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The "1950s Syndrome" and the Transition from a Slow-Going to a Rapid Loss of Global Sustainability

During the international geophysical year of 1957-1958, the geophysicist Hans Suess and the oceanographer Roger Revelle, who

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was the mentor of Al Gore, discovered that the CO<sub>2</sub> content of the atmosphere had risen since it had first been measured in the mid-1890s by Svante Arrhenius. The two scientists framed their finding this way: "Thus, human beings are now carrying out a large scale geophysical experiment of a kind that could not have happened in the past, nor could it be reproduced in the future. Within a few centuries we are returning to the atmosphere and oceans the concentrated organic carbon stored in sedimentary rocks over hundreds of millions of years. This experiment, if adequately documented, may yield a far-reaching insight into the processes determining weather and climate.<sup>71</sup>

Today this statement impresses, considering the turn of events that has since occurred. Revelle and Suess used the term "experiment" in its traditional sense of an opportunity to study (geo-)physical processes. Yet they felt that there might be some risk of climate change from the rise in  $CO_2$ , albeit in the distant future.<sup>2</sup>  $CO_2$  concentration, as estimated from ice cores, had only slowly risen from 297 parts per million (ppm) in 1900 to about 316 ppm in 1957, while today's concentration (as of 2010) is 395 ppm<sup>3</sup> (figure 7.1). Based on an extrapolation of the figures from the first half of the twentieth century, this value should not have been reached until 2212!<sup>4</sup> This illustrates how close to sustainability the global environment was in the wake of World War II, as compared with today's situation.

By the mid-1960s Revelle had already shared with his students the dramatic

CO<sup>2</sup> concentration 2009 = 395 390 370 Mauna Loa Historical CO<sup>2</sup> 350 CO<sup>2</sup> (ppmv) 330 310 290 270 1000 1200 1400 1600 1800 2000 Year

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*Figure 7.1.* The rise of greenhouse gas concentrations in the atmosphere A.D. 1000 to 2010. *Source:* Data up to 1957 is from D. M. Etheridge, L. P. Steele, R. L. Langenfelds, R. J. Francey, J.-M. Barnola, and V. I. Morgan, "Historical  $CO_2$  Records from the Law Dome DE08, DE08-2, and DSS Ice Cores," in *Trends: A Compendium of Data on Global Change* (Oak Ridge, Tenn.: Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, 1998), available online at http://cdiac.ornl.gov/trends/co2/lawdome.html. Data from 1958 is available on ftp://ftp.cmdl.noaa.gov/ccg/ co2/trends/co2\_annmean\_mlo.txt (accessed on May 13, 2010).

results of the first eight years of CO<sub>2</sub> measurements, as concentrations were rapidly increasing every year. He predicted that a continuation of this trend would force a profound and disruptive change in the entire global climate.<sup>5</sup> In 1981 the renowned meteorologist Hermann Flohn issued the following warning: "In any

case, the problem must be taken seriously: it threatens humanity as a whole, and in the course of the coming century it will threaten the generation of our children and grandchildren.... It is not a matter of arguments in the short-term political arena; the fate of our children and grandchildren all over the whole world is at stake."<sup>6</sup>

Most textbooks relate the origins of the greenhouse problem to the onset of industrialization. However, the comparison of the growth rates of CO, emissions before and after 1950 suggests that the immediate roots of the greenhouse problem in its present and future urgency are rather to be found in the twentyfive years between the late 1950s and the early 1980s. A trio of renowned scientists-including Will Steffen, the current executive director of the International Geosphere-Biosphere Programme (IGBP); Nobel laureate Paul Crutzen; and the historian John McNeill-looking at the global use of fossil fuels and raw materials over the past two centuries concluded in 2007 that the period since the onset of industrialization needs to be divided in two stages of unequal growth: namely, a first stage of slow growth before 1950 and a second stage of exponential growth since that time. Focusing on the exponential growth rates in the production of a multitude of raw materials since the 1950s, the three authors named this second stage "The Great Acceleration," probably borrowing from Karl Polanyi's concept of "Great Transformation."7 Emphasizing humankind's focal role as a force in geology and ecology, Crutzen coined the term "Anthropocene" for this period. mirroring the names of other geological epochs such as the Holocene.8 The trio concluded that economic growth, particularly the "new regime of international institutions after 1945," alongside rapid technological change and population growth, were the main causes of the "Great Acceleration."9

This argument about the two-stage character of the industrial age is not a new one. In 1992, inspired by the Meadows diagram of the remarkable take-off shift in global energy use since the 1950s (figure 7.2), I published a short essay in a Swiss environmental journal portraying this surge of energy use as historically unique and relating it to "low prices for fossil energy."<sup>10</sup> In that article I gave the phenomenon the name the "1950s syndrome." A few years later, in collaborative work on a variety of issues—such as the global oil market, road taxation, urban sprawl, air pollution, social change, the environment for children, energy, and policy options—I became convinced that most of these symptoms were in some way affected by one common driving force.<sup>11</sup> My key conclusion was that the decline in the price of fossil fuel since the 1950s, seen in relation to the price of labor and capital, was the most significant cause of the wasteful consumption of raw materials and energy, and the resulting excessive environmental stress.<sup>12</sup> The





Figure 7.2. World energy use, 1900–1990. Source: Donella H. Meadows, Dennis L. Meadows, and Jørgen Randers, Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future (Post Mills, Vt.: Chelsea Green Publishing Co., 1992), 362.

"1950s syndrome" appeared in an English summary in 1998.<sup>13</sup> A 2003 essay in a popular treatment of environmental history responded to some objections to the concept, while broadening the argumentation by including the issue of high-input agriculture.<sup>14</sup> For some reason or another, Will Steffen and his coauthors overlooked the "1950s syndrome" altogether.<sup>15</sup>

# Reception and Discussion of the Term "1950s Syndrome"

The term emphasizes the 1950s as the significant turning point from a slowgoing to a rapid loss of sustainability. "Syndrome" is borrowed from the medical field, where it designates a bundle of indicators, symptoms that collectively describe a disease. It also indicates that these different manifestations of change have not heretofore been studied together.<sup>16</sup> In general the concept of the "1950s syndrome" has been well received within environmental history.<sup>17</sup> According to

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Jens Ivo Engels, the term is attractive because it combines physical, social, and cultural aspects.<sup>18</sup> Arne Andersen has adopted the metaphor for his history of consumption.<sup>19</sup> Patrick Kupper has connected it to the fundamental reinterpretation of humankind's relationship with the environment in the early 1970s, for which he coined the term "1970s diagnosis."<sup>20</sup>

Outside the discipline of environmental history, other scholars commenting on the term have been more critical, however. Political historian Axel Schildt has pointed out that the conclusions did not apply to Germany or even to Western Europe.<sup>21</sup> Hansjörg Siegenthaler, one of the founding fathers of Swiss economic history, has argued that cheap energy was not the cause of the boom but rather one of its secondary preconditions.<sup>22</sup> Many reviewers and subsequent readers, among them such renowned German economic historians as Wolfgang König, have echoed Siegenthaler's assessment, claiming that the concept grossly overestimated the significance of cheap energy. However, neither Schildt nor König nor Siegenthaler have dealt with the issue of energy at all.<sup>23</sup>

(Environmental) historians often balk at dealing with prices and including economic arguments in their narratives. This resistive attitude is directed against the neoclassical worldview of "economic man," which is inherently ahistoric. It sees the economy as a closed system within which goods are produced by inputs of capital and labor, and then are exchanged by consumers and firms.<sup>24</sup> The field of ecological economics would be far better suited for an interdisciplinary cooperation with (environmental) historians. According to Peter Söderbaum's brilliant survey, it is open to scholars from ecology and social sciences who share the vision of ecological sustainability, although markets, wages, and prices play a role.25 There is a distinct and unresolved divide between neoclassical and ecological economists with ecological economists arguing that the neoclassical worldview fails to account for considering the physical basis of industrial production, which is energy.<sup>26</sup> For neoclassical economics, energy is just a cost factor, while for ecological economics it is a "fundamental enabling economic production."27 At the same time it is known to be the key variable for the analysis of ecosystems. Economist Hans-Christoph Binswanger argued in 1974 that "omitting energy as a production factor is the fatal flaw of both traditional liberal and socialist economics."28 This fundamental weakness of mainstream economic theory is at the root of the market failures that have caused the current critical global situation.29

Does the "1950s syndrome" stand for an epoch-making transition, dividing the period of the "industrial society" from the period of "consumer society"?

Environmental and economic historian Rolf Peter Sieferle and his coauthors have argued for interpreting the very long trend in global economic growth including the post-1950 period as a resumption of an earlier growth phase being interrupted by the exceptional circumstances during the two world wars and the intermediate crises. He also allows for the possibility that this global economic growth period could also be the superposition of a novel growth phase on the old one, driven by new technologies and using petroleum as the basic source of energy.<sup>30</sup> Surprisingly, Sieferle does not address the main issue of sustainability and relative prices. Environmental historian Joachim Radkau has agreed that the postwar period was "in all likelihood" even "far more important than the Industrial Revolution," although he is not sure in which decade the decisive change really occurred.<sup>31</sup> Christoph Maria Merki has recommended understanding the "1950s syndrome" as a metaphor for a transition period and extending it in three ways: (1) from environmental history to other subdisciplines such as economic and social history; (2) spatially from Western Europe to the entire globe; and (3) finally from the 1950s to the entire period until the present.<sup>32</sup>

Several critics have focused on the name "1950s syndrome" as a point of contention. They have argued that the 1950s was a decade of transition rather than a period of take-off.<sup>33</sup> Frank Uekoetter has gone as far as to claim: "If a prize would be given for the most misleading term in environmental history research 'the 1950s syndrome' would be a leading contender. Designating a single decade in the title distracts from the fact that the thesis refers to the entire postwar period." He further claims that the name "1950s syndrome" hampers the exploration of the early environmental movement in Germany.<sup>34</sup> The designation advanced by the Steffen and coauthors, "The Great Acceleration," would be an alternative to "1950s syndrome."<sup>35</sup> It has the advantage of addressing the longer-term dynamic of the process leading to the loss of sustainability without, however, referring to a syndrome and pointing to the time of the turnover. Perhaps a combination of both labels, such as "the 1950s syndrome or the Great Acceleration," may be the best solution.

However we might designate this phenomenon, we need a better understanding of the obvious but as yet unsettled question: What can explain the surge of global energy use after the late 1950s? This question is best handled by separating it into two further issues: (1) To what extent was the surge of global energy use related to economic growth and/or to population growth? (2) To what extent did the discovery of giant oil fields and the declining prices for fossil fuels in relation to the price of labor encourage the substitution of energy for labor?

