SUSTAINABLE DEVELOPMENT AND ENVIRONMENTAL MANAGEMENT IN RUSSIA

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MASTER OF PHILOSOPHY

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CERTIFICATE

This is to certify that the dissertation entitled "**Sustainable Development and Environmental Management in Russia**" submitted by **ANURAG PRIYADARSHI** in partial fulfillment of the requirement for the award of the degree of **MASTER OF PHILOSOPHY** of this university, has not been previously submitted for any other degree of this or any other university. To the best of our knowledge, this is a bonafide work.

We recommend that this dissertation be placed before the examiners for evaluation.

Professor Shams-ud-Din

(CHAIRPERSON)

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(SUPERVISOR)

There is enough in nature

to feed everyone's need,

not everyone's greed.

— M.K. Gandhi.

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A.Priyadarshi

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CHAPTER 1 – INTRODUCTION

State Of The World

In its spring 1997 semiannual economic assessment, the International Monetary Fund (IMF) projected the global economy would grow 4.4 per cent in 1997, the fastest in a decade. There were few signs of trouble; inflation was low, budget deficits were shrinking in the leading economies and international trade and capital flows were expanding. The report was, as the Financial Times observed, one of the most glowing accounts of global economic prospects in decades.[1] The global output of goods and services grew from just under $5 trillion in 1950 to more that $ 29 trillion in 1997, an expansion of nearly sixfold. From 1990 to 1997, it grew by $5 trillion - matching the growth from the beginning of civilization to 1950. This brought widespread economic and social progress. Worldwide life expectancy climbed from 47 years in 1950 to 64 years in 1995. Literacy levels rose on every continent. Throughout much of this period, diets were improving .[2]

As the economy grows, pressures on the Earth's natural systems and resources intensify. From 1950 to 1997, the use of lumber tripled, that of paper increased sixfold, the fish catch increased nearly fivefold, grain consumption nearly tripled, fossil fuel burning nearly quadrupled, and air and water pollutants multiplied several fold. The unfortunate reality is that the economy continues to expand, but the ecosystem on which it depends does not, creating an increasingly stressed relationship.[3] While economic indicators such as investment, production, and trade are consistently positive, the key environmental indicators are increasingly negative. Forests are shrinking, water tables are falling, soils are eroding, wetlands are disappearing, fisheries are collapsing, rangelands are deteriorating, rivers are running dry, and plant and animal species are disappearing. Evidence of mounting stresses can be seen as sustainable yield thresholds are crossed and as waste absorptive capacities are overwhelmed. Once the sustainable yield threshold of a natural system is crossed, growth in consumption can continue only by consuming the resource base itself.[4]

The biological impoverishment of the Earth is accelerating as human population grows.[5] The share of bird, mammal, and fish species that are now in danger of extinction is in double digits—11 percent of all bird species, 25 percent of mammals, and 34 percent of fish. Local ecosystems start to collapse when rising human demands on them become excessive. Soil erosion has forced Kazakhstan to abandon half its cropland since 1980. The Philippines and Côted' Ivoire have lost their once luxuriant stands of tropical hardwoods—and the thriving forest product export industries that were based on them.[6] In the United States, the rich oyster beds of the Chesapeake Bay that yielded over 70 million kilograms per year a century ago produced less than 2 million kilograms in 1998. The projected growth of world population from 6 billion at present to nearly 9 billion by 2050 will exacerbate nearly all environmental problems, especially since almost all this growth will come in the developing world where countries are already struggling to manage the effects of their rapidly growing populations.[7]

Another trend affecting the entire world is rising temperature. Record-setting temperatures in the 1990s are part of the twentieth-century warming trend. Just over the last three decades (between 1969-71 and1996-98), global average temperature has risen by 0.44 degrees Celsius (0.8 degrees Fahrenheit). In the 21st century, temperature is projected to rise even faster. Rising temperatures are melting glaciers from the Peruvian Andes to the Swiss Alps. The two ice shelves on either side of the Antarctic peninsula are retreating. Over roughly a half-century through 1997, they lost 7,000 square kilometers of ice. But then within a year they lost another 3,000 square kilometers. Scientists attribute the accelerated ice melting to a regional temperature rise of some 2.5 degrees Celsius (4.5 degrees Fahrenheit) since 1940.[8]

One of the less visible trend shaping our future is falling water tables. Although irrigation problems such as waterlogging, salting, and silting go back several thousand years, aquifer depletion is new, confined largely to the last half-century, when powerful diesel and electric pumps made it possible to extract underground water far faster than the natural recharge from rain and snow. Reports

estimates that the worldwide overpumping of aquifers, which is concentrated in China, India, North Africa, the Middle East, and the United States, exceeds 160 billion tons of water per year. Since it takes roughly 1,000 tons of water to produce 1 ton of grain, this overpumping is the equivalent of 160 million tons of grain, or half the U.S. grain harvest. [9] In consumption terms, the food supply of 480 million of the world's 6 billion people is being produced with the unsustainable use of water. If all countries stabilised water tables this year by eliminating overpumping, the world grain harvest would fall by roughly 160 million tons, driving grain prices off the top of the chart. "Environmental decline is often seen as gradual and predictable, but if we assume this, we are sleepwalking through history," said Chris Bright. "As pressures on the Earth's natural systems build, there may be some disconcerting surprises as trends interact, reinforcing each other and triggering abrupt changes."[10]

For example, in October 1998, Hurricane Mitch slammed into Central America and stalled for more than a week. Nightmarish mudslides obliterated entire villages; 10,000 people died; half the population of Honduras was displaced and the country lost 95 percent of its crops. Global warming and the more destructive storms associated with it may explain why Mitch was the fourth strongest hurricane to enter the Caribbean this century, but much of the damage was caused by deforestation. If forests had been gripping the soil on those hills, fewer villages would have been buried in mudslides. Another large-scale example of trends reinforcing each other can be seen in the Amazon, where the forest is being weakened by logging and by clearing for agriculture. As the Amazonian forest dwindles, it dries out. As it becomes drier, it becomes more vulnerable to fire. [11] The fire feedback loop is also affected by forces outside the region, such as higher temperatures. By burning large amounts of coal and oil, the United States, China, and other countries may, in effect, be burning the Amazon. [12]

In India, one of many countries where population is outrunning water supply, water pumped from underground far exceeds aquifer recharge. The resulting fall in water tables will eventually reduce irrigation water supplies, threatening India's food

security.[13] Unless New Delhi can quickly devise an effective strategy to deal with spreading water scarcity, India—like Africa—may soon face a decline in life expectancy. In a surprise finding, the study reports that the number of people who are overnourished and overweight now rivals the number who are undernourished and underweight, each group containing roughly 1.2 billion people.

On the food front, world grain prices in late 1998 dropped to the lowest level in two decades, partly because of the economic downturn in several East Asian countries, but more fundamentally because of extensive overpumping for irrigation in both China and India, with 1.25 and 1 billion people, respectively. In effect, both countries are expanding food production in the short run by depleting their aquifers, which means they will face sharp cutbacks in irrigation water supplies once the aquifers are depleted. In 1998 the Earth's average temperature was record high, leading to more evaporation and rainfall and powering more destructive storms. It may have helped push other indicators off the chart as well. For example, weather-related damage worldwide totaled $92 billion in 1998, up a staggering 53 percent from the previous record of $60 billion in 1996. Record storms and floods drove an astounding 300 million or more people from their homes in 1998, more people than the total population of the United States. Many of those forced from their homes lived in China's Yangtze River valley, [14] in Bangladesh, and in eastern India.[15] Smaller numbers, living in the Caribbean and Central America, were driven from their homes by two of the most powerful hurricanes ever to have come out of the Atlantic: Georges and Mitch.[16]

While the rise in the Earth's temperature was accelerating, the growth of the global economy showed decelerating trends in the late 1990s. Economic turmoil in East Asia, Russia, and Brazil slowed economic growth from 4.2 percent in 1997 to 2.2 percent in 1998, the slowest in seven years. Closely associated with the economic turmoil was a 4 percent drop in international trade in 1998, the first decline in 15 years. "The increase in armed conflict was another source of turmoil in 1998," said Michael Renner.[17] After five annual declines, the number of wars in the world

climbed from 25 to 31 in 1998. Nearly all were internal or civil wars in the developing world, except for Serbia's Kosovo province. Driven partly by concerns about climate change and partly by depletion of fossil fuel resources, the world energy economy is undergoing massive reconstruction, shifting from historically heavy reliance on oil and coal to renewable energy sources, such as wind turbines and solar cells. While wind use was expanding at 22 percent a year from 1990 to 1998, and solar at 16 percent per year, the use of oil was growing at less than 2 percent, and that of coal was not increasing at all. Glimpses of the new emerging energy economy can be seen in the solar cells rooftops of Japan and Germany and in the wind farms of Denmark, India, Spain, and the U.S. states of Minnesota, Wyoming, and Oregon. The economic and ecological importance of species invasions, an inevitable result of increasing globalisation, also appears to have become more significant. Finally, new wars have broken out which, like all wars, threaten not only the environment of those directly involved but that of neighbouring states, and those downstream on major rivers.[18] Related to this is the environmental importance of refugees, who are forced to make unrestricted assaults on the natural environment for their survival.[19]

Two over-riding trends characterise the beginning of the third millennium. First, the global ecosystem is threatened by grave imbalances in productivity and in the distribution of goods and services. A significant proportion of humanity still lives in dire poverty, and projected trends are for an increasing divergence between those that benefit from economic and technological development, and those that do not. This unsustainable progression of extremes of wealth and poverty threatens the stability of society as a whole, and with it the global environment. Secondly, the world is undergoing accelerating change, with environmental stewardship lagging behind economic and social development. Environmental gains from new technology and policies are being overtaken by population growth and economic development. The processes of globalisation that are so strongly influencing social evolution need to be directed towards resolving rather than aggravating the serious imbalances that divide the world today. Resolving these imbalances is the only way of ensuring a more sustainable future for the planet and society.[20]

Since 1950, the global economy has more than quintupled in size. In terms of income, the global per capita average is now 2.6 times that of 1950 (in real terms). Average figures for income hide great discrepancies between regions, between countries, and between population groups within countries. Despite some remarkable improvements, one-quarter of the world's population remains in severe poverty. Nearly half of all people now live in cities; an increasing number of them travel enormous distances every year by private car and in aircraft. In the developed world, technology has transformed patterns of work and family life, communications, leisure activities, diet and health. Similar transformations are under way in the more prosperous parts of the developing world. The impacts of these changes on the natural environment are complex. The modern industrial economies of North America, Europe and parts of East Asia consume immense quantities of energy and raw materials, and produce high volumes of wastes and polluting emissions. The magnitude of this economic activity is causing environmental damage on a global scale and widespread pollution and disruption of ecosystems.[21]

In other regions, particularly in many parts of the developing world, poverty combined with rapid population growth is leading to widespread degradation of renewable resources - primarily forests, soils and water. Many people living in subsistence economies have few alternatives to depleting their natural resources. Renewable resources still sustain the livelihood of nearly one-third of the world's population; environmental deterioration therefore directly reduces living standards and prospects for economic improvement among rural peoples. At the same time, rapid urbanization and industrialisation in many developing countries are creating high levels of air and water pollution, which often hit the poor hardest. Worldwide, the urban poor tend to live in neglected neighbourhoods, enduring pollution, waste dumping and ill-health, but lacking the political influence to effect improvements.[22]

This rise in mortality does not come as a surprise to those who track world population trends and who know that a 3 percent annual growth rate will lead to a twenty-fold population increase in a century. Although population growth has slowed

in most developing countries, it has not slowed enough in many to avoid serious problems. After nearly half a century of continuous population growth, the demand in many countries for food, water, and forest products is simply outrunning the capacity of local life support systems. In addition, the ever growing number of young people who need health care and education is exceeding the availability of these services. If birthrates do not come down soon enough, natural systems deteriorate and social services fall short, forcing death rates up.

Another consequence of continuing population growth is potentially life-threatening water shortages. If rapid population growth continues indefinitely, the demand for water eventually exceeds the sustainable yield of aquifers. The result is excessive water withdrawals and falling water tables. Since 40 percent of the world's food comes from irrigated land, water shortages can quickly translate into food shortages. Dozens of developing countries face acute water shortages early in the next century, but none illustrate the threat better than India, whose population, which is expanding by 18 million per year, will reach 1 billion in a few months. New estimates for India indicate that water withdrawals are now double the rate of aquifer recharge. As a result, water tables are falling by 1 to 3 meters per year over much of the country.[23] Overpumping today means water supply cutbacks tomorrow, a serious matter where half of the grain harvest comes from irrigated land. It is estimated that aquifer depletion and the resulting cutbacks in irrigation water could drop India's grain harvest by one fourth. In a country where 53 percent of all children are already malnourished and underweight, a shrinking harvest could increase hunger-related deaths, adding to the 6 million worldwide who die each year from hunger and malnutrition. In contrast to AIDS, which takes a heavy toll of young adults, hunger claims mostly infants and children.

The third threat that hangs over the future of countries where rapid population growth continues is shrinking cropland per person. Once cropland per person shrinks to a certain point, people can no longer feed themselves, becoming dependent on imported food. The risk is that countries either will not be able to afford the imported food or that food simply will not be available as world import needs exceed

exportable surpluses. Among the larger countries where shrinking cropland per person threatens future food security are Nigeria, Ethiopia, and Pakistan, all countries with weak family planning programmes. For example, as Nigeria's population goes from 111 million today to a projected 244 million in 2050, its grainland per person will shrink from 0.15 hectares to 0.07 hectares.[24] Pakistan's projected growth from 146 million today to 345 million by 2050 will shrink its grainland per person from 0.08 hectares at present to 0.03 hectares, an area scarcely the size of a tennis court. Countries where grain land per person has shrunk to 0.03 hectares, such as Japan, South Korea, and Taiwan, each import some 70 percent of their grain.

One of the keys to helping countries quickly slow population growth is expanded international assistance for reproductive health and family planning. At the U.N. Conference on Population and Development held in Cairo in 1994, it was estimated that the annual cost of providing quality reproductive health services to all those in need in developing countries would cost $17 billion in the year 2000. By 2015, this would climb to $22 billion. Industrial countries agreed to provide one third of the funds with the developing countries providing the remaining two thirds. While developing countries have largely honored their commitments, the industrial countries, importantly the United States, have reneged on theirs. And almost unbelievably, in late 1998 the U.S. Congress withdrew all funding for the U.N. Population Fund, the principal source of international family planning assistance.

The same family planning services-including reproductive health counseling and the distribution of condoms-that help to slow population growth also help to check the spread of the HIV virus. But unfortunately, U.S. Congress, mired in the quicksand of anti-abortion politics, is depriving developing countries of the assistance that they need. Beyond family planning, the forgiveness of international debts by governments in the industrial world could enable poor countries to make the heavy investments in education, especially of young females, that accelerates the shift to smaller families. For example, in Kenya, 25 percent of government revenue is spent on debt servicing, while 7 percent is spent on education and 3 percent on health care.[25]

The birth rate is falling in many industrialised countries; in some cases populations are actually shrinking. But in many nations where the population has exploded in recent decades, birth rates remain high, and populations will likely double or triple in the next half-century. Nevertheless, these nations are showing the early signs of "demographic fatigue" — a slowdown in population growth due not to smaller families but to increasing death rates. The burden of enormous populations is making itself felt: as governments struggle with the need to educate children, create jobs, and deal with the environmental effects of population growth, any new threat--such as AIDS or aquifer depletion—can rapidly escalate to disastrous proportions.

With their rising mortality rates, more reminiscent of the Dark Ages than the bright millennium so many had hoped for, the developing countries are falling back to an earlier demographic stage with high death rates and high birth rates, and ultimately little growth in population. Events in many countries could spiral out of control, leading to spreading political instability and economic decline. In examining the stakes involved in potentially adding another 3.3 billion people to the world population over the next fifty years, immediate expansion of international family planning assistance to the millions of couples who still lack access, and new investment in educating young people--especially women--in the Third World, helping to promote a shift to smaller families.[26]

Globalisation And Environment

In late November 1999, trade ministers from 135 countries assembled in Seattle to launch a new round of global trade talks. But things did not go according to plan. Instead, delegates to the World Trade Organisation (WTO) meeting were greeted by tens of thousands of demonstrators from around the world who delayed the start of the talks through a massive street protest that kept delegates from the convention hall. Sadly, the event turned violent when a handful of protesters used the occasion to launch a spree of random violence, and police sprayed tear gas and fired rubber bullets at the protesters. By the end of the week, hundreds of demonstrators were in

jail, mainly for the relatively innocuous offense of blocking public streets. But the official meeting was also in tatters, with delegates scurrying for airplanes without having agreed even to a draft official declaration.[27]

The "Battle of Seattle," as it was quickly dubbed, may have marked a critical turning point. If there is any clear message coming through the clouds of tear gas and broken glass in Seattle, it is true that the terms of the debate about free trade have changed. It is no longer a debate about trade at all, but rather a debate about globalisation, a process that many now understand affects not only traditional economic factors such as jobs and incomes but also the food people eat, the air they breathe and the social and cultural milieu in which they live.[28] Concern about the environmental implications of the WTO and broader globalisation trends were high on the list of the concerns of the protesters. As the controversy swirling around the Seattle meeting made clear, "globalisation" has become a contentious process. Part of the conflict stems from the fact that the term means vastly different things to different people. To some, globalisation is synonymous with the growth of global corporations whose far-flung operations transcend national borders and allegiances. To others, it signals a broader cultural and social integration, spurred by mass communications and the Internet. The term can also refer to the growing permeability of international borders to pollution, microbes, refugees, and other forces. Globalisation is used here to refer to a broad process of societal transformation that encompasses all of the above, including growth in trade, investment, travel, computer networking, and transboundary pollution.

Today's integrated world is the result of a process that can be traced back 1 million years, when early humans first migrated out of Africa throughout Eurasia. It was not until the 1500s, however, that people living several continents apart came into contact as a result of the European Age of Exploration. The late nineteenth century brought the development of steam-powered ships and railroads, which dramatically expanded international commerce and exchange. Two World Wars and the Great Depression slowed globalisation dramatically in the first half of the

twentieth century. But the second half brought globalisation back with abandon, as trade rebounded and widespread international air travel and the use of personal computers revolutionised links between countries and cultures.

Growth in trade has consistently outpaced the expansion of the global economy since World War II. The world economy has grown sixfold since 1950, rising from $6.7 trillion to $41.6 trillion in 1998. But exports increased 17-fold over this period, reaching $5.4 trillion in 1998. While exports of goods accounted for only 5 percent of the gross world product in 1950, by 1998 this figure had climbed to 13 percent. In recent decades, international investment by multinational corporations has also exploded. Over the 1980s, foreign direct investment flows grew twice as fast as trade-increasing 15-fold between 1970 and 1998, from $44 billion to $644 billion. The number of transnational corporations (TNCs) has also soared in recent decades, increasing from only 7,000 in 1970 to more than 53,000 in 1998. And not only companies are now investing abroad. Some 44 million U.S. households have at least some money in mutual funds, up from only 4.6 million in 1980. Their dollars are increasingly invested overseas: the assets of U.S.-based international and global mutual funds climbed from just $16 billion in 1986 to $321 billion at the end of 1996.[29]

The globalisation of commerce in recent decades has internationalized environmental issues. Trade in natural resources such as timber and fish is soaring. Common trappings of daily life-a teak coffee table, for instance, or a salmon dinner-can affect the well-being of people and ecosystems on the other side of the world. And international investments are giving millions of people an influence, albeit often unwitting, on environmental developments in distant corners of the planet.[30] A combination of trends has caused the world economy to begin to push up against the planet's ecological limits. In 1998, the carbon emissions that are one of the main causes of global warming were near their peaks and carbon dioxide concentration in the atmosphere again reached record levels. Biologists warn that we have entered a period of mass extinction of species-the largest die-off in 65 million years. According

to surveys by the World Conservation Union-IUCN, an estimated one quarter of the world's mammal species are threatened with extinction, as are nearly 13 percent of plant species.[31]

The world's major fisheries are on the verge of collapse, and water scarcity and land degradation threaten our ability to feed the more than 6 billion people that now inhabit the planet. The global nature of both the economy and of ecological systems causes the exchange of "environmental space" among nations. A team of researchers led by Mathis Wackernagel of the Center for Sustainability Studies in Xalapa, Mexico, has calculated what they call the "ecological footprint" of 52 nations: the amount of biologically productive land area appropriated by these countries and their inhabitants. When all 52 are tallied up, it becomes clear that the world is already living beyond its ecological means. But some countries are doing so far more than others as a result of either scarce natural capital, profligate consumption patterns, or some combination of the two. Countries in ecological deficit import natural capital from those in surplus, an element of globalisation that few people are conscious of.[32]

As environmental concerns become more pressing, they are climbing higher on the international political agenda. The Seattle meeting demonstrated that global economic negotiations that ignore ecological issues do so at their peril. But global eco-politics is becoming increasingly strained. Industrial countries often disagree among themselves, with the European Union and the United States now at odds on issues ranging from global climate change to genetically modified organisms. Environmental issues have also become acrimonious in North-South relations, with rich and poor countries divided over how to address these issues in the context of the global economy, and over how to apportion responsibility for reversing the planet's ecological decline. Globalisation in its many guises poses enormous challenges to traditional governance structures. National governments are ill suited for managing environmental problems that transcend borders, whether via air and water currents or through global commerce. Yet international environmental governance is still in its

infancy, with the treaties and institutions that governments turn to for global management mostly too weak to put a meaningful dent in the problems. Nations are granting significant and growing powers to economic institutions such as the WTO and the International Monetary Fund, but environmental issues remain mostly an afterthought in these bodies, despite the best efforts of demonstrators and public policy groups. While nation-states are losing ground in the face of globalisation, other actors are moving to the fore, particularly international corporations and non-governmental organisations. New information and communications technologies are facilitating international networking, and activist groups, businesses and international institutions are forging innovative partnerships.

Sustainable Development: The Ecosystem Approach

"The two big challenges in this new century are to stabilise climate and population," said Brown. [33] "If we cannot stabilise both, there is not an ecosystem on Earth that we can save. Everything will change. If we can stabilise population and climate, other environmental problems will be much more manageable." Stabilising population quickly depends on couples holding the line at two surviving children—an achievable goal. Some 34 industrial countries have already reached population stability, and several developing countries are approaching it, including Barbados, China, South Korea, Sri Lanka, and Thailand. The challenge is to move from the U.N. medium level projection of nearly 9 billion in 2050 to the low projection of 7 billion. The stabilising population, as is being increasingly acknowledged, depends mainly on providing universal access to family planning services and educating girls and women.[34]

Stabilising climate means replacing fossil fuels with wind, solar cells, and other renewables. Today the world gets a fifth of its electricity from hydropower, but this source is dwarfed by the potential of wind. Three U.S. states—North Dakota, South Dakota, and Texas—have enough harnessable wind energy to supply national electricity needs. China could double its current generation of electricity using only wind. Previews of the new energy economy can be seen in the solar electric roofs of

homes in Japan and Germany, the wind turbines dotting the Danish countryside, and the new wind farms in Spain and in the U.S. states of Minnesota, Iowa, and Texas. Restructuring economic policymaking to incorporate environmental issues will not be easy. But some progress was made at the World Trade Organisation conference in Seattle in early December 1999, when some 50,000 demonstrators challenged the preoccupation of WTO with economics at the expense of environmental, labour, and human rights issues. By the end of the five-day collision between the ecological principles of sustainability and the economic theory of comparative advantage that drove a half-century of trade negotiations, the WTO was in full retreat. "The scale and urgency of the challenges facing us in this century are unprecedented," said Brown. "We cannot overestimate the urgency of stabilising the relationship between ourselves, now 6 billion in number, and the natural systems on which we depend. If we continue the irreversible destruction of these systems, our grandchildren will never forgive us."[35] Nature has no reset button.[36]

Environmental laws and institutions have been strongly developed over the past few years in almost all countries. Command and control policy via direct regulation is the most prominent policy instrument but its effectiveness depends on the manpower available, methods of implementation and control, and level of institutional coordination and policy integration. In most regions, such policies are still organised by sector but environmental planning and environmental impact assessment are becoming increasingly common. While most regions are now trying to strengthen their institutions and regulations, some are shifting towards deregulation, increased use of economic instruments and subsidy reform, reliance on voluntary action by the private sector, and more public and NGO participation. This development is fed by the increasing complexity of environmental regulation and high control costs as well as demands from the private sector for more flexibility, self-regulation and cost-effectiveness.

The global system of environmental management is moving in the right direction but much too slowly. Yet effective and well-tried policy instruments do

exist that could lead much more quickly to sustainability. If the new millennium is not to be marred by major environmental disasters, alternative policies will have to be swiftly implemented. Multilateral Environmental Agreements (MEAs) have proven to be powerful tools for attacking environmental problems. Each region has its own regional and sub-regional agreements, mostly relating to the common management or protection of natural resources such as water supply in river basins and transboundary air pollution. There are also many global-level agreements, including those on climate change and biodiversity that resulted from the United Nations Conference on Environment and Development, held in Rio de Janeiro, Brazil, in 1992. One of the major conclusions of the policy review concerns the implementation and effectiveness of existing policy instruments. The assessment of implementation, compliance and effectiveness of policy initiatives is complicated and plagued by gaps in data, conceptual difficulties and methodological problems.[37]

It is obvious that the world's national economies are based on the goods and services derived from ecosystems; it is also obvious that human life itself depends on the continuing capacity of ecosystems to provide their multitude of benefits. Yet for too long in both rich and poor nations, development priorities have focused on how much humanity can take from the ecosystems, with little attention to the impact of their actions. While dependence on ecosystems may be obvious, the task of integrating considerations of ecosystem capacity into decisions about development is difficult. It requires governments and businesses to rethink some basic assumptions about how to measure and plan economic growth. Poverty forces many people to jeopardise the ecosystems on which they depend, even when they know that they are cutting timber or extracting fish at unsustainable levels. Greed or enterprise, ignorance or inattention also leads people to disregard the natural limits that sustain ecosystems. The biggest difficulty of all, however, is that people at all levels, from the farmer at the grassroots to the policy maker in the capital, either can't make good use of the knowledge at hand or lack basic information about the condition and long-term prospects of ecosystems.

