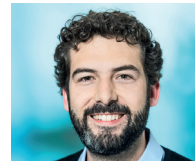


HOW GREEN IS ARTIFICIAL TURF?

AN ECOLOGICAL COMPARISON OF ARTIFICIAL AND NATURAL TURF

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The City of Zurich wishes to reduce its per-capita primary energy consumption and greenhouse gas emissions. To analyse and compare the environmental impact of different types of turf playing surfaces, the Green City of Zurich has commissioned Zurich University of Applied Sciences with a life-cycle assessment study. How do artificial turf pitches with and without infill compare with natural turf surfaces? The authors René Itten and Matthias Stucki of the Life-Cycle Assessment Research Group at Zurich University of Applied Sciences draw their conclusions.

(Un)natural?

Artificial and natural turf pitches are precisely defined and built structures, and their visible life cycle starts with their construction. However, this is almost the only thing that artificial turf and natural turf have in common. In a comprehensive life-cycle assessment, researchers at Zurich University of Applied Sciences in cooperation with the Green City of Zurich and sports ground experts have compared the environmental impact of natural and artificial turf from pitch construction through maintenance and renovation through to removal. Even if natural turf and artificial turf have the same function as a sports surface, the two product systems could not be more different.

Different environmental impacts

The artificial turf value chain of relevance for the life cycle assessment begins with the production of petroleum as the raw material, while the value chain of natural turf starts with the production of turf seeds and artificial fertilisers. The environmental impacts of the two types of turf sports surface are correspondingly different. With artificial turf, it is its production, renovation and disposal that have the biggest impact. But natural turf is also anything but natural, with the biggest environmental impact being in its operation and maintenance with the use of fertilisers, pesticides and diesel-powered vehicles for mowing and filling with sand.

However, there are differences not only between artificial and natural turf, but also within these two types. The two main types of artificial turf are with infill of sand or plastic granulate and without infill. For its part, natural turf can be classified into turf with a drainage layer and naturally drained natural turf on the existing soil.