# The Longest Boom in Human History

The boom lasting from 1950 until 1973 was the longest and the most pronounced in human history, with average growth rates in world per capita GDP of 2.91 percent.<sup>36</sup> During the boom there was a significant degree of convergence in per capita income and productivity, with most regions growing faster than the United States, the largest economy.<sup>37</sup> Per capita growth rates were highest in Western Europe, being "beyond the wildest dreams of even the most optimistic pundit or policy maker in the 1940s. Workers, both skilled and unskilled, and the owners of firms all shared in the benefits."<sup>38</sup> At no time in human history have so many people become affluent within one single generation (figure 7.3).<sup>39</sup>

Not without reason then, these years were named "Wirtschaftswunder" (in Germany), "Les trente glorieuses" (in France, see Jean Fourastié), or the "Golden Age" in the English-speaking world (see Nick Crafts).<sup>40</sup> Sociologist Burkart Lutz has summed up the impression of many contemporaries in the title of his book "The Short Dream of Everlasting Prosperity."<sup>41</sup> After 1973 there was a marked slowdown in the West and in Japan. The best performances came from the economies of East Asia.<sup>42</sup> The shift in the growth pole from the United States in the



*Figure 7.3.* Development of GDP in Austria, Germany, and Switzerland, 1913–1996 (1996 \$). *Source:* Christian Pfister, "Energiepreis und Umweltbelastung: Zum Stand der Diskussion über das '1950er Syndrom," in *Umweltgeschichte: Themen und Perspektiven*, edited by Wolfram Siemann (Munich: C. H. Beck, 2003), 62. The "1950s Syndrome"

1940s and 1950s, to Europe in the 1960s, and then to East Asia from the 1970s on, is partially depicted in figure 7.3.

Population almost quadrupled between 1900 and 2000, from 1.6 billion to almost 6 billion, and 80 percent of this growth fell within the second half of the century, with rates up to 2.2 percent per year during the 1960s.<sup>43</sup> Obviously, the pace of population growth corresponds closely with that of global energy use, but this correspondence does not necessarily entail causation. Fridolin Krausmann and his colleagues have demonstrated that fossil energy use and greenhouse gas production grew much faster in the northern hemisphere than in the southern hemisphere, whereas population growth was more rapid in the south, which increased biomass extraction and deforestation.<sup>44</sup> Table 7.1 shows that the increase in GDP between 1950 and 1973 in the "rich" countries was slightly below those estimated for the "other" countries, but because the population increase was considerably slower there, the rich nations could increase their per capita GDP far more than the other countries.<sup>45</sup>

Global energy data should similarly be broken down to regional and local levels to allow a more meaningful interpretation (figure 7.4). Our database on energy use for the entire world is incomplete. Evidence for the entire twentieth century only exists for the United States, the Soviet Union, and Western Europe (EU-15). Data for the Middle East, East Asia, and the Pacific (which includes Japan and Australia) as well as for South and Central America are available only from the mid-1960s, and for Africa only from the mid-1980s. The takeoff of energy use began in the United States during the 1940s, in Western Europe and the Soviet Union during the 1950s, and in East Asia and the Pacific area during the 1960s. The figures for the Middle East, Latin America, and Africa are low despite the significant population growth in these parts of the world. Given that the lion's

TABLE 7.1. GROWTH OF POPULATION AND GROSS DOMESTIC PRODUCT IN "RICH" AND "OTHER" COUNTRIES (PURCHASING POWER PARITY \$) IN PERCENTAGES (1950 = 100%)

	Population	GDP 1973	p. c. GD 1973	Percentage of global GDP		
	1973			1950	1973	
Rich	127	294	231	60	59	
Other	163	30 <del>9</del>	189 `	40	41	

Source: Angus Maddison, Contours of the World Economy, 1–2030 AD (Oxford: Oxford University Press 2007), 336–37.



*Figure 7.4.* Primary energy use in selected regions of the globe, 1900–2000. *Sources:* BP-Amoco, *Statistical Review of World Energy: Full Report Workbook, 2004,* available online at http://www.bp.com (accessed on September 6, 2005); U.S. Energy Information Administration, *Annual Energy Review 2003,* available online at http://www.eia.doe.gov (accessed on September 6, 2005); Brian Mitchell, *European Historical Statistics, 1750–1970* (London: Macmillan Press, 1975); International Energy Agency, *Key World Energy Statistics, 2004,* available online at http://www.iea.org (accessed on September 6, 2005); and Bouda Etemad and Jean Luciani, *World Energy Production, 1800–1985* (Geneva: Droz, 1991).

share of the increase in energy use between 1950 and 1980 is credited to the rich nations, where population growth was moderate, the significance of this factor for the upsurge in energy population growth should not be overestimated. Oil production in the Soviet Union peaked in the 1980s and has since continuously declined, whereas the production of natural gas has expanded.<sup>46</sup>

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Why was growth in Western Europe during the Golden Age so fast? This is a complex issue that seems poised to become one of the staple controversies of quantitative economic history.47 The establishment of an adequate policy framework clearly mattered. The key features of this involved a return to fixed exchange rates under the auspices of the Bretton Woods system-which was not fully achieved before late in 1958—multilateral trade liberalization and economic integration through the establishment of GATT in 1947, the European Economic Community (EEC) in 1958, and the European Free Trade Association (EFTA) in 1960, a rather cautious government intervention into the market economy.<sup>48</sup> In addition, huge investments by the U.S. administration into European economies within the framework of the Marshall Plan, the provision of various forms of welfare by public authorities, educational reform with a focus on higher education, and a kind of "social contract" between labor and capital (see Nick Crafts's work on this subject) were part of this policy framework.<sup>49</sup> It obliged entrepreneurs to make up for inflation by increasing actual wages in proportion to productivity improvements, whereas wage earners backed off from pressing for higher wages.<sup>50</sup> The collective bargaining agreement between the U.S. auto industry and the trade union of the United Automobile Workers yielded the model that subsequently became the standard throughout the United States and also in Western Europe.51

Together with the widespread establishment of welfare systems and an improved access to higher education for the middle classes, these collective-bargaining agreements were instrumental in boosting consumption of broad strata of European societies to previously unknown levels.<sup>52</sup> Nick Crafts has emphasized additional key features that shaped the economic environment during the boom: the low initial performance of the economies after World War II, which allowed high growth rates, the extent of technology transfer from the United States, the absence of competition from Asian countries, high rates of investment, and the fact "that energy and other raw materials seemed to be in elastic supply and their prices remained low."<sup>53</sup>

Economic historian Knut Borchardt has remarked that "the industrial world profited extraordinarily during the period of cheap oil."<sup>54</sup> Likewise, Eric Hobsbawm has highlighted this factor, although his reasoning is questionable. All in all, however, the unusually low prices between 1958 and 1973 went generally unnoticed, as Mohssen Massarat has observed, unlike the so-called "oil price shock" in 1973, which was intensively discussed.<sup>55</sup> The fear of a potential scarcity drove prices up, although there was more than enough oil available on global markets. The trade journal *Petroleum Intelligence Weekly* reported in August that

"near panic buying by U.S. and European independents, as well as the Japanese" was sending "oil prices sky-rocketing."<sup>56</sup>

The announcement of an energy embargo by OPEC in the context of the Yom Kippur War and the substantial increase of the oil price in late 1973 led to a rude awakening from the "short dream of everlasting prosperity" (in Burkart Lutz's words) in the form of a shock.<sup>57</sup> The usual term of "oil crisis" is inappropriate, because the devaluation of the U.S. dollar and the end of the Bretton Woods system was far more important for the subsequent economic slump in 1974–1975 than the surge in oil prices.<sup>58</sup> According to Knut Borchardt, "the oil price shock was even beneficial for the mood in West Germany, because it allowed the government to blame foreign agents for the recession. The resulting rise in unemployment could therefore be perceived as a kind of natural disaster."<sup>59</sup> In a longer-term perspective, the "oil price shock" needs to be considered as a step toward normalization of relative energy prices.

# The Substitution of Energy for Labor

To what extent did the effect of declining prices for fossil fuel in relation to the price of labor encourage the substitution of energy for labor? Economists have given a great deal of thought to the relative price effect and its limitations.<sup>60</sup> In this context it refers to the fact that the relative price of a good not only reflects the familiar model of supply and demand, but is also affected by the price change of other goods. That is, as one good becomes less costly in comparison to others, people will theoretically buy more of this good, which is called "substitution."61 Hansjörg Siegenthaler, a prominent member of the Regulation School, relates the microeconomic level of individual agency to the macroeconomic level of trade cycles and social change.<sup>62</sup> He has called attention to framing, which means that individuals rely on certain perspectives or "world views" to select, understand, and respond to information.<sup>63</sup> Accordingly, prices per se are meaningless for individual agency unless such changes are interpreted.<sup>64</sup> Interpreting the consequences of relative price effects during the golden age is complicated by the fact that it resulted from two components: namely, a strong rise in real wages and a concomitant moderate price decline for fossil fuel. It is clear that real wages were the focus of contemporary interpretations, whereas declining real fuel prices were hardly noticed.

The second line of argument focuses on the incentives for substituting labor with energy.<sup>65</sup> The unprecedented long boom of real wages, resulting from both the acute shortage of workforce and a rigid wage system, created one set of pre-

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conditions for the decline of relative prices for fossil fuel. The other set is related to the enormous available quantity and the dirt-cheap production costs of Middle Eastern oil. When Lee Everett DeGolyer, who directed the U.S. oil explorations in Saudi Arabia during World War II, returned to Washington, D.C., in 1944, he reported "that the proven and probable reserves of the region—Iran, Iraq, Saudi Arabia, Kuwait, Bahrain and Qatar—amounted to about 25 billion barrels." In fact, he suspected that the reserves would be much, much larger. And, indeed, estimates that sounded like lunacy—up to three hundred billion barrels for the region and one hundred billion barrels from Saudi Arabia alone—resulted from his trip. One of the members of his mission told officials in the State Department: "The oil in this region is the greatest single prize in all history."<sup>66</sup> The reserves in the Middle East increased from 28 billion barrels to 367 billion barrels between 1948 and 1972. The Saudi Arabian oil field Ghawar, which is the greatest oil-bearing structure in the world, began to be productive from 1949.<sup>67</sup>

Safaniya, the world's largest offshore oil field, was discovered in 1951, and in 1956 the Saudi Arabian Aramco confirmed the scale of Ghawar and Safaniya.<sup>68</sup> In the same year M. King Hubbert developed the Peak-Oil model, according to which the production rate of a limited resource will follow a roughly symmetrical bell-shaped curve based on the limits of exploitability and market pressures. Hubbert argued that the rents for petroleum would evolve according to the changes of known reserves. As long as reserves are increasing, rents are declining, which was indeed the case until 1972. A cartel of seven multinational petroleum companies (among them Exxon, Shell, Texaco, and British Petroleum) known as "the Majors" or "the Seven Sisters" determined global oil prices until the 1970s.<sup>69</sup> Their profits were enormous compared with the small expenditures for producing the oil and the royalties they had to pay to the producing countries.<sup>70</sup> With a total production cost of around eighty-five cents selling for around \$2.50, a barrel of oil was already highly competitive in the late 1940s. During the 1950s production costs plummeted as low as ten cents to twenty cents a barrel.<sup>71</sup>

Not surprisingly, oil production boomed and explorations were rapidly expanded in view of the possibility of such fabulous economic profits.<sup>72</sup> "New oil" increasingly flowed from the mid-1950s to the already expanding production of oil from activated wells. The result was overproduction, despite the enormous boom in demand, accentuated by the fact that "independent" producers increasingly entered the market.<sup>73</sup> The competition among suppliers of crude oil was reinforced by the growing number of refiners independent of "the Big Seven."<sup>74</sup> Both the petroleum companies and the elites of the oil-producing countries strove to pump out the producing fields as quickly as possible. Their mutual

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interest in doing so, called the "dual system," was rooted in the legal terms of the leasing conditions. On the one hand, the oil companies feared obtaining less favorable conditions after expiration of their contracts. The elites of the oil-producing countries, on the other hand, needed increasing income to persuade their clientele to stick with them.<sup>75</sup> These dual driving forces expanded the over-production and the already existing pricing pressure.

