CARMAGEDDON

PART THREE: THE EARTH AND THE CAR

It has been demonstrated that the global car industry contributes to global warming far more than is indicated by the statistics for global car exhaust emissions. It was then argued that in order to combat global warming, the historical carbon debtor countries should repay their carbon debts whilst the historical carbon surplus countries could continue to expand. Some of the most over-industrialized nations, with the largest carbon debts, would not only have to dramatically curb their CO_2 emissions but adopt massive reforestation and deconstruction policies. If this is the case would there be any room whatsoever for cars in such countries?

SEVEN: THE ECOLOGICAL CASE FOR BANNING THE CAR.

xl) A Hypothetical Analysis of England's Carbon Status.

This section provides a hypothetical carbon cycle analysis of England's carbon status in order to indicate the scale of the country's carbon debts and the types of policies it would need to implement if it is to play its part in combatting global warming.

Given that England was the first country to industrialize and that it is sitting upon widespread seams of fossil fuels either in the form of coal or oil which have led it to export huge quantities of carbon, then let it be assumed, for the sake of this hypothetical example, that its historical, supply side emissions amount to 8,000,000,000 tonnes of carbon, (8 GtC). Given the destruction of its forests, assume also that it has absorbed only a meagre 2 GtC. This leaves it with an historical carbon debt of about 6 GtC.

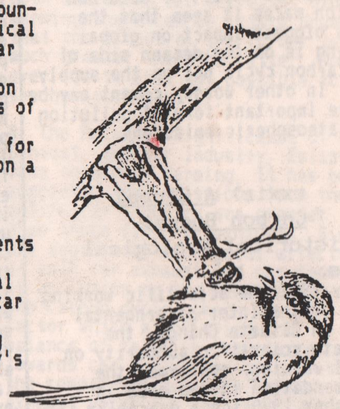
This debt is not too fanciful given that, "If we attributed to the English climate a growing potential similar to the world average (actually it is below that) then that area could sequester bio-mass through solar energy at the rate of 2×10^9 GJ/yr. The UK energy consumption in recent years has been around 10×10^9 GJ/yr. Thus the natural bio-mass system could not, by a factor of 5, match demand." ('Malcolm Slesser 'Energy in the Economy' p.97). In other words, for a number of years, if not decades, England has been living beyond its biomass energy capacity by a factor of five and so a historical carbon debt in the region of 6 Gt of carbon may not be too wide of the mark.

xli) The Ecological Case for Banning the Car in England.

If it was agreed at a future Earth summit on global warming that countries should repay their historical carbon debts within a thirty year period, this would mean that England would have to make carbon repayments of 200,000,000 tonnes of carbon *per annum*, (200 MtC). At present, England is responsible for exporting about 135 MtC of carbon a year (equivalent to about 540 million tonnes of CO_2).

Although technological improvements to the car could reduce carbon emissions, and although political reforms to the car could limit car numbers, the combined effect of these policies would fall a long way short of meeting the country's carbon target.

If England had to repay its historical carbon debt at the rate of 200 MtC each year, which it must do if the global community is going to combat global warming on a just and equitable basis, then it is easy to appreciate there would be little excuse for such an ecologically extravagant form of transport as cars. To convert the country from an annual carbon exporter of 135 MtC per year to a carbon importer of 200 MtC per year, would require a transport revolution. Indeed, meeting such a carbon target would also require a social, economic, and political revolution more fundamental than anything yet seen throughout history. It would require nothing less than large scale deconstruction. Half the country would have to be declared a wilderness area in order to dramatically increase its carbon absorption capacity.



This hypothetical example shows clearly the extent of the challenge which global warming poses to the over-industrialized nations. It will be argued that banning the car in Britain would be impossible. And yet, given the scale of the ecological debts which this country owes to the rest of the world and to future generations, it is the impossible that is needed.

WE EITHER ERADICATE THE CAR OR IT WILL ERADICATE US

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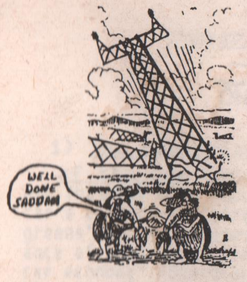
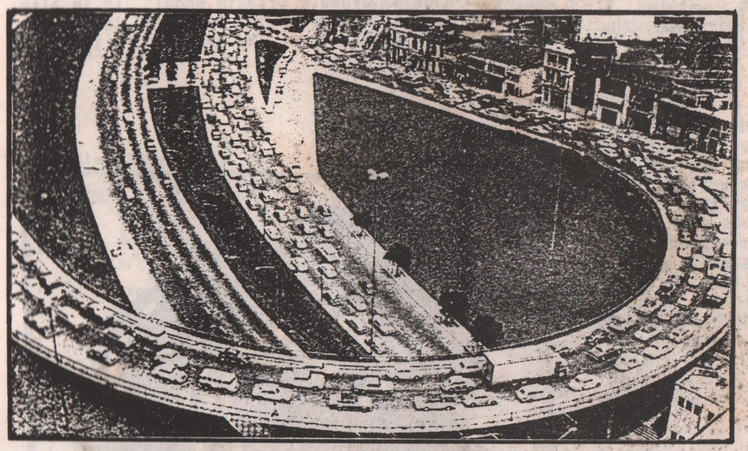


THE TERRA FIRM

A THEORETICAL JOURNAL FOR DEEP GREENS

OFF-PRINT ONE OF ISSUE no.2

BAN CARS



THE CAPITALIST,
FREE MARKET SOULTION
TO TRANSPORT
IS NOTHING LESS THAN
TOTAL, ECOCIDAL LOONACY

CARS KILL A MILLION PEOPLE EVERY YEAR:
HALF OF THE DESTRUCTION OF THE OZONE LAYER IS CAUSED BY CARS:
CARS ARE THE BIGGEST CONTRIBUTOR TO ACID RAIN IN EUROPE WHICH CAUSES £800,000,000,000 OF DAMAGE EVERY YEAR:
THE CAR INDUSTRY IS TURNING MILLIONS OF ACRES OF THE AMAZON RAINFOREST INTO DESERT:
CARS ARE ONE OF THE TOP FOUR CONTRIBUTORS TO GLOBAL WARMING:
CAR INDUSTRY EMISSIONS CONTRIBUTE MORE TO GLOBAL WARMING THAN CAR EXHAUST EMISSIONS:
THE CAR INDUSTRY'S BIGGEST CONTRIBUTION TO GLOBAL WARMING IS SMOTHERING THE PLANET IN TARMAC, OIL AND CEMENT:
THE CAR INDUSTRY HAS COVERED NEARLY 1% OF THE PLANET'S LAND SURFACE IN COAGULATED OIL SLICKS:
THE GENERAL PUBLIC PAYS THREE OUT OF EVERY FOUR POUNDS OF THE TOTAL COSTS OF MOTORING:
GREENPEACE SUPPORTS A BAN ON TOXIC WASTE INCINERATORS BUT NOT A BAN ON CARS EVEN THOUGH THE CAR INDUSTRY PRODUCES MORE TOXIC WASTE THAN ANY OTHER INDUSTRY AND CARS RELEASE MORE TOXIC FUMES THAN TOXIC WASTE INCINERATORS:
THE DEPARTMENT OF TRANSPORT ENCOURAGES DEVELOPERS TO BUILD ROADS THROUGH SITES OF SPECIAL SCIENTIFIC INTEREST:
LARGE NUMBERS OF TORY MINISTERS HAVE BEEN DIRECTORS OF ROAD/CAR/OIL COMPANIES:
WHEN DEPARTMENT OF TRANSPORT CIVIL SERVANTS RETIRE MANY PICK UP LUCRATIVE PAY PACKETS FROM THE ROAD/CAR/OIL INDUSTRY.

BAN CARS

Page Two

THE TERRA FIRM ISSUE

'The Case for Banning the Car' was published in October 1990 and an updated and considerably enlarged edition has just been published under the title of 'A Preliminary Proof for a Temporary Ban on Cars, An Application of the Carbon Theory of Value', 'Ban Cars II' is a much shortened version of that work.

TRADE IN YOUR TERRA FIRM ISSUE

If, after reading this issue, you are tempted to wade through the full version, send this magazine to the address on the back page for a trade-in with £1 off the price of the full version i.e. £2.50 instead of £3.50.

ACKNOWLEDGEMENTS

Given the shortage of space in this mini-issue, the acknowledgements have been presented in the maxi-issue.

THE THIRD EDITION

Although the theory which provides the framework for proving the ecological case for banning the car was transparent when the first edition was written, there wasn't sufficient empirical evidence at that time to substantiate the proof so no attempt was made to highlight the theory. Since then, however, enough facts and figures have emerged which make it worthwhile outlining the theory in this edition. But, there is a considerable amount of empirical research on the ecological impact of the car which still needs to be carried out. Once this has been completed it will be possible to fill in some of the many information gaps exposed by this work. What this means is that there will almost certainly be a third edition of 'Ban Cars'.

PREFACE

Most green critiques of the car present a list of the car industry's damage to the environment. It is assumed that the longer the list and the greater the quantities of pollution emitted by each item on the list, the more convincing the critique of the car - although, after wading through pages and pages of figures about x million tonnes of *this* car pollutant and y million tonnes of *that* car pollutant, the alleged seriousness of the ecological damage caused by the car industry tends to lose all credibility when readers reach the section on, 'What should be done to minimize the car's impact on the environment?' only to find motorists being advised to switch off their headlights after parking their car in order to save electricity.

No matter how long such lists may be and no matter how large the quantities of pollution may be, this sort of ecological critique is virtually meaningless. Pointing out that cars emit x million tonnes of a pollutant is meaningless without, at the very least, an ecological context which explains the ecological significance of the damage caused by such pollution. Typical of this approach is Greenpeace's 'The Environmental Impact of the Car' which is little more than a shopping list of pollutants.

This work does not so much provide an ecological context within which statistics about car industry pollution make more sense, but presents a dynamic model of how car pollution triggers off a set of chain reactions to the planet's carbon cycle thereby causing a spiral of ecological damage. This model, the carbon theory of value has been partially derived from the 'general circulation model' used by the Inter-governmental Panel on Climate Change.

As far as is known, this is the first time an attempt has been made to assess the car industry from the perspective of a 'dynamic climate model'. It is also the first time such a model has been used to assess the ecological viability of any ooman activity.

Drawing by Carlos Llerena.

Carlos Llerena

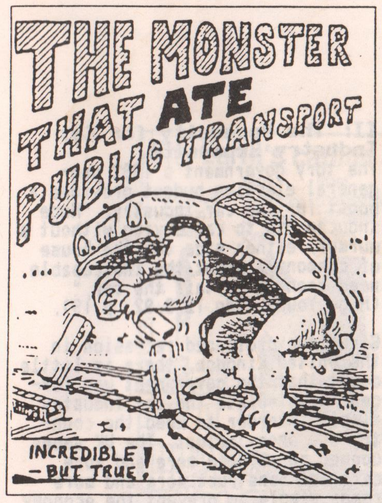
PART ONE:
THE HUMAN COSTS OF THE CAR

ONE: CAR - MAGEDDON; THE 'GREAT CAR ECONOMY.'

Page Three

i) The Explosive Growth of the Car Industry.

Mrs Thatcher once rebuffed the car's critics as "airey fairy greens" and emphasized the importance of what she called the "great car economy" (Guardian 17.3.90). This description is not without its merits. The car is gradually dominating the lives of everyone on the planet, not merely the carless but people living in remote third world villages thousands of miles from the nearest road or petrol filing station. The car has transformed cities and the countryside. It plays a central role in the global economy.



I: The Growth in the Car Population.

A: Global Figures. Prior to the 20thC few people had seen a car let alone owned one. Today, "The total world-wide vehicle population in 1985 was 500 million with cars just slightly under 400 million," (Michael P Walsh, p.269). "We have achieved this astonishing figure from scratch inside this century, and in particular since 1959, when there were a mere 50 million cars worldwide, of which two-thirds were in America." (Richard North p.160).

Millions of cars are manufactured each year. "Each working day, 126,000 cars roll off the production lines - nearly 33 million annually," (Norman Myers 'Future Worlds,' p.141). "Worldwide more than one car is produced every second," ('Mad Car Disease' p.8).

Within a couple of decades there could be a billion vehicles on the road, "in 25 years' time the OECD forecasts more than a billion (trucks and cars)," (John Vidal, Guardian 18.10.91, p.31).

B: Britain; "The number of cars on British roads increased from just over 2 million in 1951 to 18 million in 1988. The department of transport predicts there will be an extra 25 million cars by 2025." (Mick Hamer, 'Cars Come to the End of the Road' p.32-33). "Statistics put the number of registered cars at 19.7 million as against over 45,750,000 adults. Light goods vehicles bring the total to nearly 22 million." ('Road to the Future' p.18). The vehicle population .. is increasing by more than 2 million a year," (Richard Askwith, p.18).

Prince Charles stated, "It was "staggering" to think that there are now 2½ times as many cars in Europe as in 1970. He asked, "Isn't it time to ask how we are physically going to cope with what is rapidly becoming a monster of our own making? Have we not planned our cities in a way that gives succour to such an extraordinary voracious beast?" (Guardian 1.5.91, p.2).

II: The Global Spread of Car Ownership.

Car ownership is not evenly spread around the world. Consumers in the over-industrialized nations own the vast majority of cars whilst only a tiny fraction exist in third world countries. "Some 7% of the world's population own private cars and only a tiny proportion of that minority of mankind lives in the third world," (Pettifer & Turner).

However, most of the resources used in the construction of cars come from third world countries. Cars are the archetypal symbol of third world exploitation.

III: The Growth of the Multi national Road/Car/Oil Corporations.

