Strand Map: Considering Costs and Benefits of Technology

9-12 (3C) In deciding on proposals to introduce new technologies or to curtail existing ones, some key questions arise concerning alternatives, risks, costs, and benefits. What alternative ways are there to achieve the same ends, and how do the alternatives compare to the plan being put forward? Who benefits and who suffers? What are the financial and social costs, do they change over time, and who bears them? What are the risks associated with using (or not using) the new technology, how serious are they, and who is in jeopardy? What human, material, and energy resources will be needed to build, install, operate, maintain, and replace the new technology, and where will they come from? How will the new technology and its waste products be disposed of and at what costs?

9-12 (8D) As technologies that provide privacy in communication improve, so do those for invading privacy.

9-12 (8F) Biotechnology has contributed to health improvement in many ways, but its cost and application have led to a variety of controversial social and ethical issues.

9-12 (8C) Industrialization brings an increased demand for and use of energy. Such usage contributes to the high standard of living in the industrially developing nations but also leads to more rapid depletion of the earth's energy resources and to environmental risks associated with the use of fossil and nuclear fuels.

9-12 (3C) Human inventiveness has brought new risks as well as improvements to human existence.

9-12 (8D) The quality of communication is determined by the strength of the signal in relation to the noise that tends to obscure it. Communication errors can be reduced by boosting and focusing signals, shielding the signal from internal and external noise, and repeating information, but all of these increase costs. Digital coding of information (using only 1's and 0's) makes possible more reliable transmission of information.

6-8 (3C) Rarely are technology issues simple and one sided. Relevant facts alone, even when known and available, usually do not settle matters entirely in favor of one side or another. That is because the contending groups may have different values and priorities. They may stand to gain or lose in different degrees, or may make very different predictions about what the future consequences of the proposed action will be.

6-8 (3C) New technologies increase some risks and decrease others. Some of the same technologies that have improved the length and quality of life for many people have also brought new risks.

3-5 (3C) Technologies often have drawbacks as well as benefits. A technology that helps some people or organisms may hurt others—either deliberately (as weapons can) or inadvertently (as pesticides can). When harm occurs or seems likely, choices have to be made or new solutions found.

3-5 (8A) The damage to crops caused by rodents, weeds, and insects can be reduced by using poisons, but their use may harm other plants or animals as well, and pests tend to develop resistance to poisons.