

LAUNDRY DETERGENT POWDER COMPACTION

VOLUNTARY INDUSTRY INITIATIVES 2008-2015 CLOSEOUT REPORT



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Table of Contents

Table of Contents	2
Executive summary	3
Key achievements	3
Introduction and background	5
Scope	6
<i>Products</i>	6
<i>Geographical</i>	6
<i>Participating companies</i>	6
LSP-2 and PREP-P3 commitments	7
<i>Recommended dosage</i>	7
<i>Packaging</i>	7
<i>Communication</i>	8
Quantification of detergent tonnage reduction	11
<i>Methodological considerations</i>	11
<i>Market dynamics</i>	11
<i>Benchmark tonnage</i>	15
<i>Tonnage reduction</i>	17
Quantification of environmental achievements	23
<i>Methodology: environmental benefits per kg of detergent</i>	23
<i>Estimated environmental benefits of LSP-2 and PREP-P3 compaction</i>	25
Annex 1 - LSP-2 Project Description	27
Annex 2 - PREP-P3 Project Description	28



Executive summary

The voluntary industry initiatives “Laundry Sustainability Project 2” (LSP-2) and “Product Resources Efficiency Project - Powders 3” (PREP-P3) aimed to reduce the environmental impact of heavy duty powder detergents for household laundry in Europe, through product compaction. These projects were initiated, promoted and deployed by A.I.S.E. (the International Association for Soaps, Detergents and Maintenance products) with the support of its National Associations partners. This was done under full transparency, making participation entirely voluntary, as well as open to any company wishing to participate - whether a member of the association or not.

LSP-2 ran for three years from January 2009 until Spring 2012. The subsequent PREP-P3 initiative ran for two years, from mid 2012 to mid 2014. Both initiatives covered the European Union in addition to the four countries of the European Free Trade Association. The main commitment of the initiatives was a compaction of the laundry detergent powder, leading to a reduction of the standard recommended dose down to maximum 85 g/wash (and 135 ml/wash) for LSP-2 and further down to maximum 75 g/wash (and 115 ml/wash) for PREP-P3. In parallel, packaging had to be reduced proportional to the dosage reduction. To ensure correct product use, clear communication of the dosage changes had to be implemented on pack, by means of standardised visuals.

The laundry powder detergent tonnage reduction achieved by these two initiatives was estimated by comparing the actual tonnage after the full implementation of each compaction wave, with the extrapolated benchmark tonnage, as if the dosages had remained constant at the pre-compaction level. This fairly complex methodology was required because of the substantial dynamics in the detergent market during the execution of these projects. Most importantly, the shift over time from powders to other forms made it impossible to interpret the extent to which an observed tonnage reduction had been the result of compaction - or rather of market dynamics. Using accurate data about individual producers' dosage and market share, relevant extrapolations could be made. Further, the calculation took into account the reality that on the one hand, dosage reductions were also implemented by several companies who had not signed up to the voluntary agreement, but de facto followed suit. On the other hand, some consumers may - at least initially - have continued dosing intuitively at the same level as before, rather than according to the on-pack instructions.

It must be emphasised that multiple assumptions were made and that the available data had inherent limitations. Hence, while the calculated tonnage reductions are reasonable estimates, they cannot be considered as exact figures.

LSP-2 has led to an estimated laundry powder detergent tonnage reduction by 81000 tonnes per year across Europe, which is 7% of the non-compacted benchmark. 95% of this was materialised in Western Europe. This can be explained by the fact that for Central Europe, LSP-2 came very soon after the immediately preceding compaction initiative LSP-1 (that focussed on Central Europe). This led to less interest by the companies in this region to implement a new compaction initiative right away.

For PREP-P3 the laundry powder detergent tonnage reduction across Europe is estimated to be 97000 tonnes per year - over 9% of the non-compacted benchmark. In Western Europe the compaction savings were smaller than the LSP-2 achievement, with 64000 tonnes per year. This is in line with the different dosage reduction commitments of the two initiatives. In Central Europe, on the other hand, the reduction was substantially higher than for LSP-2, with 33000 tonnes per year, over 12% of the non-compacted benchmark. This implies that in Central Europe the goals of both initiatives were reached mostly through the implementation of PREP-P3.

Compared to the 2008 dosage situation, the combined annual laundry powder detergent tonnage reduction achieved by 2015, through LSP-2 and PREP-P3 together, is estimated to be 162000 tonnes per year across Europe. This is a reduction by about 15%, that was achieved in Western Europe as well as (closely) in Central Europe. Since the implementation of both initiatives, an estimated cumulative tonnage reduction of nearly three-quarters of a million tonnes had been achieved by the end of 2017.

The laundry powder detergent tonnage reduction leads not only to less use of detergent chemicals, but also has important environmental benefits. By 2015, the annual reduction of greenhouse gas emissions is estimated to be 148000 tonnes of CO₂eq/year. This corresponds with over 1 billion km driven with an average new passenger car. The packaging waste reduction is estimated at over 12000 tonnes per year. This can be visualised as the content of 12 Olympic swimming pools filled with crushed cardboard waste, every year. The estimated annual truck transport reduction is 520 million tonne.km per year. This is equivalent to 10000 journeys of a heavy truck all the way from Barcelona to Warsaw - or over 500 times around the earth.



Key achievements

	LSP-2	PREP-P3
Deployment	2009 - 2012	2012 - 2014
Dosage reduction to max.	85 g/wash 135 ml/wash	75 g/wash 115 ml/wash
Detergent tonnage reduction	81000 tonnes/year	97000 tonnes/year

Combined achievements	
Detergent tonnage reduction	162000 tonnes/year or nearly 750000 tonnes in total by the end of 2017
Greenhouse gas reduction	148000 tonnes of CO ₂ eq/year = 1 billion car kilometers
Packaging waste reduction	12000 tonnes per year = 12 Olympic swimming pools
Transport reduction	520 million tonne.km per year = 500 times around the earth with a heavy truck



Introduction and background

Over the past decades, stepwise, the laundry detergents industry has been reducing the volume and weight of washing powders needed per laundry load. In the 1970s, a typical standard dose was in the order of 275 grams per wash. This was gradually reduced to reach values of about 175 grams per wash by the 1990s. Around that time, in parallel with the 'regular' powder detergents, so-called 'compact' laundry powders appeared in some markets, to be dosed at around 100 grams per wash. Subsequently, several voluntary initiatives through A.I.S.E. contributed to further compaction of the 'regulars', with the standard dosage now at or below 75 grams per wash for all detergent powders.

This closeout report presents and analyses the results of the "A.I.S.E. Laundry Sustainability Project 2" for Heavy Duty Laundry Powder Detergents" (LSP-2)¹ and of the "A.I.S.E. Product Resources Efficiency Project for Laundry Powder Detergents" (PREP-P3)². These were consecutive voluntary industry initiatives launched by A.I.S.E.³ LSP-2 and PREP-P3 aimed to further reduce the environmental impact of heavy duty laundry powder detergents for household laundry, promoting sustainable production and consumption via the concentration of such products together with adequate consumer information.

The LSP-2 initiative was opened on January 1, 2009 and lasted for over three years until March 31, 2012. The subsequent PREP-P3 initiative was opened on July 1, 2012, for two years, closing on June 30, 2014.

This initiative came within the framework of A.I.S.E.'s agenda for sustainability and the industry's commitment to reducing the environmental impact of detergents⁴. The first initiative in this area was the A.I.S.E. "Code of Good Environmental Practice" (which became a European Commission Recommendation - 98/480/EC) and the associated "Washright" campaign. Building on the positive outcome of the "Code" and wanting to continue along the lines of delivering measurable sustainability benefits in the area of laundry detergents, in 2006 A.I.S.E. launched its first "Laundry Sustainability Project" (LSP-1), which focussed on powder detergents for household laundry. Although it was open in virtually all European countries, its focus was on the Central and Eastern European region, where the "Code" had not been implemented. In 2008, the members of A.I.S.E. recognized the value of continuing along this route and initiated two new parallel initiatives. One aimed once more at powder detergents (LSP-2, as covered in this closeout report). The other addressed for the first time the category of household laundry liquid detergents (LSP-L, see separate closeout report).

This report covers the results of the LSP-2 initiative in the period from 2008 (base-line reference year) until 2011, and further the results of the PREP-P3 initiative in the period from 2012 (base-line reference year) until 2014. It presents the sustainability benefits achieved in the total region in terms of reduction of raw materials, packaging materials, greenhouse gas emissions, and transport.

Please note that to calculate the total tonnage reductions, potentially sensitive information was obtained from the participating companies (e.g. individual product dosage) and from external data providers (e.g. individual market shares). These data were aggregated by A.I.S.E. in the calculations and are not included individually in this report.

¹ See in Annex 1 the Project Description document for the "A.I.S.E. Laundry Sustainability Project LSP-2".

² See in Annex 2 the Project Description document for the "A.I.S.E. Product Resources Efficiency Project for Laundry Powder Detergents PREP-P3".

³ A.I.S.E. - Association Internationale de la Savonnerie, de la Détergence et des Produits d'Entretien - the International Association for Soaps, Detergents and Maintenance Products.

⁴ See www.aise.eu – (Our activities > Sustainable Cleaning > Product Resource Efficiency Projects).



Scope

Products

The LSP-2 and PREP-P3 initiatives were aimed at all heavy-duty⁵ low suds laundry powder detergents used for household laundry. In addition, laundry liquid detergents targeted to the Industrial & Institutional (I&I) sector but sold in Cash & Carry markets, and thus easily available to consumers, were also within scope of the initiative.

