

ECONOMIC RECOVERY

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August 1965

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This paper will constitute a chapter of a book on civil defense being edited by Professor Eugene Wigner of Princeton University and Oak Ridge National Laboratory.

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I. THE POSSIBILITY OF ECONOMIC SURVIVAL AND RECOVERY

Our society has not, to this date, seriously attempted to adapt to an overwhelmingly significant change in the environment of human existence -- the possibility of nuclear war. The reasons are various. First, we have understandably been far more urgently concerned with deterring potential attackers from deliberately initiating such a war, and also with reducing the possibility of its occurrence through accident or misunderstanding. Second, even granting the desirability of a "damage-limiting" posture, there is a widespread belief that physical protection of population from modern nuclear threats is hopeless. This belief is erroneous, as has been shown in earlier chapters. Finally, many who would concede the possibility of vastly improving survivorship from direct physical hazards like blast and radiation still cannot conceive that a functioning economic system could be reconstituted after such a shock. They picture the hapless survivors as doomed to ultimate starvation, or at best to a meager existence in a world bearing no resemblance to pre-disaster America. Hence the familiar refrain: "If the bomb comes, I want to be the one who goes first." This belief is, to a degree, self-fulfilling; the less the rational forethought and meaningful effort devoted to the problem, the more difficult and more costly achievement of recovery will be in terms of otherwise avoidable sacrifices of human lives and values -- and the poorer the prospect for ultimate success.

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What are the prospects for recovery from nuclear war? There are certainly going to be great human losses due to privation and disease even after the cessation of the direct physical effects of bombing. Equally obviously, the society will be permanently scarred and modified in ways we can hardly imagine. Since history cannot be expunged, certain losses are indeed irrecoverable. But what we ordinarily have in mind by failure to recover would be a situation in which the survivors of the military blows could not reconstitute a viable socio-economic system. This would be the case if the society degenerated to robber bands living by mutual pillage, or tribal clans grubbing for subsistence. Somewhat less drastically, we can imagine a surviving integrated community, but one unable to reverse an inexorable downward spiral as irreplaceable capital equipment and stocks inherited from pre-disaster times are gradually used up.

To get an overall view of the likelihood of this sort of development, we should first turn to history.¹ While there is no experienced disaster quite like a large-scale nuclear war, the record of human existence includes some fearsomely destructive events. Historical disasters may be divided into two categories, according to whether they are of localized or generalized extent. A localized disaster is usually associated with a specific event: earthquake, tornado, air-raid, siege, etc. Though geographically limited it may be exceptionally violent, as in the case of the destruction of the 30,000 inhabitants of St. Pierre in the 1902 eruption of Mt. Pelee on Martinique. (The one survivor of that catastrophe happened to have excellent shelter -- he was in a solitary-confinement cell of the local prison!) The most severe of the more recent localized disasters have been air-raids, especially the nuclear attacks on Hiroshima and Nagasaki and the incendiary bombardments of Hamburg, Dresden, and Tokyo.

¹ A review of historical disaster experiences is provided in J. Hirshleifer, "Disaster and Recovery: A Historical Survey," The RAND Corporation, RM-3079-PR, April 1963.

Generalized disasters -- catastrophes encompassing whole societies -- are exemplified by destructive wars, famines, revolutions, and pestilences. In the past these have ordinarily taken months or years of time to develop their full effects. Nuclear war would probably combine the suddenness usually characteristic of localized disasters with an enormous scale of generalized effect. So each of the two historical types of calamity is of some relevance.

Economic recovery from localized bombing attacks has, in general, been quite remarkable.¹ In Hiroshima, for example, power was generally restored to surviving areas on the day after the attack, and through railroad service recommenced on the following day.² By mid-1949 population was back to the pre-attack level, and 70% of the destroyed buildings had been reconstructed.³ In general, populations of damaged areas have been highly motivated to stay on, even in the presence of severe deprivation; once having fled, they have been anxious to return. The thesis has even been put forward that a community hit by disaster rebounds so as to attain higher levels of achievement than would otherwise have been possible.⁴ While this cannot be proved from the historical record, it is clear that there is a strong tendency to return to previous levels and

¹ The most complete analysis of World War II experience is Fred C. Iklé, The Social Impact of Bomb Destruction (University of Oklahoma Press, 1958).

