Chapter 10

Technology policy for nonviolent struggle

The basic idea of technology for nonviolent struggle is straightforward. Actually bringing this alternative about—doing relevant research and developing, testing and implementing relevant technologies—is much more difficult. In this chapter I discuss priorities for moving towards technology that serves nonviolent rather than violent struggle.

The term usually used when discussing priorities of this sort is "policy," in this case technology policy. The idea of policy, though, has come to refer primarily to decisions and implementation by governments. Governments are certainly important players in R&D, but not the only ones. After discussing priorities, I look at what can be done by three particular groups: governments; scientists and engineers; and community groups.[1]

Before beginning, it is worth emphasising that there are enormous institutional and conceptual obstacles to promoting nonviolent struggle.[2] Many government and corporate leaders would do everything they could to oppose development of grassroots capacity for nonviolent action, since this would pose a direct threat to their power and position. Furthermore, the idea of popular nonviolent struggle is extremely challenging to many people given standard expectations that the "authorities" or experts will take care of social problems, including defence. Therefore, to talk of technology policy for nonviolent struggle may seem utopian. But if alternatives are ever to be brought about, it is important to talk about them now. Without vision and dialogue, there is little hope of building a nonviolent future.

Priorities

The traditional idea of technological advance was the "linear model": first there is scientific research; the results of the research are applied, thereby producing a technological application; finally, the technology is taken up in the marketplace. Among those who study technological innovation, this simple model is pretty much discredited. Innovation seldom happens this way.

Another model is "market pull." There is a demand for a certain product or service. This encourages technologists to search for a suitable solution; sometimes this involves doing directed research.

In practice, the process of innovation is usually complex. It involves market incentives, new ideas coming out of basic research, economic and psychological commitments to current systems, and the particular agendas of interest groups such as politicians, government bureaucracies, corporate elites, and various pressure groups. Nevertheless, the usual models of innovation focus on several key players: government and the market and their relation to R&D. The "market" is constituted by those who buy and sell the product in question.

For weapons, the market has only a partial relevance, since a large fraction of production is carried out by governments for their own use. In most capitalist economies, corporations are heavily involved in weapons production, in which case the major purchasers are governments. Technology policy for military defence is therefore primarily concerned with government funding, regulation and promotion of the process of innovation.

Technology policy for nonviolent struggle is different in a fundamental way, aside from the obvious difference between nonviolence and violence. As outlined in the previous chapter, the very method of doing R&D for nonviolent struggle needs to involve all interested members of the community, since they are the ones who will be on the "front line" in carrying out nonviolent action. The immediate implication is that the highest priority should be put on measures that involve as many people as possible and minimise dependence on groups with special skills or resources. Accordingly, I now outline four ways of promoting technology for nonviolent struggle, in order of priority.

1. Implement currently available technologies

This includes things such as expanding access to computer networks, teaching workers how to shut down and start up factory equipment, promoting use of self-reliant energy systems, and running simulation exercises in neighbourhoods and workplaces. Such measures do not require any new technologies, much less any research. However, they would have a strong indirect influence on R&D. When people learn how to use existing technology, they often have ideas about how it could be improved, adapted or replaced. The key point here is to link the use of the technology to the goal of nonviolent struggle.

For example, when users of computer networks think about how to communicate in an emergency, they are likely to ask "what if?" questions. What if an aggressor coerces the system administrator? What if messages are intercepted and read? This is likely to lead to pressure for better security, such as standard use of encryption, and contingency measures for an emergency. This in turn could readily stimulate research in particular directions.

When workers think about how to resist a takeover of their factory, initially they may want to know how to protect themselves or how to make sure the aggressor can be resisted with the least risk to anyone's life. Once they learn more about how the factory operates, they may have ideas about reorganising production, accounting systems, work arrangements and the like, all of which could make the workers better able to resist an attack. This in turn would likely lead to a number of puzzles for engineers.

Thus, to set top priority on implementing currently available technologies is likely to lead directly to demands for finding and implementing different technologies. The biggest advantage of this approach, though, is that it can generate support for further measures. Rather than do research in isolation from the application and hope that people find it relevant to technology, this approach uses implementation as a way to mobilise knowledge and skills.

