ESD.864 PROBLEM SET: System Modeling

System Modeling

Due Tuesday, April 9:

This problem set asks you to practice box model calculations, using an existing box model, and translate the results to policy. Given that I suspect few class participants have a great deal of background in this area, this problem also simulates a type of analysis that is common for "science advisors" to do: get up to speed quickly on a very technical issue, with little background except a general science/engineering education, in order to make policy recommendations.

1. Applying a Box Model to Policy

Consider the case of the chemical endosulfan in the context of the Stockholm Convention. Endosulfan was proposed for inclusion by the European Union (see document on Stellar). The OECD overall environmental persistence and long-range transport screening tool can be found at:

http://www.oecd.org/env/ehs/risk-assessment/oecdpovandlrtpscreeningtool.htm

Use the tool to assess whether endosulfan meets the criteria for persistence and long-range transport under the Stockholm Convention.

To assist your analysis, read the manual for the tool (available at the link above, and on the class website). You will also find the supporting documentation in the EU endosulfan proposal submission useful in specifying inputs for endosulfan. The EU proposal is provided as UNEP-POPS-POPRC.4-14.English.pdf, and the more in-depth supporting information is provided as UNEP-POPS-POPRC.4-INF-14.English.pdf.

1) What is the overall persistence and long-range transport potential of endosulfan? Show your work, and include uncertainty analysis.

2) Write a short memo detailing the results from your application of the screening tool, taking into account uncertainties, and recommending whether endosulfan meets the Stockholm Convention criteria. In making your decision, you should base your results on the criteria in Annex D of the Convention (provided as UNEP-POPS-COP-CONVTEXT-D.En.pdf). It allows you to base your decision on model results, but doesn't require it.

Tips and clarifications:
It is not as clearly stated in the documentation as it could be that alpha and beta endosulfan both transform to endosulfan sulfate; it is up to you to decide how to incorporate that information.

--You will find useful information in the following link:
http://chm.pops.int/Convention/POPs%20Review%20Committee/Chemicals/tabid/781/language/en-US/Default.aspx
(Particularly the risk profile)

In addition, you may wish to refer back to the lecture notes for the criteria for adding substances in the Stockholm Convention. You can also find this information on the Stockholm Convention web site at http://www.pops.int.

The link to Annex D can be found here:
http://chm.pops.int/Convention/POPsReviewCommittee/Overview/tabid/2806/Default.aspx

--Kaw is the "dimensionless" version of the Henry's Law constant.
Kaw=H/RT where R is the gas constant in the appropriate units. The OECD tool indicates standard conditions (ie T=0 C)

--You also might find interesting two technical arguments from "opposing" sides in the endosulfan debate:
http://www.ipen.org/ipenweb/documents/poprc%20documents/endosulfan%20pop%20screening%20criteria.pdf {from an environmental NGO}
and
http://chm.pops.int/Portals/0/Repository/POPRC4/FU/SUBM/DRP/UNEP-POPS-POPRC4FU-SUBM-ENDOSU-DRP-India-090601.English.DOC {from India}

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