

Towards an integrative approach for mapping Natura 2000 habitats of the coast of Ameland

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Background

- Integrated Coastal Zone Management (ICZM)
- ‘Soft engineering techniques’ building on natural processes: sand nourishment (beach, foreshore)
- Ecological Optimized Coastal Defense
- Requires: an integrated approach for mapping and monitoring of the coastal zone, including Natura 2000 habitats (biodiversity goals)

Background

- Different monitoring programs with different objectives:
 - 'Monitoring van Waterstaatkundige Toestand des Lands' by RWS,
 - Trilateral Monitoring and Assessment Program (TMAP) by RWS and LNV,
 - Monitoring of effects of gas extraction by the NAM,
 - Etc.
- No complete coverage of coastal Natura 2000 habitats of the coastal zone, but.....
 - Different type of remote sensing images and data products available
 - 'New' image analysis techniques offer opportunities

Research objectives and approach

- Mapping Natura 2000 habitats of the coastal zone of Ameland (complete coverage)
- Based on:
 - Available remote sensing images / data products (aerial photographs, LIDAR, JARKUS, etc.)
 - 'New' image analysis techniques: segmentation and classification (multi scale, object based and rule based)

Object based (segmentation)

- Clustering pixels to 'meaningful' objects: 'image segments'
- Size of the created objects determined by scale parameter: 'maximum allowed heterogeneity'
- The scale parameter is an dimensionless threshold which controls the heterogeneity of the objects



Multi scale (segmentation)

- Human perception (size, shape, colour, ...)



Scale parameter 750



Scale parameter 250



Scale parameter 50



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Rule based (classification)

EUNIS habitat classification system: hierarchical system (multi scale), 3-4 levels, based on decision rules

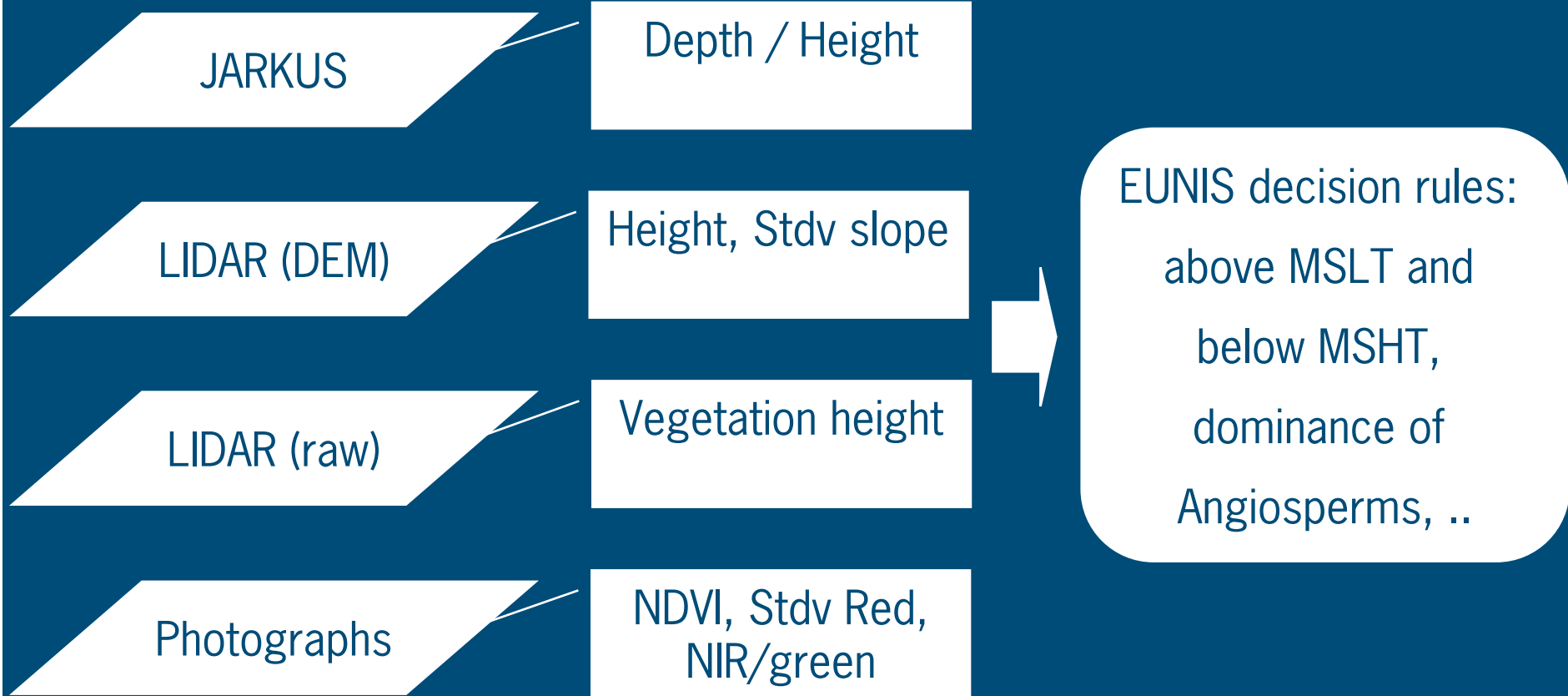
A Marine habitats

- A2 Littoral
 - A2.5 Salt marshes

B Coastal habitats

- B1 Beach
 - B1.1 Sand beach drift lines
- B1 Dunes
 - B1.3 Shifting coastal dunes
 - Embryonic shifting dunes
 - Shifting white dunes
 - B1.4 Stable coastal dunes

