To increase public awareness in supporting Javan leopard conservation, socialization and communication network is necessary needed. Establishing Javan Leopard Conservation Forum is one of the goal. This forum will be the main stakeholders who actively campaign to get support from the public, including from the business sector in order to contribute and participate through CSR programs (Corporate Social Responsibility) and CER (Corporate Environment Responsibility). All stakeholders should be responsible to rise public awareness, such as PHKA through UPT, police and prosecutors, NGOs, research institutions, local governments, universities and other education in general as well as private sectors.

D. Strategy and Action Plan for Ex-Situ Conservation Program

D.1. The expected conditions

Facing many threats in their natural habitat, in situ conservation efforts is not enough to guarantee the population sustainability. Ex situ conservation support is needed by conservation breeding in facilities such as zoos, safari parks and wildlife parks. Recording the origins and proliferation of Java in leopard

conservation organizations is essential for genetic management, therefore the need for national and international studbook keeper managed under Indonesia authority.

Javan leopard conservation efforts in ex situ should be regulated by the protocol and standard rules in order to guarantee the health and animal welfare, as well as zoonosis. Utilization of Javan leopard from breeding facilities also need to be regulated. Meanwhile, a strong coordination and communication among conservation organizations will improve the management of Javan leopards ex situ meta population.

Javan leopard conservation ex-situ has a very important role to support the conservation of Javan leopards in situ in their natural habitat so that should be a single package that cannot be separated. Synergy between ex situ conservation institutions and in situ organizations in situ conservation (KSDA and National Parks) is urgently needed. Thus the expected conditions that support from of ex-situ conservation program to effectively improve in situ conservation program can be realized.

D.2. Action plan

To achieve the expected conditions of ex-situ conservation of Javan leopard, can be started by creating or revise regulations, guidelines and protocols related to the existing ex-situ conservation of Javan leopard. To that must be supported by science and technology research, particularly about life of Javan leopard outside their natural habitat. Studies in conservation organizations such as breeding techniques, DNA tagging and the use of microchips as identification must be conducted. Genetic mapping, handling and zoonosis as well as welfare and bioethics in the management of ex situ conservation institutions must socialized continuously. For that also need to be supported by adequate human resource capacity that would be obtained through training on a regular basis.

The important thing between ex situ and in situ conservation is integrated programs, where the role of ex situ conservation institution can playing important roles in in situ conservation. Involvement of ex situ conservation, among others through the transfer of knowledge from experience in handling Javan leopards in captivity to the field workers through training or workshops. Besides, ex situ conservation agencies have an important role while conflict happen. Conflict leopard need to be rescued and rehabilitated in ex situ conservation institutions. Furthermore Javan leopards that have been rehabilitated can be reintroduced or translocated to suitable habitat after a feasibility study. To support the ex situ conservation, especially in rehabilitating conflict leopard, it is necessary to build a sanctuary that is adequate as a place to rehabilitate the Javan leopard out of the habitat to be maintained temporarily until the time may introduced or translocated in to a new place.

Successful ex situ conservation can guarantee the sustainability of the in situ population. Ex situ conservation should be supported by the appointment of a national coordinator for the studbook keeper and coordinate with international leopard studbook keeper. Considering ex situ program is classified as high cost programs, support from donors is needed. Activities that require huge funds, among others for the breeding program, a program of reintroduction / translocation and handling of zoonosis and rehabilitation. To achieve this goal, participation of all stakeholders from PHKA through UPT, through its partners such as ex-situ conservation agencies, NGOs, research institutions, local governments, educational institutions and the business world is needed.

E. Strategy and Action Plan for Data and Information

E.1. The expected conditions

Currently, data and information of bio-ecology of Javan leopard is still lacking, even the development of the population and its distribution over the last few decades unmonitored thus hampering conservation efforts because there is no scientific considerations. Research activities to provide input to the management of Javan leopard conservation is urgently needed. Research activities that have so far not been done in a comprehensive and integrated approach but partial, making it difficult to use as a material consideration in the determination of policy. Research and development activities related to the conservation of Javan leopards should be done in an integrated, continuous and thorough. Hence the need for research and development programs carried out by the definite and competent research institutions with consistent financial support. In this case the Research and Development Center for Conservation and Rehabilitation (PUSKONSER), FORDA has a strategic role in determining the success of Javan leopards conservation efforts.

