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D6.1 Biodiversity trends associated with SEA, SIA and EIA practices

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1. Executive summary

1. This report relates trends of policies on land uses and economic activity to trends in ecosystem services and biodiversity in cultivated areas as well as in protected areas. It is based on data from 30 countries, gathered by systematic survey of governments at national and local level, plus CORINE land-cover, Streamlined European Biodiversity Indicators World Bank governance indicators, and data from the UN and an FP6 study.

2. In areas outside Natura 2000,change to artificial land-cover (CORINE data) was associated, probably causally, with population growth rate and relative rarity of EIAs and SEAs; since 2000, artificialisation has increased as strongly inside as outside Natura 2000 but is less coupled to population growth. Semi-natural habitat had increased where environmental data were considered poor but more guidance texts were available.

3. Numbers of EIAs and SEAs were highest in countries where local administrations consulted most with NGOs, were responsible for fewest local residents and perceived nature most positively. Positivity to nature was also associated with consulting NGOs, but also with population density, political stability, and an administrative priority on the environment (rather than economics) when managing land and species.

4. The Natura2000 allocation was considered most sufficient in countries with the highest World Bank governance scores. However, habitat conservation status did not link to socio-economic or environmental variables to an appreciable extent.

5. Species conservation status was best in countries with the most wetland, and generally where GDP was highest and hunters and anglers most prevalent in the populations.

6. Hunters were most prevalent in populations of countries with low human population density and abundant semi-natural habitat; anglers were most prevalent where there was most water and least designation of areas of Special Conservation Interest. The conservation status of species was best known and the influence of NGOs at local level was highest where there were most anglers.

7. Except for consultation, the processes used when conducting assessments and monitoring their results did not positively affect the number of assessments, the environmental and social impacts investigated, or the numbers of those using the resources.

8. The Nature Positivity index estimated in the study was a better indicator of beneficial environmental awareness than knowing the word biodiversity or being aware of biodiversity loss. It may also be wise to record numbers of resource users, as indicators of healthy environments and conservation potential, in Europe, as in North America.

2. Introduction

2.1. Scene setting within TESS

The call ENV.2007.4.2.1.1 was about development of innovative methodologies for scaling down from the EU or national level to the regional and local level the analysis of policy impacts on multifunctional land uses and the economic activity, with special emphasis on new Member States as well as on Accession and Candidate Countries. It was to include participatory approach and to take into account stakeholder perspectives. The improved methodologies should enhance the scope of strategic environmental assessment (SEA), sustainability impact assessment (SIA) and environmental impact assessments (EIA). The expected impact is to enhance analysis of possible policy impacts (in particular related to rural development and to Cohesion Policy and Pre-Accession Aid) on sustainable development by the different Commission services.

TESS has a three-stage approach to these requirements. The first was to investigate how information on biodiversity and related environmental matters from the national and local levels are integrated into formal assessment and planning decisions, and also what information is needed by individual stakeholders for their daily management decisions (as explained in more detail in Hodder *et al*. 2009, Perella *et al*. 2009 and Sharp *et al*. 2009). The second stage used information from that first stage to develop a standard survey, of how environmental assessment functions at national and local levels across all EU member states (plus 4 potential members), and to seek associations with indicators of biodiversity and related environmental quality across these states that may indicate best practice. This pan-European survey (described in more detail in Kenward *et al*. 2010) contributed about half of the 65 variables in a database for analysis of biodiversity and other trends relevant to SEA and EIA; SIA could not be considered as it has not become a formal assessment process (Sharp *et al*. 2009). The third stage will design a Transactional Environmental Support System (TESS) to encourage collection of information, especially from mapping at local level, not only for development subject to statutory Environmental Impact Assessments and other formal land-use planning processes, but especially also to guide the myriad daily decisions made less formally by those who manage land or species (see Kenward *et al*. 2010).

The analysis reported here is important both for examining the operation of the statutory EIA and SEA assessments across Europe and for the design of a TESS. This is because although the legislative framework for EIA and SEA is created at high level in national governments, the actual conduct of the assessments is mostly at the lowest levels (Sharp *et al*. 2009), especially for EIA. Therefore, the attitudes and consultative processes behind these assessments needed survey at local level. This is also the level at which a TESS must operate in order to guide the decisions from individual managers of land and species.

Managers and other beneficiaries of wild resources are important because they provide positive and negative impacts on biodiversity outside the formal assessments. Their economic significance alone may be considerable, as European anglers and hunters and wildlife watchers spend in excess of €40 billion annually (Kenward *et al.* 2009), with the former categories also having appreciable positive impact on habitats (Oldfield *et al*. 2003, Sharp 2010). Beneficiaries and managers of wild resources could also be important when involved in consultations on formal assessments, depending on the

attitudes of the local government administrations. This report pays particular attention to these local considerations, which have been overlooked in previous studies.

It was apparent at the start of data-collection that indicators of trends in biodiversity, in terms of changes specific taxa, were still inadequate for analysis of relationships across countries. Therefore, analyses in this report focussed more on status of species and habitats, for example as registered annually in reporting for Article 17 of the Habitats Directive, on the status of recreations that depend on the abundance of particular species, and on trends in remote-sensed land-cover that are a proxy for the habitat changes which impact biodiversity.

2.2. Data in the Pan-European Database

The variation in ecological and economic conditions across Europe, when combined with the rich diversity of cultural history and governance processes, provides a rich field for analysing associations between existing conditions and environmental trends. Therefore, according to the TESS Description of Work, “Country Coordinators ... will collect data systematically by means of a questionnaire design based on findings of WP2 [and] apply a similar process at local level based on findings of WP3 ... for construction of matrices relating policies on land uses and economic activity to trends in ecosystem services and biodiversity in cultivated areas as well as in protected areas.”

In the reports from WP2 and WP3, it was noted that formal environmental decision by government at various levels includes Biodiversity Action Plans (BAPs, NBSAPs) under Article 6 of the Convention on Biological Diversity, planning for payments under the Common Agricultural Policy (CAP), and Land Use Planning (LUP) for all developments, whether or not EIA or SEA are also involved. Questions from WP2 on governance of all these formal decision processes therefore became part of EU-wide survey in WP5. So too did questions from WP3, on decision-making and related information requirements of local administrations, as well as on attitudes of local authorities towards managers of land and species and the extent of their participation in the formal decision processes.

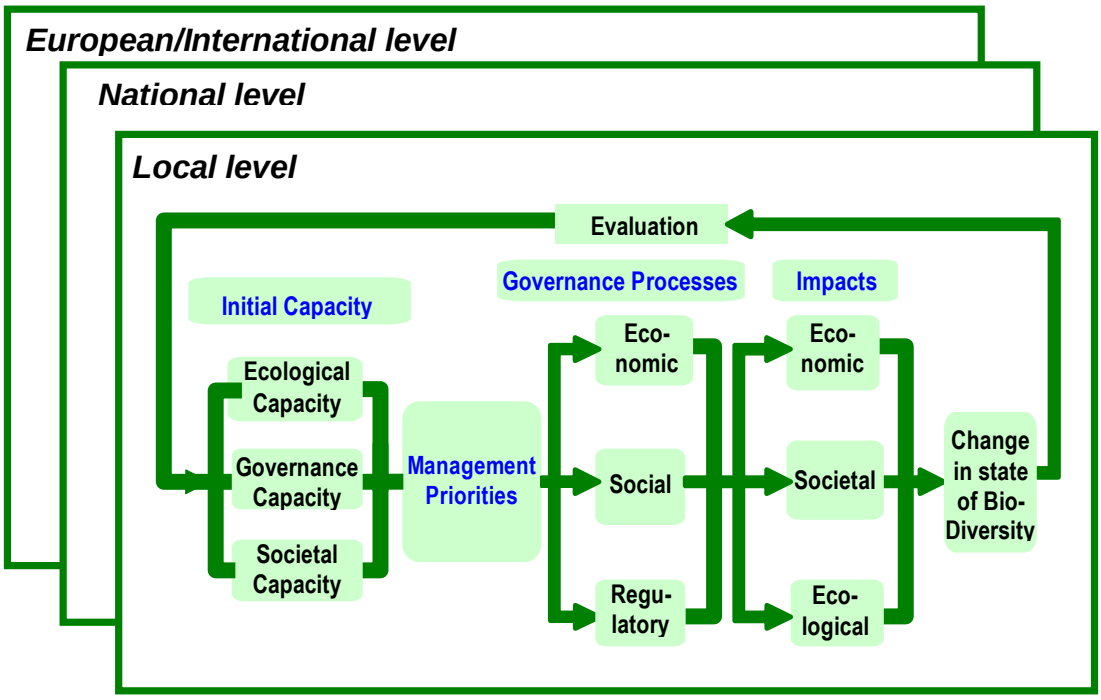
The resulting database from 31 countries (the 27 EU states plus Norway, Switzerland, Turkey and the Ukraine) includes 27 variables from the Pan-European Survey in WP5. Another 28 variables were selected from data collated by the European Environment Agency (and in some cases reworked extensively) or by the United Nations. We used 10 variables on governance and participation, including World Bank governance indicators, collected in the previous GEMCONBIO project (Manos & Papathanasiou 2008).

In examining the matrix of variables from the database, this report makes extensive use of relational statistics, including bivariate correlations and multiple regression models. Finding relationships is important not only when they might reflect causal mechanisms, but also at least to find variables which could be useful to record systematically in future as indicators of impacts on the environment.

3. Methods

3.1 The approach

Analyses in this report were based on the GEMCONBIO analytic framework (Manos & Papathanasiou 2008), as published in Kenward *et al.* (2011). This recognises that **Capacity** variables of an enduring nature, whether geographic or long-term social and governance institutions, are fundamental in effect. Capacity variables should be considered before **Priority** variables which reflect the more immediate choices of societies, and the **Process** variables (including tools) used to affect those priorities, all of which may affect socio-economic or ecological **Impact** variables.



The analysis Framework from GEMCONBIO that is used as a basis for the governance indicators derived by the TESS Pan-European survey.

Broadly speaking, the availability of particular institutions and of information in various categories (indicated by its current use) are measures of Governance Capacity, together with 6 governance indices from the World Bank. Population density and GDP measures, together with tendency of governments to embrace knowledge leadership (Kenward *et al*. 2011) are measures of Societal Capacity and the measures of main ecosystem categories as land-cover represent Ecological Capacity. These have Management Priorities about which questions were asked directly and indirectly (e.g. in terms of data demand for social, economic and ecological aspects of ecosystem services) with further environmental priorities indicated by national extent of protected areas. Economic, Regulatory and other Social Processes are indicated, respectively and *inter alia*, by the provision of agri-environmental funding under the CAP, by the levels at which decisions are made and by presence or absence of different consultation practises as recorded in

the survey. Societal impacts were assessed in the survey by questions that revealed attitudes of local administrations to wildlife costs and benefits. Ecological impact indicators came mainly from the European Environment Agency (EEA), together with remote sensing data on growth of artificial and semi-natural habitats. Economic impacts were measured as the number of hunters and anglers that the national environments were supporting.

An analysis based on this framework can only reveal associations between capacity, priority and process variables on one hand, and impact variables on the other. The causality of such associations cannot be assumed. Thus, if there is an association between A and B such that both increase at the same time, the increase in B may be caused by A, or the increase in A caused by B, or the increase in both be caused by a third factor which influences both A and B. All that can definitely be said if an increase A is associated with an increase in B, it is unlikely that variable A or B affects the other variable negatively.

3.2 Selection of variables

The detailed list of Capacity, Priority, Process and Impact variables, its meaning and computation is given by Ewald, Beja and Kenward (2011). For convenience, the variable descriptions are also tabulated here in Appendix 1.

Methodology of the questionnaire surveys at national and local levels is described in Deliverables 5.1 (Kenward *et al*. 2009) and 5.2 (Ewald *et al.* in prep) and is not repeated here in detail. At national level, Country Coordinators in 30 countries listed and then contacted ministry officials who could answer the questions. At local level (typically the administration of the lowest LAU category involving elections), listings on LAU2s in five geographically separated regions for each country were sampled at random to give 5 that had a population of at least 200 (to achieve a representative administration) and a population density of <150 inhabitants per square kilometre (defined as rural in ESPON 2009, which makes clear that there is no standard definition of rurality for EU policy or statistical purposes); this latter criterion failed only for the very high density communities on Malta and Greek islands.

International data also came from European Environment Agency, including CORINE land-cover (http://www.eea.europa.eu/publications/COR0-landcover) and SEBI indicators (http://www.eea.europa.eu/publications/progress-towards-the-european-2010-biodiversity-target-indicator-fact-sheets.), with data on country area and size of human population, Gross Domestic Product (GDP), urbanisation and unemployment from databases managed by the UN (http://esa.un.org/unpp/) and World Bank (http://data.worldbank.org/indicator). Six indicators of governance quality have been estimated by the World Bank since 1996 (Kauffman *et al*. 2010).

Statistics on the numbers of hunters and anglers in the EU were collected from national organisations representing these activities during the preceding project on Governance and Ecosystem Management for Conservation of Biodiversity (Manos & Papathansiou 2008). The majority of cases were based on license data and for TESS were cross-checked against databases held by partner FACE and by the European Anglers

Alliance. Data for countries outside EU were collected from government or private sources by relevant Country Coordinators.

Ecological impact variables merit a particular consideration in the present context, as they are intended to be direct or indirect indicators of biodiversity change at the European level. The selection of impact variables was thus considered critical to understand how policy and governance affects biodiversity in Europe, and involved:

- Screening of direct and indirect indicators of biodiversity change used at the European level (e.g., EEA).
- Development of additional indicators of biodiversity change from raw data available at the European level.

Indicator screening was based on a thorough review of the literature, trying to find variables meeting the following requirements:

- Indicators should provide, as much as possible, direct information on temporal changes in species diversity for a wide range of organisms.
- Indirect indicators should provide information on factors that are known or presumed to be correlated with temporal trends in biodiversity (e.g., protection level, public awareness, pollutants).
- Information should be available for a large proportion of European countries covered by the WP5 enquiries.
- There should be a time series of indicator data, preferably spanning the past two decades (1990-2010).
- Information should be as recent as possible, preferably covering the last decade (2000-2010).

Screening of variables suggested that direct information on biodiversity change at the Pan-European scale is scarce and based on just a very few groups of intensively studied organisms (e.g., birds). In fact, although many indirect indicators have been used to estimate temporal trends in biodiversity across Europe, it is unclear to what extent they reflect actual changes in biodiversity. Therefore, this study focused to a large extent on the Streamlining European 2010 Biodiversity Indicators (SEBI 2010), developed by the European Environment Agency, which are probably the most comprehensive set of biodiversity indicators at the Pan-European scale. Many of the SEBI indicators could not be used, however, because information was only available for a few countries, time series were too short or information was outdated. Because of this, the following subset of SEBI indicators was adapted to develop the impact variables in the present study:

- (1a) Trends in bird abundance (Common birds in Europe – Population Index).
- (3) Species of European Interest (conservation status based on Article 17 Assessment by Member States).
- (4) Ecosystem coverage (based on land cover changes assessed from CORINE Land Cover information).
- (5) Habitats of European Interest (conservation status based on Article 17 Assessment by Member States).
- (8) Coverage of protected areas (sufficiency index and % cover by Special Protected Areas and Sites of Community Importance).
- (10) Invasive alien species (number per country).
- (26) Public awareness (awareness + concern).

