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## Contribution of 'Real Nappies for London' to local authority waste prevention – 2012–2016

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### **Abstract**

To help prevent disposable nappy (DN) solid waste, the Women's Environmental Network developed the 'Real Nappies for London' (RNfL) scheme. In partnership with local authorities (LAs), RNfL promotes the use of real nappies (RNs) within nine boroughs of London, preventing the use of 4290 DNs per child, from new born to 2-5 years of age. The scheme issued a voucher to residents who registered, redeemable for the average value of £45 against the purchase of RN products. Over a period of 4 years from 2012 to 2016, RNfL issued 4192 vouchers, of which 3188 were redeemed, resulting in 3145 t of DN waste prevention. The 2012–2016 performance equated to a combined LA saving of £320 791 based on an average landfill tax of £84/t and disposal cost of £18/t across LAs in England. Cost to LAs for RNfL voucher processing is £28 690 (£9/voucher), achieving a cost-effective ratio of 1:11. RNs are a valuable waste-prevention tool working at the top of the waste hierarchy, in LAs. The

resident network, built by the RNfL scheme, also provides a channel for LAs to communicate important waste messages to residents at low to no cost.

## **1. Introduction**

In 2007, in England, the Department of Environment, Food and Rural Affairs (Defra) published the Waste Strategy for England 2007 (WS2007) (Defra, 2007a). This waste strategy, including its annexes, is part of the implementation for England of the requirements within the European Waste Framework Directive (EWFD) 2008 (EC, 2008) to produce waste management plans. Within the United Kingdom there are four waste strategies: one for England and one each for the devolved assemblies/parliaments of Northern Ireland, Scotland and Wales. England has made significant advances in many areas of waste management, including recycling.

The key objectives in England included a decoupling of waste growth (in all sectors) from economic growth recognised through a target, originating in WS2007 (revised in 2011), to reduce the amount of local authority collected waste (LACW) – that is, waste collected from households across England by local authorities (LAs). Waste not re-used, recycled or composted fell from over 22.2 Mt in 2000 by 45.7% to 12.5 Mt in 2015 (Defra, 2016) with the initial aspiration to reduce it to 12.2 Mt and achieve a 50% recycling rate by 2020, as set out in the EWFD. Targets for recycling are also proposed through the EC-Circular Economy Package, proposed in 2015 (65% recycling of LACW by 2030); and the United Nations- Sustainable Development Goals, adopted in 2015, propose to reduce waste generation substantially through prevention, reduction, recycling and reuse by 2030 (UN, 2015).

The rates of recycling (including composting) had increased from around 7% in 1996 to 27% by 2006 before reaching a total of 44-8% across LAs in England by 2013/2014. In 2014/2015, England achieved a recycling rate of 43-9%, down from 44-8% on the previous year (Defra, 2016). The recycling rate for 2015/2016 remained at 43-9% (Defra, 2016). 2014/2015 was the first year the recycling rate fell, despite slowing since 2005/2006, which could indicate that LAs have exploited the easiest targets and exhausted current waste management options. LAs are now facing a challenge, identifying new areas and efficiencies in waste service provision (Gilford et al., 2013), through manipulating behaviour change for increased prevention and efficient source separation of recyclates (Thompson et al., 2011). Political pressure to achieve the 50% recycling target by 2020, as set out in the EWFD, as well as the landfill tax escalator rate of £84/t (2016), introduced in 1996 by the government to help finance the environmental impact and control of waste disposed of to landfill, under the landfill directive (EC, 1999), continue as the main drivers for LAs in England to reduce LACW to landfill and seek alternative sustainable disposal routes, such as incineration with energy recovery (EfW).

### *1.1 Disposable nappies*

If LAs within England are to progress waste management practice to meet targets for reuse, recycling and composting they will need to make further gains from LACW (Defra, 2015). Disposable nappies (DNs), a significant identifiable product within the LACW stream, totals approximately 4% of the residual fraction in England and equates to around 3 billion units, weighing an estimated 690 000 t, costing LAs over £60 million per annum for disposal (Wrap, 2016). In Defra's Waste Prevention Programme for England

– Call for Evidence March 2013 (WPPE) (Defra, 2013a) DNs were not identified as a priority component for separation from LACW, requiring alternative treatment. However, DN waste did feature as a case study in WPPE Household Waste Prevention in Action – Examples from Across England 2013 (Defra, 2013c).