All nations—rich and poor—are experiencing the effects of ecosystem decline in one form or another: water shortages in the Punjab, India; soil erosion in Tuva, Russia; fish kills off the coast of North Carolina in the United States; landslides on the deforested slopes of Honduras; fires in the disturbed forests of Borneo and Sumatra in Indonesia. The poor, who often depend directly on ecosystems for their livelihoods, suffer most when ecosystems are degraded. At the same time, people in all parts of the word are working to find solutions: community forest conservation programmes in Dhani, India; collective management of grasslands in Mongolia; agricultural transformation in Machakos, Kenya; removal of invasive tree species to protect water resources in South Africa; and restoration of the Everglades in the United States. Governments and private interests are spending billions trying to rectify ecosystem degradation or, at least, stave off the consequences — and countless billions more may be needed to restore ecosystems on a global scale. [38]

Human knowledge of ecosystems has increased dramatically, but it has simply not kept pace with the ability to alter them. Unless knowledge gained is used to sustainably develop Earth's ecosystems, the risk of inflicting damage on them with dire consequences for economic development and human well being is even greater. Thus, the urgency of this issue: shortsighted, avoidable mistakes can affect the lives of millions of people, now and in the future. Human beings can continue blindly altering Earth's ecosystems, or they can learn to use them more sustainably. If they choose to continue the current patterns of use, they face almost certain declines in the ability of ecosystems to yield their broad spectrum of benefits—from clean water to stable climate, fuelwood to food crops, timber to wildlife habitat. People can choose another option, however. It requires reorienting how they perceive ecosystems, so that they learn to view sustainability of the ecosystems and natural resources as essential to their own. Adopting this "ecosystem approach" means people evaluate their decisions on land and resource-use in terms of how these affect the capacity of ecosystems to sustain life, not only human well-being but also the health and productive potential of plants, animals, and natural systems. Maintaining this capacity becomes a pass-key to human and national development, hope for ending poverty,

safeguard for biodiversity, and passage to a sustainable future. It is hard, of course, to know what will be truly sustainable in either the physical or political environments of the future. That is why the ecosystem approach emphasises the need for both—good scientific information and sound policies and institutions. On the scientific side, an ecosystem approach should: [39]

- Recognise the "system" in ecosystems, respecting their natural boundaries and managing them holistically rather than sectorally.
- Regularly assess the condition of ecosystems and study the processes that underlie their capacity to sustain life so that people understand the consequences of their choices.

On the political side, an ecosystem approach should:

- Demonstrate that much can be done to improve ecosystem management by developing wiser policies and more effective institutions to implement them.
- Assemble the information that allows decision-makers at all levels to weigh the trade-offs among various ecosystem goods and services and among environmental, political, social, and economic goals.
- Include the public in the management of ecosystems, particularly local communities, whose stake in protecting ecosystems is often greatest.

The goal of this approach is to optimise the array of goods and services ecosystems produce while preserving or increasing both their capacity to produce these things in the future. The ecosystem approach complements the concept of *environmental security* that analyses the impact of environmental degradation on the well-being of societies and economies, and the environmental factors behind potentially violent conflicts.[40]

This research on 'Sustainable Development and Environmental Management in Russia' compares already available data about the condition of major classes of ecosystems: agro-ecosystems, coastal areas, forests, freshwater systems, and grasslands. The concept of sustainable development has two dimensions – the spatial and the temporal. This research may be limited in history to a study only of the post-

Soviet environmental issues confronting the regions of the Russian Federation. However, it would remain incomplete without references to the environmental legacy that the Russian Federation inherited from the former USSR. The following chapters examine not only the quantity and quality of outputs but also the biological basis for production, including soil and water condition, biodiversity, and changes in land use over time. And rather than looking just at marketed products, such as food and timber, the research intends to evaluate the condition of a broad array of ecosystem goods and services that people rely on but do not buy in the marketplace. The bottom line is a comprehensive evaluation, based on available information, of the current condition of major ecosystems. It is an evaluation that clearly shows the strengths and weaknesses of the information at hand. It tries to identify significant gaps in the data and what it would take to fill those gaps. Satellite imaging and remote sensing, for example, have added to information about certain features of ecosystems, such as their extent, but on-the-ground information for such indicators as freshwater quality and river discharge is less available today than in the past.

Although some data are being created in abundance, the research shows that Russian institutions have not yet succeeded in coordinating their efforts. Scales now diverge, differing measures defy integration, and different information sources may not know of each other's relevant findings. This is dealt in *Chapter 5 on Strategies for Sustainable Development.* There is a keen awareness that the scientific knowledge and political will required to meet this challenge are often lacking today. To make sound ecosystem management decisions in the 21st century, dramatic changes are needed in the way the knowledge and experience at hand is used, as well as the range of information brought to bear on resource management decisions. A truly comprehensive and integrated assessment of Russian ecosystems is needed to meet information needs and to catalyse regional and local assessments. The successful conclusion of the ecosystem assessment will generate new information, integrate current knowledge, develop methodological tools, prevent violent conflicts and increase public understanding of environmental issues. At local, national, and regional scales it will build the capacity to obtain, analyse, and act on improved information.

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CHAPTER 2 – RUSSIAN ECONOMY AND THE ENVIRONMENT

The Russian Federation, or Russia (until December 1991 officially known as the Russian Soviet Federative Socialist Republic-RSFSR), constituted the major part of the USSR, providing some 76% of its area and approximated 51% of its population in 1990. It is bounded by Norway, Finland, Estonia and Latvia to the north-west and by Belarus and Ukraine to the west. The southern borders of European Russia are with the Black Sea, Georgia, Azerbaijan, the Caspian Sea and Kazakhastan. The Siberian and Far Eastern regions have southern frontiers with the People's Republic of China, Mongolia and the Democratic People's Republic of Korea. The eastern coastline is on the Sea of Japan, the Sea of Okhtsk, the Pacific Ocean and the Barents Sea. The northern coastline is on the Arctic Ocean The region around Kaliningrad (formerly Konigsberg in East Prussia), on the Baltic Sea, became part of the Russian Federation in 1945. It is separated from the rest of the Russian Federation by Lithuania and Belarus. It borders Poland to the south, Lithuania to the north and east and has a coastline in the Baltic Sea.

The climate of Russia is extremely varied, ranging from extreme Arctic conditions in northern areas and much of Siberia to generally temperate weather in the south . The average temperature in Moscow in July is 19°C and the average for January is -9°C. Average annual rainfall in Moscow is 575 mm (23 inches). The official language is Russian, but a large number of other languages are also used. Christianity is the major religion, mostly adhered to the ethnic Russians and other Slavs, with the Russian Orthodox Church the largest denomination. The main concentrations of adherents of Islam are among Volga Tatars, Chuvash and Bashkirs, and the peoples of the northern Caucasus, including the Chechen, Ingush, Osetians, Kabardinians and the peoples of Dagestan. Buddhism is the main religion of the Buryats, the Tuvans and the Kalmyks. The large pre-1917 Jewish population has been depleted by war and emigration, but there remain some 700,000 Jews in the Russian Federation. The national flag (proportion 3 by 2) consists of three equal horizontal

stripes of (from top to bottom), white, blue and red. The capital is Moscow (Moskva).[1]

The Russian Federation within its present boundaries has an area of over 17 million square km, with approximately 150 million population. The federation comprises 89 territories, including 21 republics, 6 krays, 49 oblasts, 2 cities with federal status (Moscow and St. Petersburg), and 11 national (autonomous) territories, i.e. 1 autonomous oblast (Jewish) and 10 autonomous okrugs. Today the political situation in Russia has become highly complicated. Numerous disagreements have arisen between the main political forces, frequently resulting in various kinds of political and organisational counteractions. The crisis in Chechnya and Dagestan has recently served as one of the major catalysts of social and political instability,[2] although on the other hand it has considerably strengthened the positions of the conservatively-minded political wing. Russia has been recognised by the global community as a country with an economy in transition. The country is in a stage of transition from a planned socialist economy to a Western-style market system. However, for many political, historical, economic, social and cultural reasons, the practical introduction of a market economy has been conducted very inconsistently, if not chaotically. Among the various consequences are the still unpredictable behaviour of the national currency and an overall decline of economic activity. [3]

Anomalies of Economic Growth

Economic growth today, as defined by Simon Kuznets, is economic development in which the long-term growth of production consistently exceeds the growth rate of the population. [4] This is a new phenomenon in world economic history. For most of (this history), production growth has been at approximately the same rate as population growth, while per capita income has stabilised at a low, level. There is reason to believe that this process has a certain time frame: because of resource constraints; the growth rate of per capita GDP cannot exceed population growth indefinitely.[5] It can be assumed that economic growth today is a process of transition

from one stable state (pre-industrial agrarian societies) to another (post-industrial societies with high per capita income).

The characteristic features of such growth is industrialisation accompanied by a decrease in share of agriculture in national production and employment, urbanisation, an increase in literacy, a rise in levels of education and life expectancy, and a demographic transition (a decline in mortality which causes an increase in population growth rate, and a further decline in the birthrate which causes a decrease in population growth rate). The share of foodstuffs in aggregate consumption diminishes, while the share of savings and state expenditures in gross domestic product gradually increases; these processes have taken place against a background of gradual internationalisation of economic development and a rising share of exports in gross domestic product. The dynamics of income differentiation in various stages of industrialisation have been multidirectional. Rising inequality indicators in the first stages of industrialisation have usually been followed by their gradual lowering.[6]

The history of Soviet industrialisation can be divided into two substantially different stages based on resource management and developmental strategies. In the first stage the resources of the traditional sector were not exhausted. Per capita food production was greater than per capita food consumption. The economy was autarkic. Exports of the manufacturing branches were limited. Exports of agricultural produce and mineral raw materials provided the minimal hard currency earnings necessary to borrow technical achievements from the developed market economies. The share of exports in GDP declined rapidly and then remained at a persistently low level for a long time.

In the second stage, the requirement for food increased along with rising per capita GDP exceeding the volume of stagnating national agricultural production. Stagnant prices and rising income levels created massive spurt in demand which the agriculture was unable to meet given its low productivity. Hence, Soviet Union became a net food importer. Given the chronically low competitiveness of the manufacturing branches, the load on exports of mineral raw materials increased

sharply. They were needed not only for technology transfer but also for financing food imports. In order to increase the latter it was necessary to increase the share of exports in GDP and per capita exports of mineral raw materials.[7]

Following the dissolution of the USSR, the action of market regulators have generated trends bringing the structural characteristic of post-Soviet economy closer to economic parameters similar to market economies at the same level of development. The programme of economic reforms to effect the transition from a centrally-planned economy to a market-oriented system is proceeding in Russian Federation.[8] Prices have been liberalised precipitation high inflation, stabilisation and structural adjustment programmes are being implemented. However, in the present also, the Russian economy differs because of the large volume of redistribution of resources through the state budget, the high energy-intensiveness of production, and the smaller share of exports of products of the manufacturing branches in gross domestic product.[9]

GENERAL ECONOMIC TRENDS

In 1997, according to estimates by the World Bank, Russia's Gross Domestic Product (GDP), was US$436 billion which declined to $ 276.6 billion in 1998 equivalent to $2,410 per head. Between 1991 and 1998, it was estimated, GDP per head decreased, in real terms at an average annual rate of 6.7%. Over the same period the population decreased by an annual average of 0.1%. In 1997 GDP was $403,500m., equivalent to $2740 per head. Gross Domestic Product (GDP) increased, in real terms, by an annual average of 2.8% in 1980-90, but decreased by an average of 6.5% in 1991-98. GDP decreased in real terms by 0.9% in 1997, but declined by 4.6% in 1998.[10] The Institute of Sociopolitical Studies of the Russian Academy of Sciences have made economic estimates and their impacts on the social sphere, demographic processes, ecology and political relation of Russian society.[11]

Agriculture and forestry (excluding fishing) contributed 7.2% of GDP in 1997. Some 15.7% of the employed labour force were engaged in the agricultural

sector in 1995.According to World Bank estimates, agricultural GDP fell by 6.9% annually between 1991 and 2008. Agricultural output declined by an annual average of 1.5% in 1992-95; output decreased by 8.5% in 1995 and by 5.1% in 1996. However, in 1997 agricultural output grew by 2.0%. **Industry** (including mining, manufacturing, construction and power) contributed 31.3% of GDP in 1998,according to the estimates of the World Bank. In 1995 the industrial sector employed 33.7% of the employed labour force. Industrial GDP declined, in real terms, by 25.1% n 1994 and by 4.7% in 1995. In further declined by 7.4% and 6% in 1997 and 1998 respectively. Industrial output decreased by 9.0% in 1996, but growth of 1.9% was recorded in 1997. **Mining and quarrying** employed some 1.6% of the total labour force in 1995. Production of mineral fuels and ferrous metals decreased throughout the early 1990s, declining by some 10% in 1996, compared with the previous year. In 1995 the **manufacturing sector** decreased in real terms, by 14.5% in 1996, but rose by 1.6% in 1997.**The services sector** contributed 62.1% of GDP in 1998 (compared with 36.1% in 1990). In 1995 the sector provided 46.7% of employment. The volume of services provided by banks, insurance companies, other financial organisations and real estate agents increased substantially in 1993-96.[12]

In 1995, Russia recorded in overall budget deficit of 71,801,000m., roubles (equivalent to 4.5% of GDP). The budget deficit was over 9% of GDP in 1997-98. In 1991-95 the average annual rate of inflation was 562%. Consumer prices rose by an average of 1529% in 1992. Following the collapse of the rouble, the rate grew to 27.8% in 1998. In February 1999 some 1,956,000 people were registered as unemployed (2.4% of the labour force); however total unemployment, calculated according to International Labour Organisation methods, was estimated to have reached 8,983,000 (12.4% of the labour force).[13] Despite political and economic uncertainly and institutional impediments, economic reform is moving ahead, forcing a radical restructuring of the Russian economy. Several factors are driving the restructuring process: (1) a decline in state orders for industrial production, most importantly for defence needs; (2) a reduction in state-supported capital investment; (3) the reduction and reorientation of government subsidies; and (4) the integration of

the Russian economy with the global economy. In addition to the impact of these changes on macroeconomic conditions, they have exerted a substantial impact on the individual sectors of the economy. [14]

The economic outlook is unpromising[15] and this has roots in environmental mismanagement. A sizable share of the economy is environmentally based. The sectors of agriculture, forestry, fisheries, mining and quarrying contribute one-tenth of Russia's gross national product and employ about one-fifth of Russia's labour.[16] Yet the natural-resource base is severely overburdened. Deforestation is rampant in the Far-East[17] and a 'Timber famine' is imminent in the future. The upland forest areas provide critical cover for catchment zones that supply water to hydropower projects and irrigation needs. The progressive deforestation reduces water flows. As a result, erosion derived sedimentation cutts short the operational lives of major hydroelectric reservoirs.[18]

A large share of Russia's primary product output now has been diverted from domestic to global markets. In 1994, for example, the performance of nonferrous and ferrous metals producers improved in relation to the rest of the industrial economy as a result of a sharp increase in exports. Exports of timber, pulp, paper, and chemicals also accelerated.[19] There is a realignment of the Russian economy away from manufacturing towards the increasing dominance of the service sector and natural resources development, and this is being facilitated by greater integration into the world economy. The unsustainable exploitation of natural resources for export markets is threatening Russian society.

The drop in production is naturally accompanied by a fall in living standards. The total number of unemployed (calculated according to International Labour organisation) as of May 1,1999 was estimated to be 10.4 million people or 14.2 % of the whole number of the work force (these indices have been corrected according to results of the spot check survey carried out in February 1999) The number of officially registered unemployed has been steadily declining. As of May 1, it was 1.85 million people, which is 81 thousand less compared to 2.5% of the total work forces

(it was 2.6 % in the beginning of 1999)[20] Accompanying this are the phenomena of growing social stratification and a corresponding increase of the income gap between the richest and the poorest. A rise in unemployment and growing income disparity leads to unsustainable lifestyle providing little incentive to conserve, and such populations are vulnerable to employment in illegal mining and logging.

The transition to market relations has dramatically deepened social and property differentiation in Russia. The most-affluent 10 percent account for 33 percent of the national income, whereas the least affluent 10 percent possesses only 2.6 percent of the national income. According to official data, 32.3 million persons, or 22 percent of Russia's population were living below the poverty line in January-November 1996.[21] The gap in levels of population income is also widening regionally. Per capita income in Moscow is 3 times higher than the Russian Federation average.[22]

Based on a survey of unemployment problems, the highest level of unemployment—5.5-6.5 percent— was noted in six regions of the nation: Moscow; Riazan, Tver, and Belgorod oblasts; and the republic of Tatarstan and Sakha (Yakutia). In forty-one regions, it exceeded the average for the Russian Federation, including an excess of almost 3 times in the Republic of Dagestan. The most strained situation has developed in the labour markets of Ivanovo, Vladmir, Pskov, and Kirov oblasts and in the republic of Ingushetia, Kalmykia, Dagestan, and Udmurtia, where the supply of the labour force considerably exceeds the demand for it. The continuation of a general trend toward higher unemployment coupled with a declining volume of production increases the load on job vacancies.[23]

The economic downturn in Russia extends beyond the loss of markets, productions, investments and unemployment. When economic growth stops, social strains emerge and political systems are destabilised. All too often the result is civil turmoil and outright violence, either within a country or with neighboring countries. This has been brought into focus by civil wars, the collapse of state structures, and

major humanitarian crises around the world.[24] Thomas Homer-Dixon, the coordinator of a research project on environment and violent conflicts has concluded that conflicts fueled in part by the degradation of renewable resources (cropland, water, forests, and fish), population growth, and unequal resource distribution are likely to become more frequent in future decades as more of these resources are depleted. He has suggested that a growing number of societies experiencing such conflicts will either fragment or become more authoritarian.[25]

A relationship is established between the high levels of unemployment in Dagestan and the ensuing ethnic crisis. The terrorist insurrection in Dagestan and Chechenya are not merely 'resurfacing of ancient hatreds'[26] between Islam and Orthodox Christianity, but a war over sharing of precious petroleum and natural gas resources and control over the oil pipeline routes.[27] Dagestan borders the Caspian Sea that has 150 billion barrels of oil and 75 billion tonnes cubic metres of natural gas reserves, which comprise 16 percent and 53 percent of world resources respectively. The post-Soviet era is characterised by escalation of conflict among the Caspian Sea littoral states over fishing, shipping, exploration of hydrocarbons and the legal status of the region.[28]

The Tajik-Kirghiz riots in Isfaza (1989) was not a spillover of the historical Shia-Sunni conflicts, but was profoundly rooted in claims over renewable natural resources like agricultural farmland and irrigation water of Matchoi canal. Similarly, the Uzbek-Meskhetian Turk riot in Ferghana (1989), and Kirghiz-Uzbek riot in Osh (1990) were also the consequences of unsustainable developmental strategies in the Soviet period.[29] It has been discussed in the following pages that the Soviet Union's centralised Economic policies, collectivisation and subsidies in agriculture and industry had reduced the incentives to conserve and pollute less. The consequent environmental degradation had adverse impacts on the economy. The indigenous nationalities were competing for the same economic space due to similar skills, similar cultural orientation and lack of occupational diversification. The explosive

combination of socio-economic inequity and environmental degradation resulted in violent conflicts.

Foreign investors have shown considerable interest in large-scale projects in Russia, mainly in those related to mineral resources, transportation, and communications. The foreign investment portfolio made up US$ 200 million by May 1995.[30] Russia is still one of the biggest industrial countries in the world in terms of net production.[31] The rapidly growing private sector occupies a significant position in the fields of finance, trade and services. The federal programme of privatisation accounts for the growing share of private enterprises in all sectors of the economy.[32] Any longer-term economic predictions must take into account a substantial political component. The uncertainties are associated with the concrete ways of future political and economic development, and there is a fairly wide spectrum of possibly achievable alternatives.[33]

Finally, with regard to any forecast, it is worthwhile to note that an important feature of the Russian political and administrative systems, which is not uncommon also outside Russia, is that the motivation for any kind of decision-making at almost any level is a complex mixture of official, personal, and economic interests, which always must be taken into account. Furthermore, it is not uncommon that the special importance of personal factors is misunderstood or underestimated by analysts and newcomers to the Russian market.

After a period of crisis exacerbation, some positive trends became visible in the Russian economy. Positive shifts in the real sector of the economy have been followed by stabilisation of budget deficit to around 9 percent of GDP in 1997-1998,[34] which means that the financial and monetary policies are reasonable. After the acute phase of the crisis, prices for outputs of natural monopoly had been stable which with decrease in real salary favoured the improvement of the financial situation in the real sector. During the development of import replacement, toughening of limits on foreign currency purchase and decrease in currency demand secured smooth variation of rouble exchange rate under some increase in currency reserves.

At the same time economic situation is being complicated and contradicted. Some positive tendencies in the dynamics of tax revenues have been visible, however acuity of financial problems of the budgetary system is being aggravated by servicing foreign debt. Unsettled issues on repayment and restructuring state debt, and new foreign loans have negative impacts on economic situation. Although investment rates have decreased, investment activity of the real sector has not been reestablished. The share of the state investment amount has been low and private investment and financial resources are still inaccessible for the real sector. During the political and economic instability, investment risks have been very high.[35]

The reduced domestic demand is putting obstacles in the way of achieving a high level of GDP, such as investment in fixed capital, state consumption, and particularly on real income and consumption of the population. Practically, net export was the only increasing element in the context of falling domestic consumption and accumulation. Redistribution was made in favour of gross savings at the expense of domestic consumption; but use of gross savings has been reoriented from domestic investment into capital operations which is export oriented and for repayment of foreign loans.[36]

Despite the sharp downturn in domestic economic output overall, the consequent impact on the environment has been mixed. With respect to air and water pollution, over the four year period 1990-1993, emissions from stationary sources declined by only 27 percent (i.e., by less than the decline in general economic output.) From 1991-1993 the volume of suspended solids discharged in wastewater decreased by a similar amount. The total amount of wastewater discharged that did not comply with water pollution regulations, however, remained unchanged over this period. In short, while the gross impact on the environment has decreased significantly in many ways, the Russian economy has become more pollution intensive.[37]

There are several reasons why the decrease in emissions has not kept pace with the decline in production. First, and most important, those enterprises fighting for their economic survival, have cut spending on their pollution control efforts.

Second, production lines have been working below design capacity, thereby reducing efficiency. Third, frequent disruptions of continuous processes (such as refining and smelting) have increased emissions. Finally, pollution derived from personal consumption, such as automobile emissions and generation of solid waste, is rapidly increasing as a result of the increasing consumer orientation of the Russian economy and is offsetting the environmental gains from the decline in industrial output.[38]

Increase in specific types of pollution reflects reduction or elimination of state funding and /or increasing obsolescence of infrastructure. [39] The lack of improvement in wastewater discharges, for example reflects the poor state of municipal sewage treatment systems in Russia. During the Soviet era, construction and maintenance of sanitation services was funded either directly by the central government or by local enterprises. Service was provided free of charge. Municipalities have been left with little money to invest on infrastructure maintenance or even to purchase essential treatment agents. Thus although municipal wastewater treatment loads have fallen by about one quarter, overall compliance with discharge regulations and the state of Russia's rivers and lakes has not improved.

The "state strategy of Economic Security" approved by the Russian Presidential ukase (decree) has identified the increased differentiation of the population with respect to poverty and the rise of poverty level, the *structural distortion of the Russian economy*, the increasing unevenness of regional socio-economic development, and the criminalisation of economic growth. [40] These factors have disastrous impact on the state of Russia's environment.

