

## Example Final Examination R&SD

Advice:

- Read first all questions before starting to answer them, and plan the time available. Each question could be answered in about half an hour. The questions are weighted equally.
- Write the answers for each question on a separate sheet, with your name, so that they can be sorted and given to the teacher concerned.
- Make your answers not longer than is necessary: quality will be judged, not quantity.
- If a question is not clear, ask the attendant for help.

### Question 1.

#### *Introduction*

The mobility policy of many governments is aimed at three different targets: (1) optimizing accessibility (i.e., less/no traffic jams); (2) increasing traffic safety (i.e., less accident victims); (3) decreasing the negative environmental effects (e.g., lower energy use, less emissions).

Three main policy instruments are used to achieve these targets: (a) technical or infra-structural measures (e.g., cleaner cars, more roads), (b) financial instruments (e.g., fuel taxes, road tolls), and (c) organizational changes (e.g., improving public transport, spatial design).

The Table below shows 9 examples of specific measures, categorized by – vertically - the primary target (accessibility, safety, environment) and by – horizontally - the policy instrument (technical & infra-structural, financial, organizational).

<b>instrument target</b>	<i>technical &amp; infra-structural</i>	<i>financial</i>	<i>organizational</i>
<i>accessibility</i>	build more roads	introduce or raise highway tolls	promote tele-working
<i>safety</i>	build heavier cars	raise ‘own risk’ for accident cause*	lower maximum speed
<i>environment</i>	catalysts and diesel filters obligatory	increase fuel taxes	‘right of way’ for bicycles and public transport #

\* the person who causes an accident pays a much higher ‘own risk’ (Dutch: ‘eigen risico’)  
 # bicycles & public transport always have ‘right of way’ (Dutch: voorrang) over cars

Each of the measures in the Table has a primary target (row of the table). For instance, “building more roads” (upper left cell) is aimed at increasing accessibility. However, such a measure may also affect the two other – *secondary* - targets (in the “more roads” example: safety and environment).

*Your task*

Choose 6 of the measures in the table. For each of these, analyze and try to predict if and how this measure will affect the two non-primary (or *secondary*) targets. In other words, for each of the 6 measures, indicate and briefly motivate:

- (a) whether you expect any effects on the secondary targets, and if so
- (b) what the direction of these effects will be

For example, in the “build more roads” example, indicate and motivate whether you expect this measure to result in an increase or decrease of traffic safety and/or the environmental load.

TIP: It may help if you try to assess, for each of the 6 measures separately,

- (a) how this measure will work out at the micro-level, i.e., how it will affect the mobility behavior of individual people in terms of, for instance, amount travel, travel mode choice, purchase decisions, driving style, and so on.
- (b) how, in turn, these micro- (or behavioral) changes will affect the secondary targets.

Finally, based on your findings, formulate a conclusion about the following questions:

- To what extent are the three main policy targets (accessibility, safety and environment) mutually compatible?
- Are there policy measures that would serve all three goals?

## **Question 2.**

To develop approaches for sustainable building the Trias Energetica is often used. The Trias Energetica is built up as follows: first prevention, second substitution by renewable resources, third efficiency.

- A. Explain why the Trias Energetica is a useful framework for the design of sustainable buildings and discuss some example measures for buildings based on the Trias Energetica.

In Dutch waste policy the so called Ladder of Lansink is still in use. The Ladder of Lansink consists out of four steps: first prevention, second re-use and recycling, third combustion of waste, four dumping of waste in the underground.

- B. Is de Ladder of Lansink comparable with the Trias Energetica? Explain your answer!
- C. Is the Ladder of Lansink a useful framework for the design of a sustainable waste policy? Explain your answer.

According to some textbooks the waste management policy in the 20<sup>th</sup> century was based on the concentrate and contain strategy. In the 21<sup>st</sup> century it should be based in the resource recovery strategy.

