



ECONOMIC, SOCIAL AND POLITICAL CONSEQUENCES IN WESTERN EUROPE

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It is by now a well established fact that the radiological consequences of the Chernobyl accident are fortunately far less substantial as it has been frequently predicted and claimed in the media (for references, see [1]):

1. There have been so far about 30 identifiable premature deaths due to acute radiation syndrome (less frequent estimates are somewhat higher up to 100 - 200 when including partially radiation-related cases).
2. Of the approximate 700 childhood thyroid cancers that may be attributable to radioiodine emissions, 90 - 95% are curable (many are treated in Western Europe, in particular Germany).
3. No increases in leukemia or other types of cancer, or genetic defects, have so far been detected, nor are they likely based on the evaluation of the Hiroshima and Nagasaki data.
4. There have been no detectable radiation-related effects in Western Europe, or other countries outside the former western Soviet Union.

There may be some late cancers there in future years, resulting in a total number of radiation-related premature deaths eventually reaching one or two hundred. There have also been speculations about additional cancers in large populations in the northern hemisphere exposed to Chernobyl fallout. Assuming the validity of the linear no-threshold radiation effect hypothesis, the multiplication of very small "risks" with very large population number thus yielded figures of 5.000 to 25.000 cancers, in addition to the 40 - 70 millions to be expected in this area during the next 70 years. Such speculations are, and will remain, purely hypothetical, and appear to have little radiobiological substance. Nobel laureate R.S. Yalow recently stated: "No reproducible evidence exists of harmful effects from increases in background radiation three to ten times the usual levels", and a summary of recent data on low-level radiation effects concludes: "Actual scientific data on health effects from low-to-moderate doses of ionizing radiation contradict the presumed linear no-threshold response model" [2].

On the other hand, there have been and remain tremendous psychosocial and economic effects of the accident. In particular in the western parts of the former Soviet Union, against the background of disintegrating structures, have been a distrust of inefficient and corrupt administrators, poor medical services and food supplies, destabilization and serious economic problems of large population groups, losses of agricultural areas, and problems caused by large-scale evacuation and resettlement programs. A large number of psychosomatic and neurological disorders including alcoholism, loss of hair, impotence, even laziness and traffic accidents, have been attributed to radiation effects and strange new diseases such as "chronic radiation sickness" or "radiation AIDS" have been claimed. Most radiobiologists would, however, consider such claims as nonsense, even if some highly indirect relationships may perhaps be established. Unfortunately, many of such problems attributed by some to the Chernobyl accident can also be observed in other parts of the former Soviet Union which have not been affected by fallout. Many people, in particular children, cannot be classified as "healthy" according to the WHO definition, and life expectancy has dropped substantially in many parts of the former Soviet Union in the past decade.

Other and even less likely low-dose effects have been claimed frequently for even less affected areas, e.g. increases of birth defects, or damage to animals and vegetation, in Western Europe. Fortunately, such "findings" have never been confirmed by serious investigations. There have, however, been substantial economical, social and political consequences of the Chernobyl accident in this region, of which only a few of the more important ones are listed here:

1. In many Western European countries, there is now much less acceptance of nuclear power than before the accident. For example, the major German (social-democratic) opposition party (SPD), ruling several of the federal states, which had been a strong supporter of nuclear energy in earlier years of the German nuclear program, adopted a strictly anti-nuclear policy shortly after the accident. This led to tremendous economic losses primarily in the SPD-ruled states. The projects which have since been cancelled already represent investments of about 11.000 million U.S. dollars (based on the current exchange rate 1 \$ = 1.43 DM). This includes the completed Kalkar Fast Breeder Plant now to be used as an amusement park (5.000 mill.), the operational Hamm-Uentrop high-temperature pebble-bed reactor (3000 mill.), the Wackersdorf reprocessing plant under construction (2.200 mill.), and the almost completed Hanau MOX fuel element manufacturing plant (770 mill.). Other investments including the operational Mülheim-Kärlich NPP (4.900 mill.) and repositories (2.200 mill.) are in acute danger of being permanently shut down for non-technical reasons closely associated with the media's response to Chernobyl [3]. No new NPP is currently under construction in Germany, and the future of the nuclear industry looks far from promising. The total economic losses, in case the 20 NPP providing about 30% of Germany's electricity are closed down as demanded as a post-Chernobyl effect by the second and the third largest political parties, would amount to approx. 180.000 mill. - not including the likely climatic costs due to the increased CO₂ releases.
2. The decision not to continue the operation, or to complete construction of eleven Russian-type LWR power plants in former East Germany after reunification in 1989/1990, and to decommission these plants at an eventual cost of up to 10.000 million, was also strongly affected by a deep distrust against nuclear energy, in particular against all Russian NPP. If upgraded with modern safety systems, at least some of these plants could have served as models for modernizing similar plants in Eastern Europe.
3. Technically unnecessary, politically motivated shut-downs of German NPP have also been very expensive, amounting to 2.500 mill. so far in just one plant (Mülheim-Kärlich). In other cases, excessive delays in the licensing of operation, or of re-starting following routine shut-downs, amounted to 1-2 mill. per day.
4. There are, of course, numerous indirect consequences of such actions. For example,
 - Germany has no new demonstration plants for the possible export of advanced reactor designs to a number of interested buyer countries,
 - valuable scientific and technical know-how is irreversibly lost with the (frequently early) retirement of a whole generation of scientists and engineers in this field, and substantially reduced advanced nuclear training and research, and
 - even very minor nuclear-related activities, e.g. the transport of used fuel elements in an "Castor" cask (considered the probably safest in the world) to a temporary storage facility in Gorleben, leads to antinuclear including criminal activities. The expenses for police protection of the transport of one cask in 1995 (ca. 40 mill.) amounted to more than twice of the total costs of the Finnish repository.
5. Chernobyl strongly contributed to basic changes in the perception and acceptance of minor civilisatory risks by the media, politicians, and the general public, which are not restricted to the peaceful uses of radiation and nuclear energy, but extend into many other areas of technological progress. This resulted in serious problems in the essential dialogue between the economical and political circles in some countries such as Germany, which in turn had a negative impact on the reliability of long-term economic

planning and affects the general investment climate with rather dramatic effects on employment and social stability. It is obviously difficult to quantify such developments in monetary terms, but they are likely to be much larger than some of the more direct Chernobyl effects, such as

- largely unnecessary destruction of produce, milk, etc. (300 mill. in West Germany, including 50 mill. for the "decontamination" of a cattle feed additive), [4], and
 - expensive organizational changes, such the creation of sophisticated new national emergency response and radiation monitoring systems, laws, regulations, and standards (in Germany total costs exceeding 200 mill.).
6. Also difficult to quantify are the costs of the psychosomatic stress and anxiety in the general public. For example, estimates of thousands (up to 40.000!) additional abortions in the post-Chernobyl months in Western Europe have been published [5] and seem not unlikely, considering the atmosphere of radiophobic hysteria which had been created in some countries. Late effects include an intensified radiophobia, resulting for example in patients refusing radiation therapy or radiodiagnostics even when they badly needed it.
7. Also not yet finalized are the estimates of the costs for the Western European taxpayers resulting from bilateral and multilateral assistance for clean-up operations and modernizing (or closing down) nuclear facilities in Eastern Europe, establishing and improving regulatory authorities and inspection organisations, etc.. Currently in the range of thousands of millions, it may eventually reach much larger amounts. The Western European support for improving reactor safety in Eastern Europe amounts to at least 1300 mill. so far (200 mill. from Germany). The PHARE and TACIS programs of the European Union represent 500 mill., bilateral western projects total 1200 mill. [8].

