Green Footprints

An experiment to nudge people towards responsible litter disposal

April 2015

CONTENTS

Glossary of terms

- **Green footprints:** Self-adhesive, non-slip, green vinyl stickers in the shape of footprints. These were placed on the ground in a 'walking' design towards a bin.
- **Salience:** The prominence of something (e.g. a feature or message) in relation to its surroundings, i.e. something that is highly salient stands out. Behavioural science has identified that salience plays a key role in how people respond to prompts[1]. Salience refers to any aspect of a stimulus that works to attract people's attention. For example, practitioners might use environmental cues, incentives or messaging to attract people's attention by engaging with their cognitive, motivational and/or emotional functions. In this report, we refer to the salience of litter bins and how this can be increased. The salience of something is linked to relevance – efforts to make something stand out more are most likely to work when they are delivered precisely at the point that the information, service or infrastructure is most relevant to people (for example, messaging around litter that engages people while out and about is more likely to be effective than when delivered on leaflets to people's homes).
- **Baseline monitoring phase:** Three weeks of litter and waste monitoring conducted by the partners prior to the implementation of the footprints. Partners measured and recorded the weight in kilograms of all waste collected from their target site on their chosen monitoring days (minimum of two days per week), both in rubbish bins and litter collected from the ground.
- **Intervention monitoring phase:** Three weeks of litter and waste monitoring conducted by the partners immediately after the installation of the green footprints, as per the above.

[1] *EAST: Four simple ways to apply behavioural insights*, The Behavioural Insights Team, April 2014.

1. Executive Summary

1.1. Background

Since 2013, Keep Britain Tidy has been working with local land managers to deliver a series of experiments aimed at changing littering behaviour as part of its Defra funded *Social Innovation to Prevent Littering* programme. The experiments are evaluated to assess their impacts on behaviour and litter on the ground, with a view to encouraging replication to scale the intervention across England.

This year, Keep Britain Tidy tested and evaluated the use of green footprints as a 'nudge' behaviour intervention to reduce litter by partnering with the following four land managers:

- Darlington Borough Council
- Cheshire West and Chester Council
- Hull City Council
- Northumberland County Council

Behavioural science has identified that salience plays a key role in how people respond to prompts[2]. Salience refers to any aspect of a stimulus that works to attract people's attention. For example, practitioners might use environmental cues, incentives or messaging to attract people's attention by engaging with their cognitive, motivational and/or emotional functions.

The use of green footprints is one way in which the salience of a litter bin can be increased. Pairs of green footprints are placed on the ground to highlight and direct location users towards the nearest bin, thereby 'nudging' them towards more responsible litter disposal. The approach was first developed and tested by Pelle Guldborg Hansen in Copenhagen in 2011. The approach has also been tested in Wales and was used as an awareness raising activity in Shrewsbury. However, prior to this experiment, no known trials of the approach had robustly tested the impacts of the footprints on the amount of litter in bins and on the ground, nor their longer term effectiveness. Keep Britain Tidy therefore sought to build on the research of Hansen and others for this purpose in partnership with the local authorities listed.

[2] *EAST: Four simple ways to apply behavioural insights*, The Behavioural Insights Team, April 2014.

The green footprints *in situ* in Copenhagen

The experiment was conducted at two locations per partner area: one park/recreation area and one main retail and commercial area. This allowed the effectiveness of the footprints at different land use types to be tested.

1.2. Aim

The aim of the experiment was to test the application of green footprints as a nudge approach for increasing bin usage and so decreasing the amount of litter present on the ground.

Evaluation objectives

The experiment evaluation objectives were to identify:

- the impacts of the footprints on litter on the ground;
- the longevity of any impacts over a three month period, and
- what would improve the impact, effectiveness, appropriateness and efficiency of the approach.

1.3. Methodology

The experiment methodology is detailed at Section 3.3 of this report and summarised below.

Partners were invited to express their interest in taking part in the Green Footprints experiment. Those that took part were fully committed to taking part in the experiment following the guidelines provided by Keep Britain Tidy, including a full evaluation of the project. They also represented a range of geographic locations.

The green footprints used in the experiment were printed on bright green vinyl, making them highly visible. The footprints were self-adhesive and were installed by the partners. Partners were advised to use three pairs of footprints placed in a 'walking' design towards each bin in their selected location.

The green footprints were tested at two locations per partner: one park/recreation area and one main retail and commercial area. This allowed the effectiveness of the footprints at two different land use types to be assessed (to our knowledge, this intervention had previously only been trialled in town centres). The sites were areas of high footfall and all had a sufficient number of bins to be suitable for the experiment. The size of the target sites was determined by natural boundaries (e.g. the length of a high street or the boundaries of a park) and varied across all four partners. The green footprints were placed at all bins within the target areas.

