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AMERICA 2000

An Education Strategy



**“...making this land all
that it should be.”**

George Bush

A Message from the Secretary

The national education goals adopted by President Bush and the governors in 1990 are ambitious—but worthy of a great nation. The AMERICA 2000 Education Strategy described in the pages that follow is a bold, complex, and long-range plan to move every community in America toward those goals.

The AMERICA 2000 Education Strategy has a language of its own. One good way to begin reading this booklet is to turn first to the Glossary of Key Terms. In time, these terms will become familiar to the millions of people who are needed to make America all that it should be.

Lamar Alexander
Secretary of Education
April 18, 1991



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AMERICA 2000: An Education Strategy

Overview

AMERICA 2000 is a long-term strategy to help make this land all that it should be—a nine-year crusade to move us toward the six ambitious national education goals that the president and the governors adopted in 1990 to close our skills-and-knowledge gap.

The strategy anticipates major change in our 110,000 public and private schools, change in every American community, change in every American home, change in our attitude about learning.

This strategy is bold, complex and long-range. It will start quickly—but results won't come quickly. It will occupy us at least for the rest of this decade.

We already know the direction in which we must go; the AMERICA 2000 strategy will help us get there.

It will spur far-reaching changes in weary practices, outmoded assumptions and long-assumed constraints on education. It will require us to make some lifestyle changes, too. Yet few elements of this strategy are unprecedented. Today's best ideas, dedicated education reformers, impressive innovations and ambitious experiments already point the way. We already know the direction in which we must go; the AMERICA 2000 strategy will help us get there.

AMERICA 2000 is a national strategy, not a federal program. It honors local control, relies on local initiative, affirms states and localities as the senior partners in paying for education and the private sector as a vital partner, too. It recognizes that real education reform happens community by community and school by

school and only when people come to understand what they must do for themselves and their children and set about to do it.

The federal government's role in this strategy is limited as—wisely—its part in education always has been. But that role will be played vigorously. Washington can help by setting standards, highlighting examples, contributing some funds, providing flexibility in exchange for accountability, and pushing and prodding—then pushing and prodding some more.

The AMERICA 2000 strategy has four parts that will be pursued simultaneously. They can be visualized as four giant trains—big enough for everyone to find a place on board—departing at the same time on parallel tracks on the long journey to educational excellence. All four must move swiftly and determinedly if the nation is to reach its destination:

1. **For today's students**, we must radically improve today's schools, all 110,000 of them—make them better and more accountable for results.
2. **For tomorrow's students**, we must invent new schools to meet the demands of a new century—a New Generation of American Schools, bringing at least 535 of them into existence by 1996, and thousands by decade's end.
3. **For those of us already out of school and in the work force**, we must keep learning if we are to live and work successfully in today's world. A "Nation at Risk" must become a "Nation of Students."
4. **For schools to succeed**, we must look beyond their classrooms to our communities and families. Schools will never be much better than the commitment of their communities. Each of our communities must become a place where learning can happen.

Four big trains, moving simultaneously down four parallel tracks: Better and more accountable schools; a New Generation of American Schools; a Nation of Students continuing to learn throughout our lives; and communities where learning can happen.

The Challenge: America's Skills and Knowledge Gap

Operation Desert Storm was a triumph of American character, ability and technology—a victory for America and all it stands for. It helped show that our nation can do whatever it decides to do—and that our people can learn anything they need to learn.

Still, eight years after the National Commission on Excellence in Education declared us a “Nation at Risk,” we haven’t turned things around in education. Almost all our education trend lines are flat. Our country is idling its engines, not knowing enough nor being able to do enough to make America all that it should be.

*As a nation, we now invest
more in education than in
defense.*

Yet we’re spending far more money on education. Total spending for elementary and secondary schools more than doubled since 1980—while the number of students remained about the same. In real terms, education spending increased approximately 33 percent more per public school student. As a nation, we now invest more in education than in defense. But the results have not improved, and we’re not coming close to our potential or what is needed.

Nor is the rest of the world sitting idly by, waiting for America to catch up. Serious efforts at education improvement are under way by most of our international competitors and trading partners. Yet while we spend as much per student as almost any country in the world, American students are at or near the back of the pack in international comparisons. If we don’t make radical changes, that is where they are going to stay.

Meanwhile, our employers cannot hire enough qualified workers. Immense sums are spent on remedial training, much of it at the college level. Companies export skilled work—or abandon

projects that require it.

Shortcomings are not limited to what today's students are learning in school. The fact is that close to 85 percent of America's work force in the year 2000 is already in the work force today. They are the products of the same education system.

Perhaps 25 million adults are functionally illiterate. As many as 25 million more adult workers need to update their skills or knowledge.

While more than 4 million adults are taking basic education courses outside the schools, there is no systematic means of matching training to needs; no uniform standards measure the skills needed and the skills learned.

While the age of technology, information and communications rewards those nations whose people learn new skills to stay ahead, we are still a country that groans at the prospect of going back to school. At best, we are reluctant students in a world that rewards learning.

And there is one more big problem: Today's young Americans spend barely 9 percent of their first eighteen years in school, on average. What of the other 91 percent, the portion spent elsewhere—at home, on playgrounds, in front of the television?

- ☐ For too many of our children, the family that should be their protector, advocate and moral anchor is itself in a state of deterioration.
- ☐ For too many of our children, such a family never existed.
- ☐ For too many of our children, the neighborhood is a place of menace, the street a place of violence.

- ❑ Too many of our children start school unready to meet the challenges of learning.
- ❑ Too many of our children arrive at school hungry, unwashed and frightened.
- ❑ And other modern plagues touch our children: drug use and alcohol abuse, random violence, adolescent pregnancy, AIDS and the rest.

No civil society or compassionate nation can neglect the plight of these children—in almost every case, innocent victims of adult misbehavior.

But few of those problems are amenable to solution by government alone, and none by schools alone. Schools are not and cannot be parents, police, hospitals, welfare agencies or drug treatment centers. They cannot replace the missing elements in communities and families.

We tend to say that “the nation is at risk, but I’m okay.”

Schools can contribute to the easing of these conditions. They can sometimes house additional services. They can welcome tutors, mentors and caring adults. But they cannot do it alone.

At one level, everybody knows this. Yet few Americans think it has much to do with them. We tend to say that “the nation is at risk, but I’m okay.” Complacency is widespread with regard to one’s own school, one’s own children, one’s own community.

This leaves us stuck at far too low a level, a level we ought not tolerate. One of the lessons of the education reform movement of the 1980s was that little headway can be made if few of us see the need to change our own behavior. Yet few of us can imagine what

a really different education system would look like. Few of us are inclined to make big changes in familiar institutions and habits.

Until last year, few could even describe our education goals. As a nation, we didn't really have any.

In 1990, the president and the governors adopted six ambitious education goals. AMERICA 2000 is a strategy to achieve them.

America's Education Goals

By the year 2000:

1. All children in America will start school ready to learn.
2. The high school graduation rate will increase to at least 90 percent.
3. American students will leave grades four, eight, and twelve having demonstrated competency in challenging subject matter including English, mathematics, science, history, and geography; and every school in America will ensure that all students learn to use their minds well, so they may be prepared for responsible citizenship, further learning, and productive employment in our modern economy.
4. U.S. students will be first in the world in science and mathematics achievement.
5. Every adult American will be literate and will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship.
6. Every school in America will be free of drugs and violence and will offer a disciplined environment conducive to learning.

The four-part AMERICA 2000 Education Strategy will enable us to achieve these goals.

I. For Today's Students: Better and More Accountable Schools

Goals served: All six, but especially #2 (90 percent graduate from high school), #3 (competence in core subjects) and #4 (first in the world in science and mathematics).

Strategy: Through a 15-point accountability package, parents, teachers, schools and communities can all be encouraged to measure results, compare results and insist on change when the results aren't good enough.

Specifics:

New World Standards: Standards will be developed, in conjunction with the National Education Goals Panel. These New World Standards—for each of the five core subjects—will represent what young Americans need to know and be able to do if they are to live and work successfully in today's world. These standards will incorporate both knowledge and skills, to ensure that, when they leave school, young Americans are prepared for further study and the work force.

American Achievement Tests: In conjunction with the National Education Goals Panel, a new (voluntary) nationwide examination system will be developed, based on the five core subjects, tied to the New World Standards. These tests will be designed to foster good teaching and learning as well as to monitor student progress.

Encouragement to use the tests: Colleges will be urged to use the American Achievement Tests in admissions; employers will be urged to pay attention to them in hiring.

Presidential Citations for Educational Excellence: Citations will be awarded to high school students who do well on American Achievement Tests. Until those tests become available, Presidential Citations for Educational Excellence will be awarded based on

Advanced Placement tests.

Presidential Achievement Scholarships: Once enacted by Congress, these scholarships will reward academic excellence among needy college and university students.

Report Cards on results: In addition it reports to parents on how their children are doing, report cards will also provide clear (and comparable) public information on how schools, school districts and states are doing, as well as the entire nation. The national and state report cards will be prepared in conjunction with the National Education Goals Panel.

Report Card data collection: Congress will be asked to authorize the National Assessment of Educational Progress regularly to collect state-level data in grades four, eight and twelve in all five core subjects, beginning in 1994. Congress will also be asked to permit the use of National Assessment tests at district and school levels by states that wish to do so.

*If standards, tests and report
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Choice: If standards, tests and report cards tell parents and voters how their schools are doing, choice gives them the leverage to act. Such choices should include all schools that serve the public and are accountable to public authority, regardless of who runs them. New incentives will be provided to states and localities to adopt comprehensive choice policies, and the largest federal school aid program (Chapter 1) will be revised to ensure that federal dollars follow the child to whatever extent state and local policies permit.

The school as the site of reform: Because real education improvement happens school by school, the teachers, principals and parents in each school must be given the authority—and the responsibility—to make important decisions about how the school will operate. Federal and state red tape that gets in the way needs to be cut. States will be encouraged to allow the leadership of individual schools to make decisions about how resources are used, and Congress will be asked to enact Education Flexibility legislation to remove federal constraints that impede the ability of states to spend education resources most effectively to raise achievement levels. The Business Roundtable, the U.S. Chamber of Commerce, and other private groups representing the private sector are to be commended—and encouraged—in their important efforts to create state and local policy environments in which school-by-school reform can succeed.

Merit Schools Program: Individual schools that make notable progress toward the national education goals deserve to be rewarded. Congress will be asked to enact a new program that will provide federal funds to states that can be used as rewards for such progress. States may “bank” those funds over several years to create even more incentives for successful schools and teams of school professionals.

Governors’ Academies for School Leaders: Academies will be established with federal seed money, so that principals and other leaders in every state will be able to make their schools better and more accountable.

Governors’ Academies for Teachers: Academies will also be established with federal seed money, so that teachers of the five core subjects in every state will be ready to help their students attain the New World Standards and pass the American Achievement Tests.

Differential teacher pay: Differential pay will be encouraged for those who teach well, who teach core subjects, who teach in

dangerous and challenging settings, or who serve as mentors for new teachers.

Alternative teacher and principal certification: As part of the AMERICA 2000 Excellence in Education Act of 1991, Congress will be asked to make grants available to states and districts to develop alternative certification systems for teachers and principals. New college graduates and others seeking a career change into teaching or school leadership are often frustrated by certification requirements unrelated to subject area knowledge or leadership ability. This initiative will help states and districts to develop means by which individuals with an interest in teaching and school leadership can overcome these barriers.

Honor teachers: The federal government will honor and reward outstanding teachers in all five of the core subjects with Presidential Awards for Excellence in Education.

II. For Tomorrow's Students: A New Generation of American Schools

Goals served: All six. In fact, they are the principal standards against which every New American School will be measured.

Strategy:

We will unleash America's creative genius to invent and establish a New Generation of American Schools, one by one, community by community. These will be the best schools in the world, schools that enable their students to reach the national education goals, to achieve a quantum leap in learning, and to help make America all that it should be.

A number of excellent projects and inspired initiatives already point the way. These include Washington State's Schools for the 21st Century, TheodoreSizer's Coalition of Essential Schools, James Comer's School Development Program, Henry Levin's Accelerated Schools, RJR Nabisco's Next Century Schools, the Saturn School of Tomorrow in St. Paul, and other commendable efforts.

But this strategy goes beyond what these pioneers have begun. It enlists communities—aided by the best research and development the nation is capable of—in devising their own plans to break the mold and create their own one-of-a-kind high-performance schools. It relies on clear, rigorous measures of success—the New World Standards and American Achievement Tests discussed under Part I. The goal is to bring at least 535 such schools into existence by 1996. And it calls on leaders at all levels to join in this effort.

Specifics:

Research and development: America's business leaders will establish—and muster the private resources for—the New American Schools Development Corporation, a new nonprofit organization that will award contracts in 1992 to three to seven R & D

think tanks, school innovators, management consultants, and others. The president will ask his Education Policy Advisory Committee, as well as the Department of Education, to examine the work of these R & D Teams (and similar break-the-mold school reform efforts), and to report regularly on their progress to him and to the American people.

New American Schools: The mission of the R & D Teams is to help communities create schools that will reach the national education goals, including New World Standards (in all five core subjects) for all students, as monitored by the American Achievement Tests and similar measures. Once the R & D is complete and the schools are launched, the operating costs of the New American Schools will be about the same as those of conventional schools.

***R&D Teams...can be expected
to set aside all traditional
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Breaking the Mold: The R & D Teams—and the communities and states with which they work—can be expected to set aside all traditional assumptions about schooling and all the constraints that conventional schools work under. They will naturally need to consider the policy environment within which schools can thrive. Time, space, staffing and other resources in these new schools may be used in ways yet to be imagined. Some schools may make extensive use of computers, distance learning, interactive video-discs and other modern tools. Some may radically alter the customary modes of teaching and learning and redesign the human relationships and organizational structures of the school. Whatever their approach, all New American Schools will be expected to produce extraordinary gains in student learning.

Note: A New American School does not necessarily mean new bricks-and-mortar. Nor does a New American School have to rely on technology; the quality of learning is what matters.

AMERICA 2000 Communities: The president will call on every community in the land to do four things: adopt the six national education goals for itself, establish a community-wide strategy for achieving them, develop a report card for measuring its progress, and demonstrate its readiness to create and support a New American School. Communities that accept this challenge will be designated (by the governors of their states) as "AMERICA 2000 Communities."

The First 535+ New American Schools: Each AMERICA 2000 Community may develop a plan to create one of the first 535+ New American Schools with limited federal support for start-up costs. In that plan, they will be expected to suggest their own answer to the question: What would it take to develop the best school in the world in *this* community, a school that serves the children of this community while also meeting the national education goals?

Governors, in conjunction with the secretary of education, will review these community-developed plans, with the assistance of a distinguished advisory panel, and will determine which AMERICA 2000 communities in each state will receive federal help in starting New American Schools. At least one New American School will be created in each congressional district by 1996. This distribution assures that every type of community in every part of the country will have the chance to create and establish one of the first 535+ New American Schools. The governors and the secretary will take added care to make sure that many such schools serve communities with high concentrations of "at-risk" children.

Funding: American business and other donors will make sufficient funds available through the New American Schools Development Corporation to jump-start the R & D Teams—at least \$150-200

million. Congress will be asked to provide one-time grants of \$1 million to each of the first 535+ New American Schools to help cover their start-up costs. State, local, and private sources will enable thousands more such schools to begin by the end of the decade.

Bringing America On-Line: The secretary, in consultation with the President's Science Advisor and the Director of the National Science Foundation will convene a group of experts to help determine how one or more electronic networks might be designed to provide the New American Schools with ready access to the best of information, research, instructional materials and educational expertise. The New American School R & D Teams will be asked for their recommendations on the same question. These networks may eventually serve all American schools as well as homes, libraries, colleges and other sites where learning occurs.

III. For the Rest of Us (Yesterday's Students/ Today's Work Force): A Nation of Students

Goals Served: All six, but especially #5 (adult literacy, citizenship, and ability to compete in the workplace).

Strategy:

Eighty-five percent of America's work force for the year 2000 is already in the work force today, so improving schools for today's and tomorrow's students is not enough to assure a competitive America in 2000. And we need more than job skills to live well in America today. We need to learn more to become better parents, neighbors, citizens and friends. Education is not just about making a living; it is also about making a life.

That is why the president is challenging adult Americans to "go back to school" and make this a "Nation of Students." For our children to understand the importance of their own education, we must demonstrate that learning is important to grown-ups, too. We must ourselves "go back to school." The president is urging every American to continue learning throughout his or her life, using the myriad formal and informal means available to gain further knowledge and skills.

