

**Canadian Environmental Network**

**CONSULTATION REPORT FORM**

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**Title of Consultation:** Western Canada Sulphur and Nitrogen Workshop

**Date(s) held:** 28-29 April 2009

**Location:** Banff, Alberta

**Delegate Name and Affiliation:** .....Jennifer Grant, Pembina Institute.....

**Number of ENGO Delegates at Consultation:** .....2.....

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**What was the purpose of the consultation?**

The workshop objectives are: to assess the state of the science on atmospheric deposition of sulphur and nitrogen and ecosystem impacts in Western Canada; to develop an understanding of the implications of the latest science to current policies and programs aimed at addressing acid and nitrogen deposition; and to identify areas for future concentration for Canada's acid rain science and policy efforts in western Canada.

**What were the outcomes of the consultation?**

Key points from the various presentations:

- Issues to consider when measuring S/N deposition: 1) amount, frequency and form of pollutant, 2) receptor responses, 3) landscape (upland vs. wetland), 4) link biological and chemical responses to air pollutants, 5) cumulative effects of disturbances
- Most monitoring of air pollutants under auspices of CCME federal/provincial/territorial cooperation, Canada-US air quality agreement, and in an international context, UN ECE LRTAP monitoring program
- Nationally, SO<sub>2</sub> reductions have been substantial – wet sulphate deposition in the east has declined significantly
- NO<sub>x</sub> on the other hand – has remained relatively constant over time in Canada
- Vehicle NO<sub>x</sub> reductions offset by growth in upstream oil and gas sector
- Nationally, wet nitrate deposition has declined significantly since 2000
- Seeing significant increase in ammonia in western Canada
- Climate change; will modify the atmospheric response to air pollutant emission reductions and in some instances significantly reduce the predicted benefits
  
- The Alberta's Acid Deposition Management Framework was developed in 1999 for the province of Alberta by CASA stakeholders - runs on a 5 year acid deposition assessment cycle
- Management actions in case of exceedance of target load: development of a reduction plan with stakeholders from area causing and affected by the exceedance in 2 years

- implementation of the plan in 3 years
- measurable reductions to be achieved in 5 years
- deposition to be reduced to below the target in ten years
- for oil sands, monitoring program developed in 2003 by CEMA
- goal → deposition from industrial activity will be managed to maintain the chemical characteristics for soils and lakes – not using critical load approach
- time to effect approach; proposed that management response consider the predicted time frame for effects; for near future risk of acidification; less than 15 years; reduce emissions to meet objectives; - operations still continue, must use BPs
- There are medium risk (15-30 years) and low risk (30 years) management responses as well
- the management framework consider effects in SK through a MOU with SK – will work together to reduce emissions in AB – is this is NOT a part of the management plan.
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- High level of uncertainty with regard to deposition and monitoring and in western Canada – for the west, little to no data for NO<sub>3</sub>, SO<sub>4</sub>, Precipitation monitoring in western Canada – relatively low
- Uncertainties; massive data gaps and inconsistencies with US data
- EC would like to expand sites to western Canada; remains to be seen when/where/whether they will go in

#### **Methods for determining wet and dry S & N deposition in the oil sands; current deposition estimates**

- Methods/approaches/ and some results from WBEA's monitoring efforts
- Challenges in the AOSR: WBRM = 16,000km<sup>2</sup>, changing industrial landscape, fixed, mobile and fugitive sources, continuous ambient air monitoring in valley, logistics
- Methods: 15 continuous air monitoring stations: (SO<sub>2</sub>, TRS, NO, NO<sub>2</sub>, nH<sub>3</sub>)
- Integrated time averaged PM, VOC, precip, HNO<sub>2</sub>, HNO<sub>3</sub>
- 27 passive sampling sites
- vegetation, bog and soil receptors
- newer programs; ambient ion monitor, conditional time averaged flux (COTAG) and instrumented analogue sites
- key issue: no deposition mapping in western Canada;
- some of the highest deposition sites are in SK
- N deposition in throughfall: 0.5 to 1.8 kg/ha
- S deposition in throughfall – 0.9 to 2.8 kg/ha
- N and S deposition is 21-29 kg /ha /year
- Highest level of anthropogenic influence is at the stand edge
- **Existing case; Nox = 261 t/day; planned development case Nox = 620 t/day**
- No base line knowledge; time trend would be critical for region;
- WBEA has one SK monitoring site located just adjacent to FM across the border

