Assessing Water Ecosystem Services and their Dependency on Land use changes

A Case Study of the Azov sea basin

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with CEU Syslab
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Content

- Background
- Research question
- Methodology
- Preliminary Results
Background
Project

- Part of Environmental Systems laboratory at CEU, Budapest, Hungary
- Ongoing since 2012, work in progress
- With Viktor Lagutov & Irina Gilfanova
- Focussed research on the Azov sea Basin

Sara Pruckner, February 2018
UN Conference Pakistan
Project – Environmental Systems Laboratory at CEU

- **Project aim:**

  To assess the development of Ecosystem Goods & Services in the Azov Sea Basin with ArcSWAT Modelling

- **My Focus:**

  To analyse Land Use and Land Cover changes in the basin with Google Earth Engine as an input to the project

Sara Pruckner, February 2018
UN Conference Pakistan
The Azov Sea Basin

(Lagutov and Lagutov 2010)
Google Earth Engine

Human Action

Change in water quality

Change in EGS

Change in value

ArcSWAT

(Keeler et al. 2012)
“What has been the influence of land use and land cover changes on ecosystem goods and services of the Azov Sea basin in the past 30 years, and how could this relationship develop in the future?”
Methodology Google Earth Engine
Methodology Google Earth Engine

- Supervised Landuse classification

- Using Landsat 8 images of August of different years, clipped to the borders of the basin
Creating Training Data

- Least cloudy picture available for time frame for every single point chosen
- Band combination 6-5-4 used for vegetation analysis

<table>
<thead>
<tr>
<th>Bands</th>
<th>Wavelength (micrometers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band 1 - Ultra Blue (coastal/aerosol)</td>
<td>0.435 - 0.451</td>
</tr>
<tr>
<td>Band 2 - Blue</td>
<td>0.452 - 0.512</td>
</tr>
<tr>
<td>Band 3 - Green</td>
<td>0.533 - 0.590</td>
</tr>
<tr>
<td>Band 4 - Red</td>
<td>0.636 - 0.673</td>
</tr>
<tr>
<td>Band 5 - Near Infrared (NIR)</td>
<td>0.851 - 0.879</td>
</tr>
<tr>
<td>Band 6 - Shortwave Infrared (SWIR) 1</td>
<td>1.566 - 1.651</td>
</tr>
<tr>
<td>Band 7 - Shortwave Infrared (SWIR) 2</td>
<td>2.107 - 2.294</td>
</tr>
<tr>
<td>Band 8 - Panchromatic</td>
<td>0.503 - 0.676</td>
</tr>
<tr>
<td>Band 9 - Circus</td>
<td>1.363 - 1.384</td>
</tr>
<tr>
<td>Band 10 - Thermal Infrared (TIRS) 1</td>
<td>10.60 - 11.19</td>
</tr>
<tr>
<td>Band 11 - Thermal Infrared (TIRS) 2</td>
<td>11.50 - 12.51</td>
</tr>
</tbody>
</table>

(Barsi et al. 2014)
Creating Polygons
Training classifier & Image classification

```javascript
// Create a random forest classifier with custom parameters.
var classifier = ee.Classifier.randomForest().train(
  features: training,
  classProperty: 'class',
  inputProperties: bands
);

// Train the classifier.
var trained = classifier.train(training, 'class', bands);

// Classify the image.
var classified = clipped.classify(trained);

// Create a palette to display the classes.
var palette = ['0000FF', 'ff500', '000000', 'ff0000', '00ff00', '0f0f0f', 'ff4f4f'];

// Display the classification result and the input image.
Map.addLayer(classified, {min: 0, max: 5, palette: palette}, 'Landuse Type 2015');
```

Different classifier types
Preliminary Results
Land use analysis Google Earth Engine

Black: Urbanised areas
Green: Naturally vegetated areas
Orange: Cropland
Yellow: Pasture/livestock
Blue: Water
Land use analysis Google Earth Engine

Black: Urbanised areas
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Blue: Water
Accuracy Assessment

Legend:

0 = Water
1 = Vegetated Cropland
2 = Urban land
3 = Bare cropland/Pasture
4 = Natural vegetation/forest

Resubstitution error matrix:

```
List (5 elements)
- 0: [139949,4,4,0,6]
- 1: [9,9279,91,37,122]
- 2: [11,134,2753,75,39]
- 3: [2,65,31,12232,25]
- 4: [6,113,55,27,11834]
```

Training overall accuracy:

0.9951611900306948
Issues to solve

- Cloudless pictures vs. same month of the year
- More detailed land use training data for different years
- Separate accuracy assessment data
- Creating an input for ArcSWAT
References


Thank you for your attention!