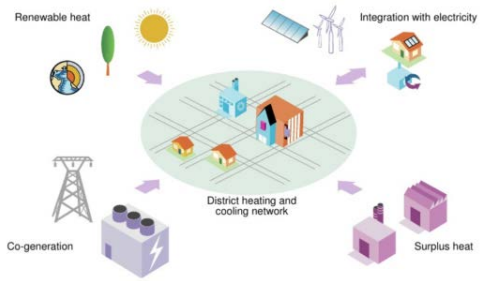
Examples of topics

Topics related to Smart Cities offer many challenges:

- Smart Energy,

  According to EU directives to reduce carbon emission, new houses need to meet nearly zero-energy requirements. Re-evaluating the energy requirements of new houses are important for the long run; however the majority of houses in urban areas will remain as they currently are for a great many years, thus with lots of badly performing buildings. So one topic could be to develop scenarios to upgrade the large building stock in urban areas. *[research topic: "Sustainable Transformation"]*

  Another topic related to Smart Energy is city planning. Current estimates note that cities are responsible for two-thirds of global energy use and more than 70% of green house gas emissions. So, in addition to improving existing and new houses on a component level, we need to consider integral concepts, too, for instance concepts enabling neighborhood-wide energy networks. By looking at the district level, you will find ample opportunities to recapture waste heat (or waste cold). However this requires a city that facilitates different types of use-it-or-lose-it sources. Incorporating new concepts for energy use on a district level, for example, will locate producers of excess heat (manufacturing facilities, data-distribution centers, et cetera) close to users of heat. Or will capture body heat by a set-up that optimizes the transfer of heat from a crowded urban place into nearby buildings or homes. *[research topic: "Smart Living Environments"]*



- Smart Environment.

  New technologies, such as indoor agriculture, may offer great opportunities for empty buildings. By using LED technology, one can grow crops in a compact indoor space, such as a multi-storey warehouses. New techniques in LED lighting, vertical and stackable growing trays, hydroponic systems, et cetera, open a window of opportunities for new facilities as well as for buildings which are currently vacant. Additional advantages are a well controlled environment resulting in a high harvest certainty and production speed (instead of five crops lettuce a year, indoor agriculture may grow 15-25 times a year). And indoor agriculture has a low risk where diseases and pests are concerned; therefore little or no pesticides are needed.
  However, indoor agriculture may not only affect rehabilitation of vacant real estate, but might over time influence transportation and the way we organize our living environment.

Urban farming can lead to more unexpected changes of buildings in cities. Take, for example, the Tropicana building (Rotterdam). Here, a company grows edible mushrooms, cultivated on coffee grounds (a residual product from the local catering industry that is now discarded and burned in waste incineration) in the dark spaces. Another fine example is the vertical greenhouse, applied in the RAI in Amsterdam. Here the facade is made as double layer, creating a greenhouse in between. In this way the facade can be used to grow vegetables and herbs that can be used in the restaurant. This building also collects rain water for the irrigation of the plants. *[research topic: "Sustainable Transformation"]*

