The use of Ecological Footprint and Biocapacity Analyses as Sustainability Indicators for Sub-national Geographical Areas: A Recommended Way Forward

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Definition of Terms

In this report we use the following terminology and abbreviations:

FoN – The Footprint of Nations study and methodology used to calculate the footprints and biocapacities of 52 Nations as described in Wackernagel et al (1999) and Chambers, Simmons and Wackernagel (2000). These studies are based on 1993 consumption data. The calculation spreadsheet can be downloaded from www.rprogress.org.

LPR – The updated methodology used to calculate the footprints and biocapacities of 152 Nations for the 'Living Planet Report 2000' published by WWF International. These calculations were undertaken by Mathis Wackernagel et al. The full calculation spreadsheet can be downloaded from www.rprogress.org. These calculations are based on 1996 data. There is a current commitment from WWF to update this report every two years – the next report being produced in time for the World Summit on Sustainable Development (Rio +10) in 2002.

SGA – Sub-national geographical area. Any geographically defined area which is smaller than the Nation state. For example, a county, municipality, watershed or city. This term has been introduced to overcome the problem of defining the area of investigation (what constitutes a City?) and the differences between political and administrative structures across the Nation states of Europe.

Description of Ecological Footprint and Biocapacity

The **ecological footprint** (EF) measures how much bioproductive area (whether land or water) a population would require to sustainably produce all the resources it consumes and to absorb the waste it generates, using prevailing technology. It therefore indicates the demand for resources.

Because of market mechanisms these areas can be anywhere in the world and the footprint is an aggregate of many plots of varying quality and size located in different climates.

The **biocapacity** (BC) measures the bioproductive supply, i.e. the biological production in an area. It is an aggregate of the production of various ecosystems within the area, e.g. arable, pasture, forest, productive sea. Some of it is built or degraded land. Biocapacity is dependent not only on natural conditions but also on prevailing farming/forestry practices.

Ecological footprints and biocapacities are usually presented together. In the FoN and LPR they are both expressed in the same area units – hectares of world average bioproductive space. Meaningful aggregation of areas of different quality is only possible where such normalisation occurs.

The EF (as measured using global average yields) is normalised by applying **equivalence factors** – these are multipliers which adjust different land and sea types according to their relative bioproductivity.

When calculating the biocapacity of an area, the land types and sea space available are normalised to world average equivalents using locally derived **yield factors**. These are multipliers which express the extent to which local bioproductivity is more or less that of the world average for that land or sea type.

EF's and BC's have been used to indicate:

1. The extent of human demands on scarce global, national, regional etc. bioproductivity.
2. Whether the average per capita consumption is sustainable and equitable when compared with the global average available biocapacity.
3. The potential for Countries/SGA's to live within the biocapacity available within their own boundaries.

Various secondary analyses have also been undertaken comparing, for example, National ecological footprints with economic performance (Sturm et al 2000; Chambers et al 2000), indicators of welfare and social deprivation indices (Lewis 1997).

Further reading

For those interested in understanding EF and BC concepts in more details the authors have prepared 2 background papers:

- More about Ecological Footprint Analysis
- Critiques of Ecological Footprints and Biocapacity Analysis

Both papers are attached as Annex 1.

Description of criteria

We present here a set of criteria to try to understand the key differences between the applications of the EF concept within the EU. In this way we hope to move forward with a common, agreed method of analysis.

These criteria are then applied to the main National studies presented at the Rome Workshop. The results of this evaluation are shown in Table 1.

Criterion 1: 'Geographical' or 'Responsibility' Principle

A fundamental question is whether the aim of the study is to footprint the SGA or the consumption of the population (the community) within that SGA. The two can give very different answers. As an example let us imagine that a small region has an airport within it. Do we include the full impact of this airport as part of the footprint or estimate only that part of the impact that is attributable to the population within the region? The first approach has been termed the 'geographical principle', the latter the 'responsibility principle' (see 'European Common Indicators Methodology Sheet No. A2').

Criterion 2: Use of global versus local yields

Whether the yields used for agricultural and forest products are based on local (SGA), national or global average yields.

Studies are generally split into those that try to calculate the footprint based on 'actual' yields[1] (Italy), those that use global average yields (Sweden, FoN, LPR) and those that do both calculations (UK, Holland).

If the consumption is expressed in actual yields then the results cannot easily be compared with other countries/regions and no assessment of global sustainability can be made. This is because the results are not expressed in world average bioproductive area.

However, using actual yields does provide useful information for regional sustainability planning and gives a clearer picture of the actual productive area appropriated and the location of that area around the globe. But it is recognised that to obtain information on local yields for all imported products is extremely difficult.

Criterion 3: Use of equivalence factors

A description of whether different land types are adjusted for their differing bioproductivities when determining the footprint.

If equivalence factors are not used then the consumption of different land types cannot meaningfully be aggregated into a footprint and the result is not easily comparable across regions as the hectares have not been standardised to world average bioproductive space (or 'area units' as they are referred to in LPR).

Criterion 4: Use of a component versus compound model

A description of whether the footprint results are presented broken down into policy-relevant components (housing, travel and so on) or not.

Many studies fall in between 'pure' compound (e.g. FoN/Sweden) and component approaches (e.g. UK/Holland) as they do break down consumption into some activity components.

