3.Methodology and model The model used to analyze the environmental impact of primary aluminium production consists of several layers of flows, sub–processes and materials.Important conversion ratios, like the mass of bauxite required for the production of 1kg of alumina and the mass of alumina required for 1kg of primary aluminium, are fixed for every country, respectively 1.53kg/kg and 1.935kg/kg (according to global data in EcoInvent v3.0 [10]).According to the USGS [16] about 10% of all mined bauxite and 10% of alumina is used for other processes (chemicals, cement, abrasives etc).Many hundreds of other flows and processes are included in the total analysis, and the variables that were actively used or altered in the different simulations are shown in red color.These are: i) heat energy mix, ii) electricity energy mix and iii) energy density (in kWh/kg) for example in the smelting and refining process.For instance, the impact of alumina refining is computed for 1kg of refined product, taking into consideration the heat mix and bauxite production, but not the smelting process.Aluminium hydroxide is produced from bauxite ore, which was taken equal for all countries throughout the study.In the analysis methods where the three process steps are separately treated, impact results are obtained by only considering the upstream elements of the given flow scheme up to the point where the impact is assessed.Alumina and bauxite inputs are given in kg while electricity and heat inputs in kWh.The required energy for alumina refining is provided by heat generation, of which a part can be electricity (at medium voltage).Generally speaking the electricity is not used to generate heat, but is required for auxiliary processes of the refining plant.This assumption is valid as most plants in the world operate with the same basic technology, mainly the energy requirements differ.Additionally, the fact that some bauxite and alumina is being used for other products than primary aluminium is not taken into account.The last step of the simulations regards the computation of the impact, which is based on the production of one final kilogram of primary aluminium.Similarly, the impact of bauxite production is computed for only 1kg of ore, leaving out all other branches.Regarding alumina, the process is divided into two subprocesses: the production of aluminium hydroxide and the production of alumina.Figure 1 is a simplified illustration of the structure of the process network implemented for this analysis.