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# Verbraucherbefragung – Nutzung der Programme bei neuen Politikoptionen für das Ökodesign und das Energielabel von Waschmaschinen

Projekt BfEE 12/2016 im Auftrag des Bundesamtes für Wirtschaft und Ausfuhrkontrolle (BAFA) und dem Bundesministerium für Wirtschaft und Energie (BMWi)

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Zusammenfassung der Ergebnisse


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## 1. Hintergrund und Zielsetzung des Vorhabens

Die europäischen Verordnungen zum Ökodesign[1] und Energielabel[2] von Haushaltswaschmaschinen befinden sich derzeit in Revision. Analysen im Rahmen einer wissenschaftlichen Vorbereitungsstudie im Auftrag der europäischen Generaldirektion DG JRC[3] haben ergeben, dass das technische Optimierungspotenzial im Hinblick auf eine weitere Verbesserung der Energieeffizienz von Waschmaschinen begrenzt ist. Gleichzeitig zeigte sich jedoch, dass durch ein verändertes Verbraucherverhalten, insbesondere durch häufigere Nutzung der energieeffizientesten Programme sowie durch höhere Beladung der Waschtrommel, deutliche Energieeinsparungen erzielt werden könnten. So ist aus einer europäischen Verbraucherstudie bekannt, dass Verbraucher einen Mix aus verschiedensten Programmen nutzen. Am häufigsten zum Einsatz kommen Kurzprogramme (13%) sowie Normal-Baumwollprogramme 40°C (15%) bzw. 60°C (11%). Hingegen werden die Energiespar-Baumwollprogramme, die Grundlage für die Angabe des Energieverbrauchs auf dem Energielabel sind (sog. Standard-Programme), lediglich zu 10% (40°C) bzw. 7% (60°C) genutzt. Diese Programme sind energieverbrauchsoptimiert, häufig durch Verwendung geringerer Waschtemperaturen bei gleichzeitiger Verlängerung der Programmdauer. Die zum Teil deutlich längeren Laufzeiten im Vergleich zu Normal-Baumwollprogrammen werden als Hauptgrund für ihre seltenere Nutzung angesehen, da ein Großteil der Verbraucher Laufzeiten von mehr als drei Stunden nicht akzeptiert. Weiterhin ist aus Verbraucherstudien bekannt, dass die durchschnittliche Beladung einer Waschmaschine lediglich 3,4 kg beträgt.

Vor diesem Hintergrund haben das Öko-Institut e.V. und die Universität Bonn, Sektion Haushaltstechnik, im Auftrag des Bundesamtes für Wirtschaft und Ausfuhrkontrolle (BAFA) sowie des Bundesministeriums für Wirtschaft und Energie (BMWi) die Studie „Verbraucherbefragung – Nutzung der Programme bei neuen Politikoptionen für das Ökodesign und das Energielabel von Waschmaschinen“ durchgeführt. Es wurde analysiert, ob die seitens EU Kommission vorgeschlagenen Politikoptionen hinsichtlich Programmwahl und Beladungsmenge von den TeilnehmerInnen verstanden und akzeptiert werden, d.h. tatsächlich zu einer Veränderung des Verbraucherverhaltens führen würden. Dabei sollte festgestellt werden, ob und in wie weit das veränderte Verbraucherverhalten zu Energieeinsparungen führen würde. In einer repräsentativen Onlinestudie wurden jeweils 1.200 Verbraucherinnen und Verbraucher in vier europäischen Ländern (Deutschland, Frankreich, Polen sowie Schweden) befragt.

## 2. Zusammenfassung der Ergebnisse der Verbraucherumfrage zur Programmnutzung bei Waschmaschinen

***Akzeptieren Verbraucherinnen und Verbraucher, wenn die nominale Waschtemperatur in einem Energiesparprogramm nicht erreicht wird?***

Der Hälfte aller TeilnehmerInnen der Befragung war nicht bewusst, dass der Energieverbrauch des Waschens vornehmlich von der Waschtemperatur abhängt.

