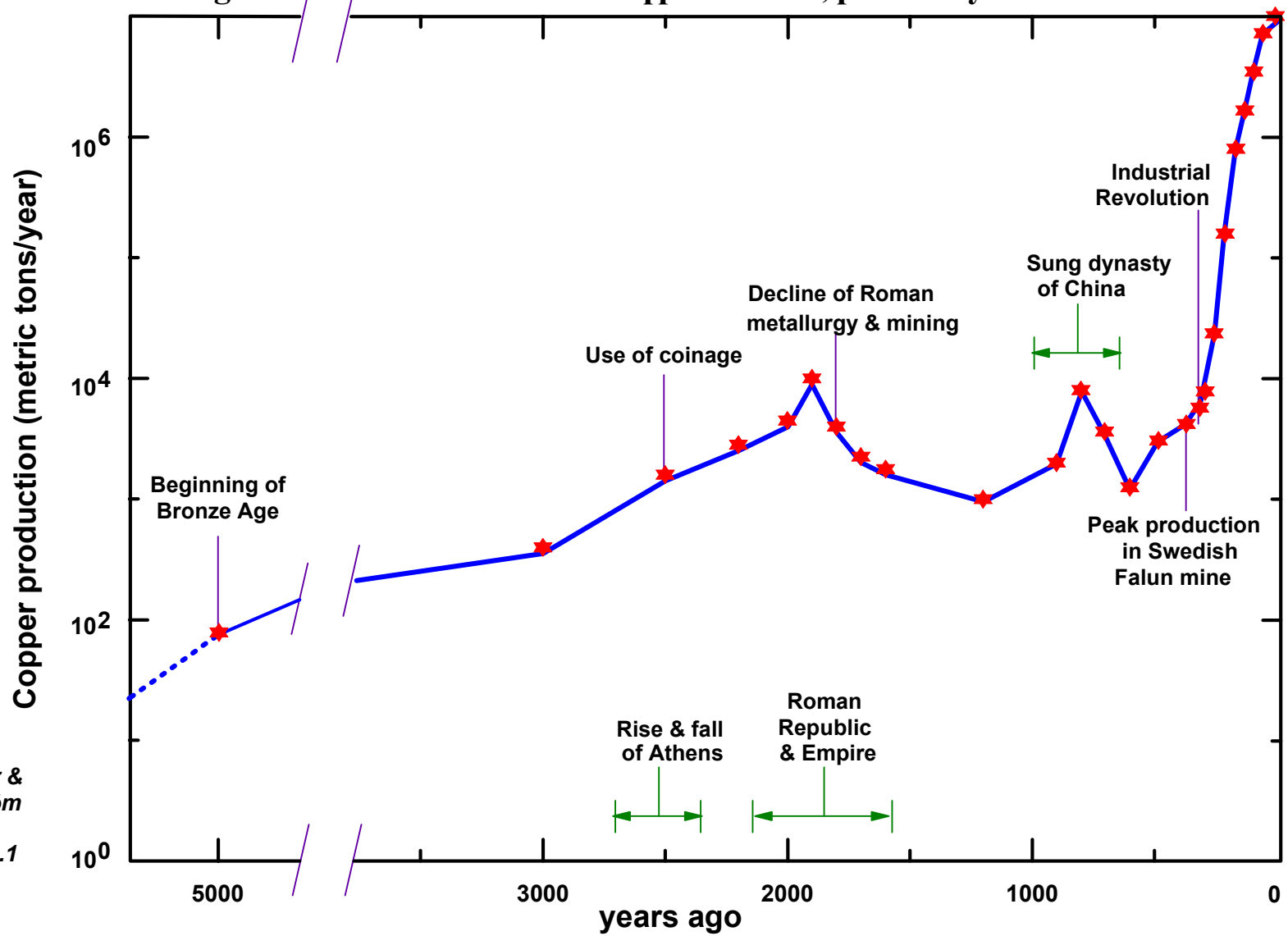
Figure 1.1: Variations in the rate of copper extraction, past 5000 years



Source: Landner & Lindström 1999, Figure 2.1

Figure 1.2: Copper production at the mine in Falun, Sweden

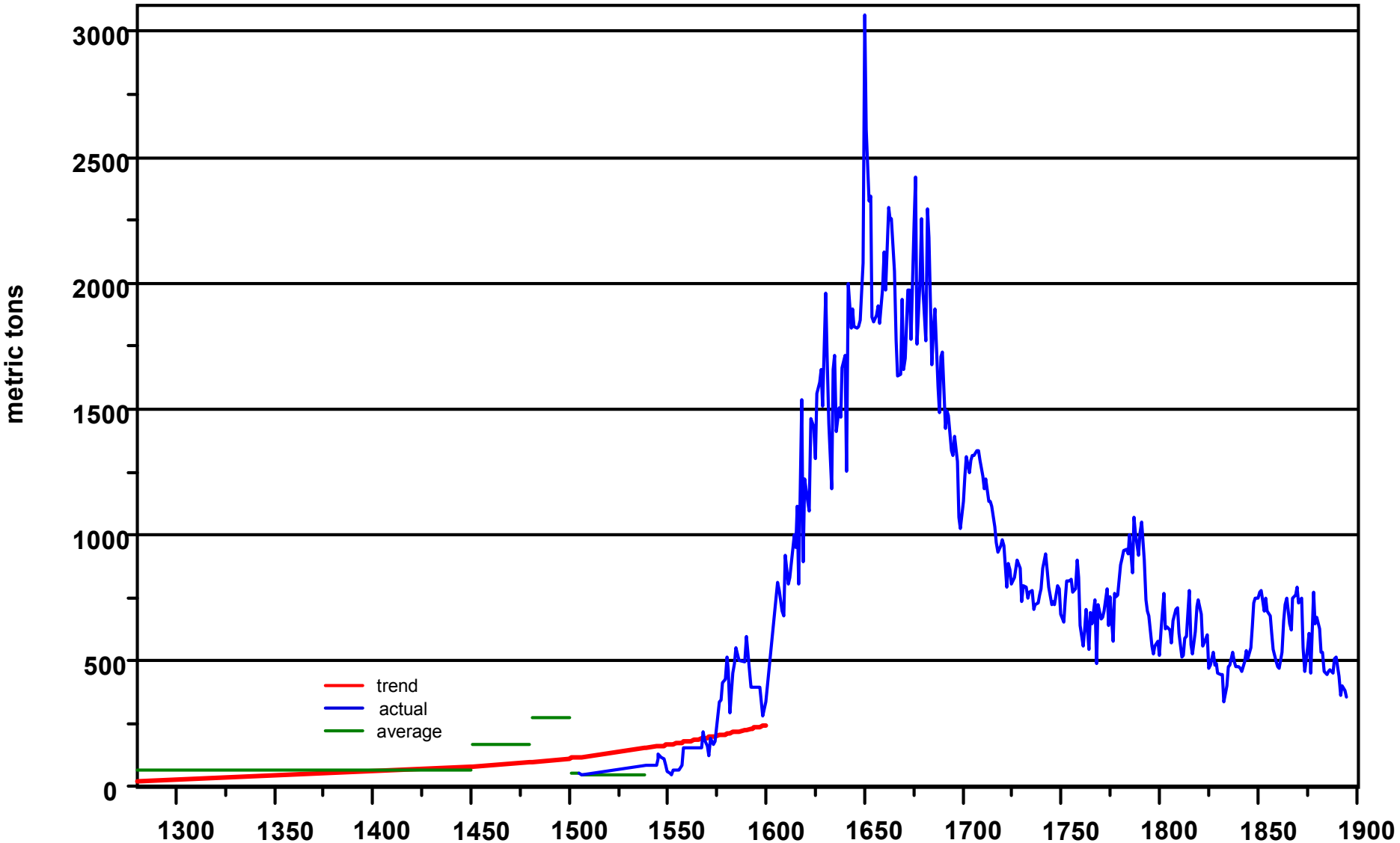
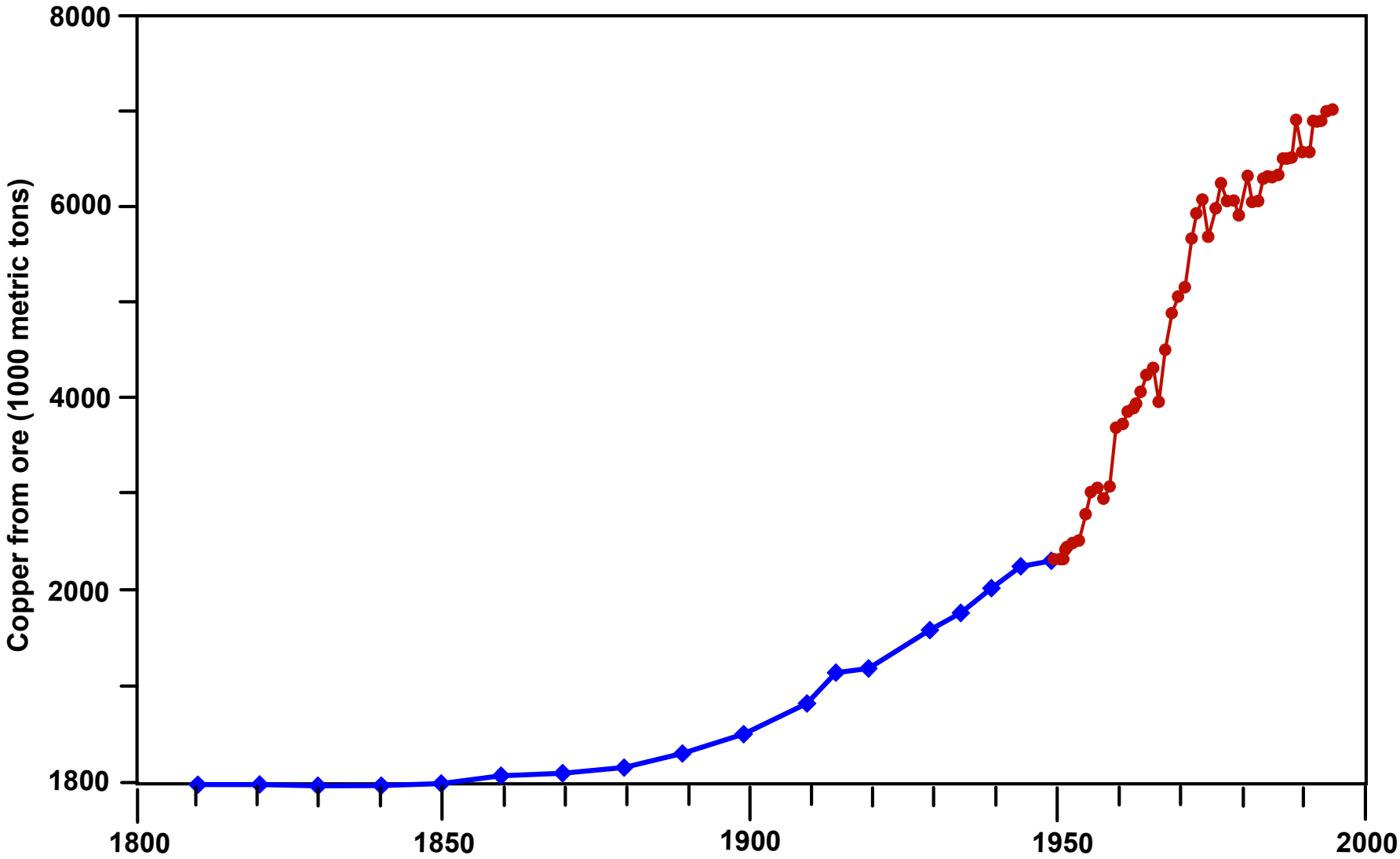
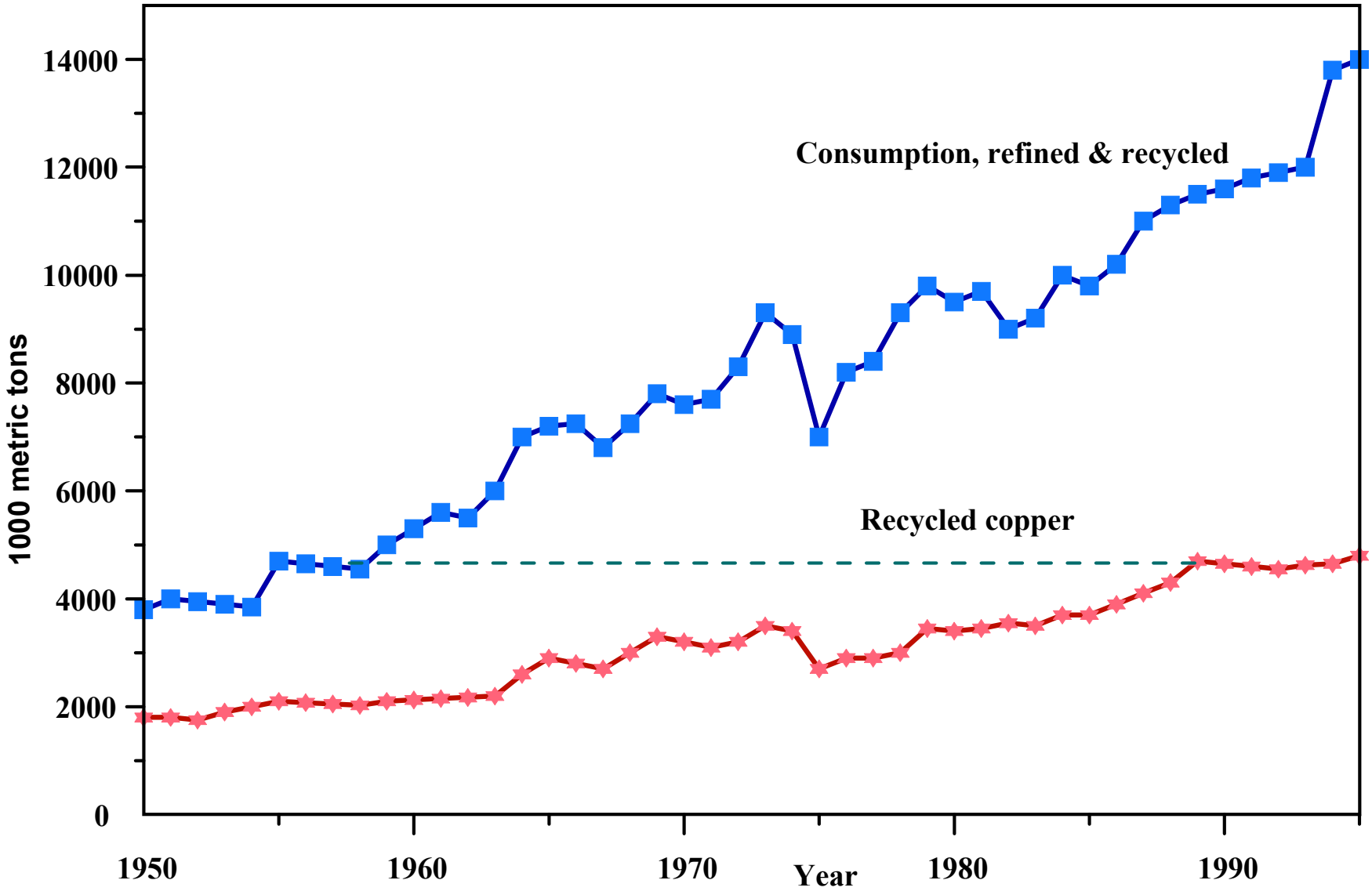


Figure 1.3: Total production of copper from ores in the "Western World", 1810 - 1995



Source: Landner & Lindström 1999, Figure 4.1

Figure 1.4: Total consumption of copper in the "Western World", 1950-1995



Source: Landner & Lindström 1999, Figure 4.2

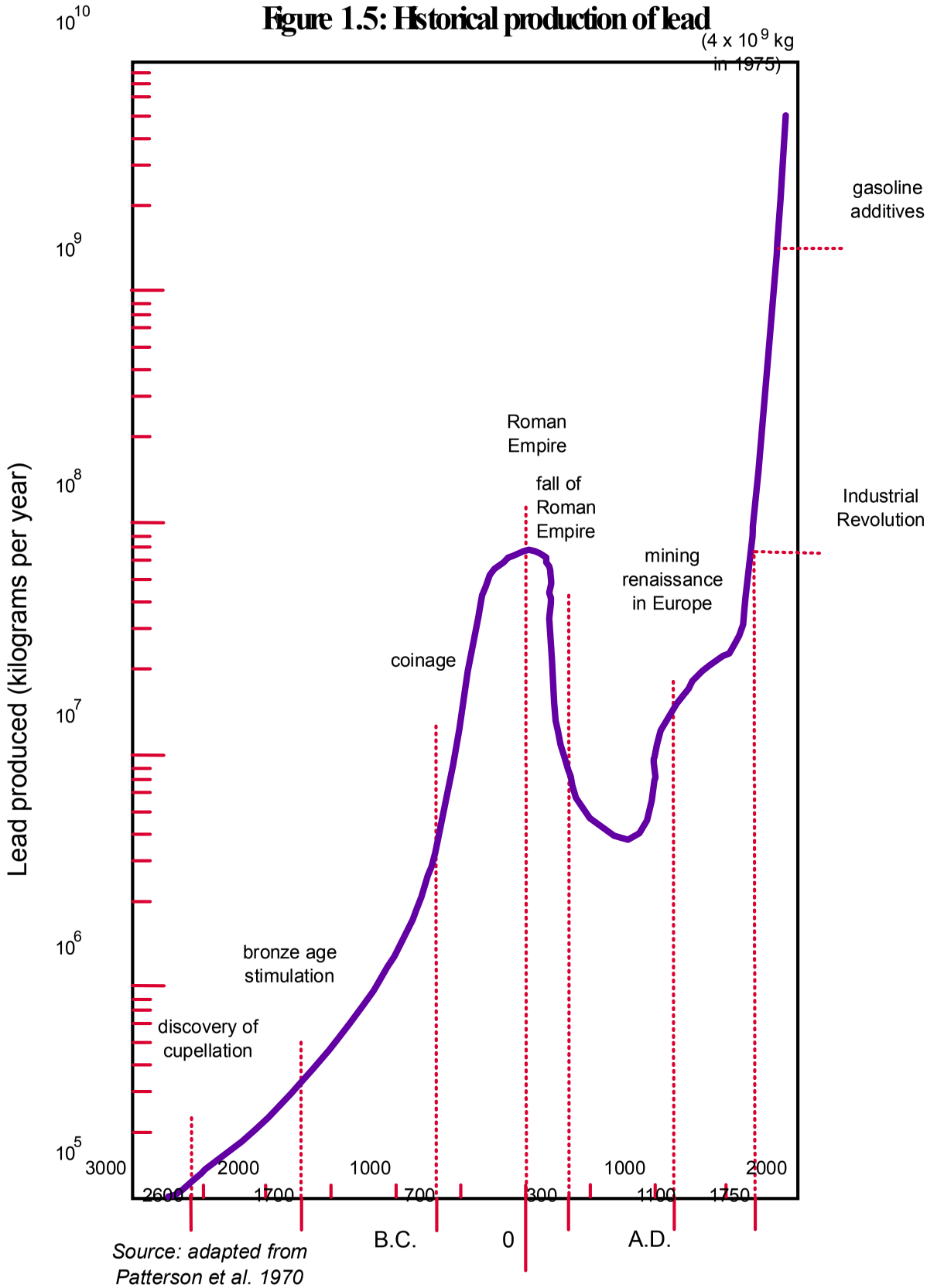
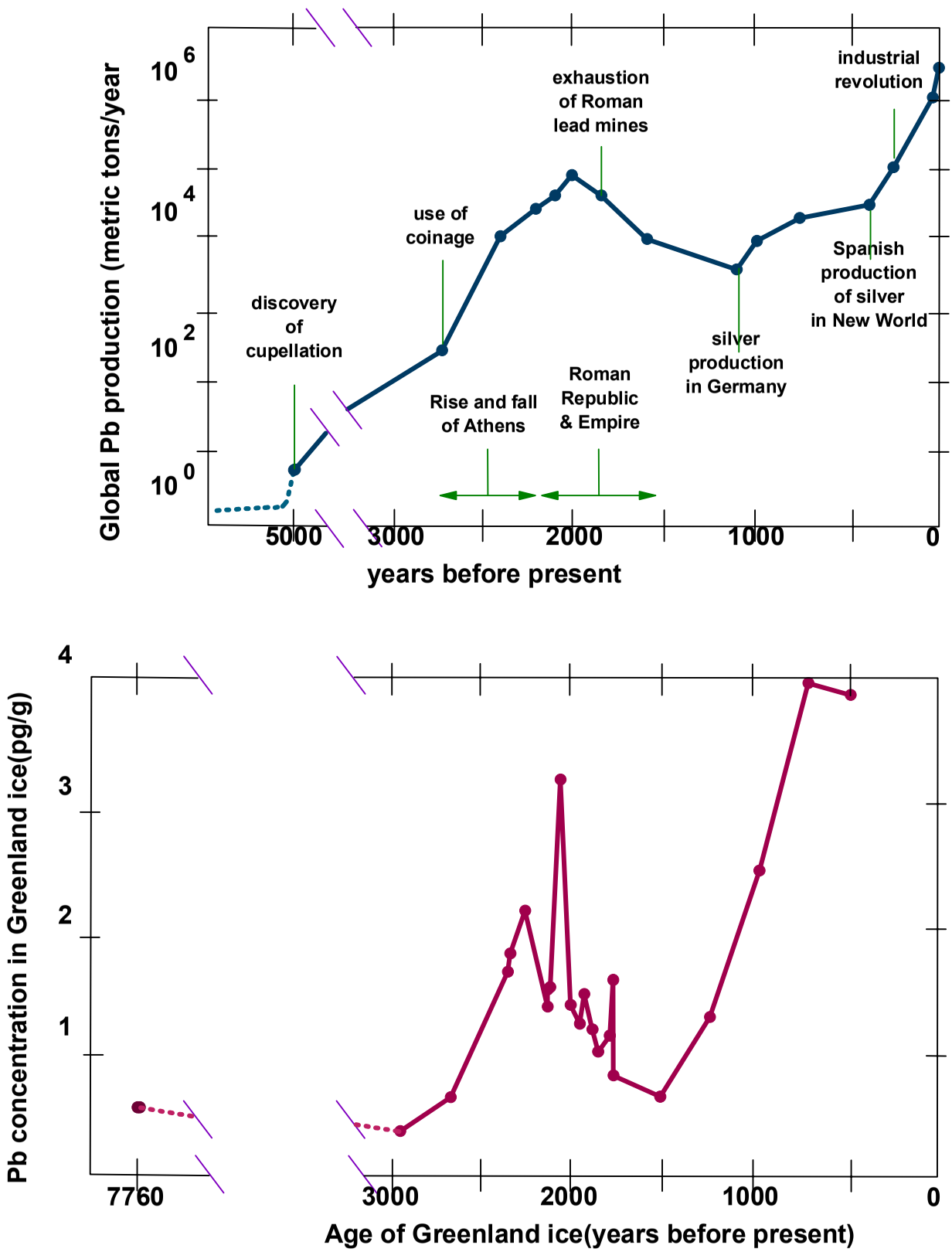


