パプアニューギニア国

環境保護・保全公社

パプアニューギニア国
生物多様性保全のためのPNG保護区
政策強化プロジェクト

事業完了報告書
（別冊1 Vol.5）

2021年8月

独立行政法人
国際協力機構（JICA）

日本工営株式会社
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環境
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E. 成果 4

E-1 GIS データ及び情報の構築・管理

活動実績報告書：活動コンポーネント成果 4-1

活動コンポーネントの概要及び主要な成果品
GIS データ及び情報の構築・管理

1. 背景及び概要

本プロジェクトの成果 1 が目指すのは「保護区ネットワークのための中央行政の機能強化」であり、成果 2 及び 3 が目指すのは「保護区管理（及び設立）の機能強化」である。成果 4 は、成果 1～3 の達成を側面支援するための「情報整備・広報・啓発の強化」を目指すものであり、本コンポーネントは特に GIS データを活用した支援を行った。

まず CEPA のデータ管理状況や、GIS 担当者の技術力や業務の内容・役割などについて確認するとともに、陸域・海域生態系に関するデータを収集、あるいは購入、作成し、プロジェクト GIS データベースを構築した。整備したデータを用いて、成果 1～3 の活動を支援するための各種のテーマ図を作成した。また、作成したデータやマップが継続的に管理・更新され、将来の保護区管理の適正化に役立つよう CEPA と協議するとともに技術移転を行った。

2. 目的

モデル保護区の管理及び新規保護区の設立のためのデータや情報を収集、作成、及び管理する。

3. 活動内容

(1) CEPA の GIS/RS 関連機材や人員、並びにそれらの稼働状況の確認
(2) プロジェクト GIS データベースの構築・管理
(3) 空間情報の整理、及び空間データの解析処理、各成果関連マップの作成
(4) 空間データ・情報管理のための CEPA の能力開発

4. 活動経緯と実績

(1) CEPA の GIS/RS 関連機材や人員、並びにそれらの稼働状況の確認

2015 年 6 月	CEPA の GIS/RS 関連機材や人員、並びにそれらの稼働状況を確認した。
2015 年 10 月	プロジェクトの GIS/RS 関連機材の利用方法や使用場所を決定し、必要な機材の購入とセットアップを行った。

(2) プロジェクト GIS データベースの構築・管理

2015 年 6 月-10	CEPA 所有の GIS/RS 関連データの内容や管理状況、職員の GIS/RS ス

月	キルや役割等を確認した。
2015 年 6 月- 2016 年 12 月	無料データを含む既存の生物多様性に係る GIS/RS 情報やデータの収集・処理を行った。
2015 年 6 月- 2016 年 4 月	高解像度衛星画像を購入し、解析処理を行った。
2015 年 10 月- 2016 年 4 月	プロジェクト GIS データベースの整備、強化、管理方法を決定した。
2015 年 10 月- 2016 年 12 月 添付資料 4.1.1	プロジェクト GIS データベースを構築した。

(3) 空間情報の整理、及び空間データの解析処理、各成果関連マップの作成

2015 年 9 月- 2017 年 4 月 添付資料 4.1.2	空間情報の整理、及び空間データ処理を行い、プロジェクト対象地マップや PNG の保護区マップ等、成果 1 に係るマップを作成した。
2015 年 9 月- 2018 年 10 月 添付資料 4.1.2	空間情報の整理、及び空間データの解析処理を行い、土地被覆・利用マップや Varirata 国立公園（VNP）施設マップ、VNP 管理ゾーニングマップ等、成果 2 に係るマップを作成した。
2015 年 10 月- 2020 年 1 月 添付資料 4.1.2	空間情報の整理、及び空間データの解析処理を行い、マングローブマップや海洋保護区マップ、Bootless Bay 国立海洋保護区域（BBNMS）ゾーニングマップ等、成果 3 に係るマップを作成した。

(4) 空間データ・情報管理のための CEPA の能力開発

2016 年 4 月、 2017 年 1 月- 2020 年 2 月 添付資料 4.1.3- 4.1.8	CEPA の能力開発研修のため、データ管理に係るマニュアルやガイドを作成した。
2016 年 4 月、 2019 年 6 月- 2020 年 2 月	データの持続的な利用を目的とし、GIS やデータベース、IT 管理者並びに保護区管理担当者を対象に、データ管理に係る協議や研修を行った。

5. 評価

(1) 成果到達度の評価

評価指標	指標の到達度の自己評価	評価結果

5 種類以上の情報発信媒体を作成し、広報・啓発戦略に沿って、ターゲットエリアの人口の30%以上に宣伝する。	Achieved	各種情報発信媒体のコンテンツとして、本活動で収集・作成した情報やマップを活用した。（本評価指標は活動実績報告 4-2 の評価指標と重複するため、詳細は活動実績報告 4-2 を参照。）

(2) 目標到達度の評価

評価指標	指標の到達度	評価結果
情報発信媒体	Achieved	10 種類以上の情報発信媒体を作成した。

6. 教訓

(1) 陸域・海域生態系に関するデータの整備と継続性の確保

関係機関との協力・連携により、対象の保護区及び周辺地域の陸域・海域生態系の関連データを整備することができたものの、CEPA の人的リソースが不足していたため、CEPA 職員にデータの構築に多く関わってもらうことは適わなかった。しかし、CEPA の GIS/RS データの管理状況や職員の技術能力を確認した上で、GIS データベースに関する資料やデータ管理に係るマニュアル等を準備し、またそれらを使って CEPA 職員との協議や研修を行うことで、プロジェクト終了後もデータが継続的に利用される環境を整えることができた。

7. 提言

(1) プロジェクトデータベースの活用

プロジェクト終了後は、CEPA の IT、DB、GIS 担当職員と協議した結果に基づき、本プロジェクトデータベースを CEPA の GIS サーバに格納し、CEPA 職員が自分たちの PC 端末からデータベースにアクセスできる環境を整えることを提案する。CEPA では様々なプロジェクトが行われているが、データの利用が適切に行われていないことが多い。本プロジェクトで整備した GIS データベースや説明資料、関連マニュアル、データの内容を整理した「アトラス」は、一つのパッケージとして、データ・情報整備のプロトタイプとなり得るものである。よって、CEPA 職員が今後、他ドナーとデータ・情報整備方法についてコミュニケーションをとる際にはこれを活用することを提案する。

8. 主要な成果品リスト:

1) Project GIS database list （添付資料 4.1.1）
2) Project map list （添付資料 4.1.2）
3) Introduction of Satellite Imagery – WorldView-2 (Apr 2016) （添付資料 4.1.3）
4) Updating facility database (Jul 2016) （添付資料 4.1.4）
5) Update of VNP facility database (Oct 2018) （添付資料 4.1.5）
6) Manual on Getting location information (Feb 2018) （添付資料 4.1.6）
7) ENVI manual (Apr 2017) （添付資料 4.1.7）
8) GIS Data Management (Feb 2020) （添付資料 4.1.8）

以上

添付資料 4.1.1 Project GIS database list

CEPA-JICA Project GIS Database

CEPA-JICA Project GIS Database Folder Description

File type	Folder name	Description
Satellite & airborne imagery (original/pre-analysis data)	01_Satellite	Satellite imagery (original/pre-analysis data)
	02_DEM	Satellite imagery (DEM) (original/pre-analysis data)
	03_TopoMAP	Topographic Survey map (1:100,000) produced by RASC
	09_DroneData	Drone imagery
Analysis data	11_TopoAnalyst	Topological analysis data
	12_SatelliteAnalyst	Satellite imagery analysis data
Thematic data	21_Boundary	Boundary data
	22_Census	Census data
	23_ForestMap	National Forest Base Map
	24_Landuse	Land use map
	25_LandCon	Land condition map
	26_GeologicalMap	Geological map
	27_Fishery	Fishery related data
	28_Mining	Mining related data
	29_ProtectedArea	Protected area data
	30_Others	Other data
	31_VarirataNP	Varirata NP related data
	32_MarineNP	Marine PA related data
Existing system & data sets	41_PNGRIS	PNGRIS (PNG Resource Information System)
	42_Geobooks	Geobook data produced by UPNG
	51_Hansen	Global Forest Change data by Hansen et al.
	52_Openstreetmap	Open street map
	53_Google	Google satellite imagery
	54_ISCGM	International Steering Committee for Global Mapping data
Map layout & output images	81_MapLayout	Map layout (Map document file)
	82_Maps	Report file/Exported map
	83_Logo	Image for map (ex: PNG logo)
Other documents	91_Documents	Other documents (non-spatial data) such as manuals

: There is only trial data now.

: There is only data gotten from CEPA.

: There is only data gotten from CEPA, but data links to Map document created in the Project.

CEPA-JICA Project GIS Database List

Last updated date: 13 Nov 2020

File type	Folder name			File name	Description	Extent	Souce	Prepared
Satellite & airborne imagery (original/pre-analysis data)	01_Satellite	LANDSAT		(many)	Landsat imagery downloaded about every 5 years Unprocessed	Project Area	http://earthexplorer.usgs.gov/	1
		LANDSAT_CEPA		S-55-051.img	Landsat mosaic imagery	PNG	CEPA database	
		RapidEye_2010	geotif	(many)	RapidEye imagery	PNG	PNGFA	1
		WorldView2		(many)	WorldView-2 imagery	Project Area	Procured by CEPA-JICA Project	1
		PALSAR	PALSAR IMAGES	(many)	ALOS/PALSAR imagery. Stack images of HH, HV, and HHHV	PNG	PNGFA	1
		z_indexmap		(many)	Data for index map of satellite imagery	-	Prepared by CEPA-JICA Project	1
				IndexMap_Satellite.mxd	Index map of satellite imagery	-	Prepared by CEPA-JICA Project	1
	02_DEM	ALOS_DEM		(many)	ALOS DEM	Project Area	http://www.eorc.jaxa.jp/ALOS/aw3d30/index_j.htm	1
				ASTGTM2_S10E147_dem.tif	ASTER GDEM Used for analysis of surface and watershed in the Project.	Project Area	http://www.jspacesystems.or.jp/ersdac/GDEM/J/	1
		SRTM_30		SRTM30.tif	SRTM DEM 30m	PNG	http://www2.jpl.nasa.gov/srtm/	1
		SRTM_90		srtm_png.img	SRTM DEM 90m (mosaic for entire PNG)	PNG	http://www2.jpl.nasa.gov/srtm/	1
				srtm_png_sub_rp0_u55s.img	SRTM DEM 90m (mosaic for entire PNG) (UTM)	PNG	http://www2.jpl.nasa.gov/srtm/	1
				s10_e147_1arc_v3.tif	SRTM (30mDEM)	Project Area	http://www2.jpl.nasa.gov/srtm/	1
	03_TopoMAP	geo_image		8378_Gaire.tif/8379_PortMoresby.tif	Topographic Survey map (1:100,000) produced by RASC	PortMoresby around	CEPA database	
	09_DroneData				Drone imagery	Project Area	Acquired by CEPA-JICA Project	1
Analysis data	11_TopoAnalyst	ASTER_GDEM	topo	aspect	Aspect	Project Area	Processed by CEPA-JICA Project	1
				dem_utm	Surface created by ASTGTM2_S10E147_dem.tif	Project Area	Processed by CEPA-JICA Project	1
				hillshade	Hillshade	Project Area	Processed by CEPA-JICA Project	1
				hillshademsk	Hillshade masked inside land	Project Area	Processed by CEPA-JICA Project	1
				hillshade_5m	Hillshade (cell size: 5m)	Project Area	Processed by CEPA-JICA Project	1
				slope	Slope	Project Area	Processed by CEPA-JICA Project	1
				contour_10.shp	10m interval contours	Project Area	Processed by CEPA-JICA Project	1
				contour_50.shp	50m interval contours	Project Area	Processed by CEPA-JICA Project	1
			watershed	(many)	Watershed created by ASTER GDEM	Project Area	Processed by CEPA-JICA Project	1
		PNG_Contours		(many)	Contour	PNG	CEPA database	
		SRTM_30		DEM_SRTM30_z55.tif	Surface created by SRTM30.tif	PNG		1
				hillshade_srtm30_z55.tif	Hillshade	PNG		1
				contour100_srtm30_z55.shp	100m interval contours	PNG		1
		SRTM		dem_srtm90	SRTM (90m) DEM	PNG	Processed by CEPA-JICA Project	1
				hillshade1	Hillshade created by dem_srtm90	PNG	Processed by CEPA-JICA Project	1
				slope1	Slope created by dem_srtm90	PNG	Processed by CEPA-JICA Project	1
				contour_100	100m interval contours created by dem_srtm90	PNG	Processed by CEPA-JICA Project	1
				contour_50	50m interval contours created by dem_srtm90	PNG	Processed by CEPA-JICA Project	1
			CEN	(many)	SRTM analysis data set in Central province	Central province	Processed by CEPA-JICA Project	1
			NTH	(many)	SRTM analysis data set in Northern province	Northern province	Processed by CEPA-JICA Project	1
	12_SatelliteAnalyst	ndvi			(trial)		Processed by CEPA-JICA Project	1
		ndwi			(trial)		Processed by CEPA-JICA Project	1
	21_Boundary	Kokoda		kokoda_catchmentboundary.shp	Catchment area intersect with Kokoda project area	Kokoda project area	CEPA database	
				Kokoda_Interim_Protection_Zone.shp	Kokoda project area	Kokoda project area	CEPA database	
				Kokoda_Track_BillJames.shp	Kokoda track	Kokoda project area	CEPA database	
			NMB_Cadastral_M	Goldie_NW.tif/Kokoda_SW.tif/Sogeri_NE/Sogeri_SE	Topographic map	Kokoda project area	CEPA database	
			Social_Mapping	Kokoda_Social_Mapping.gdb		Kokoda project area	CEPA database	
		PNG_Coast		PNG PROVINCIAL BOUNDARY.TAB	Coast line	PNG	CEPA database	
				Project_boundary.shp	Project are boundary	Project Area	Created by CEPA-JICA Project	1
				Project_boundary_20160328.shp	Project are boundary (updated on 28th March 2016)	Project Area	Created by CEPA-JICA Project	1
				Project_boundary_20160328_utm55.shp	Project area boundary (UTM zone 55)	Project Area	Created by CEPA-JICA Project	1

File type	Folder name			File name	Description	Extent	Souce	Prepared
		ProjectArea		Project_boundary_20160328_outside.shp	Central Province areas outside "Project_bouhdary_20160328.shp" (for map)	Project Area	Created by CEPA-JICA Project	1
				Central_LLG_20151015.shp	LLG data in Central province	Central province	Created from Census data	1
				Central_LLG_20161012.shp	LLG data in Central province	Central province	Originally from Cencus data; modified coastline with XX and World View imagery for around target area	1
				PNG_outside.shp	Sea area outside PNG (for map)		Created by CEPA-JICA Project	1
	22_Census	Census2011		(many)	PNG Census 2011	PNG	NSO	1
	23_ForestMap			(many)	Forest Base Map created by JICA-FA project	Central province	PNGFA	1
	24_Landuse	CRC_SI		(many)	Land cover classification map	PNG	CEPA database	
		DAL_landuse		(many)	Land use map	PNG	CEPA database	
		vegetation		(many)	Vegetation map	PNG	CEPA database	
	25_LandCon	EnvironmentalConstraints		(many)		PNG	CEPA database	
		PeatSoils		(many)	Peat soil	PNG	CEPA database	
	26_GeologicalMap	MRA_PNG_GeologicalRegion		MRA PNG Geological Region.shp	Geological map	PNG	CEPA database	
	27_Fishery	NewGuinea_Fisheries		(many)	Fishery related data	PNG	CEPA database	
	28_Mining	MRA_Mining_Tenaments		(many)	Mining related data	PNG	CEPA database	
	29_ProtectedArea	PNG_Protected_Areas		(many)	Protected area	PNG	CEPA database	
	30_Others	Power		Naoro_Brown_Power_Infructure.shp	Electric power plant	NCD around	CEPA database	
		Thumb_Mountains_Track		(many)	Mountain track	NCD around	CEPA database	
				VNP_Boundary.shp	Varirata NP boundary	Vrirata NP	Digitized Varirata National Park Map	1
				VNP_Boundary_buffer.shp	3 km buffer area of Varirata NP boundary	Vrirata NP		1
				Landuse_201610	Land use map	Project Area (terrestrial)	Created by interpreting WorldView imagery, site visit, and referring Varirata National Park map, past LANDSAT imagery, etc.	1
				VNP_VegetationMap_1510.shp	Vegetation map around Varirata NP created by interpreting and digitizing openlayer (google images) on QGIS	Vrirata NP around	Created by CEPA-JICA Project	1
				VNP_River.shp	River	Project Area	Created by referring ISCGM data, DEM, Varirata National Park Map, etc., digitizing World View imagery, and field survey	1
				VNP_Road.shp	Road in Varinata NP	Vrirata NP	Created by digitizing World View imagery and getting location with GPS	1
				Settlement_CEN	Settlement	Central province	Modified PNG Geobook data by hearing and site visit	1
				hillshd_VNP_5idw_p1_fix30.tif	Hillshade	Vrirata NP	Analyzed SRTM DEM	1
				VNP_Facility_db.xls	Facility in Vrirata NP (database)	Vrirata NP	Created by CEPA-JICA Project	1
				VNP_Facility_pnt.shp	Facility in Vrirata NP (point data) (Results of the first VNP facility assessment implemented by the CEPA-JICA Project)	Vrirata NP	The data is used for the maps before April, 2018.	1
				VNP_Facility_lin.shp	Facility in Vrirata NP (line data) (Results of the first VNP facility assessment implemented by the CEPA-JICA Project)	Vrirata NP	The data is used for the maps before April, 2018.	1
				VNP_Facility_png.shp	Facility in Vrirata NP (polygon data) (Results of the first VNP facility assessment implemented by the CEPA-JICA Project)	Vrirata NP	The data is used for the maps before April, 2018.	1
				VNP_Facility_update_pnt.shp	Facility in Vrirata NP (point data)	Vrirata NP	The data is updated according to the situation of the facility on site with "VNP_Facility_db.xls".	1
				VNP_Facility_update_lin.shp	Facility in Vrirata NP (line data)	Vrirata NP	The data is updated according to the situation of the facility on site with "VNP_Facility_db.xls".	1
				VNP_Facility_update_png.shp	Facility in Vrirata NP (polygon data)	Vrirata NP	The data is updated according to the situation of the facility on site with "VNP_Facility_db.xls".	1
				VNP_DistancePiles.shp	Distance piles placed in Varirata NP	Vrirata NP	Created by CEPA-JICA Project	1
				DigicelTower2.shp	Digicel tower	Vrirata NP	Created by CEPA-JICA Project	1

File type	Folder name			File name	Description	Extent	Souce	Prepared
Thematic data	31_VarirataNP	data		PoliceTower.shp	Police Repeater Communication Tower	Vrirata NP	Created by CEPA-JICA Project	1
				CameraTrap.shp	Camera trap (data before 15 Oct 2015)	Vrirata NP	Created by CEPA-JICA Project	1
				CameraTrap_update.shp	Camera trap	Vrirata NP	Created by CEPA-JICA Project	1
				PotentialBirdWatchingSites.shp	Potential bird watching sites (2016.04.06 version)	Project Area	Created by CEPA-JICA Project	1
				VNP_Zone.shp	VNP management zone	Vrirata NP	Created by CEPA-JICA Project	1
				MAB_Zone1.shp	MAB zone for terrestrial	Project Area	Created by CEPA-JICA Project	1
				MAB_Zone2.shp	MAB zone between terrestrial and marine	Project Area	Created by CEPA-JICA Project	1
				MAB_Zone_merge.shp	Merged data of MAB_Zone1.shp and MAB_Zone2.shp (Created for BR Nomination Form)	Project Area	Created by CEPA-JICA Project	1
				MAB_Zone_merge_diss.shp	Dissolved data of MAB_Zone_merge.shp (Created for BR Nomination Form)	Project Area	Created by CEPA-JICA Project	1
				MAB_Zone_merge_diss_pnt.shp	Center point of MAB_Zone_merge_diss.shp (Created for BR Nomination Form)	Project Area	Created by CEPA-JICA Project	1
				MAB_Zone_terrestrial.shp	MAB zone (only proposed terrestrial area) (Created for BR Nomination Form)	Project Area	Created by CEPA-JICA Project	1
				MAB_Zone_terrestrial_pnt.shp	Center, mostnorthern, mostsouthern, mosteastern, and mostwestern points of MAB_Zone_terrestrial.shp (Created for BR Nomination Form)	Project Area	Created by CEPA-JICA Project	1
				PopDen2008_sqkm.tif	Population density analyzed using Census Unit 2008	Project Area	Created by CEPA-JICA Project	1
				PopDen2008_sqkm_clp.tif	Population density analyzed using Census Unit 2008 (clip with land area)	Project Area	Created by CEPA-JICA Project	1
				ward_boundary_smp.shp	Tentative boundary of wards	Project Area	Created by CEPA-JICA Project	1
			landuse_r	(many)	Process data for developing land use map merged Landuse_201610 and Forest Base Map	Vrirata NP around	Created by CEPA-JICA Project	1
			biological_survey_2017	Frog_habitat.shp	Distribution of lake frogs	Vrirata NP	Field survey data implemented in the CEPA-JICA Project. Data reported in "Final Report Biodiversity (Fauna) Survey for Varirata National Park May 2018"	1
				Raggiana Bird of Paradise_display tree.shp	Location of Raggiana Bird of Paradise display trees	Vrirata NP		
				Megapode_mounds.shp	Location of Megapode Mounds	Vrirata NP		
				Giant_Bandicoot_distribution.shp	Potential distribution of the Giant Bandicoot (*Peroryctes broadbenti*)	Vrirata NP		
				Castanopsis forests.shp	*Castanopsis acuminatissima* dominated forests	Vrirata NP	Field survey data implemented in the CEPA-JICA Project. Data reported in "Final Report Biodiversity (Flora) Survey for Varirata National Park May 2018"	1
				Lantana camara.shp	Occurrence of *Lantana camara*	Vrirata NP	Field survey data implemented in the CEPA-JICA Project. Data reported in "Final Report Invasive Species Management Plan for Varirata National Park May 2018"	1
				Spathodea campanulata.shp	Occurrence of *Spathodea campanulata*	Vrirata NP		
				Tradescantia sp.shp	Occurrence of *Tradescantia* sp.	Vrirata NP		
				Mature Piper aduncum plants.shp	Distribution of mature *Piper aduncum*	Vrirata NP		
				Clidemia_density.shp	Density of Clidemia (*Miconia crenata*)	Vrirata NP		
				Dogs_observed.shp	Areas of VNP where dogs are commonly observed	Vrirata NP		
				Rusa Deer_observed.shp	Areas of VNP where rusa deer are commonly observed	Vrirata NP		
				Wild Pigs_observed.shp	Areas of VNP where wild pigs are commonly observed	Vrirata NP		
		old		varirata.shp	Protected area derived from PNG Geobook	Vrirata NP	CEPA database	
				varirata_facility.shp	Facilities including Lookouts and toilets in VNP protted by referring Varirata NP map	Vrirata NP	Created by CEPA-JICA Project	1
		etc		map_layoutframe.shp	Layout frame for VNP map	Vrirata NP	Created by CEPA-JICA Project	1
				MapPges_DetailLocation.shp	Data for map	Vrirata NP	Created by CEPA-JICA Project	1
				map_tile_WV2.shp	Layout frame of VNP map for World View 2 images	Vrirata NP	Created by CEPA-JICA Project	1
				ProposedBR_location_pnt.shp	Points data to confirm Proposed BR location for BR Nomination Form	Vrirata NP	Created by CEPA-JICA Project	1
		ref		variratamap.tiff	Varirata NP map	Vrirata NP	CEPA database	
				variratamap_reference.tiff	Varirata NP map georeferenced	Vrirata NP	CEPA database	

File type	Folder name			File name	Description	Extent	Souce	Prepared
		ref		variratabasemap.tif	Varirata NP map georeferenced	Vrirata NP	Created by CEPA-JICA Project	1
				digicel tower.txt	Lat/long infomation of degicel tower	Vrirata NP	GPS info by CEPA-JICA Project	1
	32_MarineNP	data		BBay_Sites.shp	Sites (International dive site, UPNG research site, Customary/traditional fishing feround)	Project Area (marine)	Created by CEPA-JICA Project	1
				BBay_coastline_buff20m.shp	20m buffer from coastline	Project Area (marine)	Created by CEPA-JICA Project	1
				Road_P.shp	Road	Project Area	Modified Openstreetmap line data by interpreting WorldView-2 imagery	1
				Mangrove.shp	Mangrove	Project Area (marine)	Created by referring World View imagery and field survey	1
				Mangrove_area.shp	Mangrove (divided regions)	Project Area (marine)	Created by CEPA-JICA Project	1
				Mangrove_outline.shp	Outline of Mangrove	Project Area (marine)	Created by CEPA-JICA Project	1
				Mangrove_sanctuary.shp	Mangrove inside Marine Sanctuary area	Project Area (marine)	Created by CEPA-JICA Project	1
				Mangrove_outline_pnt.shp	Rough points along outlines of mangrove inside marine sanctuary area	Project Area (marine)	Created by CEPA-JICA Project	1
				Reef.shp	Reef	Project Area (marine)	Created by referring World View imagery and "PAPUA NEW GUINEA SOUTH COAST APPROACHES TO PORT MORESBY DEPTH IN METRES" map	1
				Reef_sanctuary.shp	Reaf inside Marine Sanctuary area	Project Area (marine)	Created by CEPA-JICA Project	1
				Seagrass.shp	seagrass	Project Area (marine)	Created on the basis of field survey	1
				Sargassum.shp	sargassum (seaweed)	Project Area (marine)	Created on the basis of field survey	1
				Depth_line.shp	Depth in meter	Project Area (marine)	Created by referring World View imagery and "PAPUA NEW GUINEA SOUTH COAST APPROACHES TO PORT MORESBY DEPTH IN METRES" map	1
				Motupore_island.shp	Motupore Island	Project Area (marine)	Created by CEPA-JICA Project	1
				Motupore_island_630mbuf.shp	630m buffer from coast line of Motupore Island	Project Area (marine)	Created by CEPA-JICA Project	1
				630m_line.shp	(for map)	Project Area (marine)	Created by CEPA-JICA Project	1
				Motupore_island_20mbuf.shp	20m buffer from coast line of Motupore Island	Project Area (marine)	Created by CEPA-JICA Project	1
				Motupore_Zone.shp	Zone in Motupore Island	Project Area (marine)	Created by CEPA-JICA Project	1
				Motupore_Zone2.shp	Zone in Motupore Island (second plan)	Project Area (marine)	Created by CEPA-JICA Project	1
				UPNG_land.shp	UPNG survey area at Tahira	Project Area (marine)	Created by the paper map shown UPNG land and and field survey (GPS data)	1
				UPNG_Zone.shp	Zone in UPNG land	Project Area (marine)	Created by CEPA-JICA Project	1
				UPNG_Zone2.shp	Zone in UPNG land (second plan)	Project Area (marine)	Created by CEPA-JICA Project	1
				CPC_land.shp	CPC land boundary	Project Area (marine)	Created by CEPA-JICA Project	1
				CPC_Zone.shp	Zone in CPC	Project Area (marine)	Created by CEPA-JICA Project	1
				Tahira_farm_Mangrove.shp	Tahira farm and neaby mangrove areas	Project Area (marine)	Created by CEPA-JICA Project	1
				Tahira_farm_Zone.shp	Zone in Tahira farm	Project Area (marine)	Created by CEPA-JICA Project	1
				CPG_land.shp	CPG land boundary	Project Area (marine)	Created by CEPA-JICA Project	1
				Proposed MPA Boundary_lin.shp	Boundary of marine area of proposed Marine Protected Area	Project Area (marine)	Created by CEPA-JICA Project	1
				Proposed MPA Boundary_pin.shp	Main points on boundary of marine area of proposed Marine Protected Area	Project Area (marine)	Created by CEPA-JICA Project	1
				MPA_Terrestrial_area.shp	Terrestrial area of Marine Sanctuary area	Project Area (marine)	Created by CEPA-JICA Project	1
				MPA_Marine_area.shp	Marine area of Marine Sanctuary area	Project Area (marine)	Created by CEPA-JICA Project	1
				CEN_gov_land.shp	Central government land	Project Area (marine)	Created by CEPA-JICA Project	1
				Customary_land.shp	Customary land	Project Area (marine)	Created by CEPA-JICA Project	1
				Signboard_prohibition	Signboard for prohibition against mangrove trimming	Project Area (marine)	Created by CEPA-JICA Project	1
				Pipeline.shp	Pipeline	Project Area (marine)	Digitized	1
				MAB_Zone_Marine.shp	MAB zone for marine	Project Area (marine)	Created by CEPA-JICA Project	1
				NMS_region_areas.shp	Rough region areas of National Marine Sanctuary	Project Area (marine)	Created by CEPA-JICA Project	1
				NMS_Zone.shp	Management zone of National Marine Sanctuary	Project Area (marine)	Created by CEPA-JICA Project	1
				Feature.shp	Jetty, Resort, Habitat areas, Cultural/Historical areas	Project Area (marine)	Created by CEPA-JICA Project	1
				Tuna migratory route.shp	Tuna migratory route	Project Area (marine)	Created by CEPA-JICA Project	1
				Yellow-fin tuna.shp	Yellow-fin tuna	Project Area (marine)	Created by CEPA-JICA Project	1

File type	Folder name			File name	Description	Extent	Souce	Prepared
				Ship route	ship route	Project Area (marine)	Created by CEPA-JICA Project	1
				Docking mooring facility.shp	Docking and mooring facilities (location options)	Project Area (marine)	Created by CEPA-JICA Project	1
				High water mark.shp	Estimated high water mark	Project Area (marine)	Created by CEPA-JICA Project	1
		etc		cal_Area.xlsx	Area of proposed MPA and Mangroves	Project Area (marine)	Created by CEPA-JICA Project	1
				mangrove_outline_LatLon.xlsx	latitude and longitude of "Mangrove_outline_pnt.shp"	Project Area (marine)	Created by CEPA-JICA Project	1
				map tile_mangrove2000.shp	Tiles for mangrove map (1:2,000)	Project Area (marine)	Created by CEPA-JICA Project	1
		ref		google_capture.jpg	google image around Bootles Bay	Project Area (marine)		1
Exsisting system & data sets	41_PNGRIS	PNGRIS2007_PNG	PNGRIS2007_PNG_Capitals	PNG_Provincial_Capitals_PNGRIS.shp	Provincial capitals	PNG	CEPA database	
			PNGRIS2007_PNG_Coastline	PNG_coastline.shp	PNG coastline	PNG	CEPA database	
			PNGRIS2007_PNG_Districts	(many)	Districts	PNG	CEPA database	
			PNGRIS2007_PNG_Provinces	PNG_Provincial_Boundaries_PNGRIS2007.shp	Provinces	PNG	CEPA database	
	42_Geobooks	PNG_Geobook		(many)	PNG geobook	Central province	CEPA database	
	51_Hansen			(many)	Global Forest Change data by Hansen et al. :Forest cover, Loss, Gain, Lossyear, First, Last	PNG	http://earthenginepartners.appspot.com/science-2013-global-forest/download_v1.2.html	1
	52_Openstreetmap			line.shp/point.shp/polygon.shp	Road	Project Area	https://openstreetmap.jp/	1
	53_Google			varirata google.jpg	google earth capture imagery	Project Area	Google Earth	1
	54_ISCGM			(many)		PNG	http://www.iscgm.org/	1
Map layout & output images	81_MapLayout	Atlas			Map layout for Atlas		Created by CEPA-JICA Project	1
		MAB			Map layout related to the Project	Project Area	Created by CEPA-JICA Project	1
		Mangrove			Map layout related to Mangrove	Project Coastal Area	Created by CEPA-JICA Project	1
		Marine			Map layout related to Marine PA	Project Coastal Area	Created by CEPA-JICA Project	1
		Motupore			Map layout related to Motupore	Motupore	Created by CEPA-JICA Project	1
		VarirataNP			Map layout related to Varirata NP	Varirata NP	Created by CEPA-JICA Project	1
		Zoning			Map layout related to Zoning		Created by CEPA-JICA Project	1
		etc			Other map layout		Created by CEPA-JICA Project	1
	82_Maps				Output maps		Created by CEPA-JICA Project	1
	83_Logo				Images for map (ex: PNG logo and JICA logo)			1
Other documents (non-spatial data)	91_Documents	VNP Facility management		List of Facility_YYYYMMDD.xlsx	Lists of VNP Facility			1
				VNP-Facility-profile-No.xlsx	Profiles of VNP Facility			1
				Updating facility database_201607.pptx	Manual on updating VNP facility database (Excel) (July 2016, by Mr Imai)			1
				Update of VNP facility database_20181025.pptx	Manual on updating VNP facility database (GIS) (October 2018)			1
				Maps for VNP Facility Management_20181025.xlsx	Contents of Maps for VNP Facility Management (October 2018)			1
		Manuals and related documents		Manual on Getting location information_20180209.pptx	Manual on Getting location information (Importing GPS data to GIS) (February 2018)			1
				ENVI manual_20170404.pdf	ENVI manual (4 April 2017)			1
		Presentation documents		20160422_Introduction of Satellite Imagery.pptx	Introduction of Satellite Imagery - WorldView-2 (22 April 2016)			1
				20200204_GIS Data Management.pptx	GIS Data Management (February 2020)			1
				CEPA-JICA Project GISDB list.xlsx	CEPA-JICA Project GIS Database list			1
				CEPA-JICA Project Map list.xlsx	CEPA-JICA Project Map list			1

添付資料 4.1.2 Project map list

Maps for target protected areas (overall map)

Map document

Data folder	GISDB¥81_MapLayout¥MAB	
Data	File name	Description
	MAB_base.mxd	Provisional Project Boundary Map
	Project Site.mxd	Project Site map (there are several maps)
	Terrestrial Areas Map.mxd	Terrestrial Areas Map (WorldView-2)
	Terrestrial Areas Map_VNP.mxd	Varirata National Park Map (WorldView-2)
	Terrestrial Areas_Landuse.mxd	Land Use Map (Proposed terrestrial areas)
	Marine Areas Map (satellite).mxd	Marine / Coastal Areas Map (WorldView-2)
	Marine Areas Map_Bbay (satellite).mxd	Marine / Coastal Areas (Bootles Bay) Map (WorldView-2)
	MAB_zoning.mxd	Management zone map

Exported map

Data folder	GISDB¥82_Maps¥MAB		
Data	File name	Description	Corresponding map document
	MAB_base.jpg	Provisional Project Boundary Map	MAB_base.mxd
	Project Site.jpg	Project Site map (there are several maps)	Project Site.mxd
	Terrestrial Areas Map.jpg	Terrestrial Areas Map (WorldView-2)	Terrestrial Areas Map.mxd
	Terrestrial Areas Map_VNP.jpg	Varirata National Park Map (WorldView-2)	Terrestrial Areas Map_VNP.mxd
	Terrestrial Areas_Landuse.jpg	Land Use Map (Proposed terrestrial areas)	Terrestrial Areas_Landuse.mxd
	Marine Areas Map (satellite).jpg	Marine / Coastal Areas Map (WorldView-2)	Marine Areas Map (satellite).mxd
	Marine Areas Map_Bbay (satellite).jpg	Marine / Coastal Areas (Bootles Bay) Map (WorldView-2)	Marine Areas Map_Bbay (satellite).mxd
	MAB_zoning.jpg	Management zone map	MAB_zoning.mxd

Maps for Varirata National Park

Map document

Data folder	GISDB¥81_MapLayout¥VarirataNP	
Data	File name	Description
	VarirataNP_base.mxd	VNP basic map included land use
	VarirataNP_facility.mxd	Map for facility management (maps of overall view/ distribution of detail location maps of facility)
	VarirataNP_facility_D.mxd	Map for facility management (detail location maps)
	VarirataNP_camera trap.mxd	Map for facility management (distribution of camera traps)
	VarirataNP_Main Signboard.mxd	Map designed for main signboard
	VarirataNP_guide map.mxd	Map designed for guide map (overall view)
	VarirataNP_guide map_circuit track.mxd	Map designed for guide map (circuit track)
	VarirataNP_guide map_gares lookout track.mxd	Map designed for guide map (gares lookout track)
	VarirataNP_guide map_scarp track.mxd	Map designed for guide map (scarp track)
	VarirataNP_guide map_self guide track.mxd	Map designed for guide map (self guide track)
	VarirataNP_IC.mxd	Map for Information Center
	VarirataNP_zoning.mxd	Varirata National Park zoning map

Exported map

Data folder	GISDB¥82_Maps¥VarirataNP		
Data	File name	Description	Corresponding map document
	VarirataNP_base.jpg	VNP basic map included land use	VarirataNP_base.mxd
	VarirataNP_facility_A.jpg	Map for facility management (overall view: main facility)	VarirataNP_facility.mxd
	VarirataNP_facility_B.jpg	Map for facility management (distribution of detail location maps of facility)	VarirataNP_facility.mxd
	VarirataNP_facility_C1.jpg	Map for facility management (overall view: sign board, bridge, hand rail, car parking)	VarirataNP_facility.mxd
	VarirataNP_facility_C2.jpg	Map for facility management (overall view: toilet)	VarirataNP_facility.mxd
	VarirataNP_facility_C3.jpg	Map for facility management (overall view: structure)	VarirataNP_facility.mxd
	VarirataNP_facility_D_01.jpg	Map for facility management (detail location map (1))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_02.jpg	Map for facility management (detail location map (2))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_03.jpg	Map for facility management (detail location map (3))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_04.jpg	Map for facility management (detail location map (4))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_05.jpg	Map for facility management (detail location map (5.1))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_06.jpg	Map for facility management (detail location map (5.2))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_07.jpg	Map for facility management (detail location map (6.1))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_08.jpg	Map for facility management (detail location map (6.2))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_09.jpg	Map for facility management (detail location map (7))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_10.jpg	Map for facility management (detail location map (8.1))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_11.jpg	Map for facility management (detail location map (8.2))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_12.jpg	Map for facility management (detail location map (9))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_13.jpg	Map for facility management (detail location map (10))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_14.jpg	Map for facility management (detail location map (11))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_15.jpg	Map for facility management (detail location map (12 & 13))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_16.jpg	Map for facility management (detail location map (12))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_17.jpg	Map for facility management (detail location map (13))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_18.jpg	Map for facility management (detail location map (14))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_19.jpg	Map for facility management (detail location map (15))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_20.jpg	Map for facility management (detail location map (16))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_21.jpg	Map for facility management (detail location map (17.1))	VarirataNP_facility_D.mxd
	VarirataNP_facility_D_22.jpg	Map for facility management (detail location map (17.2))	VarirataNP_facility_D.mxd
	VarirataNP_camera trap_[Date].jpg	Map for facility management (distribution of camera traps)	VarirataNP_camera trap.mxd
	VarirataNP_Main Signboard.jpg	Map designed for main signboard	VarirataNP_Main Signboard.mxd
	VarirataNP_guide map.jpg	Map designed for guide map (overall view)	VarirataNP_guide map.mxd
	VarirataNP_guide map_circuit track.jpg	Map designed for guide map (circuit track)	VarirataNP_guide map_circuit track.mxd
	VarirataNP_guide map_gares lookout track.jpg	Map designed for guide map (gares lookout track)	VarirataNP_guide map_gares lookout track.mxd
	VarirataNP_guide map_scarp track.jpg	Map designed for guide map (scarp track)	VarirataNP_guide map_scarp track.mxd
	VarirataNP_guide map_self guide track.jpg	Map designed for guide map (self guide track)	VarirataNP_guide map_self guide track.mxd
	VarirataNP_IC.jpg	Map for Information Center	VarirataNP_IC.mxd
	VarirataNP_zoning.jpg	Varirata National Park zoning map	VarirataNP_zoning.mxd

Maps for Marine Protected Areas

Map document

Data folder	GISDB¥81_MapLayout¥Marine	
Data	File name	Description
	Mangrove.mxd	Mangrove map
	Marine Areas Map_Bbay_protected area.mxd	Marine Areas (Bootles Bay) Map for Marine Protected Areas (there are several version)
	Marine Areas Map_Bbay_NMS.mxd	Marine Areas (Bootles Bay) Map for National Marine Sanctuary
	Marine PA_FieldSurvey.mxd	Marine Protected Areas map
	Marine PA_CPC.mxd	Marine Protected Areas (CPC land) map
	Marine PA_Motupore.mxd	Marine Protected Areas (Motupore Island) map
	Marine PA_Tahira farm.mxd	Marine Protected Areas (Tahira farm) map
	Marine PA_UPNG.mxd	Marine Protected Areas (UPNG land) map
	Marine PA_CPG.mxd	Marine Protected Areas (CPG land) map
	Marine PA_mangrove location.mxd	Mangrove location map of Marine Protected Areas
	Marine PA_signboad.mxd	Marine Protected Areas map for signboad

Exported map

Data folder	GISDB¥82_Maps¥Marine		
Data	File name	Description	Corresponding map document
	Mangrove.jpg	Mangrove map	Mangrove.mxd
	Marine Areas Map_Bbay_protected area.jpg	Marine Areas (Bootles Bay) Map for Marine Protected Areas (there are several version)	Marine Areas Map_Bbay_protected area.mxd
	Marine Areas Map_Bbay_NMS.jpg	Marine Areas (Bootles Bay) Map for National Marine Sanctuary	Marine Areas Map_Bbay_NMS.mxd
	Marine PA.jpg	Marine Protected Areas map	Marine PA_FieldSurvey.mxd
	Marine PA_CPC land.jpg	Marine Protected Areas (CPC land) map	Marine PA_CPC.mxd
	Marine PA_CPC land_Zone.jpg	Marine Protected Areas (CPC land) zoning map	Marine PA_CPC.mxd
	Marine PA_Motupore.jpg	Marine Protected Areas (Motupore Island) map	Marine PA_Motupore.mxd
	Marine PA_Motupore_Zone.jpg	Marine Protected Areas (Motupore Island) zoning map	Marine PA_Motupore.mxd
	Marine PA_Tahira Farm.jpg	Marine Protected Areas (Tahira farm) map	Marine PA_Tahira farm.mxd
	Marine PA_Tahira Farm_Zone.jpg	Marine Protected Areas (Tahira farm) zoning map	Marine PA_Tahira farm.mxd
	Marine PA_UPNG land.jpg	Marine Protected Areas (UPNG land) map	Marine PA_UPNG.mxd
	Marine PA_UPNG land_Zone.jpg	Marine Protected Areas (UPNG land) zoning map	Marine PA_UPNG.mxd
	Marine PA_CPG.jpg	Marine Protected Areas (CPG land) map	Marine PA_CPG.mxd

Various types of maps requested

Map document

Data folder	GISDB¥81_MapLayout¥etc	
Data	File name	Description
	Protected Area_0.1.mxd	PNG Protected Areas
	Potential Bird Watching Sites_1.0.mxd	Potential Bird Watching Sites
	Landsat.mxd	Time-series LANDSAT images of the target sites
	Hansen.mxd	Distribution of Hansen data of the proposed terrestrial areas
	White Map.mxd	White map with settlements

Exported map

Data folder	GISDB¥82_Maps¥etc		
Data	File name	Description	Corresponding map document
	Protected Area_0.1.jpg	PNG Protected Areas	Protected Area_0.1.mxd
	Potential Bird Watching Sites_1.0.jpg	Potential Bird Watching Sites	Potential Bird Watching Sites_1.0.mxd
	Landsat.jpg	Time-series LANDSAT images of the target sites	Landsat.mxd
	Hansen.jpg	Distribution of Hansen data of the proposed terrestrial areas	Landsat_Hansen.mxd
	White Map.jpg	White map with settlements	White Map.mxd

Maps for the Project Atlas 2017

Map document

Data folder	GISDB¥81_MapLayout¥Atlas	
Data	File name	Description
	C1_S1_01_Location.mxd	Location map of the target sites
	C1_S1_02_LANDSAT.mxd	Time-series LANDSAT images of the proposed terrestrial areas
	C1_S1_02_WorldView2.mxd	WorldView-2 images of the proposed terrestrial areas
	C1_S2_01_Environment.mxd	Physical environment maps of the proposed terrestrial areas
	C1_S3_01_Ward.mxd	Socioeconomic maps of the proposed terrestrial areas
	C2_S1_01_Location.mxd	Location map of the target sites 2
	C2_S1_02_WorldView2.mxd	WorldView-2 images of the Varirata National Park

Exported map

Data folder	GISDB¥82_Maps¥Atlas		
Data	File name	Description	Corresponding map document
	C1_S1_01_Location.jpg	Location map of the target sites	C1_S1_01_Location.mxd
	C1_S1_02_LANDSAT.jpg	Time-series LANDSAT images of the proposed terrestrial areas	C1_S1_02_LANDSAT.mxd
	C1_S1_02_WorldView2.jpg	WorldView-2 images of the proposed terrestrial areas	C1_S1_02_WorldView2.mxd
	C1_S2_01_Altitude.jpg	Altitude of the proposed terrestrial areas	C1_S2_01_Environment.mxd
	C1_S2_02_Slope.jpg	Slope of the proposed terrestrial areas	C1_S2_01_Environment.mxd
	C1_S2_02_Basin.jpg	Catchment of the proposed terrestrial areas	C1_S2_01_Environment.mxd
	C1_S2_02_Vegetation.jpg	Land Use Map of the proposed terrestrial areas	C1_S2_01_Environment.mxd
	C1_S3_01_Population.jpg	Population per Census Units	C1_S3_01_Ward.mxd
	C1_S3_01_PopulationDensity.jpg	Population density	C1_S3_01_Ward.mxd
	C1_S3_01_Ward.jpg	Distribution of Words	C1_S3_01_Ward.mxd
	C2_S1_01_Location.jpg	Location map of the target sites 2	C2_S1_01_Location.mxd
	C2_S1_02_WorldView2.jpg	WorldView-2 images of the Varirata National Park	C2_S1_02_WorldView2.mxd

Map for Facility Management in Varirata National Park
Last revised date: 25th October, 2018

Map document folder: GISDB\81_MapLayout\VarirataNP
Exported map folder: GISDB\82_Maps\VarirataNP
* Version of the files, which trailling number indicates, could be changed.
* The maps should be updated periodically followed by field survey of facility management.
* Refer to each Sheet for the original layer setting.

No.		Map	File name of exported map	Map document	Map reflects result of ...	Note
1	Facility	Location of Facilities in Varirata National Park (Gazette Area)	*(to be exported when needed)*	VarirataNP_facility_update_1.0.mxd	Latest facility update	as of May 2018
2	management	Facility Map (Sign board, bridge, hand rail, car parking)	*(to be exported when needed)*	VarirataNP_facility_update_1.0.mxd	Latest facility update	as of May 2018
3		Facility Map (Structure)	*(to be exported when needed)*	VarirataNP_facility_update_1.0.mxd	Latest facility update	as of May 2018
4		Facility Map (Toilet)	*(to be exported when needed)*	VarirataNP_facility_update_1.0.mxd	Latest facility update	as of May 2018
5		Distribution of Camera Traps (22 SEP 2015 - 15 OCT 2015)	VarirataNP_camera trap_22SEP15_2.0.jpg	VarirataNP_camera trap_update_1.0.mxd	Latest facility update	as of May 2018
6		Distribution of Camera Traps (15 OCT 2015 - 2016)	VarirataNP_camera trap_15OCT15_2.0.jpg	VarirataNP_camera trap_update_1.0.mxd	Latest facility update	as of May 2018
7		Distribution of Camera Traps (2016 - Early 2017)	VarirataNP_camera trap_2016_2.0.jpg	VarirataNP_camera trap_update_1.0.mxd	Latest facility update	as of May 2018
8		Distribution of Camera Traps (As of 10 NOV 2017)	VarirataNP_camera trap_10NOV17_2.0.jpg	VarirataNP_camera trap_update_1.0.mxd	Latest facility update	as of May 2018
9		Distribution of Detail Location Maps of Facilities in Varirata National	*(to be exported when needed)*	VarirataNP_facility_update_1.0.mxd	Latest facility update	as of May 2018
10		Detail Location Map of Facilities (1) Along main road: Entrance - Mai	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
11		Detail Location Map of Facilities (2) Main Picnic Area	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
12		Detail Location Map of Facilities (3) Picnic Site 2	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
13		Detail Location Map of Facilities (4) Lodge Area	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
14		Detail Location Map of Facilities (5.1) Lake Site	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
15		Detail Location Map of Facilities (5.2) Lake Site	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
16		Detail Location Map of Facilities (6.1) Camping Area	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
17		Detail Location Map of Facilities (6.2) Camping Area	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
18		Detail Location Map of Facilities (7) Main Outlook	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
19		Detail Location Map of Facilities (8.1) Self Guide Track (Main Outlook	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
20		Detail Location Map of Facilities (8.2) Self Guide Track (Picnic site 2 s	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
21		Detail Location Map of Facilities (9) Circuit Track	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
22		Detail Location Map of Facilities (10) Picnic Site 3	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
23		Detail Location Map of Facilities (11) Picnic Site 4	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
24		Detail Location Map of Facilities (12 & 13) Ranger's quarter & house	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
25		Detail Location Map of Facilities (12) Ranger's quarter	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
26		Detail Location Map of Facilities (13) Ranger's house	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
27		Detail Location Map of Facilities (14) Signs on main road	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
28		Detail Location Map of Facilities (15) Scarp Track	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
29		Detail Location Map of Facilities (16) Gare's Lookout Track	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
30		Detail Location Map of Facilities (17.1) Boundary Track	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
31		Detail Location Map of Facilities (17.2) Boundary Track	*(to be exported when needed)*	VarirataNP_facility_D_update_1.0.mxd	Latest facility update	as of May 2018
32		Location of Facilities in Varirata National Park (Gazette Area)	VarirataNP_facility_A_1.1.jpg	VarirataNP_facility_1.1.mxd	First facility assessment	
33		Facility Map (Sign board, bridge, hand rail, car parking)	VarirataNP_facility_C1_1.1.jpg	VarirataNP_facility_1.1.mxd	First facility assessment	
34		Facility Map (Structure)	VarirataNP_facility_C2_1.1.jpg	VarirataNP_facility_1.1.mxd	First facility assessment	
35		Facility Map (Toilet)	VarirataNP_facility_C3_1.1.jpg	VarirataNP_facility_1.1.mxd	First facility assessment	
36		Distribution of Camera Traps (22 SEP 2015 - 15 OCT 2015)	VarirataNP_camera trap_22SEP15_1.1.jpg	VarirataNP_camera trap_1.1.mxd	First facility assessment	
37		Distribution of Camera Traps (15 OCT 2015 - as of Today)	VarirataNP_camera trap_15OCT15_1.1.jpg	VarirataNP_camera trap_1.1.mxd	First facility assessment	as of 20 Oct 2015
38		Distribution of Detail Location Maps of Facilities in Varirata National	VarirataNP_facility_B_1.1.jpg	VarirataNP_facility_1.1.mxd	First facility assessment	
39		Detail Location Map of Facilities (1) Along main road: Entrance - Mai	VarirataNP_facility_D_01_1.1.jpg	VarirataNP_facility_D_1.1.mxd	First facility assessment	
40		Detail Location Map of Facilities (2) Main Picnic Area	VarirataNP_facility_D_02_1.1.jpg	VarirataNP_facility_D_1.1.mxd	First facility assessment	
41		Detail Location Map of Facilities (3) Picnic Site 2	VarirataNP_facility_D_03_1.1.jpg	VarirataNP_facility_D_1.1.mxd	First facility assessment	
42		Detail Location Map of Facilities (4) Lodge Area	VarirataNP_facility_D_04_1.1.jpg	VarirataNP_facility_D_1.1.mxd	First facility assessment	
43		Detail Location Map of Facilities (5.1) Lake Site	VarirataNP_facility_D_05_1.1.jpg	VarirataNP_facility_D_1.1.mxd	First facility assessment	
44		Detail Location Map of Facilities (5.2) Lake Site	VarirataNP_facility_D_06_1.1.jpg	VarirataNP_facility_D_1.1.mxd	First facility assessment	
45		Detail Location Map of Facilities (6.1) Camping Area	VarirataNP_facility_D_07_1.1.jpg	VarirataNP_facility_D_1.1.mxd	First facility assessment	
46		Detail Location Map of Facilities (6.2) Camping Area	VarirataNP_facility_D_08_1.1.jpg	VarirataNP_facility_D_1.1.mxd	First facility assessment	
47		Detail Location Map of Facilities (7) Main Outlook	VarirataNP_facility_D_09_1.1.jpg	VarirataNP_facility_D_1.1.mxd	First facility assessment	

48		Detail Location Map of Facilities (8.1) Self Guide Track (Main Outlook	VariRataNP_facility_D_10_1.1.jpg	VariRataNP_facility_D_1.1.mxd	First facility assessment	
49		Detail Location Map of Facilities (8.2) Self Guide Track (Picnic site 2 s	VariRataNP_facility_D_11_1.1.jpg	VariRataNP_facility_D_1.1.mxd	First facility assessment	
50		Detail Location Map of Facilities (9) Circuit Track	VariRataNP_facility_D_12_1.1.jpg	VariRataNP_facility_D_1.1.mxd	First facility assessment	
51		Detail Location Map of Facilities (10) Picnic Site 3	VariRataNP_facility_D_13_1.1.jpg	VariRataNP_facility_D_1.1.mxd	First facility assessment	
52		Detail Location Map of Facilities (11) Picnic Site 4	VariRataNP_facility_D_14_1.1.jpg	VariRataNP_facility_D_1.1.mxd	First facility assessment	
53		Detail Location Map of Facilities (12 & 13) Ranger's quarter & house	VariRataNP_facility_D_15_1.1.jpg	VariRataNP_facility_D_1.1.mxd	First facility assessment	
54		Detail Location Map of Facilities (12) Ranger's quarter	VariRataNP_facility_D_16_1.1.jpg	VariRataNP_facility_D_1.1.mxd	First facility assessment	
55		Detail Location Map of Facilities (13) Ranger's house	VariRataNP_facility_D_17_1.1.jpg	VariRataNP_facility_D_1.1.mxd	First facility assessment	
56		Detail Location Map of Facilities (14) Signs on main road	VariRataNP_facility_D_18_1.1.jpg	VariRataNP_facility_D_1.1.mxd	First facility assessment	
57		Detail Location Map of Facilities (15) Scarp Track	VariRataNP_facility_D_19_1.1.jpg	VariRataNP_facility_D_1.1.mxd	First facility assessment	
58		Detail Location Map of Facilities (16) Gare's Lookout Track	VariRataNP_facility_D_20_1.1.jpg	VariRataNP_facility_D_1.1.mxd	First facility assessment	
59		Detail Location Map of Facilities (17.1) Boundary Track	VariRataNP_facility_D_21_1.1.jpg	VariRataNP_facility_D_1.1.mxd	First facility assessment	
60		Detail Location Map of Facilities (17.2) Boundary Track	VariRataNP_facility_D_22_1.1.jpg	VariRataNP_facility_D_1.1.mxd	First facility assessment	
61	Guide map	Varirata National Park Map	*(to be exported when needed)*	VariRataNP_guide map_update_1.0.mxd	Latest facility update	as of May 2018
62		Gare's Lookout Track	*(to be exported when needed)*	VariRataNP_guide map_gares lookout track_u	Latest facility update	as of May 2018
63		Circuit Track	*(to be exported when needed)*	VariRataNP_guide map_circuit track_update_	Latest facility update	as of May 2018
64		Self Guide Track	*(to be exported when needed)*	VariRataNP_guide map_self guide track_upda	Latest facility update	as of May 2018
65		Scarp Track	*(to be exported when needed)*	VariRataNP_guide map_scarp track_update_1	Latest facility update	as of May 2018
66		Varirata National Park Map	VariRataNP_guide map_1.3.jpg	VariRataNP_guide map_1.3.mxd	First facility assessment	
67		Gare's Lookout Track	VariRataNP_guide map_gares lookout_1.3.jpg	VariRataNP_guide map_gares lookout track_1	First facility assessment	
68		Circuit Track	VariRataNP_guide map_circuit_1.3.jpg	VariRataNP_guide map_circuit track_1.3.mxd	First facility assessment	
69		Self Guide Track	VariRataNP_guide map_scarp_1.3.jpg	VariRataNP_guide map_self guide track_1.3.m	First facility assessment	
70		Scarp Track	VariRataNP_guide map_self guide_1.3.jpg	VariRataNP_guide map_scarp track_1.3.mxd	First facility assessment	
71	Main signboard	Varirata National Park Main Area	*(to be exported when needed)*	VariRataNP_Main Signboard_update_1.0.mxd	Latest facility update	as of May 2018
72		Varirata National Park Main Area	VariRataNP_Main Signboard_1.1.jpg	VariRataNP_Main Signboard_1.1.mxd	First facility assessment	
73	Base map	Land Use Map of Varirata National Park	VariRataNP_base_landuse_1.3.jpg	VariRataNP_base_1.3.mxd		

Facility management

Map document
VariRataNP_facility_update_1.0.mxd

To do:
- Change layer on/off.
- Change title.
- Change legend.

