



Shoreline Video Assessment Method (SVAM) Manual



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GIZ in Viet Nam

The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH has been working in Viet Nam for more than 20 years. We currently have around 250 specialised staff deployed across the country, including national and international personnel, Development Advisors and CIM experts.

On behalf of the German Government, GIZ provides advisory services to the Government of Viet Nam and is currently engaged in three priority areas: (i) Vocational training; (ii) Environmental policy and sustainable natural resource use; and (iii) Energy.

GIZ Viet Nam's main commissioning party is the German Federal Ministry for Economic Cooperation and Development (BMZ). Other commissions come from the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), the Federal Ministry for Economic Affairs and Energy (BMWi) and the Federal Ministry of Finance (BMF). GIZ Viet Nam is also engaged in various projects co-funded by the Australian Government (Department of Foreign Affairs and Trade – DFAT) and the European Union and cooperates closely with the German development bank KfW.

The Integrated Coastal Management Programme (ICMP) is being co-financed by the German and Australian Governments. In order to strengthen resilience and to reduce vulnerabilities to climate change impacts, the ICMP supports Viet Nam in sustainably managing coastal ecosystems of the Mekong Delta affected by climate change. The Programme is being implemented by GIZ in close collaboration with the Ministry of Agriculture and Rural Development (MARD), as well as several departments of the five programme provinces An Giang, Bac Lieu, Ca Mau, Kien Giang and Soc Trang of the Mekong Delta.

For further information, please visit www.giz.de/viet-nam, and <http://daln.gov.vn/icmp-cccep.html>.



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Part 1 of this manual is based on; Introduction to MangroveWatch Shoreline Video Assessment; developed by Jock Mackenzie at MangroveWatch

Part 2 of this Manual is based on a report published by Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, Conservation and Development of the Kien Giang Biosphere Reserve Project:

Assessing Mangrove Forests, Shoreline Condition and Feasibility of REDD for Kien Giang Province Vietnam. By Dr Norm Duke, Dr Nick Wilson, Mr Jock Mackenzie, Mr Hai Hoa Nguyen and Dr David Puller



Introduction





The SVAM enables a rapid, cost-effective assessment of shoreline condition that requires little expertise in data collection but still enables detailed assessment of shoreline features. The use of a standardised assessment method means that SVAM is repeatable for future monitoring purposes. *The use of video provides a permanent record of shoreline condition from which to assess future change.*

The Shoreline Video Assessment Method (SVAM) was developed by MangroveWatch¹, an Australian monitoring program that partners mangrove scientists and community participants. It provides a qualitative assessment of shoreline habitat, physical condition and human influence, determined from continuous video recordings of the shoreline and intertidal zone along coastline/estuary banks.

A continuous digital video recording of the shoreline is made. The video is analysed for a number of features that relate to the 'condition' of the coast. The state of the coastline is determined through observations of; shore type, bank type and condition, erosion condition, adjacent land use, built features and vegetation. The state of mangroves can also be determined through observations of; height, tree density, dominant species present, the health of the forest and the number of seedlings.

Simultaneous GPS data enables these features to be mapped to give a spatial representation of shoreline habitats and their condition. Qualitative interpretations made during analysis are based on quantitative baseline studies. Video interpretation relates only to the intertidal zone and up to 20 m above the tidal limit.

There are two stages to the process, capturing the shoreline video and the later assessment in the laboratory. The two stages are described below.

¹ MangroveWatch is a joint initiative of TropWater, James Cook University and The University of Queensland and is funded from The Australian Government. <http://www.mangrovetwatch.org.au/>.

Shoreline Video Capture



As the video is assessed elsewhere, and sometimes by a different person, it is important to provide as much ancillary information as possible. This includes written notes and a continuous commentary on the soundtrack of the video.

A few points to note

Video team members

There are 5 separate tasks involved in SVAM

1. Boat Driver
2. Observer / recorder
3. GPS operator – turning GPS on, taking tracks and extra waypoints
4. Photographer – take as many as you can (will have a higher resolution than the video AND have a GPS fix
5. Video camera operator – ensure the video camera is pointed at right angles to the boat, to minimise vibration and to ensure the shoreline is in the frame.

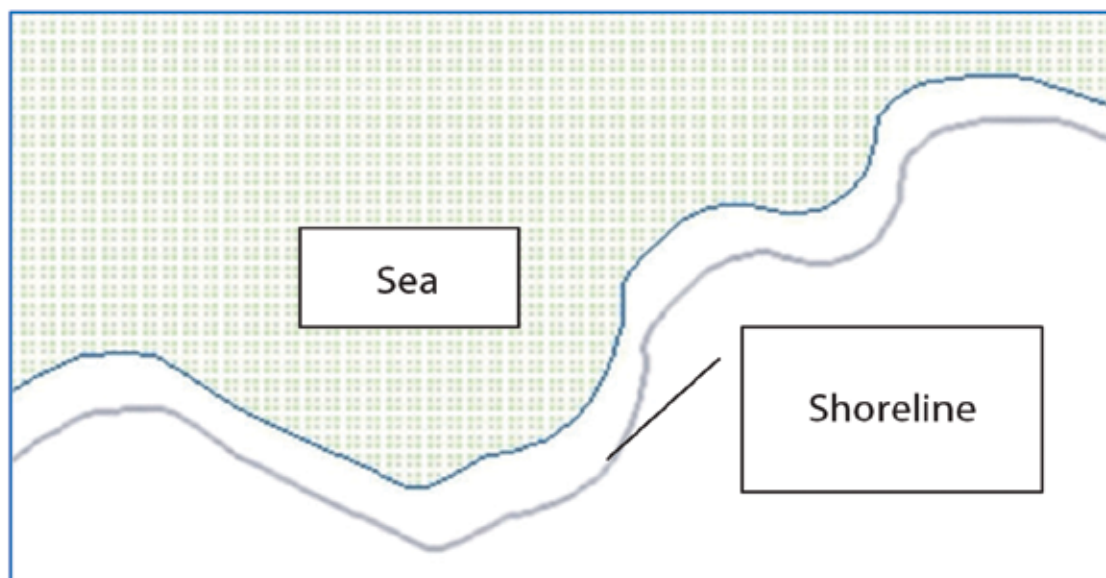
The five tasks are outlined in the following pages, followed by an outline of the steps involved in the collection of digital video and ancillary information.



1. The Boat Driver

The role of the boat driver is to provide the platform from which the SVAM is undertaken.