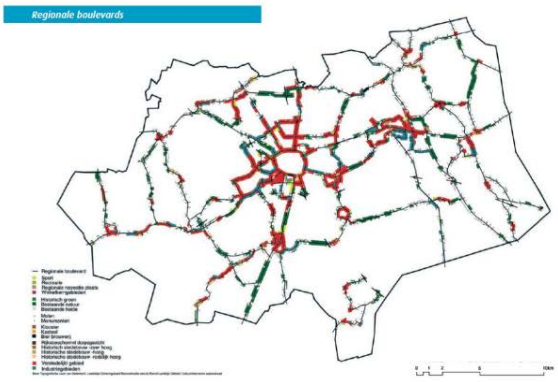
- Smart Mobility,

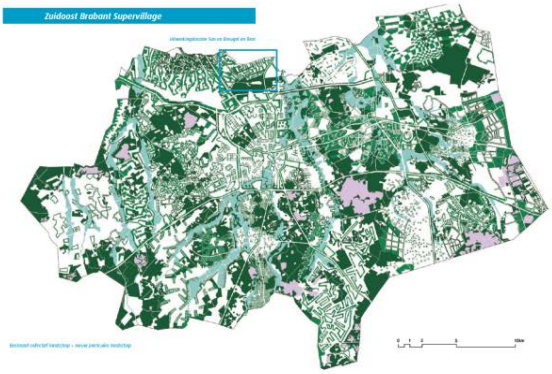
  One may expect major changes regarding mobility in the near future. As mobility strongly influences the way cities are organized and functions, cities are expected to adapt quite fast too. Take for example, the solar powered car Stella, created and built by a team of TU/e students who now run the very promising company called Lightyear. Starting from the idea that some decades from now, urban transport will be largely based on solar mobility it is unlikely that people will still park their car underneath a building in an underground parking garage. People will be more likely to park their car in the open, or even at the roof level of buildings. Can you think of the consequences and what will we do with the vacant underground space?
  [research topic: "Sustainable Transformation"]

  Having solar cars may lead to a mobility platform that produces energy instead of using it. This might transform society tremendously. For instance, what if solar cars are connecting when charging in between rides? Will we have to reconsider our opinion regarding parking lots and parking problems, shifting from ugly fields of sheet metal to powerful solar power plants?
  [research topic: "Quality of life"]

- Smart Infrastructure,

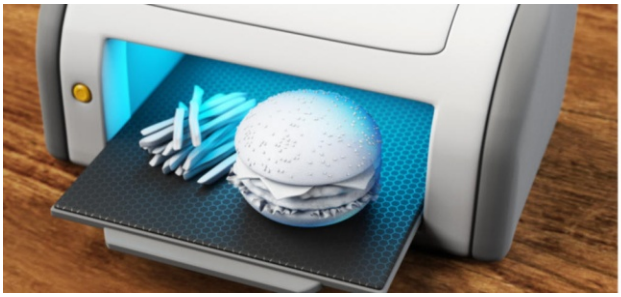
  Changes regarding mobility affect infrastructure and may lead to a different way of looking at a city. Maybe a city is no longer considered a compact unity with one core as city centre. For infrastructure that acts as a complex network, the many interchanges become the governing environments. Concepts such as Brainport city as a super village might become prosperous.
  [research topic: "Quality of life"]

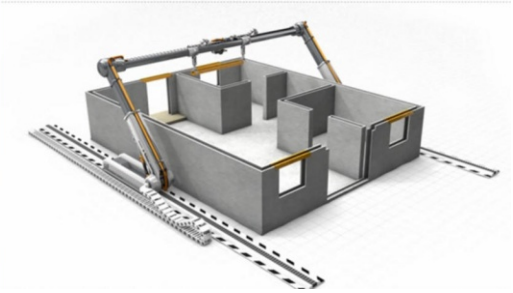




- Smart Technology,

  Changes in the way we live, and how cities function are an inevitable effect of the many challenges we will face in (digital) technology developments. You might consider, as an example, how a city will be affected if the majority of people engage in 3D-printing a range of everyday items. 3D-printing on a small scale might lead to radical changes as well as large scale 3D-printing. *[research topic: "Smart Living Environments"]*





- Smart People, Smart Living

  Today's economical changes combined with new possibilities by digital and telecommunication technologies affect the way people live and work. For instance, an increasing part of the working population is self-employed (zzp-ers). This number has risen from 1 out of 17 (two decades ago) to 1 out of 7. One might notice the effects of this change in the use of office space (and probably in the vast amount of vacant offices too). Changes in the way people cooperate, however, will result in other effects on city life as well. *[research topic: "Quality of life"]*

- Smart Healthcare

  New developments in personal healthcare allow the elderly to live independently in their own homes for a longer period of time. This change, in combination with other shifting family situations, implies that the demand side from the housing market differs from the supply side.

As an example, the demand for single-occupant apartments has increased in the last decade while the demand for family houses has decreased.
A need to offer more single family houses can be combined with the introduction of different types of social services and products that help elderly people to live independently in their own home. And with the challenge in terms of the isolation of individuals that will cause buildings, public spaces, and transportation systems to be used differently. *[research topic: "Quality of life"]*

- Smart Economy,

Fast changes in buying behavior (for instance the move to online retail in web shops) have already affected the coherence of a city. You can already notice a large number of commercial buildings that are vacant. Shopping areas in city centers are already more compact and are used in other ways. So, what should we do with the many vacant stores just outside the city centre and in the district centers in order to keep these livable areas? *[research topic: "Sustainable Transformation"]*