Following a life-cycle assessment study published by the Environment Agency in May 2005 (EA, 2005) indicating that reusable nappies (RNs) offered no greater environmental benefit than DNs, many LAs considered the financial investment required to join a scheme promoting the use of RN to be a risk. Despite a later acknowledgement of the limitations of the life-cycle assessment, in a revision published in 2008 (EA, 2008) to amend any misunderstanding projected by the previous assessment, it led to a loss of consensus on the benefits of RNs for LAs and stalled the progress of a London-wide scheme developing.

LACW is the single largest source of DN waste in England. The debate continues across many of the 326 LAs (DCLG, 2016) in England over the development of separate collection for DNs from LACW, but LAs have not put forward proposals that enable the DN waste disposal industry to invest and advance with infrastructure to reduce reliance on landfill. Alternative disposal routes (Table 1) need reliable feed stock supply to exist and operate successfully. Introduction of collection within the existing LACW arrangements would generate feedstock supply to proposed new facilities and probably support growth (e.g. social enterprise).

## 1.2 Alternative disposal routes

There are three key alternative technologies to landfill suitable for the management of DN waste (Table 1). Incineration with energy from waste (EfW) (Defra, 2014), is the process of generating energy in the form of electricity and/or heat from the direct combustion of waste. Dedicated DN in-vessel composting systems (IVC) (Envirocomp) (Colón et al., 2013) consist of a metal or plastic vessel or lined concrete bunkers in which air flow, temperature and moisture can be controlled, maintaining ideal composting conditions. Nappies entering the plant are shredded, combined with green waste and composted. The plastics are then removed, leaving compost. Compost produced at such a facility is used primarily for land restoration, not meeting the PAS 100 standard for agricultural application to land (Wrap, 2011). DN recycling (Knowaste) (Deloitte, 2011) is a mechanical process. DN waste is opened and sterilised using autoclave technology. It is then shredded and materials separated. At this stage, the cellulose fibres are reclaimed and packed, plastics granulated and further washed before pelletising and packing, in preparation for resale.

Landfill and EfW are currently the main disposal routes for DN waste. IVC is relatively common, primarily for food waste and sludge disposal, but not so for DN waste. Knowaste has tested a plant in England, but uncertainty concerning supply of reliable feedstock, planning delays for new infrastructure and funding for these facilities are key issues surrounding future development.

## 2. Research context

The 'Real Nappies for London' (RNfL) scheme began in 2007 with the aim of preventing DN waste arising, through a campaign to increase the use of real nappies (RNs) (Warner et al., 2015). The campaign involved partnership with LAs, offering parents of newborns (or children up to 18 months old) a contribution to the cost of obtaining RN products, in the form of a voucher scheme. The scheme was initially adopted by and offered to the residents of 13 out of 33 London boroughs. Warner et al. (2015) quantified the contribution that RNfL made to waste prevention, in partnership with LAs. The cost reduction achieved in landfill tax and disposal cost, 2007–2012 (5 years) was £647 466.

This paper evaluates the performance of RNfL 2012–2016 (4 years) in nine out of 33 London boroughs (Table 2) (Warner et al., 2015). It looks at key circumstances influencing changes that may have affected performance, in comparison to 2007–2012. It considers the RNfL user demographic and whether motivation in the decision-making process to use RNs was financial, environmental or both. It also looks at the value that RNfL holds for LA beyond waste prevention, now and in the future.

[insert Table 1 here]

[Insert Table 2 here]

The key questions for the future of RNfL are: what are the key points from 2012 to 2016 performance; what are the core values for RNfL beyond landfill diversion; and what is the outlook of RNfL for the future?

### 2.1 Data provision and limitation

RNfL performance data presented in Table 3 were obtained from the RNfL (LA) database, under restricted access, for the purpose of this research. The date range is from July 2012 to July 2016 for the data consisting of the number of registered users for the period in comparison to the number of redeemed vouchers after registering. The information on setting up RNfL, the scheme model and operating process was provided by RNfL. The amount of DN usage, from birth to toilet-trained child (2-5 years), is a mean of 4-7/d, weighing a total of 7-6 kg/week (230 g per used DN) (EDANA, 2005; RNfL, 2013a, 2013b).