- Start and stop the boat at the start point that is identified by the recorder.
- This will be a canal, headland, conspicuous building or structure on the shore.
- This ensures that multiple videos can be matched together
- Try to keep 50 m off the shore – this gives suitable image and avoids excessive zooming
- Travel at 20 – 22 km/hr – use the GPS to monitor the speed.
- Try as best as possible to follow the curves of the shore, don't cut in close to headlands



- Avoid stopping and starting during the recording.
- If you have to stop (e.g. for a fishing net, shallow water etc.) let the team know so that they can record it, take a waypoint and stop videoing.
- If you do stop turn the boat around so the point can be videoed again on the restart.

2. The Observer/Recorder

The role of the observer is to record all of the information that will make the video easier to interpret later. The most important job is to record the exact time and GPS position of when the video starts, stops and restarts, and any changes in direction (reversing, going around obstacles etc.).

At the start of each video the Observer/Recorder documents:

- Observer/Recorder Name
- Physical location
- Description of the start point (readily identifiable)
- GPS position **AND** waypoint no.
- Exact time of video start (to the nearest second)
- Direction of boat travel
- Photo number of the first photo



While travelling record

- The time, GPS waypoint number and photo number of any stops and restarts
- The time, GPS waypoint number and photo number of any changes in direction

AND MOST IMPORTANTLY

- A general description of the shore type
- Note any dramatic changes in shore type, including waypoint number and photo number.
- Notify the team that 20 minutes of video has been recorded and that a new Stop/Restart will be required.

3. GPS Operator

The role of the GPS operator is to ensure that adequate high resolution GPS information is recorded.

A number of steps MUST be carried out before any videoing takes place:

The First step for the GPS Operator in any SVAM session is to synchronise the video and camera time to the GPS.

- Before every trip ensure that all previous data from the GPS has been downloaded and there is sufficient storage space on the GPS.
- Set the GPS to record a position every 2 seconds.
- Before starting to video
- Check the track log settings and MAKE SURE THE TRACK LOG IS ON.
- Check that the 'record method' is set to Time (NOT Auto or Distance)

The GPS Operator will need to inform the observer **-shout out loud** so that it is heard on the sound track of the video the following information:

- The waypoint number i.e. waypoint xx
- A description of why the waypoint was taken

At the start and during each session take a **WAYPOINT** of:

- The start point at which videoing commenced
- Any stop or restart points
- Any significant features (erosion, mangrove damage, significant infrastructure, etc.)
- The point at which videoing stopped

4. Photographer

This task can be carried out by the observer

The photographs will have a higher resolution than the video AND will also have a GPS position.

The First step for the photographer in any SVAM session is to synchronise the video and camera time to the GPS.



The role of the photographer is to provide extra information that may not be captured by the video. The photographer must **shout out loud** (so it can be heard on the video sound track) the following information:

- The Photo number i.e. PHOTO xx
- A description of what the photo is of

At the start and during each session you will need to take photos of;

- The identifiable start point
- Any stop or restart points
- Any significant features (erosion, mangrove damage, significant infrastructure,
- The SVAM team in action

5. Video camera Operator

The aim of collecting **video** is to ensure that the shoreline is in the frame of the camera AND to ensure that the scene being filmed is perpendicular to the path of the boat.

The **soundtrack** is also a valuable record of ancillary information so the video operator needs to ensure that GPS waypoint and photo points are also recorded (by repeating if necessary).

Setting up for filming

- Position yourself -face perpendicular to the direction of travel i.e. sit across the boat looking out to the side. A plastic or fold up chair is useful.



**Video operator facing sideways to direction of travel, resting tripod on knees to avoid vibration
Observer / Recorder recording GPS waypoint numbers**



- Attach the camera to the tripod.
- Adjust the tilt of the camera - hold the tripod with the legs closed and one hand holding the adjustment arm.
- *Buffer the tripod against vibration -brace the tripod between your legs or against your body.*

It is important to buffer the tripod against vibration. Holding it on your leg or placing it on a life jacket helps prevent vibration.

- If sun glare is a problem find some way to shade the camera. The film will be poor quality if the sun is falling on the camera lens.
- Use a polarising filter.
- If necessary shade the camera with an umbrella.
- **Do not zoom in to fill the screen.** *Make sure that some water and some sky is visible. This ensures that all of the shore including the mangroves is visible even if the boat rocks.*

1002 Capturing Video

A decorative graphic consisting of a solid blue vertical bar on the left, followed by a wavy blue line that extends across the width of the page. The line is composed of several overlapping, semi-transparent blue shapes that create a sense of motion and depth.



The First step in any SVAM session is to synchronise the video and camera time to the GPS.

Select start Point

- Select an identifiable start point and check that recorder, GPS and still camera are ready.

Boat Driver	Position the boat at the start location and hold the boat steady at that position
Observer Recorder	Record the prestart information
Video Camera Operator	Ensure the camera is in the correct position. Finger on the record button ready to record



Start Recording

Boat Driver	Start moving in the intended direction of travel
Video Camera Operator	Shout 3-2-1 GO Then immediately press record
GPS Operator	On GO Take a GPS waypoint and shout WAYPOINT NUMBER
Photographer	Take a photo of the start point and shout PHOTO NUMBER
Observer	Record the waypoint and photo numbers
Video Camera Operator	After the waypoint and photo numbers are recorded clearly state the date, time, location, direction of travel and a description of the shore type

During Videoining

Video Camera Operator

- Keep the video camera pointed at right angles to the bow (Do NOT point the video forward or backward).
- Keep an eye on the viewer and make sure the tops of the trees are in the top of the frame AND that some water is visible at the bottom – if necessary tilt the video up or down.
- Make sure you can see the roots of the mangrove and the edge of the bank.
- Limit the use of the zoom – if possible, position the boat closer to the mangroves, rather than zoom.
- Tell the boat driver if you need to be closer or further away from the bank.
- Make sure the boat driver doesn't go too fast.
- Provide active commentary during the video.
- Keep the lens and viewfinder dry.

Note the fewer the stops in the video the easier it is to interpret.

But videos need to be kept to less than 25 minutes as file sizes of HD video will become too large.

Around 20 minutes is ideal.

GPS Operator, Photographer and Observer/Recorder

- Note any significant features (erosion, mangrove damage, significant infrastructure, change in shore type etc.) by collecting waypoints (shout WAYPOINT NUMBER), photos (shout PHOTO NUMBER) and written notes.
- Keep track of the time since recording started and after 20 minutes identify a potential new stop/restart point



If the boat stops for a period longer than 30 second:

- Make sure the team is ready.
- If you will be continuing at a later time - choose an identifiable start point for the next restart.

Video Camera Operator	Shout 3-2-1 STOP Then immediately press stop recording
GPS Operator	On STOP Take a GPS waypoint and shout WAYPOINT NUMBER
Photographer	On STOP Take a photo of the start point and shout PHOTO NUMBER
Observer	Record the waypoint and photo numbers

To Restart Filming

- The boat driver turns the boat around so the identifiable start point can be videoed again on the restart.
- Start with a countdown as described previously.

