UN environment WCMC

UN Environment
World Conservation Monitoring Centre

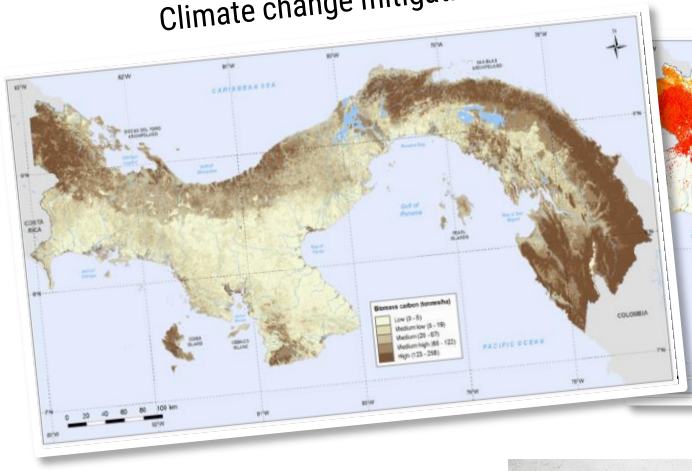
COMBINING MULTIPLE SOURCES OF INFORMATION TO SUPPORT REDD+ PLANNING

UNEP-WCMC

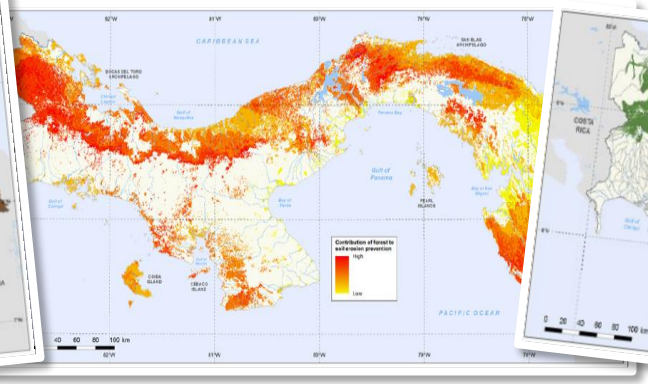
FEBRUARY 2018

Introduction

Climate change mitigation



Soil erosion control



Promotion of nature-based tourism

MULTI-CRITERIA EVALUATION

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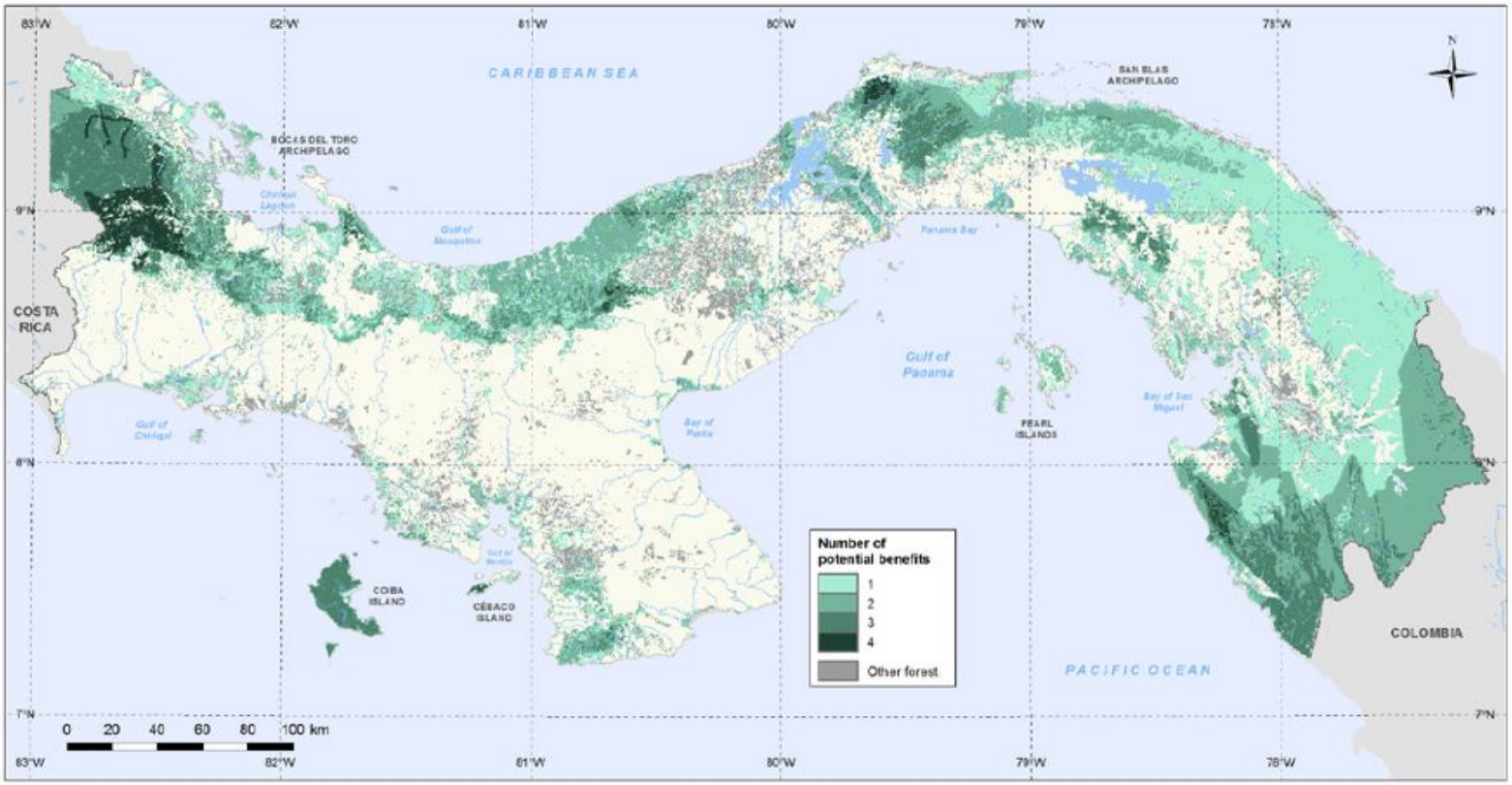
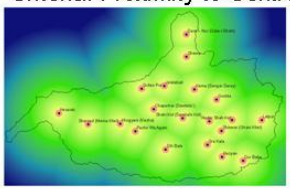