- D. Describe the main elements of the resource recovery strategy and explain why this strategy is more sustainable than the waste management practices in the 20<sup>th</sup> century.

### Question 3.

(a) Explain the concept of Radiative Forcing

For atmospheric CO<sub>2</sub>, the expression for Radiative Forcing (RF) is:

$$RF [W/m^2] = 5.41 \ln (C/C_0),$$

in which C<sub>0</sub> is the original, natural concentration of CO<sub>2</sub> in the atmosphere, and C is the present-day concentration (both expressed in ppm). (ln is the natural logarithm)

(b) Calculate the present-day RF for CO<sub>2</sub>. What are the values for C and C<sub>0</sub> that you use (take your "best estimate") ?

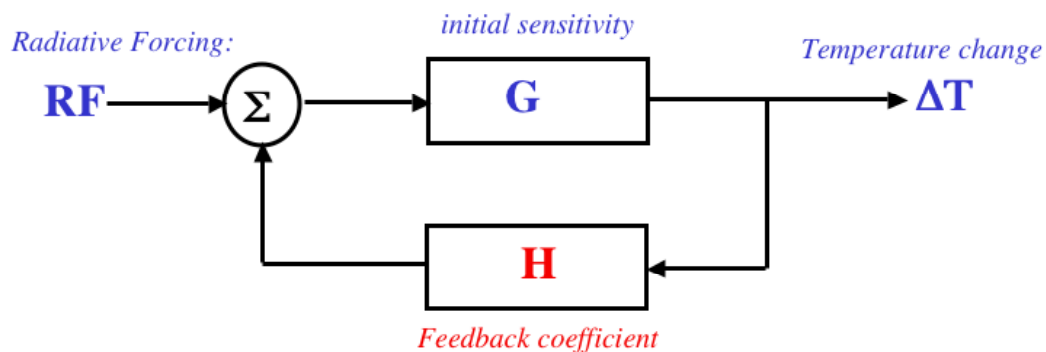
(c) What would be the temperature effect, given the initial temperature sensitivity  $G = 0.3 \text{ K} / (W/m^2)$

(if you were not able to find an answer at (b) take  $RF = 2 \text{ W/m}^2$  for this question)

In reality, the relation between RF and T is not straight forward, but characterised by feedbacks.

(d) Mention at least three feedback effects, along with their direction (amplification or damping)

The basic model for feedback is given in the figure below:



(e) Give the expression of  $\Delta T$  in terms of RF, G and H

(f) Calculate the temperature change based on the RF from question (b), and using  $H = +1$ . Does this situation represent amplification (feed-forward) or damping (feed-back) ?

#### **Question 4.**

The production of meat has a large impact on the environment. A shift to a vegetarian menu is therefore often mentioned as an option to reduce the environmental impact of food consumption. Meat, however, has an important function in the human diet as protein source. Next to this livestock plays a vital role in food production systems since it can convert non human edible biomass (grass/wastes) into livestock products (meat, eggs and milk) and its manure is used for fertilization of crops.

A change to a vegetarian menu will have large consequences. Discuss these consequences at different levels of scale (local, regional, national and global). Pay attention to the consequences for the environment, for the economy and for the social system.

#### **Question 5.**

Many different definitions of "Sustainable Tourism" and "Eco-Tourism" are in use to discern them from "ordinary" tourism. Give a definition for "Sustainable Tourism" and "Eco-Tourism" each, that you think captures the essential aspects.

Given your definitions, present for both types of tourism a check-list of 5 important items to judge hotels that claim to offer services in accordance with either "Sustainable Tourism" or "Eco-Tourism". The lists may of course overlap but should not be identical and show the difference in aims and claims.

Put yourself in the place of an Inspector from Green Peace or the World Wildlife Fund. Then comment on the concepts of "Sustainable Tourism" and "Eco-Tourism", and the checklists. Clearly many pages could be written on this topic, given enough time and paper, so limit yourself to about one page and the most important aspects.