The fundamental assumption is that since popular involvement is the foundation for successful nonviolent struggle, popular involvement is also the foundation for the promotion of science and technology for nonviolent struggle.

2. Search out and disseminate existing ideas

Examples here include radios operating on very low power, medical techniques for diagnosing the use of torture, and plants that can be readily grown locally for food. These are areas in which technologies or techniques are available but not widely known. There are lots of radios available that operate using mains electricity or conventional batteries, and there are factories to produce such radios. By contrast, there are few micropower radios available and relatively few people who know how to build them. Similarly, some researchers have developed techniques for diagnosing particular types of torture, but very few medical practitioners or others know about these techniques, much less how to apply them.

From the point of view of any group promoting nonviolent struggle, it is first necessary to search out these sorts of ideas. Then they need to be tested. Assuming they are

useful ideas, they need to be publicised in the right quarters. Testing and publicity are interactive. The results of testing can be the basis for publicity, whereas publicity can lead to testing by others, or to awareness that others have already developed the same technique.

The next stage is to begin to implement these technologies. That takes us back to priority 1.

3. Adapt existing technology

This includes modifying factory design so that workers can control production more easily (shutting it down or gearing it up), developing short-wave radio sets so that they can be used as public phones, and designing dams and power plants so they are less susceptible to sabotage. The basic idea here is to use existing technology but to modify it to better serve the purposes of nonviolent struggle.

In the case of factory design, this might mean introducing a crucial piece of equipment—such as a special computer chip—that can be easily destroyed, thereby rendering the factory useless for a period of time until a replacement could be reconstructed. Depending on the factory, this might be straightforward or difficult, but in either case it means a modification of the existing design rather than redesigning the factory from scratch.

In the case of short-wave radio, existing sets would need modification for use as public phones, to make them simpler to use, relatively resistant to weather and mishandling, etc. Again, the aim is to adapt the technology for nonviolent purposes.

Adaptation of this sort is not necessarily easy. It can pose difficult technical challenges. It also must involve prospective users. The workers must be involved in the factory redesign process, otherwise the new system may turn out to be useless or even counterproductive. A public short-wave radio system has to be tried out by the sort of people who would actually use it. In the testing that is an essential part of the adaptation of the technology, many suggestions for improvement and new ideas are

likely to arise. The whole process should be an interactive and iterative one.

If a modification of technology turns out to be effective, then it becomes worthwhile to tell others about it. It becomes an "available" technology that others may want to use. This takes the process back to approach 2, searching and disseminating existing ideas.

In reality, there is a lot of overlap between these two approaches. An existing technology can seldom be transplanted directly from one situation to another. Adaptation is usually required. Even factories producing the same product using the same method are designed in somewhat different ways. The workers have different skills and experiences. This means that equipment designed for one factory is likely to need modifications in order to work effectively in another. Similarly for short-wave radio. From one community there may be differences in climate, language, common knowledge, treatment of public facilities and so forth. Factors such as these need to be taken into account in designing and implementing any system.

4. Develop new technologies

Examples here include new varieties of crops that do not rely on artificial pesticides or fertilisers, new communication systems that are resistant to centralised control, and new styles of architecture to facilitate ease of construction and to foster community solidarity. The challenge to develop new technologies to serve nonviolent struggle could require scientific investigations. For example, crop planning for self-reliant communities might lead to puzzles in mathematical ecology somewhat different from the standard ones. Introducing computer chips and sensors in walls, appliances and so forth—called ubiquitous computing—might, in some circumstances, be valuable for nonviolent struggle. How could it be done in a way that gives no power to any group trying to control the population? Just as whole branches of current theoretical work in various disciplines have evolved from the puzzles deriving from

practical problems, so it is likely that the practical problems of nonviolent struggle would give rise to numerous theoretical investigations.

Compared to using or modifying existing technologies to serve nonviolent struggle, developing new technologies requires much more effort and gives less guarantee of success. Even more important than this, though, is participation in trying out technology. Implementing existing technology involves the users immediately. Their responses are essential for making the technology actually serve the purposes of nonviolent struggle. Developing new technology, by contrast, is seldom a community-based enterprise. It often requires specialised skills. Therefore it is best done in the context of widespread support for nonviolent approaches rather than as the vanguard of nonviolent struggle. Without popular involvement, new technologies are likely to simply sit on the shelf, untested and unknown.

