

## Chapter 6

### Survival

For a society to engage effectively in a struggle, whether violent or nonviolent, it must be able to maintain the necessities of life, such as food and shelter. In industrialised societies, many important systems, including agriculture, energy, water, transport and housing, have become highly vulnerable to either military attack or sabotage.

Take the electricity system, for example: a few bombs or just some calculated breaches of proper procedures could put large generating plants and transmission stations out of action. If computer programs that ensure a balance between electricity supply and demand were intentionally altered, a system breakdown could easily be triggered.

Fuel supplies are only somewhat more secure. Oil refineries are perhaps the most vulnerable point: a few knowledgeable workers could put them out of commission. Oil pipelines and ocean tankers are also easy targets for determined saboteurs.<sup>1</sup>

Water supplies for many cities are quite vulnerable to attack. All it would take is destruction of a few large dams or poisoning of the water supply.

Food supplies are far more vulnerable to disruption than just a century ago. Production is now heavily dependent on fertilisers and pesticides; factories producing these could be put out of action. Biologically sophisticated saboteurs might be able to spread pests and diseases to major crop areas. Few people still live on the land; city populations depend on shipment of large quantities of food from agricultural areas.

Then there is the transport system. Disruption of electricity and fuel supplies would be

devastating. Another approach would be tampering with transport computer systems. City traffic would be reduced to a crawl if traffic lights were out of action, and air traffic would become much more risky if automated systems were disrupted.<sup>2</sup>

For a military system, these vulnerabilities mean that an effective defence must prevent the enemy from entering the country's territory. A single bomber or missile can cause enormous havoc. The vulnerability of modern technological systems thus is a justification for so-called "forward defence," namely powerful offensive capacities, including nuclear weapons as deterrents. Vulnerability is also a justification for tight internal security, to guard crucial facilities from saboteurs and to keep information about both military and civilian facilities secret. Thus, vulnerable technological systems play a role in promoting two of the worst features of the warfare society: offensive military capacity and internal repression.<sup>3</sup>

These considerations in themselves should be enough to motivate investigation into less vulnerable systems. In the case of nonviolent struggle they become overwhelming. Without military forces, there is nothing to physically stop enemy troops from entering the community, taking over key facilities such as power stations, cutting off supplies or even destroying the facilities. Given this possibility, developing resilient systems is essential.

Actually, the problem of survival is seldom a telling factor in major struggles. In most wars, even the most ferocious, no attempt has been made to starve the enemy population to death. Nevertheless, there are some instructive examples where survival has played a key role.

After Iraqi troops invaded Kuwait in August 1990, international sanctions were applied to Iraq, preventing most imports and exports. Even after the defeat of Iraq military forces by the US-led coalition in March 1991, the blockade was continued. The bombing of Iraq in early 1991 destroyed much of the country's infrastructure, including water purification plants, electricity generating plants and industry. The continuation of the blockade—which also prevented import of food and medicines, in contravention of international humanitarian agreements—has led to enormous suffering and increased mortality and perhaps a million or more deaths as a result.<sup>4</sup> This example illustrates the high vulnerability of a westernised society.

Although economic “sanctions”—restraints on trade—are commonly seen as a nonmilitary alternative to war, they rely on armed force for implementation and definitely cannot be considered a method of nonviolent action. Sanctions often are ineffective or counterproductive.<sup>5</sup>

Beginning in 1975, the Indonesian government enforced an effective blockade against East Timor in order to combat guerrilla and popular resistance. Since East Timor is half of a remote island, the other half of which is Indonesian territory, enforcing the blockade was not difficult, given that no other government did much to challenge the Indonesian occupation in spite of repeated United Nations resolutions.<sup>6</sup> Direct killings and starvation due to the blockade led to the deaths of perhaps one third of the East Timorese population. In this case, the blockade has been a potent tool against a largely rural society.

In 1988, people of the island of Bougainville in the southwest Pacific declared their independence from Papua New Guinea. The PNG government mounted a military operation against the Bougainville Revolutionary Army, supplementing this with a blockade. The blockade was intended to be total, preventing even medicines from being brought in. As

might be expected, this has led to considerable suffering on the island.

