Adept Economics

March 2017

Cost-effectiveness of Synthetic Turf for Use in Local Government Applications

Report prepared for Urban Turf Solutions

Adept Economics

Adept Economics is a Brisbane-based consultancy providing expert economic analysis and advice for private and public sector clients who want to know, for example, whether an investment project is worthwhile or a policy or program is beneficial and cost-effective.

Adept can help you by preparing business cases, reports for boards or senior executives, or funding submissions to governments, councils and other funding agencies.

Contact

Gene Tunny – Principal, Adept Economics

PO Box 1201, Milton QLD 4064

gene.tunny@adepteconomics.com.au

Author

Gene Tunny, with research assistance provided by Roshana Hall and Patrick Windle

Cover photo

Roundabout in Gladstone covered in synthetic turf produced by Urban Turf Solutions

Disclaimer

This report has been prepared in accordance with the scope of services described in the contract or agreement between Adept Economics and the Client. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client. Furthermore, the report has been prepared solely for use by the Client and Adept Economics accepts no responsibility for its use by other parties. The report is not financial advice.

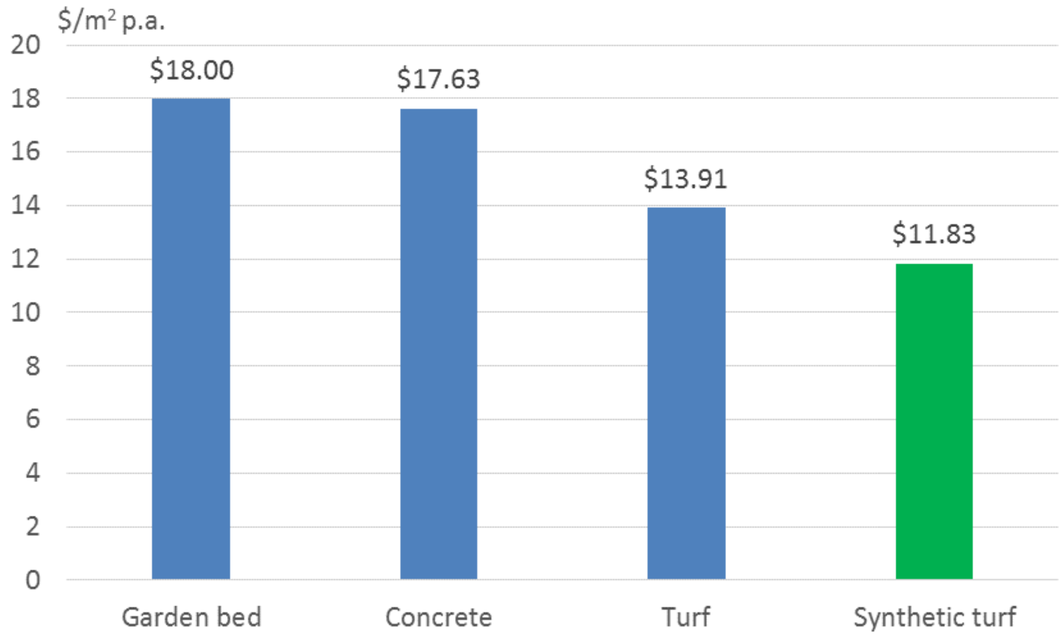
Summary

Synthetic turf can be a cost-effective investment for home owners, businesses and local governments. While up-front outlays can be higher than for natural turf, lower maintenance costs mean that synthetic turf can be cost-effective and result in monetary savings over the lifecycle. Also, unlike natural turf in applications where it is not watered, synthetic turf will remain green during drought conditions, maintaining its visual amenity.

Synthetic turf has been widely used in residential and sporting developments for many years, and is increasingly being used by local governments, in applications such as roundabouts and median strips. For example, Gladstone Regional Council has recently used synthetic turf manufactured by Queensland-based Urban Turf Solutions (UTS) on a local roundabout and median strip.

UTS has commissioned Adept Economics (AE) to analyse the relative cost-effectiveness of different landscaping options from a local government perspective. The analysis reveals that, due to savings on maintenance over the lifecycle, the average annual cost of synthetic turf is significantly lower than other landscaping options for the median strip example analysed. For example, a median strip landscaped with synthetic turf can be 15 percent cheaper over the lifecycle than a median strip landscaped with natural turf (Figure S1).

Figure S1. Average annual lifecycle cost of different landscaping options for a 300m^2 median strip



Source: AE estimates, 2017.

