

Fells

PROJECT MANAGEMENT INSTITUTE

SEMINAR SYMPOSIUM - OCTOBER 1990



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## PROJECT EARTH

AT THE BEGINNING OF THE 80'S THE POPULAR TRENDS WERE JUNK FOOD, JUNK BONDS AND PLAIN EVERYDAY JUNK. BUT THESE EXCESSES OF THE 80'S HAD BEEN TRANSFORMED INTO WIDESPREAD PUBLIC SUPPORT FOR OAT BRAN, CONVENTIONAL FINANCING AND SUSTAINABLE DEVELOPMENT BY THE BEGINNING OF THE 90'S. LET'S TAKE A LOOK AT WHAT MIGHT HAPPEN TO OUR PLANET NOW THAT SO MANY PEOPLE ARE "LYING DOWN IN GREEN POSTURES".

CREDIT FOR THE RISING POPULARITY OF THE ENVIRONMENTAL MOVEMENT IS OFTEN CLAIMED BY SMALL ACTIVIST OR ENVIRONMENTAL GROUPS. THERE IS LITTLE DOUBT OF THE ROLE THEY HAVE PLAYED. BUT RECENTLY IT HAS BEEN THE MAJOR ATTENTION GIVEN BY GOVERNMENTS AND THE MEDIA THAT HAS ESCALATED THE PROFILE OF ENVIRONMENTALISM. SUCH THAT TODAY THERE IS A "GREAT GREEN HYPE" AFFECTING THE SOCIETY OF MOST RICH NATIONS.

THE FIRST IMPACT HAS BEEN THE EMERGENCE OF THE ENVIRONMENTAL PROTECTION INDUSTRY. WITH A GROWTH RATE OF 20% PER YEAR IN NORTH AMERICA, THE ENVIRONMENTAL PROTECTION INDUSTRY IS DESCRIBED AS THE MOST DYNAMIC INDUSTRY OF THE 90'S.

THE "GREAT GREEN HYPE" HAS BEEN CHARACTERIZED BY PERSONAL MEDIA APPEARANCES FROM POLITICIANS, ENVIRONMENTAL WATCH DOGS, MEDIA TYPES AND ROCK STARS. NOTICEABLE BY THEIR ABSENCE, UNLESS THEY WERE REACTING TO AN OIL SPILL OR A TOXIC LEAK, HAVE BEEN BUSINESS LEADERS AND SCIENTISTS. PERHAPS THEY HAVE BEEN CAUGHT BETWEEN TWO EXTREME POSITIONS. ON THE ONE

HAND, THERE ARE THOSE WITH RADICAL POLITICAL AGENDAS AND ENVIRONMENTAL CAUSES. THE POSITIONS OF MANY SUCH GROUPS ARE OFTEN CHARACTERIZED BY A LACK OF EITHER ACUMEN OR ACCURACY. ON THE OTHER HAND, THERE ARE GOVERNMENTS AND MEDIA WHO OFTEN ARE GUILTY OF MISINTERPRETATION, EXAGGERATION AND INJUSTIFIED EXTRAPOLATION OF DATA LEADING TO THE CREATION OF AN UNINFORMED AND CONFUSED GENERAL PUBLIC AND NO CLEAR POLICIES.

ALTHOUGH ENVIRONMENTALISM IS NOW RIDING THE CREST OF A WAVE OF FAVORABLE POPULAR AND POLITICAL OPINION, SURELY THAT POPULARITY WILL EVENTUALLY DECLINE UNLESS THE MOVEMENT IS BASED ON SOUND SCIENCE AND ECONOMIC FOLLOW-THROUGH. THIS IS WHAT THE SUSTAINABLE DEVELOPMENT CONCEPT IS ALL ABOUT.

NOW, AT LAST, BUSINESSES ARE STEPPING FORWARD TO AVOID BEING FORCED TO ACT WITHOUT THE BENEFIT OF PRECISE PLANNING AND TECHNICAL INPUT ON MANY OF THE LOCAL ENVIRONMENTAL ISSUES THAT ARE POLITICALLY VOLATILE TODAY: THE FUTURE USE OF LANDFILLS, THE OPERATION OF WASTE TREATMENT CENTRES, THE LOSS OF PRODUCTIVE SOIL, THE SAFETY OF DRINKING WATER AND THE CONTROL OF CARBON DIOXIDE EMISSIONS, TO NAME A FEW. THE TIME IS PAST FOR BUSINESSES TO REACT AND CURE - TODAY THEY MUST BE PROACTIVELY INVOLVED IN ANTICIPATING AND PREVENTING ENVIRONMENTAL PROBLEMS. IT'S TRITE BUT TRUE TO SAY THAT BUSINESS AND SCIENCE ARE NOW SEEN TO BE PART OF THE SOLUTION RATHER THAN JUST PART OF THE PROBLEM.

EDUCATIONAL LEADERS ALSO REALIZE THAT THERE ARE NO EASY SOLUTIONS. THE BEST ONES KNOW THAT WHAT IS NEEDED IS TO SOLIDIFY THE NEW ENVIRONMENTAL ETHIC INTO THE FABRIC OF OUR SOCIETY BY EDUCATING THE YOUNG ABOUT THE EARTH, NATURAL SCIENCE AND THE EFFECT OF HUMANS ON IT. BUT, EVEN BEFORE THIS NEW GENERATION OF INFORMED ENVIRONMENTALISTS ARRIVE, CORRECTIVE ACTION MUST BE TAKEN. WE MUST MOVE BEYOND OUR PRESENT POSITION TO A NEW POSITION WHERE ENVIRONMENTAL SAFETY AND PUBLIC HEALTH ARE A GIVEN, NOT AN AFTERTHOUGHT.

THE RESULT OF ALL THIS IS THAT SOME REAL PROGRESS IS BEING MADE IN SOME SELECTED PARTS OF THE WORLD. BUT HOW WILL HISTORY VIEW OUR LITTLE PERIOD OF TRUSTEESHIP WHEN IT VIEWS THE CURRENT STATE OF OUR WHOLE PLANET FROM SOME POINT IN THE FUTURE. WHAT KIND OF REPORT CARD WILL WE GET? WELL, LET'S LOOK AT THE FACTS.

### FACTS ABOUT THE AIR

IF THE WORLD WERE THE SIZE OF AN APPLE, THEN THE ATMOSPHERE WOULD BE AS THICK AS THE APPLE SKIN.

