The University of Sydney
Integrated Sustainability Analysis ™

Clarification of the derivation and meaning of figures relating to greenhouse gas emissions in the Balancing Act report on three forestry sectors

27th May 2005

SUMMARY

- *The analytical procedure which gives a high greenhouse emissions intensity (kg CO_2-e /$) for the three forestry sectors is explained. Our nation-wide study has used the established conventions of the National Accounts that are set by UN Standards, and then applied by our own Australian Bureau of Statistics.*
- *We have noted the Forestry sectors' anomaly specifically on pages 65, 69 and 74 in Volume 2 of the report.*
- *To not follow the established conventions of Environmental Accounting would decrease the rigour of our work, and open up the economy-wide numeracy of the Balancing Act report to claims of "issue management".*
- *There are many specific cases throughout the Australian economy which, for example, lead to an under-reporting of more than eight billion dollars of mineral and petroleum royalties which do not appear against the resource sectors that provide them.*
- *Another example is that tobacco excise provides five billion dollars in tax revenue but it produces an estimated seven billion dollars in health problems. This criticism has already been made, ie. that the authors of Balancing Act should use a net figure of minus two billion dollars for the government revenue indicator. This criticism is similar to the emissions and sinks problem. We discuss the issue in the report, but we do not massage the data to provide the required outcome.*
- *A number of media responses have taken very narrow perspectives, whereas the whole aim of Balancing Act is to provide, in one glance, the 'bigger' picture, ie. the forestry sectors are much more than just the greenhouse component.*
- *The authors apologise for the unintended outcome experienced by the Forestry sectors and related downstream sectors. It is part of the challenges that are still to be resolved in order to establish a consistent approach to Environmental National Accounting.*
- *We respond with a recalculation of the spider diagrams for three Forestry sectors based on net zero emissions (long-term decay pool), which will take us outside the established accounting conventions we are trying to follow.*

The University of Sydney and the CSIRO have jointly published a report entitled 'Balancing Act' which enumerates the Triple Bottom Line performance of industry sectors classified according to the Input-Output Tables published by the Australian Bureau of Statistics.

With respect to the three forestry industries covered in the report, it is noted that the greenhouse gas indicator is treated according to established accounting conventions.

In the following, this treatment will be further explained and clarified. Re-calculated spider diagrams for the forestry sectors based on net zero emissions are presented in the Appendix.

1) How input-output accounting works

The calculations underpinning Balancing Act proceed in two stages: For each of the ten indicators, each industry sector is characterised by:

1) Direct impacts: Take data on how much of the indicator is used/generated in the respective industry, and divide by gross output (in $) of that industry;
2) Indirect upstream impacts: Take data on how much the respective industry buys in from other industries, throughout the entire supply chain, infinitely, and multiply with how much of each indicator is used/generated in those upstream industries.

The sum of direct and indirect impacts are the total impacts of each sector.

Because of its supply-chain focus, input-output analysis distributes impacts initially occurring within producing industries to downstream final users. For example, the input-output procedure accounts for the passing-on of greenhouse gas emissions in the forestry sector to downstream users of forestry products; the respective emissions appear in the supply chain of those users. The final intensity of any sector depends on two factors: a) how large the impact is (in physical units), and b) what the value of the final output is (in $).