#### **Biogeochemistry of bogs in Alberta**

- Bogs: provide ecosystem services, C sequestration, provide archives of past deposition/pollution and can serve as monitoring tool for current deposition
- Bogs are ombrotrophic; inputs solely from precipitation and no access to groundwater. Therefore nutrient poor; what goes in the bog, stays in the bog
- Net primary production exceeds decomposition; greater than 50% organic material, very acidic (ph of 3-4.5), water logged, anaerobic
- Greatest ecosystem service = carbon sequestration
- Bogs = canary in the coal mine as monitor for current pollution

- The N cycle in Bogs and triphasic response – done in Europe but might not apply to western Canadian bogs; rather than wait for deposition to get higher, we should proceed with fertilization studies; being done
- N deposition in bogs is still low...

### **Critical loads for S/N – with terrestrial and aquatic critical loads**

- Critical loads = effects based approach
- four elements: receptor, biological indicator, chemical criterion, critical limit: the most unfavourable value that the chemical criterion may attain without long-term harmful effects to ecosystem structure and function
- Calculating critical loads: empirical, mass balance or dynamic modelling
- Total gap in BC about understanding critical loads in BC
- Limitations and uncertainties: deposition, weathering rates, critical ANC limit, treatment of N
- N deposition in the oil sands region – very little understanding and high degree of uncertainty despite five years of research
- Total nitrogen deposition – increases in the oil sands region attributed to ammonium – not sure where this ammonium comes from
- Total ambient n deposition in the oil sands region is 1-10 or so; and is wet ammonium and nitrate is increasing across Alberta

### **Indigenous knowledge considerations in changing ecosystems**

- Proposed TEEM community based berry monitoring project
  - o Goal: to establish a program to assess and monitor quality and availability of berry populations using both western scientific knowledge and indigenous knowledge and indicators
- Links changes on land as indicated by western science and how people are experiencing that change
- Some effects of increased nitrogen deposition on *vaccinium* spp:
  - o Increased susceptibility to fungus, decreased concentrations of carbon based secondary metabolites such as phenolics
  - o Decreased abundance of *V. mytilus* and increased growth of grasses
- Indicators for berry condition: level of rain, temp spring/summer, and forest fire in the region

### **Health implications of sulphur and nitrogen emissions**

- What are the direct/indirect effects of s/n emission on human health?
- Direct exposure to SO<sub>2</sub> and NO<sub>x</sub> emissions → increased incident of asthma, broncho-constrictions symptoms, increased risk of respiratory diseases, increase and more severe common viral infections, drinking water that is high in NO<sub>x</sub> increases risk of blue baby syndrome and reproductive issues
- Indirect impacts – eutrophication – changes in nitrogen levels of marine and fresh waterways have been linked to an increase in algal blooms which relate to increased toxicity of drinking water, increased toxicity in shellfish being consumed by humans, increased mosquito larva which may cause increased spread of west Nile, malaria in tropical countries
- Indirect impacts – ozone; NO<sub>x</sub> is one the primary component in the creation of ground level ozone and smog: exposure to smog and ground level ozone; irritates the eyes, nose, throat, lungs, exacerbate respiratory symptoms such as asthma, increases risk of cardiovascular disease, may lead to lung cancer

## **What are the implications of the outcomes of the consultation?**

- monitoring efforts in W. Canada – particularly BC and AB – have always been low relative to Eastern Canada. Unfortunately efforts are getting even lower; due to limited funding – this is concerning given anticipated new oil and gas development in BC and forecasted expansions of oil sands in AB/SK
- Limited baseline data exists – this makes it hard to measure impacts – how do you measure potential impacts of new developments without a sound baseline?
- several academic institutions and gov agencies are interested in S/N deposition and have projects underway but there appears to be little standardization when it comes to methods/monitoring protocols. Standardizing monitoring/modeling may fill some of the many gaps raised.

## **What action, in your opinion, should be taken by the ENGO community in the aftermath of this consultation?**

**Advocate to resolve, share, learn more about the following gaps...**

1. Need coordinated data collection/methods modeling nation-wide
2. Need baseline data/monitoring for undeveloped regions
3. Need to ensure SK/AB MOU has an effective management plan tied to it
4. No data for circumpolar region
5. Little understood about bogs
6. Do a better job at understanding temporal cumulative impacts
7. Need to look at heavy metals; mercury – and acidifying emissions
8. Need to make policy on adequate information – acknowledge uncertainty.