THE ATMOSPHERE ROTATES AROUND THE WORLD 40 TIMES EVERY YEAR, SO BOUNDARIES DON'T COUNT WHEN THE AIR IS POLLUTED.

ACID RAIN HAS IMPEDED THE GROWTH OF TREES AND REDUCED AGRICULTURAL YIELDS IN EASTERN CANADA AND THE UNITED STATES.

DEPLETION OF THE UPPER ATMOSPHERE OZONE LAYER HAS INCREASED 2% SINCE 1970.

60% OF ALL CANADIAN HOMES ARE SINGLE DETACHED HOMES.

77% HAVE ONE OR MORE CARS.

73% OF THE OCCUPANTS JOURNEY TO WORK BY PRIVATE AUTO.

THERE ARE 400 MILLION AUTOMOBILES IN THE WORLD. EACH ONE EMITS MORE THAN ITS OWN WEIGHT IN CARBON EACH YEAR.

ABOUT 50% OF ALL URBAN SPACE IN CANADA AND THE U.S.A. IS DEDICATED TO THE AUTOMOBILE (DRIVEWAYS, ROADS, FREEWAYS, PARKING LOTS).

#### FACTS ABOUT WATER

IF THE WORLD WERE A BASKETBALL, THEN ALL THE WATER ON EARTH WOULD BE LESS THAN 1 CUP AND ALL THE WATER FIT FOR HUMAN CONSUMPTION WOULD BE ONE LARGE DROP.

WORLDWIDE WATER USE DOUBLED BETWEEN 1940 AND 1980 AND IS EXPECTED TO DOUBLE AGAIN BY THE YEAR 2000.

CANADIANS USE ENOUGH WATER TO PROVIDE THE EQUIVALENT OF 2000 TOILET FLUSHES PER PERSON EVERY DAY.

25% OF ALL EASTERN CANADIAN LAKES AND RIVERS CANNOT SUPPORT FULL MARINE LIFE.

### FACTS ABOUT THE SOIL

LAND COVERS 30% OF THE PLANET.

IN CANADA WE CLEAR 1 MILLION HECTARES/YEAR. IN BRAZIL WE CLEAR 2.3 MILLION HECTARES/YEAR OF RAIN FOREST. THIS IS EQUIVALENT TO 1 FOOTBALL FIELD EVERY 2 SECONDS, EVERY DAY, ALL YEAR LONG. IF THE CLEARING CONTINUES AT THIS RATE, THE BRAZILIAN RAIN FOREST WILL BE GONE IN 30 YEARS.

WORLDWIDE WE LOSE 40 BILLION TONNES OF SOIL EACH YEAR AND 27 MILLION HECTARES ARE TAKEN OUT OF AGRICULTURAL PRODUCTION FOR URBAN USE (50% OF WHICH IS REQUIRED FOR AUTOMOBILES).

CANADIANS PRODUCE MORE THAN 30,000 TONNES OF TOXIC WASTE EACH DAY.

EACH CANADIAN PRODUCES 1 TONNE OF SOLID WASTE PER YEAR.

EACH YEAR CANADIANS THROW AWAY:

- 24 MILLION TIRES
- 175 MILLION SPRAY CANS
- 300 MILLION LITRES OF WASTE OIL
- 550 MILLION POUNDS OF SOILED DIAPERS

82% OF ALL CANADIAN WASTE GOES INTO LANDFILLS

28% OF ALL JAPANESE WASTE GOES INTO LANDFILLS

#### FACTS ABOUT THE WORLD

THE WORLD POPULATION HAS INCREASED FROM 2.5 BILLION IN 1950 TO 5.2 BILLION IN 1990.

THE SIX BILLIONTH PERSON IS EXPECTED TO BE BORN IN 1998, AND THE EIGHT BILLIONTH IN 2025.

ALMOST 100 MILLION PEOPLE WILL BE BORN EACH YEAR DURING THE NEXT DECADE - 94% OF THEM IN DEVELOPING COUNTRIES!

PEOPLE IN DEVELOPED COUNTRIES ACCOUNT FOR 20% OF THE POPULATION AND 80% OF THE CONSUMPTION OF WORLD RESOURCES.

PEOPLE CURRENTLY UNLEASH 15 BILLION TONNES OF CO<sub>2</sub> EVERY YEAR - UP TO 10 FOLD SINCE 1900. AMERICANS AND CANADIANS LEAD THE WORLD IN CO<sub>2</sub> EMISSIONS PER CAPITA.

WORLD ECONOMIC ACTIVITY IS UP 20 FOLD SINCE 1900.

WORLD CONSUMPTION OF FOSSIL FUELS IS UP 30 FOLD SINCE 1900.

OUR ANNUAL CONSUMPTION OF FOSSIL FUELS IS NOW EQUIVALENT TO 1 BILLION YEARS OF NATURE'S PRODUCTION.

GLOBAL MILITARY EXPENDITURES ARE \$35,000 (U.S.) PER SECOND AND STILL GROWING. IN MANY COUNTRIES MILITARY EXPENDITURES PRE-EMPT SCARCE RESOURCES AND DIMINISH DEVELOPMENT PROSPECTS THUS CREATING RESENTMENT AND CONFLICT.

BY THE YEAR 2000, NEARLY 42% OF THE WORLD'S POPULATION WILL BE LESS THAN 25 YEARS OF AGE. MANY OF THESE WILL DEPEND LARGELY ON OTHERS FOR FOOD, EDUCATION, CLOTHING AND SHELTER.

BY THE YEAR 2025, 57% OF THE WORLD'S POPULATION WILL LIVE IN URBAN CENTRES COMPARED TO 34% CURRENTLY.



WHAT DO 1 BILLION PEOPLE LOOK LIKE?

- 3 TIMES U.S.A. AND CANADA TOGETHER
- ENGLAND, FRANCE, 1 GERMANY, ITALY, JAPAN AND INDIA ALL TOGETHER
- ALL THE PEOPLE ON EARTH IN 1930
- THEY NEED 875 TRILLION CALORIES EACH YEAR
- THEY NEED 1,627,550 DOCTORS AND 10,169,550 TEACHERS TO MEET U.S.A. STANDARDS
- THEY NEED 700 BILLION LITRES OF WATER EACH DAY TO MEET U.S.A. STANDARDS

IN THE 900 DAYS TAKEN TO PREPARE THE BRUNDTLAND COMMISSION REPORT THE FOLLOWING ENVIRONMENTAL EVENTS OCCURRED:

- A DROUGHT TRIGGERED AN ENVIRONMENTAL CRISIS IN AFRICA KILLING A MILLION PEOPLE AND PUTTING 35 MILLION AT RISK
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- A LEAK FROM A PESTICIDES FACTORY IN BHOPAL, INDIA, KILLED OVER 2000 PEOPLE AND BLINDED OR INJURED 200,000 MORE
- LIQUID GAS TANKS EXPLODED IN MEXICO CITY KILLING 1000 AND LEAVING THOUSANDS MORE HOMELESS

- A NUCLEAR REACTOR EXPLOSION AT CHERNOBYL SENT NUCLEAR FALLOUT ACROSS EUROPE INCREASING THE RISK OF FUTURE HUMAN CANCER.
  