Table 1: Green Footprints experiment testing sites

Partner	Parks/recreation site	Main retail and commercial site
Cheshire West and Cheshire Council	Whitby Park, Ellesmere Port	Ellesmere Port Town Centre
Darlington Borough Council	South Park, Darlington	High Row, Darlington Town Centre
Hull City Council	West Park/Entrance to Kingston Communications Stadium, Hull	Queen Victoria Square/King Edward Street, Hull
Northumberland County Council	Newbiggin by the Sea promenade	Station Road retail area, Ashington

As the experiment tested 'nudge' theory, in order to ensure that the results of the experiment were accurate and unbiased, Keep Britain Tidy and partners did not undertake any promotional activity that would alert people to the purpose of the Green Footprints experiment, before or during its delivery.

Using hand scales, each partner weighed all litter found at their target sites, both in bins where green footprints were situated, and on the ground[3]. This monitoring took place in three phases; for three weeks prior to the installation of the footprints (baseline monitoring), three weeks once installed (intervention monitoring) and a further three weeks, three months after installation (long term monitoring). Unfortunately, however, a large proportion of the adhesive green footprints went missing prior to the long term monitoring phase. This has impacted on the quality of the long term monitoring data and as such, this data has been discounted from the experiment analysis. Further details regarding the missing adhesive footprints are provided at Section 3.3.6.

The monitoring results were analysed to determine the change in the proportion of litter recorded on the ground after the green footprints were installed, compared to baseline monitoring. This was deemed the most appropriate measure of impact as it allowed for fluctuations in the overall amount of waste deposited in the bins and litter on the ground (e.g.

[3] Some partners monitoring litter on a daily basis, whilst others monitored a few times a week, or did not include weekends in their monitoring

during special events) be accounted for, providing a more accurate measure of the impact of the experiment.

In-depth interviews with each project manager at Darlington Borough Council, Cheshire West and Chester Council, Hull City Council and Northumberland County Council also took place to evaluate the experiment.

1.4. Results

Objective 1: To identify the impact of the footprints on litter on the ground

Overall, there was an average 15.9% reduction in litter on the ground in the three weeks following the implementation of the green footprints compared to the baseline monitoring. Six of the eight testing site experienced a reduction in litter. Hull City Council recorded the largest reductions in litter of the partners at both of its sites; 46.1% at the parks/recreation site and 42.4% at the main retail and commercial site.

The footprints appear to have been more effective in reducing litter at the parks/recreation sites than the main retail and commercial sites.

Objective 2: To identify the longevity of any impacts over a three month period

Unfortunately the experiment was unable to provide any firm conclusions regarding the longer term effectiveness of the footprints due to both the adhesive and painted footprints not lasting the monitoring period (i.e. from the installation of the footprints to the end of the long term monitoring period, approximately three months later). Keep Britain Tidy recommends that future iterations of the approach conduct long term monitoring to assess its ongoing effectiveness, noting that the footprints will need to use more permanent materials to ensure their longevity.

Objective 3: To identify what would to improve the impact, effectiveness, appropriateness and efficiency of the green footprints for any future iterations of the project

Overall, all the partners were very satisfied with the Green Footprints experiment and felt that the green footprints had reduced littering in at least one of their areas. All of the partners said that they were considering continuing to use the footprints in their current locations or rolling them out to new locations that they had identified, where they felt the footprints would be more effective and/or appropriate. For example, a number of partners mentioned using the footprints in secondary retail areas and around primary and secondary schools. Partners said that they preferred secondary retail areas to main retail and commercial areas because they were cleansed less frequently and the style of the footprints were more appropriate to their surroundings (compared to ‘old town’ style commercial centres). One partner organisation

was making enquiries as to how footprints could be used to 'nudge' school children towards taking a safe route across school grounds (by avoiding a car park, for example).

Suggestions from the partners for improving the experiment included improving the durability of the green footprints stickers or using stencils with permanent, quick dry paint.

Partners were generally happy with the process and methodology of the experiment. Despite this, they did state that using a control site in the experiment would make the research more robust, although they would have required external resource to undertake this monitoring. Keep Britain Tidy recommends that other practitioners using green footprints monitor the impacts of these over the longer term using control sites if they have the resource to do so, as this will add to the body of evidence. This experiment has shown that the footprints have had an impact in most areas in the short term.

1.5. Recommendations

The results indicate that the green footprints intervention has reduced litter levels on the ground at six out of eight testing sites. Based on these findings, Keep Britain Tidy believes that this low cost and practical solution could be replicated successfully by other land managers. The following recommendations are based on the findings of the experiment evaluation and are aimed at organisations wishing to replicate Green Footprints experiment in their areas, with a view to scaling this innovative approach across England.

- **Recommendation 1:** Conduct site visits and behavioural observations prior to installing the footprints to ensure that the sites are appropriate for the intervention and to observe pedestrian traffic flows around bins so that the layout of the footprints can emulate this.
- **Recommendation 2:** Source permanent materials for the footprints, such as those used for road traffic markings.
- **Recommendation 3:** Consider increasing the salience of the bins themselves to complement the footprints. Brightly coloured bin wraps, flags above bins, wraps that change colour in response to temperature or even solar-powered LED lighting could be used to draw attention to bins during the day and/or at night time.
- **Recommendation 4:** Consider, in certain locations, increasing the salience of the footprints and bins after dark by using glow in the dark materials.
- **Recommendation 5:** Ensure that footprints are placed in a 'walking' design towards the bin, highlighting a path to the bin to location users, as opposed to in a 'standing' position. Photos or drawings could be provided to staff installing footprints to make their intended design clear.
- **Recommendation 6:** Where funding and resource allows, continue to monitor the impacts of green footprints alongside control sites to assess their longer term

effectiveness and suitability to different land use types. This will help to add to the body of evidence for the use of footprints to change behaviour.