² U.S. Strategic Bombing Survey, The Effects of Atomic Bombs on Hiroshima and Nagasaki (June 1946), p. 8.

³ Research Department, Hiroshima Municipal Office, as cited in Hiroshima, Hiroshima Publishing Company (1949).

⁴ This is the key theme of a great pioneering study based on the aftermath of the 1917 Halifax explosion -- Samuel H. Prince, Catastrophe and Social Change (Columbia University -- Longmans, Green & Co., 1920). Compare the cynical remark about the recent Alaskan disaster: "The earthquake was the best thing that ever happened to Anchorage."

growth trends.¹ This evidence suggests that disaster in some way liberates springs of energy and unselfish activity not ordinarily called upon in periods of normalcy.

The historical record is not so clear for the larger-scale, slower-developing generalized catastrophes. Cases in recent history are few, and so particularized by special circumstances that it is difficult to draw firm conclusions. Over the broad sweep of history, however, the experience has been on the whole again surprisingly favorable. In the mid-19th century John Stuart Mill commented on:

...what has so often excited wonder, the great rapidity with which countries recover from a state of devastation; the disappearance, in a short time, of all traces of the mischiefs done by earthquakes, floods, hurricanes, and the ravages of war. An enemy lays waste a country by fire and sword, and destroys or carries away nearly all the moveable wealth existing in it: all the inhabitants are ruined, and yet in a few years after, everything is much as it was before.²

And in the twentieth century the industrial recoveries of Germany and Japan since World War II have continued to excite wonder, as has the impressive progress of Russia despite revolution and exceptionally destructive wars.

On the other hand, there are a number of seemingly less favorable recovery experiences. Among those sometimes mentioned are the alleged depression in western Europe following the Black Death of 1348-50, and the century-long population decline of Ireland after the potato blight and famine of the 1840s.³ Actually, in the decade after the Black Death, there was quite a rapid recovery from the

¹ Iklé, op. cit., pp. 211-224.

² J. S. Mill, Principles of Political Economy, Book I, Ch. 5.

³ Both of these instances, and also the economic decline of Mesopotamia following the Mongol invasions, have been cited by one author as support for a pessimistic evaluation of the prospect for recovery from nuclear war: T. Stonier, Nuclear Disaster (Meridian Books: World Publishing Co., 1964), pp. 152, 159-65.

original disaster.¹ What might be argued is that the rate of economic progress of western Europe in the following century was perhaps slower than might have been expected, though that is difficult to establish.² In any case, the major impediments to growth in that period appear to have been the losses associated with continuing onslaughts of plague and repeated destructive wars -- rather than failure to recover from the original blow.³ As for Ireland, a crucial point not to be overlooked is that the abolition of the English corn laws in 1846 permanently impaired the economic viability of Ireland's major export industry. And the potato blight, like the plague five hundred years earlier, did not strike only a single blow but rather remained as a recurring source of economic loss.

A further remark of John Stuart Mill is of interest here:

The possibility of a rapid repair of their disasters, mainly depends on whether the country has been depopulated. If its effective population have not been extirpated at the time, and are not starved afterwards, then, with the same skill and knowledge which they had before, with their land and its permanent improvements undestroyed, and the more durable buildings probably unimpaired, or only partially damaged, they have nearly all the requisites for their former amount of production.⁴

Mill's remark, about the significance for recovery of the degree of depopulation, is consistent with the observation that destroyed cities recover only slowly, if at all, when the destruction takes the form of near-total depopulation (Carthage, Pompeii, St. Pierre,

¹ J. Saltmarsh, "Plague and Economic Decline in England in the Later Middle Ages," Cambridge Historical Journal, v. 7 (1941), p. 25.

² Aggregate production declined with the sharp drop in population, but on a per-capita basis the period may have been a prosperous one. Some historians have called it a "golden age" for the common man, due to the high level of wages prevailing in an era of labor scarcity. See W. H. Beveridge, "The Yield and Price of Corn in the Middle Ages," The Economic Journal (Economic History Series No. 2), May 1927, pp. 164-65.

³ Saltmarsh, loc. cit., pp. 27-29.

⁴ Mill, op. cit.