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1 Verordnung (EU) Nr. 1015/2010 der Kommission vom 10. November 2010 zur Durchführung der Richtlinie 2009/125/EG des Europäischen Parlaments und des Rates im Hinblick auf die Festlegung von Anforderungen an die umweltgerechte Gestaltung von Haushaltswaschmaschinen

2 Delegierte Verordnung (EU) Nr. 1061/2010 der Kommission vom 28. September 2010 zur Ergänzung der Richtlinie 2010/30/EU des Europäischen Parlaments und des Rates im Hinblick auf die Kennzeichnung von Haushaltswaschmaschinen in Bezug auf den Energieverbrauch (ABl. L 314 v. 30.11.2010, S. 47).

3 http://susproc.jrc.ec.europa.eu/Washing_machines_and_washer_dryers/index.html

Befragt danach, was sie tun würden, wenn das Energiesparprogramm eine geringere Temperatur als angegeben erreicht (z.B. 50°C statt 60°C), würden 71% der Befragten das Programm auch weiterhin nutzen, wenn sie mit dem Waschergebnis zufrieden sind, d.h. reduzierte Temperaturen in energiesparenden Programmen wurden von den TeilnehmerInnen der Verbraucherumfrage überwiegend akzeptiert.

***Wie häufig werden die Standard-Baumwollprogramme, die dem Energielabel zugrunde liegen, aktuell genutzt?***

Die heutigen Maschinen bieten oftmals parallel zu den energiesparenden, aber dadurch länger laufenden 40°C- und 60°C-Standardprogrammen, die dem Energielabel zugrunde liegen, „normale“ Baumwollprogramme für 40°C und 60°C mit kürzeren Programmlaufzeiten. Die befragten TeilnehmerInnen der Verbraucherumfrage wählten die schnelleren Baumwollprogramme deutlich häufiger als die entsprechenden längeren vierstündigen Energiesparprogramme (35% vs. 21% beim 40°C-Programm bzw. 24% vs. 15% beim 60°C-Programm).

***Würde sich die Nutzungshäufigkeit der Energiesparprogramme, die dem Energielabel zugrunde liegen, durch Einführung von Zeitlimits und Mindesttemperaturen erhöhen? Würden parallel angebotene besonders energiesparende, jedoch vergleichsweise sehr lange laufende Programme von Verbrauchern genutzt?***

Eine Einführung von Zeit- und Temperaturlimits bei den 40°C- und 60°C-Energiesparprogrammen, d.h. eine Programmdauer von maximal 2,5 Stunden und Mindesttemperaturen von 35°C bzw. 55°C, steigerte bei den TeilnehmerInnen der Verbraucherumfrage die Akzeptanz dieser Programme: Bei 40°C wurde das Energiesparprogramm mit jeweils 25% gleich häufig ausgewählt wie das entsprechende Normalprogramm. Bei 60°C wurde das Energiesparprogramm mit 19% sogar geringfügig häufiger ausgewählt als das entsprechende reguläre Baumwollprogramm, das 17,5% der Befragten wählten. Ca. 10% der Befragten nutzten in diesem Szenario das zusätzlich angebotene besonders energiesparsame Programm mit einer Laufzeit von fünf Stunden.

***Würden Baumwollprogramme, in denen leicht verschmutzte 30°C-, 40°C- und 60°C-Wäsche (Programm „ECO 30-60°C“) bzw. normal verschmutzte 40°C- und 60°C-Wäsche (Programm „ECO 40-60°C“), gemeinsam gewaschen werden können, verstanden und akzeptiert, d.h. ausgewählt?***

Der Vorschlag zur Einführung der Waschprogramme „ECO 30-60°C“ für leicht verschmutzte Wäsche (Waschtemperatur 30°C, Programmdauer 3 Stunden) und „ECO 40-60°C“ für normal verschmutzte Wäsche (Waschtemperatur 40°C, Programmdauer 3 Stunden) hat das Ziel, den VerbraucherInnen durch die Programmbezeichnung einerseits zu signalisieren, dass Wäschestücke, die für verschiedene Waschtemperaturen gekennzeichnet sind, im gleichen Programm gemeinsam gewaschen werden können, und es sich dabei um energie- und wassersparende Baumwollprogramme handelt.