As it will be a new digital file, all of the previous steps will be required.

A decorative graphic consisting of a solid blue vertical bar on the left, followed by a wavy blue line that extends across the page. The line is composed of several overlapping, semi-transparent blue shapes that create a sense of depth and movement.

1003 Video Assessment



The aims of rapid video assessment are to:

- Quantify shoreline physical condition– substrate and erosion.
- Categorize and quantify shoreline mangrove forest type, extent and condition.
- Identify and quantify shoreline resource use.
- Identify and quantify threats to the shoreline mangrove resource.

The Video Assessment Process

The video is assessed as a continuous point intercept transect of the coast. The assessment process involves watching the digital video and recording the exact time (in minutes and seconds after the start of the video) that conditions are observed to change. Changes in shoreline physical condition; or mangrove forest type, extent and condition are assessed by scoring a series of indicators that are described below.

The indicators are divided into three groups; shoreline physical condition indicators; shoreline mangrove forest type, extent and condition indicators; and mangrove resource use indicators. (see section Detailed Description of the Indicators on page 16)

Only the initial 20m intertidal zone visible in the frame and/or the directly adjacent terrestrial habitats (if visible) are used for assessment.

It is generally easier to manually record data on a printed worksheet. The initial values of each indicator are scored for the start point. As the video is watched change in any indicator is noted against the video time (significant change will require that the video is paused in order to update all of the necessary indicators). Whenever a way point and/or photo are captured the time of capture and the number is also recorded. The excel file used for data input has a spread sheet that can be printed to use to record changes in indicator values against time.



Data Input SVAM2013.xlsm

It should be expected that assessing the video will take 2.5 to 3 times longer than the actual length of the video.

Video file names

The Sony Handycam will label each video using the date and time that video started recording. The format is yyyyymmddhhmmss (4 digit year 2 digit month 2 digit day 2 digit hour 2digit minutes 2 digit seconds). Therefore the exact time of each 3 second frame of the video can be calculated simply by adding the number of 3 second units to the time at the start of the video. In this way the GPS data can be matched with the video data. See section Converting text or UTM GPS data into local time and excel format on page 14 for details.

Data entry

There are two excel workbooks that are designed to assist in assessing and entering SVAM data. The first worksheet is the main form for inputting SVAM data. The second workbook is used to import the geographic coordinates and time information into the data entry worksheet.

Using The SVAM2013 Data Input Form In Microsoft Excel.

The input of data is semi-automated in the excel macro workbook:

Data Input SVAM2013.xlsm

When this worksheet is opened the ENABLE MACROS option must be selected.

The workbook should always be at the front of the screen, you cannot use the same computer to view video and input data at the same time.

This workbook contains 5 worksheets

- 1 'Data Input' worksheet has brief instructions and explanations.
- 2 'Data' worksheet is where data is entered.
- 3 'Shoreline' worksheet describes the options that are available for each shoreline physical condition indicator.
- 4 'Mangrove' worksheet describes the options that are available for each shoreline mangrove forest type, extent and condition indicator and for the mangrove resource use indicators
- 5 'Data sheet' is a worksheet that can be printed out and used to manually record changes that are observed in the video.

The 'Data Input' worksheet is used to access data input forms. By selecting the picture in the spread sheet the Data worksheet and the shoreline physical condition input form will open.

Instructions for using the input form are shown at the side.

To input data select the appropriate value for each indicator.



When is selected the information is transferred to the data sheet.

If **Mangroves** is selected then after next is selected the mangrove condition input form will open and the appropriate value for each indicator can be selected.

When on the mangrove condition form is selected the information is transferred to the data sheet and you are returned to the shoreline condition input form.

The existing values for each indicator are retained so that if the value of the indicators does not change, then the data sheet can be rapidly filled.

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10004 Geo location



The GPS tracklog will contain a series of time and GPS coordinates. The time of the video is used to match each 3 second time frame in the assessment to a specific GPS location.

It is crucial that the tracklog data and the waypoint data are both downloaded from the GPS.

The SVAM data sheet requires information from both the GPS and the video analysis. The method of collecting waypoints that is outlined in the section Capturing VideoShoreline Video Capture on page 8 simplifies the process of extracting the relevant GPS data from the tracklog of the GPS. As the location of each start point and end point is known the relevant trackpoints between the start point and end points of each video can be extracted for further processing. A snap shot of a completed data sheet is shown below.

	Date & Time	Distance traveled (m)	Video Seconds	Latitude	Longitude	What is there?	Shore Type	Bank Slope	Mangrove position	Bank substrate	Total flat substrate	Crusian	Development	Recently Cleared Mangroves	Nyssa	Sea Wall	Threatened Hoopoe	Litter	Sea Dyke	Fish Trap	Wood/Brack Water	Replanting	Seeding?	Dominant Species 1	Dominant Species 2	Height	Mangrove Density	Canopy Condition	Dead Trees	Cutting	
1	17/04/2012 11:39:15	18	0:06:18	9.851413	104.917945	1	1	1	0	1	1	4	0	0	0	0	0	0	0	0	0	0	1	1	0	3	4	5	0	0	
2	17/04/2012 11:39:18	18	0:06:21	9.851452	104.917688	1	1	1	0	1	1	4	0	0	0	0	0	0	0	0	0	0	1	1	0	3	4	5	0	0	
4	17/04/2012 11:39:21	18	0:06:24	9.851491	104.917531	1	1	1	0	1	1	4	0	0	0	0	0	0	0	0	0	0	1	1	0	3	4	5	0	0	
5	17/04/2012 11:39:24	18	0:06:27	9.851530	104.917374	1	1	1	0	1	1	4	0	0	0	0	0	0	0	0	0	0	1	1	0	3	4	5	0	0	
6	17/04/2012 11:39:27	18	0:06:30	9.851569	104.917217	1	1	1	0	1	1	4	0	0	0	0	0	0	0	0	0	0	1	1	0	3	4	5	0	0	
7	17/04/2012 11:39:30	18	0:06:33	9.851607	104.917061	1	1	1	0	1	1	4	0	0	0	0	0	0	0	0	0	0	1	1	0	3	4	5	0	0	
8	17/04/2012 11:39:33	18	0:06:36	9.851646	104.916904	1	1	1	0	1	1	4	0	0	0	0	0	0	0	0	0	0	1	1	0	3	4	5	0	0	
9	17/04/2012 11:39:36	18	0:06:39	9.851685	104.916747	1	1	1	0	1	1	4	0	0	0	0	0	0	0	0	0	0	1	1	0	3	4	5	0	0	
10	17/04/2012 11:39:39	18	0:06:42	9.851726	104.916594	2	1	2	2	1	1	4	0	0	0	0	0	0	0	0	0	0	1	1	0	3	4	5	0	0	
11	17/04/2012 11:39:42	18	0:06:45	9.851768	104.916432	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	17/04/2012 11:39:45	18	0:06:48	9.851808	104.916279	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	17/04/2012 11:39:48	18	0:06:51	9.851850	104.916126	2	1	2	2	1	1	4	0	0	0	0	0	0	0	0	0	0	1	1	0	3	4	5	0	0	
14	17/04/2012 11:39:51	18	0:06:54	9.851892	104.915974	1	1	1	0	1	1	4	0	0	0	0	0	0	0	0	0	0	1	1	0	3	4	5	0	0	
15	17/04/2012 11:39:54	18	0:06:57	9.851933	104.915771	1	1	1	0	1	1	5	0	0	0	0	0	0	0	0	0	0	1	1	0	3	4	5	0	0	
16	17/04/2012 11:39:57	18	0:07:00	9.851974	104.915608	1	1	1	0	1	1	5	0	0	0	0	0	0	0	0	0	0	1	1	0	3	4	5	0	0	
17	17/04/2012 11:40:00	18	0:07:03	9.852015	104.915445	1	1	1	0	1	1	5	0	0	0	0	0	0	0	0	0	0	1	1	0	3	4	5	0	0	
18	17/04/2012 11:40:03	18	0:07:06	9.852057	104.915283	1	1	1	0	1	1	5	0	0	0	0	0	0	0	0	0	0	1	1	0	3	4	5	0	0	