Criterion 5: Extent to which local, as opposed to national, consumption data has been used

Some studies have found regional data difficult, or impossible, to obtain and have been forced to resort to using National data adjusted for local population size.

This obviously has implications for the preparation of accurate regional footprints. Ideally, all data should be available collected uniquely for the study region but such an approach is difficult to standardise.

[1] *The yields where the products are grown – or a best estimate of these.*

Criterion 6: Extensions to basic footprint accounting

This criterion indicates whether the study has gone beyond the FoN methodology and sought to account for a wider range of impacts.

Criterion 7: Omissions from basic footprint accounting

This criterion indicates whether the study has fallen short of FoN methodology and sought to account for fewer impacts or land types.

Criterion 8: Data sources

A description of whether data sources are International, National or SGA.

Europe-wide or International data sources are to be preferred as these could be used to apply the EF method in different countries using a consistent collection method.

Criterion 9: Means of dealing with Nuclear Power

How the controversial issue of nuclear power is dealt with.

Most studies treat nuclear power as fossil fuels to 'compensate' for the problems inherent in risk-based calculations.

Criterion 10: Embodied energy estimates used for calculating manufactured/processed products

Whether, or not, local, national or global estimates have been used to calculate the embodied energy in manufactured, process products.

Criteria 11: How Built Land is accounted

In the FoN study built land is accounted as having the same bioproductivity as arable land. Some studies, however, treat built land as having average bioproductivity.

Criteria 12: How biodiversity is accounted

Biodiversity has been variously accounted for as both a discount from supply (available biocapacity) and as a percentage responsibility of the footprint (LPR). Some studies do not refer to biodiversity at all.

Criteria 13: How CO2 sequestration is accounted

As CO2 is a global pollutant, most studies use the global average sequestration rate reported in FoN.

Criteria 14: Whether biocapacity is considered

Whether, or not, the study includes a calculation of biocapacity. Without such a calculation it is difficult to assess the sustainability of the SGA.

Comparison of Studies based on Criteria

Table 1 describes Italian, Dutch, Swedish, Finnish, Spanish, Norwegian and UK methodological approaches based on the criteria described above. Where information is not known or unclear the relevant cell is marked with a question mark.

Table 1: Comparison of studies on 14 criteria.

	Studies *(and SGAs)*						
Criteria	**Italy** ***(Turin)***	**Netherlands** ***(various)***	**Sweden** ***(various)***	**Finland** ***(various)***	**Spain** ***(Navarre/Tudela)***	**Norway** ***(Stavanger)***	**UK** ***(various)***
1: Geographical or Responsibility principle	Responsibility	Responsibility?	Responsibility	Responsibility	Responsibility	Responsibility	Responsibility
2: Use of global versus local yields	Uses estimated actual yields (a mix of local, national and global according to origin).	Does calculations with both local and global yields.	Global	Does calculations with both estimated actual yields (a mix of regional, national and global according to origin) and global only. The former seems to be preferred.	Uses local yields except for 'imports'.	Local yields for agricultural products.	Does calculations with both local and global yields.
3: Use of equivalence factors	Equivalence factors used.	Only use equivalence factors when dealing with global yields. Global yields preferred.	Equivalence factors used.	Only use equivalence factors when dealing with global yields. Not preferred method.	Equivalence factors used.	?	Equivalence factors used.
4: Use of a component versus compound model	5 main components	22 components	Compound	5 components	4 components	5 components	25 main components
5: Extent to	A mix of local and	Mostly local –	All National	Food, commodities	Local consumption	National data for	All local data

which local consumption data has been used	adapted National data.	except energy data? Based on profiling by income group.	consumption data.	and transport (except road traffic) are National. The rest local.	data where available	food and commodities. Mix of Local/National data for housing, services and transport.	except air travel (estimated from a larger region)
6: Extensions to basic footprint accounting	Includes Methane from landfill plus several additional product consumption categories. Also includes embodied energy for unprocessed food and wood products.	Uses LCA data – not trade data – to determine consumption. Therefore includes additional life cycle effects?	Some attention to N & P pollution from farming	Treats processed wood products more extensively.	No	No?	Uses LCA data- not trade data - to determine consumption. Therefore includes additional life cycle effects.
7: Omissions from basic footprint accounts	None	Sea area excluded?	None	Sea area excluded		Sea area excluded?	None
8: Sources of consumption data	Municipal Land Coordination Plan, ISTAT, Italian Ministry of Industry & Trade, UN Industrial Statistics Yearbook, Ambiente Italia, Provincial Observatory on Waste	Dutch Central Bureau of Statistics, RIVM, Survey?	FAO	Various Finnish sources.	Institute of Statistics of Navarre, Directorate General for Ag, Livestock and Food, Dept. of Industry and Labour, Dept. of Public Works, Transport and Communications. Office for Territorial Wealth, Energy supply companies, Town Council of Tudela, National Statistics Institute.	?	Over 200 local orgs. including retailers, energy suppliers, passenger and freight transport companies, schools, local Council, waste disposal company, Environment Agency and so on.