3. 3 Data analysis

To investigate relationships between variables, we use statistics which estimate probability. For a single test of a relationship, if the probability is 0.05, it means that there is a one in twenty chance that the relationship is due to chance. However, the more tests that are done the more likely that a relationship will arise by chance. If 100 statistical tests are done, on average 5 should be significant at P=0.05 or less. The problem of chance results can be reduced by setting a level of P=0.01 for accepting results as statistically significant; even so, an average 1 in100 will be chance results.

For comparing pairs of variables, correlation coefficients are estimated, and if significant at P<0.01 a trend-line is fitted and a value R^2 indicates the proportion of variation in A explained by variation in B. A relationship in which one variable explains more than 50% of variation in another is considered strong.

Tests of the influence of several variables together on one variable are based on multiple regression analysis, which is a flawed but convenient standard for rapid processing of a large database. For this analysis, it is important that relationships result from a statistically normal distribution of data about lines that best fit trends. If there are outliers, they may have a severe effect on the results. Transformations, such as the use of logarithms, can be used to try to normalise data, but are not always effective. Visual inspection of results is important to indicate possible outlier effects.

Based on these considerations, the analysis was performed as follows:

1. To increase comparability between countries, numbers of environmental assessments were expressed per unit area. Numbers of users of natural resources (hunters, anglers) were expressed as densities when considering ecological effects and as prevalence (%) in the population for social effects. To normalise data distributions, these densities and proportions were log-transformed, as were all proportions of surface covered by particular habitats (artificial surfaces, agriculture, forestry, wetland, water and other semi-natural habitats) or protection categories (SPA, SCI and all protection categories). A variable for sufficiency of Natura 2000 coverage tended towards 100% and was therefore given an angular transform.

2. Variables in particular categories that there though likely to correlate strongly were identified and reduced to the most divergent ones. Thus, among governance variables from the World Bank, all inter-correlated strongly except Political Stability; this variable was kept and Control of Corruption used to represent the others due to prior use in environmental governance analysis (Smith *et al.* 2003).

3. A matrix of correlation coefficients was prepared for capacity, priority and process variables on one hand and all impact variables on the other. The index of formal assessments (mean number of EIAs and SEAs registered at national level) was also included, because although this was a Process variable for ecological impacts, it was also important to understand what causes variation between countries in the numbers of assessments. Some socio-economic variables (including four of social attitude and one of Natura 2000 sufficiency) together with density and prevalence of hunters and anglers, were used both as a capacity variables but also as a impact variables to see what might be affecting social attitudes and abundance of resource users.

4. The correlation matrix was marked to indicate associations significant at P<0.01 and all such relationships were plotted for inspection. Outlying effects were noted especially for data on hunters and population density from Malta, which also had local area populations exceeding the 150/km² criterion. Luxembourg too was an outlier in two respects, including an indicated 25% per annum loss of semi-natural land-cover. To minimise distortion from outliers, initial regression analyses excluded without Luxembourg and Malta. Cyprus lacked survey data; it was omitted entirely.

5. Inspection showed that the effects of outliers from Malta and Luxembourg were not enough to affect conclusions, so these analyses were run again with Luxembourg and Malta included. Analyses were run with and without single country outliers in Quality of National Data and Numbers of Measures Applied in Assessments, but there were no meaningful results for Change in Semi-natural Habitat unless Luxembourg was excluded or set to 0, or for the Farmland Bird Index unless two outliers (Bulgaria and Portugal) were omitted.

4. Results

The analysis matrix contained 48 capacity, priority and process variables that were estimated in different ways, and 16 impact variables, giving a total of 768 correlations to examine. Among them, some 8 at $P<0.01$ would be expected to arise by chance, and perhaps 1 at $P<0.001$. In fact, 31 were significant at $P<0.01$ and 9 of those at $P<0.001$. Thus, many of the relationships were not likely to result from chance. A tendency for relationships to occur repeatedly for particular variables showed that these were at least important as indicators, and that they perhaps also involved causal relationships.

4.1 Relationships of Ecological Impact Variables

4.1.1 CORINE variables

Two types of ecological impact variables reflected potentially detrimental changes in land use between 2000 and 2006, estimated from CORINE land cover information. Variables from CORINE data were available for 24 of the 27 countries within the European Union and also for Norway and Turkey, making 26 cases for analysis. Twenty four also had estimates at national level of numbers of EIA and SEA. Sample size was reduced to 21 EU countries in analysis contrasting land cover changes inside and outside Natura 2000, and the time periods 1990-2000 and 2000-2006.

4.1.1.1.Rates of artificialisation

The annual growth rate of artificial surfaces, mainly from building development and road construction (CORINE categories 11 and 12), was an indicator of loss of habitats and also likely sometimes to be subject to environmental assessment processes that represent decisions taken by government. Rates of artificialisation were computed for each country, and then separately for areas inside and outside Natura 2000. This was aimed at estimating the drivers of artificialisation within the most important areas for biodiversity conservation in Europe, which should thus be under the strictest regulations and management to avoid negative impacts. Similar analysis were carried out considering the period 1990-2000, to check whether protection reduced artificialisation and changed its main socio-economic drivers.

In 1990, 0.6% and 4.8% of land surface inside and outside Natura 2000 sites, respectively, was covered by artificial surfaces. Artificial surfaces inside Natura 2000 increased by 4.7% (177.8 km^2) in 1990-2000, and by 3.1% (122.1 km^2) in 2000-2006. Protection status did not appear to have any positive effect in reducing the mean rates of artificialisation across countries. Artificialisation increased significantly between the periods 1990-2000 and 2000-2006, with no significant differences between areas inside and outside Natura 2000 (Figure 1). A considerable proportion of variation in artificialisation inside Natura 2000 could be accounted for by a linear relationship with artificialisation outside Natura 2000 (Figure 2), both in 1990-2000 (R^2=0.86, $F_{1,19}$=116.6, P << 0.001) and, to a lesser extent, in 2000-2006 (R^2=0.59, $F_{1,19}$=27.1, P << 0.001). There was a strongly significant correlation between time periods in artificialisation outside Natura 2000 (r=0.79, P << 0.001), and less so outside Natura 2000 (r=0.58, P = 0.006).

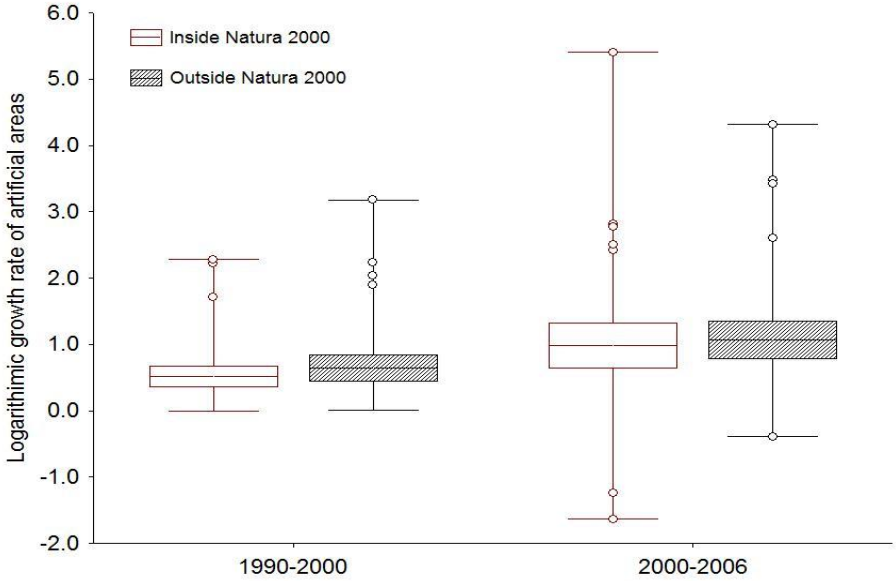


Figure 1 Mean (± s.e.; range) of logarithimic growth rates of artificial areas across 21 EU countries, inside and outside Natura 2000 sites, before (1990-2000) and after (2000-2006) classification. Points indicate values at > 4 s.e. from the mean.

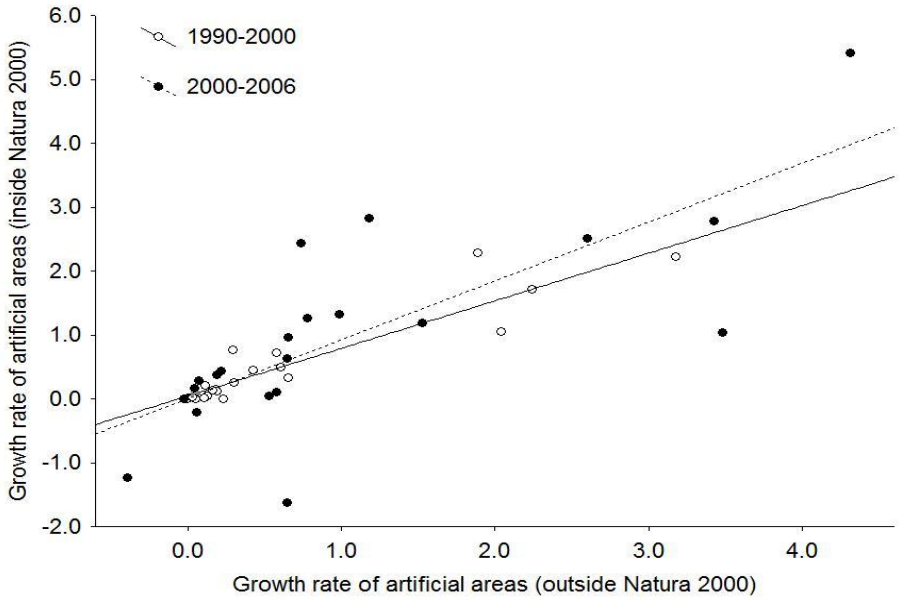


Figure 2 Linear regression fits between the logarithmic growth rates of artificial surfaces inside and outside Natura 2000 sites, in 1990-2000 and 2000-2006, in 21 EU countries.

In the period 1990-2000, artificialisation inside Natura 2000 showed a positive relationship with the annual growth rate of GDP (P = 0.023), and weakly with high GDP (P = 0.061) and the population growth rate (0.096) in combination. Very much the same relationships were found outside Natura 2000, a strong positive relation between artificialisation and annual growth rate of GDP (P = 0.011), and weak positive relations with GDP (P = 0.076) and the population growth rate (0.058). In 2000-2006, no socio-economic variable was related to artificialisation inside Natura 2000, whereas the growth of artificial surfaces increased with population growth rates outside Natura 2000. Taken together, these results suggest that between 1990-2000 and 2000-2006 there was a progressive decoupling of socio-economic processes inside and outside Natura 2000.

The effect of population growth rate on artificialisation was highly significant (P=0.001) only when combined with the prevalence of statutory environmental assessments (SEA, EIA) in the country. Thus, there was most artificialisation in countries with high population growth rates and few statutory assessments (Figure 3), a relationship which explained 56% of the variation in growth of artificial surfaces.

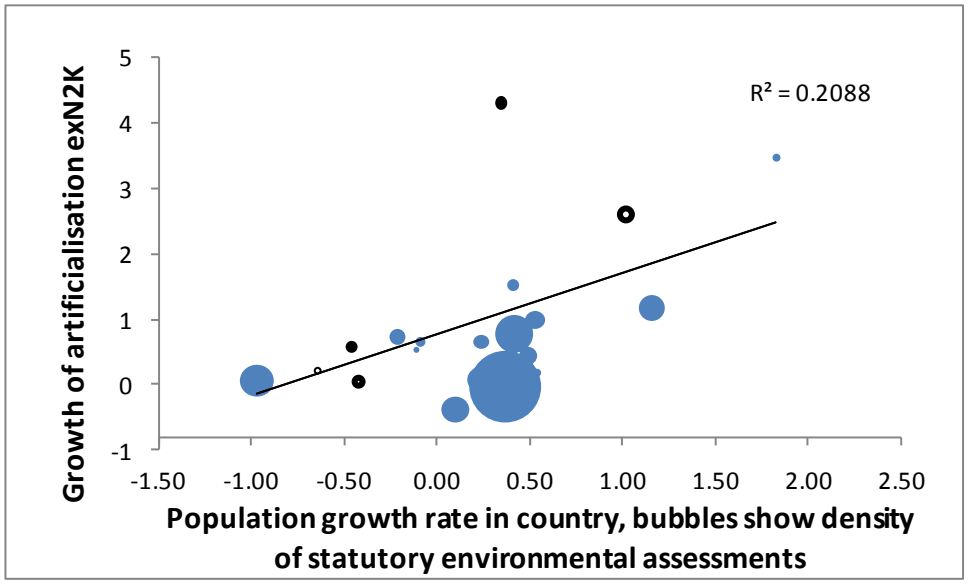


Figure 3. Outside Natura 2000 sites, countries with high population growth rate (horizontal axis) had high rates of artificialisation (vertical axis), unless they had many statutory environmental assessments (as shown by large bubble size).

A separate relationship found was for most artificialisation where there was the highest number of guidance texts to assist the conduct of statutory assessments. This relationship was the only one detected with artificialisation within Natura2000 sites (P=0.034), but was highly significant only in areas outside N2K (P<0.001) or if both areas were combined (P=0.007). The effect was clearly associated with having a large number of assessment texts rather than fewer than about 8 (Figure 4).