In the cases of Iraq, East Timor and Bougainville, blockades were used to help subjugate an armed resistance and, in each case, caused hardship and death in the population. The existence of an armed resistance helped to provide a public justification for these blockades, however inhumane and illegal they may be. If the resistance is totally nonviolent, it becomes more difficult to justify a blockade. Perhaps the best example of such tactics used against an unarmed resistance is the Israeli occupation of Palestine, mentioned in chapter 3. During the intifada, from 1987 to 1993, the Palestinian resistance to the Israelis was largely nonviolent, though it is more appropriate to call it unarmed since it was mostly a lack of arms rather than a principled position that restricted the use of violence. (The throwing of stones was a commonly used tactic.) The Israeli occupiers used a variety of harsh methods to quell the resistance, including beatings, destroying houses and shops, enforcing curfews (often for days at a time), closing down schools and universities, and preventing travel. The net effect of these measures made survival problematic for many Palestinians, for example when economic sanctions reduced family finances to minimal levels and curfews prevented movement out of houses for all but a few hours per day. The Palestinian case is different from that of Iraq, East Timor and Bougainville both in the lack of a resistance armed with more than slingshots and stones and in the enormous international sympathy and support generated by the struggle.

Although a population waging a nonviolent resistance—at least one with a capacity to communicate to the rest of the world—is unlikely to be starved to death or otherwise find its very survival at stake, it is prudent to be prepared for the worst. This is a task for engineers.

Historically, the engineering profession began with military applications. When a branch of engineering developed that was

concerned with nonmilitary applications, it was called civil engineering to emphasise the civilian orientation. Today, there are many branches of engineering, from mechanical to computer engineering, all of which can be used for military or nonmilitary purposes. As described in chapter 2, even ostensibly nonmilitary engineering can often be adapted for military purposes. There are very few engineers who have even considered what it would mean to direct their specific engineering talents to promoting peace.<sup>7</sup> Presented here are a few preliminary ideas about redesigning technological systems to make them more suitable for nonviolent struggle.<sup>8</sup> It would only take a few dedicated engineers or other experts to test and develop these ideas.

The water supply, especially one based on large dams, is highly vulnerable to disruption. Dams could be designed so that, in an emergency, the water could be released quickly but safely. In a number of countries that are still developing their infrastructure, choosing microhydro rather than large dams would greatly aid resilience against attack. Another approach is using water tanks and dry toilets to reduce water requirements from a central supply system which might be destroyed by an aggressor.

Similarly, producing steel at numerous minimills, geographically dispersed, provides greater resilience than having a few large integrated steelworks. Installing solar and wind power systems throughout the country would mean that the population could not be held hostage by control over electricity generating plants. The challenge is to develop technologies that are efficient and require little maintenance. Of course, economic incentives are important in promoting such alternatives.

Bridges are often attacked by aggressors. Building a bridge that would survive any attack would be impossibly expensive, though designs allowing easy rebuilding would be possible. Also, bridges might be designed so that saboteurs could easily be detected. Laser detectors, perhaps?

Similar considerations apply to housing. In order to be able to reconstruct destroyed buildings, designs should be simple and straightforward, relying on readily available materials. Portable homes might be useful for moving people around the country. There is some research on cheap, effective housing for the Third World which may be applicable. Research could be done on materials to make tents long-lasting. Combined with telecommunications, tent-based activists would be hard to track down.

In the case of manufacturing, aggressors often take over plants for their own purposes. To resist, workers could go on strike, but torture against workers or their families could be used to break the strike. Another approach is to go slow and make “inadvertent” mistakes, as done in some factories taken over by the Nazis in World War II. A technological solution—raised by Johan Galtung, quoted in chapter 4—is to design the factory so that vital pieces of equipment can be removed or destroyed. Replacements could be kept in a safe place, such as another country. Torture would be pointless, since it couldn’t get the factory going again. Actually, in many modern factories, the technological sophistication is so great that outsiders would not know whether the workers were resisting or not.

When hierarchies are flattened and groups of workers can operate without a boss, the workforce is better equipped to resist a takeover. Therefore, manufacturing systems that are tied to empowering the workers may be the best for nonviolent struggle.