2. A guide to delivering the Green Footprints

1. Select a site

- Target littering hotspot areas, such as high streets, secondary retail areas or parks/recreation areas. Target sites that are likely to be frequented by your target audience. For example, a number of partners suggested targeting areas around secondary schools.
- The target area should contain several street litter bins dispersed across the site to maximise the visual impact of the green footprints (though the number of bins will depend on the size of the site and at smaller sites two or three bins may be adequate).
- Check that the site is appropriate in terms of layout and any cultural/heritage concerns.
- Observe and identify predominant flows of pedestrian traffic around the bins (where most people are coming from to the bin) so that you can emulate these with your green footprints.

2. Source materials for green footprints

- Source permanent materials for the footprints, such as those used in paint-on or adhesive road markings.
- The footprints should be brightly coloured so that they stand out. To date (and to our knowledge) only green footprints have been tested with the intention of evoking 'environmental' associations, however other colours or patterns could also be effective.
- Adhesive footprints should be made of a non-slip material. If using a stencil, ensure that there is enough space around the frame to avoid paint splattering over the edges.
- Produce one right and one left foot stencil/adhesive footprint. The size of the footprint should be large enough to stand out. We used a 280mm x 100m sized footprint print (approximately a men's UK size 10).

3. Put green footprints in place

- Partners should ensure they install green footprints in a walking design, as opposed to a standing design. This is an integral part of the experiment, highlighting a path towards the bin. These should mimic the predominant flow of pedestrians towards the bins, as identified during the site observations.
- Partners using paint to create their green footprints should ensure they leave enough time for it to dry, so late night application is advisable.
- Green footprints should be applied in dry weather.

4. Communications

- As the intervention uses a nudge style approach to subconsciously influence behaviour, promoting the green footprints initiative is not required, and indeed significant promotion may undermine the novelty of the footprints in their environment, and thus their effectiveness. We would recommend avoiding significant publicity, however practitioners could conduct some promotion (e.g. newsletter articles, photos calls, etc.) if they wish to demonstrate how they are trying to tackle litter without impacting on the approach too much.

5. Monitoring

- While monitoring is not necessary for the intervention, if resourcing allows Keep Britain Tidy strongly recommends that practitioners monitor the impacts of the footprints on an ongoing basis. This will allow practitioners to assess their long term effectiveness and suitability to different locations, to make informed decisions around the ongoing use of the footprints and similar interventions in their areas, and to add to the body of evidence on this approach. Furthermore, monitoring will provide practitioners with results that can be used for internal reporting and external communications, providing feedback to stakeholders such as members and the public.
- Monitoring does not have to be resource-intensive, but could entail 'snapshot' monitoring, such as a few days before the intervention, followed by every other month. The days of the week chosen for the monitoring should be consistent for each monitoring phase (i.e. every Wednesday, Friday and Saturday).
- Litter monitoring should include monitoring or both litter on the ground and in bins at the target sites to account for fluctuations in visitor numbers or special events that may influence behaviour.
- Alternatively, practitioners could consider behavioural observations to monitoring the impacts of the footprint to littering. Keep Britain Tidy can provide guidelines for conducting behavioural observations.

3. Introduction

3.1. Background

The use of green footprints is one way in which the salience, or visibility, of a litter bin can be increased. Pairs of green footprints are placed on the ground to highlight and direct location users towards the nearest bin, thereby 'nudging' them towards more responsible litter disposal. The approach was first developed and tested by Pelle Guldborg Hansen in Copenhagen in 2011 (see *Nudging litter into the bin* case study below). The approach has also been tested in Wales and was used as an awareness raising activity in Shrewsbury. However, prior to this experiment, no known trials of the approach have robustly tested the impacts of

the footprints on the amount of litter in bins and on the ground, nor their longer term effectiveness. Keep Britain Tidy therefore sought to build on the research of Hansen and others in partnership with four local authorities.

Nudging litter into the bin: a trial by Pelle Gulburg Hansen

The green footprints nudge approach was first developed and tested by Pelle Guldborg Hansen and his students in Copenhagen in 2011. In a high footfall area, researchers gave out wrapped sweets to people in the street and counted the number of wrappers that were littered on the streets, placed in bins and left in bicycle baskets. They then placed green footprints on the ground leading up to litter bins in the area, and repeated the sweets distribution and counting task. The result was a 46% decrease in wrappers that ended up on the street. The team who conducted the experiment believe that the footprints work as a visible, possibly subconscious, reminder for those who aren't fully aware of their actions when they litter.

3.2. Aim and objectives of the project

The aim of the research is to test the application of green footprints as a nudge approach for increasing bin usage and therefore decreasing the amount of litter present on the ground.