The first car manufacturers have grown throughout the 20thC to become some of the world's most powerful multinational corporations. "Car manufacturers include the largest transnational corporations on earth. General Motors, the biggest, has a turnover larger than the gross domestic product of all Third World nations excluding Mexico, China, Brazil, and India. Production of trucks and cars dominates many economies," (Ian Breach). "The modern oil corporation, with assets greater than those of most countries, has functioned as a private government in its global planning and controls," (Robert Engler).

"Six of America's ten largest industrial corporations are either oil or auto companies," (David Morris 'Getting from Here to There' p.6).

IV: The Importance of the Car Industry to Gross Domestic Product.

Increasing automation continues to reduce employment in car manufacturing - despite the increasing number of cars being produced. Correspondingly, employment is not a good indicator of the car industry's significance to national economies.

"In the USA, the car consumes 10% of gross national product, with Americans spending 15% of their personal income on automotive transport," (Steve Elsworth, p.50).

"The European motor industry accounts for 9% of Europe's manufacturing output," (Guardian 7.6.91 p26).

V: The Importance of the Car Industry to the Global Economy.

Car manufacturing is the biggest industry on Earth. "The production of automobiles is the world's number one industry. The number two industry supplies their fuel," (David Morris 'Getting from Here to There' p.6).

"Half the world's earnings are auto-related; half the world's resources are auto-devoted." (Heathcote Williams, p.31).

It should be easy to appreciate that if there was a global ban on cars the global economy would teeter on the brink of collapse.

ii) The Global Scalextric Set.

World trade began in the days of colonialism. The global economy was created by multinational companies trading around the world. The global village came into being through satellites which enable instantaneous global communications to take place from virtually any spot on Earth.

The global scalextric set is still under construction. Huge road building programmes are currently being undertaken in virtually every country in the world. Roads are being constructed to improve links between Russia and western Europe; the United States with South America; and the west coast of South America to the east coast, etc.. The global scalextric set will consolidate the global village.

I: Roads Built.
Britain has, 1,600 miles of motorway network and 5,100 miles of trunk roads. (Guardian 22.5.91, p.3). The United States has 3.9 million miles of public roads.

Quite how long the Earth is likely to survive if the global scalextric set continues to spread is not known but what is certain is that although oomans started building it only a few decades ago the ecological bill has yet to be paid.

II: Miles Travelled.
Throughout ooman history, the vast majority of people have remained rooted to the soil and have rarely moved beyond the confines of their community. Today, however, people can travel virtually anywhere around the world. Cars enable people to go wherever they want and as far as they want.

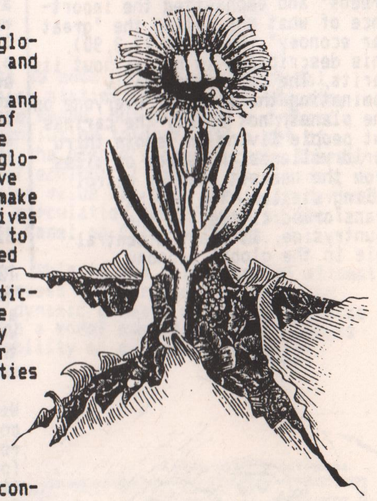
A: America; "In 1975, 130,000,000 American drivers drove a total of 133,010,000,000,000 miles." (Michael McFadden, 'Free People's Transit' p.5).

B: Britain; "In 1984 there were 2,700,000,000,000 vehicle miles by car, taxi and motorcycle against 243,000,000,000 passenger miles by domestic air." (TEST 'Wrong Side of the Tracks.' p.33).

III: Commuting and Leisure Activities.
In Germany, "While the rate of increase of car commuting, business travel and even holiday journeys has been levelling off 'leisure driving' now accounts for 50% of annual car/kilometres. Sales of 'fun cars' - campers as big as furniture vans, and overland jeeps - went up last year by 25%." (Guardian 24.1.92. p.29).

iii) Autocrazy.

I: Auto-centric Societies.
Whilst the global economy, the global telecommunications network, and the global village have brought many benefits to the super rich and the upper middle classes, most of the costs have been borne by the poor. The same is true for the global scalextric set. The poor have had their land expropriated to make way for roads, have had their lives ruined by motorways built close to their homes, and have been forced to subsidize motorists and road construction. Whilst cars dramatically improve the quality of life for car-owners they dramatically decrease the quality of life for the carless. Auto-centric societies are highly stratified and thus highly unequal.



II: Auto-cracy.
Since the invention of the car, motorists have gradually taken control of government and have won positions of power in society. They then use their political power to transfer resources from the carless to car owners. Motorists create a dictatorship, an auto-cracy, to promote their interests no matter how much these interests might harm other people and conflict with the general good. Whilst cars were once regarded as a liberatory technology, it is becoming increasingly obvious that they are now part of the oppression of everyday life.

iv) The Nightmare Rolls On And On.

I: Everyone Should Have a Car.
Thatcher's ideal of everyone on the planet having a car which they can use to go where they like, when they like, as often as they like, and as far as they like, is an utterly obscene ecological folly. The hordes of motorists charging around the world's roads like overgrown whizz-kids are a major cause of environmental devastation and threaten an ecological calamity. This, however, does not stop politicians from continuing to encourage wider car ownership.

During the 1992 UK general election campaign, John Major talked about wealth creation and the pathway to prosperity started by his predecessor. He promised, "I'm going to turn that pathway into a four lane motorway." (Guardian 6.4.92. p.12). To ecological ignoramuses such as John Major the best indicator of prosperity is the number of four lane motorways.

II: The Necessity for Car Industry Expansion.
The tory government's 1992 pre-general election budget provided a boost for the car industry. "Huge inducements to car buying without a murmur, either side (of the house of commons), about the inescapable need soon to curtail the car." (Hugo Young, Gdn 12.3.92. p.19).

Given the prolonged recession in the United Kingdom, there is little doubt that the government was forced to stimulate the car industry simply in order to keep the country's economy afloat. The UK seems doomed to produce more and more cars and construct more and more roads simply to prevent the economy from contracting. It would seem that cars are no longer needed for mobility (this could be achieved more efficiently by public transport) and roads aren't needed to increase access (since this could be done by rail) but because the British economy needs the car industry to maintain growth. As a consequence, the British road/car/oil industries have to be kept going no matter what the ecological damage.

PART TWO: THE ECOLOGICAL COSTS OF THE CAR.

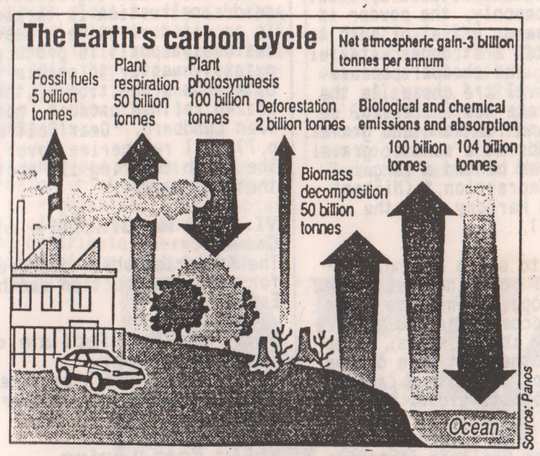
TWO: THE EFFECT OF THE CAR INDUSTRY ON THE DEMAND SIDE OF THE EARTH'S CARBON CYCLE.

v) Global Warming and the Carbon Cycle.

I: Carbon Costs.
Part Two explores the car industry's effects on the planet's ecology but does not attempt to assess the damage in monetary, but in ecological, terms, i.e. how the car industry, the car infrastructure. and car emissions affect the planet's carbon cycle. The costs are not measured in pounds, shillings, and pence but in ounzes, pounds, and tons of carbon.

II: The Supply and Demand Side of the Carbon Cycle.
Global warming is a natural phenomenon which raises the average temperature of the Earth by 33C. The blanket of greenhouse gases around the Earth keeps the global average temperature at around 14C. Without it average temperatures would be a very chilly -19C.

Global warming is created by two natural processes. The first is the greenhouse effect which consists of greenhouse gases such as water vapour, carbon based gases (such as carbon dioxide, methane and CFCs), and non carbon gases. The second is the heat effect which consists of thermal pollution and the planet's albedo. The biggest terrestrial contributor to the greenhouse effect is water vapour. The main anthropogenic contribution is through deforestation and carbon emissions - primarily carbon dioxide although, in the future, this could be overtaken by methane emissions. Thus, the primary human contribution to the greenhouse effect is through the planet's carbon cycle.



Taken from the GUARDIAN 21.2.92 p.27.

For the sake of simplicity, the planet's carbon cycle can be divided into a supply side, in which carbon emissions are released into the atmosphere, and a demand side, in which carbon dioxide is absorbed by biomass. Humans are severely disrupting both sides of the carbon cycle. They are not merely dumping huge amounts of carbon into the atmosphere, they are also cutting down forests and smothering the Earth with roads and buildings. Covering the land with concrete or tarmac has the same effect as deforestation - it reduces the Earth's ability to breathe in carbon dioxide and thus prevents the increasing quantities of carbon which are being dumped into the atmosphere from being removed. In other words, as far as the greenhouse effect is concerned, cement is just as serious a form of pollution as atmospheric emissions. The increase in carbon emissions and the decrease in the planet's photosynthetic capacity are leading to a dramatic rise in the level of atmospheric carbon.

The human race increasingly finds itself in the dangerous predicament that no matter how much it reduces carbon emissions, global warming continues to get worse because more and more of the planet's capacity for photosynthesis is being destroyed. Ultimately, this predicament could reach the point where levels of atmospheric carbon continue to rise depite a 99% reduction in anthropogenic carbon emissions.

The predicted increase in global warming will change the planet's climate and push the tropics towards the poles. This will cause the polar ice caps to melt and increase sea levels which will result in the flooding of coastal areas - where many of the world's largest cities are located. Global warming will produce a strange combination of droughts and flooding. There will also be an increase in the number of extreme weather events such as gales and hurricanes. Global warming is one of the biggest environmental threats facing life on Earth - although not the worst. It poses a much greater danger than either acid rain, which according to the Brookhaven National Laboratory in New York kills about 50,000 Americans a year, (Guardian 30,6,90); or ozone depletion which will lead to a world wide increase in eye cataracts and malignant melonomas.

III: The Car and the Carbon Cycle.

The car industry is disrupting both sides of the carbon cycle. Whilst the car's contribution to the supply side of the carbon cycle is discussed endlessly, the effect of car industry emissions is discussed much less frequently and the car industry's effect on the demand side of the carbon cycle is rarely stressed at all - the Green party's recent document on transport being only the latest example of this half baked view of global warming. It has been ignored in the same way that the nuclear power industry refused to take into consideration the decommissioning costs of nuclear power stations and was thus able to argue that the price of nuclear powered electricity was much lower than coal or oil fired electricity. Whereas corruption in the nuclear power industry clearly stemmed from highly trained scientists desperately trying to protect their jobs, it is strange that environmentalists are also involved in a conspiracy to ignore the car's contribution to the demand side of the carbon cycle.

IV: The Carbon Theory of Value.

This chapter outlines the ways in which the car industry destroys the planet's carbon absorption capacity. A carbon trace is needed to ascertain the car industry's total impact on the demand side of the carbon cycle. The following chapter examines the car's contribution to the supply side of the carbon cycle. This will enable the car industry's total impact on the planet's carbon cycle, and thus global warming, to be assessed.

THE EARTH'S LIFE-SUSTAINING PROCESSES ARE BEING DESTROYED BY CAR PARKS

vi) Road Construction.

I: Mining for Raw Materials.

Massive strip mining and quarrying operations are carried out all over the world to obtain the raw materials needed to lay roads. Open cast mining strips away trees and vegetation (and wildlife) thereby completely eradicating its ability to absorb carbon dioxide. This exacerbates global warming.

"The Croft quarry, owned by English Chinsa Clays, is one of the many quarries supplying stone mainly for road construction, and it is big. Annual production approaches 3 million tonnes. The working area occupies 100 hectares (250 acres)." (Michael Allaby 'Into Harmony with the Planet' p,80).

Foster Yeoman ., "will move mountains. Over the next 50 years, it is his job to break up and take away the 2,000 foot Scottish mountain of MacArthur. There are plans to shift at least 10 million tonnes of rock a year to help build England's, Europe's and even America's motorways. Six superquarries could extract 18 billion tonnes of scottish rock over 200 years with a total annual turnover of £360 million. (Guardian 13,3,92, p,27).

"Cement is sometimes used by itself but, more commonly, the powder is mixed with sand, gravel or both to make concrete, a stronger material than cement, and cheaper because sand and gravel are cheap. As the use of concrete has increased, so has the demand for sand and gravel. When work ends at a sand or gravel pit, it leaves behind a large, often deep depression." (Michael Allaby 'Into Harmony with the Planet' p,84).

In addition to strip mining, various types of buildings associated with mining operations have to be erected to accommodate and service those working in the mines. These buildings smother yet more of the Earth's carbon absorption capacity and thereby boosts global warming.

The machines used in mining operations are built in factories which also smother the Earth.

II: The Construction of Roads to Service Mines.

Roads have to be built to transport raw materials from open cast mines to the market and this again smothers the Earth.

III: Waste Heaps.

One of the major side products of mining and quarrying are waste heaps. These smother yet more of the Earth thereby destroying its carbon absorption capacity. In addition, some of the run-off from slag heaps and waste tips leaches into the soil thereby poisoning vegetation and reducing the planet's capacity for photosynthesis.

IV: The Processing of Raw Materials.

Once mined, the raw materials (e,g, sand, gravel, rocks, etc) are transported to be processed. The factories in which the processing takes place cover more of the Earth's surface thereby destroying more of the planet's carbon absorbing capacity. Processing almost invariably entails the creation of yet more waste heaps.

V: The Production of Tarmac.