The increasing *Structural distortion of the Russian economy* with a trend towards its transformation into a fuel raw materials periphery of developed countries could lead to drastic depletion in Russian natural resources.[41] The preservation of this trend would lead to the development of a semi-colonial type economy. The squandering of natural resources and the exhaustion of their reserves catalysed by market economy has implications for future generations. The increased dependence on conditions in the global market has weakened state control over its natural

resources and increased trade in timber and fish, often at the peril of sustainability. The deepening differentiation between branches and regions of Russia can lead to conflicts over sharing of precious natural resources.[42] The *disintegration of Russia's scientific-technical potential* due to economic downturn has affected the environmental management. The mass 'Brain drain' abroad, to other branches and to the sphere of small and medium-scale business has led to a precipitous decline in scientific activity in Russia. This issue is dealt in some detail in the next chapter (chapter 3) on *Population and Environment in Russia.*

The *loss of self-sufficiency with respect to food is because of* the unbearable economic conditions for food producers. In the first half of the1990s, the food problem greatly intensified. The food shortages have been overcome and the market is filled with products but their consumption in terms of overall volume and on a per capita basis has droped rapidly. With respect to the level of nutrition, the ranking of Russian population dropped from sixth or seventh place to fortieth place in the world. A considerable number of Russians-several tens of millions of them-are undernourished in the real sense of word. Food riots as seen in developing countries of Africa and Asia are predicted in the Russian Federation if the food situation does not improve rapidly.[43]

One more aspect of the food problem-the correlation between domestic food production and food imports from abroad-gradually acquired importance. Expanded imports in connection with the liberalisation of foreign trade led to the squeezing of Russian producers out of the market. Imports now account for more than one-third of the country's food resources. In large cities it is one half; and in Moscow and St. Petersburg 70-80 percent. Russian dependence on the foreign market for food has gone beyond the critical point. One-fourth of the hard-currency receipts that are so necessary for the technological modernisation of the national economy go for the purchase of food.[44] Agriculture and food security is discussed in detail in chapter four on *Environmental Problems in Russia.*

The loss of manageability of the economy due to institutional failures has also affected the implementation of environmental legislation, and conformances to environmental parameters are a casualty with the elimination of administrative-command system of governance. Over the course of market reforms, a "management vacuum" has developed in the Russian economy. While the administrative-command system of economic management from top to bottom was eliminated, a new system of management appropriate to a market economy had not been created. The gaping void is filled with mafia-shadow ties and relations. This situation is the direct result of the forced privatisation of state-owned property. Some of the state-owned property has passed into the hands of new owners. But in the great majority of cases, the only thing that changed was the title of ownership. There were no real changes in the technology, organisation, and management of enterprises. Moreover, many viable structures and complexes were destroyed under the pretext of demonopolisation and deconcentration. There were numerous collisions between the new owners and the production collectives (Zil joint–Stock Company [JSC], Noril' skii nikel' Russian JSC, and others). Banks and other financial structures frequently viewed the acquisition of large blocks of stocks as a purely speculative deal aimed toward a more profitable resale of the stocks. It is not surprising that the state of environment at privatised enterprises has not improved in the majority of cases.[45]

The criminalisation of the economy has encouraged illegal mining, poaching and logging. Mafia activity not only includes narco-terrorism, racketeering and illegal arms traffic, but is also found in eco-terrorist activities.[46] In an institutional sense, the Russian economy today is in a kind of mutant state. It incorporates both residual features of the previous hypercentralised system with its high degree of monopolisation, as well as market elements, which, to be sure, tend to be borrowed from the previous century. Unfortunately, criminalisation, which in recent years has begun threatening national security, has become its deep, substantive characteristic. The criminalisation of the economy embraces a broad range of processes that have many hues and manifestations. They include any economic actions that circumvent or violate existing laws, rules, and statutes. This disease has spread to all spheres of the

economy and affects all economic entities from small enterprises to gigantic corporations. The nexus between organised criminal groups-between narco-terrorism, eco-terrorism and secessionist movements threatens the national security of Russia.[47]

Retaining the trends to stabilise the situation in the Russian economy has positively affected the financial situation. However, there has been a considerable reduction in real income of population, especially in real wages.[48] This has an overall adverse impact on the health and nutritional status of the populations. The financial results of the enterprises have been influenced both by competition from foreign goods in the domestic market and increase in export of wood-pulp and paper industry, chemical and oil industry and non-ferrous industry. Thus unsustainable resource use is being encouraged to assist the liberalisation programmes

The fall in meat and fish industries is a consequence of the fall in purchasing power of population that are increasingly shifting to potato and starchy foods to replace the expensive meat and fish, thereby affecting their health.[49] The specific weight of unprofitable enterprises in fuel, light, wood- pulp and paper industries is much higher than the average in all industrial brunches. There is increasing danger that there enterprise may aim to achieve profitability at the expense of sustainability.

Though the situation in the investment sphere remains problematic, measures taken by the Government to support investments into the real sector has attracted foreign investments. The volume of direct foreign investments in 1999 did not exceed the level of 1998 (3.4 billion dollars). The foreign investment in environmental technologies is negligible, being concentrated in the profitable consumer and energy sectors. The arrears in pension as on May 1, 1999 made up 16.5 billion rubles; compared to January they declined by 9.8 billion rubles. Clearing off of pension payments is ahead of schedule, which was worked out by the Ministry of Finance and the Pension Fund on March 15, 1999.The delay in payment of arrears to Social sector and to pensions has compromised on the quality of life of the Russian population, especially the vulnerable sections like women, children and the aged.[50]

The Ecological Consequences of Subsidies

The broadest possible interpretation of the concept of "subsidy", is any state intervention that leads to a reduction in prices compared to the level that would exist under free market conditions. Proceeding from this concept, the amounts of tax concessions for energy producers, state investments, customs duties on exported (or subsidies for imported) energy, the non-tariff regulation of foreign trade (by setting quotas for the export or import of fuel and energy), and favorable rates for the transportation of energy resources, along with the direct regulation of prices, can then all be considered subsidies to the energy sector. Many countries artificially maintain low prices for energy through direct subsidies for producers. The amount of direct subsidies around the world in 1987 was estimated to be approximately $230 billion (20-25 percent of the value of the fuel resources consumed at world market prices). The elimination of all subsidies would result in declines in the production of energy, and would lead to a 9 percent reduction in the emission of carbon into the atmosphere, provided world price levels for energy remained unchanged. The most significant energy subsidies existed in the USSR. Thus, in 1987, according to the calculations of B. Larsen and A. Shah, it had 75 percent of all energy subsidies and 18.4 percent of world carbon emissions (second in the world after the United States).[51]

The pre-reform period in Russia may be described as a period of cheap raw materials and energy. This was due to a number of factors. First, there was a presence of major reserves of raw mineral and fuel resources. Second, there was a desire, characteristic of a centralised planned economy, to increase the consumption of resources instead of increasing the efficiency of their utilisation. Enormous investments went into oil and gas production, with a very low vested interest in the adoption of energy-conserving technologies. Third, the low prices for energy resources and the high energy intensiveness of production were elements of the specific mechanism for the maintenance of equilibrium in the distribution of

production resources between the civilian and defense sectors of the national economy, which were competing with each other.

Most of the "quality" economic resources of the former USSR went to the defence sector, while civilian production was based on a much lower quality resource base. The unjustifiably high levels of domestic energy consumption, along with the low prices for energy, served to compensate, as it were, for the backward technologies in the civilian sectors and the lack of economic incentives for energy conservation in the defense sector. This was essentially the main condition of the development of the "civilian economy", given the presence of the extremely heavy burden of the multitude of defence programmes.[52]

The pre-reform period in Russia may be described as a period of cheap raw materials and energy. There was the direct subsidisation of the coal industry. Throughout the 1990-96 period, in Russia there existed four types of energy subsidies.

(1) Major direct subsidies for the coal industry,

(2) Reduced prices for energy and fuel for households, partially supported by the local budgets and partially by other consumers through cross subsidisation,

(3) Constraints on the rise in domestic prices for oil through export quotas and duties, making it possible to keep these pries at lower levels relative to world market prices

(4) And the use of income from oil and gas exports for the cross subsidisation of the domestic producers of those energy resources, whose activity used to be clearly undervalued.[53]

The total amount of such subsidies in 1990 was 6 billion rubles (0.9 percent of GDP). The subsidies reached 125 percent of the average prices of the enterprises per metric ton of coal.[54] Such a practice not only canceled out any incentive for energy

conservation , but also facilitated a deterioration in the quality of the coal being produced, because it provided an incentive for the production of low-grade coals (lower in calorific value, high in ash content , and with high sulfur content as well).Domestic prices for energy resources in Russia were an average of 2.5-3 times lower than in countries of the Organisation for Economic Cooperation and Development (OECD). The chief result was an undervaluation of the importance of energy conservation. The incentives for conserving energy were extremely weak, both for planning bodies and for individual enterprises. The high energy intensiveness of production was aggravated by the operation of outmoded equipment that did not meet ecological standards. The factors led to an increase in emissions of substances by industrial enterprises that cause environmental pollution. The actual consumption of energy in Russia in 1990 was 2.5 times more than would have been necessary for the production of GDP with the technologies utilized at the time in the United States. The collapse of energy intensive industries in the former Soviet Union lowered Russian carbon emissions by 33 percent between 1990 and 1996. [55]

The energy policy of the government has been subject to constant change since the start of economic reform in Russia in 1992. There has been a gradual liberalisation of prices, but elements of state regulation have been retained to this day. Most of the subsidies for industrial consumers in Russia had been abolished by 1995. Environmental payments for pollution and taxes on emissions of carbon dioxide (CO2) gas officially approved in Russia in 1990 and enacted in 1991 . Their distinguishing feature in Russia is the use of two levels of payments: One of pollution within the limits of stipulated norms, and the other, 5 times more, for emissions exceeding a given level. The imposition of taxes on SO2 and Nox emissions has been discussed repeatedly in Russia, but never been implemented in practice. Gurvish et al have predicted emissions of pollutants into the atmosphere which is determined by the changes in the volume and structure of energy consumption, and the application of new technologies with lower environmental contamination levels. The relative role of those factors differs substantially for various substances: the dynamic of Nox and CO2 emissions is associated with energy consumption , while the upgrading of

technologies has the greatest significance for SO2 and solid particles. The emissions of the former two substances will increase rapidly after the year 2000 concurrently with the expansion of energy consumption, while emissions of SO2 and solid particles will decline right up until 2005, after which they will rise slightly if the energy subsidies are preserved, or remain stable if they are abolished. [56]

During the period of reforms, the energy policy of the government has been subject to constant change since the start of economic reforms in Russia in 1992. There has been gradual liberalisation of prices, but elements of state regulation have been retained to this day. Unrestricted prices for crude oil, petroleum products, and coal were instituted through several devices in 1992-93. The rates for electric power have nevertheless remained controlled, but they have been partially decentralised, with the transfer of authority for the establishment of prices to special regional bodies that bring together representative of the producers and consumers of energy, as well as the regional authorities. The prices for natural gas have formally remained under the strict control of the state, but in practice they are being regulated more and more by monopoly —the Gazprom Russian joint-stock company. Exports of oil were limited by export quotas right up until 1995, when they were abolished. At the same time, export duties have existed that called upon to cover the difference between domestic prices for crude petroleum and the prices in the world market, which were especially high in 1992-93. The export duties were abolished only in 1996. Most of the subsidies for industrial consumers in Russia had been abolished by 1995. The process of their complete elimination is nevertheless still far from complete, and one cannot be certain that it will be possible to maintain the price levels that have been attained presently. [57]

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CHAPTER 3 - POPULATION & ENVIRONMENT IN RUSSIA

The concern over "overpopulation" (being defined as a state in which population and resources move into dis-equilibrium) is not a new one. Ancient societies were also aware of the Malthusian dilemma of population expanding beyond the limited agricultural means of the community. The early Babylonian epic of Atrahasis (1700 BC), the forerunner of the Noah story of Genesis, presents the great flood as a conscious effort on the God's part to control the growth of the human population as "the land was bellowing like a bull" under the stress of mankind. The epic concludes with the observation that barrenness, stillbirth and natural disasters were all part of the cosmic order to balance humankind's number with the land's bounty.[1] Nearly a millennium later, in the Homeric poem *Cypria, Zeus* is said to have brought on the Trojan War so "the load of death might empty the world," and thus "relieve all nurturing earth."

While such myths indicate that ancient communities had some realisation that there was a limit to the carrying capacity of the and on which they lived, not until the rise of the Greek city-states do we see a civilization more than passively concerned with the delicate balance between food supply and population. The ancient Grek philosophers, especially Plato and Aristotle, often warned their readers of the dangers posed by overpopulation and were strong advocates of the stationary state-one committed to zero population growth. In fact, Robert Malthus was so taken with the Greek experience that he devoted an entire chapter to the Hellenic world in his classic study, *An Essay on the Principle of Population* (1872, Seventh edition). [2]

As a simple collection of mass, the human population has no environmental implications. If they stood together, today's 6 billion humans would occupy a circle with a radius of less than 8 miles that extended an infinitesimal distance into the atmosphere. It is human activity that has changed the face of the globe, and the relation between human activity and human numbers is not always straightforward. The most direct connection involve a basic biological requirement: human beings

must consume an average of 1700 calories per day to meet minimal metabolic demands. The basic reason why human beings do not stand together but have dispersed across the earth's surface is that the nutrients to sustain plant growth, and the solar energy required for photosynthesis, are themselves widely dispersed. When labour required for photosynthesis are relaxed, people congregate to a far greater extent than when agriculture is the dominant activity.[3]

The hazard to human well being posed by population growth has conventionally been framed in terms of the ratio of population or labour supply to other factors of production. For Malthus, the salient ratio involved land resources. In the 1940s, concern shifted to exhaustible resources, to minerals and especially energy supplies. In 1950s, Coal and Hoover re-framed the debate in terms of physical capital.[4] By the 1980s, the primary concern had shifted to human capital (World Bank 1984).

In the 1990s much of the anxiety about population growth has returned to its Malthusian origins. Land scarcity and degradation of soils in developing regions is seen by many as major constraint to agricultural development. Since most of the world's poor are located in rural regions of developing countries and are primarily dependent on agriculture for their livelihood, a special focus on poverty has redirected attention to the agricultural sector. Certain agricultural economists have become more pessimistic about prospects for productivity advances that outpace population growth. And the example of Africa, where food production has lagged behind population growth for two decades, has added empirical content to what might otherwise seem vague apprehensions.

These genuine concerns have been reinforced by the growth of popular attention to environmental issues. Much of the growth in attention to environmental issues is undoubtedly a result of increased affluence: ordinary people have come to expect standards of cleanliness and safety in their surroundings that were previously the exclusive province of the rich or well-born.[5] Since the markets that helped to produce affluence did little to protect citizens from industrial waste products, a catch-

up phase of government activism was initiated. In addition, ethical systems have been changing in ways that place higher value on the maintenance of a natural order, including the survival of other species. Mathews traces the rapid emergence of the environment into the realm of high politics during the 1980s when western politicians were racing to keep up with their greener and greener constituencies.[6] The growing concern with environmental issues means that the relationship between population growth and environmental quality is increasingly salient in international discussions of population policy. This chapter provides a brief review of what is known about the effect of population transition on environmental quality in Russia and analyses the complex relationship of population with agriculture and industrial pollution and natural resources depletion in Russia.

Population Concerns in Russia

The population of Russia as on January 1, 1998, was 147.1 million people. The country's population has been declining for seven years now. It decreased by 1.6 million people over 1992-96 alone.[7] And the population losses are continuing. Both increases and decreases in the population of Russia have two sources - natural and migrational gains. Natural gains played the decisive role before the end of the 1980s, when the impact of migration was inconsequential. When in 1992 the natural gains were replaced with natural losses, the gains from migration could not make up the difference. Natural population growth depends on three factors: the birth rate, the mortality rate, and the age and gender breakdown.

The overall fertility factor of a hypothetical generation[8] for the urban population which had virtually never dropped below 1.7 and was at that level in 1990, literally collapsed, slipping to 1.16 by 1996. The value dropped sharply for the rural population as well, dropping below a value of 2 for the first time. At the beginning of the 1990s, at the ages of thirty to forty years, male mortality in Russia was 3.4 times higher, and female mortality 2 times higher, than in the West. The Russian mortality pattern of 1990 was 147 of every 1,000 boys born would die sooner or later from accidents (and in the west, only 63). A new turn was noted in 1995, this time for the

better. The expected life span for men had increased by 3.6 years, and for women by 2.1 years, by the beginning of 1998. But the expected life span in Russia is still very low; it is presently at the same level as it was in the end of the 1970s for women, and even worse than this is the extremely low level for men.[9]

The limited nature of demographic potential makes it necessary to pay particular attention to the problem of preserving the available human resources, even though this issue has other foundations as well that are non-instrumental, associated with the fundamental purposes of the development of society. Russia's life potential increased significantly in the middle of the 20th century as a result of the decline in mortality and the rise in the expected life span. But the protracted stagnation in the area of life and health-care of Russians, and the increasing lag behind world achievements associated with it signify enormous losses of life potential for the population. They affect all of the principal components of life potential - the aggregate years of working life, and the aggregate time of life of pre-work and post-work age.[10]

Social and economic turmoil in Russian Federation has contributed to a general lack for confidence in the future, reflected in fewer marriages, more divorces, declining birth rates and increasing domestic violence. The expectation of life at birth has declined to 59.7 for males and 72.5 for female in 1996 from a high of 65.0 and 74.6 in the Soviet era (1987). The registered live birth rate has decreased from 14.7 per thousand in 1989 to 8.8 per thousand in 1996. Similarly, registered marriage rate has declined from 9.4 to 5.9 and registered death rate has increased from 10.7 to 14.1 per thousand in the same period.[11]

Perhaps surprisingly, mortality among children and mothers have so far increased only modestly. Some of the most visible human signs of deteriorating conditions have been among men between 30 and 40 years of age. Available data for this group show a higher than usual incidence of stress-related illnesses, alcohol and drug abuse, suicides, accidents and homicides, all of which have left families in distress. High inflation continued to plague the social fabric of the Russian

Federation. Women and children were the main causalities of civil war and ethnic strife in the Caucasus where the state institutions were unable to cover the costs of essential services. A UNICEF financed analysis of the situation of children in the Russian Federation found that the abuse of alcohol, tobacco and drugs by mothers contributed to a doubling of diseases, congenital and otherwise, among newborns between 1989 and 1993, and that 15-30 per cent of preschool children suffered from chronic diseases. Both infant and maternal mortality rates increased slightly and were more than double the average for Western industrialised countries.[12]

The demographic crisis in Russia is an extremely alarming process. To a certain extent it may be explained by global trends associated with industrialisation and social progress, with the sex and age structure of the country's population, and with the influence of extended demographic waves. But such a sharp increase in negative demographic trends cannot be understood outside the context of the difficult socioeconomic crisis. A decline in population growth rate over a number of decades has occurred in the majority of developed countries, but its absolute decline has been noted only in a few instances and in individual years due to a decline in the birth rate and an almost steady decline in the death rate. In Russia there was simultaneously a sharp decline in the birth rate (from 16.6 per thousand in 1985 to 9.6 per thousand in 1994) and an equally sharp increase in the death rate (from 1.3 to 15.7 per thousand during the same years); the natural decline in population beginning in 1992 became a stable trend.[13]

The lowering of the birth rate factor (number of births per 1,000 persons) cannot be explained by the aging of the population. The reverse in more likely true: the aging of the population is a consequence of the lowering of the birth rate. The number of births in women of child-bearing age (18-44 years) is declining. According to a population microcensus, 24 percent of the women in this age group who do not have children do not intend to have a child; 41 percent prefer having three or more children. The number of abortions per 1,000 women of child-bearing age in Russia is 7-10 times higher than in Western European countries.[14] It is more than two times

higher than the number of birth. The reasons here are unquestionably socioeconomic. Many Russian couples and single women cite their loss of hope regarding Russia's economic and social recovery as a cause for lower birth rates.[15]

Socioeconomic factors also account for the sharp rise in the death rate. It involved primarily persons of able-bodied age-especially males. The increase in the death rate due to accidents, poisonings, and trauma was particularly large. Among the reasons for mortality, the latter occupy second place after cardio-vascular diseases and first place in the mortality of the able-bodied population. In 1994 as compared with 1990, mortality due to murder increased by 2.3 times; due to suicide, by 1.6 times; and due to alcohol, by 3.8 times. Mortality due to these reasons alone increased by 100,000 persons, that is, by 0.7 per thousand. Mortality due to accidents, poisonings, and trauma during these years increased by 1.9 times, raising its level by 1.1 per thousand. All negative trends in the population reproduction process are expressed in life expectancy. In Russia in 1995 there was an unprecedented decline of this indicator as compared with 1988-from 70 to 65 years. For the sake of comparison: life expectancy in the United States and Great Britain is 65 years: in Canada, 76 years; in Sweden, 78 years; and in Japan, 79 years and is tending to rise.[16]

Population and Industrial Pollution

The principal environment threat in most developed countries, and in several developing countries as well, is the pollution of air and water supplies by the production or consumption of industrial products. Air and water supplies have historically functioned as common property resources that serve as a repository or sink for the byproducts of industry. Like other common property resources, they have been too heavily exploited because users have inadequate incentives to maintain their quality. This was particularly true for the collective farming (Kolkhozes and Sovkhozes) and the centralised industrial management in Soviet Union. Ninety percent of USSR's economic potential was controlled by the Central ministries in Moscow. They behaved like enormous monopoly concerns disregarding local interests of the regions and republics, dispatching out dated equipment and pesticides

that were banned, and were more concerned with figures and abstract targets. Such an economy stifles initiative and creates a perpetual imbalance between the republic and the centre.[17] Perhaps the form of 'pollution' that is currently eliciting the most alarm is carbon dioxide, whose rapid rate of increase in the atmosphere has raised the threat of global warming.

The role of population growth in producing industrial pollution is less obvious than in the case of agrarian transformations. The reason is that people require a certain amount of food to stay alive. If the population is to grow, resources must be reshuffled to ensure that their needs are met. No such compelling logic comes into play in the case of, say, automobile emissions or chlorofluorocarbons. These are the product of industrial processes that vary dramatically in intensity and nature from place to place, with little if any direct link to human biological requirements. In order to gain some sense of the contribution of population growth to various forms of pollution, analysts have frequently resorted to an identity developed by Paul Ehrlich:[18]

I =**PAT**, Where

I = environmental impact, i.e. the numerical value of some pollutant

P =population size

A =affluence, usually measured as GNP per capita

T = technology, usually measured as the amount of pollution per unit of GNP

The components of this identity are arbitrary; but Ehrlich's formulation has face validity. Since people's activities are the principle source of pollution, it is reasonable to suppose that more people will produce more pollution (P). Most pollution is a product of industrial production, the per capita volume of which is captured in the A term; and production can occur with different technologies, the pollution content of which is effectively captured by T. For present purposes, we will assume that the I= PAT equation is a properly specified causal model of the sources

of pollution at a country or regional level. A conventional application of the equation has also been presented by Norman Myers.[19]

The application of Ehrlich's formulation to Russian conditions gives interesting results. Firstly, the population size (P) of Russia is 147 million in 1998, and has been declining by 0.2% per year in 1992-98. The population density was 88 persons per 1000 hectares in 1993, which is much less than the global average of 427 persons.[20] Population issues have been discussed above in *'Population Concerns in Russia'* Population growth has therefore a marginal influence on industrial pollution in Russia. Secondly, the affluence of Russian population measured in terms of GNP per capita (A) was US$ 2300 which has fallen by 6.7 per cent per year in 1991-98. Industrial production has fallen by an average of 11.7 percent per year in 1991-1998, and by 7 percent in 1998 alone. Private consumption has grown very slowly by 4.3 percent between 1991 and 1998, and in fact fell by 3.3 percent in 1998.[21] Thus industrial pollution in Russia cannot also be attributed to unrestrained economic growth (A). Chapter two has dealt in detail about the Russian economy.

In fact, the decline in general economic output and population is not accompanied by corresponding decline of emissions from stationary sources, which declined by only 27 percent in 1990-93. The total amount of wastewater discharge that did not comply with water pollution norms remained unchanged during the period. The per capita Carbon dioxide emissions in 1991 was 12.31 metric tons, which declined rather slowly to 10.7 metric tons in 1996.[22] Thus, although the gross environmental impact has declined, Russian industries have become more pollution intensive. It is it the third component of Ehrlich's identity 'T' or technological backwardness of Russia which effectively capture the pollution content measured in terms of amount of pollution per unit of GNP. The most significant reason is that Russian enterprises fighting for their economic survival are unable to invest in clean-technologies, pollution control equipments and skilled scientific manpower. Industrial pollution is dealt in detail in chapter four.

The pollution per unit of GNP (T) illustrated by the Carbon dioxide emissions has increased from 4.5 Kg per dollar in the Soviet Union (1991) to 4.7 Kg per dollar in the Russian Federation (1996-98).[23] This is an increase of 4.4 percentage between 1991-98. It indicates that Russians are producing, on an average, more Carbon dioxide for every dollar (or rouble) spent now, than in the Soviet period. Thus each rouble is being invested in a manner which produces more Carbon dioxide, because the rouble is not being spent on environmental technologies and sustainable strategies that could control pollution from vehicle exhausts and industries. The Carbon dioxide emissions per unit of GNP for Russian Federation at 4.7 Kg per dollar is huge compared to the values for USA, UK, Japan etc. whose emissions are below 1 Kg. per dollar for all these countries. [24]

Environmental Technologies in Russia:

The Science and Technological crisis in Russia is reflected in the falling expenditure in basic and applied research and the continuing 'brain drain' from the realms of scientific organisations. For instance the cooling towers used for cooling the water circulating in the water circulation cycle are exceedingly widespread. They were constructed in the 1960s, are now in need of replacement. The service life of the wooden elements in a hostile environment is not long, about three years. Then the wood rots and is subject to slime growth, the nozzle heads fall apart, and they are difficult and expensive to change; as a result, the cooling towers usually stand empty, without the recovery systems. This causes enormous emissions and losses of water is extremely costly and continues to grow more expensive today. It is a widespread phenomena in Russia that obsolete equipment are causing heavy pollution.[25]

Russians are troubled by the quality of the water supplied by water systems, which depends on the state of the reservoirs. The process of clarification has a substantial impact on the quality of water in the first stage of treatment. An expensive coagulant- aluminum sulfate-is used most often but is not cost-effective for large volumes of water. Efficient and new technologies such as water magnetisation have yet to find a market in Russia.[26] The treatment of air for dust, soot, nitrogen-oxides,

ammonia, sulfur, and other pollutants requires installations that use the effect of swirling counterflows (VZP installations). The number of industrial units certified for Environmental Management Systems (ISO 14001) in Russia is also less. [27]

The use of green technologies is required in the Russian Federation to supply household and industrial installations with drinking water supplied by water systems; the scrubbing of dust and soot emissions, sulfur-oxides, nitrogen, and carbon from the exhaust gases of boilers and thermal power plants, ventilation systems, and other types of production of mechanical and liquid impurities; the recovery of flare gases at enterprises and oil fields; the degassing of ammonia-containing ventilation emissions; the delivery of installations for the local heating of the pneumatic instrument {SLOP}; the delivery and installation of small-scale installations for the smoke-free destruction of solid domestic wastes with a productivity of 50 to150 kg/ hour; and the manufacture of special clothing from anti-static, non-combustible, and water-and oil-repellent fabrics, and installation of bag filters and electrostatic precipitators (ESPs). These are essential technologies for sustainable industrial development.[28]

The best of conditions for the development of eco-friendly technologies unfortunately do not exist in Russia today. The enormous outflow of specialists is an immense impediment. There is an appreciable gap between the generations, as there was at the beginning of the century, before the 1920s; the older generations is not passing along, and the younger generation is not yet receiving the accumulated experience. The middle generation has dropped out as the connecting link. The older generation, firsthand and by torturous trial and error, gained an awareness of the problems and the methods of solving them: the next generation will have to do the job all over again. They will have to cover the hard road of life's learning from the beginning, and that is always more difficult, and the technology will be at a new level as well, when the negative impact on the environment is stronger than in past decades.

