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Topic (i): New opportunities created by cooperation and partnership

THE LANDSCAPE GROUP – INTEGRATION OF STATISTICAL AND ADMINISTRATIVE DATA WITH LAND COVER INFORMATION

Submitted by Eurostat[1]

Contributed paper

I. INTRODUCTION

1. A joint effort on creating agri-environmental indicators has been established within the Commission services and the European Environment Agency. To date, the group has created two reports on the subject. The work has been done in cooperation between Agriculture Directorate-General, Environment Directorate-General, Eurostat, the European Environment Agency and the Joint Research Centre. The organisation of the group and the main conclusions from the reports are presented.

II. THE POLITICAL MANDATE

2. The European Council in Vienna in December 1998 reaffirmed a former commitment to integrate the environment and sustainable development into all Community policies. It requested the Commission to provide a coordinated report on indicators. The Agriculture Council was invited to continue its work with a view to submitting a comprehensive strategy, including a timetable for further measures and a set of indicators, to the Helsinki European Council. The Agricultural Council requested in June 1999 a report on agri-environmental indicators from the Commission.

3. With its communication to the Council and the European Parliament on "Indicators for the integration of environmental concerns into CAP[2]", the Commission has recently re-asserted its interest in setting up agri-environment indicators and has presented a timetable to be followed for the development of these indicators.

4. The indicators which would be developed must present a sufficiently accurate picture of the underlying processes and relationships that link human activities with the environment. Among the required operational indicators were those on landscape and land use.

5. A group with participation of experts from the Commission services was established to make a report on landscape and land use indicators.

III. THE GROUP

6. When developing indicators to be used for political issues, those indicators must be based on up-to-date information and the working methods must be consistent. This can only be assured through working together across the Commission services and the European Environment Agency. A series of experts were

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[2] **C**ommission **A**griculture **P**olicy

called upon to create sufficiently operational indicators on landscape and land use taking the human impact into account. Information on agriculture, environment, statistics and geography was necessary to create these indicators.

7. The group has made two reports[3]. The group consists of experts from Agriculture Directorate-General (DG Agri), Environment Directorate-General (DG Env), Eurostat, the Joint Research Centre (JRC) and the European Environmental Agency (EEA).

8. DG Agri participation was expected. Eurostat participated with two experts, one from the agricultural unit and one from GISCO[4]. GISCO participated as the expert on the Geographical Information System (GIS). JRC's contribution of expertise to this group was their knowledge of the combination of GIS and statistics, and the use of land cover models. EEA and DG Env participated with their respective expertise in environmental issues.

IV. THE ORGANISATION OF THE GROUP

9. Choosing the experts for this group was only part of the challenge. Another aspect was to organise the work in an efficient way to make sure that the report answers the questions provided and would be ready in time.

10. At the first meeting of the group it was decided how the group should work. The important aspects were noted as follows:

- the objective of the group;
- the deadline for the objective;
- the organisation of the work, e.g. deciding on the division of tasks, deciding on the necessary meetings.

11. On the basis of the request from the Agriculture Council, the objective was clear from the beginning:

To write a report on agri-environmental indicators for landscape and landuse.

12. The deadline for the report was also defined from the beginning.

13. The organisation of the work in the group had to take into account the fact that the Commission services involved in the work were scattered around Europe (Belgium, Denmark, Italy and Luxembourg). It was therefore essential that the work of the group be well organised.

14. The group decided to have a progress meeting every two months. All participants would be responsible for specific inputs to the report and each participant would send his/her contribution to the other participants for comments as soon as a first draft was made available. This meant that the report could progress rapidly. Working in this way was efficient since it ensured that everybody agreed on the direction of the reports, and minor problems could be solved outside the progress meeting.

15. This being the case, one last and very important aspect of the cooperation had to be resolved, namely the decision on the contents of the reports and the division of the tasks. For both reports, the table of contents was discussed and decided at the first meeting. It was essential that everybody in the group agree. No changes were introduced later on. At the same time it was specified who would be responsible for the different parts of the content. Therefore, the division of tasks was clear from the very beginning.

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[3] "From Land Cover to Land Diversity in the European Commission", report from the European Commission, published May 2000
"Towards Agri-Environmental Indicators. Integrating Statistical and Administrative data with Land Cover Information", 2001.