The experiment evaluation objectives were to identify:

- the impacts of the footprints on litter on the ground;
- the longevity of any impacts over a three month period; and
- what would improve the impact, effectiveness, appropriateness and efficiency of the approach.

3.3. Methodology

3.3.1. Partner selection

Partners were invited to express their interest in taking part in the Green Footprints experiment through the Keep Britain Tidy Network and other contacts. Those that were

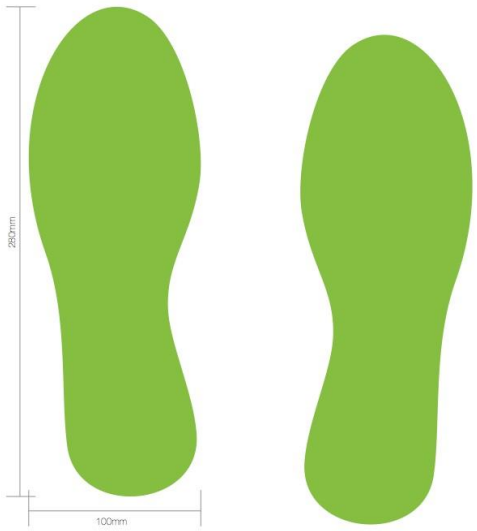
selected demonstrated a strong interest for improving environmental quality in their area, were committed to the experiment and represented a range of geographic locations. The selected partners were:

- Darlington Borough Council
- Cheshire West and Chester Council
- Hull City Council
- Northumberland County Council

3.3.2. Footprints design

The design of the footprints for the experiment was based on those used in Pelle Gulburg Hansen's research. The footprints used in the experiment are shown in Figure 1 below. These were printed on bright green, non-slip vinyl and are 100mm x 290mm in size. Their bright green colour made them highly visible and their vinyl material made them weather proof. The footprints were self-adhesive so partners could install them themselves.

Figure 1: Green Footprints design



Partners were advised to use three pairs of footprints for each bin in their selected location and place the footprints in a 'walking' design towards the bin.

3.3.3. Experiment target sites

The experiment was conducted at two locations per partner: one park/recreation area and one main retail and commercial area. The sites were areas of high footfall and all had a sufficient amount of bins to be suitable for the experiment.

Two different land uses were selected to allow the effectiveness of the footprints in different locations to be established and to be the best of our knowledge the green footprints had not been previously tested in parks and recreational areas.

Table 2: Green Footprints experiment testing sites

Partner	Parks/recreation site	Main retail and commercial site
Cheshire West and Cheshire Council	Whitby Park, Ellesmere Port	Ellesmere Port Town Centre
Darlington Borough Council	South Park, Darlington	High Row, Darlington Town Centre
Hull City Council	West Park/Entrance to Kingston Communications Stadium, Hull	Queen Victoria Square/King Edward Street, Hull
Northumberland County Council	Newbiggin by the Sea promenade	Station Road retail area, Ashington

Experiment targets sites varied in size with each partner however, remaining consistent throughout the experiment to allow robust comparisons.

3.3.4. Monitoring and evaluation

The monitoring of litter at the target site, both in litter bins and on the street, was integral to the experiment as a measure of the impact of the Green Footprints experiment.

Using hand scales, each of the partners weighed the litter, both in bins where green footprints were situated and on the ground at the target area. This was done as part of each partner's normal cleansing routine. This monitoring took place in three phases; three weeks prior to the installation of the footprints (baseline monitoring), three weeks once installed (intervention monitoring) and a further three weeks, three months after installation (long term monitoring). Monitoring both disposed waste in the bins and litter on the street allowed fluctuations in the overall amount of deposited items in the sites (e.g. dry or wet weather, local events or school holidays, when litter tends to increase) to be accounted for, as the analysis measured the amount of litter as a proportion of the total deposited items – including litter and items placed inside litter bins and recycling bins.

The results show the change in proportion of litter recorded on the street after the green footprints were installed, compared to the baseline monitoring.

The experiment evaluation is also informed by an in-depth interview with each project manager at Darlington Borough Council, Cheshire West and Chester Council, Hull City Council and Northumberland County Council.

Table 3: Evaluation methodology

Data collection method	Methodology
Site monitoring – litter weighing	**Aim** • To identify the impact of the footprints on litter on the ground • To identify the impact of the longevity of any impacts over a three month period. **Data collection** • Litter collected from the bins and on the ground was weighed and recorded (in kilograms) each week[4] by the partners. • The data was collected in three phases: o Baseline monitoring (phase 1) – Monday 18 August – Sunday 7 September 2014 o Intervention monitoring (phase 2) – Monday 8 September – Sunday 28 September 2014[5]. **Data population** • Eight monitoring sites across four partner areas **Analysis** Quantitative data analysis using Microsoft Excel. The findings of the analysis were cross-checked with the partners' interpretation of the monitoring results (as identified during the partner interviews) and reviewed through internal workshops.
Partner interviews	**Aim** To identify learnings to improve the impact, effectiveness, appropriateness and efficiency of the approach **Data collection** • A semi-structured telephone interview with all partners, conducted by Keep Britain Tidy at the end of the experiment. **Data population** • Four partners **Analysis** Qualitative data analysis using NVivo software. The findings of the analysis were reviewed through internal workshops.