Location of Facilities in Varirata National Park (Gazette Area)

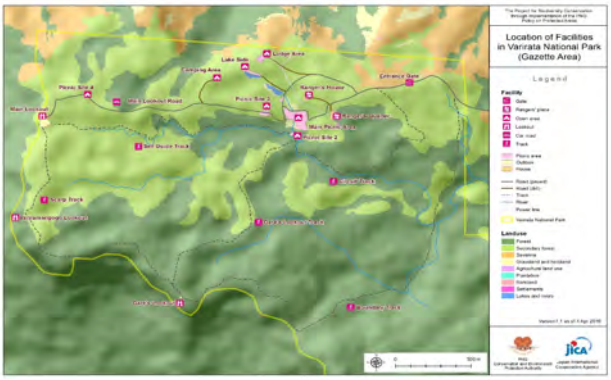
Rendered Layers

- Main body
  - VariRataNP_D
  - VariRataNP_C3
  - VariRataNP_C2
  - VariRataNP_C1
  - VariRataNP_A,B
    - VNP_Facility_pntAnno
    - VNP_Facility_update_pnt
    - VNP_Facility_update_lin
    - VNP_Road(1,2,3)
    - VNP_River
    - VNP_Facility_update_png(6,7,9)
    - map_layoutframe
  - VNP_Boundary
  - Landuse_201610
  - Landuse_201610_FBMcolour
  - hillshd_VNP_5idw_p1_fix30.tif

Major Definition Query

Layer name	Definition Query
VNP_Facility_update_pnt	"Id" =1
VNP_Facility_update_lin	"Id" =1
VNP_Facility_update_png(6,7,9)	

Image



Facility Map (Sign board, bridge, hand rail, car parking)

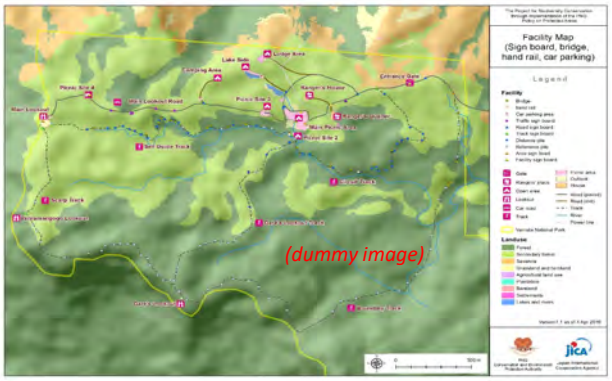
Rendered Layers

- Main body
  - VariRataNP_D
  - VariRataNP_C3
  - VariRataNP_C2
  - VariRataNP_C1
    - VNP_Facility_update_pnt(4,5,8)
      - Sub_category
      - Bridge
      - hand rail
      - Car parking area
    - VNP_Facility_update_pnt(29-35)
      - Sub_category
      - Traffic sign board
      - Road sign board
      - Track sign board
      - Distance pile
      - Reference pile
      - Area sign boad
      - Facility sign board
  - VariRataNP_A,B
    - VNP_Facility_pntAnno
    - VNP_Facility_update_pnt
    - VNP_Facility_update_lin
    - VNP_Road(1,2,3)
    - VNP_River
    - VNP_Facility_update_png(6,7,9)
    - map_layoutframe
  - VNP_Boundary
  - Landuse_201610
  - Landuse_201610_FBMcolour
  - hillshd_VNP_5idw_p1_fix30.tif

Major Definition Query

Layer name	Definition Query
VNP_Facility_update_pnt(4,5,8)	"VNP_Facility_update_pnt.Id" = 2 AND("Sheet1$.Sub_category_No" = 4 OR "Sheet1$.Sub_category_No" = 5 OR "Sheet1$.Sub_category_No" = 8)
VNP_Facility_update_pnt(29-35)	"VNP_Facility_update_pnt.Id" = 2 AND("Sheet1$.Sub_category_No" = 29 OR "Sheet1$.Sub_category_No" = 30 OR "Sheet1$.Sub_category_No" = 31 OR "Sheet1$.Sub_category_No" = 32 OR "Sheet1$.Sub_category_No" = 33 OR "Sheet1$.Sub_category_No" = 34 OR "Sheet1$.Sub_category_No" = 35) AND ("Sheet1$.Condition" <> 'Removed' AND "Sheet1$.Condition" <> 'will be removed')

Image



Facility Map (Structure)

Rendered Layers

- Main body

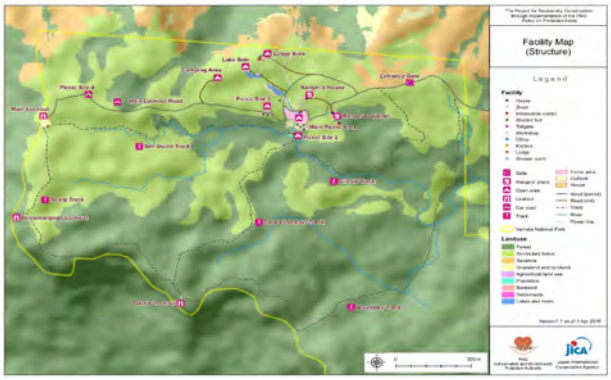
Major Definition Query

Layer name	Definition Query

- VariRataNP_D
- VariRataNP_C3
- VariRataNP_C2
  - VNP_Facility_update_pnt(9-13,18-22)
    - Sub_category
      - House
      - Shed
      - Information center
      - Shelter/ hut
      - Tollgate
      - Workshop
      - Office
      - Kitchen
      - Lodge
      - Shower room
- VariRataNP_C1
- VariRataNP_A,B
  - VNP_Facility_pntAnno
  - VNP_Facility_update_pnt
  - VNP_Facility_update_lin
  - VNP_Road(1,2,3)
  - VNP_River
  - VNP_Facility_update_png(6,7,9)
  - map_layoutframe
- VNP_Boundary
- Landuse_201610
- Landuse_201610_FBMcolour
- hillshd_VNP_5idw_p1_fix30.tif

VNP_Facility_update_pnt(9-13,18-22)	"VNP_Facility_update_pnt.Id" = 2 AND("Sheet1$.Sub_category_No" = 9 OR "Sheet1$.Sub_category_No" = 10 OR "Sheet1$.Sub_category_No" = 11 OR "Sheet1$.Sub_category_No" = 12 OR "Sheet1$.Sub_category_No" = 13 OR "Sheet1$.Sub_category_No" = 18 OR "Sheet1$.Sub_category_No" = 19 OR "Sheet1$.Sub_category_No" = 20 OR "Sheet1$.Sub_category_No" = 21 OR

Image



Facility Map (Toilet)

Rendered Layers

- Main body
  - VariRataNP_D
  - VariRataNP_C3
    - VNP_Facility_update_pnt(28)
  - VariRataNP_C2
  - VariRataNP_C1
  - VariRataNP_A,B
    - VNP_Facility_pntAnno
    - VNP_Facility_update_pnt
    - VNP_Facility_update_lin
    - VNP_Road(1,2,3)
    - VNP_River
    - VNP_Facility_update_png(6,7,9)
    - map_layoutframe
  - VNP_Boundary
  - Landuse_201610
  - Landuse_201610_FBMcolour
  - hillshd_VNP_5idw_p1_fix30.tif

Major Definition Query

Layer name	Definition Query
VNP_Facility_update_pnt(28)	VNP_Facility_update_pnt.Id =2 AND "Sheet1$.Sub_category_No" = 28 AND ("Sheet1$.Condition" <> 'Removed' AND "Sheet1$.Condition" <> 'will be removed')

Image

Distribution of Detail Location Maps of Facilities in Varirata National Park (Gazette Area)

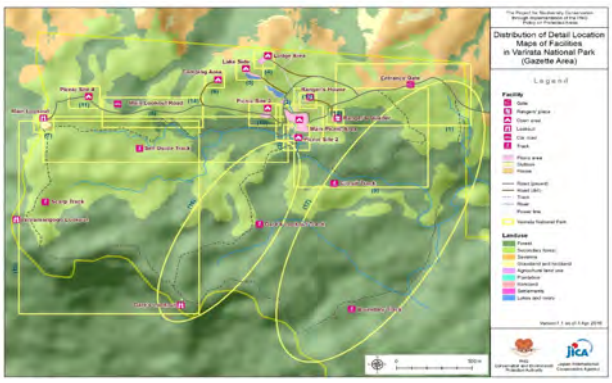
Rendered Layers

- Main body
  - VariRataNP_D
  - VariRataNP_C3
  - VariRataNP_C2
  - VariRataNP_C1
  - VariRataNP_A,B
    - VNP_Facility_pntAnno
    - VNP_Facility_update_pnt
    - VNP_Facility_update_lin
    - VNP_Road(1,2,3)
    - VNP_River
    - VNP_Facility_update_png(6,7,9)
    - map_layoutframe
  - VNP_Boundary
  - Landuse_201610
  - Landuse_201610_FBMcolour
  - hillshd_VNP_5idw_p1_fix30.tif

Major Definition Query

Layer name	Definition Query
VNP_Facility_update_pnt	"Id" =1
VNP_Facility_update_lin	"Id" =1
VNP_Facility_update_png(6,7,9)	

Image



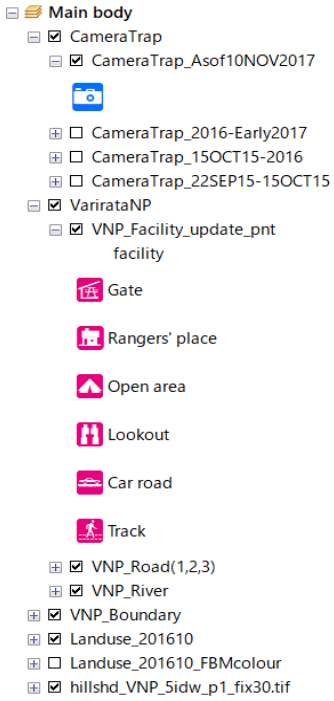
Facility management

Map document
VariraNP_camera trap_update_1.0.mxd

To do:
- Change layer on/off.
- Change title.

Distribution of Camera Traps (22 SEP 2015 - 15 OCT 2015)

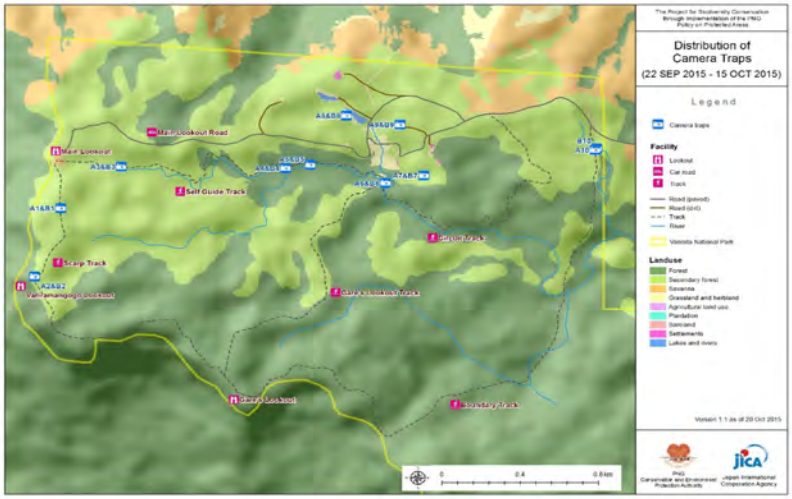
Rendered Layers



Major Definition Query

Layer name	Definition Query
CameraTrap_22SEP15-15OCT15	"st_date" = date '2015-09-22 00:00:00'
VNP_Facility_update_pnt	"Id" = 1 AND("facility" = 'Car road' OR "facility" = 'Lookout' OR "facility" = 'Track')

Image



Distribution of Camera Traps (15 OCT 2015 - 2016)

Rendered Layers

Major Definition Query

Layer name	Definition Query
CameraTrap_15OCT15-AsOfToday	"end_date" = date '2015-12-31 00:00:00'
VNP_Facility_update_pnt	"Id" = 1 AND("facility" = 'Car road' OR "facility" = 'Lookout' OR "facility" = 'Track')

Distribution of Camera Traps (2016 - Early 2017)

Rendered Layers

Major Definition Query

Layer name	Definition Query
CameraTrap_15OCT15-AsOfToday	"end_date" = date '2015-12-31 00:00:00'
VNP_Facility_update_pnt	"Id" = 1 AND("facility" = 'Car road' OR "facility" = 'Lookout' OR "facility" = 'Track')

Distribution of Camera Traps (As of 10 NOV 2017)

Rendered Layers

Major Definition Query

Layer name	Definition Query
CameraTrap_15OCT15-AsOfToday	"end_date" = date '2015-12-31 00:00:00'
VNP_Facility_update_pnt	"Id" = 1 AND("facility" = 'Car road' OR "facility" = 'Lookout' OR "facility" = 'Track')

Facility management

Map document
VarirataNP_facility_D_update_1.0.mxd

To do:
- Change View extent by using bookmark.
- Change title.
- Change legend.

Detail Location Map of Facilities (1) Along main road: Entrance - Main Picnic Area

Bookmark
Bookmark 1_3000

Detail Location Map of Facilities (2) Main Picnic Area

Bookmark
Bookmark 2_1000

Detail Location Map of Facilities (3) Picnic Site 2

Bookmark
Bookmark 3_700

Detail Location Map of Facilities (4) Lodge Area

Bookmark
Bookmark 4_500

Detail Location Map of Facilities (5.1) Lake Site

Bookmark
Bookmark 5_1500

Detail Location Map of Facilities (5.2) Lake Site

Bookmark
Bookmark 6_600

Detail Location Map of Facilities (6.1) Camping Area

Bookmark
Bookmark 7_1500

Detail Location Map of Facilities (6.2) Camping Area

Bookmark
Bookmark 8_500

Detail Location Map of Facilities (7) Main Outlook

Bookmark
Bookmark 9_500

Detail Location Map of Facilities (8.1) Self Guide Track (Main Outlook side)

Bookmark
Bookmark 10_3000

Detail Location Map of Facilities (8.2) Self Guide Track (Picnic site 2 side)

Bookmark
Bookmark 11_3000

Detail Location Map of Facilities (9) Circuit Track

Bookmark
Bookmark 12_3000

Detail Location Map of Facilities (10) Picnic Site 3

Bookmark
Bookmark 13_1000

Detail Location Map of Facilities (11) Picnic Site 4

Bookmark
Bookmark 14_500

Detail Location Map of Facilities (12 & 13) Ranger's quarter & house

Bookmark
Bookmark 15_1000

Detail Location Map of Facilities (12) Ranger's quarter

Bookmark
Bookmark 16_500

Detail Location Map of Facilities (13) Ranger's house

Bookmark
Bookmark 17_500

Detail Location Map of Facilities (14) Signs on main road

Bookmark
Bookmark 18_3000

Detail Location Map of Facilities (15) Scarp Track

Bookmark
Bookmark 19_4500

Detail Location Map of Facilities (16) Gare's Lookout Track

Bookmark
Bookmark 20_4500

Detail Location Map of Facilities (17.1) Boundary Track

Bookmark
Bookmark 21_6000

Detail Location Map of Facilities (17.2) Boundary Track

Bookmark
Bookmark 22_4500

Rendered Layers

- Main body
  - MapPages_DetailLocation
  - VariraNP_D
    - VNP_Facility_update_pnt(4,5,8)
    - VNP_Facility_update_pnt(29-35)
    - VNP_Facility_update_pnt(9-13,18-22)
    - VNP_Facility_update_pnt(28)
    - VNP_Facility_update_pnt(16,17,24-26)
    - VNP_Facility_update_lin(14,15,23,27)
    - VNP_Facility_update_lin
    - VNP_Facility_update_png(6,7,9)
    - VNP_Road(1,2,3)
    - VNP_River
  - VariraNP_C3
  - VariraNP_C2
  - VariraNP_C1
  - VariraNP_A,B
  - VNP_Boundary
  - Landuse_201610
  - Landuse_201610_FBMcolour
  - hillshd_VNP_5idw_p1_fix30.tif

Major Definition Query

Layer name	Definition Query
VNP_Facility_update_pnt(4,5,8)	"VNP_Facility_update_pnt.Id" = 2 AND("Sheet1$.Sub_category_No" = 4 OR "Sheet1$.Sub_category_No" = 5 OR "Sheet1$.Sub_category_No" = 8)
VNP_Facility_update_pnt(29-35)	"VNP_Facility_update_pnt.Id" = 2 AND("Sheet1$.Sub_category_No" = 29 OR "Sheet1$.Sub_category_No" = 30 OR "Sheet1$.Sub_category_No" = 31 OR "Sheet1$.Sub_category_No" = 32 OR "Sheet1$.Sub_category_No" = 33 OR "Sheet1$.Sub_category_No" = 34 OR "Sheet1$.Sub_category_No" = 35) AND ("Sheet1$.Condition" <> 'Removed' AND "Sheet1$.Condition"
VNP_Facility_update_pnt(9-13,18-22)	"VNP_Facility_update_pnt.Id" = 2 AND("Sheet1$.Sub_category_No" = 9 OR "Sheet1$.Sub_category_No" = 10 OR "Sheet1$.Sub_category_No" = 11 OR "Sheet1$.Sub_category_No" = 12 OR "Sheet1$.Sub_category_No" = 13 OR "Sheet1$.Sub_category_No" = 18 OR "Sheet1$.Sub_category_No" = 19 OR "Sheet1$.Sub_category_No" = 20 OR "Sheet1$.Sub_category_No" = 21 OR
VNP_Facility_update_pnt(28)	VNP_Facility_update_pnt.Id =2 AND "Sheet1$.Sub_category_No" = 28 AND ("Sheet1$.Condition" <> 'Removed' AND "Sheet1$.Condition" <> 'will be removed')
VNP_Facility_update_pnt(16,17,24-26)	VNP_Facility_update_pnt.Id =2 AND("Sheet1$.Sub_category_No" = 16 OR "Sheet1$.Sub_category_No" = 17 OR "Sheet1$.Sub_category_No" = 25 OR "Sheet1$.Sub_category_No" = 26)
VNP_Facility_update_lin(14,15,23,27)	VNP_Facility_update_lin.Id =2
VNP_Facility_update_lin	"Id" =1
VNP_Facility_update_png(6,7,9)	

Image

Guide map

Varirata National Park Map

Map document
VariraataNP_guide map_update_1.0.mxd

Rendered Layers

- Main body
  - VariraataNP_Guide
    - VNP_Facility_update_pnt(4,8(subset))
    - VNP_Facility_update_pnt(30,31,34,35)
    - VNP_Facility_update_pnt(32)
  - VariraataNP_A,B
    - VNP_Facility_upadate_pnt
    - VNP_Facility_update_lin
    - VNP_Road(1,2,3)
    - VNP_Road(0_car road,foot path)
    - VNP_Road(1,2,3)
    - VNP_Road(0_car road,foot path)
    - VNP_River
    - VNP_Facility_update_png(6,7,9)
  - VNP_Boundary
  - Landuse_201610
  - Landuse_201610_FBMcolour
  - hillshd_VNP_5idw_p1_fix30.tif
- Overview2
  - Settlements
    - Settlement_CEN
    - png2000_cu_appx_point
  - baselayer
    - VNP_Road
    - Road
    - VNP_River
    - water
  - VNP_Boundary
  - LLG boundary
  - hillshademsk

Major Definition Query

Layer name	Definition Query
VNP_Facility_update_pnt(4,8(subset))	"VNP_update_Facility_pnt.Id" = 2 AND ("Sheet1$.Sub_category_No" = 8 OR ("Sheet1$.Facility_No" = 23 OR "Sheet1$.Facility_No" = 92 OR "Sheet1$.Facility_No" = 99 OR "Sheet1$.Facility_No" = 130 OR "Sheet1$.Facility_No" = 137 OR "Sheet1$.Facility_No" = 178))
VNP_Facility_update_pnt(30,31,34,35)	"VNP_Facility_update_pnt.Id" = 2 AND ("Sheet1$.Sub_category_No" = 30 OR "Sheet1$.Sub_category_No" = 31 OR "Sheet1$.Sub_category_No" = 34 OR "Sheet1$.Sub_category_No" = 35)
VNP_Facility_update_pnt(32)	"VNP_Facility_update_pnt.Id" = 2 AND "Sheet1$.Sub_category_No" = 32 AND ("Sheet1$.Condition" <> 'Removed' AND "Sheet1$.Condition" <> 'will be removed')
VNP_Facility_update_pnt	"Id" =1
VNP_Facility_update_lin	"Id" =1
VNP_Facility_update_png(6,7,9)	
Settlement_CEN	onoff = 1

Image

Gare's Lookout Track

Map document
VariraataNP_guide map_gares lookout track_update_1.0.mxd

Circuit Track

Map document
VariraataNP_guide map_circuit track_update_1.0.mxd

Self Guide Track

Map document
VariraataNP_guide map_self guide track_update_1.0.mxd

Scarp Track

Map document
VariraataNP_guide map_scarp track_update_1.0.mxd

Rendered Layers

- Main body
  - VariratNP_Guide
    - VNP_Facility_update_pnt(4,8(subset))
    - VNP_Facility_update_pnt(30,31,34,35)
    - VNP_Facility_update_pnt(32)
  - VariratNP_A,B
    - VNP_Facility_update_pnt
    - VNP_Facility_update_lin
    - VNP_Road(1,2,3)
    - VNP_Road(1,2,3)
    - VNP_Road(0_car road,foot path)
    - VNP_Road(1,2,3)
    - VNP_Road(0_car road,foot path)
    - VNP_River
    - VNP_Facility_update_png(6,7,9)
  - VNP_Boundary
  - Landuse_201610
  - Landuse_201610_FBMcolour
  - hillshd_VNP_5idw_p1_fix30.tif
- VNP
  - VariratNP_A,B
    - VNP_Facility_update_pnt
    - VNP_Road(1,2,3)
    - VNP_Road(1,2,3)
    - VNP_Road(0_car road,foot path)
    - VNP_Facility_update_png(6,7,9)
  - VNP_River

Major Definition Query

Layer name	Definition Query
VNP_Facility_update_pnt(4,8(subset))	"VNP_update_Facility_pnt.Id" = 2 AND ("Sheet1$.Sub_category_No" = 8 OR ("Sheet1$.Facility_No" = 23 OR "Sheet1$.Facility_No" = 92 OR "Sheet1$.Facility_No" = 99 OR "Sheet1$.Facility_No" = 130 OR "Sheet1$.Facility_No" = 137 OR "Sheet1$.Facility_No" = 178))
VNP_Facility_update_pnt(30,31,34,35)	"VNP_Facility_update_pnt.Id" = 2 AND ("Sheet1$.Sub_category_No" = 30 OR "Sheet1$.Sub_category_No" = 31 OR "Sheet1$.Sub_category_No" = 34 OR "Sheet1$.Sub_category_No" = 35)
VNP_Facility_update_pnt(32)	"VNP_Facility_update_pnt.Id" = 2 AND "Sheet1$.Sub_category_No" = 32 AND ("Sheet1$.Condition" <> 'Removed' AND "Sheet1$.Condition" <> 'will be removed')
VNP_Facility_update_pnt	"Id" =1
VNP_Facility_update_lin	"Id" =1
VNP_Facility_update_png(6,7,9)	
Settlement_CEN	onoff = 1

Image

Main signboard

Varirata National Park Main Area

Map document
VarirataNP_Main Signboard_update_1.0.mxd

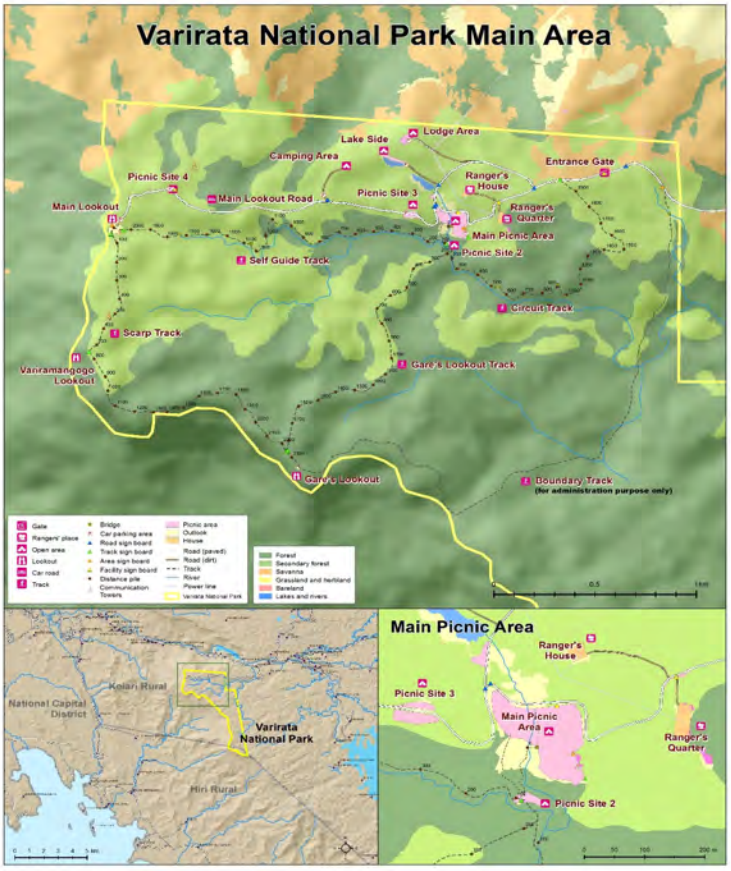
Rendered Layers

- Main body
  - VarirataNP_Guide
    - Police_repeater
    - Digicel_tower
    - VNP_Facility_update_pnt(4,8(subset))
    - VNP_Facility_update_pnt(30,31,34,35)
    - VNP_Facility_update_pnt(32)
  - VarirataNP_A,B
    - VNP_Facility_pntAnno
    - VNP_Facility_update_pnt
    - VNP_Facility_update_lin
    - VNP_Road(1,2,3)
    - VNP_Road(0_car road,foot path)
    - VNP_Road(1,2,3)
    - VNP_Road(0_car road,foot path)
    - VNP_River
    - VNP_Facility_update_png(6,7,9)
  - VNP_Boundary
  - Landuse_201610
  - Landuse_201610_FBMcolour
  - hillshd_VNP_5idw_p1_fix30.tif
- Overview
  - Settlements
    - Settlement_CEN
    - png2000_cu_appx_point
  - baselayer
    - Road
    - VNP_Road
    - VNP_River
    - water
  - VNP_Boundary
  - LLG boundary
  - hillshademsk
- Main Picnic
  - VarirataNP_Guide
    - VNP_Facility_update_pnt(4,8(subset))
    - VNP_Facility_update_pnt(30,31,34,35)
    - VNP_DistancePiles
  - VarirataNP_A,B
    - VNP_Facility_pntAnno
    - VNP_Facility_update_pnt
    - VNP_Facility_update_lin
    - VNP_Road(1,2,3)
    - VNP_Road(0_car road,foot path)
    - VNP_Road(1,2,3)
    - VNP_Road(0_car road,foot path)
    - VNP_River
    - VNP_Facility_update_png(6,7,9)
  - Landuse_201610
  - Landuse_201610_FBMcolour

Major Definition Query

Layer name	Definition Query
VNP_Facility_update_pnt(4,8(subset))	"VNP_Facility_update_pnt.Id" = 2 AND ("Sheet1$.Sub_category_No" = 8 OR ("Sheet1$.Facility_No" = 23 OR "Sheet1$.Facility_No" = 92 OR "Sheet1$.Facility_No" = 99 OR "Sheet1$.Facility_No" = 130 OR "Sheet1$.Facility_No" = 137 OR "Sheet1$.Facility_No" = 178))
VNP_Facility_update_pnt(30,31,34,35)	"VNP_Facility_update_pnt.Id" = 2 AND ("Sheet1$.Sub_category_No" = 30 OR "Sheet1$.Sub_category_No" = 31 OR "Sheet1$.Sub_category_No" = 34 OR "Sheet1$.Sub_category_No" = 35)
VNP_Facility_update_pnt(32)	"VNP_Facility_update_pnt.Id" = 2 AND "Sheet1$.Sub_category_No" = 32 AND ("Sheet1$.Condition" <> 'Removed' AND "Sheet1$.Condition" <> 'will be removed')
VNP_Facility_update_pnt	"Id" =1
VNP_Facility_update_lin	"Id" =1
VNP_Facility_update_png(6,7,9)	

Image



Base map

Land Use Map of Varirata National Park

Map document
VarirataNP_base_1.3.mxd

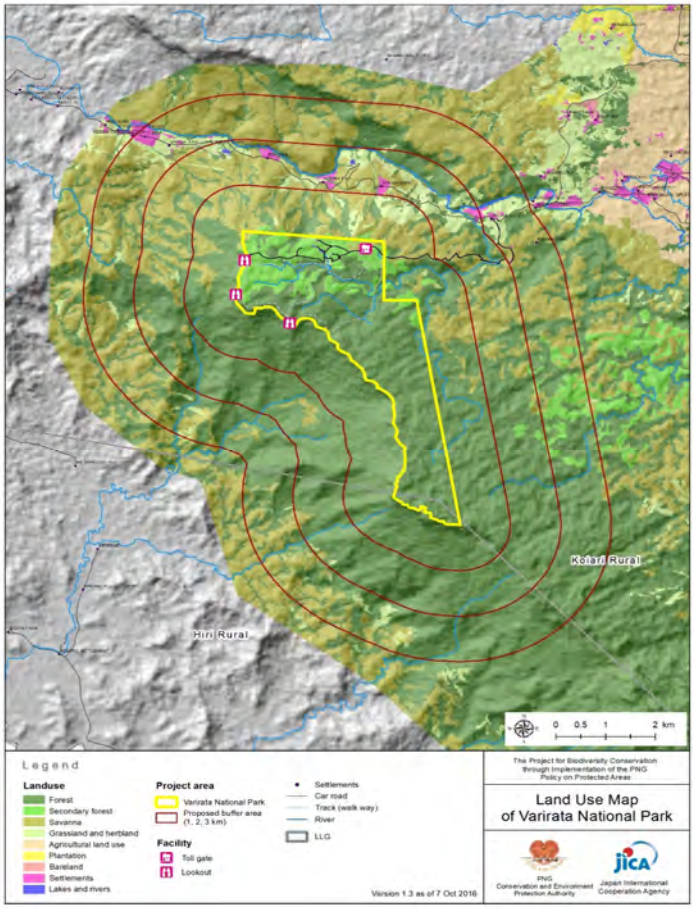
Rendered Layers

- Layers
  - Settlement_CEN
  - VarirataArea
    - VNP_Facility_update_pnt
    - VNP_Boundary
    - VNP_Boundary_buffer
    - VNP_Road
  - baselayer
    - Road
    - kokoda
    - LLG
    - VNP_River
  - Landuse_201610_FBMcolour
  - Landuse_201610
  - landcover_p003_03_tmp_dis
  - VNP_VegetationMap_1510
  - watershed
  - terrain
    - wshed10000poly
    - slope
    - aspect
    - dem
    - hillshademsk
  - SatelliteImagery

Major Definition Query

Layer name	Definition Query
VNP_Facility_update_pnt	"Id" = 1 AND ("facility" = 'Gate' OR "facility" = 'Lookout')
VNP_Road	"Id" = 1 OR "type" = 'Car road'

Image



添付資料 4.1.3 Introduction of Satellite Imagery – WorldView-2

The Project for
Biodiversity Conservation through Implementation of
the PNG Policy on Protected Areas

Introduction of Satellite Imagery - WorldView-2 - procured in the Project

Ayako OCHI

22 Apr 2016

Contents

- Introduction to satellite imagery procured
  - Purpose of procurement of satellite imagery
  - Image type, price, extent purchased
  - Points of concern
- Introduction of WorldView-2
  - Features and Design specifications
  - How to search imagery
- View of the imagery (Demo)
  - Condition of imagery, comparison to other satellite imagery, image composition, and application
- Future plan

Introduction to Satellite Imagery Procured
Purpose of procurement of satellite imagery

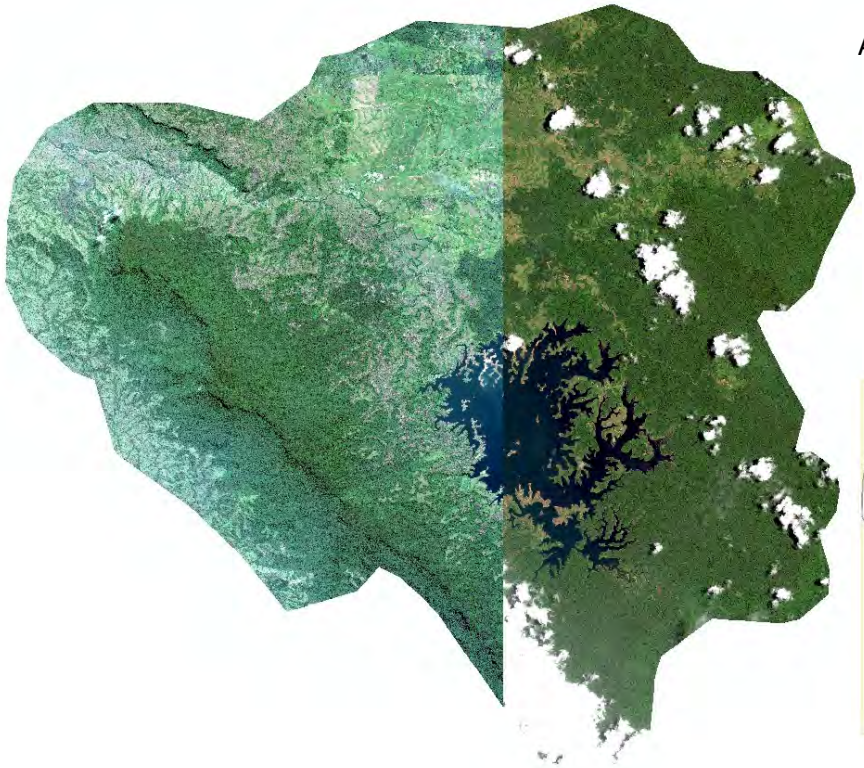
High resolution satellite imagery enables you to…

- Get a grasp of environment (land use/cover) in area of interest,
- Figure out location and amount of environment elements more precisely by interpreting and analyzing imagery,
- Capture condition and location of mangroves and coral reef spatially, and
- Create more catching map, say use of imagery for base map.

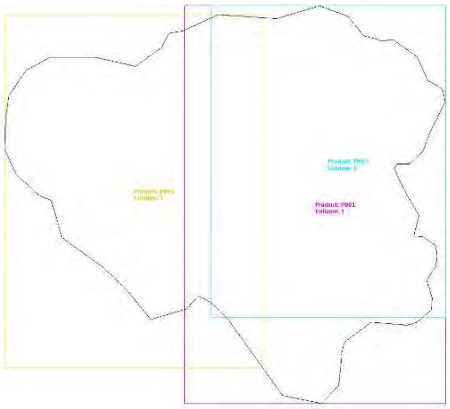
Introduction to Satellite Imagery Procured
Image Type, Price, Extent Purchased

- Satellite image: WorldView-2 (Archive, Orthoready, 50-60cm class)
- Supplier: DigitalGlobe
- Price: 4,300 yen/km2 (about 110K/km2) + tax
  - Got 40 % discount because of an agreement between KKC and supplier of DigitalGlobe product in Japan
- Target area
  - Terrestrial areas: 494km2
  - Marine / coastral areas: 223km2

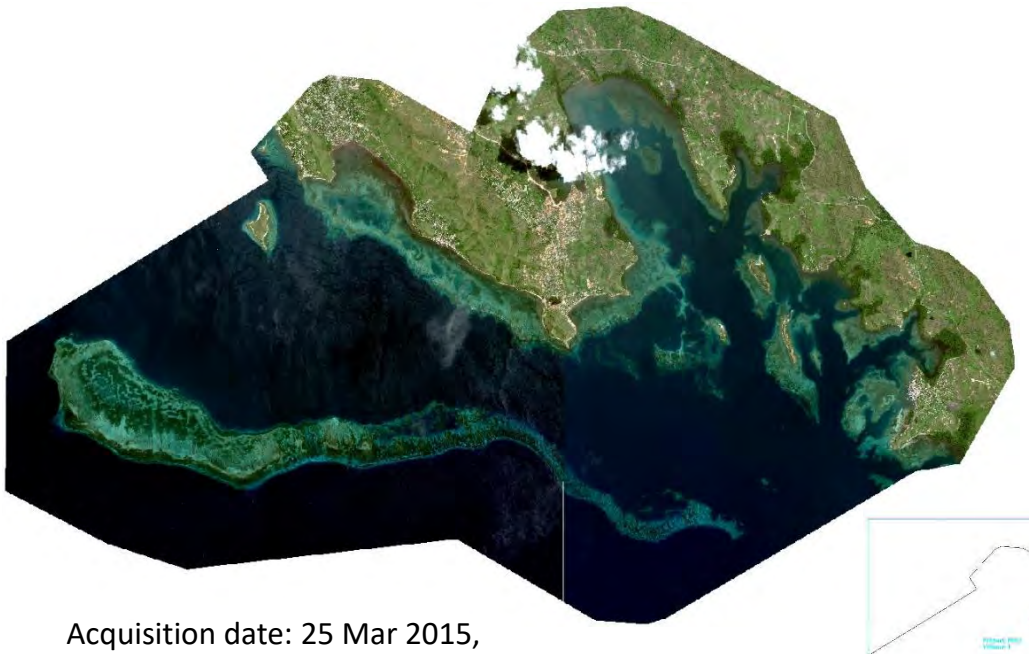
Introduction to Satellite Imagery Procured Terrestrial areas



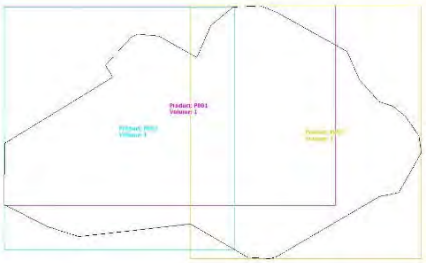
Acquisition date: 24 Jul 2012,
1 Nov 2011,
and 29 Jan 2011



Introduction to Satellite Imagery Procured Marine / coastral areas



Acquisition date: 25 Mar 2015,
25 Mar 2015,
and 11 Jun 2014



Introduction to Satellite Imagery Procured
Points of Concern

DigitalGlobe

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Version A2-24-15

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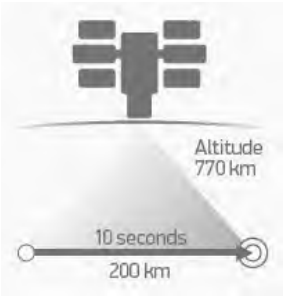
Introduction of WorldView-2
Features and Design Specifications

- Launch Information
  - Date: October 8, 2009
  - Launch Site: Vandenberg Air Force Base, California
- Orbit
  - Altitude: 770 km
  - Period: 100 min.
- Mission Life: 10-12 years
- Sensor Bands
  - Panchromatic: 450 - 800 nm
  - 8 Multispectral:
    - Coastal: 400 - 450 nm
    - Blue: 450 - 510 nm
    - Green: 510 - 580 nm
    - Yellow: 585 - 625 nm
    - Red: 630 -690 nm
    - Red Edge: 705 - 745 nm
    - Near-IR1: 770 - 895 nm
    - Near-IR2: 860 - 1040 nm



Altitude and slew time

The most spectral diversity commercially available
- 4 standard colors: blue, green, red, near-IR1
- 4 new colors: coastal, yellow, red edge, and near-IR2

Introduction of WorldView-2
Features and Design Specifications

- Sensor Resolution
  - Panchromatic: 0.46 m GSD at nadir, 0.52 m GSD at 20° off-nadir
  - Multispectral: 1.85 m GSD at nadir, 2.07 m GSD at 20° off-nadir
- Swath Width: 16.4 km at nadir
- Retargeting Agility: Time to Slew 200 km: 10 sec
- Revisit Frequency (at 40° N Latitude):
  - 1.1 days at 1 m GSD or less
  - 3.7 days at 20° off-nadir or less (0.52 m GSD)
- Capacity: 1 million km2 per day

Very high resolution:
Product: 50-60cm class

* GSD: Ground Sample Distance

Introduction of WorldView-2
How to Search imagery

https://browse.digitalglobe.com/imagefinder

Introduction of WorldView-2
How to Search imagery

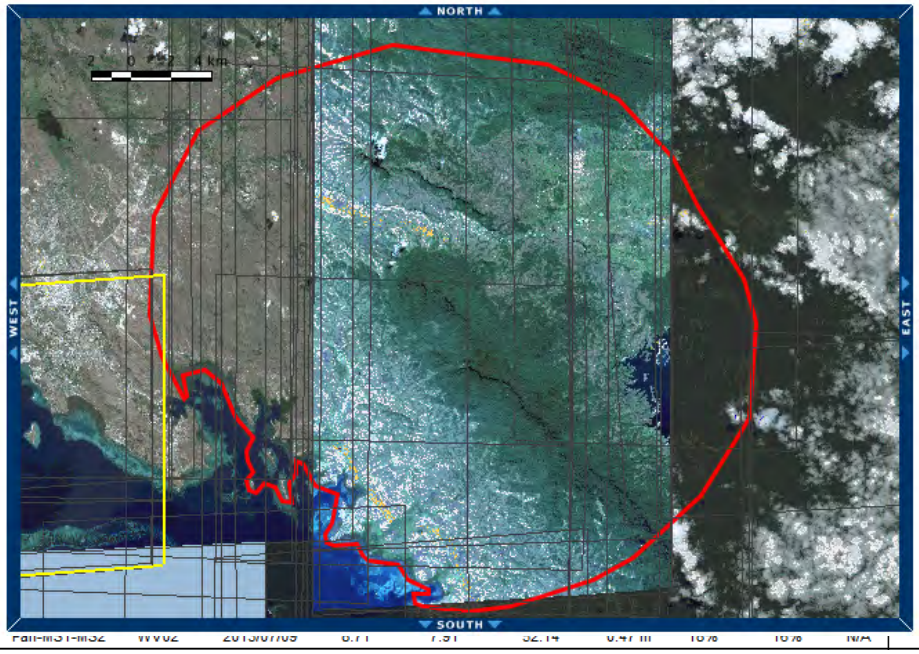
Search Filter

Archive:	Raw Imagery
Spacecraft:	WV01, WV02, WV03, GE01 (Ctrl+Left Click to select multiple Spacecraft.)
Imaging Bands:	Pan, Pan-MS1, Pan-MS1-MS2, SWIR (Ctrl+Left Click to select multiple bands.)
Earliest Acquisition Date:	1/1/11 (mm/dd/yy)
Latest Acquisition Date:	9/17/15 (mm/dd/yy)
Maximum Cloud Cover:	20 %
Maximum Off Nadir Angle:	25 °
Minimum Sun Elevation Angle:	0 °
Maximum GSD:	All m (Select 0.5 for eligible imagery for 40 cm products)

Reset filter to original defaults

Introduction of WorldView-2
How to Search imagery

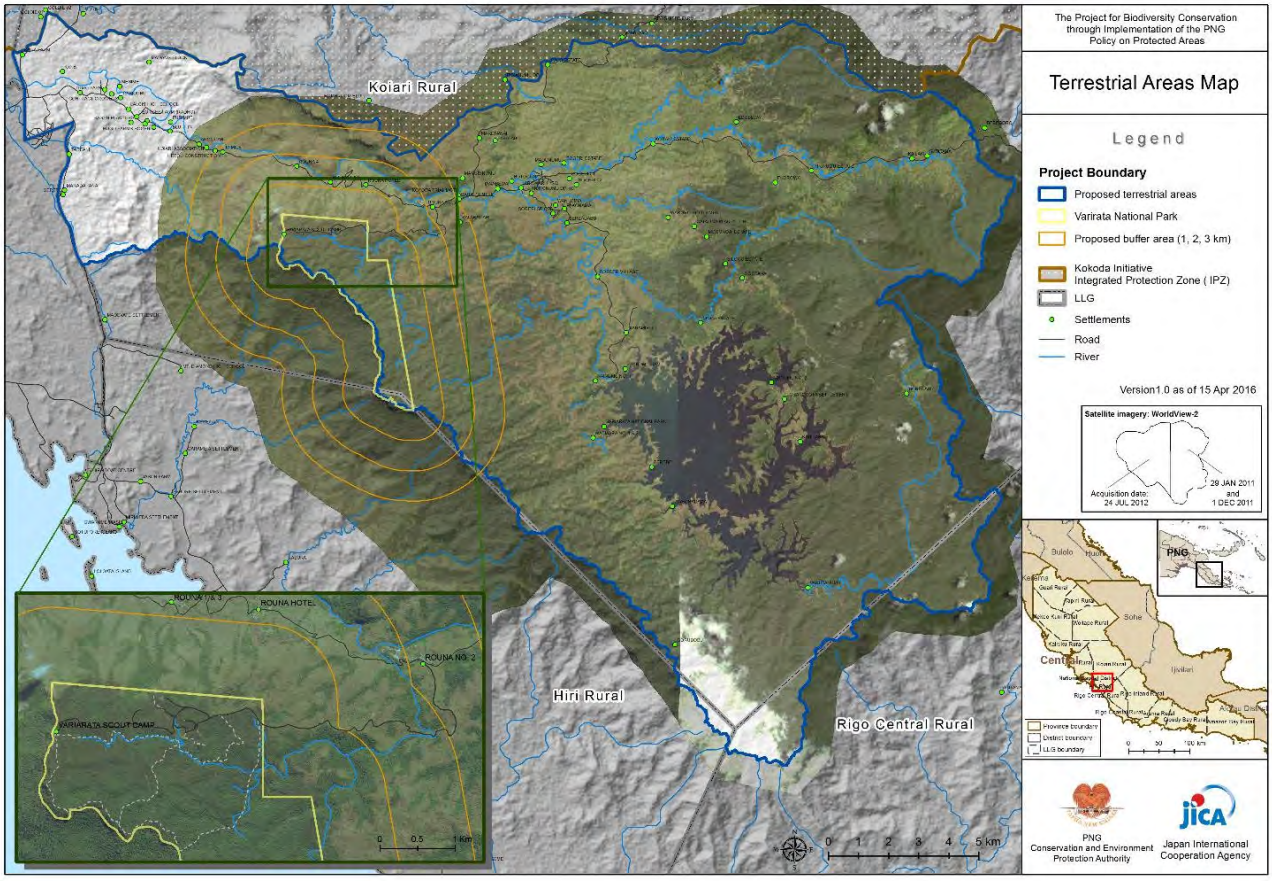
Select	Browse Image	Catalog Id	Imaging Bands	Spacecraft	Acquisition Date	Total Max Off Nadir Angle	Area Max Off Nadir Angle	Area Min Sun Elevation	Area Max GSD	Total Cloud Cover Pct	Area Cloud Cover Pct	MS Aggr
☐	☐ View	103001000F729900	Pan-MS1-MS2	WV02	2011/12/17	5.78°	5.61°	67.38°	0.47 m	6%	9%	N/A
☐	☐ View	1030010019A99700										
☐	☐ View	1030010008928B00										
☐	☐ View	103001000E6A7B00										
☐	☐ View	103001000F150100										
☐	☐ View	103001000F658000										
☐	☑ 4 View	103001002598C900										
☐	☐ View	1040010003220700										
☐	☐ View	1030010040498D00										
☐	☐ View	1030010012592D00										
☐	☐ View	103001002500F100										
☐	☐ View	10300100341E7300										
☐	☐ View	103001001E47A500										
☐	☑ 3 View	1030010024D39200										
☐	☐ View	103001000E110500										
☐	☐ View	103001000F189300										
☐	☐ View	103001001A220C00										
☐	☐ View	1030010024503700										



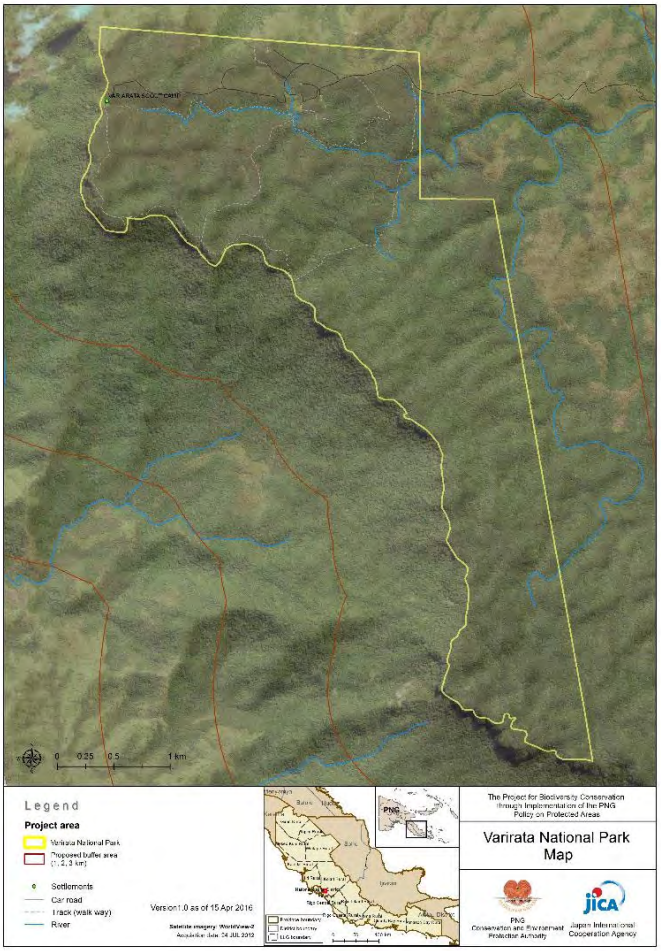
View of the Imagery (Demo)

- Condition of imagery
- Comparison to other satellite imagery
- Image composition