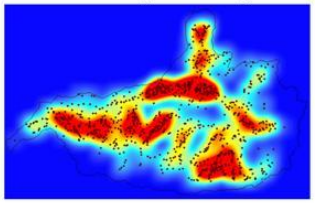
Multiple Criteria Analysis – Suitability Modelling

Example study:
Identifying Sites for Building Hospitals

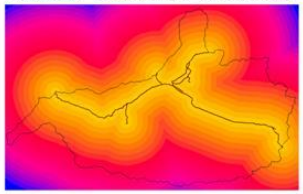
Criteria: Proximity to Centres



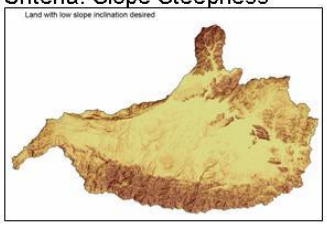
Criteria: Village Density



Criteria: Proximity to Roads

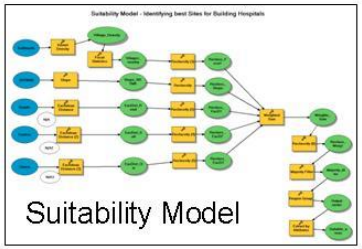


Criteria: Slope Steepness



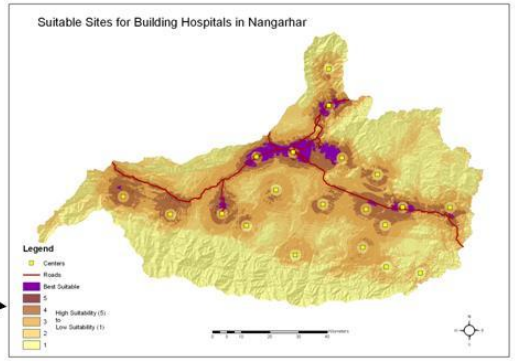
Criteria: Distance to existing Hospitals