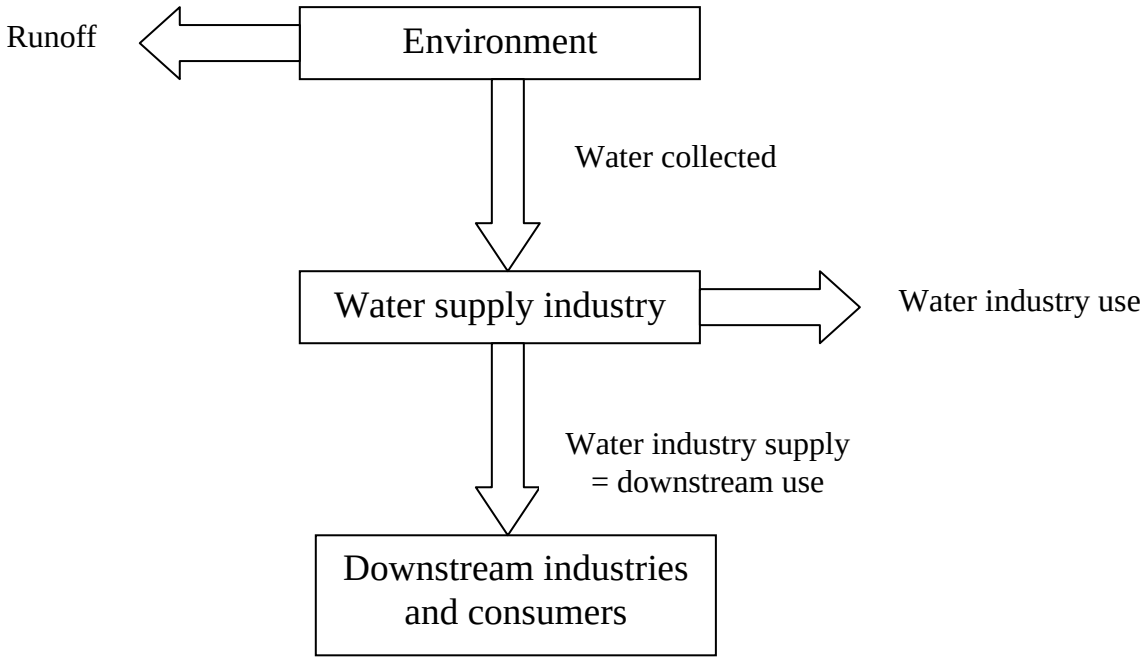
2) Physical flow accounting

The three forestry sectors in the CSIRO's and University of Sydney's study 'Balancing Act' are the only sectors in the entire economy that feature a negative value for any of the ten indicators: greenhouse gas emissions in these three sectors are negative because emissions due to slash from harvesting and other sources are more than offset by removals from CO_2 sequestration during forest growth. Creating timber products basically "locks away" carbon, at least temporarily, so that short term 'emissions' are negative.

Within Balancing Act, greenhouse gas emissions relating to the three forestry industries were identified as the class '5.A. Changes in Forest and Other Woody Biomass Stock' in the National Greenhouse Gas Inventory. Even though forestry sectors may carry out some land clearing reported under '5.B. Forest and Grassland Conversion', this item was not allocated to any of the forestry sectors, but to beef cattle grazing. Within greenhouse gas emissions reporting to the IPCC, emissions in this class '5.A. Changes in Forest and Other Woody Biomass Stock' are reported as net of removals. As a result, for example in the 2000 National Greenhouse Gas Inventory, class 5.A. shows a total net removal of about 24 Mt CO_2.

The IPCC accounting practice is different from the accounting practice used by the Australian Bureau of Statistics, for example in the Australian Water Accounts (4610.0), and the Input-Output Tables (5209.0).

For example, in the Water Accounts' *use tables*, water sourced by the water supply industry is assigned to be supplied by the environment (rainfall). The water industry uses water in the process of operation, and then supplies mains water to downstream users.

