Potential Public Health Impacts of Natural Gas Development and Production in the Marcellus Shale in Western Maryland

Impact Assessment

- Methods

- Assessment of major stressors
  - Air quality
  - Production/Flowback Water related issues
    - Water quality
    - Soil quality
    - Naturally Occurring Radioactive Materials
  - Noise
  - Earthquakes
  - Public Safety
    - Traffic
    - Crime
    - Sexually Transmitted Diseases
  - Occupational Health
  - Health Care Infrastructure
  - Cumulative Exposures

- Recommendations for each stressors **IF** Maryland moves forward with UNGDP

Impact Assessment: Methodology

- Comprehensive Review of Literature
  - # of peer-reviewed journal articles reviewed
  - # of reports reviewed
- Where applicable, analyzed the primary data instead of relying on author's interpretation
- Conducted noise monitoring
  - Inside and outside homes in Doddridge County in WVA
  - Near natural gas compressor stations

Impact Assessment: Methodology

- Evaluation of Hazards
  - Vulnerable populations
    - No (1):   Affects all populations equally
    - Yes (2):   Disproportionately affects vulnerable population
  - Duration of exposure
    - Short (1): Lasts less than 1 month
    - Medium (2): Lasts at least one month but less than one year
    - Long (3): Lasts one year or more
  - Frequency of exposure
    - Infrequent (1): Occurs sporadically or rarely
    - Frequent (2): Occurs constantly/ recurrently

Impact Assessment: Methodology

- Likelihood of health effects
  - Unlikely (1): Little/no evidence that exposure is related to adverse health outcomes.
  - Possible (2): Evidence in other settings suggest exposure to the agent is potentially related to adverse health outcomes.
  - Likely (3): Evidence in other settings have shown exposure to the agent is related to adverse health outcomes.

- Magnitude/severity of health effects
  - None(0): Does not cause any adverse health effects
  - Low(1): Causes of health effects can be quickly and easily managed or do not require treatment
  - Medium(2): Causes health effects that necessitate treatment and are reversible
  - High(3): Causes health effects that are chronic, irreversible or fatal

Impact Assessment: Methodology

– Geographic extent

- Localized (1): Effects restricted to immediate vicinity
- Community-wide (2): Effects not restricted to immediate vicinity

– Effectiveness of Setback

- Positive(1): Setback potentially minimizes exposure
- Negative(2): Setback unlikely to minimize exposure

– Public Health Impact (*Concern*)

- No-Low: Impact received a score of 6-9
- Medium: Impact received a score of 10-14
- High: Impact received a score of 15-17

Example: Air Quality

Evaluation Criteria	Score
Vulnerable populations	2
Duration of exposure	3
Frequency of exposure	2
Likelihood of health effects	3
Magnitude/severity of health effects	3
Geographic extent	1
Effectiveness of Setback	1
Overall Score	15
Hazard Rank	H

Disproportionately affects vulnerable population (leaving near site, w/o mineral rights

Will last >1 year, particularly related to flaring, compressor stations

Continuous exposure

Air pollutants that are associated with UNGDP are known to have negative health effects in other settings

Resulting adverse health effects can be chronic, and irreversible

Adverse effects more prevalent in the close proximity to source

Effective setback distance can minimize exposure

High likelihood that UNGD associated changes in air quality will negatively impact public health in MD

Hazard Evaluation Summary
(Using Modified Goldman Terminology)

Topic	Level of Concern for Potential Negative Public Health Impacts
Air Quality	**High**
Healthcare Infrastructure	**High**
Occupational Health	**High**
Social Determinants of Health	**High**
Cumulative Exposures/Risks	**Moderately High**
Flowback and Production Water-Related	**Moderately High**
Noise	**Moderately High**
Earthquakes	**Low**

- High = high concern for potential of negative health impacts
- Moderately High = moderately high concern for potential of negative health impacts
- Low = low level of concern for potential of negative health impacts

Reviewer's Comments

- Reviewers:

Dr. John Adgate
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Omission of Methane Climate Impacts

- Our charge was to examine health impacts that would be primarily visited upon the local populations in Western Maryland. Climate impacts are global and not localized.

- Adequately assessing the impacts of methane as a transition fuel and its consequent trade-offs against other policy alternatives requires complex and expensive climate simulation computations, is highly subject to how far in the future one projects, and requires major assumptions about what policy alternatives are politically realistic.

