The main characteristics of the four SRES storylines and scenario families
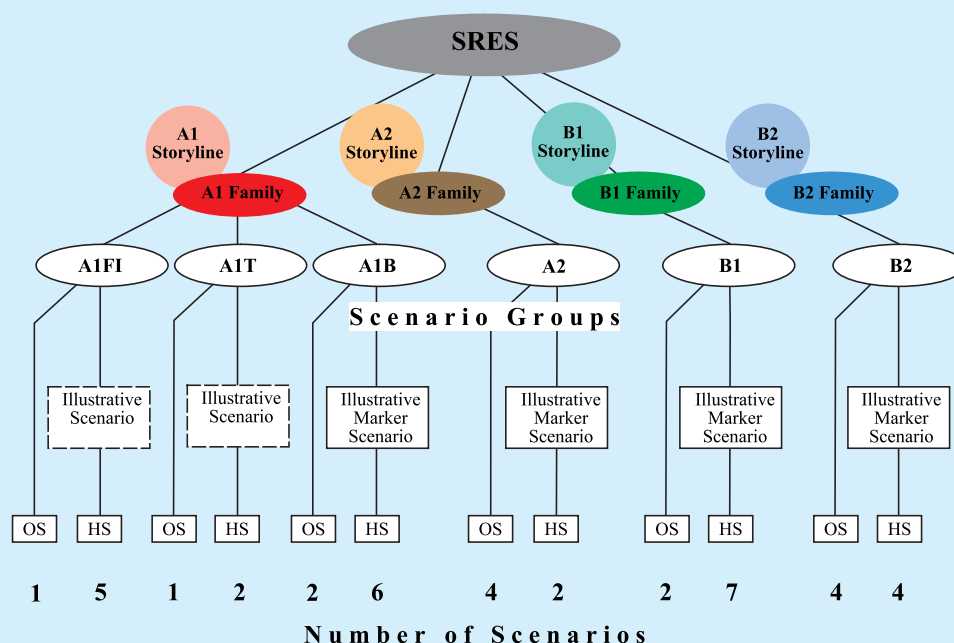

Figure 1: Schematic illustration of SRES scenarios. Four qualitative storylines yield four sets of scenarios called "families": A1, A2, B1, and B2. Altogether 40 SRES scenarios have been developed by six modeling teams. All are equally valid with no assigned probabilities of occurrence. The set of scenarios consists of six scenario groups drawn from the four families: one group each in A2, B1, B2, and three groups within the A1 family, characterizing alternative developments of energy technologies: A1FI (fossil fuel intensive), A1B (balanced), and A1T (predominantly non-fossil fuel). Within each family and group of scenarios, some share "harmonized" assumptions on global population, gross world product, and final energy. These are marked as "HS" for harmonized scenarios. "OS" denotes scenarios that explore uncertainties in driving forces beyond those of the harmonized scenarios. The number of scenarios developed within each category is shown. For each of the six scenario groups an illustrative scenario (which is always harmonized) is provided. Four illustrative marker scenarios, one for each scenario family, were used in draft form in the 1998 SRES open process and are included in revised form in this Report. Two additional illustrative scenarios for the groups A1FI and A1T are also provided and complete a set of six that illustrates all scenario groups. All are equally sound.

By 2100 the world will have changed in ways that are difficult to imagine – as difficult as it would have been at the end of the 19th century to imagine the changes of the 100 years since. Each storyline assumes a distinctly different direction for future developments, such that the four storylines differ in increasingly irreversible ways. Together they describe divergent futures that encompass a significant portion of the underlying uncertainties in the main driving forces. They cover a wide range of key "future" characteristics such as demographic change, economic development, and technological change. For this reason, their plausibility or feasibility should not be considered solely on the basis of an extrapolation of *current* economic, technological, and social trends.

- The A1 storyline and scenario family describes a future world of very rapid economic growth, global population that peaks in mid-century and declines thereafter, and the rapid introduction of new and more efficient technologies. Major underlying themes are convergence among regions, capacity building, and increased cultural and social interactions, with a substantial reduction in regional differences in per capita income. The A1 scenario family develops into three groups that describe alternative directions of technological change in the energy system. The three A1 groups are distinguished by their technological emphasis: fossil intensive (A1FI), non-fossil energy sources (A1T), or a balance across all sources (A1B).[3]

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[3] Balanced is defined as not relying too heavily on one particular energy source, on the assumption that similar improvement rates apply to all energy supply and end use technologies.