Figure 1.5: Historical production of lead

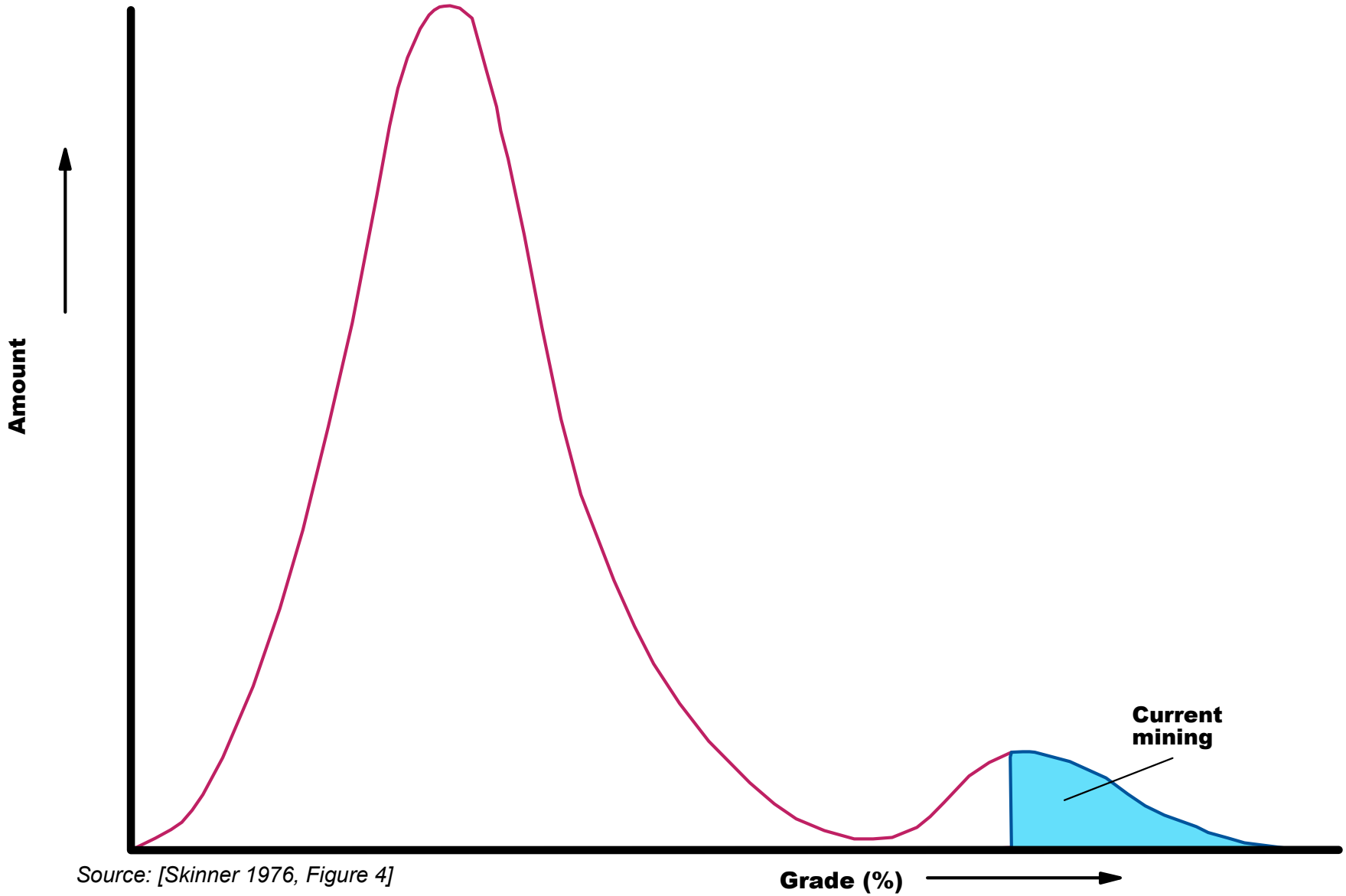
Source: adapted from Patterson et al. 1970

Figure 1.6: Greenland ice and lead production



Source: [Boutron 1998, p. 158]

Figure 1.7: Probable distribution of a geochemically scarce metal in the Earth's crust



Source: [Skinner 1976, Figure 4]

Figure 2.1: Mass flows (kg) in the production of 1 MT copper (simplified processes, typical material mixes)

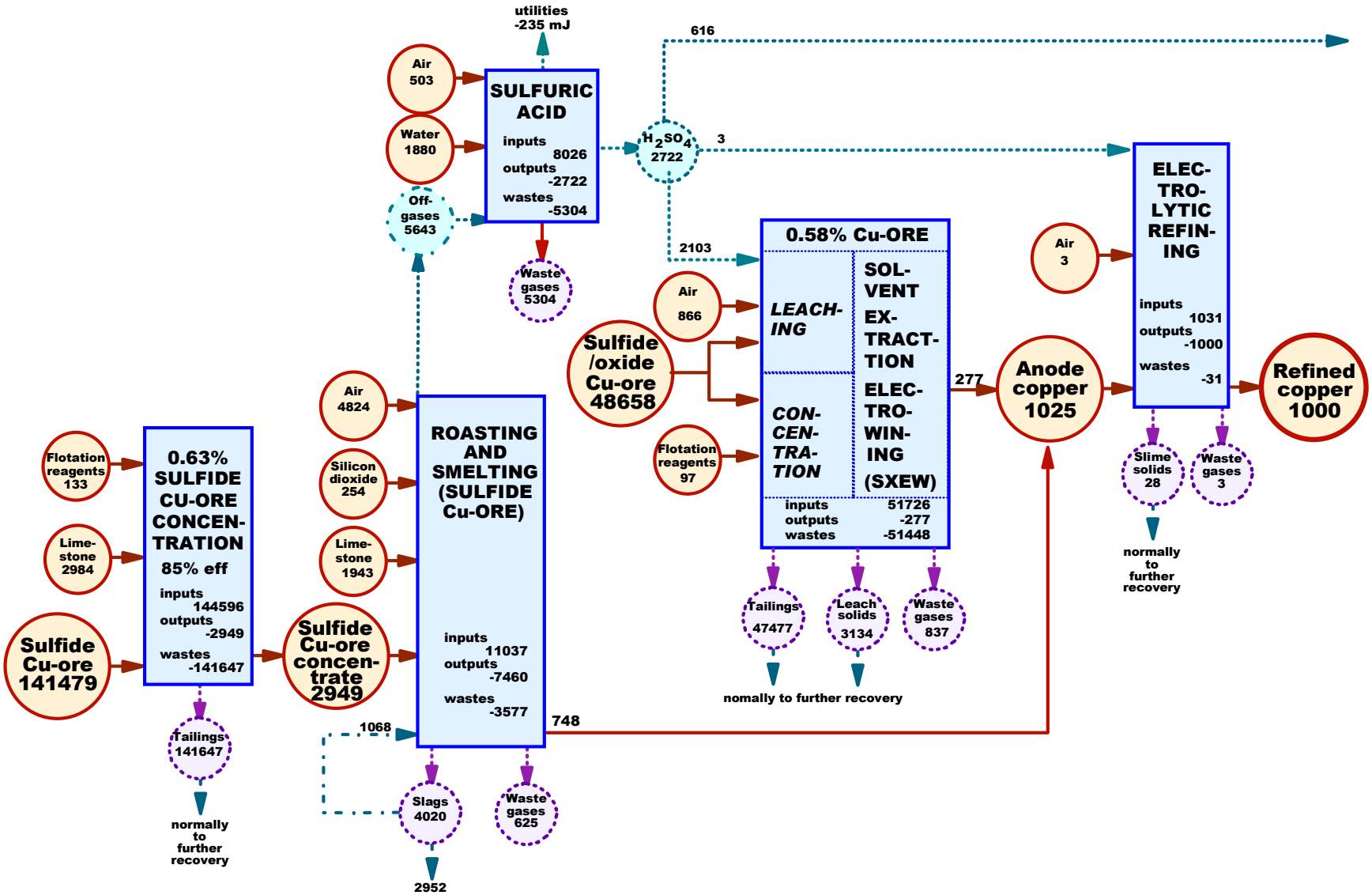


Figure 2.2: US copper ore grade percent,1880-2000

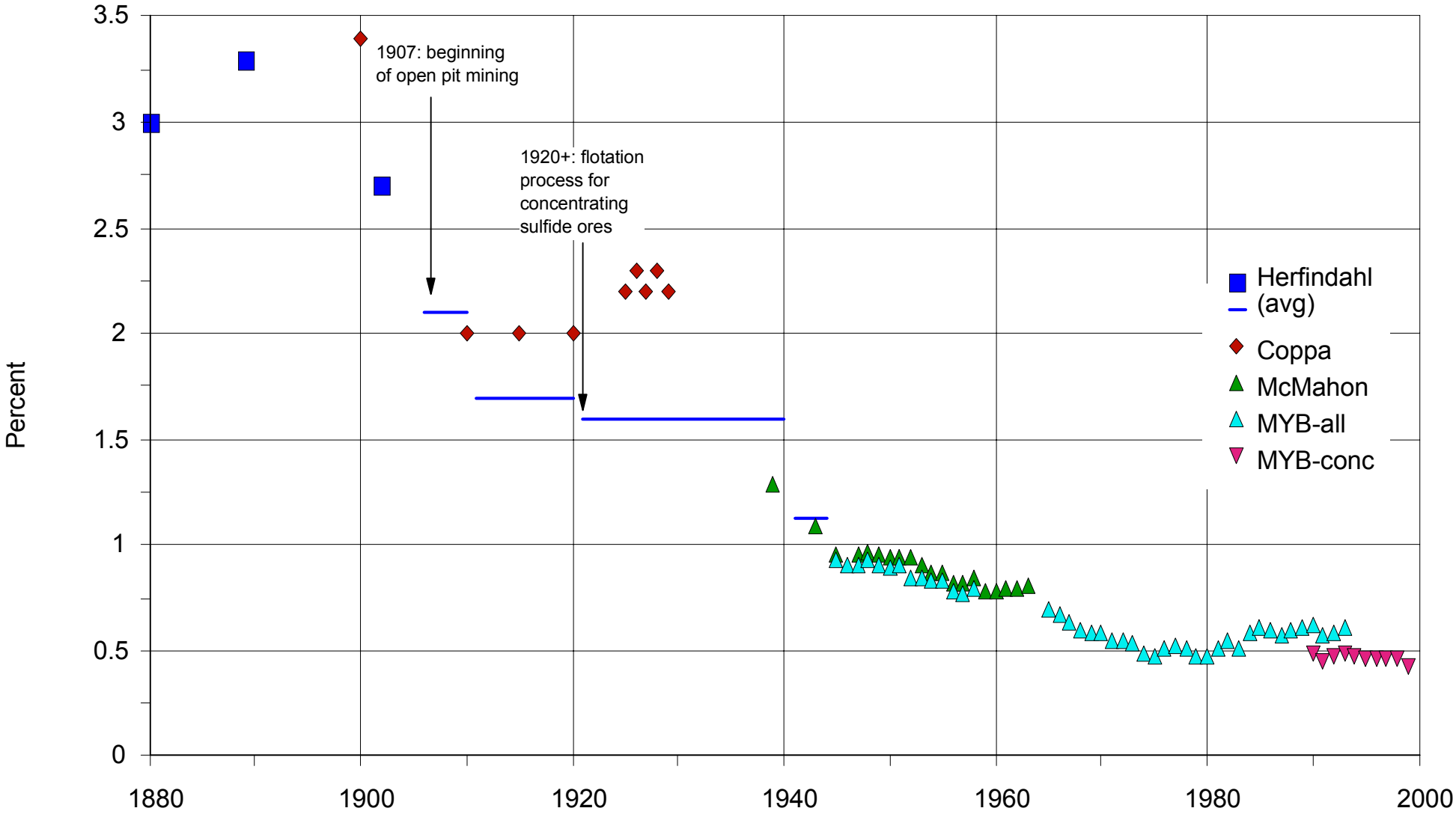


Figure 2.3: Exergy flows (mJ) in the production of 1 MT copper (simplified processes, typical material mixes)

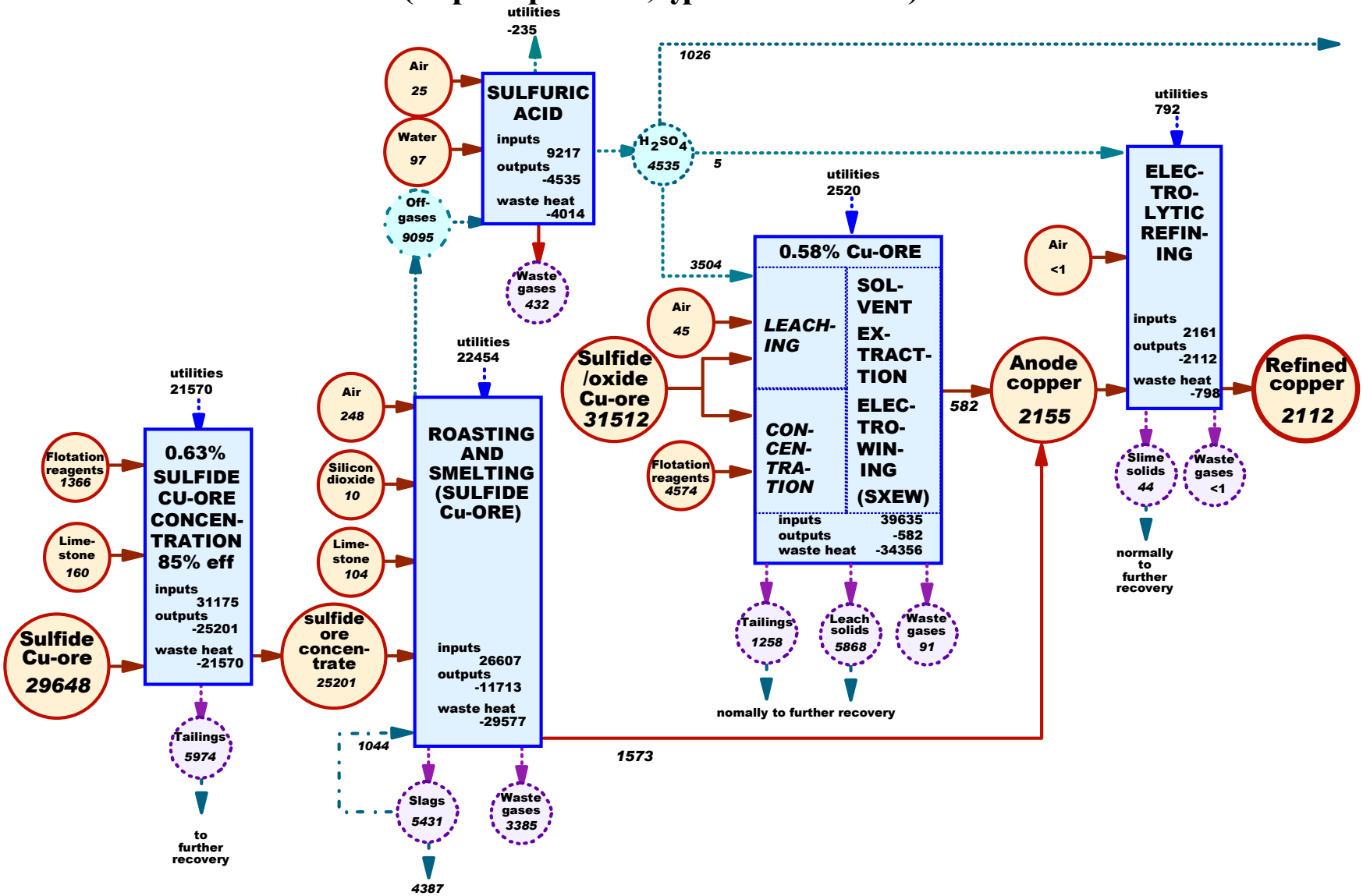


Figure 2.4: Primary copper mass and exergy flows

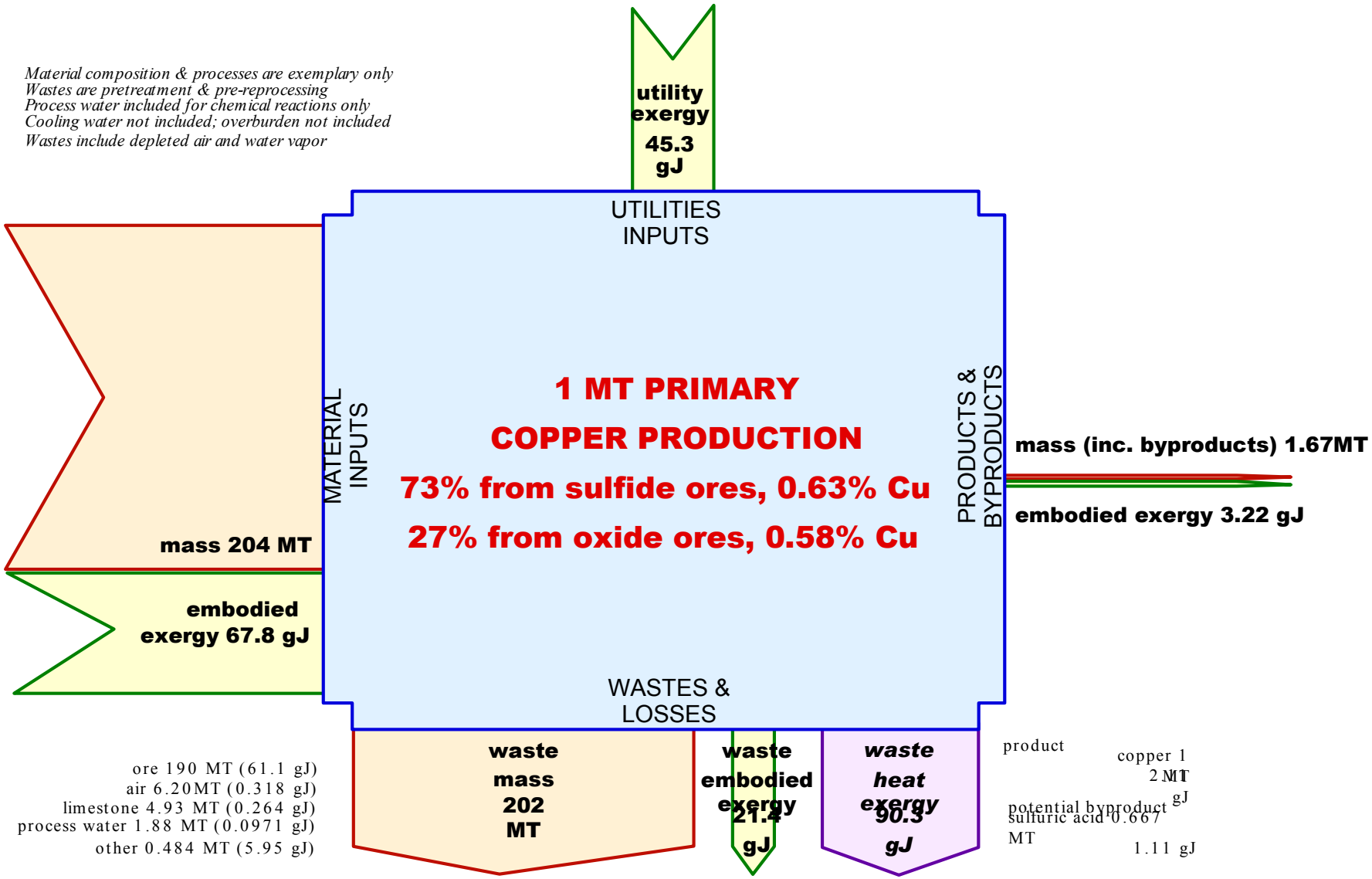


Figure 2.5: France; copper foundry production, imports, exports &apparent consumption, 1913 - 1998 (3 year moving averages)

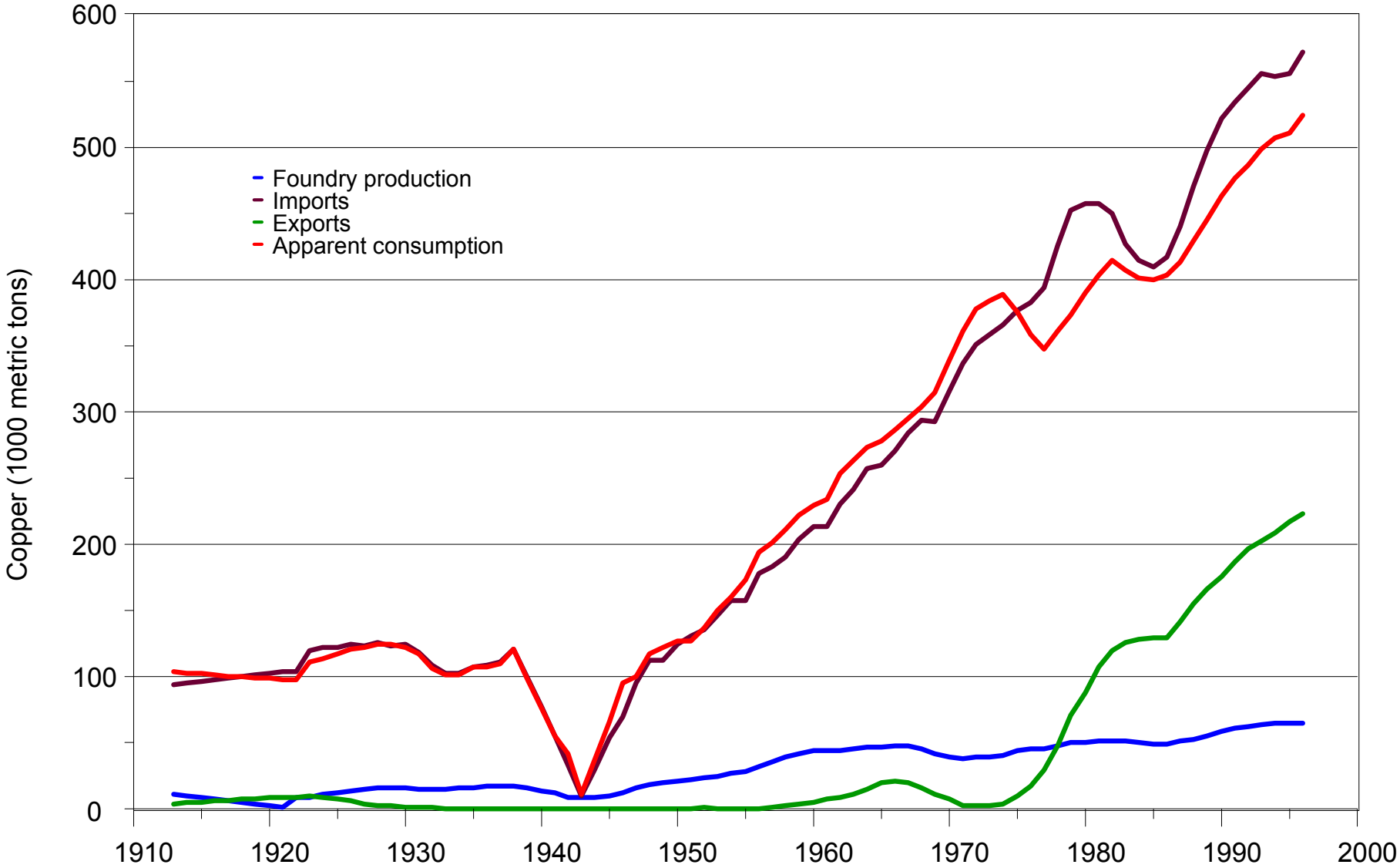


Figure 2.6: United Kingdom; copper foundry production, imports, exports &apparent consumption, 1913 - 1998 (3 year moving averages)

