# BUILDING A KNOWLEDGE PARTNERSHIP

## GENERAL INSTRUCTIONS - PART I

### OVERVIEW

- You are assigned either a "Knowledge Producer" or a "Knowledge Consumer" role.
- The Livability Consortium, an academic consortium consisting of two leading universities in the country of Boharia (a relatively large developing country in Latin America) and several international experts, applied for a federal grant to conduct a multi-year, multi-million dollar research program on air pollution in Bohar City. They just got informal word from the Boharia National Science Foundation that their proposal will be funded if they are able to leverage the grant by finding one or several matching grants.
- With some urgency, the President of Boharia has urged the Consortium to form a "Knowledge Partnership," consisting of knowledge producers and consumers, to help the country address ground-level ozone problems in the capital, Bohar City (a metropolitan area with more than 14 million residents). Air pollution impacts are clearly taking a serious toll on the population.
- When the Mayor of Bohar City got wind of this proposed Knowledge Partnership, she had some specific ideas about whom some of these 'knowledge partners' should be (including corporations and government agencies who could possibly put up matching grants as well as use the research findings) so that the effort would address real issues in her city (and help her win reelection).
- The potential members of the "Knowledge Partnership" have met once so far. In a lengthy initial meeting they discussed their interests and stated their views on the details of a proposed joint effort.
- You are about to attend the second meeting of the proposed Partnership, in which the research community, key policy makers and selected stakeholder representatives will see if they can agree on how to proceed with a joint research project.

### GAME LOGISTICS AND SCHEDULE

#### Preparation

You will receive 3 documents:

- ***General Instructions*** describing the situation in Boharia and Bohar City at present. These offer background information on air quality and public health trends, along with a bit of background about the other participants and their organizations. You are receiving these instructions via e-mail prior to the AGS technical meeting. **It will also be in your AGS registration packet. It is very**

This simulation was written by Catherine Ashcraft and Mieke van der Wansem of the Consensus Building Institute under the direction of Professor Lawrence Susskind, Massachusetts Institute of Technology on behalf of the Alliance for Global Sustainability.

**important that you read and understand this information before the Monday morning session!**

- ***Group Confidential Instructions*** describing the major points of agreement and disagreement within your "group" (knowledge producer or knowledge consumer) that came out at the last meeting. You need a group strategy for moving a joint research project forward. Again, you are receiving these instructions before the AGS meeting. **You will need to read and be familiar with these instructions!**

- ***Individual Confidential Instructions*** describing how, in the role you have been assigned, you are thinking about the partnership, your attitude toward the usefulness of basic as compared to applied research, possible time constraints that might affect you and your organization, and a sketch of your political and professional biases regarding air quality management. These instructions will be given to you on Monday morning. At that time, you will have approximately 45 minutes to read these and prepare for the upcoming "meeting".

**Pre-Meeting: Knowledge Producer/Consumer Group Caucus (30 min)**

You will have 30 minutes to meet with the other four members of your sub-group. Depending on your role, you will either meet with the Knowledge Producers or the Knowledge Consumers. During this time, you should focus on:

1. Is it possible to develop a group strategy for moving the joint research project forward?
2. What are the likely sources of funding available?
3. What constraints are there on this funding?

**Negotiation (90 min)**

You will have 90 minutes to address three questions:

1. What should be the scope of the multi-year research effort? Or, to put it another way, "How should the Partnership's research priorities or mission be defined?"
2. What timetable will the Partnership adopt for meeting its various goals and objectives?
3. What kinds of research "products" will the Partnership seek to produce in order to ensure maximum impact of its research results?

Note that the ten of you met once last month. At that time, you all agreed to involve a neutral facilitator to help manage the full group discussions. The facilitator will notify you when only 15 minutes remain. At that point, please summarize the research strategy you have developed and test the level of agreement within the group. Designate a member of the group to present your results.

**Full Group Debriefing (60 min)**

We will reconvene to hear brief summaries of all the groups' experiences and to discuss what lessons might be learned from the Knowledge Partnership simulation. Our goal, of course, is to see what the implications are for the Alliance for Global Sustainability.

**FINAL NOTES**

During your group conversations, you may explain your goals and underlying interests to all the other players in as much or as little detail as you like, AND with as much or as little accuracy as you think appropriate. **HOWEVER, DO NOT SHOW YOUR CONFIDENTIAL INSTRUCTIONS TO ANY OTHER PLAYER**

You are obliged to follow your confidential mandate, even if in "real life" you do not have these same interests or beliefs. Your goal is to meet the interests you have been assigned. Within these constraints, you are free to **BE AS CREATIVE** as possible.

**TIME IS EXTREMELY LIMITED.** Be as efficient as you can with your words and your time.

# BUILDING A KNOWLEDGE PARTNERSHIP

## GENERAL INSTRUCTIONS - PART II

Bohar City is notorious for its high (and increasing) levels of air pollution. While recent national efforts to curb emissions have yielded modest improvements, national air quality standards are still exceeded regularly and there is growing concern that the environmental, health, and economic impacts of air pollution are taking an unacceptable toll on the population (see Appendix A).

