



**Aalto University School of Chemical Technology**

Industrial Symbiosis: Puu-0.3310 5 Cr. / Gary Watkins

**Exam 19.02.2014**

**Answer ONLY FIVE (5) of the following 8 questions. All questions are worth 5p.**

1. Explain (briefly) the meaning of the following terms: (1p each. 5p total.)

- Tragedy of the Commons
- Eco-efficiency
- The rebound effect
- DFES
- MFA

2. As they grow, how might Less Developed Countries (LDCs) develop their infrastructure (transportation, energy, water, waste treatment) in ways different from the traditional Highly Developed Countries' (HDCs) model? What gains could be made by doing so? 5p.

3. Describe the 5 different types of Eco-Industrial Park (EIP) in terms of the location and role of actors and the types of material exchanges and relationships between them...5p.

4. Choose a manufacturing process, with which you are familiar and, to the extent possible, evaluate the process, pointing out its strengths and weaknesses from an industrial ecology standpoint. 5p.

5. What are the differences between the Industrial Ecology (IE) and Industrial Symbiosis (IS) approaches? Discuss their scales and focus. Which approach is adopted in which applications? Give examples. 5p.

6. What are the main features and key stages of an LCA assessment? Discuss the framing of the question used in your GaBI practical exercise and its specific focus in terms of product impacts. 5p.

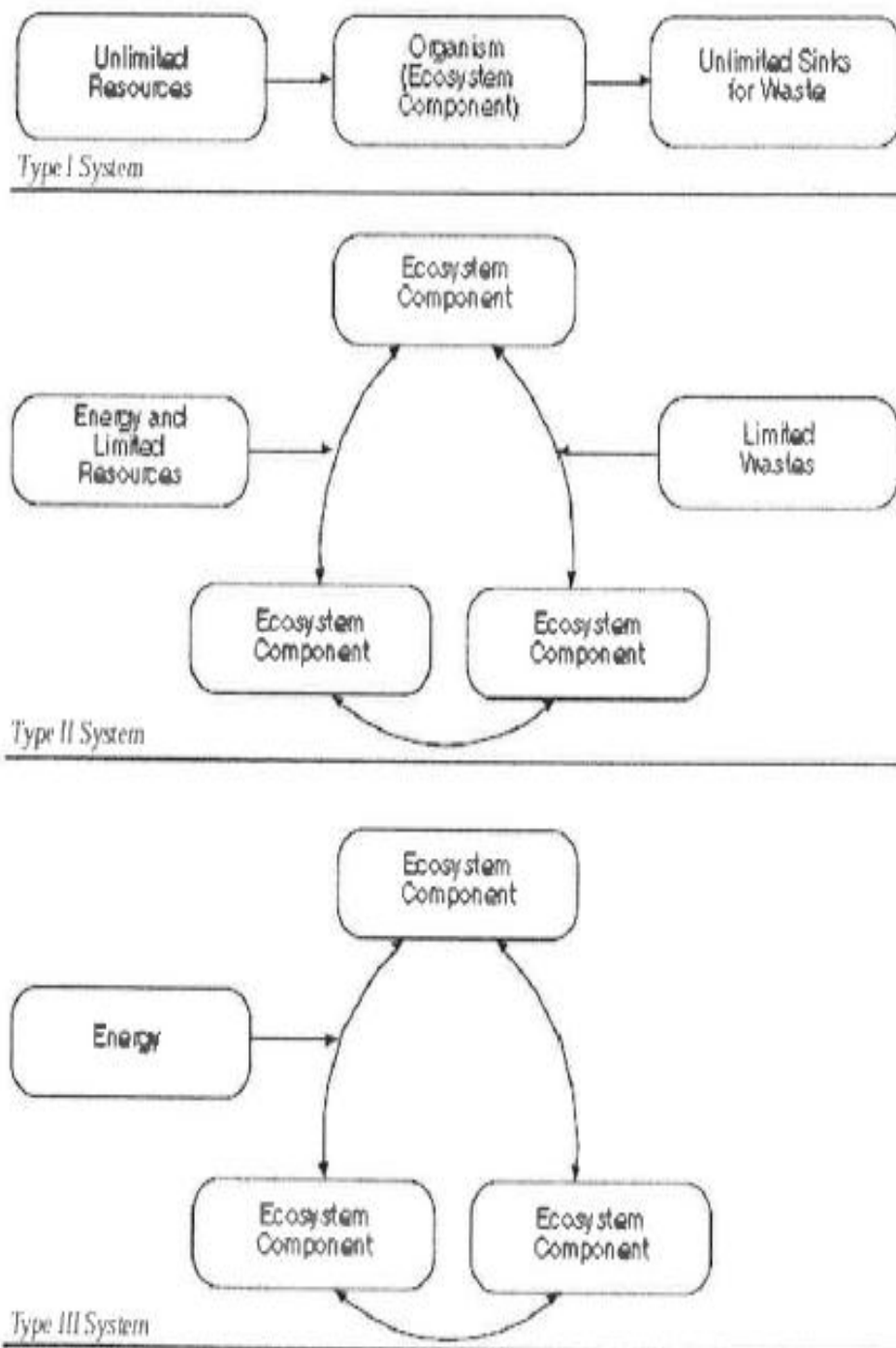
7. Discuss the differences between the ecosystem types shown in Figure 1 below. Suggest in which ways industrial ecology type thinking can approach a Type II system for human systems. Is a fully functioning Type II industrial ecosystem the ultimate? Is it realistic to work towards a Type III industrial ecosystem? Does a true Type III system exist in nature? 5p.

8. Discuss the metaphor of "Industrial metabolites and enzymes" within the context of industrial symbiosis/ecology. Give examples of each for a chosen system. 5p.



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**Figure 1 - Ecosystem Types I, II, III**