Far from being just the outflow of market forces, energy prices were at their lowest since the interwar period.<sup>76</sup> Political authorities in Western Europe commissioned a set of studies about the most reliable sources of energy supply in the mid-1950s, the most important of them being the OEEC Hartley Report. Considering several scenarios, such as increasing importation of cheap U.S. coal and promoting nuclear energy, which was still a developing industry, the report finally recommended the import of oil as being the best solution to improve the prosperity of Western Europe.<sup>77</sup> The democratization of consumption became a "basic right during the Cold War, and it was a fundamental argument in the favor of capitalism in the competition with the socialist countries."<sup>78</sup>

Reconstructing Western Europe was the first objective of U.S. policy in the Cold War, and without abundant and cheap Middle Eastern oil this would not have been possible.<sup>79</sup> Governments, hesitating between the strategically and socially desirable maintenance of the domestic coal industries, and the possibility of improving their competitive capability with the United States by opening up their markets to the flood of cheap Middle Eastern petroleum, finally decided in favor of the second option.<sup>80</sup> In fact, the growth rates during the golden age could not have been realized on the basis of coal.<sup>81</sup> The decision of governments to decontrol oil imports was taken just before the crumbling quasi-monopoly of the Big Seven sent prices plummeting from 1957.<sup>82</sup> It needs to be stressed as well that all agents anticipated energy prices to rise both for coal and for oil.<sup>83</sup> None of them expected oil prices to decline in a situation of rising wage pressure and economic pick-up, because such a feature was simply not known from past experience.

After the temporary closing of the Suez Canal during the war in 1956, a new class of very large crude carriers (VLCC) carrying several hundred thousand tons of oil was launched. Transporting a barrel of crude on such a giant was considerably cheaper than on the relatively small vessels on which petroleum had been previously shipped.<sup>84</sup> Pipelines built from the petroleum harbors to the inland refineries contributed to further lowered transport prices.<sup>85</sup> In the end the international price of oil fell sufficiently to pose a competitive threat to domestic fuel industries in the United States.<sup>86</sup> To protect domestic oil producers,

President Eisenhower therefore arranged for a system of mandatory quotas on imports in March 1959, which depressed world market prices even further for the next fourteen years.<sup>87</sup> The combination of these factors led petroleum prices in 1991 dollars to drop 20 percent between 1957 and 1973.<sup>88</sup>

The competitive advantage of oil imports over domestic coal in Western Europe initiated a new conflict during these years, which was mainly reported in the business sector of the media and barely hit the headlines. In its physical properties coal is inferior to oil with regard to energy density, stocking losses, and emissions of  $CO_2$ , soot, and  $SO_2$ .<sup>89</sup> The change from coal to oil heating mattered, not the least in large smog-ridden conurbations such as London.<sup>90</sup> The higher energy density implies that more units of useful work is provided per unit of thermal input.<sup>91</sup> Besides its physical and environmental advantages, oil is more convenient to use than coal, as it does not need to be scooped into the boiler. Most important, underground-mined European coal was far from being competitive with dirt-cheap Middle Eastern oil. At the same time, U.S. coal mined from open pits became competitive during the 1950s.<sup>92</sup>

Mechanization of underground coal mining was limited to coal-cutting machines, conveyor belts, electric trains, and elevators, leaving much to the hard physical work of miners. As a result, labor made up the lion's share of production cost. Demand rose and fell according to the business cycle involving corresponding fluctuations of wages and energy prices and accordingly the hiring and firing of miners.<sup>93</sup> Early on, European governments were aware of the tightening competitive environment on the energy market through increasing petroleum imports. According to Peter von Allmen's findings, the attempt to create a common market for coal and steel through the foundation of the European Coal and Steel Community in 1951 was primarily intended to improve the competitive ability of domestic coal production.<sup>94</sup>

The shift in the proportionate use of coal and oil had already begun in the early 1950s. Things went haywire in 1957. Miners could hardly be found on the dried-up job market, and coal prices rose substantially.<sup>95</sup> At the same time fuel prices plummeted by 60 percent within three years.<sup>96</sup> The Big Seven weathered the slump by subsidizing part of transport costs from their benefits.<sup>97</sup> As a result, coal shortages ended quickly, being replaced by mounting piles of unwanted coal at pitheads.<sup>98</sup> Governments in the United Kingdom and in West Germany, and to a lesser extent in France, took some measures to protect domestic fuel industries, mostly in view of avoiding or buffering social conflicts. The worst shocks were avoided with the easy availability of new jobs in other branches of the economy and rather generous social compensation plans according to the abundant public revenue.<sup>99</sup>

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Within a couple of years the Western European fuel economy was turned upside down. In 1955 coal provided 75 percent and petroleum just 23 percent of total energy use. By 1972 the share of coal had dropped to 22 percent while that of oil had risen to 60 percent. While in 1950 the United States was the only country with a well-developed oil industry, between 1950 and 1973 the industry in the rest of the world grew ninefold at an annual rate of 10 percent.<sup>100</sup> After 1962 crude oil and oil products accounted for more than the half of the global freight volume of international maritime shipping.<sup>101</sup>

The profound change in the structure of the energy sector led to a globalization shock in the field of energy supply that is akin to the globalization shock in grain supply that happened in the early 1880s. The "grain offensive" of the United States and Russia at that time resulted from the opening up of the American West and the Russian plains for commercial grain farming and the concomitant construction of a network of railways and steamboats for shipping the grain to Europe at prices that undersold the production cost of many domestic producers.<sup>102</sup> The glut of cheap overseas grain led to a substantial lowering of grain prices relative to wages, which may have boosted the trade cycle during the two decades preceding World War I. However, the grain offensive undermined Europe's food security with far-reaching consequences in World War I. Likewise, the "petroleum offensive" of the 1950s and 1960s jeopardized Europe's energy security, leaving the region entirely dependent on an outside energy supply and vulnerable to extortion, as the oil price shock in 1973 and more recent events have revealed.<sup>103</sup>

At about the same time energy markets in the socialist countries were reshaped as in the West.<sup>104</sup> From 1955 the Soviets got a surplus of oil, which in part went to the satellites for prices somewhat below the world market level to build up chemical industries.<sup>105</sup> Total Soviet oil exports to all of the COMECON countries grew up to a maximum of ninety-two million tons at the time of "Soviet Peak Oil" in 1981, which fell far short of the import of Western European countries.<sup>106</sup> Not surprisingly, coal remained the most important fuel in Eastern Europe until 1989, which may be one reason why these countries were economically less successful.<sup>107</sup> Coauthors Petra Kuskova, Simone Gingrich, and Fridolin Krausmann have investigated the energetic transition in Czechoslovakia using the approach of material-flow accounting. This country was a center for heavy industry within COMECON. The decades between 1950 and 1981 saw a 400 percent surge in fossil energy consumption, up to a per capita use 2.7 times higher than in neighboring Austria. Environmentally inferior brown coal made up the largest share of this.<sup>108</sup> The situation in neighboring East Germany was hardly better. The resulting enormous air pollution with  $SO_2$  was at the root of "death of the forests" (*Waldsterben*), which typically was rampant in the early 1980s in such regions as the hilly area of Erzgebirge, situated between the CSSR and East Germany.<sup>109</sup> Thus the socialist bloc substantially contributed to the rising levels of greenhouse gases.

In the West the main reason for the substantial decline of the cost of fossil energy in relation to the cost of labor is the effect of two components at the root of the "1950s syndrome": namely, sharply rising real wages and the concomitant availability of dirt-cheap petroleum.<sup>10</sup> Understanding the causes of this "great energy price anomaly," as the feature may be named, is complicated by the fact that the surge in real wages was itself an effect of declining relative prices for fossil fuel to an extent, which still remains to be investigated. The instance of declining prices for fossil fuels during the most unprecedented period of economic growth is a unique feature in human history. It not only contrasts strongly with previous historical experience, but also with the situation in the twenty-first century, where energy prices are again positively correlated with the business cycle.

Among the many consequences of the "great energy price anomaly" are its effects on innovative activity. In 1932, John R. Hicks introduced the theory of "induced innovation," which states that changes in relative factor prices should lead to innovations that reduce the need for the relatively expensive factor.<sup>111</sup> Co-authors Richard G. Newell, "Adam B. Jaffe, and Robert N. Stavins found that the nature of the technical change depended on energy prices. High prices tended to encourage energy efficiency improvements. Lower prices led to technological change related to time-saving, implying a substitution to a more energy-intensive production.<sup>112</sup> David Popp has statistically supported this argument by demonstrating for the United States from 1970 to 1993 that both energy prices and the quality of existing knowledge had significant positive effects on energy-efficient innovations.<sup>113</sup>

There is also historical evidence for Hick's theory. For example, energy prices were high in relation to labor before the late 1950s. The forerunner of the steam engine, Thomas Newcomen's steam pump (invented in 1712), was an incredible energy guzzler fed with coal leavings and working with 0.5 percent energy efficiency. Watt's steam engine (developed in 1765) was already 60 percent more energy efficient than the steam pump, whereas the steam turbine built by Parson in 1884 was as much as 90 percent more efficient than Watt's construction.<sup>114</sup> As a result, the cost of steam power in Britain fell from 4.5 pounds in 1760 to 15 pence by 1910.<sup>115</sup> As long as energy was the marginal factor, the quest for economic efficiency likewise improved ecological sustainability per unit of energy services

consumed. The reverse can also be true. The sustained decline in the relative energy price during the "great energy price anomaly" might have choked off innovative activity related to energy efficiency. In particular, this refers to the development of sustainable forms of energy use, such as solar, wind, and geothermic energy.<sup>16</sup> Whereas solar homes became increasingly popular in the United States during the late 1940s and early 1950s, "constantly falling fuel prices led to an almost universal lack of interest in solar architecture by the late 1950s."<sup>117</sup>