[4] **GIS** for the **Co**mmission

V. DIVISION OF TASKS

16. The overall objective of the group is to develop agri-environmental indicators on landscape and landuse. The 2000 report was mainly concerned with assessing the relevance of the CORINE Land Cover[5] (CLC) inventory as a source of information for landscape characterisation. The 2001 report was a follow-up of the 2000 report and was built on its main conclusions. The main topic in this report is the problem of spatial transformation of data. New databases are also introduced serving as a possibility of comparison with the CLC. Additionally, the statistical linkage with geography is introduced.

17. As the first report is the starting point, the content has a more general character. Both DG Agri and Eurostat contribute with landuse indices; DG Agri with a land cover index and Eurostat with indices to capture structural information (in particular the aspects of temporal changes of landscape structures, the potential application of landscape metrics and the data requirements are treated). The EEA is studying the assessment of the human impact on landscape fragmentation. The JRC is analysing the CLC inventory by comparing the landscape metrics with the information from the sites of MARS[6].

18. The second report is a further development of the first report and therefore has a more practical character. DG Agri compares the CLC with landuse in Slovenia and with the IACS[7]. Eurostat describes the problems faced by the heterogeneity of the units in the NUTS nomenclature (GISCO) and the possibility of linking the Farm Structure Survey with the CLC (Agriculture unit). The EEA models nutrient surplus using CLC where the DG Env introduces the NATURA2000 project concerning a European network of protected sites. Lastly, the JRC contributes with the methodology for the geographical use of statistical data and for comparison and usage of the CLC.

VI. CONCLUSIONS IN THE REPORT "FROM LAND COVER TO LANDSCAPE DIVERSITY IN THE EUROPEAN UNION"[8]

19. The objective of the study *From Land Cover to Landscape Diversity in the European Union* is to assess the relevance of the CLC database as a source of information for landscape characterisation.

VI.1 Covered topics

20. For this study, the CLC information was aggregated in a limited number of indices[9] easily derived by automatic computation. The aim was then to evaluate the feasibility of working with these indices, and to assess their relevance, sensitivity, stability, redundancy and completeness when applied to the question of landscape diversity. From the analyses, it can be concluded that the problem is complex and that simple solutions can be misleading.

VI.2 The main results

- The working scale imposed by CLC data has important consequences. A minimum polygon size of 25ha is imposed. In general this results in an overall underestimation of the diversity of landscapes when these are, on average, smaller than the minimum chosen.
- The fragmentation for some regions can be underestimated because of the rules for interpretation of local photos.
- Heterogeneous areas are included in CLC to assess complexity and diversity when mapping. The results did not take this particularity of the CLC nomenclature into account. This leads to a general underestimation of landscape diversity. The composition of heterogeneous agricultural areas requires further study in order to be able to assess rural landscape diversity.

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[5] **C**o-**or**dination of **In**formation on the **E**nvironment
[6] **M**onitoring **A**griculture by **R**emote **S**ensing
[7] **I**ntegrated **A**dministrative and **C**ontrol **S**ystem
[8] To obtain a copy of the reports please contact by e-mail anette.bjoernsson@cec.eu.int
[9] Patch density, Edge density, Number of classes, Shannon diversity index, Interspersion and juxtaposition index.

- The stability is not assured, as the size of the observation unit used for calculations is not neutral. It was found that a more detailed analysis should be favoured.
- The long known fact that the correlations observed depend on the size of the unit of observation was confirmed. The conclusion should not be drawn from this that the indices are redundant but it does mean that the ad hoc scale of observation should be defined before any correlation is evaluated.
- In general the limited number of indices chosen cannot pretend to be a comprehensive approach for landscape diversity assessment but the study shows that the underlying information can be usefully represented by the indices chosen. Further analysis of the conceptual problem of landscape description is now needed.

21. Despite the various reservations made above, three main conclusions can be drawn:
    - The automatic computation of diversity indices using CLC data is feasible using reasonable resources, and the derived European maps show relevant complementary information on landscape.
    - This study should help to orientate the future work of updating CLC within the CLC2000 project. The limitations and confusions encountered relate mainly to the handling of heterogeneous agricultural areas and consequently the working scale. Consideration should be given to this, so that the CLC data in the future can be used reliably as a homogeneous data set covering the whole of Europe. The integration of CLC data with other geo-referenced datasets such as elevation, linear and point features would improve the assessment of landscape diversity.
    - It appears that, besides CLC, more detailed information will also be needed to answer the wide range of questions related to the description and ongoing analysis of the European landscape. The availability of alternative, complementary material such as aerial orthophotographs, should be considered.

