

# **GUIDELINES FOR PREPARING A TECHNOLOGY POLICY PAPER FOR the WASHINGTON INTERNSHIPS FOR STUDENTS OF ENGINEERING (WISE) PROGRAM**

## ***PURPOSE***

The purpose of a technology policy paper is to provide an up-to-date analysis of a current issue in public policy which centers around scientific or technological developments. It is intended to inform those affected by a particular issue; therefore it must be balanced and should be relatively comprehensive. A policy paper is a research paper, intended to bring the best, most current information to bear on an important topic. It should synthesize and summarize existing information in clear and insightful ways; it will not contribute new, original data.

A policy paper is not:

- A technical paper; it should not include 10-20 pages of descriptions of the technology; the challenge is to concisely and clearly give the non-technical reader a sufficient understanding of the technical aspects of the issue involved, without going into detail.
- A legal brief; it is not intended to take an advocacy position or to verify a predetermined conclusion, although it may make recommendations.
- A history paper; it must address an issue of current or future importance.
- A journalistic account; it should not rely primarily on anecdotes, personal experiences, anonymous sources, or newspaper accounts.

## ***COMPONENTS***

The policy paper must include all of the following components, in approximately the length indicated for a paper 30-40 pages in total length (double spaced).

### **A. Issue Definition (4-6 pages)**

Begin your paper with a short section introducing your topic. The purpose of this section is to give the reader an immediate indication of the issue you are addressing and why it is significant. Be very explicit about the subject matter and be careful to define the central terms of your paper. Most of

this section should be devoted to indicating why this topic is worthy of consideration. The operating assumption in writing this section should be that the reader is an ardent skeptic. Questions which may be appropriate to answer in this section include:

- What is the key driving force of this issue? For example, what scientific or technological changes led to this issue?
- How many people are affected by this issue?
- Does this issue have severe economic, environmental, or social consequences?
- If the issue is not dealt with, will it cause irreversible damage?
- Has the issue generated significant public reaction or concern?

**B. Background (5-7 Pages)**

This section of the paper should describe the key technological and historical aspects of the issue (without resorting to a historical chronology) and the policy system which has developed to deal with the issue. Policy systems will be very different for each issue; for example, the policy system for dealing with strategic arms limitations is very different than the system for dealing with acid rain.

Among the questions which should be answered in this section are the following:

- When did the issue arise?
- Which participants in the system (interest groups, political leaders, etc.) brought the issue to public attention?
- What were the interest and values at stake; e.g., economic growth vs. environmental protection. (See the "Interest and Values" checklist Table 1).
- When and how did the government respond? Which levels of government were viewed to be responsible?
- What is the legal and regulatory framework which has developed? For example, describe the laws and regulations enacted, the agencies responsible for administering these laws, etc.
- How have government policies affected the issue to date?

One of the greatest difficulties faced, both in writing the paper and in making the oral presentation, will be to keep this material concise. Students will read vast amounts about their topic and it will be

difficult to resist the temptation to tell the reader about everything learned in the process. Don't do it! Find a clever way to get the key information needs across to a lay audience clearly and concisely.

### **C. Key Conflicts and Concerns (6-8 pages)**

This section flows naturally from the background section by discussing the immediate and future aspects of the issue. It is intended to describe why this issue has been difficult to resolve. For example, this could include discussion of potential technological breakthroughs, economic costs, impasses between key individuals, arguments over the state of knowledge (e.g., our capacity to predict impacts from acid rain), etc. By the end of this section, the reader should have a good picture of the key conflicts over this issue and the future prospects for resolving it. Questions to be asked in this section include:

- What are key constraints to resolving this issue?
- How credible is our knowledge about this issue? Are the participants disagreeing over "the facts"?
- How are the participants behaving in order to realize their values and interests? What resources (money, people, time, media) are they using?

Note: For many papers, Sections B and C can be combined.