Jerusalem after the exile to Babylon, and again after the Jewish-Roman Wars, are among the possible examples). It is also consistent with the viewpoint that a nation's wealth, and more particularly the source of its recovery capability, lie more importantly in its human rather than its material resources. Human knowledge, skill, and energy count more than bricks, mortar, and machines -- as the postwar recoveries of Germany and Japan, despite the ravaged state of their cities and industrial plant, proved once again in the twentieth century. We all depend, in short, on one another much more than we depend on material objects.

The argument about the overriding importance of population survival does have its limits, as Mill suggests. If the ratio between population and resources gets too far out of line, very serious economic difficulties may be encountered. Population-protection policies against the direct bomb hazards can conceivably be pushed too far, achieving a degree of only-temporary survival not maintainable in terms of resources. Or perhaps the disruption consequent upon the attack may make impossible the utilization of resources that physically survive. These topics are taken up in the following sections which discuss, respectively, resource availabilities as against needs of the postattack society, and the possibilities for successfully marshalling the resources so as to meet those needs.

II. RESOURCE AVAILABILITY VERSUS NEEDS

Any attempt to assess the prospects for maintaining the survivors of nuclear attack, and for reorganizing the available human and material resources so as to achieve a meaningful recovery, is beset by crucial quantitative uncertainties. The first of these concerns the scale and pattern of attack. On the matter of scale, the difference between being attacked by Russia and being attacked by China (or Cuba!) comes immediately to mind. Or, consider the difference between a Russian "all-out" attack and a Russian "limited" attack designed to achieve some political or strategic purpose short of total nuclear holocaust. The pattern of attack also may be critically important. The thrust could be directed primarily against American offensive military sites (especially missile and bomber bases) as a pre-emptive move, or alternatively against cities; as an economic catastrophe, the latter would be much more serious. Technical details may be of great importance: ground-burst bombs will spread lethal fallout while airburst bombs will not, whereas fire hazards will be greater for the latter. And finally there is the state of our defenses to consider: active defenses may destroy some incoming bombers and missiles, and passive defenses will further reduce the impact upon people and material property. It is impossible here to devote the space necessary to provide quantitative detail on the implications for survival and recovery of these many possibilities. Instead, the discussion will concentrate on the permanent underlying factors, favorable and unfavorable, and the generalizations about the vulnerability picture that remain applicable under a wide variety of circumstances.¹

In the immediate aftermath of the attack the society will enter what may be called the "emergency phase," defined essentially by the priority of direct life-saving tasks over all ordinary economic

¹ For a quantitative perspective, see Sidney G. Winter, Jr., "Economic Viability After Thermonuclear War," The RAND Corporation, RM-3436-PR (September 1963).

activity. This period may vary from days to months in different localities, depending upon the severity of destruction. Civil-defense operations, with the assistance of military forces and surviving agencies of government, would be directed toward extricating and transporting survivors from damaged or contaminated areas, feeding and clothing refugees, and maintaining or restarting communications, power, water, sewage, and other vital utility services. Activities here must meet urgent time-constraints, to make the impaired living environment viable again or to move survivors to lesser-damaged areas, before the limit of human ability to subsist without such help is reached. A major feature to appreciate is that there will be varying intensities and types of damage over different parts of the nation. In some areas of essentially complete property destruction, if blast shelters have been provided there will nevertheless still be considerable population survival. Other areas will have lesser degrees of blast and fire damage or fallout contamination, or combinations thereof; with good shelter, population survival in such less severely hit areas might approach 100 per cent. And, finally, there may be more or less extensive untouched regions. During this period, in the damaged areas communications will be disturbed and transportation largely stopped except for the most critical movements; the survivors will have to subsist mainly on locally available stocks, often under conditions of great privation. After the end of the emergency phase, whether or not that has been efficiently managed, a degree of stability will have been attained. Those who have not perished in the emergency period will have been relocated, if necessary, and arrangements for regular food supplies will have been organized. It is at this point that civil-defense operations in the ordinary sense terminate, and the problem shifts to economic reconstruction.