*Education is not just about
making a living; it is also about
making a life.*

Specifics:

Private-Sector Skills and Standards: Business and labor will be asked to adopt a strategy to establish job-related (and industry-specific) skill standards, built around core proficiencies, and to

develop "skill certificates" to accompany these standards. The president has charged the secretaries of Labor and Education to spearhead a public-private partnership to help develop voluntary standards for all industries. Federal funds are being sought to assist with this effort, which will be informed by the work of the Labor Department's Commission on Work-Based Learning and the Secretary's Commission on Achieving Necessary Skills.

Skill Clinics: The strategy will promote one-stop assessment and referral Skill Clinics in every large community and work-site, including many federal agencies. In the Skill Clinics, people can readily find out how their present skills compare with those they'd like to have—or that they need for a particular job—and where they can acquire the skills and knowledge they still need.

Federal Leadership: Federal agencies will set an example for other employers by embarking upon a government-wide program of skill upgrading. The president has asked the director of the Office of Personnel Management to lead this important initiative.

Recommitment to Literacy: The nation's efforts will be strengthened by developing performance standards for all federally aided adult education programs and holding programs accountable for meeting them; by expanding the National Adult Literacy Survey so that we have better information on a regular basis about the condition of literacy among adults. The administration will also work with Congress and the governors to enact sound literacy and adult education legislation.

National Conference on Education for Adult Americans: A major conference will be called to develop a nationwide effort to improve the quality and accessibility of the many education and training programs, services and institutions that serve adults.

IV. Communities Where Learning Can Happen

Goals Served: All six, but especially #1 and #6
(children starting ready to learn) and
(drug- and violence-free schools).

Strategy:

Even if we successfully complete the first, second and third parts of the AMERICA 2000 education strategy, we still will not have done the job. Even with accountability embedded in every aspect of education, achieving the goals requires a renaissance of sound American values—proven values such as strength of family, parental responsibility, neighborly commitment, the community-wide caring of churches, civic organizations, business, labor and the media.

It's time to end the "no fault" era of heedlessness and neglect, and as we shape tomorrow's schools, to rediscover the timeless values that are necessary for achievement.

Government at every level can play a useful role, and it is incumbent upon all of us to see that this is done efficiently and adequately. But much of the work of creating and sustaining healthy communities, communities where education really happens, can only be performed by those who live in them: by parents, families, neighbors and other caring adults; by churches, neighborhood associations, community organizations, voluntary groups and the other "little platoons" that have long characterized well-functioning American communities. Such groups are essential to the building of relationships that nurture children and provide them people and places to which they can turn for help, for role models and for guidance.

Specifics:

AMERICA 2000 Communities: The president is challenging every city, town and neighborhood in the nation to become an AMERICA 2000 Community by:

- (1) Adopting the six national education goals for itself
- (2) Establishing a community-wide strategy for achieving them
- (3) Developing a report card for measuring its progress
- (4) Demonstrating its readiness to create and support a New American School

Designation by Governors: Designation as an AMERICA 2000 Community will be made by the governors, with 535+ of them getting help in creating the first New American Schools by 1996.

Recognition: The president and the administration will promote AMERICA 2000 Communities with national attention to and rewards for community planning and progress with special emphasis on their creation in areas of concentration of at-risk children.

The Cabinet: The Domestic Policy Council's Economic Empowerment Task Force, working with the National Governors' Association and other state and local officials, will seek ways to maximize program flexibility and effectiveness in meeting the needs of children and communities, including streamlined eligibility requirements for federal programs, better integration of services, and reduced red tape.

Individual Responsibility: Increased attention will be focused on adult behavior, responsibility for children, and family and community values essential for strong schools—including parents as teachers of their children and parents as school partners.

Who Does What?

The four-part AMERICA 2000 strategy depends upon the strong and long-term commitment of all Americans.

The President, the Department of Education and the entire Cabinet will help keep the focus on this strategy, will spotlight areas of trouble as well as examples of excellence, will reward progress and spur change.

The Congress will need to pass the AMERICA 2000 Excellence in Education Act, containing most of the federal initiatives in support of this strategy. Since most of the important changes need to occur outside Washington, we hope that every member of Congress will also press for the kinds of state and local changes that need to be part of this strategy, foster the establishment of AMERICA 2000 Communities in their states and districts, and serve as mentors to the New American Schools in their districts.

The Governors, too, are key. They will designate the AMERICA 2000 Communities. They (with the secretary of Education) will decide where the first 535+ New American Schools are located. With their legislatures, they will have the opportunity to support the new schools as they do the old. They will catalyze the creation of Governors' Academies for School Leaders and Governors' Academies for Teachers of core subjects. In no state is an Education President or federal program as important as a committed Education Governor.

The Business Community is also vital. It will jump start the R & D Teams that will design the New American Schools. It will use the American Achievement Tests in hiring decisions, will develop and use its own skill standards and—perhaps most important—will provide people and resources to help catalyze needed change in local schools, communities and state policies.

And at the community level, it will take all of us—principals, teachers, students, business, office-holders, the media, the medical and social service communities, civic and religious groups, law

enforcement, caring adults and good neighbors—to cause the planning and follow-through that every AMERICA 2000 Community will need.

Most of all, it will take America's parents—in their schools, their communities, their homes—as helpers, as examples, as teachers, as leaders, as demanding shareholders of our schools—to make the AMERICA 2000 education strategy work—to make this land all that it should be.

Glossary of Key Terms

American Achievement Tests: The anchor for a new system of voluntary national examinations at the fourth, eighth and twelfth grades in each of the five core subjects, tied to the New World Standards.

AMERICA 2000: An Education Strategy: An action plan to move America toward the six national education goals through a populist crusade, by assuring accountability in today's schools, unleashing America's genius to jump-start a new generation of American schools, transforming a "Nation at Risk" into a "Nation of Students," and nurturing the family and community values essential to personal responsibility, strong schools and sound education for all children.

AMERICA 2000 Communities: Communities, designated by the governors, that meet the president's four-part challenge: that (1) adopt the six national education goals for themselves, (2) create a community-wide plan for achieving them, (3) develop a Report Card to measure their progress, and (4) demonstrate their readiness to create and support a New American School. 535+ such communities will open New American Schools by 1996.

Better and More Accountable Schools: A 15-part improvement package for today's schools, designed to move America toward the six national education goals, including New World Standards, American Achievement Tests, Report Cards and school choice.

Federal Role: While the federal government's role in education is and should remain limited, the administration is committed to providing R & D, assessment and information, assuring equal opportunity and, above all, leading the nationwide effort to achieve the six education goals.

535+ by 1996: At least 535 New American Schools will be up and running in AMERICA 2000 Communities across the country—at least one in each congressional district—by 1996, as well as in Puerto Rico, the District of Columbia and the U.S. territories.

From a “Nation at Risk” to a “Nation of Students”: Adults—today’s work force—“go back to school” for further study, to learn a new skill to help them earn their living, or to acquire additional knowledge to help them live a better life.

Governors’ Academies for School Leaders: State or regional Academies catalyzed with federal seed money, that train principals and other school leaders in the design and execution of school improvement strategies, accountability mechanisms, and school-site management.

Governors’ Academies for Teachers: State or regional Academies in each of the five core subjects, catalyzed with federal seed money, that train teachers in the five core subjects to ensure that they possess the knowledge, the skills, and the tools they need to help students meet the New World Standards and do well on the American Achievement Tests.

Job Skill Standards and Job Skill Certificates: Standards to be established jointly by employers and labor for each industry, beginning with the fundamental categories and definitions developed by the Department of Labor’s SCANS Commission, that will assist workers to see what skills are needed to perform a job and to evaluate their own grasp of those skills. Certificates will be given (by the private sector) to those who acquire the skills and meet the standards.

New American Schools Development Corporation: A non-profit, non-governmental organization, created by American business leaders and other private citizens, that will receive funds, sponsor a competition and establish, support and monitor three to seven R & D Teams. The mission of these teams is to help AMERICA 2000 Communities invent and create their own new American schools.

New Generation of American Schools: Major nationwide effort to invent and create 535+ schools by 1996 (and many more

thereafter) that are the best in the world. Located in AMERICA 2000 Communities, these schools will reach the national education goals at operational costs not exceeding those of conventional schools.

New World Standards: Definitions of what American students should be expected to know and be able to do upon completion of schooling, meant to function as benchmarks against which student and school performance can be measured.

Populist Crusade: A national crusade led by the president—school by school, neighborhood by neighborhood, community by community—to transform American education and to spur fundamental changes in the ways we educate ourselves and our children. It also will be a restoration of what we think is important, a homecoming in sound values and community attitudes.

R & D Teams: Partnerships of corporations, universities, think tanks, school innovators, management consultants and others, selected through a competitive process by the New American Schools Development Corporation to receive up to \$30 million each over three years to conceptualize and invent New American Schools.

Report Cards: A public reporting system on the performance of education institutions and systems, providing maximum information at the school, district, state and national levels.

School as the Site of Reform: The individual school is education's key action-and-accountability unit. The surest way to reform education is to give schools and their leaders the freedom and authority to make important decisions about what happens, while being held accountable for making well-conceived efforts at improvement and for achieving desired results.

Skill Clinics: Just as health clinics diagnose health and refer people to appropriate care, skill clinics will be centers in every

community and large workplace where people can go to get their own job skills evaluated, find out what skills they need to learn to hold a certain job or get a better one, and find out where they can go to gain those skills.

Skills and Knowledge Gap: Too many of us lack the knowledge—especially of English, mathematics, science, history and geography—and the skills necessary to live and work successfully in the world as it is today.

Unleash America's Genius: Bringing the best minds and creative energies from education, technology, management and other fields together in a pioneering effort to create a New Generation of American Schools that are the best in the world.

Some Questions and Answers

Q. How much will the AMERICA 2000 plan cost?

A. The Department of Education will support appropriate activities under existing programs in this year's budget to get AMERICA 2000 off the ground—and the president is requesting \$690 million for the strategy in the 1992 budget. That does not include programs in many other departments (e.g. Labor, HHS, HUD), which are essential to the success of AMERICA 2000. Nor does it include the \$150-200 million from the business community to jump-start the New American Schools R&D Teams.

But two other points need to be made. First, state and local governments provide more than 90 percent of all education funding—a responsibility both the president and the governors have concluded should not be altered. But AMERICA 2000 is not expected to raise state or local spending.

Second, both state/local funding and federal funding have increased dramatically in recent years without significant results. Since 1980, public funding is up 33 percent per student (after inflation). The answer does not lie in spending more money on old ways—but to redirect our resources and our energies to new approaches.

*Nobody says education is free,
but ingenuity, commitment and
accountability matter more
than money.*

With state, local and private sources doing their parts, and the federal government doing its, the elements of this strategy that may need money will have what they require. Excellent schools, let's remember, don't have to cost more than mediocre ones. Nobody says education is free, but ingenuity, commitment and accountability matter more than money.

Q. Aren't the New American Schools going to be more expensive than today's schools?

A. No. It will be a requirement for the R & D Teams that the new schools they design can operate at costs no more than conventional schools.

Q. Is the R & D for New American Schools likely to stress technology and glitz rather than teaching and learning?

A. Schools should certainly avail themselves of the help that technology can furnish. (Some say that schools are one of the few institutions in society largely untouched even by the Industrial Revolution, much less by the Information Age.) But technology is no cure-all for educational and social problems. Great schools are built by people, people who care and who act. A great school is one where adults teach children sound values and good character as well as knowledge and skills. Their secret ingredient is human, not electronic.

We expect that the R & D Teams will begin by erasing *all* conventional assumptions and constraints about schooling: the schedule (and calendar), curriculum, class size, the pace of learning, teacher/student ratios, adult roles, teacher recruitment, health and nutrition, discipline, staff development, organizational and management structures, resource allocation, students-as-tutors, the nature of instructional materials, and much more.

Q. Why should there be only 535+ New American Schools?

A. We want there to be thousands. These are just the *first* 535+. In time there could be 110,000. We believe—and hope—that many states and communities will move quickly toward their own New American Schools.

Q. What's the plus sign in "535+?"

A. We propose to provide federal start-up funds not just for one New American School for every Senator and Representative that a state has, but also for the District of Columbia, Puerto Rico and the U.S. territories.

Q. Is it worth becoming an AMERICA 2000 Community if you don't win one of the first 535+ New American Schools?

A. It sure is. Every neighborhood, town or city that cares about its kids, its schools and its future will want to become an AMERICA 2000 Community. The act of creating such a community—by meeting the president's four-part challenge—will itself do immense good. Consider, for example, what it means to devise a community plan to ensure that all children enter school ready to learn...that all the schools are safe and drug free...that all adults will be literate. We predict that, by the year 2000, there will be literally thousands of AMERICA 2000 Communities. They will be the pace-setters, the beacons, the heartbeat of this education strategy—and of their children's future.

Q. Will choice apply to private schools as well as public? Will it apply to religiously affiliated schools?

A. It will apply to all schools except where the courts find a constitutional bar. The power of choice is in the parents' leverage both to change schools and to make change in the schools. The definition of "public school" should be broadened to mean any school that serves the public and is held accountable by a public authority.

Q. What do you say to those who argue that school choice mainly benefits the well-to-do and the white?

A. Rich parents, white and non-white, already have school choice. They can move, or pay for private schooling. The biggest beneficiaries of new choice policies will be those who don't now have any alternatives; with choice they can find a better school for their children or use that leverage to improve the school their children now attend.

Q. Aren't the places that most need radical changes in their arrangements for children—those with the highest concentrations of at-risk girls and boys—those least able to make such changes?

A. It has been demonstrated in a number of communities that we must never underestimate the effectiveness of a community that

decides to transform itself. It's true, of course, that the AMERICA 2000 strategy can do the greatest good for troubled rural and inner-city areas, and we all need to be sure that they get whatever catalyst help they need to take part.

Q. Will the American Achievement Tests compete with the work of the National Education Goals Panel?

A. No, we expect to follow the Panel's lead in developing the New World Standards and the American Achievement Tests.

Q. Do national tests mean a national curriculum?

A. No—although surveys and polls indicate that most Americans have no objection to the idea of a national curriculum. The American Achievement Tests will examine the *results* of education. They have nothing to say about how those results are produced, what teachers do in class from one day to the next, what instructional materials are chosen, what lesson plans are followed. They should result in *less* regulation of the means of education—because they focus exclusively on the ends.

Q. When will the new tests be ready?

A. In 1994, we will have available a system of high quality individual tests, at least in reading, writing and mathematics—education's traditional “three R's”—for states and localities that want them. Because the new American Achievement Tests probably cannot be perfected that quickly, we will ask Congress to authorize the rapid deployment of an individual version of tests used by the existing National Assessment of Educational Progress.

Q. Do we really need another test? Aren't tests biased against minorities?

A. A nationwide system of high quality national exams—more than one version, but calibrated to the same standards—will probably begin to take the place of some of today's numerous testing schemes. As for bias, the new tests will be screened to eliminate it. Bear in mind that minority parents also want to know how well their children—and the schools their children attend—are doing in relation to the national education goals and standards.

Sometimes less-than-satisfactory news serves to catalyze needed changes.

Q. Can all six national goals really be reached?

A. They are all ambitious. Some, like literacy for *all* adults, and leading the *whole world* in math and science, are very challenging. But each is a worthy national objective, and we should not rest until all are achieved. The AMERICA 2000 strategy will give us the tools we need to achieve them.

*It's another of those historic
American challenges—and it
starts in every community,
every school, every household.*

Q. How much of this is just politics?

A. Better education benefits the entire nation, not one particular political party. AMERICA 2000 is a non-partisan education reform strategy. There is plenty of room on these four trains for every American, and we begin with the assumption that everyone will want to climb aboard. Sure, we'll argue about the details in the formal political process and elsewhere, and the strategy will doubtless be improved through those arguments. But let's talk them through in a spirit of wanting a first-rate education for all our children, in every corner of this great land.

Q. What's the single most important part of the AMERICA 2000 strategy?

A. The most controversial may be school choice—at least until it's well understood. The knottiest is probably standards-and-testing, which is technically quite complex. The most dramatic is the R & D for New American Schools. But the most important may be the AMERICA 2000 Communities! Washington cannot achieve the six education goals for the country; that has to happen at the local level. It's another of those historic American challenges—and it starts in every community, every school, every household.