# The Rise of Consumer Society and the Accelerated Loss of Ecological Sustainability

Changes in energy use and greenhouse gas emissions, even far-reaching ones, are not sufficient to justify the designation of a historical epoch. Rather, it must be demonstrated that such changes significantly altered peoples' way of life, their scope of action, their options and aspirations. Such issues as global energy use and relative prices are difficult to bring into line with narratives of people's experience. A cursory reading of the relevant issues, however, may suggest that the change in relative prices in the context of the "1950s syndrome" led to the emergence of "consumer society" in Western Europe.<sup>118</sup> This impression clearly overstrains the explanatory power of the concept. Granted, there is consensus that a Western European "consumer society" did not emerge before the end of the 1950s or the early 1960s—overlooking differences between countries—before "a predominant part of the population substantially consumed beyond its basic needs."<sup>119</sup>

Important components are found in the technological style of Fordist-Taylorist mass production, which unfolded in the United States during the interwar period and in Western Europe from the late 1950s. It allowed for substantial reduction in the cost for durable consumer goods (cars, household appliances, and the like). Few contradict that this changeover grew out of profound changes in the availability of time and money.<sup>120</sup> Likewise, most scholars agree that the consumer society cannot be boiled down to the ownership of new consumer durables like cars and washing machines. For the first time a generation had grown up after World War II, for which austerity and threats to physical integrity in the context of war had no longer been a formative experience.<sup>121</sup> In this context Victoria De Grazia has referred to a "change of a bourgeois mode to a fordist mode of consumption," introducing not only features of mass distribution such as the supermarket, chain retailing, professional advertising, but also more fundamentally eroding the pyramidal class constellation typical of European societies that implied carefully demarcated class-specific systems of "barriers and levels" in consumption.<sup>122</sup> Above all, the consumer society brought a multiplication of options and a diversification of practices.<sup>123</sup> Such changes were cultural rather than income driven and need to be embedded within a history of mentalities that should also consider economic and ecological arguments.

To what extent were the changes in relative prices for labor and energy in the 1950s responsible for the development of the wasteful type of "Western" consumer society? To answer this, we should briefly recall the way of life in Western Europe at the eve of the 1950s. Wages covered basic needs without offering large surpluses for the choice of individual lifestyles. Most of the household budget was spent on food, clothing, shelter, and the raising of children. In war-ridden countries such as Germany, people could survive only by tapping into every possible source of food, especially during the first postwar period.<sup>124</sup> A remark in a student's essay is revealing for the magnitude of the distress. It reads: "My best day was when my brother Friedrich died. Since then I have a coat and shoes and socks and a knit vest."<sup>125</sup> Working-class households still lived on tight burdens in the early 1950s. Coffee remained a Sunday treat throughout the decade.<sup>126</sup>

The situation in France and in the United Kingdom was not much better.<sup>127</sup> Workers had to live in crowded flats within walking, biking, or tramway distance from their place of work. Meeting the needs of a household was a study in rational planning. Food was bought in small "mom-and pop" retail stores.<sup>126</sup> The goods were wrapped in paper bags or sold without any packaging.<sup>129</sup> Fruits and vegetables originated from the surrounding countryside and changed according to season. Such descriptions are not inspired by nostalgia. Rather, they show how the idea of near sustainability was translated into real life. Both men and women, and to some extent even children, particularly in the economy's traditional sector, had to perform hard physical work with no hope of increases in wages.<sup>130</sup> A typical West German housewife worked seventy hours a week in the 1950s—not including the non-wage-earning work that women did for their children, their husbands, and their families.<sup>131</sup> The term "ancien regime ccologique" sums up this situation well.<sup>132</sup>

How sustainable was the "ancien regime ecologique"? The scholars Mathis Wackernagel and William Rees at the University of British Columbia have created a widely recognized comprehensive ecological accounting system for assessing the environmental impact of human activities known as an "ecological foot-print."<sup>133</sup> The ecological footprint measures the amount of biologically productive land and sea area human activity requires to produce the resources it consumes and absorbs the waste it generates, and compares this measurement to how much

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biologically productive land and sea area are available. Ecological overshoot occurs when a population's demand on an ecosystem exceeds the capacity of that ecosystem to regenerate the resources it consumes and to absorb its wastes. Most "northern" countries had an overshoot of more than four global hectares (gha) per person in 2005, with the United States leading the list. Historical figures are available back to 1961.<sup>134</sup>

The example of the Netherlands is representative for Western Europe (figure 7.5).<sup>135</sup> From 1961 to 1973—that is, during the period of most rapid divergence between real wages and energy-prices—the ecological footprint in that country shows a continuous strong rise. Since 1973, however, it has fluctuated on the same level. To what extent was the effect of relative prices related to human decision making? This issue needs to be broken down, with production and consumption being the two major fields of economic activity. Regarding consumption, we need to distinguish between buying commodities or services and making



*Figure 7.5.* The ecological footprint of the Netherlands, 1961–2000. The carbon component of the "ecological footprint" translates the amount of carbon dioxide into the amount of productive land and sea area required to sequester carbon dioxide emissions. *Source:* Brad Ewing, Steven Goldfinger, and Mathis Wackemagel, *The Ecological Footprint Atlas* (Oakland, Calif.: Global Footprint Network, 2008), 36. Data kindly provided by Global Footprint Network, National Footprint Accounts, 2008, available online at http://www.footprintnetwork.org. For more information about the footprint methodology and calculation standards, see http://www.footprintnetwork.org.

longer-term investments. Individual preferences prevail in buying clothes, furniture, consumer electronics, and services, whereas economic arguments might have been more significant in making longer-term investments, such as choosing the place of residence or the size of the family car.

The case of production of goods and services, including packaging and distribution, is more obvious.<sup>136</sup> Firms and governments make decisions according to the laws of the market economy. In a period of galloping real wages, a myriad of decisions made at the level of the individual firm were targeted at saving labor, or time, which is much the same thing. Such measures were justified as "rationalization," "savings of costs," "improving the quality of location," and so forth. Disregarding improvements in organization, most measures involved additional inputs of fossil energy without explicitly addressing this factor, because it was not cost relevant. The specific logic of such decisions widely differs according to economic sector. Agriculture is possibly the best suited case for demonstrating the effect of changes in relative prices, because the productivity increase in this sector known as the "Green Revolution" was by far the most outstanding.<sup>137</sup>

# The "Green Revolution"

"Modernizing" agriculture in Western Europe in terms of increasing yields per hectare and raising labor productivity was a long-lasting process going back to the Middle Ages.<sup>138</sup> Paul Bairoch has distinguished three phases. During the first, organic phase, agricultural production was essentially "solar," depending on recycling inputs grown on the farm and a substantial input of labor. The second, mechanical phase from the mid- to late nineteenth century involved the application of more efficient tools, horse-drawn machinery, and a limited amount of inputs from outside the farm. The third phase, that of "high-input agriculture" beginning in the 1950s, marks a significant breakaway from traditional agriculture, using renewable solar energy to produce a surplus of consumable biomass based on soil, plants, and photosynthesis.<sup>139</sup> High-input agriculture involves a set of heavy motorized labor-saving machinery introduced in combination with such land-saving techniques as high-yield varieties, depending on massive inputs of fertilizer and pesticides.<sup>140</sup> Rolf Peter Sieferle and his coauthors have demonstrated that cultivated areas ceased to be net producers of biomass for human and animal consumption through this transition, because the input of fossil energy exceeded the energy content of the biomass harvested.<sup>141</sup> The Green Revolution was not limited to Western Europe; it also became a major feature in Asia and Latin America.142

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Hermann Priebe has considered the development of European agriculture before World War II as being a telling example of "organic development": "A centuries-old epoch, during which renewable resources were carefully managed, ended in the post war period."<sup>143</sup> Indeed, before the mid-1950s most of the farmers still worked with horse-drawn machinery. They relied on their own fodder, and most of the manure was produced directly on the farm. Weeds were mechanically suppressed and bugs were picked out by hand.<sup>144</sup> For the Austrian peasant the Middle Ages lasted until the mid-twentieth century.<sup>145</sup>

After the war the immediate concern throughout Western Europe was raising agricultural production. Besides food shortages, there was a general need to maintain a good balance of trade by keeping imports as low as possible. The recovery, assisted by Marshall Plan funds, was extremely rapid. Labor productivity increased faster in agriculture than in other sectors. It tripled in France and Denmark between 1960 and 1980. Fridolin Krausmann has summarized



*Figure 7.6.* Grain yield of cereals, total biomass yield agriculture, and total nitrogen application (artificial fertilizer) in Austria, within the borders since 1830. *Source:* Fridolin Krausmann and Helmut Haberl, "The Process of Industrialization from the Perspective of Energetic Metabolism: Socioeconomics Energy Flows in Austria, 1830–1995," *Ecological Economics* 41, no. 2 (2002): 177–201.

the course of agricultural development in Austria from 1830 to 2000, assessing biomass yields, grain yields, and the input of artificial nitrogen fertilizer in a comprehensive graph (figure 7.6). This 170-year-long period is divided into two phases of unequal growth. Before 1950 annual biomass yields grew at an average of 1 percent. Subsequently, annual growth rates of biomass production and yields jumped to 4.5 percent, which, among other causes, was the effect of a massive input of artificial nitrogen fertilizer.<sup>146</sup>

Considering the rate of increase in productivity and input of artificial fossil fuels, the transition from traditional to high-input agriculture certainly deserves the term "revolution" in the intrinsic sense of a rapid, deep-reaching, and irreversible process.<sup>147</sup> Eric Hobsbawm has pointed to the fact that the Green Revolution led European peasants to vanish and that this outcome, involving a significant loss of culture and traditional practices, is irreversible.<sup>148</sup> That said, it needs to be stressed that in Asia and Latin America the Green Revolution was crucial for feeding the rapidly expanding populations.<sup>149</sup> Indeed, after 1950 real agricultural prices remained stable or even decreased in a survey of 130 countries.<sup>150</sup>

To assess the extent to which Europe's Green Revolution was promoted by changing relative prices for labor and (fossil) energy, prices of wage labor, capital, and energy have been collected from primary sources in Switzerland, for which reliable data exists.<sup>151</sup> At first glance Switzerland would seem not to be an appropriate candidate for a case study of agricultural economics in Western Europe, since it is outside the European Union. The EU has directed the agricultural policy in the Community's member countries since the 1950s. However, the principles of Swiss agricultural policy were very close to those of the EEC, except that tariff barriers were even higher. The incentive structure set by agricultural administrations both in the EEC and in Switzerland encouraged the production of nearly unlimited quantities of milk, grain, potatoes, and so on, because target prices were paid regardless of the amounts produced.<sup>152</sup>