1 2 3 4 5



Ranking and Weighted Overlay

Output



from **'high'** to **'low'**

Final Output suggests
areas that best meet criteria

http://spatialventures.com.au/en/services/spatial-analysis/gis/

MULTI-CRITERIA EVALUATION

Data feeding into a multi-criteria analysis will be variable by nature:

- Simple presence/absence, e.g. Protected areas
- Data spread across a range of values, e.g. Carbon density in Tn/ha

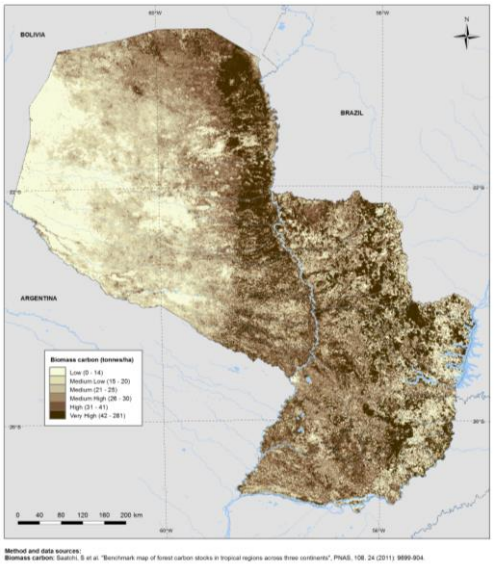
There are a range of multi-criteria approaches that can be taken, ranging from simple to complex and they vary in the way they treat the data

There are two main approaches:

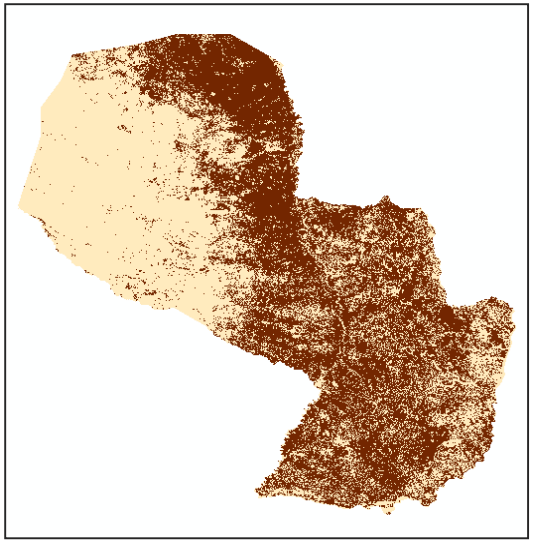
- Boolean
- Fuzzy Overlay

BOOLEAN INTERSECTION

- The simplest variant of criteria processing
- Prior to the combination, each input criteria is converted to Boolean (i.e. suitable =1/unsuitable = 0) statements of suitability for the decision under consideration.
- Then, factors (layers) can be combined using Raster calculator