To demonstrate the possible savings that LAs in England could achieve, savings by LA, through the RNfL scheme, are based on an average landfill tax of £84/t and a disposal cost of £18 (2016) across LAs in England, as the preferred disposal route for DN (Wrap, 2016).

### 3. Women's environmental network and RNfL

The Women's Environmental Network (WEN) in England, founder of RNfL scheme, makes the connection between women's health, well-being and environmental issues. WEN inspires women to make environmentally informed choices and empowers women to



become agents of change in their families, networks and society, to participate equally in an environmentally sustainable future (WEN, 2017).

Campaigning for the use of RNs gathered momentum around 1998, after WEN initiated 'Real Nappy Week'. Around this time several London boroughs – Camden, Hackney, Haringey and Islington – decided to offer cash-back schemes, piloted by 'Nappy Ever After' (not-for-profit local nappy laundry service and dedicated RN shop), whereby residents were financially enabled to buy or launder RNs, rather than using DNs.

In 2003, the North London Waste Authority (NLWA) decided to pilot a cash-back (refunded by LA after purchase) scheme in Camden (NLWA, 2007). The scheme offered up to £35 for residents for using an RN laundry service. The positive outcome of this pilot demonstrated an increase in RN use and also raised awareness of the issues surrounding DNs among health professionals (NLWA, 2012). Confirmation that parents applying for the RN vouchers were actually using RNs for their child required signed documentation from their associated health professional (Wrap, 2006a) as part of the application process. The cash-back scheme was extended to include all North London boroughs in the NLWA: Barnet, Camden, Enfield, Hackney, Haringey, Islington and Waltham Forest (NLWA, 2007).

[Insert Table 3 here]

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In 2004, the Labour government provided £2-3 m of central funding to RN campaigners through the delivery body Wrap (the Waste and Resource Action Programme) (Defra, 2007b; Wrap, 2005), to encourage RN use on a national scale and reduce solid waste to landfill at LA and the community level. The funds were partly used financially to support and expand existing RN networks and campaign groups. Wrap also created a new brand image and online portal for the promotion of RN use (Wrap, 2006b). The focused funding

from government into the national campaign, led by Wrap, enabled WEN to develop their own London campaign.

Using funding from the Community Recycling and Economic Development (CRED) programme, London Recycling Fund (LRF), Western Riverside Environmental Fund (WREF) and participating London waste authorities (Warner et al., 2015), WEN explored options for setting up a London-wide scheme. The RNfL scheme for London (RNfL, 2006) was launched on 1 July 2007.

The use of RNs presented an opportunity for significant prevention of DN waste, as well as benefitting parents by offering a cheaper alternative to DNs, with proven carbon reduction (EA, 2008) as well as reduced disposal cost liability for LAs (Wrap, 2016). The use of RNs, preventing DN waste, is a valuable tool working at the top of the waste hierarchy (Defra, 2011b).

#### 4. LA waste management in London

London has a population of 8.63 million (2016) (ONS, 2016) and is divided into 33 boroughs, 32 governed by a borough council. The ancient City of London forms a 33rd division and is governed by the City of London Corporation. London is made up of four statutory joint waste disposal authorities (SJWDAs): East London Waste Authority (ELWA), North London Waste Authority (NLWA), West London Waste Authority

(WLWA) and Western Riverside Waste Authority (WRWA). The remaining 12 boroughs, not under an SJWDA, are unitary authorities (UAs).

The four SJWDAs are made up of councilors nominated from the borough councils. The remaining UAs are independent waste authorities in their own right. The four SJWDAs and the UAs, in London, are each responsible for waste collection and disposal.

#### 5. RNfL scheme

Initially, 13 London boroughs joined the RNfL scheme, five from the NLWA, two from ELWA, two from WRWA, one from WLWA and three UAs (Warner et al., 2015), mainly those who already had the cash-back systems in place. RNfL considered the scheme attractive to LAs, as it took away much of the administrative burden of rewarding RN use (WEN, 2006). Boroughs without an RN scheme in place found it hard to justify the cost of joining the scheme even though there were greater savings that could be achieved through waste prevention. For participating boroughs, RNfL took over the administration inherent in delivering the scheme (Warner et al., 2015). Elements of the scheme are:

- processing the evidence of parent's identity documentation (ID)
- the birth and residence of the baby
- maintaining register of vouchers issued by boroughs and pack information
- reimbursing suppliers

- maintaining parent feedback
- responding to public inquiries
- marketing and promotion.