One of the main ingredients used in road construction is tarmac. Tarmac is an oil derivative, "Heavy, toxic residual asphalt is produced in quantity mostly to enable the simultaneous production of the most prized refined product, gasoline." (Jan Lundberg, 'Dear Caltrans' p,7). Oil refineries cover more of the Earth reducing its photosynthetic capacity.

VI: The Manufacture of Cement.

The factories which produce cement for road construction smother the Earth.

VII: The Manufacture of Drainage Pipes.

The factories which produce drainage pipes for roads smother the Earth.

VIII: Road Laying.

The raw materials from mines and the refined materials from processing industries are transported to road construction sites. Covering the Earth with a road permanently destroys the land's ability to absorb CO_2 and thus exacerbates global warming.

It is ironic that while there are worldwide protests against oil spills there are far fewer concerning new roads - indeed most motorists seem intent on transforming the Earth into a gigantic Scalextric set. The amount of oil dumped into the oceans is probably little different from that used to cover the planet in roads and car parks. The Exxon Valdez spilled eleven million gallons of oil in Prince William Sound in Alaska and caused widespread environmental damage and yet far more oil is used to cover the land in roads. ROADS ARE JUST COAGULATED OIL SLICKS. Ecologically speaking there is little difference between an oil slick which has been illegally dumped at sea and a democratically approved, and government funded, road. The main difference is that whereas an oil slick at sea damages the Earth's photosynthetic capacity only temporarily (before it is eventually dissolved), roads cause permanent ecological damage. Such is the state of legality amongst the planetless, denatured, oomano-imperialist, thugs currently ruling the planet.

IX: Road Landscaping.

The construction of roads often necessitates the construction of tunnels, bridges, etc., which in turn may involve the diversion of rivers and streams, etc. Such forms of landscaping often ruin the aesthetic appeal of an area but, much more importantly, also destroy yet more of the planet's ability to absorb CO_2.

X: Pollution from Roads.

Many roads are composed of highly toxic chemicals. The basic material used in road construction is asphalt, the toxic tar which remains after coal and oil processing. In addition various types of road aggregate are used; either the toxic residues from toxic waste incinerators; or waste material from rubbish tips; or fly ash from coal burning in power stations. If any of these toxic substances leach into the soil they poison vegetation (and groundwater) and reduce the planet's capacity for photosynthesis.

In addition, road building causes soil erosion which leads to a decrease in vegetation, "The combination of clearcutting and road building contribute enormously to the erosion of the soil." (Ruth Loomis, p,118).

XI: The Deliberate Ruination of SSSIs.

In Britain, what increases road construction damage to the planet's carbon absorption capacity is that the road construction industry, and the over-civilized thugs in the department of transport, tend to search for the cheapest possible route. "A survey by Friends of the Earth in 1986 showed that road-building was harming no less than 110 officially designated Sites of Scientific Interest (SSSIs). New roads actively seek out SSSIs and other protected sites; they are cheap because they cannot be developed for housing, so road builders use them to keep down their costs." (Geoffrey Lean, p,26).

Just how devastating this can be was revealed by Charles Windsor, "who was launching, as patron, a campaign by the Royal Society for Nature Conservation to save what is left of Britain's wildlife and its habitats (who) said road building plans in the south east would damage or destroy at least 372 SSSIs." (Guardian, 26,10,90). And, English Heritage claims that, "800 archaeological sites are threatened with destruction or disturbance by the government's road building programme." (Guardian 16,10,90).

If roads were constructed solely through run down industrial estates the additional damage inflicted on the planet's ecology would be minimal since the land would already be biologically inactive. But, when roads emasculate SSSI's this makes a far greater impact on the planet's carbon absorption capacity.

XII: Area of Roads and Car Parks Suffocating the Planet.

The amount of land suffocating under roads is becoming an increasingly significant proportion of the planet's total land area.

A; America; "The paved road came with a bang to the US; from non existence 100 years ago to 3 million miles now." (Richard North, p,160). "US roads, parking lots and other paved areas take up 16 million hectares." (John E Young 'Reducing Waste' p,41).

Paradoxically, there are more roads in America's wilderness areas than there are highways outside. "Wilderness activists point out that there are eight times as many roads in our national forests as there are in the Interstate Highway System." (Jan Lundberg, 'Dear Caltrans' p,7). As a consequence, one of the Forest Service's main functions is cutting down trees in order to build roads. "The United States Forest Service employs the second highest number of road engineers of any agency in the world (over 1,000). During the next half century, the Forest Service plans to build an additional 350,000 to 580,000 miles of road, mostly for logging." (Dave Foreman, p,70). The Forest Service employs more road builders than it does ecologists.

B; Britain; "Roads now cover an area roughly three times the size of Berkshire." (Richard Askwith, p,18); "When placed in terms of the size of Great Britain, (road landtake) is equivalent to 1,15% of the total land area. This compares to the total built up area of Great Britain of approximately 10%." ('Wrong Side of the Tracks' p,176).

The figures given above for the amount of land suffocated by roads are an underestimate. "Together with the necessary junctions, approach roads and hard shoulders, every mile of motorway takes up nearly 25 acres of land." (Mick Hamer, 'Splitting the City'). Although it has just been pointed out that roads take up 1,15% of the total land area of Great Britain, "This figure underestimates the road system's actual primary landtake as it does not include land taken up for off-road parking. This is a significant omission. Parking requirements for one car, at work, at home and at shopping areas have been calculated at 4000 square feet of asphalted land. Furthermore, the land set aside for parking subsequently remains empty for 80% of the time." (TEST 'Wrong Side of the Tracks' p,176).

"In terms of parking, it has been calculated (by taking the entire stock of car parking and dividing by the number of registered cars) that each car requires 372 square metres, 3 times the size of the average home." (TEST 'Wrong Side of the Tracks' p,8).

vii) Road Maintenance.

I: Road Repairs.

All roads have to be maintained. Road maintenance equipment and materials have to be stored in depots which again smother the Earth and decreases the planet's carbon absorption capacity.

II: Maintaining Roadside Verges.
Maintaining roadside verges and central reservation areas usually involves the use of pesticides, This reduces the planet's photo-synthetic capacity, In addition, these poisons leach into the soil and kill off more photosynthetic activity, "The position of the Alliance for a Paving Moratorium .. is that roadside spraying is just another one of the downsides of more roads despoiling the environment and threatening public health, We are also most aware of the role of petroleum and of the petroleum industry in marketing pesticides and related products, The oil industry is mainly interested in gasoline production and profits, and refineries must run at high utilization of capacity to be efficient and profitable, Refineries must produce great quantities of products such as asphalt and various chemicals which must go somewhere., 'The solution to pollution is dilution' thus asphalt and herbicides are spread about the land making it possible for refineries to function .. near full throttle," (Jan Lundberg 'Dear Caltrans' p12),

III: Salting.
Most major roads are salted during icy conditions to prevent accidents, There are salt depots all over the country for use on local roads, They smother the Earth's life sustaining processes,

IV: Salt Poisoning.
The salt which is poured onto the roads is eventually washed into neighbouring soils where it damages trees, "The numbers (of trees) affected are large with studies suggesting that in western europe some 70,000 trees are killed annually by salt poisoning, Damage caused by salt has been recognized by the US Federal Highways Administration to be so great and economically expensive that it has proposed the use of alternatives," (TEST 'Wrong Side of the Tracks' p,186), Yet again, the planet's carbon capacity is reduced,

Just in case there might be doubts about the corrosive power of salt and the extensive damage it causes trees, it should be pointed out that many bridges in the UK have deteriorated badly because of 'concrete cancer' caused by salting, The treasury condemned the DoT for not taking preventative action, "We also regard it as most unsatisfactory that although chloride contamination was recognized as a very serious problem in the 1970s it took the department until 1986 to appoint consultants to assess the problem," (Guardian 17,10,90),

V: Road Accident Spillages.
Some traffic accidents involve lorries which spill toxic chemicals onto the road, These poisons leach into the soils and damage trees and vegetation,

VI: Pollution from the Wear and Tear on Tyres.
It might be thought that pollution from the wear and tear of tyres would be minimal and yet when the tiny micrograms of tyre which are worn off everytime a car is used, are multiplied by the trillions of miles which motorists travel every year the result is a large source of pollution, "The major heavy metal emitted from tyres is zinc with up to 4 mg per vehicle km released, Taking the typical US figure of 90 mg of tyre products released per vehicle km we find that in the UK and US in 1988 roughly 33,000 tonnes and 180,000 tonnes of tyre wear products were produced respectively," (TEST 'Wrong Side of the Tracks' p,188),

Metals from tyres are washed from the road and into soils or drains, Either way they eventually damage vegetation which reduces the planet's capability for photosynthesis,

viii) The Manufacture of Traffic Service Equipment.

Roads are not simply strips of bare tarmac, They also provide anarray of traffic services for motorists,

I: The Manufacture of Traffic Service Equipment.
There are factories all over the world which manufacture street/motorway lighting; traffic lights; belletia beacons; roadside signposts; 'cats' eyes'; traffic hazard warning lights; motorway breakdown telephones, etc., Each one of these factories decrease the planet's carbon absorption capacity,

ix) Developments Associated with Roads.

I: Opening up Land to Developers.
Roads are not simply a means to enable motorists to travel more quickly from one place to another, They are also constructed to open up areas for 'development' i,e, factories which could benefit from easy access to the road network or housing for commuters, "Development almost always tends to follow new roads consuming more green land," (Ian Breach), For example, the proposed M11 East Coast motorway from Cambridge to Newcastle has been estimated to cost £1,000,000 and the only way of recouping such an investment is by selling land adjacent to the motorway for development, The motorway's sponsors are proposing to build 29 new villages along the motorway,

The development which follows in the wake of new roads means that even more of the Earth is suffocated by cement thereby, contributing further to the build up of greenhouse gases,

II: Opening up Land to Slash and Burn Developers.
The ecological damage caused by new roads is even worse in Third World countries, As soon as roads have been hacked through rainforest areas, tens of thousands of 'poverty stricken' peasants and gold diggers of all description (some of them not so poor they can't afford pick-up trucks) stream into the forest and frantically begin to burn down trees - either to create pasture for livestock animals or to search for minerals, "Logging also promotes deforestation indirectly through the construction of roads that allow slash and burn agriculturalists to penetrate deeper into virgin forest," (S Postel & L Heise 'Reforesting the Earth' p,13); A road is being built from Brazil to Guyana, "Guyana is now set to become the gateway to the northern Amazon, The Brazilian funded US$30 million road being pushed through from Brazil to the Guyanan coast and ports will open up 140,000 sqr miles of Guyanan forest," (Guardian 1,11,91, p,33),

Once slash and burn farmers have exhausted the land, and once the looters have extracted what resources they can find, whether gold or wildlife, the land is left virtually bereft of life, Yet another small part of the planet is thereby rendered ecologically redundant,

x) The Car Manufacturing Process.

I: Mining for Raw Materials.
The carbon trace analysis used above to explore the ecological impact of mining for the raw materials used in road construction can also be applied to the mining of the raw materials needed to manufacture cars, However, the quantity and range of resources needed for the latter is vastly greater than that for laying roads, The manufacture of cars requires raw materials from virtually every part of the globe,

Perhaps the most frightful example of the ecological destruction caused by mining for raw materials needed by cars, is the open cast mining of iron ore in the Amazon which has turned vast areas of rainforest into desert, "The Brazilian Carajas project, one of the greatest man-made ecological disasters this century, All the evidence shows that an area of Amazonian rainforest larger than Europe has been deforested or flooded in the last 10 years partly to provide EC industry - including British Steel - with cheap ore, The EC provided a $600 million loan contract in return for 13,6 million tonnes of iron ore a year for 15 years, The parallel Grande Carajas project costing US$62 billion and covering an area of 900,000 sqr kilometres which has involved vast hydro-electric projects, iron ore workings, lakes the size of Europe, a railway and other developments," (Jackie Williams Guardian 6,12,91, p,30), "The EC were involved in destroying 100,000 square kilometres of the Amazon in the name of dirt cheap iron ore for European foundries," (Gdn 5,7,91, p,29),

II: A List of the Raw Materials Used in Car Manufacture.
One way of indicating the scale of the damage being inflicted on the planet's carbon absorption capacity by the mining, processing, and manufacturing processes involved in car production is by outlining the vast amounts of resources used,

"The motor industry consumes resources more voraciously than any other industry;-
20% of all steel,
10% of all aluminium,
7% of all copper,
13% of all nickel,
35% of all zinc,
50% of all lead,
60% of all natural rubber,
and between 35-60% of oil production depending upon country, (Ian Breach),

Also used is asbestos, "Asbestos is used in brake linings, clutch facing and automatic transmissions, In 1984 motor vehicles accounted for 22% of the total asbestos used in the USA," (TEST 'Wrong Side of the Tracks' p,102),

"Six million tonnes of platinum ore have to be refined every year for car catalytic converters," ('The Environmental Impact of the Car' p,43),

III: The Processing of Raw Materials.
The same type of ecological damage which occurs during the processing of raw materials used to construct new roads also takes place during the processing of raw materials for car manufacture, Factories which process raw materials smother the planet's carbon absorption capacity,

In addition, the iron ore currently being extracted from the Amazon is smelted using charcoal created by burning millions of the surrounding trees,

"Cars use 10% of OECD plastics production, for a whole range of fittings - from fuel tanks, to seat frames, to battery cases," ('The Environ, Impact of the Car' p,44),

IV: Waste Heaps.
Just as was the case with mining for raw materials used in road construction, the processing of raw materials used in car manufacture produces waste heaps which destroy the planet's carbon absorption capacity, "After either type of mining (open-cast or underground), the process of concentrating the ore leaves more residues, which are called tailings, Finally, in metal production, smelting and refining remove the remaining impurities in the form of slag," (John E Young 'Reducing Waste' p,42),

V: Car, and Car Component, Factories.
Once the raw materials have been processed they are transported either to car component factories or straight to car production/assembly plants, These are massive hangar like constructions which cover huge areas of land thereby smothering even more of the planet's life giving processes, Car factories, however, compose only a fraction of the total number of factories associated with car production, There are a vast number of car supply factories producing components/accessories for the car industry,

VI: Car Accessories.
Over the last decade there has been a dramatic increase in the number of car accessories, This is primarily due to the emergence of the micro-chip industry which has computerized a large proportion of a car's mechanics,

Once upon a time car accessories meant radios and additional car headlights, Today, there are stereo cassette players, car phones, air conditioning units, refrigerators, power steering, miniature television sets, computerized anti-locking systems, computerized suspension systems, etc., In the pipeline are head up displays such as those used in jet fighters and, "An anti-noise technology could soon make Japanese cars among the quietest in the world," (New Scientist 28,3,92),

The factories manufacturing these products also adversely effect the planet's ecology,

xi) Oil.