Table 1: Interest and Values Checklist

SOCIAL	ECONOMIC	ENVIRONMENTAL	POLITICAL/ INSTITUTIONAL
<p>Quality of Life</p> <ul style="list-style-type: none"> <li>• Educational Opportunities</li> <li>• Health Care</li> <li>• Housing</li> <li>• Utilities</li> <li>• Recreational Opportunities</li> <li>• Public Safety</li> <li>• Aesthetics</li> <li>• Comfort</li> <li>• Lifestyle</li> <li>• Leisure</li> </ul> <p>Stability/Certainty</p> <p>Equity</p> <p>Health</p> <ul style="list-style-type: none"> <li>• Occupational</li> <li>• Public</li> </ul> <p>Conservation</p> <p>Safety</p> <ul style="list-style-type: none"> <li>• Occupational</li> <li>• Traffic</li> </ul> <p>Security/Crime</p> <ul style="list-style-type: none"> <li>• Personal</li> <li>• Community</li> </ul> <p>Autonomy</p> <ul style="list-style-type: none"> <li>• Independence/Freedom</li> </ul> <p>Cultural</p> <p>Moral/Ethical</p> <p>Religion</p> <p>Ethnicity</p> <p>Personal Efficacy</p> <p>Heritage</p> <ul style="list-style-type: none"> <li>• Artifacts and Sites</li> <li>• Lifestyle</li> <li>• Mores</li> <li>• Resources</li> </ul> <p>Status</p>	<p>Economic Opportunities</p> <ul style="list-style-type: none"> <li>• Employment</li> <li>• Small Business</li> <li>• Corporate</li> </ul> <p>Personal Income</p> <p>Public Revenues</p> <ul style="list-style-type: none"> <li>• Taxes</li> <li>• Fees/Transfers</li> </ul> <p>Property Values</p> <p>Cost-of-Living</p> <p>Inflation</p> <p>Economic Well-Being</p> <ul style="list-style-type: none"> <li>• Lifestyle</li> <li>• Security</li> <li>• Status</li> </ul> <p>Economic Sectoral Changes</p> <ul style="list-style-type: none"> <li>• Manufacturing</li> <li>• Agriculture</li> <li>• Other Extractive</li> <li>• Service</li> <li>• Government</li> </ul> <p>Economic Growth</p> <ul style="list-style-type: none"> <li>• Local</li> <li>• Regional</li> <li>• National</li> </ul> <p>Competition for</p> <ul style="list-style-type: none"> <li>• Labor</li> <li>• Resources</li> </ul>	<p>Aesthetics</p> <ul style="list-style-type: none"> <li>• Air Quality</li> <li>• Water Quality</li> <li>• Land Forms</li> <li>• Rivers and Streams</li> <li>• Visual Intrusions</li> <li>• Noise</li> <li>• Odors</li> <li>• Wildlife/Plants</li> </ul> <p>Physical Alterations</p> <ul style="list-style-type: none"> <li>• Air Quality</li> <li>• Water Quality and Availability</li> <li>• Land-Use Changes</li> <li>• Rivers and Streams</li> <li>• Weather Modification</li> <li>• Visibility</li> </ul> <p>Archeological Sites and Artifacts</p> <p>Parks and Recreational Areas</p> <p>Unique or Rare species and Habitat</p> <p>Toxics and Hazardous Substances</p> <p>Population Density</p> <p>Stability</p> <p>Diversity</p> <p>Production</p> <p>Open Space</p>	<p>Public Participation</p> <ul style="list-style-type: none"> <li>• Leadership</li> <li>• Access</li> <li>• Personal Power and Efficacy</li> </ul> <p>Ethnic Identity</p> <ul style="list-style-type: none"> <li>• Self-Determination</li> <li>• Control over Communal Property and Resources</li> <li>• Intergovernmental Relations</li> </ul> <p>Autonomy</p> <ul style="list-style-type: none"> <li>• Community</li> <li>• State</li> <li>• Regional</li> <li>• Organizational</li> </ul> <p>Stability</p> <ul style="list-style-type: none"> <li>• Leadership</li> <li>• Rules of the Game</li> <li>• Planning Capability</li> <li>• Organizational Inertia</li> </ul> <p>Interdependence</p> <p>Regulation and Control</p> <p>Public/Private Ownership</p> <p>Complexity/Simplicity</p> <p>Good Government</p> <p>Partisanship</p>

**D. Policy Alternatives (10-15 pages)**

This section informs the reader about the choices for resolving or mitigating the problem.

Alternatives should be limited to options which policymakers can control--it is not appropriate to

focus on such broad alternatives as societal changes or new economic systems. This section is to include the following components.