### 5.1 Scope and cost of the RNfL scheme

The fixed annual fee for LA's to join the RNfL scheme was

£6000, incorporating all the voucher administration and marketing assistance provided by RNfL (Warner et al., 2015). However, despite the fixed-fee structure, each borough continued to pay the value of the vouchers themselves, leading to a variation in voucher value across the boroughs, as shown in Table 2.

Since there were different levels of uptake within each borough, it became apparent that a fixed fee for administration did not represent good value for boroughs with a lower level of participation. Therefore, RNfL altered the pricing structure to provide four levels of LA involvement to lower the cost and increase uptake of the scheme. The four levels are listed below.

- Level 1 – RNfL offered boroughs running their own scheme a simple association, placing their logo on the RNfL website and establishing a link, leading residents to their own website. RNfL has also suggested options for a joint GoReal (RN national scheme) and RNfL

membership, combining the London scheme with the national scheme for the provision of RN trial kits and loaning RN (EC, 2013).

- Level 2 – administration covered processing the evidence of parent’s ID, residence and birth of baby, maintaining register of vouchers issued by boroughs and pack information, reimbursing suppliers, maintaining parent feedback and responding to public inquiries, at £9 per voucher issued.

- Level 3 – marketing and publicity of the voucher scheme cost the borough £2000, providing 3000 leaflets, a managed page on the RNfL website to apply for vouchers and to find out about promotional or information exchange events. Online presence also facilitated data feedback to enable the calculation of resident participation and tonnages diverted from landfill. Regular email reminders were sent to subscribers or voucher recipients encouraging RN use or to engage them in other re-use activities.

- Level 4 – marketing of cash-back schemes for boroughs seeking to enhance the uptake of RNs. Marketing, feedback and advice was £1500, plus leaflets at £200 per 1000, or postcards at £150 per 1000 and £9 per voucher to cover the voucher-processing costs.

The option of four pricing structures was a more cost-effective approach, as boroughs could continue to administer the vouchers through RNfL, but opt out of additional costs, such as on and offline marketing.

## 6. RNfL scheme performance 2012–2016

From 2012 to 2016, nine boroughs were actively using the RNfL scheme (Table 3). The number of boroughs taking part and overall voucher uptake has reduced (Table 3) in comparison to the 2007–2012 quantification (Warner et al., 2015).

In comparison to the overall (average per year) outcome from 2007 to 2012 (Warner et al., 2015), RNfL issued an average of 1930 vouchers per year from 2007 to 2012 in comparison to a 1048 yearly average from 2012 to 2016, a reduction of 46%. The average number of vouchers redeemed per year from 2007 to 2012 was 1409 compared to a yearly average of 797 from 2012 to 2016, a 43% reduction. The diversion from landfill of 1392 t average per year from 2007 to 2012 compared to a yearly average of 786 from 2012 to 2016, a 44% reduction. A comparison between the number of vouchers issued and redeemed overall for 2007–2012 shows that 37% of the vouchers issued were not redeemed, and for 2012–2016 this figure had reduced to 24% issued but not redeemed. In comparison to 2007–2012, RNfL's overall performance for 2012–2016 was reduced by 46%.

### 6.1 LA savings through DN waste prevention

The performance data for prevention between 2012 and 2016 are displayed in Table 4. The basis of the calculation takes an average rate of 50% RN usage, in combination with DN, for the period of approximately 2-5 years (912 d) per child, from birth to potty trained (EDANA, 2005). It also uses an average diversion of 4-7 DN per day, being

replaced by the use of RNs. This would give a waste prevention total of 4290 DN units (rounded up from 4289) weighing 987 kg (230 g/unit) per child, from birth to potty trained (2-5 years) (EDANA, 2005; RNfL, 2013a). Drawing on the database figures displayed in Table 4, from 2012 to 2016 (4 years), 4192 vouchers had been issued, of which 3188 had been redeemed at a proposed waste prevention of 3145 t of DN waste. The cost reduction of around £320 791 was achieved (Table 4) as a result of the RNfL scheme 2012–2016, based on 2016 (average across England for 2016) landfill tax of £84/t and £18 disposal fee per tonne (total £102).