Another immense constraint is that the budgetary allocations for science has dropped precipitously. As a result the number of scientific research organisations and

especially of scientific technical divisions at enterprises declined from 400 in 1991 to 276 in 1994. The staff of scientific organisations during the same period declined from 1,943, 000 to 1,218,000 persons, that is, by 37.3 percent. Budget expenditures on science dropped to 0.32 percent of GDP, which was 6 times lower than the national security threshold. Moreover, the decline of GDP volume was also more than twofold. Science and science services changed from one of the most prestigious spheres of activity into one of the lowest paid branches. In 1996, the average wage for Science and Technology personnel was lower than in the natural-gas industry, the electric-power industry, and industry as a whole by 5 times, 2.5 times, and 2 times respectively, with wages being paid after long delays. Scientific organisations and institutions are concerned with finding money to pay for public utilities. Purchases of instruments, equipment, and supplies were almost completely terminated and subscriptions to foreign literature and periodicals were cancelled.[29]

A tilt in favour of the West, and orientation towards foreign technologies and solutionss can unfortunately be clearly discerned. Russian technological developments are being ignored, and the attitude toward them is not a constructive one. The underestimation had also existed before, and domestic developments have always had to breakthrough despite the fact that they are better, of higher quality, and cheaper. This is best illustrated when the problem arose of neutralising the gaseous emissions of the Northern Thermoelectric Power Plant of Moscow, preference was given to the Western firm of Topsa, and its treatment installation with catalytic converters were procured . It was well known to Russian scientific fraternity that the quality of Topsa's catalytic converters was ten times worse than Russian ones. For the indigenously produced catalytic converters, the service lives were an order of magnitude longer, the degree of purification was much higher, and the costs for manufacturing and operations were lower. However the increasing fascination for the west and 'eurocentrism' in science tilted the deal in favour of Topsa.[30]

In fact the West, if they are superior to Russia in this field, are not superior in the technological solutions but rather in the organisation and regulation of business.

There, according to the law-and its observance is strictly monitored-all motor vehicles have to be refueled with clean fuel, not leaded. Russia is probably the only chemically developed nation in the world which continues to produce leaded gasoline, with the additive tertraethyl lead which is an anti-knock compound, but has adverse impacts on the health of the nation. Not a single catalytic converter, even the most modern can work for long on leaded fuel since the lead is poison for any catalytic converter. The neutralisation of the gaseous emissions of clean and leaded fuel are not all the same thing. Western neutralisers are manufactured using precious metals from the platinum-palladium group, designed for the use of clean fuels. Such a solution is economically inaccessible to Russians.[31]

The Russian scientists have therefore devised economical technologies. These have potential applications in the developing countries of Asia and Africa that are deprived of technological innovations and their diffusion. *The State Scientific Research and Planing Institute for the Nitrogen Industry and the Products of Organic Synthesis* found a replacement for the platinum-palladium group in the so-called nickel-metallic alloys. They are very close to precious metals in catalytic activity, but are many times cheaper. It is true, their lifetime is a little less, but they are significantly better in economic impact. They are beyond competition in a "quality-price" regard. All of the developed countries are moving in the same direction today: they are looking for a replacement, but the processes were developed in Russia fundamentally and technologically.[32] There are several other Russian innovations that seek global recognition and have implications for a clean environment.

Land Transformations And Food Production

Farming is by far the most important human activity that has transformed the land, and continues to be the principal route by which humans affect the environment. Eleven percent of the earth's land surface is now cultivated, although less than one percent is in permanent crop. Another 26 percent is pasture, and 31 percent is forest.[33] The amount of land that could under certain circumstances, be used to grow crops is roughly three times the amount that is currently used for this purpose.[34] The food

needs of a growing population can be met either through intensification of production on land that is already cultivated or though expansion of cultivation into new territories (extensification). Both processes have ecological consequences that vary from setting to setting. Until the early part of the 20th century, the principal means of expanding production in Russia was the cultivation of new lands, typically after the destruction of forest cover. Forests that covered nearly all of Europe, including Russia in 900 AD had virtually disappeared by 1900. They were converted primarily into agricultural fields and pastures to feed the growing population.[35] A similar process is occurring on a much-compressed time scale in Russia today.

The three major processes responsible for deforestation in Russia are-the clearing of land for agricultural purposes, the harvesting of fuel wood for energy, and commercial logging. The last of these processes has the weakest link to population growth, since it is primarily responsive to supply and demand conditions on an international market. The far-east region of Russia faces increasing pressure on forests due to enhanced economic activity arising from the new liberalisation policies, and is not influenced by population pressures.

The immediate environmental impact to forests and rangelands in Russia comes from logging. East Asia, most importantly Japan and North and South Korea, have traditionally exploited the large market for wood products from the Russian Far East.[36] Logging operations in the Far East have been confined largely to the areas adjacent to rail lines: the Trans-Siberian, Baikal-Amur (BAM), and "Little BAM" railways. Recent investment from abroad has expanded logging along the coast of Primorskiy Kray. Most logging operations have entailed the clear-cutting of trees with insufficient efforts at regeneration - a trend that has intensified with economic reforms as logging firms have sought to cut costs and speed operations. The result has been widespread erosion, which has degraded landscapes, polluted local streams and rivers, and disturbed the region's rich fish resources.[37]

The destruction of forests in Russia has several adverse consequences that vary in intensity from place to place. When forests are destroyed on hillsides, rates of soil

erosion typically increase, sometimes dramatically. Fuel wood from forests supplies much of household energy needs in poorer parts of Russia. Faster rates of evaporation in deforested areas can lead to desiccation of soils and potential climatic change. Forests are the home to millions of species whose disappearance depletes the genetic stock available to humans and raises profound ethical concerns.[38] Russia's rich biodiversity is discussed in chapter 4. And aesthetically, forests are often more appealing than what replaces them.

There is no doubt that population growth has played a major role in the destruction of forests. But like any other process subject to purposive human action, the process of deforestation is influenced by a wide range of factors that modify, mute, or accentuate the direct influence of population growth. Because the connection between population growth and deforestation is subject to many contingencies, one should not expect close statistical relationships between the two. Palloni's review is most thorough, although he issues many qualifications and notes that deforestation can occur under conditions of rising population pressure, declining pressure, or no pressure.[39] It is the last qualification which is most applicable to Russia. Infact, the Russian Federation is confronted with problems of population losses. It is not the population numbers which are affecting the Russian environment, but rather the adverse quality of life of the Russian populations that is a threat to sustainable development and environmental management Among the most important of these factors are social institutions that are capable of controlling access to forest resources.

The Russian government and institutions are not powerful enough to control access to land resources. The most important issue relates to land that are in a sense common property resources. It is widely recognised that common property, open access resources are depleted too rapidly because those who exploit them have little or no incentive to preserve them for future use. Such exploitation occurs in frontier areas where administrative structures are weakest and least likely, at least in the short term, to internalise the externalities arising from land misuse. The Kolkhozes were collective farming initiatives in the Soviet Union that have suffered from excessive

environmental degradation. Even the most advanced industrial democracies have had difficulty establishing rules of access to fish stocks in international waters.[40] As a result, the majority of fish stocks in Russia are classified as 'overutilised', fished beyond the point where natural increase can sustain the yield (Rosenberg et al . 1993).

The clearing of forests for cultivation of crops accounts for a majority of recent deforestation. Population growth and economic development will stimulate forest clearance for agriculture when it raises the demand for food, which it almost inevitably will and/or reduces the wages for unskilled labor. This latter response is also likely but far less certain.[41] Both of these responses have the effect of increasing the profitability of agriculture. However, forest clearance will occur only if new lands are accessible and if extensification is competitive as compared to intensification as an economic strategy for producing more food.

Alternative responses to an increased demand for food involve increasing production on lands already cultivated. The most important ways of doing so are the introduction of new crop varieties, increased frequency of cropping, application of additional fertilizers, expansion of irrigation, storage, and marketing can result in a higher proportion of product reaching consumers. In certain settings, the economic attractiveness intensifying production dominates that of extensification. In Russia, the sown area in 1997-1998 was reduced under all major crops except for wheat and buckwheat. A lower gross output was recorded for all crops except rice in the same period.[42] This increases the need for intensification to feed the population.

The applied technology in Russia is largely market driven, without much attention for product quality. Moreover, interactions between machinery and plants, soils, animals and humans do not receive enough interest, thus making the agricultural practice wholly unsustainable. It is therefore important to choose appropriate technology, farming and marketing technologies. The year 1998 was extremely hard for Russian agricultural producers. First, on record, grain production proved to be an unprofitable enterprise. The loss was about 17% according to preliminary estimates, excluding state subsidies including state grants and

compensations – 4%. Low demand linked with small paying capability of processing enterprises led to an approximate 17% fall in their selling prices, while the production costs lifted 30%. During the year enterprises preferred to sell grains at low prices and be paid in cash. Much grain was sold to pay credit debts.[43]

Perhaps the most ecologically damaging component of intensified production is associated with the expansion of irrigation. Already, 70 percent of the fresh water used by humans is used for irrigation, which waters one-sixth of the world's arable lands.[44] The best possibilities for irrigation, where streams carry water from snow-clad mountains are already heavily exploited. Fields already irrigated are being abandoned as levels in wells sink, soils become salty, and competition for water sharpens. For instance, during the Soviet period, large scale diversion of water from the Amur darya (oxus) and Syr Darya for cotton crop resulted in the rivers no longer flowing into the Aral Sea. In the last two decades the sea has diminished by half. A salt desert has surfaced in the dried out area where once wild life flourished. The sea port of Muinak and Aralik are today surrounded by large areas of sand banks. In the summer months, sandy soil is carried by the wind over Kara-Kalpak Autonomous Republic destroying the fertile soil.[45] The depletion of soil fertility led to an increase in fertilisers and pesticides so that the soil turned into a chemical addict. The toxic water from the fields drained into the rivers, lakes and sands there by contaminating potable freshwater resources. In Karakalpia 73 percent of the population was suffering from disease.[46]

'The tragedy of the Aral Sea was cold bloodedly planned,' states N.Nazarbaev, the President of Kazakhastan. 'The Planner of grand canals even maintained that the Aral Sea is useless'.[47] Planners during Brezhnev period embarked on the 'Project of the Century to divert the northern and Siberian rivers southwards to increase water supply for irrigation. Fortunately, the project to build 2400 km. long channel was terminated in 1986 because of growing public pressure, but not before untold environmental damage had been inflicted on the land. The Russian Federation continues to suffer the consequences of unsustainable practices of the past.[48]

Population growth is not the only factor affecting the rate of resource degradation, and in many contexts it is undoubtedly not the most important factor. The World Bank's (1992) review of population/environment/agriculture linkages lists a huge array of obstacles to expanded food production and better resource management. These include weak land tenure systems, inadequate credit availability, biased agricultural prices and exchange rates, adverse tax policies, weak agricultural extension services, excessive government control, and civil wars. But few if any of these problems will be resolved through rapid population growth. They are the context on which this growth will be imposed. According to the Bank they have the effect of compelling growing populations to exploit even more extensively the resources available.

Diminishing returns to irrigation and fertilizer use, combined with evidence of extensive soil depletion, have made some of the most sober agricultural economists pessimistic about the prospects that food supplies will outpace population growth in developing countries. According to Vernon Ruttan, it is apparent that the gains in agricultural production required over the next quarter century will be achieved with much greater difficulty than in the immediate past. The incremental responses to the increase in fertilizer use have declined. Expansion of irrigated areas has become more costly Maintenance research, the research required to prevent yields from declining, is rising as a share of research efforts.[49] Russia's environmental problems, though not related to increasing population pressure, are deep-rooted in a complex web of socio-economic, political and institutional factors that affect the environmental security of the nation.

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CHAPTER 4 -RUSSIAN RESOURCES DEPLETION AND ENVIRONMENTAL POLLUTION

The Russian Federation incorporates 89 regions and possesses the status of a country of transitional economy. Its area is 17 000 000 sq. km (11.4 % from the total land area). The seashore length is 38, 807.5 km. The country's total border is 14, 509.3 km. There are over 120,000 rivers and about 2,000 thousand lakes over the country. The area of wetlands is up to 2, 000 sq. km while permafrost grounds cover almost 65 % of the country's territory. There are large plains and mountain provinces (the Khibins, Caucasus, Urals, Altai, Sayans, Verkhoyansk Ridge, Kamchatka and Transbaikalia mountains). Its plains include ecosystems of 8 natural zones (biomes): polar deserts, arctic and subarctic, forest tundra, taiga, broad-leaved forests, steppes, semiarid and arid zones. There are more than 11 000 species of vascular plants, 320 - mammals, about 730 - birds, 75- reptiles, about 30 amphibian species, almost 400 species of coastal sea fish, and 270 fresh water fish species that show the relevant biodiversity status of Russia. There are 75 protected areas in the federation occupying over 20 million hectares covering 1.2 percent of land area.[1]

As the 20th century draws to close, the Russian Federation faces unprecedented environmental crisis due to the complex interaction between Russian populations and natural resources. *The region is confronted with marginal lands and marginalised people, endangered species and endangered spaces, rising economic aspiration and shrinking resources, and wasted resources combined with mounting waste disposal problems.* Following the dissolution of the USSR, in December 1991, a programme of economic reforms was initiated to effect the transition from a centrally planned economy to market orientated system. Prices were liberalised (precipitating high inflation), a programme of mass privatisation was inaugurated, and proposals were made to reduce central government expenditure. The import of the structural changes on Russian resources, both natural and human, has been profound. Market liberalisation, "destatification" of the economy and political decentralisation have created new forces that have come to bear on the state of the Russia's natural landscape. One of the most striking outcomes of these processes has been the

economic, social, political, and environmental reorientation of Russia. In order to understand the forces shaping Russian environmental and natural resources outcomes, it is necessary to explore the patterns of natural resources consumption trends, economic indicators, population changes, and an overview of the recent developments in the major resources categories- Agriculture and food security, forests and rangelands, biodiversity, energy, urban development, water, industry etc. in the post - Soviet reform era. Despite the immense territory and the world's largest share of wilderness in the land-use balance, the negative impact of human activity on the natural environment in Russia is pronounced.

1. AGRICULTURE & FOOD SECURITY

In December 1991 the Soviet Union was liquidated and replaced by the Commonwealth of Independent States (CIS). This dramatic development changed the world. Some of the former Kolkhozes (large co-operative farms of about 6500 ha and some hundreds of households spread over several villages) and Sovkhozes (state farms specialised in a certain type of crop or type of animal husbandry of about 16,000 ha of which 5000 ha are in cultivation) have been privatised. Russia has introduced measures to stabilise domestic markets and reduce imports. The applied techcnology in Russia is largely market driven, without much attention for product quality. Moreover, interactions between machinery and plants, soils, animals and humans do not receive enough interest, thus making the agricultural practice wholly unsustainable. It is therefore important to choose appropriate technoloy, farming and marketing technologies.[2]

In Russia there are more than 26,000 large farms (former Kolkhozes and Sovkhozes). The privatisation has been accomplished to a large extent in the agricultural sector, but less in comparison to the food industry. The enterprises are dominated now by the employees of the former Kolkhozes or Sovkhozes. These forms of privatisation left the management and decision structures mostly unchanged. The food production halved between 1990 and 1996 while the number of employees remained the same.[3] The restructuring can be more successful when a closer

relationship is taken into account between productivity changes and the rewarding of the employees. In Russia there are more than 270,000 small private farms. In the process of developing the private farming programmes a lot of problems were manifested. e.g. the least productive soils were used for this purpose, authorities did not provide credits, farmers were not used to work independently and did not have the skills and knowledge to manage the private farms. The largest part (about 65%) of total agricultural production is realised on Dacha's (private households), Sovkhozes and Kolkhozes contribute for about one third and a small part (about 3%) is produced by private farms.[4]

The availability and quality of food in Russia vary greatly, from region to region. Russia's agriculture is highly diverse, reflecting differences in climate, soil and other natural resources. Environmental conditions are far from favorable for substantial farm production in large areas of country. Slightly less than 15 percent of Russia's total land area is suitable for agriculture and nearly half of that area is not cultivated, being adequate only for permanent meadows and pastures. Main agricultural lands of field-crop cultivating regions are of collective agriculture.[5] Small areas are occupied by vegetable gardens of rural and small-city residents, gardens and orchards in collective possession (0.8 and 0.3 % of agricultural lands, respectively). The land use structure differs in the European and Asian parts of Russia. State reserve lands, military, forests zapovedniks (natural reserves, national parks etc.), lakes and rivers are in Federal property or combined property. In tundra and taiga native communities virtually returned to the traditional land use. In case the Land Code is amended to permit the purchase of lands, major changes would take place in the suburbs of the big cities. A big percent of suburban agricultural lands would be converted into individual allotments and settlements.[6] This would further reduce agricultural productions and accentuate problems of urban development in cities.

Most of Russia's highly productive farmland is located in a broad band that encompasses its southern regions, where surpluses of most basic foods help supply the rest of the country. Russia's desire to bring domestic food consumption patterns

closer to those of the West (particularly with respect to raising levels of meat consumption) contributed to problems with food supplies, as did centrally set highly subsidised food prices. In Russia, as in the USSR prior to its dissolution, the impact of regional differences in soil and climate on production was magnified over the years by an economic development strategy that placed little emphasis on efficiency. Indeed many farms produced a broad range of agricultural goods regardless of relative production cost or suitability of natural resources. Central planners did not encourage regional self-sufficiency in food production. For example certain regions such as the Urals and part of Western Siberia (e.g., Kuznetsk Basin) were to specialise in the production of industrial goods and depend on a complex set of trading relationships in order to obtain the necessary food supplies. The agricultural development varies from region to region and is low if compared to the developed countries. Arable lands occupy 7.6 % of the territory and pastures and hayfields occupy 4.6 % land. Central Russia is a region of agricultural decrease and forests occupy more and more of the agricultural lands.[7]

The year 1998 was extremely hard for Russian agricultural producers. First, on record grain production proved to be an unprofitable enterprise. The loss was about 17% according to preliminary estimates, excluding state subsidies including state grants and compensations. Low demand linked with small paying capability of processing enterprises led to an approximate 17% fall in their selling prices, while the production costs lifted 30%. During the year enterprises preferred to sell grain at low prices and be paid in cash. Much grain was sold to pay credit debts. The adoption of the Russian Federation Government decree #1159 of October 6, 1998, 'On strengthening state regulation in production and circulation of ethyl alcohol and alcoholic products', resulted in flows of illicit cash money flooding the grain and oil crop markets.[8] The RF Central Bank in its July letter of the same year permitted commercial banks to trade in grain. As a consequence 19.5 million tons of 35.3 million ton reserves, as of January 1, 1999, appeared on the secondary market. Since February 1999, after the publication of the Government decree stipulating border prices for humanitarian aid and commodity credit produce delivered from the United

States and European Union, internal wholesale prices has begun to rise at a high pace. An actual limit of the price rise is seen as a function of global prices plus transportation and handling charges. *Grain may last the country till next crop, but the nation's reserves will be extremely thin.* ***This threatens the food security of the nation.***[9]

Initially, the 1998 grain harvest collected in Russia was estimated at 47.8 million tons, down 46.1% from last year. The main causes of the shortfall were a 5.5% reduction in sown areas and a 43% decrease in yield due to drought-driven drop of cereals in about 25% of sown area.

TABLE-1. **Main indicators of cereal crops**

	1997			1998		
Crops	Sown area '000 ha	Yield 100 Kg/ha	Total output mt	Sown area '000 ha	Yield 100 Kg/ha	Total output mt
Wheat	26026	1700	44.3	26044	1030	26.9
Rye	4005	1870	7.5	3777	860	3.27
Barley	12493	2910	20.79	11260	860	9.78
Oats	6436	1660	9.39	5154	890	4.58
Millet	1086	1460	1.22	974	460	0.45
Grain corn	918	1120	2.68	791	1030	0.08
Buckwheat	111	560	0.63	123	370	0.46
Rice	15	2170	0.33	15	2840	0.41
Pulses	1340	1330	1.78	1182	800	0.95

Source: Ministry of Food and Agriculture of Russia, *Sotsial 'no-ekonomiches koye polozheniye Rossii, 1999 (The Social and Economic Situation of Russia)*, 1999, Moscow: Goskomstat RF, 1999.

The above table shows that the sown area in 1998 was reduced (due to crop losses as one of the reasons) under all main crops, except for wheat and buckwheat. Yield capacity of all main crops (excluding rice) fell substantially. Total rice output in

1998 increased by 26% from the previous year. A lower gross output was recorded for all other crops. Even if favoured by satisfactory weather, the future harvests in most sown areas is threatened due to soil exhaustion, a reduced application of mineral fertilizers, lack of funds for herbicide treatment of sown areas, low renovation of old machinery and other reasons. Drought-stressed, pest-infested, feeble plants, which lack nutrients in the germinating period, perish first. The drought, which in 1998 impacted a large area of the Russian grain belt, destroyed precisely these kinds of crops.[10] The food situation in Russia therefore continues to be grim.

As a result of poor implementation of the agrarian reform in the last five years the agro-industrial complex of Russian Federation has found itself in a critical situation. Gross agricultural output has reduced by 39%. Since 1991, millions of hectares of lands have been deserted and arable areas have decreased by 15%. There is a million hectares reduction of irrigated lands. Significant changes for the worse have taken place in animal husbandry. In 1996 agricultural produce was 282 billion roubles (in current prices) which is 7% less than in 1995. Agricultural data demonstrate output reduction (and decrease of arable lands) of sunflower, sugar beet, flax (for fiber), potato and vegetables.[11]

Analysis demonstrates that while being reformed, the agricultural market of Russia found itself "open" and joined world economy without any efficient protective measures having been implemented. *The agriculture sector in Russia is imperiled at the liberalisation strategies of stabilisation and structural adjustment programmes.* Some of the positive trends include development of processing industries, diversity of foodstuffs variety and packaging, strict attention to the quality control - these aspects are among positive results of the competition. At the same time some trends, vivid now, are to be taken into account when working out the development strategy of agricultural market of Russia.[12] First of all, having been reduced during the first years of the reforms volumes of food import from foreign countries are increasing now. There is a growth of meat products and butter import, though volumes imported do not cover shortfalls of the local production. In 1994-1995 import of alcoholic

drinks and beverages increased greatly. There is a significant reduction of grain import, but a growth of flour and macaroni purchases is seen. Another trend is caused by the gradual resumption of goods flow between Russia and CIS countries. In 1995-1996 there was growth of the turnover in comparison with the previous years when abrupt reduction of food import from these countries took place. There is a 85% of CIS turnover of meat import and 91% of raw cotton belonging to Russia. Specialists consider the outlook for the development of food and agricultural market for the nearest future to be unfavourable. The situation of agro-industrial production could aggravate if economical policy (disparity of prices for agriculture and industry, producing agricultural machinery, equipment and fertilizers) is not changed. Taking into account existing macroeconomic indicators of most regions, further reduction of gross agricultural output and turnover is to be expected. It is evident that reduction of grain output to 65 - 70 mt does not provide for development of animal husbandry and poultry.[13]

Potato, vegetables and fruits are grown mainly on the private farms, where manual technologies are used. Sugar and oil production is restricted by technical and technological potentials. Crisis deepening in agro-industrial complex and national economy of Russia is to be predicted if attitude to the mechanism of food market development is not radically changed. *It will result in reduction of domestic commodity resources, food consumption and living standard of the population*, respectively. At the same time, in spite of unfavourable conditions for agro-industrial complex development in 1996, supply of agricultural products and food overtook the demand, such situation being caused by underdevelopment of agrarian market infrastructure which evoked problems with finished products sales, customers insolvency and supply of market with imported goods.[14]

Over the last 25 years the total area of agricultural land has decreased by more than 30 million ha. Approximately 1.5 million ha of agricultural land were lost in 1994 alone. The reduction of soil fertility is related to a loss of soil humus at an annual rate of 600 kg/ha. More than 1.5 million ha of land were destroyed in 1970-91

in the course of geological exploration and mining. The area damaged by industrial and agricultural toxic pollution equalled 74 million ha in 1993. At the same time, the total area of protected land reached 20 million ha in 1993.[15] Over 300,000 ha of forests were destroyed in 1994, including 270,000 ha of forests lost due to fires. Desertification problems have been reported within 17 territories of Russia. During recent years the area of reindeer pastures has decreased by 15-20%. There are pronounced trends towards a decrease of wildlife habitats (especially in the European part of Russia) and a reduction of wildlife populations. Fish populations in inland and coastal waters have been seriously affected by wastewater discharges. The application of toxicants for grain raising has stopped practically everywhere and pesticides and mineral fertilizers are falling out of use. This caused increase of wildlife in forest steppe and forests especially Lirurus tetrix, Perdix perdix, Capreolus capreolus, etc. Rice raising (the most ecologically unsafe culture in Russia) decreased from 286.5 thousand hectares in 1990 to 146 thousand hectares in 1998.[16]

Just as levels and composition of agricultural production differ greatly from region to region, so does food consumption because of differences in local food availability, income, and since 1992, local policies toward subsidies for various foods.[17] In 1991, daily food consumption in Russia averaged 3100 calories, but ranged from a high of over 3500 in five oblasts- Bryansk, Orel, Belgorod, Lipetsk, and Tambov- to a low of 2100 in Chechnya and 2400 in Murmansk. Daily consumption was above 3300 in another 12 oblasts, and 2800 calories or less in 8 oblasts.[18]

With increasing income, consumers shift their food spending from the less expensive starchy foods to higher priced meats, dairy products, vegetables, and fruits to the extent that they are available. There are great differences in regional food consumption and that these differences are wider now than during the Soviet period.[19] The reasons are disappearance of the centrally directed food distribution system; inertia that is preserving ties among producers, and retailers; local subsidies; higher

transpiration costs and increasing disarray; local bans on cross oblast shipment; rudimentary marketing information despite weekly published market price quotes.[20]

The Black Earth region, which covers much of Russia's south central part, serves as the country's breadbasket, accounted for one half of the country's cultivated farmland and four–fifths of production.[21] The decrease in state investment has curtailed soil conservation programmes, leading to faster depletion of soil fertility across all of southern and central Russia. The intensive grazing of arid grasslands in the Kalmyk republic and Astrakhan Oblast also has led to descertification. The rapidly increasing cost of agrochemical has forced farmers to cut their consumption of fertilizer by over one half in the early 1990s. Despite a 60 percent reduction in pesticide use for Russia as a whole, the Russian Environment Ministry noted in 1994 that "extremely high levels of pollution of the Kuban and Don rivers persisted as a result of pesticide runoff in Rostov Oblast and Krasnodar Kray". [22]

The problems confronting Russian agriculture includes the application of western technology without research for functional adjustments to Russian conditions. As an example, in agricultural production, it is not recommended to import costly hi-tech machinery but combining relatively cheap Russian tractors with adjusted efficient western equipment. Secondly, the development and introduction of improved and integrated work organisation at farm level in Russia is necessary. Thirdly the production, storage, delivering and marketing of crops should be optimised simultaneously in a chain perspective. From the land surface in Russia (almost as large as the total area of the USA and Canada together) less than one third is suitable for agricultural use. One third is used for arable crops, the rest for livestock production and horicultural crops. Cereals are grown for the internal use of the large Sovkhozes and Kolkhozes. To keep food prices low some support is given by the government. The production of sugar beet is concentrated in the south of Russia. Dairy farmers are not able to market their products which are of a bad quality. Modernisation is difficult because of a lack of credibility. Improving the quality of fodder crops could help the dairy and beef production as well as the arable sector

itself. In recent years pork imports increased. This did not improve the situation of pork production because slaughterhouses are dictating prices and other conditions. In the broiler and egg production sector producers work together in co-operations and in good contact with the market. The majority of vegetable growing is in private farms. Storage capacity is too low. So, supply of vegetables can only be provided in the summer months. Potatoes are often produced in combination with vegetables. The seed material and technologies used are bad and storage facilities are not present. Greenhouses are mainly located around the big cities. Heating systems cause serious problems.[23]

It may be concluded that a broad range of factors affects the food security in Russia. These include diverse environmental dimensions that affect agricultural production, regional economic specialisations reflecting priorities imposed by the Soviet system of central planning, variable progress in agrarian reform and in the role of the private sector, pronounced spatial patterns of food processing, regional differences in food preference and consumption, local food price subsidies, personal income, availability of imports and interregional trade ties etc. The influence of these factors on Russia's movement towards an unsustainable agricultural situation cannot always be documented precisely and completely, but sufficient evidence have accumulated to indicate these unfavourable changes.