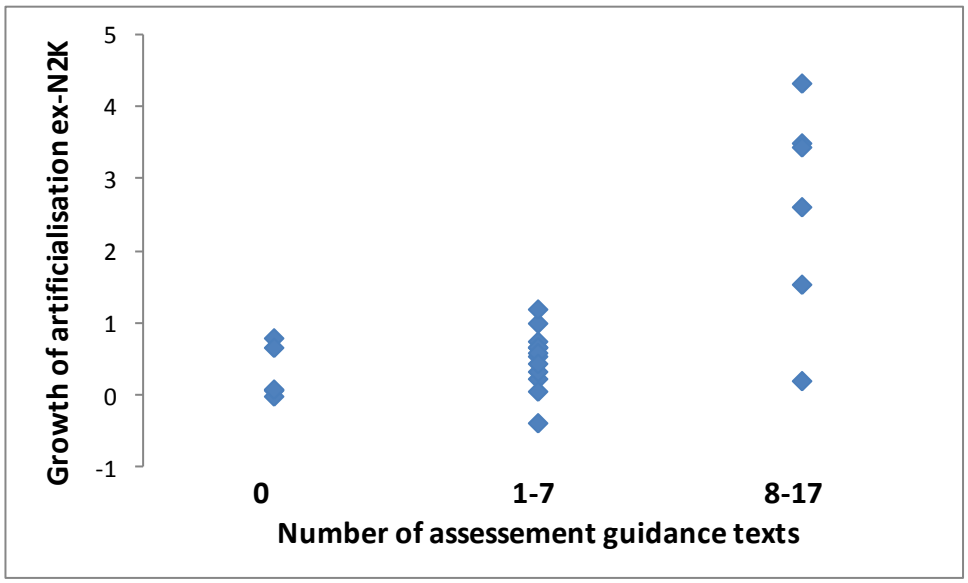


Figure 4. Countries with the highest growth rates of artificialisation outside Natura 2000 sites (vertical axis) tended to have the largest number of guidance texts for environmental assessment (horizontal axis).

4.1.1.2 Change in semi-natural habitats

Another ecological impact variable based on CORINE data was the annual rate of change in the surface covered by semi-natural habitat (CORINE categories 32 and 33). This could be both an indicator of loss of habitat (negative rates) that would be important for biodiversity, or a gain in habitat after agricultural abandonment that (in some situations but not all) has potential for restoration of biodiversity.

Again, there was a significant relationship (*P*=0.011) between the rate of change of semi-natural habitats and the number of guidance texts for environmental assessments that were listed at national level, indicating that habitat loss was higher (negative rates) where less guidance was provided (Figure 5). It is worth noting that there appears to have been gain of semi-natural habitats in many countries.

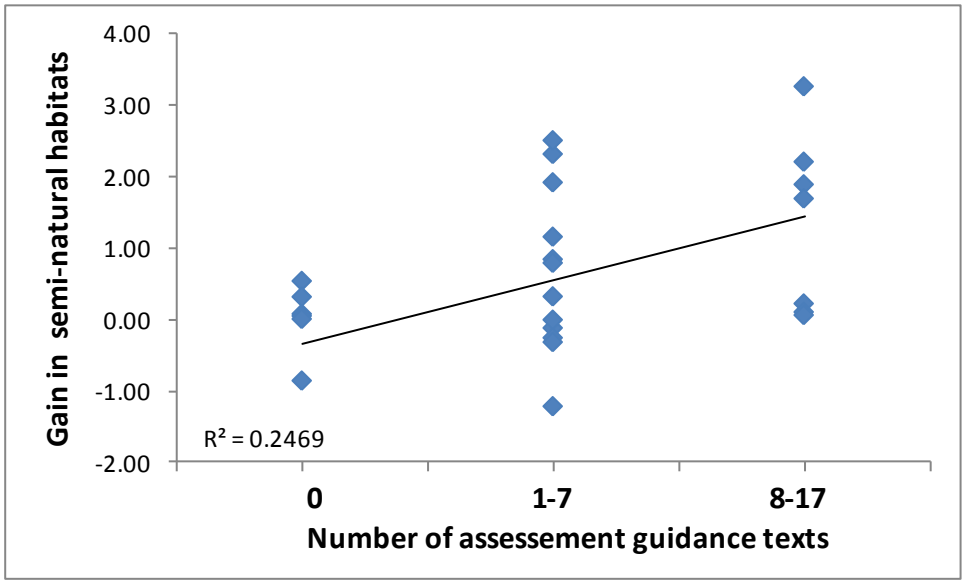


Figure 5. There tended to be most growth of semi-natural habitat cover (vertical axis) where the number of assessment guidance texts (horizontal axis) was highest.

The gain in semi-natural habitats was highest where the quality data on species and habitats available at national level tended to be low (P=0.006). Including the number of guidance texts in the regression produced a relationship (Figure 6) that was statistically highly significant (P=0.001) and explained 46% of the variation in change of semi-natural habitats.

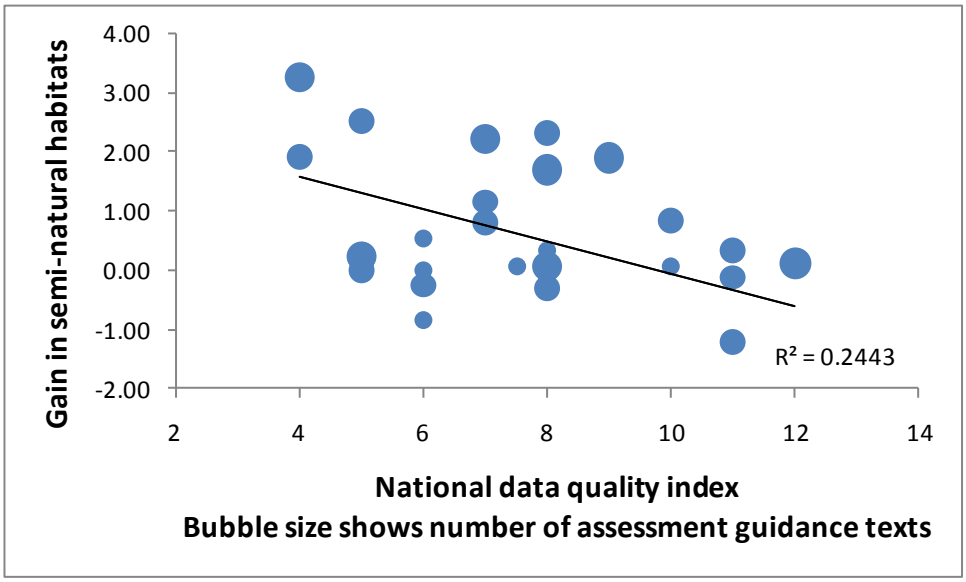


Figure 6. The growth rates of semi-natural habitat cover (vertical axis) tended to be least where the quality of environmental data was highest (horizontal axis), especially if there were many guidance texts for environmental assessment (i.e. bubbles were large).

4.1.2 Variables from reporting for Habitats Directive Article 17

Variables from reporting for Habitats Directive Article 17 were available only for countries within the European Union, and were missing for the two most recent additions as well as Cyprus. This gave a total of 24 cases for analysis.

Habitat Conservation Status showed no relationships that were even weakly significant (P=0.05) with process variables, priority variables or governance capacity variables. There was a weak tendency for habitats to be registered as less well conserved where the highest proportion of the national population was in urban developments (P=0.024) and where there was least land-cover registered by CORINE as forest (P=0.019).

Species Conservation Status had no relationships at P<0.01 to process or priority variables. However, among societal capacity variables the species status tended to be best where there was a highest proportion of Hunters plus Anglers in the national population (P=0.002) and densest populations in rural areas scheduled for survey (P=0.012), also where there was most growth in Gross Domestic Product (P=0.032). Status was also best where ecological capacity included most water (P<0.01) and especially wetland (Figure 7) as CORINE land-cover (P=0.001, Figure 7).

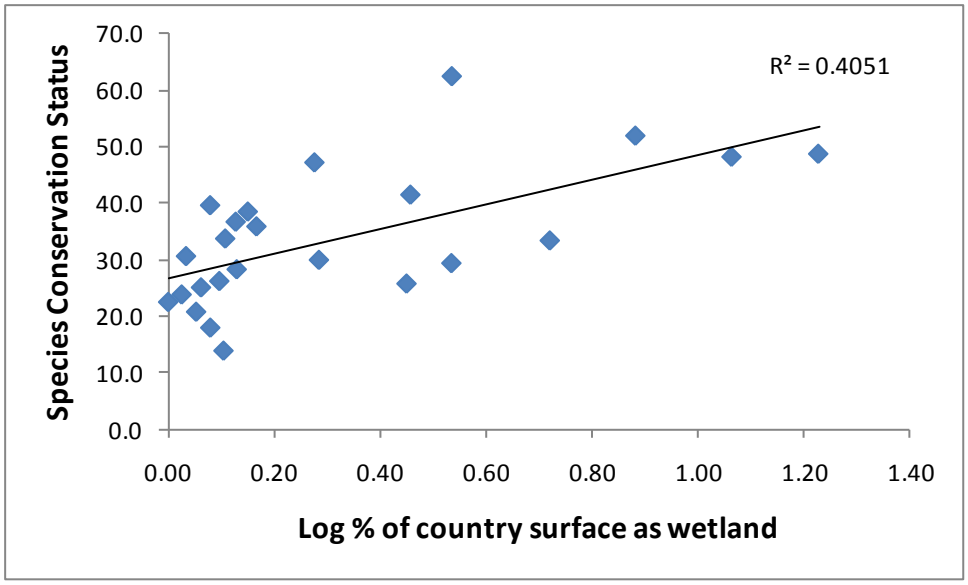


Figure 7. The percentage of species with favourable conservation status (as assessed form Article 17 reporting) tended to be least (vertical axis) where the percentage of the country covered by wetlands was greatest (horizontal axis).

The only combination of these variables that gave a significant improvement on the bivariate relationship was the combination of Hunters plus Anglers and GDP, which was highly significant (*P*<0.001) and explained 49% of the variation in Species Conservation Status. The conservation status was high where hunters and anglers were prevalent in national populations and there was most growth in GDP (Figure 8).

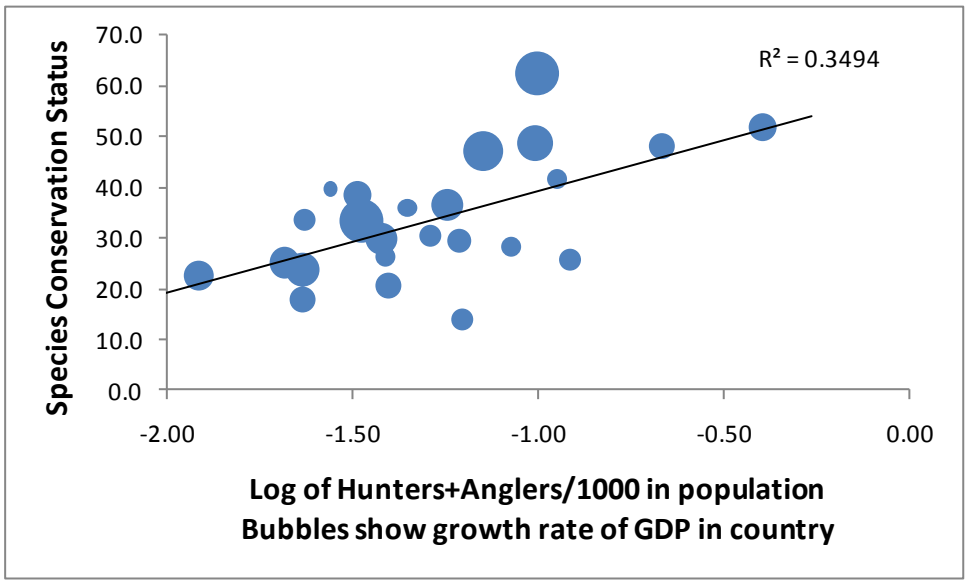


Figure 8. The percentage of species with favourable conservation status (as assessed form Article 17 reporting) tended to be highest (vertical axis) where hunters and anglers were most prevalent in the population (horizontal axis), especially in countries where the annual growth rate of GDP was high (as shown by large bubble size).

4.1.3 Invasive Alien Species and the Farmland Birds Index

The prevalence of Invasive Alien Species could be estimated for all 30 countries in the analysis. However, IAS prevalence showed only one univariate relationship that was even weakly significant, which was for IAS to be less prevalent when local authorities put a high priority on having data for environmental decisions, especially socio-economic data (*P*=0.021). The regression was improved to *P*=0.005 by adding the % of national surface covered by water. However, the relationship for 26 countries with appropriate data (Figure 9) only explained 32% of variance in the prevalence of IAS: it could have been due to chance.

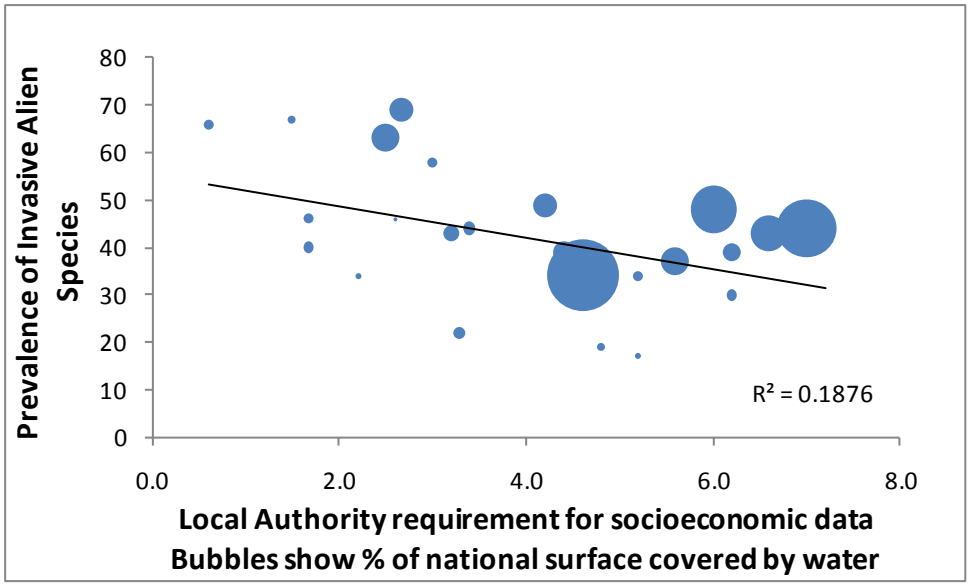


Figure 9. There was a weak tendency for the number of Invasive Alien Species (vertical axis) to be least where local authorities had most demand for data on provisioning, regulating and cultural services of ecosystems (horizontal axis), especially where more of the country was covered by water (i.e. bubble size was large).

Relationships were no more convincing for the Farmland Bird Index. This index was available for only 21 of the 27 EU states, plus Norway and Switzerland. Moreover, although 20 values lay between -3.5 and plus 1, there were outliers at -5.3, -7.9 and +6.4. With these outliers included, the only significant relationships for the Farmland Bird Index depended on the two most extreme outliers (Bulgaria and Portugal), so a further analysis was run without them. In this case, a weak relationship with numbers of Agri-environment Tools recorded (P=0.038) clearly depended on the remaining outlier (Slovakia, Figure 10).