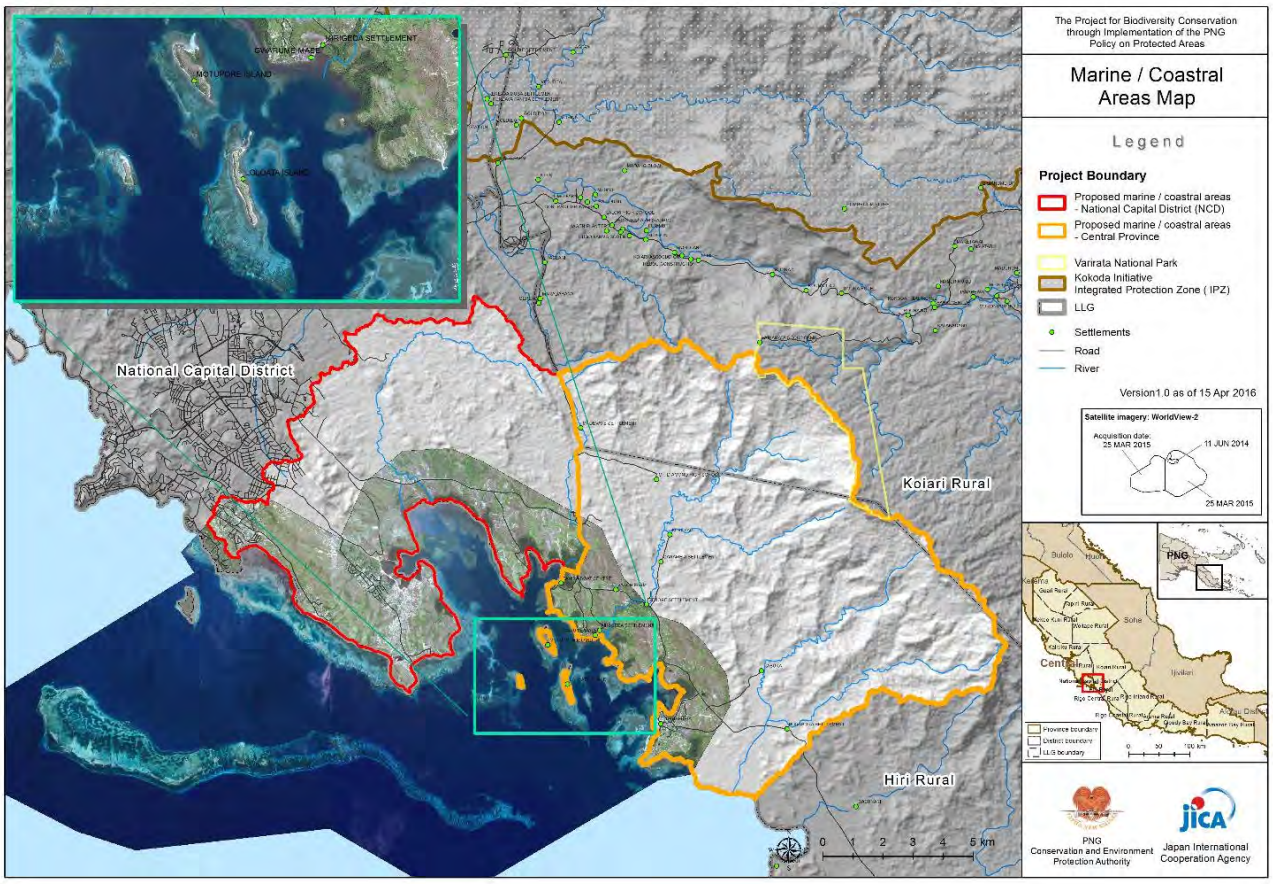
View of the Imagery – Application



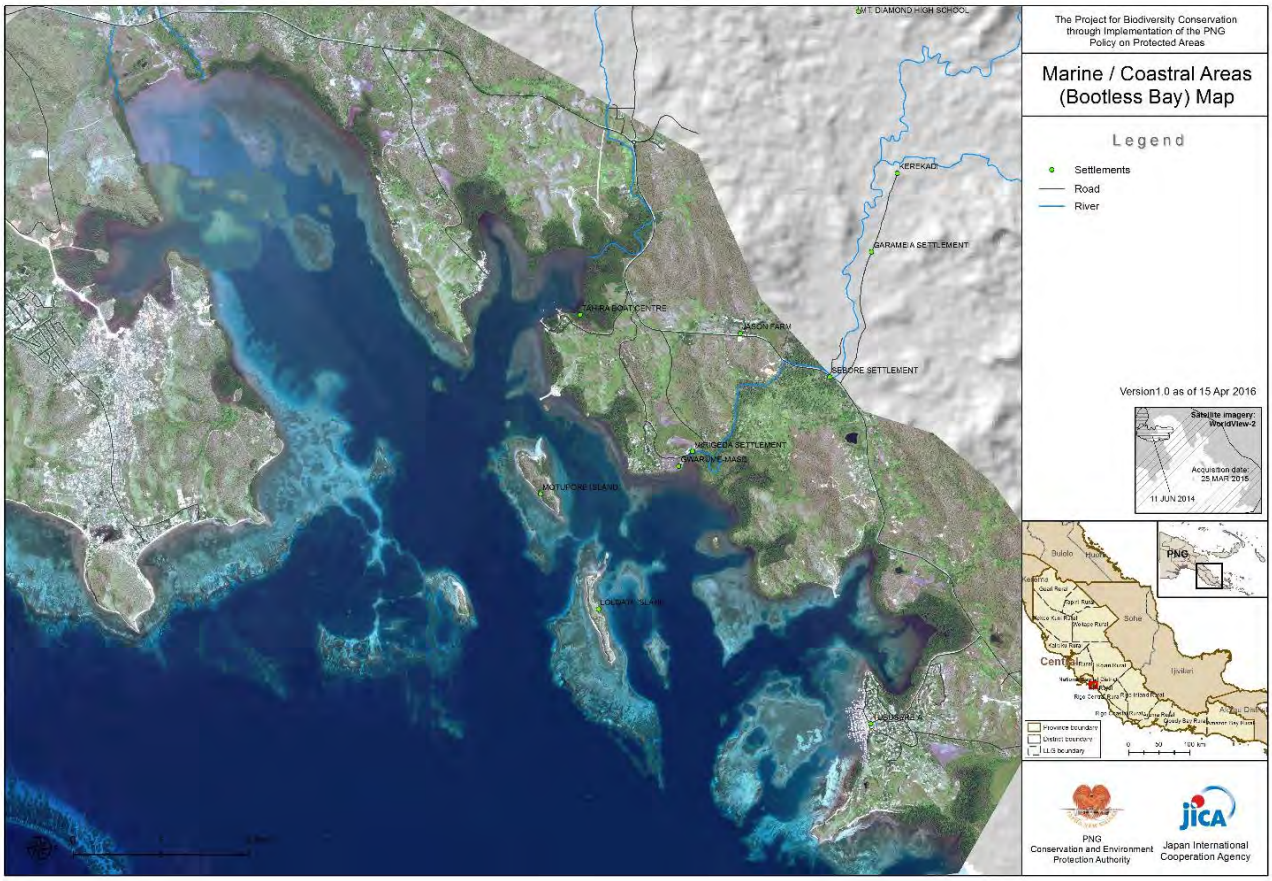
View of the Imagery – Application



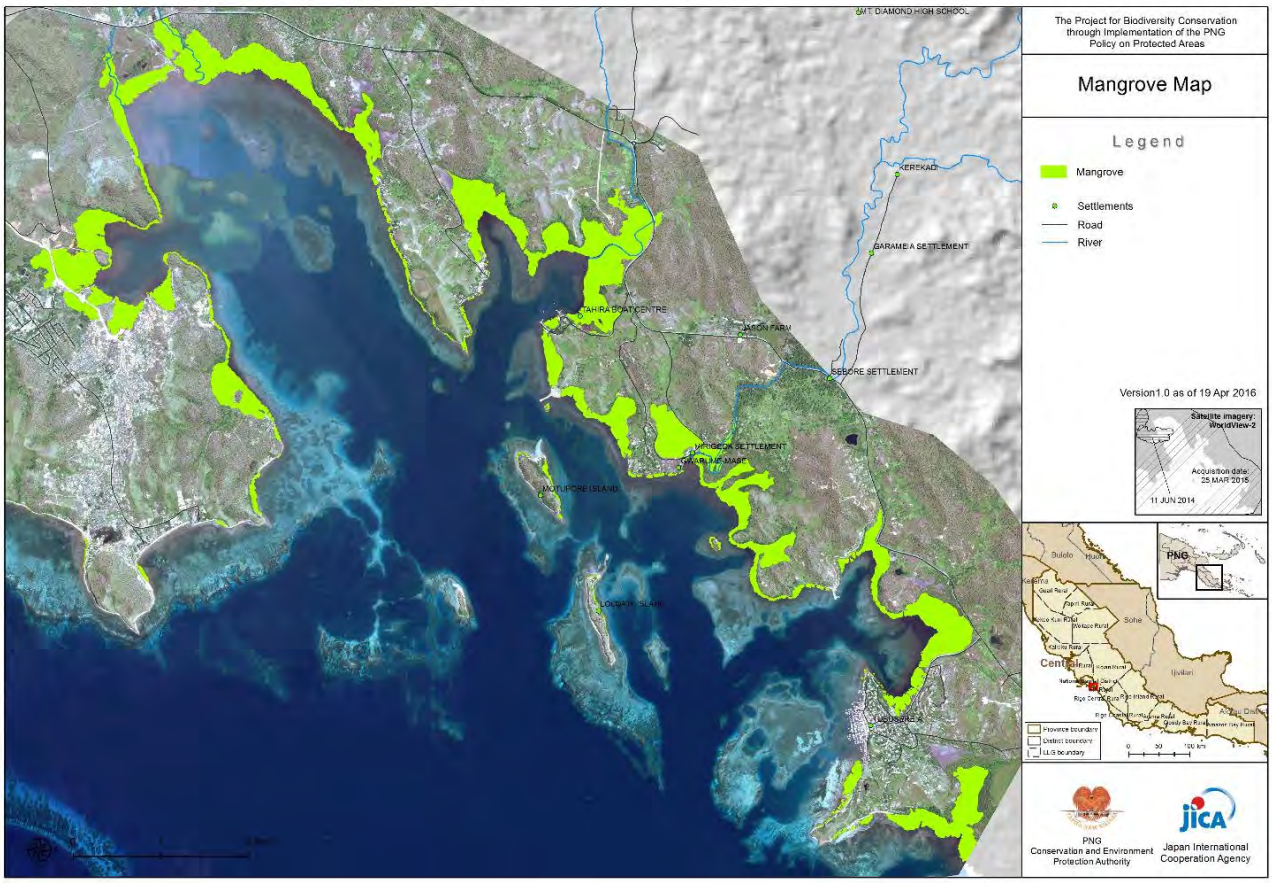
View of the Imagery – Application



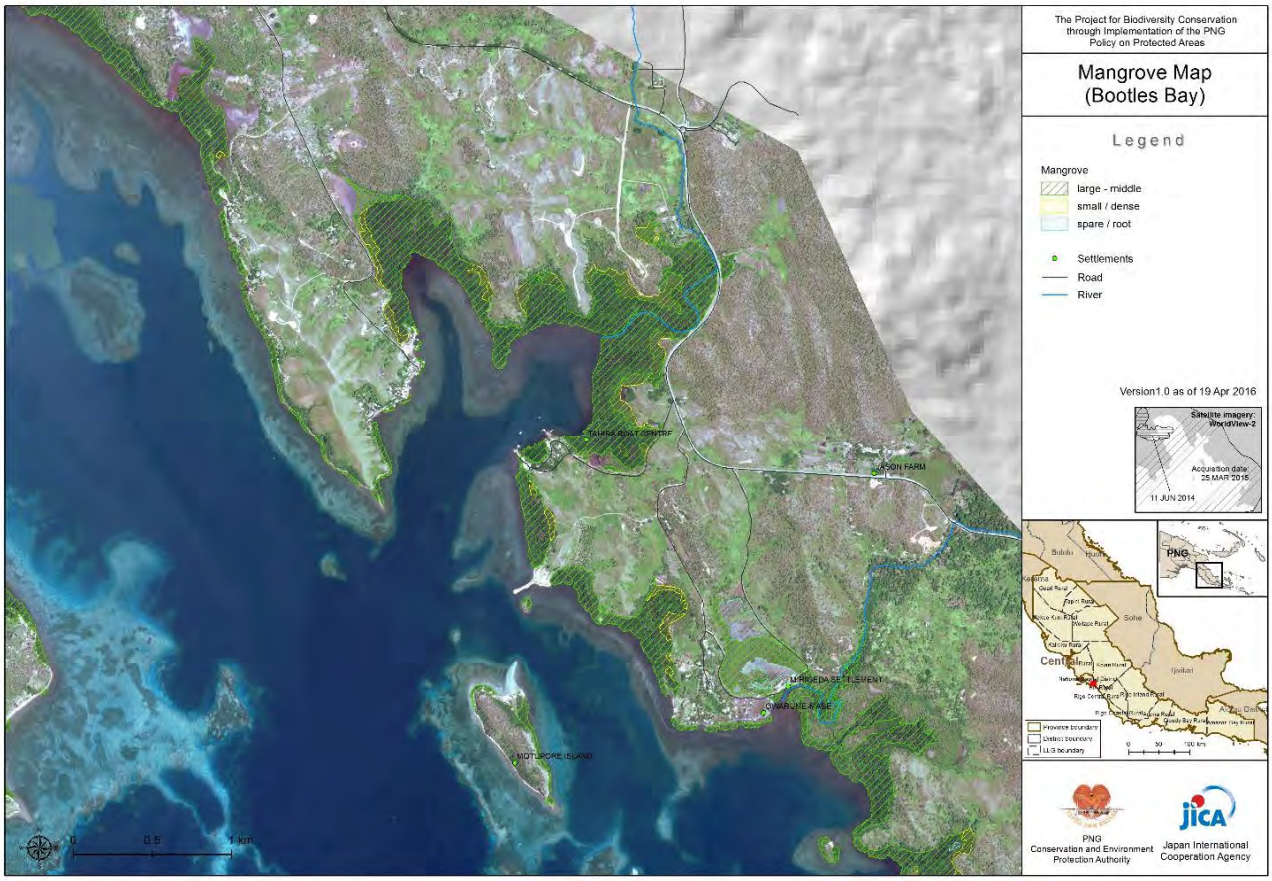
View of the Imagery – Application



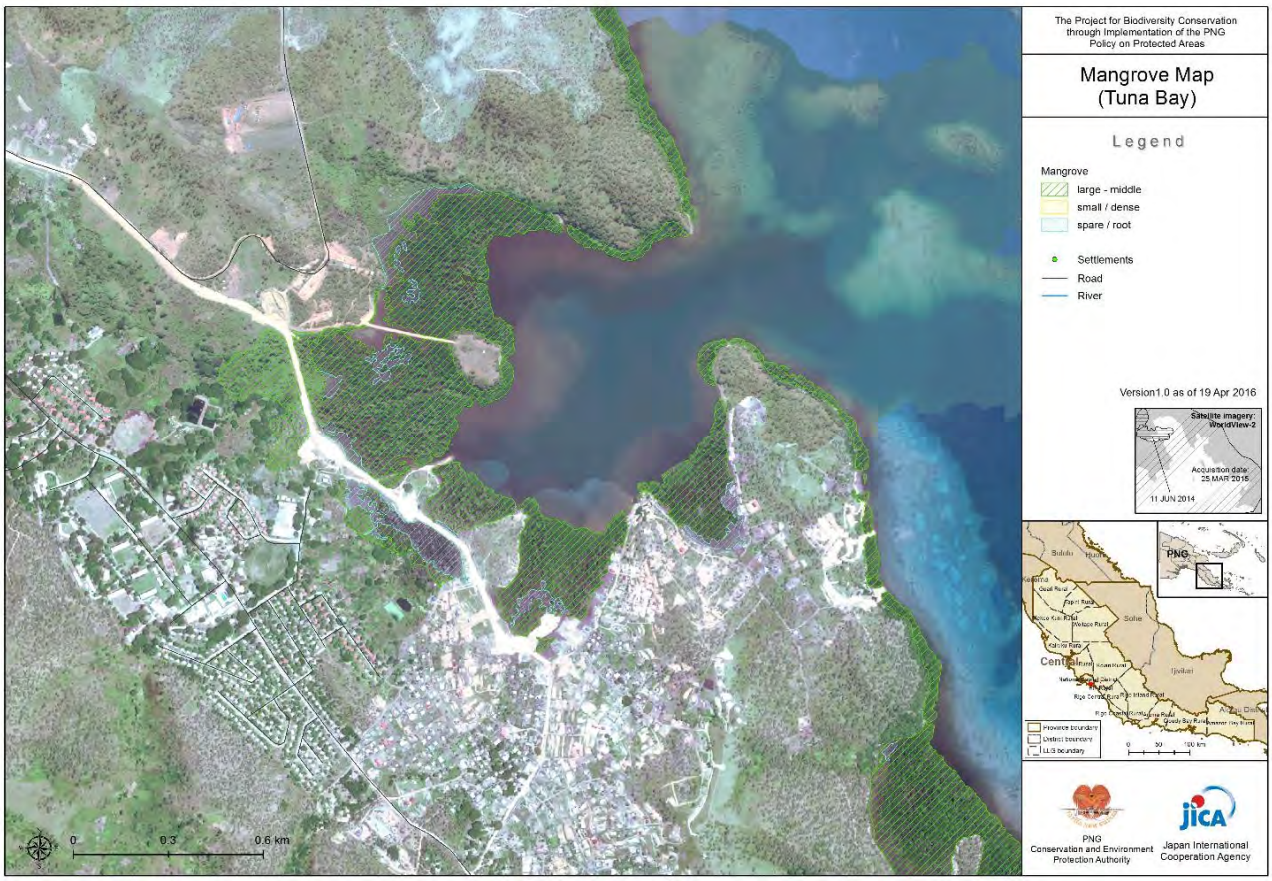
View of the Imagery – Application



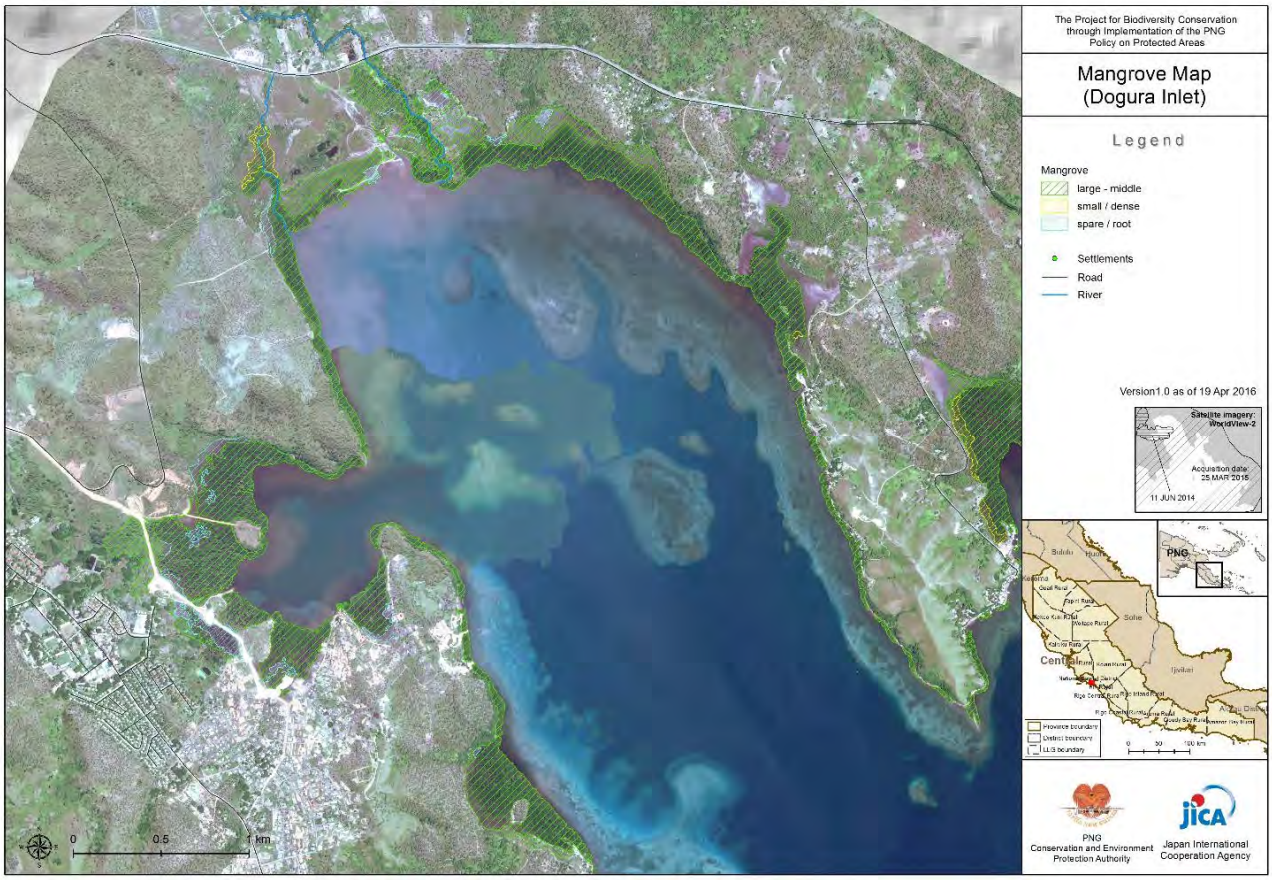
View of the Imagery – Application



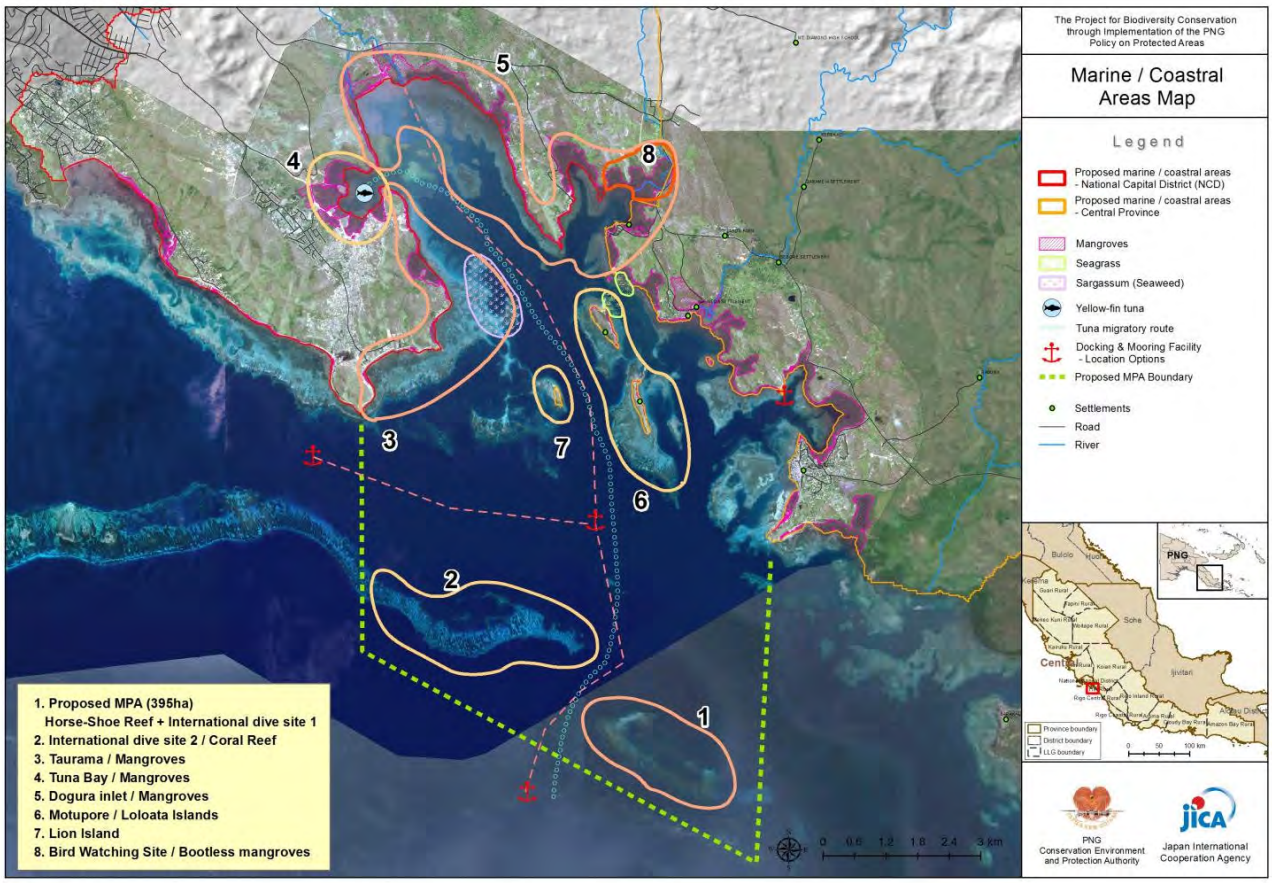
View of the Imagery – Application



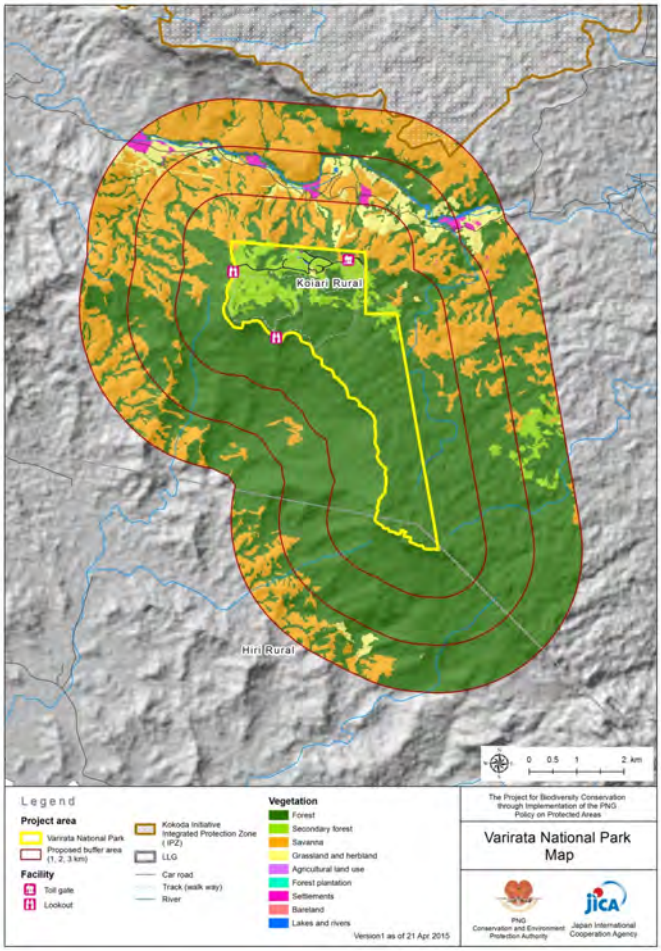
View of the Imagery – Application



View of the Imagery – Application



View of the Imagery – Application



Future Plan

- To share maps created in the folder below
  - ¥¥JICA¥JICA_public¥Maps
- To create land use/cover map for terrestrial areas
- To update mangrove map

添付資料 4.1.4 Updating facility database

Updating facility database

VNP facility management

July, 2016

CEPA-JICA Project Prepared

Procedure of updating the database

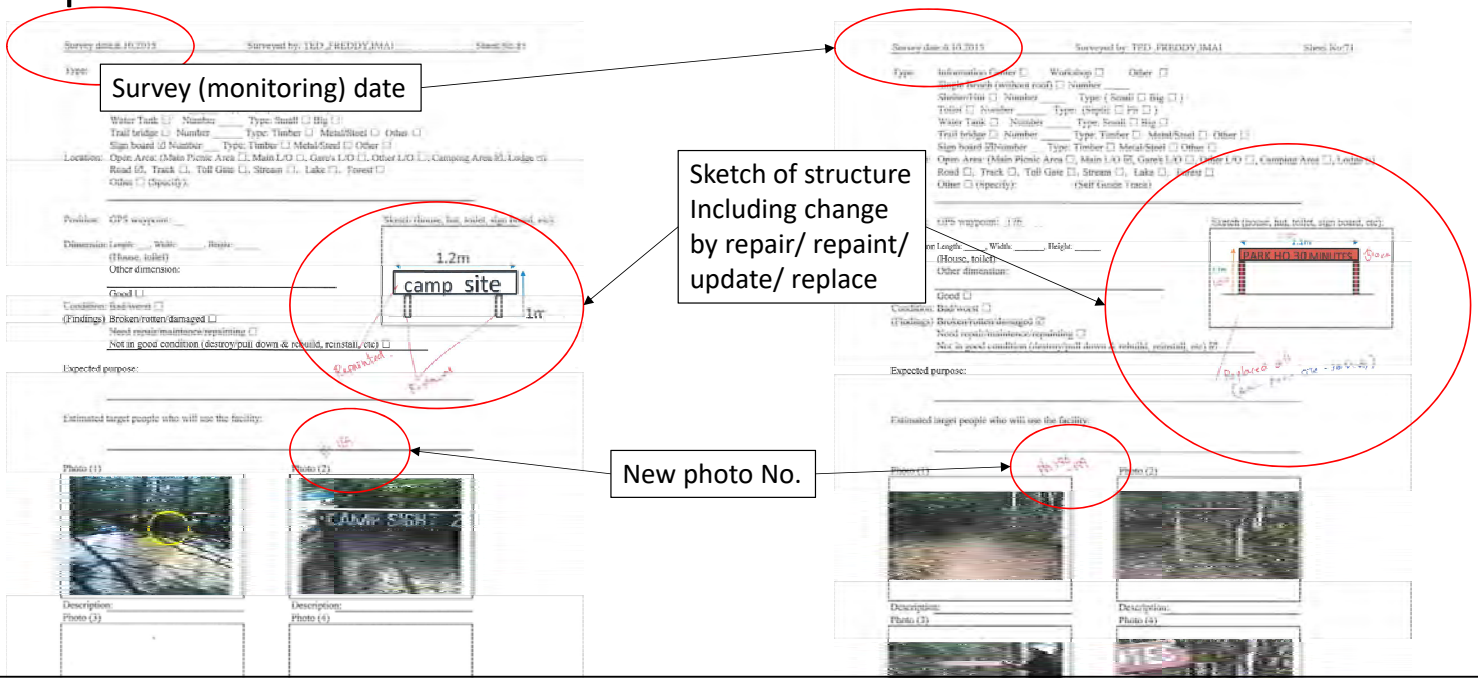
- At the site
  1. Check the condition of facility
  2. Record on existing profile
  3. Record photos which show condition such as, change, repair, replace conditions
- In the office
  1. Collect photos of updated facilities
  2. Resize photos in size of 1024 x 768 pixels and save in a specific holder
  3. Add one page next to the existing sheet of profile
  4. Fill necessary data

Updating activities at the site

- Case 1: repair, repaint, replace
  - Record on hard copy paper of the previous sheet

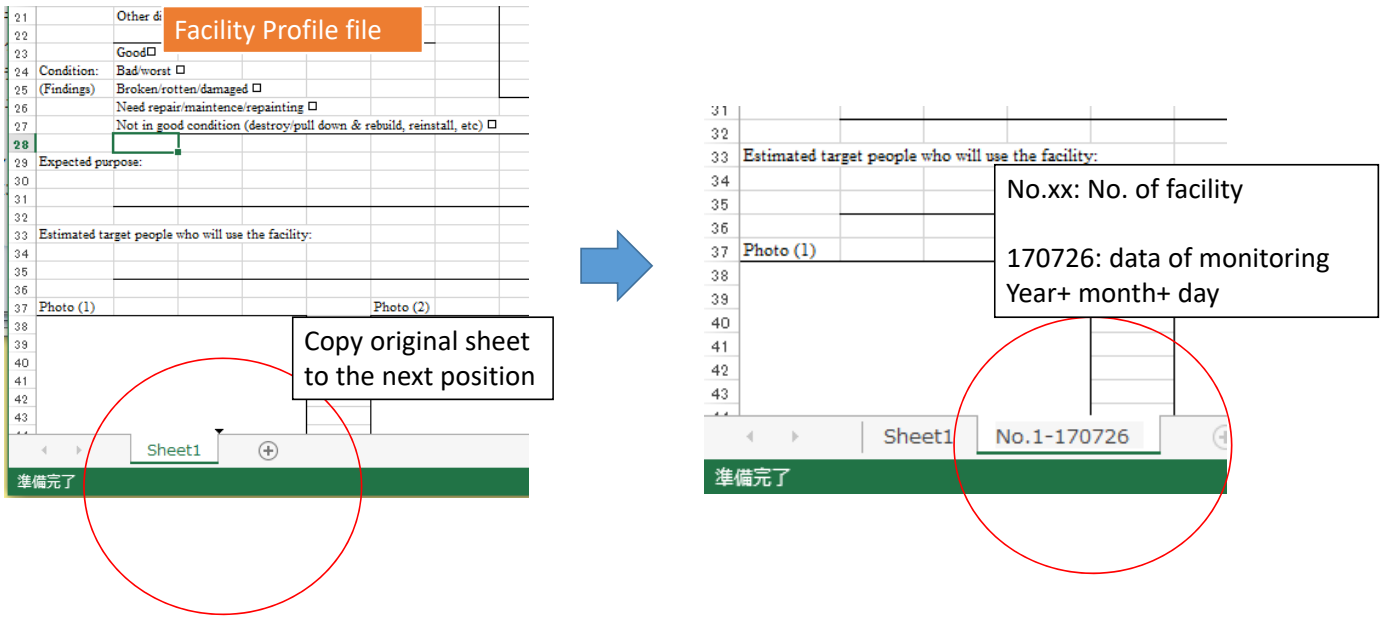
  [Point]
  - What parts were repaired?
  - How?
  - Current condition: size (measured record), condition (narratively record)
  - →with sketch, memo
- Case 2: newly set up
  - Fill out the full sheet

Example of records on hard copy paper of previous sheet



1. Collect photos of updated facilities &
2. Resize photos in size of 1024 x 768 pixels and save in a specific holder

Add one page next to the existing sheet of profile



Fill necessary data (Important information)

Monitoring “date” & Facility No.

	A	B	C	D	E	F	G	H	I	J	K
1	Facility Profile Field Note (Varirata National Park)										
2											
3	Survey date:				Surveyed by:					Sheet No:	
4											

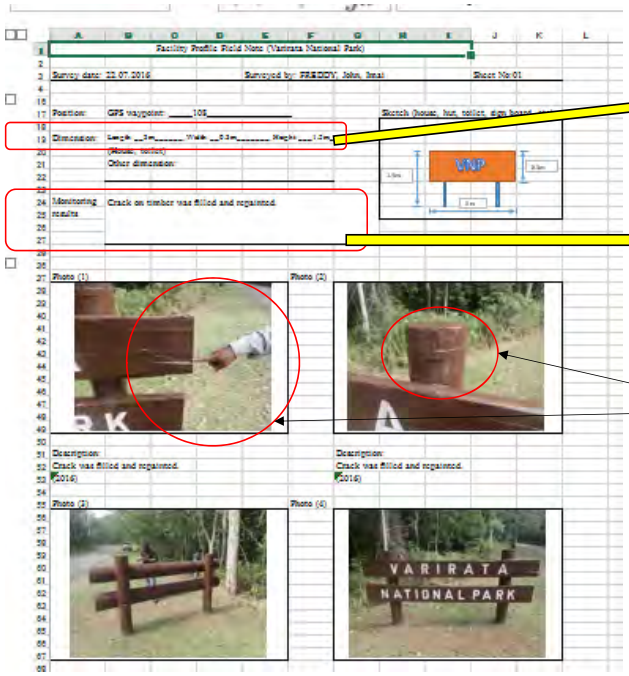
Sketch of facility

Sketch (house, hut, toilet, sign board, etc):

Pictures showing change (renew, repair, repaint,etc)

	A	B	C	D	E	F	G	H	I	J
37	Photo (1)					Photo (2)				
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										
48	Description:					Description:				
49	Photo (3)					Photo (4)				
50										
51										
52										
53										
54										
55										
56										
57										

Example of monitoring format (Excel file)



New dimension shall be described here

Dimension:	Length: __3m_____, Width: __0.3m_____, Height: ___1.5m_____

Condition shall be described here

Monitoring results	Crack on timber was filled and repainted.

New photos by monitoring
Photos shall show repair/ repaint/ replace conditions

Update list of facility

4 columns are added to record results and plan of monitoring.

Monitoring will be implemented twice a year

	T	U	W	Z	AA	AB	AC	AD
1								
2								
3						Twice /year August, February		
4								
5	Circumference (m)	Area (m2)	Damage level	Update/ repair	Date of update/ repair	Monitoring (August 2016)	Monitoring (February 2017)	
6			Slightly damage	Repainted	April, 2016	good condition		
7			Good condition					
8			Good condition					
9			Replacement is required or broken completely					
10			Good condition					
11			Good condition					
12			Slightly damage					
13			Slightly damage					
14			Slightly damage					
15			Slightly damage					
16			Good condition					

Results and date of updating
Date: year and month

Results of Monitoring

Schedule of next Monitoring

Purpose of Updating list

- Recording history of each facility
- Specify not-updated facilities (= update required facilities)
- Specify next timing of updating

→This is management of facility

End of presentation

Thanks for listening!

添付資料 4.1.5 Update of VNP facility database

The Project for
Biodiversity Conservation through Implementation of
the PNG Policy on Protected Areas

Update of VNP facility database

- Workflows -

VNP Facility management

CEPA-JICA Project Prepared

October, 2018

CEPA - JICA
Biodiversity Project

Introduction

- The database of the facilities in Varirata National Park (VNP) was created by CEPA- JICA Biodiversity Project Team.
- The VNP facility database is composed of (1) a list and profiles of facilities in Excel format, (2) spatial data in GIS (shapefile) format, and (3) related maps for management.
- These database need to be updated in accordance with facility status on-site such as removal, renovation and new construction for continuous facility management.
- This document illustrates overarching structure of the database and workflows and procedures of updating the database.

Contents

- Overarching structure
- Workflows and timeline
- Procedure: Field work
- Procedure: Update of Excel database
- Fundamental knowledge of ArcGIS database
  - Construction of GIS facility data
  - Relational database (RDB) of facility
  - Join RDB to facility attribute table
  - Definition Query of facility features
- Procedure: Update of ArcGIS database
- Procedure: Update of ArcGIS Map layout
- Data / Folder construction

Overarching structure

Facility Database

Excel database

List of Facility.xlsx

VNP-Facility-profile-001-020.xlsx
VNP-Facility-profile-021-040.xlsx
VNP-Facility-profile-041-060.xlsx
…

- List of all the facilities and facility profiles of each facility
- Extensive facility information
- Database is updated as a result of field work

ArcGIS database

VNP_Facility_update_pnt.shp
VNP_Facility_update_lin.shp
VNP_Facility_update_png.shp
…

- GIS database of all the facilities
- Database includes other related data of the park
- Database is updated by using the “List of Facility.xlsx”

ArcGIS map layout & Exported map

VarirataNP_facility.mxd
…
VarirataNP_facility.jpg
…

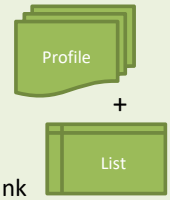
- Maps are created/updated for facility management and other materials, say guide map
- There are map layouts created ArcGIS and exported maps for use

Workflows and timeline

Field work

- Check facility condition on site
- Record on hard copy paper

Update of Excel database



- Fill necessary information in facility profile
- Update the list of facility

✓ Prepare new profile sheet to keep prior profile sheet

✓ **Never change Facility No.**, which is key to link to GIS database

✓ **Never delete records (lines of the list)** even if they are removed on site, as Facility No. is unique id

Update of map layout & export of map

- Update the map layout using the updated GIS database
- Export the updated map to use next field work, etc.

Update of ArcGIS database

- Update the GIS database as a result of field work
- Update the facility attribute table (relational database) by replacing the updated "List of Facility.xlsx"

✓ Never delete records even if they are removed on site

Recommended timeline:

- Record in the field and update of Excel DB throughout the year
- Update of the list of facility at least once a year
- Annually update of GIS database and Map

Procedure: Field work

1. Check the condition of facility
2. Record on existing profile on hard copy paper
3. Record photos which show condition such as, change, repair, replace conditions

✓ For more details, refer to "Updating facility database.pptx" prepared by the Project in July, 2016.

Procedure: Update of Excel database

Record of facility profile

1. Collect photos of updated facilities
2. Resize photos in size of 1024 x 768 pixels and save in a specific holder
3. Add one page next to the existing sheet of profile
4. Fill necessary data

Update of the list of facility

1. Update the list of facility in accordance with the facility profiles

Never change Facility No. and delete facility records even if they are removed on site, as Facility No., unique id, is key to link to GIS database.

✓ For more details, refer to "Updating facility database.pptx" prepared by the Project in July, 2016.

Fundamental knowledge of ArcGIS database

- Construction of GIS facility data
- Relational database (RDB) of facility
- Join RDB to facility attribute table
- Definition Query of facility features

Construction of GIS facility data

- GIS facility data are composed of three data:
  - Point data (VNP_Facility_update_pnt.shp),
  - Line data (VNP_Facility_update_lin.shp), and
  - Polygon data (VNP_Facility_update_pgn.shp).

Facility type of each data

Point data	
Traffic line	Bridge
	hand rail
Rangers' facility	House
	Kitchen
	Shed
	Toilet
	Water tank
Station	BBQ set
	Flag pole
	Information center
	Office
	Other
	Shelter/ hut
	Tollgate
	Workshop

Point data	
Camp Facility	Kitchen
	Lodge
	Shower room
	Toilet
	Water tank
Car parking facility	Car parking area
Water supply facility	Shed
	Water tank
	Water tap
Toilet	Toilet
Sign	Area sign boad
	Distance pile
	Facility sign board
	Reference pile
	Road sign board

Point data	
Sign	Track sign board
	Traffic sign board
Other	Other
Line data	
Station	Fence
	Gate
Camp Facility	Gate
Car parking facility	Car stop pile
	Fence
Water supply facility	Water pipe
Polygon data	
Open area	House
	Outlook
	Picnic area

Construction of GIS facility data (Cont.)

- Fields of attribute tables of facility data

VNP_Facility_pnt

FID	Shape *	Id	name	facility	no
192	Point	1	Self Guide Track	Track	0
193	Point	1	Picnic Site 4	Open area	0
194	Point	1	Picnic Site 3	Open area	0

VNP_Facility_lin

FID	Shape *	Id	facility	no
15	Polyline	0	Creek	0
6	Polyline	1	Power line	0
13	Polyline	1	Power line	0

VNP_Facility_png

FID	Shape *	Id	Name	no	area
0	Polygon ZM	2	Ranger's house	1024	718.289823
1	Polygon ZM	2	Ranger's Quarter	1023	1488.829874
2	Polygon ZM	2	Picnic site 4	1016	385.039485
3	Polygon ZM	2	Lodge Area	1017	2009.401961
4	Polygon ZM	2	Picnic Site-2	1014	715.645872
5	Polygon ZM	2	Lake Site	1019	1429.917025
6	Polygon ZM	2	Open area (near lake)	1018	655.071616
7	Polygon ZM	2	Camping site	1020	632.790062
8	Polygon ZM	2	Main Outlook	1021	3419.968864

[id] and [no] fields are significant fields. You can not change these values without reason, since they affect map view.

Field description:

FID, Shape — These fields are added automatically, so you cannot edit them.

id — This field manages features.
"2": usual facility data,
"1": facility data used for only some map (only display data), and
"0": data created through work process.
"1" and "0" are not recorded in the Excel database.

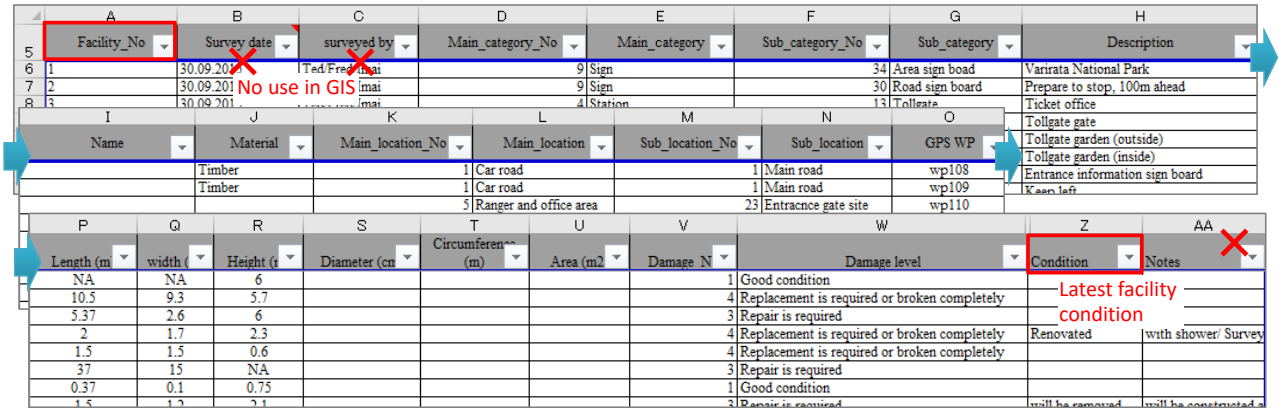
name, facility — Temporary work fields

no — This field is facility number, unique id. The Excel database also has this number, so that the field is used to join tables.

area — Area (ha)

Relational database (RDB) of facility

- Excel database (List of facility.xlsx)



  - The relational database of facility is created from the Excel database using columns which could be used in GIS. For example, [Sub_category_No] column is used to control which facilities are shown in a map and define symbol and color of each facility.
  - [Facility_No] column is used to join the facility RDB to the attribute tables of facility data.

Join RDB to facility attribute table

- Join Table
  - The prepared facility RDB is joined to the attribute tables of facility.
  - "Join Table" function lets you append additional information table (RDB) to the target feature's attribute table so that you can use information of RDB when symbolizing the features, etc.
  - A Key field, which both tables of GIS and Excel have in common, is used to join the tables.

Join the tables using these fields

Feature's attribute table of facility

VNP_Facility_pnt

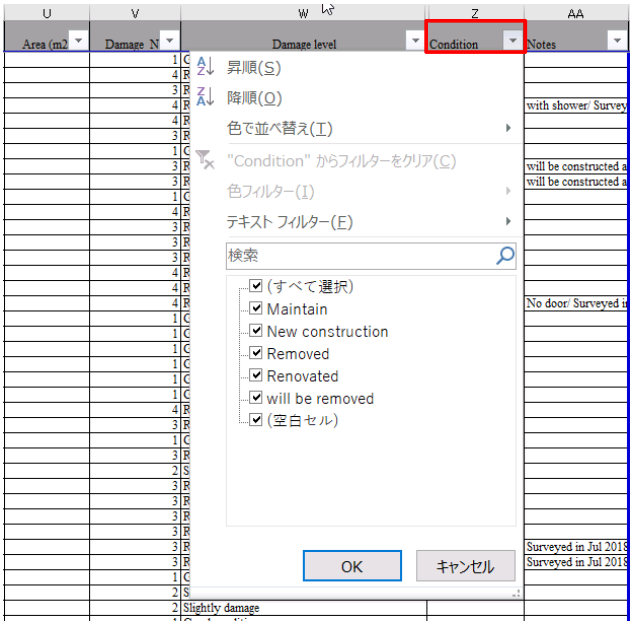
FID	Shape *	Id	name	facility	no
192	Point	1	Self Guide Track	Track	0
193	Point	1	Picnic Site 4	Open area	0
194	Point	1	Picnic Site 3	Open area	0
277	Point	1	Entrance Gate	Gate	0
278	Point	1	Variramangogo Look	Lookout	0
7	Point	2	Entrance Gate	Gate	3

Facility RDB

Facility_No	Survey date	surveyed by	Main_category_No
1	30.09.2015	Ted/Fred/Imai	
2	30.09.2015	Ted/Fred/Imai	
3	30.09.2015	Ted/Fred/Imai	
4	30.09.2015	Ted/Fred/Imai	
5	30.09.2015	Ted/Fred/Imai	
6	30.09.2015	Ted/Fred/Imai	
7	30.09.2015	Ted/Fred/Imai	

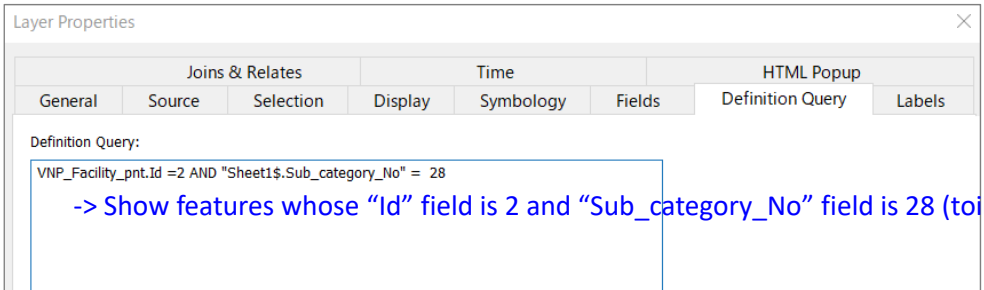
Definition Query of facility features

- Update of facility condition
  - There are 6 designation values for facility condition column:
    - (blank)
    - Maintain
    - New construction
    - Renovated
    - Removed
    - will be removed
  - On the maps for facility management, only “blank”, “Maintain”, “New construction” and “Renovated” are displayed.



Definition Query of facility features (Cont.)

- Definition Query
  - “Definition Query” function defines data (features) to be displayed by using values of fields.



VNP_Facility_pnt

FID	Shape *	Id	name	facility	no
192	Point	1	Self Guide Track	Track	0
193	Point	1	Picnic Site 4	Open area	0
194	Point	1	Picnic Site 3	Open area	0
277	Point	1	Entrance Gate	Gate	0
278	Point	1	Variramangogo Look	Lookout	0
7	Point	2	Entrance Gate	Gate	3
30	Point	2	Sign Board (100m to	Sign board	2
31	Point	2	Sign Board (Main En	Sign board	1

	E	F	G	
o	Main_category	Sub_category_No	Sub_category	Desc
8	Toilet	28	Toilet	Toilet for visiters
7	Water supply facilit	25	Water tank	Water tank for toilet
6	Car parking facility	23	Car stop pile	At car parking (main picr
9	Sign	35	Facility sign board	Toilet
8	Toilet	28	Toilet	Toilet for visiters
8	Toilet	28	Toilet	Toilet for visiters
7	Water supply facilit	25	Water tank	Water for visiters (Tuffa
7	Water supply facilit	25	Water tank	Missing water tank for vi

39	34				
40	35				

Procedure: Update of ArcGIS database

1. Create new facility features
2. Update the relational database of facility

Procedure: Update of ArcGIS database

1. Create new facility features
    1. Copy location data (GPS data) of facility acquired in the field
    2. Convert GPS data to GIS data (shapefile format)
    3. Add new field for facility no. to converted data
        - Field name: no
        - Type: Short Integer
    4. Record facility no. of each feature
    5. Delete unneeded fields
    6. Change name of existing facility data in the GIS database
        - ex. VNP_Facility_pnt_bu20170321.shp
    7. Merge the existing data (step 6) and the created data (step 1-5) together, and save in the GIS database
        - Name of new facility data should be that of original existing facility data (ex. VNP_Facility_update_pnt.shp).

Procedure: Update of ArcGIS database (cont.)

2. Update the relational database of facility
   1. Change name of the existing facility RDB
      - ex. VNP_Facility_db_bu20170321.xls
   2. Arrange the Excel databas, and save it in the GIS database
      - Create a table with columns whose values could be used in GIS
      - Name of new facility RDB should be the same name of the original existing facility RDB (VNP_Facility_db.xls).

Facility_No	Main_category_No	Main_category	Sub_category_No	Sub_category	Description
1	9	Sign	34	Area sign boad	Varirata National Park
2	9	Sign	30	Road sign board	Prepare to stop, 100m ahead
3	4	Station	13	Tollgate	Ticket office

Name	Material	Main_location_No	Main_location	Sub_location_No	Sub_location
	Timber	1	Car road	1	Main road
	Timber	1	Car road	1	Main road
		5	Ranger and office area	23	Entracnce gate site

GPS WP	Length (m)	width (m)	Height (m)	Diameter (cm)	Circumference (m)	Area (m2)	Damage_No	Damage level	Condition
wp108	3	0.3	1.5				2	Slightly damage	
wp109	1.15	0.2	1				1	Good condition	
wp110	2.1	2	2.2				1	Good condition	
wp110	3.3		1				4	Replacement is required or broken completely	
wp110	7	2.2					1	Good condition	
wp110	7	2.2					1	Good condition	
wp110	2.4	1.2	2				2	Slightly damage	
wp110	0.7	0.1					2	Slightly damage	

Procedure: Update of ArcGIS map layout

1. Confirm if “Definition Query” and “Join Table” work correctly
2. Update the labels of the facility features if there are annotations in the maps
3. Export the Maps

Procedure : Update of ArcGIS map layout

1. Confirm if “Definition Query” and “Join Table” work correctly
   1. Open the existing map documents related to the facilities in VNP
   2. Check if facility layer setting for “Join Table” works correctly
      - It is fine if the facility RDB is joined to the facility layers.
   3. Check if facility layer setting for “Definition Query” works correctly
      - It is fine if the only defined facility features render.

   ✓ If the RDB does not joined or the defined features are not rendered, check the process of creating the facility data.

Procedure : Update of ArcGIS map layout (cont.)

2. Update the labels of the facility features if there are annotations in the maps

   ✓ “Label” is automatically updated according to data update, but “annotation” need to be updated manually.

   ✓ “Label” is placed on a map by GIS so it cannot be edited manually. Conversely, “annotation” can be edited so it is created by converting label for sophisticated map.

   1. Delete the existing annotations of the facilities
   2. Label the features of the facilities
   3. Convert the labels to annotations
   4. Lay out the created annotations in place

Procedure : Update of ArcGIS map layout (cont.)

3. Export the Maps

   1. Set layer on/off, legend, and title of the layout

   ✓ A number of maps would be exported from one map document.

   2. Export the maps

      - Normal settings:
        - Resolution: 200 dpi (1,200dpi for poster in A0 size)
        - Format: JPEG or PDF
        - JPEG Quality: Max (100)

Data / Folder construction: Excel database

- List of facility
  - List of Facility.xlsx (Result of VNP existing facility assessment in 2015)
  - List_Analysis_Facility_VNP_151214_No1-254-fin.xlsx (ditto)
  - List of Facility_20180727.xlsx (as of 27th Jul 2018)
- Facility profiles
  - VNP-Facility-profile-001-020.xlsx
  - VNP-Facility-profile-021-040.xlsx
  - VNP-Facility-profile-041-060.xlsx
  - …
- Manual
  - Updating facility database.pptx

Data / Folder construction: GIS database

- Facility data / relational database
  - Data folder: GISDB¥31_VarirataNP¥data
  - Point facility data: VNP_Facility_update_pnt.shp
  - Line facility data: VNP_Facility_update_lin.shp
  - Polygon facility data: VNP_Facility_update_pgn.shp
  - Facility relational database: VNP_Facility_db.xls
- Map document (layout)
  - Data folder: GISDB¥81_MapLayout¥VarirataNP
- Exported map
  - Data folder: GISDB¥82_Maps¥VarirataNP
- Documents (manual)
  - Data folder: GISDB¥91_Documents¥VN Facility Management
  - ✓ Refer to “Map for VNP Facility Management.xlsx” for more detailed information of map setting

添付資料　4.1.6 Manual on Getting location information

The Project for
Biodiversity Conservation through Implementation of
the PNG Policy on Protected Areas

Manual on Getting location information (Importing GPS data to GIS)

Facility management

CEPA-JICA Project Prepared
February, 2018

CEPA - JICA
Biodiversity Project

Introduction

- You would be required to get location information of features to create GIS data for managing National Parks, say:
  - Updating the VNP facility database for new facilities,
  - Getting location where animals or plants are found,
  - Confirming location where an unexpected event happens, etc.

- This document shows general procedure on creating GIS data from GPS data of features/events which you get in the field.

Procedure of importing GPS data to GIS

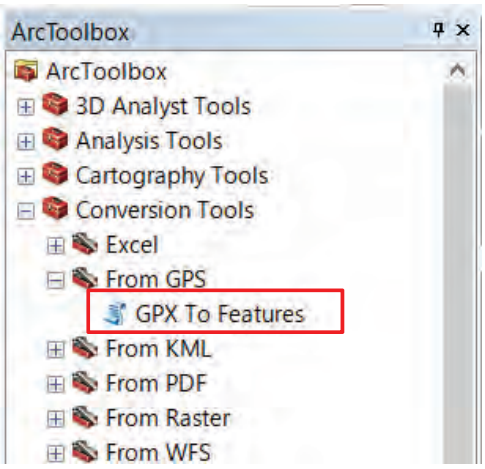
1. Get locations of features/events by GPS.
2. Import GPS data into GIS.
3. Arrange the imported data. (Option)

Procedure 1: Get locations of features/events by GPS

1. Set out GPS.
    1. Turn on the power of GPS.
    2. Confirm that battery charge is enough. If not, charge up.
    3. Navigate to [Setup] > [Position Format] on the screen to confirm GCS (Geographic Coordinate System) of [Map Datum] and [Map Spheroid] is **WGS 84**.
2. Get location of a feature or an event in the field by pushing [Mark Waypoint] button and then [Save].
    - ✓ See not to block to getting satellites by your body.
3. Turn the power off when completing getting required data.

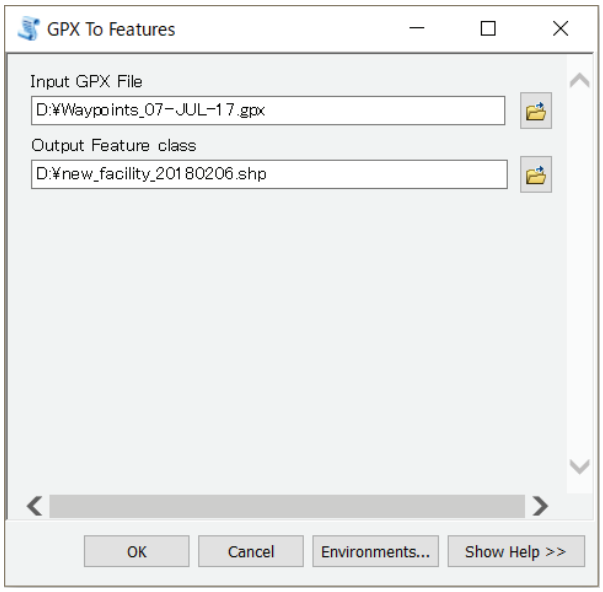
Procedure 2: Import GPS data into GIS

1. Start PC, and connect the GPS to the PC.
2. Navigate to the GPS folder >Garmin/GPX, and copy Waypoints_xxxx.gpx file in your folder (or designated work folder).
3. Open ArcMap.
4. From ArcToolbox, double-click [GPX To Features] under Conversion Tools.



Procedure 2: Import GPS data into GIS (Cont.)

5. In [GPX To Features] window, appoint Waypoints_xxxx.gpx file in [Input GPS File], and name folder and output file in [Output Feature class].



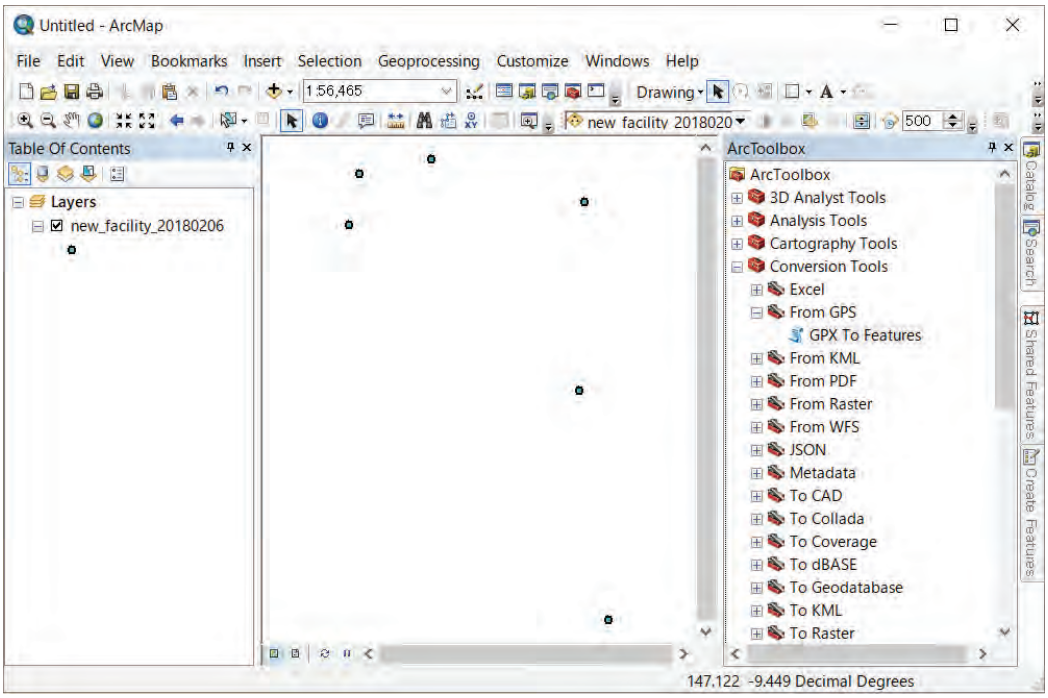
6. Click OK.

GPS data will be converted to GIS data.

The converted data are automatically imported in ArcMap.

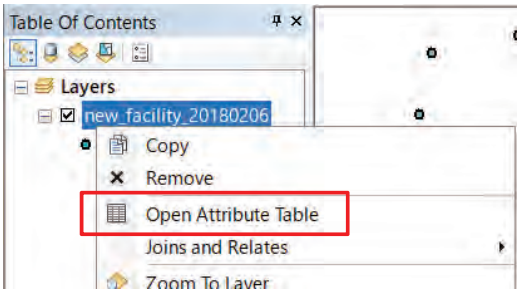
Procedure 2: Import GPS data into GIS (Cont.)

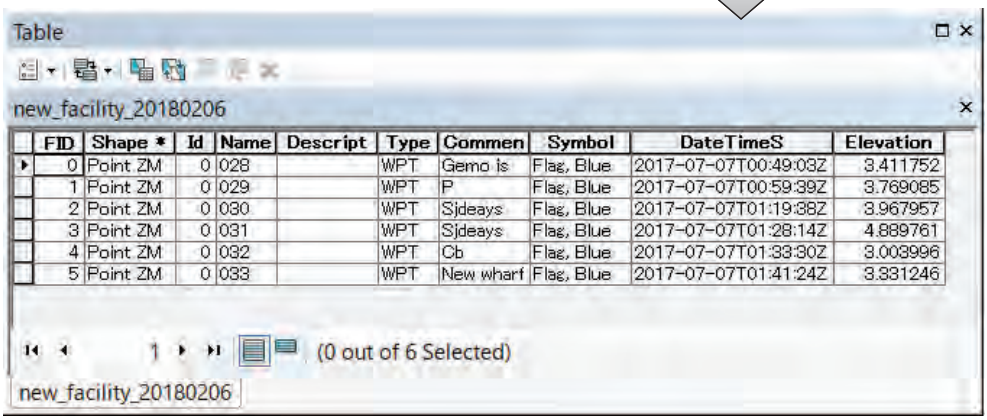
7. Confirm the imported data in ArcMap.



Procedure 3: Arrange the imported data (Option)

1. Open table of the imported (created) layer by right-clicking on the layer, and select [Open Attribute Table].



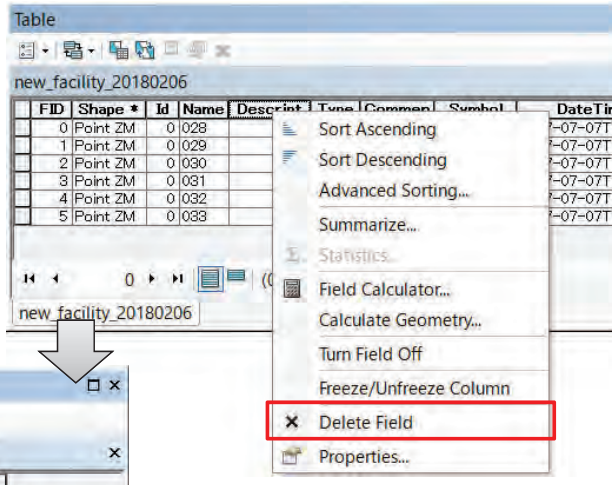


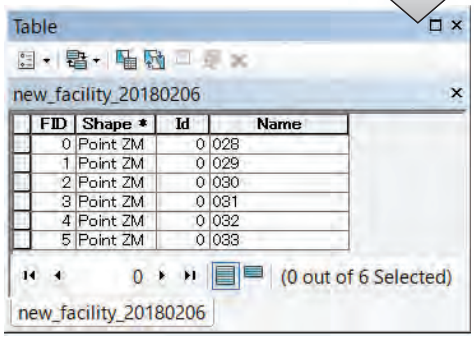
FID	Shape *	Id	Name	Descript	Type	Commen	Symbol	DateTimeS	Elevation
0	Point ZM	0	028		WPT	Gemo is	Flag, Blue	2017-07-07T00:49:03Z	3.411752
1	Point ZM	0	029		WPT	P	Flag, Blue	2017-07-07T00:59:39Z	3.769085
2	Point ZM	0	030		WPT	Sjdeays	Flag, Blue	2017-07-07T01:19:38Z	3.967957
3	Point ZM	0	031		WPT	Sjdeays	Flag, Blue	2017-07-07T01:28:14Z	4.889761
4	Point ZM	0	032		WPT	Cb	Flag, Blue	2017-07-07T01:33:30Z	3.003996
5	Point ZM	0	033		WPT	New wharf	Flag, Blue	2017-07-07T01:41:24Z	3.331246

Procedure 3: Arrange the imported data (Cont.)