Geographical

Geographically, LSP-2 was deployed in the 27 countries⁶ that were members of the European Union (EU) during the initiative plus the four countries of the European Free Trade Association (EFTA)⁷. PREP-P3 was deployed in the 28 EU countries⁶ plus the four EFTA countries⁷.

Due to the limited availability of data (e.g. market volumes, market shares, product dosage), the scope of the calculations in this closeout report is limited to 22 countries. For Central Europe these are Bulgaria, the Czech Republic, Hungary, Poland, Romania and Slovakia. For Western Europe, within scope of the report are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Participating companies

Participants included large multinational companies, SMEs, as well as private label manufacturing companies and retailers (Table 1).

Table 1. Participating companies

<i>LSP-2 participants</i>	<i>PREP-P3 participants</i>
Bestway Holdings	Henkel
Esselunga	Persan
Henkel	Procter & Gamble
Johnson Diversey	Unilever
Landmark Wholesale	Mercadona
Lidl	Reckitt Benckiser
Mc Bride	
Mercadona	
Palmer and Harvey McLane	
Powder & Liquid Products	
Procter & Gamble	
Senzora	
Unilever	
Reckitt Benckiser	

⁵ “Heavy Duty” according to EU Regulation (EC) No 648/2004, Annex VIIB: “a detergent shall be considered to be a heavy-duty detergent unless the claims of the manufacturer predominantly promote fabric care i.e. low temperature wash, delicate fibres and colours.”

⁶ Croatia is excluded from LSP-2 as it was not yet a Member State of the EU in the period 2010-2012, but was automatically included into the scope of PREP-P3 as it joined the EU during the lifetime of this project, in 2013.

⁷ The EFTA countries are Iceland, Liechtenstein, Norway and Switzerland.

LSP-2 and PREP-P3 commitments

Recommended dosage

For all their heavy duty household laundry powder detergents, companies who signed up to respectively LSP-2 and PREP-P3 committed to a standard recommended dosage⁸ not greater than resp. 85g / 75g and 135ml / 115ml per wash (Table 2).

Table 2. Recommended dosage

<i>Maximum recommended dosage for a standard wash, normal soil level, medium water hardness</i>	<i>LSP-2</i>	<i>PREP-P3</i>
g/wash	85	75
ml/wash	135	115

The LSP-2 maximum dosage aimed to drive a substantial reduction in dosage compared to the typical market situation in 2008, with an important market presence of powder detergents to be dosed at 100 g/wash or more. PREP-P3, in its turn, aimed to further reduce the dosage from the LSP-2 level down to a yet more ambitious target. Importantly when used at these lower dosages, detergents should deliver wash results equivalent to what the consumer is expecting from previous experience.

The maximum limits of respectively 85g and 75g per wash were selected based on a broad industry consultation that confirmed the technical feasibility. It was therefore expected that the required thresholds could be reached with conventional technologies, and did not represent a barrier to entry into the project for any company. On request, A.I.S.E. also offered expert assistance to companies asking for this, to prevent the possible exclusion of any company for technical reasons.

It must be noted that companies were free to decide in which countries (within scope) they wanted to participate to the initiative.

Packaging

As the compacted formulations lead to a reduced volume of detergent for a given number of wash loads, signatories to LSP-2 as well as to PREP-P3 also committed to a reduction of packaging materials.

As a minimum, the packaging reduction had to be proportional to the extent of compaction of the detergent powder - in other words, keeping fill levels overall at least in line with levels prior to the compaction initiatives. This commitment applies to all packaging types (rigid, e.g. cartons, as well as non-rigid, e.g. bags).

For individual rigid containers, there was in addition the specific commitment to always have a fill level that is at least at 70% of the maximum filling ratio.

⁸ As defined in Regulation (EC) No 648/2004, Annex VII - i.e. for a standard washing machine load, normal soil level, medium water hardness.



Communication

To reach the desired sustainability benefits, not only did the manufacturers have to develop more concentrated products, but also consumers had to adapt their dosing habits to the new dosage instructions.

On-pack

As part of their commitment, signatories to LSP-2 and to PREP-P3 were strongly urged to communicate clearly to consumers how to correctly use the new products, i.e. to apply the correct dosage. Communication to consumers had to also focus on raising awareness about the benefits of using more compacted products.

For this purpose A.I.S.E. developed non-branded material for on pack communication, made available to all participating companies.

The recommendation for consumer communication for LSP-2 included three on-pack elements (Figure 1), the exact execution depending on whether the product underwent the required compaction during the LSP-2 initiative (comparative patch), or whether it had already been compacted before (non-comparative patch).

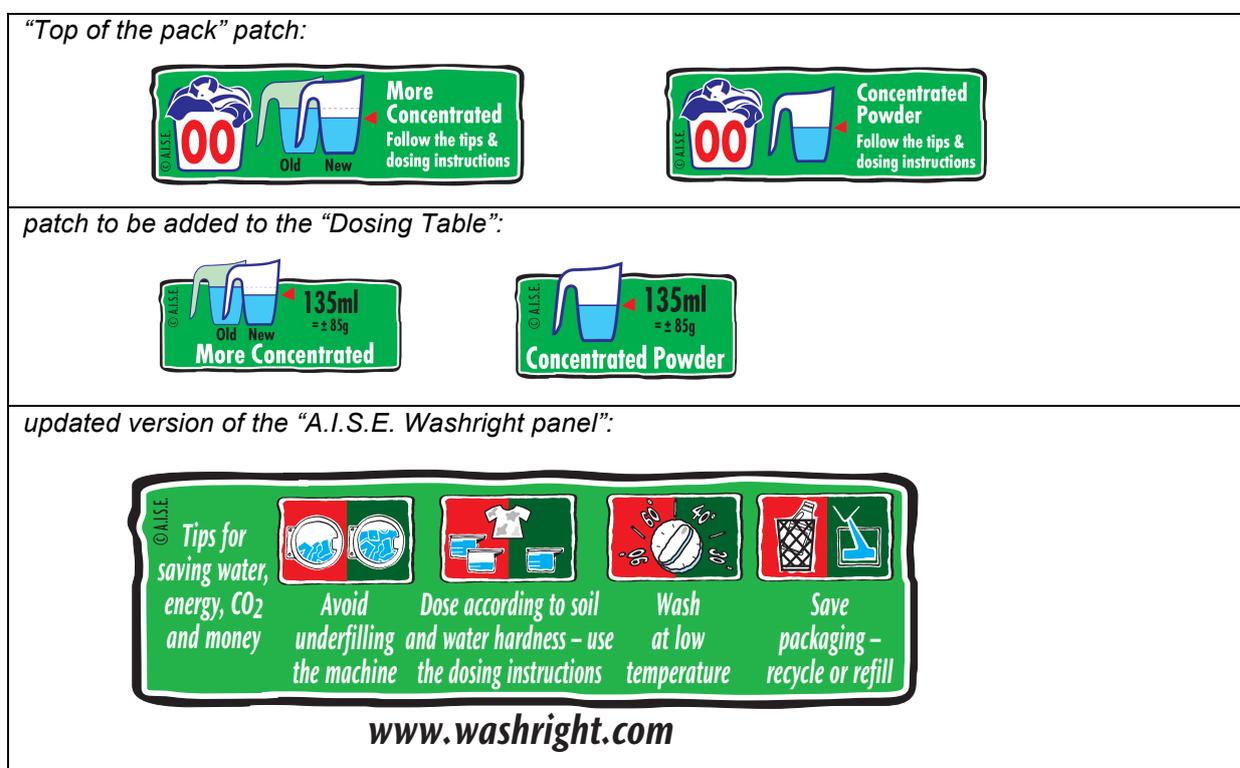


Figure 1. On-pack material for LSP-2



For PREP-3, signatories were urged to implement the on-pack materials shown in Figure 2, the execution again depending on whether the product had already been compacted to the required level prior to the PREP-P3 initiative (comparative and non-comparative versions), and also on the shape of the dosing device. Also 'silent' options were allowed instead of the monolingual versions shown below.