9: Means of dealing with Nuclear Power	Treated as fossil fuel	Treated as fossil fuel	Treated as fossil fuel	Given a low footprint of 0.00002 ha-yrs per GJ	Treats as Fossil Fuel?	?	Treats as fossil fuel
10: Embodied energy estimates used for calculating manufactured/processed products	Mix of local, national and global embodied energy figures	?	Global (Hofstetter 1992)	Use global figures (from Hofstetter 1992?) adjusted to reflect lower % of fossil fuels in imported goods except forest products where national energy intensity figures are used	Global (Hofstetter 1992)	?	Based on energy data from a variety of life cycle studies (incl. Hofstetter 1992).
11: Built land accounting	Treated as arable land - adjusted with equivalence factor?	Treated as arable land	Treated as arable land?	Not adjusted with equivalence factor	No equivalence factor applied.	?	Uses arable land yield factor.
12: Biodiversity accounting	12% deducted from biocapacity	Not included?	12% deducted from biocapacity	12% is referred to but not used.	Not included	Not included?	12% deducted from biocapacity
13: CO2 sequestration	As FoN	As FoN?	As FoN	Uses local sequestration value	Uses local sequestration value	?	Uses FoN figure for CO2 sequestration
14: Whether biocapacity is considered	Yes	No?	Yes	Yes	No?	Yes?	Yes
Other Comments	Calculations complex.	Main methodology reports in Dutch only. Key calculations are confidential. Seems similar to UK approach.	Study which most closely follows FoN methodology.		Developed 2 consumption scenarios.	Only summary paper available.	Component approach has been developed as complementary approach to FoN nat. accounting. Describes several scenarios.

Summary of main themes

Examination of the EU footprint studies has highlighted some key points:

- The methods used for calculation of SGA footprints vary greatly to the extent that it is not easy to compare one SGA with another. This is due in part to the use of different data sources (cf. Sweden) and in part from the use of different methodologies (for example Finland and Italy).
- A fundamental difference between studies is the use of estimated 'actual' versus global average yields for primary production. Some partners that have chosen to use 'actual' yields have also tried to modify embodied energy estimates for manufactured products to better reflect production at the place of origin. Few partner have tried, or succeeded, in obtaining 'actual' yields for imported products due to the effort and complexity of calculating these. Thus most partners using local yields have, in fact, ended up using global yields for imported products.
- Differences in the treatment of nuclear power, built land and CO2 sequestration have also affected footprint results.
- A few studies have gone beyond basic footprint accounting and included additional consumption/waste categories. The only obvious omission was the exclusion of sea footprints.
- Most studies are based on local investigations. These have been time-consuming and resulted in a variety of data collection approaches. Many partners have had difficulties in finding local data. It is rare that accurate and reliable local consumption data is available. Furthermore, where such data does exist it is not always collected with sufficient frequency to permit the monitoring of future progress. Of course, such data problems are not unique to footprint analysis but are common to all data-intensive methods of environmental research.
- The lack of SGA data has forced most partners to fall-back on proxy National data. This tends to mask differences between regions and make it difficult to draw conclusions about SGA-specific consumption patterns. Another view is that the differences between SGA's within a single Country are small (as is suggested in the Dutch and Swedish studies). It is likely that other factors, such as income, are a more accurate indicator of consumption in some cases than place of residence.
- Components have been used to better categorise the consumption associated with certain activities/services but few studies have then used this information to develop scenarios or suggest ways forward. More information about the Component method for calculating footprints is provided below.
- Surprisingly few studies have even undertaken biocapacity calculations to determine whether consumption is greater than the available local or global supply.
- Similarly, few studies have mentioned biodiversity.

The Compound and Component Methods

Confusion exists about the similarities and differences between the compound and component approaches to calculating ecological footprints (see Simmons et al 2000; Ecological Economics, 32, 375-380; and Chambers et al 2000 for further information on these two approaches).

The main distinction between them is they draw upon different data sources to estimate appropriated biocapacity. The compound method estimates consumption based on national trade statistics and energy budgets (a 'top down' approach). This methodology is used in the FoN/LPR studies. The component method estimates consumption through analyses of material flows and activity components (a 'bottom-up' approach). This methodology was originated in the UK by Best Foot Forward, a similar approach has been taken in the Dutch studies. The main sources of data for the component method are local investigations and life cycle studies. Analysis relies on having access to a significant database of environmental information.

The two methods are similar in other respects. For example, they both express results in world average 'area units'.

The top down, compound approach, using trade statistics, was taken in the Swedish study. National statistics on regional activities was used in order to find major local/regional differences. As the standard of living and ways of life are rather similar over the country no essential differences were found, and the SGA footprint was found through multiplication of the national average footprint with the SGA population. The conclusion for Sweden is that differences between people's footprints are more likely to be related to the level of income than to their place of residence. This may not be true elsewhere.

The component approach is illustrated in the UK Isle of Wight and Guernsey studies (the former is available from www.bestfootforward.com; the latter is reported in Ecological Economics 32, 375-380). The former involved contacting more than 200 organisations and drew heavily on BFF's EcoIndex™ database of product and material life cycle data. BFF also assisted in the detailed study of Guernsey which was undertaken as a PhD project by John Barrett (now at the Stockholm Environment Institute). In the UK differences between geographical regions has been shown by such studies. This is to be expected as the UK has both a larger and less homogenous population than Countries such as Sweden. The advantage of the component approach is that it is more educative and can be easily applied at the organisation and product levels. The disadvantage is that the data sources are more specific to the region/organisation/activity under investigation and that data collection is therefore also more time-consuming. Also, care has to be taken to avoid double-counting of impacts.