2.FORESTS & RANGELANDS

Forests cover about 69 % of Russia (11.9 million square km). The Asian part of Russia encloses 78.8 % of dense forests and 21.5 % are located in European Russia and the Urals. The average forest density of Russia is 44.7 % and reaches 57 % within boreal forests. Inspite of technological advancements, only 60 % of Russian forests has been studied in detail and managed properly. The rest (mainly low-value woods of Asian Russia) was studied only by remote sensing. There are three main forest categories in the country: protective, sanitary and waterby forests which cover 20 % of the forested area; forests in the deforested areas, having restricted forestry

regime cover 6 %, and productive woods of rich-in-forest regions occupy the remaining area.[24]

The greatest immediate environmental impact to forests and rangelands in the Far East comes from logging. East Asia, most importantly Japan and North and South Korea, have traditionally exploited the large market for wood products from the Russian Far East.[25] Logging operations in the Far East have been confined largely to the areas adjacent to rail lines: the Trans-Siberian, Baikal-Amur (BAM), and "Little BAM" railways. Recent investment from abroad has expanded logging along the coast of Primorskiy Kray. Most logging operations have entailed the clear-cutting of trees with insufficient efforts at regeneration - a trend that has intensified with economic reforms as logging firms have sought to cut costs and speed operations.[26] The result has been widespread erosion, which has degraded landscapes, polluted local streams and rivers, and disturbed the region's rich fish resources. As international companies become more involved in logging they will bring more modern technology such as harvesters and forwarders, which should increase the speed of cutting operations dramatically.

Table2.**The Forest Resources of Russia**

		Stocked forest land '000 ha.			Growing stock million cu. M.		
Region	Total land area m sq.km.	Total forest	Coniferous forest	Deciduous forest	Total forest	Coniferous forest	Deciduous forest
RUSSIA	17,075	705,789	507,708	130,498	73,028	57,677	13,964
European Russia	4,310	136,940	88,420	48,001	16,943	10,968	5,956
West Siberia	2,427	78,760	55,661	22,049	9,519	6,663	2,846
East Siberia	4,123	216,359	166,693	32,293	26,116	22,940	2,915
Far East	6,216	273,730	196,934	28,155	20,450	17,106	2,247

(**Source**-Goskomstat Rossii, 1995, pp. 3-5; Goskmstat Rossii, 1996, pp. 16-21, and Lesnoy Fond Rossii, 1995, pp. 95-97, 168-207.)

Historically, two thirds of the Russian timber harvest came from forests in the northern European part of the country especially Arkhangel'sk Oblast and the Komi republic.[27] The logging industry in the north has been severely depressed in recent years as a result of the economic downturn. In 1994, the holding company that manages the state interest in logging and forest products announced its plans to more than double cut rates in the European North over the next decade (Grigor' yev, 1995). On the Soviet side of the Finnish border a 15 to 20 mile wide strip of old growth forest, the "Green belt of Karelia," extends from the Kola Peninsula in the north down through Karelia to Lake Ladoga. This stand represents the last unfragmented boreal forest tract in the area, and an important bio-geographical bridge between Scandivania and the Russian landmass.[28] In 1995, however, the Chernomyrdin government issued a decree ordering a clear-cut to facilitate patrolling the border.

Paper and pulp production is concentrated in the north (Arkhangel'sk Oblast, Karelia, and the Komi republic), together with the major environmental problems associated with pulp and paper production -pollution of water bodies with sulfates, chlorides, phenols, and formaldehyde and air pollution from emissions of particulates, sulfur dioxide, and carbon monoxide. Two mills in Arkhangel'sk Oblast - Arkhangel'sk and Kotlas-reportedly account for 23 per cent of total wastewater discharges of Russia's entire pulp and paper sector. Cities in northern European Russia experiencing the most negative environment impacts from pulp and paper production are Kaliningrad, Perm and Arkhangel'sk. Paper production in Russia currently averages just 24 kg. Per person (compared to 142 kg. in the United States). It is not unreasonable to expect that output, especially of higher quality paper could surge in Russia to meet the demand of the emerging commercial and service sectors. Numerous Western firms have invested (or have expressed an interest in investing) in pulp and paper operations in the Russian North.[29]

3. BIO-DIVERSITY

As the world's largest country, the Russian Federation encompasses 17.1 million km^2, which is 11.4 per cent of the earth's entire land surface. Such a large area contains great biodiversity and a sizable list of endangered and threatened species as well. The necessity of conserving Russia's biotic diversity has been frequently addressed in the post Soviet period.[30] The natural zones of Russia are quite unequal in extent. Across the vast, relatively flat internal reaches of the country just two biomes- the taiga (coniferous forests) and mixed forest zones- take in well over half of the entire country. However, a far greater number of natural regions occur along the southern margins of the country, which tend to be either semi-arid or mountainous. The latter areas, as with all mountain regions of the world, exhibit vertical zonation, and consequently a greater degree of both biodiversity and threatened species (the latter in part because of the common phenomena of biological islands and heightened endemism in mountain zones). This is where the vast majority of Russia's endangered terrestrial fauna is located.[31]

The commercial significance of vascular plants lies in the fact that 1,103 of Vascular species are used in medicine (200 are officially approved), and 350 as foodstuffs. The highest degree of algae endemism[32] is at the Baikal lake. More than 160 algae species are of economic value and have found wide application in food, medicinal and other areas. Russian *lichen flora* contains about 3 000 species of 167 genera and 45 families. Lichen species are known to be environmental indicators.[33]

Northern Caucasus, South of Siberia and South of Far East are especially rich in vertebrate species. These regions are noted for high fauna endemism for being refugiums of Glacial period. The order of Rodentia is the richest in Russia. The highest species diversity is specific of the Northern Caucasus, southern Siberia and southern Far East. About 90 mammal species (33 %) of the country belong to those threatened in Central and Western Europe and the world over (39 species or 14 %, and notably whales and Panthera-like big cats). Some species being endangered in the Western Europe like brown bear (Ursus arctos) and wolf (Canis lupus) are

widespread in Russia. 61 % of Russian mammal species diversity (excluding the whale-like) and about 60 % of species from the Russian Red Book are conserved on protected areas. Approximately 50 land mammal species, mainly Ungulata species and about 20 fur animal species are subject to hunting.[34]

The Okhotsk-Korean population of the gray whale (Eschrichtius gibbosus) appears to be on the verge of extinction numbering not more than 100 animals. Their summertime habitats are in close proximity to oil extraction sites on the north-east Sakhalin shelf (international project "Sakhalin-2"), and this threatens their populations.[35] In aves fauna, Anas, Anser and Galliformes - are the sport hunting objects. The richest species diversity of reptiles is observed on the South of Far East and in Northern and Western Caucasus. Economic significance of most species is associated with their commercial value on the world market of wild animals. Tortoise and snake groups are a subject of the world market of wild animals are threatened.[36]

Fresh-water fauna is indicative of a high per cent of endemic species. The Lake Baikal basin ranks first in endemics. The highest species diversity is specific of Baikal and the Amur basin. Acipenser sturio - is registered in the IUCN Red List (status EN). Sakhalin sturgeon and white salmon are also recorded in the International Red List. Commercial fishing plays an important role in the country's economics. Sturgeons, salmons and a number of perches and carps are an object of fisheries. Ukrainian lamprey (Lampetra mariae) is recorded in the IUCN Red List (VU status). Caspian (Caspiomyzon) and river (Lampetra fluviatilis) lampreys are of commercial value. [37]

The international environmental cause celebre of the Far East is the demise of two endemic animal species: the Siberian or Amur tiger and the Amur or Far East leopard. Over the past several decades, logging has destroyed valuable habitat - an important issue given the large range that each animal requires.[38] The second and more immediate factor is commercial poaching, which has increased dramatically in recent years as trade opportunities with the outside world have opened. Local efforts to halt poaching have been impaired by insufficient funding and technical resources

for local game wardens and nature reserves, environmental laws that divide responsibility among numerous organisations, bureaucratic infighting, and limited local governmental support.[39]

4.URBAN DEVELOPMENT

A related trend that has a great impact on the environment is the long delayed suburbanisation of Russia. Central planning favored the development of large but spatially compact cities with their ubiquitous multistory apartment blocks. Planners have now retreated from this policy, which left Russia with relatively few small towns.[40] Large Soviet enterprises, which once drew people to the cities and often provided housing, are now shedding labor and some are closing their doors. Cities also are no longer the commercial meccas they once were: as the retail economy has developed rapidly, consumer goods and services increasingly are available in smaller towns and rural areas. A residential building boom is under way in the countryside, as the new upper and middle classes invest their money in real estate and elbowroom.[41]

Soviet urban planning and economic development patterns promoted the relatively compact development of Russia's cities. This has allowed the survival of vast open spaces (and their indigenous flora and fauna) between urban centres.[42] Russia today possesses a significant share of the remaining large tracts of the world's undisturbed landscapes where natural processes, have been allowed to proceed according to natural rhythms.

As restructuring moves the Russian economy towards a post industrial model in the coming years, the economic profiles of relatively wealthy cities of northern and central Russia -particularly Moscow and St. Petersburg, Kaliningrad and Nizhniy Novgorod -may shift from defence industrial production to commerce and services. Environmental impacts in these emerging trade and services centres also will shift from manufacturing oriented pollutants emitted from concentrated point sources to more diffuse and varied loads. During the 1970s and early 1980s, the Soviet government invested in a large-scale programme to convert electric power and urban

heating plants to natural gas. This resulted in a significant improvement in air quality in urban centres.

Over the past decade, the progress has been eroded, as a proliferation of cars, mostly imported, is beginning to choke roads and highways and boost levels of urban smog. Despite the economic recession the number of vehicles in Moscow for instance, in creases by an estimated 30,000-50,000 annually. In 1993, transport accounted for over three fourths of the capital's air pollution.[43] *Thus, we can expect a decrease in airborne heavy metals and highly toxic micro-pollutants and a rise in nitrogen oxides and carbon monoxide in Moscow and other regional commercial centres.* The accident that occurred in the petroleum refinery operating next to Moscow at Kapotnia released harmful substances into the atmosphere. The people living in the environs of the refinery suffer, and are sick more often from the constant emissions of the refinery . The thermoelectric power plant is a stone's throw away, and also makes its contribution on the pollution.[44] Ecological safety in large super-urbanised cities, like Moscow is conditioned by a complicated mutually dependent set of natural conditions, town-planning, engineering, social, economic and other problems, methods and ways of their decision. The condition of the environment and the probability of extreme ecological situations determine it. The condition of the environment is connected with the level of technical influence and the ability of the environment to "self-restoration" (self-maintenance). Certainly, during the operation of natural systems it is important to pass a border allowing them to keep the property of self-regulation.[45]

Another problem facing municipalities in the coming years will be to manage the explosion of solid waste generation created by the rise of the service industries and a mass-consumer society. Solid waste disposal will become an increasingly pressing issue in cities such as Moscow and St. Petersburg with relatively large segments of the population having incomes well above the Russian average.[46] Russia's southern margins are likely to see a significant increase in population in coming years, in some cases because of continued positive rates of natural increase

among the titular nationalities of (non-Russian) federation republics, and in others because of a relatively mild climate which makes the region attractive. The region has received a large number of immigrants from other republics of the former Soviet Union (notably Ukraine and Kazakhstan), and from the North and Siberia. The military conflict in Chechnya has only exacerbated the situation by generating streams of refugees. The major environmental challenge in many areas of the south, will be the provision of essential communal services such as sewerage and safe drinking water to meet the growing population's needs. In 1993-1994, for example the Russian media reported several outbreaks of typhoid and cholera. [47]

The natural environment in the Far East has remained the least developed and the most pristine part of Russia.[48] The Far East is the region of the Russian Federation that has been impacted most dramatically by marketisation and integration into the global economy. Russia's international trade has shifted significantly away from the former Soviet Bloc and Western Europe towards the dynamic economies of Asia - namely China, South Korea, and Taiwan- a trend that represent something of a return to pre-Revolutionary trade patterns.[49] Because of the region's small population and relatively pristine character the environmental, impacts of new development in the region to date are of greater significance for nature conservation than for human health concerns.

Amongst those enterprises as yet little affected by privatisation are the 'communal services', with the exception of housing. Communal services are owned and controlled by municipal authorities and a number have natural monopoly characteristics.[50] One of the largest of the communal services is water and sewerage enterprises or *vodakanly*.[51] Other communal services include waste collection and disposal , bus-tram transport and street cleaning. Whereas much attention has been given to privatisation within the RF, much less attention has been addressed to improving services in what remains of the public sector. In the former Soviet Union, water and sewerage services were planned and managed by govermment at both the regional and national levels.[52] Operation and maintenance costs were met primarily

by industrial enterprises and from state funding, and financing capital investments was a responsibility of the state. Enterprise loans were underwritten by the state and there was no effective budgetary constraint other than the amount of financing provided under the state plan.[53] The legacy is a water system with pipes and equipment that are expensive to maintain and often inappropriate to local circumstances and a capital stock which is aging and unreliable.

Within the RF today there are around 55,000 water supply and wastewater systems , of which about 8300 are in urban areas . Seven major river basins lie at the heart of the water system, with inter-basin transfers occurring through 20 major canals. To improve the access to water supplies, especially in areas where nature provides inadequate surface water, large water resource schemes were introduced during the Soviet period . These improved the availability of water across the RF, but at the expense of enormous environmental damage - of which the drying out of the Aral Sea is the best known example. In 1991 the country's water enterprises were transferred from federal ownership to ownership of the federal subjects, namely the 89 republics, oblasti, kraya and autonomous okruga and the cities of Moscow and St Petersburg which make up the RF.[54]

Local government bodies are now responsible for investment and are authorised to set tariffs. Water quality standards in the RF are set at the federal level and are monitored by local health authorities. Although standards are theoretically amongst the highest in the world, in practice they are not met. More than 20% of municipal water intakes have inadequate sanitary protection and poor sludge management at many wastewater treatment plants is an important environmental concern.[55] On average across the RF only about 40 % of municipal water and wastewater receives any treatment. More than 9 million cubic metres per day of untreated effluent is discharged into rivers, lakes or the sea. A 1995 survey by the Ministry of Health in Moscow revealed that 28% to 30% of surface water samples did not comply with chemical and bacteriological safe levels. The main polluters of water are industry, the vodokanaly themselves (in the form of untreated or inadequately

treated effluent) and agriculture (in the form run-offs of pesticides, herbicides and fertilizers.

With the relaxation in relations between the Russian Federation and the People's Republic of China cross border trade has exploded, affecting particularly areas along the Chinese border in Amur Oblast and Primorskiy and Khabarovsk krays. If investments in sanitation systems in provincial centres such as Khabarovsk and Blagoveshchensk are not forthcoming, concerns have been expressed that future economic growth could exacerbate already existing water pollution and decimate remaining fisheries along the Amur River.[56]

6.INDUSTRY

There are two specific characteritics of the items special for Russian industry environmental impact. The first is the bigger environmental impact of the same manufactured products compared to average global standards. The second is the local concentration of impact mostly in cities and industrial areas. Thus air pollution has a small impact on the watershed terrestrial ecosystem's biodiversity even in regions with a long economic history. But water ecosystem having a concentration of industrial pollutants are highly vulnerable. Currently and in the nearest future, small enterprises will be the major engine to economic growth. They are difficult to monitor and often discharge pollutants to the sewage that is normally unadjusted to industrial waste waters.[57]

Much of Russia's nonferrous metals production is located in East Siberia, especially in Krasnoyarsk Kray and Irkutsk Oblast. Smelters at the Noril'sk Nikel concern, one of the largest world producers of nickel, copper, cobalt, platinum, and other rare metals, in 1993 discharged 2.3 million tons of pollutants (mostly Sulphur dioxide)-down by 333,000 tons from the previous year. Nevertheless, Noril'sk accounted for over 10 percent of all industrial emission in Russia (26 percent of sulfur dioxide emissions), which earned the complex the dubious distinction of being the single largest point source of SO_2 emissions in the world.[58] Eastern Siberia also is

home to four of Russia's five largest aluminum smelters Bratsk, Krasnoyarsk, Sayansk, and Irkutsk. Although wages in aluminum producing cities have remained high,[59] the impact on the environment and public health, however, is grim. The city of Bratsk, for example, suffers some of the worst air pollution in Russia.[60]

Forty three percent of Russia's ferrous metals production is located in the Urals, and another major heartland iron and steel centre can be found at Novokuznetsk in Kemerovo Oblast. In the steel centre of Magnitogorsk, the volume of aerial emissions reportedly declined by almost 50 per cent in the early 1980s after several steel and coke furnaces were decommissioned.[61] The smelters at steels mills and nonferrous metallurgical plants in the Urals and Siberia have been responsible for widespread degradation of forests and Tundra, contamination of soil and surface water with metals and accumulation of slag and tailing. Hazardous waste disposal presents a long term environmental challenge for the region. The Russian electroplating industry is concentrated in Urals and West Siberia. These two regions account for 75 percent of the plating waste (sludge that contains highly toxic chromium and mercury, among other compounds) produced by the entire country, yet have the lowest rate of treatment and disposal of such sludge- only 2 percent.[62]

Regardless of both an overall decrease of industrial production and the associated reduction of emissions into the environment, violations of air quality standards were reported in 208 cities and towns surveyed in 1994. Cases where concentrations were over 10 times higher than the air quality standards were reported in 83 cities. While there is an overall favourable trend in the national air quality over time, negative trends have been observed in some of the biggest cities. There has been 13% overall reduction of emissions into the atmosphere in 1994; however on the single-source level about 4,000 enterprises (25% of all enterprises for which emission estimates are available) further increased their emissions. Negative trends have been reported for water quality. The number of water bodies with severe violations of water quality standards is gradually increasing. Contamination was detected in 1993 in approximately 5% of the ground-water supplies used by industrial and municipal

systems. About 10% of ground-water intakes have reported exhaustion of water supplies. Approximately 20% of the drinking water samples taken in 1990-94 did not meet chemical safety criteria, and 11-13% of the samples showed microbiological problems. The level of pollution of the coastal seas is constantly high.[63]

About 80 billion tons of industrial wastes have so far been accumulated in Russia, 1.1 billion tons of this amount being toxic wastes. Over 120 million tons industrial toxic wastes were accumulated in 1994 alone. Examples of more specific environmental problems present in Russia are the contamination of drinking water with dioxins, biological contamination and introduction of undesirable species, and electro-magnetic pollution. Industrial accidents are still a major problem; [64] the recent oil and natural gas spills in the Komi Republic serve as examples. Combinations of various environmental problems account for the unhealthy environment in many areas of Russia, including virtually all big cities and urban agglomerations, the European North of Russia, the catchment basins of the Baikal Lake and the Great European Lakes (the Ladoga and the Onega lakes), the Caspian and the Black seas, the Ural and Kuzbass regions, and numerous areas polluted as a result of the Chernobyl accident.[65]

7.Energy

The coal industry of the industrial heartland is clustered in several regions of the Urals and Siberia-most importantly, the Urals basin in Cheyabinsk Oblast, the Kuznetsk basin (Kuzbas) in Kemerovo Oblast, and the Kansk-Achinsk basin west of Krasnoyarsk. The region's coal industry has experienced a precipitous decline in output in recent years as a result of a decline in state investment, a collapse in industrial consumption and rising transportation costs. Coal companies in Chelyabinsk and the Kuzbas continue to work many problem mines by dint of massive subsidies from the federal government, which fears the social and political repercussions of massive unemployment. The proportion of overburden to salable coal extracted is excessive. Mine operators do not backfill exhausted works, but discard waste rock in huge cone tips. Acid drainage has polluted local surface water

resource, while mine-water pumping has lowered the water table in many locales. Subsidence has imperiled some cities and towns, most notably those in the Prokop' yevsk areas of the Kuzbas. Deep mines in and around Novokuznetsk have a rather high gas content, and in some cases the estimated energy value of the methane presently vented into the atmosphere exceeds that of the coal mined.[66]

The Volga-Urals basin has been an important oil-producing region for the past 70 years. Major oil refining and petrochemical complexes can be found in the republics of Bashkortostan, Tatarstan, and Udmurtia as well as in Saratov, Volgograd, and Astrakhan oblasts. Six of the ten most polluting oil refineries and the three most environmentally hazardous chemical and petrochemical plant in terms of air pollution are located in the Volga basin. Oil field in the Volga-Urals area are 60-90 percent depleted and the direct environmental impacts of oil production in the region should decline in the future. [67] Environmental performance in these sectors have been poor because of cutbacks in maintenance and the unstable operating regimes caused by economic dislocation.