A snap shot of the data file showing time code used to connect GPS location to video frame, the extracted latitude and longitude, and completed data for each 3 second time frame.



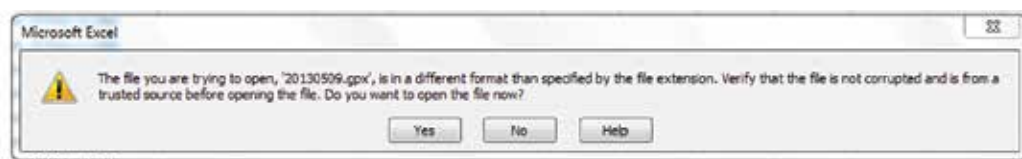
Import time and GPS data into SVAM data sheet

The first step in the process of coordinating video assessment and geographic data is to import the GPS data into excel. The steps involved will vary depending on the method used to download the files. The most common methods are outlined below.

PGS data as .gpx file opened in Excel

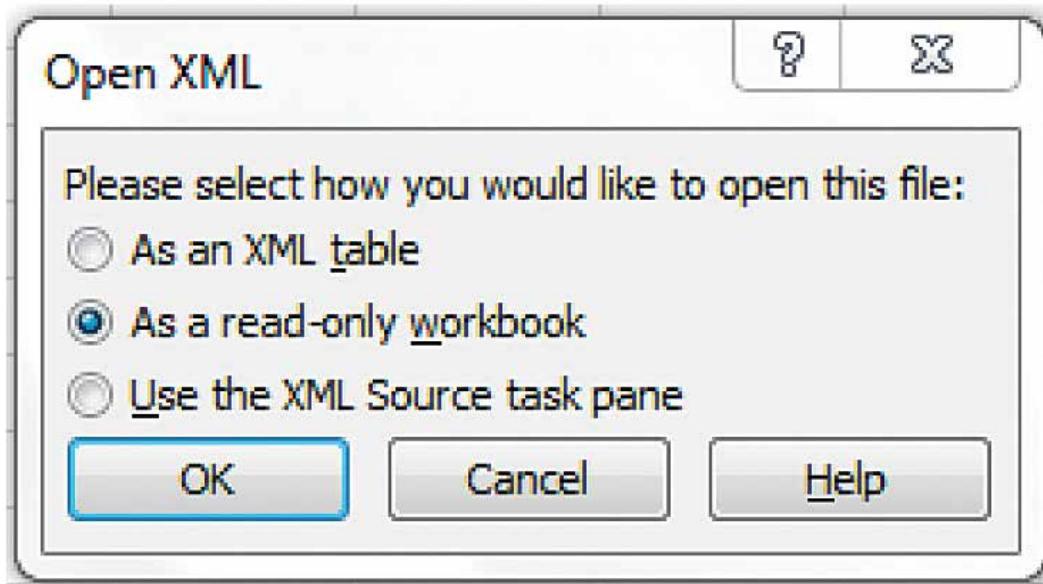
The .gpx data can be opened by excel and the data can be copied and pasted into another worksheet. This method is shown below.

When you see the following window;



select yes.

Then at the Open XML dialog box



select 'As a read-only workbook'.

This will open the data as a spread sheet and unneeded data can be removed and appropriate column titles inserted. The time will be in a column labelled /trk/trkseg/trkpt/time.

The time will be in the correct format but will be in UTM (Coordinated Universal Time). See section Converting text or UTM GPS data into local time and excel format on page 14 for a discussion of converting time formats into Vietnamese time and in the Excel time format.



The geographic position data will be in the columns labelled

Latitude data will be labelled /trk/trkseg/trkpt/@lat and

Longitude data will be labelled /trk/trkseg/trkpt/@lon.

GPS data as .csv file

If the GPS data is downloaded as a .csv file then it can be opened with excel and the file will have columns that are appropriately labelled. However the format of the time will vary depending on your GPS and/or transfer software. See section Converting text or UTM GPS data into local time and excel format on page 14 for a discussion of converting time formats into Vietnamese time and in the Excel time format.

Importing .gpx data directly into GIS software

Many GIS software platforms will open .gpx files. The details that are imported and the time format will depend on the GPS and/or transfer software. The .gpx file can be converted into a shape file and the attribute table can be exported or the .dbf file can be opened in Excel and saved as a worksheet. This method reduces the number of steps involved in determining the distance between points (see section Calculate Distance between points on page 15). The time data will generally be in UTM and text format. See section Converting text or UTM GPS data into local time and excel format on page 14 for a discussion of converting time formats into Vietnamese time and in the Excel time format.

Converting text or UTM GPS data into local time and excel format

The second step in importing GPS data is to convert the time data into local time (almost always necessary) and into excel time format (required for some methods). The following Excel file describes how to make the required changes and to import the data into the SVAM data sheet.

Convert text format UTM GPS points to Vietnam time format.xlsx

This Work book is designed to convert the time information that has been downloaded from a GPS into a format that can be used by Excel and GIS software.

GPS data is often downloaded as a 'gpx' file. The 'gpx' file format (GPs eXchange Format) is a standard format but it often outputs the time information as UTC (Coordinated Universal Time) (also called GMT Greenwich Mean Time).