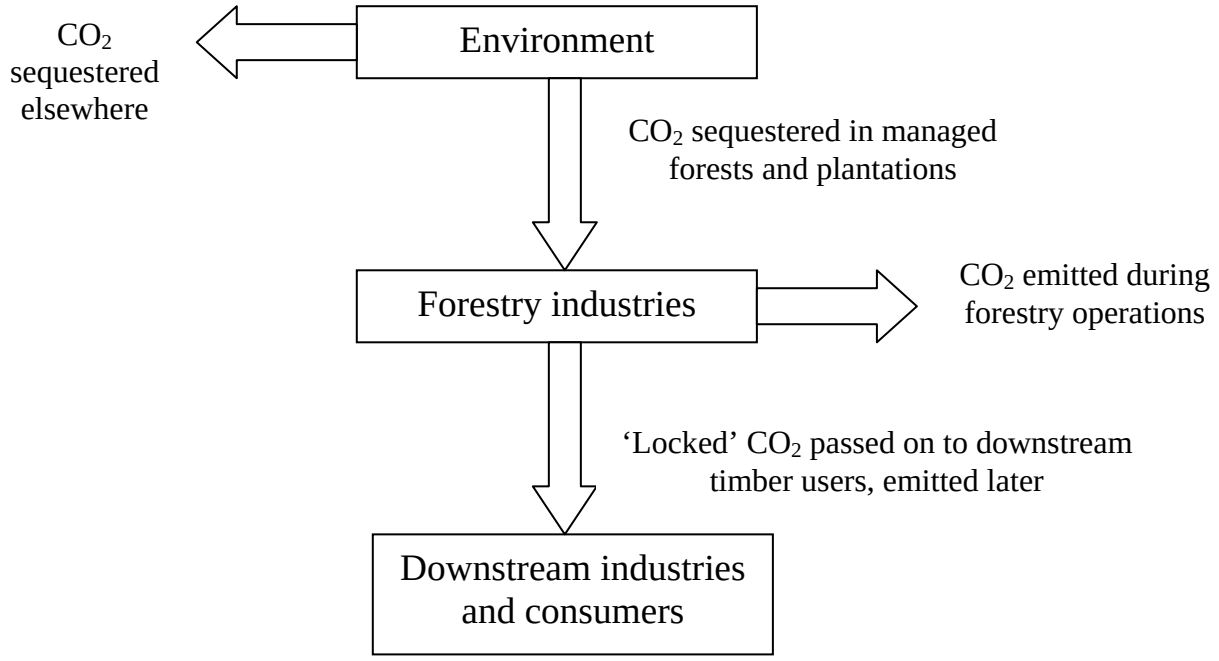


The Australian Water Accounts' use tables report only the water consumption of the water industry, not net of influx from the environment.

The Australian Water Accounts follow the UN System of Environmental and Economic Accounting (SEEA), which is a complement to the UN System of National Accounts (SNA).

In 'Balancing Act', in order to evaluate water use throughout the economy, the Australian Water Accounts' use tables (4610.0) were aligned with the use tables of the Input-Output tables (5209.0).

Applying this concept to CO_2 flows leads to the diagram below.



In order to comply with accounting practices in the Water Accounts and Input-Output tables, flows of carbon are not taken as net, but as gross, and sequestration of carbon from the atmosphere is allocated to the environment, (like water runoff) consistent with the Water Accounts.

Note that not all CO_2 emitted during forestry operations is allocated to the forestry industries. In the tables 'TBL factors' for hardwood and softwood plantations, these industries initially record 1.31% and 0.24% of national emissions, respectively (see Vol. 2, pp. 67 and 72). After passing on to downstream users, only 0.08% and 0.03% respectively remain, mostly embodied in exports. In the remaining 'Forestry and services to forestry' sector, a third of emissions is once again passed to downstream users, and most of the remaining two thirds of carbon (about 7% of national emissions) are passed on to a National Accounts component called 'Government final consumption', which reflects the government's request of its relevant departments to manage forests.

With respect to the high emissions intensities, these are the ratio of greenhouse gas emissions and the value of final demand. Such intensities can be high if emissions are high. However, they can also be high because the final product is under-valued.

3) Aligning accounting principles across all sectors and indicators

There are numerous cases in modern economies, and hence in 'Balancing Act', where through-flows such as the above occur. For example, fuel-transforming industries produce more gigajoules of energy than they consume. Like the water industry – which appears in the report to consume water, even though it supplies water – coal mining, gas and oil extraction, refining, electricity generation and gas distribution industries all appear to consume energy, even though they are by far a net producer. In this sense, the forestry industries appear to 'consume sequestration', even though they are a net producer of sequestration.

In this report, the authors had to make a decision to be consistent with accounts on remaining indicators such as water, as well as the input-output tables on which this study is based. We also had to be consistent across all sectors and report only emissions. This is why:

- we did not offset the water supply industry's water use with a negative influx representing rainfall;
- we did not offset the fuel-transforming industries' energy use with a negative influx representing feedstock; and
- we did not offset the forestry industries' greenhouse gas emissions with a negative influx representing sequestration.

Consistently within the National Input-Output Tables that underpin the 'Balancing Act' report, gross emissions for the forestry sectors, as well as gross water use for the water supply industry are used. Within the forestry reports, we have noted this by marking the greenhouse gas emissions figures as "due to accounting conventions".