- CHEMICAL LEAKED INTO THE RHINE RIVER DURING A WAREHOUSE FIRE IN SWITZERLAND KILLING MILLIONS OF FISH AND THREATENING DRINKING WATER IN THE REGION.
  
- AN ESTIMATED 60 MILLION PEOPLE DIED OF DISEASES RELATED TO UNSAFE DRINKING WATER AND MALNUTRITION; MOST OF THE VICTIMS WERE CHILDREN.

THESE FACTS DO NOT INSPIRE CONFIDENCE DO THEY?

WHO IS RESPONSIBLE FOR THESE PROBLEMS AND, MORE IMPORTANTLY, WHO IS GOING TO LEAD US INTO A BETTER WAY OF MANAGING THE EARTH? IF THE PROJECT MANAGERS OF THE WORLD HAD THEIR WAY HERE'S HOW THEY WOULD DO IT.

FIRST, THEY WOULD CREATE A PROJECT NAME, SCOPE OF WORK AND ACTION PLAN WITH BUDGET AND MILESTONES. THEY WOULD CALL THIS PROJECT "PROJECT EARTH" AND THEY WOULD PROBABLY DEFINE THE CHALLENGE IN THE SAME WAY THE CANADIAN GOVERNMENT DID:

"THE DIMINISHING POOL OF ENVIRONMENTAL CAPITAL THAT CHARACTERIZES THE WORLD ECOSPHERE WILL SIMPLY NOT SUPPORT THE RESOURCE-HUNGRY ROAD TO PROSPERITY ALREADY TAKEN BY COUNTRIES LIKE OURS."

"YOUR MISSION, SHOULD YOU DECIDE TO TAKE IT, IS TO BUILD A FUTURE FOR OUR PLANET WHICH IS MORE PROSPEROUS, MORE JUST, MORE SECURE. YOU MUST DEVELOP A NEW ERA OF ECONOMIC GROWTH, ONE THAT IS BASED ON POLICIES THAT SUSTAIN AND EXPAND THE ENVIRONMENTAL RESOURCE BASE."

"YOUR MISSION IS ABSOLUTELY ESSENTIAL TO RELIEVE THE GREAT POVERTY THAT IS DEEPENING TODAY IN MUCH OF THE DEVELOPING WORLD. THERE IS A HUMAN POPULATION EXPLOSION. THE POOR COUNTRIES ARE EXPANDING RAPIDLY. THERE ARE ALREADY TOO MANY POOR, UNPRODUCTIVE PEOPLE LIVING WELL BENEATH ACCEPTABLE HUMAN STANDARDS. THE NEED FOR ORGANIZED DEVELOPMENT UNDER "PROJECT EARTH" IS CRITICAL. THE MEANS OF SUPPORT IS LIMITED. WITHOUT ACCESS TO ADEQUATE WATER AND LAND, THERE WILL BE MASS MIGRATIONS AND ENVIRONMENTAL DEGRADATION."

"THE WORLD IS COUNTING ON YOU - GOOD LUCK."

AT THE FIRST MEETING THE MANAGERS OF "PROJECT EARTH" SELECTED THE BEST PEOPLE AVAILABLE FROM ALL BACKGROUNDS AND ALL PARTS OF THE WORLD. THEY DECIDED ON A PLAN OF ACTION.

"IF WE ARE TO SUCCEED, WE ALL NEED TO PLAY A ROLE, KNOWING THAT WE CAN MAKE WISE DECISIONS WHEN PRESENTED WITH THE FACTS. WE WILL HAVE TO INTRODUCE CHANGES - NEW AND BETTER WAYS OF DOING THINGS. THESE CHANGES WILL HAVE MANY ENEMIES. AT FIRST, THERE WILL BE FAR MORE QUESTIONS THAN

ANSWERS. PAINFUL CHOICES WILL HAVE TO BE MADE. THUS, THE FINAL ANALYSIS SUSTAINABLE DEVELOPMENT, PROJECT EARTH, MUST REST ON POLITICAL WILL."

THEN THE PROJECT MANAGERS DIVIDED THE TASKS INTO MANAGEABLE PARTS.

1. POPULATION AND HUMAN RESOURCES

"THE POPULATION IS GROWING AT RATES THAT CANNOT BE SUSTAINED BY AVAILABLE ENVIRONMENTAL RESOURCES, AT RATES THAT ARE OUTSTRIPPING ANY REASONABLE EXPECTATIONS OF IMPROVEMENTS IN HEALTH CARE, FOOD, SECURITY OR ENERGY SUPPLIES. URGENT STEPS ARE NEEDED TO LIMIT EXTREME RATES OF POPULATION GROWTH."

2. FOOD SECURITY

"GLOBAL AGRICULTURE HAS THE POTENTIAL TO GROW ENOUGH FOOD FOR ALL, BUT FOOD IS OFTEN NOT AVAILABLE WHERE IT IS NEEDED. PRODUCTION IN INDUSTRIALIZED COUNTRIES HAS USUALLY BEEN HIGHLY SUBSIDIZED ENCOURAGING THE OVERUSE OF SOIL AND CHEMICALS AND RESULTING DEGRADATION OF THE COUNTRYSIDE. MUCH OF THIS EFFORT HAS PRODUCED SURPLUSES WHICH HAVE BEEN SENT AT CONCESSIONAL RATES TO THE DEVELOPING WORLD WHERE IT HAS UNDERMINED THE FARMING POLICIES OF RECIPIENT NATIONS. DEVELOPING NATIONS NEED TRAINING AND INCENTIVE SYSTEMS TO ENCOURAGE PRODUCTION, ESPECIALLY OF FOOD CROPS."