The reconstruction effort must also meet critical deadlines. The problem here is to reintegrate the surviving pieces of the economic mechanism into a functioning whole so that production in all essential lines can be started up in time to meet urgent needs

as they come due. In the case of food, for example, national reserves in the form of agricultural price-support and other stock-piles provide a year or more of leeway¹ -- but by the end of this time there must be new production, or substitute arrangements through imports. Restoration of utilities to at least a minimal level of functioning will be quite urgent in point of time, while restoration of clothing production can be deferred for a long period. Again, failures here will be reflected in mortalities and intense suffering.²

The key industrial determinants of the prospects for successfully negotiating the reconstruction phase, so as to start on a course of meaningful recovery, are: (1) The relative balance of supplies and survival requirements after attack, and (2) The interactions of industries in the productive process. The first factor on the favorable side is that the peacetime economy has very great aggregate resources relative to rigorous needs. About one-half of current GNP would suffice to provide the present population with per capita living standards at the prosperous level of 1929. And in the reconstruction period, of course, we will not need to devote effort (in any large degree) to amusement and entertainment, to production of automobiles, to missions into outer space, and perhaps not even to armaments. Furthermore, there are enormous productive reserves in our society that are not ordinarily used: factories could operate more than one shift, labor could work overtime and the unemployed put to work, and marginal workers such as the retired, students, and housewives could enter the labor force. Finally, the unavoidable fact of heavy mortalities will reduce some demands upon the economic mechanism.

¹ Calculating in terms of 1960 data, Winter concluded that the inventories were adequate for at least two years (*ibid*, p. 117). With somewhat lower recent stocks, and somewhat larger population, a one-year reserve is still a conservative estimate.

² For a graphic description of city life with utilities suspended and food-supply disrupted, see L. Gouré, The Siege of Leningrad, 1941-43 (Stanford University Press, 1962).

On the other hand, the resources of the economy are physically vulnerable, and concentrated in cities where they can be efficiently destroyed. Tables 1 and 2 are illustrative of this concentration. The first table indicates that, for example, the top 200 areas¹ (ranked by population) contain 47.5 per cent of population and 58.9 per cent of "survival industry";² ranking by survival industry in Table 2, the top 200 account for 41.1 per cent of population and 70.6 per cent of survival industry.

A major implication of these comparisons is that the industries necessary for survival could not be destroyed without in substantial part eliminating much of the population requiring support. The collocated population figures in the tables provide an indication of the fraction vulnerable to the direct effects of the weapons, while part of the remaining population would be vulnerable to long-range fallout. Of course, a very effective civil-defense program, providing high-grade shelter (or evacuation where appropriate) would very substantially enhance population survival relative to industrial capacity. While this will make the ratios under study more adverse, a well-rounded civil-defense program would at the same time provide a much better postattack capability for utilizing such resources as remain, and may even incorporate (through underground construction and related measures) protection for essential elements of industrial capacity.

The overall indications, therefore, are that the population-resource ratio would not be shifted beyond the more austere levels of recent historical experience -- even without taking account of

¹ Areas are 20-kilometer squares (corresponding roughly to the heavy-damage zone of a 10-MT weapon), on a grid overlying the continental United States. For fuller details, see Winter, op. cit., Appendix C. The figures understate vulnerability somewhat, since an attacker could tailor his weapons to the targets somewhat more effectively. Thus, 60.5 per cent of the 1960 population was contained in 212 standard metropolitan statistical areas, of which percentage just over half were in "central cities."

² "Survival industry" refers to a selection of Standard Industrial Classification (SIC) industries judged to be most essential for postattack survival. See Winter, op. cit.

Table 1
 CONCENTRATION OF RESOURCES: AREAS RANKED BY POPULATION

Number of areas	Resource	Population	Recovery and military support industry	Survival industry	Petroleum refining	Electric power	Ports
10		11.9	16.2	15.5	.6	7.2	31.7
20		17.9	26.6	25.1	2.5	10.2	42.4
30		22.0	30.3	30.2	3.3	11.7	51.2
40		25.4	34.8	34.1	8.2	14.0	54.8
50		28.2	39.7	37.4	15.8	16.4	70.7
60		30.6	44.2	40.4	22.2	18.3	74.5
70		32.5	47.4	42.2	25.5	19.5	76.8
80		34.3	49.5	43.6	26.9	20.8	76.8
90		36.0	53.2	46.2	27.8	22.0	77.6
100		37.4	56.4	47.9	30.8	23.4	79.0
120		40.0	58.9	50.0	31.7	24.7	80.8
140		42.2	62.4	52.5	42.4	26.0	81.2
150		43.2	63.5	53.5	45.1	26.9	82.6
160		44.2	65.2	54.5	45.2	27.8	83.4
180		45.9	66.9	56.3	45.5	29.4	85.3
200		47.5	69.7	58.9	47.4	31.2	88.2
250		51.0	73.6	61.5	55.9	33.7	90.7
300		54.0	77.3	64.3	70.5	36.4	93.2
350		56.6	80.1	66.6	72.3	38.9	93.6
400		58.9	82.4	69.2	76.0	41.3	94.5
450		60.9	84.5	70.4	77.5	42.4	94.9
500		62.8	86.1	72.3	77.6	43.7	100.0