I: Oil Extraction.
Huge deposits of oil have been found all over the world, Multinational oil corporations constantly search for new sources of oil and carry out a large number of test drills to see if an area, whether on land or under the sea, has enough oil to make it profitable to extract, As a consequence of nearly a century of oil drilling there are now 2 million bore holes around the world (Heathcote Williams, p,47),

"The World Bank is giving a $100 million loan to Petroecuador for exploration and development of new oil fields in the Amazon," (Greg Gordon, p,8), "Oil companies are to drill at one of Britain's best known monuments and beauty spots in the hope of starting onshore oilfields," (Guardian, 9,4,91, p,2),

The environment is damaged by every oil well, and even by test drilling, Large areas of land are despoiled by drilling,

Some oil wells are located in inaccessible places which neccesitates the building of roads,

Oil is extracted using oil derricks, The factories in which these are constructed destroy the land's carbon absorbing potential,

Once crude oil has been extracted from the ground it needs to be transported either by supertankers, lorries or pipelines, to be refined,

II: Supertankers.
The factories in which supertankers are constructed destroy large areas of land which are no longer able to carry out photosynthesis,

III: Oil Pipelines.
One of the longest, and most infamous, oil pipelines stretches across the vast wilderness of Alasaka, But there are thousands of others around the world, "For nearly 20 years, international oil companies, led by Texaco, have sucked oil from a vast reserve near the headwaters of the Amazon, A pipeline stretches from the Oriente (the Ecuadorian Amazon), climbs nearly 10,000 feet over the Andes and drops back down to the coast for refining export (mostly to the US)," (G Gordon p8),

The factories manufacturing oil pipelines smother the Earth's life sustaining processes,

IV: Oil Refineries.
Crude oil is taken to oil refineries to be processed, There are a vast number of oil refineries around the world each one of which suffocates the Earth's carbon absorbing potential,

The refined oil is transported to countries all over the world and then discharged into oil storage depots. Onshore oil depots reduce the Earth's photosynthetic capacity. The oil is then transported by lorries to fill the world's petrol stations which also reduce the planet's carbon capacity.

V: Petrol Additives.
Because of complaints about the ooman health problems caused by the use of lead in petrol, oil companies developed 'lead free' petrol using other types of additive. The factories manufacturing additives also affect the planet.

VI: Oil Spills at Sea.
The corollary of the ever increasing oil extraction process has been an increasing number of oil spills. There have been a number of spectacular oil spills at sea when supertankers have run aground or been involved in accidents. The list of supertanker accidents is long and heartbreaking from the Torrey Canyon, Amoco Cadiz, to the Exxon Valdez. It should be noted that, "Out of 1,136 instances of ships in breach of regulations to prevent pollution only 2 were prosecuted." (Gdn 8.11.91. p.6).

It has been argued, however, that to, "focus on disasters as aberrations resulting from corporate greed is to mystify the real operational character of an entire social and technological system. The real spillage goes on every day, every minute, when capitalism and mass technics appear to be 'working' more or less according to plan. The Exxon Valdez contained some 1.2 million barrels of oil, (one barrel is roughly equal to 10 gallons; one tonne of oil is roughly equal to 4 barrels of oil); at any given time 750 million barrels (i.e. 7,500,000,000 gallons) are floating on the world's waters. In 1979, the amount of oil lost worldwide on land and sea through spillage, fire, and sinkings reached a peak of 328 million gallons; since then it has dropped to between 24 and 55 million a year, except for 1983, when tanker accidents and oil blowouts in the Iran-Iraq war brought the total up to 242 million gallons. Industry analysts say that major oil spills have declined, but that smaller spills continue to take place all the time. Most of the oil in the oceans comes not from accidents but municipal and industrial run-off, the cleaning of ships bilges and other routine activities." (George Bradford).

The only time the media takes an interest in oil spills is when a major accident occurs which threatens to devastate a large area of coastline. The vast majority of oil spills, however, are too small to make the frontline news. "A record 791 oil spills occurred around Britain's coasts in 1990, according to a survey for the advisory Committee on the Protection of the Sea." (Guardian 13.8.91. p.4).

It takes a long time for the corrosive power of the sea to dissolve and disperse oil spills and as a result, "Oil spills threaten marine life long after the event. Even now the remnants of pollution from the Amoco Cadiz, wrecked in March 1978, are interfering with the reproduction of fish around the coast of Brittany." (New Scientist 21.5.87).

The ecological damage caused by oil spills at sea (as well as on land) is exactly the same as that caused by the construction of roads - they suffocate the planet's carbon absorption capacity. Oil spills at sea block out sunlight which reduce photosynthesis. Oil spills also poison marine life which carry out photosynthesis.

VII: Oil Spills on Land.
Virtually all the world's major oil pipelines leak constantly. Sometimes major leaks occur. However, they too tend to go unreported unless they are the result of a dramatic incident. The Ecuadorian pipeline mentioned above has suffered massive leaks. "For the past two decades, this pipeline and other oil activities leaked more than 16 million gallons of oil (more than the Exxon Valdez spill) into the rainforest." (Greg Gordon, p.8).

VIII: Clean-Up Operations.
Whenever there is a huge oil spill at sea the public is immediately outraged and various authorities spring into action to 'clean up the mess'. Unfortunately, 'clean up' operations carried out by hi-tech, low-eco, minded people are often worse for the environment than the oil itself. "Chemical dispersants, which are considered to be only 10%-30% effective under ideal conditions, are themselves highly toxic." (George Bradford). Some 13 years after the sinking of the Amoco Cadiz, which is still the biggest oil spill in history, the main pollutant still lingering around the sunken wreck is not crude oil but detergent. In effect, public opinion is forcing multinational oil companies to spend money on something that is not merely futile but ecologically damaging.

IX: Wars.
Ships sunk during wars cause oil pollution and a diminution of the planet's ability to extract carbon. "1983's Nowruz oil spill in the Iran-Iraq war dumped up to 4 million barrels of oil from 7 damaged wells." (Guardian, 1.2.91. p.27).

X: Lubricating Oil.
Besides petrol, cars also need lubricating oil - another source of pollution. It has just been noted that it is not the spectacular spills of crude oil which cause the biggest environmental damage but the massive number of everyday spills. The same is true for lubricating oil. "Every two and a half weeks home mechanics create an oil spill the size of the one at Valdez, Alaska. Each year 1.2 billion gallons of oil are guzzled by vehicles in the US with half of it burning up in the engines they lubricate (a major source of pollution itself) while the other 600 million gallons are removed at oil change time. The American Petroleum Institute, an industry association, estimates that at least 240 million gallons of the latter figure are improperly disposed of during home changes by being dumped in sewers, directly onto the ground or in garbage which then winds up in landfills." (E.B. Maple p.8).

"In the US each year, oil spills 20 times the Exxon Valdez oil spill fall on roadsides or down drains, and can contaminate aquifers and rivers." (TEST 'Wrong Side of the Tracks' p.8). "It has been estimated that in the US about 210 million gallons (955 million litres) of used motor oil (more than 20 times the amount spilled by the Exxon Valdez) are poured onto the ground, down the drain or buried, every year. (TEST 'Wrong Side of the Tracks' p.189).

In Britain, "Approximately 830,000 tonnes of lubricating oil is used in this country each year, of which 270,000 tonnes is reclaimed." (Green Activist, September 1990, p.6). "28 million gallons of motor oil go missing in our freshwater system." ('Mad Car Disease' p.1).

The dumping of lubricating oil into sewers and thus into rivers has a number of adverse environmental effects. "It is illegal to dump waste oil into rivers or down drains. If it leaks into the ground it can ruin our water supply and kill wildlife. If oil gets into the sewage system, it kills the bacteria that break down and clean the effluent. It is estimated that between 50 and 100,000 tonnes of waste oil is unaccounted for each year. Much of this oil is dumped down drains or burned." (Green Activist).

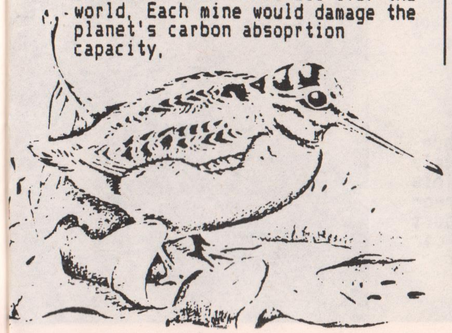
One of the bizarre results of the illegal dumping of waste lubricating oil into the sewer system is that sewage is not properly mascerated at waste treatment plants but becomes glued together into huge sewage slicks. In 1989 a yachtsman sailing up the Humber estuary, just past the city of Hull, found himself ploughing through, "two enormous slicks of raw sewage both about 100 yards long. It was so bad my wife was nearly ill." (Hull Daily Mail 11.7.89). 100 yard long turds; now there's a novelty.

However, what is of interest in this chapter is not the car industry's general environmental damage but its specific effects on the demand side of the carbon cycle. Just as was the case with crude oil/petrol, lubricating oil causes a twofold reduction in the planet's carbon absoption capacity. Firstly, when spread over the land or water it blocks out sunlight and thereby curtails the photosynthesizing process. The area which could be affected by oil spills is extremely large. "A gallon of oil spilt on water covers an area twice the size of a football pitch." (Green Activist).

Secondly, photosynthesis is also reduced by the poisoning of aquatic and land based plant life. Used lubricating oil is highly toxic. "Waste lubricating oil used in car engines contains between 15 and 20% harmful additives. These include: phosphorus, magnesium, sodium, boron, zinc, and biocides. The oil also absorbs an extra 5% lead. Esso did some tests on oil which had been used in a petrol engine for 15,000 miles and concluded that the oil had become substantially carcinogenic." (Green Activist). "Used oil is considerably more toxic and carcinogenic than the Exxon crude; one gallon can contaminate one million gallons of fresh water." ('Wrong Side of the Tracks' p.8).

xii) <u>The Car Service Sector</u>.
The previous sections have mentioned the vast number of factories involved in the car industry. The Earth's carbon capacity is reduced even further, however, by the buildings which provide motoring services, i.e. petrol filing stations, garages, car sale showrooms, car hire firms, motorway cafeterias, car accessory/component shops, etc.. Large numbers of offices are also needed to provide administrative services such as car insurance, vehicle registration, the collection of road tax and petrol tax, the AA and RAC, local authority transport departments, etc., etc.. The buildings servicing cars destroy the carbon absorbing potential of the land on which they are built.

Each one of these car-related buildings would be built with raw materials from mines all over the world. Each mine would damage the planet's carbon absoprtion capacity.



xiii) <u>The Car Disposal Industry</u>.

I: Cars.
Once cars have come to the end of their useful life (or, as is more likely to be the case, when they have been prematurely retired because of changing fashions or built in obsolescence) they have to be disposed of. "Western Europe has a population of about 120 million cars, around 7% or 8 million of which are scrapped each year. About 25% of the weight of vehicles, involving mainly plastics, glass and rubber, has to be dumped because no economic recycling processes are available." (Financial Times 30.10.90 p.30). "In western Europe, Japan and the USA, nearly 40 million cars are discarded every year." ('The Environmental Impact of the Car' p.45).

II: Tyres.
There is also a need for tyre disposal. "Every year, billions of rubber tyres are produced around the globe for all forms of motorized vehicles and bicycles. In the United States, 240 million tyres are discarded every year. 12 million in Australia." (New Scientist, 20.10.90). "23 million tyres are discarded each year in the UK alone." ('Mad Car Disease' p.1).

III: Car Batteries.
One of the more intractable disposal problems concerns the disposal of batteries. "Batteries are dumped in large numbers. 100 million are discarded every year." ('The Environmental Impact of the Car' p.45). Eventually their plastic casing cracks and toxic chemicals leak into the environment. Leaking batteries are a major pollutant which poison vegetation and thus reduce the Earth's carbon absorbing capacity.

IV: Landfil Sites.
"Western Europe, Japan and the US discard 40 million vehicles annually, and for years to come 20% or more of each one will be buried in scarce landfill sites." (John Vidal, Guardian 18.10.91. p.31).

Scrap car dealers build up huge stockpiles of cars which smother the land and destroy its capacity for photosynthesis just as much as if it was buried under cement.

Tyre disposal takes four forms; tyre dumps, landfil, tyre incineration and tyres into energy. As regards tyre dumps and landfil, "At present, about 17 million of Britain's estimated annual 27 million scrap tyres are dumped in land fills or stored. Tyres do not biodegrade in landfill dumps." (New Scientist, 3.11.90). Just as was the case with car dumps, tyre dumps smother the Earth's life sustaining processes.

V: Waste Incineration.
Waste incineration plants smother yet more of the Earth's surface.

xiv) <u>Free Range Motoring and Motor Sports</u>.