## 6.2 Highest-performing borough

The highest-performing borough for 2012–2016 is Hackney, who issued 1140 vouchers, from which 900 were redeemed.

[Insert Table 4 here]

Walker (personal communication, 14 May 2016) found the majority of RN uptake in Hackney was not by indigenous Hackney residents (Table 5), but mostly those who have recently chosen to live in Hackney because property was relatively cheap, due mainly to the poor state of repair, and also the lack of public transport available in the borough. Hackney attracted residents who wanted low-cost housing, and were not afraid of it being in a run-down condition, in a neglected area (RNfL, 2013b).



Walker (personal communication, 14 May 2016) also found that Hackney residents are considered articulate influencers, prefer quality and authenticity over new and fashionable, they are likely to appreciate second-hand clothes and furniture and are not averse to the use of second-hand nappies (RNfL, 2013b). This borough is a suitable place for growing RN culture, suggesting a specific mentality and social structure (Barr and Gilg, 2006), combined with ongoing support activities that are vital to the adoption of resident driven 'bottom-up' schemes, such as RNfL.

### 6.3 Level of deprivation – RNfL participating boroughs

The indices of multiple deprivation (IMD) 2015 (DCLG, 2016) rank RNfL's four highest-performing boroughs, Hackney 2nd, Haringey 6th, Islington 5th and Tower Hamlets 1st on a list of the most-deprived boroughs in London (Table 6). The indices explore differences in deprivation across small areas at a point in time, and provide knowledge about the underlying drivers and dimensions of deprivation. This analysis has shown that these boroughs remain highly deprived on some of the measures that underpin the overall index, especially those relating to housing, crime and recycling rates (Table 6).

Data in Table 6 suggest a key driver for residents to use the RNfL scheme is financial, as a link exists between the level of deprivation in a borough and the RNfL performance (Table 3). More-deprived boroughs have a greater network of social support services (Barr, 2007), providing a platform for communication between parents supporting decisions such as the use of RNs. Lower-performing RNfL boroughs have lower deprivation and require

less financial support, perhaps making residents less likely to register and use the RNfL voucher scheme. Environment and health concerns are also key drivers for RN use.

[Insert Table 5 here]

[Insert Table 6 here]

#### 6.4 Extended value of the RNfL scheme

Beyond landfill prevention and a saving for LAs of £320 791 (Table 4) in landfill tax and disposal cost, Walker (personal communication, 14 May 2016) found that RNfL benefits LAs in a wider context. RNfL promotes values such as pro-environmental behaviour, community cohesion, social inclusion and the accessibility of information for families on topics relating to family well-being. RNfL not only supports RN promotion and use, it helps parents share information when meeting at RN shops, RN demonstrations and RN events on all aspects of family life. RNfL has built a network through RN promotion and is in a position of communicating important waste-prevention messages from LA to a RN-user community, such as recycling campaigns.

RNfL is also active on public health issues, such as children starting primary school not being toilet trained and using DNs (RNfL, 2015). In 1962, 97% of children had achieved becoming toilet trained by the age of 36 months. By 2003, this number had reduced to around 60%, and by 2010 only 51% of children were toilet trained by 36 months (Eric, 2012), showing a progressive decline over time. Largo et al. (1996) found a link

between the increased use of DNs and lateness of toilet training. Another factor is that both parents work, finding it difficult to assist the child in matters such as toilet training, indicating a gradual shift of the domestic value set through involuntary circumstances (Eric, 2012).

The RNfL platform WEN has created makes a contribution to families beyond RN promotion and support. Although LAs are not able to quantify this contribution in cost-saving terms, it adds value to an already sustainable cost-saving scheme for LAs in London. RNfL is a good example of a 'bottom-up' scheme (RNfL) working together with 'top-down' (LAs), in partnership to achieve a common goal in waste prevention.

