

Working Together...



Finding Solutions for a Sustainable, Global Environment

Services for a Global Economy...



POLLUTION MANAGEMENT:
We use both natural systems and advanced technology to manage pollution.



INFRASTRUCTURE:
E&E has helped privatize highways, ports and harbors, and energy in many countries.



NATURAL RESOURCES:
E&E develops approaches for sustainable natural resource use.



HEALTH SERVICES:
Our health scientists and medical professionals address concerns such as asthma, emerging infectious diseases and pathogen pollution.

E&E has completed 25,000 assignments in 67 countries worldwide.

★ E&E Headquarters/Analytical Services Center • Other offices

Services for a Global Economy...



E&E's sampling team using handheld computers and a geographic positioning system to overlay sampling points on aerial photos in Kuwait.

Our expert teams can help you to successfully:

- Plan and build the infrastructure needed for economic development, such as water and wastewater treatment, energy, and transportation projects
- Prevent and manage the pollution that accompanies development
- Use natural resources in a sustainable manner
- Ensure that public health is protected

Success in the global economy requires speed and knowledge. Commercial enterprises must compete locally to win globally. But to ensure our common future while growing our national economies, businesses and governments must cooperate to sustain the world's resources.

E&E can help. As one of the oldest and most respected environmental services and engineering firms in the world, we provide practical solutions to environmental problems, from icy Antarctica to the sun-drenched deserts of Asia and Africa.

We can help you meet your environmental challenges anywhere, anytime.

- Project formulation and financing
- Environmental Impact Assessments (EIAs)
- Environmental surveys and studies
- Ecological restoration
- Energy conservation and efficiency
- Geographic Information Systems (GISs)
- Licensing and permitting assistance
- Technical training
- Global impact studies
- Biodiversity
- Natural resource management
- Institutional development
- Sustainable development plans
- Global warming and CO₂ analyses
- Site selection and planning
- Compliance assistance and analyses
- Environmental baseline studies
- Public consultation programs
- Identification of international regulatory requirements and agency consultation
- Multilateral financial institution liaison
- Due diligence and valuation for property transfers
- Cost estimates and financial analyses
- Air and water quality programs
- Monitoring and data analyses
- Pollution control equipment and engineering
- Hazardous materials/waste management
- Wetlands treatment systems
- Spill response and prevention plans
- Decision and economic analyses
- Economic analyses
- Strategic environmental management plans
- Social evaluations and management plans
- Watershed management plans



Our 75 Scientific Disciplines Include...

ACOUSTICS • AIR POLLUTION CONTROL • AIR RESOURCES PLANNING • ANTHROPOLOGY • AQUATIC BIOLOGY • ARCHAEOLOGY • ARCHITECTURE • BOTANY • BUSINESS ADMINISTRATION • CHEMISTRY • COMMUNITY RELATIONS • COMPUTER SCIENCE • CULTURAL AND HISTORIC RESOURCES • ECOLOGY • ECONOMICS • ENGINEERING—CHEMICAL, CIVIL, CONSTRUCTION, ELECTRICAL, ENVIRONMENTAL, GEOLOGICAL, MECHANICAL, NUCLEAR, SANITARY, STRUCTURAL • ENTOMOLOGY • ENVIRONMENTAL HEALTH • ENVIRONMENTAL LAW • ENVIRONMENTAL PLANNING • FOOD SCIENCE • FORESTRY • GEOLOGY • GEOPHYSICS AND GEOTECHNICS • GOVERNMENT AFFAIRS • GRAPHIC ARTS • HAZARDOUS WASTE MANAGEMENT • HAZARDS AND RISK ANALYSIS • HEALTH PHYSICS • HYDROGEOLOGY • HYDROLOGY • ICHTHYOLOGY • INDUSTRIAL HYGIENE • LAND USE PLANNING • LIMNOLOGY • MARICULTURE • MARINE BIOLOGY • MATHEMATICS AND STATISTICS • METEOROLOGY • NOISE MONITORING AND ANALYSIS • NUCLEAR TECHNOLOGY • OCCUPATIONAL HEALTH AND SAFETY • OCEANOGRAPHY • OPERATIONS RESEARCH • ORNITHOLOGY • PARASITOLOGY • PHYSICS • PROCESS DESIGN • PUBLIC HEALTH • RANGE MANAGEMENT • RESOURCE AND RECLAMATION PLANNING • SILVICULTURE • SOCIOLOGY • SOIL SCIENCE • SPILL PREVENTION AND CONTINGENCY PLANNING • SYSTEMS ANALYSIS • TECHNICAL WRITING • TERRESTRIAL ECOLOGY • TOXICOLOGY • TRANSPORTATION PLANNING • URBAN AND REGIONAL PLANNING • WATER POLLUTION CONTROL • WATER QUALITY ANALYSIS • WILDLIFE MANAGEMENT • ZOOLOGY