3.3.5. Public relations and media coverage

In order to ensure that the results of the experiment were accurate and unbiased, Keep Britain Tidy and partners did not undertake any promotional activity that would alert people to the purpose of the Green Footprints experiment, before or during its delivery.

3.3.6. Limitations of the research

Missing footprints

The adhesive used on the green footprints vinyl was not strong enough to last the duration of the experiment. All partners lost at least some of their footprints during the experiment, in some cases within the first three weeks of the intervention. This was due to mechanical

[4] Cheshire West and Chester Council and Darlington Borough Council monitored on a daily basis, Hull City Council monitored two days per week (one week day and one weekend day) and Northumberland County Council five days per week on weekdays.

[5] Partners also completed a 'Long term monitoring phase' (Monday 3 November to Sunday 23 November 2014), however unfortunately this data was not able to be used due to missing footprints – see Section 3.3.6.

cleansing sweepers lifting the footprints and to members of the public taking footprints, which became possible once the edges of the footprints started to lift as the adhesive wore away. It appears that the adhesive footprints were particularly unsuited to tarmac surfaces typically used on parks footprints. This has been a key learning from the experiment and as a result, Keep Britain Tidy recommends using a permanent adhesive (such as that used in road marking tape) or permanent paint for stencilled footprints to ensure longevity of the intervention (see Section 5). These alternatives may be more expensive to remove when they are no longer required, but will require less maintenance during and may save practitioners money in the long term.

In most cases missing footprints were quickly replaced by new self-adhesive footprints. By the longer term monitoring phase, however, the majority of footprints had gone missing at six of the eight testing sites and partners had run out of self-adhesive replacements for these. The vast majority of the footprints at these sites therefore had to be replaced with stencilled-on footprints using biodegradable paint. Partners reported that the biodegradable paint 'bled' around the edges in wet weather and came to resemble green blobs of paint, rather than footprints. As such, we are not confident that the long term (phase 3) monitoring data provides an accurate reflection of the impacts of green footprints when used as intended, and have therefore discounted this data from our analysis. Our evaluation of the green footprints initiative therefore assesses short term impacts only, taken from three weeks of monitoring before and three weeks during the intervention.

Seasonal differences in how each site is used

Furthermore, as the experiment took place from August to November, the use of and visitors to the target sites may have changed between the baseline monitoring and long term monitoring of the experiment. For example, children returned to school after the summer holidays and the days became shorter, as well as the weather being less favourable for outdoor activities. It is therefore possible that other variables may have influenced littering rates over this time period. The use of control sites in the experiment may have helped to minimise the impacts of such variables on the monitoring data.

The absence of control sites

A related limitation of the experiment was the decision not to use control sites, which Keep Britain Tidy felt would be too resource-intensive for partners to monitor, in addition to the intervention sites. Control sites would have been useful for comparing rates of litter at intervention sites to non-intervention sites and would have allowed variables such as those outlined above to be discounted more robustly. It is recommended that other researchers wishing to replicate the experiment monitor at least one control site (i.e. a site that has a similar physical environment, land use and demographic to target sites, but where no

footprints are installed) alongside the target sites to minimise the impact of such variables to monitoring data. It should be noted, however, that using control sites to monitor rates of litter in the field has its own limitations, as other external factors may interplay with results independently of intervention sites. Weather variables, or events that may change footfall or land use behaviours, can occur at either site at any time. For example, a recent experiment delivered by Keep Britain Tidy found the total weight of all deposits of waste in the study area (both items placed in the bins provided and on the floor) almost doubled between the first and second month of the experiment.

4. Results and findings

4.1. Objective 1: To identify the immediate effects of the footprints to litter on the ground

This section discusses the immediate effects of the Green Footprints experiment on litter levels across the four partner locations, i.e. when monitored for three weeks immediately after installation.

The results presented show the change in the proportion of litter recorded on the street after the green footprints were installed, compared to the baseline monitoring.

4.1.1. Overall impact on litter levels

In the first three weeks after the installation of the footprints, the proportion of litter on the ground decreased by an average 19.5% across the eight testing sites.

Table 4: Overall impact to litter levels per partner

Partner area	Baseline average daily waste (bins & litter) (kg)	Baseline average daily litter (kg)	Baseline proportion of litter	Green footprints average daily waste (bins & litter) (kg)	Green footprints average daily litter (kg)	Green footprints – proportion of litter	Percentage change in proportion of litter on ground
Hull	39.3	6.9	17.6%	39.7	4.1	10.4%	-41.0%
Northumberland	148.0	23.3	15.7%	113.0	13.0	11.5%	-26.7%
Cheshire West and Cheshire	9.1	1.0	10.8%	10.0	1.0	9.6%	-11.4%
Darlington	136.0	16.8	12.3%	110.8	13.6	12.3%	-0.2%
All sites (average)	**83.1**	**12.0**	**14.4%**	**68.4**	**7.9**	**11.6%**	**-19.5%**

Average daily weights of waste collected across all sites. Total weight of litter collected = 5,539.2kg during the baseline monitoring period and 4,626.4kg during the green footprints monitoring period.