If your GPS data looks like this

2013/04/25 3:12:51+00 or 2013/04/25T3:12:51Z

AND it is 7 hour different from the correct Vietnam time then it is in UTC time.

The workbook provides instruction on how to convert this into Vietnam time and also to convert it to the correct format for excel.



It is important to check the trackpoint data against the notes taken by the recorder. This is the best method to determine if your data is in UTM or not.

Calculate Distance between points

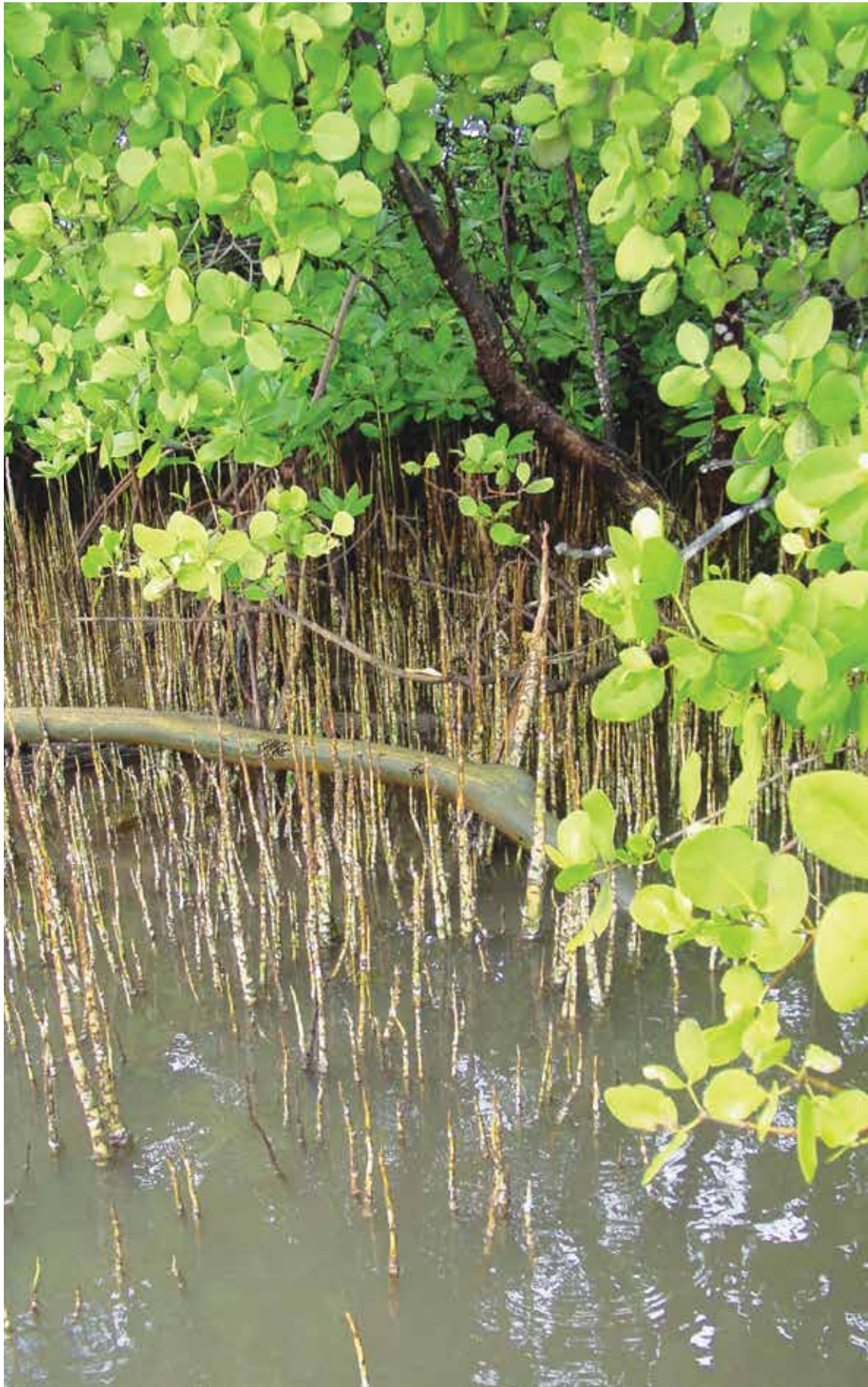
The third step in processing data is to calculate the distance between the track points. The following Excel file provides instructions and formulas to calculate the distance between two GPS points.


Calculate distance from GPS points.xlsx

Import data into SVAM2013 worksheet.

The processed data consisting of time, distance, Latitude, Longitude and distance between points is imported into the SVAM data sheet. It is important to ensure that data is pasted into the SVAM data sheet using 'paste number and format' and that data is placed into the correct location.

In order to ensure that the data input macro operated correctly, DO NOT add, remove or rearrange columns in 'data sheet' in Data Input SVAM2013.xlsm.



A decorative graphic featuring a blue wavy line that flows from the left side of the page, under the number '10005', and continues towards the right. The number '10005' is rendered in a large, bold, blue font, with the '1' being a solid vertical bar and the '0005' being semi-transparent. To the right of the number, the text 'Detailed Description of the Indicators' is written in a smaller, bold, blue font.

10005 Detailed Description of the Indicators



Shoreline Physical Condition

The shoreline physical condition is assessed through a number of indicators.

Waterways

The first indicator identifies the presence of waterways.

Presence of waterways	Description
Coast	A shore with an intertidal zone
Canal	Canal
Stream	A natural stream or stream channel
River	A wide estuary at the river mouth



Dominant shoreline habitat type

The second indicator, the dominant shoreline habitat type is a description of the section of coastline that is being traversed.

Shoreline Habitat Type	Description
Mangrove	Mostly mangrove forest
Terrestrial Fringe	Mostly covered terrestrial vegetation (trees & grass). Not sandy beach or rocky shore
Sandy Beach	Presence of a gently sloped shoreline with sandy substrate and intertidal vegetation absent.
Rocky Shore	Dominated by rock with no or sparse vegetation cover.
Plantation	Planted mangroves extend to the outer edge of the shoreline

Plantation shoreline type is made up of plantations that have been exposed by erosion. Plantations can be recognised by continuous stands of even aged, even height monocultures planted in straight rows. However variable growth rates, infilling by natural means, disease or human activities can all result in age or height variability. Natural regrowth after abandonment or natural disaster can also mimic the appearance of a plantation. Plantations are almost exclusively *Rhizophora apiculata*. In some cases scattered individual *Avicennia alba* that may have grown within or between blocks of plantation may also be present at the shoreline.



Habitat of the coast with mangroves



Soil shore-line - coconut tree and grass without sand



Sandy Beach



Rocky Shore



Eroding Plantation



Behind the shore

Where possible an indication of what is visible behind the shoreline is given.