In der Verbraucherumfrage haben die TeilnehmerInnen das Programm ECO 30-60°C mit 27% geringfügig häufiger genutzt als das reguläre 40°C-Baumwollprogramm (25%); das Programm ECO 40-60°C wurde mit 31% am häufigsten ausgewählt, das reguläre 60°C Baumwollprogramm hingegen nur noch von 15% der TeilnehmerInnen. In diesem Szenario fand demnach eine deutliche Verschiebung hin zu den energiesparenden Programmen statt, vor allem bei 60°C-Wäsche.

***Würde ein gemischtes Baumwollprogramm, in dem 40°C- und 60°C-Wäsche gemeinsam gewaschen werden kann, das reale Beladungsverhalten ändern, d.h. würden Verbraucher mehrere, bisher getrennt gewaschene Wäscheposten zu einer einzigen Waschladung zusammenfassen?***

Die Verbraucherumfrage zeigt, dass durch die Auswahlmöglichkeit der Programme ECO 30-60°C und ECO 40-60°C insgesamt 63% der Befragten ihre 40°C- und 60°C-Wäscheposten kombinieren und direkt zusammen waschen. Dies ist ein Anstieg um 22% im Vergleich zur Ausgangssituation, in der lediglich 41% der Befragten ihre Wäscheposten kombinieren.

***Welche Bezeichnung oder welches Symbol wurde als besonders sinnvoll für ein energiesparendes Standardprogramm wahrgenommen?***

Unter verschiedenen in der Verbraucherumfrage vorgegebenen Bezeichnungen bzw. Symbolen wurde der Begriff „ECO“ eingerahmt mit einem Pfeil von den TeilnehmerInnen auf Platz 1 bzw. die alleinige Bezeichnung „ECO“ auf Platz 2 gewählt. Der aktuell verwendete Energiesparprogramm-Pfeil ohne weitere Bezeichnung landete auf dem letzten Platz.

***Mit welchen der in der Verbraucherumfrage untersuchten Politikoptionen lassen sich die größten Einsparungen beim Energie- und Wasserverbrauch von Waschmaschinen erzielen?***

Die Einführung von Zeitlimits bei den 40°C- und 60°C-Energiesparprogrammen, die dem Energielabel zugrunde liegen, steigerte bei den TeilnehmerInnen der Verbraucherumfrage zwar die Akzeptanz dieser Programme, dennoch ist das Einsparpotenzial in diesem Szenario gering, da die erhöhte Nutzungshäufigkeit kompensiert wurde durch leicht erhöhte Energieverbräuche bedingt durch die höheren Waschtemperaturen im Vergleich zu aktuellen Energiesparprogrammen.

Bei Einführung der Waschprogramme „ECO 30-60°C“ für leicht und „ECO 40-60°C“ für normal verschmutzte Wäsche verringert sich der Energieverbrauch um 5% (Vollbeladung) bzw. 9% (Teilbeladung) und der Wasserverbrauch um 3% im Vergleich zur Ausgangssituation. Berücksichtigt man zusätzlich, dass ein höherer Anteil der Befragten ihre 40°C- und 60°C-Wäscheposten kombinieren und direkt zusammen waschen, so steigt das Einsparpotenzial beim Wasserverbrauch auf bis zu 8% und beim Energieverbrauch auf bis zu 15% gegenüber der Ausgangssituation.