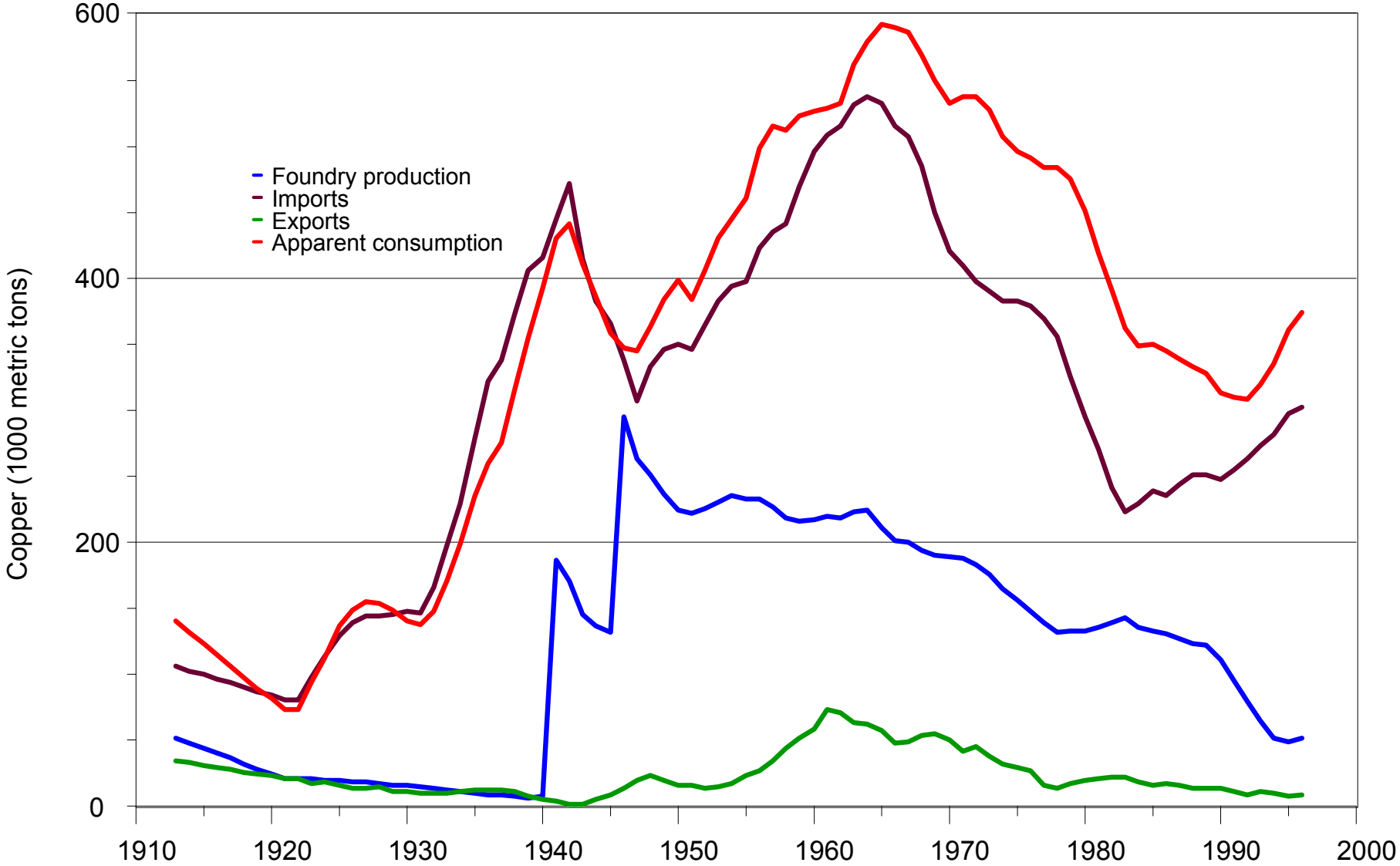


Figure 2.7: Germany; copper foundry production, imports, exports &apparent consumption, 1913 - 1998 (3 year moving averages)

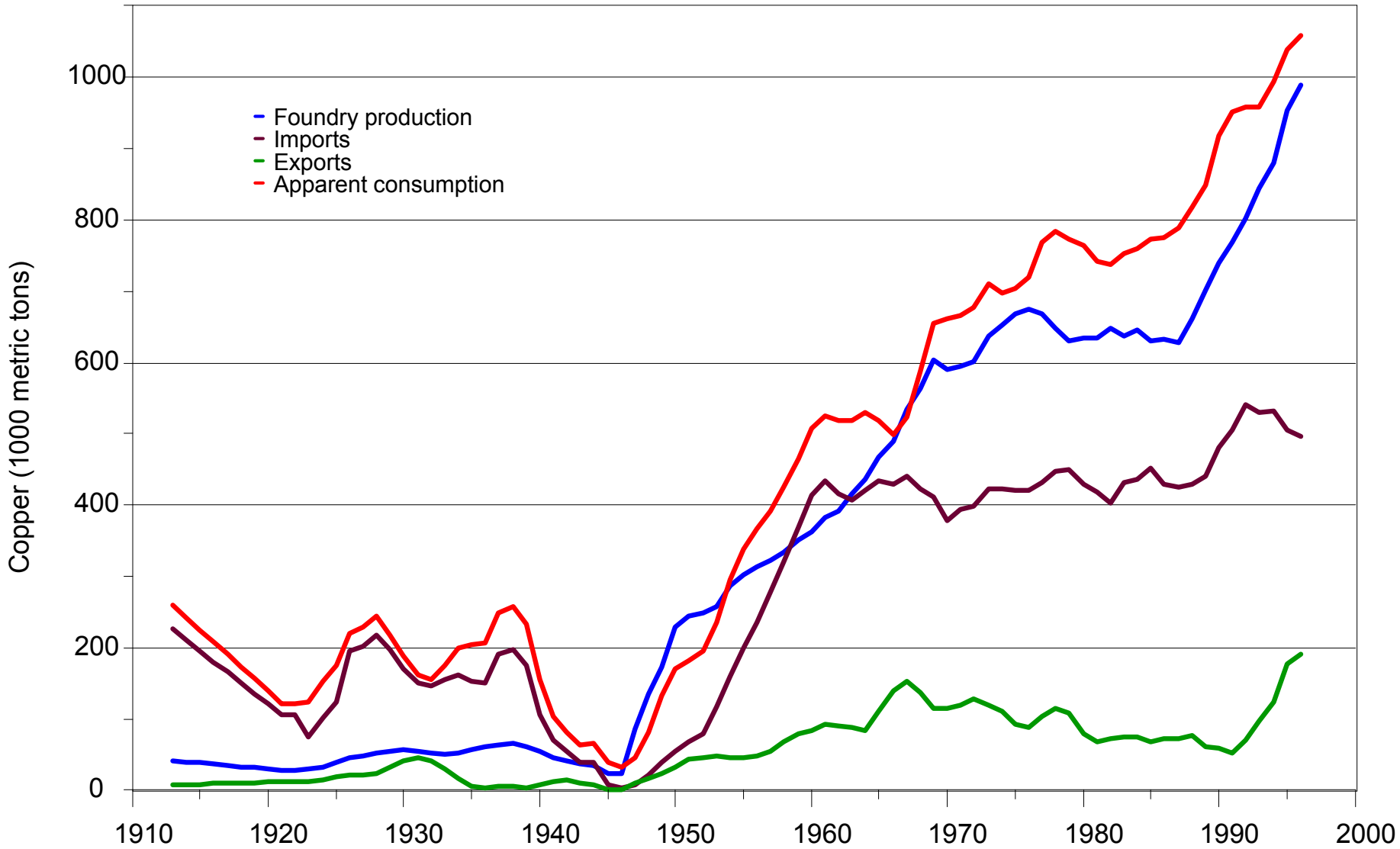


Figure 2.8: Sweden; copper foundry production, imports, exports &apparent consumption, 1913 - 1998 (3 year moving averages)

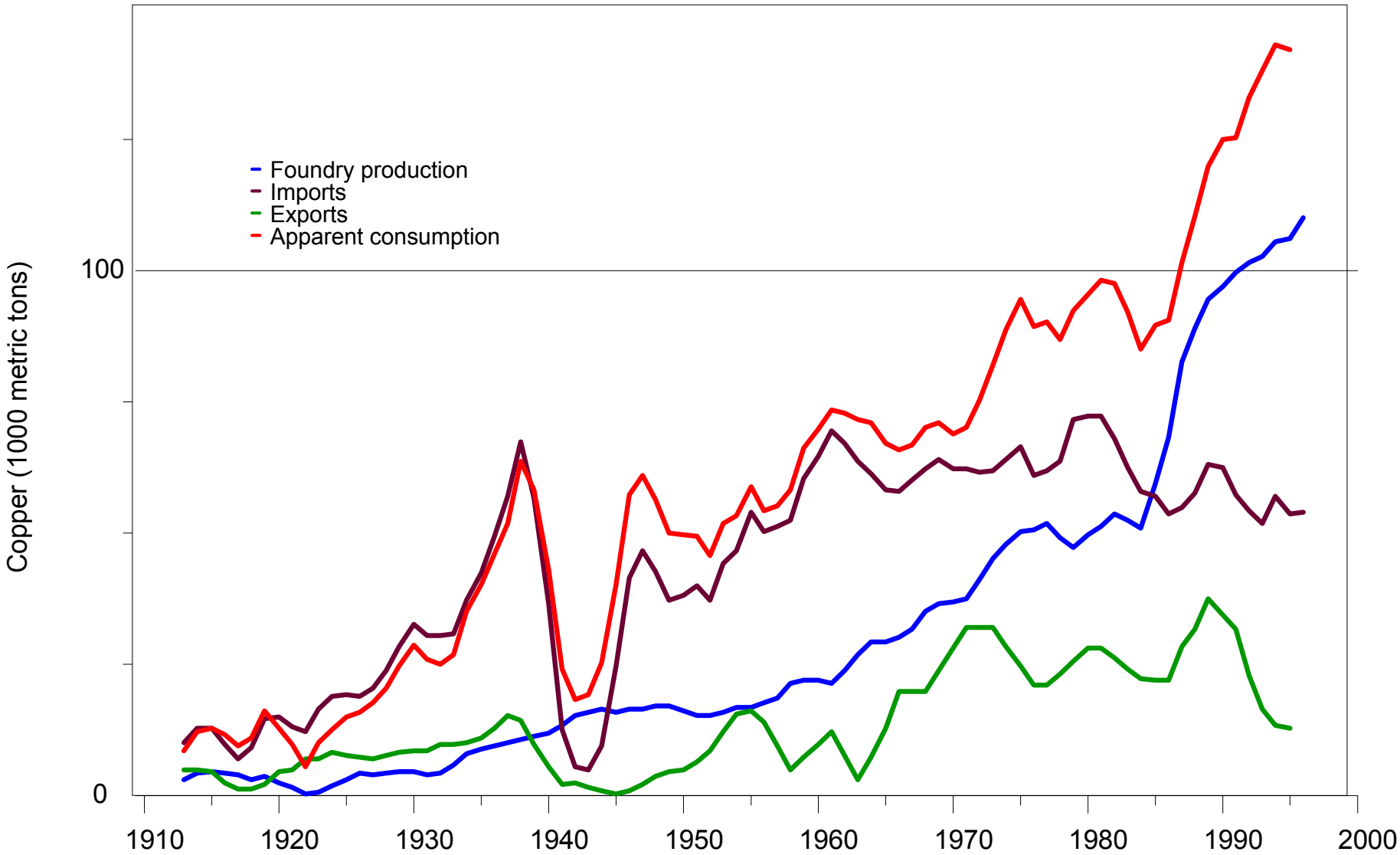


Figure 2.9: Japan; copper foundry production, imports, exports &apparent consumption, 1913 - 1998 (3 year moving averages)

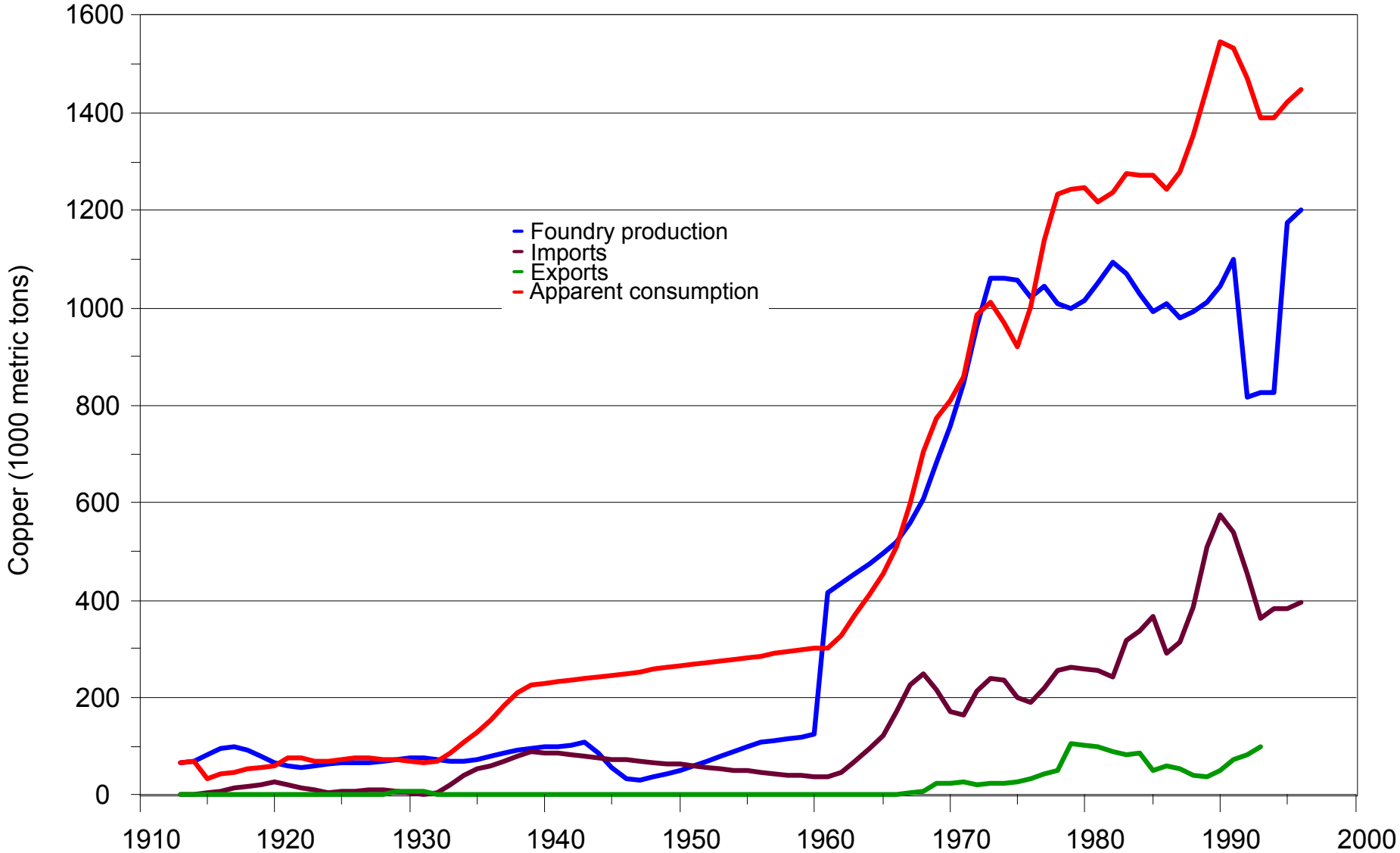


Figure 2.10: USA; copper foundry production, imports, exports &apparent consumption, 1913 - 1998 (3 year moving averages)