A well-planned and cost-effective infrastructure is the keystone to successful economic development. The ready availability of energy to fuel commerce and make homes comfortable; clean water and wastewater treatment to protect public health; and efficient transportation and communication systems to facilitate the movement of people and goods are critical investments. Yet development at the expense of natural resources wastes precious capital.

Working closely with project development teams, E&E helps clients to plan and build needed infrastructure in an environmentally responsible

manner. We compare alternatives and choose sites and routes for linear facilities that avoid environmental sensitivities while enhancing wise resource use. We conduct environmental baseline studies, including specialized biological, cultural resource, physical science and socioeconomic surveys, to facilitate the environmental impact assessment process and obtain needed permits and approvals. We consult with the affected public and refine the project to address concerns early on.

With critical shortages of clean water in many parts of the world, new technologies for water conservation, storage, reuse and treatment hold the key to the future.



Representative Projects...

BEIJING, CHINA—WASTEWATER TREATMENT SYSTEM DESIGNS FOR SEVERAL FACTORIES • **ABIDJAN, COTE D'IVOIRE**—EIA FOR REFINERY EXPANSION • **WESTERN SIBERIA, RUSSIA**—(1) EIA/MITIGATION STRATEGIES FOR PRIOBSKOYE OIL FIELD DEVELOPMENT; (2) ECONOMIC AND POLLUTION CONTROL STUDY OF THE FERROUS METAL INDUSTRY TO SUPPORT THE UTILITY/TRANSPORTATION INFRASTRUCTURE • **COLOMBIA AND PANAMA**—EIA AND ALTERNATIVES DEVELOPMENT FOR THE PAN AMERICAN HIGHWAY • **JAVA, INDONESIA**—MARINE/COASTAL ZONE STUDIES AND ENVIRONMENTAL BASELINE SURVEYS FOR GEOTHERMAL DEVELOPMENT • **FLORIDA, CARIBBEAN ISLANDS, MEXICO, CENTRAL AND SOUTH AMERICA**—ENVIRONMENTAL PERMIT AND OVERSIGHT FOR CABLE LANDINGS



▲ *Dozens of ports will be improved as trade restraints ease and waterborne commerce expands; E&E's scientists provide a sound technical basis for decision making.*

As oil and gas exploration moves into deeper waters and culturally and environmentally sensitive sites around the world, a comprehensive environmental and social strategy is critical to success. E&E's sustainable development plan for the Orinoco River Delta of Venezuela leveraged community development while enhancing oil and gas growth. ►

E&E evaluates the economic feasibility of infrastructure projects and helps clients to obtain adequate funding. Where significant environmental impacts cannot be avoided, we develop procedures and techniques to reduce or mitigate the level of impact. We train workers and monitor activities to ensure that commitments made during the planning process are fulfilled during project construction and operation.

We also help clients to assess the vulnerability of critical infrastructure to both natural and man-made disasters. We prepare contingency plans and when incidents occur, assist clients in their efforts to quickly recover and restore service.



E&E provides a full range of services...

- Siting, routing, permitting, and impact analyses
- Monitoring and analyses of air quality
- Monitoring and analyses of water quality and availability
- Compliance assistance and pollution reduction to meet local and international standards
- Environmental data and geographic information management systems
- Public and agency consultation and outreach
- Impact reduction or mitigation
- Energy efficiency; global warming and CO₂ analyses
- Dredge spoil management and disposal

...to support your infrastructure projects

- **Energy**—power generation and transmission facilities; fuel production, storage and transportation, including coal, oil, natural gas, liquefied natural gas (LNG), and hydrogen
- **Transportation systems**—highways, railroads, airports, ports and harbors, rapid transit, and other alternative means of transportation
- **Water and wastewater treatment facilities**
- **Communications**—telephone, satellite, and fiber-optic cable systems

Extracting natural resources is vital to economic growth. Mining, oil and gas production, and timber harvesting are activities essential to industrial societies. But so is guaranteeing that clean water and air, outdoor recreation, and safe food will be available to a growing population. In fact, the extent to which natural resources are protected for sustainable use may become a country's most important competitive advantage in the coming years.