3. SPECIES AND ECOSYSTEMS

"THE PLANET'S SPECIES ARE UNDER STRESS. THERE IS GROWING SCIENTIFIC CONSENSUS THAT SPECIES ARE DISAPPEARING AT RATES NEVER BEFORE WITNESSED ON THE PLANET. THE DIVERSITY OF THE SPECIES IS NECESSARY FOR THE NORMAL FUNCTIONING OF THE WORLD. THE GENETIC MATERIAL IN WILD SPECIES CONTRIBUTES BILLIONS OF DOLLARS YEARLY TO THE WORLD IN TERMS OF IMPROVED CROP SPECIES, NEW DRUGS AND MEDICINES AND RAW MATERIALS FOR INDUSTRY. THERE IS STILL TIME TO HALT THE PROCESS OF DISAPPEARING SPECIES."

4. ENERGY

"TO BRING DEVELOPING COUNTRIES' ENERGY USE UP TO INDUSTRIALIZED COUNTRY LEVELS BY THE YEAR 2025 WOULD REQUIRE INCREASING PRESENT GLOBAL ENERGY USE BY A FACTOR OF FIVE. THE PLANETARY ECOSYSTEM COULD NOT STAND THIS, ESPECIALLY IF THE INCREASES WERE BASED ON NON-RENEWABLE FOSSIL FUELS. THREATS OF GLOBAL WARMING AND ACIDIFICATION OF THE ENVIRONMENT MOST PROBABLY RULE OUT EVEN A DOUBLING OF ENERGY USE BASED ON PRESENT MIXES OF PRIMARY SOURCES.

ANY NEW ERA OF ECONOMIC GROWTH MUST THEREFORE BE LESS ENERGY-INTENSIVE THAN GROWTH IN THE PAST. ENERGY EFFICIENCY POLICIES MUST BE THE CUTTING EDGE OF NATIONAL ENERGY STRATEGIES FOR SUSTAINABLE DEVELOPMENT, AND THERE IS MUCH SCOPE FOR IMPROVEMENT IN

THIS DIRECTION. MODERN APPLIANCES CAN BE REDESIGNED TO DELIVER THE SAME AMOUNTS OF ENERGY-SERVICES WITH ONLY TWO-THIRDS OR EVEN ONE-HALF OF THE PRIMARY ENERGY INPUTS NEEDED TO RUN TRADITIONAL EQUIPMENT. AND ENERGY EFFICIENCY SOLUTIONS ARE OFTEN COST-EFFECTIVE.

A SAFE, ENVIRONMENTALLY SOUND, AND ECONOMICALLY VIABLE ENERGY PATHWAY THAT WILL SUSTAIN HUMAN PROGRESS INTO THE DISTANT FUTURE IS CLEARLY IMPERATIVE. IT IS ALSO POSSIBLE. BUT IT WILL REQUIRE NEW DIMENSIONS OF POLITICAL WILL AND INSTITUTIONAL CO-OPERATION TO ACHIEVE IT.

5. INDUSTRY

"THE WORLD MANUFACTURES SEVEN TIMES MORE GOODS TODAY THAN IT DID AS RECENTLY AS 1950. GIVEN POPULATION GROWTH RATES, A FIVE TO TENFOLD INCREASE IN MANUFACTURING OUTPUT WILL BE NEEDED JUST TO RAISE DEVELOPING-WORLD CONSUMPTION OF MANUFACTURED GOODS TO INDUSTRIALIZED WORLD LEVELS BY THE TIME POPULATION GROWTH RATES LEVEL OFF. THIS WILL TAKE MORE ENERGY AND MORE RESOURCES. BUT THE GLOBE CAN'T GIVE MUCH MORE AND THE GLOBE CAN'T TAKE MUCH MORE. SO WE WILL ALL HAVE TO PRODUCE MORE WITH LESS."

6. URBANIZATION

"THE 21ST CENTURY WILL BE LARGELY AN URBAN WORLD. FEW CITIES IN THE DEVELOPING WORLD HAVE THE POWER, RESOURCES AND TRAINED PERSONNEL TO PROVIDE THEIR RAPIDLY GROWING POPULATIONS WITH LAND, SERVICES, AND FACILITIES NEEDED FOR AN ADEQUATE HUMAN LIFE. THE RESULT IS MUSHROOMING ILLEGAL SETTLEMENTS WITH PRIMITIVE FACILITIES, INCREASED OVERCROWDING, AND RAMPANT DISEASE LINKED TO AN UNHEALTHY ENVIRONMENT. MANY CITIES IN INDUSTRIAL COUNTRIES ALSO FACE PROBLEMS - DETERIORATING INFRASTRUCTURE, ENVIRONMENTAL DEGRADATION, INNER CITY DECAY, AND NEIGHBORHOOD COLLAPSE.

INDUSTRIALIZATION, ENERGY AND FOOD DEVELOPMENT STRATEGIES MUST BE INTEGRATED WITH NEW URBAN DEVELOPMENT STRATEGIES TO ENSURE SYNERGY."

7. THE GLOBAL ECONOMY

"THE SUSTAINABILITY OF THE ECOSYSTEM ON WHICH THE GLOBAL ECONOMY DEPENDS MUST BE GUARANTEED. AND THE ECONOMIC PARTNERS MUST BE SATISFIED THAT THE BASIS OF EXCHANGE IS EQUITABLE. FOR MANY DEVELOPING NATIONS NEITHER CONDITION IS MET. WIDESPREAD CO-OPERATION ON DEVELOPMENT OF AN EFFECTIVE GLOBAL ECONOMY MUST BE ACHIEVED.

FOR EXAMPLE, GOVERNMENTS AND INTERNATIONAL AGENCIES SHOULD ASSESS THE COST EFFECTIVENESS, IN TERMS OF ACHIEVING SECURITY, OF MONEY SPENT ON ARMAMENTS COMPARED WITH MONEY SPENT ON REDUCING POVERTY AND RESTORING A RAVAGED ENVIRONMENT. GLOBALLY, MILITARY EXPENDITURES ARE ABOUT \$1 TRILLION (U.S.) PER YEAR AND CONTINUE TO GROW."

8. THE COMMONS

"THE SHARED ECOSYSTEMS INCLUDING THE OCEANS, ANTARCTICA AND OUTER SPACE RAISE PARTICULAR PROBLEMS THAT REQUIRE EXPERTISE AND SOUND MANAGEMENT. THE INTERNATIONAL COMMUNITY SHOULD DESIGN AND IMPLEMENT A REGIME FOR MANAGEMENT OF THE GLOBAL COMMONS THAT ENSURES THAT THEY REMAIN A PEACEFUL ENVIRONMENT FOR THE BENEFIT OF ALL."