### I. OVERVIEW

It is now November 2003. The President of Boharia has been in discussion with the Livability Consortium – an academic consortium involving the nation's two leading universities and several international experts – about a new research project on air quality in Bohar City. It is rumored that the Consortium has applied for a $5 million five-year grant from the Boharia National Science Foundation (BNSF). If the grant is approved, the funds will be divided between two projects proposed by the Consortium: $3 million for the Transboundary Air Pollution Project and $2 million for the Transportation Planning Project.

Livability Consortium Grant Proposal to BNSF

| | |
|---|---|
| Purpose: | A new research project addressing Bohar City's high ground-level ozone concentrations |
| Total funding request: | $5 million over 5 years = $2.5 million BNSF + $2.5 million matching funds |
| Fund allocation: | $3 million for the Transboundary Air Pollution Project to investigate the spatial and temporal patterns of ozone producing emissions |
| | $2 million for the Transportation Planning Project to explore ways of reducing emission of ozone-precursors from the transportation sector |

Typically these funds require matching funds (under the BNSF's new Public-Private Partnership Policy). The President would like to ensure that if the Consortium does receive the grant, that this research effort will actually make a difference in the quality of life for Boharians. The President feels that this will happen if knowledge producers involve knowledge consumers throughout the research process. Therefore, in response to the serious effects on the population of air pollution, the President is strongly encouraging the Consortium to establish a Knowledge Partnership of government decision makers, experts and stakeholder representatives to help the country address ground-level ozone problems in the capital, Bohar City.

When the Mayor of Bohar City heard about this, she had some specific ideas about which 'knowledge partners' should be included (i.e. corporations and government agencies who could possibly put up matching grants as well as use the research findings) so that the effort would address real issues in her city and help her win her reelection in November 2006. The Mayor does not want to be responsible for producing yet one more "useless academic study" that only engineers with advanced degrees will be able to understand. Feeling pressure from both newly formed environmental NGOs as well as other political actors in Boharia and from the federal Environmental and Health Ministries, the Mayor has decided to make air quality management a major issue in her upcoming reelection campaign. Moreover, she has identified several industry partners willing to contribute financially to a major research effort on Air Quality Management in Bohar City, as long as they have a direct role in managing the research.

The City's Ministry of Environment has informed the Livability Consortium of the Mayor's concerns (and of the possible additional funds that might be available if the "right" kind of Partnership can be created). The Ministry is responsible for monitoring air quality levels in the city. Despite everyone's acknowledgement that the Ministry's data are rife with gaps and technical inadequacies, the Ministry wants whatever research project goes forward to use (and help improve) its data. In its annual published reports, the Ministry has found that Bohar City's ozone problems are getting worse. The Ministry hopes that the work of a new public-private Knowledge Partnership will help it win broader public support for the air quality management policies it has been advocating for many years.

The Mayor has encouraged the Livability Consortium to involve the Boharia Transportation Institute, an alliance of multinational and national vehicle and vehicle parts manufacturers in the new Partnership. The Institute has offered to contribute $5 million US ($1 million per year for 5 years) to the research effort as long as certain factors are given "due consideration" and the Institute has direct involvement in the research effort. This would more than double the funding already available and satisfy BNSF's matching requirement.

The Steering Committee of the Livability Consortium is very worried. There are clearly going to be substantial disagreements between what the academic community wants to accomplish and the political objectives of the Mayor and the industry donors. The research community's approach, as the Steering Committee thinks about it, requires a time-line dictated by the demands of science, not by an upcoming election. The academic community is also very concerned about the quality of the available data. They were actually thinking of starting their own air quality monitoring effort from scratch. The scientists are especially interested in extending their ongoing basic health impacts research and their studies of the dynamics of regional climate change. They had no intention of looking at other public policy questions. Though reluctant to make it their primary objective, the Consortium is willing to explore whether or not they can contribute in some way to solving the city's air quality problems.

## II. BACKGROUND

Bohar City is located in the central valley of Boharia, a rapidly developing Latin American country. It is the most densely populated city in the country with a population just exceeding 14 million in 2002, spread over an area of about 1500 sq km. Bohar City experienced rapid population growth throughout the 20th century, as a result of migration from rural provinces and a high birth rate. Its sprawling urban development has started to engulf adjacent, once-independent towns.

Bohar City's Mayor, Yvonne Klein, was elected in 2000 to her first 6-year term. The City has grown in national importance, largely due to its success in attracting foreign investment. It currently produces a significant portion of the national gross domestic product. Major local manufacturing industries include transportation equipment, and automobile and automobile part manufacturing companies. The national oil company, Bohar Independent Petroleum (BIP), also has its main offices adjacent to its refining and processing plants, located near Bohar City's eastern edge. Mayor Klein's campaign was strongly supported by these Boharian and multinational industrial interests. She will stand for reelection in 3 years time, in 2006.