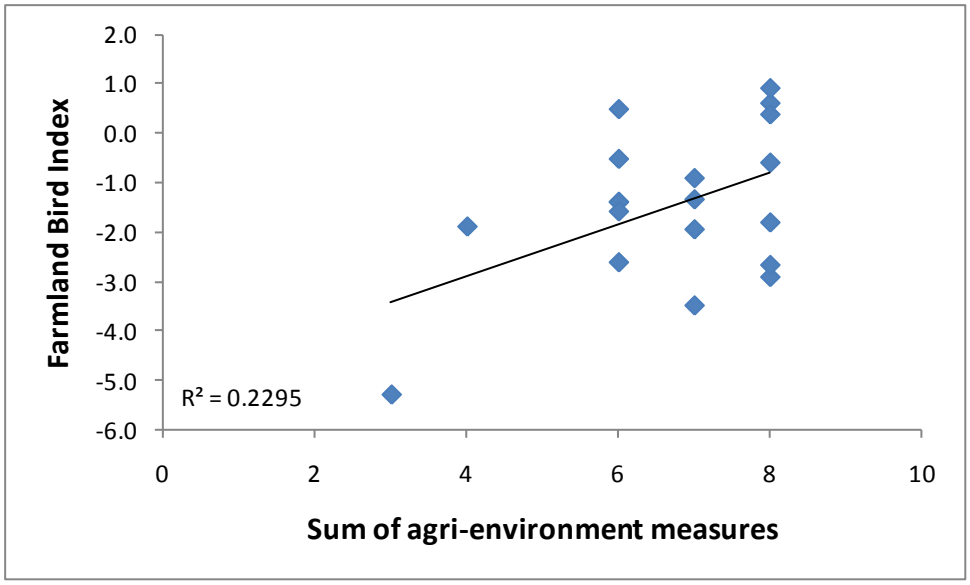


Figure 10. The correlation between the Farmland Bird Index (vertical axis) and the extent of regulatory constraint on payment from National Agri-Environment Schemes (horizontal axis) depended on an outlying point.

However, a relationship with an index of frequency of consulting at EU level by national government organisations was quite strong (*P*=0.014), though spoiled if one of the two outliers was included (Figure 11). So the tendency for the Farmland Bird Index to be best in countries that consult least with the EU about environmental issues could well be due to chance.

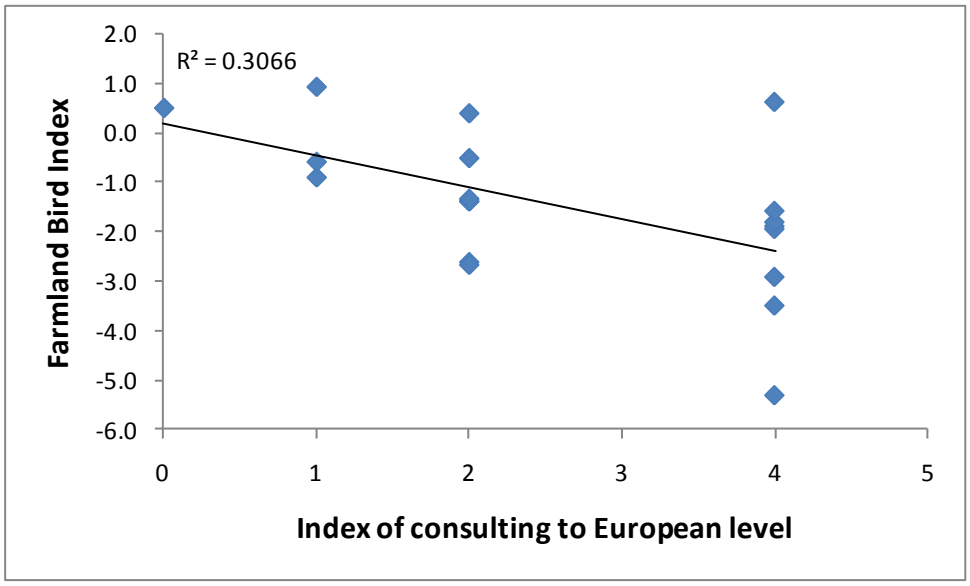


Figure 11. The Farmland Bird Index (vertical axis) tended to be lower in countries where there was most consulting on environmental matters to the European Level (horizontal axis).

4.2 Relationships of Societal Impact Variables

Of the 5 impact variables in this category, two showed no relationship stronger than P=0.03. One was an estimate of attitude to use of land and species, obtained from the assessment by the local administrations of whether contributions to conservation were greater from those utilising land and species consumptively or those watching or otherwise accessing non consumptively. The other was the proportion of national populations, sampled by Gallup in a survey about biodiversity, who recognised that biodiversity was being lost. Both these variables are given no further consideration. Two further variables from independent survey, and one from the TESS survey of local administrations, gave relationships worth considering.

4.2.1 Independent survey variables

An indicator of environmental awareness from the Gallup survey is the proportion of national populations in EU states that recognise the word 'biodiversity'. This variable was available for all 26 EU states in the analysis and showed a positive correlation with country area (*P*=0.015), but a negative relationship with the national density of environmental assessments (P=0.016). The tendency for countries with more recognition of 'biodiversity' to do fewer environmental assessments (Figure 12) replaced the effect of country size in a multiple regression.

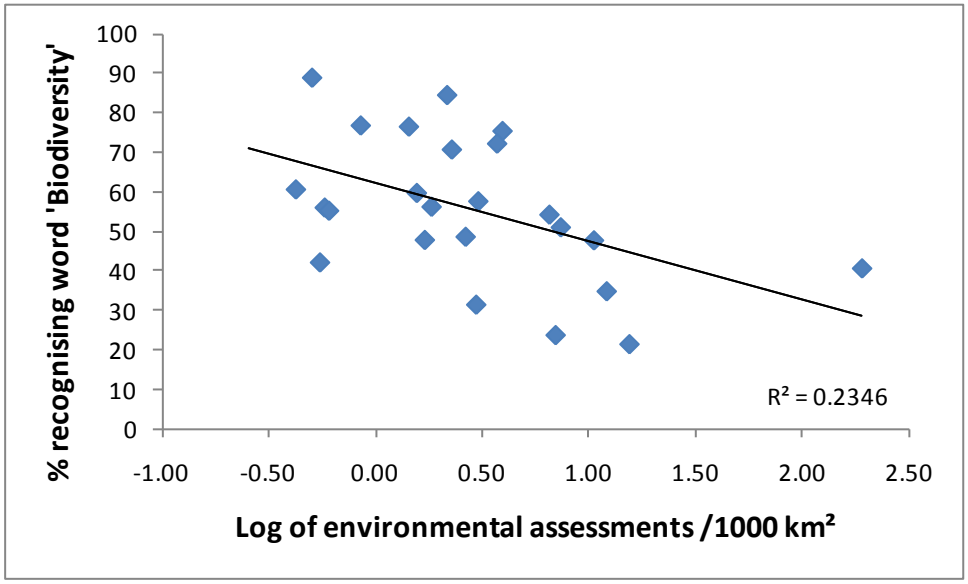


Figure 12. The percentage of populations knowing the word "biodiversity" (vertical axis) tended to be least in countries where the density of SEA+EIA assessments (horizontal axis) was highest.

Another societal variable from the SEBI set was the government assessment of the adequacy of the proportion of land designated within Natura2000. For the 26 EU countries, this variable correlated positively both with GDP per capita (*P*=0.01) and with the World Bank governance variable 'Control of Corruption' (*P*=0.002). However, variation in Control of Corruption explained 67% of variation in GDP/capita, and the only

significant tendency in a multiple regression was for the (arcsine transformed) percentage sufficiency to increase with the high quality of governance indicated by a high level of Control of Corruption (Figure 13).

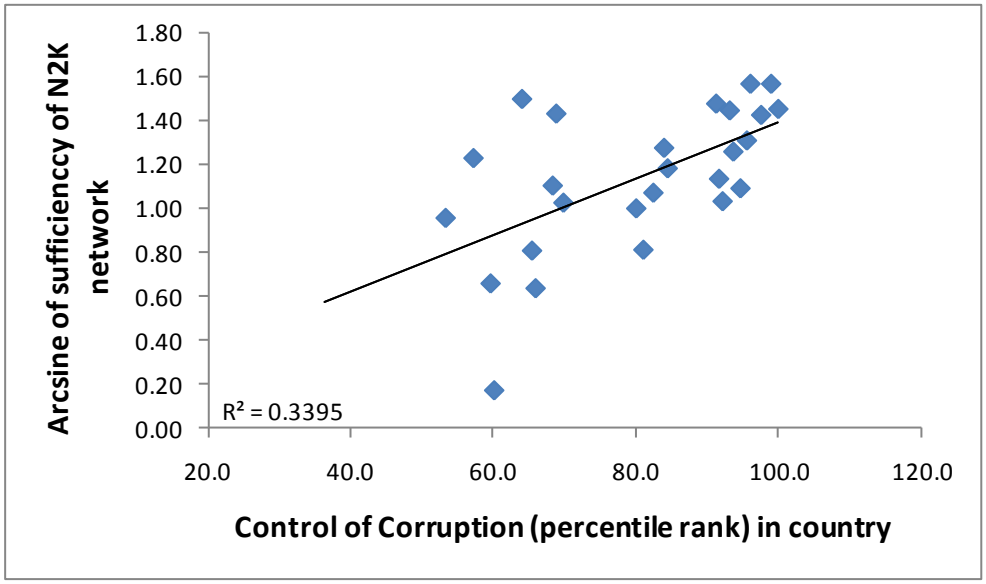


Figure 13. The sufficiency index of Natura 2000 coverage (vertical axis) tended to be highest in countries with a high World Bank index of corruption control (horizontal axis).

4.2.2 Positivity to Nature from the TESS survey

The TESS survey asked local administrations to score how strongly residents perceived benefit from biodiversity (in terms of food, materials, recreation, tourism, etc), and also how strongly their perceived costs (in terms of pests or risks from disease or wildlife, etc). The scores for perception of benefit and cost were used to derive a 'nature positivity' index.

This index, which was available for 28 countries, proved to be strongly related to different capacity, priority and process variables. The strongest relationship (explaining 41%) of the variation on the positivity index) was with the World Bank governance capacity variable 'Political Stability' (*P*=0.008). The relationship of nature-positivity with Political Stability was improved to explain 50% of variation if an effect of greater positivity where there was higher LAU2 population density (P=0.046) was also taken into account (Figure 14).

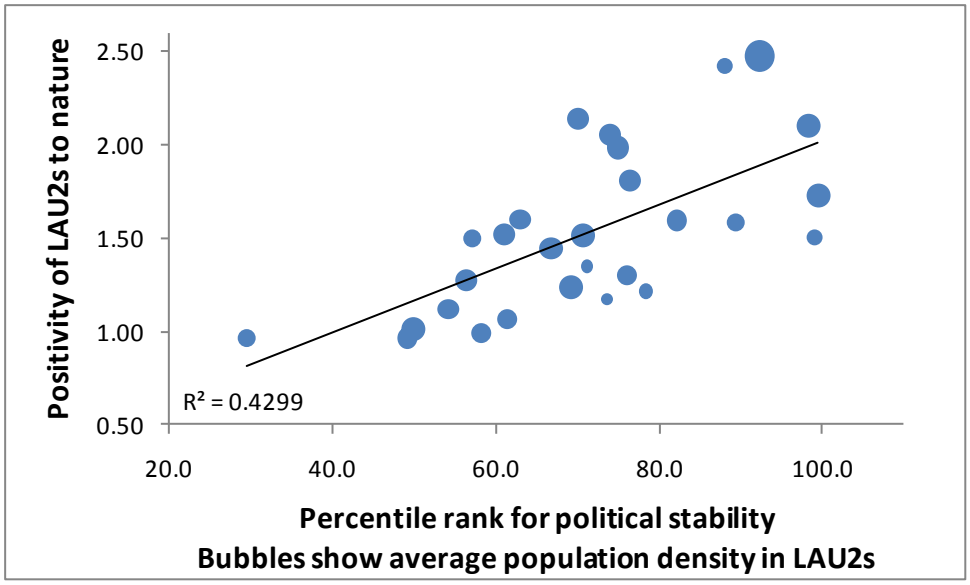


Figure 14. The index of positivity to nature at local level (vertical axis) tended to be highest in countries with a high World Bank index of political stability (horizontal axis), especially where the average rural population density tended to be high (as shown by large bubbles).

However, there was also a quite strongly positive correlation (*P*=0.005) between the nature positivity perceived by LAU2s and their tendency to consult with NGOs for environmental decision-making (Figure 15). If those two capacity variables were joined by the extent to which the decision-making process involved consulting with NGOs, the proportion of variation explained increased to 60%.

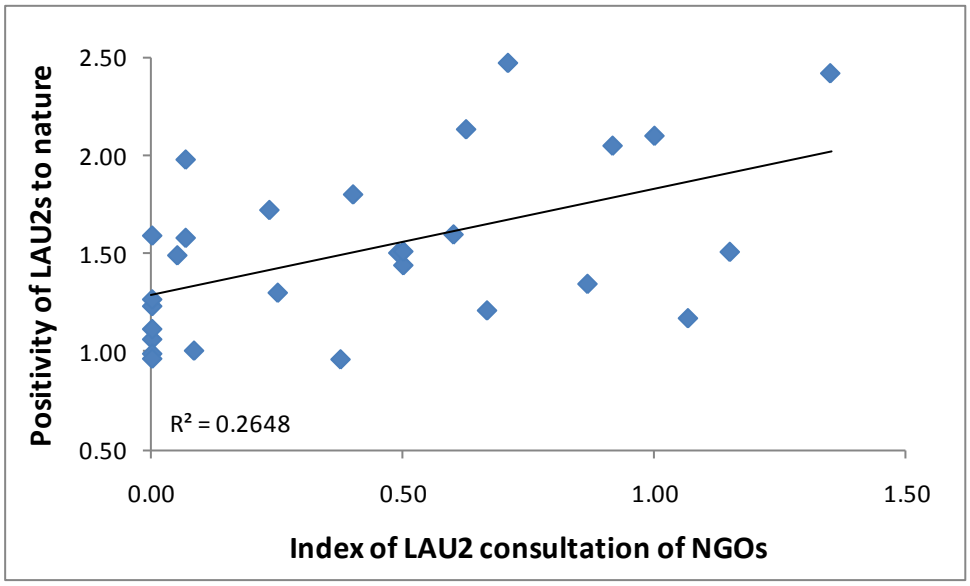


Figure 15. The index of positivity to nature (vertical axis) tended to be higher for local administrations that consulted most with NGOs at the local level (horizontal axis).

There was also a relationship between nature positivity perceived by LAU2s and whether the administrations tended to set an environmental priority in their local decision-making (*P*=0.008). A second regression model, which explained 51% of the variance in nature-positivity, was a combination of environmental priority with Political Stability (Figure 16). Addition of a third effect, of increasing nature-positivity with reduced GDP-growth improved this model too, to explain 58% of variance in nature-positivity.