Q. What can parents do to help?

A. A thousand things. They are the keys to their children's education, and there is no part of the AMERICA 2000 strategy in which they do not have an important role. As for what they can do *today*—they could read a story to their children, check to see that tonight's homework is done, thank their child's teacher, talk with their teachers and principals about how things are going in school, and set some examples for their children of virtuous, self-disciplined and generous behavior.

Q. What can the media do to help?

A. Recognize that education is an ongoing story every day—a local story *and* a national story. The details are seldom dramatic. But this is the challenge that will tell the story of America's future. By focusing on the story every day, and assigning their best to cover it, the media can help win the battle.

**For further information, contact
U.S. Department of Education
1-800-USA-LEARN
(1-800-872-5327)**

U.S. Department of Education
AMERICA 2000
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Washington, D.C. 20202-0498

ED/OS91-13

America's Climate Change Strategy



An Action Agenda

CLIMATE CHANGE: Comprehensive Approach

Gases



H₂O



CO₂



CH₄



CO



N₂O

Sinks



Rainforest



New Growth Forest



Old Growth Forest

Sources



Electrical & Industrial Production

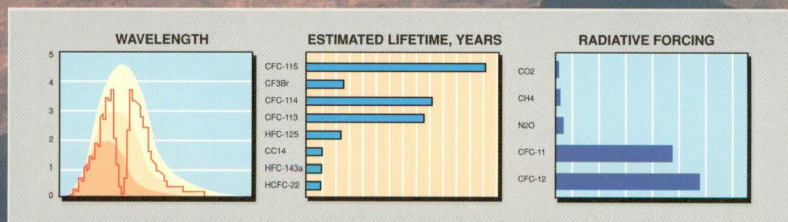


Transportation



Rice Paddies

Global Warming Potential Index



LEADERSHIP AND ACTION

President Bush has established the comprehensive strategy for action and leadership outlined on the following pages. This strategy flows from his commitment to responsible stewardship of our planet, which includes the promotion of economic growth and sound environmental policies. It is built upon a series of actions which will have broad ranging benefits—from curbing air pollution, to conserving energy, to restoring forest lands—and which will help curb net greenhouse gas emissions.

The U.S. believes that any successful global climate change strategy must be:

- **comprehensive**, incorporating all relevant greenhouse gases, their sources and sinks;
- **long term**, taking into account the full range of social, economic, and environmental consequences of proposed actions for this and future generations;
- **flexible**, built on many diverse actions (including market incentives) and readily adjustable as knowledge is improved through a robust research and development program; and,
- **integrated**, designed to involve all nations and dynamically reflect and incorporate each nation's unique circumstances into the development of a truly global response strategy.

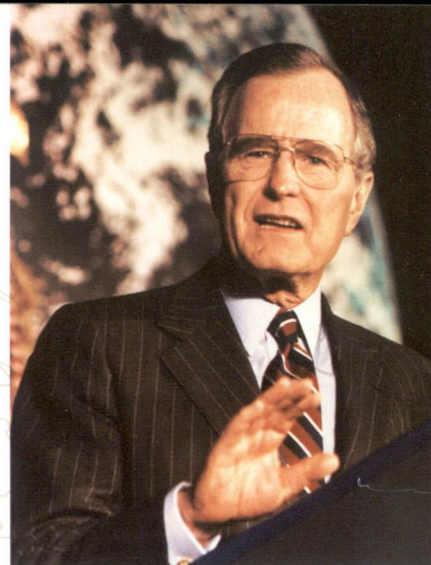
The actions which are currently included in the U.S. Climate Change Strategy will result in U.S. greenhouse gas emissions in the year 2000 being equal to or below the 1987 level. In addition, the U. S. has essentially stabilized its emissions of carbon dioxide (CO₂) over the last 15 years despite a growth in economic output of about 50 percent. During this same period, global carbon dioxide emissions have increased substantially.

This U.S. Strategy for Climate Change includes many specific actions:

- eliminating stratospheric ozone-depleting compounds which are also strong greenhouse gases;
- directly controlling various greenhouse gases and their precursors which are also air pollutants;
- reducing utility and other industrial emissions in a way that strongly encourages energy efficiency;
- increasing forest greenhouse gas sinks;
- encouraging energy efficiency in such areas as buildings, appliances, and lighting; and
- increasing the use of renewable and non-fossil sources of energy.

Integral to the U.S. Climate Change Strategy is the world's largest program of research and development:

- to increase our scientific and economic understanding of climate change and to provide a sound knowledge base for making major policy decisions; and,



- to develop and to accelerate the adoption of economically sound, environmentally beneficial, and energy efficient technologies.

In total, the U.S. proposes to invest over 2 billion dollars in these R&D efforts next year alone.

In August 1990, the Intergovernmental Panel on Climate Change (IPCC) declared in its Overview: "A comprehensive strategy addressing all aspects of the problem and reflecting environmental, economic, and social costs and benefits is necessary."

The President of the United States has established such a comprehensive strategy. The United States, today, is working to curb emissions, promote economic growth, and exercise leadership in meeting our shared responsibilities as stewards of the planet.

The United States is taking action.

GOAL: *To establish the scientific basis for National and International policy making relating to natural and human—induced changes in the global Earth system.*

particularly the climate aspects. This is to be complemented by a program of economics research to better understand the economic factors and consequences of global change and various mitigation and adaptation strategies. It is the intent of the US/GCRP to provide leaders of government with the best possible scientific and economic information as inputs to environmental policy decisions.

The highest priorities for the US/GCRP in FY 1992 are to:

1. Enhance scientific research efforts that seek to *reduce the scientific uncertainties* identified during the IPCC scientific and impact assessments.

Specifically, the USGCRP research will focus on understanding the processes affecting:

- *changing concentrations of greenhouse gases* which are implicated in future global warming predictions;
- *clouds and radiative balance* which strongly influence the magnitude of climate change at global and regional scales;
- *oceans* which influence the timing and patterns of climate change;
- *land-surface hydrology* which affects regional climate change and water availability;
- *polar ice sheets* which affect predictions of global sea level changes; and

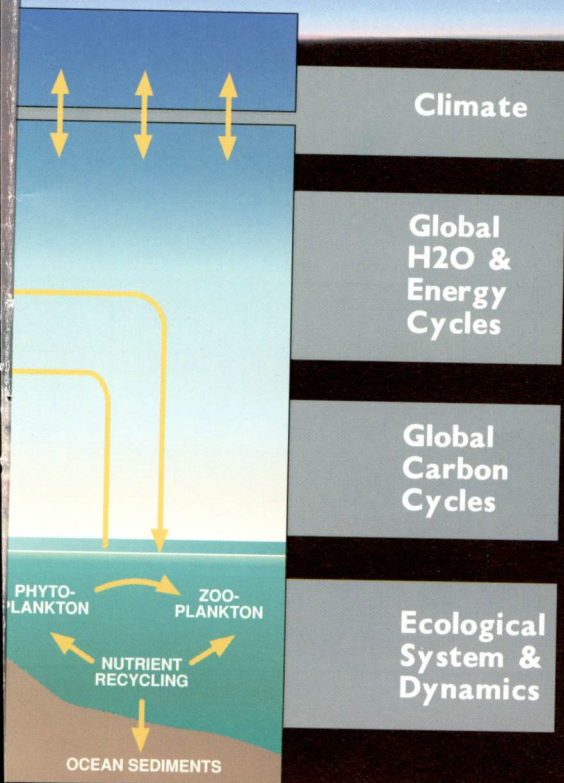
- *ecological dynamics* which are impacted by and respond to climate change.

2. Enhance scientific and economic research to support the development and implementation of a *comprehensive approach* to greenhouse gas emissions reductions, specifically a focus on:

- *sources and sinks of greenhouse gases;*
- *development of a quantitative index of radiative forcing; and*
- *development and use of economic models to generate predictions of future scenarios that cover multiple greenhouse gases and multiple economic sectors.*

The ultimate goals of the US/GCRP are to (1) Obtain a predictive understanding of the interactive physical, chemical, biological, geological, and social processes that regulate natural and human-induced changes in the total Earth system and, (2) Provide a strong scientific and economic basis for national and international policy-making related to changes in the global environment and their regional impacts.

INTEGRATING THEMES FOR RESEARCH



OBJECTIVES

- Establish an integrated, comprehensive long-term program of documenting the Earth system on a global scale.
- Conduct a program of focused studies to improve our understanding of the physical, geological, chemical, biological, and social processes that influence Earth system processes and trends on global and regional scales.
- Develop integrated conceptual and predictive Earth system models.

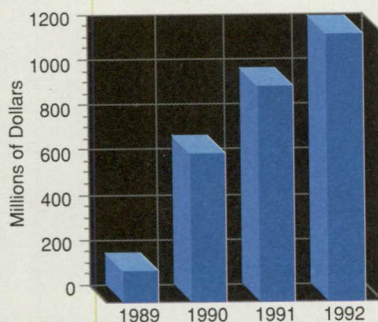
GLOBAL CHANGE RESEARCH

The Intergovernmental Panel on Climate Change (IPCC) stated that; "To reduce the current scientific uncertainties in each of the areas listed below will require internationally coordinated research, the goal of which is to improve our capability to observe, model, and understand the global climate system. Such a program of research will reduce scientific uncertainties and assist in the formulation of sound national and international response strategies."

The U.S. Global Change Research Program (US/GCRP) has been developed as a central component of the United State's approach to global change, and more specifically to address the uncertainties identified by the IPCC.

In FY 1992, the U.S plans to invest almost \$1.2 billion in this Program, which virtually doubles the U.S. commitment to the research program of the US/GCRP since it was initiated in FY 1990 (see chart below).

Funding for Global Change Research Focused Programs

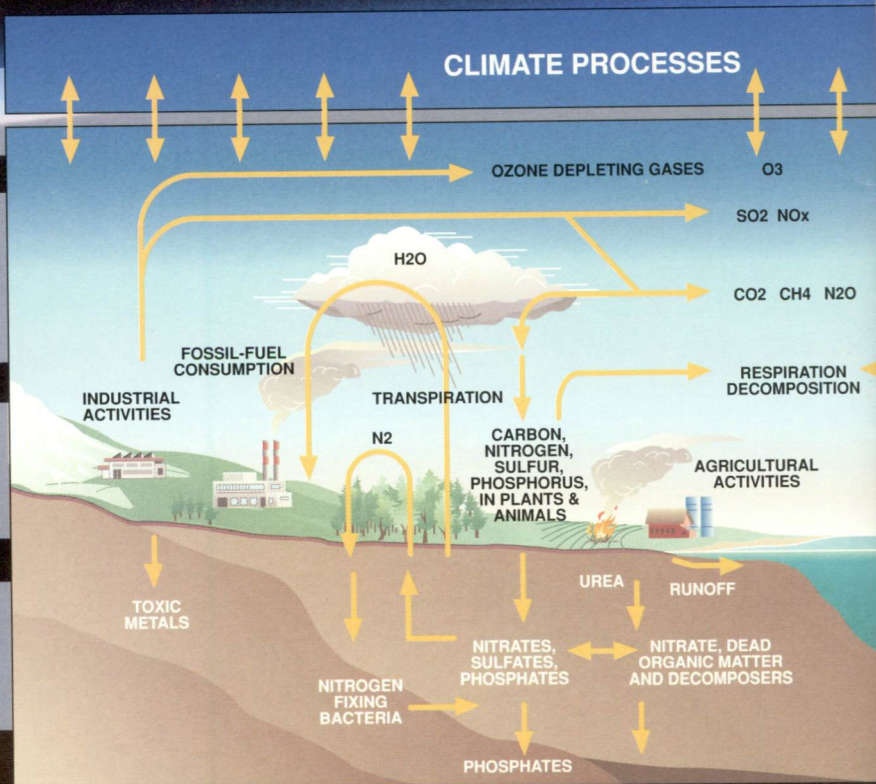


Source: U.S. Office of Management & Budget

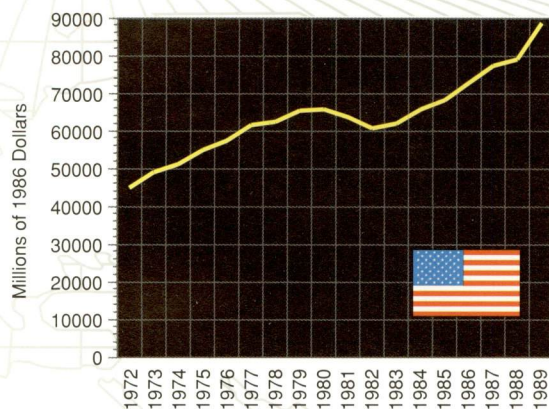
U.S. scientists have led the development of an international global change research program. Other countries have joined the U.S. in a coordinated research effort to address critical scientific uncertainties, through such international programs as the World Climate Research Programme (WCRP) and the International Geosphere-Biosphere Programme (IGBP). The total international research program, for which the U.S. provides about 50% of the financial support, is coordinated through United Nations scientific bodies (i.e., WMO, IOC, and UNEP), and through the International Council of Scientific Unions (ICSU).

Central to the US/GCRP is balance between ground and space based research activities. In-situ and theoretical studies of physical, chemical, biological, and geological processes will be complemented by a space based program to provide global observations of key environmental parameters. The U.S plans a comprehensive series of satellite launches through the coming decade to provide these global long-term observations, with a full scale Earth Observing System (EOS) in full operation by 1998.

The central task of the US/GCRP is to develop predictive understanding of the Earth's systems processes,



U. S. Pollution Control Expenditures

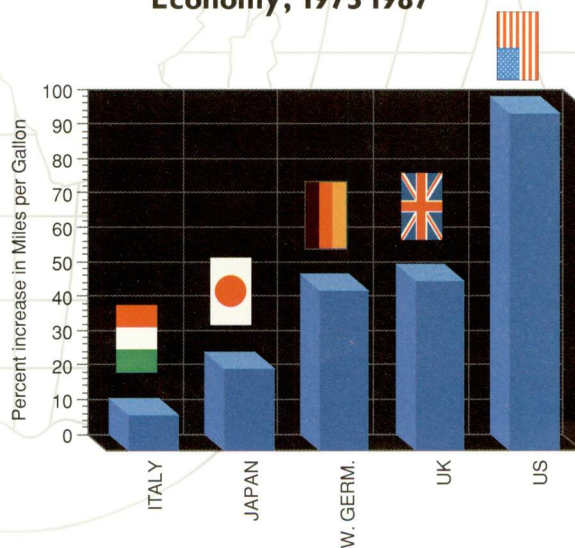


From EPA, "Environmental Investments: the Cost of a Clean Environment", July 6, 1990 draft.

CHART 28

United States' declines in emissions of volatile organic compounds, carbon monoxide, CFCs, and, to some degree, the stabilization of carbon dioxide emissions over the period from the early 1970's to the present can be attributed, in part, to U. S. investment to protect and to clean up the environment. U. S. spending for all pollution control purposes over the period is shown in Chart 29. It has grown by 100 percent from 1972 to 1989. It is expected to continue growing. Enactment of the Clean Air Act Amendments of 1990 alone is estimated to increase U.S. pollution control expenditures by an additional \$25 billion a year when fully implemented.

Improvement in New Car Fuel Economy, 1973-1987



Source: same as chart 27.

CHART 29

U. S. pollution control spending has historically been larger compared to the country's Gross Domestic Product than spending by other countries for which data is available.

TRENDS: *Transportation*

Population density in the United States is 5 to 10 times less than in many of the other G-7 countries (Chart 26). With such a low density, the U. S. spatial spread between work and home naturally increases transportation use per capita. Distribution of economic activities across a wide continent requires substantial energy consumption for moving people and freight long distances. Transportation energy consumption per capita is highest in the United States and Canada and substantially lower in the G-7 countries with high population densities.

New car fuel efficiencies in the United States are now roughly even with those of most of the other G-7 countries (Chart 27), despite much more demanding U. S. emissions and auto safety standards. The U. S. 1987 miles per gallon ratio was 28.3, within a relatively narrow range from Japan at 27.7 to the United Kingdom at 31.8. The U. S. from 1973 to 1987 increased its new car fuel economy by almost 100 percent (Chart 29).