This set of priorities may suggest that I am hostile to new technologies. Quite the contrary. If, in the long term, nonviolent methods become established as the only viable way to struggle, then new technologies are likely to be fundamental to this process. In a society built around self-reliant communities with numerous technological systems by which people can undermine aggressors, violence will be widely seen as counterproductive. So long as technological systems exist that allow centralised control—which includes everything from weapons systems to centrally controlled communication systems—the dangers of domination will persist. So in the long term the development and implementation of new technologies to serve nonviolent struggle are essential.

However, this does not mean that developing new technologies is the best approach in the short term. In present-day societies, violence and centralised control are pervasive and relatively few people are dedicated to developing nonviolent alternatives. The idea of science and technology for nonviolent struggle is virtually unknown. In this situation, the first prior-

ity is to generate greater involvement in the idea and practice of nonviolence. Concern about new technologies is more a distraction than an aid in this, given that there are numerous existing technologies that can serve nonviolent struggle most effectively.

I have talked so far about priorities for introducing technology for nonviolent struggle. I haven't actually said *who* will do the introducing. In my view, there is no single correct answer. Various groups can be involved, ranging from governments, corporations, engineers, workers and nonviolent activists.

Government

If even a single government devoted significant resources to the promotion of technology for nonviolent struggle, it would have an enormous impact.[3] It could, among other things:

• sponsor projects to implement available technologies;

• finance searches for suitable technologies that are not widely known;

• organise simulations of social defence;

• publish writings and advertisements about nonviolent struggle;

• endorse the development of contingency plans for nonviolent resistance;

• promote measures for self-reliance in various fields;

• encourage inclusion of the theory and practice of nonviolent action in schools;

• disseminate ideas about nonviolence to other governments;

• offer support—moral, human and material—to nonviolent groups opposing repression in various parts of the world;

• develop plans for nonviolent resistance within government bureaucracies;

• set up institutes for research into nonviolence.

Governments have two great advantages when it comes to promoting nonviolence: legitimacy and resources. Legitimacy is perhaps the most important. If just one government in the world decided to promote nonviolent strug-

gle, it would provide an example and inspiration to people everywhere. The resources controlled by governments are important too: money, workers, laws, policies. These resources are used now to sustain military systems. Clearly the same resources would have a giant impact if devoted instead to nonviolent struggle. But legitimacy is vital in the use of resources too: laws will be obeyed only if most people consider them legitimate; government employees can easily strangle policies if they do not think them legitimate.

The great power of government, via legitimacy and resources, is the reason why so many groups look to government to solve their problems. This applies to peace movements as well as many others. Many of the campaigns of peace movements over the decades have been aimed at changing goverment policy. Intense lobbying is carried out; rallies are held to demonstrate the strength of public commitment; demands are made for government action, such as a "nuclear freeze" or an end to foreign intervention. But in most cases these efforts have had little success. Governments are seldom responsive to peace movements and have seldom shown any interest in nonviolent struggle. There are several reasons for this.

Most fundamentally, states and militaries are sustained by each other, as noted in chapter 2. The foundation of state power is a monopoly over what is considered legitimate violence, exercised by the military and the police. Even when the threat of foreign aggression is negligible—as in geographically remote countries such as Fiji or New Zealand—military establishments are maintained and fear of enemies is fostered. Militaries are far more likely to be used internally, against the people who are supposed to be defended, than against foreign aggressors. This is most obvious in the case of military dictatorship.

Since the military is an integral, indeed essential, part of the state, it is inherently unlikely for the state to fully endorse popular nonviolent struggle as an alternative to the military. Popular nonviolent struggle might, after all, be used to challenge the status quo.

This assessment of the link between the state and the military is useful at a general level, but it gives too mechanical a picture. The state is not a unified entity: it contains the government (elected or otherwise), the legal system and various state bureaucracies to run or regulate functions such as welfare, education, industry and transport, among others. It is quite possible for different sectors of the state to promote different goals. Some governments have sponsored studies of social defence; some teachers in government schools have developed peace studies; some government departments have promoted self-reliance; and so forth. It is certainly possible for parts of the state to sponsor nonviolent struggle.