The method used by Wackernagel et al (1998) for the investigation of Santiago de Chile and subsequently by Redefining Progress and BFF in the development of their online footprint calculators (see www.rprogress.org and www.ecologicalfootprint.com) combines elements from each approach. Consumption is disaggregated into a few components representing key parts of the footprint which are, in turn, calibrated to reflect 100% of the average per capita consumption. Thus when average per capita national data is used the result is the same as that reported in the appropriate FoN/LPR study. The components used in Santiago and calculators are different - but the principle for calculating the footprint is the same (see Table 2).

Table 2: Components used in Santiago and the online calculators

Santiago de Chile	**RP Calculator (12 questions)**	**BFF Calculator (11 questions)**
Food • vegetarian • animal products • water	Food • type of diet • amount • food waste • food 'miles'	Food • type of diet • food 'miles' and freshness
Housing & furniture	Housing • number of people • house size • electricity source • energy efficiency	Housing • number of people • house size • heating/cooling bills • electricity source • energy efficiency
Transport • road • rail • air • coastal/water-ways	Transport • car mileage • ride sharing • fuel efficiency • air travel	Transport • main travel mode • vacation distance and travel mode
Goods • paper • nonsynthetic clothes • tobacco • others		Waste • volume of waste • recycling habits (Note: waste is used as a proxy for commodities)

Our Initial Recommendations

These intial recommendations represent the views of the authors based on the findings of this study and our own experience of applying and developing ecological footprint and biocapacity analyses. They reflect our initial views of the best way to progress the use of the methodology for indicating the sustainability of EU SGAs.

Recommendation 1. A template method should be developed for measuring ecological footprints and biocapacity. This should be applicable across the EU regardless of the size of a SGA or its population. This method should have the following features:

- It should be based on the responsibility principle. This is consistent with the approach taken by the EU CO2 indicator project (see CO2 Indicator number 2).
- Sustainability assessments should focus on comparisons with global biocapacity although some assessments may also choose to look at comparisons with their own SGA biocapacity, national biocapacity or even EU biocapacity.
- The method should use as a basis the FoN/LPR National footprint and biocapacity calculations. That is, the average per capita footprint should be used to determine the mean SGA footprint. It is felt desirable to make some changes to this method (see 2. below). These should be coordinated with the FoN/LPR authors to avoid a proliferation of different techniques. In addition, the method needs to be applied in a more sector/activity based manner to make it suitable for application at the SGA level (see 3. below). The problem

of inconsistent, unreliable and incomplete local data sources needs to be tackled.

Recommendation 2. There are two reasons to make some small changes to the basic FoN/LPR calculation method. Firstly, to incorporate ideas from other footprint studies and, secondly, to facilitate the calculation of SGA footprints. The changes are itemised here:

- The energy consumption portion of the FoN/ LPR calculations should be subdivided (perhaps based on Eurostat or EEA National data) into key activities areas (e.g. transport, industrial energy, and so on as per Indicator No. 2).
- Embodied energy calculations for raw materials should be included for net trade at national level. Embodied energy for food and wood are currently incomplete and could have a significant effect on certain national footprints.
- Embodied energy calculations for exported produces should reflect the National energy supply mix. It is currently assumed that all energy is fossil fuel.
- The way in which wood products are accounted should be revisited in the light of the Finnish study data.
- By default, the equivalence factor used for built land should be 1 (world average bioproductivity). This would give a more modest footprint result but it would be more widely acceptable.
- Some means of recognising the importance of low intensity agricultural methods for biodiversity and water quality is recommended to enhance this aspect of the footprint calculation This would need further research.

The authors would recommend that the way in which nuclear energy is accounted should stay the same (accounted as fossil fuel). But we recognise that further research is needed to understand the ongoing loss of bioproductivity arising from past nuclear incidents, the actual embodied fossil fuel energy associated with the life cycle of a nuclear installation, and the issue of risk as applied to EF calculations.

Recommendation 3. For use of the FoN/LPR method at the SGA level it needs to be applied in a sector/activity based manner. Thus the mean national footprint must be disaggregated into components which are understood and can be adjusted at the SGA level. A good example is that of the Santiago de Chile study, which can be further elaborated (see Table 2 above). A similar approach was taken in the Swedish study of subnational areas, although disaggregation was found unnecessary because of the small difference between SGAs.

No standard method for doing SGA footprints, based on National calculations, has, however, emerged – but several such projects are in progress (Scotland, Wales and London in the UK alone) which are working towards a standardised approach based on adjustment of the national FoN/LPR figures. The recommended approach is to vary consumption data from the national average by applying the relative differences between statistics on National and SGA consumption (SGA consumption correction factors).

For example, although Scotland has 8.6% of the UK population, statistics show that Scots consume 12% of UK energy. Thus when calculating the footprint of Scotland (a SGA) 12% of the UK's energy 'footprint' should be accounted. In this way data

from National statistical services can (still) be utilised, where it exists, to vary the consumption profile of the FoN/LPR data set to match that of the SGA.