The results indicate that overall the Green Footprints experiment has been effective in reducing litter levels, with all partners experiencing a decrease in the proportion of litter on the ground (there was an increase in litter at two of the eight target sites, as discussed in Section 4.1.2 below).

These findings are supported by the observations of the partners, who reported that they saw an impact to litter levels immediately after the green footprints had been installed:

> *"Within the three weeks of putting the footprints down it was showing results. It was surprising in some ways to see results so quickly….it was almost immediate impact. I think it was the fact that it was subconscious awareness of people who were using the bins"*
>
> *"I think the first three weeks were impressive"*
>
> (Partner Interviews)

4.1.2. Impact by land use type

The impacts of the green footprints at different land use types is summarised in Table 5 below.

Table 5: Percentage change in the proportion of litter following the implementation of the green footprints

Partner	Parks/recreation site	Main retail and commercial site
Hull	**-46.1%**	**-42.4%**
Northumberland	**+31.5%**	**-34.9%**
Cheshire West and Cheshire	**-19.5%**	**-3.9%**
Darlington	**-31.5%**	**+19.5%**
Overall average change per land use type	**-4.6%**	**-21.2%**

As shown, the green footprints had a positive effect in both parks/recreation areas and in main retail and commercial sites. All individual sites supported this except for two sites which experienced an increase in litter present: one park site in Northumberland and one main retail/commercial site in Darlington.

The overall results imply that the green footprints were more effective in main retail and commercial areas (21.2% decrease) than parks/recreation areas (4.6% decrease). However, it should be noted that for all partners apart from Northumberland, the green footprints were actually more effective in parks/recreation areas. If the Northumberland parks/recreation area results are removed from the analysis, the reduction of litter for this land use type on average is **-31.6%**. This is almost double that of the reduction recorded in main retail and commercial areas. Main retail and commercial areas can often be very crowded and this may influence the visibility, and therefore effectiveness, of the footprints, however we have not conducted research to verify this.

The Northumberland parks/recreation site was slightly unusual in that it was a promenade, unlike the other three partner sites which are more like city parks. The use of this site may

have influenced the effectiveness of the footprints there and is supported by the observations of the partner, however we have no other data to support this:

"There are high number of youths who get down there and that might be one of the reasons for the different results down there – it's dark, there's not much light and they leave their rubbish about a bit, so that's one reason for the difference"

(Partner Interview)

Another consideration is that this site was the only site in the experiment that uses wheelie bins, as opposed to open-top style litter bins. Keep Britain Tidy research has shown that people do not like to use bins where they might have to touch the bin or other people's litter, and the bins at this site may explain the difference in results found here, yet, once again, we do not have data to confirm this at the Northumberland experiment location and this does not explain the increase in litter following the installation of the footprints.

Green footprints *in situ* at Newbiggin by the Sea promenade, Northumberland

Darlington Borough Council was the only partner to experience an increase in litter at a main retail and commercial site. Schools in Darlington opened again after the summer break on week 1 of the footprints installation, therefore larger amounts of children were using this site than during the baseline monitoring period. The partner felt that this was likely to have influenced the results at their site:

'It was when the schools went back. It might have been that the footprints encourage people to use the bins, but there are other factors. It is a minor effect against other major effects like the schools coming back, so from that data you can't see the results of the footprints'

(Partner Interview)

4.2. Objective 2: To identify the longevity of any impacts over a three month period

Unfortunately the experiment was unable to provide any firm conclusions regarding the longer term effectiveness of the footprints due to both the adhesive and painted footprints not lasting the monitoring period (i.e. from the installation of the footprints to the end of the long term monitoring period, approximately three months later). Keep Britain Tidy recommends that future iterations of the approach conduct long term monitoring to assess its ongoing effectiveness, noting that the footprints will need to use more permanent materials to ensure their longevity.

4.3. Objective 3: To identify what could improve the impact, effectiveness, appropriateness and efficiency of the approach

This section discusses what the partners thought worked well in the experiment, what could be developed and other learnings to improve the design and delivery of the approach.

Satisfaction with the project

Overall, all the partners were very satisfied with the Green Footprints experiment, supporting the findings of the intervention monitoring phase, where a reduction in litter was recorded overall for all partners. All of the partners were considering continuing to use the footprints in their current locations or rolling them out to new locations they had identified, where they felt they would be most successful. Two out of the four partners thought the footprints would work well in secondary retail areas. Furthermore, some partners have had enquiries from other internal teams about adopting the footprints to 'nudge' other forms of behaviour:

> *"I would like to use them in small retail areas, blocks of shops that could potentially benefit from it. We couldn't use these areas for the experiment because the cleansing routine wasn't regular enough. We would probably spray* [the footprints]*"*

> *"We'd like to use them in the smaller secondary retail areas, such as shops near schools and colleges. Main retail areas up here tend to be heritage style where green footprints aren't quite the style, so we need to look into enforcement in those areas, but where we've got smaller towns and shopping areas, there are lots of youngsters hanging about and I think it will work really well there"*

> *"We have left them in the town centre where they were. We are not too sure looking to the future. It will depend on what local Councillors think –*

of they want to pursue it. Obviously there is a lot of change in the council so we will work with other services to see if we can use them further"

"We also had an enquiry from our school transport team – 'we like these green footprints and want to use them to guide school kids to direct them to schools' – so you could use footprints with different colours for different things"

(Partner Interviews)

All partners were also satisfied with the process of the experiment and stated the project briefings and media briefings provided by Keep Britain Tidy were clear and helpful.