- The A2 storyline and scenario family describes a very heterogeneous world. The underlying theme is self-reliance and preservation of local identities. Fertility patterns across regions converge very slowly, which results in continuously increasing global population. Economic development is primarily regionally oriented and per capita economic growth and technological change are more fragmented and slower than in other storylines.
- The B1 storyline and scenario family describes a convergent world with the same global population that peaks in mid-century and declines thereafter, as in the A1 storyline, but with rapid changes in economic structures toward a service and information economy, with reductions in material intensity, and the introduction of clean and resource-efficient technologies. The emphasis is on global solutions to economic, social, and environmental sustainability, including improved equity, but without additional climate initiatives.
- The B2 storyline and scenario family describes a world in which the emphasis is on local solutions to economic, social, and environmental sustainability. It is a world with continuously increasing global population at a rate lower than A2, intermediate levels of economic development, and less rapid and more diverse technological change than in the B1 and A1 storylines. While the scenario is also oriented toward environmental protection and social equity, it focuses on local and regional levels.

Within each scenario family two main types of scenarios were developed – those with harmonized assumptions about global population, economic growth, and final energy use and those with alternative quantification of the storyline. Together, 26 scenarios were harmonized by adopting common assumptions on global population and gross domestic product (GDP) development. Thus, the harmonized scenarios in each family are not independent of each other. The remaining 14 scenarios adopted alternative interpretations of the four scenario storylines to explore additional scenario uncertainties beyond differences in methodologic approaches. They are also related to each other within each family, even though they do not share common assumptions about some of the driving forces.

There are six scenario groups that should be considered equally sound that span a wide range of uncertainty, as required by the Terms of Reference. These encompass four combinations of demographic change, social and economic development, and broad technological developments, corresponding to the four families (A1, A2, B1, B2), each with an illustrative "marker" scenario. Two of the scenario groups of the A1 family (A1FI, A1T) explicitly explore alternative energy technology developments, holding the other driving forces constant, each with an illustrative scenario. Rapid growth leads to high capital turnover rates, which means that early small differences among scenarios can lead to a large divergence by 2100. Therefore the A1 family, which has the highest rates of technological change and economic development, was selected to show this effect.

In accordance with a decision of the IPCC Bureau in 1998 to release draft scenarios to climate modelers for their input in the Third Assessment Report, and subsequently to solicit comments during the open process, one marker scenario was chosen from each of four of the scenario groups based on the storylines. The choice of the markers was based on which of the initial quantifications best reflected the storyline, and features of specific models. Marker scenarios are no more or less likely than any other scenarios, but are considered by the SRES writing team as illustrative of a particular storyline. These scenarios have received the closest scrutiny of the entire writing team and via the SRES open process. Scenarios have

also been selected to illustrate the other two scenario groups. Hence, this Report has an illustrative scenario for each of the six scenario groups.

What are the main driving forces of the GHG emissions in the scenarios?

This Report reinforces our understanding that the main driving forces of future greenhouse gas trajectories will continue to be demographic change, social and economic development, and the rate and direction of technological change. This finding is consistent with the IPCC 1990, 1992 and 1995 scenario reports. Table 1 (see pages 13 and 14) summarizes the demographic, social, and economic driving forces across the scenarios in 2020, 2050, and 2100.[4] The intermediate energy result (shown in Table 2, see pages 15 and 16) and land-use results[5] reflect the influences of driving forces.

Recent global population projections are generally lower than those in the IS92 scenarios. Three different population trajectories that correspond to socio-economic developments in the storylines were chosen from recently published projections. The A1 and B1 scenario families are based on the low International Institute for Applied Systems Analysis (IIASA) 1996 projection. They share the lowest trajectory, increasing to 8.7 billion by 2050 and declining toward 7 billion by 2100, which combines low fertility with low mortality. The B2 scenario family is based on the long-term UN Medium 1998 population projection of 10.4 billion by 2100. The A2 scenario family is based on a high population growth scenario of 15 billion by 2100 that assumes a significant decline in fertility for most regions and stabilization at above replacement levels. It falls below the long-term UN High 1998 projection of 18 billion.

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[4] Technological change is not quantified in Table 1.

[5] Because of the impossibility of including the complex way land use is changing between the various land-use types, this information is not in the table.