Of course, such an approach requires statistics to be collected and then aggregated in a similar way at both national and SGA levels so that the relative difference can be applied to the FoN/LPR national footprint results. It also requires that any extra statistics collected relate to the consumption categories listed in the FoN/LPR spreadsheets.

The former problem can be addressed by developing a survey (preferably both paper-based and online), drawing on both the UK, Dutch and USA experiences, which can be used for directly or indirectly estimating consumption in key lifestyle areas.

Such changes as are necessary to turn the FoN/LPR calculations into more usable components can be applied ‘post hoc’ on a Country by Country basis without affecting the raw data. For example, using EuroStat data it would be possible to determine how much of the liquid fuel component of the FoN/LPR energy calculation is attributable to different travel modes.

Clearly, further research work is necessary to establish the relationships between FoN/LPR national consumption results and available Europe-wide data sources, and the survey data that would be needed to link these.

Such calculations shall not be allowed to become too tedious and could be automated by the design of a spreadsheet model. The development of such a model is also recommended as a means of making such analyses more accessible to less technical audiences and to ensure the consistency and integrity of the method.

Recommendation 4. As shown by the experience in many countries the footprint is a powerful tool for engaging the general public. Any use of the footprint should be promoted in such a way as to gain most benefit from this.

Recommendation 5. Carefully used, footprinting can also prove an aid to policy-making. A document should be developed which gives clear guidance on the potential uses of EF/BC in this context.

Questions & Answers (Oslo Workshop; August 2001)

The first version of this report (dated 3rd August) was presented to delegates at the Oslo Workshop on Ecological Fooprints held between 23rd and 25th August 2001[2]. The original report contained four questions specifically for discussion in Oslo. These are reproduced below along with the consensus view of the workshop delegates.

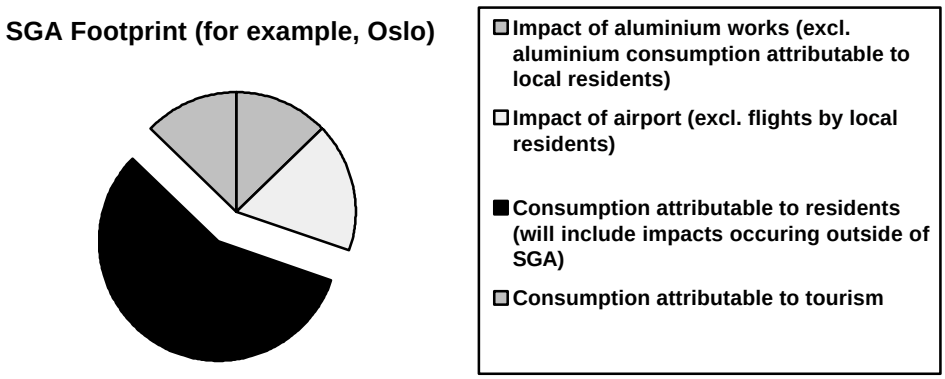
Q1: What do we want to footprint – the economic activity within a geographical area (geographical principle) or the consumption attributable to the residents of the area, whether the impacts occur inside or outside the boundaries of the SGA (responsibility principle)?

Workshop view:

Although this terminology is used elsewhere in the European Common Indicators Programme, it did cause some confusion and resulted in considerable discussion. The consensus view was that the SGA would probably want to measure the environmental impact of all activities within its borders (the geographical principle) but that only that part of the consumption attributable to the residents of the area (the responsibility principle) should be reported as part of the European Common Indicators to ensure comparability across regions. However, the ECIP should support the SGA in fulfilling the geographical principle and, ideally, any spreadsheet tool or guidance produced should cover this aspect of the footprint measurement.

In the course of the discussion several participants presented helpful diagrams to assist in the clarification of what portion of a SGA footprint should be reported to the ECIP. The diagram below shows (Diagram 1) all the impacts that might occur within an example SGA with an aluminium works, airport and significant tourist activity.

Diagram 1: Illustration of what portion of a SGA footprint would be reported as part of the ECIP. Only the black slice of the pie chart would be reported.



Q2: Should the footprint be compared with biocapacity at all, or some, of the SGA, global or EU levels.

Workshop view:

It was recommended that SGA footprints are compared primarily with global biocapacity but that national biocapacity should also be made available.

[2] Co-sponsors: **ProSus** (Program for Research and Documentation for a Sustainable Society, Centre for Development and Documentation for a Sustainable Society, Oslo University), **WNRI** (Western Norway Research Institute, Sogndal), **ENSURE** (European Network for Sustainable Urban and Regional Development, Graz, Austria), **ECIP** European Common Indicators Project, European Commission/Ambiente Italia, Rome

Comparisons with local biocapacity was not recommended, since local supply for big cities are unrealistic. Ethical issues should also be considered. Where can people in over populated areas go? Also people in SGA with surplus biocapacity may feel comfortable and believe they can continue business as before.

This must, however, be considered in relation to the informative and educational value of looking upon the own local biocapacity. This is basic for community sustainable planning. It must also be considered in relation to allocation of biocapacity for biodiversity, which must occur from the local SGA over the nation, EU and the Earth. Most important is the possibility of reducing biocapacity used in farming and forestry for maintenance of biodiversity and ecological services.