LET'S TAKE A CLOSER LOOK AT THE WORK OF JUST ONE OF THE PROJECT EARTH MANAGEMENT TEAMS. THE ENERGY TEAM IS LOOKING FOR WAYS TO CONSERVE THE USE OF FOSSIL FUEL ENERGY. LET'S SEE HOW THEIR WORK MAY CHANGE THE FUTURE OF ENERGY PROJECTS. "THERE ARE ONLY TWO WAYS TO CONSERVE FOSSIL FUEL ENERGY - REDUCE CONSUMPTION OR USE RENEWABLE ALTERNATIVES.

THE FIRST ALTERNATIVE AVAILABLE IS NUCLEAR ENERGY. THE INCREASED USE OF



NUCLEAR ENERGY HAS DISPLACED AT LEAST 5% OF FOSSIL FUEL CARBON EMISSIONS IN THE LAST 15 YEARS. YET THE SERIOUS ACCIDENTS AT THREE MILE ISLAND AND CHERNOBYL POINTED OUT THE SERIOUS VULNERABILITY OF THE NUCLEAR POWER OPTION AND HAVE SLOWED THE PACE OF MASSIVE DEVELOPMENT. INTENSE SECURITY MEASURES AND MASSIVE LEGAL AND CIVIL CONSTRAINTS TEND TO CAST DOUBT ABOUT THE FUTURE GROWTH OF NUCLEAR POWER PROJECTS.

AS THE NUCLEAR OPTION CONTINUES TO BE DEBATED, RENEWABLE ENERGY SOURCES ARE POISED TO DEVELOP RAPIDLY. WIND POWER, GEOTHERMAL POWER, SOLAR POWER, LUNAR POWER AND VARIOUS BIOMASS TECHNOLOGIES ARE AMONG THE POWER SOURCES WITH POTENTIAL TO MOVE STRONGLY INTO THE MARKET DURING THE NINETIES. THEY ALL PROVIDE THE ADDED BENEFIT OF REDUCING OR REPLACING CARBON EMISSIONS FROM POWER PLANTS AS WELL AS BEING CAPABLE OF OPERATING WITHOUT CENTRALIZED POWER GRIDS AND ALSO IN TRANSPORTATION APPLICATIONS.

WIND POWER IS ONE RENEWABLE ENERGY SOURCE THAT HAS COME OF AGE DURING THE EIGHTIES. WHEN THE DECADE BEGAN, THERE WAS LITTLE MORE THAN A FEW AGING WIND PUMPS AND MISGUIDED PLANS TO BUILD MACHINES AS LARGE AS A JUMBO JET. TODAY, THERE ARE OVER 20,000 ELECTRICITY PRODUCING WIND MACHNINES IN USE WORLDWIDE, WITH A CAPACITY OF ABOUT 1,600 MEGAWATTS. MOST OF THESE ARE IN CALIFORNIA AND DENMARK, THOUGH WIND FARMS HAVE ALSO BEGUN TO APPEAR IN INDIA, WEST GERMANY, AND OTHER NATIONS. IN CALIFORNIA ALONE, THE 2 BILLION KILOWATT-HOURS PRODUCED IN 1989 ARE ENOUGH TO MEET THE RESIDENTIAL POWER NEEDS OF SAN FRANCISCO.

THE BIG STORY, THOUGH, IS ECONOMICS. WIND POWER HAS BECOME A COMMERCIALY COMPETITIVE SOURCE OF POWER, WITH GENERATING COSTS OF 6-8 CENTS PER KILOWATT-HOUR. FURTHER ADVANCES IN THE TECHNOLOGY OF AIR-FOILS, VARIABLE DRIVE TRAINS, AND MASS PRODUCTION COULD REDUCE COSTS BY ANOTHER 25 PERCENT BY 1995. MODEST GOVERNMENTAL EFFORTS THAT OVERCOME MARKET BARRIERS COULD LEAD TO A SURGE IN WIND POWER IN THE NINETIES. WIND ENERGY ANALYST ROBERT R. LYNETTE HAS ESTIMATED THAT THIS COULD PERMIT THE INSTALLATION OF AN ADDITIONAL 6,100-31,000MEGAWATTS OF GENERATING CAPACITY IN THE WESTERN UNITED STATES BY THE YEAR 2000. NORTHERN EUROPE, NORTH AFRICA, INDIA, AND THE SOVIET UNION HAVE SIMILAR POTENTIAL. BY THE MIDDLE OF THE NEXT CENTURY, WIND POWER COULD PROVIDE MORE THAN 10 PERCENT OF THE WORLD'S ELECTRICITY.

GEOTHERMAL POWER CAN BE ANOTHER SUBSTANTIAL COMPONENT OF AN ENERGY SYSTEM RUN ON RENEWABLES. THE WORLD NOW HAS OVER 5,000 MEGAWATTS OF INSTALLED GEOTHERMAL CAPACITY, AT COSTS OF 4-8 CENTS PER KILOWATT-HOUR. RAPID GROWTH CONTINUES, WITH THE MAIN FOCUS ON DEVELOPING DIFFICULT-TO-TAP RESOURCES SUCH AS THE PRESSURIZED HOT WATER RESERVES FOUND IN ABUNDANCE IN MANY REGIONS. IN THE UNITED STATES IT IS ESTIMATED THAT INSTALLED GEOTHERMAL CAPACITY IN THE YEAR 2000 COULD RANGE FROM 4,200 MEGAWATTS (DOUBLE THE CURRENT LEVEL) TO 18,700 MEGAWATTS. OTHER AREAS LIKELY TO RELY HEAVILY ON GEOTHERMAL ENERGY INCLUDE CENTRAL AMERICA, NEW ZEALAND, THE PHILIPPINES AND THE SOVIET UNION.