VII. RESULT OF THE REPORT "TOWARDS AGRI-ENVIRONMENTAL INDICATORS. INTEGRATING STATISTICAL AND ADMINISTRATIVE DATA WITH LAND COVER INFORMATION"

22. The report "Towards Agri-Environmental Indicators. Integrating Statistical and Administrative data with Land Cover Information" is the follow-up to the report "From Land Cover to Landscape Diversity in the European Union". The report is built on the 3 main conclusions of the first report.

23. The major question raised in this publication is related to the integration process of different data sources. Ideally, accurate entry data should be merged with fine resolution spatial co-variable, forming together a strong co-relation for the output of reliable spatialised data. Compatibility of nomenclatures eases the comparisons but is in no way requested, as shown with redistribution of population data with CLC data. Limitations of administrative limits are reported, compared to grid and thematic units' presentation.

VII.1 Covered topics

24. Most of this second publication is dedicated to the problem of spatial transformation of data. Input and output spaces characteristics are commented upon. The role of the CLC co-variable is identified in terms of mean value, possible modelling of the bivariate spatial distribution resolution and scale.

25. In terms of thematic applications, various additional sectors are involved. The NATURA2000 database is explored in terms of its land cover content and comparisons established with CLC. Spatial redistribution of NUTS population statistics is also covered. On this basis, modelling strategies of calculation of nitrate surplus are evaluated.

26. Statistical data, classically available at the administrative level, are merged with georeferenced land cover, resulting in a map pointing out the main differences between aggregates of agricultural land cover

classes are presented. Some proposals are made to reallocate Farm Structure Survey data at relevant geographical levels.

27. The integration of administrative data is explored through examples taken from the integrated administration and control system. The potentiality of administrative data utilisation for the evaluation of agricultural diversity indicators is explored and its use to further characterise the agricultural content of the CLC heterogeneous classes is analysed.

28. In terms of geographic coverage, applications deal with the usual EU15 as well as with selected cases referring to the Candidate Countries.

29. In terms of the disaggregation/aggregation process, it should be stressed that no new information is created during the process and that relevant accurate output statistics require accurate information when entered, at least to the same resolution as the output.

VII.2 The main results

30. A first conclusion is that data co-registration does not pose serious problems. Even in the case of slightly different nomenclatures, links can be established between classification systems and geometrical matches obtained. On that basis, most papers conclude that the different data sources are unlikely to be equivalent. At different mapping scales, differences are observed on land cover statistics derived from image photo interpretation. Data spatialisation requires special attention in most cases and needs validation.

31. The possibilities of administrative data to extract agricultural area from heterogeneous class seem promising. The influence of the retained transformation process varies between applications. If it seems very important in the population redistribution example, the contrary seems to appear in the case of nitrogen surplus evaluation.

VIII. FUTURE ORIENTATIONS

32. Based on the results obtained in the second report, more effort is still needed to better exploit the available data. This includes the realisation of simple GIS applications to facilitate the access to the information of usual statistics with mapped land cover.

33. More work is required in the modelling inherent to any future data merge. On the basis of validation procedures, strategies have to be compared and best practices quoted. Additional efforts should be dedicated to the definition of the output space, especially regarding the thematic zoning system.

34. Finally, compared to the available data sets, only a few parts of the possible computations have been initiated. Statistical and administrative data should be integrated to land cover information on large-scale programs in order to start the real production of Agri-Environmental Indicators.

IX. CONCLUSION

35. The general conclusion, which can be drawn from cooperation in this group, is that tackling a problem as complex as, for example, the agri-environmental indicators on landscape and landuse, makes it indispensable to create multidisciplinary teams. Experience shows that with the modern communication tools, cooperation is possible between people located in various countries with a limited number of meetings. This exercise shows that some conditions for a good outcome from such a group is a clear objective, a clear deadline, clear division of tasks and disciplinary working by the participants. The resulting reports show that it was a good exercise to measure the quality of the data.