In conclusion, the consensus view was that any (tool or) guideline should tell SGA's how to calculate their own biocapacity but that this should not be reported as part of the ECIP.

Q3: Should we use the FoN/LPR methodology as a basis for calculating the EF/BC of SGAs? (i.e. use of the main national footprint with SGA adjustments combined with SGA local BC measurements).

Workshop View:

The FoN/LPR method was generally accepted assuming that some changes and improvements could be incorporated (as set out in this report and Q4 below).

It was the view of the partners that these changes should be undertaken in cooperation with the authors of the FoN/LPR.

Q4: What changes should/could be made to the FoN/LPR methodology – both to improve the accounting and to make it applicable to SGAs. Issues include those highlighted by the present comparisons between EU SGA studies such as how to deal with:

- **embodied energy in traded produce/goods**
- **nuclear energy**
- **biodiversity**
- **built land**

It has become clear to the authors during our discussions that sub-national administrative powers and responsibilities vary enormously from Country to Country. This greatly affects the quality and quantity of SGA data available and the opportunity to influence decision-making. To assist partners in better understanding the situation in other parts of Europe it would be useful for each delegate to the Oslo Meeting to give a basic overview of the situation in their locality.

Workshop view:

Although the participants seemed generally supportive of the initial recommendations of the authors on these points, it was the consensus view that these issues (and other unresolved methodological issues) were best discussed in a smaller experts' group involving those taking part in the planned pilot studies. It was suggested that this meeting takes place as soon as possible (September/October 2001).

Concerns were expressed that this expert group would not be independently resourced but would have to rely on contributions from the pilot project.

Similarly, time to liaise with the authors of the FoN/LPR is not resourced. Agreement with the FoN/LPR authors (probably Mathis Wackernagel and Jonathon Loh) needs to be reached before the end of the year to permit changes to be incorporated into the next FoN/LPR study.

Additional Comments/Decisions Arising from the Workshop.

Variation in administrative powers and responsibilities between SGA's

In the original draft of this report the authors drew attention to the need to discuss the variation in administrative powers and responsibilities from Country to Country. This greatly affects the quality and quantity of SGA data available and the opportunity to influence decision-making. It was recommended that to assist partners in better understanding the situation in other parts of Europe it would be useful for each delegate to the Oslo Conference to give a basic overview of the situation in their locality. This issue was generally acknowledged but little discussion took place.

Problems with obtaining energy data

During the Rome meeting, partners commonly reported problems obtaining energy data due, in part, to the liberalisation of the energy market. Partners wished to see action at the European level to address this. This point was re-iterated at the Oslo Workshop.

Response to Recommendation 1 in the draft report

Recommendation 1 dealt with the need to develop a template method for measuring ecological footprints and biocapacity applicable across the EU regardless of the size of a SGA or its population. It was recommended that this method should have certain features which were the subject of debate at the Oslo Workshop as part of Questions 1, 2, and 3.

As reported earlier in this document, the authors' recommendations were agreed.

Response to Recommendation 2 in the draft report

Recommendation 2 dealt with changes to the FoN/LPR methodology.

As reported earlier, these recommendations were generally agreed but final decisions were deferred to an experts' meeting.

Response to Recommendation 3 in the draft report

Recommendation 3 set out the preferred methodology in more detail. Again, the general consensus was to defer final decisions on this to the experts' meeting although there was some general agreement at the Oslo Workshop which would form a good basis for these further discussions. These are reported in the section below headed 'Oslo discussions on methodology'.

Response to issues raised in Recommendation 4 of the draft report

Recommendation 4 read:

As shown by the experience in many countries the footprint is a powerful tool for engaging the general public. Any use of the footprint should be promoted in such a way as to gain most benefit from this.

This was generally accepted.

Participants were impressed by the coherent public education campaign in Holland and would like to see this replicated at a Europe-wide level. It was suggested that

this should include an online 'quick scan' type questionnaire which not only estimated an individual's footprint but also acted as a data collection survey tool of the type recommended by the authors.

Craig Simmons agreed to pursue funding for this in collaboration with Anthony van de Ven.

Response to issues raised in Recommendation 5 of the draft report

Recommendation 5 read:

Carefully used, footprinting can also prove an aid to policy-making. A document should be developed which gives clear guidance on the potential uses of EF/BC in this context.

This was generally accepted.

There is currently no resources identified to support the production of such a document but funding could be pursued as part of the more general public education bid identified above.

Oslo Discussions on Methodology

Although it was generally agreed that final decisions on methodology should be deferred to a smaller experts' group, some progress was made on methodology at the Oslo Workshop. Those points, which were generally agreed, are documented below (see also Diagram 2).