Population Density per Square Mile, 1988

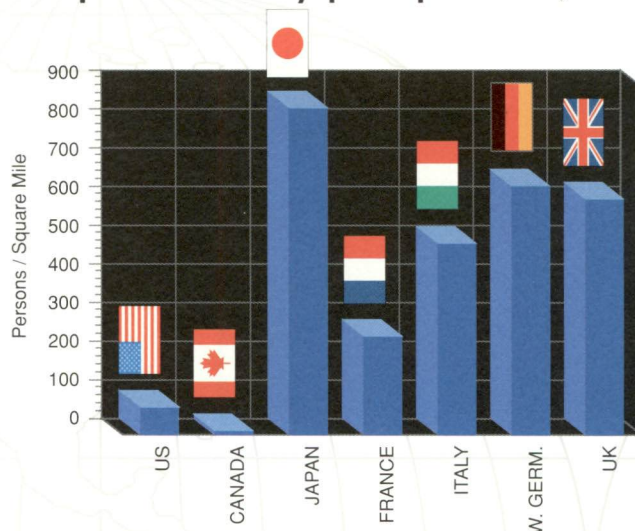


CHART 26

Population from OECD, "National Accounts 1960-1988" Vol 1 (Paris, 1990)
Area from Pharos Books "The World Almanac and Book of Facts 1990",
(New York, 1989)

New Car Fuel Efficiency

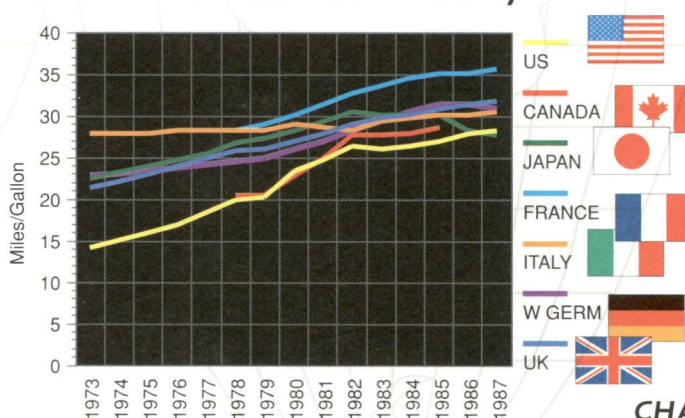


CHART 27

From OECD, "Energy Conservation in IEA Countries" (Paris 1987); IEA country submissions; and Lawrence Berkeley Laboratory (French amounts)
Conversion factors: 3.785 liters per gallon, 1.609 kilometers per mile.

Energy consumption per unit GDP
in the U.S. is comparable to other
G-7 countries.

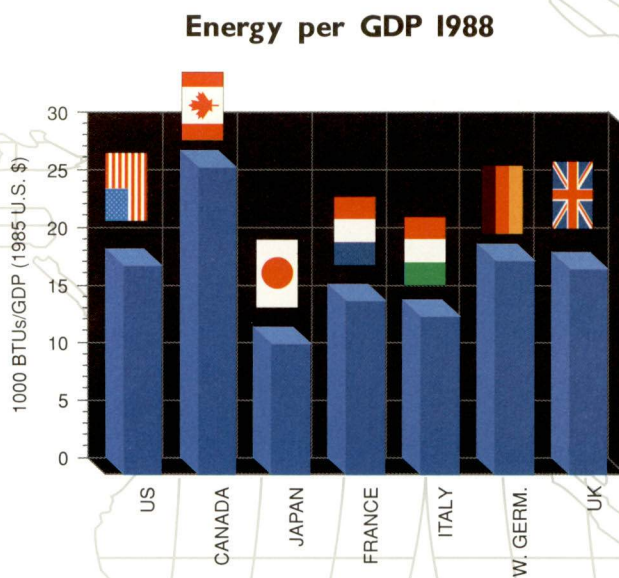


CHART 25

TRENDS: Energy Intensity

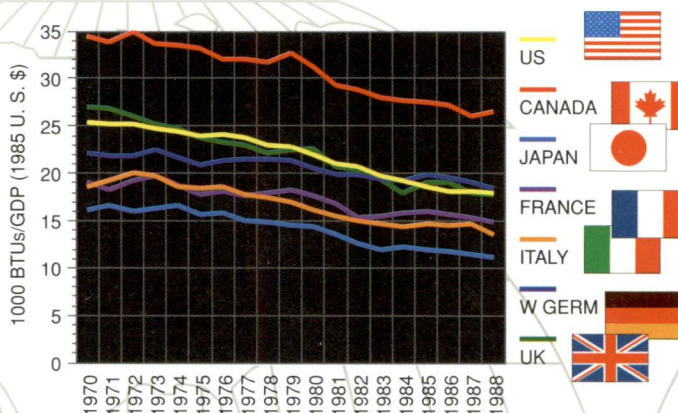
Chart 23 compares United States energy consumption per unit of gross domestic product (GDP) with Canada, Japan, France, Italy, West Germany and the United Kingdom—the other G-7 countries.

As shown in Chart 23, the United States has improved its energy use/GDP ratio since 1970, averaging an annual improvement of 2 percent per year. In 1988 the U. S. used only 70.9 % as much energy per unit of GDP as it used in 1970.

The United States' rate of improvement in the industrial energy use/gross product originating (GPO) ratio has been greater than most other G-7 countries, averaging close to 3 percent per year since 1977 (Chart 24).

Since the early 1970s, the United States has improved its heating efficiency on an energy used per square foot per degree day basis. The U.S. used in 1987 only 68.4% of the energy used per square foot in 1972. Today, U.S. energy use in dwellings per square foot per degree day is much lower than most other G-7 countries.

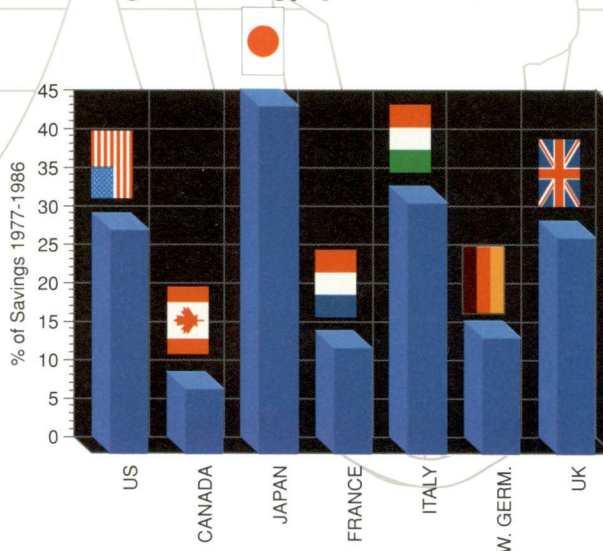
Energy Consumption per Unit of GDP



Total Consumption in Quads from International and Contingency Information Division, Statistics Branch, Energy Information Administration
GDP in 1985 \$ from "National Accounts 1960-1988", OECD (Paris 1990)

CHART 23

Savings in Energy per GPO ('77-'86)

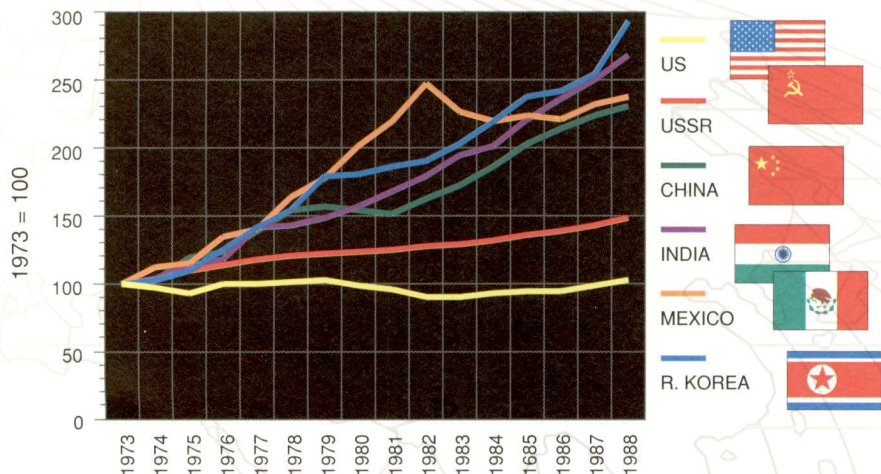


From same source as Chart 23

CHART 24

Trends in Carbon Dioxide Emissions

U. S. and High Emissions Growth Countries



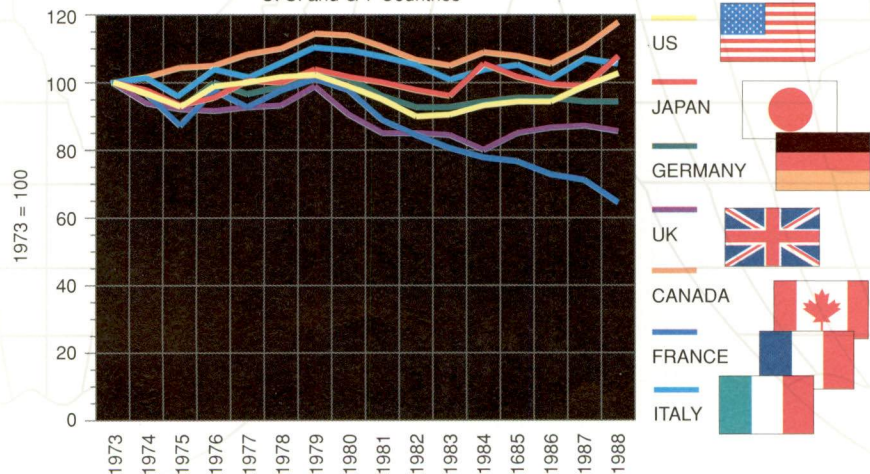
Calculated from data in DOE, "Trends '90, A Compendium of Data on Global Change", August 1990

Chart 21 compares the U. S. trend to countries which have experienced substantial growth in emissions.

CHART 21

Trends in Carbon Dioxide Emissions

U. S. and G-7 Countries



Calculated from data in DOE, "Trends '90, A Compendium of Data on Global Change", August 1990

Chart 22 compares the U. S. trend to industrial countries which have experienced moderate growth or decline in emissions.

CHART 22

TRENDS: CO2 Emissions

United States emissions in 1988 were only 2.7% above the 1973 level, despite the fact that real U. S. Gross Domestic Product (GDP), in 1985 dollars, grew by 48 percent over that period.

A key unanswered question about responding to the climate change issue is how to achieve economic growth in developing countries and economic reform in formerly centrally-planned countries without massive increases in greenhouse gas emissions.

It is important to remember that anthropogenic emissions of CO2 contribute about 4% of the total global CO2 flux.

Charts 21 and 22 compare the recent U. S. emissions trend with countries which contain most of the world's population. Those in Chart 21 have trends of rapidly growing CO2 emissions, and are likely to have substantial emissions growth in the coming decades.

Growth in CO2 Emissions and U.S. GDP

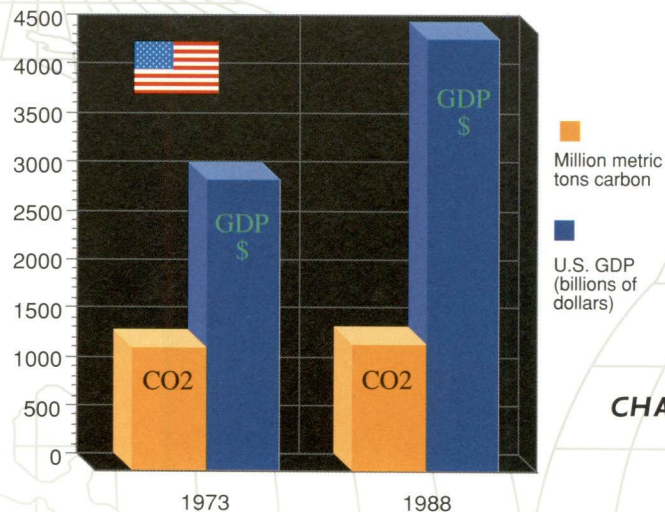


CHART 19

Source DOE Trends '90; OECD National Accounts, 1960-1988, (Paris 1990)
GDP deflators 1982=100 Source 1990 Economic Report

Emissions of CO2 Per Unit of GDP, 1988

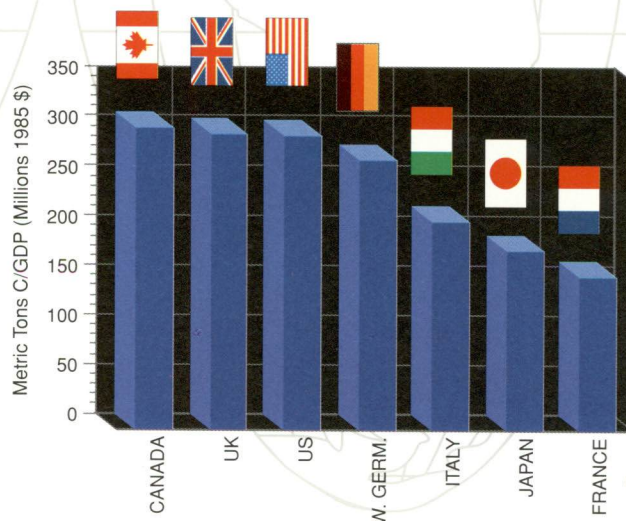


CHART 20

Emissions from DOE, "Trends '90, A Compendium of Data on Global Change", August 1990.
GDP from OECD, "National Accounts 1960-1988", (Paris 1990)

Conservation and Renewable R&D

The U.S. is funding a large research and development program for conservation and renewable energy. In Fiscal Year 1992, this effort is increased by 18 percent to a level of \$495 million, which represents an increase of over 50% since 1989.

In the long run, an adequate response to climate change will involve the use of new technologies that conserve energy or that provide energy without causing greenhouse gas emissions. These technologies will be needed in all of the economy's sectors.

The Administration is proposing to initiate, in the fiscal year 1992 budget, a new joint auto industry-government consortium to develop a battery for electric vehicles. Improved batteries could extend vehicle range to 120 to 200 miles. Fuel-cell-powered electric vehicles offer the potential to achieve up to 50 percent efficiencies.

R&D for energy efficiency in transportation includes work on high temperature internal combustion engines, gas turbine engines, fuel cells and a new initiative for electric vehicles. Air transportation energy efficiency work includes research in hybrid laminar flow, composite

materials, improved terminal operations, and improved air traffic control.

An initiative to address the problem of combustion emissions in waste-to-energy plants is being started. Further, alternative-fuel vehicle demonstration and a scale-up of a wood-to-ethanol process are being initiated.

Industrial energy efficiency R&D includes funding for more efficient steel, aluminum, and paper processes. A scale-up and test of the use of concentrated solar energy to detoxify liquid wastes is also planned.

Building energy efficiency research focuses on the interactions of energy systems, and the efficient use of advanced window technologies and building materials to control light and heat entering a building.

Total FY 1992 funding for research in new energy technologies is over \$900 million.

ENERGY INITIATIVES: *Renewables and Non-fossil Fuels*

Accelerate the transfer of photovoltaic technology to U.S. commercial production:

Recent laboratory research has achieved photovoltaic efficiencies of over 30%. With such efficiencies and improved manufacturing, today's \$4-5 prices per peak watt could be cut in half.

The U.S. will start an intensive effort with industry to understand potential improvements in photovoltaic processes. Industry joint ventures to provide practical solutions and maximize transfer of results will be encouraged. The U.S. will also provide cost-shared technical assistance to adapt manufacturing improvement techniques to specific processes. By the year 2000, greenhouse gas emission reductions will begin to phase in at 500,000 metric tons of carbon equivalent.

Expand nuclear energy capacity:

As the Nation enters the 1990s, nuclear power is the second largest source of U.S. electricity, providing almost 20 percent of America's electricity needs, and nuclear power causes no greenhouse gases.

Because of the availability of nuclear power the nation is able to avoid the use of large amounts of fossil fuels. In terms of the displacement of fossil fuels, nuclear power can be thought of as reducing utility emissions of carbon dioxide—a major greenhouse gas—by 20 percent, or approximately 128 million tons, annually in the U.S. In effect, then,

nuclear energy plants reduce overall U.S. emissions of carbon dioxide by nine percent. Worldwide, nuclear energy reduces these emissions by more than seven percent.