Behind the shore	Description
Not visible	The hind shore is blocked by the shoreline immediately in front
Taller mangroves	The immediate shoreline is backed by tall mangrove forest
Terrestrial vegetation	Terrestrial trees or other terrestrial vegetation is visible
Aquaculture	Aquaculture ponds (including abandoned ponds) is visible
Infrastructure	Urban, industrial or transport infrastructure is visible
Other	Other non-mangrove land use



Eroding aquaculture pond dykes and planted mangroves visible behind the shoreline.



Shoreline slope

Shoreline slope is determined from the steepness of the intertidal zone.

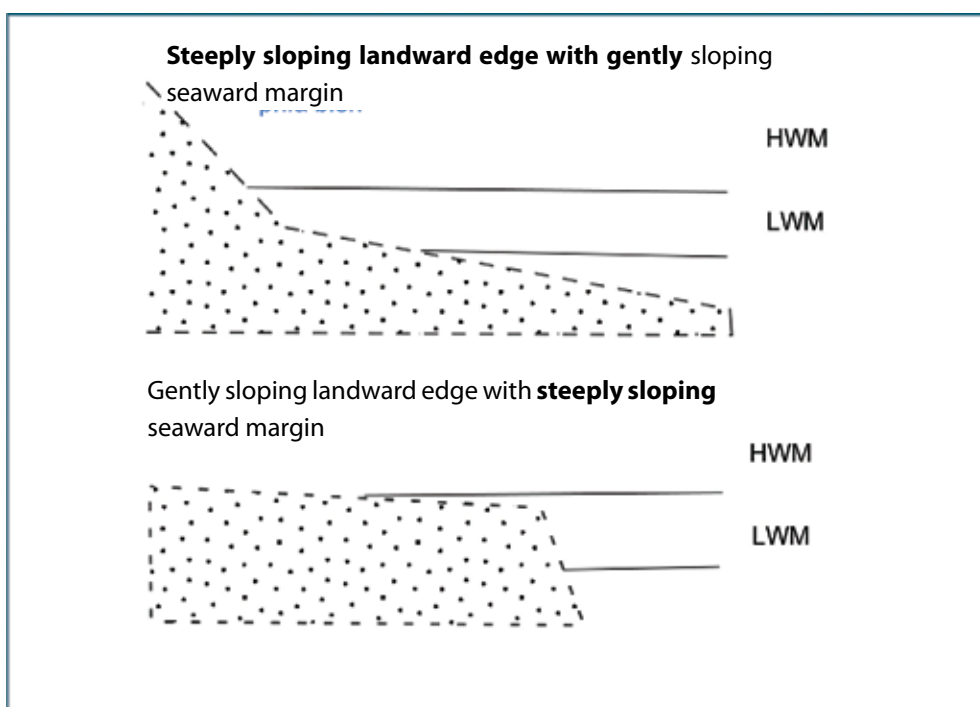
Shoreline Slope	Description
Gentle	Gently sloping shore with no changes (typical mangrove shore)
Moderate	Moderately steep slope
Steep landward edge	Steep landward edge with gently sloping seaward margin
Steep seaward edge	Steep seaward edge with gently sloping landward margin
Steep	Steeply sloping from land into the water
Sheer	Shore rises straight up from the water



Gentle; gently sloping shore with no change in slope



Moderate; moderately sloping shore.





Steeply sloping from land into the water.



Sheer slope from land into the water.



Shoreline Substrate

The dominant material that makes up the shoreline is indicated.

Tidal Flat Substrate	Description
Mud	Predominantly Mud
Sand	Predominantly Sand
Mud Dyke	Exposed earthen dyke
Sand over mud	A small sandy beach or dune over an eroded layer of mud
Rock	Rocky shore or large boulders
Rock Wall	A man made rock wall
Gabion	Rocks tied together by a wire cage



Sand Dune over mud



Rock Wall.

Tidal Flat Substrate

The dominant material that makes up the substrate of the tidal flat is indicated.

Note the tidal flat is often not visible

Tidal Flat Substrate	Description
Mud	Predominantly Mud
Sand	Predominantly Sand
Loose Stone	Predominantly loose small stones
Rock	Rocky shelf



Erosion Severity

Erosion severity is determined using qualitative assessment based on exposed sediment layers, shoreline slope, exposed roots of mangroves and mangrove condition, fallen trees, exposed/ degraded dyke and abandoned aquaculture infrastructure.

Note some or all of the descriptors may be present in each class.

Shoreline Erosion	Description
Severe Erosion	Very steep or sheer shoreline slope with an erosion scarp >1 metre in height, no mangroves present in front of the scarp, exposed sediment layers, exposed roots of mangroves, fallen trees.
Eroded	Steep shoreline slope with an erosion scarp 0.5 - 1 metre in height, exposed sediment layers, no fallen trees or exposed mangrove roots. At tall mangrove forest that ends abruptly at the shoreline with no recruitment of smaller mangroves in front is also a sign of previous erosion.
Minor Erosion	Overall gentle shoreline slope with an erosion scarp < 0.5 metre in height, mangroves may be present in front of the scarp
Stable	Gentle slope with no obvious erosion scarp, no deposition occurring, no or few seedlings.
Depositional	Mangrove seedlings and/or an obvious shallow mud apron extending seaward. Recruitment of new trees produces a forest canopy sloping downwards towards the seedlings at the sea.



Severe Erosion; showing very gently sloping landward edge with steeply sloping seaward margin, an erosion scarp >1 metre in height, no mangroves present in front of the scarp, exposed sediment layers, exposed roots of mangroves, fallen trees.



Eroded shoreline with remnant mangrove In front of small erosion scarp but the presence of seedlings indicates that erosion is not recent. The bank substrate is earthen dyke.



Another example of an eroded shoreline with a small erosion scarp (mostly hidden by high tide) but no active erosion visible. The tall forest ends abruptly at the sea.



Minor erosion; overall gentle shoreline slope with an erosion scarp < 0.5 metre in height, some mangrove seedlings are visible in front of the scarp.



A stable shoreline with no erosion scarp but no active deposition visible.

Seedling Establishment

The presence and estimated density of mangrove seedlings is indicated.

Seedlings	Description
Few	A few scattered seedlings are visible
Some	Some seedlings are visible
Many	There are many seedlings visible but there are gaps and spaces in the coverage
Dense	A dense covering of seedlings is visible in front of the more mature mangrove forest



Few seedlings visible.



Some seedlings visible.



Many seedlings visible.



Dense coverage of seedlings.

Development

The presence of **urban, industrial or transport infrastructure** on the shoreline is noted.

Active Erosion

The presence of recently fallen trees **or active sediment removal** is used to determine if erosion is actively occurring.