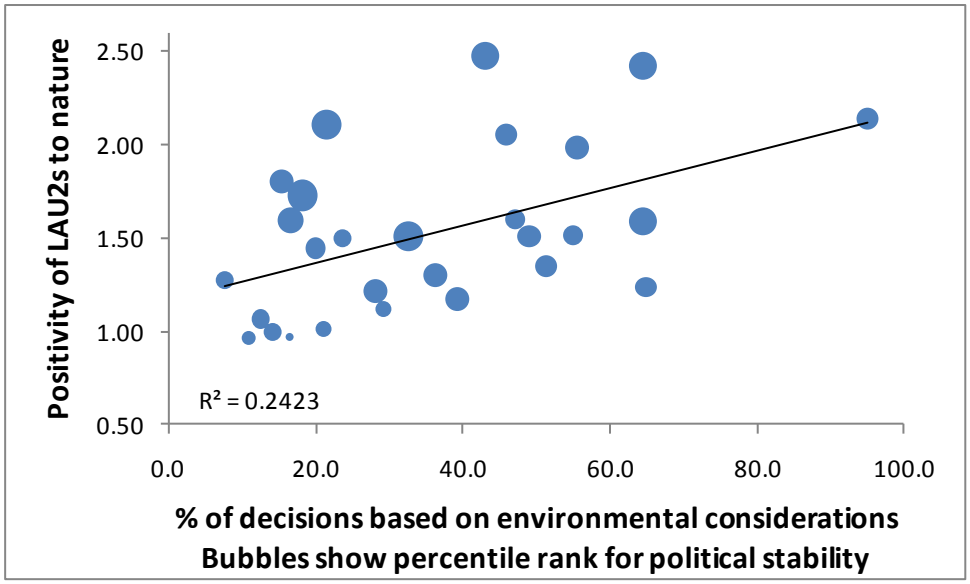


Figure 16. The index of positivity to nature (vertical axis) tended to be highest in local administrations that also took decisions mostly on an environmental basis (horizontal axis), especially where the index of political stability was high (i.e. bubbles were large).

Thus, being strongly positive about nature was a product of the most stable, ex-growth societies, where the environment was a priority in local decision-making and there was much consulting with NGOs. Interestingly, weak correlations of nature positivity with knowing the word 'biodiversity' and recognising loss of biodiversity were both negative. It is also worth noting that, although an LAU2 priority on the environment in decision making was not strongly related to consulting with NGOs at local level (*P*=0.045), a combination of little consultation with NGOs at national level and much at local level explained 37% of the variance in the percentage influence of the environment in decision-making (*P*=0.001). So the balance of priorities for the environment is associated with local, not national, consulting with NGOs.

4.3 Relationships with economic impact variables

4.3.1 Hunters as a proportion of national populations

Treating the prevalence of hunters and anglers as impact variables is appropriate not only on economic grounds, but also because these hunters and anglers tend to form NGOs which are organised down to local levels in the EU. Their representation in the population is likely to change relatively slowly, and therefore be influenced by the most durable capacity variables more than by priority or process variables, for which numbers of hunters and anglers may serve as influences rather than outcomes.

Relationships with numbers of hunters tended to be strongly impacted by the demographics of Malta, which has much the highest population density in the EU and hence an untypical rural population density overall (Figure 17). Without including Malta, there was a very strong negative relationship (P<0.001) between the proportion of the national population that hunted and the rural population density.

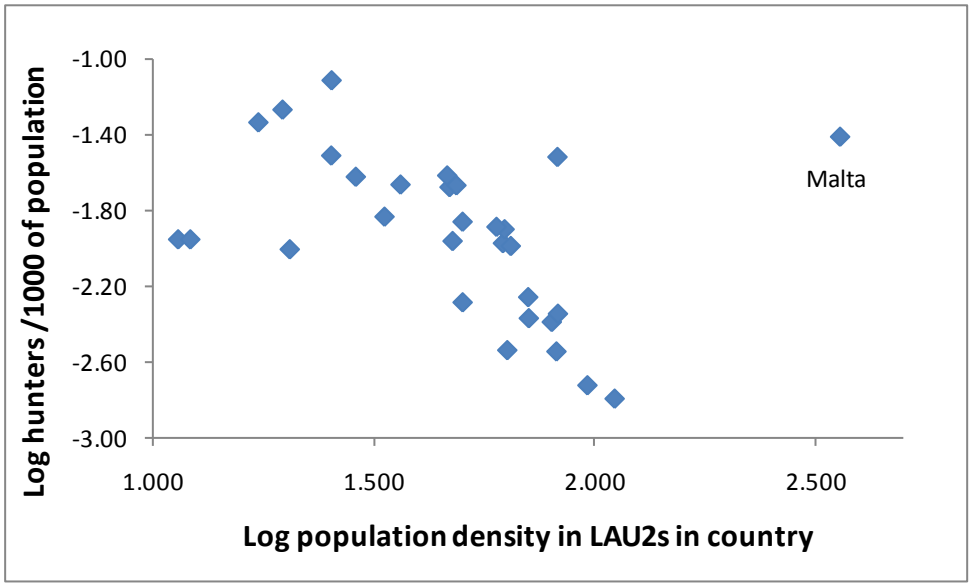


Figure 17. Except for Malta, the proportion of hunters in the national population (vertical axis) was high where the local rural population density was high (horizontal axis).

There was a similarly strong relationship with overall population density; excepting Malta, an increase in population density of a country explained 37% of the decline in the proportion of hunters in the population. However, hunter prevalence also related to land-cover, increasing with reduction in artificial surfaces (R^2 = 0.24, P=0.005) and especially with increase in semi-natural habitats (R^2 = 0.50, P<0.001) even when Malta was included. With inclusion of Malta, the combination of low population density and high availability of semi-natural habitats explained 58% of the increase in proportion of hunters in the population of a country (Figure 18).

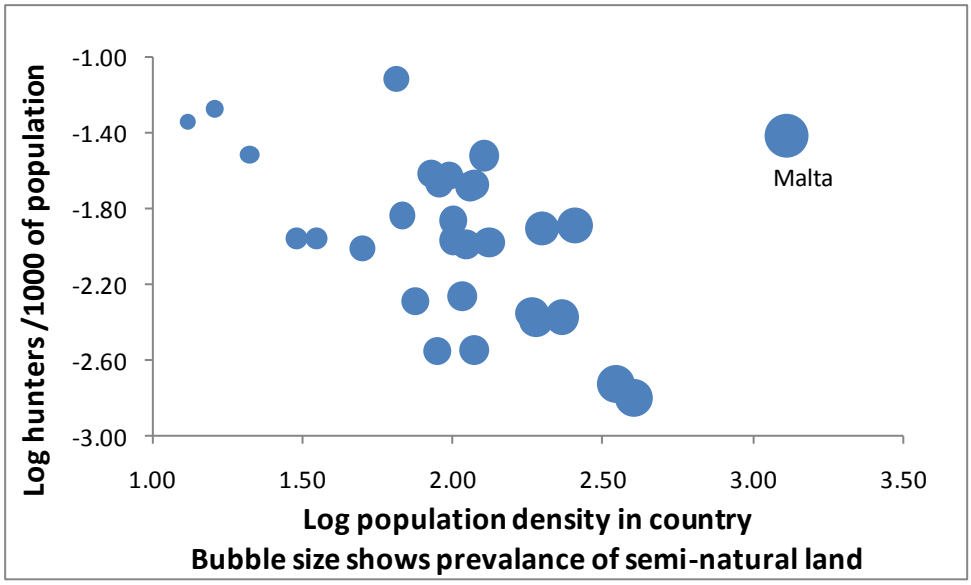


Figure 18. The proportion of hunters in the national population (vertical axis) was high in countries with low population density (horizontal axis) and especially where there was relatively little semi-natural habitat (as shown by small bubble size).

Hunter prevalence in the population also related to the population growth rate (P=0.009) of countries even with the inclusion of Malta (Figure 19). This effect added to the regression, such that a combination of low population density, abundance of semi-natural habitat and high population growth explained 67% of the increase in hunter prevalence, if Malta was excluded due to its exceptional population density.

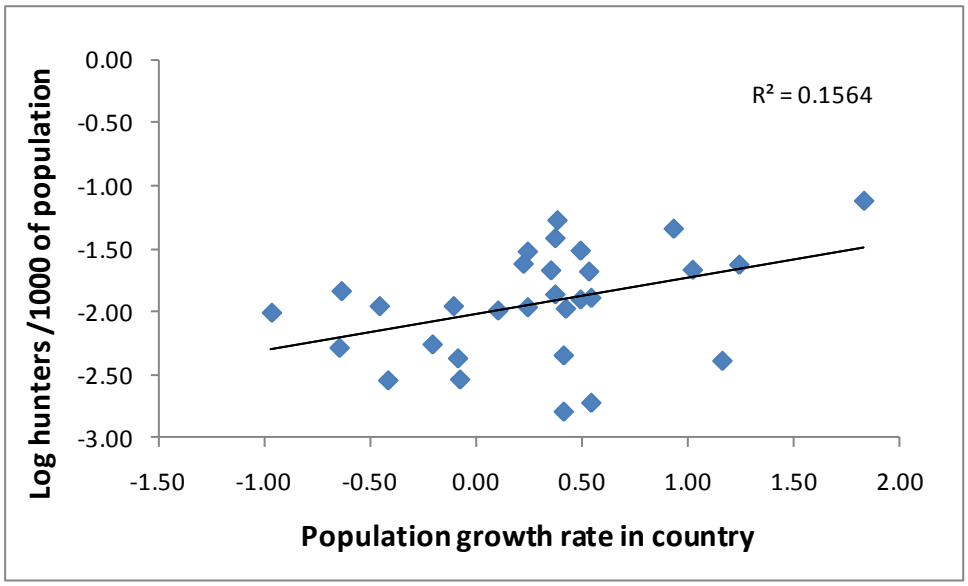


Figure 19. The proportion of hunters in the national population (vertical axis) tended to be higher in countries with a higher population growth rate (horizontal axis).

4.3.2 Anglers as a proportion of national populations

In terms of ecological or societal capacity variables, the prevalence of anglers correlated strongly (*P*=0.001) only with the proportion of a country's surface that was water (Figure 20). Thus, more than 30% of variation in the prevalence of anglers was explained by an ecological variable likely to have been causal.

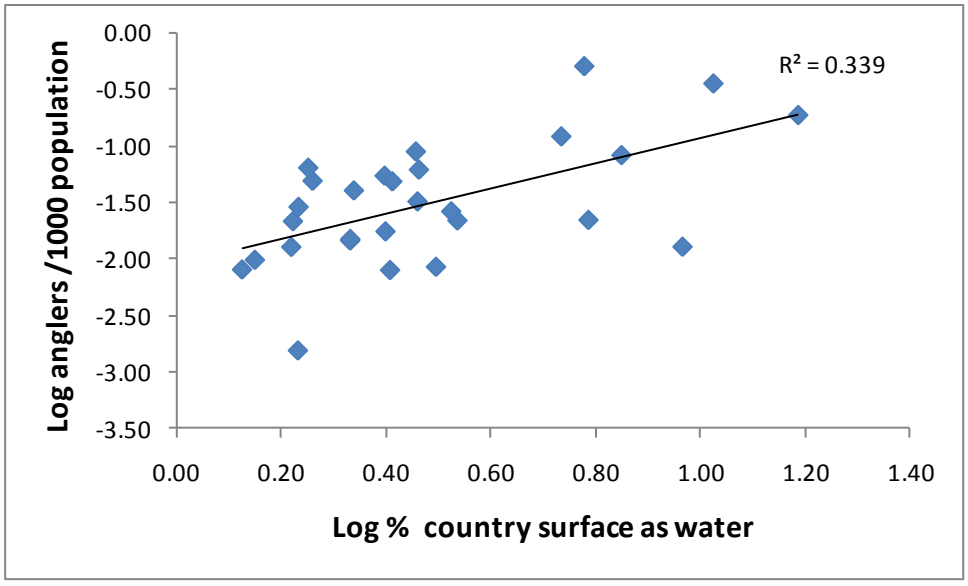


Figure 20. The proportion of anglers in the national population (vertical axis) tended to be highest where percentage cover by water surfaces was highest (horizontal axis).

However, if governance variables were also included, two further effects were important for increasing the strength of the regression model. Thus, there were also fewer anglers, especially in terms of density, as a function of country area (Figure 21) where a high proportion of the country was protected for special conservation interest.
This variable explained 58% of variation in angler density, and 69% if LAU2 officials considered NGOs to have a strong influence on local environmental decisions.

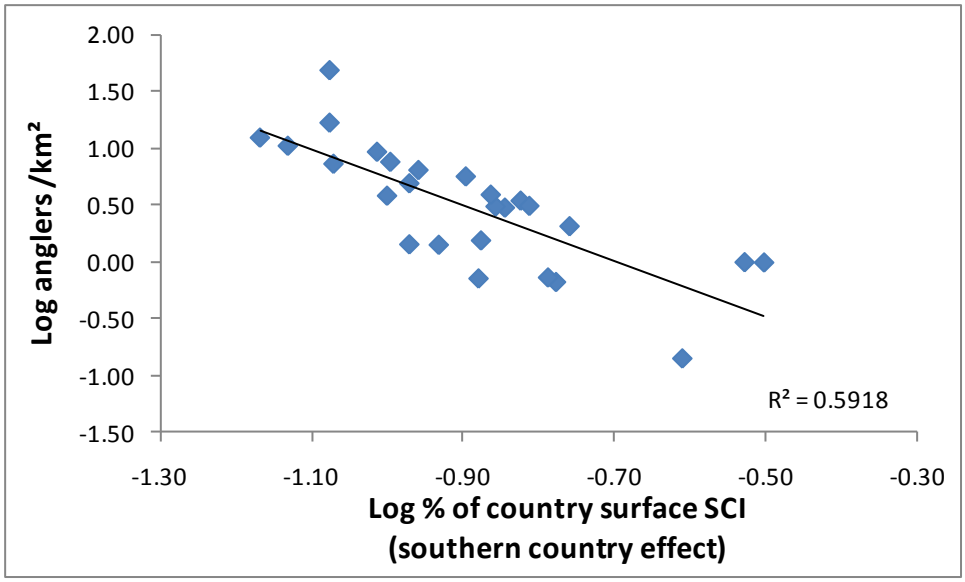


Figure 21. The proportion of anglers in the national population (vertical axis) was highest in countries with the smallest proportion of the surface designated as of Special Conservation Interest (horizontal axis).

There were also relatively few anglers where a high proportion of species in uncertain conservation status was recorded by national authorities (P=0.019). Inclusion of this variable (Figure 22) in a regression model with water raised the prediction of angler prevalence in the population from 31% to 44%.

