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# 11. Conclusions

Evidence of climate change linked to human-induced increase in greenhouse gas concentrations is well-documented. Due to rapid economic growth and large population size, energy consumption is projected to increase at the highest rates in developing countries. This increase in energy consumption will result in higher greenhouse gas emissions, associated with fossil fuel use. Additional greenhouse gas emissions originate mainly from land-use change, with deforestation in tropical countries.

Long-term and sustainable reductions of CO<sub>2</sub> emissions through land-based activities will to a large extent have to come from the use of wood for bioenergy and products. The provisions of the Kyoto Protocol with respect to sinks can be seen as a valuable incentive to protect and enhance carbon stocks now, while at the same time providing the biomass resources needed for the continued substitution of fossil fuels in the future.

Wood energy offers significant, cost-effective and perpetual opportunities for greenhouse gas emission reductions. Additional benefits offered are employment creation in rural areas, energy security, better waste control, and potentially benign effects with regard to biodiversity, desertification and recreational value. Wood energy can therefore significantly contribute to sustainable development both in developed and less developed countries, provided that all issues related to its practical exploitation are carefully considered.

There are nevertheless some barriers to woodfuel substitution including the up-front investment costs. There are three key issues that must be first addressed when considering woodfuel substitution. First, greater efforts are needed to address the efficiency and impacts of the traditional biomass sector, since it will continue to play an important role, especially in Africa and South Asia. Second, the actual emission savings associated with improvements in traditional biomass use are highly uncertain; research should address the need for better data and also the impacts of black carbon (soot), a short-lived pollutant that contributes to climate forcing. Third, advanced technologies that use wood more efficiently, especially gasification methods, require further demonstration at the commercial scale. Fourth, complications in implementing woodfuel programmes and projects – in both the traditional and modern bioenergy sectors – require more coordinated testing and evaluation. Fifth and finally, policies and institutions are needed that can incentivise and facilitate comprehensive management of forests for multiple uses, including carbon sequestration, fuel, shelter, recreation and industrial products.