Large-scale monocultures are vulnerable to disruption. A more resilient food system would include many local gardens and food-bearing trees. Relevant research here includes seed varieties robust to lack of fertilisers and pesticides, nutritious diets from wild natives, and methods for long-term storage of food.<sup>9</sup>

A transport system highly resilient to attack can be achieved by designing communities so that most travel can be accomplished by walking or cycling, in contrast with systems of

roads or rail which can be interrupted by cutting off fuel. Powered vehicles are very useful for shipping goods, so it would be valuable to design vehicles that are simple to build and repair, use fuels that can be easily produced or stored throughout the community and, perhaps, in an emergency could be powered by human muscles.<sup>10</sup> There is likely to be a trade-off between the convenience of maintaining some forms of motorised transport and their vulnerability. Thus there is a general challenge to develop motorised transport technologies that cannot be easily disrupted by an aggressor.

### Health

Many doctors and health workers have been involved in peace activism over the years,<sup>11</sup> but only some of this involvement is directly relevant to nonviolent resistance to aggression and repression. One of the ways that health professionals today help to oppose repression is by documenting cases of torture or execution. Governments routinely deny that they are involved in torture and extra-judicial execution; investigations and authoritative pronouncements by medical and forensic experts can help to expose such abuses. Some of the activities of physicians and medical researchers concerned about violations of human rights include:

- assessing cases of alleged torture;
- exhuming bodies (sometimes buried months earlier) and determining the cause of death;
- using genetic tracing to track down relatives of orphans whose parents have disappeared, presumed murdered;
- estimating the number of casualties in wars;
- carrying out psychiatric assessment of torture survivors;
- examining conditions in prisons;
- training health workers in skills related to the topics above and in the ethics of collaborating with regimes using torture.<sup>12</sup>

Technologies used for torture are mostly familiar: batons for beatings; electricity for

shock; cigarettes to cause burns. Occasionally there is some innovation in torture, such as beatings on the soles of feet (falanga) in order to inflict pain without leaving physical traces. In such cases there is a place for research to develop new means of detecting torture. Turkish physician Veli Lök helped develop a method of detecting falanga using bone scintigraphy. Courts have used medical reports based on this method as proof of torture.<sup>13</sup>

As well as exposing abuses by repression regimes, another and bigger task for health workers is to promote a healthy society. A society in which people are healthy and self-reliant in health care is undoubtedly better prepared to resist aggression and repression. Maintaining health in the face of attack is a tall order. Aggressors might

- assault nonviolent protesters or bystanders;
- engage in forced labour and torture;
- impose a blockade that cuts off food and medical supplies;
- destroy power supplies or sanitation facilities, increasing the risks of disease;
- lay landmines;
- spread diseases, inadvertently or purposefully;
- launch military attack, including bombing.

When a population uses only nonviolent methods of resistance, full-scale military attack is less likely than when there is violent resistance. Nevertheless, it is important to be prepared for serious health consequences of aggression. In such a situation, it is unlikely that the conventional medical system could cope. A large influx of casualties would overwhelm hospitals. Emergency procedures, familiar to doctors working in theatres of war, are appropriate.<sup>14</sup> Disaster planning—usually the province of civil defence managers—is needed for the health sector as well as others.

More generally, many members of the community need to develop skills in diagnosis and treatment. Simple first-aid measures are often sufficient, even for some serious injuries.

A society prepared for the adverse health consequences of aggression might:

- make first-aid training a regular part of nearly everyone's continuing education;
- run medical disaster simulations, analogous to fire drills;
- provide subsidised packages of basic medical materials to every household and building;
- make widely available handbooks describing basic medical procedures;
- set up decentralised production facilities for basic medical items such as anaesthetics and antibiotics;
- promote a simple, nutritious, locally obtainable diet;
- support use of effective alternatives to conventional medicine<sup>15</sup>;
- engage in ongoing discussion and debate about self-help and low cost methods of promoting health.

These sorts of initiatives towards self-reliance in health care often conflict with the priorities of industrialised medicine, with its reliance on expert professionals, expensive technology and drugs provided by transnational corporations. Industrialised medicine is vulnerable in the face of attack, whereas self-reliant health care is resilient.

Miriam Solomon, a researcher into health and democracy, has thought about these issues. She draws attention to the rhetoric of the World Health Organisation (WHO) "on primary health care and health promotion, as embodied, for example, in the Ottawa Charter. That document urges a range of strategies, including political ones, for developing personal skills, strengthening communities, improving the social and physical environments, reorienting health services (away from the medical model), and incorporating health sensitive public policies in all sectors." She notes that the same principles that apply to food, energy and so forth also apply to health.

