

Chapter 1

Introduction and Background

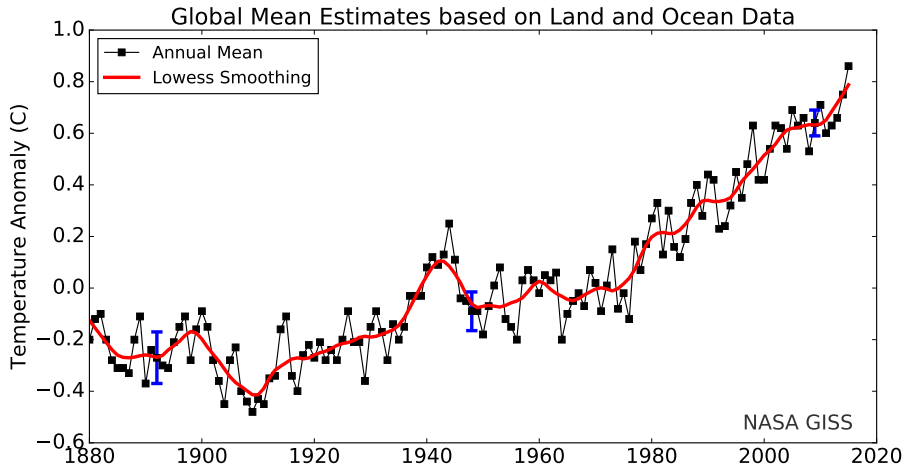


Figure 1.1: Temperature rise [**GISS2016**]

Total Annual Anthropogenic GHG Emissions by Groups of Gases 1970–2010

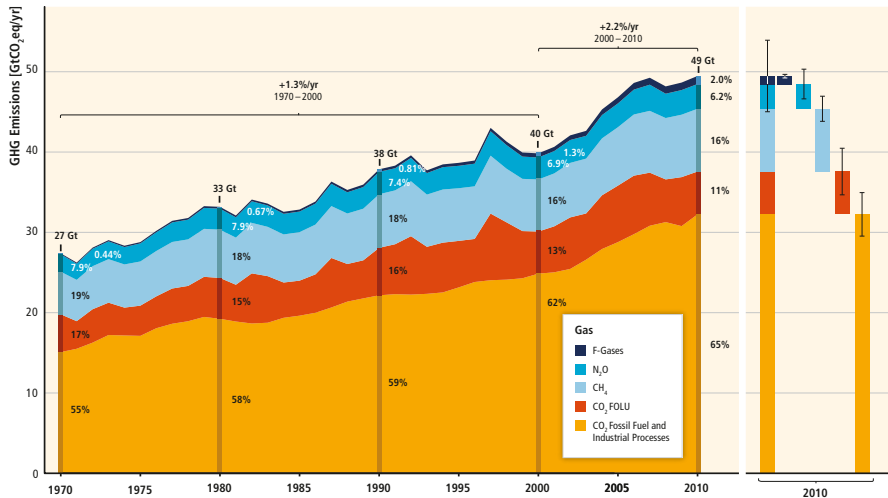


Figure 1.2: Anthropogenic GHG emissions by group of gases (1970 - 2010) [IPCC2014]