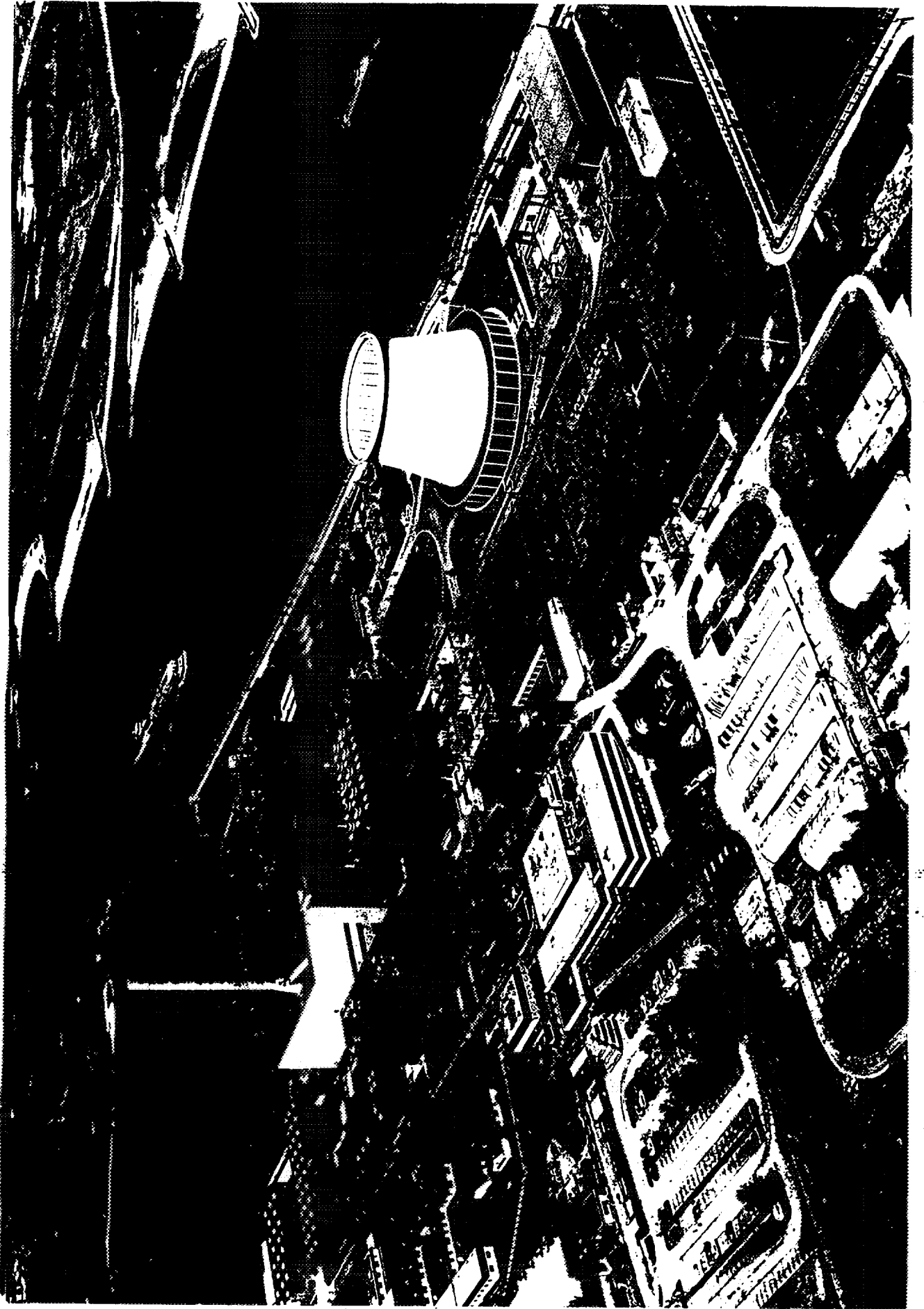
Many of the listed effects have been much less evident in more "pragmatic" countries such as France, than in more "fundamentalist" countries in Northern and Central Europe. There have also been numerous less serious but interesting side-effects following the Chernobyl accident, such as

- official limits for I-131 in milk of 20 Bq/l in the German state of Hessen (which amounted then to 1/180 th of the internationally recommended value, and to one fifth of the milk's natural K-40-activity),
- different grazing permits for cattle in the French and Dutch speaking parts of Belgium, thus making the language line (probably for the first and last time) visible by satellite,
- the refusal of valuable high-protein food gifts from the EU in Bangladesh [6], and
- problems in the export of European agricultural products, construction steel, etc., to "less contaminated" countries.