Source: Sidney G. Winter, Jr., "Economic Viability After Thermonuclear War: The Limits of Feasible Production," The RAND Corporation, RM-3436-PR (September 1963), p. 209.

Table 2
 CONCENTRATION OF RESOURCES: AREAS RANKED BY SURVIVAL INDUSTRY

Number of areas	Resource	Population	Recovery and military support industry	Survival industry	Petroleum refining	Electric power	Ports
10		10.8	20.5	19.9	1.8	7.1	27.4
20		15.3	27.5	29.2	2.4	9.9	37.5
30		17.7	30.5	35.4	10.7	12.9	49.1
40		19.9	34.8	40.1	14.6	14.7	52.1
50		21.2	36.8	44.0	22.2	16.8	55.8
60		23.3	41.4	47.6	22.8	17.7	56.8
70		25.1	44.5	50.6	25.3	19.7	57.9
80		27.9	46.8	53.2	25.4	20.4	57.9
90		28.8	48.5	55.4	25.4	21.3	57.9
100		30.2	50.8	57.4	25.5	21.7	65.0
150		35.7	57.8	65.4	39.5	26.6	66.0
200		41.1	64.9	70.6	43.0	29.8	73.6
250		44.6	67.4	74.0	47.4	32.9	83.3
300		48.0	70.6	76.7	51.9	34.7	83.6

Source: Sidney G. Winter, Jr., "Economics Viability After Thermonuclear War: The Limits of Feasible Production," The RAND Corporation, RM-3436-PR (September 1963), p. 211.

the enhanced utilization of resources that will be possible. Thus, so far as aggregate capacity is concerned, the ratio of resources-to-population does not seem liable to decline to a level that is really critical.

The vulnerability of the economic system, then, does not lie as much in its geographical concentration as initially appears. Rather, aside from the organizational or functional problem to be discussed later, the key source of vulnerability is interdependence. Interdependence derives from the division of labor that makes modern economies so productive, but this specialization means that destruction in one area or industrial sector may have far-ranging impact. It is, of course, possible to exaggerate these collateral effects. Before 1914, for example, it was seriously argued that the growing economic interdependence among nations would make a world war impossible. And, during World War II, our strategic bombing planners thought at one point that destruction of most of Germany's ball-bearing factories would bring her war machine to a halt. Nevertheless, for the much heavier levels of destruction we are contemplating here, interdependence will certainly entail critical disruptive effects. We cannot have electric power without coal, or transportation without petroleum. Nor can we have any of these without the necessary skilled labor -- which depends upon provision of food and shelter, relating back once again to the availability of electric power, transportation, etc.

The offsets of interdependence as a source of vulnerability should also be considered: Inventories at every stage of the productive process provide buffers in the short run, and rationing can limit supplies to the most essential users. In the longer run, reallocation of effort and substitution -- the shifting of resources from one employment to another -- will "break the bottlenecks." The problem of postattack resource management in the reconstruction phase is to regulate the sequential processes of rebuilding and repair in the light of these considerations, with an appreciation of

the relative essentiality of each industrial sector and economic activity.

To give one concrete instance, it seems very likely that electric power will be uniquely significant throughout. Even in the emergency phase, power may be vital to permit continued shelter occupancy where the population is pinned down by fallout contamination.¹ Power is a necessary input to other utility systems, such as water, gas, and sewage (whose continued functioning or restoration is second in order of urgency). Arrangements will have to be made for emergency repairs, load-shifting, replenishment of coal inventories, etc. Power cannot be stored, of course, but the inventories of fuel and repair parts will be crucial. Supplies and skilled labor can be brought in from undamaged areas to accelerate restoration of service, and (as in the recent Alaska disaster) emergency generators can provide substitutes for network power in the most absolutely critical uses. With a power network restored, even on a severely rationed basis, attention can be directed to starting up less immediately urgent activities.