1. Introduction

Local governments and other road infrastructure managers are faced with decisions regarding landscaping options to use in a number of applications, including roundabouts and median strips. There are a number of criteria for councils to consider, including capital costs, maintenance and operational costs, effective lives of the options, work health and safety (WHS), pollution, risk of vandalism, and drainage properties. Consistent with best management practice for assessing infrastructure investment decisions, it is necessary to look at the full lifecycle costs over long periods (e.g. 30 years). A lifecycle cost analysis considers the cost of assets over the lifecycle, including initial capital expenditures and ongoing operating expenditures.

This is what Adept Economics (AE) did for a case study of a 300m^2 median strip built for a local government council, in a study commissioned by Urban Turf Solutions (UTS). AE was requested to assess the cost-effectiveness of synthetic turf for use in council applications, compared with a range of typical alternative approaches, specifically natural turf, garden beds and concrete. The analysis could similarly apply to a roundabout of similar size, or any other public space where similar options were available, and assessment criteria were similar. AE's analysis was based on a review of the technical literature and consultations with councils and technical experts.

Note that UTS has recently supplied synthetic turf to Gladstone Regional Council, which has used it in roundabout and median strip applications (Cover image and Figure 1 below).

Figure 1. Median strip, Gladstone

Source: UTS, 2017.

To undertake the study, AE developed a whole of lifecycle cost model for each alternative that considers all relevant capital expenditures (capex) and operational expenditures (opex) over the long term (i.e. 30 years). This allows the comparison of alternatives with significantly different cash flows over time. A brief summary of the capital and operating costs for a number of alternatives with widely varying levels of installation and ongoing costs is presented in Table 1.

Table 1. Landscaping solutions for roundabouts and median strips

Solution	*Capital cost*	*Ongoing cost*
Concrete	Very high	Very low
Garden beds	Medium	High
Synthetic turf	Medium	Low
Natural turf	Low	Medium

Source: AE, 2017.

AE estimates synthetic turf is 15 percent cheaper over the lifecycle than other landscaping solutions, such as natural turf. Hence synthetic turf is potentially a cost-effective solution for councils looking to reduce maintenance costs for roundabouts and median strips, while still providing a visually appealing surface covering.

Natural turf and garden beds are expensive to maintain when the costs of weeding, regular mowing and any traffic management charges are considered. Synthetic turf is likely to be even more appealing in times of drought and water restrictions, as synthetic turf may survive while natural turf may die, reducing visual amenity and requiring costly replacement to restore that amenity.

2. Characteristics of synthetic turf

Synthetic turf has a visual appearance similar to natural turf and has improved considerably since the first Astroturf products were used on sporting fields in the late 1960s. It is durable and can last up to 15 years, although in sporting uses it may need replacing every seven to ten years. The typical product is UV-resistant and has a 40mm pile, which creates a lush look and texture. Two texture yarns can be combined to display a freshly mown look. It is spongy underfoot, and suitable for large areas.

Urban Turf Solutions has also developed a product that specifically meets the drainage requirements of councils, with similar absorption and runoff management properties to natural turf. Urban Turf Solutions has commissioned research on water permeability of its product under a range of different yarn heights and penetrations (Box 1). This research confirms that synthetic turf achieves the water-sensitive urban design objective of minimising the runoff of sheets of water onto roadways.

Box 1: Drainage characteristics of Urban Turf Solution's synthetic turf product

Keith McAullife of the Sports Turf Institute conducted an evaluation of Urban Turf Solutions products for drainage performance in April 2011. The treatments tested were:

- synthetic turf with impermeable backing with 3 different hole spacings (100mm x 100mm standard; 100 x 72mm; 100 x 46 mm)

- use of stone and high Ksat sand as under layer

- use of high and medium Ksat sands as infill, plus no infill (approx. 2kg of sand infill per tray)

- duplicates of each treatment.

Drainage performance was tested via an experimental procedure that used sieve trays 350 x 250mm in size. The synthetic turf samples were placed in the trays and the edges were raised and sealed to ensure water passed through the base. A constant head of water was applied, and the water application rate was increased until a constant depth of ponded water was achieved. The flow rate was recorded.

The study found that:

…with all the combinations of materials used drainage rate exceeded that of a well- drained natural turf system. Moving from a stone to free-draining sand under layer resulted in a 50% decline on drainage rate. The type of sand used as infill had a significant effect on drainage rate. Increasing the number of holes in the synthetic turf backing increased drainage rate through the system (doubling the number of holes effectively doubled the flow rate).