Considering the evolution of foreign wage labor, machinery, diesel, and artificial nitrogen fertilizer (figure 7.7), the massive changes in relative prices between 1948 and 1973 are striking. The price of wage labor grew almost sixfold, that of agricultural engines scarcely doubled, whereas fuel and fertilizer prices remained almost constant. It needs to be stressed that energy is the main ingredient used in nitrogen fertilizer (ammonia) production, accounting for more than 80 percent of the production costs.<sup>153</sup> The significance of declining relative energy prices needs to be considered within an economic environment shaped by technological push factors and political agents who, to keep some farmers in



*Figure 7.7.* Relative prices of foreign wage labor, machinery, fuel, and nitrogen fertilizer in Swiss agriculture, 1948–1988 (1948 = 100). *Source:* Christian Pfister, "Die Umwälzung der Landwirtschaft im Tieferen Mittelland seit den 1950er Jahren und der Untergang des Bauerntums," in *Die Bauernhäuser des Kantons*, edited by Heinrich Christoph Affolter, vol. 3 (Bern: In press).

business, strongly promoted the transition to high-input agriculture. Overmechanization at the expense of wage-labor was for larger farmers a matter of survival. Likewise, considering high fixed costs and payment of interests for machinery and low costs for fuel and fertilizer, expanding production and pushing yields to a maximum became profitable (figure 7.7). Although the availability of cheap fossil energy was of primary importance for the transition, classical studies of agricultural economics did not address this issue at all.<sup>154</sup>

The lion's share of the productivity gains benefitted the consumers. Analyzing household consumption patterns in France, West Germany, and the United Kingdom, Sabine Haustein has concluded that expenses for food declined most substantially between 1945 and 1970. The extra purchasing power was chiefly spent for "transportation"—that is, for driving a car in the context of leisure activities.<sup>155</sup> This further boosted fossil energy use and promoted economic growth in terms of a feedback effect. The environmental consequences of high-input agriculture—such as loss of biodiversity and landscape amenities, nitrification of groundwater due to overfertilization, soil erosion, and compression—were summarized by Antoinette Mannion.<sup>156</sup>

# Mass Motorization and Mobility

The automobile was and still is undoubtedly the key product of modern consumer society. Together with the family home in suburbia, it provided the basis upon which the household existed.<sup>157</sup> The car as a commodity made its breakthrough in Western Europe between the late 1950s and the early 1960s. Peter Borscheid has spoken about an "epoch-making divide in the history of mobility."<sup>158</sup> Indeed, when the writer Philip Bagwell came to live in a north London suburb in 1953, "the motor car was still not completely dominant. Private car ownership was limited to the occupance of one house in every five. Milk was delivered by means of a horsedrawn car. . . . Ten years later horse transport had disappeared from the neighbourhood and car ownership had extended to three quarters of the households."<sup>159</sup>

Mass motorization in Germany was promoted by declining selling costs for cars—for example, by 20 percent between 1948 and 1957 for VW's Beetle—and by lowering the annual tax on motor vehicles in 1955 by 20 percent.<sup>160</sup> Looking at pictures of the cars of the 1950s reveals that small cars were produced in response to the high gas prices at that time. The Morris's Minor, Citroën's legendary Deux Chevaux, Fiat's Seicento, and VW's Beetle dominated the streets, not to mention the "cabin scooters"—such fancy hybrids as the Goggomobil. In 1950 the railways still carried the lion's share of passengers, but they were under a triple threat from private cars, motor buses, and airplanes.

According to Christoph M. Merki, we would be ill advised in interpreting the "jolty triumphal procession of the automobile" solely as an effect of relative prices. It should rather be understood as a holistic process involving economic, sociological, technological, and cultural perspectives.<sup>161</sup> As people became more affluent, they appreciated the advantages of a motor car with its door-to-doortransport, convenience, privacy, and, once the fixed costs were paid, low unit cost for family transport.<sup>162</sup> One of the main motivations for buying a car was the expectation of saving time. This was only possible if the network of roads was adequately developed. The building of expressways was a key promoter of mass motorization. Leaving Italy and Germany aside, the construction of expressways in most European countries was planned and decided in the 1950s. For Gijs Mom the emergence of the limited-access highway was a turning point in the history of mobility.<sup>163</sup> "Autobahn" networks were imposed on the previous system that had been designed on different principles.<sup>164</sup>

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During the 1950s the International Federation of Roads (IFR) lobbied for the diffusion of American road-building techniques and promoted the formation of an "elite corps of highly trained road administrators over ministers and directors" as well as five hundred engineers.<sup>165</sup> Mom has argued that the building of such networks by states or state-sponsored entities "was not a response to actual demand (in terms of the number of cars used for long range mobility), but rather to expectations that these vehicles would be more widely used in the future,"166 It was fantasy, inspired by the existing railway network, and eventually road traffic came to resemble railroad traffic, in that roads caused traffic to become longrange rather than peri-urban or regional.<sup>167</sup> At the same time such views reflected the public's desires, as designed motor roads were a visible sign of progress intended to reduce accidents and to speed up traffic flows.<sup>168</sup> In Switzerland 80 percent of male voters approved a corresponding amendment to the constitution in 1958.<sup>169</sup> In 1963 construction was barely under way in most European countries, but by the end of the 1980s the European highway network had increased to forty thousand kilometers.170

The price of gas was politically determined from the very beginning of the automobile age.<sup>171</sup> The cost of expressway construction was in most countries covered by an extra tax on gasoline. However, with rising wages and declining gas prices, this tax became less and less a burden, which in fact led to an "auto-financing" of expressways in a double sense of the word.<sup>172</sup> What about relative prices? Data about wages, the prices for gas, electricity, and brown bread were collected for Switzerland between 1950 and 1990 (figure 7.8).

The cost of a liter of gasoline in 1950 was more than that of a kilogram of brown bread. A skilled worker's hourly wage was worth 4.5 liters of gasoline at that time. Forty years later, it was equivalent to more than 20 liters of gasoline. In relation to wages, gasoline had become five times cheaper during this period, including a surtax for motorway building and maintenance.<sup>173</sup> How deeply this experience altered people's attitudes was revealed in 1973 when a "right to gas" was claimed in the Swiss press as a clear analogy to the traditional "right to bread.<sup>2174</sup>

That gas prices were hardly an issue up to 1973 is precisely the key point from an ecological point of view. Once the fixed costs were paid, the mileage covered per year hardly made a difference. Low mileage was an omnipresent advertising argument until the late 1950s.<sup>175</sup> Subsequently, cars were increasingly being used for walking or biking distances that had been unthinkable before 1960. As a matter of fact, the proportion of national income spent on travel and transport alone in Western European countries roughly doubled between 1946 and the late 1980s.<sup>176</sup> The significance of the relative price effect prevailing in the 1950s may be demonstrated by assuming a rise of the gas price in proportion to real wages until 1990, which would correspond to as much as 6.60 Swiss francs of 2008 or 4.30 Euro per liter.

Nobody had anticipated the rise to predominance of road haulage in the 1950s. The growth in truck size and the greater power of engines spurred by the new expressways allowed both larger loads and greater speed. The great economic advantage of road transport was not so much cost, although that fell in real terms, as its predictability, flexibility, and speed. Using trucks meant a journey with an "unbroken scam," that is only one loading and unloading, whereas railway travel usually doubles that number.<sup>177</sup> Again the significance of the diesel prices needs to be considered from an environmental perspective. As the bulk of the costs were fixed, the mileage did not matter. As a result, long-distance road haulage became profitable, which had never been the case before. The availability of cheap and quick transport on the road and also in the air (figure 7.9) led to a



*Figure 7.8.* Hourly wages in industry compared with prices of brown bread, electric energy, and gasoline in Switzerland, 1950–1990. *Source:* Christian Pfister, "The 'Syndrome of the 1950s' in Switzerland: Cheap Energy, Mass Consumption, and the Environment," in *Getting and Spending: European and American Consumer Societies in the Twentieth Century*, edited by Susan Strasser, Charles McGovern, and Matthias Judt (New York: Cambridge University Press, 1998), 359–78.

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Figure 7.9. Average European fare for a 1000-kilometer trip (in constant 1993\$ and to 1993 prices). Source: Hans-Liudger Dienel and Peter Lyth, Flying the Flag: European Commercial Air Transport since 1945 (Basingstoke: Macmillan Press, 1998), 11.

relocation of firms and residential areas akin to the rearrangement of the spatial matrix of human activity through nineteenth-century railways. At the same time it led to a further quantum leap in globalization.

Air transport has seen the most impressive growth rates of any mode of transport since the 1950s. In Belgium, France, Spain, and the United Kingdom, for which data are available, kilometers flown by passengers grew 3,900 percent between 1950 and 1970. The surge in air transport can be explained by factors on both the demand and supply side.<sup>178</sup> It is said that World War I taught people to fly, and World War II gave them the aircraft to do it economically.<sup>179</sup> Most of the first generation of commercial jets, following the pioneering Comet built by De Havilland in 1952-such as Aeroflot's TU-104 in 1956, Boeing's B707 in 1958, McDonnell-Douglas's DC-8 in 1958, and Sud Aviation's Caravelle in 1959—went into service in the late 1950s.<sup>180</sup> The advantage of jets was their superior speed to piston engines, which considerably extended the distance that could be covered per unit of time. Jets were also capable of development in terms of power output, so that even larger planes could be built with lowered unit costs. The globalization of industries and institutions promoted the airplane as a business tool, whereas the increase in real wages and the growing availability of annual vacations brought long-distance holiday travel within the reach of the middle class.<sup>181</sup>

The "1950s Syndrome"

The price history of average airfares since 1950 (figure 7.9) depicts the two components of the "1950s syndrome" well. The surge in real wages and the decline in real fuel prices led airfares to drop substantially before 1973. Subsequently, the curve mainly depicts the effect of fuel prices, particularly the two "oil crises" and the negative oil price shock after 1986.<sup>182</sup> Railways suffered from the competition of both road and air transport. In most countries the dense rail network built up from the mid-nineteenth century until 1914 was partly dismantled in the 1960s and 1970s.<sup>183</sup>

DURING THE PAST two centuries humans have become geological agents and their continuous unbridled use of fossil fuel threatens to "burn" the planet. According to the historian Dipesh Chakrabarty, this fact has resolved the fundamental assumption of Western (and now universal) political thought to separate human history from natural history. Explaining this catastrophe in the moment of the danger that is climate change now calls for a new universal history of humans.<sup>184</sup> In particular, when and why the climate problem that plagues the world today has gotten to this state of calamitous emergency. The economist Nicholas Stern made it clear in his famous analysis that the unbridled rise of CO<sub>2</sub> concentration in the atmosphere is an expression of "the greatest and widest-ranging market failure ever seen" without answering the issue of "when" and "why."185 This task is left to the historians. Most of them point to industrialization as being the fall of humankind, and this point of view is echoed by scientists. However, the work devoted so far to the "1950s syndrome" and the "Great Acceleration" has made it clear that the greenhouse problem in its present urgency mainly results from the development within the second half of the twentieth century.