¹ The tunnel-grid shelter system described in Chapter XI provides independent power supplies for tunnel-section modules.

III. POLICY, CONTROLS, AND INCENTIVES

The problems of the emergency and reconstruction phases are not merely the mechanical or physical ones. Restoration of a functioning economic system must be achieved through an existent social organization, itself vulnerable in a variety of ways to the effects of bombing.

As mentioned earlier, the historical record does not justify predictions (appearing in the more lurid fictional treatments) of complete breakdown of law and order, with the collapse of all established authorities and norms of behavior. A somewhat less extreme possibility, worthy of some concern, would be a shift away from national loyalties and identifications to regional or local ones. Undamaged areas might refuse to share their resources or accept privations in order to assist the recuperation of damaged areas, to provide for refugees, etc. The vulnerable concentration of the federal bureaucracy in Washington raises the spectre of sheer incapacity of government at the national level. On the other hand, some elements of national authority will survive to reconstitute a legitimate government, and this government will possess what seem to be overwhelming sources of strength as against local separatism. Aside from moral authority, the national government will command a number of vital resources: a near-monopoly of information as to the overall military, political, and economic prospects; access to overseas assets and sources of assistance or trade abroad; and most important, surviving military forces.

We can presume, then, that there will be a national government engaged in some kind of overall regulation of the economic system designed to achieve the goals of postattack survival and reconstruction. Nevertheless, it is true that failures or mistakes of policy may lead to important losses in economic performance. For example, the attempt of the early Bolsheviks to run Russia without monetary exchange under the system of "war communism" led to economic catastrophe; ultimately, ideology had to give way to the New Economic Policy in the interests of survival.

In the emergency phase, and particularly in the more heavily damaged areas, the immediate economic task of sustenance -- essentially the distribution of existing stocks simply to maintain life and health -- will necessarily take priority over the longer-run task of production. For temporary sustenance, the dominant theme will be equity in rationing, in the interests of maximizing survival. In the reconstruction phase, the dominant theme will have to shift to efficiency in the utilization of resources, often at the expense of standards of equity applicable in normal times. For example, to assure that everyone capable of productive labor will be working, all personal income payments associated with property ownership may be blocked or placed under moratorium. Also, limited food supplies may be strictly reserved for productive workers, with very little allocated to the disabled or unemployable.

To direct and regulate postattack emergency and reconstruction efforts, responsibilities have been assigned to a considerable number of government agencies. Oversimplifying somewhat in the interests of brevity, responsibility for postattack social functioning is now divided between OCD and the Office of Emergency Planning (OEP), the latter a small advisory agency attached to the Executive Office of the President. OCD's sphere is primarily in the direct lifesaving aspects of postattack rescue, casualty treatment, decontamination and evacuation, etc., but includes support of civil government. Thus OCD will have primacy in the more immediate post-attack phase timewise, and in the more damaged regions areawise. Because of budget deficiencies, progress in ability to manage such large-scale postattack activity has been even slower than in the shelter program; all OCD can actually do now is advise local government, and grant some token financial support for local planning. So on the one hand we have a need for strong action, on the other hand a failure to provide for it. Unless much more effective preparations are undertaken to support the functioning of civil government, it seems (to this observer) that martial rule in damaged areas will be inevitable.

OEP's main responsibilities are for preattack preparations to enhance the nation's "mobilization base," and for laying down the principles of postattack management of the surviving economy. Some progress has been made in assuring continuity of government, by legal provision for lines of succession and by physical preparation of dispersed (and, in a few cases, protected) alternative headquarters for government agencies. In the field of postattack economic management, OEP's thinking has been directed toward perfecting and updating the financial, industrial, and consumer controls developed during World War II. The key concepts and developments are:

(a) The postattack economy is to continue privately owned and operated, subject to governmental control and direction. (b) On the consumer level, there is to be detailed rationing of commodities and a general price freeze. (c) Producing firms will acquire allocations of resources on the basis of claimancy proceedings, in which an appropriate government agency will balance the relative urgency of the various claims against the supplies available. Unlike the practice in World War II, when at various times different agencies controlled resources like manpower, rubber, steel, etc., the present concept envisages unified and centralized claimancy. (d) Vital information will be provided by the PARM (Program Analysis for Resource Management) system, an interindustry economic model associated with large-scale data-processing facilities. The PARM model is a mathematical simulation of the national economy, so designed as to take account of the interdependence of industries, locations and magnitudes of inventories, time-lags in construction, etc. This model will automatically incorporate damage-assessment information, and will provide estimates as the feasibility of proposed recovery plans. (e) During the period when federal control may be incapacitated, the "stabilization" task (rationing, price controls) and the resource-management task are both to be delegated to local authorities. (f) A currency reserve has been stockpiled for government needs.

Whether this approach is workable in the postattack era seems very much open to doubt. The history of American economic mobilization in World War II has dominated current planning, which is understandable. But relevant historical experience is hardly provided by what happened in the unattacked United States, or even in Germany under continued but non-atomic bombing. A closer analogy may be the situations of Italy, Germany, and Japan in the confusion of war's aftermath. In each of these cases the problem was to put a shattered mechanism together again, amidst damage and social disruption. It is worth noting that the attempt to export familiar types of U.S. wartime economic controls failed conspicuously in these situations -- the production recovery was disappointing from some time, while black or gray markets predominated in economic transactions. It seems evident, retrospectively, that much wiser policy would have dictated control of inflation by limiting the emission of purchasing power, without attempt to freeze prices and economic relationships at unrealistic levels. Indeed, the real beginning of postwar recovery of each of these countries was associated with just such a shift of policy.

On the other hand, confusing the attempt to restore production on a private-enterprise basis will be the destruction of assets, titles, records, financial institutions, and corporate headquarters. Private business might be paralyzed, often rendered insolvent, even in undamaged areas. Can we have confidence that currency, not to mention bank checks, will receive acceptance in exchange for real goods? One is tempted to believe that it may be necessary to cut through the difficulties by what might be called "disaster socialism" -- direction of all economic activity by fiat. Indeed, something like this seems unavoidable for damaged areas in the emergency phase; food and shelter will have to be diverted to immediate life-supporting needs, regardless of ownership status. Furthermore, the persistence of physical dangers in some areas, particularly the problem of long-term contamination by fallout, seems to dictate the continuance of quasi-military control over some portions of civil

life and productive activity. But on the other hand, the experience of Russian "war communism" confirms what we know already -- that an army is not an efficient means of organizing production, for the long pull.

To risk a prediction, quasi-military rule will prove to be unavoidable for the damaged areas in the emergency phase, to be gradually relaxed as physical hazards abate. In the undamaged areas, and in private productive activity in general, new forms of government intervention will be found necessary: guaranteeing of private transactions with financial institutions, emergency credit provisions, sweeping moratoriums on various classes of property incomes, perhaps a currency reform, etc. The object here will be to find a way, despite unavoidable inequities, to liberate private productive energies from the dead weight of past claims and contractual arrangements. An ultimate equitable rearrangement and settling of accounts (deferred to the indefinite future) will be promised.

IV. IMPLICATIONS FOR PRE-ATTACK PREPARATION

Nothing in the analysis above serves to disprove the contention that, by all accounts, the first priority is to save population. On the other hand, a well-rounded civil-defense program must recognize the life-saving implication of meeting emergency postattack needs: rescue and evacuation, feeding of survivors, etc. The first requirement here is organization, which must then be provided with stockpiles of food, clothing, and fuel, emergency communications and transportation, etc.

To facilitate recovery, hardening of facilities and provision of redundancy and buffer stocks of key equipment and inventories are indicated. Special attention, in any case, should be paid to the functioning and rapid repair of the key utility networks: power, gas, water, and sewage. Even a limited budget can do a great deal in this area. There is also a very serious need for research in what may be called "emergency technology" (see Chapter 16), and in the analysis of economic and social systems under conditions of stress and its aftermath.

From the longer-run point of view a postattack period of privation and impoverishment is definitely to be expected. But the historical record does not justify pessimism on the score of ultimate recovery -- unless, indeed, the destruction level contemplated is so great that the concept of recovery is itself hardly meaningful.