## 7. Discussion

To reduce LACW to landfill further, LAs in England need to identify components in the waste stream for separation to alternative disposal and treatment routes (Table 1). DNs make up 4% of the LACW residual fraction to landfill in England (Wrap, 2016). WEN launched RNfL on 1 July 2007 to help prevent DN waste in London, by promoting the use of RNs. This evaluation compares performance from 2012 to 2016 to published performance from 2007 to 2012 (Warner et al., 2015). From 2012 to 2016, nine boroughs took part in the scheme (Table 2). RNfL issued 4192 vouchers, from which 3188 were redeemed (Table 3), preventing 3145 t of DN waste from landfill and producing a saving for LAs of £320 791 (Table 4). Evaluation of this scheme raised several key points, addressed in the following sections.

## 7.1 DN separation from LACW

A waste-prevention policy solution for DN separation from LACW is difficult to effect, due to budget cuts, the nature of the change being targeted and the national nature of the required intervention. The Government Review of Waste Policy in England 2011 (Defra, 2011a) suggests more efficient and cost-effective disposal, treatment or prevention of DN waste. As policy evolves over time (Defra, 2013b), it is likely that opportunities will exist to make waste reduction more efficient, both with respect to the amount of DN waste that arises and the way in which that waste is dealt with. A future review of extended producer responsibility could include DNs, providing leverage against DN manufacturers to contribute financially towards separation infrastructure for DNs from LACW, and disposal cost for alternative disposal or recovery routes (Table 1) (ZWE, 2015). In the absence of a national policy driver for separation of DNs from LACW in England, LAs' support for RNfL demonstrates willingness of LAs to engage in DN waste prevention, at a local level, within nine boroughs of London (Table 2).

## 7.2 RNfL performance 2012–2016

In comparison to published figures for 2007–2012 (Warner et al., 2015), average (per year) performance for RNfL was down during 2012–2016 by 46% for vouchers issued and 43% for vouchers redeemed (Table 3), achieving a cost saving to LAs of £320 791 (Table 4). It is the opinion of the authors that the recession which began in 2008 and continues to be the reason for consequential governmental austerity measures within England (CDF, 2010) is key to reduced RNfL performance during 2012–2016, for two key reasons. First, government budget cuts to LAs have seen LAs retract spending and resources

to the most essential waste services, leading to an overall reduction in campaigning and promotion spend for 'bottom-up' schemes such as RNfL. Second, financial and employment uncertainty has negatively affected the overall birth rate in England, post-2008 recession (ONS, 2016), leading to fewer babies being born between 2012 and 2016.

### 7.3 Highest-performing borough

The highest-performing borough for 2012–2016 was Hackney (1048 vouchers (Table 3)). IMD rank Hackney the second most deprived from all 33 London boroughs (Table 6), indicating that motivation for residents to register with RNfL, for a voucher, was likely to be more financial than environmental. A link exists between the highest-performing RNfL boroughs and the level of deprivation in those boroughs (Table 6), suggesting a greater social support network exists within more-deprived boroughs, over which RNfL is able to network and communicate the scheme to parents of newborns.

### 7.4 Extended value of RNfL

RNfL is a key RN campaigner in nine boroughs of London, with 10 years (2007–2017) of operational practice. It has developed a resident network of RN users, valuable for LA/resident communication. Although an extended value, such as communicating pro-environmental behaviour to borough residents and contributing to social cohesion, is difficult to quantify, LAs know the cost involved in achieving high-quality and effective

communication with residents. LAs in London could use the network, built by RNfL, to communicate important waste messages to residents at low or no cost.

## 8. Conclusions

WEN launched RNfL in partnership with LAs in London to help prevent DN waste to landfill, the preferred disposal route (Table 1) for LACW in England. RNfL's 'bottom-up' approach to DN waste prevention, through increased RN promotion and use, practises effective waste prevention at community level in nine boroughs of London, shown in Table 2. This paper compared published performance for RNfL from 2007 to 2012 to performance from 2012 to 2016 (Table 3), in terms of waste prevention and savings achieved (Table 4). Consideration was also given to the extended value that RNfL offers LAs as a result of the partnership and successful operation of the scheme.

The authors consider the 2008 recession as a main reason for reduced performance in 2012–2016 (Table 3), compared to 2007–2012, driven by austerity measures from the central government. The key areas affecting RNfL are LA spending cuts and a fall in birth rate due to financial or job insecurity of the residents of London.

