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

Eric Baptist (UU), Pieter Slim (CL) and Anne Schmidt (CGI)

WAGENINGEN UR
For quality of life

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

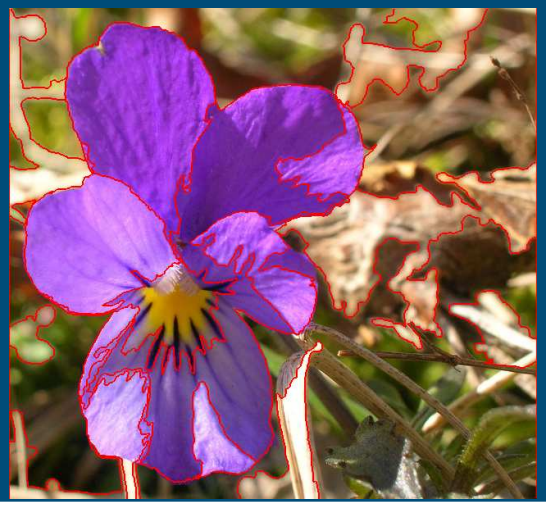
- Different monitoring programs with different objectives:
  - 'Monitoring van Waterstaatkundige Toestand des Lands',
  - Trilateral Monitoring and Assessment Program (TMAP),
  - Monitoring of effects of gas extraction by the NAM,
  - Etc.
- No complete coverage of coastal Natura 2000 habitats of the 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
- Size of the created objects determined by scale parameter
- The scale parameter is an dimensionless threshold which controls the heterogeneity of the objects



Multi scale (segmentation)

- Human perception

Scale parameter 750

Scale parameter 250

Scale parameter 50

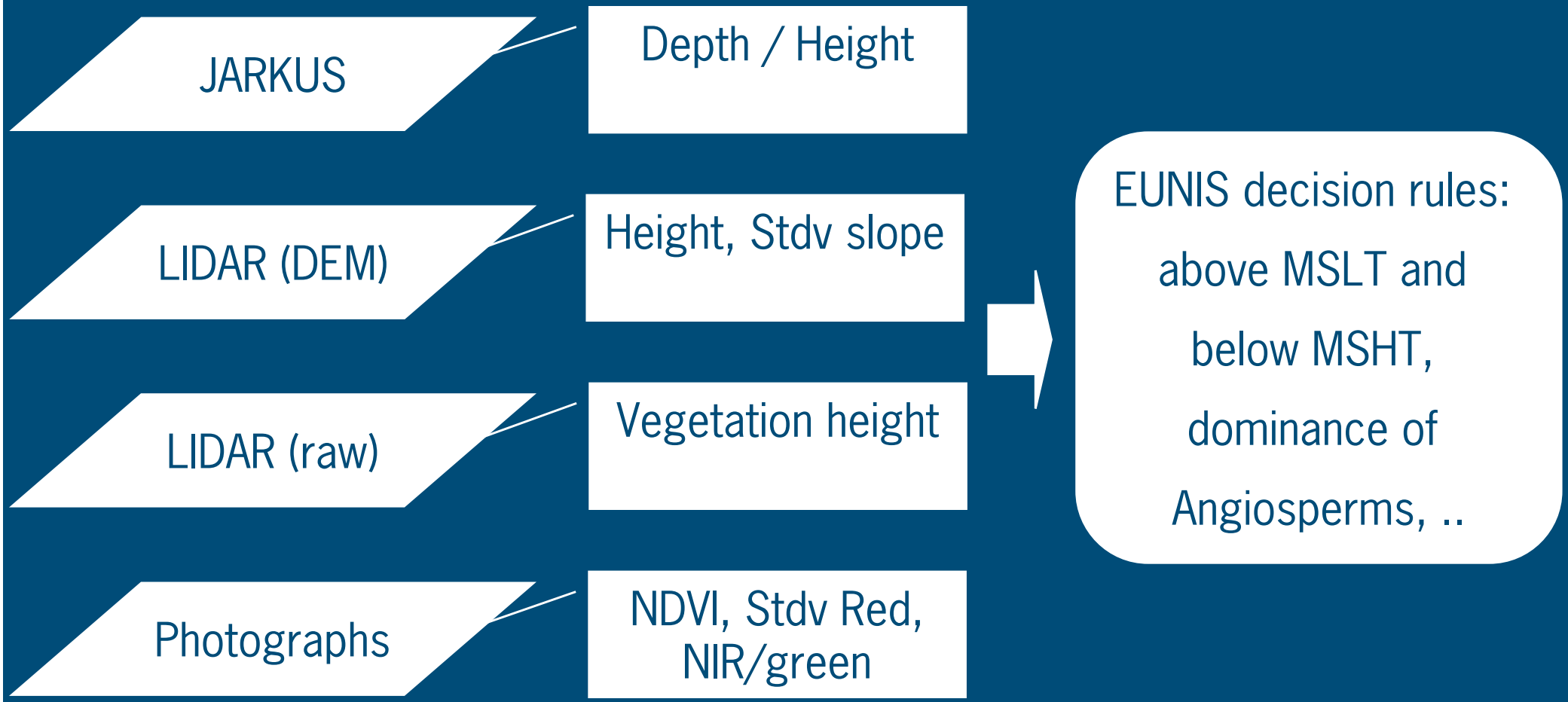
Rule based (classification)

