a nuclear attack on the fabric and population of a major city. It will also emphasise the fact that civil defence measures would be largely ineffective against any substantial nuclear attack. This project will build on the report of the Greater London Area War Risk Study (Glawars) that has recently been published. Below, Simon Hodgkinson, who works with Earth Resources Research which contributed to the book, explains the Glawars study.

# CIVIL OFFENCE

Under the new Civil Defence Regulations 1983 local authorities are required to plan for the contingency of a nuclear war. Among other things, these plans are supposed to include provision for communal fallout shelters for all survivors who need them, emergency accommodation for the homeless in the post-fallout phase and a service for the repair and reconstruction of damaged buildings.

This planning, it seems, is to be carried out in the absence of any detailed information about the likely nature, scale or effects of a nuclear attack. The Home Office's *Emergency planning guidelines for local authorities* is a masterpiece of abstract writing which in 200 pages barely alludes to the horrors that are its *raison d'être*.

Given the lack of information in the Government's publications on the subject, the GLC in 1984 wrote to the Home Office requesting information on which to base its civil defence plans for nuclear war. When no reply was forthcoming it decided to commission a major study, Glawars, to provide the necessary information and to investigate the likely effectiveness of possible civil defence preparations.

Glawars brought together an international team of scientists, military experts and disaster relief specialists who undertook the most detailed analysis ever made of the consequences of a nuclear attack on a major city. The results are published in *London under attack* (Basil Blackwell, £3·95).

Part of the Glawars study, undertaken by ERR, examined the impact which a nuclear war would have on the built environment and the viability of defence measures related to the built stock. The methods and conclusions are discussed below.

### Research methods

ERR began its analysis by constructing a geographical computer model to calculate the levels of damage to London's built stock which would result from different attacks. The model divided the London area into 1500, 1 km grid squares. Information on the numbers, types and structural characteristics of buildings in each of these grid squares was fed in from a variety of detailed databases, principally the 1971 Greater London Land Use Survey.

Using the results of a study by the Stanford Research Institute, each London building type was then matched to a US building type and its various components, such as structure, windows, walls and roofs, were assigned a set of criteria defining their likely resistance to the blast and fire effects of nuclear weapons.

This research suggests, for example, that two- to three-storey brick-built terrace houses with load bearing walls would collapse from a blast in the range of 14-28 kPa whereas typical 1960s high-rise reinforced concrete frame council housing would suffer structural collapse if the pressure increased suddenly in the range 20-70 kPa, depending on the solidity of its external cladding. Using criteria from another US study an algorithm was developed to account for the increased probability that a building weakened by a blast from one bomb, would be demolished by relatively low blast levels from subsequent detonations. Algorithms were then incorporated to calculate the blast and thermal radiation effects which would be felt in every grid square as a result of any specified nuclear attack.

The nuclear attacks used by ERR in its study were the five postulated for the Glawars study by the leading strategist, Professor Lawrence Freedman. Although it was considered unlikely that any actual nuclear war would remain limited in scale, these scenarios covered a broad range of possibilities.

Scenarios 1, 2 and 3 were small scale attacks primarily aimed at military targets. Scenario 1 was restricted to nuclear bases and London was thus assumed not to be hit. Scenario 2 added to the scenario 1 targets all military command and control centres—four such targets exist in London, all concentrated in the west, at Stanmore, Heathrow, West Drayton and Northwood. Seven weapons, all of relatively low yield (350 kt) were taken to fall on these targets. Scenario 3's targets were similar to scenario 2's, but smaller weapons were taken to be used (150 kt) and two additional weapons were detonated, one at Biggin Hill in the South and one, accidentally, on Hampstead.

Scenarios 4 and 5 assumed that urban centres were attacked and that 5 Mt and 10 Mt, respectively, fell on London. Although these attacks would probably result in severe nuclear winter effects globally, they are by no means particularly severe attacks when compared with those assumed in previous studies.