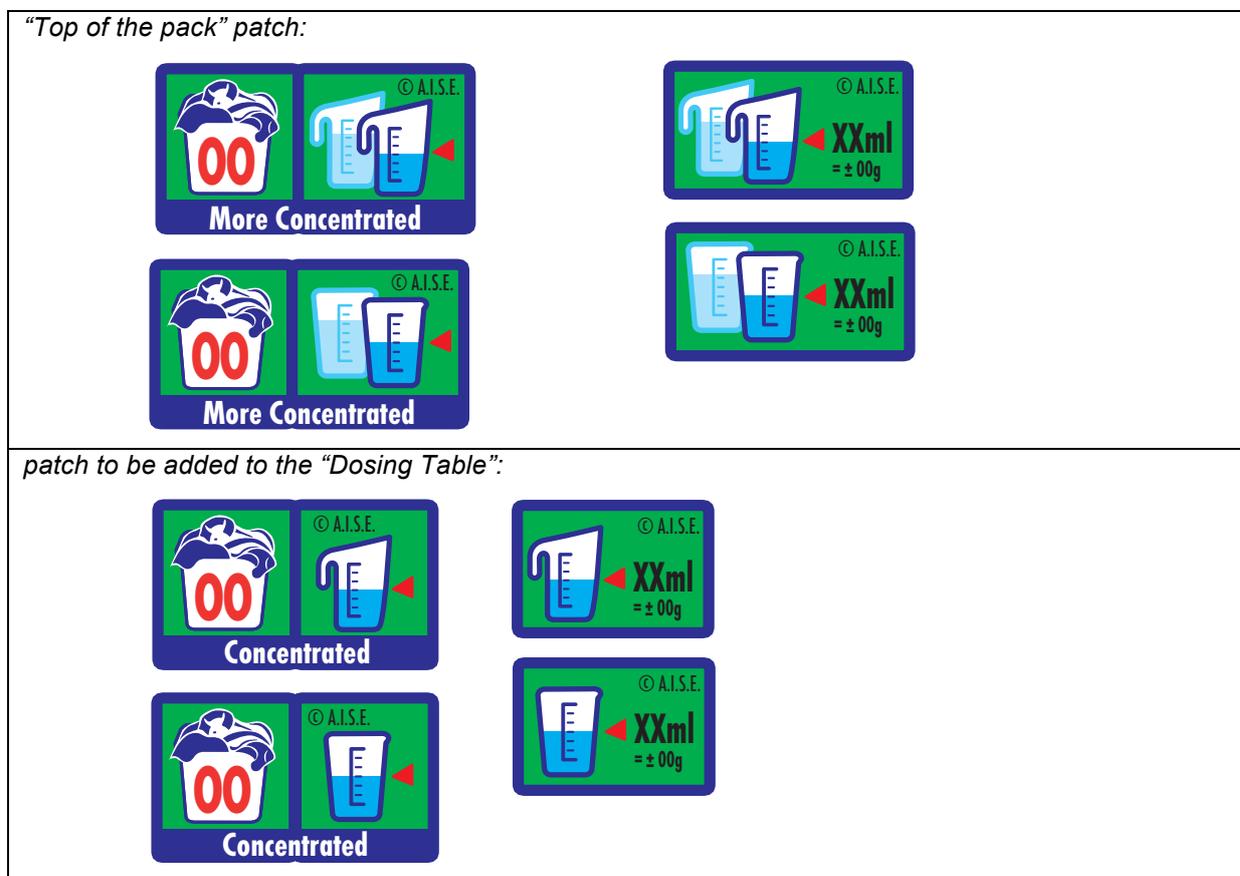


Figure 2. On-pack material for PREP-P3



A.I.S.E. campaign

In the context of the preceding project LSP-1, a consumer education and stakeholder engagement campaign had been conducted by A.I.S.E. and national associations (cf. close-out report for LSP-1⁹).

For LSP-2, which followed closely after the completion of LSP-1, a further campaign was not deemed to be necessary.

For PREP-P3, an instructional leaflet was developed (Figure 3).

Look! Your powder detergent is more concentrated. Follow the dosage instructions, help the environment!

More Concentrated

All over Europe, powder detergents are becoming more concentrated, meaning that there is less raw materials and less packaging needed, which leads to less waste and reduced CO₂ emissions from transport. Pay careful attention to the new dosing instructions, as you will need to use less detergent from now on for the same washing.

A voluntary industry initiative. www.aise.eu

Did you know that...?

- ... you can find the number of washes on the front of every pack**
You can tell how many washes you get from your laundry detergent by checking the "laundry basket" icon shown on the front of every pack. Always see the dosing instructions for detailed guidance.
- ... concentrated detergents give big benefits for sustainability**
Thanks to modern technology, concentrated detergents deliver the same wash in a smaller dose.
This saves a lot of raw materials, packaging and transport, and reduces CO₂ emissions.
Concentrated detergents give washing performance at least as good as standard detergents, and ensure a high level of safety for your health and the environment.
- ... using the right dose gives the best results**
When using concentrated detergents, always remember to pay close attention to the dosing instructions. This way, you will get optimum results while minimising any effect on the environment.

TIPS FOR SAVING WATER, ENERGY, CO, AND MONEY

- Load underfilling the machine
- Use the dosing instructions
- Wash at low temperature
- Save packaging, recycle or refill

WWW.CLEANRIGHT.EU

More info at www.cleanright.eu

Nota Bene: Please note that the figures in the dosage table and reference to "24" wash loads are for illustration purposes only.

Typical dosing instructions

WASH-LOADS	60 ml	85 ml	145 ml
1 dose (115ml + 75g)	60 ml	85 ml	145 ml
2 medium	60 ml	115 ml	175 ml
3 (175ml)	85 ml	145 ml	205 ml

HOW TO DOSE CORRECTLY

Always look for the number of washes shown on the "laundry basket" icon when comparing products. The icon tells the number of washes for medium soil and medium water hardness.

Figure 3. Leaflet for PREP-P3

⁹ www.aise.eu/documents/document/20140128125511-final-lsp-1-close-out-report-feb-2010.pdf

Quantification of detergent tonnage reduction

Methodological considerations

As consumers apply a lower dosage for the majority of the powder detergents on the market, thanks to compaction, this contributes to a notable reduction of the overall tonnage of powder detergents sold across the market.

In absence of any other market dynamics than compaction, one could simply make a direct comparison between the total powder detergents tonnage just before compaction, and the total tonnage just after compaction. The difference between both tonnages would then be the tonnage reduction that can be attributed to compaction. However, this straightforward approach is not applicable, because other substantial changes in the market have been happening in parallel. Hence, tonnage changes have not been a single-variable process:

- the overall automatic detergents market size has evolved, e.g. in some countries the market may have grown because of an increased standard of living (leading to more machine wash loads), or because of population growth;
- the preference for different forms of laundry products has changed, leading to an evolution in the powders share relative to the total market.

Consequently, to quantify the powder detergents tonnage reduction that can be attributed to the industry compaction initiatives LSP-2 and PREP-P3, a hypothetical calculated benchmark is needed. Indeed, it is necessary to separate the tonnage effect of compaction from the effect of other market dynamics.

Market dynamics

Powder detergents segment

In Figure 4, the tonnage trend for automatic detergent powders, with as reference the tonnage in the benchmark year 2008, is shown for Western Europe and Central Europe (aggregated across countries).

In 2008 the tonnages were 1217804 and 310740 tonnes/year respectively in Western and Central Europe.

A clear reduction over time is observed. For Western Europe this was a decrease of 360000 tonnes/year (29.6%) in 2012 versus 2008 (LSP-2 period); and another 157636 tonnes/year (18.4%) in 2015 versus 2012 (PREP-P3 period). For Central Europe, the reduction was by 34954 tonnes/year (11.2%) from 2008 to 2012 - but there was no notable reduction from 2012 to 2015: only 3079 tonnes/year (1.1%).

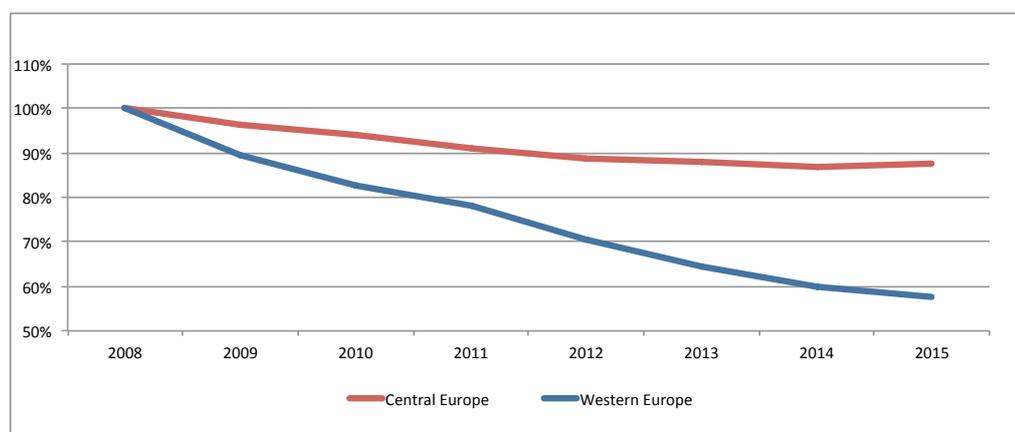


Figure 4. Laundry powders tonnage trend - aggregated by region



There was a large country to country variation in how the total powders volume evolved since 2008 (Figure 5). For most countries there was a decrease, some reaching a 50% reduction or more. But in several other countries the trend was essentially flat, and in some countries there was actually a growth of the tonnage (i.e. Poland and Bulgaria - with a market growth of about 15%).