SOLAR THERMAL POWER IS THE MOST RECENT RENEWABLE ENERGY SOURCE TO BREAK INTO THE COMMERCIAL MARKET. SINCE 1984, SOME 194 MEGAWATTS OF GENERATING CAPACITY HAS BEEN INSTALLED IN SOUTHERN CALIFORNIA IN THE FORM OF MIRRORED TROUGHS THAT FOCUS SUNLIGHT ONTO OIL-FILLED TUBES. THESE CONVEY HEAT TO A TURBINE AND GENERATOR THAT PRODUCE POWER. SOLAR THERMAL SYSTEMS CONVERT UP TO 22 PERCENT OF THE SUNLIGHT THAT HITS THEM INTO ELECTRICITY, AT A COST THAT WILL SOON REACH 8 CENTS PER KILOWATT-HOUR. NATURAL GAS SERVES AS A BACKUP SOURCE TO RUN THE TURBINES WHEN THE SUN IS NOT SHINING, WHICH ALLOWS THE SYSTEM TO PROVIDE STEADY, RELIABLE POWER THAT IS USED TO MEET PEAK DEMAND. LUZ INTERNATIONAL, THE COMPANY THAT BUILDS THE SYSTEMS, IS EXPLORING EVEN LARGER

PROJECTS IN NEVADA AND BRAZIL. THIS ENERGY SOURCE IS EXPANDING RAPIDLY, LIMITED ONLY BY THE DEMAND FOR POWER AND THE CHEAP COAL THAT IS AVAILABLE IN SOME REGIONS.

FOLLOWING CLOSELY ON THE HEELS OF SOLAR THERMAL POWER IS SOLAR PHOTOVOLTAIC TECHNOLOGY, WHICH CONVERTS THE SUN'S RADIATION DIRECTLY INTO ELECTRICITY USING SEMICONDUCTOR MATERIALS. THIS IS THE MOST TECHNOLOGICALLY ADVANCED OF THE RENEWAL ENERGY SOURCES AND THE ONE LIKELY TO ADVANCE MOST RAPIDLY IN THE YEARS AHEAD. ANNUAL INSTALLATIONS HAVE GROWN FROM JUST 1 MEGAWATT IN 1978 TO 35 MEGAWATTS IN 1988. WHILE GROWTH SLOWED TEMPORARILY IN THE MID-EIGHTIES, IT BEGAN TO BOOM AGAIN IN 1988. THE UNITED STATES, FOR EXAMPLE, IS EXPECTING AN INCREASE OF 50 PERCENT IN 1989. FUELING THIS INCREASE ARE MARKETS SUCH AS CALCULATORS, COMMUNICATIONS SYSTEMS, WATER PUMPING, AND HOME ELECTRICITY. THIRD WORLD USE OF THESE SOLAR CELLS IS EXPANDING PARTICULARLY RAPIDLY, WITH INDIA REPORTING THAT 6,000 VILLAGE SYSTEMS HAVE BEEN INSTALLED. IN MANY REMOTE AREAS, PHOTOVOLTAICS IS A PRACTICAL ALTERNATIVE TO EXPANSION OF THE ELECTRICITY GRID, PROVIDING POWER SOONER, MORE RELIABLY, AND AT LOWER COST.

SCIENTISTS AT THE U.S. SOLAR ENERGY RESEARCH INSTITUTE (SERI) ESTIMATE THAT THESE TECHNOLOGIES MAY YIELD PHOTOVOLTAIC SYSTEMS BY THE LATE NINETIES THAT ARE COMPETITIVE WITH POWER PRODUCED DURING PEAK PERIODS. THIS COULD RESULT IN 1,000 MEGAWATTS OF INSTALLED CAPACITY IN THE UNITED STATES ALONE BY THE YEAR 2000, WITH MORE RAPID GROWTH

THEREAFTER. AN ALL-OUT EFFORT TO DEVELOP SOLAR CELLS COULD LEAD TO EVEN FASTER EXPANSION. THE CHRONAR CORPORATION, WHICH HAS ALREADY INSTALLED LARGE PHOTOVOLTAIC FACILITIES IN SEVERAL COUNTRIES, ESTIMATES THAT BY INVESTING \$20 BILLION FROM 1990-95, SOME 10,000 MEGAWATTS OF SOLAR-CELL MANUFACTURING CAPACITY COULD BE PUT IN PLACE BY 1995, LEADING TO 40,000 MEGAWATTS OF INSTALLATIONS BY THE YEAR 2000.

WHILE GROWTH IN THE NINETIES WILL BE HEAVILY INFLUENCED BY ENERGY PRICES AND POLICY DECISIONS, THERE IS LITTLE DOUBT THAT IN FUTURE DECADES PHOTOVOLTAICS WILL BECOME ONE OF THE WORLD'S LEADING SOURCES OF ENERGY. CAPABLE OF BEING MOUNTED ON ROOFTOPS FOR USE IN INDIVIDUAL HOMES, OR INSTALLED IN MASSIVE QUANTITIES AS DESERT POWER PLANTS, SOLAR CELLS COULD REACH A UBIQUITY UNMATCHED EVEN BY PETROLEUM. THE SOLAR ENERGY RESEARCH INSTITUTE ESTIMATES THAT PHOTOVOLTAICS ARE CAPABLE OF SUPPLYING OVER HALF OF U.S ELECTRICITY FOUR TO FIVE DECADES FROM NOW; MANY NATIONS ARE LIKELY TO FIND SIMILAR POTENTIAL. EUROPEAN COUNTRIES, WHILE LIMITED IN THE SOLAR RESOURCES WITHIN THEIR BORDERS, ARE MAKING PLANS TO FUND THE DEVELOPMENT OF LARGE SOLAR POWER STATIONS IN THE DESERTS OF NORTH AFRICA. THESE COULD PROVIDE ELECTRICITY AND, THROUGH ELECTROLYSIS, HYDROGEN TO RUN AUTOMOBILES IN AFRICA, EUROPE, AND THE MIDDLE EAST.

BIOMASS SOURCES SUCH AS WOOD, AGRICULTURAL WASTES, AND GARBAGE ALSO HAVE GREAT POTENTIAL TO FUEL A SUSTAINABLE ENERGY SYSTEM. ALREADY, BIOMASS SUPPLIES ABOUT 12 PERCENT OF WORLD ENERGY, A FIGURE THAT REACHES AS HIGH AS 50 PERCENT OR MORE IN SOME DEVELOPING COUNTRIES. HOWEVER, MUCH OF THIS IS PROBABLY NOT SUSTAINABLE AND COULD EVEN EXACERBATE GLOBAL WARMING. IN BRAZIL, FOR EXAMPLE, LARGE SMELTERS FUELED BY WOOD FROM VIRGIN FORESTS EMIT MORE CARBON DIOXIDE THAN IF THEY WERE FUELED BY COAL. BUT WITH CAREFUL MANAGEMENT AND EFFICIENT CONVERSION, THESE ENERGY SOURCES COULD PLAY A LARGER, SUSTAINABLE ROLE IN THE WORLD ENERGY SYSTEM.