Bohar City is the cultural heart of Boharia. Boharia's largest and most prestigious universities are located in Bohar City, as are most museums and cultural institutions. The leading educational institution is the Boharia Federal University (BFU). In response to increasing enrollment numbers in the 1990s, the government established the City University of Boharia (CUB). CUB's campus is scattered throughout Bohar City. As a result, the CUB system provides access to higher education to poorer and more remote populations of Bohar City.

The main recreational opportunities within Bohar City are provided by its system of parks along the banks of the Lalli River. However, as a result of resident concerns regarding the city's ozone problems, outdoor waterside restaurants have lost business, hotel occupancy has dropped, and organized outdoor events are poorly attended. The effects of high ozone levels are compounded by Bohar City's health care system, which disproportionately serves the upper and middle classes, and leaves many low-income residents without access. High rates of illnesses and mortality associated with critical ozone levels, especially in vulnerable populations such as infants, children and the elderly, are visible effects of the increasing severity of Bohar City's air quality problems.

## III. AIR QUALITY ISSUES

The Mayor's office has received petitions from EcoBoharia, a national coalition of environmental non-governmental organizations (NGOs), and Bohar City Citizens for Clean Air, a local advocacy group concerned with public health. Both groups are demanding that action be taken to protect residents and the environment of Bohar City from frequent violations of ozone air quality standards. The Mayor recognizes that rapidly growing cities can face major environmental and human health problems, and wants to ensure sustainable development of the region's natural resources, improve Boharia citizens' quality of life, and build the city's economic base. The President has

assigned the Ministry of Environment the task of making progress on these objectives. Past policy initiatives have effectively addressed some aspects of the problem. These measures have, however, done nothing to reverse worsening levels of ground-level ozone.

***Ground-level ozone***

Ground-level ozone ($O_3$) is a secondary pollutant that is formed when solar radiation interacts with hydrocarbons (HC) and nitrogen oxides ($NO_x$). HC and $NO_x$ are primary pollutants emitted by mobile sources, such as vehicles. Industries, such as oil refining and processing, also contribute substantially to ground-level ozone. In Bohar City, rapid population growth, rapid vehicularization, and industrial activity have produced extremely high levels of air pollution. The daily 1-hour maximum air quality standard for ozone is 0.110 ppm, which is frequently exceeded. (See Appendix B) These violations put the population at risk of the health effects described below.

***Human Health***

Children, the elderly, and individuals with respiratory problems are the populations most vulnerable to ground-level ozone's detrimental health effects. However, even healthy adults can suffer health problems while outdoors when levels are high. The many effects on human health include chest pain, cardiovascular problems, coughing, nausea, and even premature death. Extended exposure to high ozone levels can also exacerbate bronchitis, emphysema, asthma, and cause serious lung damage. Societal effects include the cost of treating acute and chronic illness, as well as productivity losses. The health risk due to ozone is quantified by estimating the relationship between the incidence of adverse health effects and air quality. This risk may be greater for populations with reduced access to health care services, such as the poor in Bohar City.

***Sustainable Energy and Transport Systems***

Bohar City's Mayor is committed to increasing energy production to accelerate development and raise Boharians' standard of living, while concurrently reducing the cost of energy production and energy-related pollution. However, any emission reduction strategies will have to be sensitive to the vital role of the transportation sector in economic development. The transportation sector is a major source of ozone-producing chemicals in the metropolitan area. Old diesel run buses, aging gasoline run microbuses, and poorly maintained, aging private vehicles collectively account for about 50% of all ozone precursors. The use of private automobiles and low-occupancy mass-transit vehicles, such as microbuses, has been increasing because the mass transit system has not had sufficient investment to accommodate the changing population distribution.

## IV. RESEARCH DESIGN ISSUES AND OPTIONS

Solving the problems caused by air pollution requires not just an understanding of the physical and chemical processes involved, but also an ability to balance economic, social, and technological factors, to make decisions in the face of uncertainty and incomplete data, and to educate and involve the community to ensure public acceptance and

implementation of whatever pollution control policies are adopted. The Mayor has requested, whatever studies the Partnership undertakes, that it produce a prescriptive analysis at the metropolitan level as well as recommendations that are politically and financially implementable within the next 2 to 3 years. From the research community's standpoint, scientific investigation must be completed carefully and systematically; it cannot be completed within artificially imposed time constraints.

The specific research design questions that participants will have to reach a consensus on today are:

**1. Scope of the proposed research.**

- What research needs to be done to address the city's air quality problems?
- What data are needed to inform these studies?
- Can the Ministry's existing data set be used?
- Will the Partnership need to generate new data?