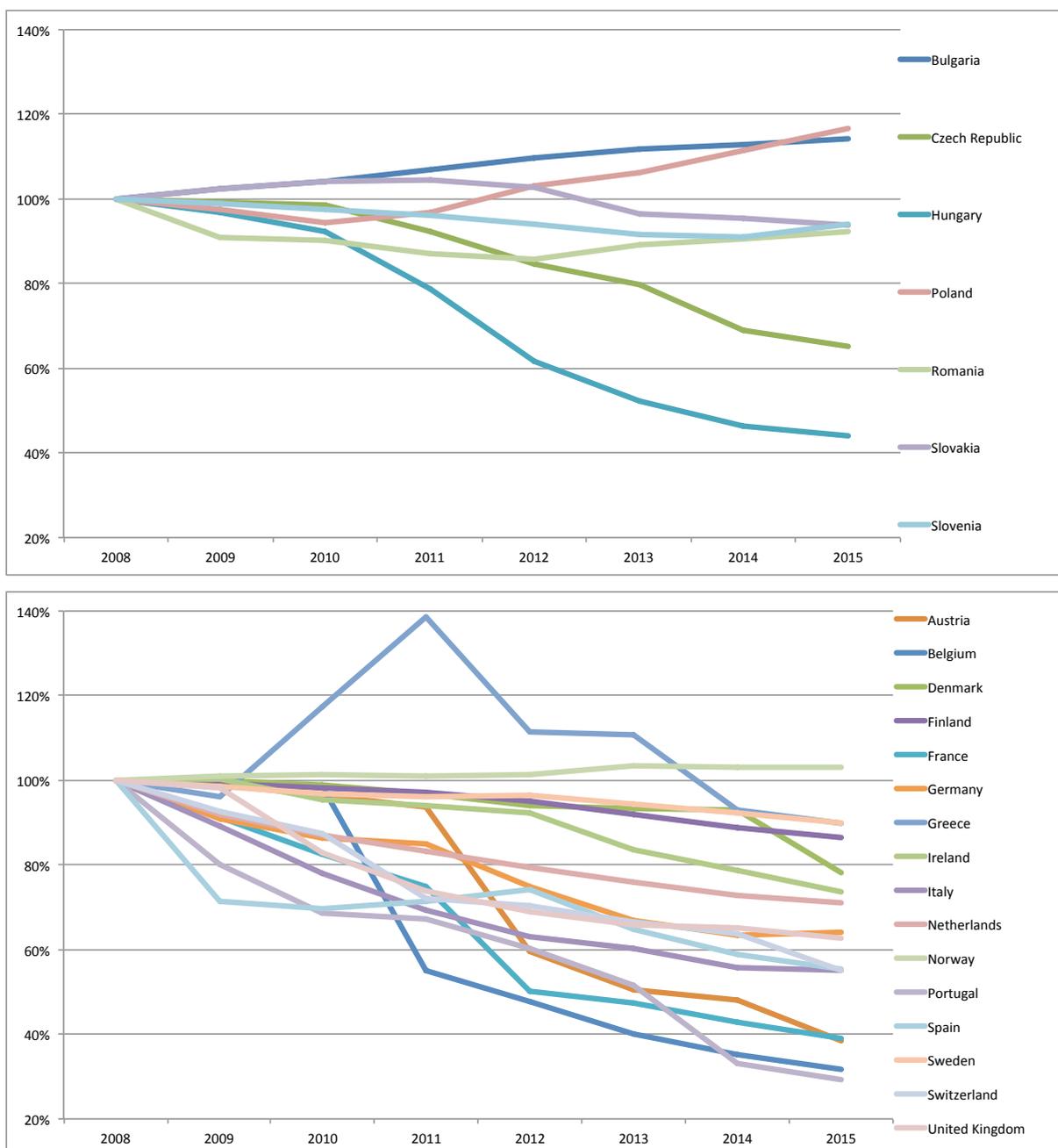


Figure 5. Laundry powders tonnage trend - by country (top: Central Europe, bottom: Western Europe)

When considering the reduction in the annual powder detergent tonnage, it is important to note that this was not only driven by the detergent dosage per wash, but also by the annual number of wash loads conducted with powder detergents, i.e. the segment size of powders in the overall laundry detergents market.

The powders segment size is determined (1) by the total automatic detergent market size (across all detergent forms) and (2) by the share of the powder form relative to other laundry detergent forms. During the period covered by the LSP-2 and PREP-P3 projects, there has been an evolution in both of these factors - as discussed below.



Total automatic detergents market size

Across Western Europe the overall automatic detergent market (across all forms) has shrunk tonnage-wise, but has retained a stable market value (i.e. the value growth did not exceed inflation). This can be seen in Figure 6. This apparent inconsistency between tonnage and value might be explained by the successful implementation of compaction across all laundry detergent forms - resulting in equivalent value (constant number of doses, at a stable price per dose) but a lower tonnage. An alternative or additional explanation for equal value with less tonnage may be a shift of the market towards product forms with a higher price setting per dose (such as capsules).

For Central Europe, the tonnage as well as the market value have remained fairly stable (Figure 6). The fact that tonnages have not decreased, despite successful compaction initiatives (as will be shown later in this report), suggests that the overall market may have grown in terms of number of wash loads per year. This could be driven by population growth but also by an increased standard of living, leading to a change of consumer habits (e.g. more frequent washes, and moving from manual or semi-automatic to machine washing). This hypothesis is partially supported by the market value trend, which shows some increase over time.

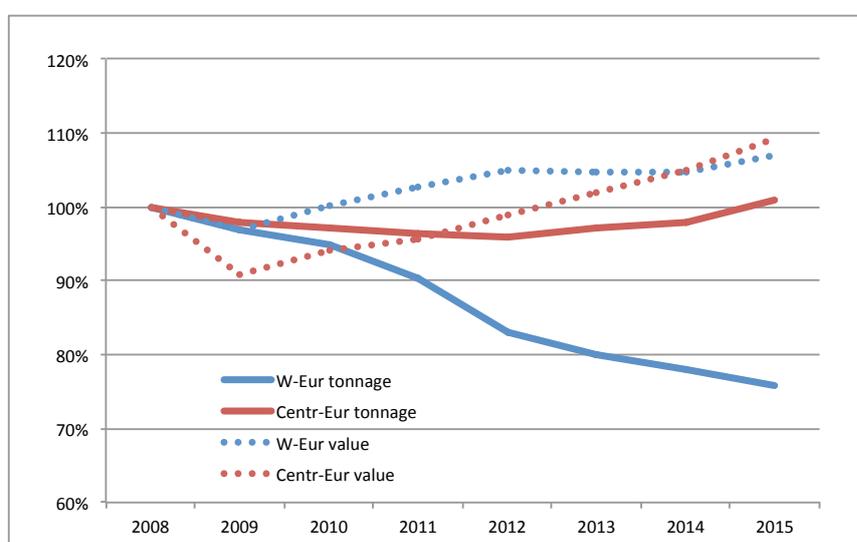


Figure 6. Total automatic detergent tonnage and value trends

Share of the powder form

Sales volume data of the different detergent forms are not available expressed in standard doses. As an approximation, the value share of the powder form might be used as an estimate of the proportion of laundry loads that are washed with powder detergent. However it is to be taken into account that the retail value per dose may be different for different forms. Hence, with this approach, forms with a lower price setting per dose (as may well be the case for powders) would appear to have a lower share than what has actually been sold.

The powders value share has decreased in both regions (Figure 7). In Western Europe this went from close to 50% of the market in 2008 to 30% in 2015. In Central Europe, powders remained the dominant form, but nevertheless the share went down from 83% of the market in 2008 to 66% in 2015.



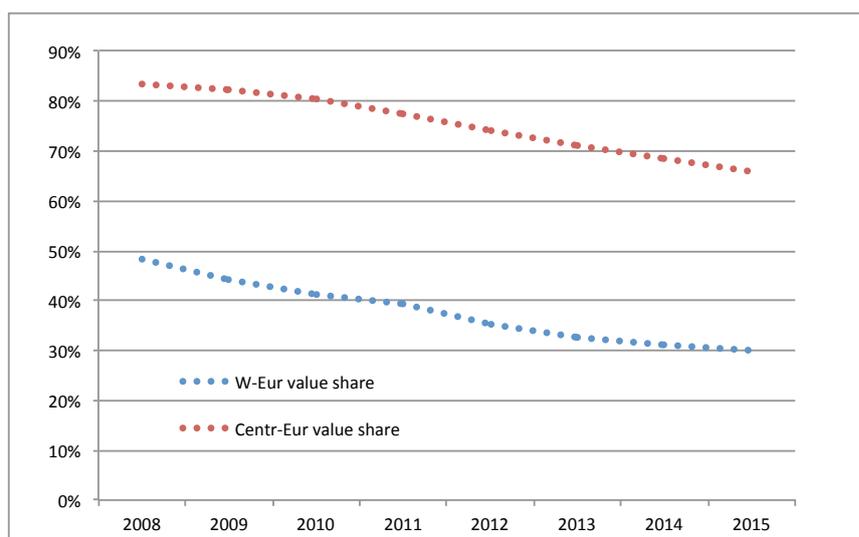


Figure 7. Laundry powders value share relative to total automatic detergents

Discussion

The overall detergent category volume and value trends between 2008 and 2015, as well as the ongoing decrease of the powders segment value share within the detergent category, indicate that multiple market dynamics have been occurring. Hence, the powders tonnage reduction has not been a single-variable process, purely attributed to compaction. While a quantitative reduction might be calculated from the tonnage trend data in isolation, these data are insufficient to determine the causal influence of compaction on detergent consumption.



Benchmark tonnage

Extrapolation from post-compaction tonnage

The hypothetical benchmark tonnage aims to represent the situation without compaction but with all other market dynamics in place. This benchmark is extrapolated from the actual tonnage after compaction, by re-scaling the latter, “reverting” the dosage reduction while maintaining the powders segment size as it was after compaction (Figure 8). This implies that only the amount of powder detergent equivalent to the number of laundry loads that were washed with powder at the time after compaction is considered. The fraction of laundry loads washed with powder detergent at the time before compaction, but that moved out of the powders market (e.g. due to a shift towards a different form) is disregarded. This is because that fraction did not contribute to a compaction related tonnage reduction.

Ultimately, the estimated tonnage reductions are calculated as the difference between the actual post-compaction tonnage and the extrapolated pre-compaction benchmark. For LSP-2, this is 2012 versus 2008, for PREP-P3 it is 2015 versus 2012, and for both combined it is 2015 versus 2008.