2. Delete unneeded fields (columns) by right-clicking on the filed and select [Delete Field].

3. Repeat step 2 until all unneeded fields are deleted.

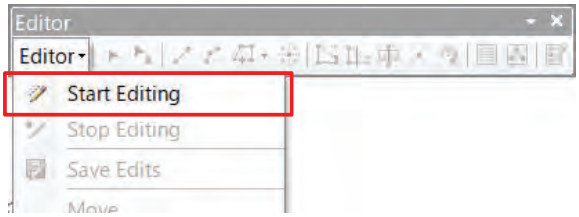




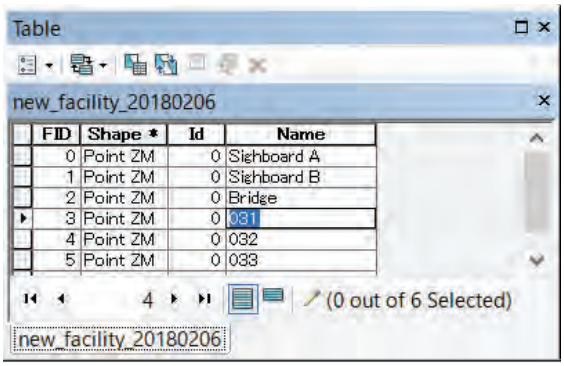
Procedure 3: Arrange the imported data (Cont.)

4. Change name of each record (row).
   1. On Editor tool bar, click [Editor] and select [Start Editing] to edit table of the layer.

      You can see that colour of fields become white when edit session starts. That means you can edit records in the table.



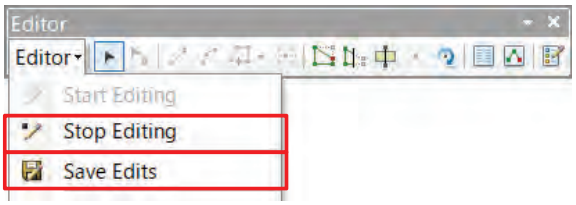
   2. Rename each record appropriate one.



Procedure 3: Arrange the imported data (Cont.)

4. Change name of each record (row). (Cont.)
   3. After you finish step 2, click [Editor] and select [Save Edits] to save your changes.
   4. Then, click [Editor] again and select [Stop Editing] to stop edit session.

   Now, edit session is finished.



5. Save the created data in the appropriate folder.

   You can compare the created data with other data by adding interested data in the ArcMap if you like.

添付資料 4.1.7 ENVI manual

GETTTING STARTED WITH ENVI 5.2

ENVI combines image processing and geospatial technology to help you extract meaningful information from all kinds of data and make better decisions. This document is introductory manual to operate ENVI 5.2 for your work.

TABLE OF CONTENTS

Contents

TABLE OF CONTENTS

ENVI INTERFACE

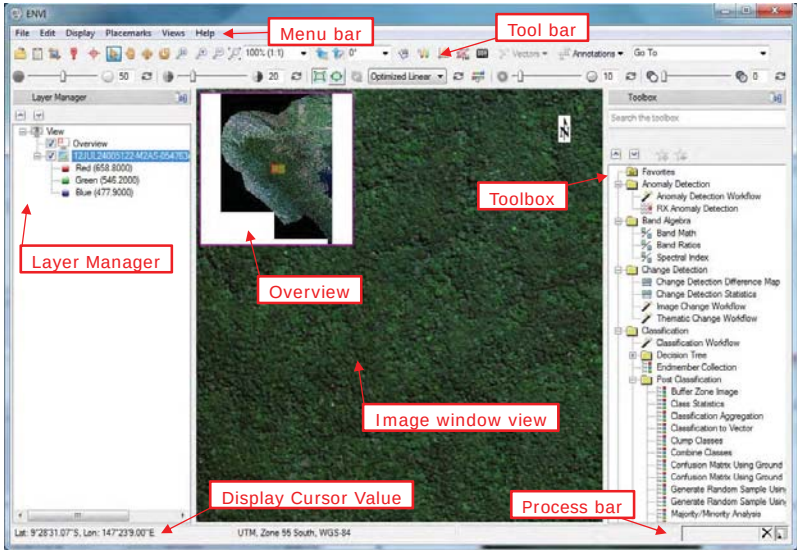
ENVI Interface

START ENVI

Select ENVI from Windows Start menu.

Start > All Programs > ENVI 5.2 >64-bit > ENVI (64-bit)

OVERVIEW OF ENVI 5.2 INTERFACE



INTERFACE MENU

NAME	DESCRIPTION
Menu bar	Basic functions for tools related to file, edit and display, window view such as split window, and imagery.
Tool bar	Operation tools for imagery displayed.

ENVI INTERFACE

Layer Manager	Manage the images displayed on image window view. Click the check box to the left of the layer to turn the layer on/off. You can access sub-menu for the layer to right-click on the layer.
Oveview	Display overview of the layer to click the check box to the left of [Overview] in the Layer Manager.
Toolbox	Storage of ENVI analysis tools in categories. Type keyword in [Search the toolbox] to display corresponding tools.
Display Cursor Value	Display information as you hover the cursor over either the Overview or the current Image window view.
Process bar	Process bar displays the process name and status for the oldest running process, along with an option to cancel the process (click the **Cancel Process** button). When all processes finish, this segment becomes blank. As one or more processes are running, click the **Process Description** button to display a window that shows the name and status of each process, and the name of the input raster images.

DISPLAY TOOLS

Display Tools

OPEN FILES

From the menu bar, select **File > Open As**, choose a sensor or file type from the options listed, and then browse for a file from the Open dialog.

Exercise:

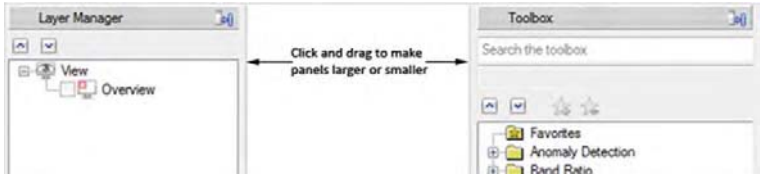
Select **File > Open As > WorldView-2**.

Navigate to the \GISDB\01_Satellite\WorldView2\00_org\054763411020_01\054763411020_01_P002_MUL\ folder, click 11DEC01004026-M2AS-054763411020_01_P002.TIL, and click [Open].

PANELS

You can adjust the Layer Manager and Toolbox panels as follows:

- Click and drag on the inside border of the panel to make the panel larger or smaller. If you drag the border all the way to the outside edge of the ENVI window, the panel will be hidden.



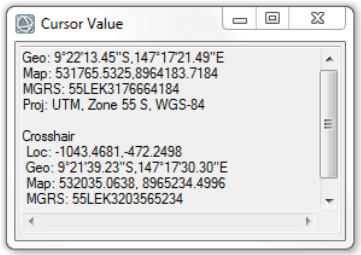
- Click the **Show panel** arrow on the outside edge of the ENVI window to show the hidden panel again.

- Click the **Detach** button in the upper-right corner of the Layer Manager or Toolbox to detach them from the interface. They become floating dialogs that you can move to a different location or separate monitor if desired.
- To re-attach the Layer Manager or Toolbox to the main application window, choose one of the following options:

- Click the Attach button in the floating dialog.
- Click the X button in the upper-right corner of the floating dialog.

CURSOR VALUE

You can access the Cursor Value window during any ENVI session by selecting **Display > Cursor Value** from the menu bar, or by clicking the **Cursor Value** button in the toolbar. The Cursor Value window opens automatically when you click the **Crosshairs** button.



The Cursor Value window contains information about the displayed data at the current cursor location.

Use the **Crosshairs** tool to overlay crosshairs on the Image window view. As you move the cursor around the Image window view, the Cursor Value window displays information about the data under the crosshairs.

ROTETE

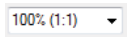
Use the following tools to rotate your display:

BUTTON	BUTTON NAME	DESCRIPTION
	Rotate View	Rotate the display in the current Image window view. Place the cursor in the Image window view and do one of the following: ▪ Click and drag the cursor to rotate clockwise or counter clockwise. ▪ Press an arrow key to rotate 5 degrees clockwise (down/right arrows) or counter clockwise (up/left arrows). ▪ Press and hold the **Ctrl** key, then press an arrow key to rotate 1 degree clockwise (down/right arrows) or counter clockwise (up/left arrows). ▪ Press and hold the **Shift** key, then press an arrow key to rotate 45 degrees clockwise (down/right arrows) or counter clockwise (up/left arrows).
	Rotate Up	Rotate the display in the current Image window view so that objects (especially buildings) are oriented vertically with your monitor. If the image contains rational polynomial coefficient (RPC) information, ENVI uses that to compute the rotation angle. If the image does not contain RPC information, or if it uses a standard projection, ENVI rotates the display to 0 degrees.
	North Up	Rotate the display in the current Image window view so that North is at the top of the Image window view. This option is only available for georeferenced images.
0.0°	Rotate To	Select a fixed rotation angle (expressed in degrees) for the display in the current Image window view. Or, type your own degree of rotation and press **Enter** on your keyboard. This drop-down list interactively reports the current degree of rotation of the display when you use any rotation tool. The following options are available from the **Rotate To** drop-down list (in degrees): **0**, **90**, **180**, and **-90**.

ZOOM

Use the following tools to zoom in or out of the display:

BUTTON	BUTTON NAME	DESCRIPTION
	Zoom	Zoom in on the display. Do one of the following: ▪ Click and drag over an area to draw a rubber-band box and zoom in on that area. ▪ Click once in the display to center the display on that location and zoom in by a fixed percentage. To exit this tool, click the **Select** button.

	Fixed Zoom In	Click this button to zoom into the center of the display by a fixed percentage. The default is 1.25x, which can be set using the **Zoom Factor** preference.
	Fixed Zoom Out	Click this button to zoom out from the center of the display by a fixed percentage. The default is 1.25x, which can be set using the **Zoom Factor** preference.
	Zoom to Full Extent	Click this button to zoom the full extent of the data layer.
	Zoom To	Select a fixed zoom percentage for the display in the current Image window view. Or, type your own percentage of zoom and press **Enter** on your keyboard.

You can also use the scroll wheel on your mouse to zoom in or out of the display. Hold down the **Shift** key while scrolling for a faster zoom. Hold down the **Ctrl** key while scrolling for a slower zoom.

GO TO

Use the **Go To** tool to jump to a specific location in an image and to center the current Image window view over that location. If **Crosshairs** are enabled, the crosshairs intersection is positioned over the location you specify.

1. Enter the coordinates in the **Go To** field, using one of the entry formats in the table below. You can also copy a location from the Cursor Value window and paste it in the **Go To** field.
2. Press **Enter**.

ENVI stores the locations you enter during your session in the **Go To** drop-down list. To jump to a stored location, select the desired location from the drop-down list.

Separate coordinate values with a comma, a space, or a comma and a space:

ENTRY TYPE	VALID ENTRY FORMATS
Lat,Lon	Enter the values in decimal degrees format or in degrees, minutes, seconds format. Decimal degrees format examples: 40.004036,105.219047 40.004036N,105.219047W 40.0481N, 105.3420W Degrees, minutes, seconds examples: 40 0 14.53,105 13 8.57 40 0 14.53N,105 13 8.57W 40 0'34.34"N, 105 13'46.20"W
DataX, DataY	Enter the value as x,y points and append an asterisk (*) to one of the values to indicate it is a data coordinate. Data x,y format examples: 181.1*, 91.1 169*, 79 29*, 45
MapX,MapY	Enter the value as x,y points in a map coordinate. Map x,y format examples: 481168,4426792 481872.8250, 4427702.4750 482970.42, 4427702.47

MENSURATION

Use the **Mensuration** tool  to measure distance and azimuth direction on an image.

ENHANCEMENT TOOLS

Enhancement tools interactively control the amount of brightness, contrast, stretch, and transparency for the selected image layer. For each tool, click and drag the slider, or enter a value in the adjacent field. You can also use the following to change slider values:

- Click on the slider bar to the right or left of the indicator or click the slider then use the **Page Up** or **Page Down** keys to move the slider value up or down incrementally by 10.
- Click on the icons to the right or left of the slider bar or click the slider then use the arrow keys on the keyboard to move the slider value up or down incrementally by one. The up/right arrow keys increase the enhancement; the left/down arrow keys decrease it.
- Click the slider then use the **Home** key to move the slider to 100 and the **End** key to move the slider to 0.
- Click the **Reset**  button for the tool to return to the default value.

- Click the **Undo** or **Redo** buttons, or select **Edit > Undo *action*** or **Edit > Redo *action*** from the menu bar to undo and redo actions.

The value in the adjacent field interactively updates as you move the slider using any of the options listed, and the Image window view immediately shows the results.

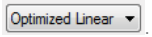
BUTTON	BUTTON NAME	DESCRIPTION
	Brightness	Darken or brighten the display of the selected image. The valid range is 0 (dark) to 100 (bright). To return to the default value of 50, click the **Reset Brightness** button.
	Contrast	Adjust the contrast of the selected image. The valid range for this slider is 0 (low contrast) to 100 (high contrast). When you adjust the contrast, the selection in the **Stretch Types** drop-down list automatically changes to **Custom**. To return to the default contrast value of 20, click the **Reset Contrast** button.
	Sharpen	Blur or sharpen the display of the selected image. The valid range for this slider is 0 (blurry) to 100 (sharp). To return to the default value of 10, click the **Reset Sharpen** button.
	Transparency	Make your image or vector layer more opaque or transparent. The valid range for this slider is 0 (opaque) to 100 (transparent). To return to the default value of 0, click the **Reset Transparency** button.

STRETCH

You can apply different contrast stretch types to enhance the appearance of an image. If the associated header file for an image specifies a default stretch, it is applied when you open the image. If the header file does not specify a stretch, then a stretch type is applied as follows:

- No stretch is applied to 8-bit byte data.
- An optimized linear stretch is applied to 16-bit unsigned integer data.
- A linear 2% stretch is applied to all other data types.

You can set the default stretch for these data types using the **Default Stretch** preferences.

To apply a different contrast stretch, select an option from the **Stretch Types** drop-down list 

. If you manually adjust the **Contrast**, the drop-down selection automatically changes to **Custom**.

ENVI determines the statistics for the stretch by using the full image extent, or only the extent that is visible in the Image window view. By default, ENVI uses the full image. To apply the stretch to only the current Image window view, click the **Stretch on View Extent**  button in the toolbar. If statistics are based on the view extent and you pan the image to a different area, click the **Update Stretch**  button to recalculate statistics on the new view in the Image window. To return to determining statistics for the full image extent, click **Stretch to Full Extent**  button.

- **No stretch** does not apply a contrast stretch.
- **Linear, Linear 1%, Linear 2%,** and **Linear 5%** apply a pre-set percent linear stretch. To apply a different percent linear stretch, click the **Custom Stretch**  button.
- **Equalization** applies a histogram equalization stretch.
- **Gaussian** applies a Gaussian stretch. The default standard deviation value is 0.3. To apply a different standard deviation, click the **Custom Stretch**  button.
- **Square Root** performs a square root gray scale transformation, then applied a linear stretch. When you select Square Root, the contrast is changed to 0 by default.
- **Logarithmic** logarithmically stretches the gray scale of the input image. It is a non-linear technique where the low-range brightness is enhanced. The logarithmic stretch is useful for enhancing features lying in the darker parts of the original image. When you select Logarithmic, the contrast is changed to 0 by default.
- **Optimized Linear** applies an optimized linear stretch, also known as a dynamic range adjustment. By default, 16-bit, unsigned integer data use the optimized linear stretch for display as it has a dynamic range set that is optimal for integer data. This stretch provides the maximum amount of information from the midtones and from the shadow and highlight regions of this data type. See Optimized Linear Stretch Background for more details.
- **Custom** opens the Custom Stretch dialog for you to adjust dark and light ranges using a histogram, described in the next section.

Click the **Reset Stretch Type**  button to return to the stretch type default for the image.

Use the **Custom Stretch** controls to adjust individual dark and light ranges for R, G, B in the current layer using a histogram. As with **Stretch Types**, you can calculate statistics on the full extent of the image, or only the extent that is visible in the current Image window view.

DISPLAY TOOLS

Click the **Custom Stretch** button on the toolbar or select **Display > Custom Stretch** to open the Custom Stretch dialog. The dialog also opens when you select **Custom** from the **Stretch Types** drop-down list on the toolbar. When the dialog is open, the **Brightness** and **Contrast** controls on the toolbar are disabled.

- If the image is color, the Custom Stretch dialog contains a histogram of all three bands and shows the smallest minimum value and the largest maximum value of the three bands. To adjust ranges for a color image, click the **Red**, **Green**, or **Blue** button to display the individual histogram for the band.
- If the image is panchromatic, the Custom Stretch dialog contains a histogram of the band and shows the minimum value and maximum values of the band.
- Drag and release the black point (left) and white point (right) sliders below the histogram to change the dark and light values. Or, type minimum and maximum values in the fields provided and press the **Enter** key.
- To set custom parameter values for **Linear** and **Gaussian** stretch types (available in the all-bands view):
- For **Linear** stretch, type a new value (0 to 49.9) in the **Linear (Percent Value)** field and press the **Enter** key.
- **Gaussian** applies a default standard deviation value of 0.3. With the stretch type **Gaussian** selected from the drop-down list, enter a new value (greater than 0) in the **Gaussian (Standard Deviation)** field and press the **Enter** key.
- To reset the stretch to what it was before opening the Custom Stretch dialog, click the **Reset Dialog** button.

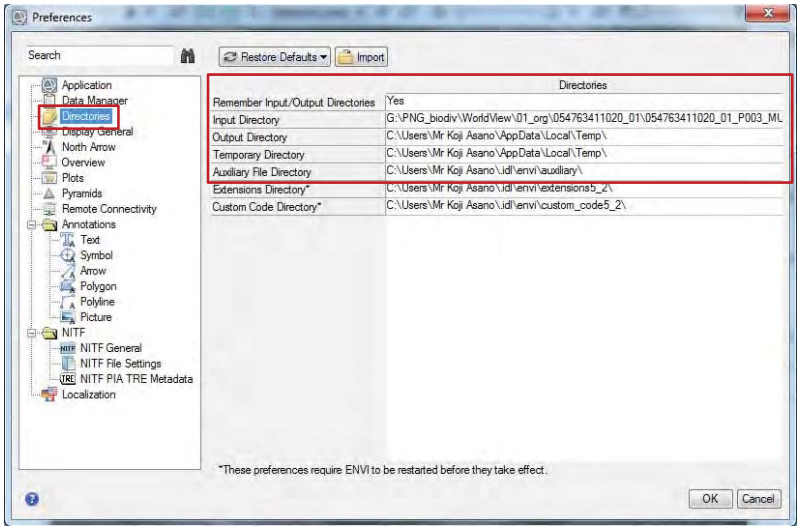
You can optionally copy the histogram from the Custom Stretch dialog and paste it into other applications, such as Microsoft Word or PowerPoint. To do this, press **Ctrl+C**, then paste into another application by pressing **Ctrl+V**.

ENVIRONMENTAL SETTING

Environmental Setting

SPECIFY DIRECTORY

You can access data used easily by specifying default directory in advance. You can set default directory by selecting **File > Preference** from the menu bar.



Select Directories, and set the following directories:

NAME	DESCRIPTION
Default Input Directory	The directory for input images. ENVI uses this directory unless you specify another path when opening a file.
Output Directory	The directory for output files. ENVI writes output files to this directory unless you specify another path when entering an output filename.

ENVIRONMENTAL SETTING

Temporary Directory	The directory used to store ENVI temporary files.
Auxiliary File Directory	The directory for auxiliary files such as header files (.hdr), pyramid files (.enp), and vector auxiliary files. This directory contains auxiliary files associated with data from read-only devices such as a CDs or folders with no write permissions.

These preferences immediately take effect on all subsequent actions without requiring you to restart ENVI.

If **Remember Input/Output Directories** is set to **Yes** (the default), ENVI will remember the last directory where you selected input files and will update the **Input Directory** preference accordingly. It will also remember the last directory where you saved any output files and will update the **Output Directory** preference. If you set this preference to **No**, the **Input Directory** and **Output Directory** preference values will be fixed.

COMPARE IMAGES

Explore Imagery

OPEN AND DISPLAY FILES

To open files:

- From the menu bar, select **File > Open** and browse for a file from the Open dialog.
- From the toolbar, click the **Open** button.
- From the menu bar, select **File > Open As** and choose a sensor or file type from the options listed. Opening files through this menu option ensures the correct metadata and ancillary files are read along with the respective image files.

To remove an image:

- From the Image window, right-click on the filename in the Layer Manager and select **Remove**. The file remains open in the Data Manager but is not displayed in the Image window.

To close all files:

- Select **File > Close All** from the menu bar. Files are removed from the Data Manager and Layer Manager.

To open files using the Data Manager:

- Select **File > Close All** from the menu bar. Files are removed from the Data Manager and Layer Manager.

ADJUST STRETCH AND CONTRAST

Refer to section ENHANCEMENT TOOLS and STRETCH in chapter DISPLAY TOOLS to adjust stretch and contrast of an image for better appearance.

Exercise:

After open RapidEye image, select [Optimized Linear] from the **Stretch types** drop down list.

Click the  button to zoom the full extent of the image.

Click the  button, and then click and drag over the image to draw a rubber-band box and zoom in on that area.

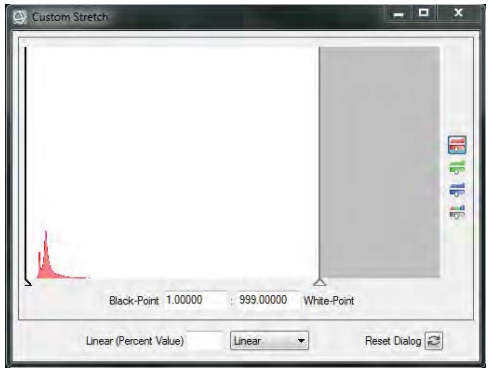
Click the  button to apply the stretch to only the current Image window view.

If you pan the image to a different area, click the button to recalculate statistics on the new view in the Image window.

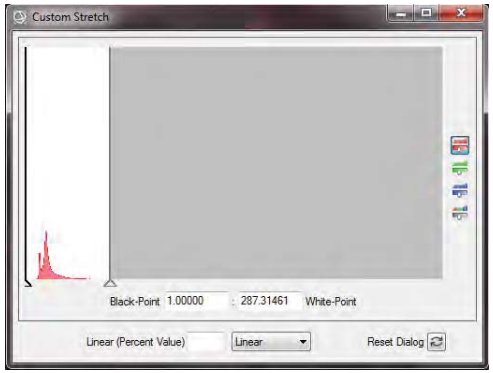
Click the button to return to determining statistics for the full image extent.

Select **Display > Custom Stretch**.

In the Custom Stretch dialog, click the red icon, select [Linear] for stretch type.



Move the right bar to fit brightness distribution.



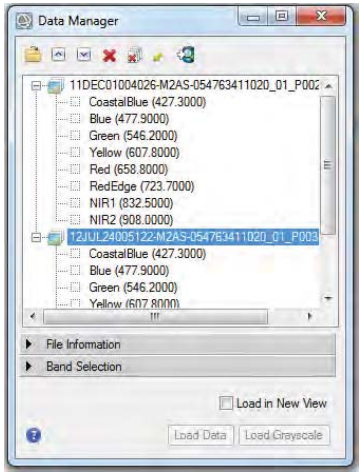
Fit brightness distribution of blue and green as well to show the image clearer.

Click the X button in the upper right corner of the Custom Stretch dialog to close the dialog.

DATA MANAGER

Data manager manages loaded files. Information of only showed images is displayed in the Data Manager. Use the Data Manager to check detailed data information and show loaded data in a different ways such as grayscale, RGB composite, etc.

To open files using the Data Manager:



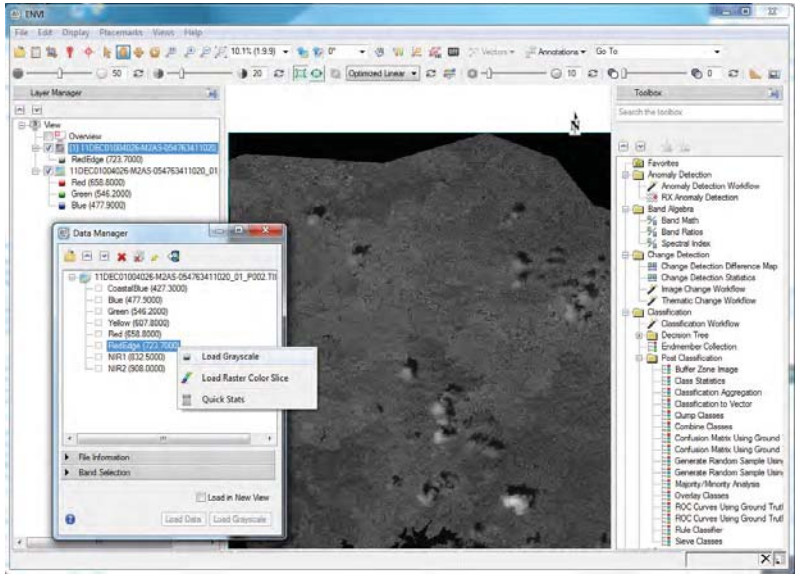
- From the menu bar, select **File > Data Manager** and click the **Open** button in the Data Manager toolbar browse for a file from the Open dialog.
- From the toolbar, click the **Data Manager** button.
- Esri layer files display in the Layer Manager and Data Manager with the layer name (not the filename).
- To close files, use the **Close** or **Close All** button in the Data Manager. You can also select **File > Close All** from the menu bar to remove all files from the Data Manager and Layer Manager.
- Click the **Pin** button in the Data Manager to have the Data Manager persist on the screen as you load subsequent layers into the display. Click the button again to have the Data Manager close whenever you load layers into the display.
- To remove a file in the Layer Manager right-click on the file in the Layer Manager and select **Remove**. To redisplay the file in the Layer Manager, open the file from the Data Manager as once loaded files are listed in the Data Manager.

Exercise:

Select **File > Data Manager**.

In the Data Manager dialog, rignt-click [RedEdge] of [11DEC01004026-M2AS-054763411020_01_P002.TIL], and select **Load Grayscale**.

[RedEdge] is added in the Layer Manager.



CHANGE COLOR

You can assign color table to a grayscale image to understand data distribution of the image easily.

There are two tools, **[Change Color Table]** and **[Raster Color Slices]**, to assign false color to an image.

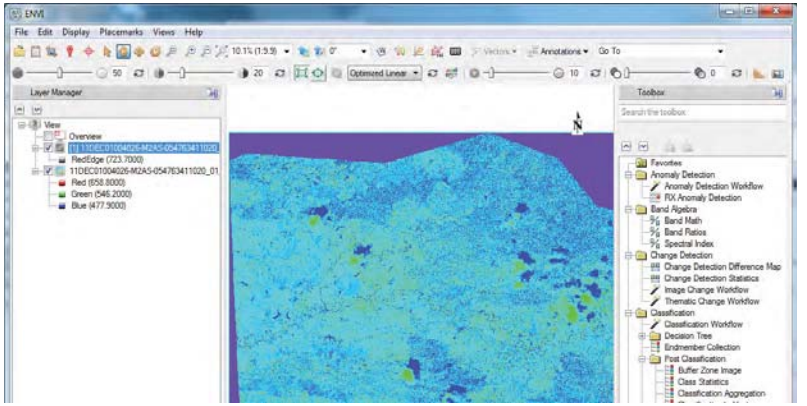
Exercise:

*You will assign false color to grayscale [RedEdge] by use of **Change Color Table**.*

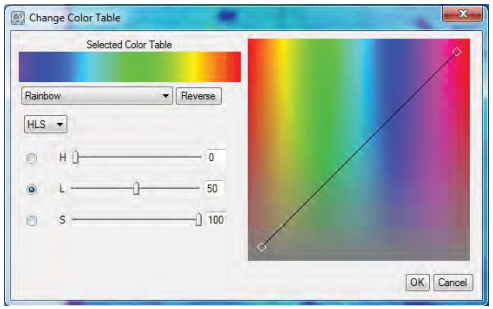
Right-click [11DEC01004026-M2AS-054763411020_01_P002.TIL] in the Layer Manager > **Change Color Table > Rainbow**.

The image are displayed by use of the color table you selected.

COMPARE IMAGES



To check color table, right-click click [11DEC01004026-M2AS-054763411020_01_P002.TIL] in the Layer Manager, select > **Change Color Table > More**.



In the Change Color Table dialog, you can select other color table in the pull-down list and change color line in the right color area.

Select **Rainbow** in the pull-dawn list to turn it back.

COMPARE IMAGES

RGB COMPOSITE

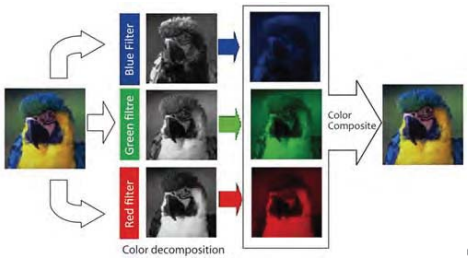
You can assign R (red), G (green), and B (Blue) to arbitrary bands by use of the Data Manager to display an image in RGB composite.

Specific band combinations are good for looking into certain features of the image.

WAVEBAND		FEATURES	WAVELENGTH (MICROMETERS)
Visible bands	Blue	·Mapping coastal water areas ·Differentiating between soil and vegetation ·Forest types mapping ·Cultural features	0.45-0.52
	Green	·Healthy vegetation ·Cultural features	0.52-0.60
	Red	–Discriminating different plant species –Soil boundaries –Geological boundaries –Cultural features	0.63-0.69
Reflective infrared bands	Near Infrared	·Vegetation biomass ·Crop identification ·Soil/crop and land/water contrasts	0.76-0.90
	Mid-Infrared	·Moisture content of plants ·Crop drought studies ·Plant health analyses ·Discriminating between clouds, snow and ice ·Geologic rock type and soil boundaries ·Soil and vegetation moisture content	1.55-1.74 2.08-2.35
Thermal bands		·Heat intensity ·Insecticide applications ·Thermal pollution ·Geothermal activity	10.04-12.35

Color composite shows three bands selected from all bands, each of which is assigned to Red, Green or Blue. Most often used composites are true color composite, false color composite and natural color composite.

COMPARE IMAGES



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COLOR COMPOSITE	FEATURES	R	G	B	LANDSAT TM	WORLD VIEW-2
True color	·Show like a color photograph	Red	Green	Blue	3:2:1	5:3:2
False color	·Similar to and infrared photograph ·Vegetation appears in red ·Water appears navy or black	NIR	Red	Green	4:3:2	7:5:3
Natural color	·Vegetation appears brilliant green	Red	NIR	Green	3:4:2	5:7:3

SPECTRAL COMPOSITE OF BANDS

LANDSAT 4-5 TM			8bits/pixel
Bands		Wavelength (micrometers)	Resolution (meters)
Band 1	Blue	0.45-0.52	30
Band 2	Green	0.52-0.60	30
Band 3	Red	0.63-0.69	30
Band 4	Near Infrared	0.76-0.90	30
Band 5	Mid-Infrared	1.55-1.75	30
Band 6	Thermal Infrared	10.40-12.50	120
Band 7	Mid-Infrared	2.08-2.35	30

LANDSAT 7 ETM+			8bits/pixel
Bands		Wavelength (micrometers)	Resolution (meters)
Band 1	Blue	0.45-0.52	30
Band 2	Green	0.52-0.60	30
Band 3	Red	0.63-0.69	30
Band 4	Near Infrared	0.77-0.90	30
Band 5	Mid-Infrared	1.55-1.75	30
Band 6	Thermal Infrared	10.40-12.50	60
Band 7	Mid-Infrared	2.09-2.35	30
Band 8	Panchromatic	0.52-0.90	15

LANDSAT 8 OLI, TIRS			12bits/pixel
Bands		Wavelength (micrometers)	Resolution (meters)
Band 1	Coastal aerosol	0.43 - 0.45	30
Band 2	Blue	0.45 - 0.51	30
Band 3	Green	0.53 - 0.59	30
Band 4	Red	0.64 - 0.67	30
Band 5	Near Infrared	0.85 - 0.88	30
Band 6	Mid-Infrared (SWIR)	1.57 - 1.65	30
Band 7	Mid-Infrared (SWIR)	2.11 - 2.29	30
Band 8	Panchromatic	0.50 - 0.68	15
Band 9	Mid-Infrared (Cirrus)	1.36 - 1.38	30
Band 10	Thermal Infrared (TIRS)	10.60 - 11.19	100
Band 11	Thermal Infrared (TIRS)	11.50 - 12.51	100

WorldView-2			11bits/pixel
Bands		Wavelength (micrometers)	Resolution (meters)
Band 1	Coastal	0.400 - 0.450	1.24-1.38
Band 2	Blue	0.450 - 0.510	1.24-1.38
Band 3	Green	0.510 - 0.580	1.24-1.38
Band 4	Yellow	0.585 - 0.625	1.24-1.38
Band 5	Red	0.630 - 0.690	1.24-1.38
Band 6	Red Edge	0.705 - 0.745	1.24-1.38
Band 7	Near-IR1	0.770 – 0.895	1.24-1.38
Band 8	Near-IR2	0.860 - 1.040	1.24-1.38

To manually display raster data:

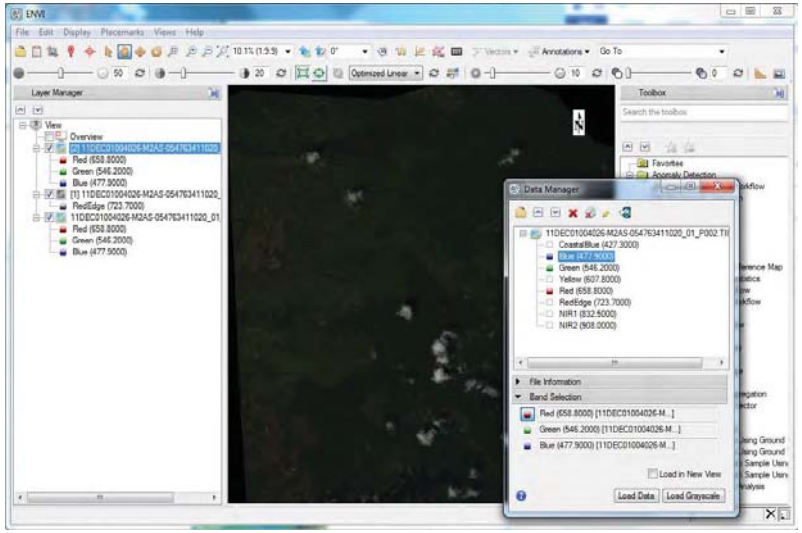
- To assign an RGB combination, expand the **Band Selections** category of the Data Manager. Click the band name you want to assign to red, then repeat to make the green and blue selections. Click **Load Data**.
- To load a true-color image, right-click on a filename in the Data Manager and select **Load True Color**. The image must have wavelengths defined for this option to be available. ENVI defines true color as the smallest difference in the wavelength values closest to red as 0.64 µm, green as 0.55 µm, and blue as 0.47 µm.
- To load a color-infrared (CIR) image, right-click on a filename in the Data Manager and select **Load CIR**. The image must have wavelengths defined for this option to be available. ENVI defines color infrared as the smallest difference in the wavelength values closest to near-infrared as 0.86 µm, red as 0.65 µm, and green as 0.55 µm.
- To load a grayscale image, select a band and click the **Load Grayscale** button.
- Right-click on a filename and select **Load Default** to display an image that has assigned default bands in the associated ENVI header. If you do not define default bands to load but the image file contains wavelength information, **Load Default** uses the default setting in the **Auto Display Method For Multispectral Files** preference.
- You can drag-and-drop individual bands from the Data Manager to multiple views.
- You can drag-and-drop a multispectral filename from the Data Manager to a view to display an RGB image in that view.

Exercise:

Select **File > Data Manager**.

In the Data Manager dialog, click Red (5), Green (3), and Blue (2) bands.

Click the **Load Data** button.



COMPARE IMAGES

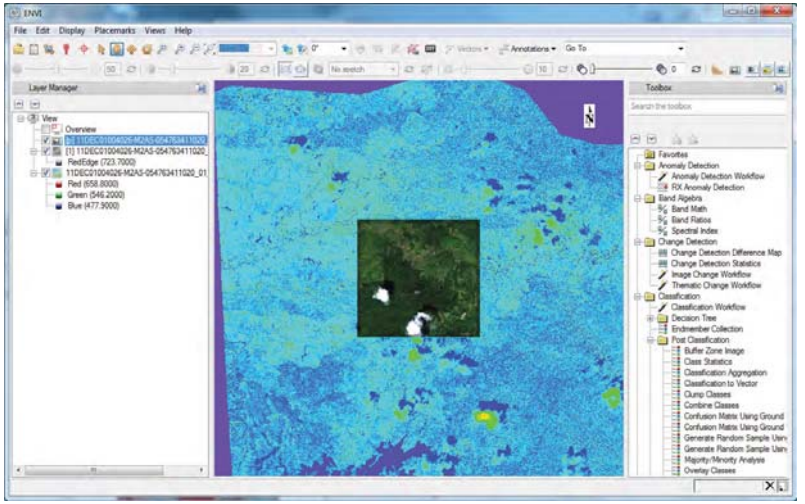
Compare Images

TRANSPARENCY LAYER

You can compare the images in one Image window view by use of transparency for the image layer below.

Exercise:

Click **Portal** button to show the Portal window in the Image window.



Move the **Transparency bar** to change transparency of the layer for data comparison.

Right-click on the Portal window, and select **Close Portal**.

MULTIPLE VIEWS AND LINK VIEWS

ENVI interface can display images in the multiple Image view windows, and link the images. It enables you to compare the images effectively.

Exercise:

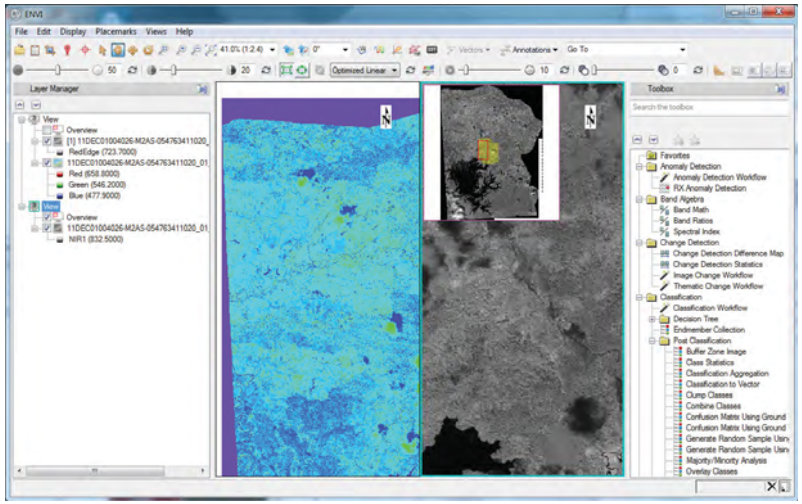
Select **Views > Create New View**.

A new window is shown.

Click the new **View** created in the Layer Manager.

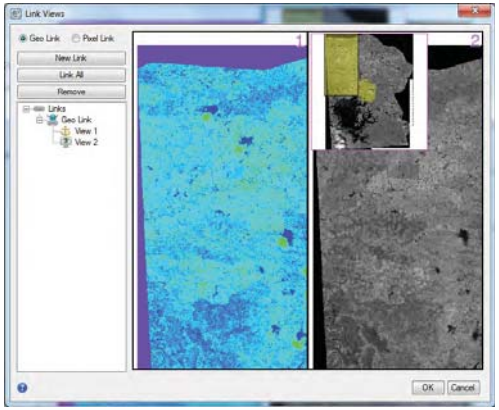
In the Data Manager, right-click NIR1 band, and select **Load Grayscale**.

Check [Overview] in the new created View.

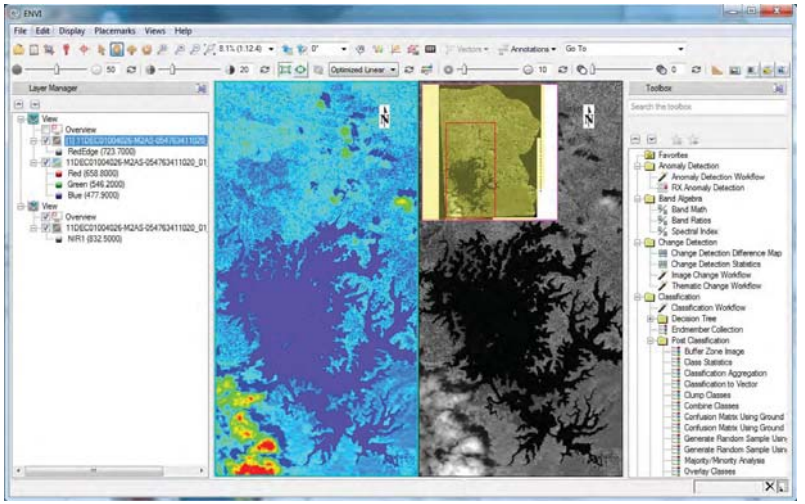


To link two images, select **Views > Link Views**.

In the Link Views dialog, click **Link All** button, and click **OK**.



Compare the linked images by using the Pan and Zoom tools.



To close the image, in the Layer Manager, right-click the grayscale image in the second View, and click **Remove**.

To close the View, in the Layer Manager, right-click the second View, and click **Remove View.**

Close all images in the same way.

*There are data in the Data Manager. To close unnecessary file, right-click the appropriate file in the Data Manager, and select **Close File**.*

Image Preprocessing

RADIOMETRIC CALIBRATION

Remote sensing data distributed in general has digital number. Digital number should be converted to actual observed value. This process is called calibration.

Use **Radiometric Calibration** to calibrate image data to radiance, reflectance, or brightness temperatures.

The following table lists the main calibration options that are available by sensor type. Use the **File > Open** menu option to select the metadata files listed in the table.

SENSOR	CALIBRATION OPTIONS			METADATA FILE TO OPEN
	Radiance	Reflectance	Brightness Temperature	
ALOS AVNIR-2 and PRISM Level-1B2 data	*	*		HDR*.txt
GeoEye-1	*	*		.til
IKONOS	*	*		metadata.txt
Landsat TM, ETM+, and Landsat-8 OLI/TIRS data	*	*	*	*_MTL.txt, *WO.txt, *.met
QuickBird	*	*		.til
RapidEye Level-1B	*	*		*_metadata.xml A NITF/NSIF license is required to open these files.
SPOT DIMAP	*	*		METADATA.DIM
WorldView	*	*		.til

Follow these steps to perform radiometric calibration:

1. From the Toolbox, select **Radiometric Correction > Radiometric Calibration**.
2. Select an input file from one of the sensors/formats listed in the table above.
3. Perform optional spatial subsetting.

4. If you are using Landsat data, choose one of the following options:
   - To compute radiance, select the multispectral and/or thermal bands in the Spectral Subset dialog.
   - To compute reflectance, select the multispectral bands in the Spectral Subset dialog.
   - To compute brightness temperatures, select the thermal bands in the Spectral Subset dialog.
5. Click **OK**. The Radiometric Calibration dialog appears.
6. From the **Calibration Type** drop-down list, select one of the following options:
   - **Radiance:** This option is available if the image has gains and offsets for each band. ENVI reads these values from metadata from the sensors listed above. Radiance is computed using the following equation:

     $$L_\lambda = Gain * Pixel\ value + Offset$$

     ENVI expects gains and offsets to be in units of W/(m² * sr * µm). If so, then radiance will be in units of W/(m² * sr * µm).
   - **Reflectance:** Top-of-atmosphere reflectance (0 to 1.0). This option is available if the image has gains, offsets, solar irradiance, sun elevation, *and* acquisition time defined in the metadata. ENVI reads these values from metadata from the sensors listed above. Reflectance is computed using the following equation:

     $$\rho_\lambda = \frac{\pi L_\lambda d^2}{ESUN_\lambda \sin\theta}$$

     Where:

     L_λ = Radiance in units of W/(m² * sr * µm)

     d = Earth-sun distance, in astronomical units.

     $ESUN_\lambda$ = Solar irradiance in units of W/(m² * µm)

     θ = Sun elevation in degrees

     With Landsat-8 files, the reflectance gains and offsets have been scaled by the sine of the sun elevation.
   - **Brightness Temperature:** This option is only available for Landsat-8, ETM+, and TM thermal imagery. Brightness temperatures (in Kelvin) are computed as follows:

$$T = \frac{K2}{\ln\left(\frac{K1}{L_\lambda} + 1\right)}$$

Where:

$K1$ and $K2$ = Calibration contstants, in Kelvin. ENVI reads these values from the Landsat metadata.

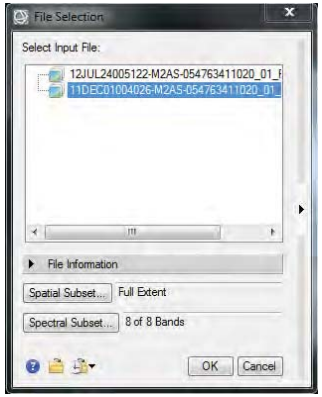
7. From the **Output Interleave** drop-down list, select an interleave option for the calibrated image:
   - **BSQ**: Band sequential
   - **BIL**: Band interleaved by line
   - **BIP**: Band interleaved by pixel
8. From the **Output Data Type** drop-down list, select a data type for the calibrated image:
   - **Float**: Floating-point
   - **Double**: Double-precision floating-point
   - **Unit**: 16-bit unsigned integer
9. To output radiance in different units than W/(m² * sr * µm), enter a multiplicative **Scale Factor** to get the calibrated image in your desired units. Otherwise, leave the default value of 1.00.
10. a If you are calibrating an image for input into FLAASH, click the **Apply FLAASH Settings** button. This will create a radiance image with the following properties, which are required for input into FLAASH:
    - BIL interleave
    - Floating-point data type
    - Scale factor of 0.1. This scales the output to units of µW/(cm² * sr * nm).

    This saves you time from having to perform all of these conversions individually. You can import the calibrated image directly into FLAASH. Because this process converts the data type to floating-point and combines all bands into a single file, the time to create an output file will increase significantly and the progress bar may pause at 25%.
11. Select an output folder and filename for the calibrated image.
12. Enable the **Display Result** option to automatically display the calibrated image upon completion.
13. Click **OK**.

Exercise:

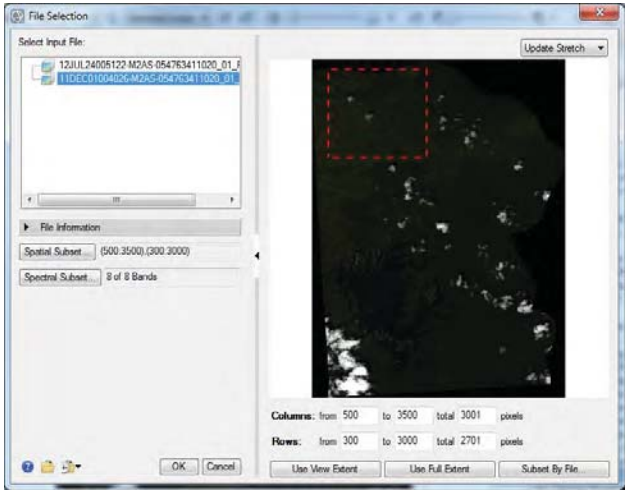
In the Toolbox, select **Radiometric Correction > Radiometric Calibration**.

In the File Selection dialog, select [11DEC01004026-M2AS-054763411020_01_P002.TIL].



To set processing extent, click **Spatial Subset**, input parameters below in the Spatial Subset dialog, and then click OK.

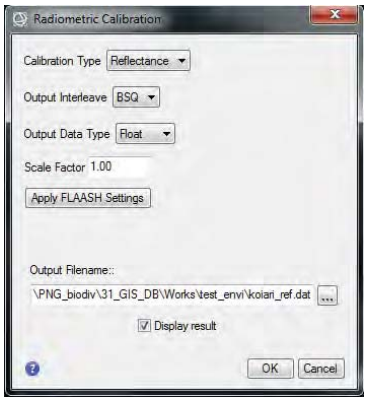
Columns: 500 to 3500 Rows: 300 to 3000



The Radiometric Calibration dialog opens. Parameters needed for calibration are automatically imported.

Set parameters below in the dialog, and click OK.

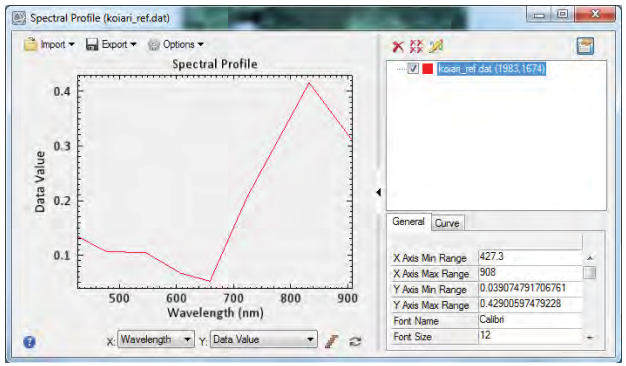
Calibration Type: Reflectance
Output Interleave: BSQ
Output Data Type: Float
Scale Factor: 1.0
Output Filename: koiari_ref.dat



After the process finish, confirm that [koiari_ref.dat] is added in the Layer Manager.

To display only [koiari_ref.dat], uncheck the others.

From the menu bar, select **Display > Profiles > Spectral** to check spectral profile for each pixel.



Reflectance spectrum, the wavelength of light is plotted on the x-axis and the albedo at that wavelength is plotted on the y-axis, ranges 0 to 1.

ATMOSPHERIC CORRECTION

Atmospheric correction removes the scattering and absorption effects from the atmosphere to obtain the surface reflectance characterizing.

Atmospheric modelling is sophisticated method to correct atmospheric disturbances. Modelling approaches are ideal when scene-specific atmospheric data (aerosol content, etc.) are available. However, atmospheric information is rarely available.

ENVI offers several atmospheric correction tools: Dark Subtraction, Empirical Line, FLAASH, Flat Field, IAR, Log Residuals, QUAC®, Thermal Atmospheric Correction, and Convert to Emissivity and Temperature.

The dark subtraction technique is the simplest and most used for image atmospheric correction.

DARK SUBTRACTION

Use **Dark Subtraction** to remove the effects of atmospheric scattering from an image by subtracting a pixel value that represents a background signature from each band. This value can be the band minimum, an average based upon a region of interest (ROI), or a value that you specify.

1. From the Toolbox, select **Radiometric Correction > Dark Subtraction**. The Dark Subtract Input File dialog appears.
2. Select an input file and perform optional spatial and spectral subsetting, then click **OK**. The Dark Subtraction Values dialog appears.
3. Select a **Subtraction Method** as described in the following sections.
4. Click **OK**. The Dark Subtract Parameters dialog appears.
5. Select output to **File** or **Memory**.
6. Click **OK**.

Select Band Minimum Subtraction

To automatically use the minimum DN value of each spectral band for the dark subtraction:

1. In the Dark Subtraction Values dialog, select the **Band Minimum** radio button.
2. Click **OK**.

Select Region of Interest Subtraction

To use the average of an ROI in each spectral band as the value for dark subtraction:

1. Define the ROIs.
2. In the Dark Subtraction Values dialog, select the **Region of Interest** radio button.
3. From the list of available regions, select an ROI.
4. Click **OK**.

Select User Value Subtraction

To enter a user-defined value to subtract from each band:

1. In the Dark Subtraction Values dialog, select the **User Value** radio button. A list of the bands and a default value of 0.0000 appear under the **Current Subtraction Values** label.
2. Select one of the band names.
3. In the **Edit Selected Item** field, enter the subtraction value. Press **Enter**.
4. Edit the other band values as desired.
5. Click **OK**.

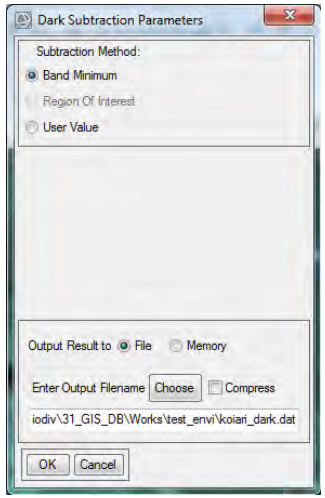
Exercise:

In the Toolbox, select **Radiometric Correction > Dark Subtraction**.

In the Dark Subtract Input File dialog, select [koiari_ref.dat], and click OK.

In the Dark Subtraction Parameters dialog, check **Band Minimum**, enter output filename, and click OK.

Subtraction Method: Band Minimum
Output Result to: File
Enter Output Filename: koiari_dark.dat

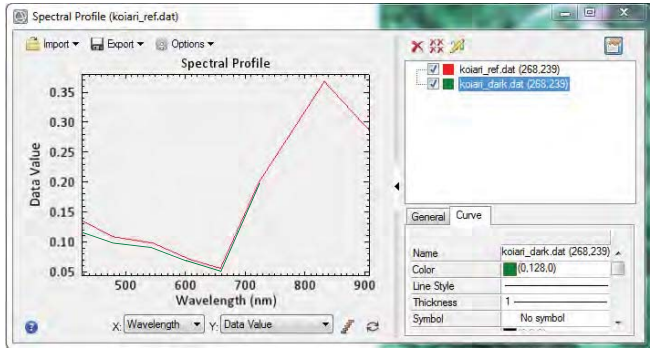


After the process finish, confirm that [koiari_dark.dat] is added in the Layer Manager.

You will check the difference between [koiari_ref.dat], pre-processed image, and [koiari_dark.dat], processed image.

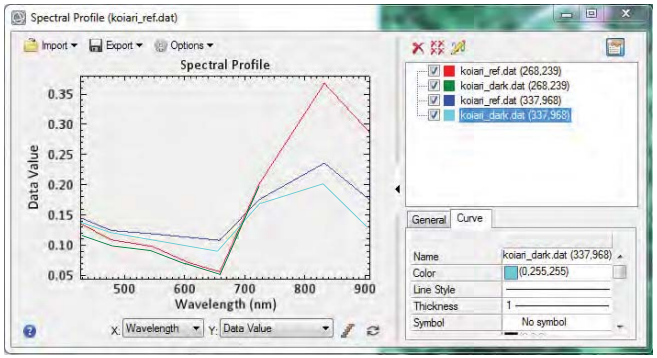
In the Spectral Profile dialog opened for [koiari_ref.dat], select **Options > Additional Profiles > Add File**, and then select [koiari_dark.dat].

Click forest on the image to show reflectance spectra of two images.



Next, hold [Shift] key and click grassland on the image.

Reflectance spectrum of grassland is added on the one of forest.



Try to click other land use such as bare land, road, or river.. After checking the differences of reflectance spectra, close the dialog.

2D SCATTER PLOT

The Scatter Plot Tool allows you to interactively classify two bands of raster data. One band provides the x coordinates and the other band provides the y coordinates. If the bands do not contain dependent data, either band can be plotted on either axis and the Scatter Plot illustrates only the degree of correlation between the two bands.

To create a 2D Scatter Plot:

1. Open a raster file.
2. Select one of the following:
   - Click the **Scatter Plot Tool** button on the toolbar.
   - Select **Display > 2D Scatter Plot** on the menu bar.

   The Scatter Plot Tool dialog appears, and a Scatter Plot layer is added to the Layer Manager.
3. By default, the Scatter Plot is computed on the pixels visible in the Image window. This is useful with large files, as it provides quick interactive response time. To include data from the entire file in the Scatter Plot, enable the **Full Band** check box in the Scatter Plot Tool dialog.

The Green band is the default x band in the plot, and the Red band is the default y band. You can select different bands from the same image or bands from another image to create the Scatter Plot as follows:

- To select different bands from the current raster, move the x and y slider bars in the Scatter Plot Tool to select a new band, or enter a band number in the field provided with the slider bar.
- To select a band from a different open raster, select **File > Select New Band > X-Axis** or **Y-Axis** from the Scatter Plot Tool menu bar. In the File Selection dialog that appears, select the new band and click **OK**. The second raster must match the current spatial size of the Scatter Plot.

You can have multiple Scatter Plots active simultaneously. To open another Scatter Plot:

1. In the Layer Manager, select the raster to use for the plot.
2. From the main menu bar, select **Display > 2D Scatter Plot**. A new Scatter Plot Tool dialog opens, and you can adjust the bands used for the plot as needed.

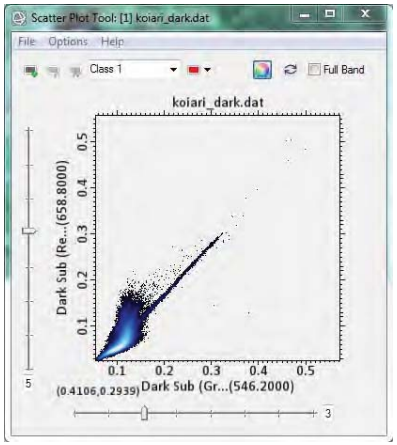
Exercise:

From the Data Manager, load a true color image of [koiari_dark.dat].