The problem is that nonviolence has a very low profile compared to military approaches. The military is well and truly entrenched, partly because of its structural relation to state power.

Peace activists often hope to sway political leaders by the logic of their arguments. This seldom has much impact, since politicians are much more influenced by power considerations. After all, the threat of global nuclear war has never been enough by itself to persuade politicians to implement nuclear disarmament.

Peace activists also try to apply pressure to political leaders through letter-writing, rallies, mobilisation of voters and civil disobedience. This has a much greater impact than just logical arguments. Nevertheless, there are limitations in the strategy of applying pressure. Political leaders are subject to other pressures, such as lobbying by supporters of the military. Promises are easy to make and easy to break. When community activists seek to get the government to take action, they do not take control of the agenda themselves. Their effort is to get someone else (the government) to take action, not to take action themselves.

Finally, even when governments do take action, they are not likely to promote a process of community mobilisation. They are more

likely to sponsor research, which may just delay the day when action occurs. They are likely to provide support for figureheads—such as prominent investigators—rather than for community-level activists.

The experiences with government sponsorship of research into social defence illustrate the above generalisations. Supporters of nonviolent action have devoted much effort to persuading governments to investigate social defence. Occasionally there have been successes. The governments of Denmark, Sweden and the Netherlands have sponsored studies.

The experience in the Netherlands is instructive.[4] In the late 1970s, a small radical party was part of a coalition government. A member of this party was made science minister, and Johan Niezing, Professor of Peace Research at the Free University of Brussels, was his chief scientific adviser. Niezing has long been committed to social defence, not for idealistic reasons but because it seems to him to be the most pragmatic alternative to the horrors of military methods.[5] As a result of Niezing's influence, one of the conditions for continuing the coalition was the acceptance of proposals to fund ten social defence research projects. A committee, chaired by Niezing, was set up to oversee the ten projects. But then there was a change of government. Funding was dramatically reduced so that there was enough for just one project.[6]

The one project was a study coordinated by Alex Schmid of Leiden University. Schmid and his collaborators concluded that an invasion by a determined military power (specifically, the Soviet Union) could not be stopped by nonviolent means.[7] In retrospect, now that the Soviet threat to western Europe has collapsed in the wake of the largely nonviolent 1989 revolutions in Eastern Europe, this analysis seems quite shortsighted. Thus ended a promising possibility for sustained research on social defence.

(Schmid went on to set up the Interdisciplinary Research Project on Root Causes of Gross Human Rights Violations, with the Dutch acronym PIOOM, at the University of Leiden. This is a vitally important social science enterprise, whose core funding remains precarious.)

The Niezing committee was disbanded in 1987; its original proposals, having been updated and augmented by Giliam de Valk, were published in English in 1993.[8] Niezing himself played a key role in ensuring that this publication took place.

These problems with getting governments to take action serve as a warning. It may be worthwhile to seek government support for nonviolent struggle, but it is wise to be aware of the difficulties. For example, at the United Nations, the most powerful governments obstructed a study of military science and technology at every stage. The study was endorsed by the General Assembly, but hamstrung by committee members (selected by governments) who were military officers or just ignorant. The study was held back by governments' refusals to provide information or their antagonism to critical comment, and was continually stalled at the publication stage.[9] The difficulties that could confront active efforts to develop technology for nonviolent struggle—which might, after all, be used against government repression—can be imagined.

In summary, government support for nonviolent struggle offers the immense advantages of legitimacy and resources. But in most cases there is likely to be great difficulty in gaining any support in the first place, due to the close connection between the military and the state. Furthermore, seeking government support has the disadvantage of trying to get others to take action rather than doing it oneself. Finally, governments are likely to sponsor research that is removed from the community.

All these features are apparent in the Dutch experience. The Netherlands government had ample resources to investigate and promote social defence, but the major political parties were not interested. It was only by a quirk of politics that government funds were allocated to social defence. The money was cut back at

the first opportunity and in any case was devoted to research rather than community action. Even so, the funding gave considerable credibility to social defence and the proposals from the Niezing Committee are a valuable resource for future research and action.