The authors did contemplate incorporating negative net emissions into the National Accounts framework. This would have created accounting and interpretation problems for data on all other sectors: in the supply chains of virtually all sectors of the economy, negative forestry emissions would be conflated with positive emissions from other industries. Totals being net of sinks would for example lead in some sectors (likely pulp and paper, wood products) to counterintuitive results, such as:

- zero order (direct) emissions being positive, first order near-zero or negative (due to timber use), and second and higher orders positive again, with negative values impossible to depict in a logarithmic spider diagram; and
- important positive structural paths representing more than 100% of a sector's total greenhouse gas emissions, because that total is net of sinks.

In the Appendix to this clarification the spider diagrams for the three forestry sectors are re-calculated as net: with their direct sectoral emissions set to zero (this is referred to as "net zero emissions").

4) The need for a meaningful alignment in future physical National Accounts

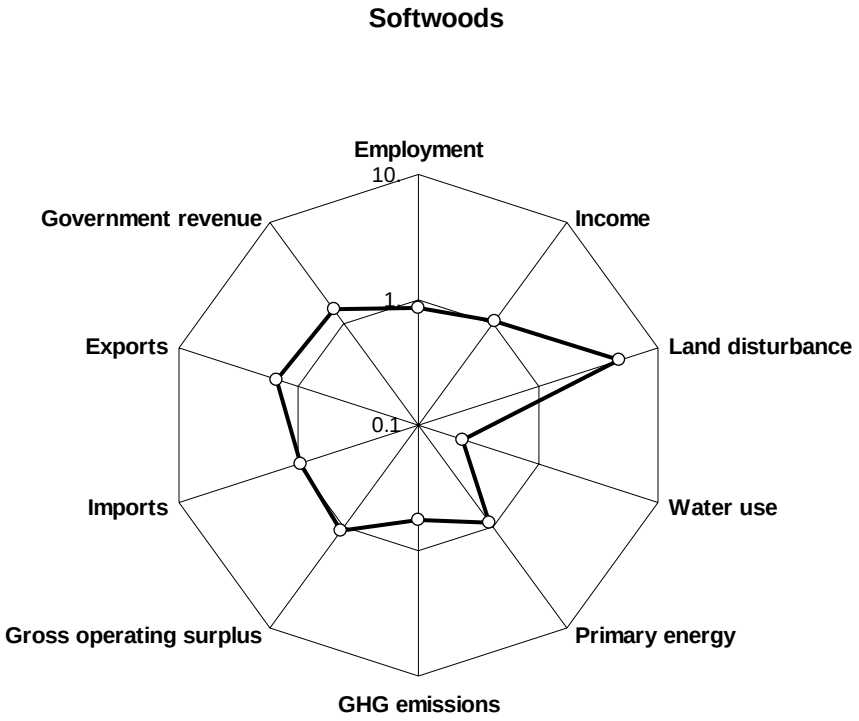
National Accounting needs ways to consistently incorporate circumstances such as those of the forestry and water supply industries, as well as many other special circumstances present throughout the economy. Negative values are one particular issue in this respect, because they stem from net values, which at present are dissected in National Accounts.

In the future, accounting practices are needed that lead to results which are at the same time easy to interpret and do not lead to counterintuitive presentation. This requires a joint effort of research and central data collection agencies, with regard to both practical and theoretical aspects.

