ergy substitution (ESUB), the international adjustment processes, backstop technologies, and other technological and socio-economic assumptions. These factors, as well as the AEEI, all influence the Carbon Intensity and Energy Intensity and determine the resulting Carbon emissions. However, they are not affected over time in the same way.

Figure 7 shows that the IPCC 1992 scenarios (IS92a, b, c, d, e, f) have a lower Carbon Intensity and a higher Energy Intensity than, for example, the standard IPCC 1990 scenarios (IPCC SA(90H) and IPCC SA(90L)) and Manne and Richels (1992). Only IS92e and IS92f approach the values of the other scenarios, with, for example, Carbon Intensities close to that of the World Energy Council (1993). The other IPCC scenarios all have much lower Carbon Intensities than all the other scenarios. In contrast, OECD GREEN (92) and IPCC EIS (90) have both high Energy and Carbon Intensities.

Thus, the Carbon emission values of the various scenarios are also affected by the different assumptions and model parameters used to determine Carbon intensity and Energy Intensity.

4 CONCLUSIONS

This survey has brought together some of the most recent information on many GHG emission models and the main assumptions used to prepare their latest "Business as Usual" scenarios forecasts. In turn, these have been used to update the relevant databases to allow comparison with the IPCC scenarios.

The major findings in relation to these scenarios are:

1. Since 1986, the range of outcomes of CO2 emission scenarios has narrowed as the outcome values have become more consistent.
2. Most of the recent scenario outcomes lie within a general band with values of 9 to 19 Giga tonnes of carbon at 2030, and 20 to 40 Giga tonnes at 2100.
3. The IPCC scenarios IS92a and IS92b are within the range of most of the other reference scenarios for the whole time period to 2100.
4. Population growth assumptions range widely, but the most practical and useful are considered to be the 1990 estimates of the World Bank and the 1987 estimates of the United States Bureau of Census and Statistics.

5. There appears to be an inconsistency between population growth and economic growth assumptions used in some models, including IS92a.

6. Autonomous Energy Efficiency Improvement (AEEI) is assumed to range between 0 and 1.5% per year.

7. The major driving force of CO2 emissions is economic growth, including that resulting from population growth, and technological change other than that introduced specifically to reduce CO2 emissions.

8. The Carbon and Energy Intensities of each model change differently over time, because of different assumptions about these driving forces and other factors, such as the elasticities of energy substitution. In particular, the IPCC scenarios have some very specific and unique changes when compared to the other scenarios.

9. A variety of work remains to be done to allow a more detailed comparison of the many CO2 emission scenarios. This includes:

   - a comparison of model structures;
   - an analysis of the consistency of input assumptions;
   - a survey of scenarios of CO2 emissions caused by land-use changes.