WOOD- AND WASTE-FIRED POWER PLANTS ARE NOW BEING BUILT IN MANY NATIONS AT COSTS THAT ARE COMPETITIVE WITH FOSSIL FUEL PLANTS. THESE PRODUCE MINIMAL AIR POLLUTION AND, AS LONG AS THEY CONSUME WASTE MATERIALS OR WOOD FROM FORESTS THAT ARE BEING REPLANTED, THEY DO NOT CONTRIBUTE TO CARBON DIOXIDE BUILDUP. POWER PLANTS THAT BURN METHANE FROM LANDFILLS ARE PARTICULARLY EFFECTIVE AT SLOWING GLOBAL WARMING, SINCE THEY CONSUME A GAS WITH 25 TIMES THE GREENHOUSE STRENGTH OF CARBON DIOXIDE. A STUDY BY ENERGY ANALYSTS IN CALIFORNIA FOUND THAT POWER PLANTS RUNNING ON LANDFILL METHANE REMOVE THE EQUIVALENT OF 3.4 KILOGRAMS OF CARBON FOR EVERY KILOWATT-HOUR PRODUCED. EACH KILOWATT-HOUR PRODUCED IN THIS WAY OFFSETS THE CARBON RELEASED WHEN 10 KILOWATT-HOURS ARE GENERATED BY A COAL-FIRED PLANT.

IN A WORLD THAT RELIES LESS ON FOSSIL FUELS, RENEWABLE ENERGY SOURCES WILL BE NEEDED TO FUEL AUTOMOBILES AND TRUCKS. IN THE UNITED STATES, NEARLY ONE-THIRD OF CARBON DIOXIDE EMISSIONS COMES FROM TRANSPORTATION, AND OTHER COUNTRIES ARE MOVING IN THE SAME DIRECTION. HOWEVER, SOME OF THE ALTERNATIVE FUELS WITH POTENTIAL TO REDUCE OIL DEPENDENCE AND AIR POLLUTION WILL NOT HELP WITH GLOBAL WARMING. METHANOL, FOR EXAMPLE, WHICH IS A CENTERPIECE OF U.S. PRESIDENT GEORGE BUSH'S CLEAN AIR PROPOSAL AND IS ALSO BEING PURSUED AS A "CLEAN" FUEL IN CALIFORNIA, PRODUCES QUESTIONABLE BENEFITS. METHANOL FROM NATURAL GAS HAS A CARBON DIOXIDE EMISSIONS RATE ABOUT EQUAL TO GASOLINE, AND METHANOL DERIVED FROM COAL (THE MOST ABUNDANT SOURCE) PRODUCES TWICE AS MUCH CARBON.

AMONG THE MORE ATTRACTIVE TRANSPORTATION FUELS THAT YIELD SUBSTANTIALLY LOWER CARBON DIOXIDE EMISSIONS ARE ALCOHOL FUELS FROM BIOMASS. BRAZIL HAS THE WORLD'S LARGEST ALCOHOL FUELS PROGRAM, WITH ABOUT 72 MILLION BARRELS OF ETHANOL DERIVED FROM SUGAR CANE ANNUALLY. THIS PROVIDED 62 PERCENT OF THE COUNTRY'S AUTOMOTIVE FUEL IN 1988. WHILE THIS HUGE PROGRAM HAS HELPED REDUCE THE COUNTRY'S DEPENDENCE ON IMPORTED OIL, IT HAS DONE SO AT A PRICE OF ENORMOUS GOVERNMENT SUBSIDIES. A FEW OTHER TROPICAL COUNTRIES HAVE ADOPTED SMALLER CANE-TO-ALCOHOL PROGRAMS, BUT THIS IS NOT A PRACTICAL OPTION FOR MOST NATIONS. THE UNITED STATES IS THE

SECOND LARGEST PRODUCER OF ALCOHOL FUELS - 20 MILLION BARRELS PER YEAR, DERIVED MAINLY FROM CORN. BUT THE UNITED STATES IS NOT A MODEL EITHER, SINCE ITS PROGRAM IS ALSO SUBSIDIZED AND IS BASED ON A FOOD CROP GROWN ON PRIME LAND. BECAUSE FOSSIL FUELS ARE USED IN THE PRODUCTION OF U.S. ETHANOL, THAT FUEL YIELDS ONLY A 63-PERCENT REDUCTION IN CARBON EMISSIONS ON AN ENERGY-UNIT BASIS.

MOST COUNTRIES HAVE MARGINAL LANDS THAT COULD BE USED TO GROW TREES THAT STORE CARBON AND AT THE SAME TIME PRODUCE FUELS. IN THE UNITED STATES ALONE, 12 MILLION HECTARES OF MARGINAL CROPLAND HAS RECENTLY BEEN RETIRED UNDER THE CONSERVATION RESERVE PROGRAM. IF PLANTED IN TREES, THIS LAND COULD YIELD AS MUCH AS 243 MILLION BARRELS OF ETHANOL EACH YEAR - EQUIVALENT TO 10 PERCENT OF U.S. GASOLINE CONSUMPTION. SINCE IN ANY GIVEN YEAR MOST OF THE LAND WOULD BE COVERED BY RAPIDLY GROWING TREES, THERE WOULD BE A CARBON FIXING CAPABILITY AS WELL. IN ADDITION, CARBON BUILDUP IN THE SOILS WOULD PROBABLY CONTINUE FOR AT LEAST SEVERAL DECADES.

AGRICULTURAL WASTES PROVIDE ANOTHER POTENTIAL FEEDSTOCK FOR FUEL ALCOHOL: WORLDWIDE IT IS ESTIMATED THAT THERE ARE ENOUGH CORNCOBS AND RICE HULLS ALONE TO PRODUCE OVER 900 MILLION BARRELS OF ETHANOL ANNUALLY - EQUIVALENT TO ALMOST ONE-FIFTH OF WORLD GASOLINE CONSUMPTION."



WHAT WILL THE FUTURE BRING?

OUR FUTURE WILL LIKELY SEE A DECLINE IN THE RATE OF GROWTH OF FOSSIL FUELS BUT COAL, OIL AND GAS WILL CONTINUE TO PROVIDE MORE THAN HALF OF THE EARTH'S ENERGY NEEDS OVER THE NEXT FIFTY YEARS.

THE DECLINE OF RELIANCE ON NUCLEAR ENERGY IS INEVITABLE IN A WORLD WITH A RESPONSIBLE ENVIRONMENTAL ATTITUDE. JACQUES COUSTEAU EXPLAINS WHY.