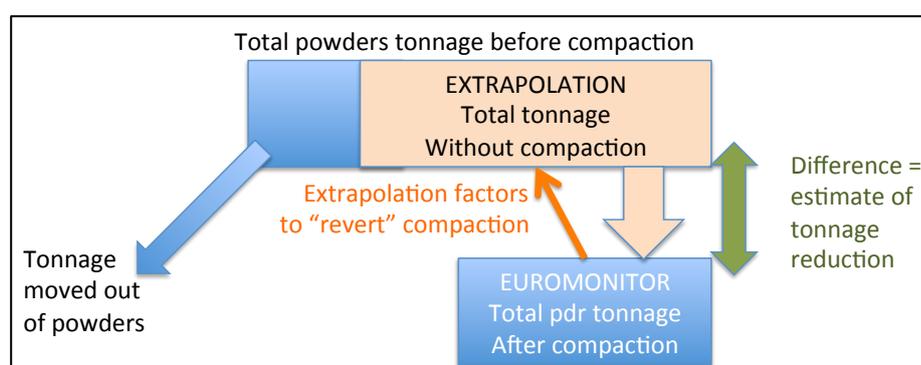


Figure 8. Pre-compaction benchmark tonnage

The annual tonnage of heavy duty laundry detergent powders after compaction, per country, was obtained from the Euromonitor¹⁰ database. This reflects the real market status in terms of the powders segment size and share after compaction.

For each country an extrapolation was conducted, based on the dosage before compaction compared to the dosage after compaction. For this purpose, the average recommended dosage in the country was determined, as the weighted average across the individual company dosages, weighted by their market value share (available from Euromonitor). The country-specific recommended dosage was obtained from the producers¹¹, for the years 2008, 2012 and 2015. This reflects the situation before LSP-2, intermediately between LSP-2 and PREP-P3, and after PREP-P3, respectively. Note that this exercise was limited to “branded goods” companies, because for private labels, no detailed value share information could be obtained.

To calculate the hypothetical “no compaction” benchmark tonnage, in addition, the following aspects were taken into consideration:

- A large percentage of the powders detergent market (close to three-quarters across Europe) is covered by LSP-2 and PREP-P3 initiative signatories. In addition, many other detergent producers have followed suit, even though they did not join the voluntary commitment to compact. While this dynamic in the market is not formally related to the A.I.S.E. initiatives, it can nevertheless be considered as a de facto consequence - and the resulting tonnage reduction is indirectly also an achievement of the initiatives. However, at least initially, one cannot assume that the entire market’s dosage will have been modified.

¹⁰ Passport, Euromonitor International 2017

¹¹ In case different brands of one company had different dosages, first the company’s weighted average dosage (per country) was determined, based on the individual brands’ market shares and dosages.

- Not all consumers dose their detergent according to the instructions on pack. In the A.I.S.E. “Habits & Practices” study of 2014¹², covering the entire EU, with 4740 panellists, 66% of the respondents indicated that they usually measure the amount of detergent they put into the machine. 65% said they are aware of the dosing instructions on pack, and 57% confirmed that they usually add the correct amount of detergent as recommended by the manufacturer. 70% of the respondents mentioned that they use either the millilitre scale or the ¼, ½,... indications on the scoop or dosing device to measure the amount of detergent. 62% were aware of the difference between compacted and traditional laundry detergents.

Based on the above considerations, it is assumed that 50% of the total considered powder detergent tonnage (across all producers) will have undergone a dosage reduction¹³. For the other 50%, it is conservatively assumed that consumers did not reduce dosage - either because their particular brand of detergent was not compacted, or because they dose intuitively rather than by following the instructions.

This is illustrated in Figure 9.

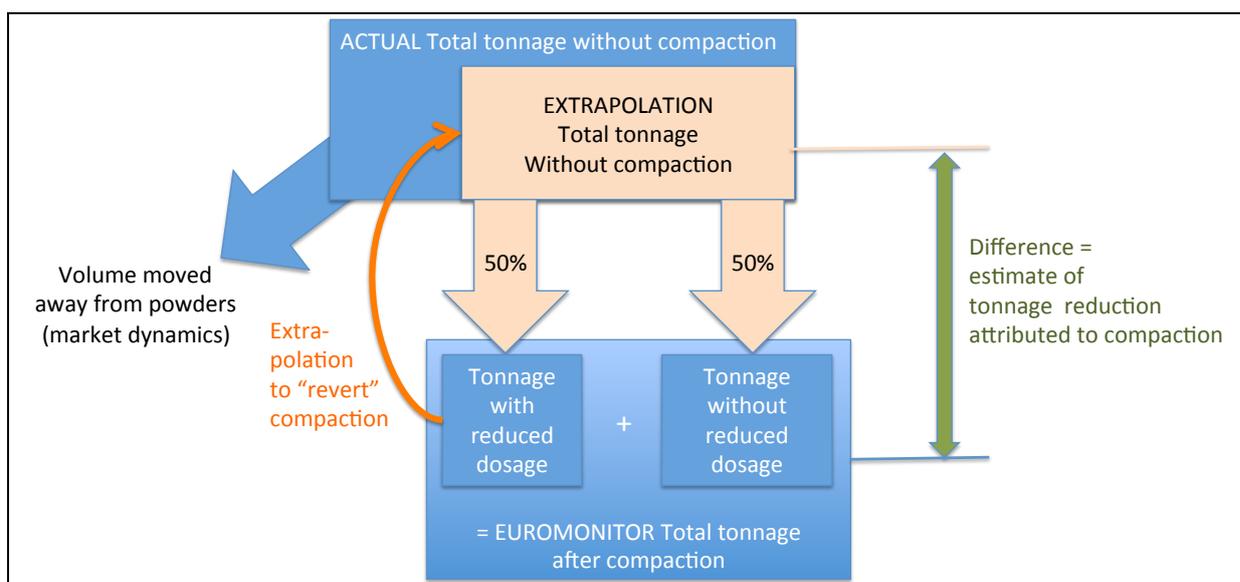


Figure 9. Methodology to quantify tonnage reduction attributed to compaction

Applying this assumption, the hypothetical “no compaction” tonnage for each country was determined as follows¹⁴:

$$\text{tonnage}_{\text{after compaction}}^{\text{actual}} = 50\% \cdot \text{tonnage}_{\text{before compaction}}^{\text{extrapolated}} + 50\% \cdot \text{tonnage}_{\text{before compaction}}^{\text{extrapolated}} \cdot \frac{\text{dosage}_{\text{new}}}{\text{dosage}_{\text{old}}}$$

$$\Rightarrow \text{tonnage}_{\text{before compaction}}^{\text{extrapolated}} = \text{tonnage}_{\text{after compaction}}^{\text{actual}} \cdot \frac{2}{1 + \frac{\text{dosage}_{\text{new}}}{\text{dosage}_{\text{old}}}}$$

It is emphasised that the “no compaction” tonnage aims to represent a reasonable estimate. Due to the multiple assumptions and limitations, it cannot be considered and an accurate tonnage calculation.

¹² Washing Habits 2014. U&A Tracking. Report prepared by InSites Consulting for A.I.S.E. <https://www.aise.eu/cust/documentrequest.aspx?DocID=3970>

¹³ Consensus decision by the A.I.S.E. PREP Task Force, February 9th, 2018

¹⁴ For the LSP-2 assessment, $\text{dosage}_{\text{old}}$ is the dosage in 2008, while $\text{dosage}_{\text{new}}$ is the dosage in 2012. For the assessment of PREP-P3, $\text{dosage}_{\text{old}}$ is the dosage in 2012, while $\text{dosage}_{\text{new}}$ is the dosage in 2015. And finally for the aggregated assessment, $\text{dosage}_{\text{old}}$ refers to 2008, while $\text{dosage}_{\text{new}}$ is the 2015 dosage.

Alternative approach - not retained

An alternative approach would be to start from the actual laundry powder tonnage before compaction, and to re-scale this tonnage to take into account the market dynamics that took place during the time compaction was implemented. For example - if the tonnage before compaction had been 1000000 tonnes/year, and it is known that 25% of the powders market moved to a different form, then the extrapolated benchmark tonnage would be 750000 tonnes/year.

In absence of other data, it was attempted to conduct this extrapolation based on the powder segment's market value (inflation-corrected). The underlying assumption is that the market value of powders would be directly correlated to the number of wash loads conducted with powders - i.e. a constant market value per dose over time (except for inflation) is assumed.

Unfortunately, this approach did not lead to plausible findings. Most likely this is because market dynamics had been more complex and thus, the value per dose had not remained constant over time.

Tonnage reduction

The results are presented in Table 3 for LSP-2 and in Table 4 for PREP-P3. Furthermore, the tonnage reductions¹⁵ from the combined effect of LSP-2 and PREP-P3 are presented in Table 5. These are estimates, based on multiple assumptions - not exact calculations.

It is estimated that LSP-2 has led to a powder detergent tonnage reduction by 81500 tonnes per year across Europe, which is 7% of the non-compacted benchmark. These savings were mainly materialised (95%) in Western Europe.

For PREP-P3 the detergent tonnage reduction across Europe is estimated to be 97000 tonnes per year which is 9.4% of the non-compacted benchmark. In Western Europe the compaction savings amounted to two-thirds of the LSP-2 achievement, with 63700 tonnes per year. In Central Europe the reduction was substantially higher than for LSP-2, with 33000 tonnes per year (this is over 12% of the non-compacted benchmark).

Across both initiatives, a cumulative effect is seen. Compared to the 2008 dosage, the combined annual detergent tonnage reduction achieved by 2015 is 162000 tonnes per year across Europe. For Western Europe the tonnage reduction achieved by the two initiatives combined is 125500 tonnes per year; for Central Europe it is 37000 tonnes per year.