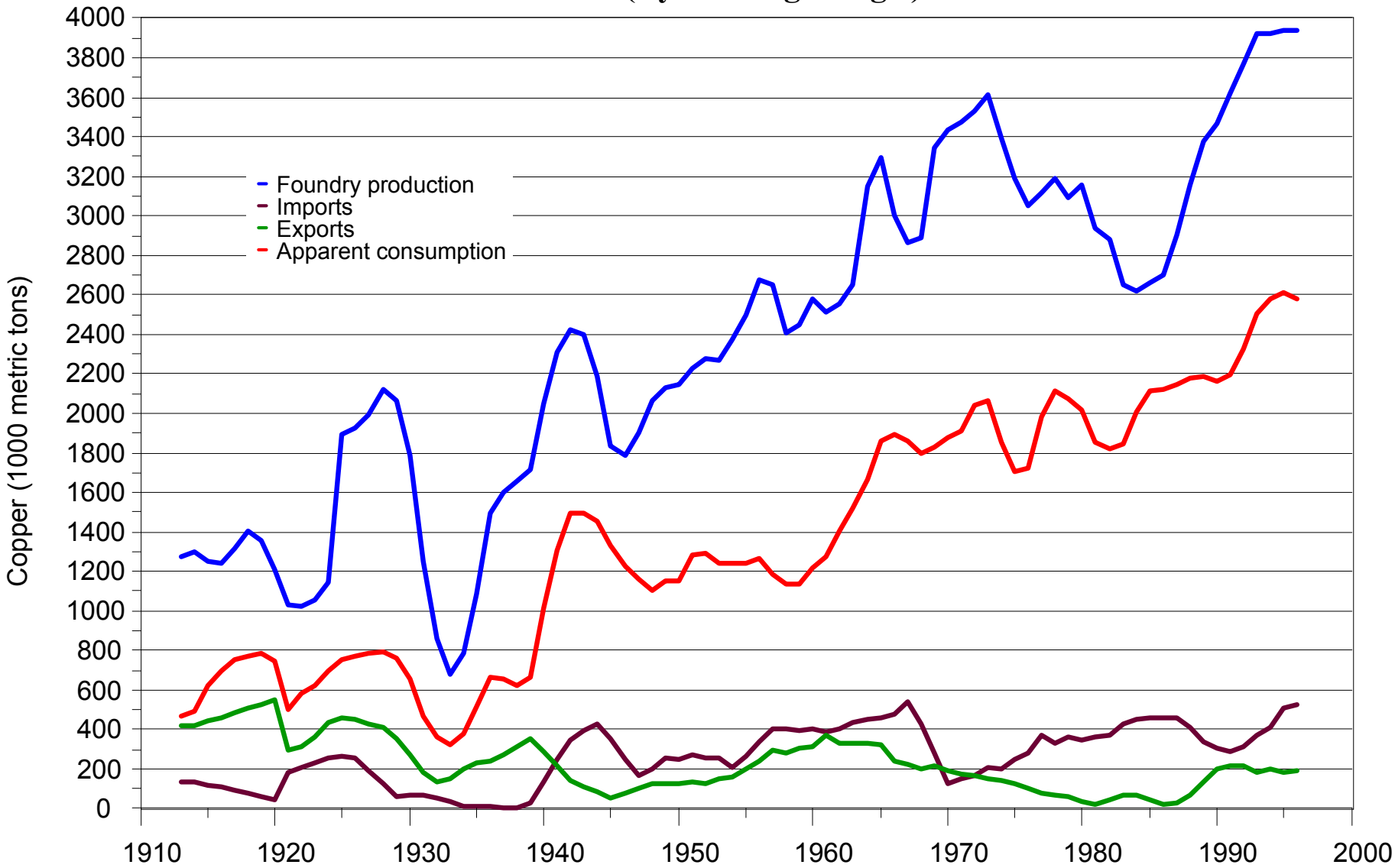


Figure 2.11: Electrical consumption of copper; US 1947 - 1993

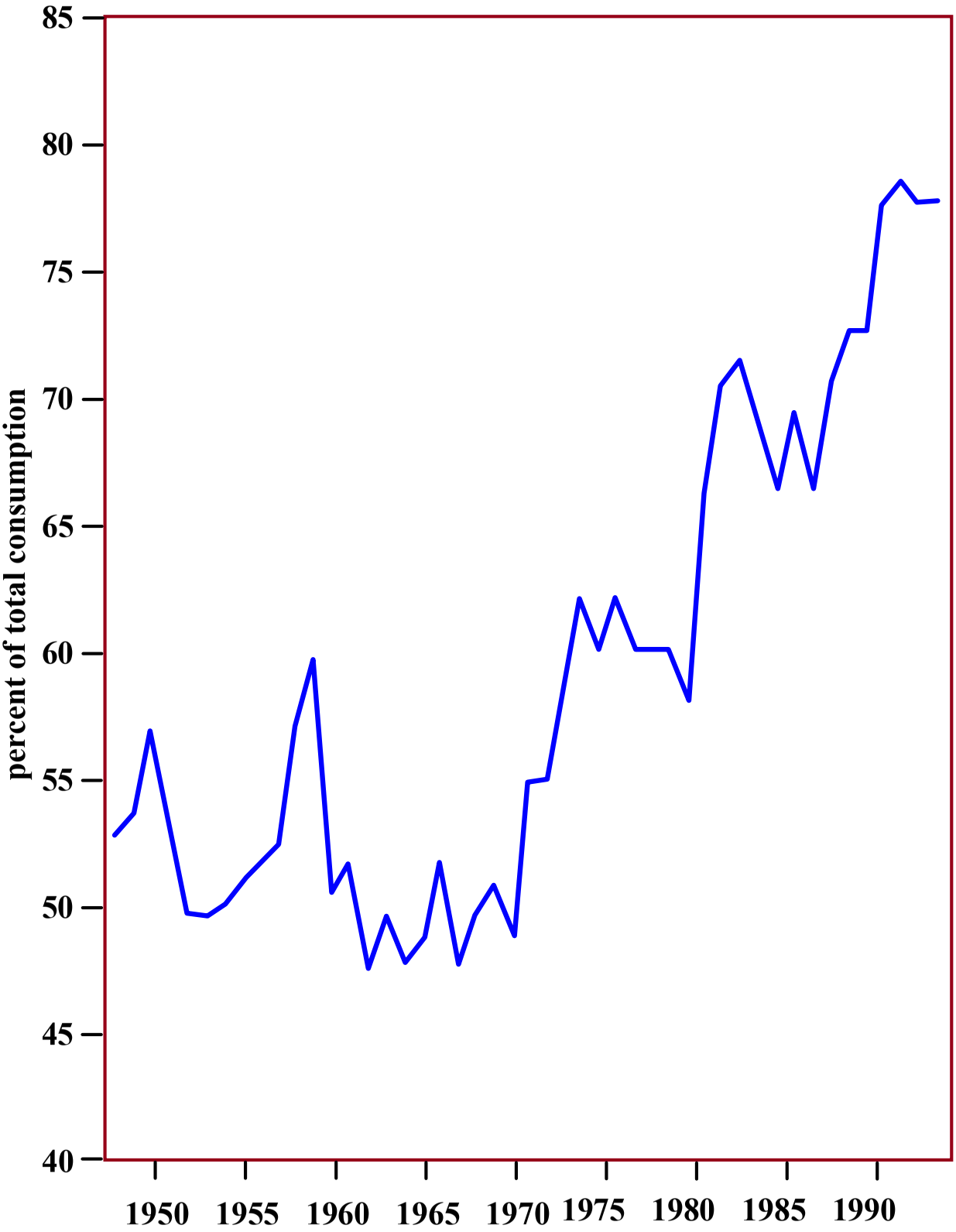
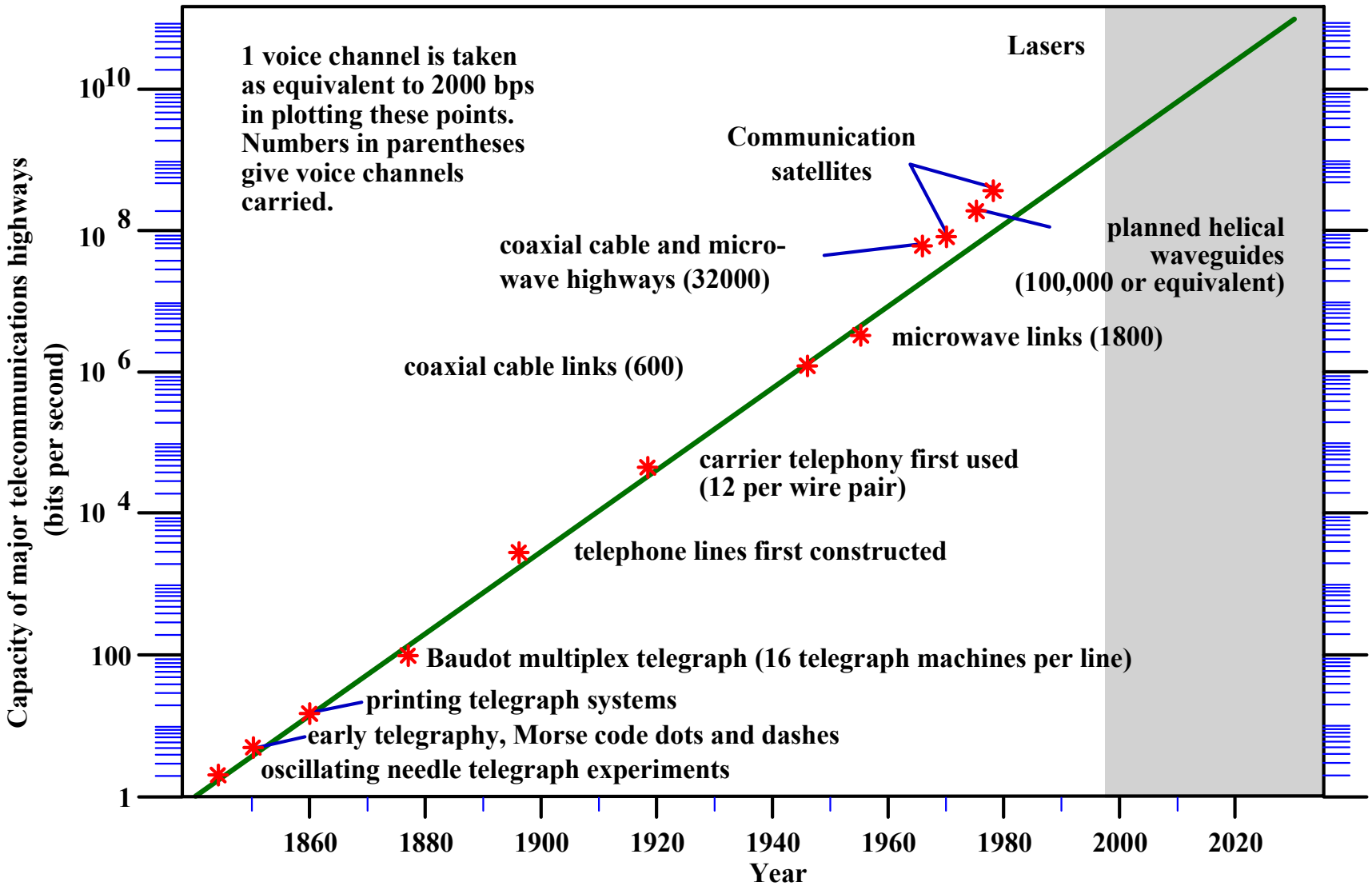


Figure 2.12: Telecommunications capacity



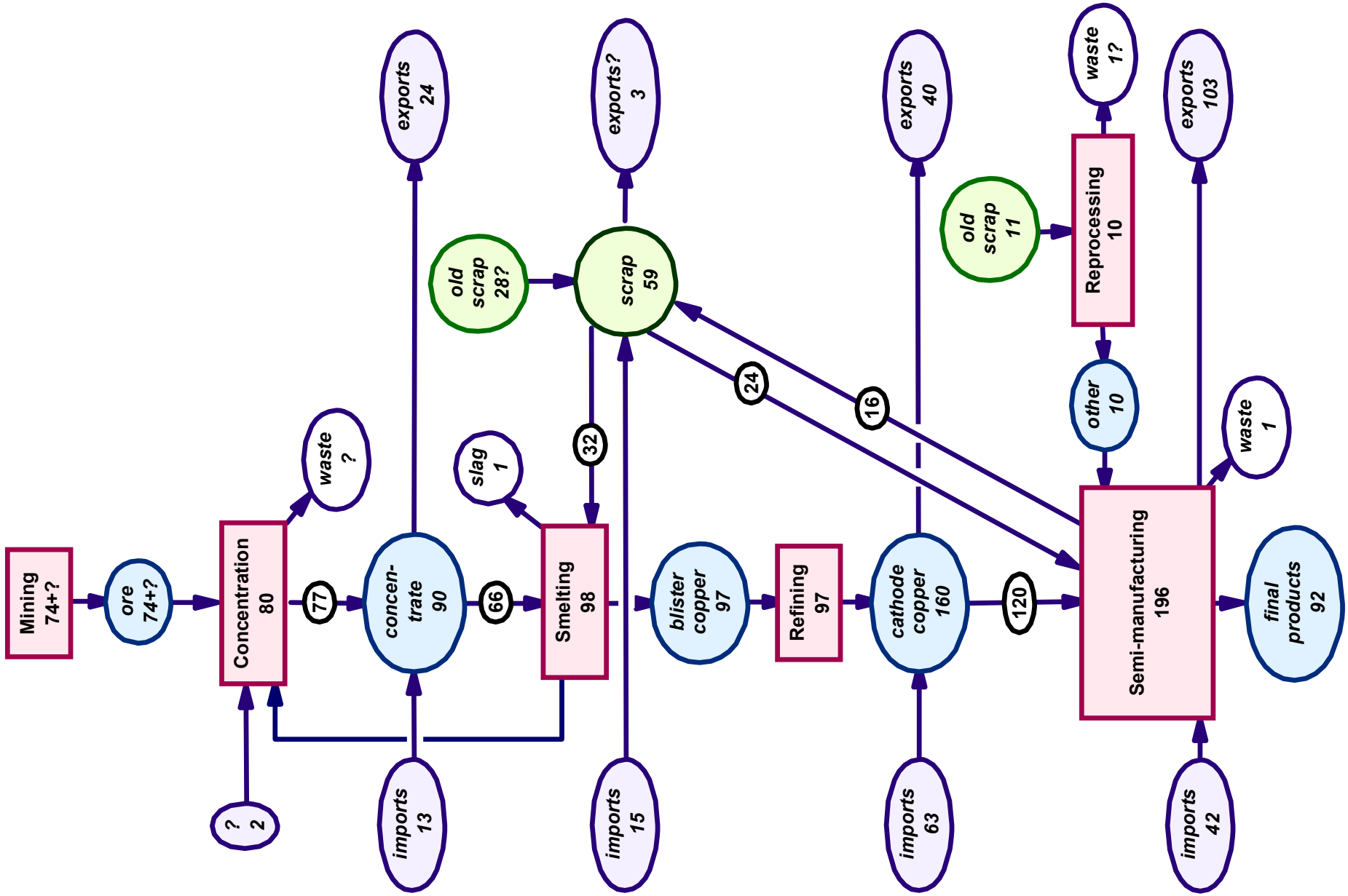


Figure 2.13: Alternative copper flows for Sweden, 1930

Figure 2.14: Price of copper on the New York market, 1870 - 2000
(cents per pound in current and constant 1987 US dollars)

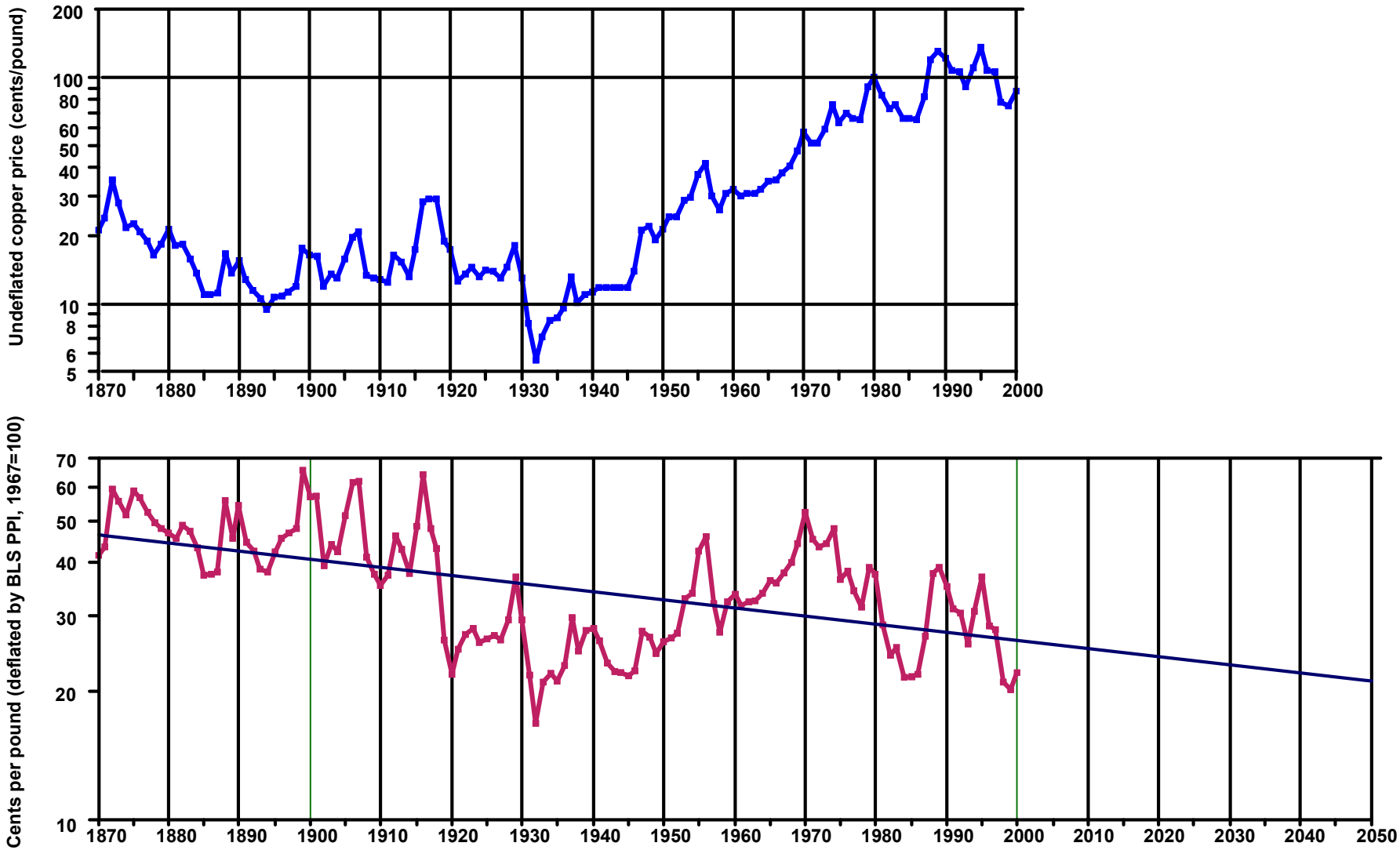
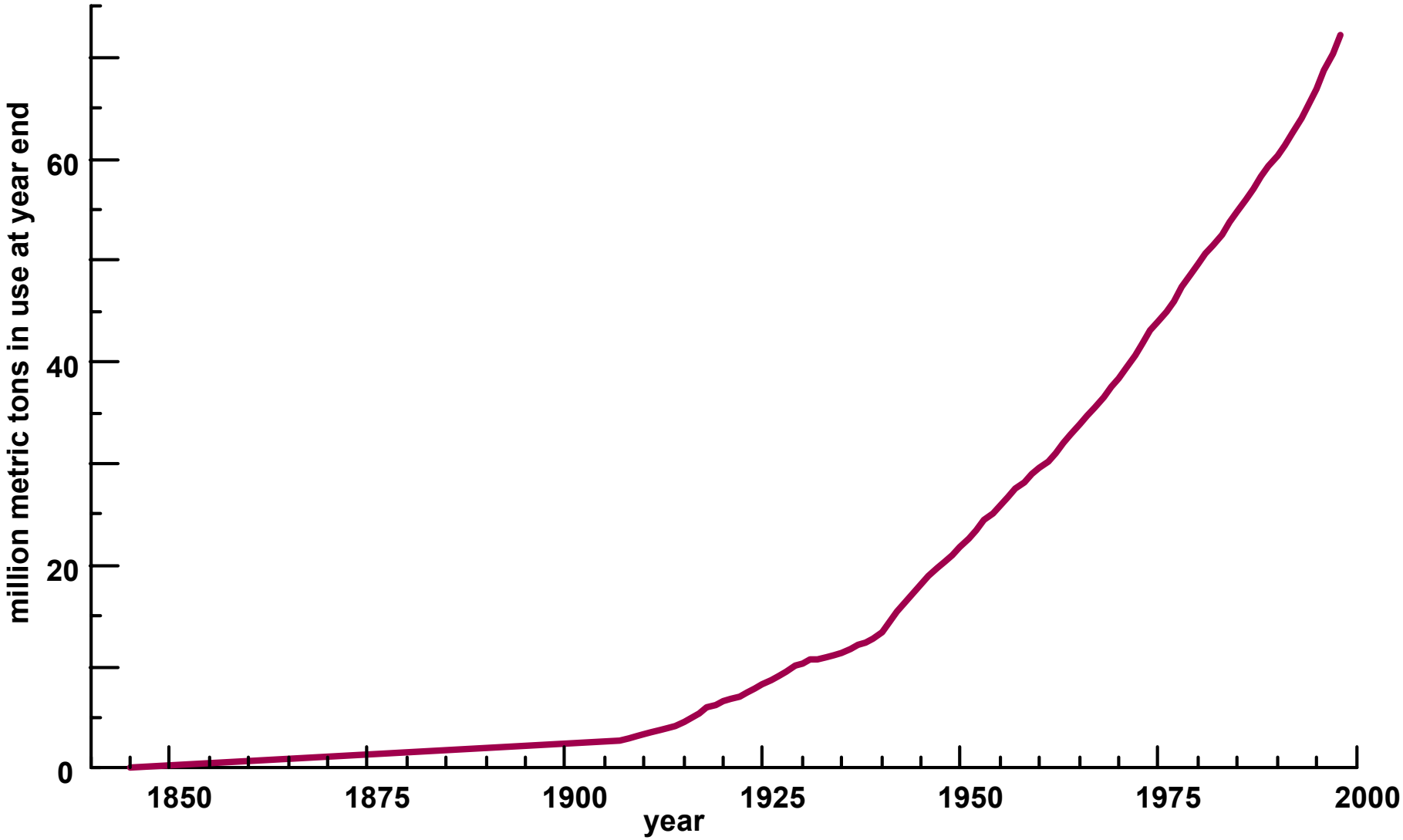
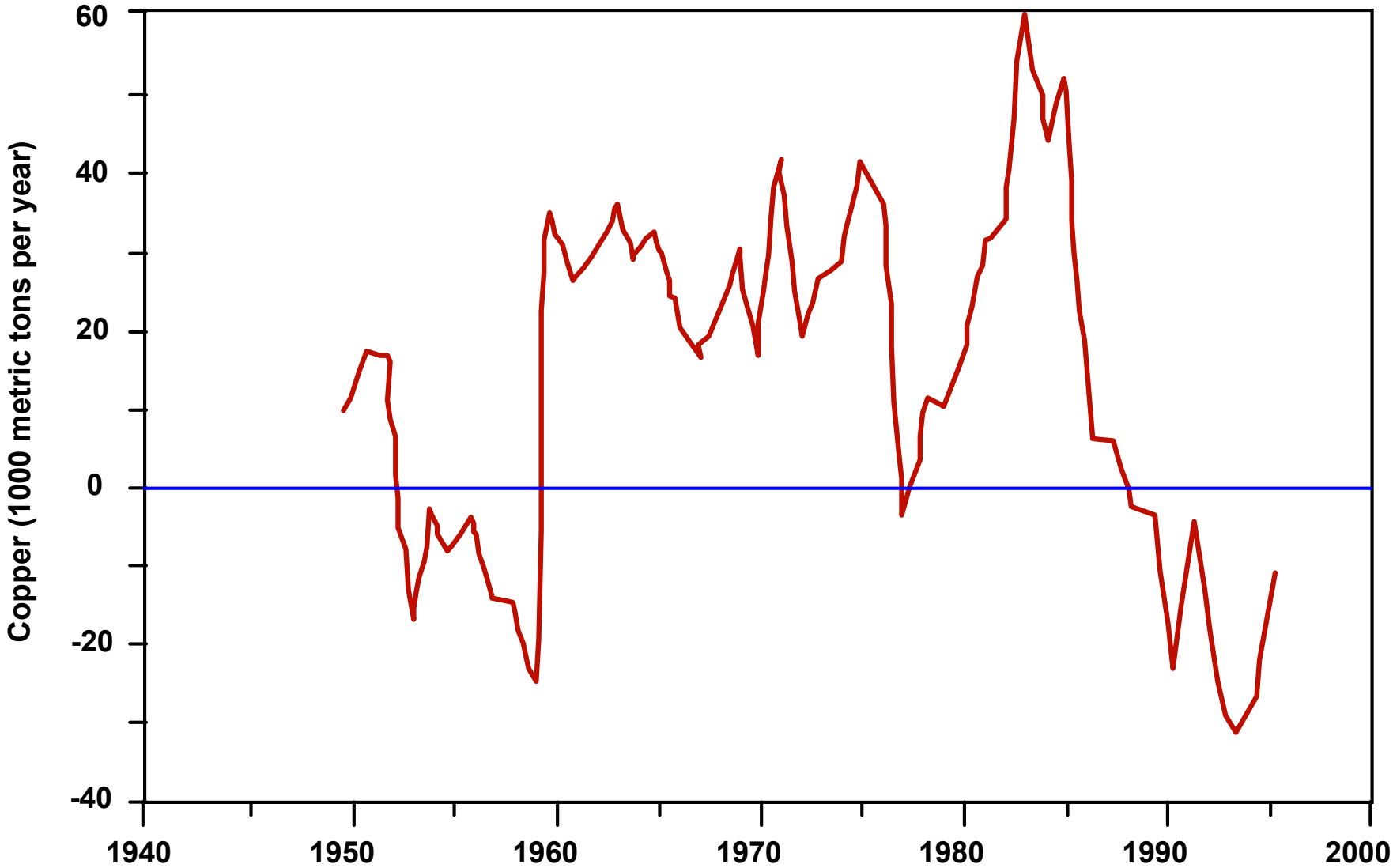


