

# List of Tables

Table 1.1	Summary of main global renewable energy (RE) indicators 2019-2020. Source: REN21 (2022). .....	24
Table 1.2	Biofuel production ranking and key feedstocks. Source: OECD/FAO (2019), “OECD-FAO Agricultural Outlook”, OECD Agriculture statistics (database) .....	34
Table 2.1	Engine adaptations for ethanol blending in gasoline. Source: ANFAVEA....	59
Table 2.2	Incremental technological advances by the sugarcane ethanol in Brazil....	63
Table 2.3	Evolution of biodiesel blends in Brazil. Source: UBRABIO based on 33.....	66
Table 3.1	Production of modern bioenergy in Brazil in 2021. Sources: as indicated in the table .....	74
Table 3.2	Raw material, industrial, and administration costs (R\$/tc) of sugarcane ethanol in Brazil: harvest 2015/16. Source: LEAL (2022) based on PECEGE/I (2015) .....	84
Table 3.3	Composition of gasoline price in Brazil – Feb 2022. Source: LEAL (2022) PETROBRAS, based on ANP and CEPEA/USP data .....	85
Table 3.5	Expected biodiesel processing capacity and compulsory consumption for different regions in Brazil from 2020 to 2031. Source: EPE (2022) ...	91
Table 3.6	Brazil’s emissions in 2019 and 2020 (tCO <sub>2</sub> e – GWP-AR5). Source: SEEG (2021).....	96

Table 4.1	Carbon footprint, reduction of emissions, and volume of ethanol produced in different regions. Source: RAÍZEN (2022).....	112
Table 4.2	Corn Production in Brazil. 1st and 2nd crops. Source: CONAB (2022) .....	120
Table 4.3	Main corn ethanol distilleries in the states of Mato Grosso and Goiás, Brazil. Source: Compiled by the authors. ....	121
Table 4.4	Comparison on sugarcane and corn ethanol indirect land use (iLUC) for a 335 M litres/day ethanol distillery. Source: by the authors.....	124
Table 4.5	Comparative advantages and disadvantages of corn and sugarcane as feedstock to produce ethanol. Source: composed by the authors ....	124
Table 5.1	Ranking of best-selling electric cars (EV) in 2021 in Brazil. Source: Canaltech (2021) .....	130
Table 5.2	Ranking of BEV, HEV, and PHEV vehicles sold in in Brazil in 2021. Source: ABVE (2021) .....	131
Table 5.3	Different alternative fuels and their respective energy density: Sources.....	133
Table 5.4	Fuel Consumption (gasoline E27.5 and E100) and cost per km for different flex-fuel vehicles in Brazil 2021-2022. Source: SODRÉ (2022).....	134
Table 5.5	Price of gasoline in different countries. Source: BALAGO (2022).....	135
Table 5.6	Comparison of different engine technologies using ethanol with flex-fuel using gasoline and ethanol. Source: CNPEM (2018) .....	139
Table 5.7	Comparative analysis of different electric car models (hybrid, hybrid plug-in, and electric) with flex fuel engines using gasoline A, gasoline C, and E100. Source: RAÍZEN (2022) .....	140
Table 5.8	Distribution of CO <sub>2</sub> emissions in the transportation sector worldwide, in 2020. Source: Statista.....	144
Table 5.9	Identified and analysed pathways to produce biofuels for aviation in Brazil. Source: BOEING/EMBRAER/FAPESP (2013).....	147
Table 5.10	Potential Biofuels for Maritime Applications. SOURCE: Compiled by the authors.....	151
Table 5.11	Basic processes of the alcohol-chemical industry. Source: BNDES (2008) adapted from SCHUCHARDT (2001) .....	153