Scientists and engineers

Many scientists and engineers are in a good position to develop science and technology for nonviolent struggle. There are a number of reasons why they haven't done so already. As described in chapter 2, most funding for science and technology comes from governments and corporations. Defence is seen as a matter for the military, and military R&D is a key driving force for science and engineering. This emphasis on military priorities filters through to civilian R&D: military priorities influence the disciplines that are most favoured and the technical problems that are seen as most significant. As high-status professionals whose privileges depend on claims to special expertise, scientists and engineers are seldom encouraged to get involved in social movements or, more importantly, to redirect their work so that professional skills become easily taken up by community activists. There is much more prestige to be gained by taking up the most esoteric theoretical challenges or constructing and using highly sophisticated technical apparatus.

If scientists and engineers were to take up practical problems in nonviolent struggle, they could have an enormous impact. They bring two great resources to bear: skills and legitimacy. Their skills are of great practical relevance in some cases, such as designing telecommunications systems or building renewable energy systems. In other cases their skills are not directly relevant to nonviolent struggle in any obvious way, but even so, the involvement of scientists and engineers would have great impact because they are the people with the greatest social legitimacy as experts in science and technology.

The basic ideas of sustainable agriculture or short-wave radio are known to many people. Applying these ideas to nonviolent struggle is not so difficult, at least at the basic level. But if an agricultural researcher or electronics engineer were to get up and say that these approaches have merit for nonviolent struggle, this would have a great impact. Scientists and engineers have credentials and often an institutional affiliation that gives them credibility.

Some scientists and engineers, especially those working at universities, have considerable freedom to choose their research topics. They are in a good position to undertake projects in support of nonviolent struggle.

I have already described some of the reasons why scientists and engineers have not already taken up this sort of work and advocacy. Many of them are heavily funded by the military or respond to research agendas shaped by military priorities. More generally, they are trained to be professionals and discouraged from building links with community groups.

But the social structures of science and engineering are only part of the problem. The very idea of science and technology for nonviolent struggle is hardly known. The peace movement for the most part has only been *against* technology, namely technology for war. The alternative to bombs and missiles is seen as civilian priorities such as hospitals, public transport and housing. The idea of "peace conversion" or "economic conversion" is to convert military production into production for "human needs," which means everything from food and clean drinking water to clothing and books. The idea that technology could be used to support a nonviolent method of struggle has not been on the peace movement agenda.

Some scientists and engineers have played a strong role in peace movements, sometimes forming their own organisations. They have used their skills to push for disarmament, for example to argue that a nuclear test ban could be adequately monitored with seismic detection capabilities. Sometimes they have tried to organise boycotts of military R&D, most

notably in the case of the Strategic Defense Initiative, commonly known as star wars, as discussed in chapter 2.

Many scientists and especially engineers have devoted their skills to goals such as sustainable agriculture, renewable energy technology, and community communication. They have worked with community activists to develop alternatives that empower communities rather than elites.

Thus there is an undoubted capacity and willingness of some scientists and engineers to use their skills and prestige to improve and promote nonviolent struggle, if only this alternative were brought to their attention and seen as a viable option. There are several ways in which this could happen. One, perhaps least likely, is that governments begin to fund nonviolence R&D. Another is that a few scientists and engineers take up the issue on their own initiative. Finally, popular support for nonviolent struggle would create a context favourable for involvement by professionals.

In summary, scientists and engineers bring two great strengths to the development and promotion of R&D for nonviolent struggle: their skills and their legitimacy. On the other hand, they face a number of obstacles, including employment and funding from governments and corporations oriented to military approaches, and their professional status which inhibits building links with community groups.

Community groups

Compared to governments and to scientists and engineers, most community groups have few resources and little legitimacy. Nevertheless, in some ways they face the fewest obstacles in the task of developing and implementing technology for nonviolent struggle.