I: Off-Road Vehicles.
The car industry's damage to the planet's carbon capacity is considerable enough when motorists are confined to the roads which have been so lavishly laid out for them. However, over the last couple of decades, a range of very powerful, off track, motor vehicles, from snowmobiles to four wheel drives, etc., have gone into mass production which enable motorists to drive over virtually any terrain in the world. "Damage to many (conservation) areas by activities of recreationists is extensively documented. Indeed, one author reviewed the impacts of off-road vehicles on public lands in the US and concluded that virtually every type of ecosystem in North America has been damaged by insensitive use of off-road vehicles." (Bill Devall, p.102). The damage to plant life caused by off-road vehicles tearing over the countryside reduces the planet's carbon capacity.

II: Motor Racing.
Almost as soon as the car was invented, racing competitions were set up. As time went by the competitions became more and more varied and involved every conceivable type of vehicle from grand prix racing, drag racing, to saloon car racing, and latest of all, monster dumpsters. The stadia in which these events take place are responsible for destroying the land's photosynthetic capacity.

xv) <u>Electricity Production</u>.
Electricity is needed throughout all phases of the car cycle described above from the mining of raw materials, road construction, road maintenance, the car manufacturing process, to car disposal, etc.. The car industry's consumption of electricity means that it must take a share of the damage power stations cause by smothering the Earth's carbon absortion capacity. The car industry does not use all the electricity produced by power stations and cannot be blamed for all the damage to the demand side of the carbon cycle - its share of the destruction would be in proportion to its consumption of the total electricity produced by power stations.

xvi) Multi-National Road/Car/Oil Corporations Reinvesting in Ecological Devastation.

After shagging the planet so spitefully during the manufacturing process, it might have been thought that multinational road/car/oil corporations would have spent some of their vast profits restoring or protecting the environment - after all, most car advertisements feature cars being driven through glorious and, if it wasn't for the road itself, unblemished countryside.

Not a bit of it. Multinational road/car/oil corporations have been snapping up huge areas of the Amazon rainforest which they then put to the torch, "Volkswagen has a ranch covering an area the size of one of Brazil's north-eastern states, and transformed the forest there into cattle pasture using fire. The fires don't bring any benefit to the local people, the poorer population. They only transform wealth, that is trees, into ashes." (Guardian 1.9.88. p.6).

Shell's subsidiary, Billiton, is part of a consortium which has been granted 30,000 hectares of land in eastern Amazonia." (New Statesman 17.8.90).

"In Brazil where corporations like Goodyear, Volkswagen, Nestle and Mitsubishi have stripped millions of acres of rainforest for lumber and cattle ranching," (George Bradford, p.76).

Japan is the world's largest importer of tropical rainforest timber. Many of the logging companies belong to the same multinational corporations which manufacture well known cars:-

The multi-national corporation Ichi-Kan logged 1,039,000 cubic metres of wood and owns the Isuzu car company.
Fuyo logged 1,030,000 cubic metres of wood and owns the Nissan car company.
Mitsui logged 474,000 cubic metres of wood and owns the Toyota car company.
Mitsubi logged 467,000 cubic metres of wood and owns the Mitsubi car company.
South East Asia 1987. Source; Hadfield and Kuroda.

"Japanese brand names unconnected with the logging trade are Susuki and Honda." (Rob Harrison 'Ethical Consumer' p.11).

xvii) The Car Industry's Impact on the Demand Side of the Carbon Cycle.

All of the above examples of the car industry's destruction of the demand side of the planet's carbon cycle are quantifiable. Unfortunately, whilst there is large amount of information about the levels of pollution emitted from car exhausts there is very little available about the destruction of the Earth's photosynthetic capacity. It is hoped that in the future more work will be done on this aspect of the car industry's impact on the carbon cycle.

The only figures available for car industry damage to the demand side of the carbon cycle are those for the amount of land smothered in cement and tarmac. "Renner calculates that 60,000 sqr miles are given over to car use in the USA, equal to 10% of all arable space." ('The Environmental Impact of the Car' p.49); "When you add up all the space devoted to parking lots, expressways, clover leafs, roundabouts, flyovers, bridges, gas stations and garages, close to a third of all land in cities goes to accommodate the automobile." (Eric Draper). Given that it has been estimated that cities occupy 2% of the planet's land surface, the overall area covered by cars could amount to about 1% of the planet's total land surface.

The car industry's effect on the demand side of the carbon cycle must be seen in the context of estimates of the total reduction in the planet's carbon capacity which has taken place since the second world war, "Before world war 2, photosynthesizers on land produced perhaps 150 billion tons of dry weight of organic matter each year. Now, thanks to the activities of our species, the annual production of organic material in terrestrial ecosystems (both natural and human controlled) has fallen to only about 130 billion tons. Some of the reasons for the decline in productivity are fairly simple and obvious; photosynthesis cannot occur on or under buildings, parking lots, airports, streets or highways." (Ehrlichs 'Earth' p.150).

What the Ehrlichs are saying is that the demand side of the carbon cycle has declined by approximately 13% over the last fifty years. This is a frightening and dangerous reduction in the planet's life support system. It is possible that the car industry is responsible for a significant proportion of this reduction.

IN THE FUTURE CARS WON'T BE THE VICTIMS OF FLOODS THEY'LL BE ONE OF THE MAIN CAUSES OF GLOBAL INUNDATION

THREE: THE EFFECT OF THE CAR INDUSTRY ON THE SUPPLY SIDE OF THE EARTH'S CARBON CYCLE.

xvii) The Car and the Supply Side of the Carbon Cycle.

The previous chapter showed how the car industry exacerbates global warming by reducing the planet's ability to absorb carbon. This chapter explores the ways in which the car industry contributes to global warming through boosting the supply side of the carbon cycle - i.e. through carbon pollution. For each phase of the car industry's contribution to the demand side of the carbon cycle highlighted in the previous chapter, there is a corresponding contribution to the supply side of the carbon cycle. This is almost inevitable given that the expenditure of energy, and thus the release of carbon emissions, is usually involved whenever some part of the car industry damages the planet's photosynthetic capacity.

Discussions about car pollution almost exclusively concentrate on exhaust emissions. This emphasis overlooks the massive levels of pollution emitted throughout the entire car industry. This chapter highlights the pollution produced throughout the car cycle and attempts to gauge the proportion of car exhaust emissions to total car industry emissions. It is theoretically possible to calculate quite accurately how much pollution is produced by the car industry if only the practical ecological work was done. In each of the cases below it should be possible to determine how much carbon pollution is released.

It should be repeated that although car industry emissions contribute to a wide range of environmental damage, the concern of this work is not with environmental damage in general, nor with the effect of car pollution on ooman health, but with the effect of these emissions on the carbon cycle.

xviii) Road Construction.

I: The Mining of Raw Materials.

Huge amounts of fuel are used to drive the machines which carry out the mining and quarrying operations for the raw materials used in road construction. This produces pollution which contributes to global warming.

The construction of the buildings associated with mining e.g. offices and canteens, etc., requires energy. These buildings need electricity for heating, lighting and power. Electricity generation causes carbon pollution.

The manufacture of the machines which excavate raw materials requires energy whether in the form of fossil fuels or electricity which causes yet more pollution.

II: The Construction of Roads to Service Mines.

The construction of roads to mining sites requires the expenditure of energy.

III: The Processing of Raw Materials.
The transportation of raw materials to refineries/smelting works requires energy, Large quantities of energy are used during the refining/smelting processes, The production of the energy used in these processes causes pollution and the processing itself generates more pollution,

IV: The Manufacture of Tarmac.
The manufacture of tarmac requires a huge expenditure of energy,

V: The Manufacture of Cement.
It was noted in the last chapter that suffocating the Earth in cement reduces the planet's carbon absoption capacity, The manufacture of cement requires the expenditure of energy and this causes pollution which contributes to global warming, The third contribution which cement makes to global warming is through the chemical reactions involved in the manufacturing process, "The demand for cement now runs at about 800 million tons per year worldwide, To produce this gigantic amount means heating limestone and clay at temperatures up to 1450C, Not only does this heating use fossil fuels, which produce CO_2, but the actual process of cement making drives off enormous quantities of the same gas, This happens as limestone, $CaCO_3$, is converted to calcium oxide, CaO, and its dreaded CO_2 escapes, Heat 1000 kilograms of limestone and you release 440 kg of CO_2, Assuming that 500 million tonnes of limestone are used for this purpose each year, then more than 220 million tonnes of CO_2 are spewing out into the atmosphere from cement works alone, This represents more than 44 kilograms or a million litres of this gas for every inhabitant on the planet every year," (John Emsley, p,81),

Unfortunately, it is not known what proportion of this 220 million tons of CO_2 should be allocated to the car industry,

VI: The Manufacture of Drainage Pipes.
The production and transportation of drainage pipes also requires energy,

VII: Road Laying.
The transportation of raw/refined materials to motorway sites causes further carbon emissions, The construction of roads is an energy intensive process which causes more pollution,

VIII: Road Landscaping.
The construction of tunnels, bridges, the diversion of rivers, etc, as well as general landscaping, involves the expenditure of energy causing more pollution,

IX: Pollution from Roads.
Roads themselves are a source of pollution, Sun baked asphalt releases methane which contributes to global warming,

xix) Road Maintenance.

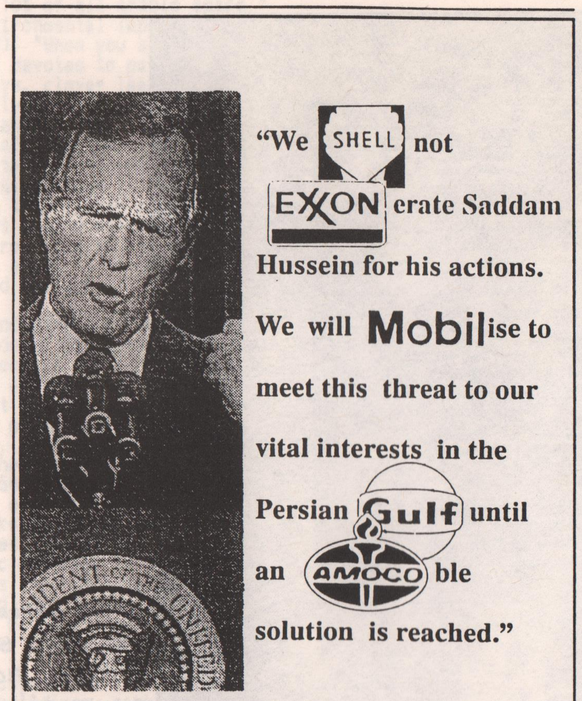
I: Road Repairs.
The machines used to repair roads require fuel, The depots in which the vehicles and materials are stored require electricity, Maintaining the vehicles and machines requires the expenditure of yet more energy,

II: Maintaining Roadside Verges.
The vehicles used to maintain roadside verges consume fuel, The manufacture of pesticides requires energy which causes more pollution,

III: Salting.
Mining the salts used on roads entails the expenditure of energy, Transporting the salts to depots around the country entails the use of further energy, Salt storage depots require heating and lighting, The vehicles used to spread salt on roads consume energy,

xx) Traffic Services.

I: The Manufacture of Traffic Service Equipment.
The manufacture of traffic service equipment requires energy which causes pollution, The vast array of traffic services provided for motorists entails the use of considerable amounts of electricity, "There are around 30,000 street lights, 2,500 illuminated signs and bollards and 11,000 non-illuminated signs in Hull, Routine maintenance comprises regular inspection cleaning and lamp changing, In addition repairs are carried out in respect of faults, vandalism and damage to equipment as a result of road traffic accidents," (Hull Civic News Feb 1992 p,6),



ROAD/CAR/OIL COMPANIES HAVE FRIENDS IN HIGH PLACES

xxi) The Car Manufacturing Process.

I: Mining for Raw Materials.
The analysis used to ascertain the pollution released during the mining of raw materials for road construction is applicable to the mining of raw materials needed in car manufacture,

It is likely that the expenditure of energy, and thus the level of pollution, required by mining will increase in the future as the mining industry is forced to exploit more and more inaccessible deposits, "The preparation of almost every primary material from its ore turns out to be an energy consuming process, As we exploit the world's resources, the grade of ore deposits is tending to fall, so that we are using more energy in the preparation and mining steps," (Malcolm Slesser 'Energy in the Economy' p,46),

II: The Processing of Raw Materials.
Again, the same carbon analysis used above in the section on the processing of raw materials for road construction is applicable to the processing of raw materials needed for the manufacture of cars,

The car industry uses huge amounts of energy, plastics, metals, chemical solvents, paints, etc,, each of which needs energy to be manufactured,

It was mentioned in the previous chapter that iron ore from the Amazon is used in the manufacture of cars, The iron ore is smelted using charcoal obtained from burning millions of trees, The production of charcoal causes pollution, The smelting process itself creates pollution,

III: Car, and Car Component, Factories.
The transportation of the refined materials either to car component, or car production, factories involves the release of vehicle exhaust emissions,

Energy is needed to manufacture car components, More energy is required to transport the components to the factories where the cars are manufactured or assembled, The manufacturing process in car plants requires large amounts of energy,

The construction of car production/assembly plants (as well as the vast number of car component factories) involves the expenditure of more energy and thus more pollution,

A; CFCs; Many of the plastics used in the manufacture of cars are treated with CFCs, "CFCs are still used in the manufacture of car seating," ('Mad Car Disease' p,6),

IV: Car Accessories.
It was pointed out in the corresponding section of the last chapter that as a result of rise of the micro-electronics industry there has been a considerable growth in the use of computerized accessories in cars, A significant part of the cars' mechanics has now been computerized,

The construction of car accessory plants requires energy, The running of these plants requires energy, The manufacture of car accessories requires yet more energy and the manufacturing process causes more pollution,

A, Air Conditioning Units and CFCs, It is commonly believed that most CFCs are used in aerosols or in home or retail refrigerators, However, the biggest consumer of CFCs seems to be cars, Although CFCs are used in the car manufacturing process their biggest use is in air conditioning units, "A substantial proportion, possibly more than half of the CFCs entering the atmosphere, comes from leaking air conditioners in American cars," (James Lovelock 'The Practical Science' p,179),

B, Fuel Consumed by Car Accessories, The use of increasing numbers of car accessories involves an increase in petrol consumption, "As the fuel consumed in traction decreases, the relative importance of the fuel demand of vehicle accessories increases, Air conditioners, power steering, alternators, water and oil pumps and lights all contribute to fuel consumption, In particular, air conditioning systems are most demanding in terms of energy consumption," (TEST 'Wrong Side of the Tracks' p,237), It would be interesting to discover what fraction of fuel consumption is used to keep car accessories functioning,

xxii) Oil.