1. Identification of Alternatives: Select several options (2 to 5) and describe what they are and what they require. You should not feel restricted to obvious options. You are encouraged to be innovative or to adapt alternatives from other related situations.
2. Criteria for Evaluation: Select the criteria by which you will evaluate each alternative (see the section on Criteria for Evaluating Alternatives). Although some criteria, such as economic effects, may be commonly used, there are no clear guidelines for choosing these criteria. The choice largely depends on your knowledge of the problem area, but guard against choosing "loaded" criteria which a priori favor one alternative. The important point here is to be clear and explicit about how you will evaluate each option.
3. Compare and Evaluate each Alternative: Using the criteria you have selected, assess the costs and benefits of each alternative. (Who will gain and lose, how much, how soon, etc.?) What trade-offs are involved among alternatives? Is there any clear choice? How feasible are the alternatives--that is, how difficult will it be to implement them?

You are not required to generate original data for this paper--in most cases sufficient information already exists. However, by the time your prospectus is written, you should know what reference material and information sources you will be using.

### ***CRITERIA FOR EVALUATING ALTERNATIVES***

While the results of the policy analyses will seldom eliminate the uncertainties that policymakers face, these results can help them to make better informed choices. Results of policy analyses are useful in this regard to the extent that they systematically describe, evaluate, and compare alternatives using clearly specified criteria and appropriate qualitative and quantitative measures.

Five general criteria for evaluation are listed in Table 2. Each criterion has to be defined more specifically for the category of problems and issues being evaluated and compared. Specific qualitative and quantitative measures have to be specified for each. For example, as applied to issues involving water supply and use in dry areas, effectiveness is defined in terms of how much water an alternative would save or add, whether it would avoid or mitigate the problem, and whether it would offer a long- or short-term solution (see Table 3). Among the quantitative measures used in

this case are gallons or acre-feet per year saved or added, the percentage increase in supply, and the duration of the solution in time (e.g. years); the anticipated degree to which the problem is avoided or mitigated is an example of a qualitative measure in this instance.

The basic point about measures is that while many policymakers desire to have a "bottom line," no single measure or evaluation criterion can provide an adequate summary of the costs, risks, and benefits of alternative policies. The combination of measures and criteria to be used is determined both by what is being evaluated and the interests and values that are at stake. Although economic measures and criteria are often used, they are frequently inapplicable and seldom provide, by themselves, an adequate basis for evaluation. For example, dollars are not an adequate measure of aesthetic values nor do they provide an accurate indication of how equitably an alternative may distribute costs, risks, and benefits. While it is possible to determine the dollar cost of environmental controls, the associated social costs often cannot be determined. By themselves, economic measures and criteria can be used to evaluate only one component of overall costs, risks, and benefits.

It should be emphasized that Tables 2 and 3 are intended as an aid for you to systematically think about policies; they are not intended to provide a rigid outline or format to be used in writing your paper. Your paper should be interesting, readable, and only include the most important, pertinent information.

**Table 2: Evaluation Criteria**

<b>Criterion</b>	<b>What Does it Evaluate?</b>
Effectiveness	Achievement of Objective <ul style="list-style-type: none"> <li>• Does it avoid or mitigate the problem or issue?</li> <li>• Is it a short- or long-term resolution or solution?</li> <li>• Is it dependent of state-of-society assumptions?</li> </ul>
Efficiency	Costs, Risks and Benefits <ul style="list-style-type: none"> <li>• What are economic costs, risks, and benefits?</li> <li>• What are social costs, risks, or benefits?</li> <li>• What are environmental costs, risk, or benefits?</li> <li>• Is it reversible/irreversible, short-or long-term?</li> </ul>
Equity	Distribution of Costs, Risks, and Benefits <ul style="list-style-type: none"> <li>• Who will benefit?</li> <li>• Who will experience the costs?</li> <li>• Who will assume the risks?</li> </ul>
Flexibility	Applicability/Adaptability <ul style="list-style-type: none"> <li>• Are local and regional differences accommodated?</li> <li>• Are differences among social groups and economic sectors taken into account?</li> <li>• How difficult will it be to administer?</li> <li>• how difficult will it be to change?</li> </ul>
Implementability	Adoptability and Acceptability <ul style="list-style-type: none"> <li>• Can it be implemented within existing laws, regulations, and programs?</li> <li>• Can it be implemented by a single agency or level of government?</li> <li>• Is it compatible with existing societal values?</li> <li>• Is it likely to generate significant opposition?</li> </ul>

