

Midterm Exam
Tuesday, 23 October 2012, 12:00 – 1:15 p.m.

Instructor: Dr. C. A. Coles

There is 1 question worth 100 marks. No, books, notes or electronic devices are permitted in this exam.

- 1) How can cities be made more sustainable? **Organize your answer under main headings or topics** and then provide discussion and go into more details related to the main headings. Give examples and explain why or how certain measures contribute to sustainability.

(100 marks)

Address mobility by improving public transit.

Introduce bus rapid transit systems to encourage better use of public transit. Remove subsidies to fuel so that people will have to pay more to own a private vehicle and so that electrification of public transit will eventually take place. Develop renewable energy such as wind and solar along with electric vehicles (EV) so that non-renewable fuels are replaced by renewable energy and so that EV batteries can be used for electricity storage by employing smart grids. Use light rail systems for the most frequently travelled routes as these will be more comfortable and less expensive to operate in the long term and can easily run on electricity.

Make cities more pedestrian and bicycle friendly,

Provide more bicycle paths and wider sidewalks, more laneways between long streets, park benches and outdoor cafes, and parks and green spaces to support pedestrians. Plant more trees to improve city esthetics and make walking and bicycling more pleasant. Introduce bicycle sharing programs. Build secure stations for parking bicycles.

Reduce automobile usage.

Reduce roadways and parking lots. Some roads can be closed to vehicle traffic on certain days and times and some roads can be made one way. Roads are expensive to maintain and repair so reducing roadways can cut costs to taxpayers and reduce greenhouse gases. Black-top roads also turn cities into heat islands so reducing blacktop surfaces can have a cooling effect. Make cities more compact (as indicated below) so automobiles are no longer a necessity. Use multilevel parking lots so that more cars can be parked in less space. Then convert surface parking lots into other uses to make better use of city space. Encourage car-sharing to cut down on the total number of cars on the road. By reducing cars and making more room for people a city is revitalized

Increase density and compactness of cities.

Promote mixed building use and mixed area use rather than separating cities into different zones by activities. Mixed use means combining residential, work, transportation and entertainment zones in the same area to improve adjacency. Mixed use also means that everyone is served (rich and poor, young and old, athletic and disabled, residents and tourists). A mixed use building may have commercial space on the main floor and apartments on the upper floors. Alternatively the mixing may be related to timing. A cinema that is used for showing films in the afternoons and evenings can be used as a lecture theatre in the mornings or building can have different seasonal uses (as was shown in the class presentations). Promote brownfield development and fill in unused spaces within the city. A more compact city and greater population per area can be better served by public transit. Also when buildings are closer together they are not as exposed to the elements.

Reduce urban sprawl.

Introduce legislation to set urban boundaries so that green spaces at the city's outskirts and wildlife habitat are preserved.

Promote urban agriculture.

Have community gardens where each family can have a plot to plant vegetables so that more local food is grown and fuel use, transportation costs, and greenhouse gas emissions are reduced. Small scale farming can improve residents' food quality and can help address issues of food security. Have a garden center where the public can be educated on growing vegetables and fruits. Build greenhouses so that the growing season can be lengthened and local food can be available for a greater portion of the year. Establish areas or buildings in which farmers' markets can take place to make local food more widely available. (Urban agriculture has many of the same benefits as increasing green spaces.)

Preserve infrastructure.

Preserve old buildings that are structurally sound but no longer used by providing new uses for them rather than tearing the buildings down and building new ones. This is less expensive, uses less new materials, is less energy intensive, produces less waste materials, lessens the noise pollution during the construction phase and makes the building ready for use much sooner. The old building has finished settling and constructing a new building can be associated with heave and settlement issues.

Employ water conservation

Employ rainwater harvesting to collect surface water (from surfaces such as parking lots and roofs) and use the water for irrigation of parks and toilet flushing where highly treated water that requires intensive energy use and chlorination is not needed and transporting the water over long distances can be avoided. Do pressure tests on the water distribution system to identify major leakages and replace with new pipe. Introduce metering to make people pay for the water that they use. Increase porous surfaces so that water with pollutants can be treated to some extent by soils and the groundwater can be recharged rather than having high runoff with erosion and carrying pollutants into bodies of water. Provide incentives for residents to switch to low flush toilets and low flow shower heads. Increase ponds to collect storm water and snow melt.

Increase green spaces

Green spaces make a city more livable. Planting trees increases cooling, air quality, biodiversity, and wildlife habitat, helps soil retain moisture and integrity, helps remove and breakdown pollutants, creates shade and reduces wind, and provide a sink for carbon dioxide. Increasing parks and green roofs is another way to increase green spaces.

Education

Use education programs to help the public to see the need for creating a sustainable city and to let them know what they can do.

Consultation

Get the public involved to generate more ideas as to how best to achieve sustainability in their city and to work towards implementing the necessary measures.

Establish a dedicated office of sustainability.

This was found to be the strongest indicator that a city was committed to developing sustainably.

Make buildings more energy efficient.

Increase insulation and seal leaks. Enable air circulation throughout house to remove indoor air pollution and moisture and prevent mold and mildew.

Improve social integration.

Having mixed use buildings and areas that are usable by all people (as explained under increasing city density and compactness) helps to improve social integration. Another way to improve social integration is to build high quality public service centers in slum areas within cities as was done in Rio, Brazil. These centers are for health service, education and access to technology so that those born into poverty may be enabled to lift themselves out of poverty.

Reduce energy use

Geothermal cooling of buildings using cool water sources is more efficient than using air conditioners. Green roofs decrease energy use (heating and cooling) of buildings and reduce noise pollution.

Develop renewable energy near to cities

Wave energy can be developed near to coastal areas, wind energy can be developed in unpopulated areas near cities, and solar energy can be installed within cities such as over parked cars in parking lots and on rooftops.

Promote tourism

Tourism as an industry might be less polluting than some other industries.