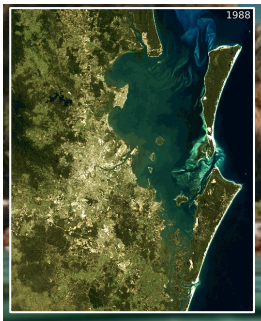
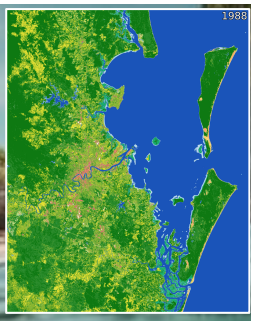


Proposed Underwater Classification



Living Earth constructs land cover classifications according to the Food and Agriculture Organisation's (FAO) Land Cover Classification System (LCCS) and from environmental descriptors retrieved or classified primarily from Earth observation data. A globally applicable change framework is then used to identify and describe change impacts based on evidence gathered through time-series comparison of the land cover maps and contributing environmental descriptors.

A current limitation of the FAO LCCS is that the first dichotomous phase distinguishes primarily vegetation from primarily not-vegetated (Figure 1), which does not allow identification and discrimination of vegetation under water (in freshwater, intertidal and subtidal zones) as well as more detailed description of these. Hence, we present a new approach to the inclusion of submerged environments within the FAO LCCS. A particularly advantage of this is that the change framework can be implemented in this environment and can be connected to human activities and natural events and processes occurring on land or in water that can be co-influential.

Land

PRIMARILY VEGETATED				PRIMARILY NOT VEGETATED			
TERRESTRIAL		AQUATIC OR REGULARLY FLOODED		AQUATIC OR REGULARLY FLOODED		AQUATIC OR REGULARLY FLOODED	
CULTIVATED TERRESTRIAL VEGETATION	NATURAL/SEMI-NATURAL TERRESTRIAL VEGETATION	CULTIVATED TERRESTRIAL VEGETATION	NATURAL/SEMI-NATURAL TERRESTRIAL VEGETATION	ARTIFICIAL SURFACE	NATURALLY BARE SURFACES	ARTIFICIAL WATER	NATURAL WATER
LIFEFORM, SPATIAL ASPECTS, CROP COMBINATION, COVER-RELATED CULTURAL PRACTICES	LIFEFORM, COVER, HEIGHT, LEAF TYPE, LEAF PHENOLOGY, STRATIFICATION	LIFEFORM, SPATIAL ASPECTS, WATER SEASONALITY, CROP COMBINATION, COVER-RELATED CULTURAL PRACTICES	LIFEFORM, COVER, HEIGHT, LEAF TYPE, WATER SEASONALITY, LEAF PHENOLOGY, STRATIFICATION	SURFACE ASPECT	SURFACE ASPECT, MACRO-PATTERN		

Biota+

A BIOTIC COMPOSITION

A1	A2	A3	A4	A5
No biota	One biota	Multiple biota	Two dominant biotas	Three dominant biota

A BIOTA COVER

A10 (> 65 %)	**A12** (40 to 65 %)	**A13** (15 to 40 %)	**A15** (4 to 15 %)	**A16** (1 to 4 %)

B BIOTA HEIGHT ABOVE SUBSTRATE

B9 (> 14 m)	**B8** (7 to 14 m)	**B7** (5 to 7 m)	**B6** (2 to 5 m)
B5 (1 to 2 m)	**B4** (0.05 to 1 m)	**B3** (0.001 to 0.05m)	

C KINGDOM

C10 ANIMALIA	**C20** PLANTAE	**C30** FUNGI	**C40** CHROMISTA	**C50** PROTISTA	**C60** PROKARYOTA
C11 Annelids	**C21** Herbaceous	**C31** Lichen	**C41** Brown algae	**C51** Algae	**C61** Bacteria
C12 Ascidians	**C22** Graminoids, **C23** Forbs		**C42** Fucoid	**C52** Red, **C53** Green	**C62** Cyanobacteria
C13 Bryozoans			**C43** Kelp		**C63** Archaea
C14 Cnidarians					
C15 Crustaceans					
C16 Echinoderms					
C17 Mollusca					
C18 Sponges					
C19 Zooplankton					

D DOMINANCE OF FIRST BIOTA (ANY)

D10 (>= 75 %)	**D12** (50 to <75	**D13** (30 to <50 %)	**D15** (10 to <30	**D16** (1 to <10 %)
D DOMINANCE OF SECOND BIOTA		**D13** (30 to 50 %)	**D15** (10 to <30	**D16** (1 to <10 %)
D DOMINANCE OF THIRD BIOTA			**D15** (10 to <30 %)	**D16** (1 to <10 %)

E M_POSITION

E1 ATTACHED/ROOTED	**E2** DETACHED/FLOATING

F SPATIAL ASPECT

F1 Colonial	*F2 Biogenic reef*	*F3 Crustose*	*F4 Cushion*	*F5 Foliose*
F6 Film	*F7 Mat*	*F8 Turf*	*F9 Forest*	

G PHENOLOGY

G1 PERMANENT	**G2** SEASONAL	**G3** EPHEMERAL

Substrate

B CONSOLIDATION

B1 CONSOLIDATED	**B2** UNCONSOLIDATED

B MSUBSTRATE

B3 ROCK	**B5** SOFT
B4 BEDROCK	**B6** HARD

MSOFT	MHARD
B7 MUD	**B10** GRAVELS
B8 SILT	**B11** GRANULES
B9 SAND	**B12** SHINGLE
	B13 PEBBLES
	B14 COBBLES
	B15 BOULDERS
	B16 STONES
	B17 RUBBLE

C MOBILITY

C1 MOBILE	**C2** STATIC

Water

A PHYSICAL STATUS

A1 WATER	**A2** SNOW	**A3** ICE

A. WATER MOVEMENT

A4 FLOWING[2]	**A6** MOVING
A5 STANDING[1]	**A7** STATIONARY

[1]Riverine; [2]Lacustrine

B3 TIDAL

B10 INTERTIDAL (LITTORAL)	
B11 SUBTIDAL (SUBLITTORAL)	
B12 INFRALITTORAL	**B13** CIRCALITTORAL

B PERSISTENCE*

B1 > 9 MONTHS
B7 7-9 MONTHS
B8 4-6 MONTHS
B9 1-3 MONTHS

C DEPTH

C1 MEDIUM TO DEEP (> 2 m)
C2 SHALLOW (< 2 m)

C BATHYMETRY	C THICKNESS
C3 (0.01-2 m)	**C3** (0.01-2 m)
C4 (2-5 m)	**C4** (2-5 m)
C5 (5-10 m)	**C5** (5-10 m)
C6 (10-20 m)	**C6** (10-20 m)
C7 (20-100 m)	**C7** (20-100 m)
C8 (>= 100 m)	**C8** (>= 100 m)

D.SEDIMENT LOADS

D ALMOST NO SEDIMENT	D WITH SEDIMENT

E SALINITY

E1 FRESH
E2 BRACKISH
E4 MODERATELY SALINE
E5 VERY SALINE
E3 SALINE
E6 BRINE
E7 VERY BRINE

F ENERGY LEVEL

F1 LOW ENERGY	**F2** MODERATE ENERGY	**F3** HIGH ENERGY