Hence this study proves that synthetic turf can meet the water sensitive urban design objectives of councils.

Source: Sports Turf Institute, 2011, Evaluation of Synthetic Turf Products for Drainage Performance, Report for Urban Turf Solutions prepared by Keith McAullife.

A comparison of synthetic turf with other landscaping options, according to decision criteria relevant to councils, is presented in Table 2. Further information on the calculation of lifecycle costs is provided below.

Table 2. Categories of costs in cost-effectiveness analysis

Options	*Aesthetics*	*Drainage*	*WHS*	*Risks*	*Effective life*
Synthetic turf	✓✓✓ Two-tone, does not get overgrown or go brown in drought	✓✓✓ Comparable to natural turf (see Box 1)	✓✓✓ Low maintenance	Minor – e.g. ripping up of product if heavy vehicle accidentally drives over it	10-15 years
Natural turf	✓✓ Looks natural, but can turn brown during drought	✓✓✓ Very good	✓ Regular maintenance (e.g. mowing) creates WHS risks	Significant risk from drought and having to replace turf Also some risk of damage from vehicles	Often driven by drought cycles unless watered
Garden bed	✓✓✓ Visually pleasing, but can turn brown during drought and can be vandalised	✓✓✓ Very good	✓ Regular maintenance (e.g. weeding) creates WHS risks	Significant risk from drought and having to replant Also some risk of damage from vehicles and vandalism	Often driven by drought cycles unless watered
Concrete	✓ Visually unappealing	✓	✓✓✓ Low maintenance	Unacceptability to public	50 years+

Source: AE, 2017.

3. Cost-effectiveness analysis of landscaping options

AE has compared the cost-effectiveness of the different landscaping options—concrete, garden bed, synthetic turf and natural turf—over a 30-year period for a case study of a 300 m^2 median strip. AE has appropriately taken into account the time value of money by discounting future costs at a rate of 6 percent per annum. All assumptions in AE's cost-effectiveness model are set out in Table A1 in the Appendix. A list of the costs that are estimated is presented in Table 3, split by capital costs (i.e. those incurred at installation or re-installation) and operating costs (i.e. ongoing costs such as maintenance). Note that the analysis assumes that the synthetic turf installation is in an appropriate location which is not flood prone.

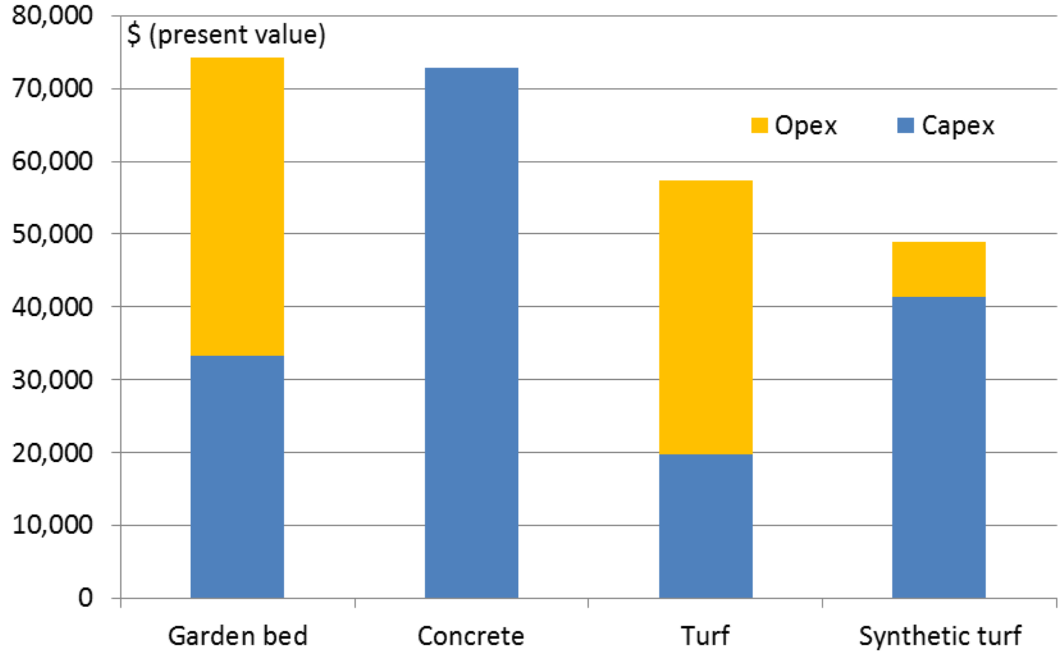
Table 3. Categories of costs in cost-effectiveness analysis for different landscaping options