Although not yet complete, the existing information has been collected in research institutes and universities, such as in PUSKONSER and Bogor Institute of Agriculture and other agencies need to be collected and compiled in a database which can be accessed by stakeholders which are concerned to Javan leopard conservation. Besides, it also needs to establish a special website, communication networks as a platform to disseminate information, sharing knowledge and experience as well as socialization media to improve conservation of Javan leopards.

As a government agency, of Ministry of Forestry, particularly the Directorate of Biodiversity Conservation (KKH) PHKA is an institution that is responsible and competent in determining Javan leopard conservation policy. It is therefore also responsible for the development of a centralized database (collection and utilization), including the preparation of the document of strategy and action plan for Javan leopard conservation. PHKA together with partners will evaluate this document to determine the success achieved Javan leopard conservation program. Together with partners, PHKA should make information media as a platform of communication between stakeholders and socialization program.

E.2. Action plan

To realize the expected conditions in the provision of data and information, it would require some effort such as publishing and disseminating research results which has been conducted by various agencies. Publication can take the form of journals, popular magazines, brochures, posters internet such as social media as well as website.

Stakeholders should be coordinating each other in a communication network so programs can be efficient and effective. Strong coordination in managing all the data and information can be collected in full so as to awaken the database is good and can be used by stakeholders in conservation efforts Javan leopard.

Support from multi-stakeholders is playing big role in making succession, therefore it should be taken measures to raise awareness and concern of all stakeholders through the dissemination of information about the importance of Javan leopards in the ecosystem in Java and its benefits for human beings. To be able to reach out to the broader community and faster delivery, the dissemination of information needs to be conducted through online media (internet) by developing a website. To realize programs of providing and disseminating information about it, PHKA needs to be supported by the partners including NGOs, research institutions, local governments, academic institutions and private sectors.

F. Strategy and Action Plan for Fundraising

F.1. The expected conditions

No doubt that in situ conservation and ex-situ require significant funding. The funding may not be enough available if only rely on government resources. Moreover, the allocation of funding for conservation is not a priority when faced with the interests of the more value the economic and political impact directly such as infrastructure and improving people's welfare. Therefore, it is inevitable to mention that funding for conservation Javan leopards require other sources of funding, outside the government and local budgets. Donor agencies, non-governmental organization, national and international business sectors can be an alternative source of funding. Sustainable funding source that will ensure the sustainability of conservation efforts. Therefore, funding mechanisms should be regulated.

Conditions which are expected in this strategy is the availability of sustainable funding in order to conserve Javan leopard and its habitat with public support. Funding is used for the implementation of the strategy and action plan in order to ensure its success. Development of sustainable funding need to be built through a mechanism of inter-agency cooperation between the recipient and the donor. Funds can be from the private sector and other institutions both within and outside Indonesia, as long as provided in accordance with applicable laws and regulations in Indonesia.

In action plan to mobilize funding, there are various possibilities, among others:

1. The potential budgeting of government funds (APBN, APBD), the funding needs to be included in the formal planning and budgeting.
2. The potential for the mobilization of international cooperation funds (between countries, or agencies), it should be noted regarding matching funds are often required, and fund disbursement mechanism
3. Potential funding from the international treaty ratified by Indonesia where there is an obligation for the participating countries are actively involved in the management and conservation of wildlife.
4. The potential mobilization of private funds, the tendency of private parties to build 'corporate social responsibility' and 'corporate environmental responsibility' will open up funding opportunities.
5. Potential standalone program with the development of programs that are able to finance the conservation of Javan leopard like Javan leopard conservation based ecotourism, etc.

F.2. Action plan

Funding development start with identifying the sources of funds followed by mobilization of funding sources, both from the government budget through APBN / APBD, and private sectors through CSR and CER, or the self-funded through development ecotourism etc. Next is the development of fund disbursement mechanism in Java leopard conservation program.

Recommended activities to achieve the expected conditions, among others:

1. Identify sources of funding.
2. Develop a draft budget at the national and regional / local (UPT).
3. Incorporate design of the funds on the official government budget, for instance through the national and regional budgets.
4. To mobilize funds through international cooperation.

5. dissemination and exposure action plan to the international community, including the possibility to cooperate on equal footing and mutual benefit.
6. Development of proposals to donors.
7. Development of mechanism for channeling funds
8. Dissemination and exposure action plans to the private sector and encourage the involvement of the private sector to participate.
9. Identification and development of a standalone program for the conservation of Javan leopards.