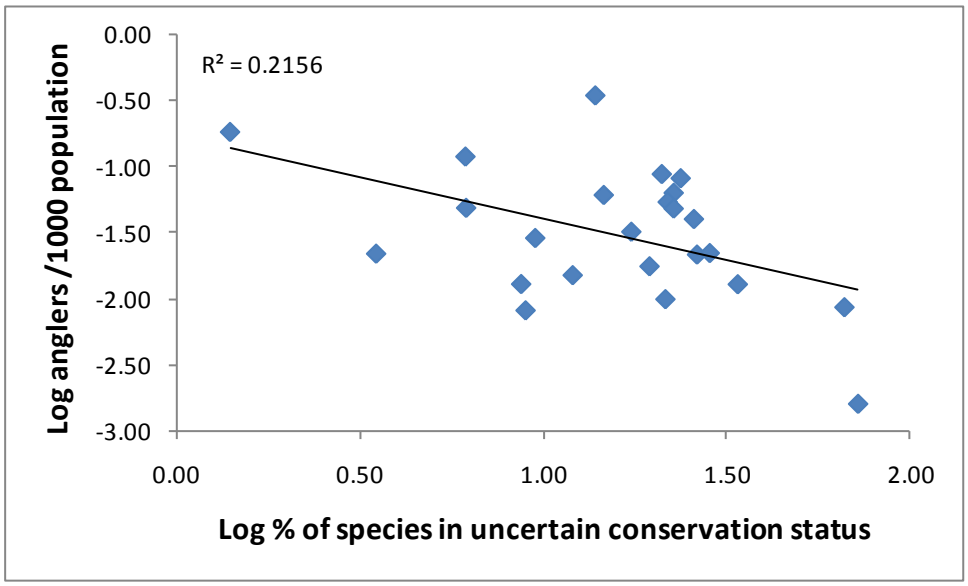


Figure 22. The proportion of anglers in the national population (vertical axis) tended to be lower when the proportion of species with uncertain conservation status (as reported in Article 17 assessment) was higher (horizontal axis).

If numbers of hunters and anglers were added together, significant positive effects of water tended to remain, together with negative effects of extensive SCI areas and

national knowledge of conservation status. However, there was no longer a significant effect of NGO influence recorded by local administrations.

4.4 Numbers of EIA and SEA assessments

The strongest capacity predictor of the density of statutory environmental assessments was the density of National (and rural) populations. This relationship, which explained 25% of variation in the density of assessments (*P*=0.004) is improved by adding the World Bank index of Political Stability (Figure 23), such that increase in population density and political stability explained 42% of the variance (*P*<0.001). However, the significance of this regression depends greatly on the relatively high density of environmental assessments on Malta; the model is marginally significant (*P*=0.018) with Malta excluded.

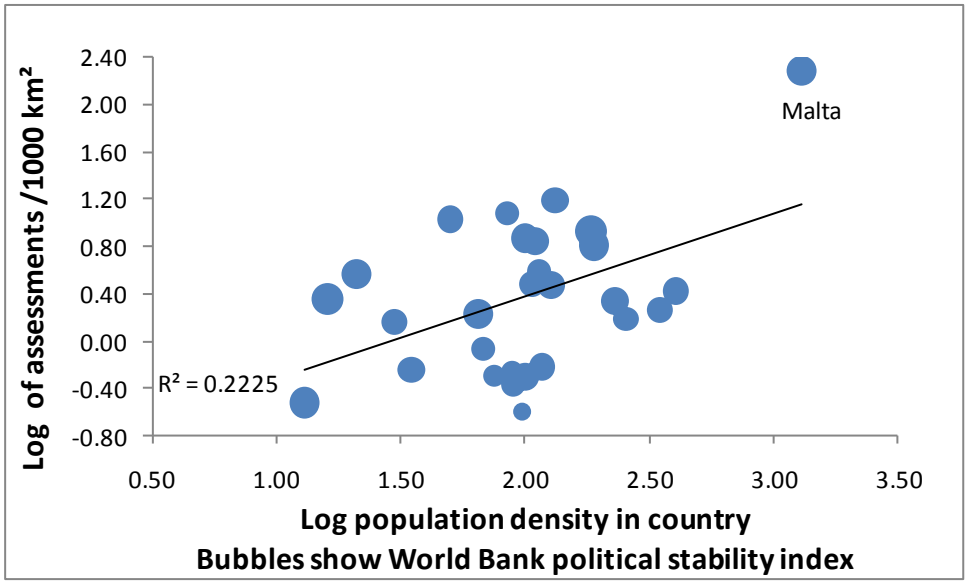


Figure 23. The density of SEA+EIA assessments (vertical axis) tended to increase with the national population density (horizontal axis), especially where the World Bank index of political stability was greater (as shown by larger bubbles).

However, it was attitudes at local level that proved the strongest predictor of numbers of SEA+EIA assessments. This indicator of attitudes at local level displaced all others in predicting the statutory assessment density (Figure 24), both with Malta included (R^2 = 0.47, *P*<0.001) and excluded (R^2=0.34, *P*=0.001).

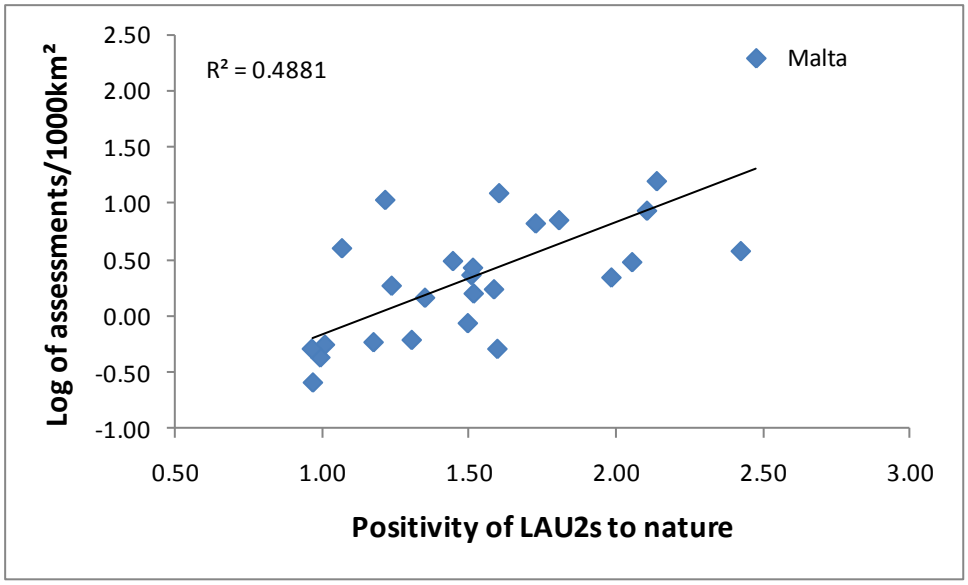


Figure 24. The density of SEA+EIA assessments (vertical axis) tended to be higher when local administrations were more positive towards nature (horizontal axis).

Nevertheless, it was possible to explain as high a proportion of the variance in number of statutory assessments from capacity variables without including an attitude variable, if a third potential predictor was included in the regression model. This is justified by the presence of 26 cases with these variables and because correlation of assessment density with population density is essentially a correction for variation in assessment numbers with size of country. When included with density, there was a positive correlation between assessment frequency and consulting NGOs at local level that explained 38% of variance in assessment frequency (P=0.002) and this was further improved by also including a negative effect of the size of local authorities (R^2=0.47, P=0.001). Thus, taking density effects into account, there were most statutory assessments where the population in LAU2 administrations was relatively small and where there was most consultation with NGOs at local level.

5. Discussion

Capacity, Priority and Process variables all affected socio-economic and ecological impact variables, though the actual influential variables strongly varied among impact indicators. In general, results suggested that variation in biodiversity trends across Europe may result from a combination of institutional settings, regulatory and management frameworks, information availability and demand, and the physiographical, ecological and socio-economic characteristics of each country. Given this complex interplay of variables, the effects of variables related to SEA and EIA were relatively minor, though in a few cases they showed significant relationships to impact variables, usually in combination with other socio-economic factors.

Disentangling the effects of the large number of variables used in this study was difficult, as they were often inter-correlated, and sample sizes on which to base the analysis were always relatively small (< 30 countries). Therefore, only one or two potential predictor variables could generally be analysed in regressions, and interactions terms were not

considered, in order to avoid inflating the risk of spurious correlations. Another potential problem was that in some analysis there were one or two countries showing up as outliers, falling off the pattern evident from the remaining countries. Usually, these countries had extreme values in some dependent or independent variable (e.g., disproportionately high population density in Malta), and so significant relationships could only be observed after removing its effects. In these cases, analyses were made with and without outliers, and the reasoning for outlier removal was duly considered. A final problem was that relationships derived from a study like this cannot be taken to imply a direct nexus of causality between the independent and dependent variable, as for instance the effect may be mediated by an unmeasured variable that is correlated with both. Furthermore, there is also the possibility that the impact variable is actually influencing the independent variable that was used to explain it, rather than the inverse. For instance, strong environmental regulations may be adopted by countries when there is the perception by governmental authorities of strong habitat losses or species declines. In a case like this, stronger regulations would be related to higher biodiversity declines, not because the regulations promote negative biodiversity trends, but because negative biodiversity trends may elicit stronger regulations. This possibility was considered when interpreting the results of analysis.

Most significant relationships with socio-economic and ecological impacts were found for capacity variables (77.5%), particularly for societal (35%) and ecological (25%) capacity variables, and to a lesser extent for governance variables (17.5%). The proportion of relationships involving capacity variables rose to 82.5% when including public awareness and economic variables that were regarded both as capacity and impact variables. The importance of the capacity variables remained essentially the same when analysing separately ecological, societal and economic impacts. To at least some extent, these results may be considered a consequence of the much higher number of capacity variables used in analysis; one would expect to have a higher number of significant relationships just by chance. Nevertheless, the percentage of significant relationships involving capacity variables appeared higher than might be expected from the percentage of variables tested (82.5% of significant relationships *versus* 66.1% of variables tested), whereas the opposite was found for priority (7.5% *versus* 14.3%) and process (10.0% *versus* 19.6%) variables. Considering only capacity variables, more significant relationships than would be expected by chance were found for ecological (25.0% *versus* 12.5%) and societal (35.0% *versus* 16.1%) variables, whereas the opposite was found for governance variables (17.5% *versus* 26.8%).

As a whole, these results suggest that structural ecological and socio-economic characteristics of each country, for instance wealth, population density, urbanization level, and dominant land cover types, may be the primary drivers for differences in the indicators of biodiversity change used in this study. Reasons for this are unclear, but it may be hypothesised that these strongly influential features have acted over long time frames, thereby having a lasting effect on biodiversity patterns and processes, and how society perceives and uses such biodiversity. In contrast, variables reflecting relatively volatile factors such as governance, and particularly the priority and process variables, may have much smaller effects at the country scale, because they have acted over shorter time frames. For instance, process variables mainly reflect regulatory frameworks enforced through management practices that have generally been in place for just a few years, and so they may not have had the time to change long-standing trends.

Such delay before an effect may explain why analyses detected no positive associations for conservation with the presence of national regulation (on alternative proposals, mitigation and monitoring) or with practises associated with monitoring or with numbers of ministries and organisations responsible for conservation at national level. It could also explain why a reduction in rates of artificialisation has yet to become apparent within areas designated for Natura 2000, and why increases in semi-natural habitats do not seem to be associated with improvements in biodiversity. Nevertheless, the analyses did find evidence of less strong relationships (especially since 2000) with factors, such as population growth, being associated with artificialisation. This could be evidence that Natural 2000 designation and processes are gradually decoupling the designated areas from detrimental effects.

Moreover, it is already evident that EIA+SEA prevalence is associated with reduced artificialisation. It is also interesting to note that a nature-positive attitude is the factor most strongly associated with the number of these assessments, and that this in turn is associated with consulting at local level and having smaller population units at local level (this is important in view of a tendency to de-tier LAU2). That raises the question of whether recording nature-positivity could be a useful indicator of conservation tendency in future. Indicators of attitude tend to self-reinforce once respondents know what is expected. However, as that effect would in itself be evidence of awareness of the importance of conservation, carefully constructed questions at individual level might provide useful evidence of the rate of gain in nature-positive attitudes.

Relationships between assessment numbers, positivity to nature and sufficiency of the Natura 2000 network were also related to World Bank indicators of governance quality. It is especially interesting that N2K completeness linked to Control of Corruption, which as well as being very strongly correlated with GDP in Europe, is also a variable that was linked to the control of factors associated to biodiversity loss (e.g. poaching) in developing countries (Smith *et al.* 2003).

The strong association between hunters and anglers and positive effects, such as prevalence of wetland, water and semi-natural habitats, and with good species conservation status may merely reflect a socio-economic response to environmental capacity. However, the links between these recreational users of resources and knowledge of species status, and with consulting at local level, may also reflect the positive relationships between hunting and angling and habitat conservation recorded within some countries (Dixon *et al*. 2009, Sharp & Maclean 2010). Whether in reflection of capacity or as drivers of conservation, it would seem wise for the Europe to include a regular census of these and others using wild resources as indicators of sustainable use, as has been done since the 1980s in North America (USDI, FWS & USDC 2006).

6. Summary

1. Population growth rate was the strongest associate of the rate of change of land-cover to artificial surfaces (e.g. buildings, roads). This 'artificialisation' was most strongly related to growth and to the relative rarity of EIAs and SEAs for countries in areas outside Natura 2000; semi-natural habitat was lost most quickly where environmental data were considered poor but where the most guidance texts were available.

2. The rate of growth of artificial land-cover has increased since 2000 to a similar extent both within and without areas designated for Natura 2000; since 2000 the relationships between population growth, economics and artificialisation have tended to decouple within Natura 2000.

3. Numbers of EIAs and SEAs were highest where local administrations perceived nature most positively (and where fewest people understood the term biodiversity). This positivity was associated with population density, political stability, more consulting with NGOs at the local level and an administrative priority on the environment (rather than economics) when managing land and species.

4. The Natura2000 allocation was considered most sufficient in countries with the highest World Bank governance scores. However, habitat conservation status did not link to socio-economic or environmental variables to an appreciable extent.

5. Species conservation status was best in countries with the most wetland, and generally where GDP was highest and hunters and anglers most prevalent in the populations.

6. Hunters were most prevalent in populations of countries with low human population density and abundant semi-natural habitat; anglers were most prevalent where there was most water and least designation of areas of Special Conservation Interest. The conservation status of species was best known and the influence of NGOs at local level was highest where there were most anglers.

7. Except for consultation, the processes used during assessments and monitoring their results did not positively affect the number of assessments, the environmental and social impacts investigated, or the numbers of those using the resources.

7. Main conclusions

1. Artificialisation is probably caused by population growth but can be decoupled.

2. Frequent EIAs and SEAs were associated with low rates of artificialisation.

3. Frequent EIAs and SEAs, but not the processes within assessments, were associated with positive attitudes to nature and consultation of NGOs by administrations at local level.

4. Numbers of hunters and anglers were linked positively to species conservation status, to knowledge of conservation status and to influence during local consultation.