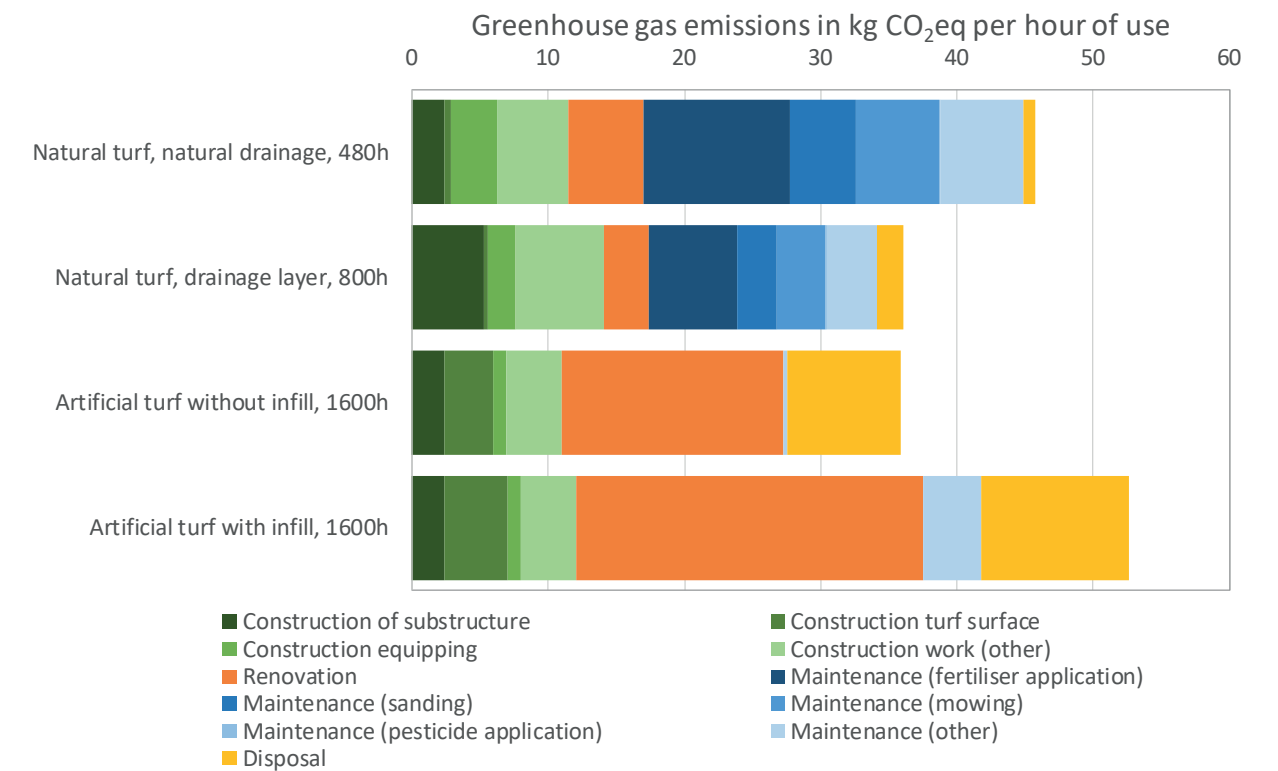
Hours of usage are decisive

The key variable for a comparison of turf playing surfaces is the annual hours of use. Unlike natural turf, artificial turf can also be used in winter or wet weather and can therefore be played on much more often. The greater the intensity of turf use, the lower the environmental impact per hour of use. A survey of the effective usage time in the City of Zurich has shown that, in reality, natural turf is used far less than is theoretically possible.

Environmental footprint per hour of use

Put to maximum theoretical use, an artificial turf pitch with infill and natural turf with a drainage layer cause the lowest greenhouse gas emissions at 36 kg CO₂eq per hour of use. A comparison of the different types of turf clearly shows where the differences lie. Maintenance causes 60% and 45% of the greenhouse gas emissions of natural turf, naturally drained and with a drainage layer, respectively. For artificial turf with and without infill, only 8% and just over 1% of the environmental impact comes from maintenance. On the other hand, renovation causes 45% to 48% and disposal 20% to 23% of the greenhouse gas emissions of artificial turf. In the case of artificial turf with infill, the granulate infill is fully replaced and disposed of during renovation.

The annual usage varies from 480 hours for naturally drained natural turf to 1,600 hours for the two types of artificial turf. Since artificial turf without infill can be used more intensively than natural turf and also impacts the environment considerably less during renovation and maintenance than artificial turf with infill, artificial turf without infill yields lower values for greenhouse gas emissions than natural turf with a drainage layer.



Greenhouse gas emissions of the various turf pitches per hour of use, broken down into the contributions from construction, renovation, maintenance and disposal.

Comparison of other environmental impacts

Any comparison of different turf sports pitches must not be reduced to greenhouse gas emissions alone, as a broader comparison taking various environmental impacts into account reveals further significant differences.

In terms of air pollutants and the eutrophication of seas and soils, the environmental impact of artificial turf is significantly lower than that of natural turf. Air pollutants and eutrophication are mainly caused by the maintenance of natural turf. More specifically, the burning of diesel during lawn-mowing causes air pollution, and the use of artificial fertilisers encourages eutrophication.

Natural turf and artificial turf differ most in terms of eco-toxic emissions. The pesticides used on natural turf are released into the environment, causing toxic effects. Since neither artificial fertilisers nor pesticides are used in the maintenance of artificial turf and diesel consumption in the maintenance of artificial turf is also significantly lower, the impact of artificial turf is significantly lower than that of natural turf in a direct comparison.

Problematic microplastic

Artificial turf with infill is a source of microplastic, which is discharged from the pitch and thus finds its way into the environment of the artificial turf pitch and into the wastewater. Granulate infill specifically from recycled car tyres contains environmentally harmful substances in the form of heavy metals and polycyclic aromatic hydrocarbons. From an environmental point of view, artificial turf with infill is therefore not recommended. The City of Zurich has already decided not to install such artificial turf any more.

Efficient usage is the watchword

The greatest potential for reducing the environmental impact of turf pitches in the City of Zurich lies in optimising their use. If sports pitches are used more intensively, then less new acreage needs to be claimed for additional facilities. Other approaches include switching from mowing to mulching to reduce the demand for fertiliser and using electrified robotic mowers instead of diesel-powered lawnmowers. However, it is not only infrastructure operators who are called upon make sport more sustainable with a low ecological footprint, but also athletes themselves, for example, by choosing environmentally friendly means of transport to get to the sports ground.

Interested?

The complete study is available in the ZHAW Digital Collection
<https://bit.ly/39s6br2>

In addition, a performance indicator model is available that allows key parameters such as the annual hours of use to be adjusted in favour of an individual life-cycle assessment for a specific turf pitch:
<https://bit.ly/3sCNbxT>