**Table 3: Evaluative Criteria and Measures**

<b>CRITERIA</b>	<b>AS APPLIED TO WATER AVAILABILITY</b>	<b>MEASURES</b>
Effectiveness  Achievement of policy objective	<ul style="list-style-type: none"> <li>• How much water can be added or saved?</li> <li>• Does it avoid or mitigate the problem?</li> </ul>	Quantitative: <ul style="list-style-type: none"> <li>• Gallons or acre-feet per year</li> <li>• Percentage reduction in water requirement</li> </ul> Qualitative: <ul style="list-style-type: none"> <li>• Degree to which the problem is avoided</li> <li>• Degree to which the problem is mitigated</li> </ul>

<p>Efficiency</p> <p>Costs, risks, and benefits</p>	<ul style="list-style-type: none"> <li>• What are the economic costs and benefits of saving a given quantity of water?</li> <li>• What are the economic and environmental risks?</li> <li>• How is water quality affected?</li> <li>• Are environmental values such as instream uses and natural beauty affected?</li> </ul>	<p>Quantitative:</p> <ul style="list-style-type: none"> <li>• Dollar costs per unit of energy produced</li> <li>• Percentage increase of costs of energy product</li> </ul> <p>Qualitative:</p> <ul style="list-style-type: none"> <li>• Acceptability of risks</li> <li>• Degree to which water quality is improved or degraded</li> </ul>
<p>Equity</p> <p>Distribution of costs, risks and benefits</p>	<ul style="list-style-type: none"> <li>• How are costs, risks, and benefits distributed among the states of the western region?</li> <li>• Are there interregional consequences?</li> <li>• How are agricultural interests affected compared to energy industry interests?</li> </ul>	<p>Qualitative:</p> <ul style="list-style-type: none"> <li>• States which are benefited or deprived</li> <li>• Degree to which interregional conflicts are increased or decreased</li> </ul>
<p>Flexibility</p> <p>Adaptability to location needs and changes over time</p>	<ul style="list-style-type: none"> <li>• How well do alternatives allow for conditions at different locations?</li> <li>• Is the option reversible?</li> </ul>	<p>Qualitative:</p> <ul style="list-style-type: none"> <li>• Degree to which location variances are obtainable</li> <li>• Degree of reversibility</li> <li>• Degree of state and local responsibility</li> </ul>
<p>Implementability</p> <p>Adoptability and acceptability</p>	<ul style="list-style-type: none"> <li>• How difficult will it be to change existing political and regulatory structures?</li> <li>• How will parties-at-interest respond?</li> <li>• How difficult will it be to administer?</li> <li>• Are the processes for making choices open to broad participation?</li> </ul>	<p>Quantitative:</p> <ul style="list-style-type: none"> <li>• Dollar costs of administration</li> </ul> <p>Qualitative:</p> <ul style="list-style-type: none"> <li>• Degree to innovation required (are new institutions or laws required, or can it be achieved with existing regulatory structure?)</li> <li>• Degree to which stakeholders are likely to respond positively or negatively</li> <li>• Degree to which decisionmaking processes are open to participation</li> </ul>

## E. Recommendations (2-5 pages)

Your paper should conclude with a summary of the central knowledge from your paper. This the "bottom line" which you would want key policymakers to be informed about. Start with a paragraph which summarizes the issue, why it is important, and why it has not been resolved. Then, have a few paragraphs with your recommendations on what can be done to resolve this issue. You do not necessarily have to recommend one choice as the solution. In fact, frequently there is no one best

choice. You may recommend a combination of choices or you may discuss the need to remove a barrier before any one choice would help--for example, a technological barrier or a barrier related to the lack of public awareness of a problem.

### ***SAMPLE TOPICS***

Examples of current policy issues include:

- Global Temperature Increases and/or Ozone Depletion
- How to Control Acid Rain
- Militarization of Space
- Municipal Control of Solid Wastes
- Safety of Commercial Air Travel
- The Federal Role in Developing Nanotechnology

Examples of poor topics include:

- The World Recession
- Marxist Thought in the 20th Century
- An Evaluation of Bill Clinton's Presidency
- Why We need Gun Control

All papers must be written in proper English: spelling errors, awkward and run-on sentences, errors in verb-subject agreement, one-sentence paragraphs, etc. are not acceptable.

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