A comprehensive strategy for nuclear energy is being developed as a part of the National Energy Strategy and is supported in the President's Fiscal Year 1992 budget. This strategy includes:

- Developing advanced light water reactors that will incorporate passive safety features in a standardized (modular) design. This will reduce the time needed to license new plants, while assuring that safety issues are adequately addressed. The U.S. is currently supporting first-of-a-kind engineering work that will assist companies in their efforts to have the Nuclear Regulatory Commission certify the safety of standardized designs;
- Conducting research and development on advanced reactor concepts with safety features that go beyond even the standardized designs ("to be intrinsically safe") currently before the Nuclear Regulatory Commission. High temperature gas cooled reactors use specially coated fuel elements that will not fail even under the high temperatures that could occur in an accident. Liquid metal reactors use liquid sodium as the heat exchange medium. Researchers have demonstrated that these new reactor types can shut themselves down safely under

conditions that would be extremely serious for present-day reactors;

- Reforming the nuclear licensing process through consolidation of the redundant aspects of the construction and operating licensing processes, without compromising nuclear safety concerns; and,
- Developing a long-term solution to the nuclear waste problem by developing a permanent repository, and possibly an interim retrievable storage facility.

DOE is funding programs that are supporting growth in nuclear energy capacity and the life extension of many currently operating plants. According to analysis done for the National Energy Strategy, support from DOE is expected to result in adding new nuclear capacity by 2000, which would result in further reductions in greenhouse gas emissions.

Increase transportation use of alternative fuels.

Use of oxygenated fuels, such as ethanol, can reduce urban smog levels and emissions of CO₂ and carbon monoxide.

U.S. research has demonstrated the technical feasibility of the processes to produce ethanol from non-food domestic resources such as wood or herbaceous crops.

The U.S. will expand current research programs in alternative fuels to include cost-shared joint ventures aimed at reducing the cost of ethanol from non-food resources. This effort will be coordinated with industry vehicle and engine development programs.

Expand national energy audit capabilities and use.

Industry, with some 350,000 separate establishments, uses 24.7 quads of energy annually. Many options exist for low-cost quick payoff energy saving investments, but smaller firms often lack the information, expertise, and specialized resources to do energy audits of their plants.

The U.S. will increase its program to train engineers in energy audit and diagnostic methods from the current 13 engineering schools to 40 nationwide in the year 2000. This will reduce greenhouse gas emissions in the year 2000 by 6 million metric tons carbon equivalent.

More efficient lighting in federal facilities.

Twenty-five percent of federal agency energy use is for lighting of facilities. However, lack of adequate flexibility for facility managers and restrictive procurement practices have slowed adoption of efficient new technologies.

The U.S. will identify energy savings options in Federal facilities. Project plans, procurement methods, and financing options will be developed to overcome the barriers to improve lighting efficiency. This will reduce greenhouse gases in the year 2000 by 1.4 million metric tons carbon equivalent.

U.S. Savings in Emissions From Initiatives in Energy Efficiency and Renewables.

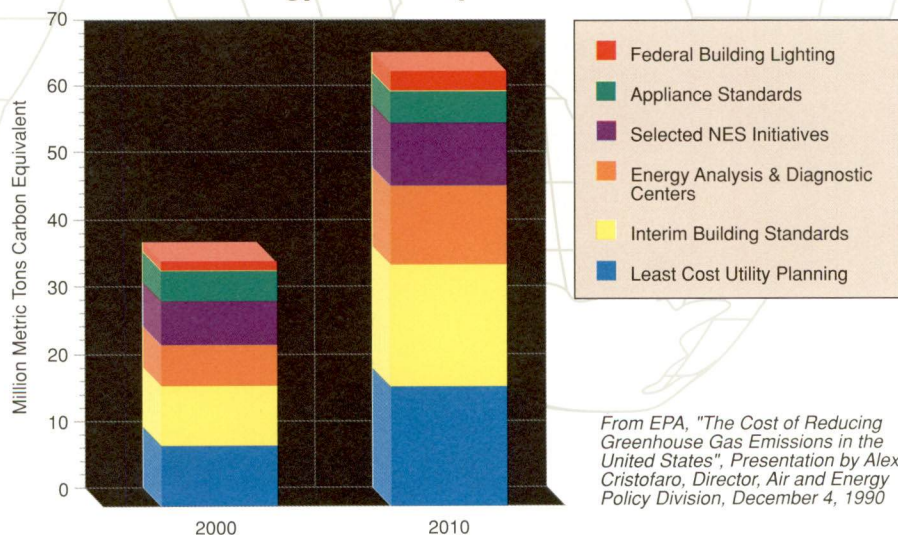


CHART 17

ENERGY INITIATIVES: *Efficiency*

The Administration is currently developing and will announce shortly a National Energy Strategy that will further contribute to the greenhouse gas emissions reductions cited here. Certain National Energy Strategy initiatives have been included in some of the calculations in this document.

The U.S. strategy for action includes a number of other energy efficiency measures beyond those in the Clean Air Act.

More efficient new appliance standards.

Large appliances account for over two thirds of home energy usage, excluding space heating. In the past three years the U.S. has imposed energy efficiency standards on many of the most energy-intensive appliances, including refrigerator/freezers, clothes washers, dryers, and dishwashers. These standards should achieve annual energy savings of 7-8% relative to projected use by the year 2000, and 14-15% relative to projected use by the year 2010.

The imposition of appliance standards has already resulted in a reduction of greenhouse gas emissions. As older appliances are replaced with new, environmentally friendly models, the greenhouse gas reductions will increase dramatically. By the year 2000, the U.S. anticipates an annual reduction of 4.4 million tons of carbon equivalent from projected greenhouse gas emission due to these standards; the annual reduction will increase to 4.9 million tons of carbon equivalent in 2010.

Level Playing Field Between Electricity Supply and Demand Reduction.

In some cases utilities can meet demands for energy services without any additional greenhouse gas emissions by investing in energy efficiency rather than by increasing electricity supply. Utilities in only 15 states are now fully able to recover costs from such investments. Absent such efficiency measures, new capacity requirements by the year 2000 are projected at more than 100,000 MW.

The U.S. will work with the States to identify regulatory barriers that discourage utility investment in cost effective energy efficiency. Utility planning techniques will be developed to consider all alternatives and their costs. The U.S. will provide training, information dissemination, and other types of technology transfer activities. These actions will reduce greenhouse gas emissions in the year 2000 by 9 million metric tons carbon equivalent.

Encourage use of energy efficient building standards.

Both the U.S. and the private sector have developed standards that would achieve 20-25% energy savings in buildings. They could save \$5 billion over 20 years from the new buildings built in a single year.

The U.S. will promote voluntary use of these standards through training programs, design manuals and computer-aided design systems. It will encourage State and local governments to use the standards in their building codes. These actions to encourage adoption of the most energy efficient modern technology in residential and commercial building will reduce greenhouse gas emissions in 2000 by 8.2 million metric tons of carbon equivalent.

Use of the modern standard in public housing assistance programs will reduce greenhouse gas emissions by 800,000 metric tons carbon equivalent in 2000.

Reductions in Carbon Dioxide Emissions

From Tree Planting Initiative

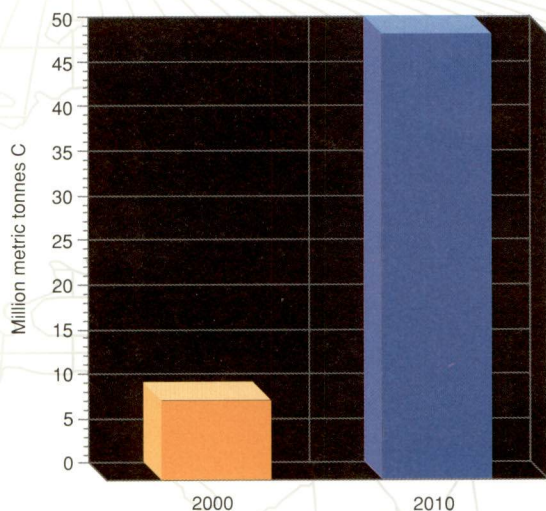
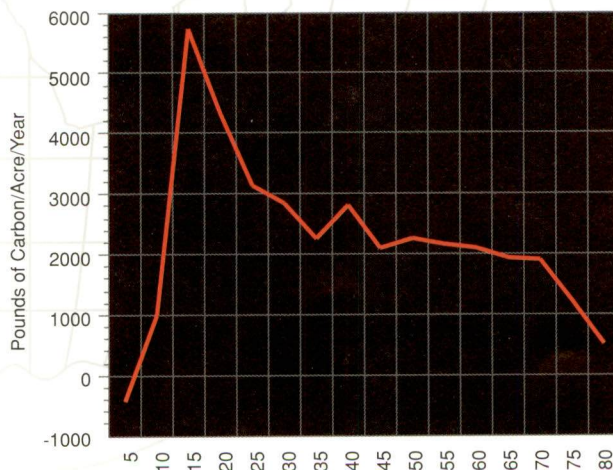


CHART 15

From EPA, "The Cost of Reducing Greenhouse Gas Emissions in the United States", Presentation by Alex Cristofaro, Director, Air and Energy Policy Division, December 4, 1990

Tree Planting Initiative

Example Carbon Sequestration by Age of Stand (Cutover)



Source: U. S. Forest Service

CHART 16

To put the power of trees as "sinks" into perspective, consider the example of an acre of improved stock of southern pine planted on a high quality site in the southeastern U. S. In the 15th year after planting these trees would take up between 5700 and 6200 pounds of carbon per acre. While the amount taken up declines thereafter as the trees mature, additional carbon continues to be taken up. (See Chart 16)

ENHANCING NATURAL SINKS

The term “sinks” of greenhouse gases is meant to include human and natural activities, processes, and phenomena that remove greenhouse gases from the atmosphere or reduce their atmospheric lifetimes. Examples include forests, soils and oceans. The IPCC recognized the importance of sinks in a report of its Response Strategies Work Group (RSWG): “The RSWG reviewed potential measures for mitigating climate change...These measures include those which limit emissions from greenhouse gas sources (such as energy production and use), those which increase the use of natural sinks (such as immature forests and other biomass) for sequestering greenhouse gases, as well as those measures aimed at protecting reservoirs such as existing forests.”

Reforestation

The President has included in both his FY 1991 and FY 1992 Budgets a major, multiyear reforestation proposal to plant one billion trees per year on 1.5 million acres and to improve forest management practices. This initiative will encompass cities and towns across America, as well as rural, private, non-industrial forest lands. It comes in addition to reforestation which Federal agencies and private companies normally perform on lands under their jurisdiction.

One purpose of this initiative is to improve the condition of private, non-industrial forest lands which now are often in poor condition due to low levels of management and investment. Improving these lands will increase benefits from soil protection, wildlife, wood products, and recreation.

This initiative also will have climate change benefits through the carbon which growing trees (sinks) remove from the air and store both as plant tissue and in the soil. The estimates of carbon removed from the atmosphere by the trees to be planted under the initiative are 9 million metric tons of carbon annually by the year 2000, growing to 50 million tons per year by 2010. (See Chart 15)

Global Forest Convention

The President proposed at the Summit of Industrialized Nations in July 1990 at Houston to begin negotiations as expeditiously as possible on a global convention on forests, aiming for completion and signing by 1992.

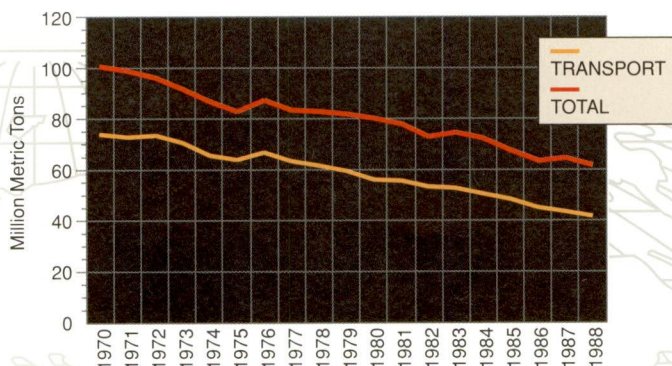
The world's forests absorb carbon dioxide as well as provide many benefits in the form of timber and fiber, soil and water protection, biodiversity, wildlife habitat, recreation and other valuable outputs. They provide the habitat for some 80% of the planet's remaining unknown and unspecified gene pool—a completely irreplaceable

and potentially enormously valuable heritage for all humankind. Temperate zone forests are being damaged by air pollution stresses and tropical forests are being rapidly lost.

The U.S. believes that the forest convention should emphasize market-based mechanisms and flexibility to achieve sound, sustainable forest use, to improve the health and vigor of forests, to encourage reforestation, and to increase the value of forests as sources of income and jobs. In addition, increasing the productivity of activities using the land base can minimize deforestation.

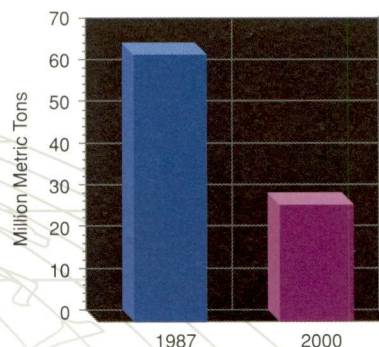
Areas suggested for international cooperation and joint action include: reforestation and rehabilitation; research and monitoring; education, training, and technical assistance; reform of the Tropical Forestry Action Plan; reduction of air pollution; bilateral and multilateral assistance; debt-for-nature swaps; and removal of harmful subsidies.

Trends in Emissions of Carbon monoxide, 1970-1987,



From EPA, "National Air Pollution and Emission Estimates, 1940-1982" Feb. 1984
 EPA, "National Air Quality and Emissions Trend Report, 1988" March 1990.
 EPA, "National Air Quality and Emissions Trend Report, 1987" March 1989.

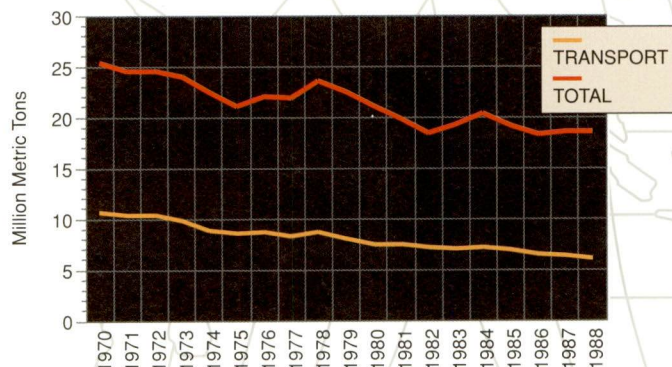
CHART 8



Source: U.S. EPA

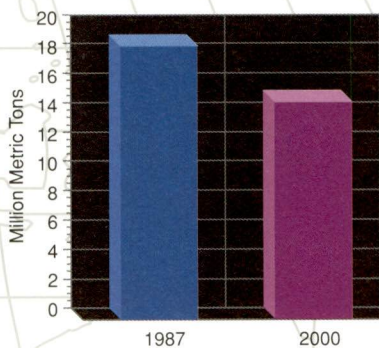
CHART 9

Trends in Emissions of Reactive Volatile Organic Compounds 1970-1987



From same sources as Chart 8

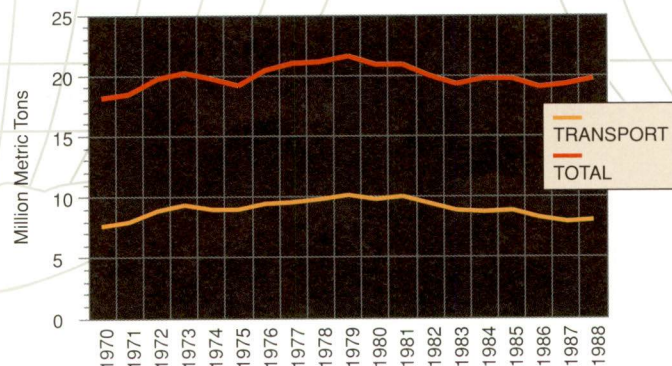
CHART 10



Source: U.S. EPA

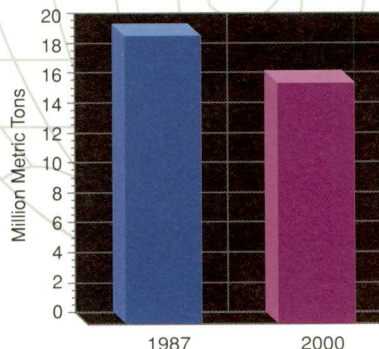
CHART 11

Trends in Emissions of NOx



From same sources as Chart 8

CHART 12



Source: U.S. EPA

CHART 13

THE 1990 CLEAN AIR ACT AMENDMENTS

The 1990 Clean Air Act Amendments, signed by the President in November 1990, will achieve substantial reductions of greenhouse gases and their chemical precursors. The Act will reduce U.S. emissions of volatile organic compounds, carbon monoxide, and nitrogen oxides, which will curb tropospheric ozone levels, in addition to reducing emissions of the more familiar pollutants such as sulfur dioxide. When converted into equivalent units of carbon emissions, taken together, these reductions will amount to a 16% decrease in greenhouse gases from these affected sources between the years 1987 and 2000. Moreover, the Act will result in direct carbon dioxide reductions due to more efficient electricity generation.