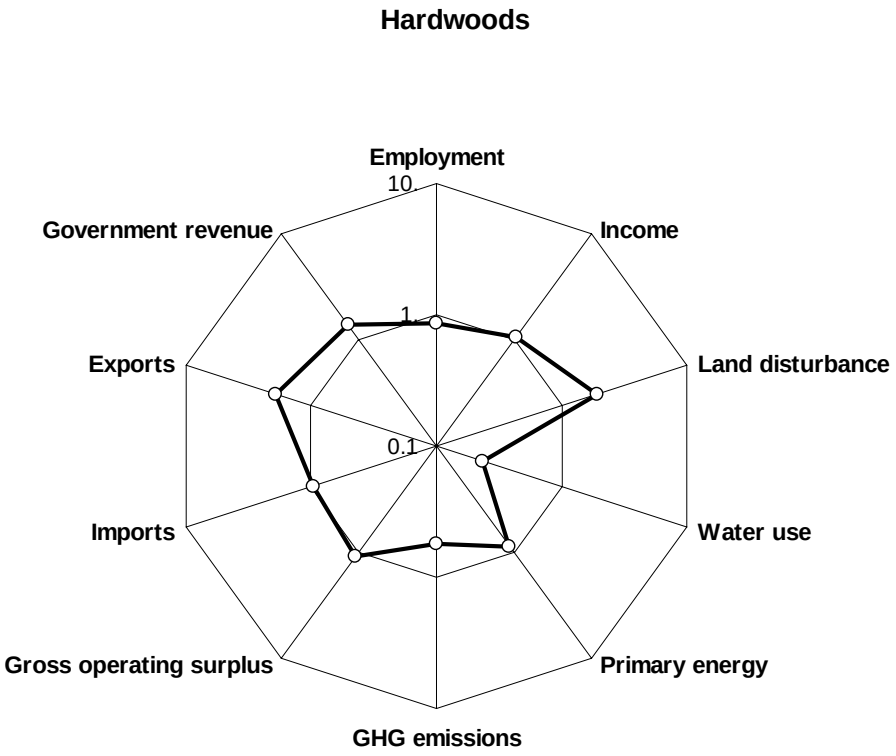
To develop consistent accounting in a way that does not produce perverse outcomes is a considerable challenge. Addressing this challenge soon for the forestry sectors will immediately reconcile this issue and help avoid the problem of the analytical procedures having to adjust the data for a particular issue while leaving scores of similarly important problems untouched. The authors are prepared to discuss a joint statement or press release which highlights the anomaly, and starts to make the case for more appropriate systems of national forestry accounts.

Appendix: Re-calculation of the spider diagrams for three forestry sectors based on net zero emissions

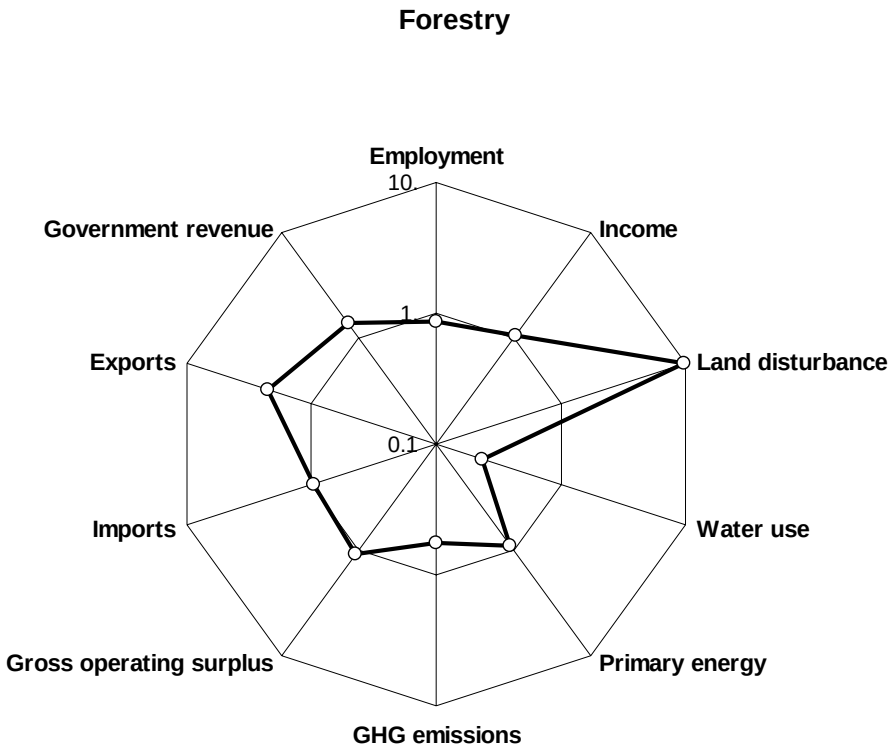
A) Softwoods (Sw)



B) Hardwoods (Hw)



C) Forestry


Forestry
Employment
10
1
0.1
Income
Land disturbance
Water use
Primary energy
GHG emissions
Gross operating surplus
Imports
Exports
Government revenue