Uncertainties in LUCC modelling: a contributive review and implications for validation techniques

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FOUR TYPE OF UNCERTAINTIES: (1) MAP ACCURACY

VALIDATION TECHNIQUES

Kappa Index of Agreement (KIA)
Overall accuracy
Producer’s / User’s accuracies

IMPLICATIONS FOR LUCC MODELING

LUCC from misclassification can be as large as LUCC in scenarios demonstrating the importance of map accuracy when developing future LUC scenarios / ecological studies (Dedoncker et al, 2007)
FOUR TYPE OF UNCERTAINTIES: (2) INHERENT MODEL UNCERTAINTY

Sources of differences in LUCC simulations
- CA competition from location probabilities
- Model randomness
- Qualitative vs. quantitative data
- Estimated land demands
- Etc.

VALIDATION TECHNIQUES

- Comparison of location / quantity of LUCC
- Occurrences of simulated LUCC
- Relative Operating Characteristic (ROC)
- Error analysis (patterns, allocation, etc.)
- Calibration / learning rates
- Etc.

IMPLICATIONS FOR LUCC MODELING

- Evaluate the predictive power of LUCC models
- Assume the system to be stationary in the future
FOUR TYPE OF UNCERTAINTIES: (3) ENSEMBLE MODEL UNCERTAINTY

VALIDATION TECHNIQUES

Same as previous ones
+ comparisons of models outcomes
+ occurrences of models outcomes

IMPLICATIONS FOR LUCC MODELING

Estimate the spatial uncertainties from various models (as in climate change modelling)
Assume the system to be stationary in the future
**FOUR TYPE OF UNCERTAINTIES: (4) ENSEMBLE FUTURE UNCERTAINTY**

**VALIDATION TECHNIQUES**

Occurrences of simulated LUCC from various scenarios / models

**IMPLICATIONS FOR LUCC MODELING**

Estimate the envelope of potential future LUCC
Account for contrasted / non-stationary scenarios
**TO SUM UP**

1. Map accuracy
2. Inherent model uncertainty
3. Ensemble model uncertainty
4. Future ensemble uncertainty

Two opposite paradigms... using common techniques

**Modelling**
Improving / assessing the predictive power

**Future studies**
Several possible futures
≠ prediction
PROSPECTS

The long term future can’t be validated

The aim is to increase the confidence end-users can have in models outcomes
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If a model is able to...

... simulate what narratives expect (new transitions, new land uses or land covers, various land demands, etc.)

... simulate what participants have designed

... simulate LUCC over a past period

... be described transparently (avoiding ‘black-box’)
PROSPECTS

Validation of simulated LUCC for contrasted scenarios?

If a model is able to...
... simulate what narratives expect (new transitions, new land uses or land covers, various land demands, etc.)
... simulate what participants have designed
... simulate LUCC over a past period
... be described transparently (avoiding ‘black-box’)

Respect of Future Studies principles

Validation of scenarios coherency and consistency

Plausibility?

Creativity
Legitimacy
Consistency
Transparency