E&E helps governments and businesses with large landholdings to fulfill their resource stewardship responsibilities. In the United States, we help the Bureau of Land Management, National Park Service and Forest Service to restore damaged areas and enhance environmental quality. Our environmental data management systems have proven invaluable for cataloguing ecosystems, whether mapping watersheds to better allow Morocco to manage its hydroelectric power system or restoring lakes in China.

We evaluate natural resources and develop management plans that balance resource extraction and other uses. We prepare integrated environmental management plans for provincial governments in China, as well as for the U.S. Department of Defense, one of the largest landowners in the world, we prepare Integrated Resource Management Plans. By understanding the life cycles and habitat needs of sensitive plant and animal species, we can identify measures to safeguard them during project development.

Similarly, we help to preserve cultural resources and heritage. Where indigenous people are affected, this can mean providing for access to hunting, fishing, and plant collection areas as well as protecting traditional villages. Using GIS to manage and map large quantities of data, we assess biodiversity and cultural resources.



■ *In Venezuela, we planned a biodiversity park to enhance local tourism development while protecting resources. We have completed 25 environmental assessments for oil and gas development in the Amazon Basin.*

■ *Reliable sources of protein will become critical as oceans become more overfished. For these reasons, we are developing new technologies and management systems for aquaculture.*



Representative Projects...

COLOMBIA—(1) CALI-MARIQUITA GAS PIPELINE ENVIRONMENTAL PLANNING AND OVERSIGHT; (2) BOGOTÁ WETLAND AND ENVIRONMENTAL MANAGEMENT PLANS • **GERMANY**—CALLENBERG LANDFILL INVENTORY AND PUBLIC HEALTH/ENVIRONMENTAL REMEDIATION AND EXPANSION RANKING FOR 296 MINE SITES • **VENEZUELA**—(1) CARIPITO-GÜIRIA OIL PIPELINE ENVIRONMENTAL FEASIBILITY AND IMPACT STUDIES; (2) ENVIRONMENTAL ASSESSMENT FOR PEDERNALES OIL FIELD SEISMIC EXPLORATION PROJECT • **CHINA**—CHAO LAKE BASIN INTEGRATED ENVIRONMENTAL MANAGEMENT PLAN • **COTE D'IVOIRE**—CONTROL OF NON-NATIVE AQUATIC WEEDS AND PROMOTION OF BIODIVERSITY • **UNITED NATIONS**—U.N. DEVELOPMENT PROGRAMME/GLOBAL ENVIRONMENTAL FACILITY • **ANTARCTICA**—EIS FOR NEGOTIATION OF AN INTERNATIONAL REGIME FOR ANTARCTIC MINERAL RESOURCES

We assist clients to restore natural resources that have been damaged by past practices. We have restored dozens of mine sites, including whole watersheds damaged by tailings piles and remnant extractive chemicals. We have revegetated landfills, pipeline right-of-ways, and sites contaminated with industrial pollutants. We prepare natural resource damage assessments. We identify management strategies to reduce tropical deforestation and unintended development.

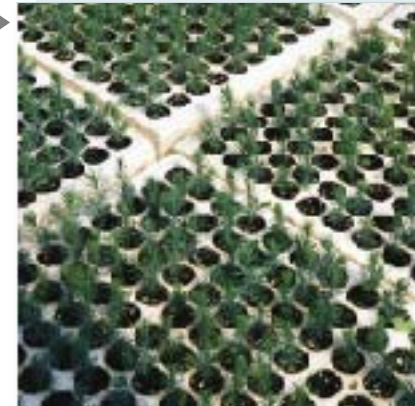
Frequently, we put natural systems to work to treat pollution from current or past operations. We have designed enhancements to natural systems that use plants to remove contaminants from groundwater, and constructed wetlands as part of a treatment system to remove contaminants from the site of a former refinery. Using the natural cleansing functions of wetlands reduces the cost of remediation while enhancing habitat.

We expect the conflicts between the agricultural production and preservation of wildlife habitat to become even more pronounced, as more land is cultivated to feed our growing populations.

