THE COST OF INACTION

A socio-economic analysis of environmental and health impacts linked to exposure to PFAS

2019 study for the Nordic Council of Ministers:
1) establish a framework (methodology) for estimating costs to society due to negative impacts linked with PFAS exposure
2) to provide monetary values for those societal costs, as documented by case studies

- Annual health-related costs: EUR 52 to EUR 84 billion for the 550 million people in the European Economic Area ($59.5 – $97 billion)
- Environmental clean-up costs: EUR 821 million to EUR 170 billion over 20 years, including O&M ($19 - $195 billion)

The cost of inaction | Nordic cooperation (norden.org)
THE CHALLENGE: DEVELOP COST ESTIMATES FOR THE USA

• Only two partial studies so far
• High-level working group established

• Decision to develop more detailed estimates for two states
  • California
  • New Hampshire
WHY CALIFORNIA?

• Large, diverse population & geography
• No primary production of PFAS
• PFAS serum concentrations of Californians is higher than average person in the US
• Water is extremely important
  • Prolonged drought
  • Recycled water not treated for PFAS contamination
• CA is main produce supplier for markets throughout the US
THE PROBLEM

• PFAS contamination is pervasive throughout California and the rest of the USA

• Awareness is growing about the associated problems, but no one knows the true cost of producing and using PFAS
DIRECT ENVIRONMENT-RELATED COSTS

- Testing and monitoring
- Drinking water remediation
- Wastewater & sewage sludge treatment
- AFFF disposal & replacement
- Groundwater & soil remediation
DIRECT ENVIRONMENT-RELATED COSTS

- Testing and monitoring → shifted to state and local officials
- Drinking water remediation → shifted to local public utilities
- Wastewater & sewage sludge treatment → shifted to local public utilities
- AFFF disposal & replacement → Department of Defence, local airports, local fire departments
- Groundwater & soil remediation → property owners, local authorities
HOW DIRECT COSTS CALCULATED FOR CALIFORNIA

• Testing and monitoring
  • Used values from CA Water Boards and CA Biomonitoring Program

• Drinking water remediation
  • Used CA drinking water monitoring + costs of remediation from real US examples

• Wastewater & sewage sludge treatment
  • Used testing from CA Water Boards + costs of remediation similar to those of drinking water

• AFFF disposal & replacement
  • Estimated quantities of AFFF + obtained costs from San Francisco & fluorine-free AFFF manufacturers

• Groundwater & soil remediation
  • Used site testing from CA Water Boards + estimated remediation
## Preliminary Costs: Non-Health

<table>
<thead>
<tr>
<th>Category</th>
<th>Assumptions</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking water remediation</td>
<td>30-year cost</td>
<td>$4.1 billion</td>
</tr>
<tr>
<td>Wastewater/sludge treatment</td>
<td>30-year cost</td>
<td>$21 billion</td>
</tr>
<tr>
<td>Soil &amp; groundwater remediation</td>
<td>10-year cost, low estimate</td>
<td>$2.6 billion</td>
</tr>
<tr>
<td>AFFF disposal &amp; replacement</td>
<td>Includes some decontamination costs</td>
<td>$207 million</td>
</tr>
<tr>
<td>PFAS testing</td>
<td>Potentially contaminated sites</td>
<td>$1.5 billion</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$29 billion</strong></td>
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</tbody>
</table>
HEALTH-RELATED COSTS

HIGH EXPOSURE
• Occupational exposure
• 2-6% of workers at certain industries
• Considered elevated risk of death due to kidney cancer from occupational PFOA exposure

MEDIUM EXPOSURE
• Californians drinking water above PFAS response levels: 19%
  • Considered elevated risk of all-cause mortality and
  • Increase in number of low-birth-weight births

LOW EXPOSURE
• Everyone else
• Californians exposed to low, background PFAS: 81%
• Considered elevated risk of death due to hypertension
## Preliminary Costs: Health

<table>
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<tr>
<th>Category</th>
<th>Assumptions</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>High exposure: kidney cancer</td>
<td>Life value: $11.6 m</td>
<td>$15 m</td>
</tr>
<tr>
<td>Medium exposure: all-cause mortality</td>
<td>Life value: $11.6 m</td>
<td>$38 b</td>
</tr>
<tr>
<td>Medium exposure: low-birth weight</td>
<td>Two-year cost</td>
<td>$167 m</td>
</tr>
<tr>
<td>Low exposure: hypertension</td>
<td>Life value: $11.6 m</td>
<td>$2 b</td>
</tr>
</tbody>
</table>

### Annual Costs: $40 billion
COSTS OF PFAS: UNQUANTIFIED COSTS

- Governance & personnel
- Research & development
- PFAS air emissions
- Product replacement
- Food contamination
- Litigation
- Other health conditions
- Loss of property value, etc.
PRELIMINARY CONCLUSIONS FOR CALIFORNIA

• Costs to society are significant
• Public utilities particularly impacted
• Health-related costs are a major societal burden
• Investment in drinking water remediation appears highly cost-effective in comparison to rise in annual health costs if no action taken
• Prevention of further contamination is urgent

THE BIG QUESTION: WHO SHOULD PAY?
THANK YOU FOR YOUR ATTENTION!