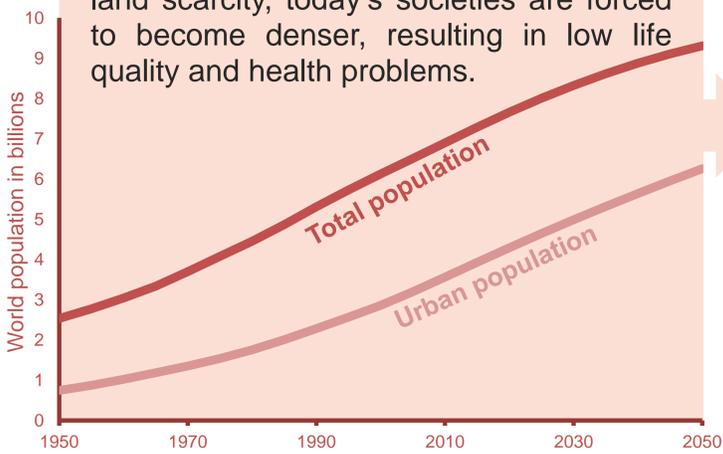


## The problem

### Urbanization:

With a growing population and increasing land scarcity, today's societies are forced to become denser, resulting in low life quality and health problems.

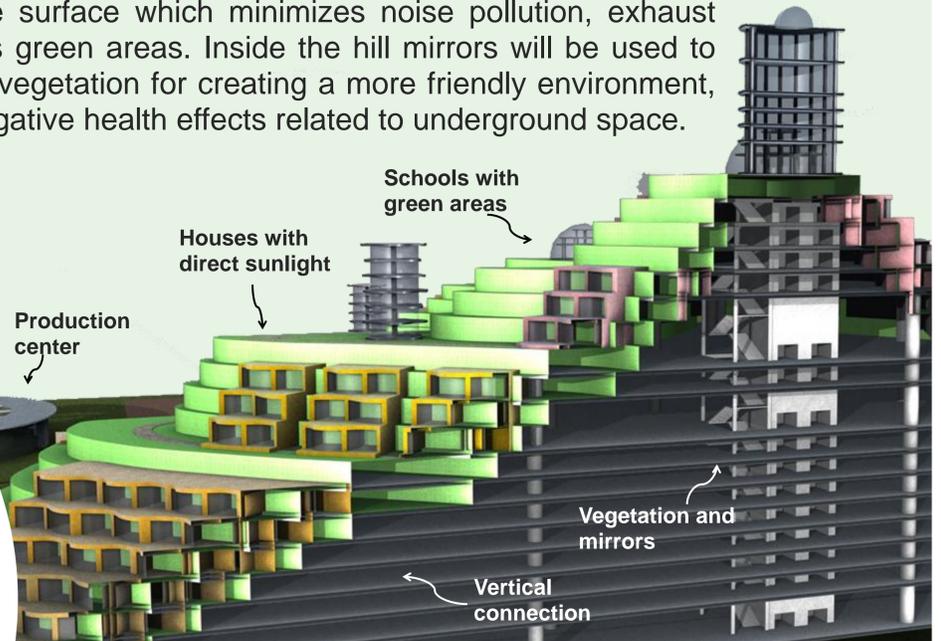


## The solution: Hillcity

### Living and working under the same roof:

Hillcity offers a closer community with high life quality, minimum traveling, clean air with low pollution, connection to nature and more time available for friends and families.

The idea is to build an artificial hill where infrastructures like houses and schools are built partly on the inside and outside of the hill resulting in a more protected area that still benefits from direct contact with the outside. Infrastructures like malls and public transport system which commonly are more isolated from the outside are instead built completely under the surface which minimizes noise pollution, exhaust gases and conserves green areas. Inside the hill mirrors will be used to capture sunlight and vegetation for creating a more friendly environment, this minimizes the negative health effects related to underground space.

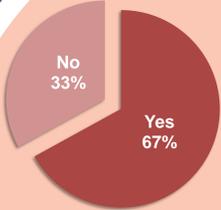


## Objective

Why should human societies adapt the concept of Hillcity and more interesting, how? The aim of our work is to bring Hillcity closer to implementation: how to solve the potential problems of air climate and how to find a potential location?

Indoor air quality and site criteria

## Challenges



Do you feel anxiety when isolated from the outside?

The results for this question were shown to be affected by the fear of *health effects*. For Hillcity a solution for the lack of direct sunlight exists, the problem remaining is:

**Air and climate quality**

### Challenges:

- Pollutants accumulated indoors: Air-conditioning system (HVAC) dilute the contaminants without treating them; Polluted outdoor air and unclean HVAC bring pollutants indoors
- Expensive cost: With large amount of air passing through HVAC, the energy consumption will be high
- Treatment not efficient: Indoor air pollutants are complex, e.g. certain VOCs require specific treatment; Byproducts are produced during the treatment

## Indoor air quality

90% percent of the time is spent indoors → creating a healthy indoor air quality (IAQ) is very important for Hillcity

### Affecting factors of IAQ:

- Temperature, humidity and air change rate
- Pollutants: particles and chemicals
- Microbials: bacteria and molds

### Technology of bipolar air ionization



1. Incoming polluted air
2. Ionization taking place
3. Activated oxygen
4. Activated oxygen reacts with germs, viruses, bacteria, etc.

### Evaluation for Hillcity

|  |  |
|--|--|
| Various target contaminants and wide application | Bipolar ionization works on PM <sub>x</sub> , VOCs, odors, smoke, etc, at room temperature without the need of catalyst. |
| High efficiency                                  | Up to 8 parameters are monitored to improve efficiency and avoid byproducts.   |
| Low energy consumption                           | Much less outdoor air needed, save the energy consumption for regular HVAC   |

## Potential location

To choose a set of criteria to be used for deciding a location, needs depending on local factors and basic needs for implementation must be considered.

**Focus:** the region between Lausanne and Geneva

How satisfied are you with the ... in Geneva?



Simple version of the criteria table created:  
(sorted after importance: high or low)

| Sustainable development       |           |  |
|-------------------------------|-----------|--|
| Potential for green energy    | High      | For sustainable development wind and solar energy are very important                   |
| Access to natural resources   | High      | Important for all cities, e.g. groundwater is one of the largest source for freshwater |
| Quality of life               |           |  |
| Connection to adjacent cities | High /low | Important for new jobs to have a connection to existing markets/businesses             |
| Safety                        |           |  |
| Low risk for natural hazards  | Low       | The resilience of a Hillcity is high, in fact high risk-zones could benefit            |

These were the identified problems together with the increased risk of floods, storms and extreme temperature.

## Hillcity: our future?

There is no need for great research to see the potential of Hillcity, one sentence is enough; **Hillcity creates new space.**

The artificial underground is the key but also the challenge as isolation from natural air has negative health effects. Bipolar air ionization has shown capable to be implement with desired results; it improves the IAQ and creates a healthy indoor environment for Hillcity.

Another strength is Hillcity's capacity to adapt after desired functions as well as location. Several of the site criteria chosen showed to be of low importance and the ones with higher, showed easy for a Hillcity to fulfill (e.g. potential for wind energy can in fact be created through the shape of the hill it self).