Challenges for partners

The main challenges for partners in delivering the experiment were:

Footprints durability

Whilst the partners felt the design of the footprints worked well and where happy with the salience of the design, they all experienced issues regarding the durability of the stickers, with many not staying stuck in place for the whole of the experiment:

"Not as robust as they could have been, they didn't stay stuck…"

"Personally, I'm not sure stickers are the answer – you have to have a pristine surface, it has to be completely flat, you can't have any ripples or bubbles"

"The only thing would be the use of a footprint stencil rather than the stickers"

(Partner Interviews)

The green footprints also became a target for people to remove:

"In the park the kids peeled them off and stuck them on trees and lamp posts. It happened pretty much straight away"

"We had a fair sited in the car park near the footprints and they went missing straight after the fair was gone. We replaced them but they went missing again two weeks later. We were reliant on the operational staff telling us they had gone"

(Partner Interviews)

In addition, some partners found that their own cleansing equipment loosened and removed the adhesive footprints:

"Our sweepers were lifting them, it's not like it was people stealing them all the time"

"Where you've got a high mechanical sweeping presence, that affects the footprints but the main cause was the footprints lifting around the edges and then people taking them off"

(Partner Interviews)

In order to resolve this, stencils were sent to partners allowing them to spray green footprints onto the ground using biodegradable paint. Some partners found that this paint did fade and become blurred quickly in bad weather, however all partners listed this as a more suitable solution to the durability of the stickers.

Testing the impact of the footprints in isolation from other variables

Whilst all partners were happy with the process of the experiment, they also expressed their concern in comparing the baseline monitoring, the intervention monitoring and the longer term monitoring (which has been discounted due to footprints not being in place for the entire monitoring period) due to changes that occurred across these three periods. Some partners stated that children returning to school and the end of British Summer Time would mean a different demographic of people were using the experiment areas, and therefore impact on the litter monitoring results:

"You went from summer, when the weather was nice and warm, to winter when it's cold. And also the summer holidays when schools were off, and then we had the next monitoring period when schools were back. And then we have long term monitoring when it's dark, so the users of the park diminish"

"It's better in the summer time – you have higher footfall, you get nice bright days, certainly it's better for the parks just for pure footfall"

"I think they need to choose their time frame so that it is consistent. Moving from summer to autumn, people behave differently"

(Partner Interviews)

Partners felt that monitoring a control site at the same time as the target sites would resolve this issue, even if this meant that each monitoring phase was slightly shorter (e.g. two weeks instead of three weeks). It should be noted, however, that shortening the monitoring period will limit the rigour of the data and that the use of control sites in the field has its own limitations, particularly when monitoring a small sample of sites. For example, it is very difficult identifying sites to use as control that are far enough away from target sites to not be influenced by the intervention, while still having the same physical and social environment so that the environmental and social cues can be comparable. Environmental and social events that influence rates of littering could also occur at one of either the target or control sites during the monitoring period, thereby impacting the data.

Resourcing the litter monitoring

The robust monitoring of litter collected from the ground and in bins at the sites was vital to the success of the Green Footprints experiment. However, along with issues regarding the robustness of the green footprints stickers, this monitoring was one of the more resource-intensive aspects:

"The monitoring would be the most time-consuming part of it"

"It's the commitment required – from our side you need to be really committed. It's not like you can just stick them down and forget about them. We changed our cleansing routine to allow for the monitoring"

"The actual monitoring process for the staff involved, it was time consuming. They had to take the bins, weigh them and then write the results. It delayed the cleansing in the town centre. In the first week it didn't look as clean so the local businesses and residents complained. We had complaints from businesses and residents saying 'why is it 10 am and the town centre is still not clean"

(Partner Interviews)

The Green Footprints experiment has shown that the experiment can have a substantial impact on litter levels in both parks and recreation areas, and retail areas. Therefore such robust monitoring may not be required in future iterations of the approach. Instead, the monitoring could be simplified to provide an indication of impact on an ongoing basis. For example, land managers could conduct 'snapshot' monitoring of litter levels for a week of the intervention period to gain an indication of impact.

5. Costs

The table below outlines to costs for materials used in the Green Footprints experiment. These are intended to provide an indicative guide for practitioners wishing to replicate the approach. It is important to note that the materials used in the experiment were not fit for purpose and are not recommended. It is likely that permanent solutions for the footprints (which we strongly recommend using) will be more expensive.