Electric Utilities

The most dramatic reductions will come from electric utilities. Under the Act, utilities, which must reduce sulfur dioxide (SO₂) emissions by 10 million tons below 1980 levels, are given the flexibility to choose how to achieve these reductions. Utilities are thus free to choose cost-effective conservation measures to achieve compliance. This powerful conservation stimulus should sharply reduce carbon dioxide (CO₂) emissions from this sector.

Further, the Act requires utilities to reduce their nitrogen oxide emissions by two million tons from projected levels under the acid rain provisions. These provisions also contain strong incentives for both electric utilities and industrial sources

to adopt advanced, energy efficient technologies that will lower overall emissions, including carbon dioxide. The Act is also expected to induce oil-burning utilities to switch to natural gas, which produces less greenhouse gas emissions than does oil.

Smog Reductions

Substantial reductions in either greenhouse gases or their chemical precursors also will result from new controls on stationary and mobile sources mandated by the new Act in order to bring cities into attainment of national air quality standards. A wide variety of stationary sources of volatile organic compounds will be required to reduce emissions by adding controls or by changing production processes. Newly tightened automobile emission standards will further reduce emissions of hydrocarbons, carbon monoxide, and nitrogen oxides, and new controls on gasoline evaporation will greatly cut volatile organic emissions. In addition, gasoline itself will be reformulated to reduce its volatility, thus reducing volatile organic emissions at the source. In total, these various requirements of the Act will result in a sharp and steady drop in U.S. tropospheric ozone, which is a key greenhouse gas.

Cleaner Fuels & Cleaner Cars

The Act will dramatically expand the introduction of clean-burning alternative fuels into the U.S. transportation sector. Several large states and the fleets of America's major

cities are expected to introduce fuels and vehicle technology which will emit fewer greenhouse gases. Beginning in model year 1994, new tailpipe emissions standards for hydrocarbons, carbon monoxide, and nitrogen oxides will be phased-in. Auto manufacturers will also have to reduce refueling emissions. Gasoline volatility will be reduced and cleaner fuels will be required in the nine cities with the worst ozone problems and in 41 areas during the winter months when carbon monoxide standards are exceeded. A clean fuel car pilot program in California will use combinations of vehicle technology and cleaner fuels to meet tight standards. Twenty-six areas will have to limit emissions from centrally-fueled fleets of 10 or more vehicles.

Regulations also are being proposed under the new source performance standards of the Clean Air Act to require capture of pollutant gases which are given off by landfills. The purpose of the regulations is to capture air toxics and volatile organic compounds which are the chemical precursors of the greenhouse gas ozone. Methane also will be captured and, if it is not economic to be processed, it will be flared. Greenhouse gas emissions in the year 2000 will be reduced by approximately 40 million tons of carbon equivalent.

Phase-Out of Major CFCs

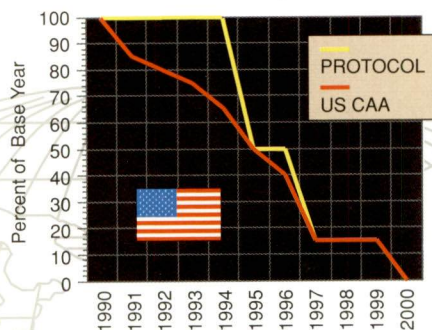
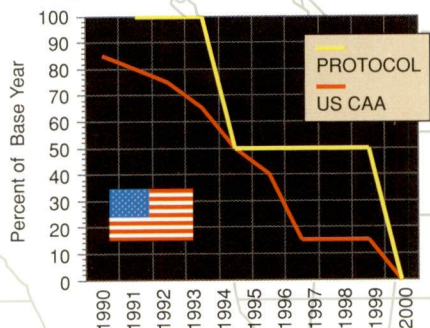


CHART 3

From Article 2A - 2E, Montreal Protocol text and Title 6 of the Clean Air Act Amendments of 1990
CAA did not apply in 1990

Phase-Out of Halons



From Article 2A - 2E, Montreal Protocol text and Title 6 of the Clean Air Act Amendments of 1990

CHART 4

Phase-Out of Carbon Tetrachloride

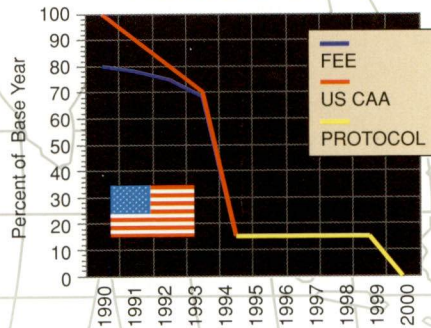


CHART 5

From Article 2A - 2E, Montreal Protocol text and Title 6 of the Clean Air Act Amendments of 1990

Production estimates under the User Fee are based on Treasury Department estimates

Phase-Out of Methyl Chloroform

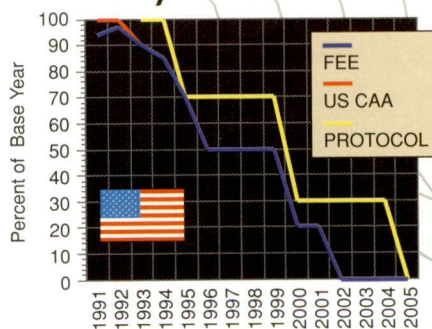


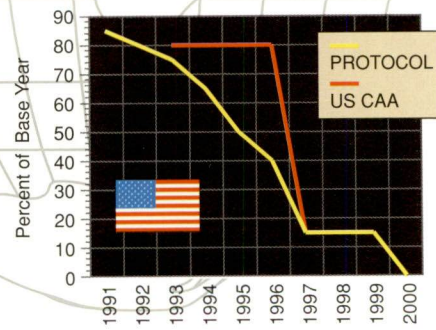
CHART 6

From Article 2A - 2E, Montreal Protocol text and Title 6 of the Clean Air Act Amendments of 1990

Production estimates under the User Fee are based on Treasury Department estimates

CHART 7

Phase-Out of Other CFCs



From Article 2A - 2E, Montreal Protocol text and Title 6 of the Clean Air Act Amendments of 1990

PHASING OUT CFC's

The United States has long taken a leadership role in addressing the problem of stratospheric ozone depletion. In 1978, the U. S. banned the use of CFCs as propellants in spray can products. Such use was considered a low value use which could be forgone given the potential damage which it was believed CFCs might be causing. Most other countries continued to use CFCs as propellants.

At the London Meeting of Parties to the Montreal Protocol, the U. S. supported a complete world-wide phase-out of CFCs, halons, and certain other ozone-depleting substances such as carbon tetrachloride and methyl chloroform. The Protocol was amended to achieve that objective.

BEYOND THE MONTREAL PROTOCOL

The U. S. has enacted legislative provisions in the recent Clean Air Act amendments which will phase out U. S. production and consumption of these ozone-depleting compounds more quickly than the amended Montreal Protocol provisions. (See charts opposite)

For each and every one of these compound groups and gases, the Clean Air Act reduces the allowed U. S. production and consumption between now and the final phase-out date substantially below what the Protocol permits. (For example, see Chart 3 regarding CFC production)

Between now and the phase-out deadlines, the U. S., under the mandates of the Clean Air Act, must reduce U.S. production below what is permitted by the Montreal Protocol by at least the following amounts:

"Cumulative Near-term Reductions in Clean Air Act Below the Montreal Protocol"

Major CFCs	19%
Halons	32%
Other CFCs	22%
Carbon Tetrachloride	13%
Methyl Chloroform	20%

THE U.S. IS AHEAD OF SCHEDULE

In addition to the more restrictive phase-out schedules required by the Clean Air Act, the 1989 Budget Reconciliation Act enacted a tax on ozone-depleting chemicals during the period of phase-out. The tax rates for each compound are its ozone-depleting potential (ODP) multiplied by \$1.37 per pound in 1990 and 1991, \$1.67 in 1992, \$2.65 in 1993 and 1994, and an increase of an additional \$0.45 in each year after 1994.

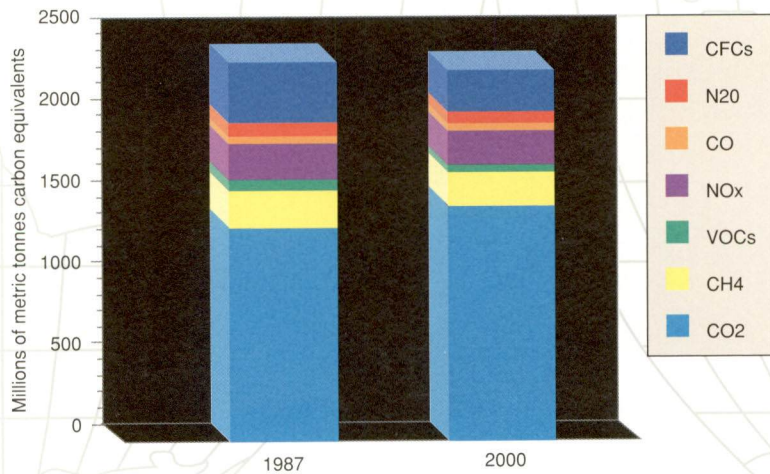
This tax has already helped to reduce U. S. CFC production in the 12-month period ending June 30, 1990 to 23% below the levels permitted by the Montreal Protocol and other U.S. law.

While these actions by the United States are justified by their benefits relating to stratospheric ozone depletion, they are also very highly significant for climate change. CFCs, halons, and carbon tetrachloride are extremely powerful greenhouse gases, thousands of times more powerful than carbon dioxide.

The actions which are currently included in the U.S. Climate Change Strategy will result in U.S. greenhouse gas emissions in the year 2000 being equal to or below the 1987 levels.

Alternative Model For Projected U.S. Greenhouse Gas Emissions

(With Current Policy Commitments)
Based on Jorgenson/Wilcoxon (1990) Model



From EPA, "The Cost of Reducing Greenhouse Gas Emissions in the United States", Presentation by Alex Cristofaro, Director, Air and Energy Policy Division, December 4, 1990

CHART 2

THE BOTTOM LINE

Implementation of the President's Comprehensive Climate Change Strategy will result in United States greenhouse gas emissions in the year 2000 being equal to or below 1987 levels.

The specific actions which will contribute to this result include:

- Phasing out CFCs and many other ozone-depleting compounds which are also greenhouse gases;
- Putting a permanent ceiling on sulphur dioxide emissions at sharply reduced levels and allowing freedom of choice in meeting the ceilings, thereby encouraging energy efficiency and reducing greenhouse gas emissions. Under the recently enacted Clean Air Act Amendments, utilities were given the flexibility to make reductions by any means—a powerful incentive for energy saving measures;
- Reducing, under the Clean Air Act, air pollutants which are either greenhouse gases themselves or greenhouse gas precursors (volatile organic compounds, carbon monoxide and nitrogen oxides);
- Initiating a program to plant a billion trees a year and to make other forest improvements, thereby enhancing sinks;
- Implementing a number of programs aimed directly at speeding the adoption of energy efficient technologies and practices in homes and businesses; and,

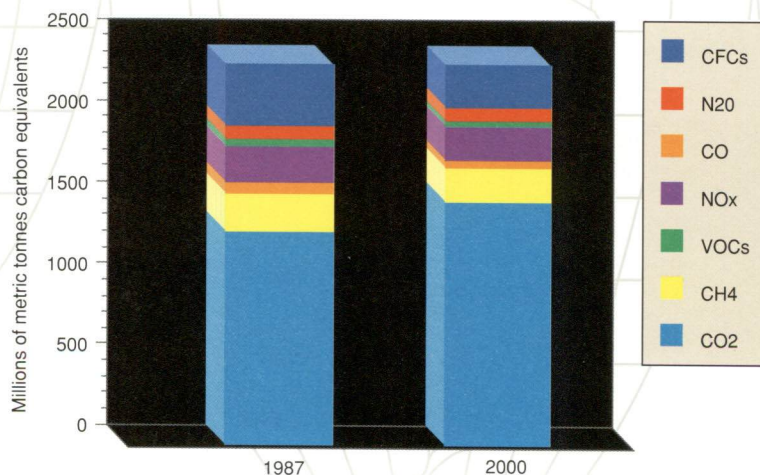
- Promoting the use of, and accelerating research into, non-fossil fuel energy sources such as solar, nuclear, and alternative fuels.

The results of these currently planned U.S. actions are illustrated by Chart 1, which shows projected U. S. greenhouse gas emissions for the year 2000. The estimate is based on calculations made by the U.S. Environmental Protection Agency.

Chart 2 shows an alternative estimate based upon a different economic model prepared by researchers at Harvard University.

Projected U.S. Greenhouse Gas Emissions

(With Current Policy Commitments)
Based on IPCC CO2 Baseline Estimate



From EPA, "The Cost of Reducing Greenhouse Gas Emissions in the United States", Presentation by Alex Cristofaro, Director, Air and Energy Policy Division, December 4, 1990

CHART 1

THE COMPREHENSIVE APPROACH TO CLIMATE CHANGE

The science and economics of human interactions with the global climate involve multiple trace gases affected by activities in every sector of human society. Each of these greenhouse gases is emitted from a variety of sources and is trapped or affected by “sinks” in different ways. Each gas has a different residence time in the atmosphere, a different ability to trap heat, and different potential impacts on the environment. What is important in addressing future climate change is the total and cumulative effect of all gases—all sources and all sinks.

In November 1990, the government ministers at the Second World Climate Conference (SWCC) declared: “We recommend that in the elaboration of response strategies, over time, all greenhouse gases, sources, and sinks be considered in the most comprehensive manner possible ...”

The “Comprehensive Approach”* has several advantages:

- It provides flexibility for each nation to develop a diverse, innovative, cost-effective mix of measures to meet its global responsibilities in a manner tailored to its own domestic circumstances;
- It is designed to employ the results of integrated scientific and economics research on a comprehensive basis, leaving no important variable omitted;
- It maximizes the benefits to the environment and to humanity from each investment; and
- It accounts for all greenhouse gases, insuring that choices do not reduce one gas but inadvertently increase another.

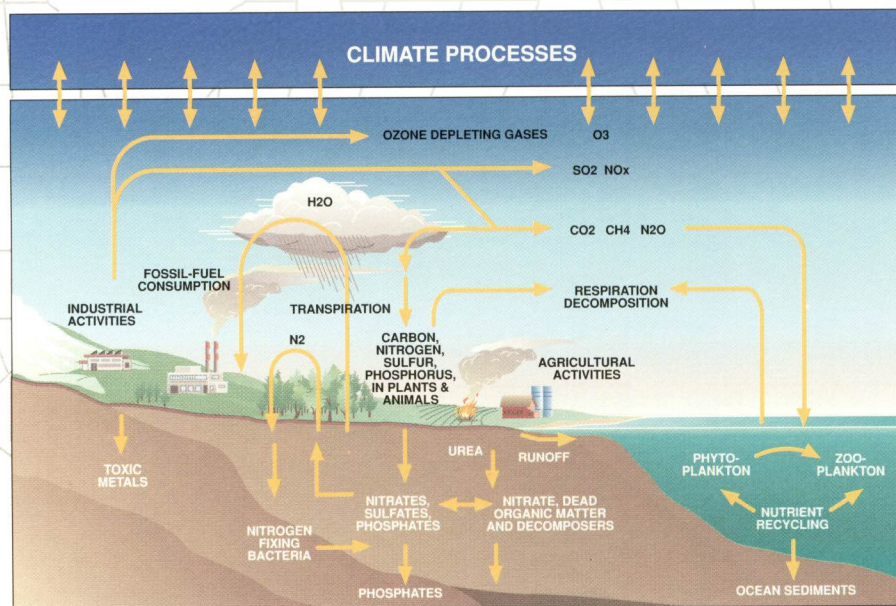
The relative benefit from a unit reduction in the net emissions of each greenhouse gas can be approximated by a measure of “global warming poten-

tial” (GWP) based on the radiative behavior of the gas in the atmosphere. The Intergovernmental Panel on Climate Change (IPCC) has calculated such a relative measure, giving carbon dioxide a value of one (1) and expressing all other gases in terms of carbon dioxide equivalents. This “index” enables a comparison of the contributions of different gases, incorporating both sources and sinks.