Option	*Capital costs*	*Ongoing costs*	*Trends*
Concrete	Sub-base materials Sub-base installation Concrete Kerb	n.a.	Cost of concrete increasing at a high rate & costs would increase further if there were a carbon price
Garden beds	Soil Soil installation Landscaping Kerb	Maintenance (incl. fertiliser) Traffic management	Maintenance costs increasing as growth in labour costs typically exceeds CPI inflation
Synthetic turf	Sub-base materials Sub-base installation Synthetic turf Infill Re-installation cost (after 10 years) Kerb	Cleaning (annual) & traffic management	Low ongoing costs & lower risk of unexpected cost increases over time
Natural turf	Soil Soil installation Turf Kerb	Mowing Other maintenance Traffic management	Maintenance costs increasing as growth in labour costs typically exceeds CPI inflation

Source: AE, 2017.

The results from AE's cost-effectiveness analysis are presented in Figure 2. Over 30 years, the total cost of a 300m^2 median strip with synthetic turf is around $48,900 in today's dollars compared with around $57,500 for a median strip with turf, $72,800 for a full concrete median strip, and $74,300 for a median strip with garden beds covering the same area.

Figure 2: Lifecycle cost comparison over 30 years (300 m^2 median strip)



Source: AE estimates, 2017, based on research and consultations with councils.

Synthetic turf has over twice the capital costs of natural turf, taking into account initial installation costs and the possible need to replace it in future years, but it achieves large savings in ongoing maintenance costs, due to the avoidance of mowing costs and any associated traffic management charges. In short, the higher capital costs for synthetic turf are more than offset by savings in operating costs over the long term.

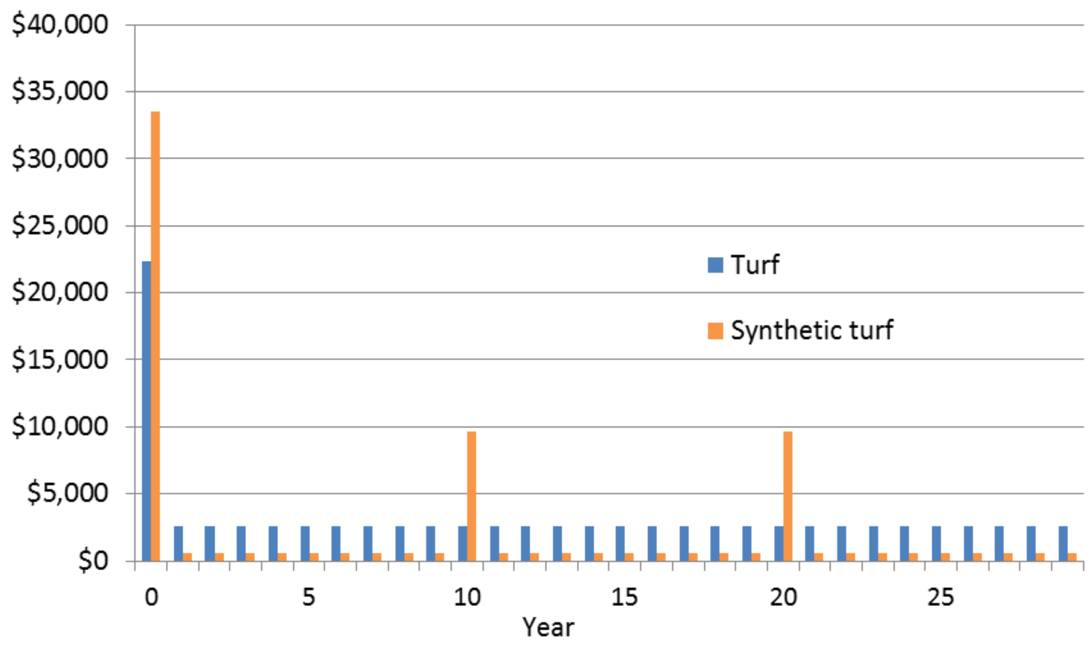
Over 30 years, operating costs for the 300m^2 median strip are estimated at around $500 per annum for synthetic turf landscaping compared with $2,700 per annum for natural turf and nearly $3,000 per annum for garden beds. Based on these savings, compared with natural turf, the initially higher capital costs of synthetic turf are repaid after five years.