### Results

The model generated detailed results for each attack scenario by grid square of the numbers of buildings of each type which were estimated to be:

- destroyed by fire or having experienced collapse of one or more major structural element
- structurally weakened and generally damaged to the extent that they would be rendered useless for their intended purpose
- damaged non-structurally; buildings with varying degrees of damage to elements such as doors, windows and roof coverings, were considered to be repairable in normal circumstances and potentially useful in their damaged state for basic shelter.

It is not possible here to present many of the detailed results. The basic results are presented in Tables I.

Estimates produced by another part of the Glawars study showed that under these attacks the great majority of the population would be killed outright. The ensuing nuclear winter would probably result in most of the survivors dying in the subsequent year or so. In the light of the unimaginably severe consequences of such an attack, and of the uselessness of any realistic civil defence measures in mitigating these consequences, the researchers decided that to plan for the contingency of such severe attacks would be a waste of public resources. But what of the lighter attacks?

Perhaps the most startling findings of the Glawars study were those for attack scenarios 2 and 3—the lightest conceivable intentional attacks on London. When all the results for these scenarios were considered cumulatively it became obvious that London's very survival as a city would be threatened by nuclear attacks of a much smaller scale than had hitherto been believed. It was concluded that, certainly following a scenario 3 attack, London would enter a spiral of decline from which it might never recover.

ERR's conclusions with respect to the built environment, and related civil defence considerations for these scenarios, were similarly pessimistic.

As Table I shows, under these two scenarios 13-18 per cent (350 000-500 000 units) of the housing stock would be destroyed and a further 5-12 per cent structurally severely damaged. By comparison a mere 204 000 homes were destroyed by enemy action in the whole of Britain throughout the Second World War.

Despite these levels of damage it might at first sight appear that, particularly under scenario 2, the situation could be managed with careful civil defence preparations. A closer examination, however, shows that Home Office's proposed civil defence preparations relating to the built stock would serve little useful purpose under these attacks. The three main types of civil defence preparations are considered below.

**Table I Destruction (d) and structural damage (sd) to the built environment by scenario (percentage of totals)**

| | *Scenario* 1 | | 2 | | 3 | | 4 | | 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *d* | *sd* | *d* | *sd* | *d* | *sd* | *d* | *sd* | *d* | *sd* |
| Housing | 0 | 0 | 13 | 5 | 18 | 12 | 81 | 11 | 95 | 4 |
| Storage sites | 0 | 0 | 14 | 8 | 18 | 16 | 90 | 6 | 97 | 3 |
| Builders' yards | 0 | 0 | 10 | 2 | 13 | 4 | 80 | 7 | 93 | 4 |
| Chemical stores | 0 | 0 | 7 | 0 | 4 | 1 | 68 | 6 | 92 | 3 |
| Schools | 0 | 0 | 19 | 5 | 18 | 9 | 76 | 13 | 92 | 7 |
| Universities, polytechnics | 0 | 0 | 23 | 3 | 19 | 3 | 77 | 4 | 88 | 2 |
| Hospitals, nursing homes | 0 | 0 | 13 | 4 | 13 | 5 | 68 | 9 | 88 | 5 |
| Industrial sites | 0 | 0 | 13 | 4 | 16 | 8 | 81 | 6 | 94 | 2 |
| Government offices | 0 | 0 | 6 | 2 | 9 | 6 | 94 | 2 | 98 | 1 |
| Commercial offices | 0 | 0 | 7 | 3 | 12 | 15 | 93 | 3 | 98 | 1 |
| Public buildings | 0 | 0 | 21 | 2 | 21 | 5 | 70 | 8 | 87 | 6 |
| Shops | 1 | 1 | 17 | 8 | 25 | 19 | 91 | 5 | 99 | 1 |

*Note:* percentages are of numbers of houses; of floor space for storage sites, builders' yards, chemical stores, industrial sites, government and commercial offices, and shops; and of site area for schools, universities and polytechnics, hospitals and nursing homes, and public buildings.
*Source:* Hodgkinson *et al.* 1986.

### Fallout shelters

The central plank of the Government's civil defence proposals in the fallout phase are that households should 'stay put' at home using and improving the radiation protection qualities of their dwellings. Local authorities are charged with additionally providing communal shelters for survivors made homeless or whose homes would not provide adequate protection.