Different groups have mentioned three specific research priorities and three possible research strategies (at their first meeting last month):

Research Priorities:

- *A study of temporal and spatial patterns of ozone emissions*
- *An analysis of the public health implications of emissions and reduction techniques*
- *Transportation options for reducing pollution levels*

**2. Research time line.**

- *Short time frame: preliminary results in 1 year*
- *Medium time frame: preliminary results in 2-3 years*
- *Long time frame: preliminary results ≥5 years*

**3. Research deliverables.**

- *Publications in peer reviewed academic journals.*
- *A comprehensive cost/benefit or policy analysis.*
- *New ozone monitoring system.*
- *Materials to support pubic education and public outreach.*

Please note that these options are not meant to preclude still others or combinations that the Partnership might choose to invent. However, the Partnership must take account of the fact that each option carries with it resource (financial, time) implications.

The facilitator's memorandum describes the options in more detail as they were discussed at the first meeting (See Appendix E).

## V. TODAY'S MEETING

The 10 stakeholders invited to today's meeting represent a cross-section of interests. They have full authority to make decisions on behalf of their respective institutions.

It is now November 2003. The past summer has kept public concerns about ozone levels in the news. The Mayor has personally communicated her enthusiasm and expectations to the group regarding their ability to develop an appropriate research strategy. The meeting is being held in the Ministry of the Environment's conference room, in downtown Bohar City. The participants have agreed that C. Friede, the retired President of Boharia Federal University, will facilitate the meeting.

**Decision Rule**

The President's office assumes that if eight of the participants at the meeting agree on how a Knowledge Partnership should operate, the group will have sufficient support to proceed. If at least eight members cannot reach an agreement, the President's office will recommend that all federal funding (BNSF) be cancelled. Therefore, **eight out of ten of the participants** must approve a Partnership plan addressing the three key issues. However, participants should strive for consensus if possible. Unresolved issues and any group left out will likely have negative effects on implementation of the Partnership effort. If the necessary support can be secured, the research strategy will be written up as a formal plan, contingent on the Ministry of the Environment's, as City representative, and Boharia Transportation Institute's, as the financial backer's, formal approvals. If no agreement can be reached, the decision on how to proceed will be postponed for at least a year, which would not be good for anyone. In that event, it is likely that BTI will withdraw its matching funds as well.

***Participants***
The following are the participants in the meeting.

**Knowledge Producers**

A. Hernandez, Professor, Boharia Federal University (BFU)
A. Hernandez is a senior professor in atmospheric chemistry at the Boharia Federal University. BFU is a member of the Livability Consortium and Prof. Hernandez is the key consortium contact at BFU. Prof. Hernandez founded and leads Boharia's Transboundary Air Pollution Project. The project aims to improve the scientific understanding of long-term air pollution dynamics. The research team is focused on the formation of ground-level ozone and its precursors, hydrocarbons and $NO_x$. The group collects and analyzes information primarily on physical and chemical systems at the national, regional, and local scales. The group also has excellent ties to similar programs at several foreign universities. As part of the Livability Consortium, Prof. Hernandez applied for a $2.5 million (US) grant from the Bohar National Science Foundation and received informal word that the grant was approved on its technical merits but that it is unlikely to be awarded unless matching funds can be generated (under the BNSF's new Public-Private Partnership policy). Professor Hernandez has a PhD in Atmospheric Chemistry from the Technical University of Norway.

R. Frau, Professor, City University of Boharia (CUB)
R. Frau is the Division Director of the Department of Urban Studies at the City University of Boharia, which is the country's premiere engineering institution. CUB is a member of the Livability Consortium and Frau is CUB's key contact for the Consortium. Prof. Frau is head of the Transportation Planning Project at the Consortium, which stands to receive $2 million from the proposed BNSF grant (if the necessary matching funds can be secured). Prof. Frau focuses on transportation planning and conducts research in Bohar City as well as other metropolitan areas in Bohar. Professor Frau has a joint PhD in Economics and Civil Engineering.

M. Tomizawa, Senior Research Scientist and Administrator, Federal Institute for Public Health (FIPH)
M. Tomizawa is Acting Head of the Federal Institute for Public Health based in Bohar City. Dr. Tomizawa has a doctorate in public health from the London School of Hygiene and Tropical Medicine. Dr. Tomizawa's dissertation focused on the relationship between air-pollutants and infant mortality. The FIPH is particularly interested in documenting the effects of ground-level ozone on the health of vulnerable populations.

P. Smith, Vice President Strategic Planning, Boharia Transportation Institute (BTI)
P. Smith leads the Institute's policy studies unit. BTI is an alliance whose members include three multinational automobile companies that manufacture passenger vehicles in Bohar and two domestic companies that manufacture specialized parts for passenger vehicles. BTI has served as a consultant to government agencies on policy matters for over 10 years. The automobile sector is one of Boharia's most important contributors to the national economy. P. Smith focuses on industry options resulting from the rising average age of the nation's private vehicles.