To confirm data distribution by using 2D Scatter plot for understanding the image to be used, select **Display > 2D Scatter Plot** to open.

Select band 3 in X-axis and band 5 in Y-axis.

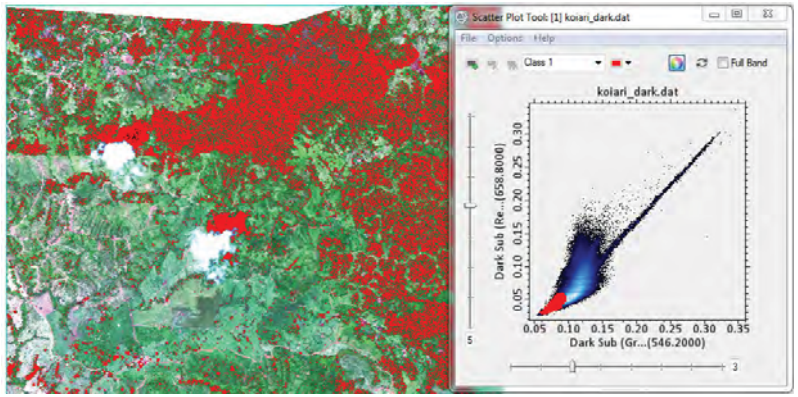
Click [Toggle Density Slice] button to activate.



In the 2D Scatter Plot, move cursor and scroll the wheel holding the center button of the mouse to move and zoom in the plotted display.

Left-click on the image and move cursor so that the corresponding values are displayed in the 2D Scatter Plot as well.

Draw round arbitrary area in the 2D Scatter Plot so that you can create Class of ROI and add Class by clicking **Add Class** button.



Create ROIs of forest, grassland, and bare land area.

In the 2D Scatter Plot, select **File > Export All Classes to ROIs**.

Confirm that [Region of Interest] is exported under the image layer in the Layer Manager.

Codicil:

*After executing processing above, you can classify the image being based on the ROI by executing **Supervised Classification** in the Toolbox.*

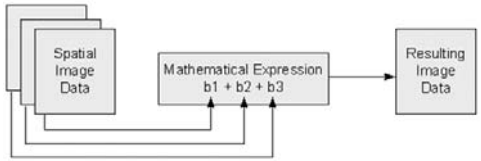
*In the Classification workflow, ROI for training data is available in shapefile format. Therefore ROI should be converted to shapefile. Click **Region of Interest (ROI) Tool** from the toolbar to open, select **File > Export > Export to Shapefile**.*

Image Analysis

BAND MATH

Band Math is a flexible image processing tool with many capabilities not available in any other image processing system. You can use the Band Math dialog to define bands or files used as input, to call a user Band Math function, and to write the result to a file or memory. The Band Math function accesses data spatially by mapping variables to bands or files.

The following figure depicts Band Math processing that adds three bands. Each band in the expression is mapped to an input image band, summed, and output as the resulting image data. You can map one or more of the expression's variables to a file instead of mapping each variable to a single band. The resulting output is a new image file. For example, in the expression b1 + b2 + b3, if b1 is mapped to a file and b2 and b3 are mapped to a single band, then the resulting image file contains the bands of the b1 file summed with b2 and b3.



To enter mathematical expressions:

1. From the Toolbox, select **Band Algebra > Band Math**. The Band Math dialog appears.
2. In the Band Math dialog, enter the desired mathematical description, including variable names, into the **Enter an expression** field. Use variables in place of band names or filenames (the variables will be assigned in the next step). Variable names must begin with the character "b" or "B" followed by up to 5 numeric characters.

   For example, to calculate the average of three bands, use the following equation:

   float(b1)+float(b2)+float(b3))/3.0

   Three variables are used in this expression: B1, B2, and B3. Note that, in this example, the IDL function float() is used to prevent byte overflow errors during calculation.

   The Band Math dialog also contains the following functionality:

   - **Previous Band Math Expressions**: This list shows previously applied mathematical expressions. To apply an expression to a new set of bands, select it from the list and enter it into the **Enter an expression** field. Click **OK**.

- **Save**: Save mathematical expressions to a file. The Save Expressions to a File dialog appears. Enter an output filename with an .exp extension. Click **OK**. You can save expressions to a file without having to first run them through the Band Math function.
- **Restore**: Restore previously saved mathematical expressions. The Enter Expressions Filename dialog appears. Select a filename and click **OK**.
- **Clear**: Clear all expressions from the **Previous Band Math Expressions** list.
- **Delete**: Delete a single expression from the **Previous Band Math Expressions** list.
- **Add to List**: To add an individual expression to the **Previous Band Math Expressions** list, enter it in the **Enter an expression** field and click **Add to List**.

3. After entering a mathematical expression in the **Enter an expression** field, click **OK**. The Variables to Bands Pairings dialog appears.

To assign values to variables:

Use the Variables to Bands Pairings dialog to assign bands from a list of input bands to variable names you entered in the **Enter an expression** field of the Band Math dialog.

Using the example mathematical expression (float(b1)+float(b2)+float(b3))/3.0,

1. In the **Variables used in expression** field, select the variable **B1 - [undefined]**.
2. Select the band in the **Available Bands List**. When the first band is selected, only those bands with the same spatial dimensions are shown in the band list.
3. Continue to assign a value to B2, B3, and so forth in the same manner.

To map variables to multiband images:

You can assign a multiband image as one or all of the variables (using an image file as a variable is considered File Math).

1. In the Variables to Bands Pairings dialog, select a variable in the **Variables used in expression** field.
2. Click **Map Variable to Input File**.
3. Select an input file the Input File dialog, and perform optional spatial subsetting, then click **OK**.
4. Continue to assign a value to B2, B3, and so forth in the same manner. If more than one file is used, they must have the same number of bands.
5. Select output to **File** or **Memory**.

6. Click **OK**. A multiband output image is produced for File Math modified by the math expression.

Exercise:

Band Math *is one of the main processing of remote sensing imagery. Arithmetic processing such as sum, difference, product, and quotient is executed for multiple bands. Operands are DN values located in the same (x,y) pixel between the bands.*

In this exercise, you will calculate NDVI (Normalized Difference Vegetation Index) by the use of the Band Math, using the following equation:

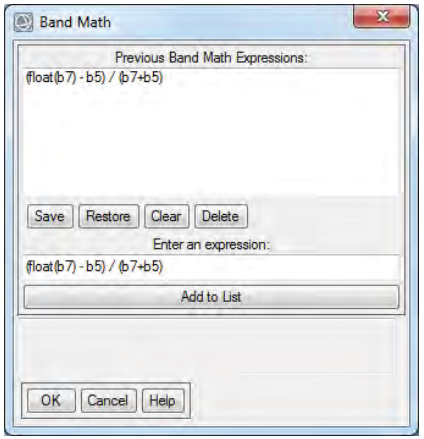
NDVI = (Near Infrared – Red) / (Near Infrared + Red)

Enter "band" in the search field of the Toolbox to search **Band Math** tool, and select **Band Math** to open.

In the Band Math dialog, enter the following equation in the **Enter and expression** field.

Enter an expression: (float(b7) – b5) / (b7 + b5)

Click [Add to List], and then click OK.

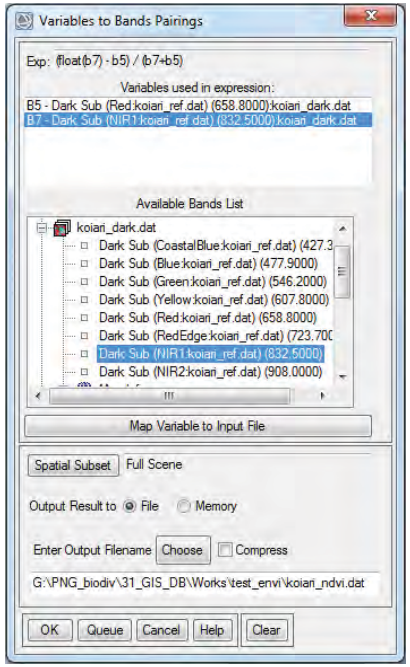


Variable to Bands Pairings *dialog appears. Bands will be assigned to variables, B5 and B7.*

Assign Band 5 of [koiari_dark.dat] to B5 in the **Variable used in expression**.

Assign Band 7 of [koiari_dark.dat] to B7 in the **Variable used in expression**.

Select [file] in the **Output Result to** field, enter output file name, [koiari_ndvi.dat], and click OK.

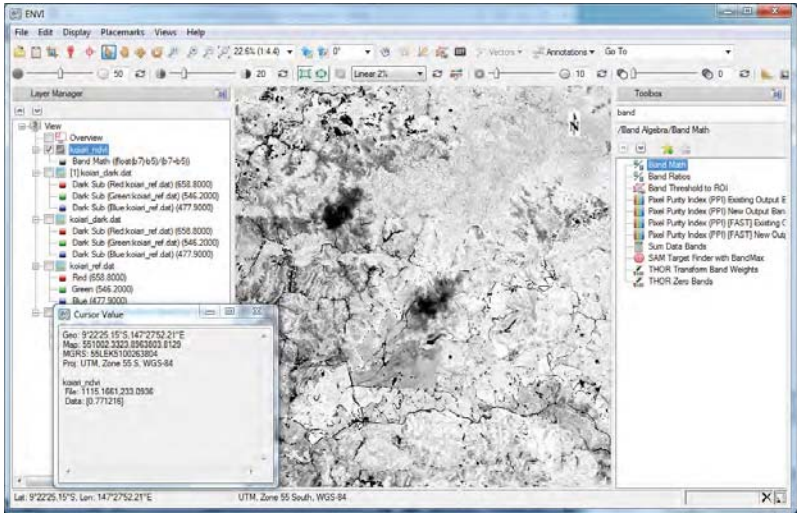


After the processing, [koiari_ndvi.dat] image will be added in the Layer Manager.

Select **Display > Cursor Value** to check the result.

Check values of [koiari_ndvi.dat] displayed in the **Cursor Value** window.

Although there are several vegetation indices, one of the most widely used is the NDVI. NDVI values range from +1.0 to -1.0. Areas of barren rock, sand, or snow usually show very low NFVI values (for example, 0.1 or less). Sparse vegetation such as shrubs and grasslands or crop lands may result in moderate NDVI values (approximately 0.2 to 0.5). High NDVI values (approximately 0.6 to 0.9) correspond to dense vegetation such as that found in temperate and tropical forests or crops at their peak growth stage.



Delete [koiari_ndvi.dat] from the Layer Manager.

Codicil:

*Through you calculate NDVI manually by using the Band Math tool for basic processing exercise in this processing, you can do it easily by using **NDVI** tool prepared under **Spectral > Vegetation** folder in the Toolbox.*

CLASSIFICATION

The Classification workflow uses either unsupervised or supervised methods to categorize pixels in an image into many classes. You can perform an unsupervised classification without providing training data, or you can perform a supervised classification, where you provide training data and specify a classification method of maximum likelihood, minimum distance, Mahalanobis distance, or Spectral Angle Mapper (SAM).

See Classification References for algorithm reference information.

Classification References:

Mahalanobis, Maximum Likelihood, Minimum Distance:

J.A.Richards, 1999, Remote Sensing Digital Image Analysis, Springer-Verlag, Berlin, p. 240.

Spectral Angle Mapper:

Kruse, F. A., A. B. Lefkoff, J. B. Boardman, K. B. Heidebrecht, A. T. Shapiro, P. J. Barloon, and A. F. H. Goetz, 1993, "The Spectral Image Processing System (SIPS) - Interactive Visualization and Analysis of Imaging spectrometer Data." Remote Sensing of Environment, v. 44, p. 145 - 163.

ISODATA:

Tou, J. T. and R. C. Gonzalez, 1974. Pattern Recognition Principles, Addison-Wesley Publishing Company, Reading, Massachusetts.

To select input files for classification:

1. Click **Browse** and select a panchromatic or multispectral image, using the File Selection dialog. The Classification workflow accepts any image format listed in Supported Data Types.
2. To apply a mask, select the Input Mask tab in the File Selection panel. Masked pixels constitute a separate class in classification output.
3. Click **Next**. The Classification Type panel appears and the file opens in a new workflow view. If the selected file is displayed in an active view before you start the workflow, the display bands and image location are retained, as well as any brightness, contrast, stretch, and sharpen settings. The image location is not retained for pixel-based images or those with pseudo or arbitrary projections.

To select a classification method:

In the Classification Type panel, select the type of workflow you want to follow, then click **Next**.

- **No Training Data:** opens the Unsupervised Classification panel to begin the unsupervised classification workflow. The unsupervised method does not rely on training data to perform classification.
- **Use Training Data:** opens the Supervised Classification panel to begin the supervised classification workflow. The supervised method uses training data from existing vector files, or from regions or points you interactively create on the image to perform classification.

Supervised Classification Settings

Supervised classification clusters pixels in a dataset into classes based on user-defined training data. The training data can come from the following sources:

- Polygons, points, or multipoints from existing vector layers or shapefiles.
- 3D point or polygon shapefiles.
- Polygons or points that you interactively create on a loaded image.

The training data must be defined before you can continue in the supervised classification workflow. Once defined, select the classes that you want mapped in the output.

Supervised classification methods include Maximum likelihood, Minimum distance, Mahalanobis distance, and Spectral Angle Mapper (SAM). If you used single-band input data, only Maximum likelihood and Minimum distance are available.

In the Supervised Classification panel, select the supervised classification method to use, and define training data.

1. Under the Algorithm tab, select a classification method from the drop-down list provided. To optionally adjust parameter settings for the algorithms:
    - **Maximum Likelihood:** Assumes that the statistics for each class in each band are normally distributed and calculates the probability that a given pixel belongs to a specific class. Each pixel is assigned to the class that has the highest probability (that is, the maximum likelihood). This is the default.
    - **Minimum Distance:** Uses the mean vectors for each class and calculates the Euclidean distance from each unknown pixel to the mean vector for each class. The pixels are classified to the nearest class.
    - **Mahalanobis Distance:** A direction-sensitive distance classifier that uses statistics for each class. It is similar to maximum likelihood classification, but it assumes all class covariances are equal, and therefore is a faster method. All pixels are classified to the closest training data.
    - **Spectral Angle Mapper:** (SAM) is a physically-based spectral classification that uses an *n*-D angle to match pixels to training data. This method determines the spectral similarity between two spectra by calculating the angle between the spectra and treating them as vectors in a space with dimensionality equal to the number of bands. This technique, when used on calibrated reflectance data, is relatively insensitive to illumination and albedo effects. SAM compares the angle between the training mean vector and each pixel vector in *n*-D space. Smaller angles represent closer matches to the reference spectrum. The pixels are classified to the class with the smallest angle.
2. Define the training data to use for classification. You must define a minimum of two classes, with at least one training sample per class.

3. Enable the **Preview** option to preview your results in a Preview Window before classifying the entire image. You can change the classification method and/or training data, then preview the results again as needed. If either the image lines or samples is greater than 1024 pixels and you want to zoom out of the data, you cannot zoom out further than 50% because it will significantly increase processing time and delay the previewed data from displaying. By design, zooming out further than 50% will result in a black Preview Window.
4. Click **Next**. The classification process begins, and the status displays on the Supervised Classification panel. When the classification process is complete, the Cleanup panel appears.

Set Advanced Options

In the Algorithm tab, you can apply no thresholding, one thresholding value for all classes, or different thresholding values for each class. Specifying a different threshold value for each class includes more or fewer pixels in a class. Enabling the Preview Window helps you to see the adjusted the values. To specify multiple values, select the class in the **Training Data** tree and enter the value. Press the **Enter** key to accept the value.

Maximum Likelihood

Set Probability Threshold

- **None:** No thresholding.
- **Single Value** or **Multiple Values**: Enter a value between 0 and 1 in the **Probability Threshold** field for all classes (**Single Value**) or specify a different threshold for each class (**Multiple Values**). ENVI does not classify pixels with a value lower than this value. The threshold is a probability minimum for inclusion in a class. For example, a value of .9 will include fewer pixels in a class than a setting of .5, because a 90% probability requirement is more strict than allowing a pixel in a class based on a chance of 50%.

Minimum Distance

Set thresholding options for **Set Standard Deviations from Mean** and/or **Set Maximum Distance Error**.

Set Standard Deviations from Mean

- **None:** No thresholding.
- **Single Value** or **Multiple Values**: Specify the number of standard deviations to use around the mean for all classes (**Single Value**) or specify a different threshold for each class (**Multiple Values**). Enter a pixel value between 0 and 10^7 in the **Standard Deviations from Mean** field. ENVI does not classify pixels outside this range. The lower the value, the more pixels that are unclassified.

Set Maximum Distance Error

- **None:** No thresholding.

- **Single Value** or **Multiple Values**: Enter a pixel value between 0 and 10^7 in the **Distance Error** field for all classes (**Single Value**) or specify a different threshold for each class (**Multiple Values**). ENVI does not classify pixels outside this range. The smaller the distance threshold, the more pixels that are unclassified.

The pixel of interest must be within both the threshold for distance to mean and the threshold for the standard deviation for a class. The condition for Minimum Distance reduces to the lesser of the two thresholds. A higher value set for each parameter is more inclusive in that more pixels are included in a class for a higher threshold.

If you select **None** for both parameters, then ENVI classifies all pixels.

Mahalanobis Distance

Set Maximum Distance Error: Select one of the following options:

- **None:** No thresholding.
- **Single Value** or **Multiple Values**: Enter a pixel value between 0 and 10^7 in the **Distance Error** field for all classes (**Single Value**) or specify a different threshold for each class (**Multiple Values**). ENVI does not classify pixels outside this range. Mahalanobis Distance accounts for possible non-spherical probability distributions. The distance threshold is the distance within which a class must fall from the center or mean of the distribution for a class. The smaller the distance threshold, the more pixels that are unclassified.

Spectral Angle Mapper

Set Maximum Spectral Angle: Select one of the following options:

- **None:** No thresholding.
- **Single Value** or **Multiple Values**: Enter a value in radians between 0 and 1.5708 (PI/2) in the **Spectral Angle** field for all classes (**Single Value**) or specify a different threshold for each class (**Multiple Values**). ENVI does not classify pixels with an angle larger than this value. The threshold angle is the angle in radians within which the pixel of interest must lie to be considered part of a class.The lower the value, the more pixels that are unclassified.

Compute Rule Images

Classifier to create a new classification image without having to recalculate the entire classification. To compute rule images for the selected classification algorithm, enable the **Compute Rule Images** check box. The output is a single file containing one rule image per class, with measurements for each pixel related to each class. The measures for the rule images differ based on the classification algorithm you choose. In contrast, the final classification image is a single-band image that contains the final class assignments; pixels are either classified or unclassified.

The pixel values in the rule images are calculated as follows:

Maximum Likelihood classification calculates the following discriminant functions for each pixel in the image:

$$g_i(x) = \ln p(\omega_i) - \tfrac{1}{2} \ln |\Sigma_i| - \tfrac{1}{2}(x - m_i)^T \Sigma_i^{-1} (x - m_i)$$

where:

i = the *i*th class
x = *n*-dimensional data (where *n* is the number of bands)
$p(\omega_i)$ = probability that a class occurs in the image and is assumed the same for all classes
$|\Sigma_i|$ = determinant of the covariance matrix of the data in a class
Σ_i^{-1} = the inverse of the covariance matrix of a class
m_i = mean vector of a class

Minimum Distance classification calculates the Euclidean distance for each pixel in the image to each class:

$$D_i(x) = \sqrt{(x - m_i)^T (x - m_i)}$$

where:

D = Euclidean distance
i = the *i*th class
x = *n*-dimensional data (where *n* is the number of bands)
m_i = mean vector of a class

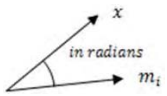
Mahalanobis Distance classification calculates the Mahalanobis distance for each pixel in the image to each class:

$$D_i(x) = \sqrt{(x - m_i)^T \Sigma_i^{-1} (x - m_i)}$$

where:

D =Mahalanobis distance
i = the *i*th class
x = *n*-dimensional data (where *n* is the number of bands)
Σ_i^{-1} = the inverse of the covariance matrix of a class
m_i = mean vector of a class

Spectral Angle Mapper classification calculates the spectral angle in radians for each pixel in the image to the mean spectral value for each class:



where:

x = *n*-dimensional data (where *n* is the number of bands)
m_i = mean vector of a class

Work with Training Data

You can load previously defined training data or create your own training data using the input image.

Load Previously Defined Training Data

Click the **Load Training Data Set** button and select a shapefile, 3D shapefile, or geodatabase that contains polygon-based or point-based training data. When you load training data that uses a different projection as the input image, ENVI reprojects it. If the training data uses different extents, the overlapping area is used for training. Loading previously defined training data replaces any training data that were drawn on the screen previously.

You can use the Attribute Viewer to group polygon regions of interest (ROIs) into fewer classes as long as the shapefile includes a CLASS_ID attribute. For example, suppose that you defined several hundred polygon ROIs representing training regions, but you only want 10 classes. Export the ROIs to a shapefile, open the shapefile in ENVI, open the Attribute Viewer, and group the polygon ROIs into 10 classes by editing the CLASS_ID values. Then import the shapefile as training data in the Classification workflow.

Interactively Define Training Data

When you select **Use Training Data**, the **Symbol Annotation**, **Polygon Annotation**, **Rectangle Annotation**, and **Ellipse Annotation** buttons are enabled in the main toolbar, and a new layer named Training Data is added to the Layer Manager. The training layer can contain either all polygons or all points.

- To create polygon-based training data, select the Polygon Annotation, Rectangle Annotation, or Ellipse Annotation buttons.
- To create point-based training data, click the Symbol Annotation button.

Once you add the first region or point to the class, the toolbar changes so that the other training data type is no longer available (for example, if you are creating polygon-based training data, the **Symbol Annotation** button is disabled).

To provide adequate training data, create a minimum of two classes, with at least one region or point per class. If you applied a mask to the input data, create training samples within the masked area only.

- To select a class to modify, select it from the **Training Data** tree.

- Add, move, and edit regions or points in the selected class. Annotations describes how to tools to mark training data. Do not draw regions or add points outside the raster bounds.
- To change the training data type if you have already added regions or points (i.e., you added points to the image but want to use polygon-based training data instead), you can delete the existing training data and start over. To delete the training data, click the **Delete Class** button, or right-click on the class and select **Delete Class**. You can also click the **Select** tool from the toolbar, select the data to delete, and press the **Delete** key on the keyboard. All regions or points must be deleted before you can proceed with the new training data type.
- To add a new class, click the **Add Class** button, or right-click and select **Add Class**.
- To delete a class, select the class to delete and click the **Delete Class** button, or right-click on the class and select **Delete Class**.
- To save the training data, click the **Save Training Data Set** button.

Note: Data originating from a 3D shapefile will not be saved in 3D format; it will be saved in the same 2D format as all other training data.

- To edit the properties for a class, see the following.

Edit Class Properties

You can change the following properties in the Supervised Classification panel:

- **Class Name:** The name of the class that will be output in the results.
- **Class Color:** The color that will display for that class in the results.
- **Fill Interior:** Specifies whether the polygon has a fill (**Solid**) or no fill (**None**).

To clean up classification results:

The optional Cleanup step refines the classification result. You can preview the refinement before you apply the settings.

Tip: Cleanup is recommended if you plan to save the classification vectors to a file in the final step of the workflow. Performing cleanup significantly reduces the time needed to export classification vectors.

1. Enable the check boxes for the cleanup methods you want to use. The following are available:
    - **Enable Smoothing:** removes speckling noise during cleanup.
    - **Enable Aggregation:** removes small regions.
2. Enter values for the cleanup methods you enabled:

    - Specify the **Smooth Kernel Size** using an odd number (e.g., 3 = 3x3 pixels). The square kernel's center pixel will be replaced with the majority class value of the kernel. The default is **3**.
    - Specify the **Aggregate Minimum Size** in pixels. Regions with a size of this value or smaller are aggregated to an adjacent, larger region. The default is **9**.
3. Enable the **Preview** option to see the cleanup results in a Preview Window before processing the entire image. You can change the cleanup settings and preview the results again, as needed.
4. Click **Next**. The Export panel appears.

To export classification results:

1. In In the Export Files tab in the Export panel, enable the output options you want. The following are available:
    - **Export Classification Image** saves the classification result to an ENVI classification file.
    - **Export Classification Vectors** saves the vectors created during classification to a shapefile or geodatabase. The output area units are in square meters.

      Note: Depending on the image size, exporting to vectors may be time-consuming. Performing the Cleanup step is recommended before exporting to vectors.
2. In the Additional Export tab, enable any other output options you want. The following are available:
    - **Export Classification Statistics** saves the classification statistics to a text file. The output area units are in square meters.
    - **Export Rule Images** saves the rule images to ENVI raster format. This option is available if you performed supervised classification and you enabled the **Compute Rule Images** option in the Algorithm tab of the Supervised Classification panel.
3. Click **Finish** to create the output, add the new layers to the Layer Manager, and save the files to the directories you specified. When the export is complete, the workflow view closes. The original data and the export data display in the Image window view. The classes display in the Layer Manager as children of the raster.

Exercise:

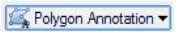
In this exercise, you will implement supervised classification.

Enter "class" in the search field of the Toolbox, and select **Classification Workflow** to open.

In the **File Selection** dialog, click **Browse**, select [koiari_dark.dat], and click OK. Click **Next** in the **File Selection** dialog to move on next step.

In the **Classification Type** dialog, select **Use Training Data**, and click **Next**.

*You will create training data by using polygon in the **Define Training Data** dialog. You will take out training data for forest, grassland, bare land, water, cloud, and shadow.*

Confirm that the **Polygon Annotation** tool  in the toolbar is selected.

You can change Class Name and Class Color of training data in the Class Properties.

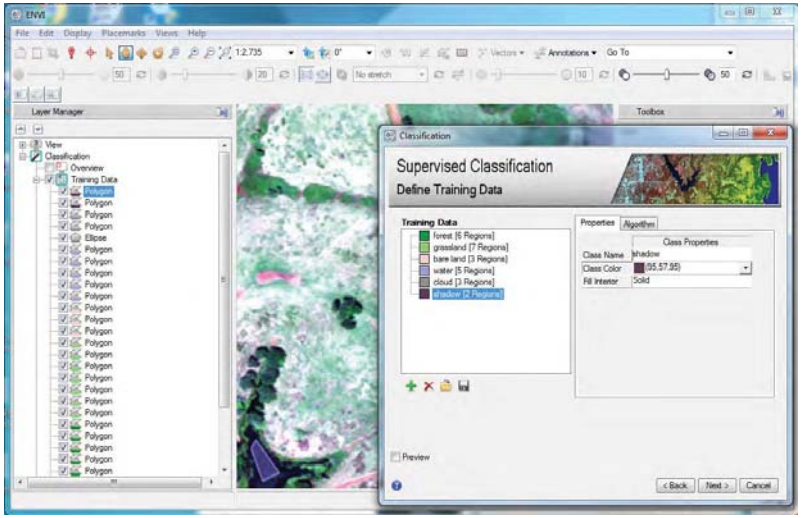
Use the **Polygon Annotation** tool to create training data. Click vertex to draw polygon and select **Accept** from the right-click menu to close the polygon.

When you delete a polygon, select **Select** tool from the toolbar, select a target polygon, and select **Clear** from the right-click menu. Or, right-click on the target polygon in the Layer Manager and select **Delete** from the menu.

When you move a polygon, select **Select** tool, select a target polygon, and drug it.

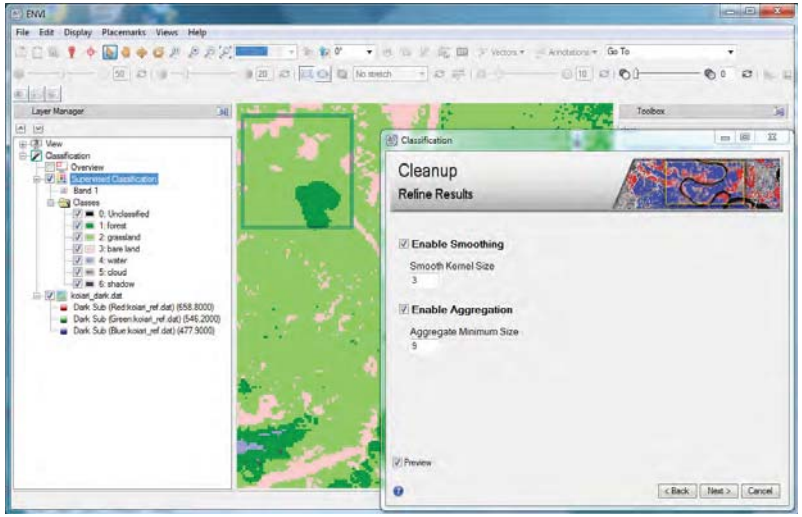
When you change a polygon, select **Select** tool, click vertex of a polygon, and drug it.

To add class, click **Add Class** button  in the Classification dialog.



After creating training data for all classes, click Next.

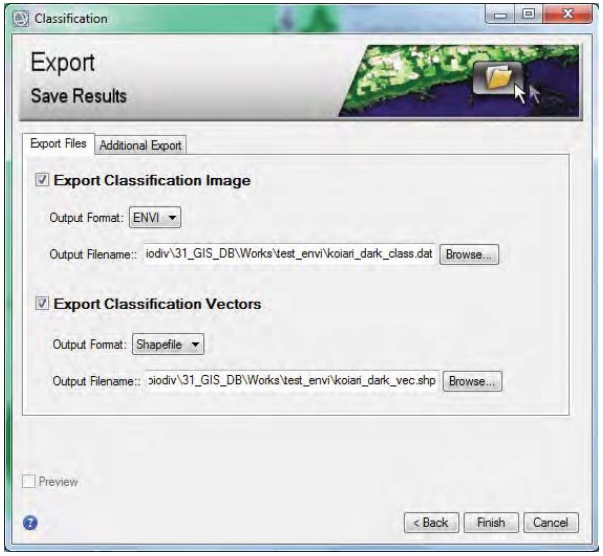
In the Refine Results dialog, adjust **Smooth Kernel Size** and **Aggregate Minimum Size** to eliminate small sized patches like noise. Tick [Preview] to display a processing result at once. After the adjustment, click Next.



In the Save Result dialog, entry output format and folder where the classification result will be exported.
You can export both of raster format and vector format.

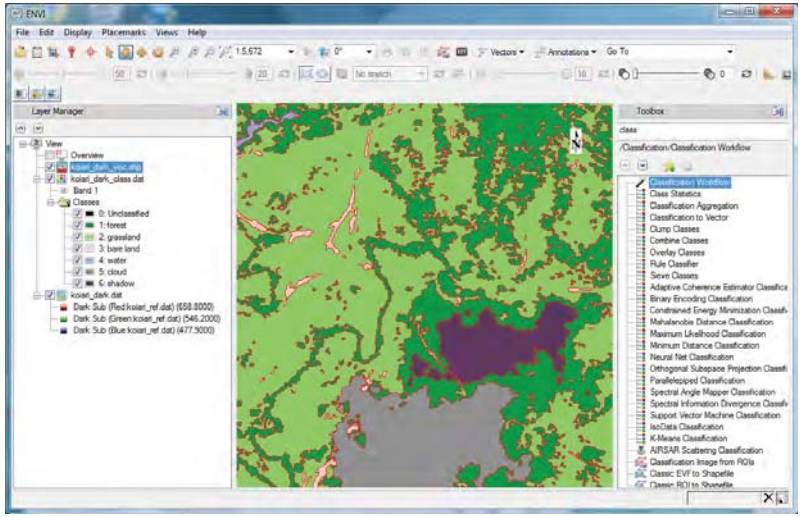
Export Classification Image: koiari_dark_class.dat

Export Classification Vectors: koiari_dark_vec.shp



After confirming export folder and file name, click Finish.

Confirm that [koiari_dark_class.dat] and [koiari_dark_vec.shp] are added in the Layer Manager.



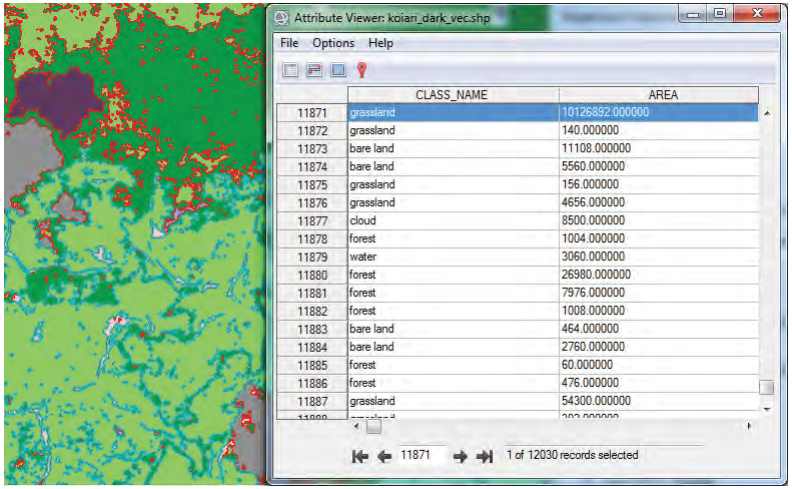
VERIFY CLASSIFICATION RESULT

Exercise:

The classification results were exported to vector file and raster file in the last exercise. You will verify each result.

Right-click on [koiari_dark_vec.shp] in the Layer Manager, select **View/Edit Attributes**.

The Attribute Viewer appears. You can confirm class and area of each classified polygon.



Next, you will compare raster data.

Move [koiari_dark_class.dat] layer to the top of the View in the Layer Manager.

Move [koiari_dark.dat] layer under the [koiari_dark_class.dat] layer.

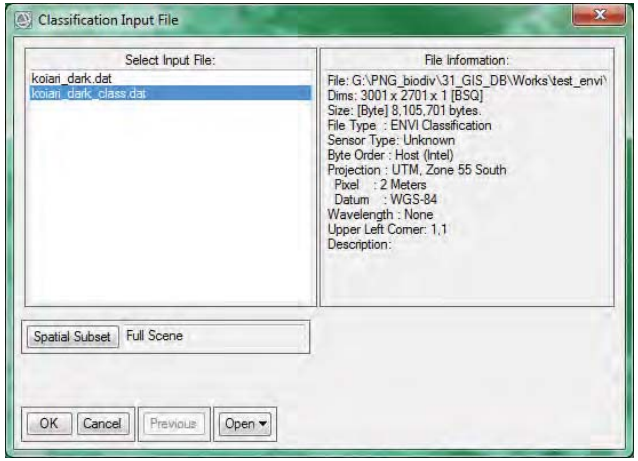
Click **Portal** button in the toolbar to compare the original image: [koiari_dark.dat] and the classification result: [koiari_dark_class.dat].

After confirming the result, close the Portal window.

You will confirm statistics using the raster classification result.

Enter "statistics" in the search field of the Toolbox, and double-click **Class Statistics** to open.

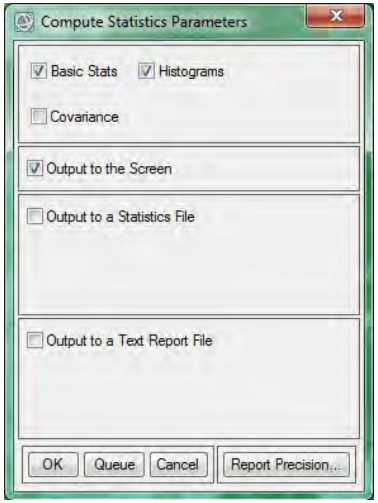
In the **Classification Input File** dialog, select [koiari_dark_class.dat], and click OK.



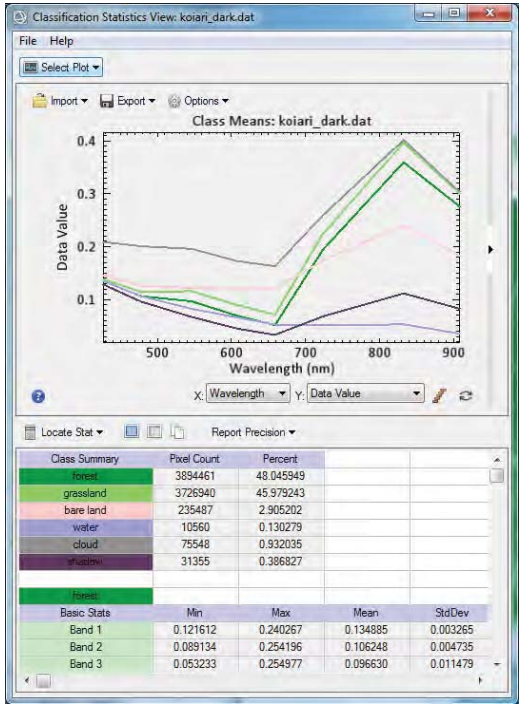
In the **Statistics Input File** dialog, select [koiari_dark.dat], click OK.

In the **Class Selection** dialog, select classes to be calculated statistics. Select from forest to shadow holding down Shift key, and click OK.

In the **Compute Statistics Parameters** dialog, tick [Histograms], and click OK.



Statistics of the classification result are exported.



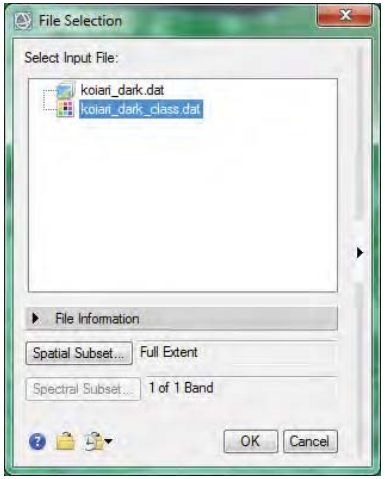
EXPORT CLASSIFICATION RESULTS

Exercise:

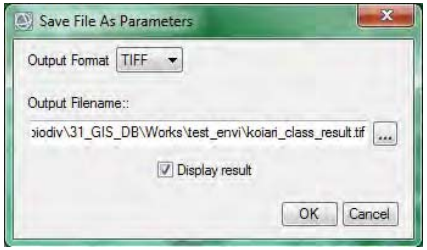
In this exercise, you will learn how to save an image. You will save the classification result in TIFF format.

Select **File > Save As > Save As... (ENVI, NITF, TIFF, DTED)**.

In the **File Selection** dialog, select [koiari_dark_class.dat], click OK.



In the **Save File As Parameters** dialog, select [TIFF] for the Output Format, entry [koiari_class_result.tif] in the Output Filename, and click OK.



Confirm that the exported file is added in the Layer Manager.

Codicil:

*There are several save menus in the **Save As** menu bar.*

For More Information

DATA PROCURED IN THE PROJECT

Satellite Imagery Procured in CEPA-JICA Biodiversity Project

High resolution satellite imagery procured by Kokusai Kogyo Co., Ltd. in the project for biodiversity conservation through implementation of the PNG policy on protected areas is transferred to Conservation and Environment Protection Authority (CEPA).

Specification of the transferred product is as follows.

Product

ITEM DESCRIPTION	QUANTITY
WorldView-2 (Archive / Ortho Ready Standard / 50, 60 cm)	
Area of interest in Papua New Guinea	
1) site_buf_simple_01_dd (054763411020_01)	492 km2
2) site_buf_simple_02_dd (054763411010_01)	233km2

1) site_buf_simple_01_dd (054763411020_01)

2) site_buf_simple_02_dd (054763411010_10)

User information transferred the product

Organization: Papua New Guinea Conservation and Environmental Protection Agency
Address: P.O. Box 6601, BOROKO. NCD Papua New Guinea
Telephone: (675) 301 4517
Person in charge: Gerard Phillip Natera
E-mail: gnatera@dec.gov.pg

Organization information who procured the product

Organization: Kokusai Kogyo Co., Ltd.
Address: 2-24-1 Harumicho, Fuchu City, Tokyo, 183-0057, JAPAN
Telephone: (81) 42 330 1050
Person in charge: Ayako OCHI
E-mail: ayako_ochi@kk-grp.jp

The product shall be used in accordance with Digital Globe Internal Use License terms.

Digital Globe Internal Use License:

https://www.digitalglobe.com/legal/information

https://dg-cms-uploads-production.s3.amazonaws.com/uploads/legal_document/file/9/WW0023A_InternalUseLicense_Ver2-24-15_JAPANESE.pdf

FOR MORE INFORMATION

WORLDVIEW-2 SPACECRAFT INFORMATION AND SPECIFICATIONS

DATA SHEET:

https://www.digitalglobe.com/resources/satellite-information

FREE DATA

USGS Earth Resources Observation and Science Center (EROS):

http://glovis.usgs.gov/
Various satellite and land characteristics datasets including the free Landsat archive

USGS EarthExplorer:

http://earthexplorer.usgs.gov/
Free aerial photography, DEM, and various satellite data including the free Landsat archive

USGS Hazards Data Distribution System (HDDS):

https://hdds.usgs.gov/hazards-data-distribution-system-hdds

UNEP Environmental Data Explorer:

http://geodata.grid.unep.ch/
A wide variety of raster and vector geospatial datasets

NOAA National Centers for Environmental Information – Earth Observation Group:

http://ngdc.noaa.gov/eog/
VIIRS data and DMSP (Defense Meteorological Satellite Program) data

Global Land Cover Facility:

http://landcover.org/data/
Various satellite and DEM datasets including the free Landsat archive

Geo Community:

http://data.geocomm.com/
A wide variety of raster and vector datasets

CGIAR Consortium for Spatial Information (CGIAR-CSI):

http://srtm.csi.cgiar.org/
SRTM 90m Digital Elevation Data

ASTER Global Digital Elevation Model (GDEM) (30m resolution):

FOR MORE INFORMATION

http://www.jspacesystems.or.jp/ersdac/GDEM/E/index.html

Brazil National Institute for Space Research:

http://www.dgi.inpe.br/CDSR/
CBERS2 and CBERS-2B data

Canadian Council on Geomatics (CCOG) GeoBase:

http://www.geobase.ca/
DEM, SPOT, Landsat and RADARSAT-1 datasets

Canadian Geospatial Data Infrastructure (CGDI) GeoConnections Discovery Portal:

http://geodiscover.cgdi.ca/
A wide variety of satellite imagery, aerial photography and geography data

Canadian Geospatial Data Infrastructure (CGDI) GeoGratis:

http://geogratis.cgdi.gc.ca/
A wide variety of satellite imagery, DEM data, etc.

ESRI ArcGIS Online:

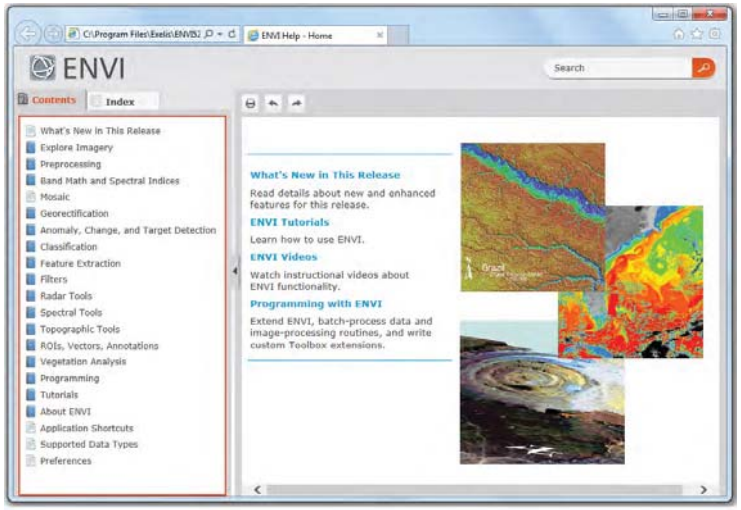
http://arcgisonline.com/
A wide variety of raster and vector datasets

FOR MORE INFORMATION

SUPPORT INFORMATION FOR ENVI

ENVI Help:

From the menu bar, select **Help > Contents**



Technical Information and Case studies:

http://www.harrisgeospatial.com/Learn.aspx

ENVI SOFTWARE PROCURED IN THE PROJECT

Product

ITEM DESCRIPTION	QUANTITY
ENVI Runtime for Windows	
1) ENVI Runtime 5.2 for Windows Floating License	1
2) ENVI5.2 for Windows Feature Extraction Module	1

添付資料 4.1.8 GIS Data Management

The Project for
Biodiversity Conservation through Implementation of
the PNG Policy on Protected Areas

GIS Data Management

Transfer the data created in the Project to CEPA
for the sustainable use of the data

CEPA-JICA Project Prepared
February, 2020

CEPA - JICA
Biodiversity Project

Introduction

- The CEPA-JICA Biodiversity Project will terminate in July 2020.
- In the Project, various GIS data and maps have been collected and created through the activities to strengthen Varirata National Park (VNP) management and to establish Marine Protected Area (MPA).
- It is desirable for CEPA to utilize the data and maps after the Project terminates.

Objectives

- To ensure the sustainability of the data created in the Project into the future, it is planned to:
  - i. let CEPA staff concerned with Protected Area know the contents of GIS data and maps,
  - ii. let IT/GIS/DB staff know GIS data formation,
  - iii. discuss possibility of utilization of the data and maps after the Project,
  - iv. share and discuss method of updating facility data in VNP for the future Park management, and
  - v. discuss how to manage / store the data in the CEPA server.

Contents / Schedule

Section	Date / Time	Title	Target person
1	4 Feb 2020 9:30 (1.5 hours)	Introduction of the data / maps to be shared (technical)	GIS/DB/IT officers
2	4 Feb 2020 11:00 (30 min)	Discussing how to store the data in the CEPA server	GIS/DB/IT officers
3	5 Feb 2020 9:30 (30 min)	Introduction of the data / maps to be shared (for Protected Area management officers)	PA management officers
4	5 Feb 2020 10:00 (2 hours)	Technical transfer and discussion of GIS data management / update for the future VNP management	GIS/DB officers, VNP management officers
5	5 Feb 2020 12:00 (30 min)	Discussion on possibility of utilization of the data and maps after the Project	PA management officers, GIS/DB officers

* GIS data server should be set up until January 2020.

1. Introduction of the data / maps to be shared

Introduction and Objectives

- In this section, the items below will be introduced.
  - the data purchased, collected and created in the Project
  - basic information of satellite imagery purchased and collected
  - basic information of Global Forest Change (GFC) data and how to get and process the data
  - the maps created
  - formation of files and folders which the data and maps are stored

- GIS data manager and operator will get grasp of the data and maps prepared in the Project to manage them for the future.
- GIS data manager and operator will get basic knowledge of satellite imagery and GFC data.
- Project GIS database and maps including GIS DB list and the related documents will be shared.

Contents

CEPA-JICA Project GIS Database

- **GIS Database** and **GIS Detabase List** (to be shared after the Project)
- Data shared by CEPA / Data created in the Project
- File format: shapefile (vector)

Data / Folder construction

- **Main folder description**

: There is only trial data now.
: There is only data gotten from CEPA.
: There is only data gotten from CEPA, but data links to Map document created in the Project.

File type	Folder name	Description
Satellite & airborne imagery (original/pre-analysis data)	01_Satellite	Satellite imagery (original/pre-analysis data)
	02_DEM	Satellite imagery (DEM) (original/pre-analysis data)
	03_TopoMAP	Topographic Survey map (1:100,000) produced by RASC
	09_DroneData	Drone imagery
Analysis data	11_TopoAnalyst	Topological analysis data
	12_SatelliteAnalyst	Satellite imagery analysis data
Thematic data	21_Boundary	Boundary data
	22_Census	Census data
	23_ForestMap	National Forest Base Map
	24_Landuse	Land use map
	25_LandCon	Land condition map
	26_GeologicalMap	Geological map
	27_Fishery	Fishery related data
	28_Mining	Mining related data
	29_ProtectedArea	Protected area data
	30_Others	Other data
	31_VarirataNP	Varirata NP related data
	32_MarineNP	Marine PA related data
Exsisting system & data sets	41_PNGRIS	PNGRIS (PNG Resource Information System)
	42_Geobooks	Geobook data produced by UPNG
	51_Hansen	Global Forest Change data by Hansen et al.
	52_Openstreetmap	Open street map
	53_Google	Google satellite imagery
	54_ISCGM	International Steering Committee for Global Mapping data
Map layout & output images	81_MapLayout	Map layout (Map document file)
	82_Maps	Report file/Exported map
	83_Logo	Image for map (ex: PNG logo)
Other documents	91_Documents	Other documents (non-spatial data) such as manuals

Data / Folder construction

- **Sub-folder** (GIS Database List)

1: Prepared by the Project

File type	Folder name		File name	Description	Extent	Souce	Prepared
Satellite & airborne imagery (original/pre-analysis data)	01_Satellite	LANDSAT	(many)	Landsat imagery downloaded about every 5 years Unprocessed	Project Area	http://earthexplorer.usgs.gov/	1
		LANDSAT_CEPA	5-55-051.img	Landsat mosaic imagery	PNG	CEPA database	
		RapidEye_2010	(many)	RapidEye imagery	PNG	PNGFA	1
		WorldView2	(many)	WorldView-2 imagery	Project Area	Procured by CEPA-JICA Project	1
		PALSAR	(many)	ALOS/PALSAR imagery. Stack images of HH, HV, and HHHV	PNG	PNGFA	1
		z_indexmap	(many)	Data for index map of satellite imagery	-	Prepared by CEPA-JICA Project	1
			IndexMap_Satellite.mxd	Index map of satellite imagery	-	Prepared by CEPA-JICA Project	1
	02_DEM	ALOS_DEM	(many)	ALOS DEM	Project Area	http://www.eorc.jaxa.jp/ALOS/aw3d30/index_j.htm	1
		ASTER_GDEM	gdem_mosaic_sub.img	ASTER GDEM (mosaic for entire PNG)	PNG	http://www.jspacesystems.or.jp/ersdac/GDEM/J/	1
			ASTGTM2_S10E147_dem.tif	ASTER GDEM Used for analysis of surface and watershed in the Project.	Project Area	http://www.jspacesystems.or.jp/ersdac/GDEM/J/	1
		SRTM_30	SRTM30.tif	SRTM DEM 30m	PNG	http://www2.jpl.nasa.gov/srtm/	1
		SRTM_90	srtm_png.img	SRTM DEM 90m (mosaic for entire PNG)	PNG	http://www2.jpl.nasa.gov/srtm/	1
			srtm_png_sub_rp0_u55s.img	SRTM DEM 90m (mosaic for entire PNG) (UTM)	PNG	http://www2.jpl.nasa.gov/srtm/	1
			s10_e147_1arc_v3.tif	SRTM (30mDEM)	Project Area	http://www2.jpl.nasa.gov/srtm/	1
	03_TopoMAP	geo_image	8378_Gaire.tif/8379_PortMoresby.tif	Topographic Survey map (1:100,000) produced by RASC	PortMoresby around	CEPA database	
	09_DroneData			Drone imagery	Project Area	Acquired by CEPA-JICA	1

Main data in the Project DB

- **Main data**
  - 01_Satellite
    - LANDSAT: for Project area/ downloaded about every 5 years/ unprocessed
    - WorldView2: for Project area/ purchased in the Project/ high resolution (for more detail, refer to other PPT document)
    - RapidEye2010: for entire PNG/ from PNGFA
    - PALSAR: for entire PNG/ from PNGFA/ ALOS PALSAR imagery
    - IndexMap_Satellite.mxd: index map of satellite imagery
  - 02_DEM
    - ALOS DEM: for Project area
    - ASTER GDEM: for Project area
    - SRTM DEM (90m): for entire PNG
    - SRTM DEM (30m): for entire PNG
  - 11_TopoAnalyst (surface, hillshade, slope, contour)
    - ASTER: for Project area
    - SRTM: for entire PNG

Main data in the Project DB

- **Main data**
  - 21_Boundary
    - Project area, etc.
  - 22_Census: PNG Census 2011 (NSO)
  - 23_ForestMap: Forest Base Map 2012 (PNGFA): for CEN, NCD
    * PNGFA revised Forest Base Map 2012, and also created Forest Cover Map 2015.
  - 31_VarirataNP
    - VNP boundary
    - Land use map of Project area
    - Facilities in VNP
    - Camera traps in VNP
    - MAB zoning map of Project area
    - Biological survey data implemented in the Project in 2017

Main data in the Project DB

- **Main data**
  - 32_MarineNP
    - Mangrove map of Project area
    - Reef map of Project area
    - Depth line
    - Zoning map of MPA (Motupore island, UPNG land, CPC land, and Tahira farm)
    - Proposed National Marine Sanctuary
    - Management zone of National Marine Sanctuary
    - A variety of features such as jetty, resort, habitat areas, cultural/historical areas
  - 51_Hansen: Global Forest Change data by Hansen et al.
    - Forest cover
    - Loss
    - Gain
    - Lossyear

Main data in the Project DB

- **Main data**
  - 81_MapLayout: folder for Map documents (mxd)
  - 82_Maps: folder for maps (jpg, pdf): maps exported from the Map documents
  - 91_Documents: folder for non-spatial data
    - GIS database list
    - Manuals and related documents
      - Updating facility database (July 2016, by Mr Imai)
      - Update of VNP facility database (October 2018)
      - Manual on Getting location information (Importing GPS data to GIS) (February 2018)
      - ENVI manual (4 April 2017)
    - Presentation documents
      - Introduction of Satellite Imagery - WorldView-2 (22 April 2016)
      - GIS Data Management (February 2020)

For your reference

Main data in the Project DB

- **LANDSAT**
  - Launch date:
    - LandLandsat-1, 2, 3: 1972
    - Landsat-4, 5: 1982
    - Landsat-7: 1999
    - Landsat-8: 2013
    - Landsat-9: 2020 (plan)
  - Operation status: under operation
  - Supplier: USGS/NASA
  - Global revisit time: 16 – 18 day
  - Swath width: 185 km

Bands & GSD (Landsat-8)

No.	Bands	Wavelength range (nm)	GSD
1	New Deep Blue	433 – 453	30 m
2	Blue	450 – 515	30 m
3	Green	525 – 600	
4	Red	630 – 680	
5	NIR	845 – 885	
6	SWIR 2	1560 – 1660	
7	SWIR 3	2100 – 2300	
8	PAN	500 – 680	15 m
9	SWIR	1360 – 1390	30 m
10	TIRS 1	10.6 – 11.19 µm	100 m
11	TIRS 2	11.5 – 12.51 µm	

  - Reference: https://directory.eoportal.org/web/eoportal/satellite-missions/l/landsat-8-ldcm

For your reference

Main data in the Project DB

- **RapidEye**
  - Launch date: 29 August 2008
  - No of satellite: 5
  - Operation status: under operation for all 5 satellites
  - Supplier: DigitalGlobe
  - Global revisit time: 1 day
  - Swath width: 77 km
  - GSD at nadir: 6.5 m (Ortho: 5 m)
  - Bands: 5 (400 – 850 nm)
    - Blue ... 440 – 510 nm
    - Green ... 520 – 590 nm
    - Red ... 630~680 nm
    - Red edge ... 690 – 730 nm
    - Near-infrared ... 760 – 850 nm

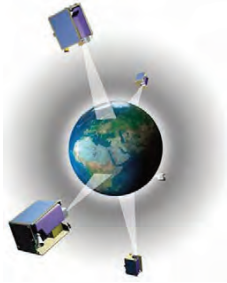


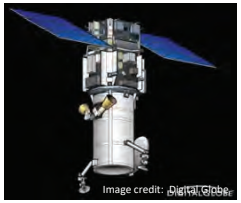
Image copyright: BlackBridge

  - Reference: https://directory.eoportal.org/web/eoportal/satellite-missions/r/rapideye

For your reference

Main data in the Project DB

- **WorldView-2**
  - Launch date: Oct 2009 (WorldView-2)
    - WorldView-1: Sep 2007
    - WorldView-3: Aug 2014
    - WorldView-4: Nov 2016
  - Operation status: under operation
  - Supplier: DigitalGlobe
  - Global revisit time:
    - 1.1 days at 1 m GSD
    - 3.7 days at 20° off-nadir or less (0.52 m GSD)
  - Swath width: 16.4 km at nadir
  - GSD at nadir:
    - 0.46 m (panchromatic)
    - 1.85 m (multispectral)
  - Reference: https://directory.eoportal.org/web/eoportal/satellite-missions/v-w-x-y-z/worldview-2



Bands

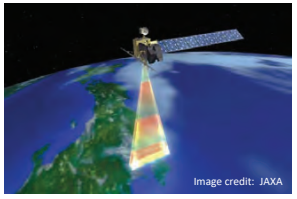
Bands		Wavelength range (nm)
Panchromatic		400 – 800
8 multispectral	Coastal	400 – 450
	Blue	450 – 510
	Green	510 – 580
	Yellow	585 – 625
	Red	630 – 690
	Red Edge	705 – 745
	Near-IR1	770 – 895
	Near-IR2	860 – 1040

** For more details, refer to the presentation: Introduction of Satellite Imagery - WorldView-2 (22 April 2016)*

For your reference

Main data in the Project DB

- **ALOS/PALSAR (Phased Array type L-band Synthetic Aperture Radar)**
  - Launch date: 24 January 2006
  - Operation status: Termination on 22 April 2011
    - ALOS-2 was launched in 2014.
    - ALOS-3 and ALOS-4 are planned in 2020.
  - Supplier: JAXA
  - Global revisit time: 46 days
  - Swath width: 70 km (High resolution mode)
  - GSD at nadir: 10 m (High resolution mode)
  - Center frequency: 1270 MHz (L-band)
  - Polarization: HH or VV / HH + HV or VV + VH
  - Reference: https://directory.eoportal.org/web/eoportal/satellite-missions/a/alos

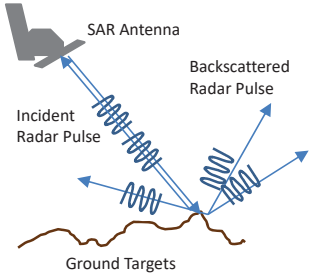


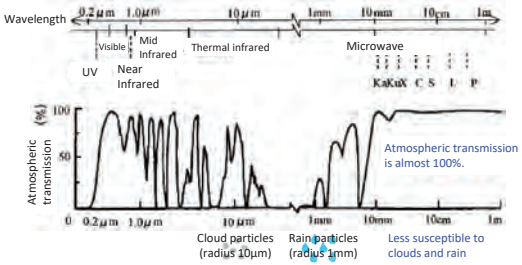
For your reference

Main data in the Project DB

- ***What is SAR - Features and points to keep in mind –***

  SAR Basic Principle
  - SAR (Synthetic Aperture Radar)
  - **Active sensor**, provides its own source of electromagnetic energy, emits radiation in the direction of the target to be investigated, and then detects and measures the radiation that is backscattered from the target
  - The advantages of **day-night operability**, **cloud penetration**, and the ability to calibrate without performing atmospheric corrections



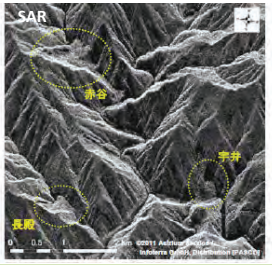


For your reference

Main data in the Project DB

- ***What is SAR images - Features and points to keep in mind –***

  Differences between SAR and optical images
  - A Single polarization SAR image is a **monochrome** image that shows the reflection intensity of microwaves, and it is **difficult to intuitively determine the ground covering condition** (difference between bare land and vegetation, etc.) compared to an optical image.
  - Since the SAR image is photographed obliquely downward, the image looks like a bird's-eye view, which has the characteristics image **distortion** and **layover**.