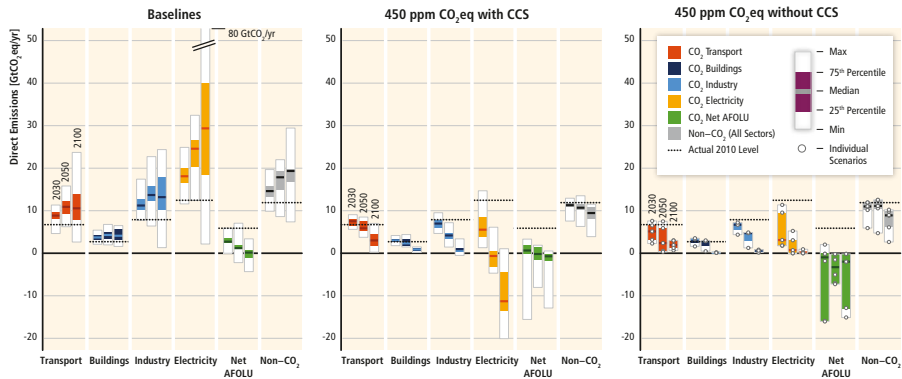


Figure 1.3: Review of different mitigation scenarios for 450 ppm

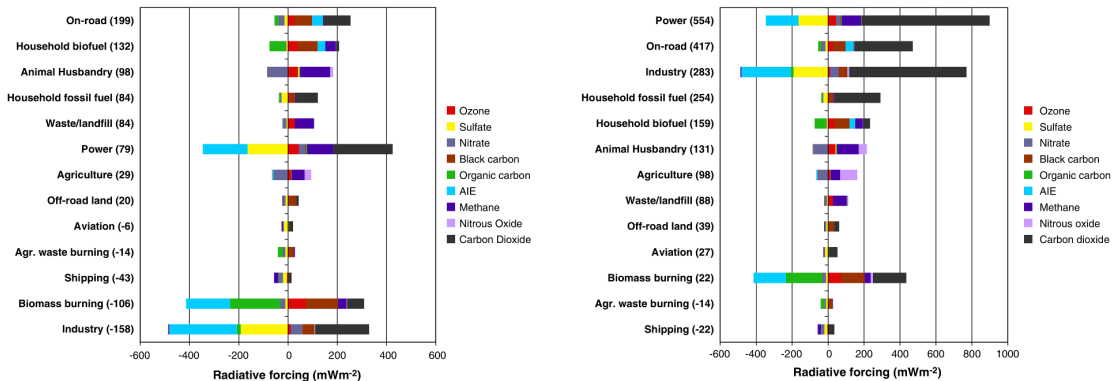


Figure 1.4: Radiative forcing due to 2000 level emissions grouped by sector in a) 2020 and b) 2100

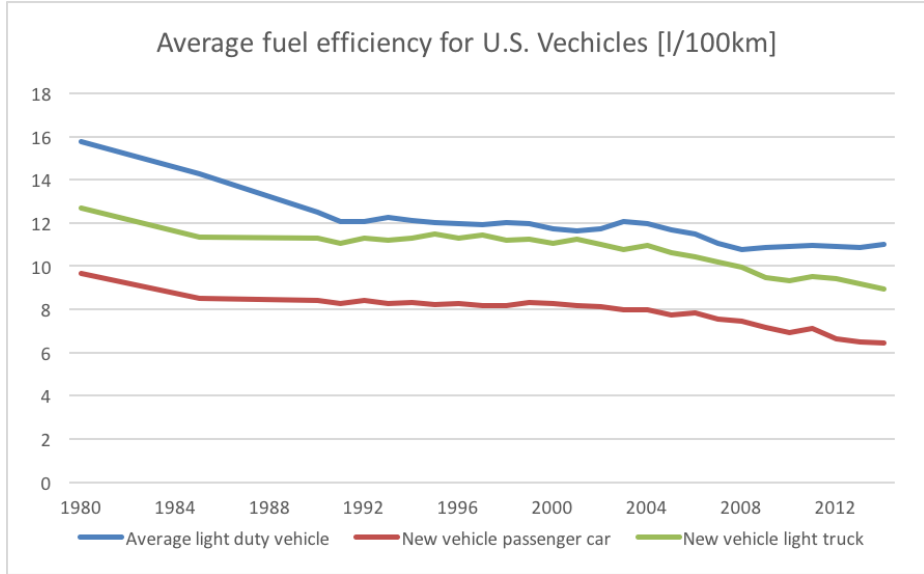


Figure 1.5:

Chapter 2

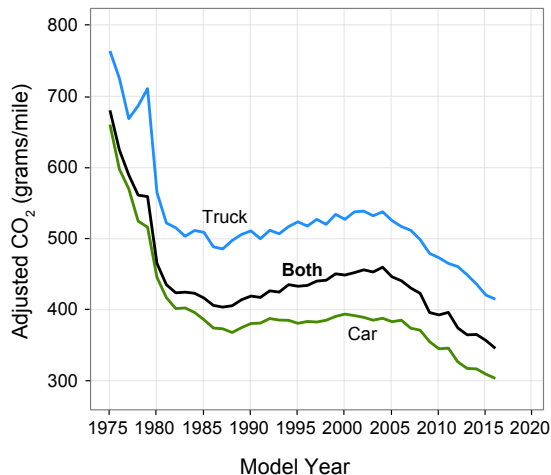
Review of the state of the art

HP



Displacement

Adjusted CO₂ Emissions for MY 1975-2016¹



Adjusted Fuel Economy for MY 1975-2016¹

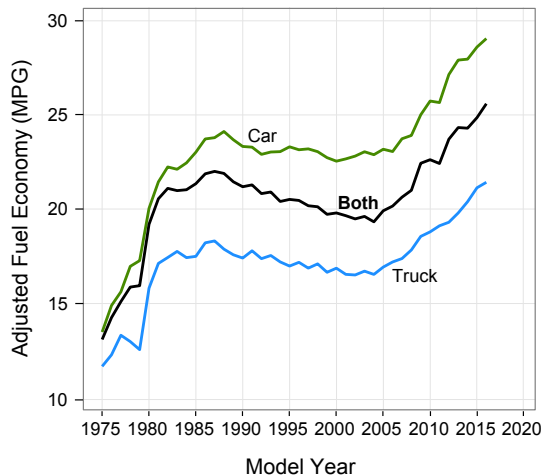


Figure 2.1: Adjusted CO₂ and fuel economy for vehicles model year from 1975 to 2016

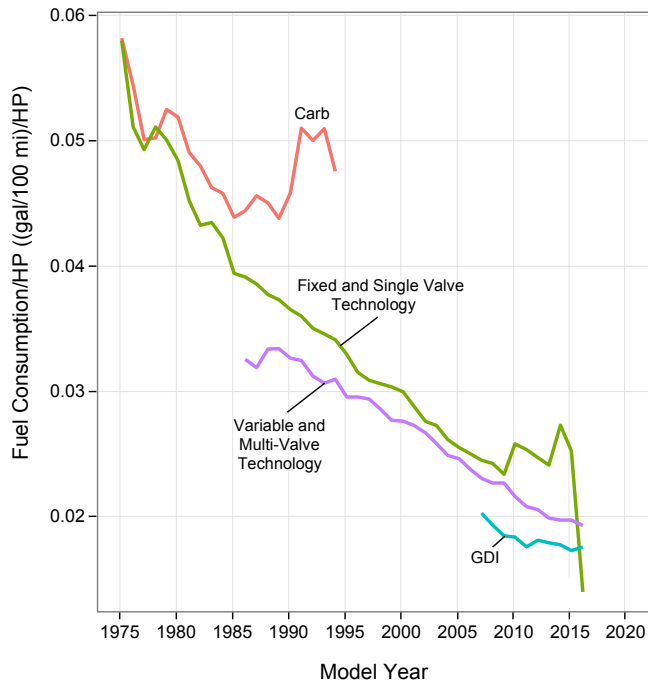


Figure 2.2: Trends of fuel consumption variation with the introduction of major fuel delivery and valve-train control technologies

HP



Displacement

HP



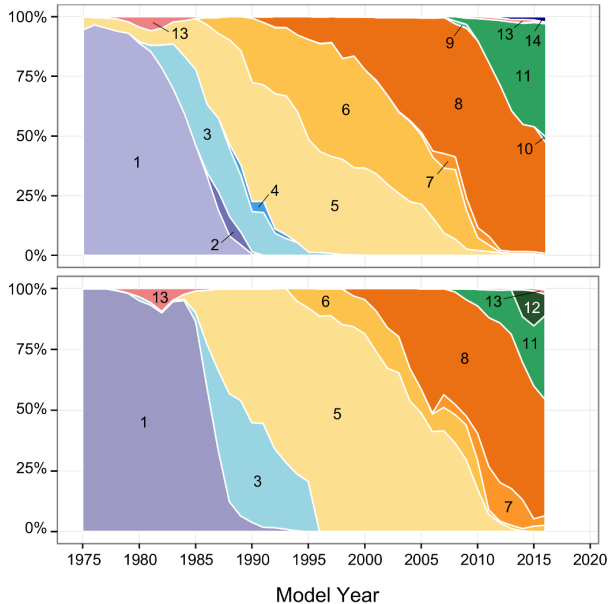
Displacement

HP



$m^2 \cdot \text{year}$

Production Share



Car

Truck

Model Year

Fuel Delivery	Valve Timing	Number of Valves	Key
Carbureted	Fixed	Two-Valve	1
		Multi-Valve	2
Throttle Body Injection	Fixed	Two-Valve	3
		Multi-Valve	4
Port Fuel Injection	Fixed	Two-Valve	5
		Multi-Valve	6
	Variable	Two-Valve	7
		Multi-Valve	8
	Fixed	Multi-Valve	9
		Two-Valve	10
Gasoline Direct Injection (GDI)	Variable	Multi-Valve	11
		Two-Valve	12
Diesel	—	—	13
Alternative Fuel	—	—	14

Figure 2.3: Percentage of MY equipped with a certain technology