In Western Europe, the tonnage reductions achieved by LSP-2 and PREP-P3 were more or less proportional to the committed dosage reductions in each initiative.

In Central Europe, the tonnage reduction achieved by LSP-2 was quite limited compared to Western Europe, whereas for PREP-P3 the relative reduction in Central Europe was more substantial than in Western Europe. This may be explained by the fact that in 2008 the Central European region had only just completed the LSP-1 compaction initiative and many companies were not yet interested in another disruptive initiative in the very short term. On the other hand, Central Europe actively embraced the lower dosages a few years later with PREP-P3. *This may seem contrary to the observation that the total powder detergent tonnage was largely flat during the PREP-P3 period (Figure 4). However the total Central European detergent market has grown during this time (Figure 6), with a high powders value share (between two-thirds and three-quarters of the market). These market dynamics may explain the flat absolute tonnage despite compaction.*

As a result, across both initiatives, in each of these two regions the tonnage reduction was equivalent - on average up to 15% compared to the no-compaction benchmark scenario.

¹⁵ Please note that the aggregated tonnage reduction across both initiatives is not identical to the sum of the reductions at the individual initiative level. This is because the "no compaction scenario" benchmark is determined as an extrapolation from the market situation in the year after completion of the specific initiative. For LSP-2 individually, the 2008 benchmark is extrapolated from the 2012 market. For the aggregated LSP-2 + PREP-P3 assessment, on the other hand, the 2008 benchmark is extrapolated from the 2015 market. Hence, the "no compaction scenario" tonnage, reflecting the 2008 dosage, is somewhat different for the LSP-2 assessment than for the aggregated LSP-2 + PREP-P3 assessment.



Table 3. Tonnage reduction attributed to LSP-2 (2012 vs. 2008 dosage)

Country	actual powders tonnage (tonnes/year)	"no compaction scenario" tonnage (tonnes/year)	tonnage reduction (tonnes/year)	% reduction vs. total tonnage without compaction
Bulgaria	24642	24975	333	1.3%
Czech Republic	36573	37525	952	2.5%
Hungary	23129	23455	325	1.4%
Poland	81453	83465	2011	2.4%
Romania	59000	58983	-17	0.0%
Slovakia	10146	10419	272	2.6%
Central Europe	234944	238821	3877	1.6%
Austria	17710	19042	1332	7.0%
Belgium	15643	16978	1336	7.9%
Denmark	12936	13634	698	5.1%
Finland	14589	14893	304	2.0%
France	51293	56253	4960	8.8%
Germany	242212	266771	24559	9.2%
Greece	18855	20584	1730	8.4%
Ireland	8769	9506	737	7.8%
Italy	84408	93149	8741	9.4%
Netherlands	20038	21775	1737	8.0%
Norway	11621	11821	200	1.7%
Portugal	41338	45449	4111	9.0%
Spain	142088	156713	14625	9.3%
Sweden	22773	22780	7	0.0%
Switzerland	17605	19134	1529	8.0%
United Kingdom	130199	141205	11006	7.8%
Western Europe	852076	929687	77611	8.3%
TOTAL EU 28+4	1087020	1168508	81488	7.0%



Table 4. Tonnage reduction attributed to PREP-P3 (2015 vs. 2012 dosage)

Country	actual powders tonnage (tonnes/year)	"no compaction scenario" tonnage (tonnes/year)	tonnage reduction (tonnes/year)	% reduction vs. total tonnage without compaction
Bulgaria	25701	33951	8251	24.3%
Czech Republic	28144	31554	3410	10.8%
Hungary	16477	18727	2250	12.0%
Poland	91984	102809	10825	10.5%
Romania	63468	70702	7234	10.2%
Slovakia	9278	10572	1294	12.2%
Central Europe	235052	268315	33263	12.4%
Austria	11415	12589	1174	9.3%
Belgium	10325	11368	1043	9.2%
Denmark	10749	11501	752	6.5%
Finland	13249	13539	290	2.1%
France	39910	43526	3616	8.3%
Germany	207450	229617	22167	9.7%
Greece	15191	16473	1282	7.8%
Ireland	6988	7581	593	7.8%
Italy	73590	80823	7233	8.9%
Netherlands	17923	19510	1587	8.1%
Norway	11821	11889	69	0.6%
Portugal	20000	21275	1275	6.0%
Spain	105759	116629	10870	9.3%
Sweden	21243	21638	395	1.8%
Switzerland	13777	15112	1335	8.8%
United Kingdom	118456	128482	10026	7.8%
Western Europe	697846	761552	63706	8.4%
TOTAL EU 28+4	932898	1029867	96969	9.4%



Table 5. Tonnage reduction attributed to LSP-2 and PREP-P3 combined (2015 vs. 2008 dosage)

Country	actual powders tonnage (tonnes/year)	"no compaction scenario" tonnage (tonnes/year)	tonnage reduction (tonnes/year)	% reduction vs. total tonnage without compaction
Bulgaria	25701	34261	8561	25.0%
Czech Republic	28144	32274	4129	12.8%
Hungary	16477	18954	2477	13.1%
Poland	91984	105043	13058	12.4%
Romania	63468	70684	7216	10.2%
Slovakia	9278	10815	1537	14.2%
Central Europe	235052	272031	36979	13.6%
Austria	11415	13432	2017	15.0%
Belgium	10325	12233	1908	15.6%
Denmark	10749	12076	1327	11.0%
Finland	13249	13814	566	4.1%
France	39910	47320	7410	15.7%
Germany	207450	250188	42738	17.1%
Greece	15191	17846	2655	14.9%
Ireland	6988	8159	1171	14.4%
Italy	73590	88294	14704	16.7%
Netherlands	17923	21040	3116	14.8%
Norway	11821	12093	272	2.3%
Portugal	20000	23243	3243	14.0%
Spain	105759	127287	21528	16.9%
Sweden	21243	21644	402	1.9%
Switzerland	13777	16288	2511	15.4%
United Kingdom	118456	138353	19897	14.4%
Western Europe	697846	823311	125465	15.2%
TOTAL EU 28+4	932898	1095342	162444	14.8%



Individual country observations

Belgium / The Netherlands

In Belgium the detergent tonnage reduction was comparable for LSP-2 and PREP-P3, with a decrease of respectively 7.9% and 9.2%. Jointly there was a tonnage reduction by 15.6%, just above the European average.

The tonnage decrease in The Netherlands on par with the European average, with 8.0% for LSP-2 and 8.1% for PREP-P3, or 14.8% combined.

Bulgaria / Romania

During LSP-2, Bulgaria achieved only a small reduction (1.3%). But subsequently, despite the fact that no-one formally signed up to the commitment in Bulgaria, during PREP-P3 there was nevertheless a decrease by 24.3%. Across the two initiatives the reduction was estimated to be 25%.

In Romania, the tonnage was reduced by 10.2% during the PREP-P3 period. In fact the average dosage had remained at 125 g/wash through LSP-2 and then was reduced to 100 g/wash in the course of PREP-P3 - leading to the estimated tonnage decrease.

Czech Republic / Slovakia

The market in these two countries is quite similar. Under LSP-2, the reduction by about 2.5% was among the best in Central Europe, where the average reduction was 1.6%. For PREP-P3 the reduction was much more substantial, 11-12%. Across both compaction projects the tonnage reduction was by 13-14% - which somewhat below the European average.

France

France achieved a tonnage reduction of 8.8% under LSP-2 and further 8.3% under PREP-P3 - jointly leading to a decrease by 15.7%. This is just above the European average.

Germany / Austria / Switzerland

With a tonnage decrease of 9.2% for LSP-2 and 9.7% for PREP-P3, and 17.1% jointly - Germany performed above the European average.

In Austria and Switzerland the detergent tonnage reduction was very similar for LSP-2 and PREP-P3, with a decrease of respectively 7.0% and 9.3% (Austria) and 8.0% and 8.8% (Switzerland). Jointly this led to a 15.0% reduction in Austria and 15.4% in Switzerland - hence, both in line with or slightly above the European average.

Greece

Also in Greece, the tonnage reduction under LSP-2 (8.4%) was similar to the PREP-P3 achievement (7.8%). Together this leads to a reduction by 14.9% - aligned with the European average.

Hungary

As seen across the Central European region, the tonnage reduction under LSP-2 was limited (1.4%) - while for PREP-P3 it was substantial (12.0%). Jointly, the 13.1% reduction is somewhat below the European average.

Italy

With an overall tonnage reduction by 16.7% Italy is - together with Spain - among the two best performing countries overall (12% above the European average). The tonnage reduction was 9.4% for LSP-2 and further 8.9% for PREP-P3.

Nordic Countries (Denmark, Norway, Sweden, Finland)

For Denmark the tonnage reduction across both initiatives was 11% - which is 25% below the European average.

In the other Nordic countries, however, the reduction was substantially less (ranging from 1.9% and 2.3% in Sweden resp. Norway, and 4.1% in Finland). The tonnage reduction in these countries was between one-tenth and one-third of the European average. This can be explained by the unique situation in these countries, where specific eco-labelled compacted formulas had already been on the



market for a longer time. As such, the compaction initiatives LSP-2 and PREP-P3 did not have a major effect on the detergent dosage in Nordic.

Poland

Poland experienced a tonnage reduction somewhat below the European average (12.4%). By far most of this was achieved via PREP-P3. But compared to the rest of the Central European region, and like Czech and Slovakia, Poland delivered better on LSP-2 (2.4% reduction) which was 50% better than the CE regional average.

Spain / Portugal

The tonnage reduction in Spain was (just above Italy) the highest in Europe, with a 16.9% reduction across both initiatives (9.3% for LSP-2 as well as for PREP-P3).