The comprehensive approach should inform the development of scientific and economics research, monitoring, technology development, and each country's action plan for dealing with global change. The costs of achieving a given reduction in the added greenhouse effect will vary from gas to gas and will vary depending on which sources or which sinks of any given gas are affected. Using the Comprehensive Approach, for example, maximum reduction in net climate impact—and therefore maximum benefit to the environment—can be achieved for any given level of investment.

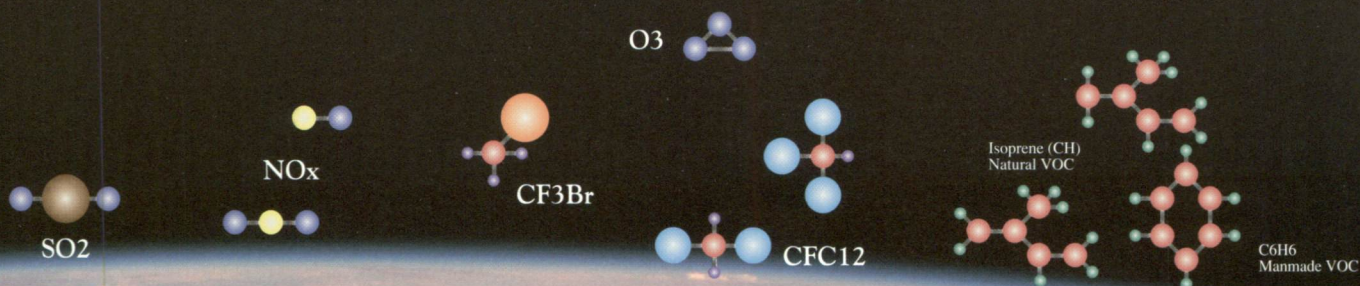
If response strategies were designed to apply piecemeal to one greenhouse gas or economic sector, economic actors could simply adjust to such narrowly focused regulation by shifting to unregulated activities that could continue to contribute to potential climate change.

A comprehensive approach, on the other hand, matches the scientific, economic, and environmental nature of the whole climate system.

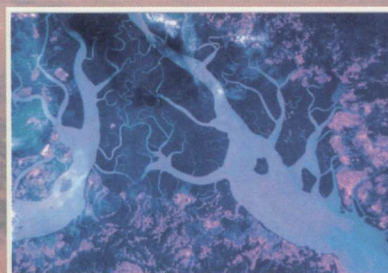


* A larger report on "A Comprehensive Approach to Addressing Potential Climate Change", prepared by a U.S. Interagency Task Force is available on request.

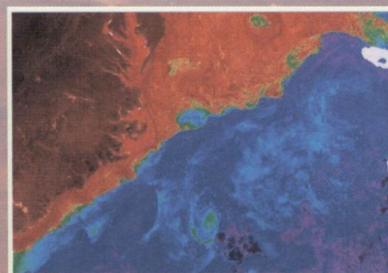
"What is important in addressing future climate change is the total and cumulative effect of all gases—all sources and all sinks."



Coastal Marsh



Watershed Ecosystems



Ocean Phytoplankton Concentrations



Irrigated Land



Burning Rainforest



Tundra

GAS	Instantaneous Radiative Forcing per KG (rel. to CO ₂)	Atmospheric Residence Years (estimated)	Relative Radiative Forcing Potential over Years		
			20	100	500
CO ₂	1	120	1	1	1
CH ₄	58	10	63	21	9
N ₂ O	206	150	270	290	190
CFC-11	3970	60	4500	3500	1500
CFC-12	5750	130	7100	7300	4500

Source: IPCC Scientific Assessment, 1990, Tables 2.3, 2.8

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The National
Conference
On Science
And Technology
Policy

Strategic
Plan

WHAT IF PEACE?



EXECUTIVE SUMMARY REPORT

THE NATIONAL CONFERENCE ON SCIENCE AND TECHNOLOGY POLICY

November 28 – 29, 1990

Principal Cosponsors:

CALIFORNIA ENGINEERING FOUNDATION
AVIATION WEEK AND SPACE TECHNOLOGY MAGAZINE

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California Engineering Foundation

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EXECUTIVE SUMMARY REPORT

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INTRODUCTION AND SUMMARY

The title of the conference was "What if Peace?" When this title was selected early in 1990, the revolution in Eastern Europe raised hope for democratization of nations that had been under a dictatorial socialism for nearly seventy years. But the United States and the USSR were moving closer together, and that opened opportunities for cooperation in contrast to what could have been mutual annihilation. In the U.S., national science and technology policy for the past 40 years had been driven by defense and military needs of this Cold War era.

The conference was justified by similarities between the 1990s and 1970s, when many engineers and scientists were purged from the defense and space industries, and much of the nation's space technical infrastructure was being destroyed as a result of major shifts in national policy and priorities. Cutbacks in defense and space in the 1970's were minor in comparison to those predicted for the 1990's, and the extreme budget deficit raised questions concerning the application of science and technology to new national and global priorities.

In August, 1990, international peace and stability were jolted when Iraq invaded Kuwait and declared that Kuwait no longer existed. Sanctions were imposed by the United Nations, and subsequently, under 12 U.N. resolutions, a consortium of nations determined that force would be needed to return sovereignty to Kuwait. On January 16, 1991, air attacks on Iraqi military facilities began.

From a near term, it is difficult to pose the question, "What if Peace?" Strategically, this question was never answered after World War II, and the nation has been involved in four military conflicts since then. Whether or not the U.S. is involved in war, the ability of the country to sustain the economics of military conflict, together with the resolution of domestic needs and nonmilitary world needs, is directly linked to the technical health of the nation.

Science and technology fuel the engine of commerce as well as provide the extra edge in military and defense operations. Standard of living, quality of life, and freedom of independent decision making are directly linked to a nation's dedication to basic research, technological development, and production of high value-added products and efficient processes.

The world is now a global market. Many nations have invested heavily in domestic product research, development, and production, and have strategic marketing plans for penetrating and controlling whole fields of components and products. In the U.S., defense and weapon systems development have been the principal forcing function for federal government investment in technology. The strategic approach has been to build and maintain an overwhelming military retaliatory capability as a deterrent to attack. However, the U.S. has had no long range

strategic policy to use its technological resources for maintaining a competitive posture in the world, and now has the dubious distinction of being the world's largest debtor nation.

Twenty years ago, the shift in national priorities resulted in a reduced federal investment in technology and the layoff of 300,000 engineers and scientists from the aerospace and defense industry. Events in Eastern Europe, such as the unification of Germany and democracy movements in many of the Eastern Bloc nations, have prompted a major shift in international military threat paradigms. Then comes the hardline military actions of the USSR to crush the growing demand by the Baltics for freedom and the shooting war in the Persian Gulf. These factors, together with the federal budget deficit, are causing a reappraisal of the U.S. investment in new defense and weapon systems and point to the need for a strategic science and technology policy that encompasses both defense and economic stability in a rapidly changing world.

To explore a resolution to this issue, the California Engineering Foundation (CEF) and *Aviation Week and Space Technology* magazine conducted the What if Peace? Conference in November 1990.

This executive summary precedes the full report of the What if Peace? project and contains a condensation of the conference findings and recommendations. The document is directed to policy makers in the government, industry, and academe.

The CEF and the conference cosponsors neither endorse nor oppose the conference products. The findings and recommendations stand on their own merit and are presented to stimulate further discussion, effect consensus-building, and be a basis for change.

A major conclusion can be drawn from the project. To compete effectively in the new world environment, changes will be required in all sectors. Lacking these changes, the U.S. standard of living and quality of life will continue to decline. There will be a reduction in taxable cash flow — a crucial factor in reducing the budget, international payments, and trade balance deficits. There will also be an increasing demand for federal funds to meet social ills, many of which result from restructuring the U.S. economic base.

The solution resides in a policy environment in America that stimulates a substantial investment increase in capital and human resources and effectively utilizes the scientific and technological base of the nation. These must be applied in high value-added enterprise that raises domestic intrinsic wealth and addresses the demands of a global market and ensures national security.

CONFERENCE OBJECTIVE

The conference objective was to produce strategic policy recommendations for directing the nation's technological resources in light of major shifts in economic and defense paradigms, and to form a network of individuals committed to implementing conference recommendations.

FINDINGS

The general findings presented reflect inputs by keynote speakers, cosponsors and participants; consensus of workshop deliberations; and research conducted by CEF in concert with other cooperating organizations. The following represent a portion of the overall project findings.

1. The world witnessed the greatest social and economic revolution in recorded history with the peaceful destruction of the Berlin wall, unification of Germany, and elections in Poland, Hungary and the Baltics. The long term outcome of these changes cannot be predicted, but there is an aura of a reduced military threat of nuclear war between the Soviet Union and the U.S.
2. The U.S. defense strategy has been based upon deterrence for 40 years. The atomic bomb, with intercontinental delivery systems, created a mutual terror environment of massive retaliation. In addition, the U.S. continued the strategy of containment by maintaining conventional forces in Europe and in other strategic areas.
3. The revolution in Eastern Europe has revealed that the Soviet Bloc is not a single nation nor a multiplicity of cooperative states dictated by the Kremlin. Eastern European countries are emerging as independent states, and the relationship between the U.S. and the Soviet Union is more positive than at anytime since World War II. The future of this relationship will depend heavily upon emerging policies in the USSR.
4. The U.S. government is searching for means to reduce its budget deficit. Prior to Iraq's invasion of Kuwait, defense expenditures were less sacrosanct than they had been in recent years. Yet the major forcing function for technological development in the U.S. for over 40 years has been weapons research and development.
5. Although the world is apprehensive over the Persian Gulf crisis, military activities, and even the armed conflict, can only lower the federal investment in technology development. Expenditures for troops and desert encampment will increase the budget deficit and put additional pressure on Congress to reduce investment in technologies and advanced high-cost weapon systems.
6. Research, development and production of new weapons will be reduced, stretched-out, or cancelled depending on the nature and length of the Iraq war.
7. Defense and space expenditures have been major sources for advanced R&D of technologies, some of which have found their way into commercial use.
8. Continued threats to world social and economic stability are not adequately addressed in established defense policy.
9. The world's expectation is that the U.S. will remain the policeman of first call.
10. The defense sector employs nearly one in three of all of the U.S. scientists and engineers, and one in seven manufacturing workers. The defense industry estimates it will lose over 800,000 jobs in the next five years. Cutbacks in 1989, 1990, and 1991 will seem small compared to 1992 and 1993 as the industry backlog dwindles.
11. Many top defense/aerospace managers resist conversion hoping that Congress will save them or that the "threat" will change. They also have a culturally-induced inability to do business in the commercial sector.

12. California received over \$55 billion — 16% of the Defense Department's \$300 billion budget in 1988. Active duty military personnel accounted for \$10 billion, while \$45 billion went to industry. Cuts in defense spending could reduce jobs in California by 120,000 in five years.
13. Congress and federal agencies resist accepting the fact that procurement laws and regulations impede government contractors from doing business in the commercial sector.
14. The U.S. tax laws and attitudes of the financial sector do not encourage risk-taking and long-term capital investment. The organizational structure of defense contractors is designed for the specific need of defense customers. Contracts and technical requirements are very specialized, and defense programs tend to be performance or technology-driven, compared to market-driven commercial products. The corporate infrastructure is designed to meet the defense customer's technical needs as compared to filling a market void in a cost-competitive manner.
15. Federal funding sources are reluctant to support R&D of the product life-cycle and production technology — both critical to cost reduction, quality improvement, and mission performance.
16. The 1991 Defense Authorization Bill includes modified rules on independent research and development (IR&D) allowables. Under the new rules, IR&D expenditures will be allowed if the contractor demonstrates that research "is of potential interest—" to the Pentagon. This change allows contractors to use IR&D funds for broader purposes, and has special relevance to technology with applications common to the commercial and military fields.
17. As defense spending shrinks, the problems for the defense industry will multiply by increased pressure towards government "make" decisions. With reduced funds, government laboratories will compete more with industry and take a higher percentage of defense dollars on a sole-source basis.
18. Congress is reluctant to cut public sector R&D and procurement facilities (government laboratories, federally-funded R&D centers, arsenals, depots, etc.), thereby thrusting an unfair proportion of the defense budget decline to industry.
19. Federal data rights and patent policies are barriers to commercial use of technology developed by government contractors, and a lack of uniform agency policy exacerbates the situation.
20. The antitrust laws impede collaborative industrial R&D and efficient use of technological resources.
21. In the past decade, federal procurement policy has been to reduce or eliminate purchasing contractor-controlled unique facilities and equipment in support of programs. Simultaneously, changes in government acquisition policies have made contractor investment in program-specific facilities and equipment increasingly unattractive.
22. There is no comprehensive system to categorize and inventory government-owned facilities managed by contractors.
23. Federal procurement regulations mandate post-contract facility and equipment disposition without adequate provisions for future use. This has resulted in billions of dollars lost and destruction of federally funded technological infrastructure.

24. Funds are not available in the public or private sectors to preserve high-value, or technology-unique facilities and equipment after contract closure.
25. The U.S. imports over 50% of its oil, reflecting a greater dependency than during the OPEC oil embargo of 1973.
26. In 1989, more capital was invested in new high-technology plants in Japan than in the U.S.
27. Hitachi engineered a 64 megabyte prototype chip, and Japan is launching a new government-industry effort to achieve world dominance in massive parallel processing technology during the 1990s.
28. The American defense industry is encumbered with debt from past weapons acquisitions and tax and procurement policies. This industry is also burdened with oversight and bureaucratic requirements which often result in cost increases of 30-50% over like commercial operations.
29. The U.S. is no longer considered a reliable scientific R&D joint venture partner by other nations because of its short-term policies which seldom exceed the federal budget cycle. This is of particular concern in multi-year, high cost research ventures such as space projects.

RECOMMENDATIONS

The conference project developed numerous recommendations for action through research, presentations of keynote speakers, and conference workshop deliberations. The following is a partial list of the conference workshop products:

DEFENSE

1. The Administration should analyze the mission of the Department of Defense, the military segment of the Department of Energy, and other government agencies involved in the military defense of the U.S., and prepare legislation during the 1992 Congressional session clearly defining defense and military missions and responsibilities for the individual military services and all affected agencies.
2. The Department of Defense, in cooperation with industrial leaders and professional, technical, and trade associations, should reach consensus on industries, technological skills, and processes critical to national defense, and develop a plan to ensure that these national resources will be available for emergencies.
3. The Congressional Office of Technology Assessment should conduct a study defining impedances and resolvers to a non-adversarial relationship between the DoD, industry, and Congress, and prepare legislation to remove statutory and regulatory barriers.
4. DoD procurement regulations should be changed to permit the purchase of commercial systems, components, parts, and processes for defense systems.

5. DoD acquisition and procurement regulations should be streamlined with particular attention given to specifications, contract controls, R&D in fixed price contracts, progress payments, and purchases of commercial products, to increase program effectiveness, reduce ambiguities and overhead costs, and to improve the contracting environment for defense projects.
6. The DoD should propose Congressional support for advanced technologies to rapidly upgrade equipment and systems, and enable the progressive development of the next generation of systems.
7. The DoD, together with NASA and leaders of the space and defense industry, should identify options for the use of space assets for intelligence, advanced warning, and expanding existing systems to provide superiority in preparedness, mobility, and endurance.
8. U.S. intelligence should be funded to develop and apply advanced technologies for comprehensive foreign surveillance and assessment of the new world political order, e.g., military, economic and competitive threats.

SPACE

1. The Congress, with universities, industry, the Administration, technical and professional societies, and trade associations, should reach agreement on a national strategic space policy that includes manned and unmanned research missions. This policy should reflect a consensus for U.S. presence in space as justification to authorizing funds for any mission, including military, commercial and scientific exploration.
2. The U.S. should enter into agreements with other nations, including the USSR, on cooperative ventures in space. Congress and other nations should establish funding and a system project office (SPO) to manage joint ventures.
3. Federal procurement laws should be modified to select contractors in two steps: 1) Qualified bidders for space projects would be chosen on specific capabilities and past performance. 2) The selected bidder would then receive a contract to prepare a detailed program proposal. This practice would provide certain benefits over current competitive procurement practices: eliminate the present method of funding proposals for future projects using overhead funds from an existing program; increase use of proposal research findings in the new program; encourage proposals from contractors not currently involved in government contracting, and who would not otherwise be capable of paying for proposal development; and shorten the procurement cycle for new programs.
4. DoD and NASA should cooperate closely in advancing space technology to minimize redundancy and maximize investment effectiveness.
5. Congress should establish special multi-year authorization and appropriation policies for space programs, since program objectives exceed the two, four, and six year budget cycles.
6. Space program objectives should include requirements for reducing or eliminating the negative environmental impacts of space development, including atmospheric chemical contamination and spent orbiting hardware.