Figure 2.15: Estimated accumulation of copper-in-use in USA, 1845 - 1998



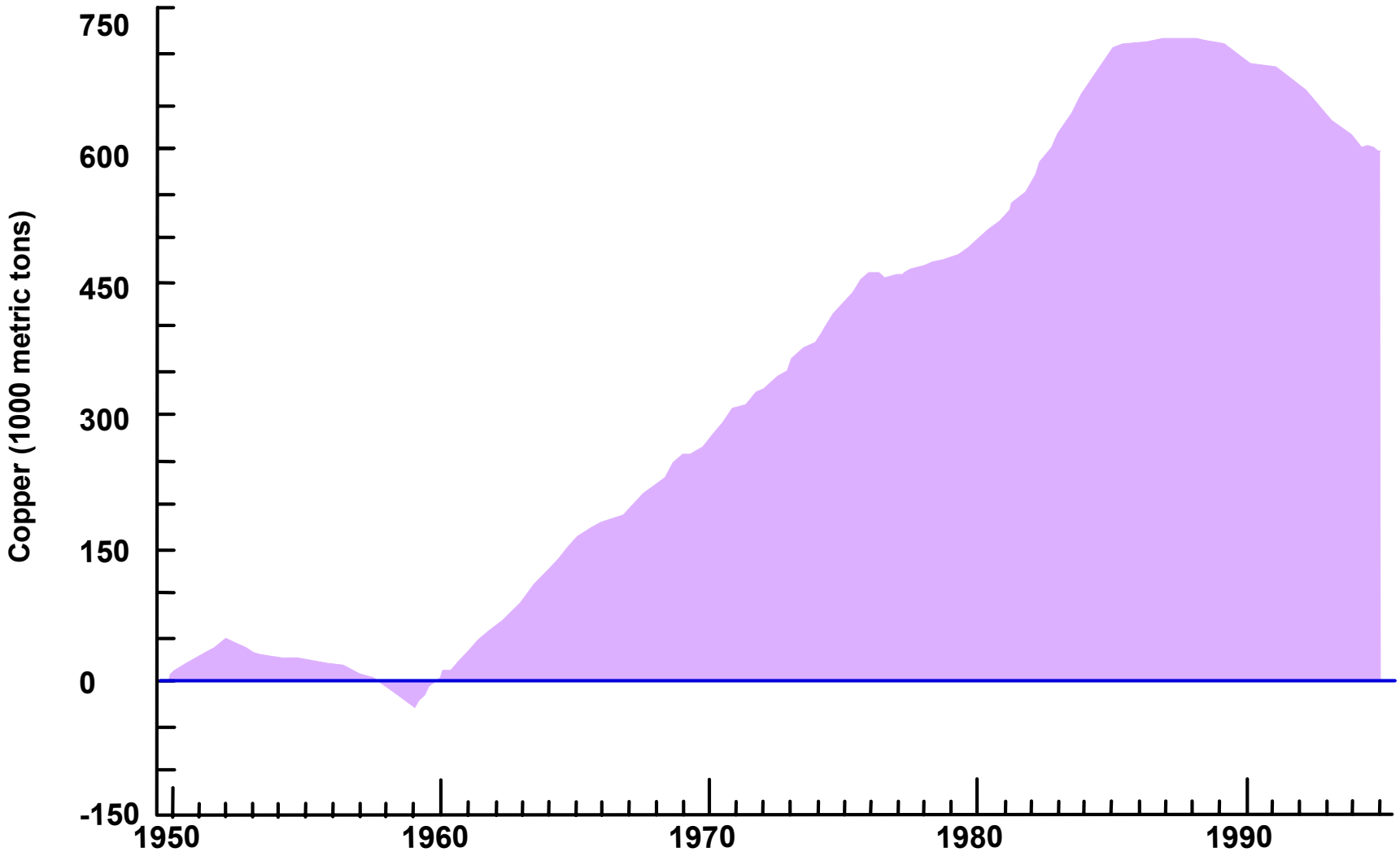
Sources: McMahon 1964, Historical Statistics, and Minerals Yearbooks

Figure 2.16: Annual change in the copper store in the Swedish technosphere: 1950 - 1995



Source: Landner & Lindström 1999, Figure 5.6

Figure 2.17: Cumulative evolution of the copper reservoir in the Swedish technosphere (1950 base)



Source: Landner & Lindström 1999, Figure 4.6

Figure 2.18: World copper production and the US manufacturing production index, 1880 - 1998 with projections to 2050

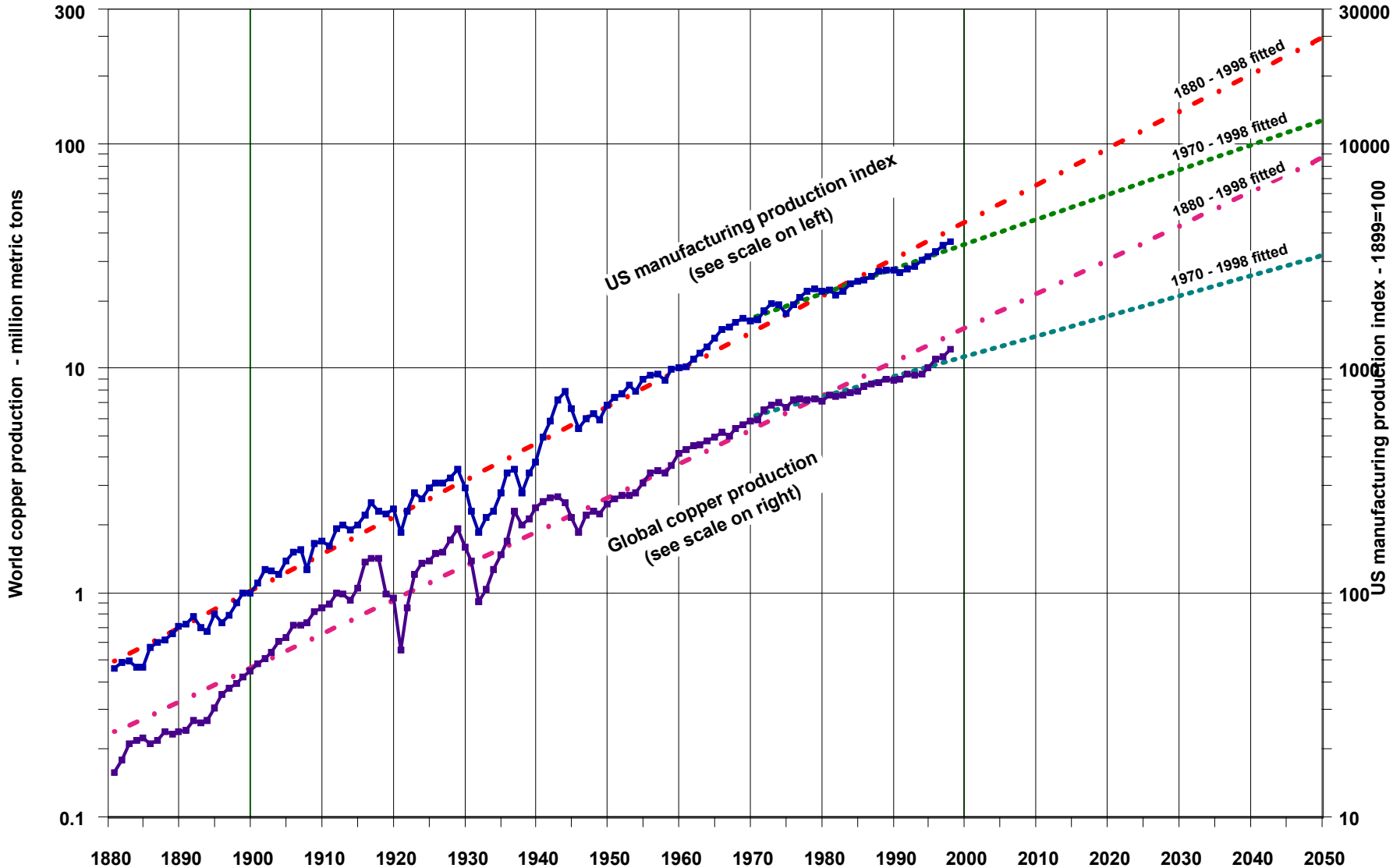


Figure 2.19: Historical and modeled Intensity of Use (consumption of refined copper) as a function of GDP/capita in 1960-1997

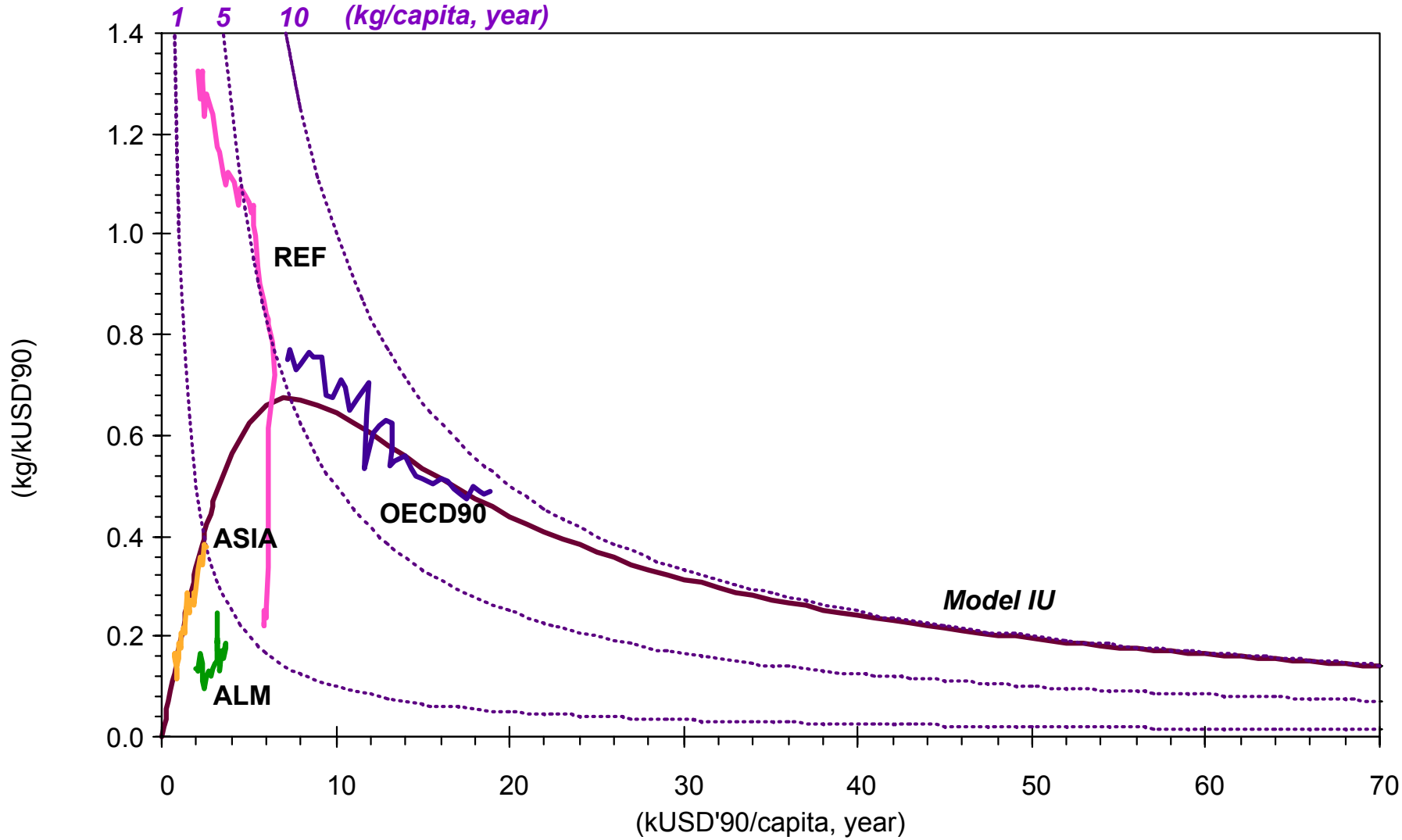


Figure 2:20: Model of the global copper system

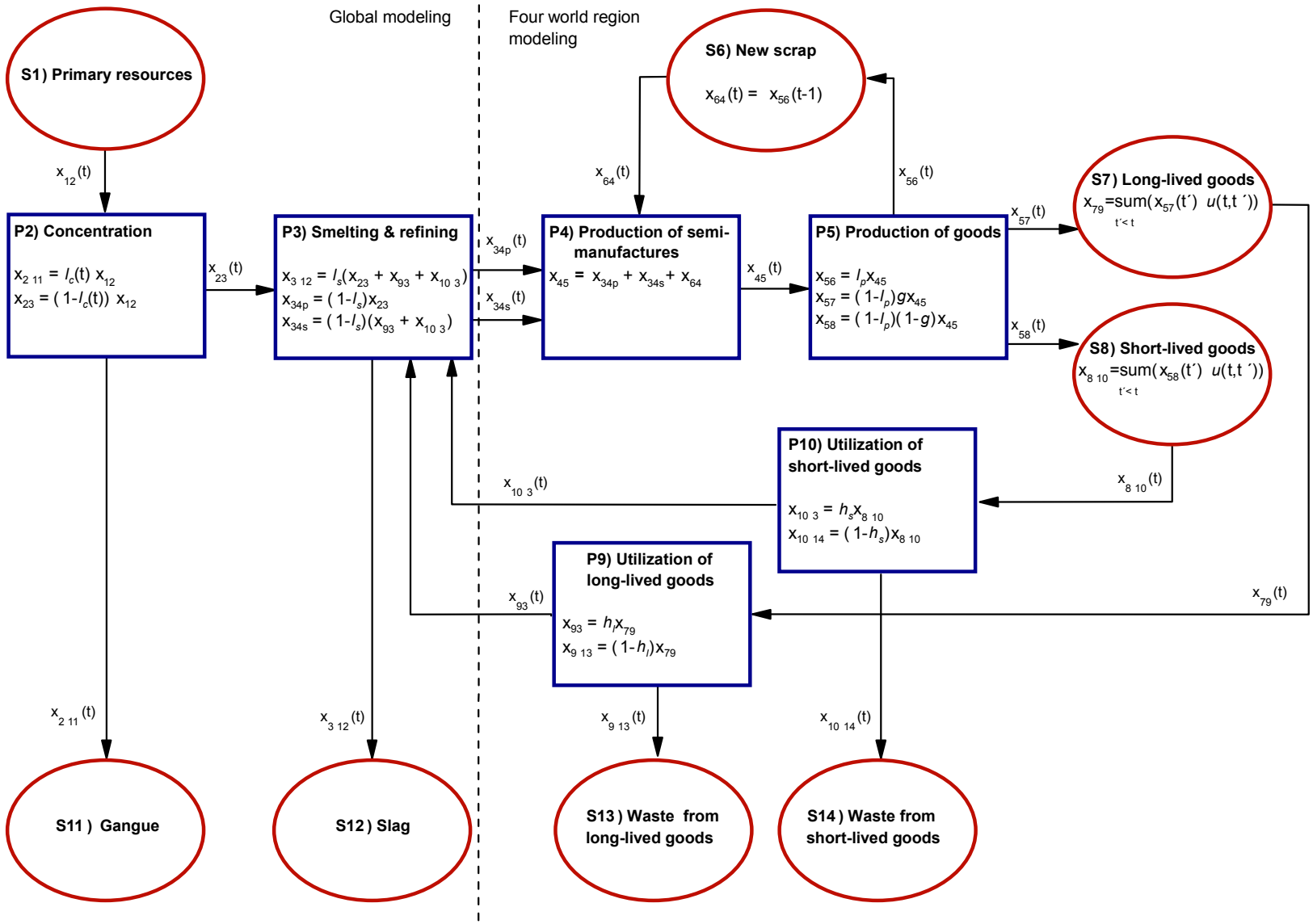


Figure 2.21: Global copper recycling (separation) efficiency
8 scenarios

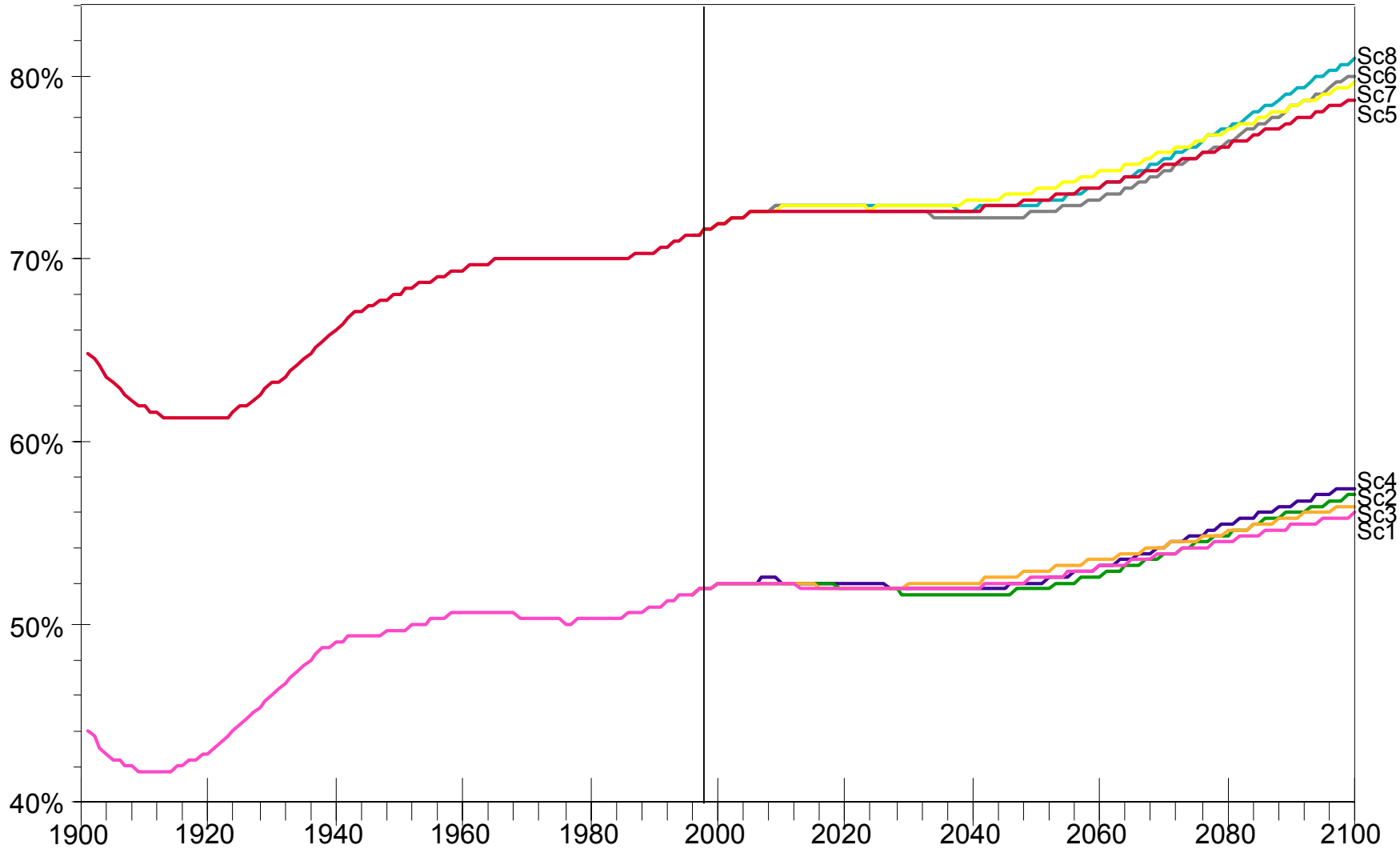


Figure 2.22: Global copper recycling rate
8 scenarios

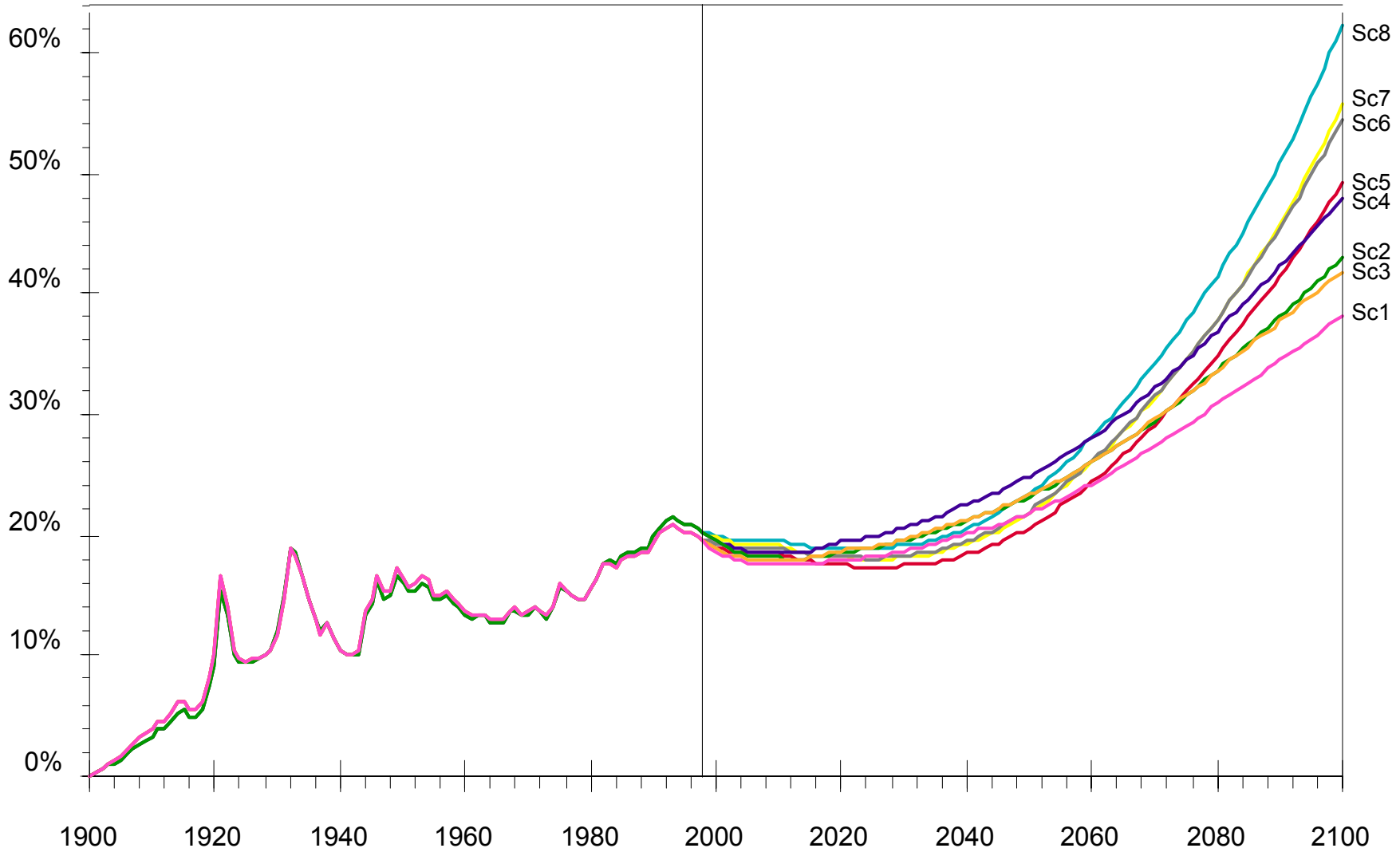


Figure 2.23: Global consumption of refined copper, scenarios 1 through 4 (low recycling efficiency)

