2.2.1 In Summary

The technical potential of PV electricity is high enough to contribute considerably to the abatement of the man-made global CO_2 problem. With the help of medium-term financial supports and long-term energy taxes (motivated by external costs), the technical potential may be exploited economically. Under grid-coupled operation, photovoltaics will most probably become cost-effective for distributed peak power production and for applications in the building sector (as cladding element). Solar electricity generation has to grow by three orders of magnitude before it encounters a (extrapolated) 10% level of the global electricity demand. Assuming ambitious growth rates, this process of transformation will take three to four decades.

2.3 A TECHNOLOGICAL BASIS FOR OFF-GRID ELECTRICITY SUPPLY – THE DEVELOPMENT DIMENSION OF PHOTOVOLTAICS

Two billion people worldwide have no access to commercial electricity. When possible, they cover their needs for electricity-based services by means of primary batteries, rechargeable batteries (car batteries) or small fossil fuel–driven generator sets. In many (if not in most) cases these supply schemes are very costly, uncomfortable, unreliable and ecologically questionable. This results in the fact that for a large fraction of the global population, services such as electric light, radio, television, telecommunication, health services, clean water, cooling, electromechanical energy and so on are not at all available or are available only at a very low level. It must be stressed that these electricity-based benefits are amongst others crucial for education, business and small commercial activities (handicrafts, agriculture, food processing etc.). Thus the lack of a stable and affordable electricity supply hinders the development of many rural and remote areas. This is ethically not acceptable; it may lead to a destabilisation of regions and foster the growth of megacities, just to name three important reasons why this situation cannot be regarded as socially sustainable.

Beyond the low power level of primary batteries, there are mainly three worldwide applicable technology groups that are able to contribute in a professional way to the electricity supply of remote areas: grid extension, diesel generator sets and renewable energies. The most prominent amongst the renewables are small hydro, wind and photovoltaics. All technologies mentioned will eventually contribute to the electricity supply of rural and remote areas.

At first sight, grid extensions seem to be the most natural and technologically elegant way to overcome shortages in the electricity supply. It turns out, however, that the initial investments for such a strategy are prohibitively high if the consumers are scattered over large areas and if the average electricity demand, that is, the energy transported over the lines, is relatively small. Under these situations it is mostly impossible to recover the investments by selling electricity to the dispersed consumers or to raise it through subsidies from governmental organisations.

The alternatives to grid extension are renewables and diesel electric systems. In the following text, the benefits and characteristics of photovoltaics will be discussed.