The category "community group" encompasses a range of organisations, including sporting clubs, service organisations such as Rotary, environmental groups, women's groups, church groups and trade unions. Just about any voluntary organisation could be included. Even some businesses and government-funded bodies might be included as community groups, as in the case of some small local businesses and libraries. In these cases it is usually the clients who make something a community organisation, in the sense that it is based on voluntary participation from members of the local community.

The concept of "community" is easy to criticise. Is there really such a thing as "community," over and above the activities of individuals? Do community groups really represent local constituencies in any fair way? Is there a "community" to be defended? Is it worth defending?

Here, community groups are taken to be relatively small organisations or groupings of people that are mostly voluntary. Whether they in some sense represent the "community" is not the central issue. The point here is not to idealise them but to comment on their strengths and weaknesses in promoting technology for nonviolent struggle.

Although few community groups have either large resources, legitimacy (for waging nonviolent struggle) or a concentration of specialist technical skills, they do have one enormous advantage. They are located at the point where nonviolent struggle can be waged. Therefore, they can proceed to develop skills and make preparations without waiting for anyone else. Theory and practice are much easier to integrate.

An environmental group, for example, could make an assessment of local dependencies in energy, transport and agriculture. How well could local people survive if liquid fuel supplies were cut off? Could they get to work? Could enough food be supplied and distributed? Could they keep warm enough in cold weather? To answer these questions, it would be necessary to do an inventory of local resources, travel patterns, transport links, contingency plans and so forth. With information in hand, it would then be possible to make suggestions for improving self-reliance, such as improving

insulation, fostering telework (working locally and using telecommunications to keep in touch with the main office), planting local vegetable gardens, etc. Obviously, any such programme of study and action would require gaining information and support from local residents.

A local club, such as Rotary, Apex or Lions, could make a study of local networks and organisations, and develop plans for resistance. This would involve liaison with many different groups, from lawyers to supermarket employees and from librarians to hairdressers. What can each group do? What might they be willing to do? How can they reach agreement? What are the warning signs that urgent preparations should begin? What systems of communication and decision making should be set up? Is it worth running a simulation?

The workers at a local radio station could make plans for action in the face of an attack. This might include preparing tapes to be broadcast in an emergency, training both workers and outsiders in use of the station's equipment, setting up plans for broadcasting from alternative premises, building links with other radio stations and communication media, and running simulations.

In each of these cases, and others, there is much that can be done with existing skills and resources. Furthermore, in most organisations there are likely to be some people with specialised skills. As soon as initial plans are made, an obvious next step is to search for information about what others have done, including information about relevant technology. This leads directly into the process of adapting existing technology to the tasks at hand. If there are difficulties in the process, local skills may be sufficient to overcome them. Alternatively, or in addition, help can be sought from engineers or others in order to tackle special problems.

Thus, when community groups prepare for nonviolent struggle, it is natural for them to begin with implementation of existing technology. In other words, they are likely to proceed with what I argued is the first priority. Unlike governments and professional researchers, there is little incentive to undertake research that is unconnected with immediate practical problems. Nevertheless, the process of tackling these practical problems will inevitably lead to challenges requiring R&D.

For community groups, preparation for nonviolent struggle need not be an abstract enterprise aimed at resisting a hypothetical invasion. There are more immediate concerns available. For example, many environmental groups use nonviolent action to oppose logging, stop freeways and so forth. Furthermore, building community self-reliance in energy, transport and agriculture is very much a part of a programme to replace current systems in order to reduce or eliminate their harmful impacts.

What about service groups such as Rotary? They can do community networking to gain support for valued projects. Another motivation is to provide skills about community networking to other groups, for example in countries under dictatorial rule.

Community radio stations can come under threat themselves, for example if they challenge powerful vested interests. Being prepared to defend against a hostile attack makes sense even if foreign invasion is remote.

Community groups need not be naive practitioners. At least some members of some groups will have knowledge of methods of scientific and social analysis. They can search available literatures, develop protocols for testing ideas and evaluating outcomes, and learn from the results of investigations and projects. Furthermore, the very process of doing community group projects will develop the skills of participants.

In summary, although community groups do not have large resources or great legitimacy, they are in a position to directly undertake the investigation and implementation of technology for nonviolent struggle. They are likely to tackle the most feasible projects first, rather than getting sidetracked into esoteric research.