Adapted from research material by National Institute for Land and Infrastructure Management

Main data in the Project DB

- ***What is SAR images - Features and points to keep in mind –***

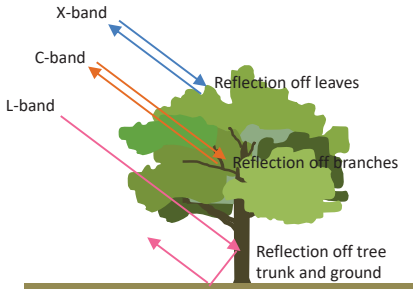
  Difference in wavelength (band)

  – Electromagnetic wave is divided into separate bands by wavelength, and called the table below.

  – Currently operating SAR satellites mainly use **L, C, and X bands**.

  – **Longer wavelength** electromagnetic waves can **easily penetrate trees**.

Bands	Wavelength (nm)
Ka	7.5 – 11
K	11 – 16.7
Ku	16.7 – 24
X	24 – 37.5
C	37.5 – 75
S	75 – 150
L	150 – 300
P	300 - 1000



Main data in the Project DB

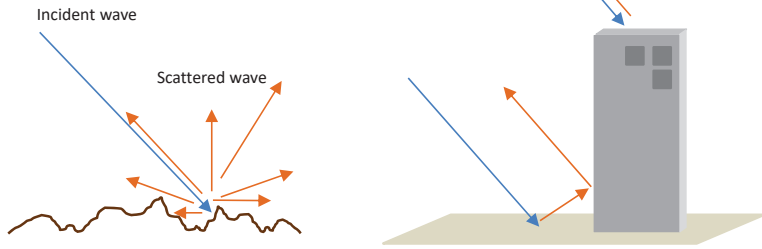
- ***What is SAR images - Features and points to keep in mind –***

  Microwave scattering

  – Scattering from the object is surface scattering. Microwaves are scattered at the interface between media.

  – The scattering is stronger as permittivity of the medium is larger. Backscattering increases as surface roughness increases (left-hand figure).

  – **Double scattering** also occurs due to artificial structures (building, etc.) (right-hand figure).



Main data in the Project DB

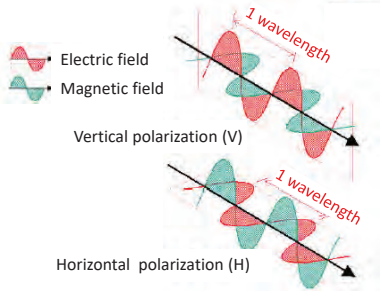
- ***What is SAR images - Features and points to keep in mind –***

  Polarization

  – Polarization describes the relationship between the **amplitude** and the **direction** of a time-varying electric field oscillation.

  – It divided into **horizontal polarization (H)** and **vertical polarization (V)** by the direction of electric field, and describes HH, HV, VH, or VV depending on the combination of transmitting and receiving (1st character: transmitting, 2nd character: receiving).

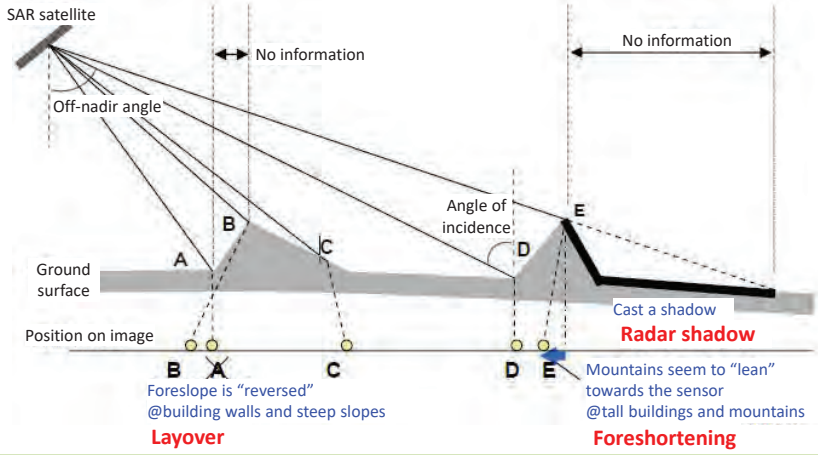
  – Strength of backscattering refers to the strength at which microwaves emitted from the SAR satellites antenna are scattered by the target object and return toward the antenna.



Main data in the Project DB

- ***What is SAR images - Features and points to keep in mind –***

  Characteristic phenomena of SAR images



Main data in the Project DB

- ***What is SAR images - Features and points to keep in mind –***

  Characteristic phenomena of SAR images

  – In a **steep mountainous area**, there are terrain and features that are difficult to see depending on the position, shape, direction, and gradient of the object.

  – **Rader shadow** zones appear as **shadow**, **jet black**, on the image -> **No information**

  – **Smooth and flat surface** (water surface, parking lot, ground, etc.) is similar to rader shadow on the image. On these surfaces, the emitted radio waves are specularly reflected, and the reflected waves do not return to the antenna. Therefore, they become black on the image, similar to radar shadow, so it is necessary to judge them from the surrounding situation.

  – **Layover** zones appear as **bright features** on the image -> **No information**

  – Since **foreshortening** distorts the shape of the object, you should always keep that in mind when interpreting and proceed with the interpretation while restoring the actual shape.

Main data in the Project DB

- **Global Forest Change data (Hansen data)** (1/7)

  – Results from time-series analysis of **Landsat** images characterizing **forest extent** and **change**.

  – Published by **Hansen** et al., University of Maryland

  – Dataset:

  - **Tree cover** in the year 2000
  - **Forest cover gain** during the period 2000-2012
  - **Forest cover loss** during the period 2000-2018
  - Circa year **2000 Landsat 7 cloud-free image** composite
  - Circa year **2018 Landsat cloud-free image** composite

  ➢ **Trees** are defined as **vegetation taller than 5m in height** and are encoded as a percentage per output grid cell, in the **range 0-100**.

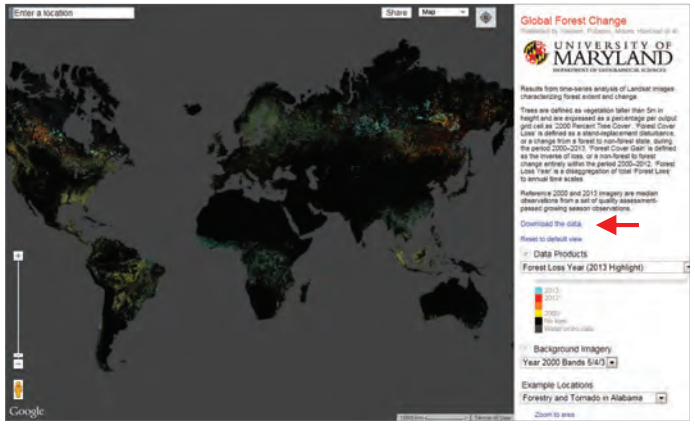
  ➢ Forest gain is encoded as either **1 (gain)** or **0 (no gain).**

  ➢ Forest loss is encoded as either **0 (no loss)** or else a value in the **range 1–17**, representing loss detected primarily in the year 2001–2018, respectively.

Main data in the Project DB

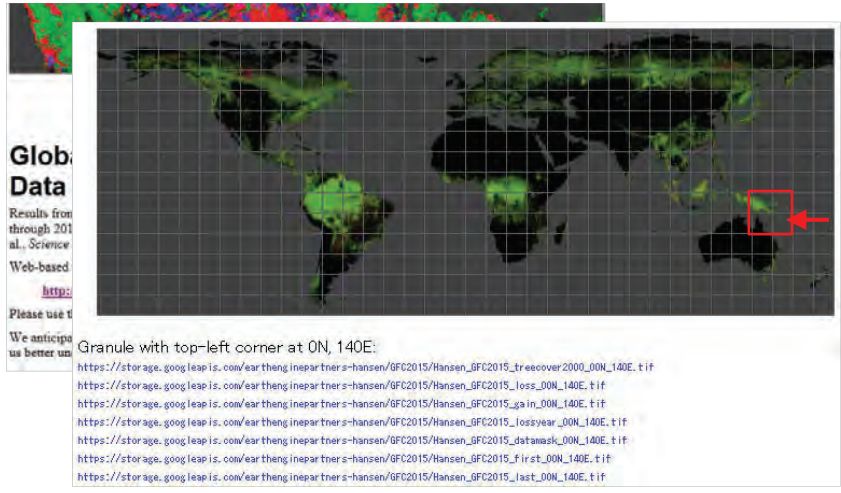
- **Global Forest Change data (Hansen data)** (2/7)

  – Data can be downloaded from the site:
  http://earthenginepartners.appspot.com/science-2013-global-forest



Main data in the Project DB

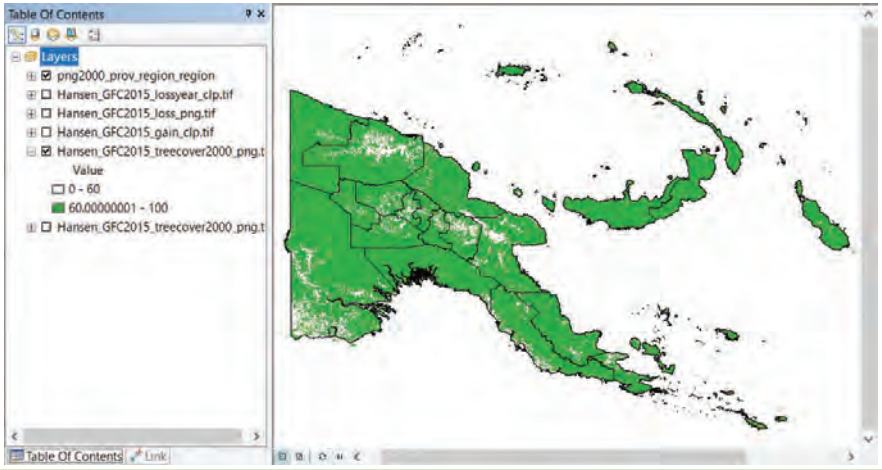
- **Global Forest Change data (Hansen data)** (3/7)



For your reference

Main data in the Project DB

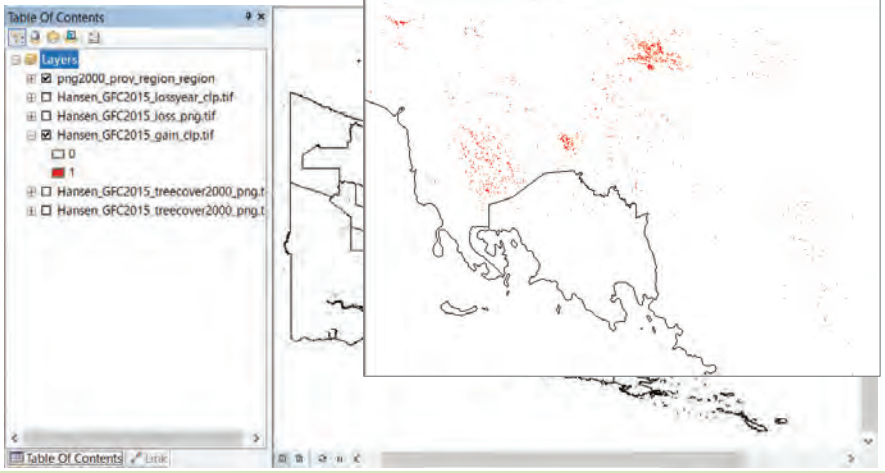
- **Global Forest Change data (Hansen data)** (4/7)
  - Tree cover in the year 2000



For your reference

Main data in the Project DB

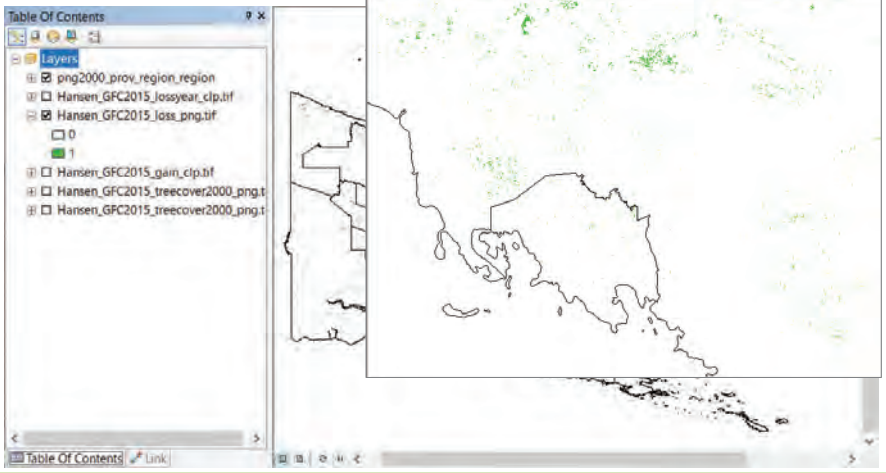
- **Global Forest Change data (Hansen data)** (5/7)
  - Forest cover gain



For your reference

Main data in the Project DB

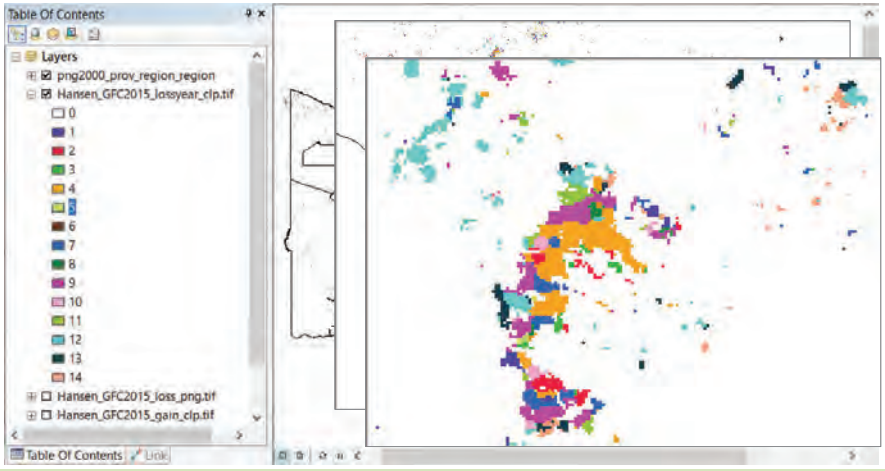
- **Global Forest Change data (Hansen data)** (6/7)
  - Forest cover loss



For your reference

Main data in the Project DB

- **Global Forest Change data (Hansen data)** (7/7)
  - Forest cover loss (year)

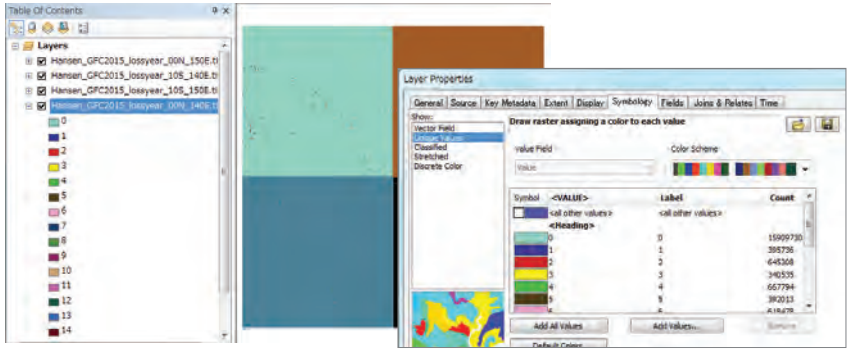


For your reference

Main data in the Project DB

- **Global Forest Change data (Hansen data): *Data adjustment*** (1/3)
  - *PNG covers four tiles, so you need to mosaic the four tiles and clip the mosaicked data only within PNG area to handle the data easily.*

1. Open ArcMap and add the data which you have downloaded.



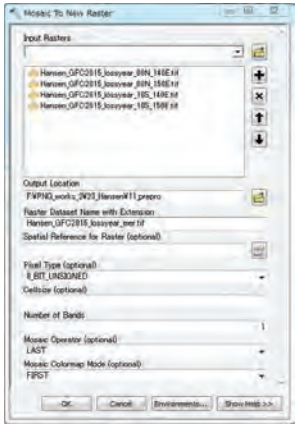
You can find forest loss year by showing data by unique value. For example, "0" in *Value* field indicates "2000", and "14" indicates "2014".

For your reference

Main data in the Project DB

- **Global Forest Change data (Hansen data): *Data adjustment*** (2/3)

2. Mosaic layers by using **Mosaic to New Raster** tool.
   - Tool: Data Management tools > Raster > Raster Dataset > Mosaic to New Raster

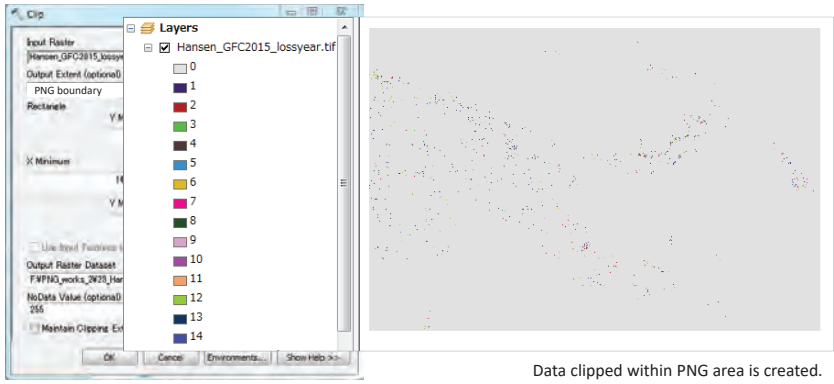


For your reference

Main data in the Project DB

- **Global Forest Change data (Hansen data): *Data adjustment*** (3/3)

3. Add PNG boundary data.
4. Clip the mosaic data with PNG boundary data.
   - Tool: Data Management tools > Raster > Raster Processing > Clip



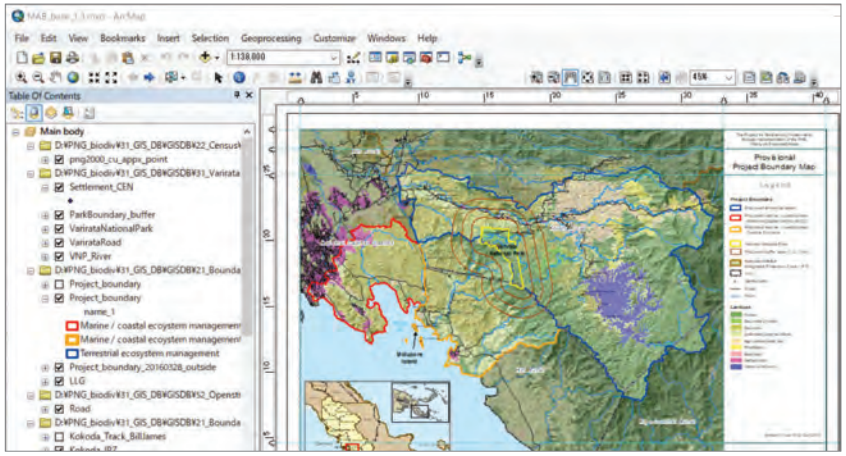
Data clipped within PNG area is created.

Main maps created in the Project

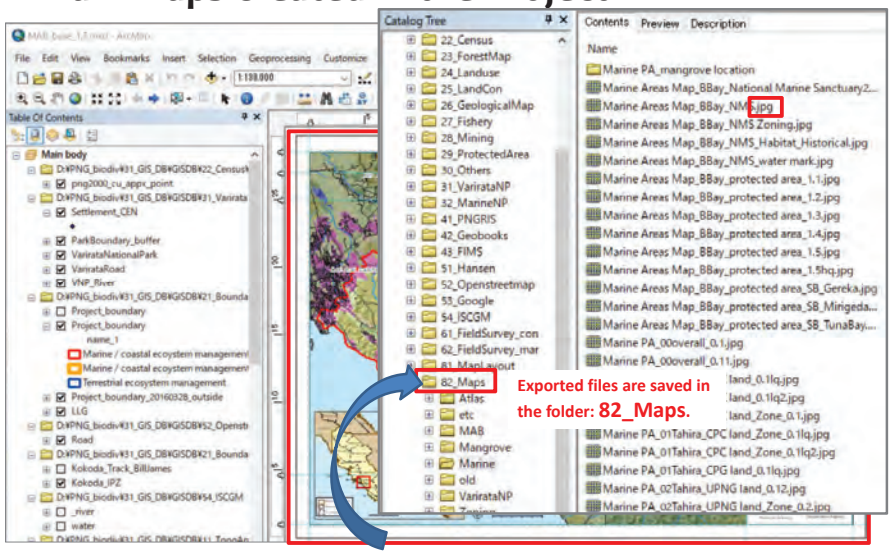
- **Map documents**: **81_MapLayout** folder
- **Exported maps**: **82_Maps** folder
- **Main maps**
  - [MAB] **Overview maps**: project boundary, satellite images, land use map, geology map, MAB zoning
  - [VariraraNP] **VNP management maps**: park facilities, camera traps, maps for signboard in VNP and wall in ICC, VNP guide maps, VNP management zone
  - [Marine] **MPA management maps**: MPA and NMS including zoning maps, mangroves of Bootles Bay
  - [Etc] **Various maps for discussions**
  - [Atlas] **Maps additionally created for Project Atlas**: location, satellite images, altitude, slope, basin, vegetation, population, ward

Main maps created in the Project

- Map document files (.mxd) are saved in ver. 10.3.
- Layers in map layout are linked to each data in the Project DB.



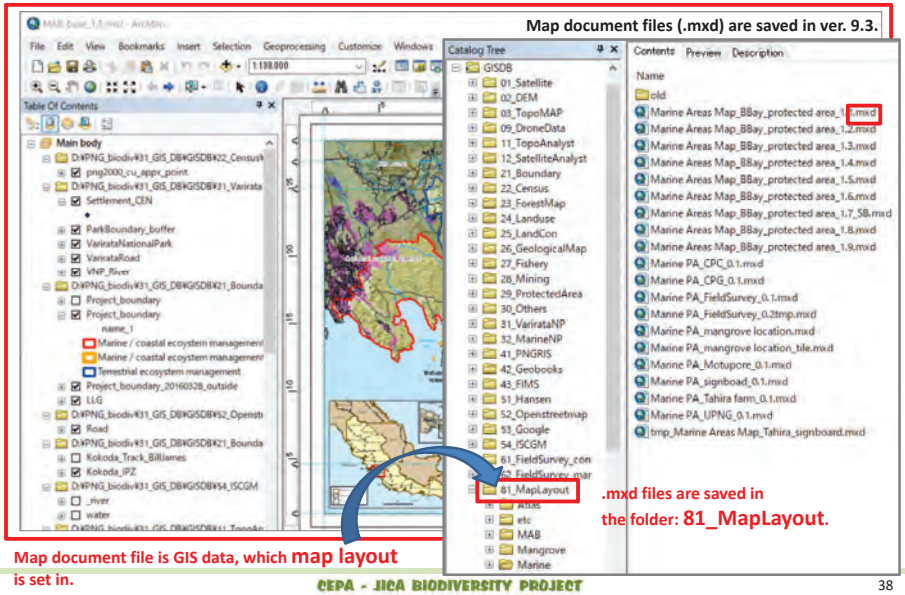
Main maps created in the Project



Map layout can be exported to image file (jpg, pdf, etc.)

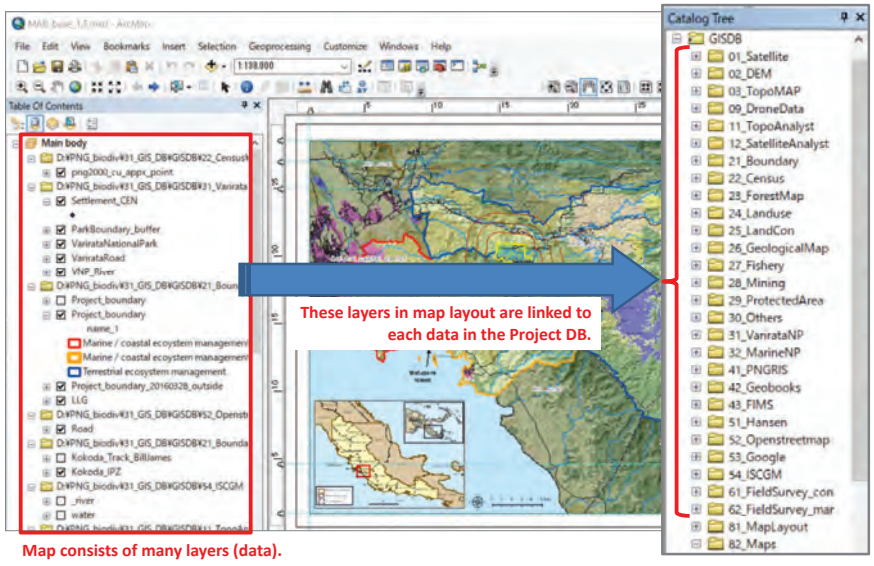
Main maps created in the Project

Map document files (.mxd) are saved in ver. 9.3.



Map document file is GIS data, which map layout is set in.

Main maps created in the Project



Map consists of many layers (data).

2. Discussing how to store the data in the CEPA server

Introduction and Objectives

- In this section, the items below will be confirmed/discussed.
  - current situation of the CEPA's GIS data server
  - how to store the data in the CEPA server in view of section 1

- The data will be stored in the CEPA server in appropriate way so that GIS data manager and operator can manage the data readily, and CEPA staff can access to the data for the future.

Contents (Discussions)

- Storage facility
  - Has GIS data server been prepared?
  - Is there any storage space for the Project data?
  - When is ready for storing the data?
- GIS data management rule
  - Is there any rule to store data?
  - Does the data need to be arranged to store in the server? (Who will do it?)
  - Who can access (view/edit) data in the server?
  - Who manages the data?
- AOB

* The meeting with the PA management officers is also planned to discuss how to utilize and manage the PA data and maps after the Project.

3. Introduction of the data / maps to be shared (for Protected Area management officers)

Introduction and Objectives

- In this section, the items below will be introduced.
  - the data purchased, collected and created in the project activities
  - formation of files and folders which the data and maps are/will be stored to share

- Staff concerned with PA will get to know the data and maps prepared in the project activities.
- Staff concerned with PA will utilize and update the data and maps for their works as needed for the future.

Contents

CEPA-JICA Project GIS Database

- **GIS Database** and **GIS Detabase List** (to be shared after the Project)
- Data shared by CEPA / Data created in the Project
- File format: shapefile (vector)

Data / Folder construction

- **Main folder description**

: There is only trial data now.
: There is only data gotten from CEPA.
: There is only data gotten from CEPA, but data links to Map document created in the Project.

File type	Folder name	Description
Satellite & airborne imagery (original/pre-analysis data)	01_Satellite	Satellite imagery (original/pre-analysis data)
	02_DEM	Satellite imagery (DEM) (original/pre-analysis data)
	03_TopoMAP	Topographic Survey map (1:100,000) produced by RASC
	09_DroneData	Drone imagery
Analysis data	11_TopoAnalyst	Topological analysis data
	12_SatelliteAnalyst	Satellite imagery analysis data
Thematic data	21_Boundary	Boundary data
	22_Census	Census data
	23_ForestMap	National Forest Base Map
	24_Landuse	Land use map
	25_LandCon	Land condition map
	26_GeologicalMap	Geological map
	27_Fishery	Fishery related data
	28_Mining	Mining related data
	29_ProtectedArea	Protected area data
	30_Others	Other data
	31_VarirataNP	Varirata NP related data
	32_MarineNP	Marine PA related data
Exsisting system & data sets	41_PNGRIS	PNGRIS (PNG Resource Information System)
	42_Geobooks	Geobook data produced by UPNG
	51_Hansen	Global Forest Change data by Hansen et al.
	52_Openstreetmap	Open street map
	53_Google	Google satellite imagery
	54_ISCGM	International Steering Committee for Global Mapping data
Map layout & output images	81_MapLayout	Map layout (Map document file)
	82_Maps	Report file/Exported map
	83_Logo	Image for map (ex: PNG logo)
Other documents	91_Documents	Other documents (non-spatial data) such as manuals

Main data in the Project DB

- **Main data**
  - 01_Satellite
    - LANDSAT: for Project area/ downloaded about every 5 years/ unprocessed
    - WorldView2: for Project area/ purchased in the Project/ high resolution
    - RapidEye2010: for entire PNG/ from PNGFA
    - PALSAR: for entire PNG/ from PNGFA/ ALOS PALSAR imagery
  - 02_DEM
    - ALOS DEM: for Project area
    - ASTER GDEM: for Project area
    - SRTM DEM (90m/30m): for entire PNG
  - 11_TopoAnalyst (surface, hillshade, slope, contour)
  - 21_Boundary (Project area, etc.)
  - 22_Census: PNG Census 2011 (NSO)
  - 23_ForestMap: Forest Base Map 2012 (PNGFA): for CEN, NCD

    * PNGFA revised Forest Base Map 2012, and also created Forest Cover Map 2015.

Data / Folder construction

- **Sub-folder** (GIS Database List)

1: Prepared by the Project

File type	Folder name		File name	Description	Extent	Souce	Prepared
Satellite & airborne imagery (original/pre-analysis data)	01_Satellite	LANDSAT	(many)	Landsat imagery downloaded about every 5 years Unprocessed	Project Area	http://earthexplorer.usgs.gov/	1
		LANDSAT_CEPA	5-55-051.img	Landsat mosaic imagery	PNG	CEPA database	
		RapidEye_2010	geotif (many)	RapidEye imagery	PNG	PNGFA	1
		WorldView2	(many)	WorldView-2 imagery	Project Area	Procured by CEPA-JICA Project	1
		PALSAR	PALSAR IMAGES (many)	ALOS/PALSAR imagery. Stack images of HH, HV, and HHHV	PNG	PNGFA	1
		z_indexmap	(many)	Data for index map of satellite imagery	-	Prepared by CEPA-JICA Project	1
			IndexMap_Satellite.mxd	Index map of satellite imagery	-	Prepared by CEPA-JICA Project	1
	02_DEM	ALOS_DEM	(many)	ALOS DEM	Project Area	http://www.eorc.jaxa.jp/ALOS/aw3d30/index_j.htm	1
		ASTER_GDEM	gdem_mosaic_sub.img	ASTER GDEM (mosaic for entire PNG)	PNG	http://www.jspacesystems.or.jp/ersdac/GDEM/J/	1
			ASTGTM2_S10E147_dem.tif	ASTER GDEM Used for analysis of surface and watershed in the Project.	Project Area	http://www.jspacesystems.or.jp/ersdac/GDEM/J/	1
		SRTM_30	SRTM30.tif	SRTM DEM 30m	PNG	http://www2.jpl.nasa.gov/srtm/	1
		SRTM_90	srtm_png.img	SRTM DEM 90m (mosaic for entire PNG)	PNG	http://www2.jpl.nasa.gov/srtm/	1
			srtm_png_sub_rp0_u55s.img	SRTM DEM 90m (mosaic for entire PNG) (UTM)	PNG	http://www2.jpl.nasa.gov/srtm/	1
			s10_e147_1arc_v3.tif	SRTM (30mDEM)	Project Area	http://www2.jpl.nasa.gov/srtm/	1
	03_TopoMAP	geo_image	8378_Gaire.tif/8379_PortMoresby.tif	Topographic Survey map (1:100,000) produced by RASC	PortMoresby around	CEPA database	
	09_DroneData			Drone imagery	Project Area	Acquired by CEPA-JICA	

Main data in the Project DB

- **Main data**
  - 31_VarirataNP
    - VNP boundary
    - Land use map of Project area
    - Facilities and Camera traps in VNP
    - MAB zoning map of Project area
    - Biological survey data implemented in the Project in 2017
  - 32_MarineNP
    - Mangrove map of Project area
    - Reef map of Project area
    - Depth line
    - Zoning map of MPA (Motupore island, UPNG land, CPC land, and Tahira farm)
    - Proposed National Marine Sanctuary
    - Management zone of National Marine Sanctuary
    - A variety of features such as jetty, resort, habitat areas, cultural/historical areas

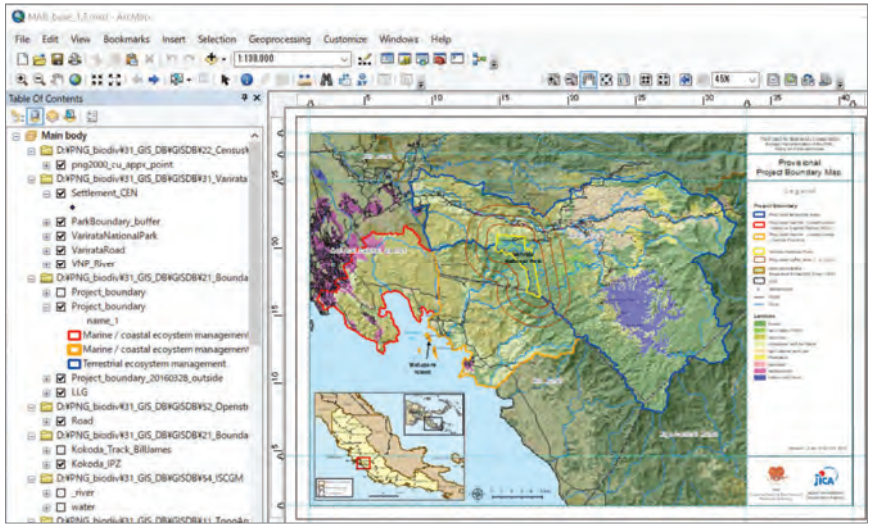
Main data in the Project DB

- **Main data**
  - 51_Hansen: Global Forest Change data (Forest cover, Loss, Gain)
  - 81_MapLayout: folder for Map documents (mxd)
  - 82_Maps: folder for maps (jpg, pdf): maps exported from the Map documents
  - 91_Documents: folder for non-spatial data
    - GIS database list
    - Manuals and related documents
      - Updating facility database (July 2016, by Mr Imai)
      - Update of VNP facility database (October 2018)
      - Manual on Getting location information (Importing GPS data to GIS) (February 2018)
      - ENVI manual (4 April 2017)
    - Presentation documents
      - Introduction of Satellite Imagery - WorldView-2 (22 April 2016)
      - GIS Data Management (February 2020)

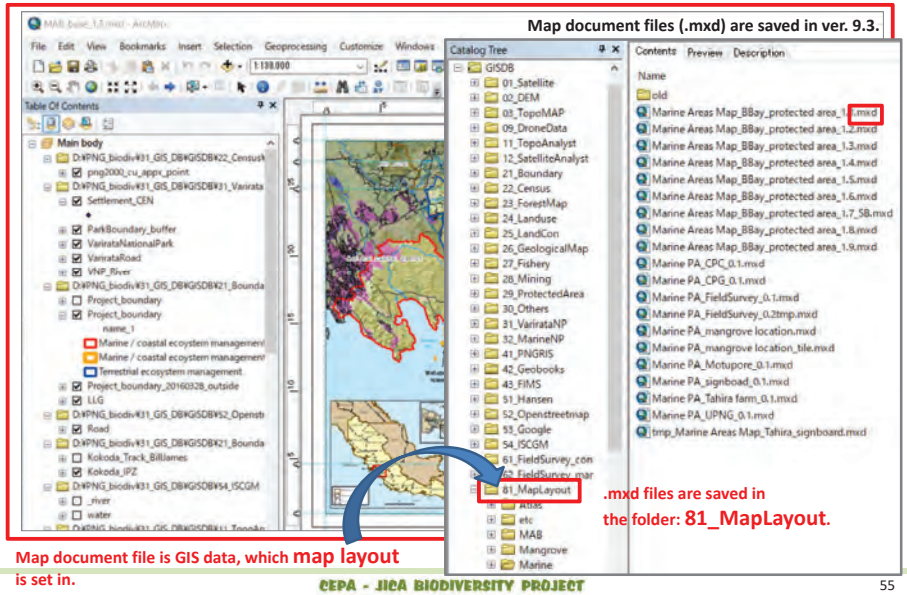
Main maps created in the Project

- **Map documents**: **81_MapLayout** folder
- **Exported maps**: **82_Maps** folder
- **Main maps**
  - [MAB] **Overview maps**: project boundary, satellite images, land use map, geology map, MAB zoning
  - [VariraraNP] **VNP management maps**: park facilities, camera traps, maps for signboard in VNP and wall in ICC, VNP guide maps, VNP management zone
  - [Marine] **MPA management maps**: MPA and NMS including zoning maps, mangroves of Bootles Bay
  - [Etc] **Various maps for discussions**
  - [Atlas] **Maps additionally created for Project Atlas**: location, satellite images, altitude, slope, basin, vegetation, population, ward

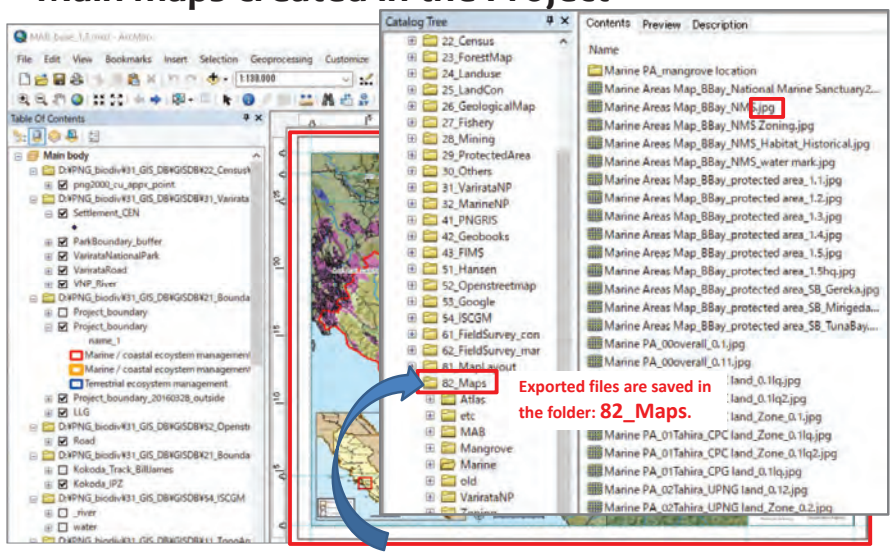
Main maps created in the Project



Main maps created in the Project



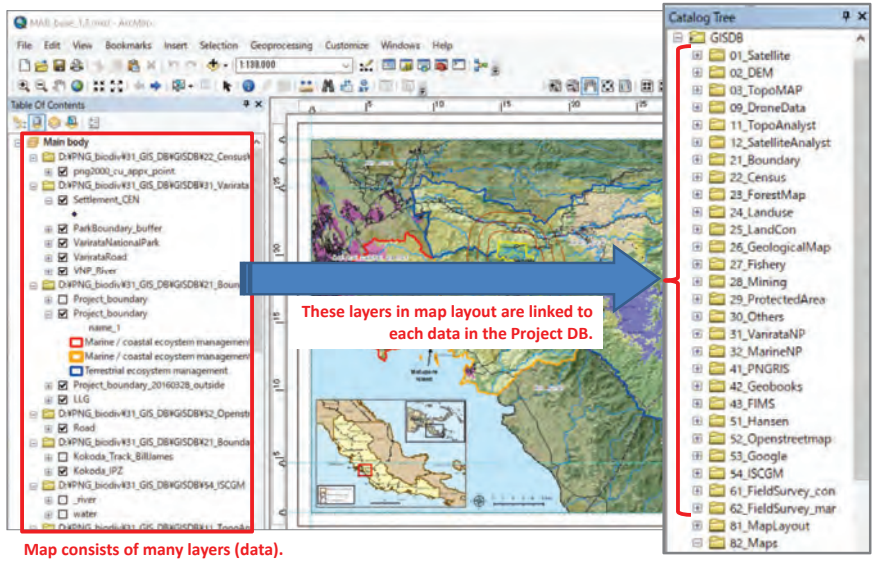
Main maps created in the Project



Map layout can be exported to image file (jpg, pdf, etc.)

4. Technical transfer and discussion of GIS data management / update for the future VNP management

Main maps created in the Project



Map consists of many layers (data).

Introduction and Objectives

- The data and maps of VNP facilities were created through the facility assessment in the project activities. The training on updating facility database, which consists of the list and the field survey sheets in Excel, was held by Mr Imai in July, 2016.
- In this section, the items below will be introduced and discussed.
  - structure of the data and maps of the VNP facilities, and how to update them
  - how to get location data using GPS and covert GPS data (gpx) into GIS data (shapefile)
  - workflow and method on updating facility information, including field survey and excel database

- Staff concerned with PA will get knowledge of how to get location information using GPS and convert the data to use in GIS.
- The GIS data and maps of the VNP facilities will be continuously and appropriately updated to manage the VNP.

Contents

A) Review of the presentation on updating facility database in Excel

B) Introduction of the procedure to get location data using GPS and covert the data into GIS

C) Introduction of the data and maps of the VNP facilities, and discussion of workflow and method on updating them

- Overarching structure
- Workflows and timeline
- Procedure: Field work
- Procedure: Update of Excel database
- Fundamental knowledge of ArcGIS database
  - Construction of GIS facility data
  - Relational database (RDB) of facility
  - Join RDB to facility attribute table
  - Definition Query of facility features
- Procedure: Update of ArcGIS database
- Procedure: Update of ArcGIS Map layout
- Data / Folder construction

A) Review of the training on updating facility database, which consists of list and field survey sheets in Excel, held by Mr Imai in July 2016

B) The procedure to get location data using GPS and covert the data into GIS for the VNP facility management

Introduction

- You would be required to get location information of features to create GIS data for managing National Parks, say:
  - Updating the VNP facility database for new facilities,
  - Getting location where animals or plants are found,
  - Confirming location where an unexpected event happens, etc.
- This document shows general procedure on creating GIS data from GPS data of features/events which you get in the field.

Procedure of importing GPS data to GIS

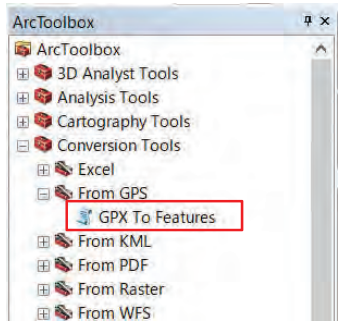
1. Get locations of features/events by GPS.
2. Import GPS data into GIS.
3. Arrange the imported data. (Option)

Procedure 1: Get locations of features/events by GPS

1. Set out GPS.
   1. Turn on the power of GPS.
   2. Confirm that battery charge is enough. If not, charge up.
   3. Navigate to [Setup] > [Position Format] on the screen to confirm GCS (Geographic Coordinate System) of [Map Datum] and [Map Spheroid] is **WGS 84**.
2. Get location of a feature or an event in the field by pushing [Mark Waypoint] button and then [Save].
   - ✓ See not to block to getting satellites by your body.
3. Turn the power off when completing getting required data.

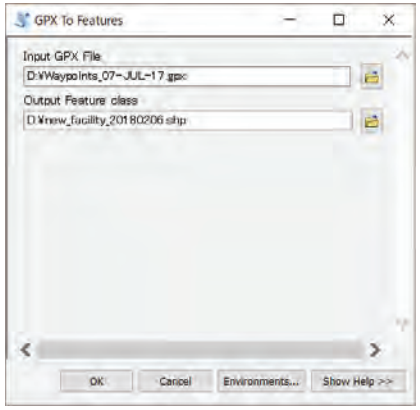
Procedure 2: Import GPS data into GIS

1. Start PC, and connect the GPS to the PC.
2. Navigate to the GPS folder >Garmin/GPX, and copy Waypoints_xxxx.gpx file in your folder (or designated work folder).
3. Open ArcMap.
4. From ArcToolbox, double-click [GPX To Features] under Conversion Tools.



Procedure 2: Import GPS data into GIS (Cont.)

5. In [GPX To Features] window, appoint Waypoints_xxxx.gpx file in [Input GPS File], and name folder and output file in [Output Feature class].



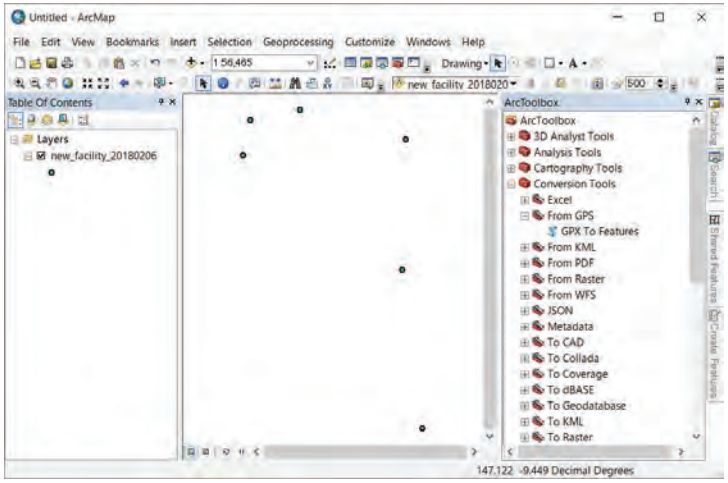
6. Click OK.

   GPS data will be converted to GIS data.

   The converted data are automatically imported in ArcMap.

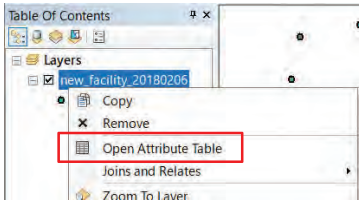
Procedure 2: Import GPS data into GIS (Cont.)

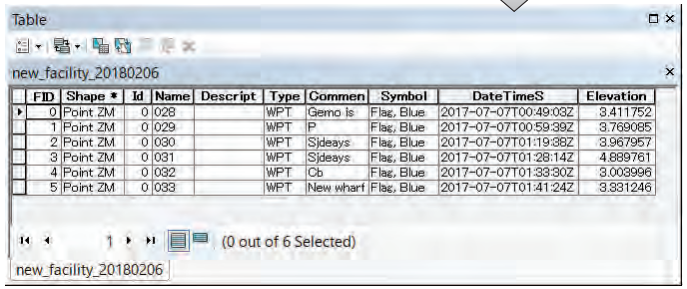
7. Confirm the imported data in ArcMap.



Procedure 3: Arrange the imported data (Option)

1. Open table of the imported (created) layer by right-clicking on the layer, and select [Open Attribute Table].

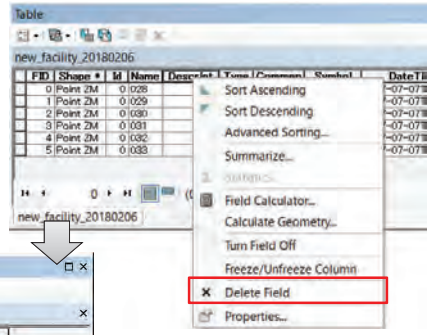


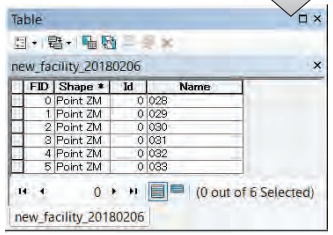


Procedure 3: Arrange the imported data (Cont.)

2. Delete unneeded fields (columns) by right-clicking on the filed and select [Delete Field].

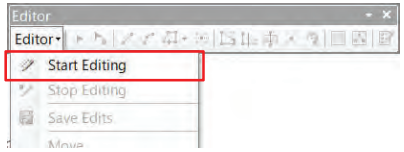
3. Repeat step 2 until all unneeded fields are deleted.





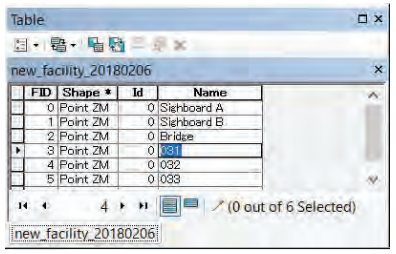
Procedure 3: Arrange the imported data (Cont.)

4. Change name of each record (row).
   1. On Editor tool bar, click [Editor] and select [Start Editing] to edit table of the layer.



You can see that colour of fields become white when edit session starts. That means you can edit records in the table.

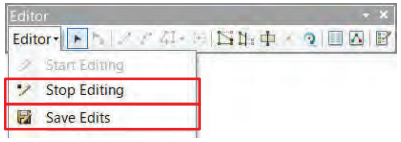
   2. Rename each record appropriate one.



Procedure 3: Arrange the imported data (Cont.)

4. Change name of each record (row). (Cont.)
   3. After you finish step 2, click [Editor] and select [Save Edits] to save your changes.
   4. Then, click [Editor] again and select [Stop Editing] to stop edit session.

   Now, edit session is finished.



5. Save the created data in the appropriate folder.

You can compare the created data with other data by adding interested data in the ArcMap if you like.

C) Workflow and method on updating the VNP facility database (GIS data and maps) for the park management

Introduction

- The database of the facilities in Varirata National Park (VNP) was created by CEPA- JICA Biodiversity Project Team.
- The VNP facility database is composed of (1) a list and profiles of facilities in Excel format, (2) spatial data in GIS (shapefile) format, and (3) related maps for management.
- These database need to be updated in accordance with facility status on-site such as removal, renovation and new construction for continuous facility management.
- This document illustrates overarching structure of the database and workflows and procedures of updating the database.

Contents

Overarching structure

Facility Database

Excel database

List + Profile

List of Facility.xlsx

VNP-Facility-profile-001-020.xlsx
VNP-Facility-profile-021-040.xlsx
VNP-Facility-profile-041-060.xlsx
…

- List of all the facilities and facility profiles of each facility
- Extensive facility information
- Database is updated as a result of field work

ArcGIS database

GIS

VNP_Facility_update_pnt.shp
VNP_Facility_update_lin.shp
VNP_Facility_update_png.shp
…

- GIS database of all the facilities
- Database includes other related data of the park
- Database is updated by using the "List of Facility.xlsx"

ArcGIS map layout & Exported map

Map

VarirataNP_facility.mxd
…
VarirataNP_facility.jpg
…

- Maps are created/updated for facility management and other materials, say guide map
- There are map layouts created ArcGIS and exported maps for use

Workflows and timeline

Field work

- Check facility condition on site
- Record on hard copy paper

Update of Excel database

- Fill necessary information in facility profile
- Update the list of facility
- ✓ Prepare new profile sheet to keep prior profile sheet
- ✓ **Never change Facility No.**, which is key to link to GIS database
- ✓ **Never delete records (lines of the list)** even if they are removed on site, as Facility No. is unique id

Update of ArcGIS database

- Update the GIS database as a result of field work
- Update the facility attribute table (relational database) by replacing the updated "List of Facility.xlsx"
- ✓ Never delete records even if they are removed on site

Update of map layout & export of map

- Update the map layout using the updated GIS database
- Export the updated map to use next field work, etc.

Recommended timeline:

- Record in the field and update of Excel DB throughout the year
- Update of the list of facility at least once a year
- Annually update of GIS database and Map

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Field Work												
Excel DB												
GIS DB												
MAP												

Procedure: Field work

1. Check the condition of facility
2. Record on existing profile on hard copy paper
3. Record photos which show condition such as, change, repair, replace conditions

✓ For more details, refer to "Updating facility database.pptx" prepared by the Project in July, 2016.

Procedure: Update of Excel database

Record of facility profile

1. Collect photos of updated facilities
2. Resize photos in size of 1024 x 768 pixels and save in a specific holder
3. Add one page next to the existing sheet of profile
4. Fill necessary data

Update of the list of facility

1. Update the list of facility in accordance with the facility profiles

Never change Facility No. and delete facility records even if they are removed on site, as Facility No., unique id, is key to link to GIS database.

✓ For more details, refer to "Updating facility database.pptx" prepared by the Project in July, 2016.

Fundamental knowledge of ArcGIS database

- Construction of GIS facility data
- Relational database (RDB) of facility
- Join RDB to facility attribute table
- Definition Query of facility features

Construction of GIS facility data

- GIS facility data are composed of three data:
  - Point data (VNP_Facility_update_pnt.shp),
  - Line data (VNP_Facility_update_lin.shp), and
  - Polygon data (VNP_Facility_update_pgn.shp).

Facility type of each data

Point data		Point data		Point data	
Traffic line	Bridge	Camp Facility	Kitchen	Sign	Track sign board
	hand rail		Lodge		Traffic sign board
Rangers' facility	House		Shower room	Other	Other
	Kitchen		Toilet	**Line data**	
	Shed		Water tank	Station	Fence
	Toilet	Car parking facility	Car parking area		Gate
	Water tank	Water supply facility	Shed	Camp Facility	Gate
Station	BBQ set		Water tank	Car parking facility	Car stop pile
	Flag pole		Water tap		Fence
	Information center	Toilet	Toilet	Water supply facility	Water pipe
	Office	Sign	Area sign boad	**Polygon data**	
	Other		Distance pile	Open area	House
	Shelter/ hut		Facility sign board		Outlook
	Tollgate		Reference pile		Picnic area
	Workshop		Road sign board		

Construction of GIS facility data (Cont.)

- Fields of attribute tables of facility data

VNP_Facility_pnt

FID	Shape *	Id	name	facility	no
192	Point	1	Self Guide Track	Track	0
193	Point	1	Picnic Site 4	Open area	0
194	Point	1	Picnic Site 3	Open area	0

VNP_Facility_lin

FID	Shape *	Id	facility	no
15	Polyline	0	Creek	0
6	Polyline	1	Power line	0
13	Polyline	1	Power line	0

VNP_Facility_png

FID	Shape *	Id	Name	no	area
0	Polygon ZM	2	Ranger's house	1024	718.289823
1	Polygon ZM	2	Ranger's Quarter	1023	1488.829874
2	Polygon ZM	2	Picnic site 4	1016	385.039485
3	Polygon ZM	2	Lodge Area	1017	2009.401961
4	Polygon ZM	2	Picnic Site-2	1014	715.645872
5	Polygon ZM	2	Lake Site	1019	1429.917025
6	Polygon ZM	2	Open area (near lake)	1018	655.071616
7	Polygon ZM	2	Camping site	1020	632.790062
8	Polygon ZM	2	Main Outlook	1021	3419.968864

[id] and [no] fields are significant fields. You can not change these values without reason, since they affect map view.

Field description:

FID, Shape — These fields are added automatically, so you cannot edit them.

id — This field manages features.
"2": usual facility data,
"1": facility data used for only some map (only display data), and
"0": data created through work process.
"1" and "0" are not recorded in the Excel database.

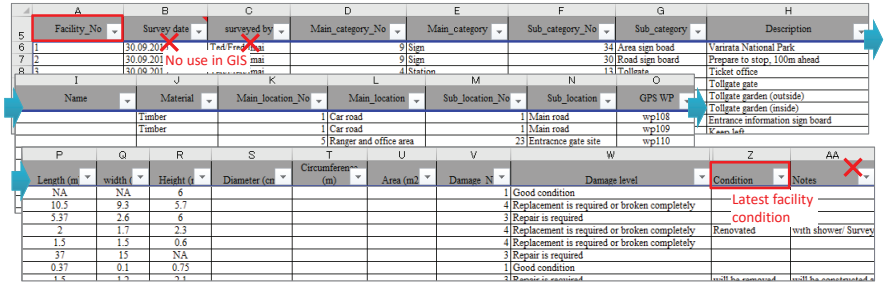
name, facility — Temporary work fields

no — This field is facility number, unique id. The Excel database also has this number, so that the field is used to join tables.

area — Area (ha)

Relational database (RDB) of facility

- Excel database (List of facility.xlsx)



  - The relational database of facility is created from the Excel database using columns which could be used in GIS. For example, [Sub_category_No] column is used to control which facilities are shown in a map and define symbol and color of each facility.
  - [Facility_No] column is used to join the facility RDB to the attribute tables of facility data.