Table 3 shows that the highest-performing RNfL borough in 2012–2016 is Hackney, as it was in 2007–2012. Hackney has a distinctive resident demographic and ethnic mix, as shown in Table 5. A link also exists to the level of deprivation in Hackney, ranking as the second most deprived from 33 London boroughs, as well as nationally from

353 council (LAs) districts, as shown in Table 6. Insight into the type of resident likely to use the RNfL voucher scheme can be drawn from this research, and suggests that motivation for RN use, in more-deprived boroughs, is financial more so than environmental, in the case of RNfL voucher recipients.

The RN network established by RNfL provides LAs with a platform to communicate important waste messages, at low or no cost, to London borough residents associated with the RNfL scheme. RNfL also communicates values such as pro-environmental behaviour to residents. Effective waste prevention is currently practised by RNfL, working in partnership with LAs in London, with the common aim of DN waste prevention. LAs should consider the expansion of RNfL into more of the 33 boroughs of London, as well as LAs across the remainder of England, as a sustainable and proven model in DN waste prevention.

## REFERENCES

Barr S (2007) Factors influencing environmental attitudes and behaviour: a UK case study of household waste management. *Environment and Behaviour* 39(4): 435–473.

Barr S and Gilg A (2006) Sustainable lifestyles: Framing environmental action in and around the home. *Geoforum*. 37(6): 906–920.

CDF (Community Development Foundation) (2010) Learning About the Impact of the Recession on Communities, Community Cohesion and Community Empowerment. CDF, London, UK.

Colón J, Mestre-Montserrat M, Puig-Ventosa I and Sánchez A (2013) Composting process with the organic fraction of municipal solid waste. *Waste Management* 33(5): 1097–1103.

DCLG (Department for Communities and Local Government) (2016) The English Index of Multiple Deprivation (IMD) 2015 – Guidance. DCLG, London, UK.

Defra (Department for Environment Food and Rural Affairs) (2007a)

Waste Strategy for England 2007. HMSO, London, UK.

Defra (2007b) Reducing the Reliance on Landfill in England – Fifty Seventh Report of Session 2006/7. HMSO, London, UK.

Defra (2011a) Government Review of Waste Policy in England 2011. HMSO, London, UK.

Defra (2011b) Applying the Waste Hierarchy – Evidence Summary. HMSO, London, UK.

Defra (2013a) Waste Prevention Programme for England – Call for Evidence – March 2013. HMSO, London, UK.

Defra (2013b) Waste Management Plan for England. HMSO, London, UK.



Defra (2013c) Household Waste Prevention in Action – Examples from Across England 2013. HMSO, London, UK.

Defra (2014) Energy Recovery for Residual Waste – A Carbon Based Modeling Approach. HMSO, London, UK.

Defra (2015) ‘Moments of Change’ as Opportunities Influencing Behaviour – Final Report. HMSO, London, UK.

Defra (2016) Statistics on Waste Managed by Local Authorities in England in 2015/16. HMSO, London, UK.

Deloitte (2011) Absorbent Hygiene Products – Comparative Life Cycle Assessment. Knowaste, Bromsgrove, UK.

EA (Environment Agency) (2005) Life Cycle Assessment of Disposable and Reusable Nappies in the UK. EA, Bristol, UK.

EA (2008) Science Report–An Updated Lifecycle Assessment Study for Disposable and Reusable Nappies. EA, Bristol, UK.

EC (European Community) (1999) Council Directive 99/31/EC of 26 April 1999 on the landfill of waste. Official Journal of the European Communities L182/1.

EC (European Commission) (2008) Waste Framework Directive. EC, Brussels, Belgium.

EC (2013) TURAS Project (Transitioning Towards Urban Resilience and Sustainability) Supportive Instruments for Local Authorities to Foster Integration of Ecodesign and Clean Technologies – Paving the Way for Product Service Systems in Resilient Urban Economies. EC, Brussels, Belgium.

EDANA (European Disposable and Nonwovens Association) (2005)

Absorbent Hygiene Products, Absorbent Hygiene Products Manufacturers Committee, Brussels, Belgium. Sustainability Report 2005. EDANA, Brussels, Belgium. See <http://www.edana.org> (accessed 04/03/2013).