"THE TOXIC AND EXPLOSIVE MATERIAL PRODUCED IN NUCLEAR PLANTS WILL HAVE TO BE ISOLATED FROM HUMANITY FOR PERIODS AS LONG AS MILLIONS OF YEARS - FAR LONGER THAN ANY ONE HUMAN CULTURE HAS EVER LASTED. THIS MEANS THAT EXTREMELY HIGH LEVELS OF DEDICATION, VIGILANCE, AND QUALITY CONTROL MUST BE MAINTAINED WITHOUT INTERRUPTION, INDEFINITELY, A SITUATION TOTALLY ALIEN TO THE HUMAN CONDITION. IN OTHER WORDS, SAFE CONTAINMENT FOR FUTURE GENERATIONS MEANS ALL NATIONS PARTICIPATING IN THE ATOMIC VENTURE WILL HAVE TO BE RULED BY STABLE GOVERNMENTS, AND MAINTAIN RELIABLE POLICE FORCES FOR MILLIONS OF YEARS!"

SOLAR, WIND, GEOTHERMAL, HYDRO AND BIOMASS RENEWABLE ENERGY RESOURCES ARE UNLIMITED AND WILL PROVIDE THE MAJOR SOURCE OF NEW ENERGY NEEDS IN THE NEXT FIFTY YEARS. NO COUNTRY OWNS THE SOLAR AND WIND RESOURCES OF THE EARTH, SO DEVELOPING NATIONS CAN NEVER BE HELD AS AN ENERGY HOSTAGE IF THEY RELY ON THEIR OWN UNLIMITED, CLEAN AND EFFICIENT ENERGY SYSTEMS.

POWER GRIDS WILL BE REPLACED BY DECENTRALIZED INDEPENDENT POWER GENERATION FACILITIES.

ENERGY EFFICIENCY APPLIANCES, AUTOMOBILES AND MACHINES WILL BE A MAJOR CONTRIBUTOR TO OUR IMPROVED WAY OF LIFE.

RECYCLING AND WASTE-TO-ENERGY RECOVERY PROGRAMS WILL REPLACE THE ANTIQUATED PRACTICES OF BURYING OUR WASTE.

AQUACULTURE WILL BECOME A NEW MAJOR INDUSTRY.

DOUBLE HULLED SUPERTANKERS WITH TWO PILOTS ON BOARD WILL BE STANDARD FOR OIL AND CHEMICAL SHIPMENTS.

THE CURRICULUM IN SCHOOLS THROUGHOUT THE WORLD WILL INCLUDE A BROAD COVERAGE OF ENVIRONMENTAL SCIENCE AND ECONOMICS.

THE PLANTING OF TREES WILL BECOME A MAJOR PART IN EVERY COUNTRY'S ENVIRONMENTAL PROGRAM.

ANTARCTICA WILL BECOME AN ENVIRONMENTAL RESERVE AND MILLIONS OF ACRES OF NEW LAND AND WATER WILL BE PROTECTED AS NATIONAL PARKS OR ENVIRONMENTAL PRESERVES.

NEW MORE EFFICIENT WAYS OF TREATING DRINKING WATER WILL BE INTRODUCED, REDUCING OUR RELIANCE ON CHLORINE.

BIRTH CONTROL AND FAMILY PLANNING METHODS AND INCENTIVES WILL BE COMMON IN MOST DEVELOPING NATIONS.

THE APPEARANCE OF NEW URBAN CENTRES NEAR FOOD PRODUCTION REGIONS WILL BE ENCOURAGED BY ALL NATIONS.

THE POTENTIAL LIST OF EXCITING CHANGES IS ENDLESS. THE NEED FOR CHANGE IS CRITICAL.

THE CHALLENGE FACING OUR SOCIETY, IN THE RICH, DEVELOPED WORLD, IS TO DEVELOP THE CORRECT ATTITUDE TOWARD THE CHANGES WE CAN SEE COMING. ARE WE GOING TO RESIST AND BE BURIED WITH THE DINOSAURS? OR ARE WE GOING TO WAIT AND SEE WHAT HAPPENS AND RISK HAVING TO FACE PROBLEMS THAT HAVE ESCALATED INTO A

GLOBAL CRISIS? OR ARE WE GOING TO STEP FORWARD FROM TODAY, ACCEPTING THE CHANGES AS ESSENTIAL AND AS CREATIVE OPPORTUNITIES FOR THE BENEFIT OF BUSINESS AND THE FUTURE OF HUMANITY? THE CHOICE IS YOURS, THE FUTURE DEPENDS ON YOU.

IF YOU DECIDE NOT TO SAY, "STOP THE WORLD, I WANT TO GET OFF", THEN YOUR FIRST CHALLENGE IS TO START AT THE BEGINNING. TODAY THERE IS SIMPLY NOT ENOUGH EDUCATED MANPOWER BEING APPLIED TO THE FRONT END PLANNING OF THESE PROJECTS OF THE FUTURE. THE WORLD IS DRIFTING WITH GREAT SPEED TOWARD THEM WITHOUT THE BENEFIT OF ORGANIZED PLANNING. THE WORLD BANK IS LIMITED IN ITS ABILITY TO PLACE PROJECT FINANCING, NOT BY THE AVAILABILITY OF FUNDS OR SUITABLE PROJECTS, BUT BY THE AVAILABILITY OF PROJECT IMPACT PLANNERS.

SO I WANT TO LEAVE THIS ORGANIZATION WITH A SIMPLE SINGLE CHALLENGE AS YOU BEGIN YOUR DAYS OF DELIBERATION TOGETHER ON AN IMPRESSIVE ARRAY OF PROJECT MANAGEMENT TOPICS. THE FUTURE NEEDS OF OUR PLANET WILL BE WELL SERVED ONLY IF WE BEGIN THE LONG RANGE PLANNING NECESSARY TO DEPLOY OUR RESOURCES IN A MORE EFFICIENT WAY TODAY. THE CRITICAL PART OF "PROJECT EARTH" NOT LIMITED TO TECHNOLOGY OR ECONOMICS, INVOLVES SORTING OUT THE COMPLEX CHAIN REACTION OF CONSEQUENCES AND BENEFITS OF THE MASSIVE CHANGES FOR WHICH OUR WORLD IS CRYING OUT.

THIS TIME OF RADICAL CHANGE IS A TIME OF GREAT OPPORTUNITY.