Dear RCM workshop participant:

This is a “README” message to orient you to materials in this folder and some guidance on how to get started on learning reduced-complexity models (RCMs). It’s written on the assumption that you are preparing for a formal or informal workshop with Prof. Adams or other RCM collaborators, but it also works for people who want to teach themselves RCMs independent of such a workshop. Important steps and materials are as follows:

1. **Install R and R Studio on the laptop you will bring to the workshop**. This will be a “hands on” workshop in which you will get a chance to use RCMs in some realistic sample cases. You will need a programming environment that will let you do matrix-vector multiplications efficiently. We recommend that you install R and R Studio on your laptop because workshop staff are most familiar with these tools. Note that there are two distinct downloads: R and R Studio. R Studio is a user-friendly software environment for using R. You can download a free version of both at <https://www.rstudio.com/>. If you are more comfortable with another programming environment such as Python or MATLAB, you may use it, but we will be limited in the amount of “debugging” help we can give.
2. **Workshop pre-reads**. We have put together a set of materials that you may find useful to review before the workshop. All of these materials are optional. We will be going over everything during the workshop itself. But you will find your time at the workshop to be much more productive if you spend some time with some of these beforehand. Learning styles vary, so there is no “right” order to look at these. However, my suggestion would be to read over the conceptual problems, then do the slides on basic concepts, and then go back and try the conceptual problems.
   1. **Conceptual problems**. These are shorter problems that test whether you understand some of the key concepts involved in using RCMs. They are all streamlined so they can be done quickly with pencil/paper or with a small spreadsheet. In the workshop, we will do more realistic examples after doing these starter problems. Note that Problem #4 on cost-effectiveness analysis is less important than Problems #1-3.
   2. **Slides on basic concepts**. This is a small subset of workshop slides that cover key concepts. They should give you enough information to think about the conceptual problems. There are two versions on the Google drive: with and without audio. The audio version takes about 20 minutes to listen to. The version without audio is a smaller file size and easier to download.
   3. **R Studio basics**. This is a short list of key commands in R Studio that you will need for the workshop. If you arrive knowing how to use each of them, you will be well positioned to tackle the RCM problems. Of course, R is a very common programming library, especially for doing statistical work, so there are abundant resources online as well.
   4. **Key papers**. These are five papers we selected that are a good introduction to RCMs and how they can be used. There is a short description of why each paper was selected. Read whatever seems most interesting, but the following order is a logical way to go:
      1. **Gilmore et al**. **2019.** This paper gives an overview of three RCMs in common use in the United States, why RCMs are useful, and some basic evaluation of those RCMs.
      2. **Heo et al. 2016.** A good description of the “marginal social cost” concept.
      3. **Heo et al. 2017**. A good example of source-receptor analysis with an RCM.
      4. **Millstein et al. 2017**. A basic application of several RCMs (AP2, COBRA, EASIUR) to assess avoided air pollution due to deployment of wind and solar power in the United States.
      5. **Sergi et al. 2020**. A more advanced application of RCMs to a policy scenario, the US Clean Power Plan. The use of RCMs here is more advanced because the paper is an optimization problem that answers the question: what is the most lives that might be saved with the Clean Power Plan if we try to maximize air pollution benefits?
   5. All of these materials are shared on a Google Drive folder here: <https://drive.google.com/drive/folders/1qTvxM_W7uwCZzMUPBcd5fMBFK-jALvpu?usp=sharing>

We look forward to seeing you very soon!

Sincerely,

Prof. Peter Adams and RCM collaborators (Carnegie Mellon University)

ACKNOWLEDGMENT: Much of these materials were developed by Medinat Akindele, a doctoral student at Carnegie Mellon University. Prof. Rebecca Garland of the University of Pretoria also contributed, and she was instrumental in organizing a workshop on RCMs at the NACA conference in October, 2022 that was the original RCM workshop and the impetus for putting these materials together.