The decentralisation of service provision, the shift away from high technology, specialised, institutionalised curative

oriented care, towards community and individual control over social, political and physical environments, as well as being consistent with health promotion and primary health care strategies, would probably also be the best preparation for social defence. Thus the uncorrupted interpretation of the New Public Health and the WHO interpretation of Health Promotion are what is needed for preparing for social defence. They are about giving people control of their own lives, empowering individuals and communities, learning skills for becoming politically and socially aware, and building community cohesion and political constituencies, with adequate sensitivity to the needs of other environments and communities.<sup>16</sup>

### Appropriate technology (AT)

Generally speaking, the entire body of work on community self-reliance is relevant to the task of building technological systems to ensure the survival of the population in the face of aggression. Much of this work goes under the title of "appropriate technology," "alternative technology," "intermediate technology" or various other names. There are various definitions of AT and a host of arguments about AT-related strategies for technological and social change.<sup>17</sup> It's not necessary to traverse these definitions and arguments here, since my aim is to point out some commonalities and differences between AT and technology for nonviolent struggle.

According to one typical source, AT covers tools and techniques that:

- "1) require only small amounts of capital;
- "2) emphasize the use of locally available materials, in order to lower costs and reduce supply problems;
- "3) are relatively labor-intensive but more productive than many traditional technologies;
- "4) are small enough in scale to be affordable to individual families or small groups of families;

“5) can be understood, controlled and maintained by villagers whenever possible, without a high level of special training;

“6) can be produced in villages or small workshops;

“7) suppose that people can and will work together to bring improvements to communities;

“8) offer opportunities for local people to become involved in the modification and innovation process;

“9) are flexible, can be adapted to different places and changing circumstances;

“10) can be used in productive ways without doing harm to the environment.”<sup>18</sup>

AT for the Third World includes simple tools for working sheet metal, organic gardening, simple-to-construct ox carts, small farm grain storage methods, techniques of growing tropical fruit trees, methods of fish farming, hand-dug wells, inexpensive water filtration techniques, local production of fuel alcohol from agricultural wastes, self-built stoves, simple windmills, small hydropower, passive solar design, biogas generators, inexpensive techniques for house building, low-cost vehicles, community health care techniques, and management skills for small businesses.<sup>19</sup> This list highlights the important point that AT is not just about implements but includes techniques for using them and fitting them into a wider programme of community development.

It is straightforward to examine these ten criteria to see whether they are also relevant to technology for nonviolent struggle.

1) If only small amounts of capital are required, then technology can more readily be replaced after destruction by an aggressor. By contrast, hugely expensive fertiliser plants, electricity generating stations or dams are obvious targets to be destroyed or taken over.

2) If materials are locally available, then an aggressor cannot cut off supply. For example, most oil supplies are imported from another part of the country or world and hence constitute a source of leverage for an aggressor.

3) Being relatively labour-intensive does not directly aid nonviolent struggle. There may be an indirect advantage, though. If more labour is required and much of it does not require highly specialised skills, then it is more likely that there will be work for anyone who wants it, with a reduction in alienation and social divisions. This in turn would help unify a community in the face of attack.

4) Affordability to families seems similar to point 1.

5) If ordinary people can understand, control and maintain technology, then it is much harder to hold them hostage via the technology. For example, most people can learn how to ride and fix a bicycle. Most can drive but not many can fix more than a few problems with cars. Few can drive a train or fly an aeroplane, much less fix them. The greater the number of people who can keep the technology going if necessary, the less vulnerable the community is.

6) Local small-scale production is less vulnerable to attack than centralised large-scale production. Water tanks to collect rain-water can be produced locally; large dams cannot and hence are a vulnerability in the face of aggression.

7) Bringing people together to work aids the potential for nonviolence resistance by fostering social cohesion. Working together in community gardens seems more likely to foster solidarity than buying food in a supermarket.

8) Having local people involved in technological adaptation and innovation builds skills and commitment that become highly valuable in case of a threat.

9) Flexibility is an obvious advantage if an aggressor tries to subjugate a population through control over technological systems.

10) Low environmental impact seems to have no direct relevance to survival of a population waging nonviolent struggle, at least in the short term. For example, if centrally generated power is not available, local coal or wood supplies might be used, causing lots of pollution but not necessarily weakening the

resistance. On the other hand, local solar and wind power might be an alternative without the same environmental impact.