I: Oil Extraction.
Drilling for oil requires energy, The construction of drilling rigs requires energy,

When oil is extracted, vast quantities of vapour from crude oil escape into the atmosphere, Gases found alongside oil deposits are often flared off producing huge quantities of pollution,

The construction of roads to oil wells located in inaccessible places necessitates the use of energy,

Once crude oil has been extracted from the ground it is transported by supertankers, lorries or by pipelines, "Crude oil requires exploration, boring of production wells, pipes and a processing stage in which the many components of crude oil are separated into a wide range of useful products, Oil can be produced ,, with a recycle of 0,007% of the energy in the crude oil, On the other hand, the refining stage can absorb up to 13% of the energy in the crude oil, For many energy sources it is the actual delivery of the energy which is energy-consuming," (Slesser 'Energy in the Economy' p,66),

II: Supertankers.
The oil industry is one of the biggest users of supertankers, "The movement of oil by sea is vital to the world's economy and one of its biggest businesses, accounting for 40% of all seaborne trade," (Michael Cross & Mick Hamer 'How to Seal a Supertanker' p,40),

The construction of factories to make supertankers requires energy, The construction of supertankers requires energy, The use of supertankers requires energy,

III: Oil Pipelines.
The construction of the factories which manufacture oil pipelines requires energy, The manufacture of pipelines requires energy, Pumping oil through pipelines requires yet more energy, Given that some pipelines are hundreds and sometimes thousands of miles long, this requires a lot of energy,

IV: Oil Refineries.
The construction of oil refineries requires energy, The operation of oil refineries requires energy, "A car usefully uses about 15% of the chemical energy in petrol, while the making of petrol involves a loss of about 20% of the energy in the original crude oil," (Slesser 'Energy in the Economy' p,24),

The transportation of petrol via supertankers to petrol depots around the world requires energy, The construction of oil storage depots requires energy, The transportation of petrol to the world's petrol filing stations requires yet more energy,

V: Clean-Up Operations.
Clean up operations involve the transportation of equipment and personnel and this consumes energy, The use of chemical dispersants requires energy,

VI: Oil Well Fires.
Whilst oil spills contribute to global warming by damaging the planet's carbon absorption capacity, oil well fires contribute to global warming through atmospheric pollution. Whereas attempts can be made to 'clean up' oil spills nothing can be done about fires except extinguish them as rapidly as possible - a difficult and dangerous procedure.

VII: Wars: The Firing of Oil Wells.
Iraq's sabotage of Kuwaiti oil wells was perhaps the worst example of this type of pollution.

VIII: Lubricating Oil.
Cars emit pollution from their exhausts and engines, "Each year 1.2 billion gallons of oil are guzzled by vehicles in the US with half of it burning up in the engines they lubricate (a major source of pollution itself)." (E.B. Maple p.8).

xxiii) The Car Service Sector.

The construction of the huge numbers of buildings in the car infrastructure, from petrol filing stations, garages, car showrooms, car hire firms, motorway cafeterias, car accessory/component shops, car parks, AA and RAC offices, car insurance office blocks, car registration, offices for the collection of road tax and taxes on petrol, local authority transport departments, etc., requires large amounts of energy. These buildings also consume large amounts of electricity to produce heating, lighting and power which causes the release of more pollution.

xxiv) The Car Disposal Industry.

I: Cars.
The transportation of redundant cars to car dumps requires fuel. Cars dumped illegally and then set on fire contribute to atmospheric pollution.

II: Recycling Cars.
Recycling consumes a great deal of energy, which causes pollution, and the recycling process itself produces more atmospheric pollution.

III: Tyres.
Occasionally, a tyre dump catches fire producing prodigious amounts of pollution. A massive tyre dump in Hagersville, Canada, caught fire and generated such high temperatures it had to be left to burn until it cooled down enough to be brought under control. "In February 1990 a single dump of 14 million tyres in Canada caught fire. The tyres burnt for two weeks. The thick acrid, black smoke from burning tyres contains suspended particulate matter and a potentially lethal cocktail of gases." (New Scientist, 20.10.90).

IV: Recycling Tyres.
Tyre recycling has become much more commonplace. It involves the expenditure of energy which creates pollution, and the recycling process itself causes further pollution.

V: Tyres-into-Energy.
In America so many tyres are discarded they are fed into incinerators to produce electricity. "With only 30% retreaded, the disposal of tyres is a major environmental problem. In the US, the 'tyres-to-energy' scheme set up in 1978 is used in 80 electricity generating plants." (TEST 'Wrong Side of the Tracks' p.252). The burning of tyres in high temperature furnaces requires a great deal of energy which causes pollution. Burning the tyres adds to the pollution.

VI: Toxic Waste Incineration.
Much of the waste from the car industry either ends up in landfil sites or is burnt in incinerators. Toxic waste incinerators require a great deal of energy to keep the furnaces at high temperatures. Incinerators also release considerable amounts of pollutioin.

VII: The Oil Recycling Con.
Many green minded motorists take their used oil along to their local 'waste recycling' centre. Unfortunately, there is no magical process which detoxifies the oil and enables it to be recycled. Sadly, most of it is given to garages to use as a cheap form of heating which, of course, results in more pollution escaping into the atmosphere. "The vast majority of waste oil that is recovered is used for fuel. Burning this oil releases heavy metals, chlorines and fluorines into the atmosphere. Currently only heaters of over 3 megawatts capacity are required by legislation to fit cleaners for air pollutants. Space heaters in 10,000 garages throughout the country burn at least 40,000 tonnes of waste oil a year with no restrictions at all." (Green Activist).

xxvi) Energy Production.

I: Electricity.
The car industry's consumption of electricity has been outlined above. Exactly how much electricity the car industry uses is not known. Whatever, the amount it must take responsibility for a corresponding proportion of the carbon pollution released by the power industry.

II: Oil.
The car industry's consumption of oil has been outlined above. Exactly how much is consumed is not known. Large amounts of oil and petrol are consumed simply to put cars on the road and make petrol available for motorists. Unfortunately, most statistics about oil consumption do not distinguish between the oil used by motorists and that used by the car industry.

xxvii) Car Exhaust Emissions.

The car industry's most well known contribution to global warming is pollution from car exhausts.

I: The Scale of Car Exhaust Pollution.
"Motor vehicles generate more air pollution than any other single human activity." (Michael P. Walsh, p.260).

II: The Number of Car Exhaust Pollutants.
Car exhausts pump out a huge number of pollutants. "Each car engine pumps out about 1000 different chemical compounds, with results varying from the well documented to the completely unknown." (Steve Elsworth, p.45). It is hardly surprising then that one commentator has lamblasted today's car-jammed streets as, "The open sewers of the car cult." (Heathcote Williams, p.28).

III: The Carbon Greenhouse Gases.
The two main carbon greenhouse gases emitted from car exhausts are carbon dioxide (CO_2) and carbon monoxide (CO).

A; CO_2; "Consumption of each gallon of gasoline results in the emission of about 6 pounds of carbon or 22 pounds of CO_2." (MP Walsh, p.284). "Each car produces 4 times its own weight in CO_2 every year." (Jonathon Porritt, p.29).

B; CO; "Motor vehicles (including lorries) in Britain add around 8 million tonnes of carbon monoxide to the environment each year." (Richard North, p.165).

IV: The Indirect Carbon Contributors to the Greenhouse Effect.
A; CO; CO contributes directly and indirectly to the greenhouse effect. Its indirect contribution is much more significant than its direct contribution. CO destroys hydroxyl, a naturally occuring atmospheric gas, which acts like a cleansing agent oxidizing airborne pollutants and greenhouse gases. The destruction of hydroxyl allows methane, the second most important greenhouse gas, to accumulate in the atmosphere. "CO is responsible for 80% of the hydroxyl radical destruction. As concentrations of CO increase, tropospheric concentrations of OH decrease, allowing other trace gases including greenhouse gases such as methane, ozone, nitrous oxides and CO itself to accumulate." (TEST 'Wrong Side of the Tracks' p.108).

It has been estimated that, "CO could be indirectly responsible for increasing greenhouse warming by 20-40% through raising the levels of methane and ozone." (TEST 'Wrong Side of the Tracks' p.108).

V: The Global Level of Carbon Pollution from Car Exhausts.
The world's car population is responsible for dumping a vast quantity of carbon into the atmosphere. "Each year, the world's nearly 400 million cars spew about 550 million tonnes of carbon into the atmosphere, 10% of the total from fossil fuels." (Christopher Flavin, p.23); "Passenger cars account for more than 13% of the total CO_2 emitted from fossil fuels worldwide, or more than 700 million tons of carbon annually." (Marcia D Lowe 'Rethinking Urban Transport' p.57).

xxviii) The Car Industry's Total Contribution to the Supply Side of the Carbon Cycle.

This chapter has investigated the carbon pollution released throughout the entire car industry. This section is concerned with assessing the total contribution which car industry pollution makes to the supply side of the carbon cycle.

I: Summary.
A; The Extraction of Raw Materials. This includes mining, quarrying, oil exploration, gas flaring, oil well fires, the escape of crude oil vapours.

B; The Processing of Raw Materials. Includes oil refining, pollution from the creation of charcoal, etc.. It was seen that the worldwide manufacture of cement generates about 220 million tonnes of CO_2 per year. It is not known what proportion of cement is used by the car industry and it is not possible to determine how much of this pollution should be allocated to the car industry.

C; Road Construction and Maintenance. Includes pollution from roads.

D; Waste Disposal. This includes the incineration of waste materials, the production of energy from waste, the so-called recycling of lubricating oil.

E; Electricity Consumption. This covers the use of electricity throughout the entire car cycle. It is not known how much electricity is used nor what proportion of the pollution from power generation is due to the car industry. However, given that the car industry uses large amounts of electricity and given the fact that power stations generate huge quantities of pollution, then the car industry could be responsible for a considerable amount of pollution from this source.

F; Fuel Consumption. The car industry uses large amounts of fuel. Even if fuel is not consumed directly by cars it is being used by the car industry. It was pointed out above that heavy vehicles accounted for 11% of the CO_2 emissions but much of this could be included as part of the pollution generated by the car industry.

G; The Manufacturing Process. Includes the manufacture of drainage pipes, traffic service equipment, car components, accessories, and cars.

H; Car Exhaust Pollution. This covers both CO_2 and CO. It has been noted that CO from vehicle exhausts could add between 20-40% of global warming. However, this is not a commonly recognized figure - the Intergovernmental Panel on Climate Change (IPCC) estimates that total methane emissions from all sources contributes only 15% to the anthropogenic increase in global warming, (IPCC 'Climate Change' p.xx). Correspondingly, this contribution to global warming will be ignored.

Assume that car exhausts generate 15% of CO_2 emissions. Given that CO_2 contributes to 55% of the anthropogenic increase in global warming then the contribution which car exhausts make to total global warming is 15% of 55% i.e. 8%.

I; The Use of CFCs. If James Lovelock's figure for the proportion of CFCs released from cars is true this would constitute the biggest single contribution cars make to global warming. Despite the fact that the car industry dumps far larger quantities of CO_2 into the atmosphere than CFCs, CFCs have a far bigger warming effect than CO_2. Given that the IPCC estimates that CFCs contribute nearly 24% to the anthropogenic increase in global warming ('Climate Change' p.xx) then, on the basis of Lovelock's figures, CFCs from car refigeration and air conditioning units compose 50% of 24% i.e. 12% of anthropogenic global warming. In addition, the car industry also uses CFCs in other parts of the car manufacturing process and this would boost the car industry's total CFC contribution to global warming even further. In comparison, as was seen in the last section, CO_2 from car exhaust emissions contributes only 8% to global warming.

J; Concluding Remarks. Most of the items on this list of the car industry's contribution to carbon pollution are unquantified - and even those which are quantified are subject to dispute. The sad fact is that there are no exact measurements for any of the classifications highlighted above. Given the huge numbers of cars on the roads and the widespread environmental damage they are causing this is shockingly irresponsible. Neither the British government nor any of the country's leading environmental groups have attempted to ascertain the total amount of pollution generated throughout the entire car cycle let alone provide a comprehensive analysis of the impact which car industry pollution has on the planet.

One of the major misconceptions arising from this ignorance about the ecological impact of the car is the overemphasis given to exhaust emissions. It has to be suspected, even from the sketchy list given above, that car exhaust emissions are not the biggest contribution cars make to global warming. It would seem that car industry pollution has a greater impact on global warming than car exhaust emissions.

II: The Overall Effect of Car Industry Pollution on the Supply Side of the Carbon Cycle.
Although the figures for car industry pollution were incomplete it is strongly suspected that the car industry generates more pollution than car exhausts. If it was possible to calculate the pollution generated by the entire car cycle, from mining, road construction and maintenance, the production of cement, the manufacture of car components/accessories/traffic services' equipment/cars, oil extraction and refining, electricity generation, car servicing, to the car disposal industry, etc., this would probably reveal that pollution from the car industry is greater than that from car exhausts. Just two sources of car industry pollution, the manufacture of cement and the use of CFCs, generate huge levels of pollution.