Conclusion

I have outlined here what I consider to be the highest priorities for technology for nonviolent struggle, which generally are the implementation of currently available technologies first and research into new developments last. Then I commented on the strengths and weaknesses of action by three groups: governments, scientific and engineering professionals, and community groups. There are also other groups that can take action, such as corporations and various international organisations. Valuable initiatives are possible from any of these. In each case it is helpful to be aware of the opportunities and likely difficulties.

There is a more fundamental question: how is action by any of these groups to be promoted? After all, there are only a few isolated initiatives for social defence around the world. There is no simple answer to the question. Action ultimately begins with individuals and small groups who decide the issue is worthy of development. As long as military priorities are dominant, including the assumption that defence means military defence/offence, the investment of major resources into nonviolent struggle is unlikely. But it is possible for the climate of opinion to change. When this occurs, there will be plenty of things to do. Until then, those who are committed to the nonviolent alternative can only do the best they can, in the knowledge that their efforts can help to create a new climate of opinion.

Notes

1. Conventional technology policy literature is not deployed in this chapter. It is almost entirely oriented to top-down decision making and provides few insights about policy making for a participatory system such as social defence. Issues such as the suppression of innovation by vested interests, the influence of managerial control, worker opposition and social movements are almost entirely absent from the conventional policy literature. Innovation from the grassroots, or more generally any innovation that is noncommercial or a challenge to state interests, is given virtually no attention. Some typical sources that fit this characterisation are Rod Coombs, Paolo Saviotti and Vivien Walsh, *Economics and Technological Change* (Basingstoke: Macmillan Education, 1987); Richard R. Nelson (ed.), *National Innovation Systems: A Comparative Analysis* (Oxford: Oxford University Press, 1993); J. E. S. Parker, *The Economics of Innovation* (London: Longman, 1974); Ray Rothwell and Walter Zegveld, *Reindustrialization and Technology* (Harlow: Longman, 1985). I thank Rhonda Roberts for helpful comments on these points. See Rhonda Roberts, "Managing innovation: the pursuit of competitive advantage and the design of innovation intense environments," *Research Policy,* Vol. 27, 1998, pp. 159-175.

2. I thank Ellen Elster for emphasising this point.

3. For a vision of government policy for socially beneficial technology, see Michael Goldhaber, *Reinventing Technology: Policies for Democratic Values* (New York: Routledge & Kegan Paul, 1986). What is lacking in Goldhaber's otherwise stimulating picture is a feasible process for moving towards such a policy.

4. This account, based on discussions with Johan Niezing, is adapted from Brian Martin, "Impressions of the Dutch social defence network," *Nonviolence Today*, #34, September-October 1993, pp. 16-18; *Civilian-Based Defense*, Vol. 8, No. 6, Winter 1993-94, pp. 2-5.

5. Johan Niezing, *Sociale Verdediging als Logisch Alternatief: Van Utopie naar Optie [Social Defence as a Logical Alternative: From Utopia Towards Option]* (Assen, Netherlands: Van Gorcum, 1987).

6. One way that this cutback was justified was on the basis of a critique of the Niezing committee proposals by social scientist Koen Koch. For Koch's views, see Koen Koch, "Civilian defence: an alternative to military defence?" *Netherlands Journal of Sociology*, Vol. 20, No. 1, 1984, pp. 1-12.

7. Alex P. Schmid, in collaboration with Ellen Berends and Luuk Zonneveld, *Social Defence and Soviet Military Power: An Inquiry into the Relevance of an Alternative Defence Concept* (Leiden: Center for the Study of Social Conflict, State University of Leiden, 1985). I reviewed it in *Civilian-Based Defense: News & Opinion,* Vol. 4, No. 4, May 1988, pp. 6-11.

8. Giliam de Valk in cooperation with Johan Niezing, *Research on Civilian-Based Defence* (Amsterdam: SISWO, 1993). The proposals were sketched in chapter 4.

9. Ulrich Albrecht, "The aborted United Nations study of the military use of research and development: an editorial essay," *Bulletin of Peace Proposals*, Vol. 19, Nos. 3-4, 1988, pp. 245-259. I thank Mary Cawte for finding this reference.