Table 6: Green Footprints experiment cost breakdown

Item	Cost per item
Green Footprint stickers – set of three pairs of footprints per bin	**£17.40 +VAT** (three left-foot and three right-foot footprints at £5.80 +VAT each)
Green Footprint stencils	**£36.25 + VAT** (two stencils – one left foot and one right foot)
Green Footprint biodegradable spray paint	**£4.50+VAT** (500ml)

6. Recommendations

The results indicate that overall the Green Footprints experiment appears to have been effective in reducing litter levels on the ground at both park/recreation areas and main retail and commercial areas. All partners were happy with the experiment, with some looking at ways they could adapt the experiment to different areas. Based on these findings, Keep Britain Tidy believes that this low cost and practical solution could be replicated successfully by other land managers. The following recommendations are based on the findings of the experiment evaluation and are aimed at organisations wishing to replicate the Green Footprints experiment in their areas, with a view to scaling this innovative approach across England.

Recommendation 1: Conduct site visits and behavioural observations prior to commencing the intervention

Conduct site visits and behavioural observations prior to installing the footprints to ensure that the sites are appropriate for the intervention and to observe pedestrian traffic flows around bins so that the layout of the footprints can emulate this. Points to consider when assess the appropriateness of the site include rates of littering, whether there are any conservation area or similar restrictions, availability of space around bins, type of bins, ground surfaces where the footprints will be placed, etc. The behavioural observations should identify how the site is used, including the predominant flow of pedestrian traffic around the litter bins. This will be useful for determining how the footprints should be laid out at each bin to mimic pedestrian flow or increase the visibility of the bins. The behavioural observations will also be useful for identifying the demographics of people at target sites, their littering behaviours and environmental and social cues influencing their behaviours,

which in turn can be used to maximise the effectiveness of the footprints (e.g. by tailoring the design of the footprints to a certain target audience) or other interventions.

Recommendation 2: Source permanent materials for the footprints, such as those used for road traffic markings

Neither the adhesive footprints nor the biodegradable spray paint trialled in this experiment were fit for purpose. Keep Britain Tidy recommends sourcing permanent materials for the footprints, such as the white tape or paint used to mark road lanes. While these materials will be more costly to remove at the end of the intervention, practitioners are likely to save on the footprints' maintenance costs.

Recommendation 3: Consider increasing the salience of the bins themselves to complement the footprints

Brightly coloured bin wraps could be used to further increase the salience of the bins. Practitioners could also try other innovation approaches to draw attention, such as wraps that change colour in response to temperature (e.g. using thermochromism).

Recommendation 4: Consider increasing the salience of the footprints and bins after dark by using glow in the dark materials

Although the experiment intended to improve the salience of bins in the day time, the green footprints were not as visible after dark. Keep Britain Tidy therefore proposes the use of glow in the dark materials for footprints and/or bin wraps in certain locations to increase bin salience at night. Some partners experienced youths littering experiment sites at night and the use of glow in the dark materials, could act as a deterrent for this sort of behaviour. This work should focus on areas where there is a highfootfall of people at night, for example anywhere with a night-time economy.

Recommendation 5: Ensure that footprints are placed in a 'walking' design towards the bin, highlighting a path to the bin to location users, as opposed to in a 'standing' position

An integral part of the Green Footprints experiment is guiding location users towards bins to encourage them to dispose of their litter responsibly. Therefore, the design in which the footprints are placed on the ground is likely to be important to the experiment's success. The footprints should be placed in a 'walking' design towards the bin, highlighting a path for location users to take, as opposed to in a 'standing' position. The site visits and behavioural observations will help to identify predominant flows of pedestrian traffic around the bins so that practitioners can emulate these or design the layout to maximise visibility.

Keep Britain Tidy recommends that practitioners use photos or drawings to make the intended layout of the footprints clear to staff installing them.

An example of the green footprints laid out in a walking design towards the bins from Darlington Borough Council

Recommendation 6: Continue to monitor the impacts of green footprints

Continued monitoring will help to add to the body of evidence for the use of footprints to change behaviour, particularly with regards to their longer term effectiveness and suitability to different land use types. The results will also help practitioners to demonstrate the value of the approach in their area, generating positive publicity regarding their efforts to prevent litter and helping to build a business case for others practitioners who may want to try to approach. This experiment has identified that green footprints can have an effect on litter levels in the short term. Therefore, future monitoring does not have to be as resource-intensive as that conducted in the experiment, but could entail 'snapshot' monitoring, whereby the weight or count of litter is monitored for a few days each month. Any litter monitoring should include both waste collected in bins and litter collected from the ground so that fluctuations in the number of visitors to the sites (e.g. during special events or changes in weather) can be accounted for. Practitioners should also consider conducting behaviour observations in place of or in addition to litter monitoring to assess changes in littering behaviours. Keep Britain Tidy can provide guidelines for conducting this research.

Where resource and funding allows, practitioners should consider monitoring control sites alongside target sites as this may help to increase the rigour of the data by discounting some variables.

7. Conclusion

The Green Footprints experiment is a low cost intervention that appears to have had an effect in reducing littering levels. It is therefore recommended that other land managers consider implementing the experiment as a means for encouraging responsible littering behaviours in their areas, although we strongly recommend further monitoring takes place and 'more permanent' footprints are used.

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