- *In Peru, we cultivated thousands of plants and seeded large areas using a hydromulcher to enable mined lands to be more quickly reclaimed and restored.*
- *Revegetation along a crude oil pipeline in the Amazon Basin included terracing and regrading the hillside, replacing valuable topsoil, and hydromulching to ensure rapid growth.*



- Permitting and environmental impact analyses
- Oceanic and coastal management
- Environmental impact statements
- Public/agency outreach
- Contingency planning
- Ecological resource protection
- Biodiversity evaluation and studies
- Natural park plans
- Wetlands/biological studies
- Wildlife, botanic, and aquatic surveys
- Threatened/endangered species surveys
- Natural resource damage assessments
- Mitigation plans and project oversight
- Restoration plans and programs
- Sustainable tourism plans
- Nongovernmental organization (NGO) partnering



Whether helping clients to incorporate state-of-the-art technology in current operations or manage legacy pollution, we use our knowledge of best practices to improve pollution management and reduce the risk of environmental damage. E&E identifies, obtains financing for, and implements cleaner production technologies. We also help clients to implement sustainable development principles in their existing operations.

To reduce pollution liability, we develop pollution reduction strategies, such as pollution prevention, waste minimization, and energy conservation programs. By taking a systems

approach, we often can reduce the use of hazardous chemicals and improve energy efficiency, at considerable cost savings. We provide due diligence and valuation for property transfers.

We design pollution management systems to meet international standards, from air emissions controls and wastewater treatment at power plants to control of wastes from mining operations. We install monitoring equipment. Our Analytical Services Center provides high quality test results. We also design waste treatment facilities, such as incinerators and engineered landfills.



■ Moroccan tannery waste.



■ E&E provided technical assistance to the Asian Development Bank to reduce pollution by promoting cleaner production processes and waste minimization in China's industrial sector.



Representative Projects...

GERMANY—WASTE MINIMIZATION/RECYCLING PLAN FOR 9 LANDFILLS IN SIX COUNTIES • **RUSSIA**—POLLUTION CONTROL AND EMISSION REDUCTION PROJECT FOR FERROUS METAL FACILITY • **CHINA**—(1) DESIGN AND CONSTRUCTION MANAGEMENT FOR AN INTEGRATED SOLID WASTE MANAGEMENT PLAN IN LIAONING PROVINCE; (2) HAZARDOUS WASTE MANAGEMENT PLAN FOR AN INDUSTRIAL PARK IN SUZHOU • **VENEZUELA**—ENVIRONMENTAL MASTER PLAN FOR FLANCO SUR ANDINO OIL PROJECT • **BULGARIA**—WASTE MANAGEMENT AND MINIMIZATION TRAINING FOR ISO 14000 STANDARDS • **POLAND**—DEVELOPMENT OF A PLAN TO MITIGATE THE NATIONAL EMERGENCY RESPONSE SYSTEM • **CURAÇAO, NETHERLANDS ANTILLES**—DUE DILIGENCE AUDITS

Pollution Management

Our environmental management information systems cost-effectively integrate environmental management with business operations. Environmental managers can track such important information as monitoring data, permit requirements, and costs and automatically generate reports.

We have cleaned up soil or groundwater contamination and remediated asbestos and lead at thousands of sites where underground storage tanks have leaked or industrial wastes have leaked or been disposed. We have designed treatment systems for exotic wastes, such as nerve gas and medical wastes.

For clients who must store large amounts of fuel or chemicals, we develop plans to prevent accidents and disasters, both manmade and natural. However, when accidents do happen, we respond to the emergency with expert technical advice to help protect worker and public health and safety and reduce liability.