7. Congress and the Administration should give priority to the development of a commercial-sized, low cost, flexible, quick response booster launch system.
8. Congress should amend the federal technology transfer laws to open NASA, the Department of Energy, and some DoD laboratories, similar to NASA's open policy in aeronautics, and improve the protection of industrial proprietary rights associated with joint industry/laboratory collaborative research. A statute should be enacted to establish uniform regulations for the transfer of intellectual property rights to industry from all federal laboratories.
9. Congress should appropriate funds to develop an advanced Landsat system and create regulatory, funding, and tax policies for privatizing system operation.
10. Congress should appropriate funds and establish regulatory protection and tax incentives for the development of experimental communication satellites to be administered by a public-private partnership. The Department of Commerce, or another federal agency, should assume the worldwide responsibility for protecting private intellectual property rights developed by the partnership.
11. Congress should increase the applied-research-to-basic-research ratio in appropriations for space program development.
12. The federal government should continue to underwrite initial development costs of space transportation.
13. Industry, academia, government, and community leaders should form a coalition to ensure the U.S. has an educational system adequate to meet its present and future technical and managerial human resource needs.
14. Congress should appropriate sufficient funds in the FY 1992 budget to initiate the President's Space Exploration Initiative.
15. Congress should direct NASA to expend a certain proportion of its funds annually for advanced technology R&D. In no case should the amount fall below \$500 million in any one fiscal year nor should it be earmarked for any specific program.

MANAGING CONVERSION

1. Industrial firms, contracting their services to the federal government for defense and space procurements, should lead in conversion without government assistance. Firms must recognize that DoD downsizing will affect them, directly or indirectly, and act immediately to modify business cultures, hire external talent, and team with commercially-oriented companies. The federal government should provide a constructive environment for conversion but not subsidize businesses.
2. Industry should initiate partnerships with government and promote industry-university-laboratory cooperation, such as the Hewlett-Packard, Dupont, and Sandia superconductivity effort, going beyond the "critical technology lists" and including specific actions (e.g., the "Illinois Model").

3. Federal procurement and tax laws and regulations should be changed to expand use of reimbursable IR&D funds for multi-use applications, thus assisting conversion. Federal limits on IR&D expenditures should be removed.
4. Congress and state legislatures should develop tax and regulatory incentives for military contractors to use facilities for commercial opportunities (e.g., remove the current 25% restraint on use of government-supplied equipment).
5. Congress should reexamine its authorization and appropriation policies and increase funding of applied technology programs needed by American industry — drawing from federal lists of “critical technologies.” A doubling of long-term funding is required, and should be available after termination of large weapons contracts.
6. The DoD, with the support of Congress, should apply its purchasing power to stimulate military/civilian integration of R&D, facilities, and products, and eliminate procurement barriers to such integration. The DoD could aid this shift by focusing procurement efforts on product cost, performance, and product quality, and de-emphasizing detailed design specifications.
7. Congress, in the short term, should appropriate “seed” loan funds to defense contractors, following successful models such as NASA’s commercialization program, to assist industry in converting federally developed technology to commercial use.
8. Congress and the Administration should remove anti-trust constraints to mergers to assure a base engineering and production capability to meet defense and aerospace needs.
9. Congress, the Administration and state legislatures, should establish state science and technology policies, including a 10-year blueprint for the growth of critical technologies having the greatest economic potential. Policies should include strategies in education, research, and assistance to declining technology-based industries.
10. States should establish new statutes, or amend administrative law practices, to provide an appeal process for business to resolve conflicts and ambiguities between federal and state regulated processes. States can modify regulatory protection without sacrificing public health, welfare, and safety and improve the business environment.
11. State programs should be developed to use existing federal funds from programs, such as the Job Training Partnership Act, to assess skills of workers displaced by defense and aerospace industry cuts. Assessment programs could be administered by community colleges, with assistance from state employment departments and industry, to match worker skills to commercial and defense industry needs.
12. State tax and regulatory policies provide incentives to stimulate the retooling of defense facilities to commercial enterprise.

13. States should support small business R&D, including technical assistance to companies to facilitate small business innovation and research (SBIR) grant proposals, provide loans to SBIR companies for commercial products or processes developed by SBIR-funded research, and establish fellowships in universities for engineering graduate students to develop experience in managing SBIR firms.

FACILITIES AND EQUIPMENT

1. The National Institute of Standards and Technology should categorize and inventory government research capabilities in all federal laboratories.
2. Federal procurement regulations should give added weight to contractors who propose use of available government facilities in new programs.
3. Federal procurement regulations should be modified to allow the use of government facilities and equipment on an "added cost basis" in all non-government programs.
4. Federal procurement regulations should be modified to simplify contractors' administrative costs for government property management by establishing: 1) accountability thresholds of no lower than \$1,000 for individual items; 2) annual reporting only, rather than on demand; and 3) eliminating property reporting requirements on contracts of less than \$100,000.
5. Federal procurement law and regulations, and national industrial policy, should be developed which allow contractors to retain excess or under-utilized government owned- high value facilities and equipment (F&E). Such regulations should provide financial incentives for contractors to maintain these facilities for future use.
6. States should amend tax laws, including local taxes, to reduce or eliminate taxes on idle facilities and equipment procured under government contracts that have potential use.
7. The federal government should assume responsibility for the cleanup of contaminated federal sites and streamline the process to indemnify contractors from environmental costs, related to pre-existing conditions. Contractors should be held harmless, and the government would bear the cleanup cost of contractor owned facilities, contaminated in the process of performing government contracts, unless the contractor is clearly negligent.
8. Federal procurement regulations affecting profit and progress payments should be modified to provide a competitive return on investment.
9. Anti-trust laws should be modified to maximize U.S. industry's competitive position on international programs by permitting formation of multi-corporate consortia to make effective collective use of existing facilities and equipment.

TECHNOLOGY TRANSFER

1. The President should propose and Congress implement legislation for an existing or new major federal agency for technology with strategic responsibility to ensure a steady supply of funding for industrially relevant technology. It should fund and support new and established technology companies for technology projects critical to the U.S. economy that are too risky or have insufficient market to attract private capital. A percentage set-aside for small business should be maintained and the constraints on competition in the contracting act should be removed for speedier, more efficient, and simplified procurement procedures.
2. The Congress should overhaul the export control laws to permit speedier processing and simplified administrative procedures. The U.S. government should work through international agreements and negotiations for access to foreign technology to ensure a two-way technology flow.
3. The Congress should establish a federal laboratory budget policy for private support and funding of federal laboratories. One approach for consideration should be a requirement that 10% of the budget of national laboratories be supported by outside funds by 1993 and the percentage increased to 20% by 1995. 10% of a national laboratory's budget should be available for industry matched initiatives. All non-classified national laboratory research should be done in collaboration with industry, with each paying their respective costs.
4. Congress should appropriate direct funding for managing technology transfer activity at the laboratory level. This will encourage more outreach, collaboration and resource sharing with industry.
5. Federal agencies sponsoring research laboratories should delegate the major responsibility for technology transfer to their laboratory directors. Focus should be on accommodating industry priorities. Technology transfer decision-making should be decentralized from the sponsoring agencies to laboratories, with general guidelines for implementation delegated to the appropriate working level in the laboratories. Agency guidelines for technology transfer should be broad, allow flexibility for laboratory directors and project managers to negotiate conditions with contractors, and provide wide discretion in the use of funds for cooperative research.
6. Congress should make permanent the R&D tax credit incentive and include eligibility for industrial partnerships with national laboratories, non-profits and universities.
7. During the annual budget cycle, Congress and the Administration should encourage R&D agencies to consult with industries to incorporate their priorities in agency budgets.
8. Funding for the technology portion of the SBIR program should be increased.

EDUCATION AND HUMAN RESOURCES

1. The engineering societies and trade associations should form an expert task force to analyze engineering undergraduate curricula in light of engineering practice to define the minimum *entry level functional capability* of engineering graduates. The analysis should focus on industrial needs and search for program content in applied technology, R&D, design, manufacturing, testing, production, and marketing in addition to basic theory and fundamentals. The results should be given to representative trade, technical, and professional organizations for industry, government, and education.
2. The National Science Foundation should fund the development of science and technology career guidance materials for schools which provide students with objective information about science and technology careers. The counseling materials, and in-service training of teachers and counselors, should not merely promote science or technology careers, but raise a student's ability to make an informed career decision.
3. Industrial representatives, concerned about the need for reindustrializing America and the conversion of the defense and aerospace industry, should develop an industrial perspective focused on engineering undergraduate curricula and university policies affecting faculty and the education system. The findings should be given to engineering universities' governing boards with the objective of effecting policy changes where required.
4. Federal procurement laws and regulations should be changed to provide recoverable overhead costs in federal contracts which permit contractors to fund human resource related conversion activities. Priority would be given to broadening the understanding of technical personnel about commercial enterprise outside the government contracting culture.
5. Industry trade associations should create task forces on engineering education and encourage constituent firms to support technical staff members serving on university advisory councils, visiting accrediting teams reviewing engineering education programs, and other programs in which industry input to curricula development is affected.
6. Federal and state tax laws should provide incentives to industry to donate equipment, maintenance services and computer software to engineering universities interested in creating hands-on technology experiences for students. Tax incentives should also be provided to firms to stimulate involvement of industry and business staff personnel in support services to schools, and corporate management should encourage and reward their staff.
7. State education departments should develop science and technology related career guidance information and assist in the training of science, math, and vocational education instructors in K-12 schools to act as science and technology career counselors.
8. Schools should explore the use of technology to improve the effectiveness of the education process, and industry and government should cooperate to increase the availability of technology equipment and provide maintenance services to schools.

9. Engineering firms and organizations should support involvement of their staff in on-going cooperative programs with schools to act as non-funded resources to the schools for curricula development and program delivery.
10. Schools, states, and businesses should extend the services developed to assist minority students seeking science and technology related careers to all interested students.

OVERVIEW

Defense and space expenditures have been the major sources of advanced R&D, some of which has found its way into commercial use. Now, Congress is critically reviewing the defense budget to reduce the federal deficit. Downsizing is a certainty, and the research, development and production of new weapons will be targets. The world is also witnessing a shift in its economics which raises questions about U.S. strategic policy in science and technology:

- *Should the federal government establish a research and development policy to assist domestic industry in competing more effectively in the global market?*
- *What are the military threats to America's security and technology response options?*
- *What other challenges threaten U.S. independence and security in a world of social and economic change, and what are the technological solutions?*
- *How can the United States shift from the management of technology based upon military threats, to a policy based on superpower peace?*

The "What if Peace?" conference project addressed these questions to produce policy recommendations for redirecting the nation's technological resources. The conference was a highly interactive working meeting, and participants developed policy recommendations in six specific areas. The conference is considered a first step in mobilizing a constituency for change.

The federal government funds nearly 50% of the over \$130 billion spent annually for R&D, and a large percentage is for weapon systems. Federal funds support 700 federal laboratories, from small research offices to large development installations. Some federal laboratories are owned and operated by the government. Others are owned by the government but operated by private firms, universities, or non-profit organizations. The laboratories, many of which have weapons missions, expend about one third of federal R&D funding, amounting to about \$20 billion a year.

The other two thirds of federal R&D expenditures fund government contractors conducting projects for space and defense. A portion of the NASA program is now devoted to weapons and defense, which deviates from the original Congressional intent when NASA was created in 1957. Then, NASA was banned from using military technology for space exploration — a fact overlooked by historians when rationalizing why the Soviet Union was first in space.

Today, a changing world may prompt Congress to use military manpower and technology to address domestic threats. Senator Sam Nunn, Chairman of the House Armed Services Committee, has already proposed using the military to help protect the nation's natural resources. Others have proposed the increased use of the military to stem the flow of illegal drugs into the U.S.

America's economy is also threatened. The U.S. is now the largest debtor nation plagued with failed lenders and international deficits of payments and trade. The country also has a growing

infrastructure debt due to inadequate investment in new facilities, deferred maintenance of existing ones, and an expanding population. A changing world economy presents the federal government with the additional challenge of creating a national industrial policy for reindustrializing America. How will the U.S., still stunned by the rapid growth of industrial competition from the Pacific Rim, meet the unified European Economic Community challenge in 1991? Should the federal government establish an R&D policy to assist domestic industry to compete more effectively in the global market? Is the current tax, regulatory, investment, research and development, and educational environment conducive to reindustrialization?

History has a way of repeating itself. In 1969, as Americans were walking on the moon, social unrest in the U.S., caused by the Vietnam war, created the anti-technology premise, "Why go to the moon when there are riots in the streets?" Emerging federal defense policy focused on R&D of committed weapons systems, the elimination of some weapons procurements, a shelving of proposed weapons projects, and sharp reductions in the space program. One result was layoffs by 1971 of nearly 300,000 aerospace and weapons engineers and scientists who could not be absorbed into non-defense industries. States having a large federal investment in space and defense through contractors and laboratories were severely affected. Unemployed or underemployed workers in California were referred to as aerobraceros. Historically, aerospace workers followed NASA and DoD contracts from firm to firm like bracero farm workers following harvests, but, in 1971, the technology crop failed for the aerobraceros.

George Santayana observed that those who do not learn from history are condemned to repeat it. Have America's public and private leaders learned enough from the history of the 1970s to avoid wasting the nation's technological resources in the 1990's and beyond? The U.S. faces threats from natural disasters, crises in transportation, international competitiveness, and problems in air quality, energy dependency, and waste management. How does the nation reindustrialize to a position that captures leadership in a world of superpower peace, Third World instability, and economic and technological competition?

CONFERENCE LOGISTICS

The conference was conducted in California, which has the largest concentration of military and space industries in the U.S. The state also has about 30 federal laboratories, many of which have weapons missions.

CONFEREES

This was an open, private sector-driven conference. Approximately 100 policy makers from industry, government, and the universities assembled to offer counsel on critical technology policy issues facing the nation.

CONFERENCE METHODOLOGY

The conference was conducted in three phases. The opening plenary session included industry, education, and government leaders discussing perspectives on the issues and the critical actions needed. The second phase consisted of parallel discussion workshops. Each workshop was conducted with a carefully developed agenda to reach consensus on an ideal vision of the future, the constraints to that vision, and critical success factors for a strategic plan. The third phase was the closing plenary review of individual workshop findings among all conferees.

CONFERENCE DEVELOPMENT

The California Engineering Foundation developed and managed the conference with counsel and assistance from *Aviation Week and Space Technology* magazine, corporate cosponsors, and experts from the public, private, and academic sectors. The conference success was achieved by pre-conference research to define issues and characteristic recommendations. Draft issues, vision statements, constraints, and critical success factors, grouped under workshop subjects, were prepared for consideration in the workshops.

POLICY ON CONFERENCE FINDINGS

The CEF views the conference as a component of a total process. Thus, conference development strategy considered the use of the results before the conference was convened. The purpose of the process was to develop science and technology policy recommendations for all sectors. In all cases, the conference findings and recommendations stand on their own merit, and sponsors and cosponsors neither automatically endorse nor oppose them.

COSPONSORSHIPS

The principal sponsors were the California Engineering Foundation and *Aviation Week and Space Technology* magazine. Corporate cosponsors provided assistance and financial support. They included: Aerojet, AT&T Network Systems, Digital Equipment Corporation, Lockheed Corporation, Northern Telecom, and Pacific Bell. The CEF was the managing and coordinating sponsor of the conference.

California Legislature cosponsors were: Assemblyman Sam Farr, Chairman, Assembly Committee on Local Government; Assemblyman Richard Polanco, Chairman, Assembly Committee on Economic Development, International Trade, and Technologies; Senator Art Torres, Chairman, Senate Committee on the Pacific Rim; and Assemblyman John Vasconcellos, Chairman, Assembly Ways and Means Committee all having demonstrated interest in technology policy.

CEF coordinated the conference with other organizations including: the American Electronics Association, the American Institute of Aeronautics and Astronautics, the Aerospace Industries Association, the Council for Chemical Research, the Industrial Research Institute, the Institute of Electrical and Electronic Engineers, and the Institute of Illinois.

CONFERENCE COORDINATOR

The conference coordinator and general manager was Dr. Robert J. Kuntz, CEF President.

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