In Portugal, LSP-2 led to a tonnage reduction by 9.0%, followed by 6.0% under PREP-P3. The cumulative decrease was 14.0% which is just below the European average.

United Kingdom / Ireland

The UK as well as Ireland achieved a tonnage reduction just below the European average, with 14.4% across both initiatives. LSP-2 and PREP-P3 both led to a decrease by 7.8%, the same in both countries.

Excluded countries

No market share data were available for several countries. Hence, any tonnage reductions achieved in these countries could not be quantified - and consequently, are not included in this assessment. This is the case for Croatia, the Baltics (Estonia, Latvia, Lithuania), Slovenia, Cyprus, Iceland, Liechtenstein, Luxembourg and Malta. Jointly these countries had a powder detergent tonnage of 46500 tonnes per year in 2015. This is 4% of the total European tonnage. Hence, by excluding these countries, and assuming compaction was implemented there similarly as in the rest of Europe, the total tonnage reduction across Europe as calculated in this report may be an underestimation by up to 4%.

Discussion

For LSP-2 no quantitative target had been included in the project description. Instead it was written that “...we can expect a significant saving in chemicals and packaging in line with what was achieved in the original ‘Code’ project.” It was estimated that thanks to the “Code of Good Environmental Practice” (1997-2001), an annual reduction by 250000 tonnes of detergents (across all product forms) had been achieved. Under the ‘Code’ the dosage had been reduced from 150 g/wash to 110 g/wash, whereas under LSP-2 the dosage moved from around 100 g/wash to 85 g/wash. Hence, for LSP-2 an overall tonnage reduction in line with the ‘Code’ and proportional to the LSP-2 dosage reduction, would be in the order of $250000 \times (100-85):(150-110) = 93750$ tonnes/year. The latter is largely in line with the actual estimate of 81000 tonnes/year.

For PREP-P3, a target reduction of detergent chemistry of 116000 tonnes/year had been put forward in the project description. The estimated tonnage reduction thanks to compaction, 97000 tonnes per year, under-achieved versus the original ambition - but only by about 16%.

Since the implementation of these two initiatives, the tonnage savings compared to the situation before these compactations continue to be materialised year after year. Since 2012 (upon completion of LSP-2), and with a further increase since 2015 (upon completion of PREP-P3), it is estimated that a cumulative tonnage reduction of nearly three-quarters of a million tonnes¹⁶ had been achieved by the end of 2017.

¹⁶ Three years (2012,13,14) with 81488 tonnes/year savings, and three years (2015,16,17) with 162444 tonnes/year savings = 732000 tonnes in total across these 6 years.

Quantification of environmental achievements

Methodology: environmental benefits per kg of detergent

The environmental benefits are quantified relative to each kg of detergent that is avoided thanks to compaction.

Carbon footprint: 0.911 kg CO₂eq emissions avoided per kg of detergent

Compacted detergents contain a lower amount of ingredients per wash, which results in energy savings at most of the detergent's life cycle stages. Consequently this leads to a reduction of the carbon footprint of the detergents.

In an ISO-compliant LCA study by PRé Consultants (2014)¹⁷, the environmental impact of powder laundry detergents has been quantified for each of the life cycle stages: ingredient production, detergent formulation (processing), packaging, transport, use phase (washing machine), and end of life. These different stages need to be considered individually to assess the applicability of the carbon footprint values to determine the environmental benefits of compaction.

1) Ingredient production

The formula design strategies used by individual companies are strictly confidential. They are different for each producer. Further, they may also be different at the brand and variant level. As a general principle, the initial steps in detergent compaction were achieved by a reduction in the amount of inert filler (mainly sodium sulphate). Because the largest contribution comes from the reduced amount of inert filler, for the carbon footprint assessment it is assumed that the reduction in chemistry has been entirely a reduction in sodium sulphate. This is a conservative approach, because recent compactations have required more complex reformulations, driving the weight efficiency of the overall formula chemistry - and hence, leading to an overall reduction of detergent chemistry.

Globally, two-thirds of sodium sulphate is obtained from natural sources, while one-third is produced in chemical processes. Of the latter a majority is actually obtained as a by-product. Consequently, for a representative mix, EcoInvent (2007)¹⁸ suggests to assume 60% of naturally sourced sodium sulphate, 15% produced in chemical processes as primary product, and 25% obtained as side products from other processes (for which no emissions are to be allocated).

In the EcoInvent 3.2 database, the "cradle to gate" carbon footprint for industrially produced sodium sulphate (Mannheim process) is 0.497 kg CO₂eq per kg of sulphate powder. For natural sources, 0.126 kg CO₂eq per kg sulphate powder is put forward. Consequently, for the representative mix, this leads to $60\% \times 0.126 + 15\% \times 0.497 = 0.150$ kg CO₂eq per kg of sodium sulphate.

2) Formulation, packaging, transport and end-of-life

The carbon footprint during a powder laundry detergent's formulation, packaging, transport and later on its end-of-life, combined, was calculated to be 62 g CO₂eq per wash (at a dosage of 81.5 g/wash) - equivalent to 0.761 kg CO₂eq per kg of detergent. This is independent of the detergent formula as it is purely driven by the amount of material. Hence, the emission value is directly applicable for the quantification of compaction-related savings.

3) Use phase

The consumer use phase is to be excluded from the assessment of compaction benefits. The environmental impact of the use phase (washing machine) is driven entirely by the amount of water used in the machine and how much energy is used to heat the water. As such, the detergent's degree of compaction has no influence on the use phase.

¹⁷ PRé Consultants. A.I.S.E Screening LCAs for Cleaning Products in Europe Compact powder and tablet laundry detergents. Report for A.I.S.E. February 2014.

¹⁸ Life Cycle Inventories of Chemicals. Data v2.0 (2007). EcoInvent report nr.8. Dübendorf, December 2007. https://db.ecoinvent.org/reports/08_Chemicals.pdf

4) Carbon footprint reduction thanks to compaction

The reduction in carbon footprint thanks to compaction consists of the savings related to the use of less sodium sulphate (0.150 kg CO₂eq per kg), and the savings achieved further downstream the life cycle thanks to the use of less material (0.761 kg CO₂eq per kg). In total, 0.911 kg CO₂eq emissions are avoided for every kg of detergent that is avoided thanks to compaction.

5) Carbon footprint benchmarks

Greenhouse gas emissions are expressed as carbon dioxide equivalents (CO₂eq). To allow a more tangible interpretation, these values can be compared to greenhouse gas emissions of common activities (Table 6).

Table 6. Greenhouse gas emission benchmarks

Activity	Emission	Source of the information	Equivalent per kg of detergent
Emission of driving an average new passenger car	118.1 gCO ₂ eq/km	ACEA ¹⁹ , average emission of new cars sold across the EU in 2016	7.7 km by car
Emission of the production of 1 kg of beef	46.2 kgCO ₂ eq/kg	FAO ²⁰ - Greenhouse gas emissions from ruminant supply chains - a global life cycle assessment	19.7 g of beef
Average EU household carbon footprint	11 tonnes CO ₂ eq/cap/year	Ivanova et al., 2017 ²¹	3% of one person's daily carbon footprint

Transport savings: 3.2 tonne.km truck transport avoided per kg of detergent

Compacted detergents require less raw material to be transported into the detergent plants, and less finished product to be transported to retailers. This results in important transport savings.

In the 2014 LCA study ^{Error! Bookmark not defined.}, it was assumed that detergent ingredients (except renewable surfactants) are transported by truck over a distance of 2000 km from the supplier to the detergent production plant. Further it was assumed that from the detergent production plant to the retailers, on average there is a transport of 1200 km by truck. Transport from the retailer to the consumer was not taken into account, because of the minimal impact and because compaction would anyhow not change the number or distance of shopping trips.

Re-applying these same assumptions, each kg of detergent that is avoided thanks to compaction leads to an avoidance of truck transport of 3200 km x 1 kg = 3.2 tonne.km. This is equivalent to 0.145 km driven by a heavy truck with a typical load²² of 22 tonnes.

Packaging savings: 76.4 g of packaging avoided per kg of detergent

Compacted detergents (meeting the commitments of LSP-2 or PREP-P3) require less packaging material, because the fill level of the packs was to be at least equivalent to the fill levels prior to compaction.

In the 2014 LCA study ^{Error! Bookmark not defined.}, it was assumed that one dose of powder detergent (81.5 g) requires 5.9g of cardboard for primary and secondary packaging, and 0.33g of shrink wrap

¹⁹ <http://www.acea.be/statistics/tag/category/co2-emissions-trends> accessed 23/10/2017

²⁰ <http://www.fao.org/docrep/018/i3461e/i3461e.pdf> accessed 23/10/2017

²¹ Diana Ivanova, Gibran Vita, Kjartan Steen-Olsen, Konstantin Stadler, Patricia C Melo, Richard Wood and Edgar G Hertwich (2017). Mapping the carbon footprint of EU regions. Environ. Res. Lett. 12 (2017) 054013

²² For consistency, assumptions were reapplied from the Closeout Report - A.I.S.E. Laundry Sustainability Project # 1 for Heavy Duty Low Suds Laundry Powder Detergents (LSP-1) (December 2009).

polyethylene. This corresponds to respectively 72.4 g of cardboard and 4 g of polyethylene per kg of detergent.

Assuming that the amount of packaging per kg of detergent will remain largely the same upon compaction, the avoidance of packaging material per kg of avoided detergent is 72.4 g of cardboard and 4 g of polyethylene, or 76.4 g combined.