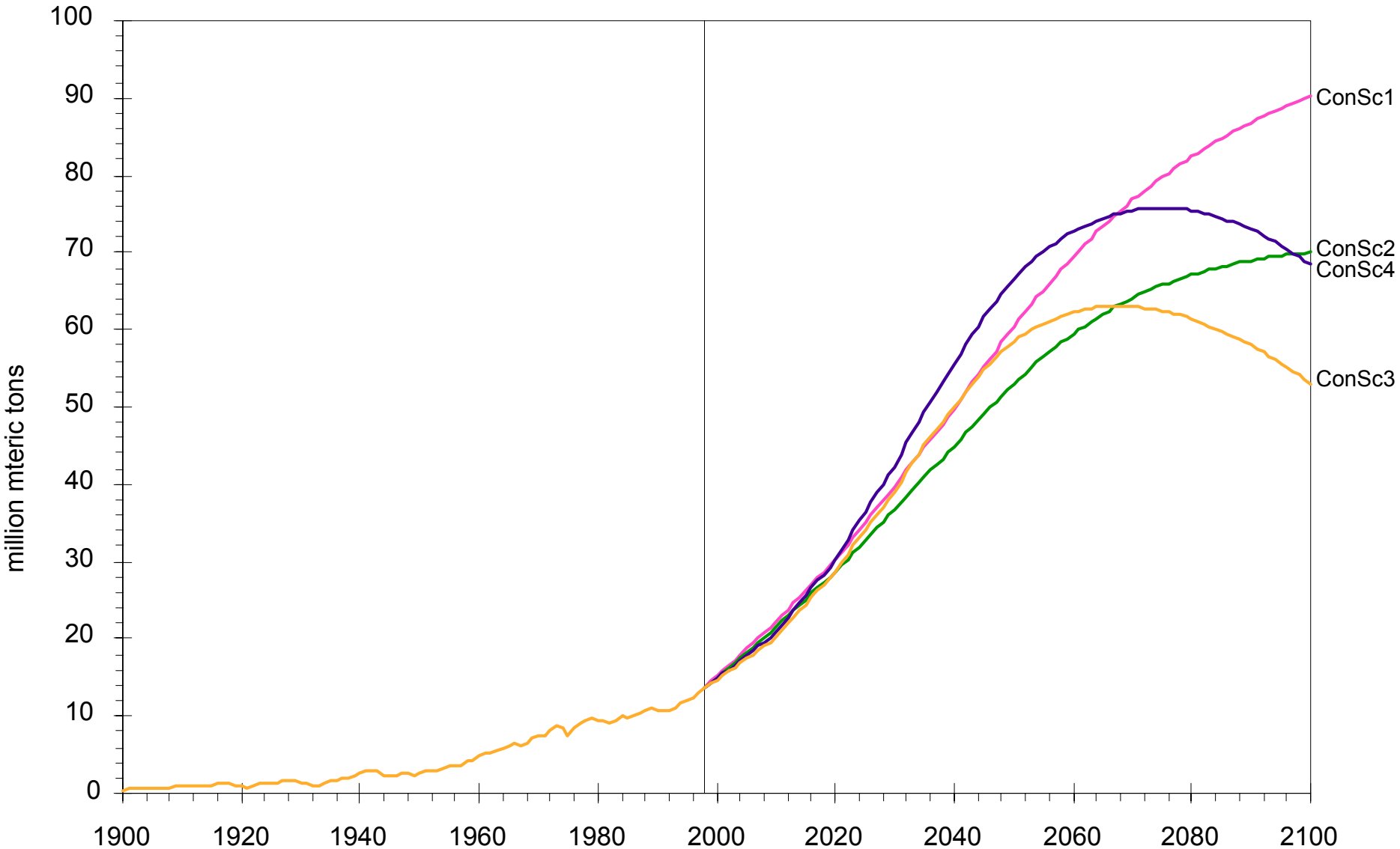


Figure 2.24: Regional consumption of refined copper; scenarios 1 and 5

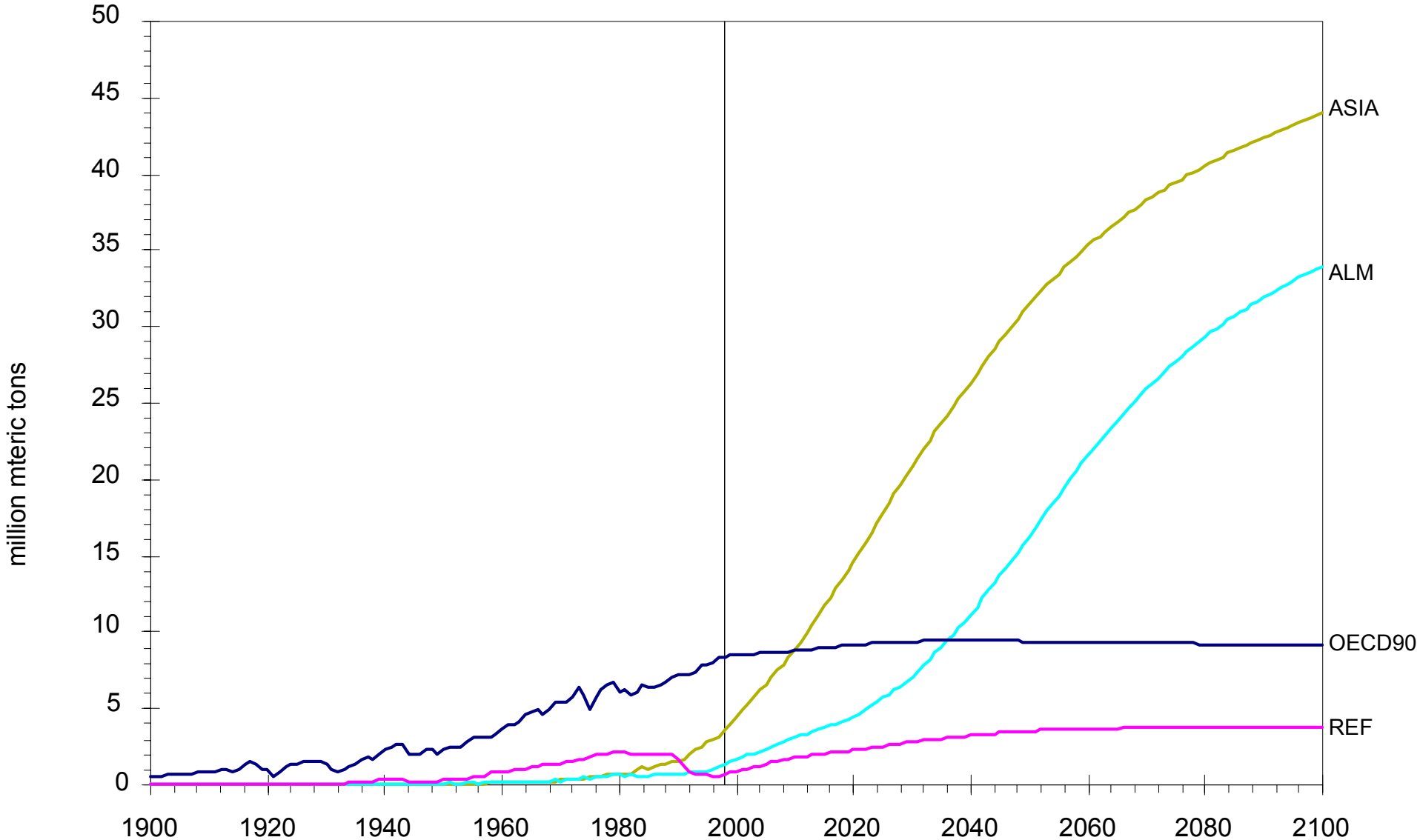


Figure 2.25: Regional consumption of refined copper; scenarios 3 and 7

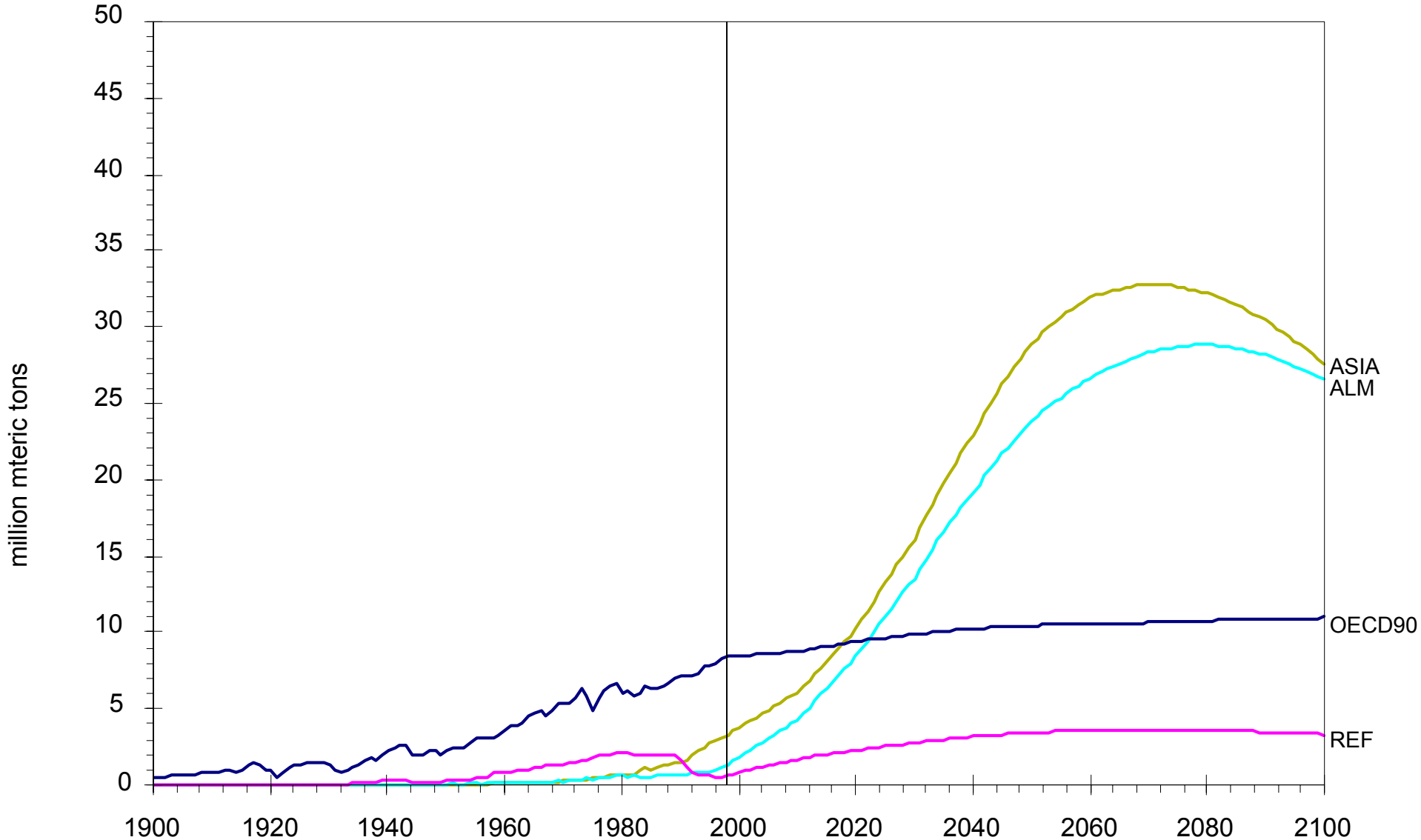


Figure 2.26: Regional consumption of refined copper; scenarios 2 and 6

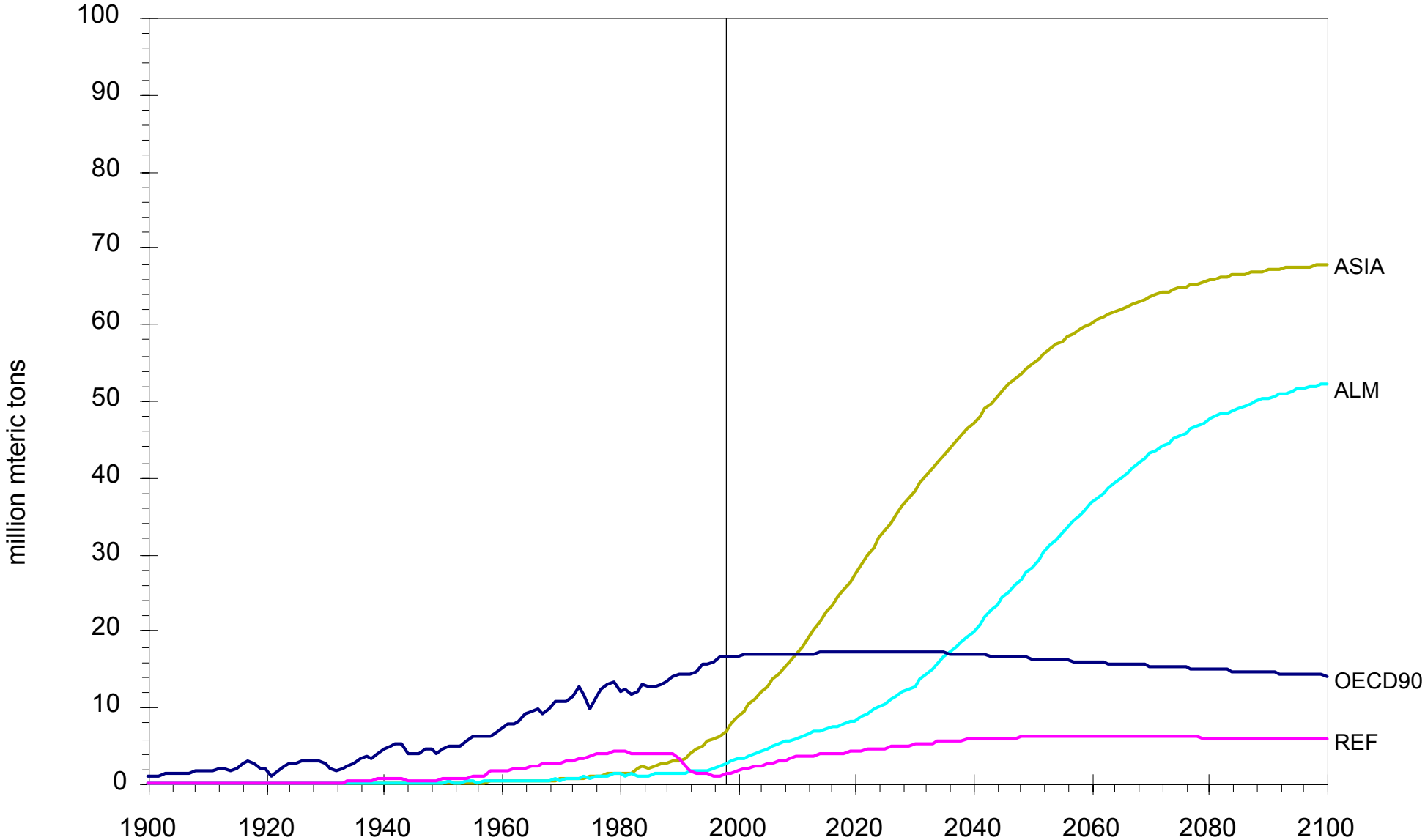


Figure 2.27: Regional consumption of refined copper; scenarios 4 and 8

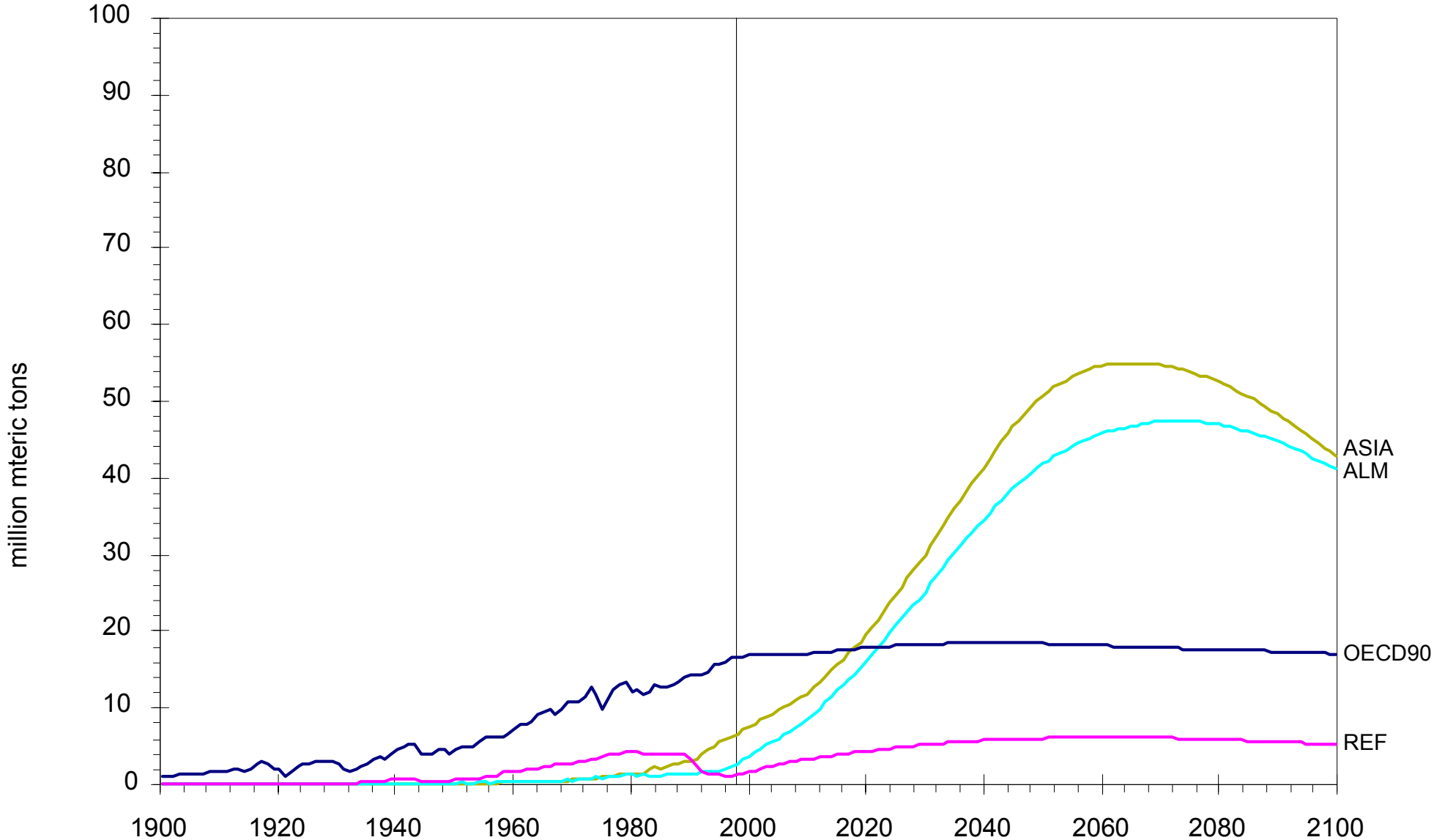


Figure 2.28: Global mine production of copper,1900 - 1998, MMT
8 scenarios

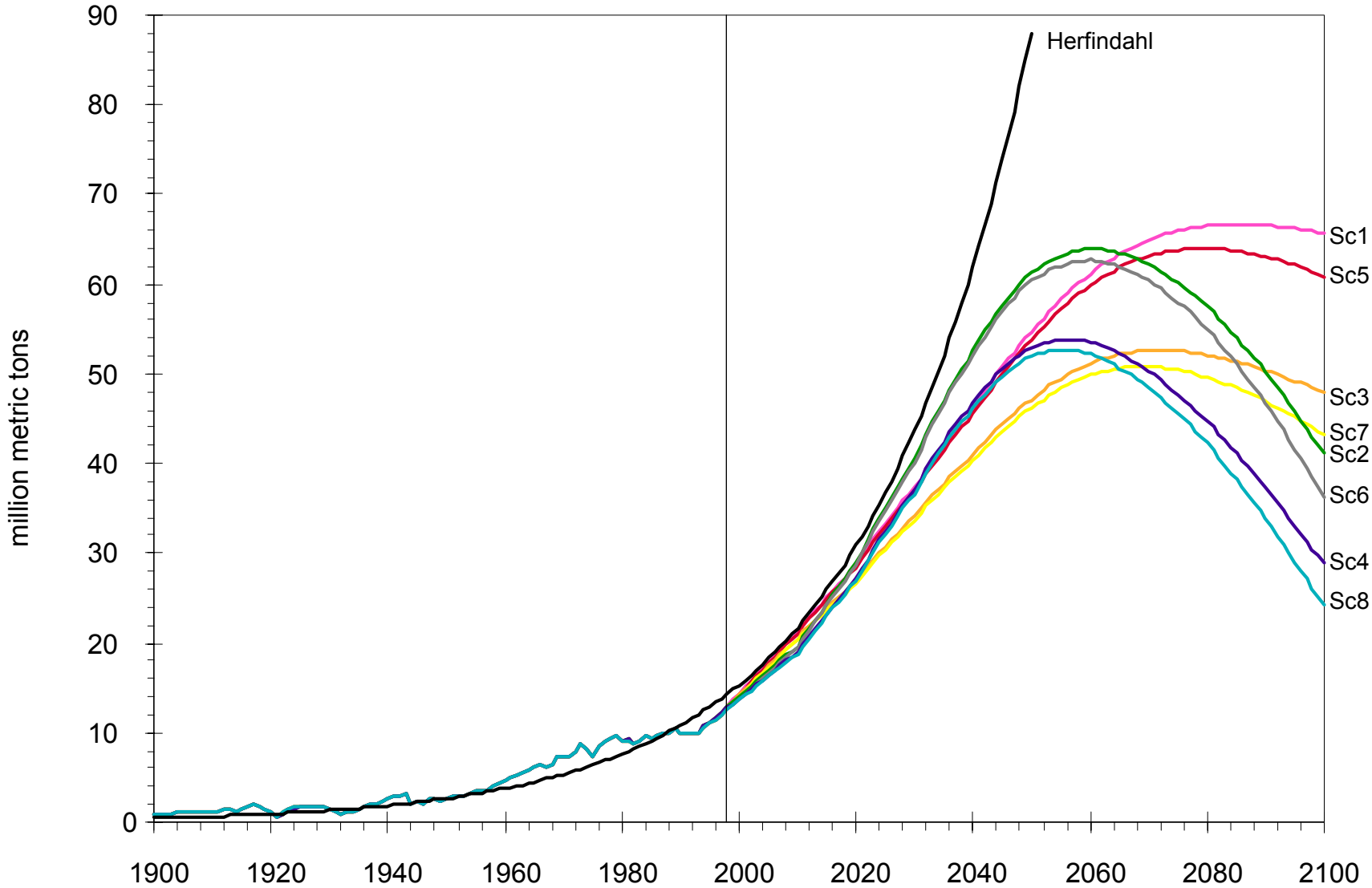


Figure 2.29: Cumulative global mine production of copper,1900 - 1998, MMT

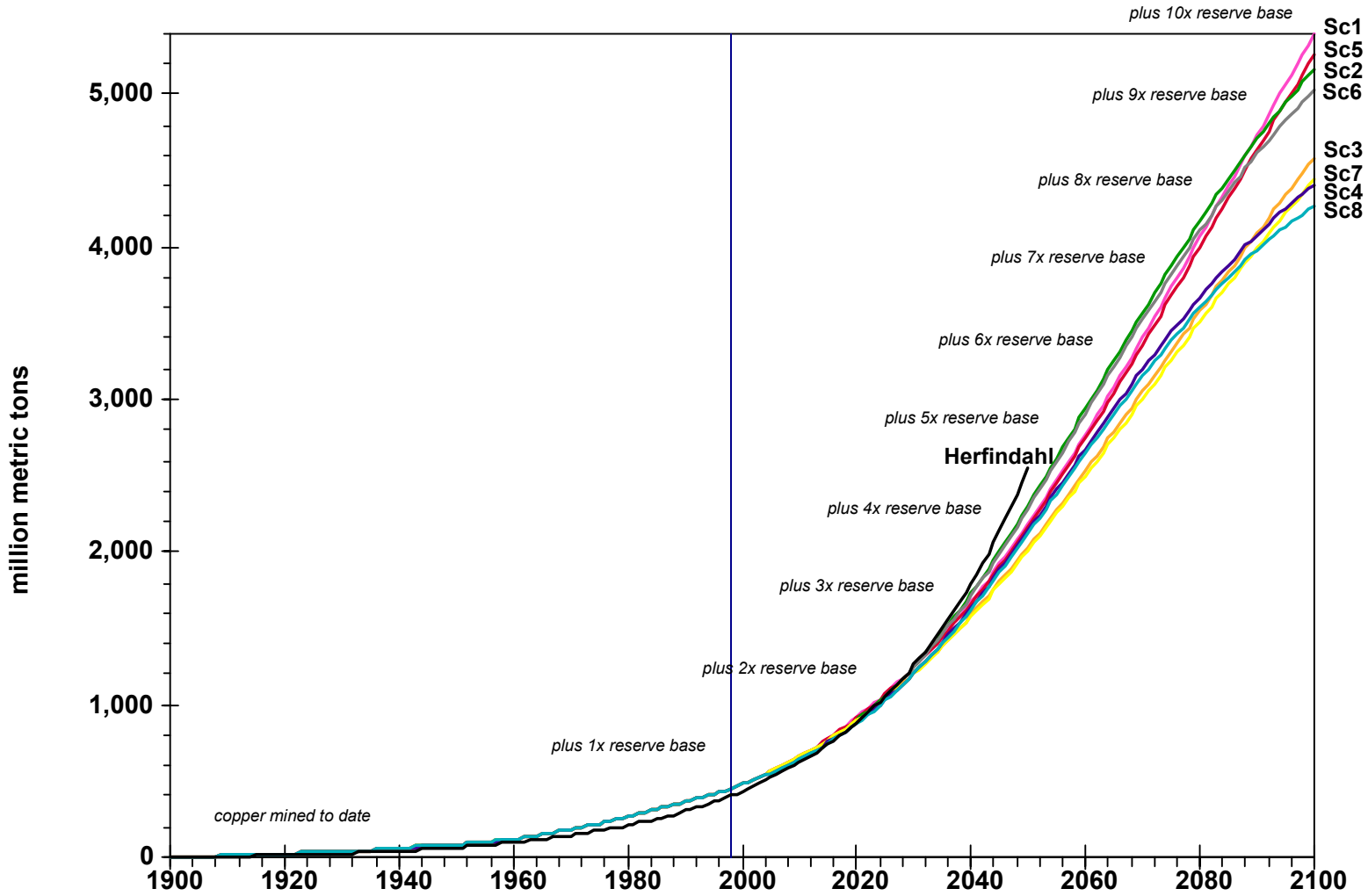