Thus, on a basis of monetary units per gram, Chernobyl fall-out became (with the possible exception of some microbes causing large epidemics and exotic transuranic elements produced in accelerators) probably the most expensive substance ever in European history.

Among the more important reasons for the dramatic distortions in the perception of the Chernobyl consequences, compared to these of other natural or man-made recent events causing a larger number of casualties (such as the sinking of the Estonia, the Bhopal chemical accident, or the Baku subway fire) are

- a most unfortunate information (initially non-information) policy by the Soviet Union after the accident, leading to much unnecessary speculation, confusion, and anxiety,
- overconservative, often politically motivated radiation protection recommendations, regulations, and concepts such as "collective dose", leading to high numbers of hypothetical cancer deaths and decisions to interdict sheep and reindeer in Norway based on calculations of a collective dose of one man-Sv thus saved at a cost of 170.000 and 57.000 \$, respectively (assuming a "price" of 100.000 \$ per man-Sv) [7], etc.,



- economical interests of the "radiation protection industry" (such as instrument manufacturers, monitoring services, decontamination and remediation companies, safety consultants, and radiation effects research institutions) resulting in an overemphasis on radiation hazards compared to other civilisatory risks,
- overrepresentation in the media of a small number of ideologically motivated antinuclear activists, promoted by journalists lacking scientific education and frequently with a tendency towards unqualified sensationalism for obvious commercial reasons,
- a tendency among many individuals and institutions (including governmental agencies) in Ukraina, Byeloruss and Russia to exaggerate Chernobyl effects, as well as potential future risks, in order to attract more attention and support during a difficult economic period, as well as
- a "Zeitgeist" in some Western countries characterized by a very sceptical attitude towards science and technology in general, which is considered more fashionable among many "intellectuals" and public opinion multipliers than the understanding of scientific, technical and economic facts.

The situation was complicated by additional psychological factors such as a deep-rooted distrust in governmental announcements in some countries. Concerning the widely discussed question of eating fresh vegetables etc., in France Prof. F. Pellerin, director of the national radiation protection service, explained on national T.V. that there are no health risks involved, and almost everybody in France believed it and acted accordingly. When the responsible German Minister of the Interior Dr. Zimmermann said the same on German T.V., very few viewers believed it, and almost nobody bought produce (in particular mushrooms and fresh berries), children were not permitted to play in sandboxes, etc.. Similar effects have been reported in other countries. For example, the director of the Norwegian Health Directorate announced on April 30, 1986, on national T.V. that "we can guarantee that there is no reason to make any changes in habits", but many people preferred to believe Swedish warnings in the media against drinking water from certain sources, etc. [9].

The change from the old Curie activity units to the numerically much more frightening Becquerels contributed further to radiophobia and confusion. One of the author's experiences may illustrate this point: When he explained in a senior staff meeting shortly after the accident that most of the public concerns were caused by the Curie-Becquerel-transition, the director of the German Standards Institute remarked with a smile: "A splendid idea. We will pay our staff in the future in Italian Lira." Remembering the days after Chernobyl also had its lighter moments, such as an inquiry of a hospitalized old lady how dangerous her bedside flowers are...

However, unfortunately what initially appeared to be just "an accident in the head" for many Western Europeans during the last decade, turned out to result in rather serious effects not of a radiological, but of a political and economic nature: Direct and indirect "costs" in Western Europe may eventually far exceed the 100.000 million dollar mark. The permanent loss of many jobs not only in the nuclear industry, higher taxes and energy prices, and reduced chances of technical and economic progress remain important long-term consequences of Chernobyl in large parts of Western Europe.

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