> 25 Th/ha



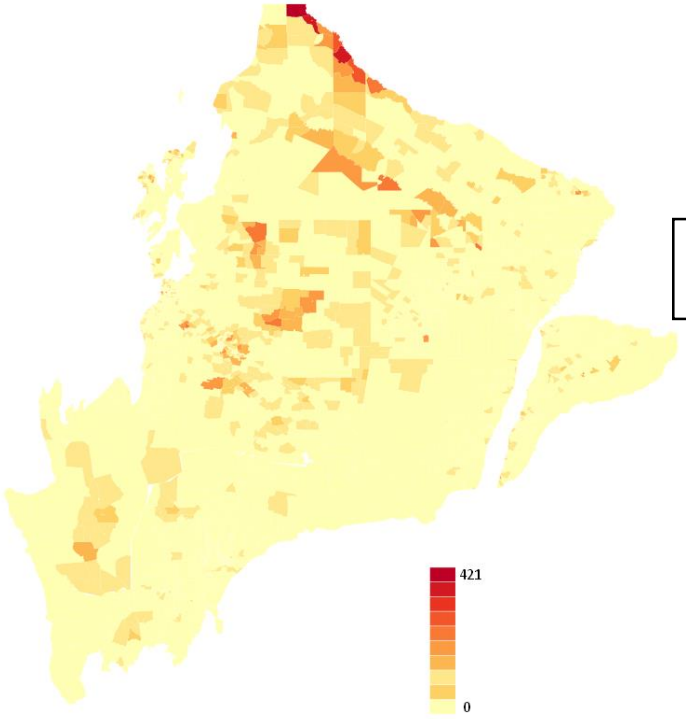
FUZZY OVERLAY

- In this approach, quantitative criteria are evaluated as fully continuous variables rather than collapsing them to Boolean constraints
- Reclassifies or transforms the data values to a common scale (data are normalised to a scale ranging from 0 - 1, 0 - 100, 0 - 255).
- The process of converting data to such numeric scales is most commonly called ‘standardisation’ or ‘normalisation’.
- Linear scaling is the most commonly (but not necessarily recommended) technique

