COST Action CA16208 / WG2 Meeting, Belgrade, 4-5 Sep. 2019 STSM: REMOTE SENSING APPLICATIONS FOR RIPARIAN ECOSYSTEMS MANAGEMENT, MOROCCO



COST Action CA16208 CONVERGES

'KNOWLEDGE CONVERSION FOR ENHANCING MANAGEMENT OF EUROPEAN RIPARIAN ECOSYSTEMS AND SERVICES'

Short Term Scientific Mission (STSM) 'REMOTE SENSING APPLICATIONS FOR RIPARIAN ECOSYSTEMS MANAGEMENT, TETOUAN, MOROCCO' (13/04/2019 - 23/04/2019)

Participants

Antonis Kavvadias (En Agris PC) Dr. Manolis Psomiadis (Agricultural University of Athens) **Host**

Pr. Mohammed Ater, Abdelmalek Esaâdi University (Tetouan-Morocco)

STUDY AREA



River Martil, Tetouan city (N. Morocco)

Excessive environmental pressures:

- State hydraulic works
- Agricultural activity
- Grazing
- Uncontrolled Waste Disposal





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CASE STUDY



Case Study Description

- UAS Aerial Photography
- Ground Photography
- Orthophoto map production
- 3D Digital Surface Model (DSM) production
- Acquisition of Satellite Imagery Data
- Imagery Data Comparison
- UAS and Satellite Imagery Case Studies Presentation at the Abdelmalek Esaâdi University











Unmanned Aerial System (UAS) Mission

Equipment

UAV: DJI Phantom 4 Advanced (tetracopter)
Camera resolution: 4K (4096x2160px)
Sensor: RGB / NIR



<u>SW</u>

- eMotion (Flight planning & control)
- AgiSoft (Image processing)
- ENVI (Imagery analysis)
- ArcGIS (GIS)





Unmanned Aerial System (UAS) Mission Description

Pre-flight Procedure

- Official Permissions: (Nope!)
- Weather forecast

 Study Area general check (obstacles, prohibited areas etc)

Aerial Photography Info

- Flight duration: 22 minutes
- Flight Altitude: 55 meters
- Number of images: 96
- Longitudinal & Lateral Overlap: 60% & 60%





Post-flight Imagery Data Process (Photogrammetric SW: Agisoft)

Derivatives:

- Orthophoto map (RGB)
- 3D Digital Surface Model (DSM)

Orthophoto map

Area: 14 Ha Spatial resolution: 2,5 cm/px

3D Digital Surface Model



DATA

Potential environmental pressures detection

- **1. Agricultural Activity**
- 2. Free grazing area
- 3. Small Industrial Installation
- 4. Ford crossing
- 5. Waste Disposal







Ground truthimg of UAS imagery data of the riparian zone

UAV aerial photos







Ground photos











Comparison of Satellite imagery data for riparian ecosystem management and temporal change detection.

A1-A2: Decrease of riparian vegetation cover along the river flood protection constructions. B1-B2 : Increase of riparian vegetation cover at the western part at the junction of the Martil river with its main tributary (LandSat 5, 8)





Presentations, Abdelmalek Esaâdi University, Tetouan, Morocco













UAS Contribution to Riparian Ecosystems Management

- Detailed 3D modeling and slope mapping (geomorphology analysis)
- Water surface change (Infrared data)
- River Islets mapping and monitoring
- Hydraulic modeling (water flow measurements, flood modeling, material volume measurements)
- Detection and volume measurement of woody or other debris accumulation
- Riparian vegetation alteration monitoring (repetitive UAS missions)







UAS Contribution to Riparian Ecosystems Management

- Riparian vegetation health conditions monitoring using vegetation indices (e.g. NDVI)
- Vegetation Species Classification
- Canopy and biomass volume measurement
- Anthropogenic pressures detection and monitoring (Illegal logging, overgrazing, illegal agricultural or industrial deposition, sand extraction etc)



 Study and planning of essential hydraulic projects for improvement and regeneration.





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Thank you!