J. Carson, Director of Air Management, Bohar City Ministry of Environment (BME)
J. Carson is a representative from the Ministry of Environment. Carson is responsible for coordinating city efforts to implement the Mayor's air pollution reduction agenda. In response to the worsening air pollution problems, the BME is pushing for tougher (national as well as metropolitan) environmental regulations. It has stated that it will seek annual emissions reductions targets for $NO_x$ and HC in order to improve city compliance with ozone standards. The Ministry produces data on a regular basis describing the ozone concentration trends for Bohar City (See Appendix A).

**Knowledge Consumers**

A. Lopez, Lead Policy Analyst, Boharia Independent Petroleum (BIP)
Boharia is the world's seventh largest oil producer. BIP is the nationalized oil company and a symbol of national sovereignty and independence. BIP has exclusive rights to explore and develop Boharia's oil reserves. BIP is a significant contributor to Boharia's GDP. A. Lopez is Lead Policy Analyst at BIP's fuels branch and investigates industry options for low-emissions innovation.

R. Rodriguez, President, Bohar City Citizens for Clean Air ($BC^3A$)
Bohar City Citizens for Clean Air is an active metropolitan advocacy group that deals with air pollution, public health, and equity issues. The group has members from many of the city's various economic groups. It has demonstrated that it can effectively mobilize its members behind issues of public concern. $BC^3A$ is critical of the national government's preferential treatment of the petroleum and automotive industries. They argue that policy changes are needed to reduce air pollution and ensure adequate health care for all of Bohar City's residents.

E. Jackson, Director, EcoBoharia
EcoBoharia is a national coalition of NGOs that deals with Boharia's environmental issues. In the past, EcoBoharia has been deadlocked with the federal government on how to address environmental issues confronting the country. The group has mobilized its members to initiate public demonstrations, boycotts, media campaigns, and has pursued litigation to achieve its goals. EcoBoharia is critical of the government's preferential treatment of industry and argues that fundamental changes in consumer behavior are needed to curb pollution.

S. Fox, Director, Bohar City Metropolitan Rapid Transit (BMRT)
Bohar Metropolitan Rapid Transit is a metropolitan transportation body organized in 1984. It is a public-private partnership. BMRT is aware that its infrastructure (consisting of a commuter rail and bus system) is no longer able to meet the expanding city's needs. However, it has been unable to generate the income it needs to document changing transportation patterns and demand in order to develop a strategy for investing in construction of new infrastructure.

J. White, Executive Director, Development Branch, Boaz Bus Manufacturing Corporation, Inc. (Boaz)
Boaz Bus Manufacturing Corporation is a national company that manufactures buses. Its main client is Bohar City Metropolitan Rapid Transit. Their share of the bus fleet has been dramatically reduced because of the rising popularity of microbuses. However, BOAZ has been investing extensively in new high-occupancy, low-emission buses and is poised to put them in circulation.

## FACILITATOR

C. Friede

C. Friede served as Chair of the Department of Mechanical Engineering and then President of Boharia Federal University before retiring eight years ago. While at BFU, Friede was known for having the ability to foster interdisciplinary research involving non-traditional partners.

## VI. APPENDICES

A. Ozone Concentration Trends in Bohar City

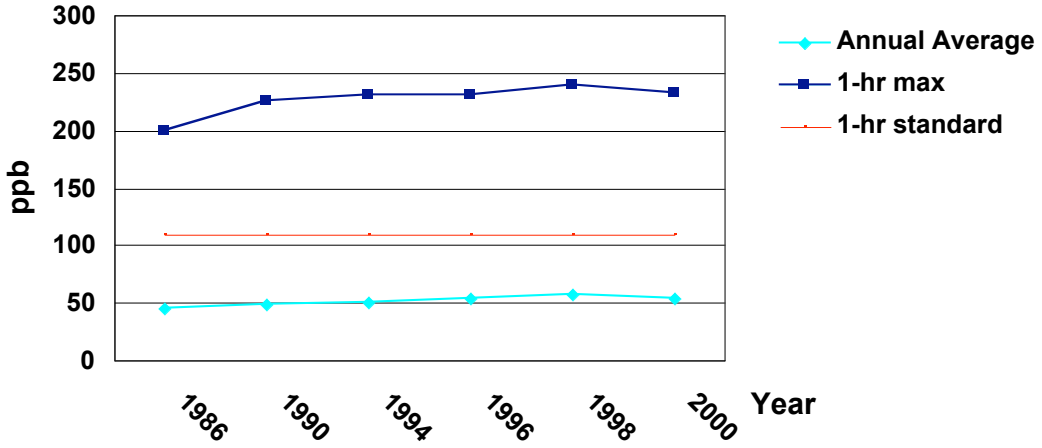
B. Days Exceeding Standards for Ozone Concentrations in Bohar City (1988-98)