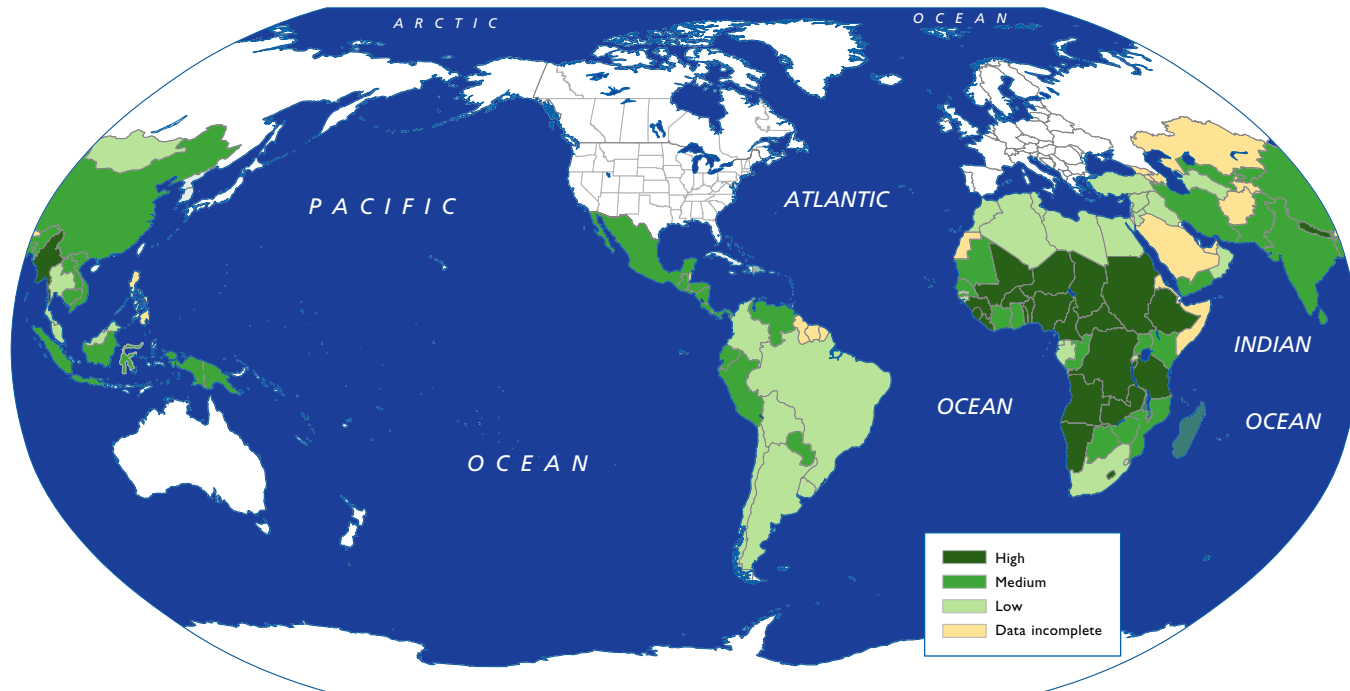
- Planning and strategy development (optimum control technology)
- Feasibility studies and technical analyses
- Compliance planning and facility reviews
- Design of pollution control systems
- Establishment of comprehensive record-keeping, audit, and training programs
- Risk assessment and management
- Contingency planning
- Emergency and non-emergency response management and support
- Damage assessment, cleanup, and environmental restoration planning and management
- Post-accident investigations and damage assessments
- Clean development mechanism certification (for CO₂ reductions)
- Greenhouse gas emission evaluations



■ *In Bogotá, Colombia, E&E modelled and planned the restoration of eight wetlands to maximize stormwater retention and stimulate environmental education.*

■ *We collected surface water samples in Bangladesh to evaluate environmental damages stemming from a gas well blowout near a national park and tea plantation.*





Potential exposure in developing countries to health risks from environmental threats

Source: *World Resources 1998-99*, The World Resources Institute, 1998

At no time in history have the links between human health and environmental conditions been more apparent. Businesses and governments everywhere must answer difficult questions:

- Will the rates of asthma increase in people living near a new power plant?
- Is the water safe to drink?
- Will mining operations impair public health?

- Are clusters of cancer among residents in a community related to environmental exposures to chemicals?
- Are bioengineered foods safe?
- How will disease vectors change as a result of new projects?
- Should neighborhoods near an industrial fire be evacuated?
- Can pesticides be safely used to control disease-carrying insects?

E&E helps businesses and governments to answer these and other questions related

to human health and the environment. We help corporations to develop programs to keep their work forces healthy at home and abroad, and to reduce the potential health effects of their operations. In fact, our own program became the model for worker health and safety legislation in the U.S.

We also design development projects to avoid unintended changes in infectious



Representative Projects...