There are many problems with this policy—the attack could occur during a working day, hysterical survivors might choose to flee their homes in the aftermath of an attack irrespective of the dangers, and so on. However, by far the most serious of these problems is that even if people did stay at home, the protection their homes would offer against fallout would be minimal.

The Government's calculations in this respect are seriously flawed. They assume that households will have all bricked up at least one window in their dwellings. All the indications are that for a whole variety of reasons—lack of materials, wherewithal, motivation, time—this kind of preparation would simply not happen on a significant scale. In addition, ERR's calculations showed that very few of London's surviving dwellings would offer survivors an adequate degree of protection. Given this, any additional communal shelter provision that local authorities made would necessarily be marginal to the need and thus be arbitrarily allocated. The researchers felt that it was difficult to justify the current expenditure of public resources on provision which in the event of this level of attack would only benefit a small minority, at the expense of the majority.

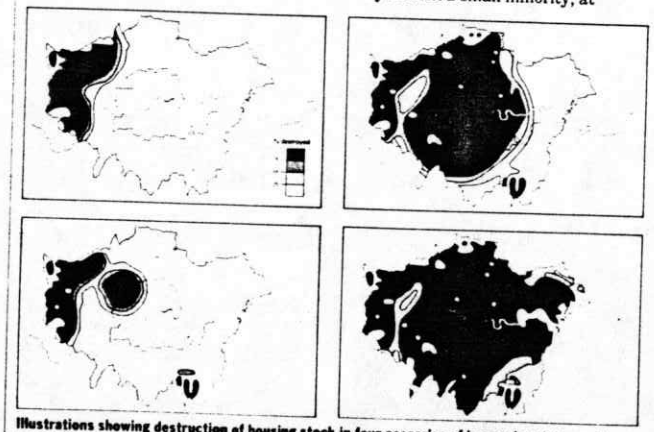
About two weeks after the attack the radiation would in theory have decayed sufficiently to make it 'safe' for survivors to come out. Local authorities are, among other things, required to plan for the post-fallout 'to provide and maintain a service in their area for the temporary accommodation and, so far as may be necessary, the maintenance of people who have been made homeless. . .'

Although it may again at first sight appear that civil defence preparations of this kind for a scenario 2 and 3 type contingency might be sensible, a closer look suggests again that official provision of this kind would merely benefit the few at the expense of the many. The housing problem in this phase would be circumscribed by a number of daunting realities—damage which would have been caused to the infrastructure would mean no domestic water or energy services for an indefinite period. Thus most surviving housing in London would have been turned into little more than shells, barely able, because of broken windows, doors and roof coverings, to keep out the elements. The main concerns of survivors in this phase would be to obtain food, water and medical help.

Studies of Third World shelter aid following war and natural disasters have found that large refugee populations have, even in the best of circumstances, only been marginally helped by official responses to their plight—most people find homes for themselves before the official aid arrives. The kind of planning which the Home Office is envisaging local authorities undertaking in relation to this emergency accommodation phase is simply not realistic and would not provide more than marginal relief, in the event of a scenario 2 or 3 type attack. For these reasons ERR again concluded that to plan for such a contingency was simply not viable.

### Reconstruction phase

The overall conclusions reached by ERR closely resembled those reached by the study as a whole—namely that affordable civil defence measures would be ineffective against any substantial nuclear attack. Given this conclusion it was felt that it would be much more worthwhile if the Home Office abandoned its view, unique among European governments, that civil defence against nuclear war was viable, and restricted emergency planning to deal principally with conventional attack and with civil hazards.



**Illustrations showing destruction of housing stock in four scenarios of increasing violence. Top left, scenario 2; bottom left, scenario 3; top right, scenario 4; bottom right, scenario 5.**

### References


*London under attack* by Robin Clarke, Basil Blackwell, 1986.
*The impact of nuclear war on London's built environment* by Simon Hodgkinson, Malcolm Fergusson, Francois Nectoux, Owen Green, Mark Barrett, South Bank Polytechnic, 1986.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