A closer examination of the process leads to the conclusion that it mainly originated in the so-called golden age (between the late 1950s and the "oil price shock" of 1973). Two sets of drivers need to be highlighted: namely, a boom in real wages, the most pronounced in human history, which was to a considerable extent a by-product of the Cold War, and a concomitant decline in real oil prices, which was mainly due to the inconceivable enormity of the Middle East oil bonanza. Just the world's largest oilfield, Ghawar in Saudi Arabia, until 2005 yielded sixty billion barrels of crude corresponding to 9.5 cubic kilometers.<sup>186</sup> While it took hundreds of millions of years for its formation, humans (mostly Western societies) will have returned its concentrated organic carbon to the atmosphere and oceans within two or three generations. In 1949 the petroleum geologist M. King Hubbert made public "that the fossil fuel era would be of very short duration."<sup>187</sup> He was right in predicting that the United States would reach Peak Oil in 1970.<sup>188</sup>

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The "great energy price anomaly" is the main reason why the Northern type of industrial society became so wasteful. The anomaly lasted long enough to effect structural changes, such as relocating firms and residential areas in a manner predicated on car transportation, restructuring the job market, and intensifying international division of labor. It fundamentally altered people's way of life, moving perceptions and dreams away from the focus on work and saving, toward leisure and spending. In historical perspective current efforts of emerging global governance to substantially lower CO<sub>2</sub> output under the threat of the greenhouse problem might be understood as attempts to get rid of unsustainable practices inherited from the "1950s syndrome" and the resulting "Great Acceleration."

No Divisions into periods are meant to give history a structure and at the same time to fix a certain interpretation of this history. This is all the more true with respect to contemporary history and especially to very recent developments. The history of the past century has seemingly been structured by more important events and "turning points" than former centuries; the past decades seem to have had more significant outcomes than former decades, and so on. On the one hand, recent developments have indeed more direct impact on our time, so that we need a closer look to explain the present state of the world. On the other hand, the perceived acceleration of "eras" and "turning points" is risky. Growing distance in time will inevitably reassess current interpretations. What seems today a crucial historical redirection may be viewed as a secondary incident in ten or twenty years. I therefore take a critical look at one of the most popular turning points of twentieth-century environmental history: the ecological turn (around 1970). Often, the development of the modern environmental movement, environmental consciousness, and environmental politics on the national and international level is depicted as a fundamental redirection of humankind's attitude to nature and the environment, putting to an end the hegemony of the modern exploiting Homo faber, who had dominated Western attitudes since early modern times.1

Modern Environmentalism

JENS IVO ENGELS

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This interpretation is not the least due to the fact that environmental historiography itself is a product of the ecological turn. The first generation of environmental historians was inspired by the politics of the environmental move-

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47. Hayden, Building Suburbia, 181–97; Robert Lang, Edgeless Cities: Exploring the Elusive Metropolis (Washington, D.C.: Brookings Institution Press, 2003); and Robert E. Lang and Jennifer LeFurgy, Boomburbs: The Rise of America's Accidental Cities (Washington, D.C.: Brookings Institution Press, 2007).

48. Rome, Bulldozer in the Countryside; Elizabeth A. Johnson and Michael W. Klemens, eds., Nature in Fragments: The Legacy of Sprawl (New York: Columbia University Press, 2005); and F. Kaid Benfield, Matthew D. Raimi, and Donald D. T. Chen, Once There Were Greenfields: How Urban Sprawl Is Undermining America's Environment, Economy, and Social Fabric (Washington, D.C.: National Resources Defense Council, 1999).

49. Owen D. Gutfreund, *Twentieth-century Sprawl: Highways and the Reshaping of the American Landscape* (New York: Oxford University Press, 2004). For an argument that "sprawl" reflects a historical trend that has more benefits than costs, see Robert Bruegmann, *Sprawl: A Compact History* (Chicago: University of Chicago Press, 2005).

50. Carl Abbott, The Metropolitan Frontier: Cities in the Modern American West (Tucson: University of Arizona Press, 1995); Robert B. Fairbanks and Kenneth Underwood, eds., Essays on Sunbelt Cities and Recent Urban America (College Station: Texas A&M Press, 1990); Char Miller, ed., On the Border: An Environmental History of San Antonio (Pittsburgh: University of Pittsburgh Press, 2001); Michael F. Logan, Desert Cities: The Environmental History of Phoenix and Tucson (Pittsburgh: University of Pittsburgh Press, 2006); and William Deverell and Greg Hise, eds., *Land of Sunshine: An Environmental History of Metropolitan Los Angeles* (Pittsburgh: University of Pittsburgh Press, 2005).

51. See Tarr, Devastation and Renewal, for references.

52. There is a huge amount of literature on environmental justice. For bibliographical guidance, see Carolyn Merchant, *The Columbia Guide to American Environmental History* (New York: Columbia University Press, 2002); and Robin Lanette Turner and Diana Pei Wu, "Environmental Justice and Environmental Racism: An Annotated Bibliography and General Overview, Focusing on U.S. Literature, 1996–2002," Berkeley Workshop on Environmental Politics, Institute for International Studies, University of California, Berkeley, 134 pages; Bibliographies B 02–7, available online at http://globetrotter.berkeley.edu/Envir Pol/Bib/B07-TurnerWu.pdf.

53. The literature on sustainable cities is extensive. A useful guide is Kent E. Portney, Taking Sustainable Cities Seriously: Economic Development, the Environment, and Quality of Life in American Cities (Cambridge: Massachusetts Institute of Technology Press, 2003).

54. The literature on cities and the history of "natural disasters," after lying dormant for sometime, has been growing rapidly in recent years. It can now be expected to grow even further as a result of the events of Katrina and New Orleans. Some recent books include Ted Steinberg, Acts of God: The Unnatural History of Natural Disaster in America (New York: Oxford University Press, 2006); Craig Colten, An Unnatural Metropolis: Wresting New Orleans from Nature (Baton Rouge: Louisiana State University Press, 2005); James Orsi, Hazardous Metropolis: Flooding and Urban Ecology in Los Angles (Los Angeles: University of California Press, 2004); Ari Kelman, A River and Its City: The Nature of Landscape in New Orleans (Los Angles: University of California Press, 2003), especially chapter 5; John M. Barry, Rising Tide: The Great Mississippi Flood of 1927 and How It Changed America (New York: Touchstone Books, 1997); and Philip L. Fradkin, The Great Earthquake and Firestorms of 1906: How San Francisco Nearly Destroyed Itself (Berkeley: University of California Press, 2005). Still provoking is Mike Davis, Ecology of Fear: Los Angeles and the Imagination of Disaster (New York: Metropolitan Press, 1998). For Europe, see Genevieve Massard-Guilbaud, Harold L. Platt, and Dieter Schott, eds., Cities and Catastrophes (New York: Peter Lang, 2002).

55. Lawrence J. Vale and Thomas J. Campanella, *The Resilient City: How Modern Cities Recover from Disaster* (New York: Oxford University Press, 2005), 345–47; see Vale and Campanella's appendix "Suggestions for Further Reading on Urban Disasters and Recovery," 357–61.

56. Ibid., 350-51.

# Chapter 7. The "1950s Syndrome" and the Transition from a Slow-Going to a Rapid Loss of Global Sustainability

1. Roger Revelle and Hans Suess, "Carbon Exchange between Atmosphere and Ocean and the Question of an Increase of Atmospheric CO<sub>2</sub> during the Past Decades," *Tellus* 9 (1957): 18-27.

2. Spencer R. Weart, The Discovery of Global Warming: New Histories of Science, Technology, and Medicine (Cambridge, Mass.: Harvard University Press, 2003), 30.

3. D. M. Etheridge, L. P. Steele, R. L. Langenfelds, R. J. Francey, J.-M. Barnola, and V. I. Morgan, "Historical CO<sub>4</sub> Records from the Law Dome DEo8, DEo8-2, and DSS Ice Cores," in *Trends: A Compendium of Data on Global Change* (Oak Ridge, Tenn.: Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, 1998), available online at http://cdiac.ornl.gov/trends/co2/lawdome.html (accessed on September 10, 2009). For measured CO<sub>2</sub> concentration at Mauna Loa since 1958, see ftp://ftp.cmdl.noaa.gov/ccg/co2/trends/co2\_annmean\_mlo.txt (accessed on September 10, 2009). This data is available online at http://www.japanfs.org/en/pages/029243.html (accessed on August 17, 2009).

4. The average increase was 0.3 ppm from 1900 to 1957. Dividing the aggregated increase of 79 ppm from 1957 to 2009 by the average increase from 1900 to 1957 yields 263 years!

5. Revelle as discussed in Al Gore, *Earth in the Balance: Ecology and the Human Spirit* (Boston: Houghton Mifflin, 2000), 5.

6. Translated from Hermann Flohn, *Physikalische Blätter* 37, no. 7 (1981): 184–90, quoted in Peter Weingart, Anita Engels, and Petra Pansegrau, "Risks of Communication: Discourses on Climate Change in Science, Politics, and the Mass Media," *Public Understanding of Science* 9, no. 3 (2000): 261–83, 268.

7. Will Steffen, Paul Crutzen, and John McNeill, "The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature?" *Ambio: A Journal of the Human Environment* 36, no. 8 (2007): 614–21, 616; Karl Polanyi, *The Great Transformation: The Political and Economic Origins of Our Time*, third edition, foreword by Joseph E. Stieglitz (Boston: Beacon Press, 2001).

8. Paul J. Crutzen, "Geology of Mankind: The Anthropocene," *Nature* 415 (2002): 23.
9. Steffen, Crutzen, and McNeill, "The Anthropocene."

10. Donella H. Meadows, Dennis L. Meadows, and Jørgen Randers, *Beyond the Limits: Confronting Global Collapse: Envisioning a Sustainable Future* (Post Mills, Vt.: Chelsea Green Publishing Co., 1992). Christian Pfister, "Das 1950er Syndrom: Der Energieverbrauch unserer Zivilisation in historischer Perspektive," *Natur und Mensch* 34, no. (1992): 1–4.

11. This collaboration took place at an interdisciplinary conference in Bern and was published as Christian Pfister, ed., *Das 1950er Syndrom: Der Weg in die Konsumgesellschaft*, second edition (Bern: Haupt Verlag, 1996), 179–200. Axel D. Neu, "Die Entfaltung der internationalen Erdölwirtschaft seit 1950," in *Das 1950er Syndrom*, edited by Pfister, 179–200. Christoph Maria Merki, "Der Treibstoffzoll aus historischer Sicht," in *Das 1950er Syndrom*, edited by Pfister, 311–32. Hans Flückiger, "Ramplanung im Spannungsfeld zwischen Trend und Steuerung," in *Das 1950er Syndrom*, edited by Pfister, 313–50. Gerhard Leutert, "Luftverschmutzung als Beispiel für Rückwirkungen auf die Umwelt," in *Das 1950er Syndrom*,

edited by Pfister, 351–76. Andreas Dieckmann, "Sozialer Wandel, Umweltbewusstsein, und Umweltverhalten," in *Das 1950er Syndrom*, edited by Pfister, 251–64. Marco Hüttenmoser, "Auswirkungen des '1950er Syndroms' auf den Alltag der Kinder," in *Das 1950er Syndrom*, edited by Pfister, 265–85. Klaus Armingeon, "Energiepolitik in Europa: Hindernisse umweltpolitischer Reformen," in *Das 1950er Syndrom*, edited by Pfister, 377–90. Wolf Linder, "Die fünfziger Jahre: Die Verarbeitung ökonomischer Modernisierung durch die politischen Institutionen der Schweiz," in *Das 1950er Syndrom*, edited by Pfister, 295–310.