Active erosion; there is a high erosion scarp and most of the fringing mangroves have been eroded, exposing the terrestrial vegetation and crops (bananas) in the hind shore.



Active erosion; there is a high erosion scarp, exposed roots and fallen trees. Sediment has been removed from the area in the centre of the photo.

Cleared Mangroves

The presence of recent *clearing* of mangroves is also noted.

Concrete Wave Protection Structure

A man made concrete wall or structure designed to protection the shore from erosion due to wave action.

Shoreline Mangrove Forest Type, Extent and Condition

The mangrove biomass is determined from qualitative assessments of mangrove forest density and relative heights.

Mangrove forest structure is categorized according the visible growth forms of trees leading to an overall forest appearance that indicates structure.

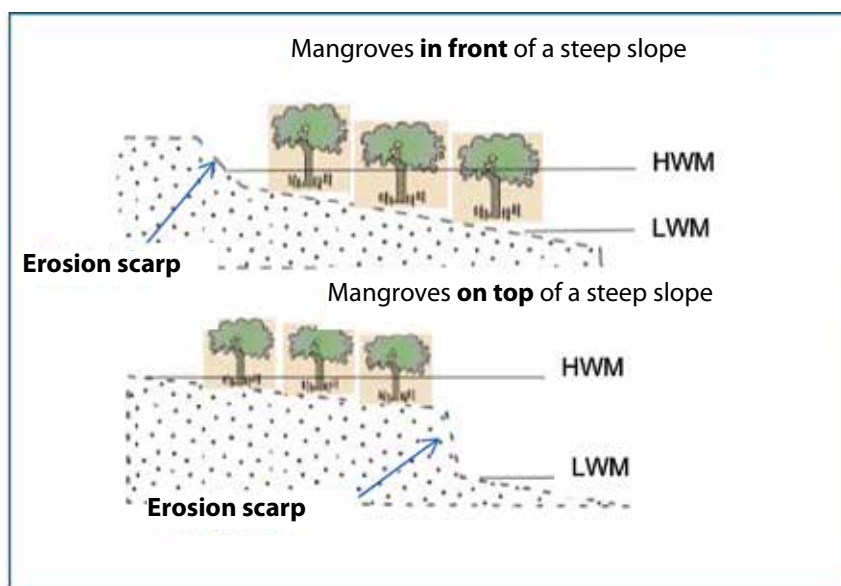
Mangrove Position

Mangrove position is a description of the location of mangroves in relation to a steep or sheer slope. *It is only used where the shoreline slope is designated as steep.*

Note this indicator is not restricted to mangrove coast.



Mangrove Position	Description
None	No mangroves present
In front	Mangroves are located in front of a steep slope
On top	Mangroves are located on top of a steep slope
Both	Mangroves are located both on top of and in front of a steep slope



Dominant mangrove genus

Genus is determined by growth form, leaf colour and root structures present in the frames. The dominant mangrove genus is assessed as the genus which makes up a clear majority of the mangrove trees along the coastal fringe (not the forest behind). If two genera are co-dominant or a second genus makes up the majority of the remaining mangrove trees, then a second dominant genus is identified. Where the forest is an even mix of multiple genera, or no dominant genus can be determined, the forest is classified as mixed.

Dominant Genus	
<i>Avicennia</i>	<i>Nypa</i>
<i>Sonneratia</i>	Mixed
<i>Rhizophora</i>	



Avicennia; Individual trees



Forest dominated by Avicennia



Sonneratia; Individual tree



Forest dominated by Sonneratia



Rhizophora; Individual tree



Forest dominated by Rhizophora



Nypa Palm



Forest dominated by Nypa

Mangrove Forest Height

Height classification is based on visual estimates using known forest heights as a reference.

Mangrove Height	Description
High	> 10m
Medium	3-10m
Low	<3m

Mangrove Density

Mangrove Density is a measure of the density of the mangrove trees that are visible. The shoreline fringing forest is classified dependent on the spacing between trees, canopy continuousness and forest width.

Mangrove Density	Description
Scattered	Only a few mangrove trees present along the shoreline
Sparse	Non-continuous forest with large gaps between trees, but an overall coverage of the shoreline edge (may be only one tree in width along the shore)
Medium	Mostly continuous forest but with large gaps. The forest is more than 2-3 trees wide.
Dense	A wide belt of continuous forest with no gaps between the trees



Scattered mangrove trees in front of an erosion scarp.



Scattered mangrove trees on a stony shoreline.



Sparse density of mangrove trees consisting of non-continuous forest one tree in width with large gaps between trees, but an overall coverage of the shoreline edge.



Medium density of mangroves; consisting of mostly continuous forest but with large gaps. The forest is more than 2-3 trees wide.



Dense mangrove forest showing a wide belt of continuous forest with no gaps between the trees.

Canopy Condition

Canopy Condition is a measure of the density of the mangrove canopy. The shoreline forest is classified by density dependent on the spacing between trees, canopy continuousness and forest width.

The condition of the canopy is only assessed if the forest is classed as continuous or dense.

Canopy Condition	Description
Fragmented	Dense forest with obvious gaps associated with tree felling/erosion
Regrowth/ Recovery	Continuous forest, but with mangrove tree height variability
Continuous	Dense continuous shoreline cover of mangrove trees of even height
Prograding/ Expanding	Continuous forest along the shoreline with a gradual decline in tree height towards the seaward mangrove margin
Plantation	Plantation trees that are actively eroding OR scattered or sparse remnant mangroves directly in front of a plantation



Fragmented Mangrove Forest; dense forest with obvious gaps associated with erosion.



Regrowth/ Recovery; continuous mangrove forest, but with tree height variability.



Continuous mangrove forest cover; a dense continuous shoreline cover of mangrove trees of even height.



Prograding; continuous forest along the shoreline with a gradual decline in tree height towards the seaward mangrove margin



Plantation; Plantation trees that are actively eroding

Mangrove Resource Use

In addition to wood harvesting, a number of other natural and anthropogenic pressures that are likely to further reduce the resilience of the mangrove forest to coastal erosion can be identified from the shoreline survey. The presence of dead trees is identified. Mangrove wood collection activity is quantified as cutting severity. Plantations are identified where possible.

Mangrove cutting

The presence and density of cut branches, stumps and felled trees is used to classify cutting severity.

Mangrove Cutting	Description
Few	One or two trees cut
Some	Some trees cut, easily noticeable in the frame
Many	Obvious presence of many cut stumps



Many cut stumps visible.

Dead Trees

This indicator is a description of the number of visible dead tree trunks.

Dead trees	Description
Few	One or two dead tree trunks
Some	Some dead tree trunks, easily noticeable in the frame
Many	Obvious presence of many dead tree trunks

Planted

Planted forests that are visible anywhere in the video are identified by trees of even age planted in orderly rows. This is distinct from the canopy density indicator that refers to what is evident at the interface of the shore and water.



