

## ***Interactive comment on “A high-resolution and harmonized model approach for reconstructing and analyzing historic land changes in Europe” by R. Fuchs et al.***

### **Anonymous Referee #3**

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This manuscript describes a fine-scale land cover reconstruction for the EU-27 for the period 1950-2010. Such a set of maps is a potentially important dataset for a range of applications, including better GHG accounting. The paper represents a major advance compared to existing datasets in terms of resolution, disaggregation methodology, and input data used. I have a few comments and suggestions for revisions that would further strengthen the paper.

#### **MAJOR COMMENTS**

P 14831 I1-5: Is it realistic to assume that population density in urban areas in Europe over the last 50 years can be reasonably well approximated based on the year 2000?

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Did you consider spatial variation in settlement density across Europe?

P 14831 I21-28 (and entire section 2.3): The assumption that the land suitability function was constant across the entire time period and can be reasonably well estimated from the year 2000 data seems very bold. Given the strong transformation of land use systems during this time period (e.g., major mechanization trends, strong increase in chemical fertilizer use, drastic decrease in labor force) and major changes in the demand side (e.g., population growth and changing consumption patterns) it is unrealistic that the suitability of a particular location for any given land use would not change. Likewise, was there no spatial variability incorporated? Given the heterogeneity in land use histories in European countries (e.g., different EU accession dates, West vs East, etc) the use of a global appears too simple.

P14834 I 3-10: Related to the above, if there were 73 sites of 30x 30 km<sup>2</sup> available for validation, why were these sites not used to estimate the suitability functions for the two different time periods? Or could these sites for example be used to provide some evidence for the assumption that the suitability functions were indeed stable?

P14837 I27 –P14839 I25: While the visual comparison is interesting, I would like to see a more thorough accuracy assessment. Given that the authors had 73 fairly large test sites, you could easily draw a stratified random sample from the downscaled land cover maps and evaluate these points against the reference maps, and calculate true area estimates and confidence intervals around them. Given that the 73 sites are a non-random selection, it would be important to correct for potential sampling bias (see Olofsson et al. for details: <http://www.sciencedirect.com/science/article/pii/S0034425712004191>). Since the air photos cover only 1950 and 1990, GoogleEarth high-resolution images could be used for an assessment of the recent (+/- 2010) maps.

P14841 – entire section 4.1.2: The discussion of the forestry sector 1950-today seems very general and focusses exclusively on Western Europe. This section should be

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expanded, and it would be good to clearly distinguish forest management (e.g., logging) from land use change (e.g., abandonment and subsequent forest expansion).

P14841 I4.1.3: Why is agricultural land management / land use change BEFORE the introduction of the CAP not discussed at all? Many of the countries modeled in this study were longer outside the EU than inside it during the study period. Even more importantly: why is agriculture in Eastern Europe before the EU-accession not discussed at all? A large part of the EU27 was socialist before 1989 and land management paradigms and land change pathways were very different there (highlighting again the problematic assumption that land suitability was the same 1950-today). I would recommend to expand this section to represent better the variation in policies and land management pathways in Europe.

P14844 – section 4.2.2: Again, this is a fairly weak section. There was a lot more regional variety than the authors acknowledge. What does “could not compete with the market” mean? Also, there was a lot of land use change in Eastern Europe already before the collapse of the Soviet Bloc (see comment above on pre-accession agricultural change).

P14845 I4-12: This section refers to the assumption of stable land suitability. Could you do a sensitivity analyses to build confidence that relaxing this assumption does not affect your main conclusions and land use/cover patterns?

#### MINOR COMMENTS

P 14826 I5: Could you be more specific as to what the “spatial, temporal, and thematic” limitations of existing datasets are? This requires more detail given that this is the major motivation for the downscaling exercise carried out.

P14826 I23-24: Given that many satellites acquire data in a systematic, standardized way, isn't the ability to map large regions and to compare across political boundaries rather a strength than a weakness of remote sensing?

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P 14828 I1-14: The methods ‘summary’ paragraph could be deleted.

P 14828 I17-25: Given that it is argued in the intro that current datasets are coarse, inconsistent across borders, and not very detailed in time, the beginning of section 2.2 seems a bit contradictory. Why are many of these datasets now used as input data if they are problematic? Also, how was the 1990-2010 period used to “inter-calibrate” these datasets that differ substantially in scale, timer periods, etc.? This needs a more thorough explanation.

P 14845 I20-29: I am not sure I understand why only net changes were available – did you not use a range of maps (CORINE, GlobCORINE, UMD, etc.) which would allow estimating gross changes? Were net changes used for all period?

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