Can I Use Remote Sensing for My Application in the Coastal Environment?

Underlying question for this section:
Is there a body of evidence to demonstrate that the use of remote sensing for mapping and monitoring a particular coastal environmental variable is "operational"?

In this context, "operational" refers to an application based on commercially available image data and software being used in a procedure that has been clearly documented and demonstrated through peer-review publication to be accurate within a specific coastal environment.

The terms "operational", "feasible" and "not possible" have been used frequently in literature that has assessed remote sensing's suitability for monitoring specific environmental indicators. We have identified "operational" and "feasible" applications to ensure full capabilities of remote sensing are considered. Operational applications are those that have been clearly demonstrated to work accurately from commercially available image data and standard image processing systems, and are delivering data at the required resolution. Feasible applications are those that have been shown to work with experimental image data sets or over limited areas with very small pixels or global scales with large pixels.

Table 3 as the first step, examples will then be presented for each parameter from CRC case studies. For the "operational" indicators Section 5 will explain how to go about using remote sensing, down to specifics and costs.

Table 3: Summary of the operational status (column 2) of coastal ecosystem indicators for use with remotely sensed data. Modified from Phinn et al. (2005), and Roelfsema and Phinn (2004 Seagrass conference Townsville)

Coastal ecosystem health indicator	**Can remote sensing be used?**	**Environmental constraints on application (e.g depth, clarity)**	**Sensor and Location of previous work (System available in Australia)**
Substrate Type Estuary	Operational (optically shallow water)	Visibility to the bottom	Hyperion Landsat TM/ETM SPOT Ikonos/Quickbird CASI/Hymap Aerial photography Side-scan sonar
Substrate Type Coral Reefs	Operational (optically shallow water)	Visibility to the bottom	Hyperion Landsat TM/ETM SPOT Ikonos/Quickbird CASI/Hymap Aerial photography Side-scan sonar
Substrate type Rock platforms	Feasible Exposed area or	Minimal surf and wave wash and visibility to the bottom	Hyperion Landsat TM/ETM SPOT

	optically shallow water)		Ikonos/Quickbird CASI/Hymap Aerial photography Side-scan sonar
Seagrass Macroalgae type	Feasible (optically shallow water)	Visibility to the bottom	Hyperion Landsat TM/ETM SPOT Ikonos/Quickbird CASI/Hymap Aerial photography Side-scan sonar
Seagrass Macroalgae Density	Operational (optically shallow water)	Visibility to the bottom	Hyperion Landsat TM/ETM SPOT Ikonos/Quickbird CASI/Hymap Aerial photography Side-scan sonar
Seagrass Macroalgae Biomass	Feasible (optically shallow water)	Visibility to the bottom	SPOT Ikonos/Quickbird CASI/Hymap Aerial photography Side-scan sonar
Coral Live/Dead	Feasible (optically shallow water)	Visibility to the bottom	MERIS Hyperion Ikonos/Quickbird CASI/Hymap Aerial photography
Water Quality – Secchi depth and /Vertical attenuation(Kd)	Feasible (optically deep water)	Can only applied where the bottom is not visible	Landsat MODIS MERIS SEAWIFS Quickbird Ikonos
Water Quality - Concentrations Chla	Operational only in coastal waters to a limited extent Feasible	Can only applied where the bottom is not visible	MODIS MERIS Hyperion CASI/Hymap Quickbird
Water Quality - Concentrations TSM/Tripton CDOM	Operational only in coastal waters to a limited extent Feasible Feasible	Can only applied where the bottom is not visible	MODIS MERIS Hyperion Landsat TM/ETM CASI/Hymap Quickbird Ikonos

Depth	Operational (optically shallow water)	Visibility to the bottom	MODIS MERIS SeawiFs Hyperion Landsat TM/ETM CASI/Hymap Airborne Laser Scanner Side-scan sonar Quickbrid Ikonos
Toxic chemical spills and oil spills	Feasible	Ocean surface roughness	Hyperion CASI/Hymap Radarsat
Algal blooms - Benthioc	Operational (optically shallow ater)	Visibility to the bottom	Landsat TM/ETM Hyperion CASI/Hymap Quickbrid Ikonos
Algal blooms - WWater column	Feasible		MODIS MERIS SeaWifs Hyperion CASI/Hymap
Algal blooms - SSurface)	Operational (clear water)		MODIS MERIS SeaWifs Hyperion Landsat TM/ETM CASI/Hymap Quickbrid Ikonos
Sea-surface temperature	Operational		NOAA-AVHRR MODIS AATSR-ENVISAT
Land-cover types	Operational	None	MODIS Landsat TM/ETM SPOT Ikonos/Quickbird Radarsat Aerial photography
Topography	Operational	None	Airborne laser scanner Stereo - Aerial photography
Terrestrial vegetation -Community/ species	Operational	Number of classes required	Landsat TM/ETM SPOT Ikonos/Quickbird Radarsat Aerial photography

Terrestrial vegetation -Condition	Operational	None	MODIS Landsat TM/ETM SPOT Ikonos/Quickbirdt Aerial photography
Terrestrial vegetation -Structure	Feasible	Topographic effects	Landsat TM/ETM SPOT Ikonos/Quickbird Radarsat Stereo - Aerial photography

TSM: Total (organic + inorganic) Suspended Matter concentration in the water column
CDOM: Coloured Dissolved Organic Matter in the water column
Chl *a*: Chlorophyll a concentration in the water column
SAV: Submerged Aquatic Vegetation (seagrass, micro/macro-algae, coral)
RS: remote sensing

A number of local, national and international monitoring and management programs have built successful monitoring and management programs for coastal environments around sets of select indicators. The following list represents recognised coastal ecosystem status indicators and an established monitoring and management program using that indicator:
- Water quality parameters – Moreton Bay Ecological Health and Monitoring Program (Dennison and Abal 1999) ; (- Algal bloom characteristics – Moreton Bay Lyngbya Task force (Roelfsema et al., 2001);
- Seagrass and benthic substrate community attributes – NOAA-Coastwatch; and
- Coral reef attributes – Great Barrier Reef Marine Park Authority, Global Coral Reef Monitoring Network (Wilkinson 2000).

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