- The resources provided would not begin to cover the necessary costs for this analysis and we did not build a team with the necessary expertise for the required analysis because that was not what was requested by DHMH.

Terminology: Intensity, Duration, Frequency, Severity, Probability, & Impact?

- Exposure intensity
  - Was considered (e.g. silica) and is incorporated in setback recommendations and assessment of potential for public health impacts
  - Implicit in likelihood and severity of health effects
- "Concern" versus "Impact"
  - We agree that "Concern" would have been a better term to use that "Impact"
    - **High** concern for potential of negative health impacts
    - **Moderately High** concern for potential of negative health impacts
    - **Low** level of concern for potential of negative health impacts

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Hazard Ranking

- I'm not normally a fan of these types of scoring systems….. But it was a reasonable choice in this case, given that a similar scale was used in one of the only other fracking HIAs conducted to date. But this implies that comparing the results with the Battlement Mesa HIA would be useful in this report. The authors later state that these types of comparisons are generally not warranted, but if the same scale is used, it would be interesting to know if similar conclusions were reached.
  - Ranking needed to inform policy makers what to focus on.
  - The ranking is intended primarily to be used internally.
  - The relative ranking of hazard can be compared. But we advise against comparing the scores, unless the scoring and ranking are used using the exact same protocol.

Rigor of Critique

- Fryzek study commits 2 cardinal sins of epidemiology
  - Outcomes were measured before exposure
  - Latency of cancer was ignored
  - No others had egregious errors of this type
- No epidemiologic study is perfect
  - Other studies each had various weaknesses
  - No other studies were totally invalidated by fatal flaws
  - Extended reviews would produce long unreadable report without increasing utility to policy makers.
  - Hill criteria look for consistency of valid studies
  - Hill abstract was peer reviewed for ISEE Conference

Vulnerability of Surface Owners

- The text on page xxiv states that property owners without mineral rights are vulnerable. ….this issue is distinct from more traditional definitions of vulnerability, i.e., age, sex, genetics, etc. I suggest treating this as part of psychosocial stress and cumulative risk, but not frame it as vulnerability.
  - We agree that this is at leas partly a psychosocial stressor.
  - But they are also vulnerable subgroup in that they will be differentially exposed because they cannot sell their land to move away from fracking that may happen in their backyard.
  - Thus they are especially vulnerable to the psychosocial stressor and to exposure disparities.
  - This is similar to the problem of poverty as a vulnerability

Surveillance

- No number of mitigation measures can provide one hundred percent assurance of UNGDP safety and it is therefore **important that the Maryland DHMH and the affected counties would have adequate funding for surveillance activities** as well as follow up investigations that would assess potential health impacts and allow for identification of ways that mitigation measures need to be improved as well as potential health impacts.

Surveillance

- "Overall, local health departments and clinics should monitor for increase in stroke morbidity and mortality in areas with UNGDP activities due to a decrease in local air quality because of PM2.5 and PM10"; this is a somewhat impractical recommendation ....Suggesting that epidemiological studies or quantitative risk assessments include stroke outcomes makes sense, but hoping to see effects through local surveillance does not.

  – While epidemiological studies and quantitative risk assessment are important, we respectfully disagree with the reviewer that active surveillance should be discounted. It is one of the core function of public health, and only means by which timely information are available to the public health practitioners. By the time epidemiological studies are available, it may be too late.

Setback for Air Pollution

- The setback recommendation is not unreasonable, but the information presented is not sufficient to feel comfortable with the suggested distance........the Colorado study cited as the foundation of the setback recommendation compared samples < 0.5 mile vs. > 0.5 mile, but did not have a strong empirical foundation for the choice of 0.5 miles, ...The authors should be clear that a setback distance adequately protective of air pollution from UNGDP activity has not yet been empirically determined.
  - We agree: a setback distance adequately protective of air pollution from UNGDP has not been empirically determined.
  - Our suggestion is based on the traffic literature, which is the closest one we could find. This needs to be determined empirically.
  - Continuous monitoring of health, and especially acute respiratory outcomes is intended to provide a means for updating these recommendations.
  - CGDP needs to consider topography issues that may make larger or smaller or contoured setbacks more appropriate.

Team Members

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