Data Sources

As indicated above, **the calculations should be based on international trade analyses and biocapacity calculations** as illustrated in the FoN study and used in the LPR. The spreadsheets for these calculations are available on the net through Redefining Progress (www.rprogress.org) and are supposed to be regularly updated through the WWF International. Next update is in progress to be ready Autumn 2002

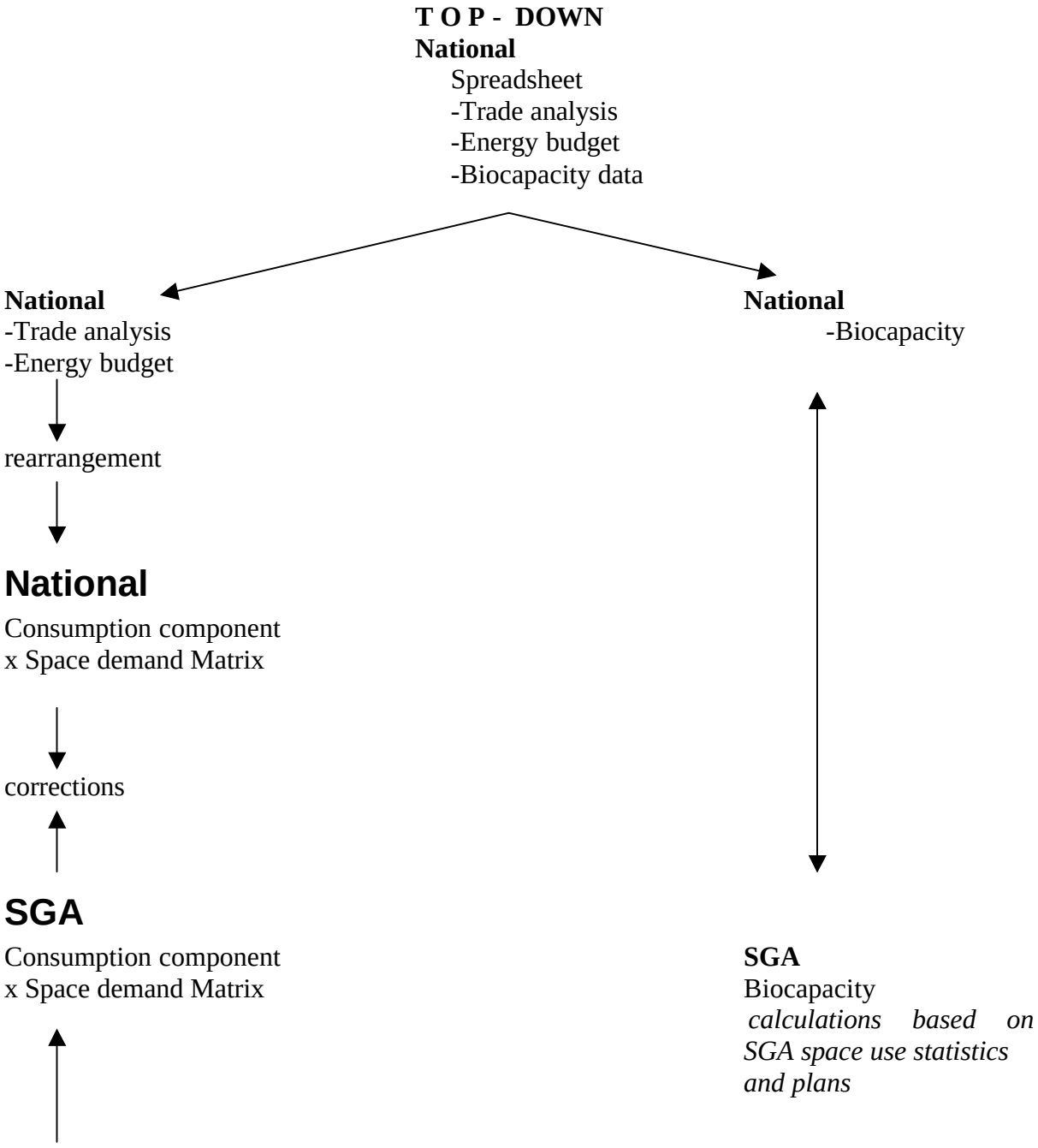
Thus each of the participating countries can get their spreadsheet showing the total consumption of around 120 items grouped into around 7 categories (animal based food products, animal based non-food products, plant based food products, chemical products etc.) The spreadsheet will also include the country's energy budget and the biocapacity. The footprint of each item consumed including the energy land demanded according to the energy budget is expressed in area units (ha world average productive space). The results are aggregated into a mean national ecological footprint.

Europe-wide data sources will need to be identified to permit the re-arrangement of the national spreadsheet components into more sector/activity-based groupings which relate more directly to consumer activities and purchases. Europe-wide data sources should ensure that there is a common methodology. (There should be a Eurostat data shop in each country).

In a second step National statistics, national and local surveys, and other local investigations will play a role in determining the deviation of SGA consumption from the National average (as described in initial recommendation 3).

Though global yields should be used for reporting to the ECIP, to ensure commonality of approach, each country/SGA can recalculate their results in local yields should they so wish.

Diagram 2: First thoughts on how National and Local Statistics might be integrated.



Consumption Component groups

It was agreed that, to keep the methodology and reporting simple, only a limited set of five component footprint values would need to be calculated to derive the European ecological footprint indicator to be reported to ECIP.

Many, if not most, SGA's would also wish to calculate many more footprint components – either as part of the overall calculation process or to assist in policy-making and scenario development. These additional components should form part of a hierarchy linked to the five 'top level' components.

It could be that an SGA would not wish to use ecological footprint analysis for smaller components and the suggested reporting format allows for this flexibility. For example, having identified a large 'housing' footprint, the SGA would be free to use a technique such as the Sustainable Process Indicator (SPI) to further explore the reasons for this and for choice of less demanding technology. Importantly, such a hierarchy of components also allows for the use of more local data sources to investigate smaller impacts where Europe-wide sources/National statistics would provide insufficient resolution.