Figure 2.30: Global stock of waste copper, 1900 - 1998, MMT
8 scenarios

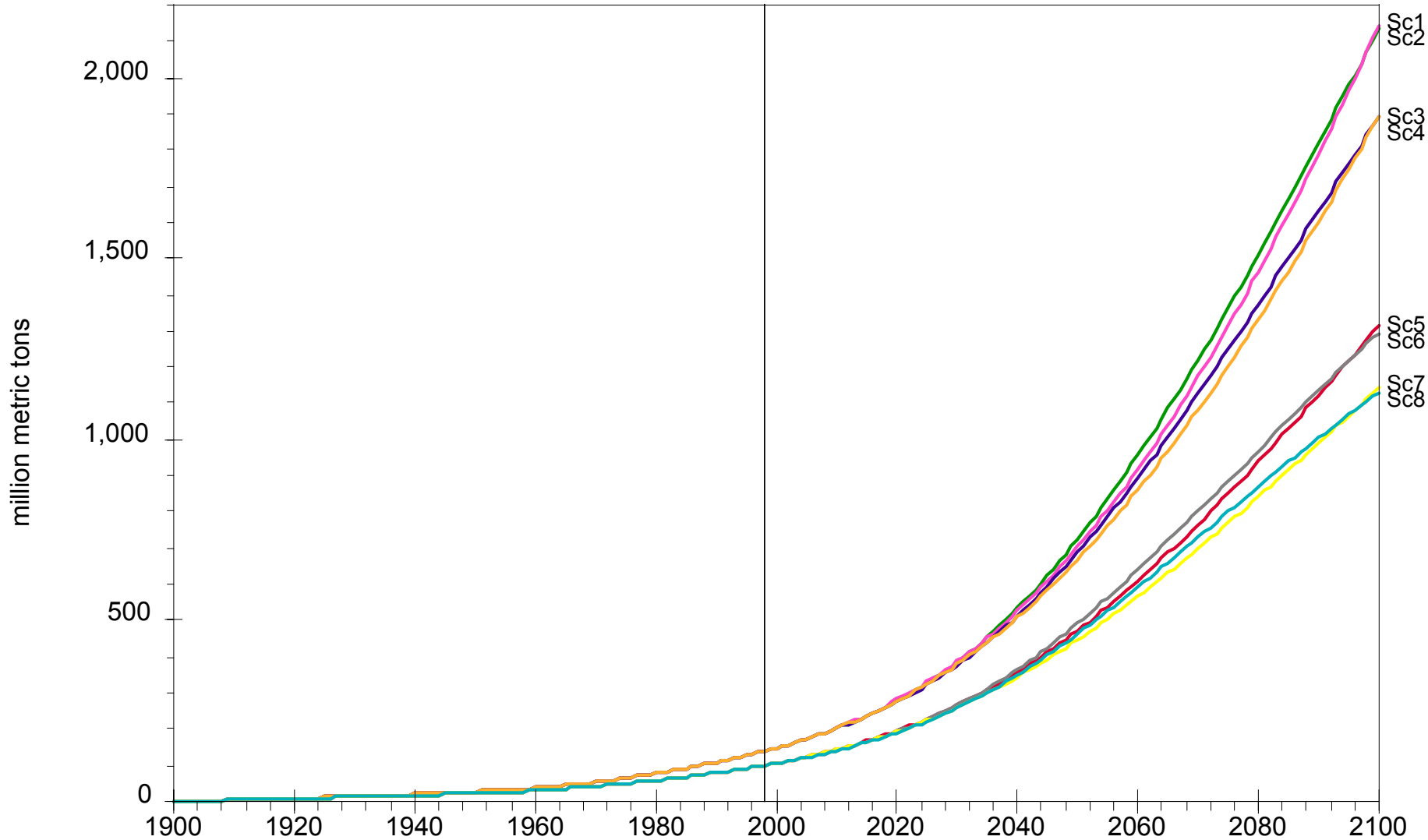


Figure 2.31: Global stock of long-lived copper products,1900 - 1998, MMT
8 scenarios

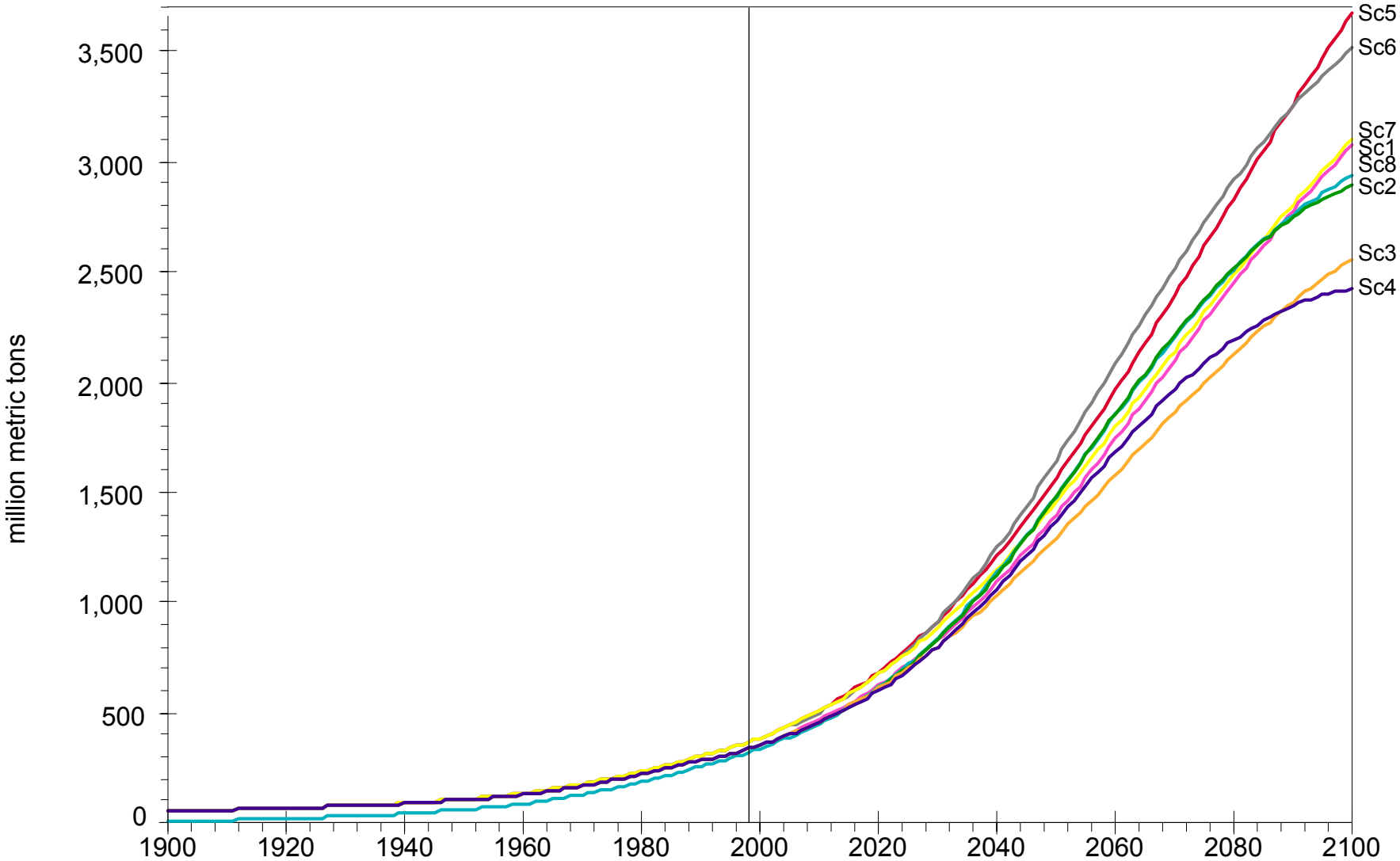


Figure 2.32: Global stock of short-lived copper products,1900 - 1998, MMT
8 scenarios

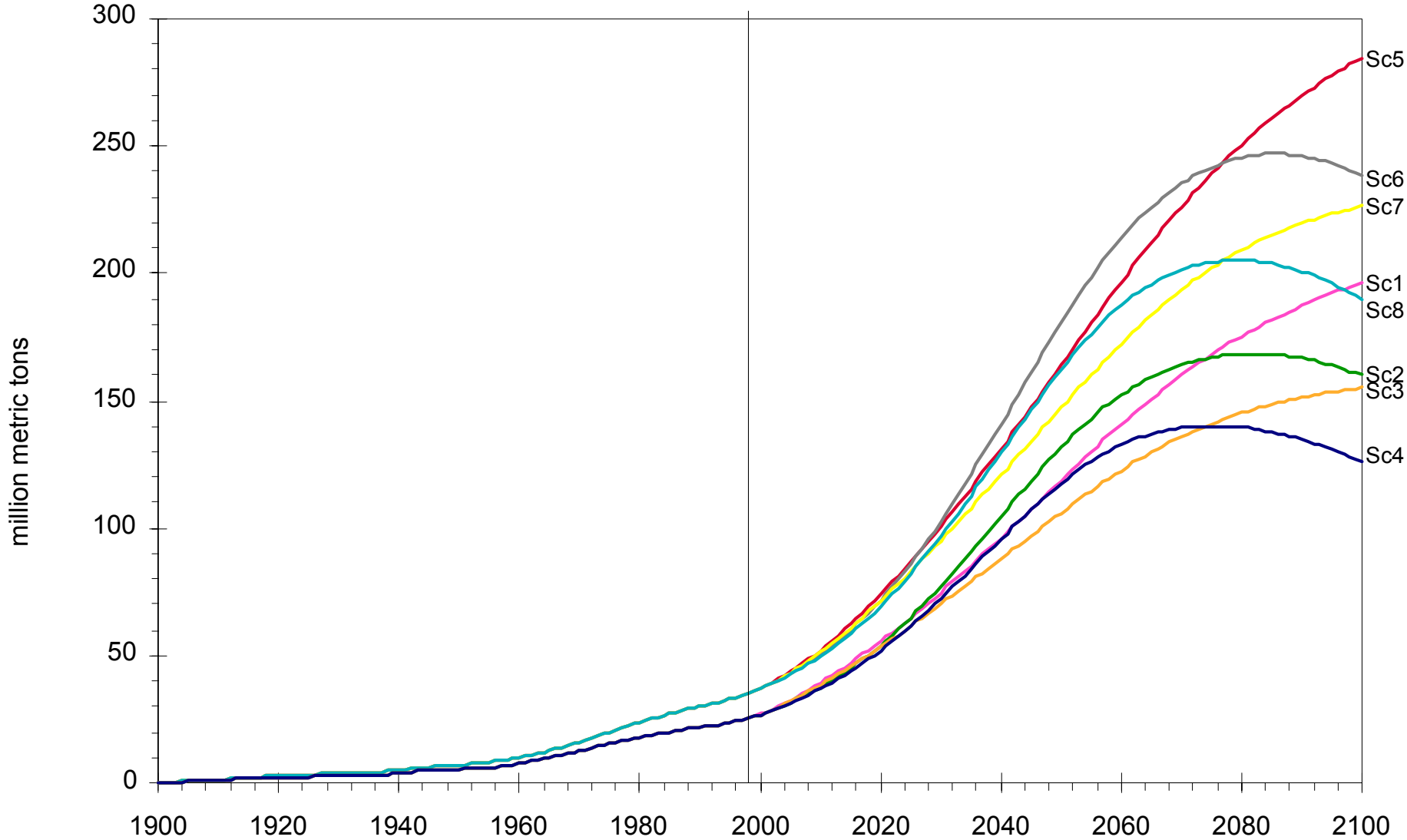


Figure 3.1: Mass flows (kg) in the production of 1 MT lead (simplified processes, typical material mixes)

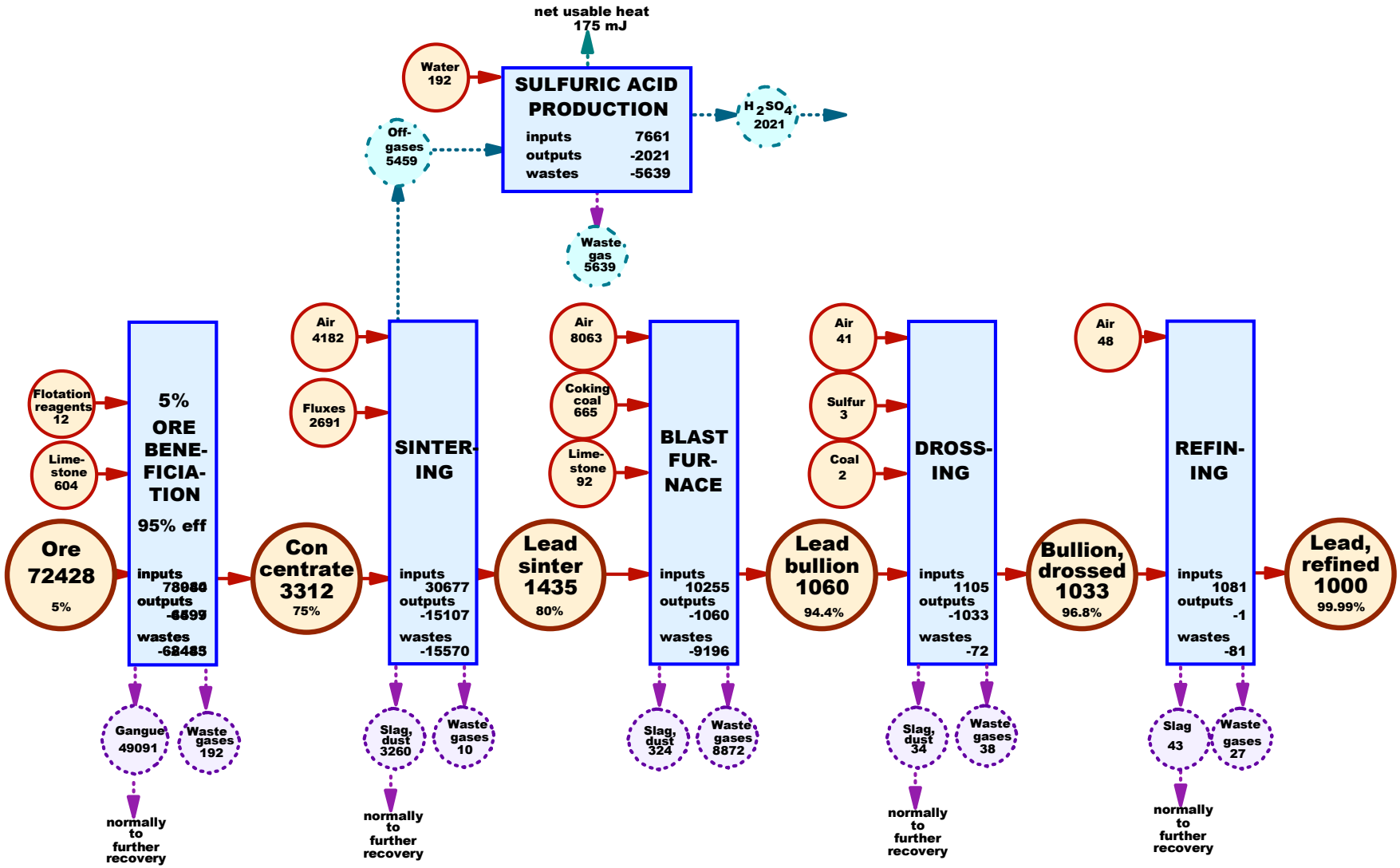


Figure 3.3: Primary lead unit mass and exergy flows

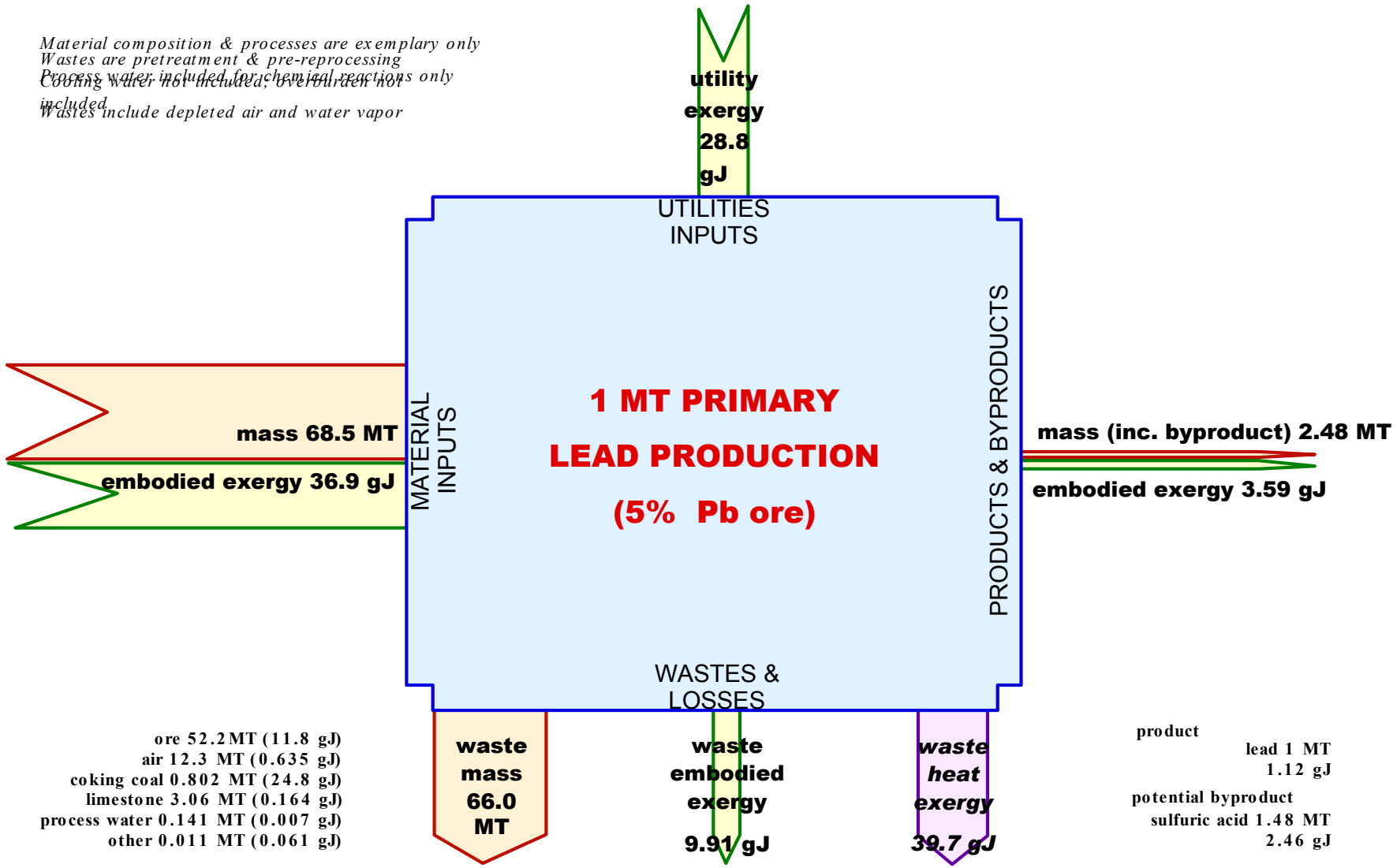


Figure 3.4: Mass flows (kg) in the production of 1 MT zinc (simplified processes, typical material mixes)