As for conservation goals to be achieved in these activities include:

1. The draft budget listed in the state budget plan financing (APBN / APBD)
2. Establishment of the draft budget at the regional level in an integrated
3. Establishment of cooperation with the private sector to implement action plans grains
4. Establishment of cooperation and funding from the international price signals to implement action plans grains
5. The implementation of the program of activities Javan leopard conservation independently.

To achieve this goal, it is necessary the role and involvement of the relevant institutions, among others PHKA through each Unit (Central TN and KSDA), Perum Perhutani, NGOs (national and international), research institutions, local governments, institutions academic and business world.

Table 9. Javan Leopard Action Plan 2015-2025

EXPECTED CONDITION	INDOCATOR	ACTIVITIES	EXPECTED TARGET			STAKEHOLDERS
			2016	2019	2023	
1. Maintain the population of Javan leopard in the wild	The population size is biologically and ecologically in dynamic equilibrium	<ol style="list-style-type: none"> 1. Conduct studies on Javan leopards in their natural habitat both in conservation areas and outside of protected areas, based on the information and signs of its existence in nature, which then mapping the distribution 2. Identify the threat level Javan leopard by loss of habitat, poaching and illegal trafficking, as well as potential conflicts of humans and leopards Java 3. Conduct assessment of the population and its distribution by using scientific methods, followed by long term monitoring 4. Maintain the population of Javan leopard in a conservation priority area followed by patrol and law enforcement to reduce the threat of loss of habitat, poaching and illegal trafficking 5. Management interventions to populations of small, isolated and non-equilibrium metapopulasi through translocation and rescue into the sanctuary 6. Maintain and improve the connectivity between Javan leopard habitat, including through development corridors and buffer around priority areas 7. Mapping and mitigating conflict between humans and leopards in cooperation with the relevant parties. 	<ol style="list-style-type: none"> 1. Map the current distribution of Java leopard both inside and outside the conservation area and the type of metapopulation 2. Recent data threats Javan leopards in nature (including the condition of habitat, poaching, illegal trafficking and conflict) and maps of vulnerability of habitat and potential conflicts between human and leopard 3. Make zoning priority habitat management and population of Javan leopards in the landscape scale 4. The implementation PHVA Workshop 	<ol style="list-style-type: none"> 1. The status of the current population of Javan leopards in the wild 2. The reduce of Javan leopard conflicts of the last five years 	<ol style="list-style-type: none"> 1. The absence of Javan leopard populations which are isolated and have a high chance of extinction 2. The stable population in leopard conservation priority area with the support of the parties 	<ul style="list-style-type: none"> • Ditjen PHKA • Perum Perhutani • NGO • Local Government • Research institutions (Balitbanghut, LIPI) • Private Sectors • Universities

EXPECTED CONDITION	INDOCATOR	ACTIVITIES	EXPECTED TARGET		STAKEHOLDERS	
2. No reduction Javan leopard habitat in nature.	The quality and quantity of Javan leopard habitat can be maintained in a broad size and carrying capacity of the habitat.	<ol style="list-style-type: none">1. Create a map of habitat suitability and capacity of Javan leopard in a landscape scale.2. Conduct assessments leopard conservation priority area of Java outside conservation areas and collaborate with Perum Perhutani to assign and manage them as protected areas through the establishment of HCVF3. In cooperation with the management of production forests, protected forests and plantations to identify and establish areas around Javan leopard habitat as a corridor or buffer expansion Javan leopard habitat4. Identify potential area for creating a corridor that connects between habitats functioning ecologically.5. Coordinate and integrate Javan leopard conservation issues with the local authorities in the evaluation of spatial plan both district and provincial level	<ol style="list-style-type: none">1. Map of habitat suitability and carrying capacity of Javan leopard inside and outside the protected areas created2. Map of Javan leopard conservation priority area inside and outside conservation areas3. Establishment of regional regulations that support the conservation of Javan leopard	<ol style="list-style-type: none">1. The creation of the document together with the government related to spatial plan considered conservation aspects in the development in every Javan leopard habitat	<ol style="list-style-type: none">1. Habitat Restoration in priority conservation area of Javan leopard2. Javan leopard populations are connected between fragmented habitat thus improving the quantity and quality of Javan leopard habitat.	<ul style="list-style-type: none">• Ditjen PHKA• Perum Perhutani• NGO• Local Government• Research institutions (Balitbanghut, LIPI)• Private Sectors• Universities
3. Establishment of infrastructure and increasing the capacity of the Ministry of Forestry in the monitoring and evaluation of the Javan leopard conservation efforts through the support of various parties.	Ministry of Forestry and its partners are able to carry out performance of monitoring of Javan leopard conservation effectively with increased support from stakeholders	<ol style="list-style-type: none">1. Develop guidelines for survey methods on habitat assessment and populations of Javan leopards2. Conduct trainings in order to increase capacity related to the conservation of the Javan leopard for PHKA staff and partners3. Develop SOP document for investigations and intelligence infringement or illegal use of Javan leopard4. Develop and disseminate effective human-leopard conflict mitigation protocol throughout the district where Javan leopards present	<ol style="list-style-type: none">1. Provide guidelines for assessment survey methods habitats and populations of Javan leopards that can be used by stakeholders2. The availability of handling protocol for human-leopard conflict mitigation	<ol style="list-style-type: none">1. Documents of training modules on Javan leopard conservation available2. SOP document investigations and intelligence for any violation or illegal use of Javan leopard and the establishment of law enforcement patrol team	<ol style="list-style-type: none">1. Synergy between Javan leopard conservation stakeholders with local government and law enforcement officers	<ul style="list-style-type: none">• Ditjen PHKA• Police Department and Justice Department• Perum Perhutani• NGO• Local Government• Research institutions (Balitbanghut, LIPI)• Private Sectors• Universities