C. Public Health Data Showing Population Exposure to Ozone

D. Days Bohar City Residents Hospitalized due to Suspected ozone-related illnesses

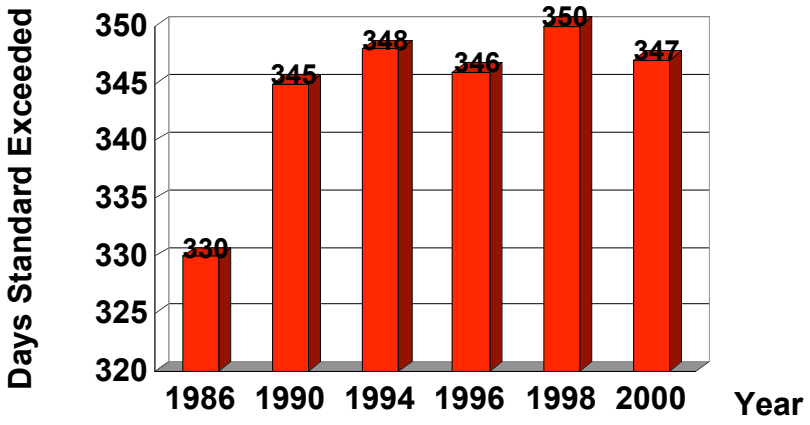
E. Memorandum by C. Friede: Summary from the First Meeting of the Proposed Knowledge Partnership. This highlights the major conflicts and lists the decisions that need to be made for any partnership or joint research effort to move forward.

## Appendix A: Ozone Concentration Trends for Bohar City



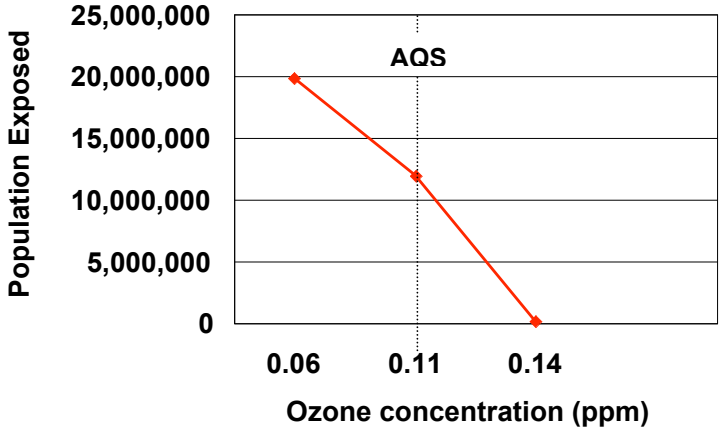

Source: Bohar City Ministry of Environment
Note: No data available before 1986, data collected at four-year intervals from 1986 to 1992, data collected at two-year intervals from 1994 to 2000, 2000 is most recent year for which data are available. Data averaged from four sites in Bohar City metropolitan area (excepting 1998, in which data were only available from three monitoring stations).

## Appendix B: Days Exceeding Standards for Ozone Concentration in Bohar City Metropolitan Area



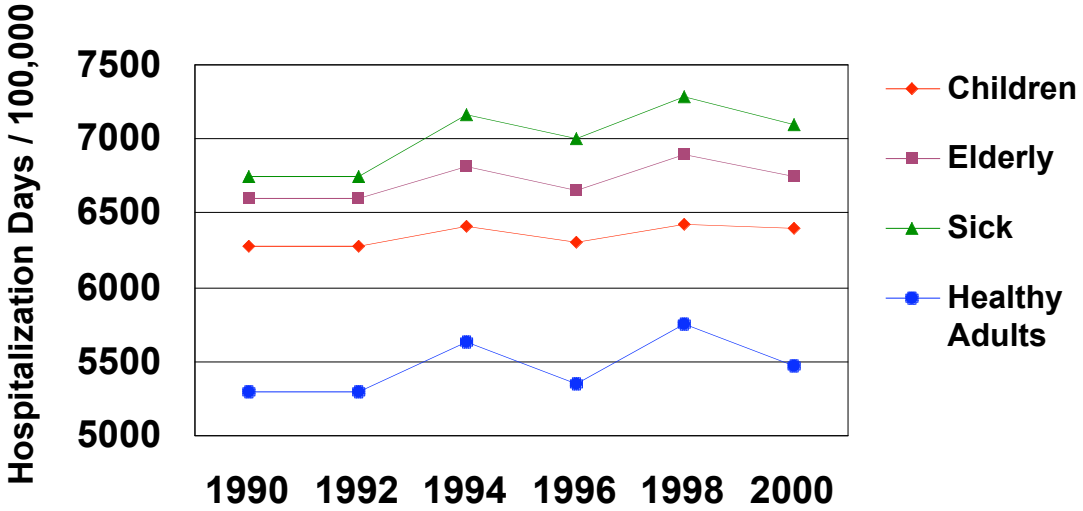

Source: Bohar City Ministry of Environment
Note: No data available before 1986, data collected at four-year intervals from 1986 to 1992, data collected at two-year intervals from 1994 to 2000, 2000 is most recent year for which data are available. Data averaged from four sites in Bohar City metropolitan area (excepting 1998, in which data were only available from three monitoring stations).

