



The University of Sydney
Integrated Sustainability Analysis™



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Student topic

Environmental implications of an ageing society

1 Brief rationale

It is known that the environmental impact of households varies with the average age of the householders. Key studies in this area combine Household Expenditure Surveys with tailored input-output databases in order to determine the environmental intensities of consumer goods. These intensities are then in turn applied to household expenditure data, to yield an environmental “budget” for the respective household.

Existing studies consider more factors than just age: Amongst the socio-economic-demographic variables are income, number of people in the household, house type, tenure type, employment status, car ownership, geographical location, number of children, etc. Some of these variables are correlated and care has to be taken in order to not confound various competing influences on environmental budgets.

The environmental variables considered in previous work are mostly energy consumption and greenhouse gas emissions (Herendeen 1978; Peet *et al.* 1985; Sastry *et al.* 1989; Aoyagi *et al.* 1992; van Engelenburg *et al.* 1994; Aoyagi *et al.* 1995; Vringer and Blok 1995; Kondo *et al.* 1996; Biesiot and Noorman 1999; Munksgaard *et al.* 2000; O'Neill and Chen 2002; Pachauri and Spreng 2002; Reinders *et al.* 2003; Pachauri 2004; Cohen *et al.* 2005; Vringer *et al.* 2007; for a review and cross-country study see Wier *et al.* 2001; Lenzen *et al.* 2006), but also water use (Lenzen and Foran 2001), nitrogen emission (Wier and Hasler 1999), land disturbance (Lenzen and Murray 2001) and others. Australian studies were carried out by Lenzen 1998 and Lenzen *et al.* 2004.

A prominent general publication of data on environmental impacts of households is the Environmental Atlas developed by the Centre for Integrated Sustainability Analysis and the Australian Conservation Foundation (www.acfonline.org.au/consumptionatlas).

Another stream of research is that of demo-economic modelling, which is aimed at constructing and applying integrated models where age cohorts are incorporated into an inter-industry model, which is then iterated over time. For examples of this type of work see Schinnar 1976; 1977; Evans and Baxter 1980; Gordon and Ledent 1980; Batey and Madden 1981; Brouwer *et al.* 1981; Batey 1985; Batey *et al.* 1988; Hynes and Jackson 1988; Jackson and Hynes 1988; Madden 1988; Hewings and Madden 1995. Stone 1966; Stone *et al.* 1968; Stone 1970 provide an overview.

So far, only little work has been done on forecasting possible future trends in environmental impacts because of an ageing society. Perhaps the most detailed study so far is that by Yamasaki and Tominaga 1997 for Japan, a nation which is reputedly plagued by low birth rates and does not encourage immigration.

2 Challenge

2.1 Develop a forecast of likely environmental impacts and analyse those contributions that are due to

- the ageing of society directly, and to
- correlated trends such as small household sizes and lower employment status.

In contrast to previous work, examine in detail the past and possible future evolution of age pyramids in Australia, and what this means for future consumer baskets and their environmental implications. Appraise the indicators energy consumption, greenhouse gas emissions, water use and land disturbance. Examine the influence of associated variables such as likely

- future household sizes,
- future urban structures,
- improved technology,
- future skill bases,
- immigration scenarios.

The main data to be used will be the Centre for Integrated Sustainability Analysis input-output database (Gallego and Lenzen 2007) and the Confidentialised Unit Record File (Australian Bureau of Statistics 2000) of past Household Expenditure Surveys conducted by the Australian Bureau of Statistics. The CSIRO's study *Future Dilemmas* (Foran and Poldy 2002) forms an excellent basis for examining Australia's future population trends.

2.2 Compare the results of this analysis with information available for other countries.

2.3 Prepare a manuscript for submission to an international peer-reviewed journal.

2.4 Optional: Explore and lay the groundwork for a demo-economic-environmental accounting framework for Australia.

3 Knowledge, tasks and skills

- Linear Algebra and matrix operations
- Basic programming in MatLab or Visual Basic
- Multiple regression
- Scientific writing

4 Supervisor

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5 References

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