Such intuitions cannot be relied upon but, in the absense of any decent statistics, they are the only means for developing a sense of scale about the total pollution caused by the car industry. By the time a car leaves the production line it has already generated a long trail of pollution. The pollution emitted by vehicle exhausts may be just a fraction of that released throughout the car cycle. It is a mistake to focus upon car exhaust emissions and ignore the pollution from the rest of the car industry.

The previous chapter explored the car industry's contribution to the supply side of the carbon cycle i.e. its carbon emissions. However, the car industry also generates large quantities of non-carbon greenhouse gases which add to the cars' impact on global warming. Given that the focus of this work is on the relationship between the car cycle and the carbon cycle it might seem that these additional contributions could be ignored. However, many of the non-carbon greenhouse gases tend to have indirect effects on the planet's carbon cycle which need to be explored. The non-carbon gases have secondary, and even tertiary, effects on global warming in which they moderate global warming in one phase but exacerbate it in the following phase. Scientists have not yet fully evaluated the net effect of these multiple impacts on global warming.

FOUR: THE DIVERSE EFFECTS OF CAR EXHAUST, AND CAR INDUSTRY, EMISSIONS ON GLOBAL WARMING.

xxix) The Non-Carbon Greenhouse Gases Emitted from Car Exhausts.

There are a number of non-carbon based pollutants from car exhausts which contribute directly to the greenhouse effect,

I: Nitrous Oxide.

II: Sulphur Dioxide.

III: Water Vapour.

xxx) The Indirect, Non Carbon Greenhouse Gases Emitted from Car Exhausts.

There are other non-carbon, exhaust pollutants which contribute indirectly to the greenhouse effect,

I: Nitrogen Dioxide and Tropospheric Ozone.

"'Nitrogen oxides' is an umbrella term for nitrogen dioxide and nitric oxide, Most of the nitrogen oxides emitted from cars is as nitric oxide, but this is rapidly converted to nitrogen dioxide in the air, and so these pollutants are generally considered together," ('The Environmental Impact of the Car' p,27),

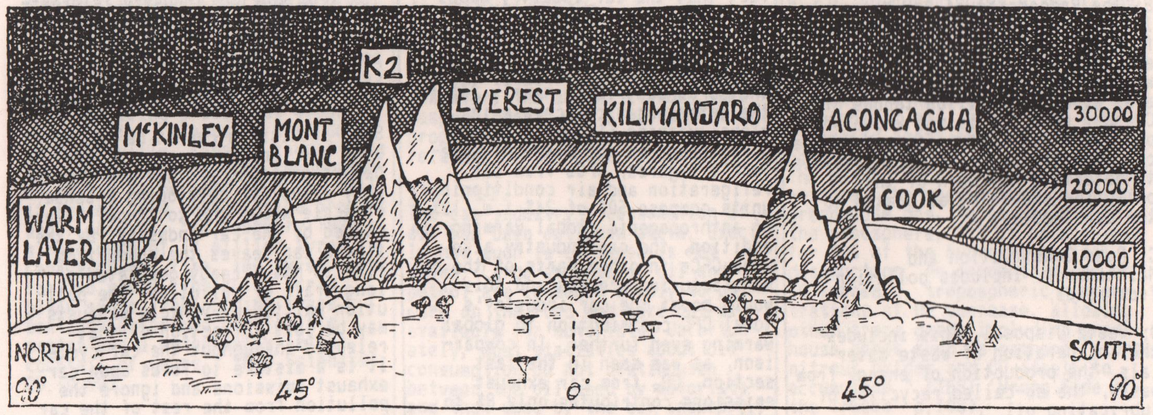
Nitrogen dioxide from car exhaust fumes reacts with other car exhaust gases in the presence of sunlight and creates tropospheric (ground level) ozone (a greenhouse gas),

It has been suggested that, "Vehicle exhaust emissions are the main source of nitrogen oxides and ozone," (Michael Allaby 'Into Harmony with the Planet' p,67), However, it is extremely difficult to measure the extent to which tropospheric ozone from car exhausts contributes to global warming, "Ground level (tropospheric) ozone makes a significant contribution to global warming, but is very difficult to quantify," ('The Environ, Impact of the Car' p,21),

xxxi) Indirect, Contributions to Global Warming.

(It ought to be pointed that there seems to be confusion as regards the exact role of nitrous oxide, Whilst some argue that nitrous oxide attacks stratospheric ozone, (Guardian 22,3,91, p,35) others argue it slows down the chlorine attack on ozone),

The Greenhouse Effect



I: Nitrous Oxide and Stratospheric Ozone Depletion.

It has just been noted that nitrous oxide is a greenhouse gas, However, nitrous oxide also contributes to global warming indirectly by counteracting ozone depletion, "The ozone layer is being destroyed by CFCs which are themselves dangerous greenhouse gases in the lower atmosphere, This destruction is damped by nitrous oxides which are also dangerous pollutants - and greenhouse gases - in the lower atmosphere, (Tim Radford, Guardian 14,2,92, p,29), This has the effect of boosting global warming, "The United Nations Environment Programme and the World Meterological Office suggest that depletion of the ozone layer ,, may in effect let more heat out through the holes than was thought, making the gases responsible for cooling the atmosphere," (Guardian 20,12,91, p,3), In other words, by moderating the depletion of stratospheric ozone, nitrous oxide helps to reinforce global warming,

xxxii) The Primary Moderating Effects of Car Exhaust Emissions on Global Warming.

It is commonly assumed that all car exhaust pollutants boost the greenhouse effect whether directly or indirectly, However, a number of pollutants create a 'cooling effect' which moderates global warming, Although these effects are caused by non carbon pollutants they have an influence on the carbon cycle as will be seen in the next chapter,

I: Acid Rain.

Acid rain triggers off the formation of clouds which reflect heat back into space and thereby dampen global warming, "Sulphur dioxide,, could possibly damp down the greenhouse effect by encouraging cloud formation," (Tim Radford 'The Crisis of Life on Earth' p,113),

Two car exhaust pollutants, sulphur dioxide and nitrogen oxide, contribute to acid rain, "Nitrogen oxides play a major role in the formation of acid rain," ('The Environmental Impact of the Car' p,27),

It is commonly believed that the biggest source of anthropogenic acid rain is fossil fuelled power stations, In fact it is cars, "Car exhausts are the biggest source of acid rain in the most prosperous countries of Europe and in the US," (Fred Pearce, p,161), The role played by cars in moderating global warming may be significant,

II: Stratospheric Ozone Depletion.

The destruction of the ozone layer helps to moderate global warming, "The IPCC report concludes that, overall, cooling caused by the thinning ozone layer cancels out warming caused by CFCs, greenhouse gases that also destroy ozone," (New Scientist 11,4,92, p,4),

Although nitrous oxide blocks the chlorine destruction of the ozone layer, volcanic eruptions produce debris which reacts with this gas and allows chlorine to react with stratospheric ozone causing ozone depletion,

Nitrous oxide/nitrogen oxides attack stratospheric ozone, "The nitrogen dioxides from car exhausts actually produce huge quantities of ozone where it can do most damage, and help to destroy it where it can do most good," (Tim Radford, p,98),

III: Aerosols.

The particulate matter, or aerosols, thrown out of car exhausts, moderates global warming by reflecting sunlight back into space, At the end of the Gulf war when the retreating Iraqi army set fire to hundreds of Kuwaiti oil wells, there was so much smoke in the atmosphere that it obscured the midday sun and caused a 10C drop in temperatures, The contribution which car exhaust particulates make to the moderation of global warming has not been measured,

In conclusion, no estimate has been made as to the scale of the cooling effect produced by any of the three phenomena outlined above so it is not possible to indicate the extent to which car exhaust emissions moderate global warming,

xxxiii) The Diverse Effects of Car Industry Emissions on Global Warming.

The previous section examined some of the effects of non-carbon, car exhaust emissions on global warming, Given the attempt to compare the global warming contributions of car exhaust fumes and car industry emissions, this section looks at the car industry's impact on global warming, Exactly the same type of ecological phenomena apply in this section as in the previous sections of this chapter, Unfortunately, if there was insufficient information about the scale of the effect which car exhaust emissions have on global warming, there is even less information about the impact of car industry emissions, Nevertheless, as has been seen from the previous chapter, the car industry generates a considerable level of pollution,

I: The Moderating Effect of Aerosols.

Cars contribute to aerosols by kicking up dust as they speed along roads, The more dust which is thrown into the air and the higher it is blown, the more of the sun's rays it reflects back into space,

It might be thought that wind disturbance caused by cars would be insignificant but one of the latest so called 'renewable' energy proposals is for the installation of wind machines along the central reservations of motorways, It is hoped they could benefit from the wind flows generated by cars thundering up the motorway, (Green Magazine, August 1990),

II: The Boosting, and Moderating, Effects of CFCs.

The car industry releases a huge quantity of CFCs, This boosts global warming, However, CFCs also attack the ozone layer and, as has been noted, this decreases global warming, However, as will be seen in the next chapter, the destruction of the ozone layer also exacerbates global warming,

Chapter two looked at the ways in which the car industry damaged the demand side of the carbon cycle. Chapter three outlined the various sources of car industry pollution and highlighted their contribution to the supply side of the carbon cycle. However, this pollution also has an impact on the planet's ability to absorb carbon dioxide, i.e. the demand side of the carbon cycle. This chapter examines the way that car exhaust, and then car industry, pollution has a major effect on the planet's photosynthetic capacity.

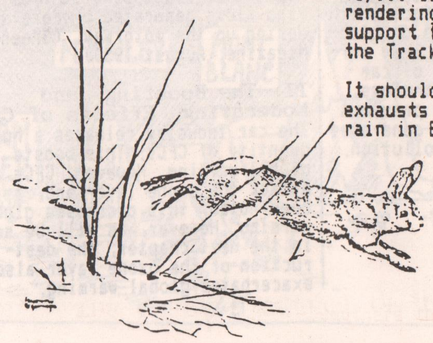
FIVE: THE EFFECTS OF CAR EXHAUST, AND CAR INDUSTRY, EMISSIONS ON THE DEMAND SIDE OF THE CARBON CYCLE.

xxxiv) Moderating Global Warming: The Fertilization Effect of Car Exhaust Emissions.

The release of carbon dioxide from car exhausts helps to promote photosynthesis. The fertilization effect moderates global warming. Unfortunately, there is no indication as to how much additional carbon dioxide is being absorbed by plants.

xxxv) Boosting Global Warming: The Primary Destruction of the Planet's Carbon Capacity.

I: Acid Rain.
It has been pointed out in the previous chapter that some car exhaust pollutants cause acid rain - which moderates global warming. However, acid rain also poisons trees and vegetation and this reduces the planet's carbon absorption capacity which, thereby, enhances global warming. "Acid rain damages leaves, reducing their photosynthetic capability and causing a loss of nutrients. Bacterial populations in the soil are suppressed, slowing rates of decomposition and the release of nutrients for the trees. Higher acidity speeds the leeching of nutrients such as potassium, calcium and magnesium from the soil, and, perhaps most importantly, mobilizes toxic metals such as aluminium which are normally combined harmlessly with other soil elements. These changes in the soil are thought by some scientists to interfere with the ability of trees to take up nutrients. Weakened by the toxic materials and the lack of essential nutrients, the trees become vulnerable to attack from insects and plant diseases." (A & P Ehrlich 'Earth' p.117).



The scale of acid rain's destruction of the planet's carbon capacity is vast. "Acid rain has now affected over 7 million hectares of forest in over 20 countries. It has eliminated trout in rivers across 35,000 square kilometres of Norway, acidified 90,000 kilometres of brooks and 18,000 lakes in Sweden and severely affected over 50 lochs in Scotland, 700,000 lakes in Canada and many in the Adirondacks in the USA." (Jonathon Porritt 'Where on Earth are we Going?' p.12); "European wide surveys have estimated that 35% of Europe's forests, or nearly 50 million hectares, are affected (by acid rain). In Norway, 35,000 km² of lakeland are affected and in Sweden 18,000 lakes have been acidified, rendering 4,000 of them unable to support fish." (TEST 'Wrong Side of the Tracks').

It should not be forgotten that car exhausts are a major source of acid rain in Europe and America.

II: Stratospheric Ozone Depletion.
It has been noted that car exhaust fumes produce nitrous oxide/nitrogen oxides which destroy the ozone layer and moderate global warming. However, the destruction of the ozone layer causes an increase in the level of ultra-violet radiation reaching the Earth's surface and this damages vegetation, "If more ultra-violet radiation reaches the surface of the Earth as a result of the ozone layer getting thinner, it will damage the proteins involved in photosynthesis." (New Scientist 9,12,89); "A 25% depletion of ozone levels would produce a 20-25% drop in soya bean yields." (Fred Pearce 'Turning Up the Heat' p.26). This reduces the planet's carbon capacity and thereby enhances global warming.

III: The Creation of Tropospheric Ozone.
It has been seen that car exhaust fumes create tropospheric ozone which acts as a greenhouse gas. However, ground level ozone also has a destructive effect on trees and vegetation which, once again, reduces the planet's ability to carry out photosynthesis and thus enhances global warming.

Just as was the case with acid rain, the extent of the damage caused to vegetation is vast. "Large areas of forest are dying and scientists suspect that a major cause is either acidification or the direct toxic effects of sulphur dioxide and ozone." (Paul Ehrlich, 'The Machinery Of Nature' p.273).

Some calculations have been done to ascertain the loss of vegetation. "Ground level ozone (from vehicle exhaust pollution) during the 1980s led to an estimated US crop loss of at least 5%, and possibly as much as 10%." (Lester R Brown). If ground level ozone causes a crop loss of between 5-10% this is a very significant level of damage to the planet's carbon capacity and is thus a major boost to global warming.