Join RDB to facility attribute table

- Join Table
  - The prepared facility RDB is joined to the attribute tables of facility.
  - "Join Table" function lets you append additional information table (RDB) to the target feature's attribute table so that you can use information of RDB when symbolizing the features, etc.
  - A Key field, which both tables of GIS and Excel have in common, is used to join the tables.

Feature's attribute table of facility

Join the tables using these fields

Facility RDB

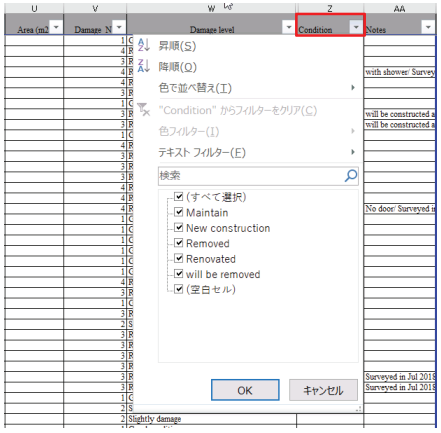
VNP_Facility_pnt

FID	Shape *	Id	name	facility	no
192	Point	1	Self Guide Track	Track	0
193	Point	1	Picnic Site 4	Open area	0
194	Point	1	Picnic Site 3	Open area	0
277	Point	1	Entrance Gate	Gate	0
278	Point	1	Variramangogo Look	Lookout	0
7	Point	2	Entrance Gate	Gate	3

	Facility_No	Survey date	surveyed by	Main_category_No
6	1	30.09.2015	Ted/Fred/Imai	
7	2	30.09.2015	Ted/Fred/Imai	
8	3	30.09.2015	Ted/Fred/Imai	
9	4	30.09.2015	Ted/Fred/Imai	
10	5	30.09.2015	Ted/Fred/Imai	
11	6	30.09.2015	Ted/Fred/Imai	
12	7	30.09.2015	Ted/Fred/Imai	

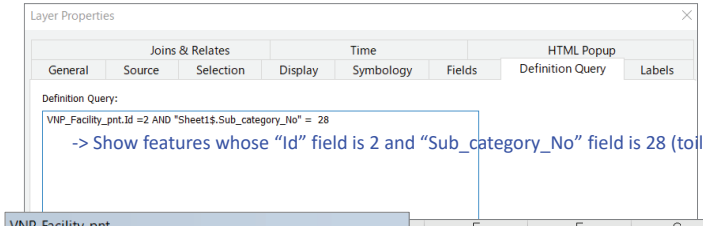
Definition Query of facility features

- Update of facility condition
  - There are 6 designation values for facility condition column:
    - (blank)
    - Maintain
    - New construction
    - Renovated
    - Removed
    - will be removed
  - On the maps for facility management, only "blank", "Maintain", "New construction" and "Renovated" are displayed.



Definition Query of facility features (Cont.)

- Definition Query
  - "Definition Query" function defines data (features) to be displayed by using values of fields.



VNP_Facility_pnt

FID	Shape *	Id	name	facility	no		Main_category	Sub_category_No	Sub_category	Desc
192	Point	1	Self Guide Track	Track	0	8	Toilet	28	Toilet	Toilet for visiters
193	Point	1	Picnic Site 4	Open area	0	7	Water supply facility	25	Water tank	Water tank for toilet
194	Point	1	Picnic Site 3	Open area	0	6	Car parking facility	23	Car stop pile	At car parking (main pic
277	Point	1	Entrance Gate	Gate	0	9	Sign	35	Facility sign board	Toilet
278	Point	1	Variramangogo Look	Lookout	0	8	Toilet	28	Toilet	Toilet for visiters
7	Point	2	Entrance Gate	Gate	3	8	Toilet	28	Toilet	Toilet for visiters
30	Point	2	Sign Board (100m to	Sign board	2	7	Water supply facility	25	Water tank	Water for visiters (Tuffa
31	Point	2	Sign Board (Main En	Sign board	1	7	Water supply facility	25	Water tank	Missing water tank for vi

Procedure: Update of ArcGIS database

1. Create new facility features
2. Update the relational database of facility

Procedure: Update of ArcGIS database

1. Create new facility features
   1. Copy location data (GPS data) of facility acquired in the field
   2. Convert GPS data to GIS data (shapefile format)
   3. Add new field for facility no. to converted data
      - Field name: no
      - Type: Short Integer
   4. Record facility no. of each feature
   5. Delete unneeded fields
   6. Change name of existing facility data in the GIS database
      - ex. VNP_Facility_pnt_bu20170321.shp
   7. Merge the existing data (step 6) and the created data (step 1-5) together, and save in the GIS database
      - Name of new facility data should be that of original existing facility data (ex. VNP_Facility_update_pnt.shp).

Procedure: Update of ArcGIS database (cont.)

2. Update the relational database of facility
   1. Change name of the existing facility RDB
      - ex. VNP_Facility_db_bu20170321.xls
   2. Arrange the Excel databas, and save it in the GIS database
      - Create a table with columns whose values could be used in GIS
      - Name of new facility RDB should be the same name of the original existing facility RDB (VNP_Facility_db.xls).

Facility_No	Main_category_No	Main_category	Sub_category_No	Sub_category	Description
1	9	Sign	34	Area sign boad	Varirata National Park
2	9	Sign	30	Road sign board	Prepare to stop, 100m ahead
3	4	Station	13	Tollgate	Ticket office

Name	Material	Main_location_No	Main_location	Sub_location_No	Sub_location
	Timber	1	Car road	1	Main road
	Timber	1	Car road	1	Main road
		5	Ranger and office area	23	Entracnce gate site

GPS_WP	Length (m)	width (m)	Height (m)	Diameter (cm)	Circumference (m)	Area (m2)	Damage_No	Damage_level	Condition
wp108	3	0.3	1.5				2	Slightly damage	
wp109	1.15	0.2	1				1	Good condition	
wp110	2.1	2	2.2				1	Good condition	
wp110	3.3		1				4	Replacement is required or broken completely	
wp110	7	2.2					1	Good condition	
wp110	7	2.2					1	Good condition	
wp110	2.4	1.2	2				2	Slightly damage	
wp110	0.7	0.1					2	Slightly damage	

Procedure: Update of ArcGIS map layout

1. Confirm if “Definition Query” and “Join Table” work correctly
2. Update the labels of the facility features if there are annotations in the maps
3. Export the Maps

Procedure : Update of ArcGIS map layout

1. Confirm if “Definition Query” and “Join Table” work correctly
   1. Open the existing map documents related to the facilities in VNP
   2. Check if facility layer setting for “Join Table” works correctly
      - It is fine if the facility RDB is joined to the facility layers.
   3. Check if facility layer setting for “Definition Query” works correctly
      - It is fine if the only defined facility features render.

✓ If the RDB does not joined or the defined features are not rendered, check the process of creating the facility data.

Procedure : Update of ArcGIS map layout (cont.)

2. Update the labels of the facility features if there are annotations in the maps
   - ✓ "Label" is automatically updated according to data update, but "annotation" need to be updated manually.
   - ✓ "Label" is placed on a map by GIS so it cannot be edited manually. Conversely, "annotation" can be edited so it is created by converting label for sophisticated map.

   1. Delete the existing annotations of the facilities
   2. Label the features of the facilities
   3. Convert the labels to annotations
   4. Lay out the created annotations in place

Procedure : Update of ArcGIS map layout (cont.)

3. Export the Maps
   1. Set layer on/off, legend, and title of the layout
   - ✓ A number of maps would be exported from one map document.

   2. Export the maps
      - Normal settings:
        - Resolution: 200 dpi (1,200dpi for poster in A0 size)
        - Format: JPEG or PDF
        - JPEG Quality: Max (100)

Data / Folder construction: Excel database

- List of facility
  - List of Facility.xlsx (Result of VNP existing facility assessment in 2015)
  - List_Analysis_Facility_VNP_151214_No1-254-fin.xlsx (ditto)
  - List of Facility_20180727.xlsx (as of 27th Jul 2018)
- Facility profiles
  - VNP-Facility-profile-001-020.xlsx
  - VNP-Facility-profile-021-040.xlsx
  - VNP-Facility-profile-041-060.xlsx
  - …
- Manual
  - Updating facility database.pptx

Data / Folder construction: GIS database

- Facility data / relational database
  - Data folder: GISDB¥31_VarirataNP¥data
  - Point facility data: VNP_Facility_update_pnt.shp
  - Line facility data: VNP_Facility_update_lin.shp
  - Polygon facility data: VNP_Facility_update_pgn.shp
  - Facility relational database: VNP_Facility_db.xls
- Map document (layout)
  - Data folder: GISDB¥81_MapLayout¥VarirataNP
- Exported map
  - Data folder: GISDB¥82_Maps¥VarirataNP
- Documents (manual)
  - Data folder: GISDB¥91_Documents¥VN Facility Management
  - ✓ Refer to "Map for VNP Facility Management.xlsx" for more detailed information of map setting

5. Discussion on possibility of utilization of the data and maps after the Project

Introduction and Objectives

- In this section, the items below will be discussed.
  - possibility of the use of the data and maps after the Project
  - how to manage the data and who manages the data

- The participants will confirm the possibility of the use of the data and maps, and the necessity of data management.
- Data management system, including person responsible for data management and update, will be established.

Contents (Discussions)

- Data usability and sustainability
  - Is the data prepared in the Project usable after the Project?
  - Are the maps prepared in the Project usable after the Project?
  - Is there any data needed to be updated (regularly) in the future?
  - Can the data and maps be updated and used for your future works?
  - In what situations and uses can the maps be usable?
- Data management
  - Who gets new/updated information if needed?
  - Who updates and manages GIS data and creates maps?
  - Who can access (view/edit) data in the server?
- AOB
  - PR: Project facebook page

E-2 広報活動

活動実績報告書：活動コンポーネント成果 4-2

活動コンポーネントの概要及び主要な成果品
広報活動

1. 背景及び概要

本プロジェクトが目指す保護区管理及び設立では、地域住民を始め広く PNG 国民の理解と支持を得て、多様なステークホルダーと協働することが重要である。そのため、広報的な手法を用いてプロジェクトの認知度を上げるとともに、活動への参加・協力を促すこととした。

プロジェクト開始段階に、C/P とともに広報/啓発戦略を策定し、広報/啓発上の課題と目的を特定した上で、具体的な手段や方法を設定した。本広報/啓発に係るアクションプランに沿い、収集・作成した情報やマップ等を活用して、様々な情報発信ツールの作成、並びに様々な媒体を通じた配布、及び発信を行った。

2. 目的

広報・啓発戦略を策定し、情報発信ツールの作成、適切な媒体を通じた配布・発信を行う

3. 活動内容

(1) 広報・啓発戦略の策定
(2) 広報・啓発戦略に沿った情報発信媒体の作成
(3) プロジェクト関連情報や作成した情報発信媒体の配布・発信
(4) 適切な媒体を通じたプロジェクト活動の宣伝・流布

4. 活動経緯と実績

(1) 広報・啓発戦略の策定

2015 年 7 月-10 月	プロジェクトの広報・啓発の目的と果たすべき役割を明確にし、CEPA の能力を評価し、課題とともに活動内容を確認した。
2015 年 7 月-10 月	広報・啓発活動の手段や対象、活動事項、期待される結果を特定した。
2015 年 10 月-2016 年 2 月 添付資料 4.2.1	上記活動の結果を受けて、「広報・啓発戦略」と「アクションプラン」を策定した。
2018 年 7 月 添付資料 4.2.2	プロジェクトの進捗や目標集団の状況を反映し、2015 年 10 月に策定した広報・啓発戦略を見直し、改定を行った。

2019 年 10 月- 2020 年 3 月 添付資料 4.2.3	プロジェクトの中で実施された広報・啓発活動を精査し、広報・啓発の最終報告書を作成した。

(2) 広報・啓発戦略に沿った情報発信媒体の作成

2015 年 6 月- 2020 年 2 月 添付資料 4.2.4	プロジェクト活動を紹介するプロジェクト冊子を年 1 回作成した。
2016 年 4 月- 2020 年 1 月 添付資料 4.2.5、4.2.6	プロジェクトニュースレターを年 2 回作成し、プロジェクトファクトシートを年 1 回作成した。
2015 年 8 月- 2020 年 6 月 添付資料 4.2.7- 4.2.12	策定した広報・啓発戦略に沿って、情報発信媒体を作成した（アトラス、環境教育教材、ポスター、バナー、サインボード、ポロシャツ、T シャツ、ベスト、ロゴ、ステッカー、スタンプ、プロモーションビデオ、等)。

(3) プロジェクト関連情報や作成した情報発信媒体の配布・発信

2015 年 10 月- 2020 年 11 月	作成した情報発信媒体をセミナーやワークショップ、その他のイベントで配布した。
2016 年 5 月- 2020 年 11 月	プロジェクト関連情報をセミナーやワークショップ、その他のイベントで発信した。

(4) 適切な媒体を通じたプロジェクト活動の宣伝・流布

2015 年 7 月- 2020 年 12 月	JICA プロジェクトホームページ（英語・日本語バージョン）を立ち上げ、プロジェクト活動を紹介する記事を配信した。
2015 年 10 月- 2020 年 12 月 添付資料 4.2.13	プロジェクトフェースブックページを立ち上げ、タイムリーにプロジェクト活動を投稿した。
2016 年 12 月	CEPA のホームページ内に CEPA-JICA プロジェクトページを開設した。
2015 年 8 月- 2019 年 5 月	PNG の新聞やテレビ等マスメディアや JICA 広報雑誌にプロジェクト関連情報を提供した。

5. 評価

(1) 目標達成度の評価

評価指標	指標の到達度の自己評価	評価結果
広報・啓発戦略を実施する。	Achieved	プロジェクト開始時に広報・啓発戦略を策定し、適時、戦略の実施状況をレビューしながら実施した。実施した結果は広報・啓発戦略最終報告書として取り纏めた。（添付資料 4.2.3）
2016 年 9 月までにプロジェクトウェブサイト作成し、計画に沿って定期的に更新する。	Achieved	2015 年 7 月に JICA プロジェクトホームページ（英語・日本語）を立ち上げ、2015 年 10 月にはプロジェクトフォースブックページを立ち上げ、2016 年 12 月には CEPA のホームページ内にプロジェクトページを開設した。それぞれのサイトの性質に合わせ、定期的な更新を行った。最も更新頻度の高いフェースブックページでは、プロジェクト終了時までに 400 回近く投稿を行った。
5 種類以上の情報発信媒体を作成し、広報・啓発戦略に沿って、ターゲット集団の 30%以上に宣伝する。	Achieved	10 種類以上の情報発信媒体を作成し、広報/啓発戦略に沿って、ワークショップ・セミナーや各種イベントの際に配布、宣伝を行った。パンフレット類等は 500 部単位で作成し、プロジェクト前半に作成した物は追加作成もしており、ターゲット集団の 30%以上に宣伝できたと考える。

(2) 目標到達度の評価

評価指標	指標の到達度	評価結果
プロジェクトの年次報告書	Achieved	プロジェクト年次報告（プロジェクトパンフレット）やプロジェクトファクトシートで広報・啓発戦略の実施状況を報告した（本報告書には他の成果の実施状況も含まれる）。（添付資料 4.2.4、4.2.6）
プロジェクトの年次報告書内のウェブサイトモニタリング報告書	Achieved	最も更新の多いプロジェクトフェースブックページのモニタリングを定期的に（全 11 回）行い、モニタリング報告書を作成した。（添付資料 4.2.13）

広報・啓発戦略、情報発信媒体	Achieved	10 種類以上の情報発信媒体を作成した。（添付資料 4.2.1～4.2.12）

6. 教訓

(1) 「広報・啓発戦略とアクションプラン」に沿った適切で効果的な広報活動の実施

プロジェクト開始時に本活動に特化した「広報・啓発戦略とアクションプラン」を策定し、対象者、広報ツール、広報手法等を明確にすることで、様々なツールを用いて適時に適切な広報活動を実施することが可能となった。その結果、広報活動を効果的なものにすることが出来た。これは関係者や地元住民のプロジェクトへの理解や自然環境保全に対する興味を醸成するだけでなく、彼らの反応を促すことにも役だった。

7. 提言

(1) プロジェクト終了後の情報発信媒体の有効活用の努力

プロジェクトで作成した様々な情報発信媒体は、プロジェクト終了後もそのまま利用できるものが多く、また最低限の改定作業により長く使えるものが多い。観光振興局（TPA; Tourism Promotion Authority）等、他関連機関とも協力し、広報発信媒体を常時設置してもらうなど、引き続き保護区や CEPA の活動についての露出を増やしていくことを提案する。また、プロジェクトのフェースブックページは、プロジェクト終了後は CEPA の保護区活動全体の紹介ページとして、引き続き CEPA の活動を紹介、発信していくことを提案する。更に、保護区のガイドや環境教育教材は、印刷したものを訪問客に販売するなど、公園管理のための収入源として活用することを提案する。

8. 主要な成果品リスト:

1) Public Relations and Awareness Strategy for CEPA-JICA Biodiversity Project 2016 - 2020, December 2015 （添付資料 4.2.1）
2) Public Relations and Awareness Strategy for CEPA-JICA Biodiversity Project 2016 – 2020 (Revised Version), July 2018 （添付資料 4.2.2）
3) Public Relations and Awareness Strategy for CEPA-JICA Biodiversity Project 2016 – 2020 (Final Report), March 2020 （添付資料 4.2.3）
4) Project brochure (project annual report) ver. 1 – 6, Output 3 version （添付資料 4.2.4）
5) Project newsletter vol. 1 – 9 （添付資料 4.2.5）
6) Project factsheet vol. 1 – 2 （添付資料 4.2.6）
7) Project Atlas (1st edition) （添付資料 4.2.7）
8) Field guide brochure: Plants, Mammals, Birds, Reptiles, Flogs, Invertebrates) （添付資料 4.2.8）

9) Biodiversity reports/Executive summary of the biodiversity reports （添付資料 4.2.9）
10) Guide Map of Varirata National Park （添付資料 4.2.10）
11) Mangrove of Bootless Bay – Identification guide （添付資料 4.2.11）
12) Common Birds of Bootless Bay – A field guide （添付資料 4.2.12）
13) Monitoring report of Facebook page for the Project （添付資料 4.2.13）

以上

添付資料　4.2.1 Public Relations and Awareness Strategy for CEPA-JICA Biodiversity Project 2016 - 2020

Public Relations and Awareness Strategy for CEPA-JICA Biodiversity Project 2016-2020

December 2015

CEPA-JICA Biodiversity Project

Table of Contents

Acronyms and Abbreviations

CEPA	Conservation and Environment Protection Authority
CSR	Corporate Social Responsibility
DAL	Department of Agriculture and Livestock
DEC	Department of Environment and Conservation
FIMS	Forest Information Management System
JICA	Japan International Cooperation Agency
GIS	Geographical Information System
GoJ	Government of Japan
GoPNG	Government of Papua New Guinea
LLG	Local Level Government
NBSAP	National Biodiversity Strategy and Action Plan
NCC	National Conservation Council
PA	Protected Area
PDM	Project Design Matrix
PNGFA	Papua New Guinea Forest Authority
PNGRIS	PNG Resource Information System
PPA	Policy on Protected Areas
PR	Public Relations
TPA	PNG Tourism Promotion Authority
UPNG	University of Papua New Guinea
VNP	Varirata National Park

1. Introduction

This Public Relations (PR) and Awareness Strategy is aimed at CEPA-JICA Biodiversity Project staff that play either a strategic, operational or influential role in communications, public relations and campaigning for the respective conservation activities affecting marine, forests, and freshwater ecosystems within the framework of CEPA-JICA Biodiversity Project (the Project) specifically focused on these thematic ecosystems - Varirata National Park in Koiari LLG and Motupore Island near Bootless Bay of Central Province.

It is the responsibility of everyone within the Project to lead and raise awareness of the status of the project target area[1] of PNG as the center of biodiversity including the network of Protected Areas (PA), and the need to conserve its biodiversity and promote sustainable livelihoods for the customary landowners.

The major targets detailed in this document relies on the cooperation of all staff of CEPA and JICA Expert Team, particularly those working at the local grass roots level such as the Koiari Rural Local-level Government (LLG) and Hiri Rural LLG.

This document shall be guided by the Environmental Communication Strategy of DEC (Draft Version 1, 2013). In addition there is a strong emphasis on how to create effective public relations and awareness campaign and the steps involved in this process.

[1] Terrestrial target and marine/coastal target (pls refer to Map 1: Locality of CEPA-JICA Project)

2. Background of the Project

The PNG's strong position on the environment is drawn from the Preamble of the National Constitution which declares our goal to be PNG's natural resources and environment conserved and used for the benefit of us and our future generation. With that position, GoPNG formulated the National Biodiversity Strategy and Action Plan (NBSAP) in 2007. However, the implementation of NBSAP has been hindered, by lack of coordination and lack of proper funding and institutional capacity. The current protected area system is small, fragmented, and is highly unlikely to be adequate in providing protection to PNG's high biodiversity. CEPA is in charge of monitoring and management of the protected areas however there is virtually no monitoring or management activity by CEPA.

The PNG Policy on the Protected Areas (PPA) was developed and approved in 2014. PPA aims to enhance PNG's governmental institutions at national, provincial and local levels to effectively manage PA network of PNG, and achieve operational function of the PPA.

CEPA-JICA Biodiversity Project is a conservation initiative, which commenced its operation in June 2015. The Project is a joint initiative between the Governments of PNG and Japan. The overall goal of the Project is "Protected Area Network is effectively managed by applying PA management (and establishment) model(s), which were developed by the Project" directly addresses the PPA implementation, to be achieved by accomplishing the project purpose by the end of the project period.

3. Project Target Areas

Project target area includes Central Province, NCDC and several target PAs. Output 2 targets Varirata National Park to be a model terrestrial PA, and Koiari Rural LLG to be a target LLG for livelihood development activities in the Project Design Matrix (PDM). Besides, Output 3 targets Motupore Island and Bootless Bay areas for developing a new marine PA model. Table 1 indicates basic information of the target areas, and Figure 1 shows the location of the target areas for the Project.

Table 1 Basic Information of target areas of the Project

WARD			Household No.	Population	VILLAGES & HAMLETS
No.	Name	Member			
Terrestrial targets - Output 2					
2	Mesime	Hon. Auda Arua	552	3130	Mesime,KOB,Iiimo Station,Pukpuk Banis,Bolo Estate, Farm, Reform Churches, Farm 16,Boroma, 14 mile Piggery Farmers,Rabidudu,Gary's Farm, Laloki Secondary, Lobunakouba Primary
3	Madovate	Hon. Manaka Bore	36	283	Madovate, Vaiagai, Maradahana, Tabeani,

					Foxsy Block
4	Furimuti	Hon. Vakari Koua	364	1870	Furimuti,CPA Compound, Koiari LLG Compound, Mekere Block, Kipalan Block, Radho, Hugo Canning, 15 Mile Station, Sidco, Riverside, Bluff Inn Motel, Hebou Compound, Franciscan Friary, Mt Koiari Block, Ted Diro, 17 mile, Gagibevai, Scout Camp, Rauna 4, Rouna 1&3, Rouna Works
5	Depo	Hon. Billy Ivai	164	967	Depo, Rouna 2, Varirata National Park, Sogeri Lodge, Kokoda Motel, Chamber, Anglician Church, Manurinumu, Magere, Bisiatabu SDA Mission, Gogosenumu, Bisianumu DPI, Ianabevai
6	Vesulogo	Hon. Helen Wiena	159	735	Vesulogo, Iiolo, New Camp(Vataro), Moenaro, Salvation Army, Girinumu 1, Girinumu 2, Owens Corner Memorial Park
7	Bereadabu	Hon. Kidu Toina	70	349	Bereadabu, Fakonama, Numuranumu, Wantomia, Pineapple Farm, Mababoto, Waharo,Boda.
8	Kailaki	Hon. Keroko	190	987	Kailaki, Edobevai, Patiki, Ekoro, Itikinumu Primary School & Estate, Manubada, Aipiri, Subitana, Kailaki Community School
10	Ogotana	Hon. Baia Toina	61	377	Ogotana, Mororo, Katalina Estate, Eilogo Estate, Wararo, Ninoa Estate
11	Kahaitana	Hon. Avana Koroi	88	631	Kahaitana, Bausaka, Nainumu 2, Forokorata, Boredabu
12	Berebei	Vacant	114	576	Berebei, Manamiro, Sirinumu Dam, Nainumu 1, Gurunumu, Koeaba, Sirinumu Primary School, Wahonadada, Kouaro, Lorikitana
13	Wautanumu	Hon. Kareki Karimu	29	149	Warutanumu, Ubatana
20	Sogeri Urban	Hon. Tau Wahona	98	554	Sogeri Station, Botoguni, Sogeri Police Station, Sogeri Health Centre, Larowari Secondary School, Sogeri Primary, Moronumu.
Total			**1,925**	**10,608**	

Source: Population Census 2010

WARD			Household No.	Population	VILLAGES & HAMLETS
No.	Name	Member			
Marine/coastal targets - Output 3					
8	Barakau	-	183	1,598	Barakau, Kerekadi, Rabuka
9	Tubusereia	-	402	3,673	Tubusereia
10	Mt Diamond	-	113	540	Loloata Island,Gwarume-Mase, Mirigeda Settlement, Garameia Settlement, Sebore Settlement, Borabora Settlement, Motupore Island, Tahira Boat Centre, Mt Diamond High School, Jason Farm
12	Dagoda	-	114	718	Dabunari, Dagoda, Seme, Vaivai
Total			**812**	**6,529**	

Source: Population Census 2000

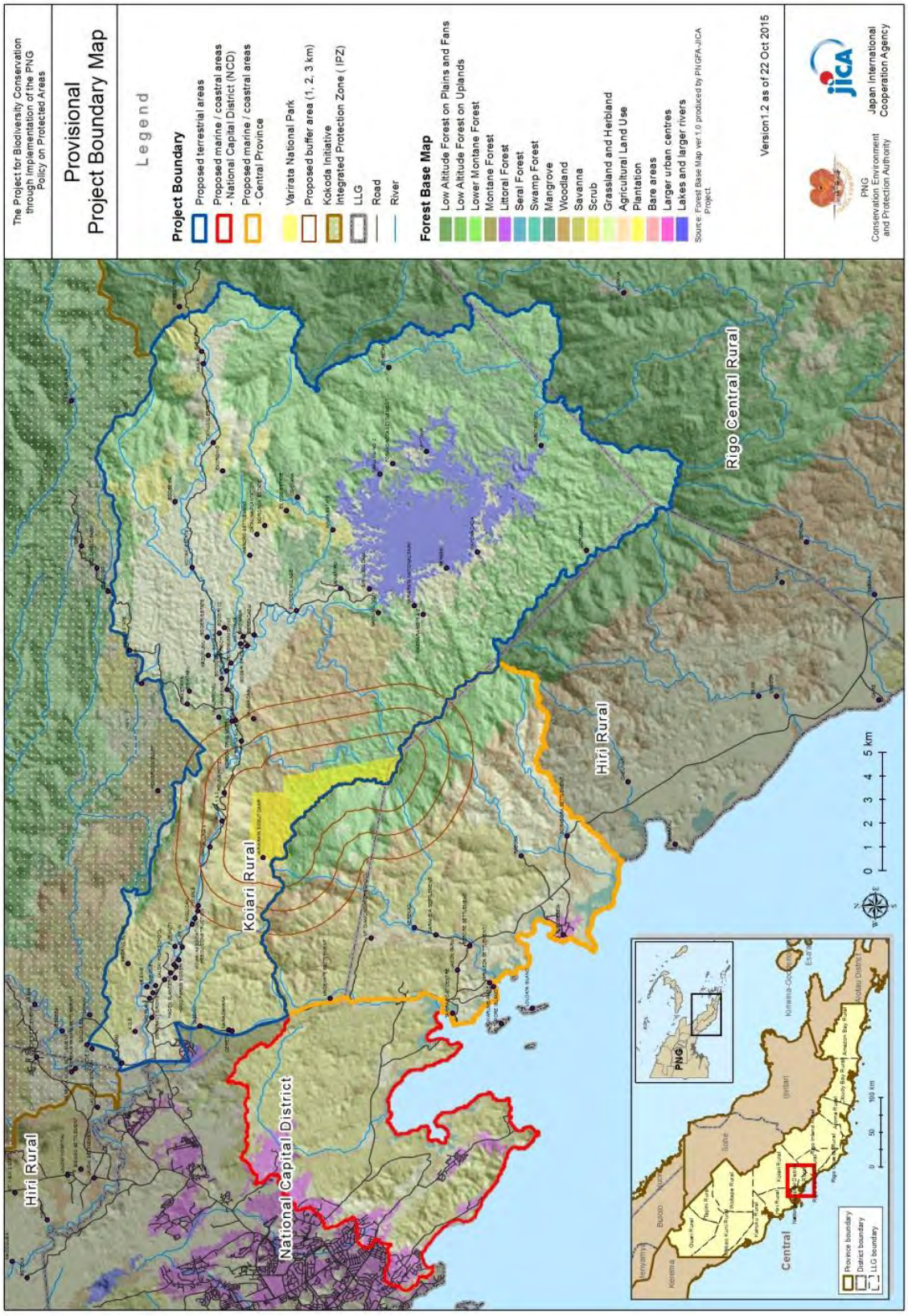


Figure 1 Map showing the location of the target areas for the Project

4. Public Relations and Awareness in the Project Framework

4.1 Project framework

Followings are key components in the project framework of CEPA-JICA Project. The PDM activities of Output 4 were developed specifically in order to share project related information and promote activities in respective project proponent. This will create an enabling environment for collaborative work and effective public relations/awareness towards achieving the common goals of the Project.

(1) Project Purpose:

Institutional capacity of CEPA for protected area (PA) management is strengthened through enhancing national-level PA governance and sustainable use of natural resources with local communities in the model Protected Areas as per the provision of the Policy on Protected Areas (PPA).

(2) Overall Goal of the Project:

Protected Area Network is effectively managed by applying Protected Area management (and establishment) model(s), which were developed by the Project.

(3) Outputs of the Project:

There are four specific outputs for this Project as following:

(1) National-level governance and management arrangement for Protected Area Network (i.e., PPA Action Plan, National Conservation Council (NCC)) is strengthened.
(2) The Varirata National Park (VNP) is enhanced as a terrestrial PA management model in accordance with PPA.
(3) A model of establishing a new marine PA is developed as per the provision of PPA and concerned laws.
(4) Public relations/awareness for biodiversity conservation is improved by disseminating project related information.

(4) Activities of Output 4

Activities related to public relations and awareness will be carried out under Output 4. Specific activities under Output 4 are:

(1) Develop strategy for public relations/awareness
(2) Collect and manage data/information for the management of model PA(s)

(3) Elaborate data/information sharing materials and disseminate through appropriate media
(4) Conduct workshop/seminar for better public relations/awareness.

5. Necessity of Developing PR Strategy for the Project

CEPA (DEC) once has developed a draft Environmental Communication Strategy (Draft Version 1) in February 2013. The Strategy tried to provide a broad overview of the guidelines for the development of effective public communication program, communicating sustainably within CEPA and the various tools, standards and training that can be utilized for the implementation of the education and awareness of different environmental issues. However, this draft strategy was neither finalized nor endorsed. At the moment, CEPA does not have policies, plans nor operational instructions for public relations and awareness, and environmental education. Therefore, it is believed that there is a greater need to develop a strategy for public relations and awareness for the Project, which can be utilized by all stakeholders and at the same time, provides guidance for the users including the PR/Communications Officers of CEPA or media officers.

6. Key Targets for the Strategy

The Strategy will play an integral role in the Project in order to assist in realizing various targets of the project activities by disseminating vital messages to the public and greater communities. The targets of the Strategy shall be relevant to the scope of the work for the Project. This section tries to clarify key targets of the Project to be assisted by the Strategy.

Towards the end of the Project's 5 year period by 2020, the Project would anticipate to realize following major targets:

(1) Make VNP management fully functioning as a model PA of terrestrial ecosystem/biodiversity management in PNG,
(2) Realize increasing number of visitors and tourists visiting the VNP on the monthly or annual basis because of improved facilities and management on the park,
(3) Promote sustainable livelihood with cultural and traditional values together with the preservation of the biodiversity in the target LLGs,
(4) Strengthen and maintain partnership with local communities including the Central Province administration, Kairiku-Hiri District administration, Koiari LLG, Hiri LLG and other key actors that the Project works with,

(5) Strengthen partnership with utility providers such as PNG Power Limited and Eda Ranu, and
(6) Be recognized as the important project partner with the other government agencies, private sectors, NGO's and civil societies.

7. Basic Strategy

There is a need to increase awareness of the Project over the first year (mid 2015 to mid 2016) and over the five year period, to raise the recognition among all of the key target audiences, and to prepare them for more targeted public relations/awareness. For that, the Project states basic strategies as below:

(1) To increase the number of regular PR/awareness outputs/activities.
(2) To enhance project team members on how to work with the media, how to be interviewed well, identify possible problem areas in dealing with the media, and how to avoid them.
(3) To increase collaboration between PR section of CEPA and the Project Team to identify good ideas for PR.
(4) To maintain and expand relations with key journalists/reporters in order to generate frequent and supportive reporting on the organisation. Special publications, social events, and journalist workshops are possible components of this strategy.
(5) Aside from the print media, the disseminating of information to the landowning communities have to be in a desired dialect (Tok Motu, or Tok Pisin) for easy communication.

8. Principles for the Strategy

All the activities under the strategy need to comply with following principles:

(1) More interaction, encouragement and dialogue among all team members of the Project and key partners in order to encourage and ensure all communication requirements are satisfied.
(2) Various PR and communications tools are to be utilized effectively to assist in promoting the overall objectives of the Project through its activities, and that communities are made aware and educated on the importance of conservation and sustainable management of the natural resources.
(3) Communication/PR Outputs (Output 4) from the implementation timeline will be reviewed and revised in consultation with respective project team members, during important and major events or occasions.

(4) All CEPA internal communication protocols including issuance of public media statements will be fully observed.

9. Target Audience and Key Message

There are basically two types of audiences which the Project targets when carrying out its PR/communications activities:

(1) Primary audience

- Local communities or landowners including churches
- Governments (including all levels of government) – decision-makers on natural resource management
- Funders/donor agencies
- Private sectors/corporations that are prepared to work in partnership and accept the environmental compliance standards as their corporate social responsibility (CSR).

(2) Secondary audience

- CEPA
- Schools and academia
- Key partners and stakeholders

It is vital for this Project and CEPA to produce relevant and key messages which can reach the target audiences and at the same time these messages can be easily understood and interpreted by them. Key messages and target audience are indicated in the table 2.

Table 2 Key messages and target audience

Key Messages	Target Audience
Terrestrial Target – Output 2	
Forging partnership to promote livelihood development and conservation of the VNP	• Local communities • Koiari LLG (including Ward areas and councilors) • Kairiku-Hiri District (esp. Hiri) • Central Provincial administration • Private sector/corporate (Eda Ranu, PNG Power Ltd) • Government line agencies (DAL, TPA)
Managing species and their habitats for the future health and benefit of local communities in one of the intact forest and least polluted freshwater systems	• Local communities • Koiari LLG (including Ward areas and councilors) • Kairiku-Hiri District (esp. Hiri) • Central Provincial administration • Private sector/corporate (Eda Ranu, PNG Power Ltd) • Government line agencies (DAL, TPA)

	• Schools/academia
Local communities and governments leading efforts to conserve the unpolluted headwaters of Siriminu Dam and surrounding savannah woodlands	• Local communities • Koiari LLG (including Ward areas and councilors) • Kairiku-Hiri District (esp. Hiri) • Central Provincial administration • Private sector/corporate (Eda Ranu, PNG Power Ltd)
Marine/Coastal Target – Output 3	
Protect 'fringing of coastal barrier complex' along coastlines of Central province/Port Moresby (including Hiri coastal shores and Bootless Bay) *(source: Map 2 Shallow_feat_data_2014_0426, University of Queensland)*	• Local communities • Hiri LLG (including Ward areas and councilors) • Kairiku-Hiri District (esp. Hiri) • Central Provincial administration • UPNG • Private sector/corporate (Loloata Resort, TPA, etc) • Schools/academia(UPNG, PAU)
Conserve priority WCMC offshore habitat within the Coral Triangle Scientific Boundary *(source: Map 2 Shallow_feat_data_2014_0426, University of Queensland)*	• Local communities • Hiri LLG (including Ward areas and councilors) • Kairiku-Hiri District (esp. Hiri) • Central Provincial administration • Private sector/corporate (Loloata Resort, TPA, etc) • Schools/academia(UPNG, PAU)
CEPA-JICA Biodiversity Project – cross-cutting	
Protection and sustainable management of natural resources that enhances biodiversity conservation and livelihoods of local communities	All partners and stakeholders

10. Tools for PR

The Project employ specific tools and medium for effective public relations and awareness as enlisted below:

(1) Website/homepage

The Project is intended to design and produce a website which will be the integral part of the public relations/awareness and communications leading to achieving its objectives. The site will be created in CEPA homepage. The Project's website, which was developed by JICA (www.jica.go.jp/png/english/activities/activity18.html) can also be linked to the CEPA homepage. Project staff will be trained to manage the web content. This will include identifying a designated project/CEPA staff who can be able to continue to upload material and update the web structure on a regular and timely basis. Responsibility for these activities lies with the PR/Communications Officer of CEPA with the direct supervision by the Project Manager.

(2) Photo library

A user friendly '*photo library'* will be set up at the project homepage so that photographs of the new priority landscapes, species, project's achievements and other project related events can be accessed to illustrate the Project's work.

(3) Print media

The PR and Awareness/Communications Officer of CEPA will monitor daily newspapers to keep track of the number of the project's press releases and feature stories which are published or reported on those newspapers. Any stories or news of relevance to the project's staff will be emailed on the day these stories were published to keep staff informed and enable them to prepare comments where necessary.

(4) Brochures/Publications

Brochures are information sheets for the Project in relation to the activities undertaken as per the respective Outputs. Publications are project's outputs, which are produced during the course of project activities, and also are appropriate to be distributed to stakeholders for enhancing effectiveness in the specific field of the project activities. The example of such brochures and publications may include the following:

- Project brochure
- VNP pamphlet
- Marine PA pamphlet
- A guide book for birds, insects, etc for VNP
- Flora and fauna biodiversity reports for VNP and new marine PA
- Monthly or annual technical reports by the Project

(5) Factsheets

The simplified and inexpensive factsheets about the Project and relevant Outputs will be published regularly(tentatively planned to be once a year). These materials can be one or two page documents following a template of factsheet to be set by the Project.
Factsheets will include:

- Basic information of the project activities
- Project achievements
- Products and publications
- Other relevant information of the VNP or new marine PA

(6) Newsletter

A newsletter (can be both hard and e-newsletter) with a given name (to be suggested by the Project, e.g. *Park Toktok, Varirata Toksave*) should be developed. This will be the primary newsletter for conveying information on significant events, achievements, and project progress, which will be communicated to stakeholders, partners, donor and JICA network. This newsletter can be produced quarterly, bi-monthly or annually with contribution of stories, news from all Project staff. The PR/Communications Officer will work closely with the Project Team members, short-term consultants and graphic designers to develop and finalise the publication and circulate the newsletter on specific time frame.

(7) Maps

The Geographical Information System (GIS) specialist of JICA Expert Team will work with consultation of CEPA GIS and Remote Sensing unit and if need arises work in collaboration with other institutions such as PNGFA (FIMS datasets), DAL (PNGRIS datasets), Department of Lands and Physical Planning, etc. to produce maps, which will be focusing on priority landscapes, species and other related information for the project documentation, presentations and external communications, public relations and awareness.

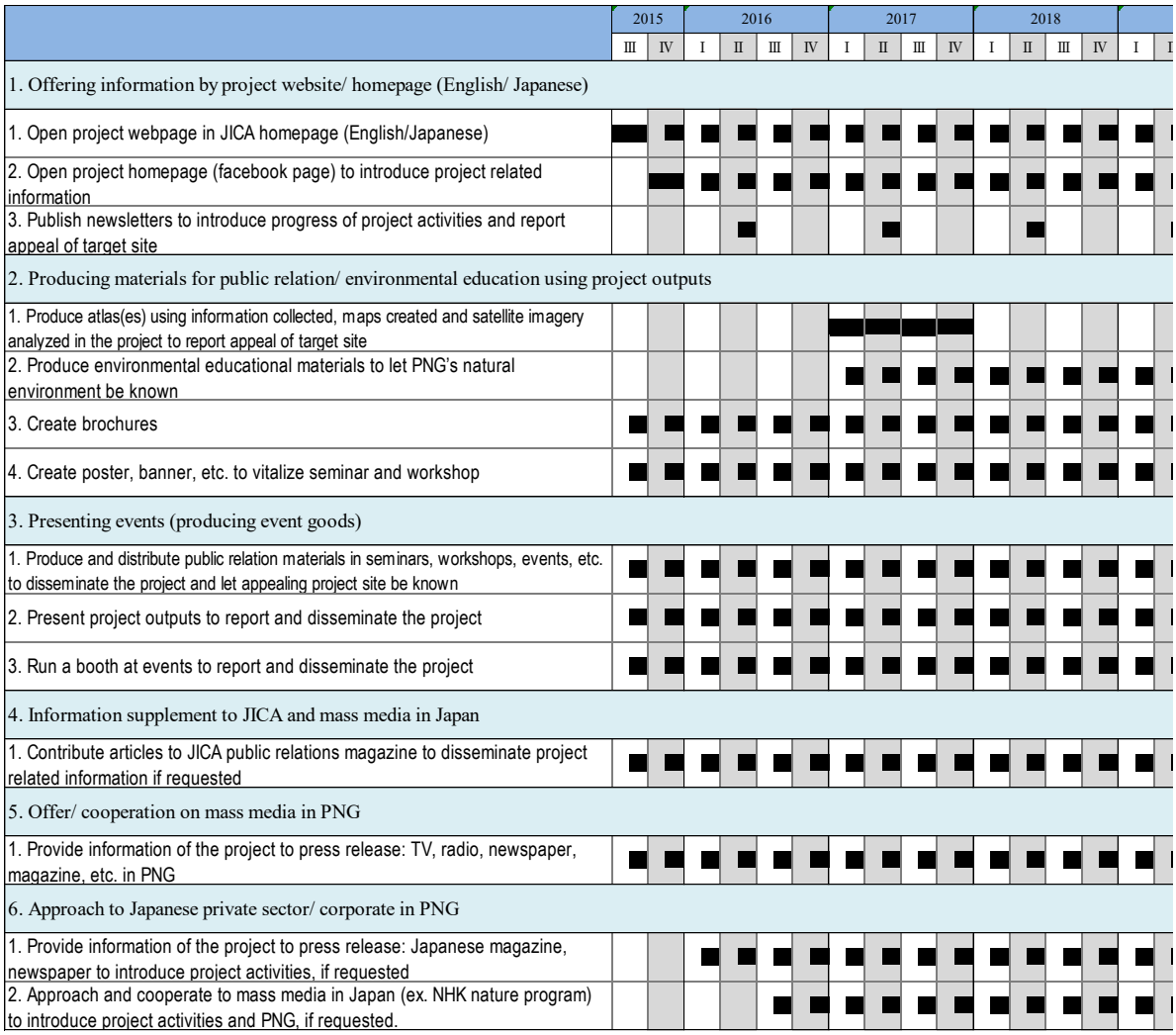
11. Key Activities, Target Audience and Actions

The Project will make necessary actions for PR and awareness as indicated below table:

Table 3 Key activities, target audiences and actions

	Key Activity	Target Audience	Action
1	Offering information by project website/ homepage (English/ Japanese)	Local communities, general nation, target LLGs, Kairiku-Hiri District, Central Provincial Administration	1. Open project webpage in JICA homepage (English/Japanese)
			2. Open project homepage (facebook page) to introduce project related information
			3. Publish newsletters to introduce progress of project activities and report appeal of target site
2	Producing materials for public relation/ environmental education using project outputs	Local communities, general nation, target LLGs, Kairiku-Hiri District, Central Provincial Administration, UPNG, PAU and other schools/academia	1. Produce atlas(es) using information collected, maps created and satellite imagery analyzed in the Project to report appeal of target site
			2. Produce environmental educational materials to let PNG's natural environment be known
			3. Create brochures
			4. Create poster, banner, etc. to vitalize seminar and workshop
3	Presenting events (producing event goods)	Local communities, general nation, target LLGs, Kairiku-Hiri District, Central Provincial Administration	1. Produce and distribute public relation materials in seminars, workshops, events, etc. to disseminate the Project and let appealing project site be known
			2. Present project outputs to report and disseminate the Project
			3. Run a booth at events to report and disseminate the Project
4	Information supplement to JICA and mass media in Japan	General nation, Japanese national	1. Contribute articles to JICA public relations magazine to disseminate project related information if requested
5	Offer/ cooperation on mass media in PNG	Local communities, general nation, target LLGs, Kairiku-Hiri District, Central Provincial Administration	1. Provide information of the Project to press release: TV, radio, newspaper, magazine, etc. in PNG
6	Approach to Japanese private sector/ corporate in PNG	Japanese nationals and private sector/ corporate in PNG, Japanese national	1. Provide information of the Project to press release: Japanese magazine, newspaper to introduce project activities, if requested
			2. Approach and cooperate to mass media in Japan (ex. NHK nature program) to introduce project activities and PNG, if requested.

12. Implementation Schedule



13. Monitoring and Evaluation

Relevant CEPA-JICA Biodiversity Project Team members will track changes and improvements in the strategy. The outputs of the public relations and the related communications matters, such as the number of press releases issued, feature stories prepared and disseminated, press conferences, seminars or workshops held would be monitored ever three months.

By the end of first 12 months (June 2016), monitoring indicators and monitoring schedule will be set for use. The Project will also discuss to set baseline levels in the first 12 months (mid 2015 to mid 2016). A simple baseline assessment will be undertaken at the end of each year.

The followings are examples of monitoring indicators:

- The number of visitors and "hits" of the website per year
- The amount and variety of its contents of website
- Greater web presence, more CEPA-JICA stories on the JICA.go.jp, CEPA webpage, and related homepages
- At least three postings to the project webpage in JICA homepage per year
- At least six postings to the project homepage per year
- At least one types of brochure, 1,000 copies, per year
- Two types of poster per year
- One type of banner per year
- Publications to be in the 3 main languages (ie.. English, Tok pisin and Motu)

添付資料　4.2.2 Public Relations and Awareness Strategy for CEPA-JICA Biodiversity Project 2016 – 2020 (Revised Version)

Public Relations and Awareness Strategy for CEPA-JICA Biodiversity Project 2016-2020 (Revised Version)

July 2018

CEPA-JICA Biodiversity Project

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GoPNG	Government of Papua New Guinea
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NCDC	National Capital District Commission
PA	Protected Area
PAU	Pacific Adventist University
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PNGFA	Papua New Guinea Forest Authority
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PPA	Policy on Protected Areas
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TPA	PNG Tourism Promotion Authority
UPNG	University of Papua New Guinea
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[1] Terrestrial target and marine/coastal target (pls refer to Map 1: Locality of CEPA-JICA Project)

2. Background of the Project

The PNG's strong position on the environment is drawn from the Preamble of the National Constitution which declares our goal to be PNG's natural resources and environment conserved and used for the benefit of us and our future generation. With that position, Government of Papua New Guinea (GoPNG) formulated the National Biodiversity Strategy and Action Plan (NBSAP) in 2007. However, the implementation of NBSAP has been hindered, by lack of coordination and lack of proper funding and institutional capacity. The current protected area system is small, fragmented, and is highly unlikely to be adequate in providing protection to PNG's high biodiversity. CEPA is in charge of monitoring and management of the protected areas however there is virtually no monitoring or management activity by CEPA.

The PNG Policy on the Protected Areas (PPA) was developed and approved in 2014. PPA aims to enhance PNG's governmental institutions at national, provincial and local levels to effectively manage PA network of PNG, and achieve operational function of the PPA.

CEPA-JICA Biodiversity Project is a conservation initiative, which commenced its operation in June 2015. The Project is a joint initiative between the GoPNG and Japan. The overall goal of the Project is "Protected Area Network is effectively managed by applying PA management (and establishment) model(s), which were developed by the Project" directly addresses the PPA implementation, to be achieved by accomplishing the project purpose by the end of the project period.

3. Project Target Areas

Project target area includes Central Province, National Capital District Commission (NCDC) and several target PAs. Output 2 targets Varirata National Park to be a model terrestrial PA, and Koiari Rural LLG to be a target LLG for livelihood development activities in the Project Design Matrix (PDM). Besides, Output 3 targets Motupore Island and Bootless Bay areas for developing a new marine PA model. Table 1 indicates basic information of the target areas, and Figure 1 shows the location of the target areas for the Project.

Table 1 Basic Information of target areas of the Project

WARD			Household No.	Population	VILLAGES & HAMLETS
No.	Name	Member			
Terrestrial targets - Output 2					
2	Mesime	Hon. Auda Arua	552	3130	Mesime,KOB,Iiimo Station,Pukpuk Banis,Bolo Estate, Farm, Reform Churches, Farm 16,Boroma, 14 mile Piggery Farmers,Rabidudu,Gary's Farm, Laloki Secondary, Lobunakouba Primary

3	Madovate	Hon. Manaka Bore	36	283	Madovate, Vaiagai, Maradahana, Tabeani, Foxsy Block
4	Furimuti	Hon. Vakari Koua	364	1870	Furimuti,CPA Compound, Koiari LLG Compound, Mekere Block, Kipalan Block, Radho, Hugo Canning, 15 Mile Station, Sidco, Riverside, Bluff Inn Motel, Hebou Compound, Franciscan Friary, Mt Koiari Block, Ted Diro, 17 mile, Gagibevai, Scout Camp, Rauna 4, Rouna 1&3, Rouna Works
5	Depo	Hon. Billy Ivai	164	967	Depo, Rouna 2, Varirata National Park, Sogeri Lodge, Kokoda Motel, Chamber, Anglician Church, Manurinumu, Magere, Bisiatabu SDA Mission, Gogosenumu, Bisianumu DPI, Ianabevai
6	Vesulogo	Hon. Helen Wiena	159	735	Vesulogo, Iiolo, New Camp(Vataro), Moenaro, Salvation Army, Girinumu 1, Girinumu 2, Owens Corner Memorial Park
7	Bereadabu	Hon. Kidu Toina	70	349	Bereadabu, Fakonama, Numuranumu, Wantomia, Pineapple Farm, Mababoto, Waharo,Boda.
8	Kailaki	Hon. Keroko	190	987	Kailaki, Edobevai, Patiki, Ekoro, Itikinumu Primary School & Estate, Manubada, Aipiri, Subitana, Kailaki Community School
10	Ogotana	Hon. Baia Toina	61	377	Ogotana, Mororo, Katalina Estate, Eilogo Estate, Wararo, Ninoa Estate
11	Kahaitana	Hon. Avana Koroi	88	631	Kahaitana, Bausaka, Nainumu 2, Forokorata, Boredabu
12	Berebei	Vacant	114	576	Berebei, Manamiro, Sirinumu Dam, Nainumu 1, Gurunumu, Koeaba, Sirinumu Primary School, Wahonadada, Kouaro, Lorikitana
13	Wautanumu	Hon. Kareki Karimu	29	149	Warutanumu, Ubatana
20	Sogeri Urban	Hon. Tau Wahona	98	554	Sogeri Station, Botoguni, Sogeri Police Station, Sogeri Health Centre, Larowari Secondary School, Sogeri Primary, Moronumu.
Total			1,925	10,608	

Source: Population Census 2010

WARD			Household No.	Population	VILLAGES & HAMLETS
No.	Name	Member			
Marine/coastal targets - Output 3					
8	Barakau	-	183	1,598	Barakau, Kerekadi, Rabuka
9	Tubusereia	-	402	3,673	Tubusereia
10	Mt Diamond	-	113	540	Loloata Island,Gwarume-Mase, Mirigeda Settlement, Garameia Settlement, Sebore Settlement, Borabora Settlement, Motupore Island, Tahira Boat Centre, Mt Diamond High School, Jason Farm
12	Dagoda	-	114	718	Dabunari, Dagoda, Seme, Vaivai
Total			812	6,529	

Source: Population Census 2000

The Project for Biodiversity Conservation through Implementation of the PNG Policy on Protected Areas
Provisional
Project Boundary Map
Legend
Project Boundary
Proposed terrestrial areas
Proposed marine / coastal areas - National Capital District (NCD)
Proposed marine / coastal areas - Central Province
Varirata National Park
Proposed buffer area (1, 2, 3 km)
Hakeda initiative
Integrated Protection Zone (IPZ)
LLG
Road
River
Forest Base Map
Low Altitude Forest on Plains and Fans
Low Altitude Forest on Uplands
Lower Montane Forest
Montane Forest
Littoral Forest
Semi Forest
Swamp Forest
Mangrove
Woodland
Savanna
Scrub
Grassland and Herbland
Agricultural Land Use
Plantation
Bare Areas
Larger urban centres
Lakes and larger rivers
Version1.2 as of 22 Oct 2015
Japan International Cooperation Agency
Hiri Rural
Kairuku Rural
National Capital District
Rigo Central Rural
Central
Rigo
0 1 2 3 4 5 km

Figure 1 Map showing the location of the target areas for the Project

4. Public Relations and Awareness in the Project Framework

4.1 Project framework

Followings are key components in the project framework of CEPA-JICA Biodiversity Project. The PDM activities of Output 4 were developed specifically in order to share project related information and promote activities in respective project proponent. This will create an enabling environment for collaborative work and effective public relations/awareness towards achieving the common goals of the Project.

(1) Project Purpose:

Institutional capacity of CEPA for protected area (PA) management is strengthened through enhancing national-level PA governance and sustainable use of natural resources with local communities in the model Protected Areas as per the provision of the Policy on Protected Areas (PPA).

(2) Overall Goal of the Project:

Protected Area Network is effectively managed by applying PA management (and establishment) model(s), which were developed by the Project.

(3) Outputs of the Project:

There are four specific outputs for this Project as following:

(1) National-level governance and management arrangement for Protected Area Network (i.e., PPA Action Plan, National Conservation Council (NCC)) is strengthened.
(2) The Varirata National Park (VNP) is enhanced as a terrestrial PA management model in accordance with PPA.
(3) A model of establishing a new marine PA is developed as per the provision of PPA and concerned laws.
(4) Public relations/awareness for biodiversity conservation is improved by disseminating project related information.

(4) Activities of Output 4

Activities related to public relations and awareness will be carried out under Output 4. Specific activities under Output 4 are:

(1) Develop strategy for public relations/awareness

(2) Collect and manage data/information for the management of model PA(s)
(3) Elaborate data/information sharing materials and disseminate through appropriate media
(4) Conduct workshop/seminar for better public relations/awareness.

5. Necessity of Developing PR Strategy for the Project

CEPA (DEC) once has developed a draft Environmental Communication Strategy (Draft Version 1) in February 2013. The Strategy tried to provide a broad overview of the guidelines for the development of effective public communication program, communicating sustainably within CEPA and the various tools, standards and training that can be utilized for the implementation of the education and awareness of different environmental issues. However, this draft strategy was neither finalized nor endorsed. At the moment, CEPA does not have policies, plans nor operational instructions for public relations and awareness, and environmental education. Therefore, it is believed that there is a greater need to develop a strategy for public relations and awareness for the Project, which can be utilized by all stakeholders and at the same time, provides guidance for the users including the PR/Communications Officers of CEPA or media officers.

6. Key Targets for the Strategy

The Strategy will play an integral role in the Project in order to assist in realizing various targets of the project activities by disseminating vital messages to the public and greater communities. The targets of the Strategy shall be relevant to the scope of the work for the Project. This section tries to clarify key targets of the Project to be assisted by the Strategy.

Towards the end of the Project's 5 year period by 2020, the Project would anticipate to realize following major targets:

(1) Make VNP management fully functioning as a model PA of terrestrial ecosystem/biodiversity management in PNG,
(2) Realize increasing number of visitors and tourists visiting the VNP on the monthly or annual basis because of improved facilities and management on the park,
(3) Promote sustainable livelihood with cultural and traditional values together with the preservation of the biodiversity in the target LLGs,
(4) Strengthen and maintain partnership with local communities including the Central Province administration, Kairiku-Hiri District administration, Koiari LLG, Hiri LLG and other key actors that the Project works with,
(5) Strengthen partnership with utility providers such as PNG Power Limited and Eda Ranu, and

(6) Be recognized as the important project partner with the other government agencies, private sectors, NGO's and civil societies.

7. Basic Strategy

There is a need to increase awareness of the Project over the first year (mid 2015 to mid 2016) and over the five year period, to raise the recognition among all of the key target audiences, and to prepare them for more targeted public relations/awareness. For that, the Project states basic strategies as below:

(1) To increase the number of regular PR/awareness outputs/activities.
(2) To enhance Project Team members on how to work with the media, how to be interviewed well, identify possible problem areas in dealing with the media, and how to avoid them.
(3) To increase collaboration between PR section[2] of CEPA and the Project Team to identify good ideas for PR.
(4) To maintain and expand relations with key journalists/reporters in order to generate frequent and supportive reporting on the organisation. Special publications, social events, and journalist workshops are possible components of this strategy.
(5) Aside from the print media, the disseminating of information to the landowning communities have to be in a desired dialect (Tok Motu, or Tok Pisin) for easy communication.