Thus, most of the ten criteria for AT are also suitable for selecting technology for nonviolent struggle and none is incompatible with requirements for nonviolent struggle. This suggests a high degree of overlap between these two ways of approaching technological choice. There are a few differences, though. The ten criteria are mainly aimed at poor countries. In rich countries, there are some technologies that do not fit AT criteria but may still be highly useful for nonviolent struggle. For example, a sophisticated system of telecommunications will aid nonviolent struggle, especially if designed so that it cannot be readily controlled or monitored centrally. There are enough technically trained people in rich countries to allow for some degree of community control of telecommunications, though in practice many changes would be necessary to bring this about.

When it comes to the major systems necessary for survival—agriculture, energy, manufacturing, transport—rich countries mostly have been moving away from criteria for AT and instead becoming more vulnerable to disruption and takeover. The AT movement provides a direction for change, and many individuals and groups have made valiant efforts to move in this direction, but they have not been very successful in the face of dominant forces, including the military—military technology is seldom AT.

The connection between AT and technology for nonviolent struggle almost seems too easy. If AT advocates had been more successful over the years, then technological systems would be set up for effective nonviolent resistance. Why should the convergence be so neat? To begin, further study is needed to determine whether the connection is really as straightforward as it seems from a preliminary analysis. But there are some general reasons for the convergence. AT can be considered to be the technological component of a general strategy of community self-reliance, which can

be treated as a strategy for development.<sup>20</sup> The strategy of self-reliance challenges the usual approach of development from above, which typically involves centralised governments (often dominated by the military) and harsh economic control by international agencies, all of which make local populations subject to both repression and international economic exploitation. Self-reliance is thus a strategy that aims at liberation from both repression and oppression. In as much as AT fits into this strategy, it provides support for nonviolent struggle against repression and oppression. Of course, AT won't provide everything useful for nonviolent struggle, but it's a good place to begin.

In poor countries, most people have traditionally lived on the land. With their integration into the world economy, there have been strong pressures to produce cash crops for export. No longer being self-sufficient in food, this makes the people more vulnerable to local dictators as well as foreign aggressors. This form of "development" thus works hand-in-hand with military systems. In this context, land reform becomes a measure to foster the capacity for nonviolent struggle. The technology of local food production is one aspect of this issue, but the key is self-reliance and local control.

**Notes**

1. On energy vulnerability see Wilson Clark and Jake Page, *Energy, Vulnerability, and War: Alternatives for America*. New York: Norton, 1981; Amory B. Lovins and L. Hunter Lovins, *Brittle Power: Energy Strategy for National Security*. Boston: Brick House, 1982; James L. Plummer, ed., *Energy Vulnerability*. Cambridge, MA: Ballinger, 1982.

2. See Colin Kearton and Brian Martin, "Technological vulnerability: a neglected area in policy-making", *Prometheus*, vol. 7, no. 1, June 1989, pp. 49-60; Peter G. Neumann, *Computer-Related Risks* (New York: ACM Press, 1995).

3. Brian Martin, "Technological vulnerability," *Technology in Society*, Vol. 12, No. 4, 1996, pp. 511-523.

4. Geoff Simons, *The Scourging of Iraq: Sanctions, Law and Natural Justice* (Basingstoke: Macmillan, 1998, 2nd ed.); Nikki van der Gaag (ed.), "Iraq: What United Nations sanctions have done" (theme issue), *New Internationalist*, No. 316, September 1999.

5. David Cortright and George A. Lopez (eds.), *Economic Sanctions: Panacea or Peacemaking in a Post-Cold War World?* (Boulder: Westview Press, 1995).

6. The contrast between UN inaction over Indonesia's invasion and occupation and UN-sponsored action over Iraq's invasion and occupation is striking.

7. One who has done so is David Paterson, "Peace and engineering," in Sandra Sewell, Anthony Kelly and Leonie Daws (eds.), *Professions in the Nuclear Age* (Brisbane: Boolarong Publications, 1988), pp. 201-212.

8. Many of these ideas come from engineers at the University of Wollongong interviewed by Mary Cawte and me.

9. Methods used by farmers to survive the impact of warfare are relevant here. For example, in Angola farmers intensively cultivated tiny plots, grew the very hardy grains millet and sorghum, took up hunting and fishing, saved seeds to sow the next year's crop and adopted mutual aid systems for planting, weeding and harvesting. Although some of these practices, such as choosing hardy grains and saving seed, reduced yields, they were more resilient in times of intense threat and stress. See David Sogge, *Sustainable Peace: Angola's Recovery* (Harare, Zimbabwe: Southern African Research and Documentation

Centre, 1992), pp. 39-41. I thank Rebecca Spence for providing this reference.