Russia's most important oil and gas producing region lies along the northern reaches of West Siberia. Tyumen Oblast alone accounts for two-thirds of Russian oil production. According to one Russian forestry expert, oil and gas development has affected 30-50 per cent of the taiga in Western Siberia.[68] The number of accidents at well sites and along oil and gas pipelines has been increasing in recent years as a result of the overall aging of the capital infrastructure and a decrease in maintenance and safety practices. In 1994, the accident rate on main pipelines increased by almost 20 percent. [69] In 1992-93, 20 major oil spills occurred in Tyumen' Oblast alone. This has resulted in serious contamination of many rivers in Western Siberia, including the Tool, Irtysh, Ob, and Tom-a problem that has worsened in recent years with the deteriorating state of the region's oil transport infrastructure. As oil fields have been depleted, development has extended northward toward the Yamal Oblast, the use of heavy equipment and indiscriminate driving patterns have devastated the Tundra. Geological prospectors have seriously degraded areas not in production. A decline in

reindeer population has been attributed to the region's expanding network of pipelines, which has interrupted their migration patterns.[70]

Nuclear energy is an important source of energy in Russia, but the decline in state funding and continuing use of obsolete technologies without adequate safety devices is an immense cause for concern. The Chernobyl disaster has cautioned the international community about the hazards to human life and health from nuclear reactors. As a result of the Chernobyl accident, over 50,000 square km of Russian territory (1.5% of the area of the European part of Russia) has been polluted with radionuclides, with radioactivity exceeding 1 Ci per km square. An area of 310 km square in the Bryansk oblast is polluted with radioactivity with the 1993 level of up to 40 Ci per km square. [71]

Over 1,500 local patterns of radioactive pollution were detected in 53 of 98 cities surveyed in 1993. As a result of radioactive ore extraction and fuel preparation for nuclear power stations, 60,000 ha of land had been contaminated with radionuclides by 1993. Approximately 1,500 million Ci of solid and liquid radioactive wastes are currently stored at radio-chemical plants. High-radiation solid wastes (13 million Ci) are stored at 24 dumping sites. Another 200 dumping sites contain 30,000 Ci of medium- and low-radiation liquid wastes. Radioactive wastes from military and naval installations continue to be a significant threat to the environment. Nuclear-powered submarines are found to generate radioactive wastes whose disposal is an immense problem for policu-makers. [72]

8.Ozone Depleting Substances :

There is a general recognition of upper atmosphere ozone depletion in the mid-1980's which has led to a substantial international effort to phase out Ozone Depleting Substances (ODS). These include chlorofluorocarbons (CFCs), halons, several halogenated solvents, and a class of transitional chemicals known as hydrochlorofluorocarbons (HCFCs). The basis of this effort is the 1987 Montreal Protocol, ratified by all developed and most developing countries. Further recognition that ozone depletion is occurring more rapidly than first anticipated has led to two protocol amendments which add to the list of ODS chemicals and accelerate phase out. The first in June, 1990 (London Amendment) added the two

solvents, methyl chloroform (MCF) and carbon tetrachloride (CTC), and tightened the phase out schedule. The Copenhagen Amendment in November, 1992 added HCFCs and methyl bromide as regulated substances, and further accelerated the phase out. Production levels of transitional HCFCs are frozen as of January 1996 with progressive reduction to phase out on schedule.[73]

Russia is one of the world's largest producers and consumers of ODS. In 1990 when production peaked, it was estimated that 198,000 mt was produced, accounting for between 15 -20% of world production. In 1992, Russian ODS production had fallen by 26% to 146,500 mt. This production supplies 100% of the domestic market, as well as the requirements of the countries of the FSU, and other export markets that continue to exist. Russian domestic consumption also peaked in 1990 at approximately 70,000 mt and had fallen by 40% to 48,365 mt in 1992. Consumption continues to decrease primarily due to the economic downturn and, to a lesser extent, phaseout action that has been taken. Five sectors account for Russia's ODS use: aerosols (46%), refrigeration and air-conditioning (27%), solvents (14%), foams (11%) and fire protection (2%). The Former Soviet Union (FSU) ratified the Montreal Protocol in November, 1988 as a developed country. The Russian Federation continues the FSU membership in the Protocol and in January 1992, Russia ratified the London Amendments. However, ratification of the Copenhagen Amendments has not occurred. Based on its ratification status as a developed country under the Montreal Protocol, Russia's obligations for ODS phaseout are in accordance with the accelerated developed country schedule for halons and for CFC, CTC and MCF.[74]

Russia recognises its legal obligations as a developed country signatory to the Montreal Protocol respecting targeted ODS phase out schedules. However, the country's economic capability to complete this task has declined significantly, since ratifying the London Amendments in 1992. As a consequence, it has fallen behind in phaseout activities and will not be able to meet its phaseout schedule obligations. A number of steps have been initiated to ensure that its obligations are met. Responsibility for ODS phase out activities has been assigned to the Ministry of Environmental Protection and Natural Protection.[75]

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[19] Money incomes in Magadan are nearly triple the countrywide average, and in Moscow City are 25 percent larger. ibid.

[20] ibid.

[21] The Black Earth region is one part of the Russian South that is not projected to experience substantial population growth because of the predominantly aging, ethnic-Russian character of the rural population. –Ministry for Environmental Protection and Natural Resources (MEPNR), 1992, p. 27.

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CHAPTER 5 - STRATEGIES FOR SUSTAINABLE DEVELOPMENT

The system of environmental management in the former Soviet Union has been characterised as fragmented and uncoordinated with more than ten government agencies having some responsibility for environmental concerns. The long-standing problem has been that the implementing ministries and overseeing government bodies had a built- in conflict of interest in being responsible for both economic targets and environmental protection. Several reorganisation attempts to further integrate environmental management under the present Ministry of Environmental Protection and Natural Resources (MEPNR) have had limited success in providing better coordination and regulatory capacity. This is mainly explained by the legacy of centralised management of the economy that emphasised production over efficiency, concentrated pollution-intensive industries in enormous complexes, compartmentalised decision-making, and treated natural resources as free goods.[1]

The failure of the previous, centrally planned Soviet system to efficiently and effectively manage regional economic development and environmental issues was implicitly recognised in the Russian Federal Treaty of March 14, 1992, that formally devolves much of the former powers and resources of the central ministries and committees in favour of regional and local level agencies. The trend toward decentralisation has major implications for solving environmental and natural resources management problems. These changes, while creating much uncertainty and confusion, also present unprecedented opportunities for providing strategically targeted support and assistance, based on sound economic, social, environmental, and natural resource management principles.[2]

While environmental protection legislation and institutions were being developed during the Soviet era, both at the central level and in the republics, environmental objectives in general remained secondary to industrial production objectives. The limited financial and other resources earmarked for environmental protection, the lack of enforcement of environmental norms and regulations, and the use of censorship and other means to control public information on the environment

contributed to weak implementation of these policies. Generally, the government largely ignored the growing environmental problems and public environmental concerns. However, there were some notable exceptions to the practice during the Soviet era, particularly with protection of wildlife and forests, and efforts to ensure safe drinking water. A shift in Soviet policy occurred in 1986 and 1988, when efforts were increased to rationalise the use of natural resources and protect the environment. Incentives for decreasing material and energy inputs per unit of output were introduced. While economic imperatives were the primary driving force behind the new policy, the growing costs to the environment were also increasingly being appreciated.[3]

In 1988 State Committee of the USSR for the Environmental Protection (USSR "Goskompriroda") was established in order to modernise the conservation and regulation of natural resource use. In 1990, this State Committee was refashioned into the Ministry for Nature Use and Environmental Protection of the USSR (USSR "Minpriroda"). The MEPNR was initially subordinate to the Union Ministry but emerged in its present form after the dissolution of the USSR in 1991. Under MEPNR there is a system of environmental or ecological committees at regional level -- i.e., for republics, oblasts, krais and okrug -- and at local or municipal level, which are responsible for the detailed implementation of policies and regulations in the sphere of environmental protection. In practice, progress in implementing policies has been slow and inconsistent. The MEPNR and its regional bodies have met strong resistance from other Ministries, State Committees and agencies, which were previously responsible for environmental issues within their respective sectors.[4]

Objectives of Environmental Management in Russia

The objectives for sustainable development and environmental management in Russia are to:[5]

(a) Incorporate environmental and natural resource management concerns directly into the economic, social and political adjustment process at the federal and regional levels of government, including the executive and legislative branches.

(b) Strengthen and streamline institutional and organisational structures for environmental and natural resources management.

(c) Improve environmental and natural resources policy and strategy formulation and implementation.

(d) Upgrade environmental and natural resources management systems, and to encourage implementation of Environmental Management Systems (EMS).

(e) Strengthen financial delivery mechanisms to address priority environmental management investment needs through the setting up and initial capitalisation of a National Pollution Abatement Facility (NPAF); and

(f) Facilitate the flow of donor and multilateral funds and resources to the environmental protection sector.

The strategy for environmental management consists of the following **five principal components:**[6]

(1) Institutional and Policy Strengthening, including the following two subcomponents:

(a) Policy and Regulatory Support and
(b) Environmental Epidemiology

(2) Water Quality and Water Resource Management.

(3) Hazardous Waste Management.

(4) The NPAF for funding economically and financially viable pollution abatement projects and

(5) The Centre for Project Preparation and Implementation (CPPI) under MEPNR.

An integrated approach to regional environmental management will be achieved through the Policy and Regulation Support Component, which will closely link with the other technical assistance components in identifying, developing and setting policies and regulations for implementation by regional environmental regulatory agencies, and at federal level. The **specific benefits** that are expected to accrue as a result of a sustainable strategy are as follows:[7]

(1) The establishment of national databases and standardised methodologies and systems for the collection and verification of environmental health and hazardous waste generation data for policymakers at the national and regional levels.

(2) The upgrading and adoption of overall environmental action plans based on environmental health priorities at the national level and in the Upper Volga and Urals regions.

(3) The development, implementation and adoption of specific action plans for water quality and resource management in the Upper Volga, Urals and North Caucasus Regions, and implementation plans for

(a) iron and steel

(b) non-ferrous metals

(c) oil refining and petrochemicals

(d) basic organic and inorganic chemicals and

(e) agriculture with particular attention to intensive livestock operations

(4) The formulation and adoption of improved regulatory systems and enforcement mechanisms for water quality and water resource management in the Upper Volga and North Caucasus regions; for hazardous waste management in the Upper Volga region and for environmental assessment at the national level.

(5) The dissemination of the experience and the results of environmental projects to other regions in the Russian Federation through a national outreach programme.

(6) The establishment and management of national facility to fund investment in pollution abatement and improved resource utilisation and recovery. The effectiveness of this Facility will be judged on the basis of the amount of private loan and equity funds it is able to leverage for pollution abatement, the extent of pollution reduction achieved through its investments and its ability to address pollution priorities identified under items (2) and (3) above.

(7) The improved organisation, management and training of staff of environmental regulatory agencies at the federal level and in the Upper Volga, the Urals, and the North Caucasus regions and

(8) Facilitating donor participation in the environmental sector in Russia through the establishment of a Centre for Project Preparation and Implementation, and donor involvement in project workshops.

Impediments to Sustainable Environmental Management

The main impediments that Russia faces may include:[8]

(1) The fragmented decision making process for environmental management at the federal and regional levels.

(2) The shortage of experienced and qualified Russian specialists in environmental economics, environmental engineering and law.

(3) The poor environmental regulation enforcement capability of the legal system in Russia.

(4) Conflicting mandates and lack of cooperation between government agencies and even between departments within the same agency.

(5) Possible delays in project implementation due to a lack of familiarity with procedures and the requirements of project management in general.

(6) Difficulties in arranging local cost financing for pollution abatement.

(7) Potential adverse impacts of high inflation on environmental projects.

(8) Arrangements for promoting inter-agency cooperation for environmental management and government's strong commitments to environmental quality improvement (usually because of strong local community pressures).

(9) Comprehensive training programmes to improve skills in environmental policy and regulation, as well as in the technical areas of environmental Epidemiology, hazardous waste, water quality management and project management. The use of twinning arrangements with foreign institutes may ensure practical application in the development of these skills. Trained personnel could also be delegated to work at regional and federal level to transfer their skills.

(10) Cooperative arrangements for pollution abatement at major polluting enterprises and negotiations with them for appropriate incentives for compliance with agreed pollution permit schedules.

Environmental Legislations in Russia

An important reason for environmental degradation is the inconsistency or misuse of environmental legislation, although its development has a rather long history. The first acts relevant to the protection of areas appeared in Russia during the 1880s in the form of hunting, land use and forestry regulations, followed by the first conservation measures in 1909. The first legislation of an environmental nature, however, was adopted as early as the 14th-17th centuries, when forests along the southern boundaries of the Russian State were granted special protection (WCMC 1991). Legislation on protected areas appeared in 1921 in the form of a decree of the Council of People's Commissars entitled *Protection of Natural Monuments, Gardens and Parks*. In 1960 the law of the Russian Federation On Environmental Protection in the RSFSR was adopted, followed by a set of separate acts related to the protection of land (1968), public health (1965), waters (1972), mineral resources (1975), forests (1977), the atmosphere (1982), and wildlife (1982). These laws tended to be general and are often considered to have contained weak sanctions with regard to infringements and hence to have had little impact. However, they have played an important part in creating the foundation of the contemporary system of environmental legislation. [9]

Currently, several hundred acts, presidential decrees, enactments of the government, ministries and sectoral agencies provide regulations in the field of environmental management.[10] The fundamental law *On the Protection of the Natural Environment* was enacted in 1991. The law was regarded as setting a foundation for more specialised environmental acts. However, the 1993 political crisis and the following adoption of the new Constitution have made the 1991 law partially inadequate with regard to the new conditions. For the time being, the 1991 law remains the main general environmental act in Russia.[11] Besides this fundamental law, a set of new specialised acts has recently been adopted, which comprises the laws On Mineral Wealth, On Sanitary-Epidemiological Public well-being, On Protected Areas, On Wildlife, as well as the Principles of Forest Legislation, the Land Code, and the Principles of Health Protection Legislation. Plans exist for the modifications and adoption of additional acts in the near future, including the Water Code, the law On Federal Natural Resources, and laws on wastes, protected ecosystems, environmental and radiation safety, drinking water, air protection, environmental insurance, payments for natural resources, environmental education, environmental management, and ecological security. Presidential decree No. 236 of 04.02.94 *On the State Strategy of the Russian Federation for Environmental Protection and Sustainable Development* required the elaboration of the Governmental Environmental Action Plan for 1994-95, which was approved by the governmental edict of 18.05.94 No. 496.[12] In 1995, new legislation (Law on Specially protected Natural Areas) was enacted governing all categories of protected land and water areas in the Russian Federation. This law establishes seven categories of protected areas in Russia, and stipulates for each specific management policies.[13]

Chapters related to environmental problems are also present within acts, which regulate the status of enterprises and business activities, consumer rights, local self-government, and taxation. Relevant chapters already exist in the current Criminal, Administrative and Civil Codes, and up-to-date environment-oriented modifications are further being made to previously adopted and newly-drafted general legislation.[14] The Russian Federation currently participates in 21 international treaties, agreements and conventions on environmental protection, and this number

can be increased to over 70 if taking into account binational, regional, and international agreements which are indirectly related to the environment.[15] In addition, the territories of Russia can issue their own acts devoted to the environment and natural resources on the issues that fall under joint federal/territorial jurisdiction according to the Constitution. Despite the considerable number of acts in force, the number of violations of environmental regulations remains very high. Possible reasons for this are the incomplete harmonisation of existing acts, and the lack of an efficient mechanism of law enforcement, including economic incentives. The complexity of the system of environmental responsibilities of the various state agencies further complicates the situation.

Up to the beginning of the 1970s, environmental management in the USSR, and hence in Russia, was performed primarily by sectoral agencies, each responsible for specific natural resources (e.g. waters, forests, land, minerals). Inter-sectoral monitoring was provided by the sanitary and hydrometeorological systems. In 1972 a decree was issued jointly by the Central Committee of the USSR Communist Party and the Council of Ministers to strengthen environmental conservation and to improve the use of natural resources. Consequently the Parliament and the Government of the USSR were made formally responsible for developing strategies for environmental management, and environmental departments were established within the system of the State Planning Committee both at central and territorial levels. This gave rise to the development of a set of environmental action plans for the country as a whole and for the separate territories, aimed at both integrated and sector-oriented environmental management. The environmental protection planning was then formally incorporated into the USSR state planning system, and various environmental management functions were delegated to over 15 different agencies. [16]

In 1988 the administrative structure was streamlined and simplified with the creation of the USSR State Committee for Environmental Protection, which was made responsible for co-ordination of environmental activities throughout the entire USSR. A corresponding branch in Russia was also established. In 1991 the latter became the Russian Ministry of Ecology and Natural Resources. The USSR ministry

ceased to function in autumn 1991, having left its Russian counterpart as a separate and independent body, the present title of which is the Ministry of Environmental Protection and Natural Resources of the Russian Federation. The present-day Russian system of environmental management incorporates elements of virtually all-existing branches of power.[17] The Inter-Agency Commission on Ecological Safety works under the Presidential Security Council to provide advice and consultations. Environmental legislation is prepared by the Committee for Ecology and the Committee for Natural Resources and Environmental Management of the lower house of the Parliament (the State Duma). The permanent Higher Ecological Council, consisting of distinguished experts in environmental sciences, has been formed under the auspices of the State Duma to provide advice. Co-ordination of the environmental activities of the various agencies is performed by the Governmental Commission for the Environment and Natural Resources.[18]

According to current legislation, the Ministry of Environmental Protection plays a central co-ordinating role in the system of agencies involved in and responsible for solving particular environmental problems. Besides general co-ordination, the ministry performs management functions with regard to protected areas of federal importance, issues regulations on environmental protection and management and environmental permits, performs and co-ordinates environmental monitoring, and manages and disseminates environmental information.[19]

Environmental Information Capacities, Institutional Structure And Data Generation Activities

The two main institutions which collect environmental data relying on their own observation networks are the Sanitary Committee and the Agency for Hydrometeorology. The Committee for Statistics is responsible for the compilation of self-reporting information from enterprises and territories, thus complementing the monitoring data on environmental quality. The Ministry of Environmental Protection is entitled to co-ordinate environmental monitoring activities of these and other sectoral agencies, each of which is responsible for a specific sector, natural resource or problem. The Ministry of Environmental Protection operates a system of 89

territorial agencies, over 240 analytical centres (special inspectorates), 21 marine inspectorates, and over 20 research institutes. The ministry checks the compliance of wastewater (over 17,000 pollution sources, 17-60 parameters), gas effluents (1 million pollution sources, 20 parameters) and solid waste composition and allocation practices with issued permits and/or established standards. It also monitors the state of wildlife and vegetation in federal nature reserves and records the state of rare and endangered species. The ministry is also responsible for the registration of all kinds of protected areas in Russia. The ministry collects statistical reporting data on emissions into the atmosphere, wastewater discharges, and toxic wastes. Some local offices, depending on their capacities, undertake more comprehensive monitoring programmes, e.g. testing the water quality of selected aquatic systems.[20]

Together with the Committee for Land Resources the Ministry of Environmental Protection is responsible for land quality monitoring The Agency for Hydrometeorology is responsible for the monitoring of air, water, and soil quality, as well as for impact and background monitoring. In addition, a decision has been taken to expand the already existing network of solar radiation measurements into a national solar radiation monitoring system, with particular reference to ultra-violet radiation. The latter will include 6 on-the-ground stations and will make use of Russian and international meteorological satellite data.[21]

Other prospective networks may be devoted to the monitoring of dioxins and greenhouse gases. The federal programme- *The Development of a System of Hydrometeorological Support of the National Economy in the Russian Federation* is aimed at maintaining the capacities of the agency. The agency is also responsible for licensing the environmental pollution monitoring activities in Russia. Since 1957 the agency has been responsible for maintaining the State Data Bank of Hydrometeorological Information (later renamed the State Data Bank on the State of the Environment), which officially forms part of the State Archive Fund. The responsible institution is the Research Institute of Hydrometeorology - World Data Centre. The agency provides access to certain kinds of satellite imagery through its NPO Planeta.[22]

The Sanitary Committee was among the first agencies in Russia to begin the collection of environmental contamination data. The initial concern was the impact of environmental quality on public health. Currently the committee operates a system of over 2,500 territorial and transportation centres and 2,600 sanitary offices which collect data on raw and drinking water quality, contamination of air and soil in settlements, urban sources of environmental impact, quality of sold, produced and imported food and consumer goods, toxic and microbiological contamination of food, indoor air quality, physical factors of environmental quality (noise, vibration) in urban and industrial areas, radiation doses, epidemics, sanitary status of territories.[23]

To assess the environmental impact on public health, health statistics are collected from health care institutions. The sanitary monitoring activities are outlined in the governmental decree of 06.11.94 No. 1146 *On Socio-Hygienic Monitoring*, by which the committee is also entitled to maintain the corresponding data bank. The Committee for Geology, with its 3 regional (sub-national) and 53 territorial centres, over 200 prospecting and research enterprises and 60 specialised enterprises of hydro-geological and engineering-geological monitoring, operates a network of 18,000 wells and polygons for monitoring ground water quality and 15,000 sites for monitoring natural geological hazards.[24] The Committee for Land Resources comprises a dense network of territorial committees of land resources which survey and regulate land use on the sub-national level. It collects data for soil fertility, swamping and salinisation, state of agricultural lands, soil pollution with heavy metals, pesticides, radionuclides, and other toxicants, hazardous exogenous processes, state of land under intensive industrial, transportation or urban use.[25]

An important source of raw data directly related to the state of the environment is the remotely-sensed data from USSR/Russian satellites. Raw or processed aircraft and satellite imagery in either analogue or digital form is available from the Agency for Geodesy and Cartography through the State Centre Priroda and through some of its local enterprises. Of special value for environmental purposes is the multiband photographic imagery of high spatial resolution, like that derived by the RESURS-F1/F2 satellites. The Agency for Hydrometeorology supplies images

from meteorological satellites, as well as from the OCEAN and the general-purpose RESURS-O platforms. In addition, the inter-departmental SovInformSputnik agency has been established for the release of the disclosed (mainly panchromatic, but very high resolution) imagery from military satellites.[26]

The limitations to environmental information and data include the inability of the territories to allocate necessary funding, the absence of environmental management experience which would be relevant to the new economic conditions, and, finally, the reluctance of some officials to set up inventory mechanisms for the use of the natural resources which are under their control. The most important problems associated with the development of environmental information systems and products in Russia are the lack of co-ordination, product incompatibility, and the abundance of parallel projects. These are accompanied by an overall decline in activity. A special problem is the lack of metainformation: although certain metainformation sources do exist, their comprehensibility and reliability is far from satisfactory.

Professional And Public Use Of Environmental Information

One of the main kinds of environmental activities to be supported by the state system of environmental information is the supervision and enforcement of compliance with environmental regulations. The supervision is carried out by federal and local authorities, as well by the Ministry of Environmental Protection, the Sanitary Committee, the Prosecutor Offices, the Ministry of Internal Affairs, the Ministry of Agriculture, the Committee for Fisheries, the Committee for Land Resources, the Agency for Forestry, the Supervisory Board for Mining and Industry, and the Supervisory Board for Radiation Safety. The ultimate goal is a gradual improvement of the state of the environment, while practical aims may be the termination of dangerous operations or the collection of fines to finance specialised funds. Decisions most often made in the course of supervision are concerned with initiation and carrying out of administrative, disciplinary or criminal investigation, imposing fines, limiting or termination of certain activities, issuing/cancellation of licenses for the use of natural resources (including air emission, wastewater or solid

waste allocation, acceptance/rejection/correction of construction and development plans and operation procedures.[27]

Environmental information is also used during the preparation of environmental impact assessments required for many projects or activities able to negatively affect the environment, including concepts, plans and programmes of sectoral or territorial development, natural resource use and protective programmes, urban development and construction projects, construction, reconstruction and technology renovation projects, regulation documents etc. In the case of court trial hearings connected with environmental problems, environmental data are used as evidence, although related experience is still controversial and limited.[28] Related problems and data requirements are associated with the introduction of environmental insurance, which is supported by the law On the Protection of the Natural Environment. Environmental information is widely used for justifying a special environmental status of a territory, including the classification as a "zone of environmental emergency" or a "zone of environmental disaster", or for supporting the establishment of protected areas.[29]

The draft law On Protection of the Environment in the Russian Federation suggests the introduction of a "post-project monitoring" aimed at the "verification of preliminary forecasts of environmental impact", and of a system of "independent external environmental audits" of enterprises. Both initiatives seem to be data-demanding. In relation to the appearance of a realty market in Russia, the attention to environmental conditions in evaluating the cost of property will undoubtedly grow further. The variations of environmental quality already play an important role in realty assessments, e.g. in Moscow. Another kind of use of environmental data is associated with the transfer to international organisations, as well as with data utilisation and analysis within various research projects.[30]

Except for research projects, the routine methodology of environmental data analysis is not very advanced as yet. Statistical and modeling approaches are not common in routine practice, with the exclusion of the Agency for Hydrometeorology.

Officially certified models of pollutant transport in the atmosphere and in the aquatic environment do not reflect the present-day state of knowledge in the fields. The culture of field model calibration and verification in everyday practice is not widespread. On the other hand, quite sophisticated analytical and modeling techniques and approach have been developed in research institutions across Russia. Their implementation is impeded not only by the absence of proper approval mechanisms for new developments, but also by the inability of decision-makers to understand the procedures and to properly use their outcomes.[31]

According to different estimate there are several hundred *to several thousand public environmental groups in Russia,* varying with respect to their attitude to problem-solving from 'eco-fund environmentalists' to pure pragmatics.[32] One of the old groups is the Russian Society for the Conservation of Nature, which started its operation in 1924. NGO activities vary at present from local protest actions to broad-scale environmental public hearings and assessments. Many of these groups are aware of existing sources of environmental information and make use of them, although NGOs do not usually trust official information. In their turn, many officials are extremely reluctant to supply any data to public groups for fear of improper and prejudiced interpretation.[33]

Environmental education

Environmental education forms a basis for the literate environmental information user community. General environmental programmes are being introduced at all levels of education, including pre-school (kindergarten), primary to high school, technical colleges, and institutions for higher education. The theory and methodology of environmental education are dealt with at about 140 institutions under 60 sub-programmes within the programme Ecological Safety of Russia. Scientists and specialist in ecology have been developing on ecological education concept and experimental models for secondary schools pupils for number of years.[34]

Several variants of these models like "Ecology and Dialectics" (the author – Tarasov, MGIUU) and many others, elaborated on the base of out-of-school work

(MGDP&S, MGCUN) were tested in a number of Moscow schools in 1996. 3 main models for school were defined: one-subject, many-subject and mixed. According to these models there have been elaborated new educational courses with ecological content, to be taught within the curriculum, as well as out-of-school work. The Moscow city ecological fund ("Mosgorecofond") sponsored the publication of some textbooks and school-appliances on ecology for secondary school, there was published literature on ecological pre-school education (magazine "Reed-pipe" ("Svirel"), "Reader in Nature Study", "Environment", school exercise-books "Town Ecology", video films on ecology, etc.).[35]

Great opportunities in the field of ecological education of schoolchildren appeared with the introduction of the new course "Moscow Study" ("Moscvovedenie"), which is the realisation of the programme "Renovation of Humanitarian Education in Russia". In Moscow, institutions of elementary and secondary professional education ecological training was carried out in the following directions: - establishing ecologically-orientated of specialties and professions;

- the creation of specialised educational institutions, training specialists in the field of industrial and agricultural ecology;
- the elaboration, inculcation and improvement of ecological component in professional education;
- training and raising the level of pedagogical staff's skills in the field of ecology.