From consultations with councils, AE understands that a major driver of the interest of councils in synthetic turf derives from the cost of traffic management requirements (imposed by the relevant WHS Code of Practice), and this is clearly a major factor influencing the relevant cost-effectiveness of synthetic turf in the case study presented here. Hence, a shift to synthetic turf, which requires much less maintenance (e.g. only an annual clean compared with a monthly mow), would substantially reduce the need for traffic management, and this would be reflected in lower contract costs for the management of council assets.

AE has prepared a relatively conservative estimate of the potential cost saving from synthetic turf because it assumes that the synthetic turf is replaced every 10 years, which is a conservative assumption. Depending on its location, and its exposure to foot traffic and (accidentally) to vehicle traffic, it could last 15-20 years.

While synthetic turf has a higher capital cost than natural turf (and garden beds) during the installation phase, it involves lower outlays over time, as shown in Figure 3, comparing natural and synthetic turf landscaping options. Hence, it may be desirable for councils, for example, to require that new developers of housing estates use synthetic turf in median strips and on roundabouts, so the council is not left with a legacy of high maintenance costs. Note the cash outlays in Figure 3 include a cost for the replacement of synthetic turf at 10 years intervals.

Figure 3 Cash outlays over time, natural turf vs synthetic turf



Source: AE, 2017.

The modelling assumes the natural turf never needs replacing, although it is possible that councils would decide to replace it or landscape it in the future. Hence, the cost-effectiveness comparison could be considered very conservative, because if allowance were made for the replacement of natural turf, or a longer economic life for synthetic turf was assumed, the cost-effectiveness of synthetic turf would be even more favourable.

4. Conclusions

The AE cost-effectiveness analysis supports further consideration by councils of the potential for synthetic turf to replace concrete, natural turf and garden beds in a number of council applications, including median strips and roundabouts. Over time, a significantly lower level of operational costs (e.g. maintenance) for synthetic turf compared with natural turf and garden beds means that synthetic turf is more cost-effective. For example, a median strip landscaped with synthetic turf can be 15 percent cheaper over the lifecycle than a median strip landscaped with natural turf. Synthetic turf is also superior to concrete, which has high upfront capital costs, and is visually unappealing. Hence, synthetic turf is a cost-effective and visually appealing option for councils.

Appendix. Costing assumptions

Table A1. Landscaping solutions for roundabouts and median strips

Parameter	*Units*	*Value*
Common assumptions		
Size of median strip (6m x 50m)	m^2	300
Discount rate	%	6
Labour cost (incl. on-costs)	$/hr	37.90
Traffic management control cost	$/visit	150
Concrete kerbing	$/m	110
Synthetic turf		
Capital cost of synthetic turf	$/ m^2	20
Cleaning costs (labour & materials)	$/clean	100
Time between cleans	years	1
Cost of infill (sand)	$/kg	0.07
Infill density	kg/ m^2	4
Road base/crusher dust cost	$/ m^2	25
Installation labour and accessories	$/ m^2	10
Re-installation (labour and accessories)	$/ m^2	10
Life of synthetic turf	years	10
Natural turf		
Capex for natural turf	$/ m^2	10
Cost of soil	$/ m^3	35
Depth of soil	m	0.15
Installation / establishment cost	$/ m^2	3
Mowing cost	$/ m^2	0.134
Times mowed per year	No. p.a.	12

Parameter	*Units*	*Value*
Maintenance (excluding mowing)	\$/sqm p.a.	0.10
Garden bed		
Capex for garden beds	\$/ m^2	55
Cost of soil	\$/ m^3	35
Depth of soil	m	0.15
Installation / establishment cost	\$/ m^2	3
Maintenance (e.g. weeding/spraying)	\$/ m^2 p.a.	3
Maintenance visits	No. p.a.	12
Water applied	L/ m^2 p.a.	100
Water charges*	\$/KL	3.77
Concrete		
Concrete (125mm thick, plain finish)	\$/m^2	175

Source: AE, 2017 based on consultations with councils, suppliers and desktop research (e.g. ABS wage data, suppliers' websites, reference to Rawlinson's Australian Construction Handbook).
**This is the current water charge per kilolitre for Logan City Council.*