5. The Nature Positivity index estimated in the study was a better indicator of beneficial environmental attitudes than being aware of the word biodiversity or of biodiversity loss.

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9. References

D2.2
Sharp, R.J.A., Ewald, J. & Kenward R.E. 2009. Model of information flows from local & regional to central. Report to the European Commission from FP7 Project #212304 (Transactional Environment Support System).

D3.2
Perrella, L., Ewald, J., Kenward R.E. & Hodder, K.H. 2009. Environmental information supply and demand at the local level: Conceptual models of information flow. Report to the European Commission from FP7 Project #212304 (Transactional Environment Support System).

D3.3
Hodder, K.H., Sharp, R.J.A., Perrella, L., Butters, J., Kenward, R.E. & Ewald, J. 2009. Synthesis report: Central and local information flows and decision making requirements. Report to the European Commission from FP7 Project #212304 (Transactional Environment Support System).

D5.1
Kenward R.E., Ewald, J., & Sharp, R.J.A. 2010. Report on pan-European survey of assessment processes. Report to the European Commission from FP7 Project #212304 (Transactional Environment Support System).

D5.2
Ewald, J. Beja, P. & Kenward, R.E. 2011. Database of SEA, SIA and EIA factors. Report to the European Commission from FP7 Project #212304 (Transactional Environment Support System).

Dickson, B., Hutton, J. & Adams, W.M. 2009. Recreational hunting, conservation and rural livelihoods. Wiley-Blackwell, Oxford, UK.

ESPON 2009. First Interim Report of ESPON Typology Compilation, ESPON 2013 Programme: http://www.espon.eu/main/Menu_Projects/Menu_ScientificPlatform/typologycompilation.html

Kenward, R. Manos, B., Arampatzis, S. & Papathanasiou, J. 2009. A transactional environmental support system for Europe. In Hřebíček, J., Hradec, J., Pelikán, E., Mírovský, O., Pilmmann, W., Holoubek, I. & Legat, R. (eds.) Towards eEnvironment (Challenges of SEIS and SISE: Integrating Environmental Knowledge in Europe). European conference of the Czech Presidency of the Council of the EU.

Kenward, R.E., Whittingham, M.J., Arampatzis, S., Manos, B., Hahn, T., Terry, A., Simoncini, R., Alcorn, J., Bastian, O., Donlan, M., Elowe, K., Franzén, F., Karacsyonyi, Z., Larsson, M., Manou, D., Navodaru, I., Papadopoulou, O., Papathanasiou, J., von Raggamby, A., Sharp, R., Söderqvist, T., Soutukorva, Å., Vavrova, L., Aebischer, N. J., Leader-Williams, N. and C. Rutz. 2011. Identifying governance strategies that support biodiversity, ecosystem services and resource sustainability. Proceedings of the National Academy of Sciences.

Kaufmann, D.l, Kraay, A. & Mastruzzi, M. 2010. Response to: What Do the Worldwide Governance Indicators Measure. European Journal of Development Research.

Manos, B. & Papathanasiou, J. 2008. GEMCONBIO: Governance and Ecosystem Management for Conservation of Biodiversity. Aristotle University of Thessaloniki, Greece.

Oldfield, T.E.E., Smith, R.J., Harrop, S.R. & Leader-Williams, N. 2003. Field sports and conservation in the United Kingdom. Nature 423: 531-533.

Sharp, R. 2010. The Great Game: the interaction of field sports and conservation in Britain from the 1950s to 2008. Pp.84-106 in Mclean, N. Silent Summer: the state of Wildlife in Britain and Ireland. Cambridge University Press, UK.

Sharp, R. & Maclean, N. 2010. Going fishing: recent trends in recreational angling. Pp.107-124 in Mclean, N. Silent Summer: the state of Wildlife in Britain and Ireland. Cambridge University Press, UK..

NUTS 2009. Eurostat website : http://epp.eurostat.ec.europa.eu/portal/page/portal/region_cities/regional_statistics/nuts_classification

Smith, R., Muir, R., Walpole, M., Balmford, A. & Leader-Williams, N. 2003. Governance and the loss of biodiversity. Nature 426: 67-70.

USDI, FWS & USDC, 2006 National survey of fishing, hunting and wildlife-associated recreation, US Department of the Interior Fish and Wildlife Service, Fish and Wildlife Service and US Department of Commerce Census Bureau, Washington DC., 2007.

Appendix 1. Variables in the D5.2 database

The 65 variables used in the analysis are tabulated below. There are descriptions for each in the following sections.

Variable Type/Category		ID	Variable (source in D5.1 as "Fx", SEBI, CORINE, GEMCONBIO etc)
Capacity	**Societal**	1	National Knowledge Leadership (F16)
		2	National Population Density
		3	National Population Growth Rate
		4	National GDP Per Capita
		5	National Annual Growth Rate of GDP
		6	National Unemployment Rate
		7	National Proportion of Population Urbanized
		8	Local Population Size (F2)
		9	Local Population Density (F1)
	Governance	10	Voice and accountability
		11	Political Stability
		12	Government Effectiveness
		13	Regulatory Quality
		14	Rule of Law
		15	Control of Corruption
		16	National number of Ministries (F32)
		17	National number of consultees (F15)
		18	National consultation of NGOs (F17)
		19	Number of guidance publications (F29)
		20	Local digital enablement index (F33)
		21	Data accessibility Index (F30)
		22	Data quality Index (F30)
		23	Proportion of species with unknown status (SEBI-3)
		24	Proportion of habitats with unknown status (SEBI-5)
	Ecological	25	Country area
		26	National land cover by artificial surfaces (%, CORINE 1)
		27	National land cover by agricultural areas (%, CORINE 2)
		28	National land cover by forest (%, CORINE 31)
		29	National land cover by other semi-natural areas (%, CORINE 32+33)
		30	National surface covered by wetlands (%, CORINE 4)
		31	National surface covered by water bodies (%, CORINE 5)
Priority	**Social**	32	Local social considerations index (F34)
	Economic	33	Local economic considerations index (F34)
	Environmental	34	Local environmental considerations index (F34)
		35	Proportion of country surface in protected areas
		36	Proportion of country surface in SPA
		37	Proportion of country surface in SCI
		38	Local data demand for ecosystem biodiversity and supporting services (F14b)
	Socio-economic	39	Local data demand for ecosystem provisioning, regulating and cultural services (F14b)
Process	**Social**	40	Local responsibility for informal decisions (F7)
		41	Consultation intensity index (F35)
		42	NGO consultation index (F36)
		43	NGO influence index (F38)
		44	Private versus public responsibility for EIA monitoring (F19)
	Economic	45	Local disempowerment index (F6)
		46	Private versus public responsibility for paying EIA monitoring (F20)
		47	Data availability index (F14a)
	Regulatory	48	National number of assessments (T2)
		49	National assessment regulatory intensity (F18)
		50	National Agri-Environment Schemes index (F25-28)
Impact	**Societal**	51	Wildlife positivity index (F39)
		52	Ecosystem use/protection index (F40)
		53	Natura 2000 Sufficiency Index (SEBI-8)
		54	Public Awareness of Biodiversity (SEBI-26)
		55	Public concern over biodiversity loss
	Economic	56	Number of hunters (GEMCONBIO+)
		57	Number of anglers (GEMCONBIO+)
	Ecological	58	Urban sprawl rate inside Natura 2000 (CORINE+)
		59	Urban sprawl rate outside Natura 2000 (CORINE+)
		60	Urban sprawl for whole country (CORINE+)
		61	Semi-natural loss rate for whole country (CORINE+)
		62	Number of invasive species (SEBI-10)
		63	Farmland bird index (SEBI-1a)
		64	Species favourable conservation status index (SEBI-3)
		65	Habitats favourable conservation status index (SEBI-5)

A1.1 Capacity variables

A1.1.1 Capacity variables: Societal

Variable Type/Category		ID	Variable (source in D5.1 as "Fx", SEBI, CORINE, GEMCONBIO etc)
Capacity	Societal	1	National Knowledge Leadership (F16)
		2	National Population Density
		3	National Population Growth Rate
		4	National GDP Per Capita
		5	National Annual Growth Rate of GDP
		6	National Unemployment Rate
		7	National Proportion of Population Urbanized
		8	Local Population Size (F2)
		9	Local Population Density (F1)

ID	Source	Name	Rationale	Description
1	F16	National Knowledge Leadership	Consultation upwards for EIA plus SEA	This variable came from responses to the national level questionnaire. Specifically from responses to Q 4 and 9. As regards SEA (Q4) if they did not report referring to institutions at the European level they were scored 0, if they did they were scored 2. In terms of EIA (Q9), they were scored 1 if there was written guidance and 1 if they were expected to ask higher level for guidance in specific circumstances. The codes from the EIA responses were summed and added to the value for the SEA. The highest score possible was 4, the lowest 0.
2	UN	National Population Density	UN data for 2010	http://esa.un.org/unpp/
3	UN	National Population Growth Rate	UN data for 2005-2010	http://esa.un.org/unpp/
4	World Bank	National GDP per capita	World Bank data for 2005	http://data.worldbank.org/indicator/NY.GDP.PCAP.KD
5	World Bank	National Annual Growth Rate of GDP	World Bank data for 1997-2007	http://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG
6	World Bank	National Rate of Unemployment	World Bank data for 2006	http://data.worldbank.org/indicator/SL.UEM.TOTL.ZS
7	World Bank	National Proportion of Population Urbanized	World Bank data for 2005	Urban population as defined by national statistical offices, calculated using World Bank population estimates and urban ratios from the United Nations World Urbanization Prospects http://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS
8	F2	Local Population Size	Population in local (LAU2) administration	This variable is the average population in the 25 randomly selected LAU2s.
9	F1	Local Population Density	Rural LAU2 population density	This variable is the average population density per km^2 in the 25 randomly selected LAU2s.

A1.1.2 Capacity variables: Governance

Variable Type/Category		ID	Variable (source in D5.1 as "Fx", SEBI, CORINE, GEMCONBIO etc)
Capacity	**Governance**	10	Voice and accountability
		11	Political Stability
		12	Government Effectiveness
		13	Regulatory Quality
		14	Rule of Law
		15	Control of Corruption
		16	National number of Ministries (F32)
		17	National number of consultees (F15)
		18	National consultation of NGOs (F17)
		19	Number of guidance publications (F29)
		20	Local digital enablement index (F33)
		21	Data accessibility Index (F30)
		22	Data quality Index (F30)
		23	Proportion of species with unknown status (SEBI-3)
		24	Proportion of habitats with unknown status (SEBI-5)

ID	Source	Name	Rationale	Description
10	World Bank	Voice and accountability	All are given as percentile scores	Kaufmann-Kraay-Mastruzzi (KKM) Worldwide Governance Indicators have been computed by World Bank since 1996 as six key dimensions of governance. A convenient source is http://en.wikipedia.org/wiki/Worldwide_Governance_Indicators
11		Political Stability		
12		Government Effectiveness		
13		Regulatory Quality		
14		Rule of Law		
15		Control of Corruption		
16	F32	National number of Ministries	Number of ministries making environmental decisions	This variable is the number of ministries listed on the "Government responsibilities" page of the national level questionnaire.
17	F15	National number of consultees	Number of official consultees for EIA	This variable was taken from the information returned on the "Government responsibilities" page where the respondents were asked to give the names of the designated mandatory consultees under Art 6.1 of EIA Directive and Art 6.3 of SEA Directive that are to be consulted by those who carry out the appropriate environmental assessment. In this case we restricted the responses to reflect the LEGAL standpoint, not what might happen in some cases.
18	F17	National consultation of NGOs	Number of other consultees	This variable was compiled from responses to Q11 in the National level questionnaire. It was simply a count of the number of NGOs that frequently comment on proposals where EIAs are required.
19	F29	Number of Guidance publications	Number of guidance publications	This variable was compiled from responses to Q16(a & b) on the national questionnaire, where respondents were asked to give examples of publications of formal and practical guidance conservation for authorities making decisions on cases requiring SEAs/EIAs/LUP.
20	F33	Local digital enablement index	Data occasional, systematic, GPS-based	This variable comes from the responses to 3a & b in the local questionnaire. A local LAU2 scored two points if they used and could name a GIS and one point if they used a GIS but could not name it in 3a. This was added to responses in 3b where they scored 3 if they took part in a scientific study of species or habitats, regardless of other responses for this question, 2 if they kept records from systematic survey or 1 if they kept occasional records. The maximum any LAU2 could score was 5. For each country we took an average of the responses from the LAU2s surveyed.

21	F30	Data accessibility Index	Data accessibility	This variable was compiled from responses to Q19a-d in the national questionnaire. Respondents were scored as: 2 each for a “yes”, 1 for a “some” and zero for “no” to Q19a, and b, while for Q19c & d, they were scored 2 for a “no”, 1 for a “some” and 0 for a “yes”. These responses were summed, with a maximum available of 8.
22	F30	Data Quality Index	Data quality sum of positives	This variable was compiled from responses to Q19e-j in the national questionnaire. Respondents were scored as: 2each for a “yes”, 1 for a “some” and zero for “no”. These responses were summed, with a maximum available of 12.
23	SEBI-3	Proportion of species with unknown status	% of species having unknown status.	Percentage of species (Habitats Directive) assessed by member states as having Unknown status. Species in each country are assessed per biogeographical region. Marine species not included. (http://www.eea.europa.eu/data-and-maps/data/article-17-database-habitats-directive-92-43-eec)
24	SEBI-5	Proportion of habitats with unknown status	% of habitats having unknown status.	Percentage of habitats (Habitats Directive) assessed by member states as having Unknown status. Habitats in each country are assessed per biogeographical region. (http://www.eea.europa.eu/data-and-maps/data/article-17-database-habitats-directive-92-43-eec)

A1.1.3 Capacity variables: Ecological

Variable Type/Category		ID	Variable (source in D5.1 as "Fx", SEBI, CORINE, GEMCONBIO etc)
	Ecological	25	Country area
		26	National land cover by artificial surfaces (%, CORINE 1)
		27	National land cover by agricultural areas (%, CORINE 2)
		28	National land cover by forest (%, CORINE 31)
		29	National land cover by other semi-natural areas (%, CORINE 32+33)
		30	National surface covered by wetlands (%, CORINE 4)
		31	National surface covered by water bodies (%, CORINE 5)

