1 Public Good

You find a very exciting summer internship job as an assistant to the director of a regional recreation office, and your first assignment is to give advice to the director about managing a beautiful wildlife reserve, which is called Diminishing Island. Below is the summary of information you have:

- The maintenance cost is $MC = 80A$ where $A$ is the land acreage maintained in Diminishing Island.
- There are 100 citizens. But only two types of residents are attracted to Diminishing Island: 10 bird-watchers and 20 wild-flower lovers. The individual marginal benefits are given by $MB_b = 20 - 2A$ for each bird-watcher, and $MB_w = 20 - A$ for each wild-flower lover.

1. **Aggregate demand and optimal level of public good**
   
   (a) What is the aggregate demand for land acreage in Diminishing Island?
   
   (b) What is the social optimal land acreage maintained in Diminishing Island?

2. **Management of public good**

   After two-week reading and talking with people, you have the four proposals on management of Diminishing Island.

   (a) **Proposal one: the local government operates Diminishing Island using its tax revenue.**
   
   How much is the optimal maintained acreage in Diminishing Island? How much is tax needed to be collected by the government? How much does each citizen need to pay in taxes for Diminishing Island? How much is total consumer surplus?

   (b) **Proposal two: the local government operates Diminishing Island by collecting entry fee.**
   
   How much is the optimal maintained acreage of Diminishing Island? How much is the entry fee? Who will pay the entry fee? How much is total consumer surplus?

   (c) **Proposal three: contracts a concession to a private firm to manage Diminishing Island.**
   
   This firm will charge admission fee and has the same maintenance cost $MC = 80A$ (note: it is possible that a concessionaire has a lower marginal maintenance cost since a private firm possible manage public good more efficiently). What is the optimal maintained acreage of Diminishing Island? How much is the admission fee per person? How much is total consumer surplus and profit for this firm?

   (d) **Proposal four: give it to the director’s big campaign donor, Mr. Greedy, to run** (which you read from the director’s mind).
   
   How much is the acreage of land Mr. Greedy decides to maintain? How much is the admission fee per visitor? How much is total consumer surplus and profit?

You want to summarize your proposals in the table below and send it to the director as a memo (you are also required to show your work for all questions).
Table 1: Summary of Your Report

<table>
<thead>
<tr>
<th>Manager</th>
<th>Local Government</th>
<th>Concessionaire</th>
<th>Mr. Greedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Funding</td>
<td>tax</td>
<td>entry fee</td>
<td>entry fee</td>
</tr>
<tr>
<td>Optimal Maintained Acreage of Land</td>
<td>entry fee</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>entry fee</td>
<td>–</td>
<td>–</td>
<td>entry fee</td>
</tr>
<tr>
<td>total consumer surplus</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>profit</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

2 Technology Adoption

You take EEP101 and work as a part time consultant at a high-tech company in downtown Berkeley this semester. Your current assignment is to give advice about whether it is profitable for this company to adopt a new technology. The production function is \( f(h_i(a_i)a_i) = \sqrt{h_i(a_i)a_i} \) where \( a_i \) is the applied input and \( h_i(a_i) \) is the input use efficiency rate for technology \( i \). The other information of the current and new technology is summarized in the following table:

Table 2: Technology Adoption

<table>
<thead>
<tr>
<th></th>
<th>Current Technology</th>
<th>New Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>fixed cost ( K_i )</td>
<td>80</td>
<td>400</td>
</tr>
<tr>
<td>input use efficiency rate ( h_i(a_i) )</td>
<td>0.4</td>
<td>0.8</td>
</tr>
<tr>
<td>output price ( p )</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>input price ( w )</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

1. Should this firm switch to the new technology?

2. Now you obtain other pieces of information:
   - The utilization of input generates pollution, and the pollution discharge is \( a_i(1 - h_i(a_i)) \);
   - Berkeley City Hall will impose pollution tax, \( V = 50 \), to reduce adverse impact on health.

Should this firm switch to the new technology?

Berkeley City Hall encourage this firm to adopt new technology by subsidy since it is cleaner. What’s the minimum subsidy in order to make this firm switch to the new technology?

3 Essay Question: Public Good

You went back to school and take upper level environmental economics course this semester after you finished internship at the regional recreation office. Your first on-class presentation is about public good, and you want to use your experience of internship and give the presentation (see Section 1). Address the following issues in less than one page (it is serious requirement which implies that grader will only read the first one page if you have more than one).

1. Is wildlife reserve, for example, Diminishing Island, a pure public good?

2. Out of these four proposals, which proposal you prefer and why?
   (hint: you may talk about feasibility, efficiency, and welfare distribution)