12. "Der langfristige Rückgang der Relativpreise der fossilen Energieträger seit den späten 1950er Jahren ist die gewichtigste Ursache für den verschwenderischen Umgang mit Rohstoffen und Energie und die daraus erwachsenden übermässigen Belastungen der Umwelt" (Christian Pfister, Ruth Kaufmann-Hayoz, Beatrice Lanzrein, Gunter Stephan, Ewald C. Weibel, and Peter Gehr, "Das 1950er Syndrom': Zusammenfassung und Synthese," in *Das 1950er Syndrom*, edited by Pfister, 21–47, 32).

13. Christian Pfister, "The 'Syndrome of the 1950s' in Switzerland: Cheap Energy, Mass Consumption, and the Environment," in *Getting and Spending: European and American Consumer Societies in the Twentieth Century*, edited by Susan Strasser, Charles McGovern, and Matthias Judt (New York: Cambridge University Press, 1998), 359–78.

14. Christian Pfister, "Energiepreis und Umweltbelastung: Zum Stand der Diskussion über das '1950er Syndrom," in *Umweltgeschichte: Themen und Perspektiven*, edited by Wolfram Siemann (Munich: Beck Verlag, 2003), 61–86.

15. Neither is it quoted in the corresponding more elaborate article by John McNeill, "Social, Economic, and Political Forces in Environmental Change, Dedal Scale (1900– 2000)," in Sustainability or Collapse? An Integrated History and Future of People on Earth, edited by Robert Costanza, Lisa J. Graumlich, and Will Steffen (Cambridge, Mass.: MIT Press, 2007), 301–30.

16. The syndrome metaphor was taken up by Hans-Jürgen Schellnhuber and coworkers to designate other problems of nonsustainable development elsewhere, such as the "Dust Bowl Syndrome" (named after the 1935 Dust Bowl in the United States; see Hans-Jürgen Schellnhuber and others, "Syndromes of Global Change," *Gaia* 6, no. 1 [1997]: 19-34) or the "Favela Syndrome" in countries of the South (see Gerhard Petschel-Held and others, "Syndromes of Global Change: A Qualitative Modelling Approach to Assist Global Environmental Management," *Environmental Modelling and Assessment* [1998]: 1-21).

17. Christoph Maria Merki, "Epochenschwellen in der Wirtschafts-, Sozial- und Umweltgeschichte: Plädoyer für eine zeitliche Erweiterung von Pfisters '1950er Syndrom," in *Nachhaltige Geschichte: Festschrift für Christian Pfister*, edited by André Kirchhofer, Daniel Krämer, Christoph Maria Merki, Guido Poliwoda, Martin Stuber, and Stephanie Summermatter (Zurich: Chronos, 2009), 347–58, 355.

18. Jens Ivo Engels, "Umweltgeschichte als Zeitgeschichte," *Politik und Zeitgeschichte* 13 (2006): 32–38, quoted in Merki, "Epochenschwellen in der Wirtschafts-, Sozial- und Umweltgeschichte," 355.

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19. Arne Andersen, Der Traum vom guten Leben: Alltags- und Konsumgeschichte vom Wirtschaftswunder bis heute (Frankfurt: Campus Verlag, 1997). Arne Andersen, "Das 50er-Jahre-Syndrom: Umweltfragen in der Demokratisierung des Technikkonsums," Technikgeschichte 65, no. (1998): 329-44.

20. Patrick Kupper, "Die '1970er Diagnose': Grundsätzliche Überlegungen zu einem Wendepunkt der Umweltgeschichte," *Archiv für Sozialgeschichte* 43 (2003): 325–48.

21. Axel Schildt, *Neue Politische Literatur* (1996), available online at http://www.ifs. tu-darmstadt.de/index.php?id=1450.

22. Hansjörg Siegenthaler, "Zur These des '1950er Syndroms': Die wirtschaftliche Entwicklung der Schweiz nach 1945 und die Bewegung relativer Energiepreise," in *Das 1950er Syndrom*, edited by Pfister, 97–105, 98. In doing so, he referred to my wording that cheap energy had "favored" the emergence of the "consumer society." See Christian Pfister, "Das '1950er Syndrom': Die umweltgeschichtliche Epochenschwelle zwischen Industriegesellschaft und Konsumgesellschaft," in *Das 1950er Syndrom*, edited by Pfister, 51–95, 77.

23. In his review of Pfister, *Das 1950er Syndrom*, Werner Abelshauser at least admits that this volume was an important step out of the ivory tower into the political arena (Abelshauser, *Archiv für Sozialgeschichte* 38 [1998]: 823–24, 823).

24. David G. Ockwell, "Energy and Economic Growth: Grounding Our Understanding in Physical Reality," *Energy Policy* 36 (2008): 4000–4400.

25. Peter Söderbaum, *Ecological Economics: A Political Economics Approach to Environment and Development* (London: Earthscan, 2001), 9–10 and 19. Significantly, Söderbaum does not mention history among the social sciences working within ecological economics, probably because historians thus far did not cooperate at all. This tergiversation may be explained with a deep-seated restive attitude of mainstream environmental history against economic arguments, just as Franz Mauelshagen diagnosed a tendency of opinion leaders in environmental history to avoid dealing with the approach of historical climatology. Franz Mauelshagen, "Keine Geschichte ohne Menschen: Die Erneuerung der historischen Klimawirkungsforschung aus der Klimakatastrophe," in *Nachhaltige Geschichte: Festschrift für Christian Pfister*, edited by André Kirchhofer, Daniel Krämer, Christoph Maria Merki, Guido Poliwoda, Martin Stuber, and Stephanie Summermatter (Zurich: Chronos, 2009), 169–93, 184.

26. Ockwell, "Energy and Economic Growth," 4001.

27. Nicholas Georgescu-Roegen, *The Entropy Law and the Economic Process* (Cambridge: Harvard University Press, 1971); and Juan Martinez-Alier and Klaus Schlüpmann, *Ecological Economics: Energy, Environment, and Society* (Oxford: Basil Blackwell, 1987). See also Ockwell, "Energy and Economic Growth," 4600–604.

28. Hans Christoph Binswanger and Elmar Ledergerber, "Bremsung des Energiezuwachses als Mittel der Wachstumskontrolle," in *Wirtschaftspolitik in der Umweltkrise*, edited by Jörg Wolff (Stuttgart: DVA, 1974), 104, quoted after Reiner Kümmel and Thomas Bruckner, "Energie, Entropie: Ökonomie, Ökologie," in *Das 1950er Syndrom*, edited by Pfister, 129–148, 131 (see also Gunter Stephan, "Das 1950er Syndrom' und Handlungsspielräume: Eine wirtschaftswissenschaftliche Betrachtung," in *Das 1950er Syndrom*, edited by Pfister).

29. Kümmel and Bruckner, "Energie, Entropie."

30. Rolf Peter Sieferle, Fridolin Krausmann, Heinz Schandl, and Verena Winiwarter, Das Ende der Fläche: Zum gesellschaftlichen Stoffwechsel der Industrialisierung (Cologne: Böhlau Verlag, 2006), 329.

31. Joachim Radkau, Nature and Power: A Global History of the Environment (Cambridge: Cambridge University Press, 2008), 252.

32. Pfister, "Die umweltgeschichtliche Epochenschwelle," 59. Merki, "Epochenschwellen in der Wirtschafts-, Sozial- und Umweltgeschichte," 355–58.

33. Siegenthaler, "Zur These des '1950er Syndroms," 100–102; and Radkau, *Nature and Power*, 285.

34. Frank Uekoetter, "Umweltbewegung zwischen dem Ende der nationalsozialistischen Herrschaft und der 'ökologischen Wende': Ein Literaturbericht," *Historical Social Research* 28 (2003): 270–89.

35. Steffen, Crutzen, and McNeill, "The Anthropocene."

36. Angus Maddison, *Contours of the World Economy*, 1–2030 AD (Oxford: Oxford University Press 2007), 71.

37. Ibid., 72.

38. Nicholas F. R. Crafts, "The Great Boom: 1950–73," in *Western Europe, Economic, and Social Change since 1945*, edited by Max-Stephan Schulze (London: Longman, 1999), 42–62, 42.

39. Hartmut Kaelble, Der Boom, 1948–1973: Gesellschaftliche und wirtschaftliche Folgen in der Bundesrepublik Deutschland und in Europa (Opladen: Westdeutscher Verlag, 1992), 12f.

40. Jean Fourastié, Les trente glorieuses ou la révolution invisible (Paris: Fayard, 1979). Crafts, "Great Boom," 42.

41. Burkart Lutz, Der kurze Traum immerwährender Prosperität: Eine Neuinterpretation der industriell-kapitalistischen Entwicklung im Europa des 20. Jahrhunderts (Frankfurt: Campus Verlag, 1989).

42. Maddison, Contours of the World Economy, 72

43. These population figures are from http://en.wikipedia.org/wiki/World\_population#Population\_figures (accessed on September 19, 2009).

44. Fridolin Krausmann, Simone Gingrich, Nina Eisenmenger, Karl-Heinz Erb, Helmut Haberl, and Marina Fischer-Kowalski, "Growth in Global Materials Use, GDP and Population during the Twentieth Century," *Ecological Economics* 68 (2009): 2696–705.

45. For many poor countries, data on GDP, sometimes even on population, are guesstimates, not considering the problems in converting the data from the original currencies to dollars and account for purchasing power parity (PPP).

46. Hans Bräker, "Die Tagungen des Rates für gegenseitige Wirtschaftshilfe und ihre

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Ergebnisse (Teil 1)," Osteuropa Wirtschaft 7, no. 1 (1962): 58, as quoted in Benjamin Spycher, "Kampf gegen jede Verschwendung? Die Energieversorgung im Rat für gegenseitige Wirtschaftshilfe 1955 bis 1985 und die Auswirkungen auf die DDR nach 1975 am Beispiel des Erdöls" (M.A. thesis, Institute of History, University of Bern, 2008).

47. Crafts, "Great Boom," 61.

48. In late 1958 current-account currency convertibility was restored by all, except three, of the OEEC nations (Imanuel Wexler, *The Marshall Plan Revisited: The European Recovery Program in Economic Perspective* [Westport, Conn.: Greenwood Press, 1983], 254). Crafts, "Great Boom," 45.