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

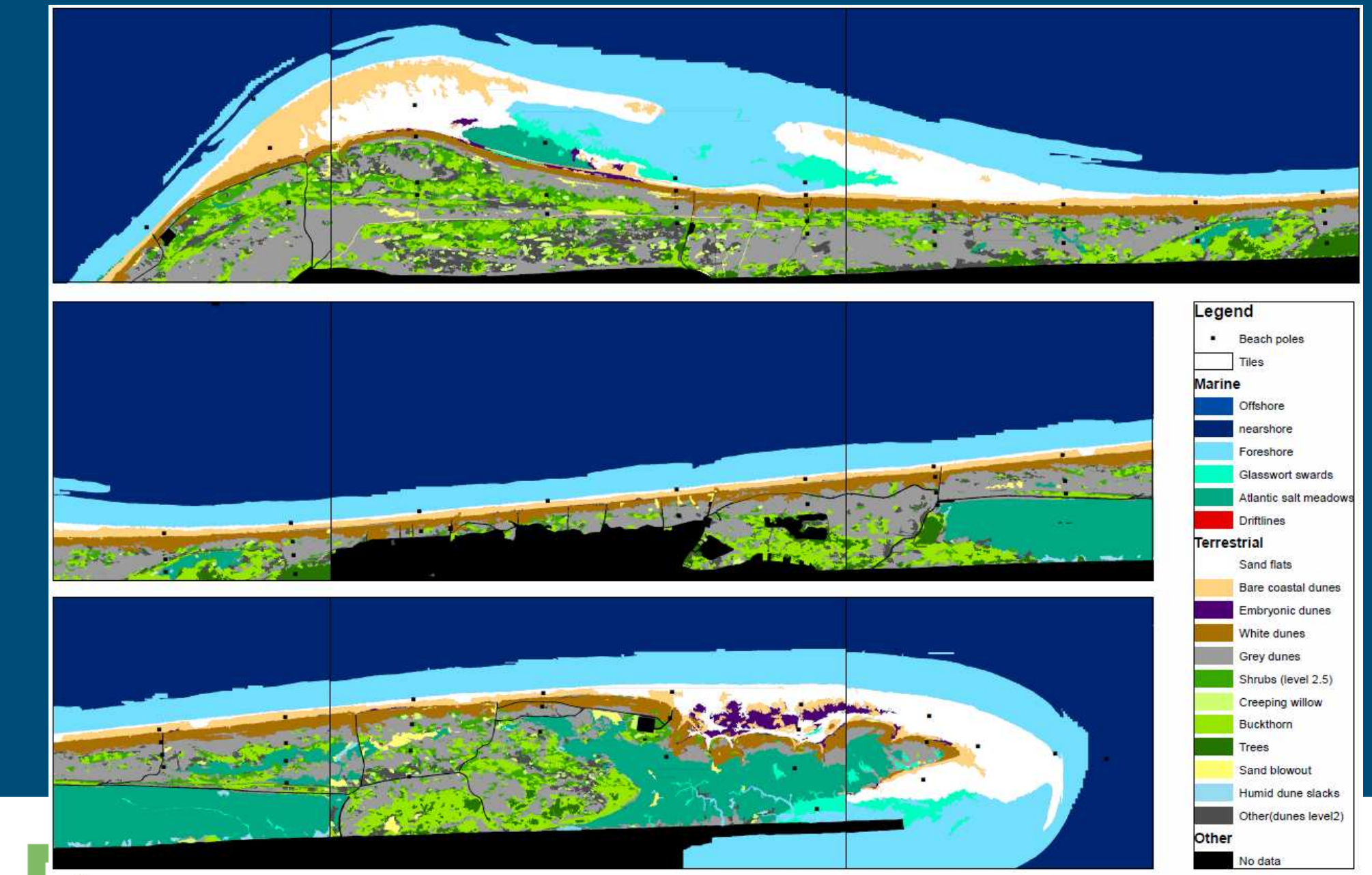


Also variables such as: shape, distance to .. etc.

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 with EUNIS habitat classification system (and Natura 2000)
- It offers a synoptic overview, it is transparent and traceable, not to costly, ..
- But at lower scale level the accuracy is not acceptable, need for better ‘quality’ data (e.g. LIDAR, false colour images)

The end

WAGENINGEN UR
For quality of life