Eric (Education and Resources for Improving Childhood Continence) (2012) The Right to Go – A Guide to Helping Early Years Settings and Schools Manage Continence. Eric, Bristol, UK.

Gilford J, Warner C and Head N (2013) Driving sustainable waste management in local authority by lowering cost whilst increasing recycling rates: the Daventry and Northampton project. *The Journal of Solid Waste Technology and Management* 39(2): 133–142.

Largo RH, Molinar L, von Siebentahl K and Wolfensberger U (1996) Does a profound change in toilet training affect development of bowel and bladder control? *Developmental Medicine and Child Neurology* 38(12): 1106–1116.

NLWA (North London Waste Authority) (2007) North London Waste Authority – Review of Real Nappy Subsidy. NLWA, London, UK. See <http://www.nlwa.gov.uk> (accessed 20/08/2013).

NLWA (2012) North London Waste Prevention Plan 2012/14. NLWA, London, UK.

ONS (Office for National Statistics) (2016) Births in England and Wales.

ONS, London, UK. See <http://www.ons.gov.uk> (accessed 01/04/2017).

RNfL (Real Nappies for London) (2006) Pan European Scheme to Promote the Use of Reusable Nappies. RNfL, London, UK. See <http://www.realnappiesforlondon.org.uk> (accessed 26/07/2013).

RNFL (2013a) Want to Find out How our Database Calculates These Tonnages? RNfL, London, UK. See <http://www.realnappiesforlondon.org.uk> (accessed 22/06/2013).

RNFL (2013b) Why Hackney is Special Borough. RNfL, London, UK. See <http://www.realnappiesforlondon.org.uk> (accessed 04/07/2013).

RNFL (2015) Potty Training. RNfL, London, UK. See <http://www.realnappiesforlondon.org.uk> (accessed 04/09/2015).

THC (Tower Hamlets Council) (2015) Deprivation in Tower Hamlets – Analysis of the 2015 Indices of Deprivation Data.

Corporate Strategy and Equality Service, Corporate Research Unit, Tower Hamlets Council, London, UK.

Thompson S, Michaelson J, Abdallah S et al. (2011) Moments of Change as Opportunities for Influencing Behaviour: A Report to the Department for Environment, Food and Rural Affairs. NEF (New Economics Foundation) for Defra. London, UK.

UN (United Nations) (2015) Sustainable Development Goals. United Nations, New York, NY, USA.

Warner C, Hilary V, Phillips P and Lappage A (2015) The ‘Real Nappies for London’ scheme 2007–2012: key findings to drive a future waste prevention agenda through landfill reduction. *Journal of Solid Waste Management and Technology* 41(1): 28–40.

WEN (Women’s Environmental Network) (2006) Real Nappies for London – Pan London Scheme to promote use of reusable nappies. WEN, London, UK. See <http://www.realnappiesforlondon.org.uk/wherewhatwho/Documents/RNfLintroOct2006.pdf> (accessed 12/04/2013).

WEN (2017) Introduction. WEN, London, UK. See <http://www.wen.org.uk> (accessed 01/06/2017).

Wrap (Waste and Resources Action Programme) (2005) Stakeholder Update. Wrap, Banbury, UK. See <http://www2.wrap.org.uk> (accessed 10/07/2013).

Wrap (2006a) Using Real Nappies on Maternity Wards. Wrap, Banbury, UK. See <http://www2.wrap.org.uk> (accessed 10/07/2013).

Wrap (2006b) The Real Nappy Campaign – December 2004 to May

2006. Wrap, Banbury, UK. See <http://www2.wrap.org.uk> (accessed 10/07/2013).

Wrap (2011) PAS 100 – Specification for Composted Materials. Wrap, Banbury, UK.

Wrap (2016) Comparing the Cost of Alternative Waste Treatment Options – Gate Fees Report 2016. Wrap, Banbury, UK.

ZWE (Zero Waste Europe) (2015) Redesigning Producer Responsibility – A New EPR is Needed for a Circular Economy. ZWE, Brussels, Belgium.

ZWS (Zero Waste Scotland) (2013) Evaluation of the Absorbent Hygiene Products Collection Trials in Scotland – Report. ZWS, Stirling, UK.