***Inwiefern beeinflusst beim Kauf einer Waschmaschine die Angabe einer Programmlaufzeit auf dem Energielabel die Kaufentscheidung der Verbraucherinnen und Verbraucher?***

Bei den TeilnehmerInnen der Befragung gab es ein sehr unterschiedliches Verständnis darüber, welche Bedeutung eine mögliche Zeitangabe auf dem Energielabel haben könnte: 40% der Teilnehmer interpretierten eine Zeitangabe auf dem Energielabel als Laufzeit des längsten Waschprogrammes; jeweils 20% assoziierten die Laufzeitangabe mit der maximalen bzw. durchschnittlichen Programmdauer im Energielabel-Programm, etwas mehr als 10% als maximale Dauer eines Energiesparprogramms. Vermutet wurden von einigen TeilnehmerInnen der Befragung jedoch auch die minimale Dauer des Energielabel-Programmes, oder gar die durchschnittliche Dauer aller Programme der Waschmaschine.

Auf dem aktuellen Energielabel erkannten die TeilnehmerInnen der Verbraucherumfrage, welches Gerät – bei gleicher Energieeffizienzklasse – dasjenige mit dem geringsten Energieverbrauch ist, und wählten dieses aus. Wurde hingegen auf dem Energielabel ergänzend eine Programmlaufzeit angezeigt, so verschob sich die ursprüngliche Kaufentscheidung. Der geringste deklarierte Energieverbrauch war nicht mehr das entscheidende Auswahlkriterium, sondern es entstand eine Abwägung zwischen Zeit und Energieverbrauch: Geräte mit kürzerer Laufzeit wurden – bei gleicher Energieeffizienzklasse – deutlich attraktiver und wurden stärker nachgefragt.

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# Consumer survey on the use of washing programmes in the context of new policy options proposed in the EU Ecodesign and Energy label revisions for washing machines

Commissioned by
Federal Ministry for Economic Affairs and Energy (BMWi) / Federal Energy Efficiency Center (BfEE)

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Explanatory notes


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## Background of the consumer survey on washing machines

Regulation 1015/2010 on ecodesign of household washing machines, and Regulation 1061/2010 on energy labelling of household washing machines are currently under a review in light of technological progress. During 2014 and 2016, a preparatory study has been carried out for the European Commission's Directorate General for the Environment by the Directorate B - Growth and Innovation of the European Commission´s Joint Research Centre (JRC), with scientific support of Oeko Institut and University of Bonn.

Major conclusions of the preparatory study (final report to be published) are the following aspects:

- Broad programme range: Washing machines are characterised by offering a broad range of programmes, besides the standard cotton 40°/60°C programmes which are the basis for the Energy label. Usually, these other programmes are not optimised for energy efficiency to such extent as the standard programmes. However, a user survey in 2015 indicated that 90% of respondents expect or understand the label to represent the performance of the WM in all programmes, not only some of them.
- Minor use of standard programmes / other programmes for the same purpose: Especially for washing machines, the standard cotton 40°/60°C programmes that are used for testing the energy performance of the appliance are used in practice by consumers only to a minor extent (17% altogether, or 5% if considering only the programmes lasting more than 3 hours). Instead, there are other programmes for the same purpose (i.e. the 'normal' cotton 40°/60°C programmes) which are more often used (26% altogether) but which consume more energy and water than the standard programmes. In some appliances, consumers can also alter the standard cotton 40°/60°C programme by adding options such as ‘short’ or different temperatures. However, such alterations should have an influence on the energy and water efficiency of this programme.
- Long programme duration: The standard cotton 40°/60°C programmes, whose consumption values are displayed on the Energy label and thus influence the purchase decisions of consumers, are designed and configured to improve the energy efficiency, often at the expense of reducing the washing temperature and prolonging the programme duration (according to the Sinner’s Circle principle) – characteristics that are not fully convenient to consumers. The 2015 user survey indicates that the reluctance to use long programmes (beyond 3 hours) is large.
- Underloading combined with increase in rated capacity of machines: In general, consumer research shows that the average amount of load under real-life conditions is on average still only 3.3 kilogram per cycle for the cotton programmes, which is far away from full load conditions and also from the average 5 kg load used for measurement under standard conditions for a 7 kg capacity machine. In parallel, there is an apparent trend towards an increase of the rated load capacity of machines, for which it seems easier to reach good labels based on the current calculation formulas for the Energy label’s energy efficiency index make it easier for larger machines to reach good labels. However, the lower consumption per kilogram of laundry is only obtained if the machines are fully loaded, a condition difficulty met in households nowadays.
- According to the review study, important energy savings could be achieved by increasing the frequency of use of standard cotton programmes and the implementation of technical improvement options together with an increase of the loading.