8. Principles for the Strategy

All the activities under the strategy need to comply with following principles:

(1) More interaction, encouragement and dialogue among all team members of the Project and key partners in order to encourage and ensure all communication requirements are satisfied.
(2) Various PR and communications tools are to be utilized effectively to assist in promoting the overall objectives of the Project through its activities, and that communities are made aware and educated on the importance of conservation and sustainable management of the natural resources.
(3) Communication/PR Outputs (Output 4) from the implementation timeline will be reviewed and revised in consultation with respective Project Team members, during important and major events or occasions.

[2] CEPA does not have the unit which specializes in PR/awareness. The Project collaborate with the sections related to PR, including Environmental Information and Science Division and Information and Communication Technology Branch.

(4) All CEPA internal communication protocols including issuance of public media statements will be fully observed.

9. Target Audience and Key Message

There are basically two types of audiences which the Project targets when carrying out its PR/communications activities:

(1) Primary audience

- Local communities or landowners including churches
- Governments (including all levels of government) – decision-makers on natural resource management
- Funders/donor agencies
- Private sectors/corporations that are prepared to work in partnership and accept the environmental compliance standards as their corporate social responsibility (CSR).

(2) Secondary audience

- CEPA
- Schools and academia
- Key partners and stakeholders

It is vital for this Project and CEPA to produce relevant and key messages which can reach the target audiences and at the same time these messages can be easily understood and interpreted by them. Key messages and target audience are indicated in the table 2.

Table 2 Key messages and target audience

Key Messages	Target Audience
Terrestrial Target – Output 2	
Forging partnership to promote livelihood development and conservation of the VNP	• Local communities • Koiari LLG (including Ward areas and councilors) • Kairiku-Hiri District (esp. Hiri) • Central Provincial administration • Private sector/corporate (Eda Ranu, PNG Power Ltd) • Government line agencies (DAL, TPA)
Managing species and their habitats for the future health and benefit of local communities in one of the intact forest and least polluted freshwater systems	• Local communities • Koiari LLG (including Ward areas and councilors) • Kairiku-Hiri District (esp. Hiri) • Central Provincial administration • Private sector/corporate (Eda Ranu, PNG Power Ltd) • Government line agencies (DAL, TPA) • Schools/academia

Local communities and governments leading efforts to conserve the unpolluted headwaters of Siriminu Dam and surrounding savannah woodlands	• Local communities • Koiari LLG (including Ward areas and councilors) • Kairiku-Hiri District (esp. Hiri) • Central Provincial administration • Private sector/corporate (Eda Ranu, PNG Power Ltd)
Marine/Coastal Target – Output 3	
Protect 'fringing of coastal barrier complex' along coastlines of Central province/Port Moresby (including Hiri coastal shores and Bootless Bay) *(source: Map 2 Shallow_feat_data_2014_0426, University of Queensland)*	• Local communities • Hiri LLG (including Ward areas and councilors) • Kairiku-Hiri District (esp. Hiri) • Central Provincial administration • UPNG • Private sector/corporate (Loloata Resort, TPA, etc) • Schools/academia(UPNG, PAU)
Conserve priority WCMC offshore habitat within the Coral Triangle Scientific Boundary *(source: Map 2 Shallow_feat_data_2014_0426, University of Queensland)*	• Local communities • Hiri LLG (including Ward areas and councilors) • Kairiku-Hiri District (esp. Hiri) • Central Provincial administration • Private sector/corporate (Loloata Resort, TPA, etc) • Schools/academia(UPNG, PAU)
CEPA-JICA Biodiversity Project – cross-cutting	
Protection and sustainable management of natural resources that enhances biodiversity conservation and livelihoods of local communities	All partners and stakeholders

10. Tools for PR

The Project employ specific tools and medium for effective public relations and awareness as enlisted below:

(1) Website/homepage

The Project is intended to design and produce a website which will be the integral part of the public relations/awareness and communications leading to achieving its objectives. The site will be created in CEPA homepage (http://www.pngcepa.com/projects/) and as facebook page. The Project's website, which was developed by JICA (www.jica.go.jp/png/english/activities/activity18.html), can also be linked to the CEPA homepage. Project staff will be trained to manage the web content. This will include identifying a designated project/CEPA staff who can be able to continue to upload material and update the web structure on a regular and timely basis. Responsibility for these activities lies with the PR/Communications Officer of CEPA with the direct supervision by the Project Manager.

(2) Photo library

A user friendly '*photo library*' will be set up at the project homepage so that photographs of the new priority landscapes, species, project's achievements and other project related events can be accessed to illustrate the Project's work.

(3) Print media

The PR and Awareness/Communications Officer of CEPA will monitor daily newspapers to keep track of the number of the project's press releases and feature stories which are published or reported on those newspapers. Any stories or news of relevance to the project's staff will be emailed on the day these stories were published to keep staff informed and enable them to prepare comments where necessary.

(4) Brochures/Publications

Brochures are information sheets for the Project in relation to the activities undertaken as per the respective Outputs. Publications are project's outputs, which are produced during the course of project activities, and also are appropriate to be distributed to stakeholders for enhancing effectiveness in the specific field of the project activities. The example of such brochures and publications may include the following:

- Project brochure
- VNP pamphlet
- Marine PA pamphlet
- A guide book for birds, insects, etc for VNP
- Flora and fauna biodiversity reports for VNP and new marine PA
- Monthly or annual technical reports by the Project

(5) Factsheets

The simplified and inexpensive factsheets about the Project and relevant Outputs will be published regularly(tentatively planned to be once a year). These materials can be one or two page documents following a template of factsheet to be set by the Project.
Factsheets will include:

- Basic information of the project activities
- Project achievements
- Products and publications
- Other relevant information of the VNP or new marine PA

(6) Newsletter

A newsletter (can be both hard and e-newsletter) with a given name (to be suggested by the Project, e.g. *Park Toktok, Varirata Toksave*) should be developed. This will be the

primary newsletter for conveying information on significant events, achievements, and project progress, which will be communicated to stakeholders, partners, donor and JICA network. This newsletter can be produced quarterly, bi-monthly or annually with contribution of stories, news from all Project staff. The PR/Communications Officer will work closely with the Project Team members, short-term consultants and graphic designers to develop and finalise the publication and circulate the newsletter on specific time frame.

(7) Maps

The Geographical Information System (GIS) specialist of JICA Expert Team will work with consultation of CEPA GIS and Remote Sensing unit and if need arises work in collaboration with other institutions such as Papua New Guinea Forest Authority (PNGFA) (Forest Information Management System (FIMS) datasets), Department of Agriculture and Livestock (DAL) (PNG Resource Information System (PNGRIS) datasets), Department of Lands and Physical Planning, etc. to produce maps, which will be focusing on priority landscapes, species and other related information for the project documentation, presentations and external communications, public relations and awareness.

11. Key Activities, Target Audience and Actions

The Project will make necessary actions for PR and awareness as indicated below table:

Table 3 Key activities, target audiences and actions

	Key Activity	Target Audience	Action
1	Offering information by project website/ homepage (English/ Japanese)	Local communities, general nation, target LLGs, Kairiku-Hiri District, Central Provincial Administration	1. Open project webpage in JICA homepage (English/Japanese)
			2. Open project homepage (facebook page) to introduce project related information
			3. Publish newsletters to introduce progress of project activities and report appeal of target site
2	Producing materials for public relation/ environmental education using project outputs	Local communities, general nation, target LLGs, Kairiku-Hiri District, Central Provincial Administration, UPNG, PAU and other schools/academia	1. Produce atlas(es) using information collected, maps created and satellite imagery analyzed in the Project to report appeal of target site
			2. Produce environmental educational materials to let PNG's natural environment be known
			3. Create brochures
			4. Create poster, banner, etc. to vitalize seminar and workshop
3	Presenting events (producing event goods)	Local communities, general nation, target LLGs, Kairiku-Hiri District, Central Provincial Administration	1. Produce and distribute public relation materials in seminars, workshops, events, etc. to disseminate the Project and let appealing project site be known
			2. Present project outputs to report and disseminate the Project
			3. Run a booth at events to report and disseminate the Project
4	Information supplement to JICA and mass media in Japan	General nation, Japanese national	1. Contribute articles to JICA public relations magazine to disseminate project related information if requested
5	Offer/ cooperation on mass media in PNG	Local communities, general nation, target LLGs, Kairiku-Hiri District, Central Provincial Administration	1. Provide information of the Project to press release: TV, radio, newspaper, magazine, etc. in PNG
6	Approach to Japanese private sector/ corporate in PNG	Japanese nationals and private sector/ corporate in PNG, Japanese national	1. Provide information of the Project to press release: Japanese magazine, newspaper to introduce project activities, if requested
			2. Approach and cooperate to mass media in Japan (ex. NHK nature program) to introduce project activities and PNG, if requested.

12. Implementation Schedule

Activities	2015		2016				2017				2018				2019				2000	
	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II
1. Offering information by project website/ homepage (English/ Japanese)																				
1.1 Open project webpage in JICA homepage (English/Japanese) to introduce the project and main project activities																				
1.2 Open project homepage (facebook page) to introduce project related information, target site and project activities timely																				
1.3 Publish newsletters to introduce progress of project activities and report appeal of target site																				
2. Producing materials for public relation/ environmental education using project outputs																				
2.1 Produce atlas(es) using information collected, maps created and satellite imagery analyzed in the Project to report appeal of target site																				
2.2 Produce environmental educational materials to let PNG's natural environment be known																				
2.3 Create brochures to report project activities																				
2.4 Create poster, banner, sign board, etc. to vitalize seminar and workshop																				
3. Presenting events (producing event goods)																				
3.1 Produce and distribute public relation materials in seminars, workshops, events, etc. to disseminate the project and let appealing project site and PNG's natural environment be known																				
3.2 Present project outputs to report and disseminate the project																				
3.3 Run a booth at events to report and disseminate the project																				
4. Information supplement to JICA and mass media in Japan																				
4.1 Contribute articles to JICA public relations magazine to disseminate project related information if requested																				
5. Offer/ cooperation on mass media in PNG																				
5.1 Provide information of the Project to press release: TV, radio, newspaper, magazine, etc. in PNG to disseminate project activities information																				
6. Approach to Japanese private sector/ corporate in PNG																				
6.1 Provide information of the Project to press release: Japanese magazine, newspaper to introduce project activities, if requested																				
6.2 Approach and cooperate to mass media in Japan (ex. NHK nature program) to introduce project activities and PNG, if requested																				

13. Monitoring and Evaluation

Relevant CEPA-JICA Biodiversity Project Team members will track changes and improvements in the strategy. The outputs of the public relations and the related communications matters, such as the number of press releases issued, feature stories prepared and disseminated, press conferences, seminars or workshops held would be monitored ever three months.

By the end of first 12 months (June 2016), monitoring indicators and monitoring schedule will be set for use. The Project will also discuss to set baseline levels in the first 12 months (mid 2015 to mid 2016). A simple baseline assessment will be undertaken at the end of each year.

The followings are examples of monitoring indicators:

- The number of visitors and "hits" of the website per year
- The amount and variety of its contents of website
- Greater web presence, more CEPA-JICA stories on the JICA.go.jp, CEPA webpage, and related homepages
- At least three postings to the project webpage in JICA homepage per year
- At least six postings to the project homepage per year
- At least one types of brochure, 1,000 copies, per year
- Two types of poster per year
- One type of banner per year
- Publications to be in the 3 main languages (ie.. English, Tok pisin and Motu)

Midterm Monitoring and Evaluation in July 2019

In July 2019, the project activities and achievements were monitored in the Table 4. The specified activities were basically implemented at a good rate, and the activities and the tools for PR well contributed to disseminate the project activities.

In latter half of the Project, the Project Team will more focus on producing environmental educational materials to be displayed in Information Center Complex in VNP and mangrove information center of marine PA. Moreover, the Project Team will provide information of the project activities and achievements to press release such as TV, newspaper, magazine, etc.

Table 4 Activities and achievements as of July 2019

Activities	Activities/Achievements
1. Offering information by project website/ homepage (English/ Japanese)	
1.1 Open project webpage in JICA homepage (English/Japanese) to introduce the project and main project activities	Project webpage was opened in JICA homepage (English/Japanese) and CEPA homepage. 8 postings as of July 2018.
1.2 Open project homepage (facebook page) to introduce project related information, target site and project activities timely	Facebook page of the Project was opened. 179 postings as of July 2018.
1.3 Publish newsletters to introduce progress of project activities and report appeal of target site	Newsletters were published twice a year (6 Newsletters as of July 2018).
2. Producing materials for public relation/ environmental education using project outputs	
2.1 Produce atlas(es) using information collected, maps created and satellite imagery analyzed in the Project to report appeal of target site	Atlas (draft) was created.
2.2 Produce environmental educational materials to let PNG's natural environment be known	Guide Map of Varirata National Park (1st edition) was published.
2.3 Create brochures to report project activities	Brochures were published (3 for the Project, 1 for Output 3). 2 Factsheets were published.
2.4 Create poster, banner, sign board, etc. to vitalize seminar and workshop	Various PR materials were created. - Banner (3) - Poster (more than 7) - Sign board (11: the Project, VNP at main picnic area and main lookout, Bird Watching in VNP, Megapod explanation in VNP, Bird Watching at PAU, marine PA at Tahira UPNG land (2 sites), Motupore Island, and Tahira farm, and mangrove protection) - Logo (2: VNP and BBMCI) - Sticker (4: the Project, VNP, project boat and BBMCI) - Polo shirt
3. Presenting events (producing event goods)	
3.1 Produce and distribute public relation materials in seminars, workshops, events, etc. to disseminate the project and let appealing project site and PNG's natural environment be known	Various PR materials were produced and distributed in seminars, workshops, events, etc. - 100 T-shirts for BBMCI (100) were distributed at the launching ceremony of the project boat (35 participants). - 100 T-shirts for "Friends of Varirata" were distributed at the Inaugural Event for Renovated Facilities in VNP (more than 100 participants).
3.2 Present project outputs to report and disseminate the project	The Project Team participated in Kokoda Initiative workshop and made presentation on the project. A presentation was made at the World Oceans Conference in UN HQ, New York City. 15 seminars/workshops were held. - Kick-off Seminar/Workshop for the Project (94 participants) - Inception and Follow-up Workshop for Koiari (73 and 27 participants) - Workshop on Livelihood Development & Bird Watching in Koiari (31 participants) - VNP Landowner Workshop on Livelihood development (25 participants) - Inception and the 2nd Workshop for the creation of BBMCI (33 and 55 participants) - VNP Wrap-up Workshop on the Project Achievements 2015-2016 (57 participants) - Inaugural Launch for the Renovated Facilities in VNP (128 participants) - 5 times meeting for BBMCI (104, 17, 19, 23, and 20 participants) - Seminar for explanation of the results of social mapping and socio-economic survey (21 participants)
3.3 Run a booth at events to report and disseminate the project	The Project was promoted in the World Wildlife Day event at Nature Park. Major sponsorship of the World Environment Day event at VNP (Over 400 participants). The Project Team ran a booth at the World Oceans Conference in UN HQ, New York City. The Project Team launched the CTI Day.
4. Information supplement to JICA and mass media in Japan	
4.1 Contribute articles to JICA public relations magazine to disseminate project related information if requested	Project news was picked up in JICA Natural Environment Conservation Knowledge Management Network Newsletter "Shizen Kankyo Dayori" vol. 17.
5. Offer/ cooperation on mass media in PNG	
5.1 Provide information of the Project to press release: TV, radio, newspaper, magazine, etc. in PNG to disseminate project activities information	Project news got into the newspaper in PNG 11 times.
6. Approach to Japanese private sector/ corporate in PNG	
6.1 Provide information of the Project to press release: Japanese magazine, newspaper to introduce project activities, if requested	Not yet.
6.2 Approach and cooperate to mass media in Japan (ex. NHK nature program) to introduce project activities and PNG, if requested	Not yet.

添付資料 4.2.3 Public Relations and Awareness Strategy for CEPA-JICA Biodiversity Project 2016 – 2020 (Final Report)

Public Relations and Awareness Strategy for CEPA-JICA Biodiversity Project 2016-2020

Final Report

November 2020

CEPA-JICA Biodiversity Project

Table of Contents

Table of Contents

Acronyms and Abbreviations

Acronyms and Abbreviations

BBMCI	Bootless Bay Marine Conservation Initiative
CEPA	Conservation and Environment Protection Authority
CSR	Corporate Social Responsibility
DAL	Department of Agriculture and Livestock
DEC	Department of Environment and Conservation
FIMS	Forest Information Management System
JICA	Japan International Cooperation Agency
GIS	Geographical Information System
GoJ	Government of Japan
GoPNG	Government of Papua New Guinea
LLG	Local Level Government
NBSAP	National Biodiversity Strategy and Action Plan
NCC	National Conservation Council
NCDC	National Capital District Commission
PA	Protected Area
PAU	Pacific Adventist University
PDM	Project Design Matrix
PNGFA	Papua New Guinea Forest Authority
PNGRIS	PNG Resource Information System
PPA	Policy on Protected Areas
PR	Public Relations
TPA	PNG Tourism Promotion Authority
UPNG	University of Papua New Guinea
VNP	Varirata National Park

1. Introduction

This Public Relations (PR) and Awareness Strategy was aimed at CEPA-JICA Biodiversity Project staff that play either a strategic, operational or influential role in communications, public relations and campaigning for the respective conservation activities affecting marine, forests, and freshwater ecosystems within the framework of CEPA-JICA Biodiversity Project (hereinafter called the Project) specifically focused on these thematic ecosystems - Varirata National Park (VNP) in Koiari Local-level Government (LLG) and Motupore Island near Bootless Bay of Central Province.

It is the responsibility of everyone within the Project to lead and raise awareness of the status of the project target area[1] of PNG as the center of biodiversity including the network of Protected Areas (PA), and the need to conserve its biodiversity and promote sustainable livelihoods for the customary landowners.

The major targets detailed in this document relies on the cooperation of all staff of Conservation and Environment Protection Authority (CEPA) and Japan International Cooperation Agency (JICA) Expert Team, particularly those working at the local grass roots level such as the Koiari Rural LLG and Hiri Rural LLG.

This document shall be guided by the Environmental Communication Strategy of Department of Environment and Conservation (DEC) (Draft Version 1, 2013). In addition there is a strong emphasis on how to create effective public relations and awareness campaign and the steps involved in this process.

This final report also mentions the outputs and effects of the PR and awareness activities implemented in the Project by November 2020. The discussions and lessons learned in the activities of the Project will be an indication of future PR and awareness activities in CEPA.

[1] Terrestrial target and marine/coastal target (pls refer to Map 1: Locality of CEPA-JICA Project)

2. Background of the Project

The PNG's strong position on the environment is drawn from the Preamble of the National Constitution which declares our goal to be PNG's natural resources and environment conserved and used for the benefit of us and our future generation. With that position, Government of Papua New Guinea (GoPNG) formulated the National Biodiversity Strategy and Action Plan (NBSAP) in 2007. However, the implementation of NBSAP has been hindered, by lack of coordination and lack of proper funding and institutional capacity. The current protected area system is small, fragmented, and is highly unlikely to be adequate in providing protection to PNG's high biodiversity. CEPA is in charge of monitoring and management of the protected areas however there is virtually no monitoring or management activity by CEPA.

The PNG Policy on the Protected Areas (PPA) was developed and approved in 2014. PPA aims to enhance PNG's governmental institutions at national, provincial and local levels to effectively manage PA network of PNG, and achieve operational function of the PPA.

CEPA-JICA Biodiversity Project is a conservation initiative, which commenced its operation in June 2015. The Project is a joint initiative between the GoPNG and Government of Japan (GoJ). The overall goal of the Project, "*Protected Area Network is effectively managed by applying PA management (and establishment) model(s), which were developed by the Project*" directly addresses the PPA implementation, to be achieved by accomplishing the project purpose by the end of the project period.

3. Project Target Areas

Project target area includes Central Province, National Capital District Commission (NCDC) and several target PAs. Output 2 targets Varirata National Park (VNP) to be a model terrestrial PA, and Koiari Rural LLG to be a target LLG for livelihood development activities in the Project Design Matrix (PDM). Besides, Output 3 targets Motupore Island and Bootless Bay areas for developing a new marine PA model. Table 1 indicates basic information of the target areas, and Figure 1 shows the location of the target areas for the Project.

Table 1 Basic Information of target areas of the Project

WARD			Household No.	Population	VILLAGES & HAMLETS
No.	Name	Member			
Terrestrial targets - Output 2					
2	Mesime	Hon. Auda Arua	552	3130	Mesime,KOB,Iiimo Station,Pukpuk Banis,Bolo Estate, Farm, Reform Churches, Farm 16,Boroma, 14 mile Piggery Farmers,Rabidudu,Gary's Farm, Laloki Secondary, Lobunakouba Primary

3	Madovate	Hon. Manaka Bore	36	283	Madovate, Vaiagai, Maradahana, Tabeani, Foxsy Block
4	Furimuti	Hon. Vakari Koua	364	1870	Furimuti,CPA Compound, Koiari LLG Compound, Mekere Block, Kipalan Block, Radho, Hugo Canning, 15 Mile Station, Sidco, Riverside, Bluff Inn Motel, Hebou Compound, Franciscan Friary, Mt Koiari Block, Ted Diro, 17 mile, Gagibevai, Scout Camp, Rauna 4, Rouna 1&3, Rouna Works
5	Depo	Hon. Billy Ivai	164	967	Depo, Rouna 2, VNP, Sogeri Lodge, Kokoda Motel, Chamber, Anglician Church, Manurinumu, Magere, Bisiatabu SDA Mission, Gogosenumu, Bisianumu DPI, Ianabevai
6	Vesulogo	Hon. Helen Wiena	159	735	Vesulogo, Iiolo, New Camp(Vataro), Moenaro, Salvation Army, Girinumu 1, Girinumu 2, Owens Corner Memorial Park
7	Bereadabu	Hon. Kidu Toina	70	349	Bereadabu, Fakonama, Numuranumu, Wantomia, Pineapple Farm, Mababoto, Waharo,Boda.
8	Kailaki	Hon. Keroko	190	987	Kailaki, Edobevai, Patiki, Ekoro, Itikinumu Primary School & Estate, Manubada, Aipiri, Subitana, Kailaki Community School
10	Ogotana	Hon. Baia Toina	61	377	Ogotana, Mororo, Katalina Estate, Eilogo Estate, Wararo, Ninoa Estate
11	Kahaitana	Hon. Avana Koroi	88	631	Kahaitana, Bausaka, Nainumu 2, Forokorata, Boredabu
12	Berebei	Vacant	114	576	Berebei, Manamiro, Sirinumu Dam, Nainumu 1, Gurunumu, Koeaba, Sirinumu Primary School, Wahonadada, Kouaro, Lorikitana
13	Wautanumu	Hon. Kareki Karimu	29	149	Warutanumu, Ubatana
20	Sogeri Urban	Hon. Tau Wahona	98	554	Sogeri Station, Botoguni, Sogeri Police Station, Sogeri Health Centre, Larowari Secondary School, Sogeri Primary, Moronumu.
Total			**1,925**	**10,608**	

Source: Population Census 2010

WARD			Household No.	Population	VILLAGES & HAMLETS
No.	Name	Member			
Marine/coastal targets - Output 3					
8	Barakau	-	183	1,598	Barakau, Kerekadi, Rabuka
9	Tubusereia	-	402	3,673	Tubusereia
10	Mt Diamond	-	113	540	Loloata Island,Gwarume-Mase, Mirigeda Settlement, Garameia Settlement, Sebore Settlement, Borabora Settlement, Motupore Island, Tahira Boat Centre, Mt Diamond High School, Jason Farm
12	Dagoda	-	114	718	Dabunari, Dagoda, Seme, Vaivai
Total			**812**	**6,529**	

Source: Population Census 2000

Figure 1 Map showing the location of the target areas for the Project

4. Public Relations and Awareness in the Project Framework

Project framework

Followings are key components in the project framework of CEPA-JICA Biodiversity Project. The PDM activities of Output 4 were developed specifically in order to share project related information and promote activities in respective project proponent. This was expected to create an enabling environment for collaborative work and effective public relations/awareness towards achieving the common goals of the Project.

(1) Project Purpose:

Institutional capacity of CEPA for protected area (PA) management is strengthened through enhancing national-level PA governance and sustainable use of natural resources with local communities in the model Protected Areas as per the provision of the Policy on Protected Areas (PPA).

(2) Overall Goal of the Project:

Protected Area Network is effectively managed by applying PA management (and establishment) model(s), which were developed by the Project.

(3) Outputs of the Project:

There are four specific outputs for this Project as following:

(1) National-level governance and management arrangement for Protected Area Network (i.e., PPA Action Plan, National Conservation Council (NCC)) is strengthened.
(2) The Varirata National Park (VNP) is enhanced as a terrestrial PA management model in accordance with PPA.
(3) A model of establishing a new marine PA is developed as per the provision of PPA and concerned laws.
(4) Public relations/awareness for biodiversity conservation is improved by disseminating project related information

(4) Activities of Output 4

Activities related to public relations and awareness are carried out under Output 4. Specific activities under Output 4 are:

(1) Develop strategy for public relations/awareness
(2) Collect and manage data/information for the management of model PA(s)
(3) Elaborate data/information sharing materials and disseminate through appropriate media
(4) Conduct workshop/seminar for better public relations/awareness.

5. Necessity of Developing PR Strategy for the Project

CEPA (formerly DEC) once developed a draft Environmental Communication Strategy (Draft Version 1) in February 2013. The Strategy tried to provide a broad overview of the guidelines for the development of effective public communication program, communicating sustainably within CEPA and the various tools, standards and training that can be utilized for the implementation of the education and awareness of different environmental issues. However, this draft strategy was neither finalized nor endorsed. At the moment, CEPA does not have policies, plans nor operational instructions for public relations and awareness, and environmental education. Therefore, it is believed that there is a greater need to develop a strategy for public relations and awareness for the Project, which can be utilized by all stakeholders and at the same time, provides guidance for the users including the PR/Communications Officers of CEPA or media officers.

6. Key Targets for the Strategy

The Strategy plays an integral role in the Project in order to assist in realizing various targets of the project activities by disseminating vital messages to the public and greater communities. The targets of the Strategy shall be relevant to the scope of the work for the Project. This section tries to clarify key targets of the Project to be assisted by the Strategy.

Towards the end of the Project's 5 year period by 2020, the Project would anticipate to realize following major targets:

(1) Make VNP management fully functioning as a model PA of terrestrial ecosystem/biodiversity management in PNG,
(2) Realize increasing number of visitors and tourists visiting the VNP on the monthly or annual basis because of improved facilities and management on the park,
(3) Promote sustainable livelihood with cultural and traditional values together with the preservation of the biodiversity in the target LLGs,
(4) Strengthen and maintain partnership with local communities including the Central Province administration, Kairiku-Hiri District administration, Koiari LLG, Hiri LLG and other key actors that the Project works with,
(5) Strengthen partnership with utility providers such as PNG Power Limited and Eda Ranu, and
(6) Be recognized as the important project partner with the other government agencies, private sectors, NGO's and civil societies.

7. Basic Strategy

There is a need to increase awareness of the Project over the first year (mid 2015 to mid 2016) and over the five year period, to raise the recognition among all of the key target audiences, and to prepare them for more targeted public relations/awareness. For that, the Project states basic strategies as below:

(1) To increase the number of regular PR/awareness outputs/activities.
(2) To enhance Project Team members on how to work with the media, how to be interviewed well, identify possible problem areas in dealing with the media, and how to avoid them.
(3) To increase collaboration between PR section[2] of CEPA and the Project Team to identify good ideas for PR.
(4) To maintain and expand relations with key journalists/reporters in order to generate frequent and supportive reporting on the organisation. Special publications, social events, and journalist workshops are possible components of this strategy.
(5) Aside from the print media, the disseminating of information to the landowning communities have to be in a desired dialect (Tok Motu, or Tok Pisin) for easy communication.

8. Principles for the Strategy

All the activities under the strategy need to comply with following principles:

(1) More interaction, encouragement and dialogue among all team members of the Project and key partners in order to encourage and ensure all communication requirements are satisfied.
(2) Various PR and communications tools are to be utilized effectively to assist in promoting the overall objectives of the Project through its activities, and that communities are made aware and educated on the importance of conservation and sustainable management of the natural resources.
(3) Communication/PR Outputs (Output 4) from the implementation timeline are reviewed and revised in consultation with respective Project Team members, during important and major events or occasions.
(4) All CEPA internal communication protocols including issuance of public media statements are fully observed.

[2] CEPA does not have the unit which specializes in PR/awareness. The Project collaborate with the sections related to PR, including Environmental Information and Science Division and Information and Communication Technology Branch.

9. Target Audience and Key Message

There are basically two types of audiences which the Project targets when carrying out its PR/communications activities:

(1) Primary audience

- Local communities or landowners including churches
- Governments (including all levels of government) – decision-makers on natural resource management
- Funders/donor agencies
- Private sectors/corporations that are prepared to work in partnership and accept the environmental compliance standards as their corporate social responsibility (CSR).

(2) Secondary audience

- CEPA
- Schools and academia
- Key partners and stakeholders

It is vital for this Project and CEPA to produce relevant and key messages which can reach the target audiences and at the same time these messages can be easily understood and interpreted by them. Key messages and target audience were indicated in the table 2.

Table 2 Key messages and target audience

Key Messages	Target Audience
Terrestrial Target – Output 2	
Forging partnership to promote livelihood development and conservation of the VNP	• Local communities • Koiari LLG (including Ward areas and councilors) • Kairiku-Hiri District (esp. Hiri) • Central Provincial administration • Private sector/corporate (Eda Ranu, PNG Power Ltd) • Government line agencies (DAL, TPA)
Managing species and their habitats for the future health and benefit of local communities in one of the intact forest and least polluted freshwater systems	• Local communities • Koiari LLG (including Ward areas and councilors) • Kairiku-Hiri District (esp. Hiri) • Central Provincial administration • Private sector/corporate (Eda Ranu, PNG Power Ltd) • Government line agencies (DAL, TPA) • Schools/academia
Local communities and governments leading efforts to conserve the unpolluted headwaters of Siriminu Dam and surrounding savannah woodlands	• Local communities • Koiari LLG (including Ward areas and councilors) • Kairiku-Hiri District (esp. Hiri) • Central Provincial administration • Private sector/corporate (Eda Ranu, PNG Power Ltd)

Marine/Coastal Target – Output 3	
Protect 'fringing of coastal barrier complex' along coastlines of Central province/Port Moresby (including Hiri coastal shores and Bootless Bay) *(source: Map 2 Shallow_feat_data_2014_0426, University of Queensland)*	• Local communities • Hiri LLG (including Ward areas and councilors) • Kairiku-Hiri District (esp. Hiri) • Central Provincial administration • UPNG • Private sector/corporate (Loloata Resort, TPA, etc) • Schools/academia (UPNG, PAU)
Conserve priority WCMC offshore habitat within the Coral Triangle Scientific Boundary *(source: Map 2 Shallow_feat_data_2014_0426, University of Queensland)*	• Local communities • Hiri LLG (including Ward areas and councilors) • Kairiku-Hiri District (esp. Hiri) • Central Provincial administration • Private sector/corporate (Loloata Resort, TPA, etc) • Schools/academia (UPNG, PAU)
CEPA-JICA Biodiversity Project – cross-cutting	
Protection and sustainable management of natural resources that enhances biodiversity conservation and livelihoods of local communities	All partners and stakeholders

10. Tools for PR

The Project expected to employ specific tools and medium for effective public relations and awareness as enlisted below:

(1) Website/homepage

The Project was intended to design and produce a website which would be the integral part of the public relations/awareness and communications leading to achieving its objectives. The site were expected to be created in CEPA homepage (http://www.pngcepa.com/projects/) and as facebook page. The Project's website, which was developed by JICA (www.jica.go.jp/png/english/activities/activity18.html), can also be linked to the CEPA homepage. Project staff were intended to be trained to manage the web content. This includes identifying a designated project/CEPA staff who can be able to continue to upload material and update the web structure on a regular and timely basis. Responsibility for these activities lies with the PR/Communications Officer of CEPA with the direct supervision by the Project Manager.

(2) Photo library

A user friendly '*photo library*' was intended to be set up at the project homepage so that photographs of the new priority landscapes, species, project's achievements and other project related events can be accessed to illustrate the Project's work.

(3) Print media

The PR and Awareness/Communications Officer of CEPA intended to monitor daily newspapers to keep track of the number of the Project's press releases and feature stories which are published or reported on those newspapers. Any stories or news of relevance to the Project's staff were intended to be emailed on the day these stories were published to keep staff informed and enable them to prepare comments where necessary.

(4) Brochures/Publications

Brochures are information sheets for the Project in relation to the activities undertaken as per the respective Outputs. Publications are project's outputs, which are produced during the course of project activities, and also are appropriate to be distributed to stakeholders for enhancing effectiveness in the specific field of the project activities. The example of such brochures and publications might include the following:

- Project brochure
- VNP pamphlet
- Marine PA pamphlet
- A guide book for birds, insects, etc for VNP
- Flora and fauna biodiversity reports for VNP and new marine PA
- Monthly or annual technical reports by the Project

(5) Factsheets

The simplified and inexpensive factsheets about the Project and relevant Outputs intended to be published regularly (tentatively planned to be once a year). These materials can be one or two page documents following a template of factsheet to be set by the Project.
Factsheets were expected to include:

- Basic information of the project activities
- Project achievements
- Products and publications
- Other relevant information of the VNP or new marine PA

(6) Newsletter

A newsletter (can be both hard and e-newsletter) with a given name (to be suggested by the Project, e.g. *Park Toktok, Varirata Toksave*) was intended to be developed. This expected to be the primary newsletter for conveying information on significant events, achievements, and project progress, which would be communicated to stakeholders, partners, donor and JICA network. This newsletter can be produced quarterly, bi-monthly or annually with contribution of stories, news from all Project staff. The PR/Communications Officer was intended to work closely with the Project Team members, short-term consultants and graphic

designers to develop and finalize the publication and circulate the newsletter on specific time frame.

(7) Maps

The Geographical Information System (GIS) specialist of JICA Expert Team intended to work with consultation of CEPA GIS and Remote Sensing unit and if need arises work in collaboration with other institutions such as Papua New Guinea Forest Authority (PNGFA) (Forest Information Management System (FIMS) datasets), Department of Agriculture and Livestock (DAL) (PNG Resource Information System (PNGRIS) datasets), Department of Lands and Physical Planning, etc. to produce maps, which would be focusing on priority landscapes, species and other related information for the project documentation, presentations and external communications, public relations and awareness.

11. Key Activities, Target Audience and Actions

The Project made necessary actions for PR and awareness on the basis of the table indicated below.

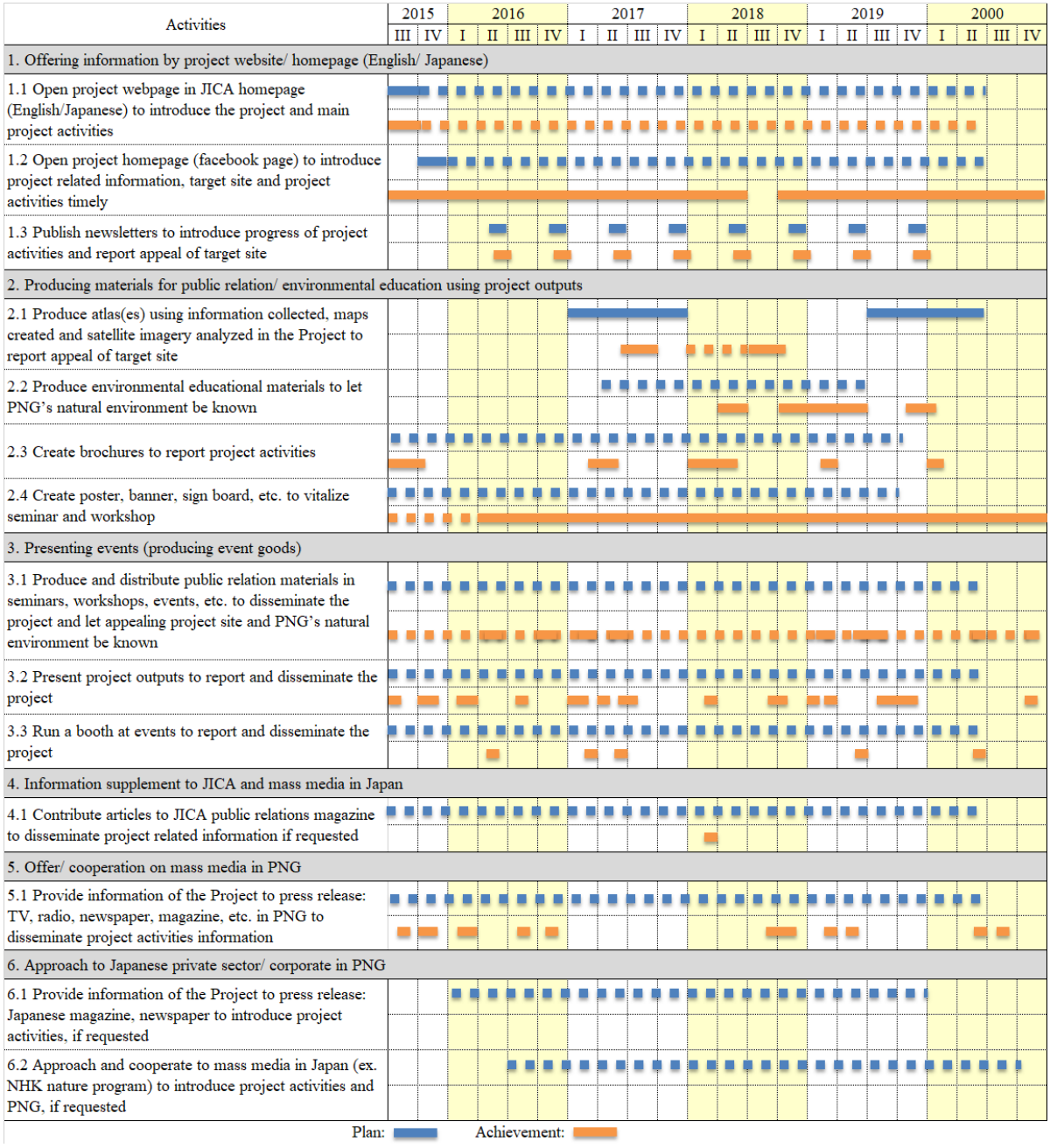
Table 3 Key activities, target audiences and actions

	Key Activity	Target Audience	Action
1	Offering information by project website/ homepage (English/ Japanese)	Local communities, general nation, target LLGs, Kairiku-Hiri District, Central Provincial Administration	1. Open project webpage in JICA homepage (English/Japanese)
			2. Open project homepage (facebook page) to introduce project related information
			3. Publish newsletters to introduce progress of project activities and report appeal of target site
2	Producing materials for public relation/ environmental education using project outputs	Local communities, general nation, target LLGs, Kairiku-Hiri District, Central Provincial Administration, UPNG, PAU and other schools/academia	1. Produce atlas(es) using information collected, maps created and satellite imagery analyzed in the Project to report appeal of target site
			2. Produce environmental educational materials to let PNG's natural environment be known
			3. Create brochures
			4. Create poster, banner, etc. to vitalize seminar and workshop
3	Presenting events (producing event goods)	Local communities, general nation, target LLGs, Kairiku-Hiri District, Central Provincial Administration	1. Produce and distribute public relation materials in seminars, workshops, events, etc. to disseminate the Project and let appealing project site be known
			2. Present project outputs to report and disseminate the Project
			3. Run a booth at events to report and disseminate the Project
4	Information supplement to JICA and mass media in Japan	General nation, Japanese national	1. Contribute articles to JICA public relations magazine to disseminate project related information if requested
5	Offer/ cooperation on mass media in PNG	Local communities, general nation, target LLGs, Kairiku-Hiri District, Central Provincial Administration	1. Provide information of the Project to press release: TV, radio, newspaper, magazine, etc. in PNG
6	Approach to Japanese private sector/ corporate in PNG	Japanese nationals and private sector/ corporate in PNG, Japanese national	1. Provide information of the Project to press release: Japanese magazine, newspaper to introduce project activities, if requested
			2. Approach and cooperate to mass media in Japan (ex. NHK nature program) to introduce project activities and PNG, if requested.

12. Implementation Schedule and Actual Achievement

Implementation schedule and actual achievement for each PR and awareness activity are shown in table 4.

Table 4 Implementation schedule and actual achievement of PR and awareness activities



13. Monitoring and Evaluation

Monitoring and indicators

The Project Team members tracked changes and improvements in the strategy. The outputs of the public relations and the related communications matters, such as the number of press releases issued, feature stories prepared and disseminated, press conferences, seminars or workshops held were monitored every three months.

By the end of first 12 months (June 2016), monitoring indicators and monitoring schedule were set for use. The Project also discussed to set baseline levels in the first 12 months (mid 2015 to mid 2016). A simple baseline assessment was undertaken at the end of each year.

Monitoring indicators are shown in Table 5.

Table 5 Monitoring indicators of PR and awareness activities

Activities	Tools	Indicators
1. Offering information by project website/ homepage (English/ Japanese)		
1.1 Open project webpage in JICA homepage (English/Japanese) to introduce the Project and main project activities	Open project webpage in JICA homepage (English/Japanese)	The number of posting on Project webpage in JICA homepage: **more than 3 a year**
1.2 Open project homepage (facebook page) to introduce project related information, target site and project activities timely	Open project homepage (facebook page)	The number of posting on Project homepage (facebook page): **more than 6 a year** The number of visitors and "Likes" of the website per year
1.3 Publish newsletters to introduce progress of project activities and report appeal of target site	Publish newsletters	Newsletters: **more than twice a year**
2. Producing materials for public relation/ environmental education using project outputs		
2.1 Produce atlas(es) using information collected, maps created and satellite imagery analyzed in the Project to report appeal of target site	Produce atlas(es)	Atlas: **1-2 publication(s)**
2.2 Produce environmental educational materials to let PNG's natural environment be known	Produce environmental educational materials	Environmental educational material: **more than 4**
2.3 Create brochures to report project activities	Create brochure	Brochure: **annual**
2.4 Create poster, banner, sign board, etc. to vitalize seminar and workshop	Create poster, banner, sign board, etc.	**More than 4 types of PR tools** other than the tools above (poster, banner, sign board, etc.) The amount and variety of tools
3. Presenting events (producing event goods)		

3.1 Produce and distribute public relation materials in seminars, workshops, events, etc. to disseminate the Project and let appealing project site and PNG's natural environment be known	Produce and distribute public relation materials in seminars, workshops, events, etc.	Various PR materials in each event
3.2 Present project outputs to report and disseminate the Project	Present project outputs	Seminar/workshop: **more than once a year**
3.3 Run a booth at events to report and disseminate the Project	Run a booth at events	Booth at events
4. Information supplement to JICA and mass media in Japan		
4.1 Contribute articles to JICA public relations magazine to disseminate project related information if requested	Contribute articles to JICA public relations magazine	Project news is picked up in JICA public relations magazine
5. Offer/ cooperation on mass media in PNG		
5.1 Provide information of the Project to press release: TV, radio, newspaper, magazine, etc. in PNG to disseminate project activities information	Provide information of the Project to press release in PNG	Project news get into the media in PNG: **more than once a year**
6. Approach to Japanese private sector/ corporate in PNG		
6.1 Provide information of the Project to press release: Japanese magazine, newspaper to introduce project activities, if requested	Provide information of the Project to press release in Japan	Project news get into the media in Japan
6.2 Approach and cooperate to mass media in Japan (ex. NHK nature program) to introduce project activities and PNG, if requested	Approach and cooperate to mass media in Japan	Project news get into the media in Japan

Outputs

The project activities and achievements from the beginning of the Project to March 2020 were shown in the Table 6.

Table 6 PR and awareness activities and achievements

Activities	Achievements
1. Offering information by project website/ homepage (English/ Japanese)	
1.1 Open project webpage in JICA homepage (English/Japanese) to introduce the Project and main project activities	Project webpage was opened in JICA homepage (English/Japanese) in June 2015 and CEPA homepage. **12 postings** as of February 2020.
1.2 Open project homepage (facebook page) to introduce project related information, target site and project activities timely	Facebook page of the Project was opened in October 2015. **180 postings** and **1,494 likes** as of May 2018. Facebook page was renewed in October 2018. More than **212 postings** and **1,109 likes** as of November 2020.
1.3 Publish newsletters to introduce progress of project activities and report appeal of target site	Newsletters were published twice a year (**9 newsletters**) and printed for **4,200 copies**.

2. Producing materials for public relation/ environmental education using project outputs	
2.1 Produce atlas(es) using information collected, maps created and satellite imagery analyzed in the Project to report appeal of target site	Atlas 2017 was created and printed for **100 copies**.
2.2 Produce environmental educational materials to let PNG's natural environment be known	Various environmental educational materials were created. - **Guide Map of Varirata National Park** (1st edition and 2nd edition) (5,500 copies) - **Field guide brochures for VNP** (1,000 copies) - **Biodiversity report book** (110 copies) - **Mangrove identification guide of Bootless Bay** (500 copies) - **Common birds field guide of Bootless Bay** (500 copies)
2.3 Create brochures to report project activities	Brochures were published (**7** for the Project, **1** for Output 3) and printed for **3,100 copies**. **2 factsheets** were published and printed for **800 copies**.
2.4 Create poster, banner, sign board, etc. to vitalize seminar and workshop	Various PR materials were created. - **Banner** (19 types) - **Poster** (more than 56 types) - **Sign board** (24 types: the Project, VNP at main picnic area and main lookout, Bird Watching in VNP, Megapod explanation in VNP, Bird Watching at PAU, marine PA at Tahira UPNG land (2 sites), Motupore Island, Tahira farm, and mangrove protection, VNP new entrance fees, and Tahira marine station) - **Logo** (2 types: VNP and BBMCI) - **Sticker** (4 types: the Project, VNP, project boat and BBMCI) (3,062 copies) - **Polo shirt** (69) - **Vest** (60) - **Video** (2 types: Promotional video of VNP, and Short highlight video of the Varirata Cultural Tour)
3. Presenting events (producing event goods)	
3.1 Produce and distribute public relation materials in seminars, workshops, events, etc. to disseminate the Project and let appealing project site and PNG's natural environment be known	Various PR materials were produced and distributed in seminars, workshops, events, etc. - 100 T-shirts for BBMCI (100) were distributed at the launching ceremony of the project boat (35 participants). - 100 T-shirts for "Friends of Varirata" were distributed at the Inaugural Event for Renovated Facilities in VNP (more than 100 participants).
3.2 Present project outputs to report and disseminate the Project	The Project Team participated in Kokoda Initiative workshop and made presentation on the project. A presentation was made at the World Oceans Conference in UN HQ, New York City. 25 seminars/workshops, ceremonies and events were held. - Kick-off Seminar/Workshop for the Project (94 participants) - Inception and Follow-up Workshop for Koiari (73 and 27 participants) - Workshop on Livelihood Development & Bird Watching in Koiari (31 participants)

	- VNP Landowner Workshop on Livelihood devlopment (25 participants) - Inception, the 2nd and 3rd Workshop for the creation of BBMCI (33, 55, and 26 participants) - VNP Wrap-up Workshop on the Project Achievements 2015-2016 (57 participants) - 9 times meeting for BBMCI and BBNMS working group (104, 17, 19, 23, 20, 24, 20, 20 and 34 participants) - Seminar for explanation of the results of social mapping and socio-economic survey (21 participants) - Biodiversity and Conservation seminar (346 participants) - Launching ceremony of the project boat (25 participants) - Inaugural Launch for the Renovated Facilities in VNP (128 participants) - Inagural ceremony for the Information Center Complex in VNP (98 participants) - The signing ceremony of MOU between Central Provincial Government and CEPA (47 participants) - The event of community awareness on Bootless Bay MPA (about 500 participants) - Study Tour to VNP and National Museum of PNG (77 participants) - Varirata National Park one day tour packages (40 + 131 participants) - The Project accepted two students of Pacific Adventist University on internship for 6 weeks.
3.3 Run a booth at events to report and disseminate the Project	The Project was promoted in the World Wildlife Day event at Nature Park. Major sponsorship of the World Environment Day event at VNP (Over 400 participants), Mirigeta (more than 800 participants) and at the Adventure Park. The Project Team ran a booth at the World Oceans Conference in UN HQ, New York City. The Project Team launched the CTI Day.
4. Information supplement to JICA and mass media in Japan	
4.1 Contribute articles to JICA public relations magazine to disseminate project related information if requested	Project news was picked up in JICA Natural Environment Conservation Knowledge Management Network Newsletter "Shizen Kankyo Dayori" vol. 17.
5. Offer/ cooperation on mass media in PNG	
5.1 Provide information of the Project to press release: TV, radio, newspaper, magazine, etc. in PNG to disseminate project activities information	Project news got into the newspaper in PNG **more than 22 times**.
6. Approach to Japanese private sector/ corporate in PNG	
6.1 Provide information of the Project to press release: Japanese magazine, newspaper to introduce project activities, if requested	Not performed.
6.2 Approach and cooperate to mass media in Japan (ex. NHK nature program) to introduce project activities and PNG, if requested	Not performed.

Discussion and lessons learned

The Project team implemented various activities by using specific tools and medium for creating effective public relations and raising awareness. Discussion and lessons learned through the respective activities and tools were described in this section.

(1) Opening project website/ homepage (English/ Japanese) (Activity 1.1, 1.2)

The Project utilized JICA homepage (English/ Japanese), CEPA homepage and facebook page to introduce the Project and project activities targeting at wide variety of audiences.

The Project opened project webpage in JICA homepage, both of English and Japanese websites, and introduced brief overview of the Project and main project activities.

As a result of the discussions with CEPA officers, project website was intended to be opened in CEPA homepage to introduce project related information, target site and more detailed project activities timely targeting at CEPA officers, bodies concerned and general nation. Additionally, it was intended for CEPA officers and general nation to download output documents and official documents. Project webpage was opened in CEPA homepage. A CEPA officer was appointed to be a person responsible for updating information periodically.

In the beginning, the CEPA website was expected to be updated periodically by CEPA staff to introduce the progress of project activities. However, CEPA outsourced the design of their homepage at that timing, and they have lacked the authority to edit the site since then because the website dataset has not been delivered by the contractor due to CEPA's payment delay. Therefore, the Project team decided to open project facebook page and public project information on it, because periodic update of the website in CEPA homepage was impossible. A link to project facebook page was provided on the project website at CEPA homepage. On the other hand, download site of official documents shall be at CEPA homepage. At present, since it is not able to upload the documents at CEPA homepage, the Project team decided to use former CEPA homepage, which is still usable, for uploading.

Project facebook page was opened to periodically introduce the project activities. Not only JICA experts but also CEPA officers and local staff were assigned as person in charge of updating project facebook page, because JICA short-term experts are not fully presented at PNG. Lots of articles with photos were posted on the page to introduce project activities, announce and report project related events and deliver documents such as project brochures.

From the characteristics of facebook, there were the following advantages:

(i) information can be sent frequently and timely and
(ii) lots of people access the page friendly and frequently.

Since many people and bodies are involved in the Project, the page also helped them understand the Project, share information, and enhance the motivation of the people involved. In addition, the Project was able to grasp the reaction of users through their comments posted on the

facebook page. Operation of the page was monitored through a monitoring report created in every six months.

As an issue, the page was created using the account of a CEPA officer at that time, but the page could not be updated and continued due to resignation of the officer. Therefore, it was necessary to migrate the page. If you use an individual account to create facebook page, problems related to update and maintenance of the page may be occurred when involved staff is transferred or retired. It is better to request the C/P to offer the account for creating facebook page.

(2) Publishing newsletters/ factsheets (Activity 1.3)

Project newsletter was published every six months (total of 9 volumes) to post information on significant events, progress and achievements of project activities and report appeal of target site. It was proper frequency in terms of fulfillment of contents of articles. Basically 500 copies were printed for each volume. The articles were compiled using the posts on project facebook page for efficient work. The newsletters helped to communicate to stakeholders, partners, donors and JICA network. They were also delivered at the events and information center in VNP.

Project factsheet was published annually in the first 2 years to sum up the project activities of the year. It is useful to report the project activities only before specific outputs come out. Therefore, the use scene was limited, since it may not be so interesting for general public. During the last three years of the Project, the contents of the factsheet were included in project brochure.

Newsletter and factsheet were used the same design code, such as colour and font, and template set by the Project.

(3) Creating brochures (Activity 2.3)

Project brochures are information sheets for the Project in relation to the activities undertaken as per the respective Outputs. They were created annually (total of 6 versions) to convey information of progress, achievements and plan for each Output that summarizes the activities from the beginning of the Project to that year. Basically 500 copies were printed for each. These were useful tools for getting to know the Project comprehensively. They were distributed not only at the events but also when introducing the Project to the visiting missions.

(4) Producing atlas (Activity 2.1)

Spatial information was developed in GIS database and various GIS maps were created for the target sites. In the middle term of the Project, a project atlas was produced by summarizing the maps created, satellite imagery analyzed and information collected in the project activities to introduce and appeal the environment of the target sites. The atlas includes not only the maps

but also explanatory text and photos focusing on priority landscapes, species, environment, VNP, Bootless Bay Marine Conservation Initiative (BBMCI), etc. Design work for its cover, header and footer was outsourced in order to make the atlas attractive. 100 copies were printed to deliver to the bodies concerned. In the future, it is assumed to be used in the VNP information center. C/P officers also recognized that the atlas was useful to easily learn what data and maps the Project had been created and to be used to introduce the CEPA's activities.

The design and layout of the atlas was intended to be reused, so delivery in illustrator format was desired, but it was only delivered in PDF format due to budget limitations. If you have a budget, it is desirable to create it in illustrator format so that it can be reused in the future.

(5) Producing environmental educational materials (Activity 2.2)

The Project produced environmental educational materials such as field guides and biodiversity reports using the results of field surveys conducted in the Project. These were distributed at the events such as workshops and seminars or distributed to the visiting missions. These products will be sold by CEPA after the end of the Project and will be one of the revenue sources for the park management.

These types of products have high needs from the general public as well as those involved in the Project, but there were few things that could be referenced. Disseminating the park's natural environment and attraction promotes people's interest and knowledge, thereby raising awareness of biodiversity conservation.

In addition, as part of each Output activity, the Project has produced various materials for public relations and environmental education, such as signboards that introduce VNP, species, conservation efforts, enlightenment, and caution, logo design of VNP and BBMCI, VNP stamps, VNP guide map, promotion video for VNP. These designs were basically done by the Project, but some designs such as logos were done by external designers. Since PNG Tourism Promotion Authority (TPA) had a similar concept, the promotion video for VNP was created in collaboration with them.

In the future, CEPA may collaborate with Department of Education and PNG TPA to create and use environmental educational materials.

(6) Creating various tools for awareness (Activity 2.4)

The Project created banners, flag banner, sign board, map posters to vitalize seminars and workshops. These tools can be used many times, so you have more opportunities to use them if you create them early in the Project. Map posters were very useful as a tool for raising interest and discussion among participants. These tools are essential because they enliven the meeting atmosphere.

(7) Producing various PR materials/ goods (Activity 3.1)

The Project produced various PR materials and goods such as T-shirt, polo shirt, vest and stickers for distribution at seminars, workshops and events. The tools above (2) to (6) were also used in the events. These tools raise awareness of the people involved and let appealing project site and PNG's natural environment be known. Good items are used (and worn) even after the event, which is effective in implementation of raising awareness activity of the Project.

(8) Presenting project outputs (Activity 3.2)

The Project team members presented at the workshop and conference organized by other organizations to disseminate the Project and report project outputs. It was helpful to make progress of the project activities clear to stakeholders and encourage their involvement in the implementation.

(9) Run a booth (Activity 3.3)

The Project runs a booth at the events using the tools above (2) to (6) to report and disseminate the Project's achievements. It was helpful to draw attention of local community and general nation to the Project implementation, particularly in activities for natural environmental conservation.

(10) Holding seminars/ workshops

Project seminars/ workshops, Kick off Seminar, Mid-term Review Seminar, and Closing/Wrap-up Seminar, were conducted for better public relations/ awareness. These were planed and implemented in response to comments of stakeholders. Workshops and meetings were also held on specific themes such as Koiari, livelihood development, VNP facility, BBMCI.

Process of being prepared for the events and coordination with the concerned parties was carried out carefully and took time. As a result, effective discussion with those people involved in the Project was obtained, pressing forward and promoting the project implementation.

(11) Information supplement to JICA and mass media in Japan (Activity 4)

The Project team member contributed articles to JICA public relations magazine, "JICA Natural Environment Conservation Knowledge Management Network News", to disseminate the Project's activities and outputs to Japanese national.

(12) Offer/ cooperation on mass media in PNG (Activity 5)

Information collected from the events conducted by the Project was used for making press release in PNG to disseminate project activities. The events were often featured in newspaper

and TV. It was useful not only for raising awareness of the general public but also for drawing attention of and increasing motivation of stakeholders.

(13) Approach to Japanese private sector/ corporate in PNG (Activity 6)

Initially, approaching to Japanese private sector/ corporate in PNG was also considered in dealing with the possibility of cooperation with corporate CSR activities. If requested, it was also in mind to introduce PNG and project activities to Japanese magazines and mass media. However, there was actually no such opportunity, so this activity was not implemented.