

2- *No blue, no green. No irrigation, no relevant benefits of green areas*

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1. How parks would parks without irrigation look like

If we want to keep our cities green (and the working paper of the group 1 clearly outlines its benefits), irrigation is required, especially in hot summer months even if it just as emergency system in order to guarantee the survival of the entire green area. We show the importance of irrigation on three examples from Australia, Germany and Spain.

Show the research that demonstrates difficulties of keeping urban green without irrigation

Compare the actual rainfall with the water needed for growth of a specific plant

In South Australia, which experiences hot, dry summers, it becomes very difficult and resource-intensive to maintain lush, green landscapes throughout the year. Historically, urban green space in Adelaide was allowed to dry out during warmer months and become brown, as most public open space was not irrigated. Between the 1960s and 1980s community perceptions of green space changed, and the urban population developed an expectation, that their green space indeed be green.

As climate change is expected to bring hotter, drier summers to South Australia, as well as more frequent and severe droughts, it is important to determine whether it is important to continue maintaining such resource-intensive spaces, or if it makes more sense to minimise urban parks, or alter them to suit their local climate. Such alterations could include such things as reducing areas of lawn and turf by increasing paved or mulched areas, replacing existing vegetation with drought-tolerant species; or reverting back to the pre-1960s approach of allowing vegetation to brown during drier months. Clearly, such adaptation

strategies will result in a reduction of lush, green open space that much of the community has become accustomed to.¹

Urban green is important – for recreation, micro-climate and biodiversity in cities. But **there is no green without blue: water** is essential. Urban green spaces are increasingly suffering from persistently warm and dry periods. Even in temperate latitudes such as Germany, precipitation amounts are decreasing while evaporation rates remain high, increasing irrigation needs.²

As of today, most green public parks in the Mediterranean are under irrigation. Cases when irrigation is broken just for couple of weeks has very negative effects on the conditions of the vegetation and quality of life of the citizens and are even highlighted in the local press. This may lead to lose the entire green area which normally was done with a huge initial investment and all simply by not maintaining working a good irrigation system.³



Park in Spain where irrigation has not been working for 3 weeks⁴

¹http://www.goyderinstitute.org/_r115/media/system/attrib/file/106/U.2.2%20Task%206%20-%20Greenspace%20Report_Final.pdf

²<https://www.igb-berlin.de/en/news/meeting-water-needs-urban-green-spaces-sustainable-way>

³https://sevilla.abc.es/sevilla/sevi-pp-denuncia-servicio-parques-y-jardines-esta-sin-camiones-riego-201908021313_noticia.html

⁴<https://www.heraldo.es/noticias/aragon/zaragoza/2019/07/17/el-parque-de-oriente-pide-agua-a-gritos-tras-veinte-dias-sin-riego-1325590.html>

2. More parks under irrigation - cooler city climate - less water required to keep them green

Vegetation in cities is more exposed than in an open landscape - microclimate is hotter (heat island) - that could be reduced by growing more green - cooling event. There is a significant positive effect - people spend more (I guess more not less) time outside in cooler parks in the summer - social interactions, sports, benefits for both physical and mental health. Also, since the weather is colder and people spend more time outside, the need to have air conditioning running all the time is lower. This leads to lower energy consumption and greenhouse gas emissions. Also, air conditioning is heating the areas outside of the buildings, thus, the less people use it, the better for the city microclimate⁵.

Urban vegetation can have a cooling effect of between 2 – 8°C due to increases in evapotranspiration. This can reduce building energy consumption by 7 – 47%.

The main question we face in the context of drought and water restriction is: what spaces are valuable enough to preserve using irrigation? The assumption is that if a space that needs to be irrigated is not considered environmentally, socially and/or economically valuable, then vegetation loss will occur. The loss of vegetation needs therefore to be understood in the broader context of environmental, social, and economic impacts of lost and damaged urban green space⁶

Overall, if there is enough vegetation in the city, the heating effect is slowed down, and the amount of water used for irrigation in all parks can be eventually reduced - there is an important self-enforcing circular effect in place. Thus, an irrigation system in place is necessary to keep the vegetation green and microclimate cool, however, with a significant area of parks, a need for irrigation and water consumption per m² of park will be decreasing.