ID	Source	Name	Rationale	Description
25	World Bank	Country area		http://data.worldbank.org/indicator/AG.SRF.TOTL.K2
26	CORINE	National land cover by artificial surfaces (%)	Standard habitats from remote-sensed data 1990-2000-2006	Computed in a GIS from Corine Land Cover maps available at http://www.eea.europa.eu/data-and-maps . CLC Category 1 (Level 1)
27	CORINE	National land cover by agricultural areas (%)		Computed in a GIS from Corine Land Cover maps available at http://www.eea.europa.eu/data-and-maps . CLC Category 2 (Level 1)
28	CORINE	National land cover by forest (%)		Computed in a GIS from Corine Land Cover maps available at http://www.eea.europa.eu/data-and-maps . CLC Category 31 (Level 2)
29	CORINE	National land cover by semi-natural areas (%)		Computed in a GIS from Corine Land Cover maps available at http://www.eea.europa.eu/data-and-maps . CLC Category 32+33 (Level 2)
30	CORINE	National land cover by wetlands (%)		Computed in a GIS from Corine Land Cover maps available at http://www.eea.europa.eu/data-and-maps . CLC Category 4 (Level 1)
31	CORINE	National land cover by water bodies (%)		Computed in a GIS from Corine Land Cover maps available at http://www.eea.europa.eu/data-and-maps . CLC Category 5 (Level 1)

A1.2 Priority variables

Variable Type/Category		ID	Variable (source in D5.1 as "Fx", SEBI, CORINE, GEMCONBIO etc)
Priority	Social	32	Local social considerations index (F34)
	Economic	33	Local economic considerations index (F34)
	Environmental	34	Local environmental considerations index (F34)
		35	Proportion of country surface in protected areas
		36	Proportion of country surface in SPA
		37	Proportion of country surface in SCI
		38	Local data demand for ecosystem biodiversity and supporting services (F14b)
	Socio-economic	39	Local data demand for ecosystem provisioning, regulating and cultural services (F14b)

ID	Source	Name	Rationale	Description
32	F34	Local social considerations index	Social considerations	These variables come from the responses to Q1o. in the local questionnaire. The local authorities were asked to estimate the proportion of their time was spent assessing either: the social, the economic, or the environmental aspects when making statutory decisions on land use (SEA, EAI, LUP). They were asked to do this individually for all sizes of decisions – in actuality most of the respondents made the same response for all sized areas but the averages across all sizes of decisions were used if there was a response across the size ranges. Within a country the average response of the LAU2s was used.
33	F34	Local economic considerations index	Economic considerations	
34	F34	Local environmental considerations index	Environmental considerations	
35	UN	Proportion of country surface in protected areas	Interest in habitat protection	UN data for 2008, obtained from http://data.worldbank.org/indicator/ER.LND.PTLD.TR.ZS
36	EC	Proportion of country surface in SPA		% of Total National Area within Terrestrial SPA http://ec.europa.eu/environment/nature/natura2000/barometer/docs/SPA_EU27.pdf
37	EC	Proportion of country surface in SCI		% of Total National Area within Terrestrial SCI http://ec.europa.eu/environment/nature/natura2000/barometer/docs/SPA_EU27.pdf
38	F14b	Local data demand for ecosystem biodiversity and supporting services	Sum for supporting + biodiversity	This variable comes from the responses to Q3d. 1-3 and Q3d.10 – 12 in the local questionnaire. Authorities were given a score of one for each data type that was needed, with a maximum here of 6 if all types of biodiversity and supporting services data were needed, regardless of whether or not it was available. Within a country the average response of the LAU2s was used.
39	F14b	Local data demand for ecosystem provisioning, regulating and cultural services	Sum for provisioning + regulating + cultural	This variable comes from the responses to Q3d. 4-9 and Q3d.13 – 15 in the local questionnaire. Authorities were given a score of one for each data type that was needed, with a maximum here of 9 if all types of biodiversity and supporting services data were needed, regardless of whether or not it was available. Within a country the average response of the LAU2s was used.

A1.3 Process variables

A1.3.1 Process variables: social

Variable Type/Category		ID	Variable (source in D5.1 as "Fx", SEBI, CORINE, GEMCONBIO etc)
Process	Social	40	Local responsibility for informal decisions (F7)
		41	Consultation intensity index (F35)
		42	NGO consultation index (F36)
		43	NGO influence index (F38)
		44	Private versus public responsibility for EIA monitoring (F19)

ID	Source	Name	Rationale	Description
40	F7	Local responsibility for informal decisions	Responsibility_ informal_ decisions	This variable comes from the responses to Q1a-g., yeses were coded as 1and these were summed, with a maximum score of 13 if there was responsibility for all listed matters on private land as well as land owned by the local authority. Within a country the average response of the LAU2s was used.
41	F35	Consultation intensity index	Composite_ consulting intensity	This variable comes from responses to Q1i-m. & Q1q. in the local questionnaire. Responses in Q1i-m. were quantified as: Mandatory or Always as 5, Usually as 4, Often as 3, Occasionally as 2 and Never as 1. Responses to Q1q were ranked as follows: If only one organisation was listed as being consulted then the response was ranked as 1, if more than two were listed but there was variation in the number of times they were consulted per year then the response was ranked 2, if more than 1 organisation was given and they were consulted equally the response was ranked 3. The average of the responses to Q1i-m was calculated and multiplied by the rank for the responses to Q1q. Within a country the average response of the LAU2s was used.
42	F36	NGO consultation index	Ratio of NGO to government consultation	This variable was calculated from the responses to Q1q in the local questionnaire. The number of NGO organisations and the number of government agencies listed were counted, with a ratio calculated of NGO/Government – the higher the value the more consultation with NGOs. Within a country the average response of the LAU2s was used.
43	F38	NGO influence index	Difference of NGO dialogue and influence	This variable was calculated from the responses to Q1j & k in the local questionnaire. Responses were quantified as: Mandatory or Always as 5, Usually as 4, Often as 3, Occasionally as 2 and Never as 1. A For each country we took an average of the responses from the LAU2 surveyed for each question. The average of the score for influence was subtracted from the average of the score for dialogue. Positive values represent more dialogue than influence; negative values represent more influence than dialogue.
44	F19	Private versus public responsibility for EIA monitoring	Private, public, civic index responsibility for EIA monitoring	This variable is taken from responses to Q8e in the national level questionnaire. An index was calculated for who undertook monitoring of a proposal post development, based on the relative responsibility of the government, developers and NGOs (e.g. +3= developer only, +2= developer +consultant, +1= developer +government, 0=developer+government + NGO, -1=government only, -2=government+ NGO, -3 = NGO only).

A1.3.2 Process variables: economic and regulatory

Variable Type/Category		ID	Variable (source in D5.1 as "Fx", SEBI, CORINE, GEMCONBIO etc)
Process	Economic	45	Local disempowerment index (F6)
		46	Private versus public responsibility for paying EIA monitoring (F20)
		47	Data availability index (F14a)
	Regulatory	48	National number of assessments (T2)
		49	National assessment regulatory intensity (F18)
		50	National Agri-Environment Schemes index (F25-28)

ID	Source	Name	Rationale	Description
45	F6	Local empowerment index	Sum of LAU2 responsibility scores for assessments	This variable is from responses to the national questionnaire in Q1, Q6, Q14 on the level where decisions on assessments are made for (SEA, EIA, LUP) and LAU2 answers to Q1p. Responses were coded: 2 where national indicated that LAU2 (municipalities) are responsible and LAU2s indicate decisions, or LAU2s record much decision-making consistently; 1 where national didn't indicate LAU2 responsibility but consultation, or a few decisions were recorded by some LAU2s; 0 where national did not indicate LAU2 responsibility and no LAU2 decisions were recorded. The responses for all 3 questions were summed and the total divided by the number of responses times 2. The higher the proportion, the more power the local government had over decisions.
46	F20	Private versus public responsibility for paying EIA monitoring	Private, public payment index	This variable is taken from responses to Q8d in the national level questionnaire. An index of relative responsibility of developer and government for payment (e.g. +1=developer alone, 0=developer+government, -1=government alone) was calculated.
47	F14a	Data availability index	ratio_of_ data_ needed_ that_ were_availabl e_to_that_ unavailable	This variable was calculated from responses to Q3d.1-15 in the local level questionnaire. For those data that were reported as "needed" by the local authorities we summed up the number that respondents indicated they could access "all" or "most" of this data (considered available) and also summed up the number where they reported only "some" or "none" of the data could be accessed (unavailable). We divided the number available by the number unavailable for each LAU2 surveyed. Within a country the average response of the LAU2s was used.
48	T2	National number of assessments	SEA_EIA_ MATRIX_ STATISTIC	This variable comes from information gathered in the national questionnaire. If both the number of SEAs and EIAs are known, we took an average; if only one was known we used that figure. ***NB we extrapolated from LAU2s surveyed in Italy and Poland***.
49	F18	National assessment regulatory intensity	sum of codes: alternatives, mitigation, monitoring	This variable is taken from responses to Q8a,b & c in the national level questionnaire. Responses to these three questions regarding mitigation, alternative approaches and monitoring were categorised into voluntary – no mandatory responses – coded as 0, Sometimes mandatory – only one mandatory response to these questions – coded as 1, Sometimes Mostly mandatory – two of the three responses were mandatory or yes in the instance of monitoring undertaken, Mandatory – all of the responses were mandatory or yes.
50	F25-28	National Agri-environment Schemes index	Sum AES: designation, map, baseline, monitoring	This variable is taken from responses to Q23, 27, 25a & d in the national level questionnaire. Values were coded from Q23: 0 if funds only available on Natura 2000 lands, 1 if available there and other designated land, 2 if available everywhere provided certain conditions are met. Values were coded from Q27 as: No map required = 0, map but not allowed to be digital = 1, map and can be digital = 2. Values were coded from Q25a as: no requirement for prior information = 1, requirement for prior information = 2. Values were coded for Q25d as: No monitoring of compliance with agri-environment option implementation = 0, monitoring of compliance only but not environmental outcomes = 1, monitoring of both compliance and environmental outcomes = 2. Codes for each country were summed to give a value out of a possible 8.

A1.4 Impact variables

A1.4.1 Impact variables: societal and economic

Variable Type/Category		ID	Variable (source in D5.1 as "Fx", SEBI, CORINE, GEMCONBIO etc)
Impact	**Societal**	51	Wildlife positivity index (F39)
		52	Ecosystem use/protection index (F40)
		53	Natura 2000 Sufficiency Index (SEBI-8)
		54	Public Awareness of Biodiversity (SEBI-26)
		55	Public concern over biodiversity loss
	Economic	56	Number of hunters (GEMCONBIO+)
		57	Number of anglers (GEMCONBIO+)

ID	Source	Name	Rationale	Description
51	F39	Wildlife positivity index	ratio of benefits to costs from biodiversity	This variable attempts to describe the attitudes of local authorities to the people that manage land and species. It is taken from responses to Q2.k-o and Q2. q-t. Responses for Q2.k-o were coded as from 5 = "Highly" valued to 1 for "Not at all" valued. Responses for Q2.k-o were coded as from 5 = "A lot" of cost to 1 for costing "Not at all". A ratio was calculated of the benefits to the costs and within a country the average response of the LAU2s was used.
52	F40	Ecosystem use/protection index	Cons land ratio others conservation benefits from activities	This variable attempts to describe the attitudes of local authorities to the people that manage land and species. It is taken from responses to Q2.a-j. Responses were coded as 1 = never, 2 = occasionally, 3 = often, 4 = usually and 5 = always. The sum of these for consumptive stakeholders (collectors of snails, fungi etc., fishing and hunting) and landuse stakeholders (farming and forestry) was divided by the value for other stakeholders (bird feeders, walkers etc., horse riders, wildlife excursion participants and gardeners) to give a ratio of conservation benefits between the two types of stakeholders. Higher values indicated that consumptive and landuse stakeholders were considered by the local authorities to undertake conservation work than other stakeholders. Within a country the average response of the LAU2s was used.
53	SEBI-8	Natura 2000 Sufficiency Index	Implementation efficacy	State of progress by Member States in reaching sufficiency for the Habitat Directive Annex I habitats and Annex II species http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsien160
54	SEBI-26	Public Awareness of Biodiversity	Public awareness	From Gallup Organization (2007). Flash Eurobarometer Series #219. Attitudes of Europeans towards the issue of biodiversity (http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsien170): Percentage of population knowing the meaning of the term biodiversity (% I've heard of it and I know what it means + % I've heard of it but I do not know what it means)
55	Gallup	Public concern over biodiversity loss		From same survey as (53): Percentage of population answering that loss of biodiversity in their country was a very serious + a fairly serious problem
56	GEM-CON-BIO	Number of hunters	Typically, counts of licences	Data on EU27 in GEMCONBIO were collected from national NGOs, checked against databases held by federations at European level (FACE, EAA) and completed by country coordinators for the four countries outside the EU.
57	GEM-CON-BIO	Number of anglers		

A1.4.1 Impact variables: ecological

Variable Type/Category		ID	Variable (source in D5.1 as "Fx", SEBI, CORINE, GEMCONBIO etc)
Impact	**Ecological**	58	Urban sprawl rate inside Natura 2000 (CORINE+)
		59	Urban sprawl rate outside Natura 2000 (CORINE+)
		60	Urban sprawl for whole country (CORINE+)
		61	Semi-natural loss rate for whole country (CORINE+)
		62	Number of invasive species (SEBI-10)
		63	Farmland bird index (SEBI-1a)
		64	Species favourable conservation status index (SEBI-3)
		65	Habitats favourable conservation status index (SEBI-5)

ID	Source	Name	Rationale	Description
58	CORINE	Artificialisation rate inside Natura 2000	`Standard habitats from remote-sensed data 1990-2000-2006	Computed in a GIS from Corine Land Cover maps available at http://www.eea.europa.eu/data-and-maps . CLC Category 2 (Level 1)
59	CORINE	Artificialisation rate outside Natura 2000		
60	CORINE	Artificialisation rate for whole country		
61	CORINE	Semi-natural loss rate for whole country		Computed in a GIS from Corine Land Cover maps available at http://www.eea.europa.eu/data-and-maps . CLC Category 32+33 (Level 3)
62	SEBI-10	Number of invasive species	Invasives indicate lack of care	Number, in each country, of the listed 'worst' terrestrial and freshwater invasive alien species threatening biodiversity in Europe. Only index available for all survey countries.
63	SEBI-1a	Farmland bird index	Composite population trend indicator	Slope of linear trend of Farmland bird index vs. Year (countries with > 3 years; Dates 2000-2007) from Eurostats: (http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsien170)
64	SEBI-3	Species favourable conservation status index	% of species having favourable status.	Percentage of species (Habitats Directive) assessed by member states as having Favourable status. Species in each country are assessed per biogeographical region. Marine species not included. Computation of % Favourable excludes species with unknown status (http://www.eea.europa.eu/data-and-maps/data/article-17-database-habitats-directive-92-43-eec)
65	SEBI-5	Habitats favourable conservation status index	% of habitats having favourable status.	Percentage of habitats (Habitats Directive) assessed by member states as having Favourable status. Habitats in each country are assessed per biogeographical region. Computation of % Favourable excludes habitats with unknown status (http://www.eea.europa.eu/data-and-maps/data/article-17-database-habitats-directive-92-43-eec)