10. Ivan Illich, *Energy and Equity* (London: Calder & Boyars, 1974), argued that in an equitable society, transport speeds should be no greater than about 15 miles per hour. He favourably referred to the example of a slow-but-efficient goods vehicle used in Mexico. Although Illich's strict limit on speeds can be criticised, his basic analysis is relevant to the task of building a transport system for nonviolent struggle. Arguably, an equitable system, in which no segment of the population obtains transport privileges at the expense of others, is likely to promote the sort of community solidarity so necessary for waging nonviolent struggle. As well as fostering solidarity, is it also the case that "slow is beautiful" when it comes to developing a transport system resilient against attack?

11. Nick Lewer, *Physicians and the Peace Movement: Prescriptions for Hope* (London: Frank Cass, 1992).

12. An excellent compendium of materials is Carola Eisenberg and Susannah Sirkin (directors), *Human Rights and Medicine: The Uses of Medical Skills in Documenting Abuses and Treating the Victims* (conference proceedings) (Department of Social Medicine, Harvard Medical School and Physicians for Human Rights (100 Boylston Street, Suite #702, Boston MA 02116, USA), 10-11 April 1992). These proceedings include, among others, copies of the following publications: Clyde Collins Snow, Eric Stover and Kari Hannibal, "Scientists as detectives: investigating human rights," *Technology Review*, February/March 1989, pp. 43-51; Paul Wise, Nancy D. Arnison, Gregg Bloche and Jane G. Schaller, "Operation *Just Cause*: a case study in estimation of casualties after war," *PSR Quarterly*, Vol. 1, No. 3, September 1991, pp. 138-144; Anne E. Goldfield, Richard F. Mollica, Barbara H. Pesavento and Stephen V. Faraone, "The physical and psychological sequelae of torture," *Journal of the American Medical Association*, Vol. 259, No. 18, 13 May 1988, pp. 2725-2729; Kenneth S. Pope and Rosa E. Garcia-Peltoniemi, "Responding to victims of torture: clinical issues, professional responsibilities, and useful resources," *Professional Psychology: Research and Practice*, Vol. 22, No. 4, 1991, pp. 269-276.

13. Veli Lök, letter to Brian Martin, October 1994.

14. An excellent practical reference is Hans Husum, Swee Chai Ang and Erik Fosse, *War Surgery Field Manual* (Penang: Third World Network, 1995). The authors provide information for emergency operations in forward clinics and argue that in war zones surgery can be done by people without formal medical qualifications.

15. Robert Burrowes suggested the points about diet and alternatives to conventional medicine.

16. Miriam Solomon, letter to Brian Martin, 20 January 1992.

17. A penetrating examination of this area is given by Kelvin W. Willoughby, *Technology Choice: A Critique of the Appropriate Technology Movement* (Boulder: Westview Press; London: Intermediate Technology Publications, 1990). See also Godfrey Boyle, Peter Harper and the editors of *Undercurrents* (eds.), *Radical Technology* (London: Wildwood House, 1976); David Dickson, *Alternative Technology and the Politics of Technical Change* (London: Fontana, 1974); Romesh K. Diwan, "Total revolution and appropriate technology," *Gandhi Marg*, Vol. 4, No. 7, October 1982, pp. 631-645; Romesh Diwan, "Appropriate technology: political and economic obstacles," *Gandhi Marg*, Vol. 5, No. 2, May 1983, pp. 65-74; Ivan Illich, *Tools for Conviviality* (London: Calder & Boyars, 1973); George McRobie, *Small is Possible* (London: Jonathan Cape, 1981); Willem Riedijk, *Technology for Liberation: Appropriate Technology for New Employment* (Delft: Delft University Press, 1986).

18. Ken Darrow and Mike Saxenian (eds.), *Appropriate Technology Sourcebook: A Guide to Practical Books for Village and Small Community Technology* (Stanford, CA: Volunteers in Asia, 1986), p. 7.

19. These examples are taken at random from Darrow and Saxenian, *ibid.*

20. Johan Galtung, Peter O'Brien and Roy Preiswerk (eds.), *Self-Reliance: A Strategy for Development* (London: Bogle-L'Ouverture, 1980).