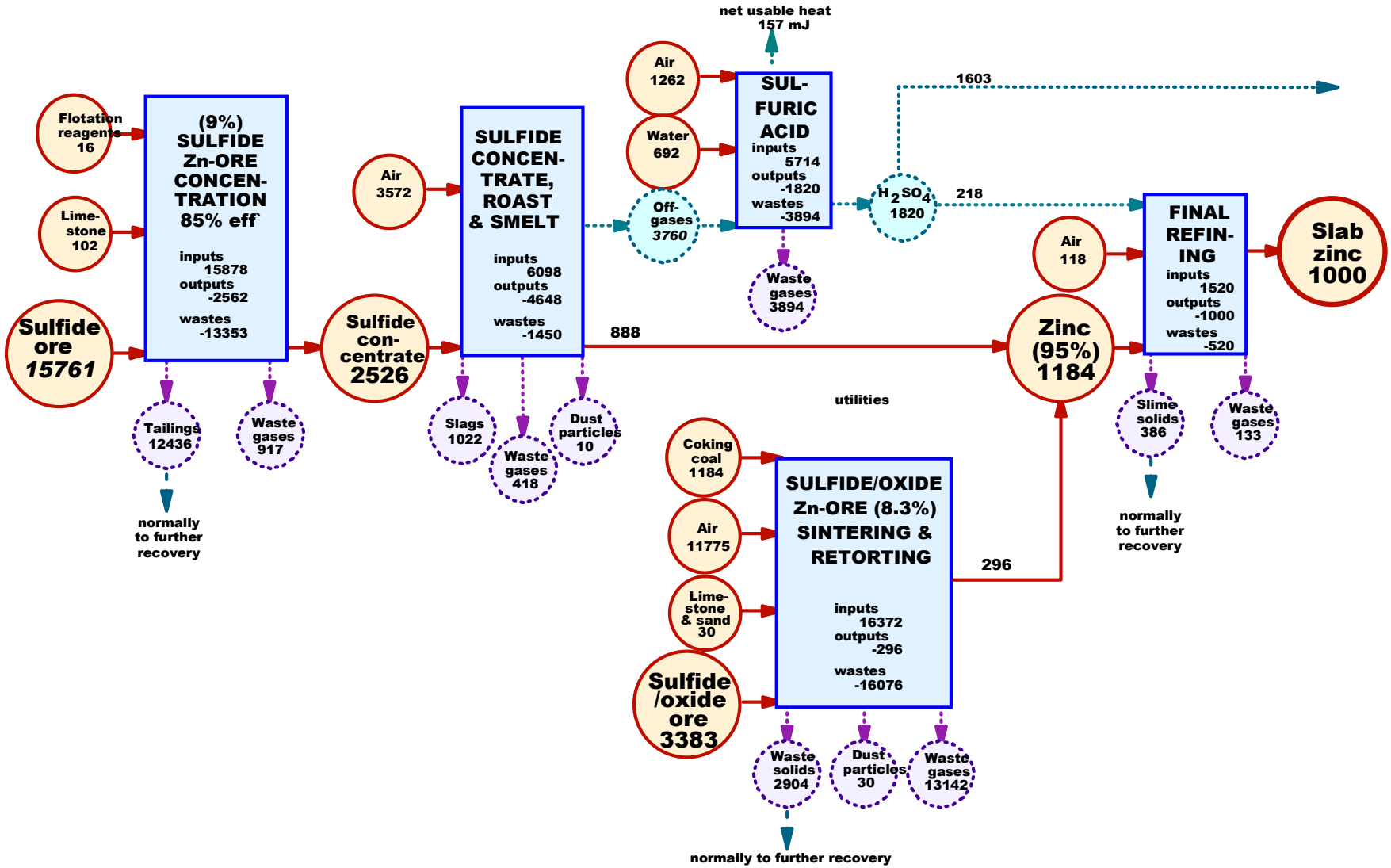


Figure 3.4: Mass flows (kg) in the production of 1 MT zinc (simplified processes, typical material mixes)

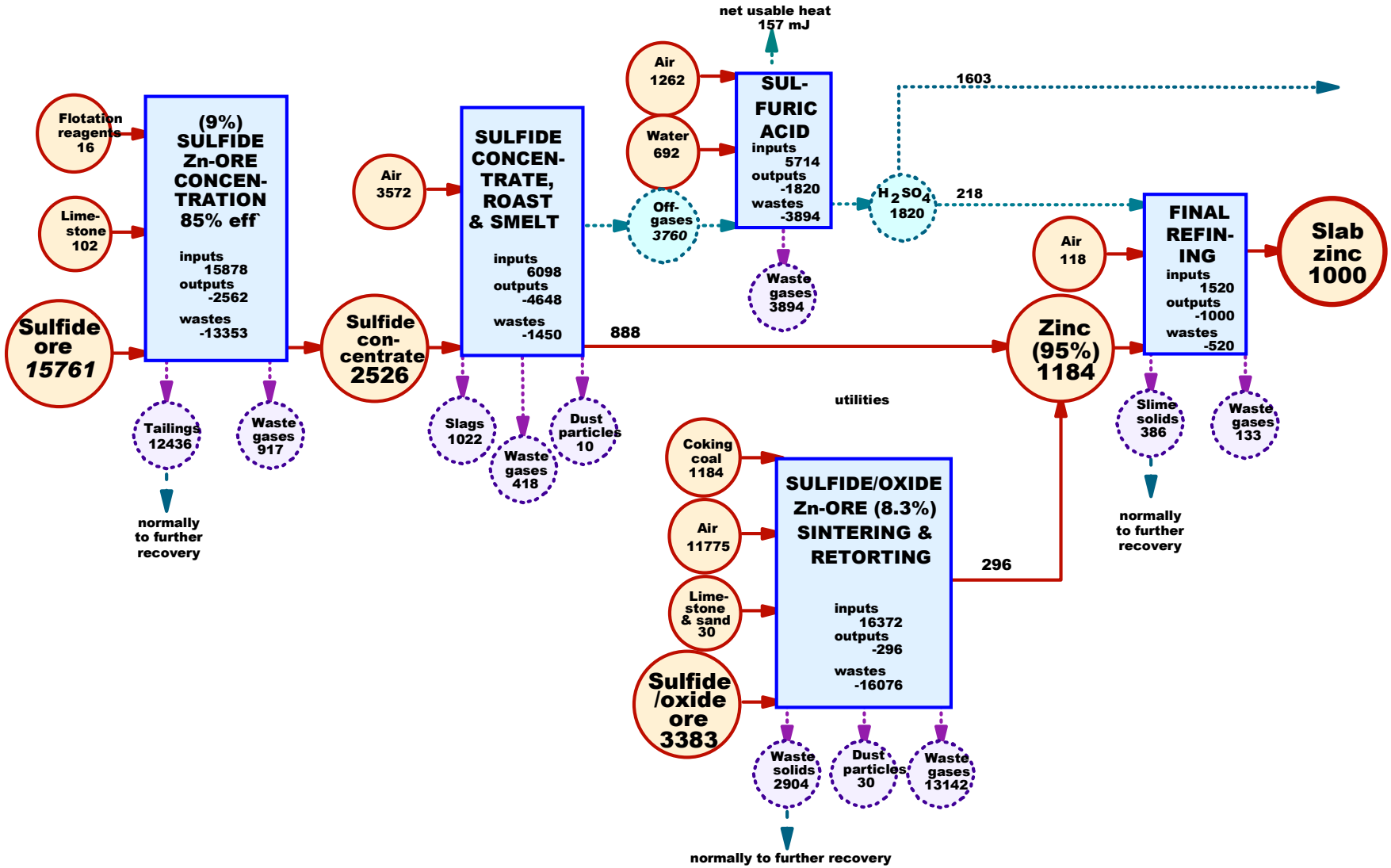


Figure 3.5: Exergy flows (mJ) in the production of 1 MT zinc (simplified processes, typical material mixes)

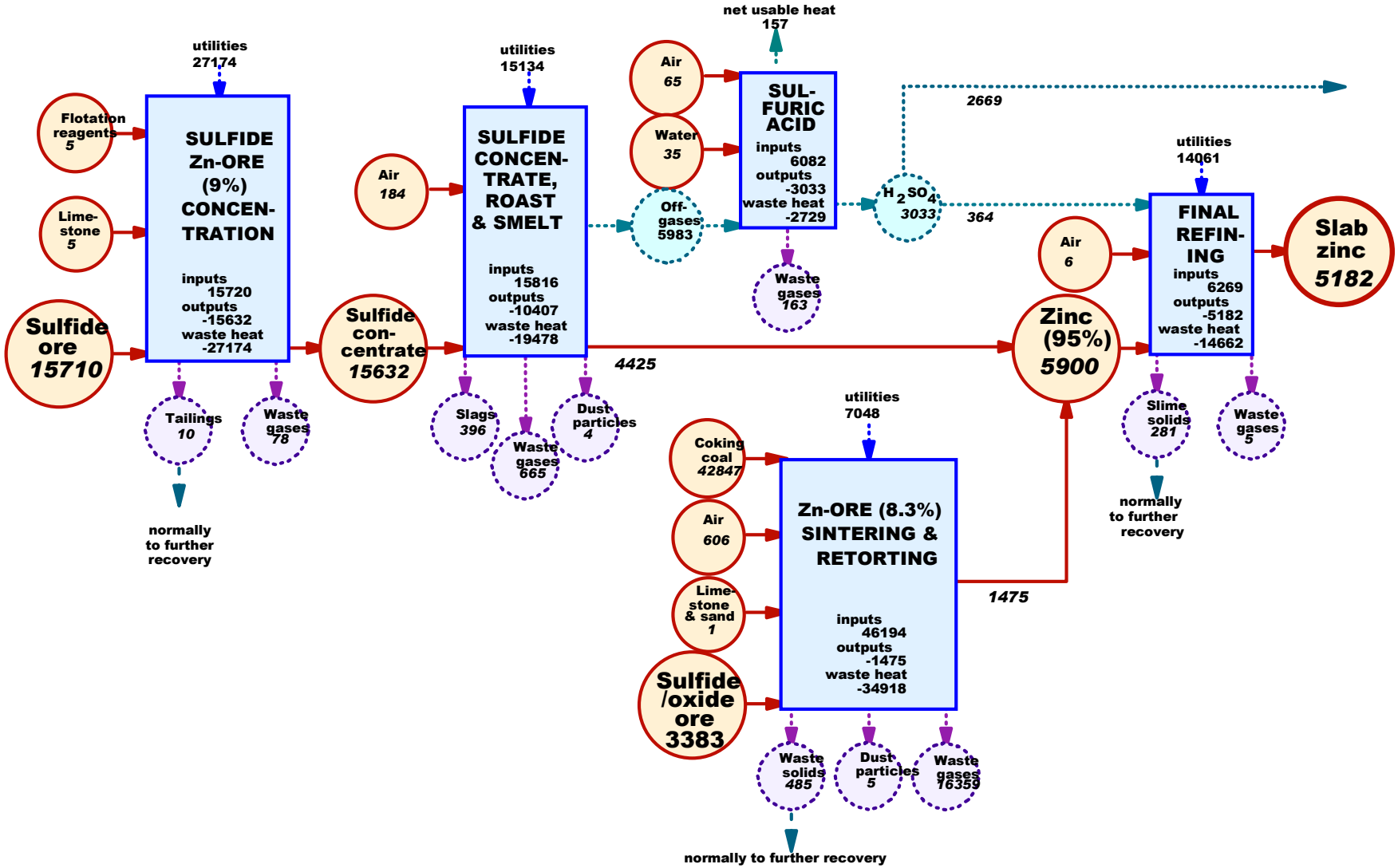


Figure 3.6: Overall unit zinc mass and exergy flows

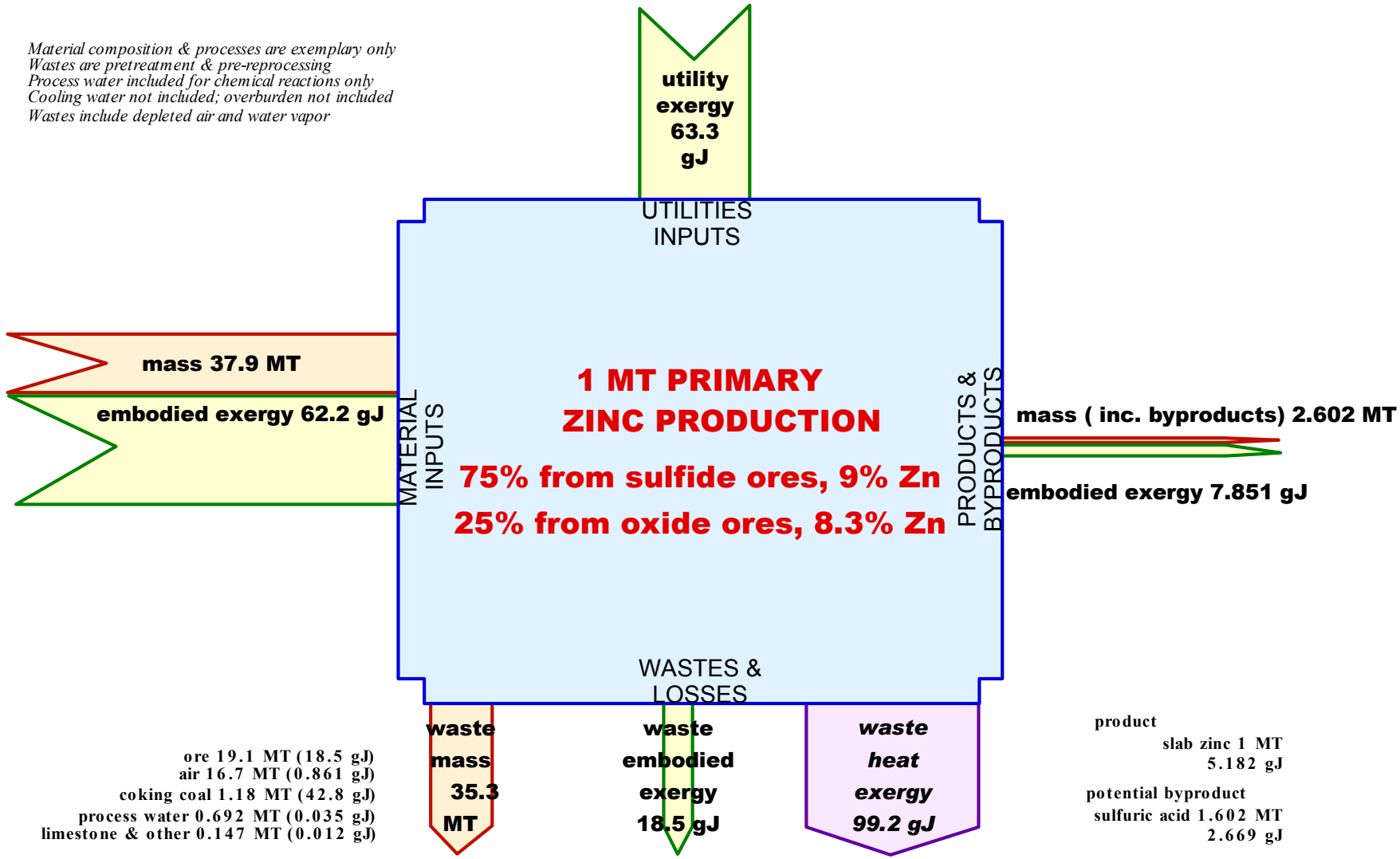
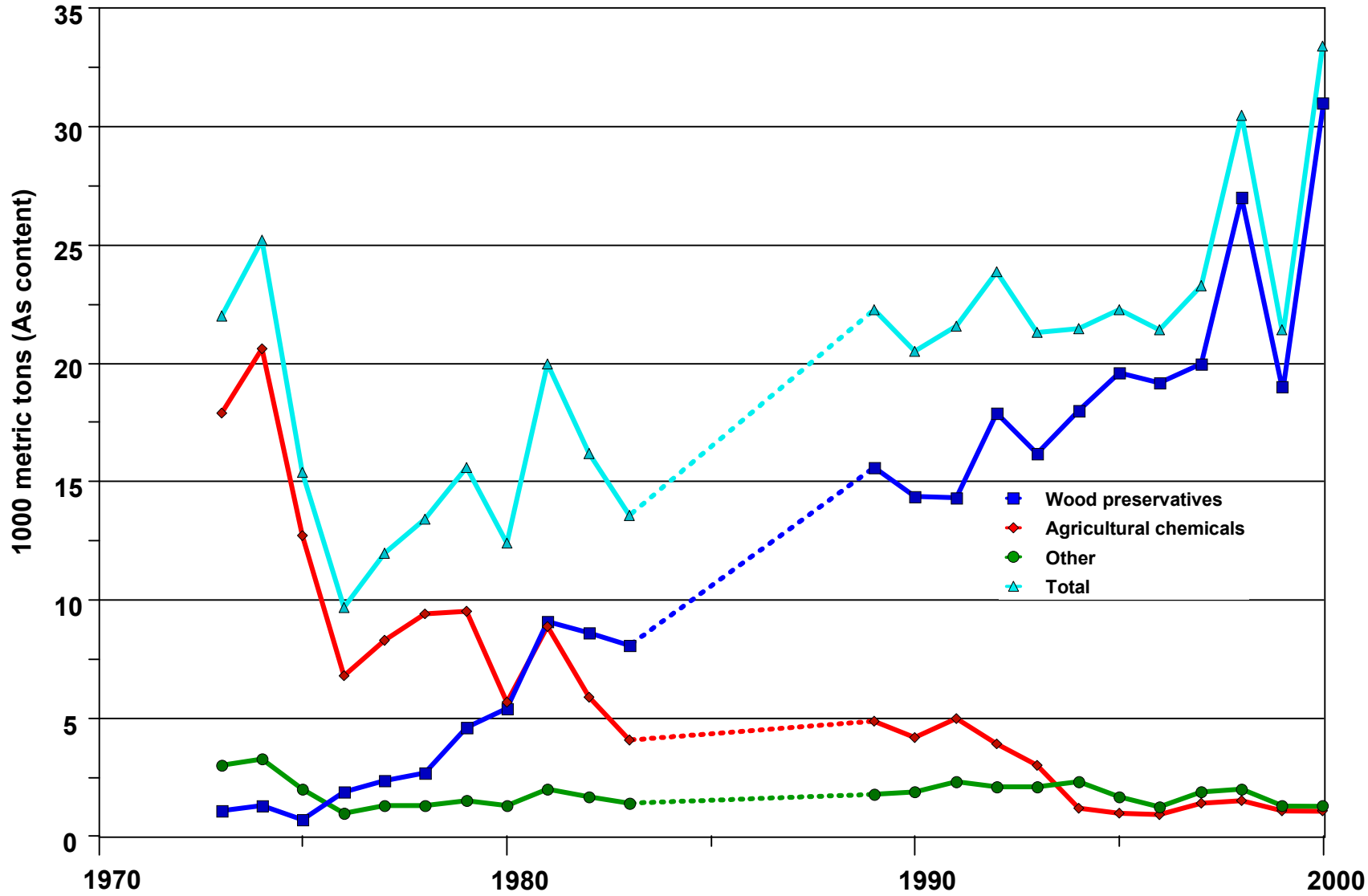


Figure 3.7: Arsenic demand patterns in the United States, 1973 - 2000 (kMT)



Source: USBM, USGS. Minerals Yearbooks, various years, "Arsenic" Table 1

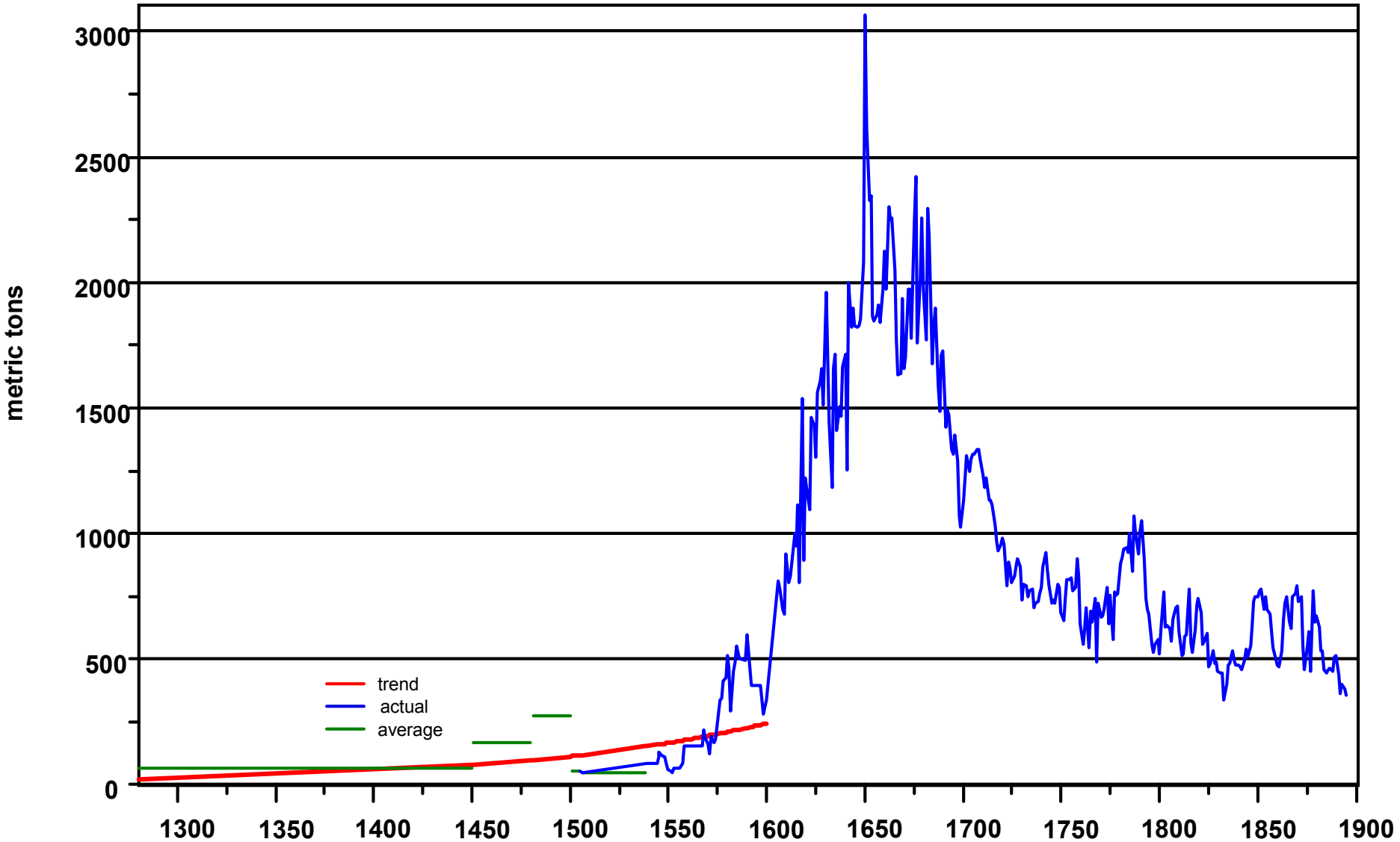



Figure Annex 1 (1.2): Copper production at the mine in Falun, Sweden