This can be converted to volume of packaging waste using the bulk density of cardboard packaging waste (compacted in a crush/press car, data for the Netherlands²³), which is 320 kg/m³. Hence, 1 tonne of crushed detergent powder packaging waste takes up a volume of about 3.125 m³. This means 1 tonne of avoided detergent results in 0.226 m³ of packaging waste savings.

Estimated environmental benefits of LSP-2 and PREP-P3 compaction

The environmental benefits are directly proportional to the reduction in detergent tonnages. Consequently, across LSP-2 and PREP-P3 combined, about 75% of these benefits are materialized in Western Europe, and 25% in Central Europe. Relative to the market size in each region, Western and Central Europe have a largely equivalent contribution to these benefits.

The benefits below are intended to be reasonable estimates - not exact calculations.

Climate

Across the EU28+4 countries, LSP-2 resulted in an estimated greenhouse gas reduction by 74000 tonnes of CO₂eq every year, while PREP-P3 led to an annual saving of 88000 tonnes of CO₂eq per year. Both initiatives combined, relative to the 2008 situation, resulted in a reduction of greenhouse gas emissions of 148000 tonnes of CO₂eq per year.

Across the LSP-2 and PREP-P3 initiatives, the annual greenhouse gas reduction corresponds with more than 1 billion km driven with an average new passenger car, or with the production of over 3 million kg of beef. It is equivalent to the carbon footprint of almost 13500 people every year.

Waste

The estimated annual packaging savings amount to over 6000 tonnes/year for LSP-2 and over 7000 tonnes/year for PREP-P3. Jointly after both initiatives, a packaging waste reduction of over 12000 tonnes per year was achieved, including 650 tonnes/year of plastic reduction. Volume-wise, the compaction initiatives led to a reduction of crushed packaging waste by nearly 39000 m³ per year. This is equivalent to the content of 12 Olympic swimming pools²⁴ filled to the brim with crushed cardboard waste, every year.

Transport

Thanks to the LSP-2 and PREP-P3 compaction, truck transport of detergent raw materials and finished products was reduced - estimated by about 520 million tonne.km every year. This is respectively 260 million and 310 million tonne.km per year for LSP-2 and PREP-P3 individually.

For Western Europe, the transport savings across both initiatives are estimated at over 400 million tonne.km. This equates to 18 million km with a heavy truck (of 22 tonnes), and can be visualised as 10000 trucks driving across Western Europe from Hamburg (Germany) to Naples (Italy). For Central Europe, these savings are estimated at nearly 120 million tonne.km - which is over 5 million km with a heavy truck. This can be pictured as 10000 trucks driving from Prague (Czech Republic) to Budapest (Hungary). (Figure 10).

²³ UNECE (2012). https://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.33/2012/mtg1/conversion_coefficients_Netherlands_EN.pdf

²⁴ 50 m long x 25 m wide x 2.5 m deep = 3125 m³

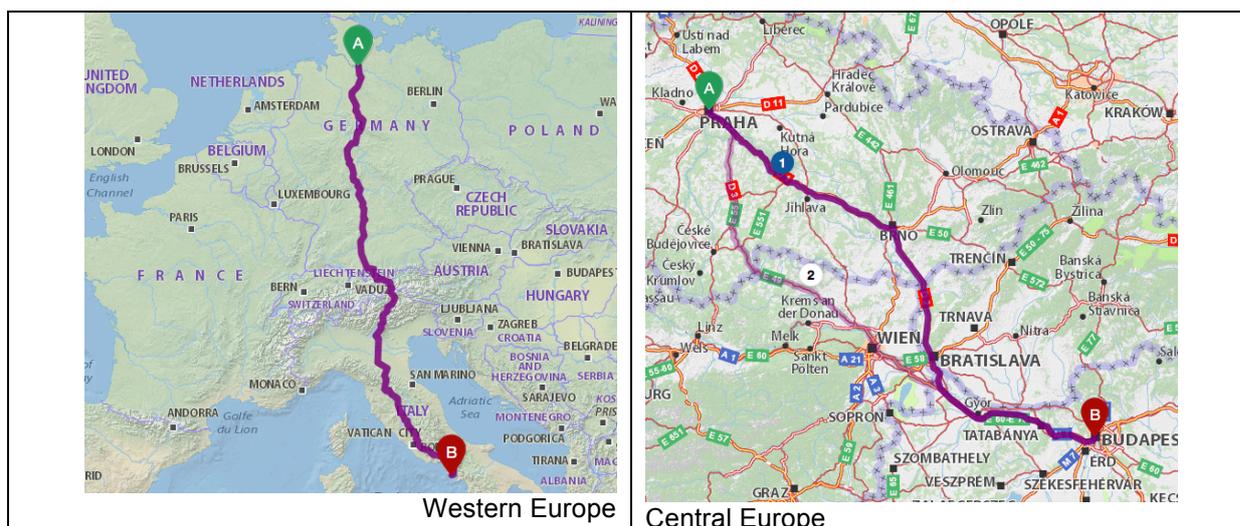


Figure 10. Transport savings per region, visualised as truck journeys (of 10000 heavy trucks).

Across Europe, the cumulative transport savings of LSP-2 and PREP-P3 are equivalent to 1000 heavy truck journeys all the way from Barcelona (Spain) to Warsaw (Poland) (Figure 11). These estimated savings are also equivalent to one heavy truck (of 22 tonnes) not having to drive 23.5 million km, or more than 500 times around the earth's circumference, every year.

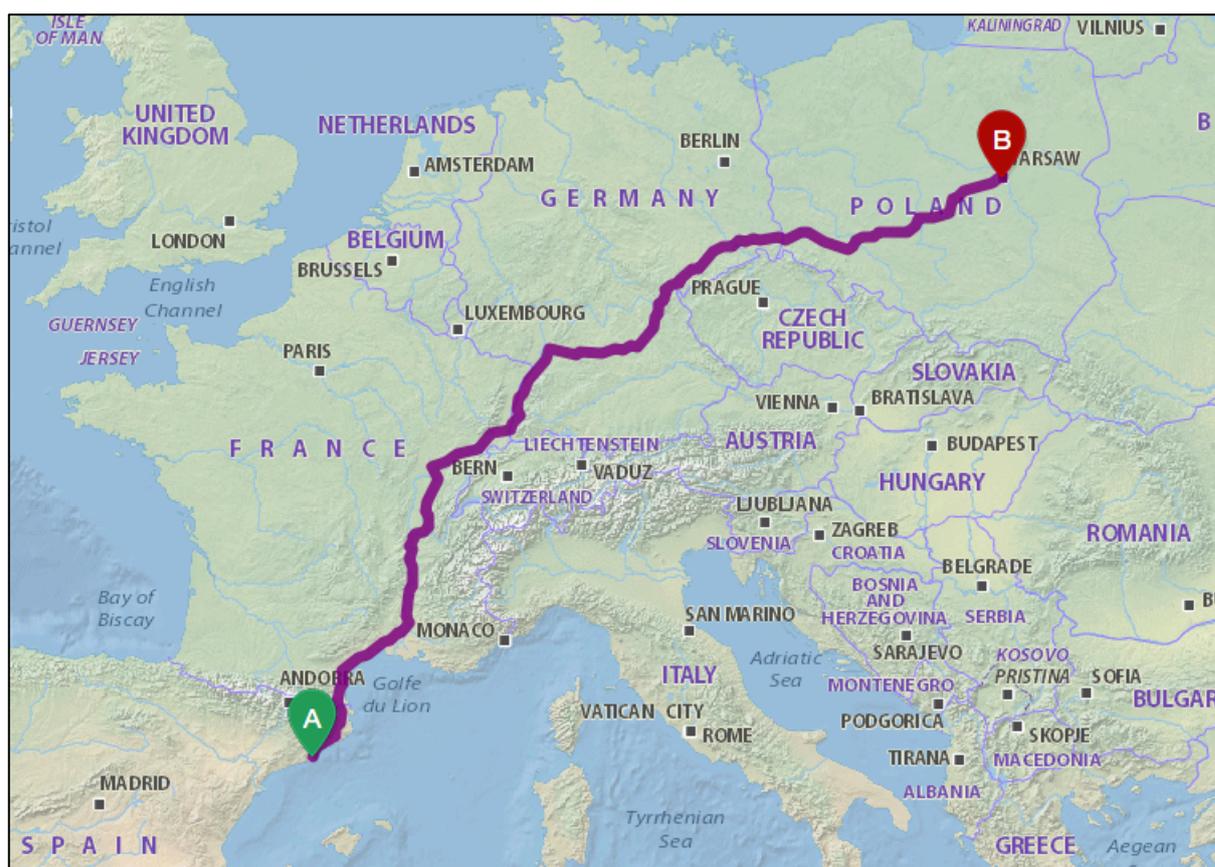


Figure 11. Transport savings across Europe, visualised as truck journeys (of 10000 heavy trucks).



Annex 1 - LSP-2 Project Description

The LSP-2 project description can be found on the A.I.S.E. web site:

“Our activities” → “Sustainable cleaning” → “Product resource efficiency projects”

The direct link is:

<https://www.aise.eu/documents/document/20140226120132-lsp-l-project-description-final.pdf>



Annex 2 - PREP-P3 Project Description

The PREP-P3 project description can be found on the A.I.S.E. web site:

“Our activities” → “Sustainable cleaning” → “Product resource efficiency projects”

The direct link is:

https://www.aise.eu/documents/document/20140226120132-13-07-01_prep-p3_projectdescription_final.pdf