1006 Further Data Analysis



The data files produced by the SVAM data input process will produce an Excel file of indicator values for each 3 sec time frame of the video.

Creation of Biomass classes

Biomass classes were derived from a combination of three indicators, Height, Mangrove Density and Canopy Condition. Values were assigned according to the table below.

The data can be further analysed to derive information for the detection of Hot Spots of erosion and pressure from human activities.

Creation of extreme erosion class

An extra erosion class of extreme was constructed to indicate areas where severe erosion has resulted in almost complete removal from the shore exposing the land use behind the remaining scattered mangroves. The class consists of points where

- The Erosion class is Major AND
- Mangrove density is scattered, OR
- The Canopy Condition is Sp/Sc Plantation, OR
- There is Infrastructure Behind the shore.

Creation of Human Influence classes

Presence of a wave break fence or of a concrete or rock wall artificial protection

The remainder of the Human impact was created from the addition of three indicators Cutting, Recently Cleared Mangroves and development



The Very High stress class represents areas where there are recently cleared mangroves; development is visible on the shoreline and cutting is rated as Many.

Other Information

The Excel file can be exported to a GIS to be converted into a GIS layer that will contain all of the indicator values for each 3 second geolocation.

The observer's notes will also produce a list of the time that each photo was captured, and a list of waypoints. The time, description and file name of each photo is entered into a spread sheet. The time that each photo was taken can be matched to the GPS data to determine the position along the coast that the photo depicts. This can be converted to a shape file that can be used to show the position of each photo in a GIS.

The description of each waypoint can be attached to the waypoint attribute list and the file can be exported from Excel into a GIS to be displayed as extra data.

Height	Height Value	Mangrove Density	Density Value	Canopy Condition	Condition Value	Rank
Very Short	4	Scattered	1		0	1
Very Short	4	Sparse	2		0	1
Very Short	4	Medium	3	Fragmented	1	1
Very Short	4	Dense	4	Fragmented	1	1
Short	3	Scattered	1		0	1
Short	3	Sparse	2		0	1
Short	3	Medium	3	Fragmented	1	1
Short	3	Dense	4	Fragmented	1	1
Very Short	4	Medium	3	Continuous	3	2
Short	3	Medium	3	Regrowth/ Recovery	2	2
Medium	2	Scattered	1		0	2
Medium	2	Sparse	2		0	2
Medium	2	Medium	3	Fragmented	1	2
Tall	1	Scattered	1		0	2
Tall	1	Sparse	2		0	2
Tall	1	Medium	3	Fragmented	1	2
Tall	1	Dense	4	Fragmented	1	2
Short	3	Medium	3	Continuous	3	2
Very Short	4	Dense	4	Regrowth/ Recovery	2	3
Short	3	Dense	4	Regrowth/ Recovery	2	3
Very Short	4	Dense	4	Continuous	3	3



Height	Height Value	Mangrove Density	Density Value	Canopy Condition	Condition Value	Rank
Very Short	4	Medium	3	Regrowth/ Recovery	2	3
Medium	2	Medium	3	Regrowth/ Recovery	2	3
Short	3	Dense	4	Continuous	3	3
Medium	2	Dense	4	Regrowth/ Recovery	2	4
Tall	1	Medium	3	Regrowth/ Recovery	2	4
Medium	2	Medium	3	Continuous	3	4
Medium	2	Dense	4	Fragmented	1	4
All Heights	6		5	Sp/Sc Plantation	5	4
Medium	2	Dense	4	Continuous	3	5
Very Short	4	Medium	3	Prograding	4	5
Very Short	4	Dense	4	Prograding	4	5
Short	3	Medium	3	Prograding	4	5
Short	3	Dense	4	Prograding	4	5
Medium	2	Medium	3	Prograding	4	5
Medium	2	Dense	4	Prograding	4	5
Tall	1	Medium	3	Prograding	4	5
Tall	1	Dense	4	Regrowth/ Recovery	2	5
Tall	1	Dense	4	Prograding	4	5
Tall	1	Medium	3	Continuous	3	5
Tall	1	Dense	4	Continuous	3	5

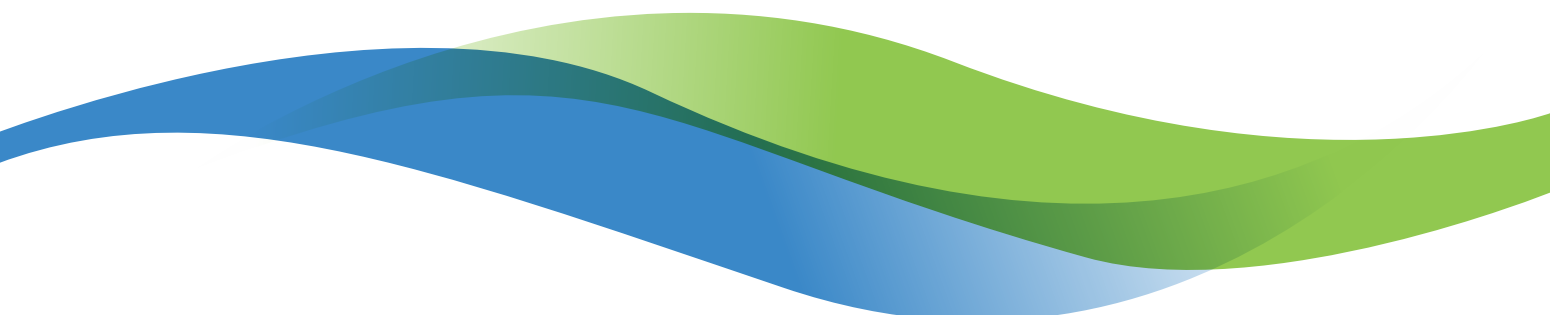
A decorative graphic featuring a blue wavy line that flows across the page. Overlaid on this line are large, semi-transparent blue numbers '100077'. To the right of the numbers, the text 'Accessing the Data' is written in a bold, dark blue font.

100077 Accessing the Data



Shoreline Video assessment will produce the following products for each District;

1. Excel files showing indicator values and derived information for each 3 sec time frame of the video.
2. GIS layers with an accompanying attribute table that can be used to display any individual indicator or combination of indicators in a GIS.
3. Photos with an accompanying excel file listing the latitude and longitude of the position of each photo that can also be converted to a GIS layer.
4. Waypoints depicting start points, stop points and other significant features (as an Excel table and as a GIS layer)
5. Videos – in order to find out the video that is associated with a particular location, the video name and the appropriate timeframe of the video can be extracted by viewing the SVAM GIS layer at that location.



Department of Agriculture and
Rural Development of
Ca Mau Province