49. On the Marshall Plan, see Wexler, *Marshall Plan Revisited*. On various forms of welfare, see Paul Johnson, "Welfare States," in *Western Europe: Economic and Social Change since 1945*, edited by Max-Stephan Schulze (London: Longman, 1999), 122–39. On educational reform, see Martin McLean, "Education," in *Western Europe*, edited by Schulze, 191–211.

50. Lutz, Der kurze Traum immerwährender Prosperität, 191–93; and Michael J. Piore and Charles F. Sabel, Das Ende der Massenproduktion: Studie über die Requalifizierung der Arbeit und die Rückkehr der Ökonomie in die Gesellschaft (Berlin: Klaus Wagenbach, 1985), 90–94.

51. Gabriel N. Alexander, "Impartial Umpireships: The General Motors–UAW Experience," in *Arbitration and the Law-Proceedings of the Twelfth Annual Meeting* (Washington, D.C.: National Academy of Arbitrators, 1959), 108–59.

52. On the establishment of welfare systems, see Johnson, "Welfare States," 122–23. On access to higher education, see McLean, "Education."

53. Crafts, "Great Boom," 43.

54. Knut Borchardt, "Die wirtschaftliche Entwicklung der Bundesrepublik nach dem 'Wirtschaftswunder," in *Der Weg der Bundesrepublik: Von 1945 bis zur Gegenwart*, edited by Franz Schneider (Munich: C. H. Beck Verlag, 1985), 193–216, 209.

55. Mohssen Massarat, "Erschöpfbare Ressourcen zu Dumpingpreisen: Wohlstand auf Kosten des Südens und künftiger Generationen," in *Das 1950er Syndrom*, edited by Pfister, 149–78.

56. Daniel Yergin, The Prize: The Epic Quest for Oil, Money, and Power (New York: Free Press, 1992), 591.

57. On the energy embargo by OPEC, see ibid., 735-47.

58. On the term "oil crisis," see Diona Venn, *The Oil Crisis* (London: Longman, 2002). For Germany, see Borchardt, "Die wirtschaftliche Entwicklung der Bundesrepublik nach dem 'Wirtschaftswunder,'" 202; and Klaus Voy, Werner Polster, and Claus Thomasberger, *Marktwirtschaft und politische Regulierung: Beiträge zur Wirtschafts- und Gesellschaftsgeschichte der Bundesrepublik Deutschland (1949–1949)* (Marburg: Metropolis-Verlag, 1991). For Switzerland, see Heidi Schelbert, "Schweizerische Wirtschaftsentwicklung seit 1950," in *Das 1950er Syndrom*, edited by Pfister, 201–18, 202–5. 59. Borchardt, "Die wirtschaftliche Entwicklung der Bundesrepublik nach dem 'Wirtschaftswunder,'" 202.

60. Siegwart Lindenberg and Bruno S. Frey, "Alternatives, Frames, and Relative Prices: A Broader View of Rational Choice Theory," *Acta Sociologica* 36, no. 3 (1993): 191–205, 191.

61. Dealing with this issue in somewhat more detail should not be seen as legitimizing the neoclassical construct of the "economic man" that is now seen to have engendered most environmental problems, last but not least regarding global warming. Although ecological sustainability is of primary importance, Peter Söderbaum's argument is convincing: we should not throw out the baby with the bathwater by distancing ourselves from arguments of neoclassical economics, which still have their uses. Söderbaum, *Ecological Economics*, chapter 7.

62. Hansjörg Siegenthaler, *The Regulation School: A Critical Introduction* (New York: Columbia University Press, 1990).

63. See Lindenberg and Frey, "Alternatives, Frames, and Relative Prices," 191.

64. Hansjörg Siegenthaler, Regelvertrauen, Prosperität, und Krisen: Die Ungleichmässigkeit wirtschaftlicher und sozialer Entwicklung als Ergebnis individuellen Handelns und sozialen Lernens (Tübingen: J. C. B. Mohr [Paul Siebeck], 1993).

65. Possibly the best study on this issue is still Helmut J. Frank, *Crude Oil Prices in the Middle East: A Study in Oligopolistic Price Behavior* (New York: Praeger, 1966).

66. Yergin, The Prize, 393.

67. Matt Simmons, Twilight in the Desert: The Coming Saudi Oil Shock and the World Economy (Hoboken, N.J.: John Wiley, 2005), 151–52.

68. "Saudi Aramco History." available online at http://www.jobsataramco.com/Home/ history.aspx (accessed on November 3, 2009).

69. Yergin, *The Prize*; Anthony Sampson, *The Seven Sisters* (Sevenoaks, England: Coronet, 1988).

70. Frank, Crude Oil Prices in the Middle East, 128.

71. John Blair, *The Control of Oil* (London: Macmillan, 1976), 47 and following pages, quoted in Peter von Allmen, "Energie und Europa—Kohle, Öl, und das "friedliche" Atom" (Ph.D. dissertation, Bern, 2002), 158, available online at http://www.stub.unibe.ch/down load/eldiss/o2allmen\_p.pdf (accessed on September 19, 2009).

72. Martin Chick, Electricity and Energy Policy in Britain, France, and the United States since 1945 (Cheltenham: Edward Elgar, 2007), 8–9.

73. Sampson, Seven Sisters, as quoted in Jacoba van der Linden, Dynamic International Oil Markets (Dordrecht: Kluwer Academic Publishers, 1991), 147n72.

74. Edit Penrose, The Large International Firm in Developing Countries: The International Petroleum Industry (London: G. Allen and Unwin, 1968), 79.

75. Massarat, "Erschöpfbare Ressourcen zu Dumpingpreisen," 166-71.

76. Von Allmen, "Energie und Europa"; and Chick, *Electricity and Energy Policy*, 8–10. 77. Frank, *Crude Oil Prices in the Middle East*, 142. On the Hartley Report, see Organi-

zation for European Economic Co-operation, *Europe's Growing Needs of Energy: How Can They Be Met?* (Paris: OEEC, 1956).

78. Andersen, Der Traum vom guten Leben, 765.

79. Ian Seymour, OPEC: Instrument of Change (London: Macmillan Press, 1980).

80. Von Allmen, "Energie und Europa," 135-41.

81. Borchardt, "Die wirtschaftliche Entwicklung der Bundesrepublik nach dem 'Wirtschaftswunder,'" 209.

82. Von Allmen, "Energie und Europa," 135-41.

83. Werner Abelshauser, Der Ruhrkohlebergbau seit 1945: Wiederaufbau, Krise, Anpassung (Munich: C. H. Beck Verlag, 1992), 110.

84. Frank, Crude Oil Prices in the Middle East, 86.

85. For the United Kingdom, see John Sheail, An Environmental History of Twentiethcentury Britain (Basingstoke: Palgrave Macmillan, 2002), 204-11.

86. Richard H. K. Vietor, *Contrived Competition: Regulation and Deregulation in America* (Cambridge, Mass.: Harvard University Press, 1994), 95, as quoted in Chick, *Electricity and Energy Policy*, 8.

87. Richard H. K. Vietor, Energy Policy in America since 1945: A Study of Business-Government Relations (Cambridge: Cambridge University Press, 1984), 347.

88. Neu, "Die Entfaltung der internationalen Erdölwirtschaft seit 1950," estimated from figure 29 on page 185. Prices are in US\$ from 1991.

89. Georg Erdmann, *Energieökonomik: Theorie und Anwendungen* (Zurich: B. G. Teubner Verlag, 1992).

90. Peter Brimblecombe, *The Big Smoke: A History of Air Pollution in London since Medieval Times* (London: Methuen, 1987).

91. D. J. Stern and C. Cleveland, *Energy and Economic Growth*. Rensselaer Working Paper in Economics No. 0410 (Troy, N.Y.: Rensselaer Polytechnic Institute), as quoted in Ockwell, "Energy and Economic Growth," 4602.

92. Von Allmen, "Energie und Europa," 119-21.

93. Klaus Tenfelde, Sozialgeschichte der Bergarbeiterschaft an der Ruhr im 19. Jahrhundert (Bonn: Verlag Neue Gesellschaft, 1981), 292; and Abelshauser, Der Ruhrkohlebergbau seit 1945, 72.

94. Von Allmen, "Energie und Europa," 90-167.

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96. Abelshauser, Der Ruhrkohlebergbau seit 1945, 92.

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98. Chick, Electricity and Energy Policy, 9.

99. Abelshauser, Der Ruhrkohlebergbau seit 1945, 72; and Chick, Electricity and Energy Policy, 13.

100. Thomas G. Weyman-Jones, Energy in Europe (London: Methuen, 1986), 55.

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102. Harry Fornari, Bread upon the Waters: A History of the United States Grain Exports (Nashville, Tenn.: Aurora Publishers, 1973).

103. Uwe Röndigs, Globalisierung und europäische Integration: Der Strukturwandel des Energiesektors und die Politik der Montanunion, 1952–1962 (Baden-Baden: F. Steiner Verlag, 1996, 2000). Jens Hohensee, Der erste Ölpreisschock, 1973–74 (Stuttgart, 1976). Venn, Oil Crisis.

104. Joszef M. Brabant, *Economic Integration in Eastern Europe* (New York: Routledge, 1989), 320.

105. Jennifer L. Considine and William A. Kerr, *The Russian Oil Economy* (Cheltenham: Edward Elgar, 2002), 63. Dumping prices paid by noncommunist countries still were substantially lower (ibid., 82). COMECON officials decided in 1958 to take average world market prices for reference adjusting export prices to member states in each case after a couple of years (Brabant, *Economic Integration in Eastern Europe*, 320). Bräker, as quoted in Spycher, "Kampf gegen jede Verschwendung?"

106. Considine and Kerr, Russian Oil Economy, 137; and Margaret Chadwick, David Long, and Machiko Nissanke, Soviet Oil Exports: Trade Adjustments, Refining Constraints, and Market Behaviour (Oxford: Oxford University Press, 1987), 36.

107. Spycher, "Kampf gegen jede Verschwendung?" 65-66.

108. Petra Kuskova, Simone Gingrich, and Fridolin Krausmann, "Long-term Changes in Social Metabolism and Land Use in Czechoslovakia, 1830–2000: An Energy Transition under Changing Political Regimes," *Ecological Economics* 68 (2008): 394–407.

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111. David Popp, "Induced Innovation and Energy Prices," *American Economic Review* 92, no. 1 (2002): 160–80, 170.

112. Richard G. L. Newell, Adam B. Jaffe, and Robert N. Stavins. *The Induced Innovation Hypothesis and Energy-Saving Technological Change*. NBER Working Paper 6437 (Cambridge, Mass.: National Bureau of Economic Research, 1998), as quoted in Robert Fouquet, *Heat, Power, and Light: Revolutions in Energy Services* (Cheltenham: Edward Elgar, 2008), 19.

113. Popp, "Induced Innovation and Energy Prices," 160.

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