At 'ecologically-orientated colleges' and technical schools training for the following specialties takes place: "Environmental protection and rational use of natural resources", "Atmosphere protection at enterprises", "Exploitation of equipment and water-supplying and water-allotting systems", "Monitoring of air pollution", "Monitoring of water pollution", "Monitoring of soil pollution". Certain ecological subjects are also included into the curriculum of non-ecological technical schools and colleges. Intensification of ecological training in all fields and specialities takes place at higher professional schools. There has been formed a list of ecological specialities for which Higher Educational Institutions train specialists in ecology. The educational methods maintenance, worked out within the framework of

the state programme "Ecological Safety of Russia" (1993-1995), is widely used in the multi-level system of higher education.[36]

In their last years of study, students begin to concentrate on questions connected with their future professional activity, concerning the interaction between man and technosphere. With this purpose into the educational-professional programmes of all fields and specialties of higher professional education, there have been included the subject "Life Safety", which has the purpose of giving the students knowledge and practical experience, which is essential for creating safe and harmless conditions of life; projecting new equipment and technological processes in conformity with modern requirements of ecology and safety of their exploitation; making prognoses and taking right decisions in emergency situations on protecting population, industry objects against possible consequences of accidents, catastrophes and natural disasters. This type of education and training has as its result the fulfillment of a special ecological issue in the graduation paper (projects) of VUS graduates.[37]

According to the ecological directions in higher education, adopted in 1994, training of specialists in ecological field is accomplished by the following higher educational establishments (VUSs): Lomonosov Moscow State University ("MGU"), the Moscow State Academy of Delicate Chemical Technology, Mendeleev Russian Chemical-technological University, Moscow State Technological University, Moscow State Engineering-physical Institute, Moscow State Building University and others. Since 1996, the "Ecotechprom" State enterprise has been holding a cycle of constantly functioning seminars "City ecology: problems and solutions", directed at improving ecological, economy- juridical and science- technical knowledge of listeners.

A number of secondary-/high-school institutions have introduced special environmental courses, e.g. Health and the Environment, Man and the Biosphere, Basic Biology, Human Ecology, Nature & Culture. Environmental problems are also being taught in the context of international school projects, i.e. international projects on river watch GREEN, and a project on domestic animals and acid rain, the KidNet.

A considerable environmental component is present in basic high-school courses in Biology and Geography. A separate compulsory course Ecology has recently been introduced in school curricula. Local and national Olympiads (contests) in Biology and Geography for school students have been arranged for years, a national Olympiad on the Environment has been held.. Environmental projects and camps are held in many parts of the country, including the All-Russian Summer School on Ornithology, Geo-Botany and Aquatic Ecology held on the Black Sea. A national competition for school students Water on the Earth was held in 1994.[38]

As regards the non-professional environmental education in the institutions of higher education, Biology and Basic Ecology course for science students and a Life Safety course for engineering students (which covers the issues previously taught within Occupational Safety, Civil Defence and Environmental Protection courses) are now being taught on a compulsory basis at the institutions of higher education. At the same time there are only a few institutions offering really advanced courses in environmental data analysis, environmental modelling or environmental decision-support. Nevertheless, in spite of the economic difficulties, the Russian educational system, with its deep traditions, numerous links to industry, government, the business and research community, and its highly-qualified personnel, has much to offer with regard to the development of environmental information systems and networks.[39]

Media remain an important mean of distributing environmental information and knowledge. The central environmental newspapers Zelenyy Mir (The Green Wood, 40,000 copies, more then 20 issues a year), Spaseniye (Salvation), and the magazines ECOSInform (1,000 copies), Eurasia-Monitoring (2,000 copies), Ekologic skiy Vestnik Rossii (Ecologica Bulletin of Russia), Svet: Priroda i Chelovek (Light: Man and Nature), Priroda (Nature), Bereg ya (Cherish-Goddess), Svirel' Reed-Pipe, children magazine, 15,000 copies) publish various environmental materials, including national state-of-the-environment reports. Over 50 environmental periodicals were published in 30 territories in 1993.[40] More than 100 popular periodicals devoted to local geographical and environmental studies were published regularly in 1990-93 Non-specialised periodicals and news agencies also pay

considerable attention to environmental affairs, though the publication lost a lot of interest in the environment in recent years. A number of environmental programmes are broadcasted at central and local TV and radio stations (eg. People's Earth, Ecological Microphone). Again, the pronounced lack of funding and the fact that environmental programmes and publications are not very attractive for commercial advertisers make the operation of such media extremely difficult. Some financial support is provided by the ministry of Environmental Protection, ecological funds and other external sources. A number of professional periodicals devoted to the environment experience face similar problems.[41]

Legal And Economic Framework

The framework for the generation, distribution and use of environmental information is defined by current environmental and information legislation, which is eclectic by nature and has not been comprehensively developed as yet . The new Constitution adopted in 1993 contains a number of statements directly related to environmental information problems. The most important innovation is the special regime of environmental data distribution. Besides the general rights of citizens to information expressed in article 24 (information affecting rights and freedoms) and article 29 (collection and dissemination of information, the Constitution directly states that "Everyone has the right to a healthy environment and to reliable information about its state" (42), and "The concealment by officials of facts and circumstances which threaten the life or health of people entails responsibility in accordance with federal legislation " (41 (3)).[42]

The law On the Protection of the Natural Environment, currently in force, states that the "designated agencies receive environmental information from other agencies, institutions, organisations and enterprises on a free-of-charge basis" (7). These agencies, in their turn, are entitled to provide the public with necessary environmental information (6, 7), including the annual national state-of the-environment report (6). Citizens and public groups have the right of access to

"timely, complete and reliable information on the state of the environment and on measures for its protection" (12, 13). Conditions should be provided for free, unrestricted international exchange of information on environmental research and engineering (92).[43]

Laws devoted to the protection of specific resource (e.g. air, water, land, forest, wildlife), or to the regulation of activities with substantial environmental components (e.g. civil construction, sanitary supervision) usually also contain chapters on related information activities. The laws On the Protection of Atmospheric Air in the RSFSR (45), On Public Sanitary-Epidemiological well-being (5, 32), On Mineral Wealth (27-32), On the Principles of Urban Construction in the Russian Federation 6, 8), On Wildlife (15, 16), Water Code of the RSFSR (104-108), Land Code of the RSFSR (109-111), and Principles of Forest Legislation of the Russian Federation (74-78) explicitly and in more or less detail regulate the collection and use of relevant data.[44] It is generally required that information collected and stored under state programmes (such as national monitoring systems or state cadastres) should be managed according to unified standards, and unconditionally used for official purposes. Relevant state agencies are made responsible for managing certain kinds of data by the above-mentioned acts, as well as by the corresponding Statutes, of which each one is devoted to a single agency, describes its functions, rights and responsibilities, and is approved by the government.

The problems associated with the current low level of funding of environmental information activities and of environmental management as such make it difficult to predict how soon the concepts introduced by the above-mentioned regulations will be implemented in practice, and how this will influence the performance of the respective agencies and institutions. A major contradiction is the fact that environmental data can be made completely open only if the government takes the full financial responsibility for data generation and information analysis systems. Otherwise, either no data will be produced or efforts will be made at every level to avoid their free dissemination.

Agriculture

The problems of agriculture and food security confronting Russia has been discussed in the previous chapters. To solve the problems arising in crop production the following measures need to be taken first hand:[45]

— to keep and support agricultural enterprises that specialise in crop growing;

— to raise the efficiency of agricultural enterprises;

— to introduce new technologies based on the most modern machinery;

— to establish special enterprises that will specialise in all–year–round production of disease –free seed material;

— to provide the private sector with high quality seeds of the best varieties.

__ to discourage monocultures and encourage crop rotation and fallow lands to regain the fertility of soils.

__ to use biofertilizers like mycorhhizza, and chemical fertilizers and pesticides must be discouraged.

__ to make optimum use of irrigation waters and construction of irrigation canals after adequate environmental impact assessments.

__to grow crops in conformance with local climate and soil resources. The cultural needs of the people must be respected.

The recent situation in agriculture in Russia is marked by the seed deterioration and by considerable amount of weeds, pests and diseases on the fields. The analysis shows that in the past 10–12 years the sowing of certified seeds of spring cereals and leguminous crops decreased from 93% to 78-80%. Sowing of seeds certified as the seed standard first grade has declined from 30% to 17% of the total seed material sown. As it often happens nowadays the companies and physical persons without special training or skills started to produce and, to sell the seeds without observing the most general agro-technical requirements of seed growing, the rules of seed treatment, storage and sales. As a result a big amount of the questionable quality seeds appeared on the market. The seeds of cultivators and hybrids, especially vegetables, of foreign selection are on sale that have arrived to Russia within the humanitarian aid and that are not adapted to growing under specific soil and weather conditions of Russia. Besides they do not have proper certificates proving their grade and sowing properties. All the above have resulted in an urgent need for laws and

regulations in seed production. In December, 1997, the Federal Law "On seed production" was adopted and by the Decree of the Government of the Russian Federation 1200 dated 15.10.1998 "Regulations of variety and seed control of agricultural plants in the Russian Federation" came into force.[46]

This Law has been developed on the basis of international practice. Taking into consideration the fact that modern seed production system is based on free market demands and in order to make the process better organised, the law establishes production requirements for certain seed grades as well as sales regulation for seed lots. The main provision of this law concerns the introduction of sector seed certification system. As adopted by the international practice all seeds appearing on the market, Federal and regional insurance funds included, must have certificates proving their grade and growing properties. According to the above Decree, seed certification is now the responsibility of the State Seed Inspectorate of Russia.[47]

During the mid-1970s, an interesting alternative production system was gaining both notice and respect. It was referred to as the **French-Intensive/Biodynamic method**, because it shared techniques and philosophies from both these European farming systems. In more recent years, the name has evolved to Biointensive Mini-Farming [BIMF]. A mini-farm is small. It looks like a large, diverse garden, with an arrangement of raised beds and paths rather than traditional rows. Equipment, such as rototillers, tractors and plows, is totally absent. (hand tools and hand implements are used: wheel hoes, string trimmers, etc.) BIMF is an organic system. Synthetic pesticides and soluble, commercial fertilizers are not used. Its organic character means less pollution of the environment and a more stable agro-ecosystem, where natural, biological control agents proliferate. Russian farmers are increasingly using this method for sustainable agriculture. [48]

The Ministry of agriculture governs the *agricultural restructuring process.* Local authorities are responsible for agricultural production. The Agricultural Service (AS) of the Ministry is the state information and advisory service. It operates at three levels: federal, regional and in districts. The AS helps agricultural producers and

processors to increase profitability and competitiveness using modern information and communication technologies. The AS is active both in the agricultural industry as well as in the regions. In 1990 farmers, agricultural scientists, journalists and people from the government established the Russian Association of farmers' enterprises and agricultural co-operative societies (AKKOR). This public organisation unites private owners to protect the interests of the farmers and small co-operatives against state agricultural farms and to promote the growth of the farmers' movement in Russia. AKKOR supports farmers in processing and marketing their products. AKKOR and some other companies established the Foundation for the Development of Rural Credit Cooperation. This foundation promotes credit co-operation development and founded with AKKOR the Union of Rural Credit Co-operatives who is active in attracting financial means for the development of credit co-operations. The Russian government allows foreigners to lease land for the purpose of farming. With the help of foreign technical and scientific assistance and financing Russia could become an important food supplier in the world.[49]

Forests and Woodlands

As far as forests are concerned, it is now apparent that new sources of financing will need to be found if they are to help in balancing the carbon budget. A growing number of developing countries have started to attract private investment for carbon sequestration, while a few industrial countries are beginning to draw upon public support for increasing forest area. One promising innovation that has emerged but is not yet widely employed is the partial use of carbon tax revenue to support forestry projects. Overall, carbon storage remains one of the most cost-effective yet least exploited means of slowing climate change. Russia has designated protected forest areas, because of the need to protect the local flora and fauna, and to help balance the carbon budget.

In Russia, *Zapovednikin* represent the primary type of nature conservation territories in the Russian Federation, and primarily function as scientific study areas and as "standards of nature (etalony prirody)".[50] Since the end of 1991, several significant trends can be seen with regard to the Russian system of zapovedniki. Their

number and area has increased greatly and many new reserves have appeared in locations where none previously existed. One incentive for the rapid increase in nature reserves since 1991 has been the moveemnt toward the privatisation of land, which has created sense of urgency in the creation of reserves out of state lands while the opportunity exists.[51] On the unfavorable side, funding for the preserves has been decimated, poaching of plants and animals has increased and the overall biological integrity of many preserves is declining or threatened. Many of the preserves have had to reduce their staffs considerably, maintenance is routinely deferred, scientific studies have been curtailed, and many preserves are having to engage in local (or even international) fund-raising just to survive. Salaries are often not paid in time and are discouragingly low to start with, by one account averaging only $100 to $200 (US) per month.[52]

It is not surprising that there has been a marked increase in the incidence of poaching on the preserves because of the general increase in criminal activities, and the decreased funding for internal security on the zapovedniki. This affects both plants and animals and is caused both by economic necessity on the part of nearby villagers, and by criminal elements who are happy to deplete Russia's natural wealth to feed the international trade in live animals, plants and animal parts.[53] The Siberian tiger is perhaps the best known example of a Russian endangered species that is in increased peril following the break up of the USSR but it is hardly alone. The decrease in funding and personnel and the increase in poaching activities has diminished the biological integrity of many of Russia's nature reserves. This means a deterioration in the quantity of local flora and fauna, or in the strength of ecological interrelationships or genetic diversity on the reserve, or in the health of the flora and fauna that likely that is there regardless of its numerical trend. In some of the more remote zapovedniki it is likely that not too much deterioration has occurred, but in reserves located closer to concentration of human population the situation is often critical.[54]

Climate change

A successful Protocol on climate change could be an important step in the long-term effort to protect the world from the most devastating effects of climate change. But even at best, it will provide only the broadest framework-the targets, timetables, reporting requirements, and trading mechanisms needed to deal with climate change-leaving it to national governments to work out the details. The success of this endeavour will therefore hinge largely on the policies undertaken by individual countries to reduce their emissions of greenhouse gases. International coordination could make these changes more attractive politically, overcoming the competitiveness arguments that have stalled unilateral efforts and building trust between industrial and developing nations.[55]

One of the most important overall lessons to date of efforts taken to slow climate change is that no single policy will by itself solve the problem. Adjusting energy prices to accurately reflect the environmental consequences of fossil-fuel use is arguably the most important policy, but that reform alone will not suffice. Many market barriers-from lack of information to the anti-competitive practices of some industries-impede the implementation of well-established climate-friendly technologies and practices. Accordingly, only a diverse portfolio of policies can ultimately reverse the growth of emissions. Government policies that traditionally play out in isolated chambers must instead be assembled into complex orchestras, coordinating a wide range of instruments, and working in concert toward a shared goal. [56]

Among the policies adopted so far, it is clear that the removal of energy subsidies has had the greatest short-term impact on emissions trends, in some cases contributing to sharp reductions. But this is largely a one-time effort, and many countries no longer have sizable energy subsidies to eliminate. Still in Russia, further cuts could have a great effect. And today's high subsidies for road use offer additional unrealised potential for lowering emissions. Experience shows that energy and emissions taxes can have a significant impact as well, but so far-with the partial exception of gasoline taxes, Russia has not found the political courage to add new energy taxes that really bite. Another useful lesson that can be drawn from the policy

record to date is the proven effectiveness of energy efficiency standards, although the slow turnover of devices such as automobiles and home appliances means that it will take time for their full impact to be felt. Unfortunately, progress in setting new energy efficiency standards over the past five years has been limited.[57]

Ozone depleting substances

Recent experience also suggests that rapid progress can be made in addressing other greenhouse gases. Incentives in a growing number of industrial and developing countries are beginning to encourage new technologies and processes to cut emissions of methane and nitrous oxide. HFCs and CFCs have yet to receive sufficient attention, but already there are signs that government regulations and required phaseouts could spur a speedy development of alternatives to these potent, long-lasting chemicals-much as the Montreal Protocol has sparked phasing out the use of ozone-depleting chemicals.

The Former Soviet Union (FSU) ratified the Montreal Protocol in November, 1988 as a developed country. The Russian Federation continues the membership in the Protocol and in January, 1992, Russia ratified the London Amendments. Based on its ratification status as a developed country under the Montreal Protocol, Russia's obligations for ODS phase out are in accordance with the accelerated developed country schedule for halons, CFC, CTC and MCF. Development of the ODS phase out Country Programme was completed in August 1994 with Danish support and World Bank technical input. A position paper based on the Country Programme has been prepared by MEPNR, describing an achievable phase out programme. This position paper and the Country Programme have been adopted by in a formal Resolution the Government, dated May 24, 1995 as the legal basis for its implementation. Assuming international financial assistance is available, production would be phased out on schedule. consistent with domestic consumption phase out schedules, and phase out in countries of the FSU to which Russia is the sole supplier, particularly Ukraine and Belarus.[58]

Russia has also established the basic institutional structure to support the administration of the proposed ODS phaseout programme. An Inter-Agency Commission has been created to coordinate ODS policy among all relevant government agencies with specific sub-commissions dealing with legal, technical, economic/institutional, and monitoring aspects. An ODS Task Force has been established by ministerial decree within MEPNR and an implementation unit has been established within the Ministry's Centre for Project Preparation and Implementation of International Projects on Technical Assistance (CPPI). The Task Force has been assigned overall responsibility for implementing the national phaseout strategy and to act as a secretariat for the Inter-Agency Commission. As documented in the Country Programme and designated in the Government Resolution Number 526, various policy and regulatory initiatives are currently under development within MEPNR including the issuing of production/import licenses, the introduction of sector Specific bans, and allocation of economic support for ODS replacement projects at the industry level from Russian and international sources. These institutional strengthening initiatives specific to the phase out of ODS are consistent with Russians overall commitment to increasing its overall institution capacity in environmental management. The country is currently investing US$60 million in such strengthening related to various environmental problem areas through the World Bank Environmental Management Project Loan.[59]

This brief history of climate policy, with its short but instructive record of successes and failures, makes it clear that it is far too early to despair for the future of any climate treaty. So, too, does experience with past international environmental agreements, which shows that governments are often slow to implement new treaties at first, but can then move into high gear and make rapid progress. The Vienna Convention to protect the ozone layer was originally passed in 1985, but it took two years to achieve a legally binding protocol, and several more years before steep declines in chlorofluorocarbon (CFC) production occurred as the protocol was strengthened by subsequent amendments. The climate convention is on a slower track, but that is hardly surprising, given the central role that fossil fuels play in today's economy, and the power of the industries that supply and use them.[60]

Urban Development

The Moscow region is one of the largest regions in the world, its growth and development are inevitably accompanied by occurrence of a number of urgent problems, among which the second place is taken by the ecological problem after criminality. In September, 1994 the government of Moscow adopted the "Integrated Ecological Programme of Moscow" for the period till 2005. The government of Moscow has designated the priority directions of work in the field of environmental protection. It is the rigid control over motor transport exhaust and industrial waste release, the use of lands of all categories on the territory of the city, the state of surface waters, the dumps of polluting substances, the formation of wastes and their processing, the introduction of new processing equipment at enterprises . However solving ecological problems is not only the task of different governmental bodies, it is impossible to solve these problems without the participation of the whole society.[61]

The Government of Moscow has allocated 23 million roubles on the accomplishment of courtyards and entrances. In 1998 this money was spent on the realisation of the urban programmes " My Courtyard " and " My Entrance ". During the realisation of the programmes, planned for 3 years, the city administration intends to properly organise all the inhabited sectors of Moscow. The success of these programmes will change the city and make it comfortable for the residents. However without the participation of the public all the efforts are doomed to failure as it happened to campaigns which were carried out during the previous years. The accomplishment of court yards and entrances should unite all Muscovites and raise the organisation of life to a new level.

The Moscow Committee for the Environmental Protection and Natural Resources ("Moscompriroda") continued the work begun in 1995 for establishing direct bilateral relationships with the former USSR countries' environment protecting organisations – Belarus, Kazakhstan, Kyrgyzstan, some European cities. Work on implementing the "Agreement on collaboration in the field of environmental protection between Moscow Committee and Senate Department on city development

and environmental protection of Berlin" signed in August, 1995 was continued. The Committee takes part in the realisation of a number of international projects on technical assistance, that industrially developed countries offer to Russia.[62]

Moscompriroda jointly with the Department of Internal Affairs of the Moscow City Government held negotiations with the representatives of the consulting company Price Waterhouse and the World Bank for attracting credits from international financial organisations and private investors for solving Moscow ecological problems. The effort towards the entry of Moscompriroda into international organisations, dealing with environmental protection, was continued. The Committee's representative participated in the conference "The Role of Local and Regional Authorities in Environmental protection in Cities", organised by the Congress of local and regional authorities of Europe (CLRAE) with financial assistance of the Council of Europe. It is planned, that Moscompriroda will become more active in its work aimed at setting up direct contacts with a number of international organisations such as the United Nations Environment Programme (UNEP), the UN Industrial Development Organisation (UNIDO), the UN European Economic Commission (UN/ECE) and the International Council for Local Ecological Initiative (ICLEI).[63].

The local authorities at all levels are concerned with the quality of life in the urban cities. This includes the issues of communal services like transportation, sewerage,[64] air and water quality, storage and disposal of wastes, industrial pollution etc. There have been efforts to invest the local authorities with sufficient powers to improve the lives of their residents. However, the multiplicity of implementing agencies, overlapping jurisdiction, ambiguous and incomplete legislations are impediments to urban development. Further, there is a necessity to find the adequate funding for these efforts. International cooperation can go a long way in making urbanisation sustainable.

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CHAPTER 6 - CONCLUSION

Soon after the Bolshevik revolution Leon Trostsky, looking into the future, proudly declared:

> The present distribution of mountains and rivers, of fields, of meadows, of steppes, for forests, and of seashores, cannot be considered final. Man has already made changes in the map of nature that are not few nor significant. But they are mere publics' practice in comparison with what is coming. Faith merely promises to move mountains; but technology, which takes nothing "on faith", is actually able to cut down mountains and move them. Up to now this was done for industrial purposes (mines) or for railways (tunnels); in the future this will be done on an immeasurably larger scale, according to a general industrial and sarcastic plan. Man will occupy himself with re-registering mountains and rivers, and will earnestly and repeatedly make improvements in nature. In the end, he will have rebuilt the earth, if not in his own image, at least according to his own taste. We have not the slightest fear that this taste will be bad. - (Trotsky, Leon, '"Revolutionary and Socialist Art," *Literature and Revolution*, U.S.A. Ann Arbor Paperbacks, The University of Michigan Press, 1968, p.251.)

Today these words sound ironical. In the USSR the 'artistic' endeavors to improve upon nature have resulted in a vastly depleted forest cover, the near extinction of the Aral Sea, the environmental degradation of millions of hectares of arable land and grasslands, expensive and ineffective attempts to force a change in the course of rivers. The Caspian Sea is contaminated with hydrogen sulphide. Industrial waste has been regularly discharged in the world's largest fresh water lake, lake Baikal. Nuclear waste was dumped year after year in the North Sea and the rivers. And linked inextricably to it all is the untold human misery. The ostensible 'supremacy of man' theories has resulted in fight against nature, the 'conquest of nature' and social engineering have finally taken their toll. For in all these gigantic economic schemes the human being was forgotten, his centuries- long experience was rejected and replaced by planning, science and technology. Trotsky was voicing the ideas prevalent in Europe at the time—the supremacy of man over nature, the latter being viewed as something antagonistic requiring conquest, subjugation, a force to be

tamed. For over seventy years the USSR was ostensibly forging ahead economically, next only to the USA, with the aim to catch up and leave it behind.

In the economic sphere the last sixty years witnessed the gradual rise of an industrialised nation-state. The survival of the nation-state depends on unification of the economy, education, media and language. However, its short-term tangible results are more than offset by the havoc it creates in all fields, including ecology, in most modern societies. In the USSR this havoc was manifested because of the rigid system of centralized planning where by an intricate network of interdependence spread throughout the country and led to further erosion and destruction of local cultures. Ninety percent of the country's economic potential was in the hands of the central ministries in Moscow. They behaved like enormous monopoly concerns disregarding local interests of the regions and republics, despatching out-dated equipment and pesticides that were banned, and were more concerned with figures and abstract targets. Such an economy, stifles initiative, creates a perpetual imbalance between the republics and the centre. And a monopoly over the economy inevitably means a monopoly of culture. This obliteration of local cultures is almost inevitable when food production, industry, education, communication, administration and media function under the control of the centre.

Additionally, once land become the property of the state, an uncaring attitude towards it surfaces among the populace. In earlier times collective property, whether of cattle or grazing land, was a norm in these parts and meant collective responsibility and care by individual families, extended families, as well as the clan. Socialist nationalisation and collectivisation made the individual indifferent and cynical. His attitude now was that if everything belonged to the state it therefore belonged to no one. And this was all due to the marginalisation of the individual who, ostensibly, was now the master of the land but, in reality, a paid labourer. The environmental impact of collectivisation has been discussed in the previous chapters.

The obsession with gigantomania—from large-scale dams to enormous industrial units—finally took its toll. Numerous citizens residing in the Soviet Union

have been time and again dispossessed leading to their economic and cultural displacement. Many are extinct or on the verge of extinction. This loss is irreplaceable. Today there remain twenty six nationalities in the northern and far eastern regions. They were officially referred to, inexplicably, as 'Small Peoples'. They had to suffer nuclear tests in the Arctic in the 1950s and 1960s, oil exploration and its spill outs in the 1960s, pipelines dug through their grazing lands in the 1970s. Their areas of habitation are zones of ecological disaster.