It should be remembered that most ground level ozone is created by car exhaust emissions. "Vehicle exhaust emissions are the main source of nitrogen oxides and ozone." (Michael Allaby 'Into Harmony with the Planet' p.67).

IV: Contamination.
"More than a tenth of the world's soils have lost a substantial amount of their natural fertility in the past 45 years, according to the first results of a 15 year Global Assessment of Soil Degradation, funded by the United Nations Environment Programme. In Europe an estimated 20 million hectares of soils have been seriously damaged by industrial activity, mostly by air pollution such as acid rain and the fallout of heavy metals." (New Scientist 16,5,92 p.7).

xxxvi) Boosting Global Warming: The Secondary Destruction of the Planet's Carbon Capacity.

I: Acid Rain and Aerosols.
It was pointed out in the previous chapter that acid rain moderates global warming by shielding the Earth's surface from the sun. It was then pointed out that it boosts global warming by poisoning vegetation. Acid rain (and aerosols) also provide a secondary boost to global warming because reflecting sunlight back into space stunts the growth of vegetation and thus reduces its ability to extract carbon from the atmosphere.

xxxvii) The Effects of Car Industry Pollution on the Demand Side of the Carbon Cycle.

Once again, for the sake of gauging the relative significance of car exhaust, and car industry, emissions, this section looks at the car industry's effect on the demand side of the carbon cycle. The same ecological analysis applies in this section as in the last.

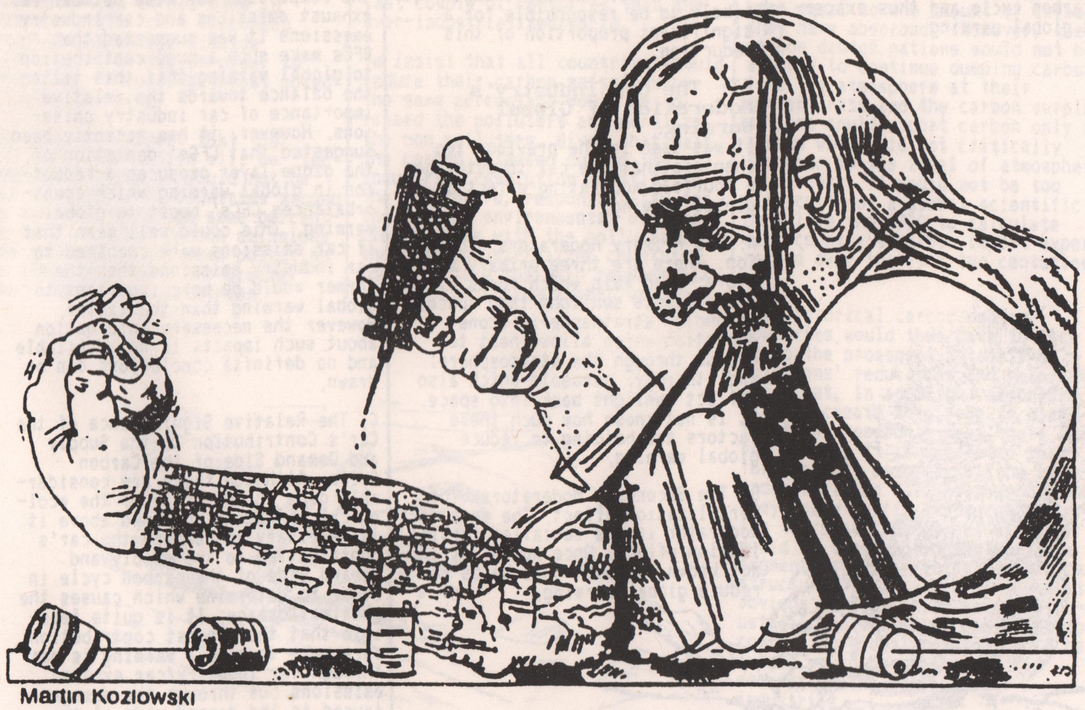
I: Moderating Global Warming: The Fertilization Effect.
Car industry pollution also contributes to the fertilization effect. There are no figures as to the extent of this contribution.

II: Boosting Global Warming: The Primary Destruction of the Planet's Carbon Capacity.
There are no figures for the car industry's contribution to acid rain, ozone depletion, nor the creation of tropospheric ozone.

III: Boosting Global Warming: The Secondary Destruction of the Planet's Carbon Capacity.
Similarly, there are no figures which quantify this effect.

It is not possible to say how much the global car industry's output of acid rain, ozone depletion or ground level ozone compares to that of car exhaust emissions.

IV: Conclusions.
It is peculiar that most of the effort that has been put into exploring and measuring global warming has focussed on greenhouse emissions. Very little scientific research work has been done on the demand side of the carbon cycle. There is no sign that the demand side of the carbon cycle is even going to be taken seriously either by politicians or by many environmentalists and yet it is transparent that reducing CO_2 emissions will have no effect on combatting global warming if there are no policies to stop the destruction of the planet's ability to absorb carbon. Reducing the amount of carbon being dumped into the atmosphere is irrelevant if it is not being removed from the atmosphere.



Martin Kozlowski

SIX: THE OVERALL EFFECT OF THE CAR INDUSTRY ON THE CARBON CYCLE.

xxviii) The Overall Effect of the Car Industry on the Carbon Cycle.

It is clear there is a very complex relationship between the car industry and the carbon cycle and that assessing the ecological effects of the car industry needs a great deal of research. This research is imperative if policies to stop the planet's ecology from collapsing are to be properly formulated and implemented. This chapter attempts to summarize the car industry's impact on the carbon cycle.

I: The Car Industry's Boost to Global Warming.

A; Primary Decarbonization. Chapter two outlined the five ways in which the car industry reduces the demand side of the carbon cycle. On land; firstly, deforestation/uprooting vegetation; secondly, smothering the Earth with buildings, concrete/tarmac; thirdly, poisoning vegetation. In the seas; firstly, suffocating aquatic vegetation; secondly, poisoning aquatic vegetation. All of these effects prevent the planet from breathing in carbon dioxide which allows carbon to accumulate in the atmosphere thereby boosting global warming. It has been estimated that the car industry suffocates about 1% of the planet's land surface. What this means in terms of a reduction of the planet's carbon capacity is not known.

B; Atmospheric Pollution. Chapter three explored the way the car industry boosts the supply side of the carbon cycle and thus exacerbates global warming.

C; Secondary Decarbonization. Chapter four showed that the car industry generates huge amounts of acid rain, ozone depletion, and ground level ozone which damages the demand side of the carbon cycle and increases global warming. Very little scientific work has been done, yet again, to estimate this type of damage. It is not possible to determine just how much secondary decarbonization reduces the demand side of the carbon cycle. From the research work which has been done in America it is clear, however, that it is not insignificant.

D; Tertiary Decarbonization. Chapter four also showed that acid rain and aerosols from the car industry stunt the growth of vegetation which boosts global warming. Once again, no research work has been done on this issue.

Although it is not possible to say with any scientific certainty whether primary decarbonization causes more or less damage to the planet's life sustaining processes than secondary and tertiary decarbonization, these three factors undoubtedly add considerably to the destruction of the planet's carbon absorption capacity. The main estimate of the effect which humans have on the demand side of the carbon cycle is that since the last world war net primary production has been reduced by 13%. This is a colossal loss. The car industry is likely to be responsible for a significant proportion of this reduction.

II: The Car Industry's Moderation of Global Warming.

It was seen in the previous two chapters that the car industry has a fourfold moderating effect on global warming.

A; The Primary Moderators; Pollution. There are three primary moderators; acid rain which forms clouds and reflects sunlight into space; secondly, stratospheric ozone depletion which allows heat to escape through the stratosphere; and, thirdly, aerosols which also reflect sunlight back into space. It is not known how much these factors are helping to reduce global warming.

B; The Secondary Moderators; The Fertilization Effect. The secondary moderator is the so-called fertilization effect. Once again, it is not known how much this helps to reduce global warming.

Virtually no scientific work has been done on the car industry's moderation of global warming. As a result it is not possible to obtain even a rough gauge of its impact on global warming. This means a comprehensive assessment of the ecological damage caused by the car industry cannot be completed until this issue has been investigated.

III: Gauging the Factors Contributing to the Car Industry's Effect on Global Warming.

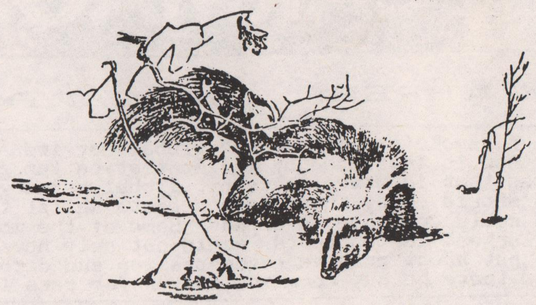
A; The Relative Significance of the Car Industry's Boosting and Moderating Effects on Global Warming. Although the car industry both increases and decreases global warming there can be little doubt that the effect of the former is much greater than the latter. However, it is just not possible to say how much greater.

B; The Relative Significance of Car Exhaust, and Car Industry, Emissions on Global Warming. It has been suggested that emissions from the entire car industry are greater than those from car exhausts. Given the additional ecological effects of both car exhaust and car industry pollution on the demand side of the carbon cycle, there is one factor which might swing the balance of relative importance back towards car exhaust emissions. When the comparison was made between car exhaust emissions and car industry emissions it was suggested that CFCs make such a huge contribution to global warming that this tilted the balance towards the relative importance of car industry emissions. However, it has recently been suggested that CFCs' depletion of the ozone layer produces a reduction in global warming which counterbalances CFCs' boost to global warming. This could well mean that if car emissions were compared to car industry emissions then the former would be more important to global warming than the latter. However the necessary information about such impacts is not available and no definite conclusions can be drawn.

C; The Relative Significance of the Car's Contribution to the Supply and Demand Side of the Carbon Cycle. Although there are considerable gaps in the scale of the ecological phenomena outlined above it is necessary to compare the car's contribution to the supply and demand side of the carbon cycle in order to determine which causes the greatest damage. It is quite feasible that the biggest contribution cars make to global warming is not through car industry/car exhaust emissions but through the damage caused to the demand side of the carbon cycle.

For example; the average car might pump out exhaust fumes for 4 hours a day but the roads on which it runs have destroyed that land's capacity for photosynthesis 24 hours a day, 365 days a year. Again, the average car might emit 4 times its own weight in CO_2 every year but, by the same token, the trees knocked down to provide it with a car park no longer absorb similar quantities of CO_2 each year.

In conclusion, it is possible that the pollution emitted by car exhausts not only makes a smaller contribution to global warming than the pollution generated by the rest of the car industry but that these combined emissions make a smaller contribution to global warming than the damage which the car industry and car exhaust emissions to the demand side of the carbon cycle. The combined impact of decarbonization makes it seem that the car's biggest impact on global warming is on the demand side of the carbon cycle not on the supply side. In other words, cement may be a more important form of pollution than atmospheric emissions.



xxxix) A Global Carbon Budget.

I: Historical Ecological Debts.

In May 1992 the scientific working group of the Inter-governmental Panel on Climate Change, the ultimate scientific authority on global warming, confirmed the recommendation it had made in September 1990 for a draconian reduction in carbon dioxide emissions of 60-80% in order to combat the increasing threat posed by global warming.

There is no prospect that the IPCC's recommendation will be implemented because it would not be fair to expect all countries around the world to make the same percentage cuts in their carbon emissions. Some countries have been polluting the atmosphere to a far greater extent than other countries.

Since the beginning of the industrial revolution, the over-industrialized nations have not merely pumped far more carbon into the atmosphere than third world countries, they have virtually eradicated their forests and thus played no significant role in extracting carbon from the atmosphere. Third world countries have not only released far less carbon pollution than the over-industrialized countries, they have absorbed far more carbon, because of their extensive forests, than the over-industrialized nations. If it is unfair to demand draconian cuts in carbon emissions from third world countries struggling to industrialize, it is even more nonsensical to expect these countries to take an equal role in combatting global warming when they have also absorbed far more carbon over the last couple of centuries than the over-industrialized world.

To insist that all countries should reduce their carbon emissions by the same percentage would be to reward the polluters and penalize the non polluters. Given that half the carbon released during the industrial revolution is still in the atmosphere, responsibility for the pending environmental disasters clearly lays with the polluters, the over-industrialized countries, who must take the main responsibility for combatting global warming.

The only way the global community can combat global warming is on the basis of global justice in which those countries which have exported more carbon than they have imported pay off their historical carbon debts to those countries which have imported more carbon than they have exported. The basic principle for reducing atmospheric carbon on a just and equitable basis is for each country to balance its historical carbon budget. This means that whilst the carbon debtor nations, primarily over-industrialized countries, would have to repay their debts by absorbing an amount of carbon equivalent to that which they have released over the last two centuries, the carbon creditor nations, primarily third world countries, would be entitled to continue releasing carbon, i.e. developing, until their emissions were equal to the amount of carbon they have absorbed. (However, the carbon debtor nations would not be allowed to continue dumping carbon into the atmosphere at their current rate and the carbon surplus nations could export carbon only at a rate which did not critically increase in the level of atmospheric carbon). It would not be too difficult for a global scientific body like the IPCC to calculate each country's carbon import-export record over the last two centuries.

The historical carbon debtor countries would thus have to face up to the proespect not only of emissions' reductions and reforestation but, in addition, deconstruction to create more room to plant the trees needed to meet their carbon target. It is suspected that for the vast majority of the over-industrialized nations the only way they could fulfil their contribution to combatting global warming would be through digging up large segments of their industrial infrastructure. In fact one of the most obvious ways by which an over-industrialized nation's commitment to combatting global warming could be judged would be whether it was deconstructing superflous industries.