3. Particularly vulnerable areas

Particularly vulnerable is the vegetation exposed to even more extreme temperatures and weather conditions - for example grass belts under the

tram lines. The irrigation there is fundamental to keep the lines green, but it results in a huge difference in temperature if we compare it to Tram lines with concrete bases.

Another example of extreme exposure is areas under high active usage of the public - areas to play sports, picnics, social meetings, playgrounds. We want to encourage people to spend active and social time outdoors, but these exposed areas need even more irrigation.

Another case is areas in the shade of large trees - do not allow rain to get to the ground and allow grass to grow -where irrigation is needed.

Soils under trees are particularly dry, which is mainly due to the high-water demand of urban trees. In addition, there are interception losses from the canopy. To counteract future water stress because of several consecutive drought years, sustainable irrigation management will be required. While grasslands show high evaporation rates in the upper soil layers, they also promote rainwater infiltration, which can provide moisture to the soil and contribute to groundwater recharge⁷.

Growing adapted species to the local climate or reducing too much the lawn surface sometimes may not be enough to guarantee that citizens perceive those green areas as lush enough to use it and therefore create the positive effect proven by green areas in cities.

In any case, an efficient irrigation system shall be installed (as said, at least, as emergency, as even adapted species may suffer the severe droughts that continuously increase due to climate change).

Another point in relation with need of irrigation : without urban green space, the urban environment may encounter very large soil stability problems such as dust and sediment loss. By maintaining green space, stability in the soil is retained. In some cases, it may be necessary to use irrigation to maintain this green space resource to prevent soil stability problems.

Nowadays technology has advanced significantly in irrigation devices improving the water distribution and uniformity, reducing the precipitation rate allowing modern and well-designed systems to water at a lower precipitation rate than average soil's infiltration rate (around 13 mm/hr) which guarantees an efficient usage of 100% of the water used to water reducing to almost 0 water loss.

In fact, different studies prove that water usage can be reduced just by updating irrigation systems nozzles up to a 30 %.⁸

In cases of green areas where users can have access for periods long enough as to get inside the water window, subsurface irrigation can be a great solution that has lately improved with systems that allow a perfect distribution uniformity below the soil (better than the old simple dripline net) and allow to water even during heat hours and with users in the green areas, apart from being resistant to root intrusion.

Last developments in irrigation have not only improved the distribution uniformity and the precipitation rate of direct irrigation devices but have allowed maintenance companies (municipalities or contractors) to have access with reasonable prices to weather data (till 10 years ago investments for these required thousands of Euros while now we are talking of hundreds). This allow to adapt irrigation times and duration on daily bases to match the daily local ET of each park, as, even on the same city, each park can be on its own a microclimate with different conditions due to the surrounding buildings, type of vegetation, soil, and overall surface. These updates get real time sent through internet to the local controller without needing the maintenance person to be on the site reducing furthermore the maintenance cost.

This irrigation systems self-adapting to the weather changes can provide very different saving water results (in some cases even above 30%) depending on the latitude, and seasonal weather (rainy or hot summer) but are always positive if we compare it to the old strategy of leaving standard irrigations times based on seasons or simply adapt them, even on daily bases, by manually changing the water budget by a local maintenance person.

Just to recap: green areas are proven to be necessary and have different positive effects in cities and people.

Green areas effect increases if perceived to be lush by citizens.

Irrigation systems are always necessary to maintain healthy city green areas and to preserve the investment of making them by guaranteeing its survival during heat waves.

Maintenance of green areas has developed significantly increasing efficiency and reducing water usage bringing water waste close to 0 if correctly designed.

⁵ <https://www.theguardian.com/environment/2019/aug/29/the-air-conditioning-trap-how-cold-air-is-heating-the-world>

⁶ http://www.goyderinstitute.org/_r115/media/system/attrib/file/106/U.2.2%20Task%206%20-%20Greenspace%20Report_Final.pdf

⁷ <https://www.igb-berlin.de/en/news/meeting-water-needs-urban-green-spaces-sustainable-way>

⁸ For example R-VAN from RainBird or MP Rotator from Hunter Industries