The practice of subsidising the agriculture and industrial sector not only canceled out any incentive for resource conservation , but also facilitated a deterioration in the quality of the resources being produced. It encouraged unsustainable environmental practices like the production of low-grade coals, overexploitation of agricultural lands and enhanced industrial pollution. Domestic prices for energy resources in Russia were an average of 2.5-3 times lower than in countries of the Organization for Economic Cooperation and Development (OECD). The chief result was an undervaluation of the importance of energy conservation. The incentives for conserving energy were extremely weak, both for planning bodies and for individual enterprises. The high energy intensiveness of production was aggravated by the operation of outmoded equipment that did not meet ecological standards.

The distinguishing characteristic of post-Soviet era is the absence of what international security analyst Lawrence Freedman calls the "strategic imperative"—the motivation among the major states to compete for military power. As military threats have subsided or disappeared, other threats, especially environmental ones, have emerged with greater clarity. It has thus become possible to argue persuasively that environmental threats are an essential component of national or international security. The term "national security" has never had a precise definition, even during the cold war. In the post-cold war era divergent concepts of security have been advanced by theorists and statesmen, each of which can be categorized on the basis of three major dimensions:

- Whether it assumes that security is based primarily on conflict or cooperation;
- The unit of analysis (individual, national, or global);
- The threats with which it is concerned.

The traditional concept of national security that evolved during the cold war viewed security as a function of the successful pursuit of inter-state power competition. It took the sovereign state as the exclusive unit of analysis, and was concerned only with military threats or those related to an "enemy." National security was also used to convey the idea that a particular set of problems was most important to the state, and required the mobilisation of a high level of material and human resources.

Environmental security represents a significant departure from this approach to national security. It addresses two distinct issues: the environmental factors behind potentially violent conflicts, and the impact of global environmental degradation and ecosystem destruction on the well-being of societies and economies. The idea that environmental degradation is security issue when it is a cause of violent conflict appears to be consistent with the traditional definition of national security. However, proponents of environmental security emphasize that environmental degradation is the result of impersonal social and economic forces, and requires cooperative solutions.

This focus on threats that do not involve an enemy state or political entity disturbs many theorists and practitioners of national security, for whom the only issues that should be viewed as "security" issues are those that revolve around conflict itself. More broadly, environmental security is concerned with any threat to the well-being of societies and their populations from an external force that can be influenced by public policies. Proponents of environmental security argue that increasing stresses on the earth's life-support systems, renewable natural resources and ecosystems have profound implications for human health and welfare that are at least as serious as traditional military threats.

Environmental security deals with threats that are not only the unintended consequences of social and economic activities, but also develop very slowly compared with military threats. Thus the time horizons it requires for policy planning are extremely broad. While some programmes aimed at reducing population growth rates can achieve significant results in a decade or two, it takes far longer for declining birth rates to affect natural resource management. A typical programme to reverse the environmental degradation of an entire ecosystem and to rehabilitate that ecosystem can take as long as 50 years to produce the desired results. Policies to restore the ozone layer will take up to 100 years to take effect, and those to produce climate change could take even longer. These time horizons represent a major obstacle to integrating environmental security into policymaking processes, since political systems are not organized to look that far ahead. This is further accentuated in Russia where the state institutions are rudimentary.

The case of environmental security rests primarily on evidence that there has been serious degradation of natural resources (freshwater, soils forests, fishery resources, and biological diversity) and vital life-support systems (the ozone layer, climate system, oceans, and atmosphere) as a result of the recent acceleration of economic activities. These ecosystem changes could have far-reaching effects in the long run and have been discussed in the preceeding chapter. The relationship between scarce natural resources and international conflict is not a new issue. But unlike traditional national security thinking about such conflicts, which focus primarily on nonrenewable resources like minerals and petroleum, the environmental security approach address renewable resources—those that need not be depleted if managed sustainably. Conflicts involving renewable natural resources are of two kinds: those in which resource depletion is the direct objective of the conflict, and those in which it is an indirect cause of the conflict. Freshwater resources and fish stocks are the clearest examples of renewable resources that have been the direct objective of potentially violent international conflicts.

International conflicts over fishing grounds have been frequent in recent decades. Thirty such conflicts were reported last year alone, including several in

which force was used. Without any international agreement on managing fish stocks that straddle the exclusive economic zones of states or that migrate between EEZs, or between coastal zones and the high seas, even normal fluctuations in stocks increase interstate competition over fishery resources. But with more than half the world's major maritime fisheries already in serious decline from overfishing and the rest exploited up to or beyond their natural limits, the potential for political and even military confrontation is growing. Russia, whose fish catch in its own EEZs is reduced by the operations of distant fishing fleets in the adjoining high seas, has threatened to use force to stop ships it finds overfishing, even outside its EEZs. The environmental security approach thus offers a clear alternative to traditional security thinking about international conflicts over ecosystems and renewable natural resources. It suggests that the key problem is to conserve the resource in order to maintain adequate supplies well into the future, rather than trying to control more of a resource that is being depleted.

According to the Soviet model of development, economic growth was obtained by constantly boosting inputs such as natural resources. Yet, Soviet enterprises never managed to utilize each new resource increment more productively, thereby reducing the wealth-generating capacity of the economy over the long term. The rank inefficiency of the economy that resulted was manifested most clearly in widespread environmental degradation and natural resources depletion. Eventually, it no longer was possible to elevate the energy and raw material inputs needed to sustain further growth under this model, and the Soviet economy and polity succumbed to the sheer volume of waste it created. Post-Soviet Russia, therefore, now needs to de-industrialise and de-materialize its economy in order to improve the well-being of its citizenry as well as the quality of its environment. Yet old Marxist notions of modernity, development, and power are robust, and few in Russia have yet to ponder the opportunities afforded by a new development path that severs the linear relationship between industrialisation, resource consumption, and economic growth.

Nonetheless, since the government initiated reform in 1992, the Russian economy has been undergoing a far-reaching and irreversible restructuring. Although

the economy has begun to de-industrialise, it has yet to start to de-materalize. In fact, the relative role of materials (i.e., natural resource development) in the economy has increased while the efficiency of many sectors has decreased. And as already noted, the economy's pollution intensity (emissions per unit of economic output) also has increased. It has been seen that technological backwardness has been a contributing factor to environmental degradation in Russia.

The present dissertation has attempted to demonstrate how these phenomena are playing out differently across sectors, regions and ecosystems in Russia. The variation largely is determined by the territories' diverse factor endowments. In industrial (capital-rich) areas, such as Chelyabinsk and Kemerovo, restructuring is having a positive effect on short-term environmental problems, such as air pollution. Nevertheless, long term problems, such as accumulated hazardous waste dumps and groundwater contamination, will not be mitigated by restructuring. On the other had, resource-poor regions, such as Tyumen', that have been able to divert their output to international markets, continue to pursue raw materials development (albeit at overall lower rates) and this has resulted in the continuation of pre-existing problems.

The Russian Federations is marked by a great variation in socioeconomic development across its regions. Soviet development policy, although oriented toward sustaining national security interests, also was guided by a strong redistributive ethic aimed at reducing disparity. Every region shared in the pie doled out by Moscow. The demise of central planning ended this leveling policy, and a notable increase in income disparity among regions is beginning to emerge, largely along the Rustbelt/natural resources cleavage. The economic downturn in Russia extends beyond the loss of markets, productions, investments and unemployment. When economic growth stops, social strains emerge and political systems are destabilised.

The concept of *sustainable development* has two components-the spatial and the temporal. There is a necessity to conserve natural resources so that they can be redistributed across regions and communities. Also, the sustainable use of natural resources is equally essential since it belongs to future generations. As discussed, the

Soviet system was unable to maintain environmental quality and conserve resources for the future generations and failed in the temporal dimension. However, it did maintain an egalitarian and equitable distribution of wealth and resources across space by providing a good quality of life to its citizens defined in terms of literacy, health services, life expectancy etc. This was in conformity with the basic assumption of Karl Marx that human societies would endeavour to organise themselves in the most productive and efficient patterns.

Soviet policy-makers understood Marx only partially – ie. in spatial terms, but failed miserably to fulfill his prophesy in temporal terms. Thus, Trotsky's possibilism to exploit nature was aimed at improving the lives of the people only of his time. It was not aimed at a sustainable future. But Marx had said, "Even a whole society, a nation, or even all simultaneously existing societies taken together, are not the owners of the globe. They are only its possessors, its usufructuraries, and, like, *bone patres familias,* they must hand it down to succeeding generations in an improved condition." (Ivanov, E., ed., *Marxist – Leninist Philosophy*, Progress Publishers, 1987, p.107.) The Soviet Union, on the contrary handed over a legacy of degraded environment, dying ecosystems and environmental insecurity to its successors – the Russian Federation and other members of the Commonwealth of Independent States (CIS). This was in contradiction to Marxist philosophy.

Given the reduced role of the federal government, efforts to manage Russia's complex and expensive environmental problems will have to be funded largely with local resources and ability of different regions to pay for conservation and redemption programmes also is diverging. The challenge for Rustbelt regions is to devise and implement strategies for managing industrial decline given modest or dwindling resources. The question for natural resource-rich regions is whether to use their continuing income to manage current crises or to prevent future degradation.

One question Rustbelt regions need to address is whether the decision to close an enterprise should be made solely on economic criteria, or whether environmental factors should be included as well. Operations may exist that are relatively sound financially, but which have a markedly negative and costly environmental impact that is not registered in a traditional balance sheet. Second, resources must be directed

towards maintaining existing, cost-effective environmental protection investments, for example, in wastewater treatment systems. Rustbelt regions also must decided how to allocate scarce and dwindling resources to manage persistent (and often expensive) environmental threats. The choice for money to be spent on long-term stabilisation and eventual clean-up or brown fields to be written off as "sacrifice zones" is a difficult one. Finally, there are the challenges of managing the environmental impact of new growth, such as extending sewerage system to expanding suburbs. These are questions of more immediate issues of public health and finance and resource allocation.

The environmental policy challenges facing resource-rich regions are more abstract. Most immediately, the issue of property rights must be resolved. Uncertainty over ownership of natural resources (an issue that has been kept separated form debates on land privatization) has promoted a short-term, exploitative, "Klondike" mentality of maximizing returns before changes occur in the overarching legal environment affecting a particular development. Many communist and nationalist commentators have decried Russia's new global status as a "raw-materials colony" to be exploited by international capital. Russia's sizable natural resource wealth remains in the hands of the state (which appears likely for the immediate future), and the state must assert its rights and adopt strong and enforceable measures to regulate their best use. Over the longer term, the finite nature of the resource endowment of the various regions dictates that they must decide how best to manage development in a sustainable manner. This raises the broader issue of the future role of raw materials—and, implicitly, the region—in the national economy and environmental security by controlling pollution, conserving natural resources and protecting the ecosystems.

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www.unfpa.org UN Population Fund.

www.unicef.org website of UN International Children's Fund

www.unpd.org UN Population and Development

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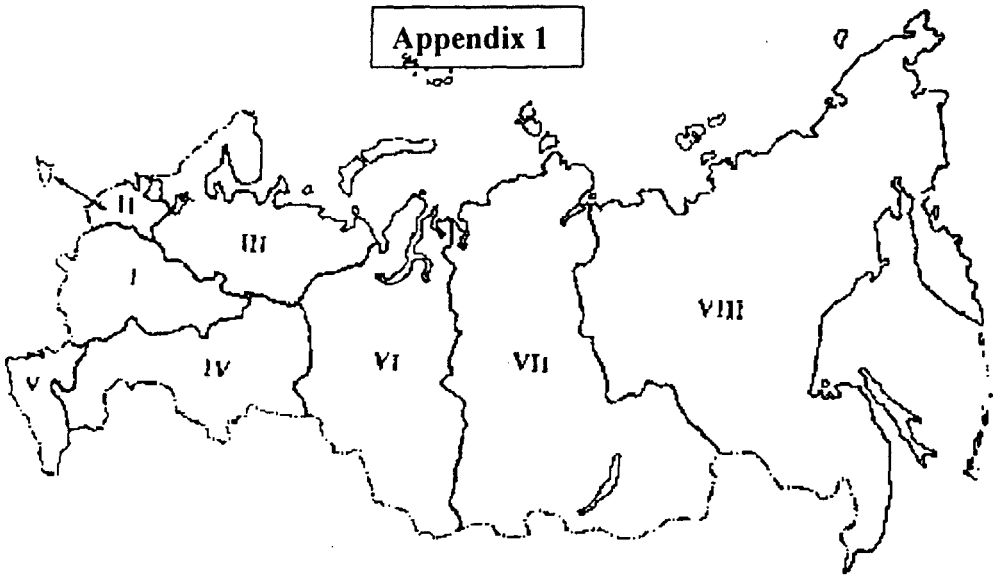
www.worldbank.org/unep/soe.htm for State of the Environment reports

www.wri.org is the website of World Resources Institute.

www2.wcmc.org.uk World Conservation Monitoring Centre.

Appendix 1



I	Central Russia	IV	Ural-Volga Region	VI	West Siberia
II	North-West Russia	V	European South	VII	East Siberia
III	European North			VIII	Far East

[redacted]. Socio-economic regions of Russia (Dronov *et al.* 1994)

[redacted]. Major environmental problems by regions of Russia; Modified from (Mnatsakanian 1992)

PROBLEM DESCRIPTION	I	II	III	IV	V	VI	VII	VIII
Air Pollution								
Conventional Air Pollution	●	●	●	●	●	●	●	●
Toxic Air Pollution	●	●	●	●	●	●	●	●
Acid Precipitation	●	●	●	●		●		
Water Pollution								
Point Source River Pollution	●	●	●	●	●	●	●	●
Non-Point Source River Pollution	●	●		●	●		●	
Pollution and Eutrophication of Lakes	●	●	●	●		●	●	●
Pollution of Seas		●	●	●	●	●	●	●
Pollution of Ground Water	●			●				
Soil and Land-Use Problems								
Soil Erosion	●	●		●	●	●		●
Deflation	●			●	●	●	●	
Desertification and Salinisation				●	●			
Acidification		●	●					
Soil Pollution with Heavy Metals	●		●	●		●	●	●
Soil Pollution with Pesticides	●			●	●			
Radioactive Pollution of Land	●	●	●	●			●	
Destruction of Land due to Mining	●		●	●		●	●	●
Solid Waste Disposal Problems	●	●		●	●	●		
Liquid Waste Disposal Problems	●	●	●	●			●	●
Deforestation								
Excess Cuts of Forests	●	●	●	●		●	●	●
Forest Fires			●				●	●
Degradation of Forests due to Pollution	●	●	●	●		●	●	●

(SOURCE : www.grida.no/enrin)

Appendix -2

Table A. Principal environmental data responsibilities of selected state agencies

SUBJECT	MOE	HME	SAN	GEO	WAT	LND	FOR	FSH	AGR	CON	STA
STATE / CONTAMINATION											
Air		●	●								
Water		●	●	●	●			●		●	
Land/ Soils	●	●	●			●			●		
Rocks/ Minerals				●							
Vegetation	●	●	●				●		●		
Wildlife	●	●	●					●	●		
EXPLOITATION / USE											
Water	●			●	●					●	●
Land						●				●	●
Rocks/Minerals				●							●
Vegetation							●			●	●
Wildlife								●	●		●
EMISSIONS/ WASTES											
Atmospheric Emissions	●	●	●								●
Wastewater Discharges	●		●	●	●					●	●
Conventional Wastes	●		●							●	●
Toxic Wastes	●		●								●
Radioactive Wastes	●		●								●
PROTECTION/ RESTORATION											
Air	●	●	●								●
Water	●		●	●	●						●
Land/ Soils	●		●			●				●	●
Rocks/ Minerals	●			●							
Vegetation	●						●			●	●
Wildlife	●							●	●		●

KEY:

MOE — Ministry of Environmental Protection
HME — Agency for Hydrometeorology
SAN — Sanitary Committee
GEO — Committee for Geology
WAT — Committee for Water Resources
LND — Committee for Land Resources
FOR — Agency for Forestry
FSH — Committee for Fisheries
AGR — Ministry of Agriculture
CON — Ministry of Civil Construction

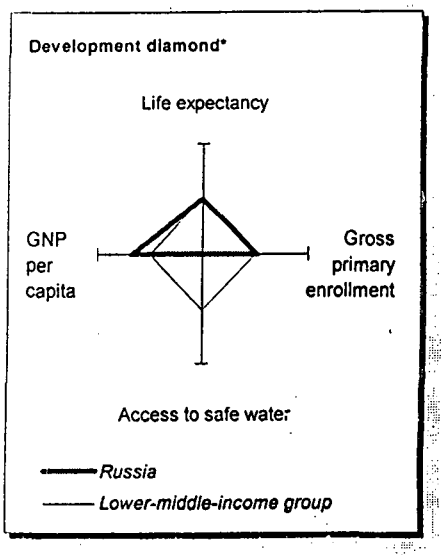
$SOURCE : www.grida.no/enrin)

APPENDIX - III

Russia at a glance

9/8/99

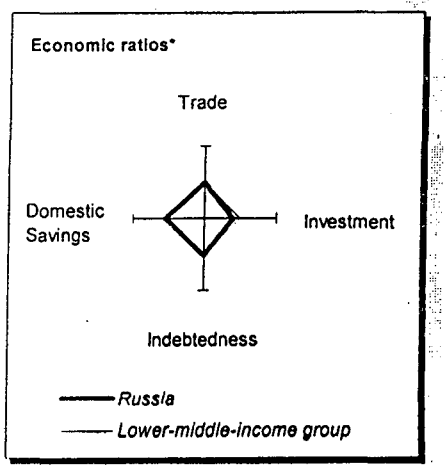
POVERTY and SOCIAL	Russian Federation	Europe & Central Asia	Lower-middle-income
1998			
Population, mid-year *(millions)*	146.9	473	908
GNP per capita *(Atlas method, US$)*	2,300	2,190	1,710
GNP *(Atlas method, US$ billions)*	337.9	1,039	1,557
Average annual growth, 1992-98			
Population *(%)*	-0.2	0.1	1.1
Labor force *(%)*	0.1	0.6	1.5
Most recent estimate (latest year available, 1992-98)			
Poverty *(% of population below national poverty line)*	31	..	..
Urban population *(% of total population)*	77	68	58
Life expectancy at birth *(years)*	67	69	68
Infant mortality *(per 1,000 live births)*	17	23	38
Child malnutrition *(% of children under 5)*	3	..	..
Access to safe water *(% of population)*	..	..	75
Illiteracy *(% of population age 15+)*	1	4	14
Gross primary enrollment *(% of school-age population)*	107	100	103
Male	108	101	105
Female	107	99	100



KEY ECONOMIC RATIOS and LONG-TERM TRENDS

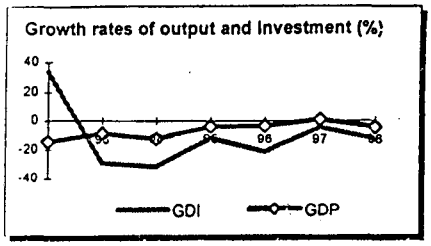
	1977	1987	1997	1998
GDP *(US$ billions)*	..	..	436.0	276.6
Gross domestic investment/GDP	..	..	21.3	18.5
Exports of goods and services/GDP	..	..	23.6	31.7
Gross domestic savings/GDP	..	..	24.2	23.5
Gross national savings/GDP	..	..	22.0	19.0
Current account balance/GDP	..	..	0.7	0.5
Interest payments/GDP	..	..	1.0	1.3
Total debt/GDP	..	..	28.9	64.7
Total debt service/exports	..	..	6.4	10.3
Present value of debt/GDP	..	..	26.6	..
Present value of debt/exports	..	..	114.5	..

	1977-87	1991-98	1997	1998	1999-03
(average annual growth)					
GDP	..	-6.5	0.9	-1.6	0.5
GNP per capita	..	-6.7	0.8	-6.4	0.9
Exports of goods and services	..	2.5	5.1	-0.9	2.1

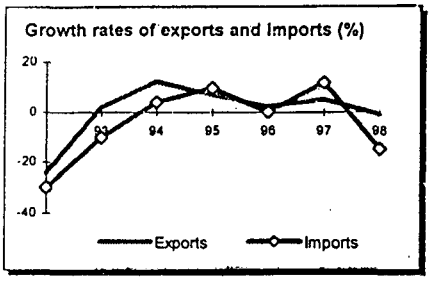


STRUCTURE of the ECONOMY

	1977	1987	1997	1998
(% of GDP)				
Agriculture	..	..	7.2	6.6
Industry	..	..	35.4	31.3
Manufacturing	..	..	..	..
Services	..	..	57.3	62.1
Private consumption	..	..	61.4	61.4
General government consumption	..	..	14.4	15.1
Imports of goods and services	..	..	20.7	26.7



	1977-87	1991-98	1997	1998
(average annual growth)				
Agriculture	..	-6.9	0.1	-6.1
Industry	..	-11.7	-7.4	-7.0
Manufacturing	..	..	..	..
Services	..	-2.5	5.9	-0.3
Private consumption	..	4.3	1.9	-3.3
General government consumption	..	-9.6	14.3	-19.2
Gross domestic investment	..	-16.3	-4.4	-12.3
Imports of goods and services	..	-1.6	12.0	-14.7
Gross national product	..	-6.9	0.5	-6.7

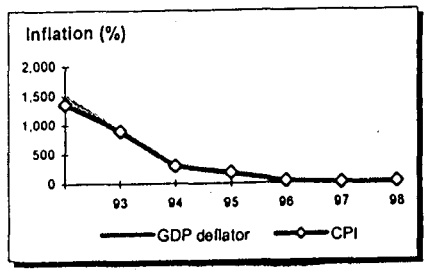


Note: 1998 data are preliminary estimates.

* The diamonds show four key indicators in the country (in bold) compared with its income-group average. If data are missing, the diamond will be incomplete.

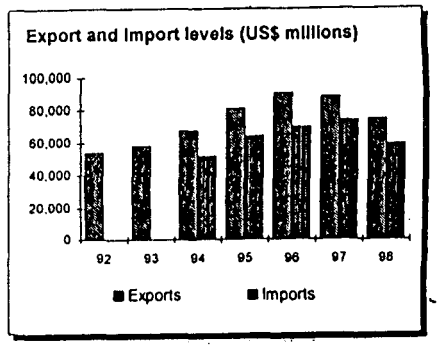
PRICES and GOVERNMENT FINANCE

	1977	1987	1997	1998
Domestic prices				
(% change)				
Consumer prices	..	..	14.8	26.8
Implicit GDP deflator	..	..	16.5	11.6
Government finance				
(% of GDP, includes current grants)				
Current revenue	..	..	34.8	32.1
Current budget balance	..	..	-1.5	-3.3
Overall surplus/deficit	..	..	-9.2	-9.1



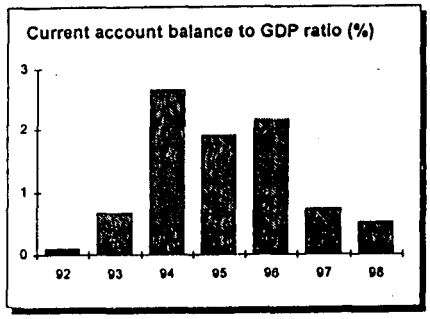
TRADE

	1977	1987	1997	1998
(US$ millions)				
Total exports (fob)	..	..	88,676	74,762
Crude oil	..	..	14,773	10,284
Natural gas	..	..	16,419	13,339
Manufactures	..	..	9,450	8,436
Total imports (cif)	..	..	74,451	59,696
Food	..	..	13,400	10,017
Fuel and energy	..	..	2,064	1,654
Capital goods	..	..	18,900	15,856
Export price index *(1997=100)*	..	..	100	84
Import price index *(1997=100)*	..	..	100	96
Terms of trade *(1997=100)*	..	..	100	87



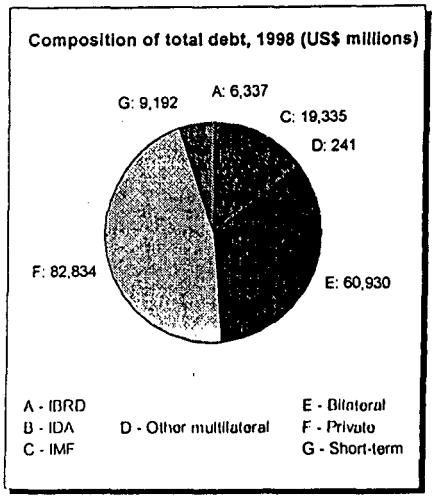
BALANCE of PAYMENTS

	1977	1987	1997	1998
(US$ millions)				
Exports of goods and services	..	..	102,834	87,686
Imports of goods and services	..	..	90,065	73,844
Resource balance	..	..	12,769	13,841
Net income	..	..	-9,200	-11,991
Net current transfers	..	..	-362	-400
Current account balance	..	..	3,207	1,449
Financing items (net)	..	..	-2,232	-14,817
Changes in net reserves	..	..	-975	13,368
Memo:				
Reserves including gold *(US$ millions)*	..	..	17,785	12,223
Conversion rate *(DEC, local/US$)*	..	..	5.8	9.7



EXTERNAL DEBT and RESOURCE FLOWS

	1977	1987	1997	1998
(US$ millions)				
Total debt outstanding and disbursed	..	38,316	126,037	178,869
IBRD	..	0	5,053	6,337
IDA	..	0	0	0
Total debt service	..	8,753	6,679	9,141
IBRD	..	0	178	382
IDA	..	0	0	0
Composition of net resource flows				
Official grants	..	0	..	..
Official creditors	..	612	2,645	625
Private creditors	..	3,786	4,984	20,691
Foreign direct investment	..	0	6,241	2,182
Portfolio equity	..	0	1,206	1,604
World Bank program				
Commitments	..	0	3,444	1,500
Disbursements	..	0	2,691	1,226
Principal repayments	..	0	0	66
Net flows	..	0	2,691	1,160
Interest payments	..	0	178	316
Net transfers	..	0	2,513	844



(Source : www.worldbank.org)