## Appendix C: Population Exposure to Stated Ozone Concentration (1994-2000)




Source: Federal Institute for Public Health
Note: The air quality standard (AQS) is 0.110 ppm. All population points to the right of this standard indicate population that was exposed to ozone levels in excess of it. Data on ozone concentrations are from the Bohar City Ministry of the Environment, and are averaged from data collected biennially from four monitoring stations from 1994-2000 (excepting 1998, in which data were available from only three stations).

## Appendix D: Days Bohar City Residents Hospitalized due to Suspected Ozone-Related Illness




Source: Federal Institute for Public Health. Data collected solely from Bohar City Hospital.
Note: Children Hospitalization Days: days admitted to hospital/100,000 Bohar City residents aged 0-14 years; Elderly Hospitalization Days: days admitted to hospital/100,000 Bohar City residents aged 65 years and older; Sick Hospitalization Days: days admitted to hospital/100,000 Bohar City residents with known chronic heart and lung disease; Healthy Adults Hospitalization Days: days admitted to hospital/100,000 Bohar City non-children, -elderly, or -sick residents.

## Appendix E: MEMORANDUM
## Prepared by C. Friede, Facilitator

### SUMMARY OF THE FIRST MEETING FROM THE PROPOSED KNOWLEDGE PARTNERSHIP

I appreciate the confidence you have placed in me to facilitate these research partnership discussions. I recognize the enormous time constraints we are working under, and have prepared this memorandum to prevent us from going over ground already covered. I have attempted to faithfully summarize your views as you presented them in the first meeting of the Proposed Knowledge Partnership. Please be advised that this memorandum is intended as a memory aid only, and not as an endorsement or criticism of any course of action or rationale. I hope you will take the time to read it over and use this as a springboard from which to generate new ideas to move the partnership forward.

*Participants*

**Knowledge Producers:**
J. Carson, Director of Air Management, Bohar City Ministry of Environment (BME)
R. Frau, Professor, City University of Boharia (CUB)
A. Hernandez, Professor, Boharia Federal University (BFU)
P. Smith, Vice President, Boharia Transportation Institute (BTI)
M. Tomizawa, Senior Research Scientist and Administrator, Federal Institute for Public Health (FIPH)

**Knowledge Consumers:**
A. Lopez, Lead Policy Analyst, Boharia Independent Petroleum (BIP)
R. Rodriguez, President, Bohar City Citizens for Clean Air ($BC^3A$)
E. Jackson, Director, EcoBoharia
S. Fox, Director, Bohar City Metropolitan Rapid Transit (BMRT)
J. White, Executive Director, Development Branch, Boaz Bus Manufacturing Corporation, Inc. (Boaz)

## Alliance Motivation

Several reasons were stated for why members should wish to be engaged in this effort. They were as follows (in no particular order):

- ***A serious public need*** to address the issue of air pollution
- ***Good publicity*** that will accompany any agreement to address the air pollution crisis
- ***Increased funding*** that may be available from the Boharia National Science Foundation and other institutions (for example, the Boharia Transportation Institute) if an agreement can be reached

- ***Partnership model*** as the next wave of research, advantages to embracing early, being a prototype
- ***Industry*** sees potential benefits from working with universities on this and future R&D
- ***Universities*** see collaborating with industry as a way to test some of their ideas

*Main Issues and Options*

The following is a summary of the main issues that we must address and specific options that were discussed:

***Issue 1: Scope of the proposed research.***

How should the Partnership's research priorities and/or mission be defined?

***Options:***

A. Basic research on the science of ozone
B. Research on public health aspects of the problem
C. Analyses of public policy alternatives, in particular of transportation sector strategies

A. Basic research is needed to reduce uncertainties regarding how ozone fluctuates over space and time in Bohar City. To characterize how ozone emissions change over space and time, considerable data will need to be collected to permit any meaningful analysis. The Ministry of Environment has a data set (with some deficiencies) available. Some in the research community criticized the deficiencies of the Ministry's data set and advocated establishing a new, systematic monitoring system to develop new databases regarding ozone and ozone formation. The data will inform modeling and forecasting of important trends. The members of the Livability Consortium noted that it was their initial $2.5 million grant proposal that initiated this effort. They stated that just creating a new monitoring system to provide data for a 5-year study would cost $1 million. A serious monitoring effort would then cost an additional $400,000 a year to maintain. Then, the estimated 5-year total cost would be $3 million.

B. Studies are needed that close gaps in our understanding of the effects of ozone on public health. Of particular value are studies that target the health implications of poor air quality on particularly vulnerable populations, such as infants, youth, the elderly, and poor populations. These populations are likely to suffer the effects of exposure more than others as a result of their reduced access to health services. Using such research, public health officials could develop quantitative objectives for infant mortality, childhood asthma, respiratory infections and targets for primary health care coverage. Mayor Klein has stated that she hopes that the work of the Knowledge Partnership can be applied as soon as possible, which strengthens the recommendation for a more immediate time frame. Taking a long-

term outlook, the Federal Institute of Public Health has proposed establishing a Center for Air Quality Management at its Bohar City facility. This Center would evaluate the actual benefits in terms of public health of the City's air quality improvement strategy. Funding for it would be representative of the participants of the air quality management team and would include government, industry, academia, and other non-governmental actors.