$$X_i = (x_i - \min_i) / (\max_i - \min_i)$$

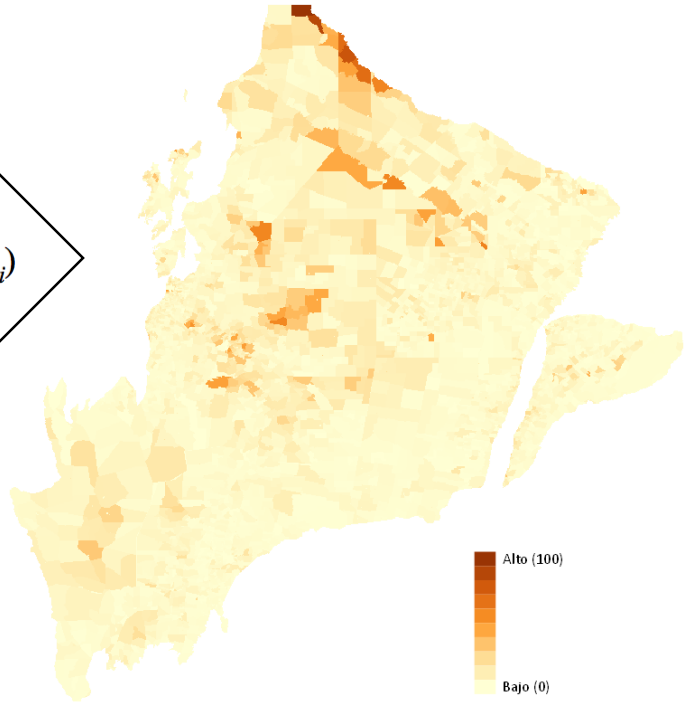
NORMALIZATION

Original layer



$$X_i = (x_i - \min_i) / (\max_i - \min_i)$$

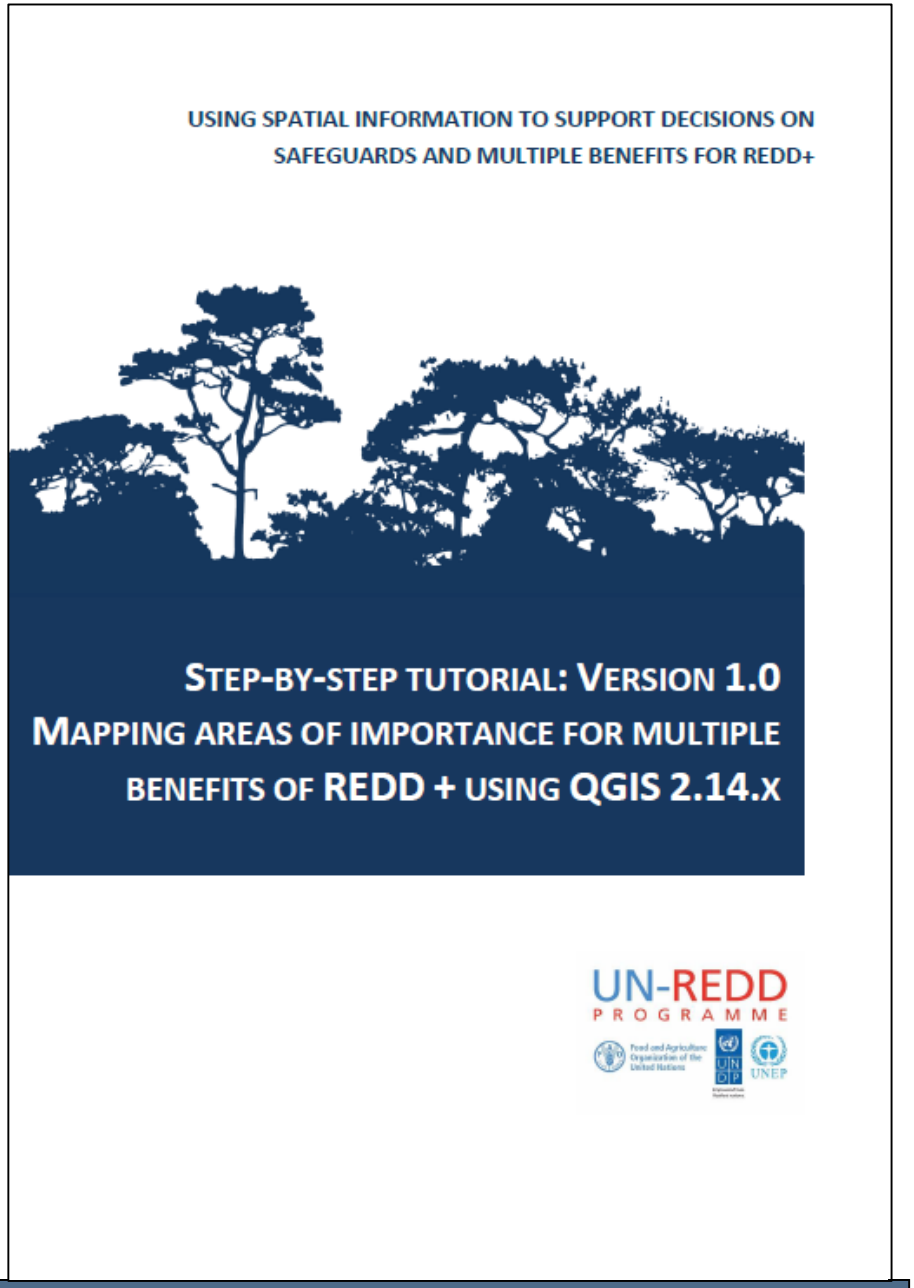
Normalized layer



FUZZY OVERLAY

- Traditionally, standardised factors are combined by means of weighted linear combination – that is, each factor is multiplied by a weight, with results being summed to arrive at a multi-criteria solution
- The more important the criterion, the higher value it gets.
- The weights assigned to the input rasters must equal 100 percent.
- The layers are multiplied by the appropriate multiplier, and for each cell, the resulting values are added together.
- We rarely use this method in our analysis because of it is complex to obtain accurate weights (involve specific policy/expert consultation)

EXERCISE


USING SPATIAL INFORMATION TO SUPPORT DECISIONS ON
SAFEGUARDS AND MULTIPLE BENEFITS FOR REDD+
STEP-BY-STEP TUTORIAL: VERSION 1.0
MAPPING AREAS OF IMPORTANCE FOR MULTIPLE
BENEFITS OF REDD + USING QGIS 2.14.X
UN-REDD
PROGRAMME
UNEP