Applying EUNIS decision rules to RS derived variables

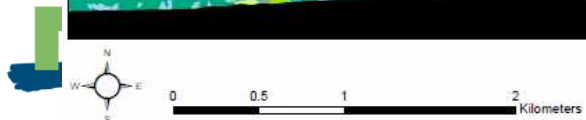
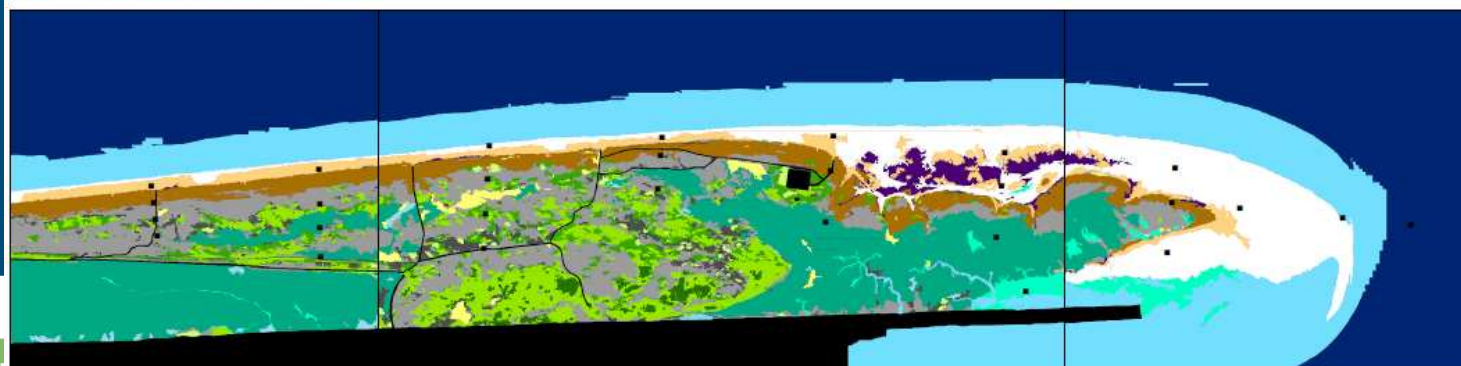
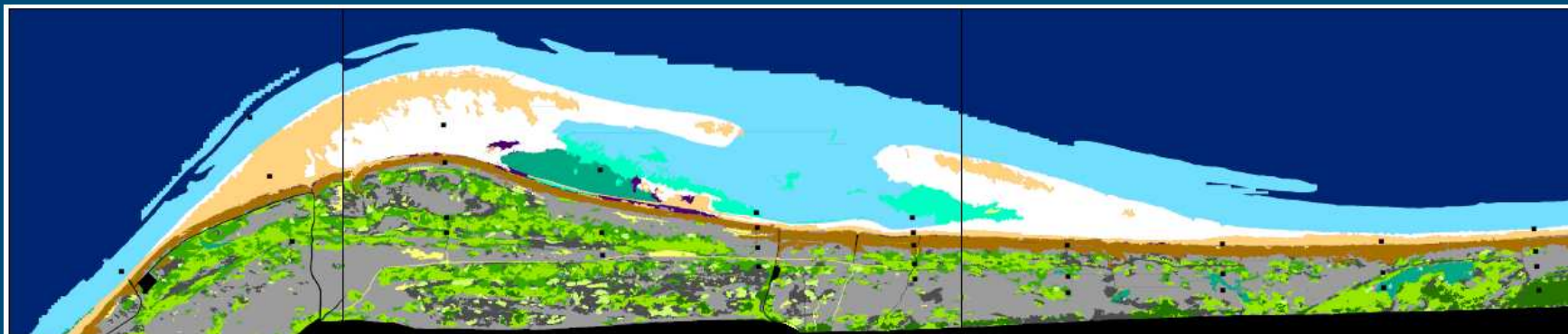


Also variables such as: shape, distance to .. etc.

Segmentation and classification on 4 scale levels

- Level 1: marine – coastal habitats
- Level 2: offshore, nearshore, foreshore (beach face), backshore (beach) and dunes
- Level 3: salt marshes, beach, shifting dunes, stable dunes, dune scrub, humid dune slacks
- Level 4: pioneer salt marshes (low), sand beach drift lines, shifting embryonic dunes, Buckthorn and Willow dune scrub

Results: map (level 4)



Results

- Overall accuracy

Level 1	Level 2	Level 3	Level 4
91%	81%	54%	49%

- Confusion between:

- Humid dune slack and salt marsh
- Pioneer salt marsh and salt marsh
- Sand beach, sand beach drift lines and bare dunes
- Buckthorn and Willow scrub

- Due to;

- Dynamics (succession), data quality (LIDAR), translation RS to field variables (especially vegetation), ...

Discussion

- Integrative mapping and monitoring of coastal zones might be more efficient: multiple use of data products, integration of knowledge, ..
- Object based, multi scale and rule based approach fits with EUNIS habitat classification system (and Natura 2000)
- It offers a synoptic overview, it is transparent and traceable, not too costly, ..
- But at lower scale level the accuracy is not acceptable, need for better 'quality' data (e.g. LIDAR, false colour images)

The end



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