CHILE—AIR POLLUTION REDUCTION PLAN • **CHINA**—(1) DEVELOPMENT OF 10 CLEANER PRODUCTION PROGRAMS; (2) EIAs FOR EXPANSION OF FOOD PROCESSING FACILITY; (3) ENVIRONMENTAL HEALTH AND SAFETY SURVEYS; (4) INDUSTRIAL ENTERPRISE ENVIRONMENTAL AUDIT, MONITORING, AND TRAINING PROGRAM • **EL SALVADOR, BRAZIL, COSTA RICA, COLOMBIA, AND ECUADOR**—ENVIRONMENTAL AUDITS AND ENVIRONMENTAL HEALTH AND SAFETY TRAINING • **BOLIVIA**—ENVIRONMENTAL, HEALTH, AND SAFETY PLANNING AND STANDARDS DEVELOPMENT FOR AN INDUSTRIAL PARK • **GERMANY, BULGARIA, RUSSIA, AND HUNGARY**—EUROPEAN TRAINING PROGRAMS • **SAUDI ARABIA**—HEALTH SURVEYS AND MONITORING AND ASSESSMENT STUDIES

disease patterns, and to reduce potential future liability from health claims, by providing the scientific analyses needed to make sound decisions.

We help governments to make policy decisions about how to best protect public health. For example, E&E evaluated the potential public health impacts of installing an incinerator to destroy chemical weapons left over from the Cold War.

At thousands of sites contaminated with hazardous materials, E&E has helped clients to determine safe cleanup levels. For example, at a drinking water reservoir contaminated by past mining activities, E&E measured and evaluated the risk of low levels of mercury contamination to human health. This allowed the government to determine that the reservoir could continue to be safely used for drinking water.

The World Bank now requires that environmental impact assessments evaluate the potential health effects of major development projects such as dams and highways.

Developing answers to health questions requires many different types of expertise, and a full understanding of the interaction between environmental factors and disease. E&E's health professionals include medical doctors, toxicologists, molecular biologists, public health specialists, air and water quality experts, epidemiologists, infectious disease specialists, and industrial hygienists. Working as multi-disciplinary teams, we have completed hundreds of projects around the globe.

- *For a study of the environmental, ecological, and engineering feasibility of constructing the last link of the Pan-American Highway across the Darien region in Panama and Colombia, E&E evaluated the potential for transmission of infectious diseases such as hoof and mouth disease and other economically devastating diseases.*

- Environmental Impact Assessments (EIAs)
- Licensing and compliance analyses
- Regulatory compliance support
- Health effects assessments
- Air quality analyses
- Medical waste management and disease control
- Radiation protection, contamination/exposure monitoring and control
- Industrial hygiene services
- Hazardous and other waste management
- Mitigation plans and project oversight



For further information, visit the Ecology & Environment, Inc., website at www.ene.com

Not long ago,
we thought of the environment simply as natural
surroundings, and of ecology as the study of the
interrelations between wildlife and those surroundings.
Now that advanced technology has brought together increasing
numbers of scientists of many disciplines to achieve a common
understanding of ecological processes, we have a much more
comprehensive view of ecology. That view transcends physical
and biological considerations to encompass the totality of
man and the environment, including his socioeconomic
well-being and health.

Gerhard J. Neumaier
E&E President



Worldwide Ecology & Environment, Inc. Locations...

BUFFALO (HEADQUARTERS) • ABIDJAN • ABU DHABI • ALMATY • ANCHORAGE • ANKARA • ARKHANGEL • BATON ROUGE • BEIJING • BOGOTÁ • BOMBAY • BOULDER • BROUMANA • BUCHAREST • BUDAPEST • BUENOS AIRES • CAIRO • CARACAS • CHEMNITZ • CORK • CHICAGO • CLEVELAND • DALLAS • DAMMAM • DENVER • FRANKFURT • GRAND CAYMAN • GRAND JUNCTION • HOUSTON • INNSBRÜCK • JAKARTA • JEDDAH • KANSAS CITY • KATOWICE • KUALA LUMPUR • KUNMING • KUWAIT CITY • LA PAZ • LIMA • LISBON • LONG BEACH • MANAMAH • MANILA • MIAMI • MOSCOW • MUSCAT • NEW YORK CITY • ORLANDO • PENSACOLA • PORTLAND • QUITO • RABAT • ROME • SAINT LOUIS • SANTIAGO • SÃO PAULO • SAN FRANCISCO • SAN JOSE • SANTA CRUZ • SEATTLE • SHANGHAI • SHENYANG • TALLAHASSEE • TEL AVIV • TIANJIN • UZENMUNAIGAS • WASHINGTON, D.C. • WEST PALM BEACH • WHEELING • WUHAN