The five recommended top level components are reported in Table 3 below.

Note: A request to the Swedish Statistics EuroStat Data Shop after the Workshop found that they could, for a fee, reorganise the Trade consumption data into Consumption Component groups. A pilot study is recommended.

Table 3: Component x Area demand Matrix for five 'top level' components. Calculated per capita (entries with a '?' are likely to be very small)

	Food	Transport (passenger)	Housing	Commodities	Services
Energy	**x**	**x**	**x**	**x**	**X**
Built Land	**X?**	**x**	**x**	**x**	**X**
Arable	**X**			**X**	
Pasture	**X**			**X**	
Forest	**X**		**x**	**X**	
Sea	**x**			**X?**	

Total mean national footprint: ***as before***

Total SGA mean footprint after corrections:

Method of Calculation

The matrix given in Table 3 is first constructed for the average national citizen and then corrected for SGA peculiarities by comparing the difference between national and local consumption. In this way a figure for the average SGA resident can be calculated.

The **method for achieiving this needs further research and documentation** to ensure compatibility of approach throughout Europe.

The most certain **estimation of the biocapacity** can be made at the level of an SGA where there should be information about land use in agriculture, about built areas, areas for roads, deposits and other installations, for water protection, nature

reserves, etc. Only at the local level can information about the management intensity and the yield on such areas be found. It can also be found to what extent biocapacity is set aside for ecosystem services and biodiversity. Thus there may be considerable deviations from the mean national biocapacity per capita and changes can be considered in the planning process.

Use of Survey Tool

A survey tool, such as the Dutch Quick Scan or UK EcoCal (both available as electronic and paper-based questionnaires) can be used both to engage with the public and to collect SGA-specific data. The results can be used to adjust the National average footprint directly or to validate other data sources.

The development of a survey tool, which integrates into a Europe-wide compatible approach, needs further research.

Calculation Spreadsheet

The other main topic of discussion was the means by which the footprint calculations would be performed. It is important that the municipalities can do the calculations themselves.

There was strong support for the development of a simple, easy-to-use computer programme/spreadsheet which goes beyond the basic component calculations to provide more general support and guidance for the calculations.

References

Best Foot Forward (www.bestfootforward.com)
Chambers, N., Simmons, C., Wackernagel, M. 2000 *Sharing Nature's Interest: ecological footprints as an indicator of sustainability*. Earthscan: London.
Holmberg, J., Lundquist, U., Robért, K-H. and Wackernagel, M. 1999. *The ecological footprint from a systems perspective of sustainability*. International Journal of Sustainable Development and World Ecology 6, 17-33.
Lewis, K. 1997. *Ecological Footprint Analysis: an 'average' method for an 'average' world?* BSc. dissertation, University of East Anglia, Unpublished.
Lewan, L. In Swedish, translation will come on internet <www.environ.se/sams>
"Ecological Footprints and Biocapacity, tools for planning and monitoring of sustainable development in an international perspective" Report from the Dept of Housing and Planning & The Swedish EPA, 2000.
Loh, J. 2001. *Personal Communication*. WWF-International, Gland, Switzerland.
Loh, J. et al. 2000. *Living Planet Report*. WWF-International, Gland, Switzerland. http://www.panda.org/
Pearce, D. 2000. *Public Policy And Natural Resources Management: A framework for integrating concepts and methodologies for policy evaluation*. Prepared for DGXI, European Commission. http://europa.eu.int/comm/environment/enveco/studies2.htm - 26
Redefining Progress (www.rprogess.org)
Simmons, C., Lewis, K., Barratt, J., 2000 *Two feet - two approaches* Ecological Economics, 32, 375-380
Van Kooten, G. C. and Bulte, E. 2000. *The Economics of Nature: Managing Biological Assets*, Oxford Blackwell.
Wackernagel, M., Onisto, L., Linares, A.C., Falfán, I.S.L., García, Suárez Guerrero, A.I., Suárez Guerrero. M.G. 1997. *Ecological Footprints of Nations: how much nature do they use? -- how much nature do they have?* Report submitted to Rio+5 Forum.

Wackernagel, M., Onisto, L., Linares, A.C., Falfán, I.S.L., García, Suárez Guerrero, A.I., Suárez Guerrero. M.G. 1999. *National Natural Capital Accounting with the Ecological Footprint Concept.* Ecological Economics (29)3 (1999) pp. 375-390.
Wackernagel, M. 2001. *Using Ecological Footprint Analysis for Problem Formulation, Policy Development and Communication*. Prepared for DGXI, European Commission. http://europa.eu.int/comm/environment/enveco/studies2.htm - 26.
Wackernagel, M. et al . 1998. *The Ecological Footprint of Santiago de Chile*, Local Environment, 3(1) p 7-25. Revised Version June 11, 2001. Redefining Progress, Oakland, CA USA.
Wackernagel, M., Lewan, L., Borgström-Hansson, C. 1999 Evaluating the Use of Natural Capital with the Ecological Footprint. Applications in Sweden and subregions. *Ambio 28/7(1999) 604-612.*