EXPECTED CONDITION	INDOCATOR	ACTIVITIES	EXPECTED TARGET			STAKEHOLDERS
		5. 5Develop a partnership program Javan leopard conservation inside and outside the priority areas				
4. Javan leopard ex-situ conservation programs can effectively support in-situ conservation programs	Support from ex-situ conservation program to in-situ conservation program can be actualized	<ol style="list-style-type: none"> 1. Conduct research on Javan leopard outside their natural habitat (in the ex-situ conservation institutions) and disseminating results. 2. Setting up a breeding protocol Javan leopards that can be used by ex-situ conservation institutions effectively and to develop the capacity and skills of staff of ex-situ conservation institutions for various aspects such as zoonosis, health and utilization. 3. To register using a microchip to all Javan leopards in any ex situ conservation organization and prepare breeding program 4. Enhancing the role of ex-situ conservation institutions in the development of education and research, facilitating in-situ in workshops and workshops, as well as the provision of experts in conflict resolution 5. Develop program of rescue, rehabilitation and release of Javan leopards and prepare the implementation protocol. In preparing this required a series of meetings/workshops involving experts 	<ol style="list-style-type: none"> 1. The availability of research data Javan leopards in ex-situ conservation institutions 2. Coordinator leopard studbook keeper for Java established 3. The availability of rescue and rehabilitation facility Javan leopard and the availability of the technical implementation of the protocol. 	<ol style="list-style-type: none"> 1. Availability of guidelines and protocols related to the conservation of Javan leopards that live outside their habitat 	<ol style="list-style-type: none"> 1. The active participation of ex-situ conservation institutions related to in situ conservation activities Javan leopard 	<ul style="list-style-type: none"> • Ditjen PHKA • Perum Perhutani • NGO • Local Government • Research institutions (Balitbanghut, LIPI) • Private Sectors • Universities
5. Availability of data and Javan leopards information media	Increasing of public awareness and their involvement in Javan leopards conservation	<ol style="list-style-type: none"> 1. Survey the involvement of community support as a baseline monitoring campaign achievement in national level 2. Improving socialization and education Javan leopard conservation 	<ol style="list-style-type: none"> 1. Availability of survey data to measure the success of the conservation of Javan leopard, strengthening local wisdom and their general and local regulations about conservation around 	<ol style="list-style-type: none"> 1. Update the survey results about public support, including increasing knowledge and strengthening local wisdom 	<ol style="list-style-type: none"> 1. Availability of data and media information and ongoing complete and accessible and easily understood by the public, either through social networks, websites, 	<ul style="list-style-type: none"> • Ditjen PHKA • Perum Perhutani • NGO • Local Government • Research institutions (Balitbanghut, LIPI) • Private Sectors

EXPECTED CONDITION	INDOCATOR	ACTIVITIES	EXPECTED TARGET			STAKEHOLDERS
		4. The pattern of PES (Payment for Environmental Services) to run optimally and fund disbursement mechanism 5. Development of proposals to various donors				<ul style="list-style-type: none"> • Universities • PKBSI