C. An analysis of public policy alternatives should assess comparative impacts on ozone levels. In particular, an evaluation of transportation strategies is needed to assess how updating the existing mass transit system could meet the changing distribution of the City's population and reduce emission of ozone precursors. This analysis could include a characterization of all mobility and transport options, a comparative analysis of emissions, and/or forecasts of transportation related pollutants.

We discussed trying to balance these research objectives within a phased research plan. The major limitation on the scope of our research was identified as fund availability.

***Issue 2: Research Timeline***

What timetable will the Partnership adopt for meeting its various goals and objectives?

***Options:***

*A. Short time frame: Results in 1 year*
Action is needed as soon as possible to alleviate the suffering of Bohar City's citizens and reduce the potential risks they are facing.

B. *Medium time frame: Results in 2-3 years*
If the need to take action to alleviate the crisis is balanced with the need to ensure the robustness of the data and analysis, this time frame is more appropriate. This is also likely to be the relevant time frame for the cost/benefit studies needed to inform transportation policy. This time frame would be compatible with the Ministry of Environment and the President's requests.

*C. Long time frame: Results in ≥ 5 years*
A long time frame is vital to establishing the statistical significance of key trends. Without the necessary longitudinal data, it will not be possible to credibly characterize how ozone fluctuates over space and time or to describe the population's exposure to ozone and the associated health effects. At minimum, creating and maintaining a complete data collection system for five years will cost $3 million.

Using multiple timelines simultaneously, or phasing, was proposed as a strategy for accommodating different research interests. There was discussion about timelines for releasing any preliminary research results. The major debate centered on how long the

various studies would require so that they could be conducted in a credible way and what time constraints certain policy decisions would put on our research design.

***Issue 3: Research Deliverables***

What kinds of research products or deliverables will the Partnership seek to produce in order to ensure maximum impact of our research results?

***Options:***

*A.* *Peer reviewed academic journals.* These will primarily facilitate the exchange of scientific data and information among experts and technical staff in relevant fields. Outputs in this form increase the scientific standing of the research results.

*B.* *Cost/Benefit or Policy analysis.* Technical reports assigning monetary value to various costs and benefits could be prepared. Coupled with analytical reports outlining policy options and their implications, such analyses would be most useful to industry and government.

*C.* *New ozone monitoring system.* Either the Ministry of Environment's existing monitoring system could be renovated and expanded, or an entirely new monitoring system could be built.

*D.* *Public outreach.* Research summaries written or produced in a "popular" format will help stakeholders and the general public understand more about the problem and possible public policy responses. Workshops, press releases, television segments, policy statements and materials for public schools would all help, in the long run, to increase public awareness and build political support for action.

It was generally agreed that these could be produced concurrently, but that different participants might be involved in producing different formats.

## Ground Rules

The ground rules we have agreed to abide by at all future meetings are:

1. Only one person will speak at a time and no one will interrupt when another person is speaking.

2. Each person should express his or her own views rather than speaking for others at the table.

3. Each person will make every effort to stick to the agenda.

4. If any participant opposes someone else's suggestion they must propose an alternative that could realistically meet all parties' needs.

5. Decisions will be made by consensus, if possible. If no consensus can be reached, an eight out of ten vote is needed for approval of any "package" of decisions (Note: Boharia Ministry of Environment and Boharia Transportation Institute need to formally approve proposals involving non-BNSF money).

6. If no consensus and no eight-out-of-ten vote can be reached, the decision about how and whether to pursue a joint research partnership will be postponed for at least one year.

# Suggested Agenda for the Second Meeting of the Knowledge Partnership

***Pre-Meeting Caucus***

**Pre-meeting caucus of separate sub-groups (30 min)**
Knowledge producers and knowledge consumer sub-groups meet separately to develop their negotiation strategies.

***Negotiation (90 min)***

**Specifying the research scope (40 min)**
Facilitator leads discussion about research scope. At the end of 30 minutes, the group should try to tentatively agree on the scope of the research.

**Specifying a research timeline (20 min)**
Within this time, the group should try to tentatively agree on a timeline for the research effort. Please note that until the final agreement is drafted, all aspects (even previously agreed upon points) are subject to change based on the group's decision.

**Specifying research deliverables and an overall agreement (30 min)**
The group will have approximately 30 minutes to decide on research deliverables. Everyone will be notified when only 15 minutes remain. At that point, the facilitator will work with the group as a whole and may meet privately with group members to develop an overall agreement. This will include specifics describing the research scope, timeline, and deliverables. The group should designate a member to present its results.