Against this background, DG JRC proposed different policy scenarios which took the above listed challenges into account (OLD, BAU+, ECO, ECO+). These alternatives to the business-as-usual

(BAU) scenario answer in different ways the above mentioned constraints with regard to programme time, programme temperature, load, and the resulting washing performance.

Based on this information, the German Federal Ministry for Economic Affairs and Energy (BMWi) and the Federal Energy Efficiency Center (BfEE) launched the study "Consumer survey on the use of washing programmes in the context of new policy options proposed in the EU Ecodesign and Energy label revisions for washing machines." Main target of the consumer survey is to analyse, if energy and water saving washing behaviour of consumers based on their programme choices and loading attitudes can be triggered by the policy instruments EU Ecodesign and Energy label.

The consumer survey study is carried out by Oeko-Institut in cooperation with University of Bonn. The detailed concept of the consumer survey has been developed by University Bonn and Oeko-Institute, including feedback from an Advisory Group with representatives from the Federal Ministry of Economic Affairs and Energy (BMWi), the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), the Federal Environmental Agency (UBA), the Federal Energy Efficiency Center (BfEE), the Federal Institute for Materials Research and Testing (BAM), the Institute for Energy and Environmental Research (ifeu), and adelphi.

## Explanatory notes regarding the consumer survey on washing machines

The consumer survey consists of different categories of questions: general socio demographic questions, questions with regard to the general understanding of the Energy label, questions on purchase decisions based on the Energy label, and finally questions regarding decisions on washing behaviour based on different washing machine panels reflecting the policy scenarios proposed in the EU revision study on household washing machines by DG JRC. Deviating from the policy scenarios proposed by DG JRC, the following variations have been made within the consumer survey based on the discussions within the Advisory Group.

Analysed policy scenarios: Business as Usual (BAU), Business as Usual adapted (BAU+), and ECO + ECO light. The policy scenario OLD proposed by DG JRC was not chosen for further analysis within this consumer survey. Reason: the policy scenario OLD does not foresee any regulation of the programme duration. However, it is expected, that this scenario would lead to the provision of parallel programmes with shorter programme duration after a certain time. Thus, OLD will probably induce another programme variety in future as simulated by the current consumer survey meaning that the results of the survey would not lead to reliable results for the regulation

### Policy scenario BAU

Consisting of two standard cotton programmes for 40°C and 60°C which are optimised for energy efficiency by using reduced temperatures (30°C and 50°C) and prolonged programme durations (4 hours); in parallel, the machine offers regular cotton programmes for 40°C and 60°C at these indicated temperatures, but with shorter programme durations (1.5 hours and 2 hours).

| Programme | Duration | Washing temperature | Energy consumption | Water consumption |
|---|---|---|---|---|
| Cotton 30 °C | 1:30 h | 30 °C | 0,76 kWh | 72 L |
| Cotton 40 °C | 1:50 h | 40 °C | 0,96 kWh | 72 L |
| Cotton 40°C with arrow | 4:00 h | 30 °C | 0,70 kWh | 55 L |
| Cotton 60 °C | 2:00 h | 60 °C | 1,52 kWh | 72 L |

| | | | | |
|---|---|---|---|---|
| Cotton 60 °C with arrow | 4:00 h | 50 °C | 0,94 kWh | 55 L |
| Cotton 90 °C | 2:10 h | 90 °C | 2,30 kWh | 72 L |

**Policy scenario BAU+:**

For this scenario, the standard cotton programmes for 40°C and 60°C have been adapted by regulating the minimum temperatures not going below 35°C and 55°C, enabling slightly shorter programme durations compared to the BAU scenario (each 2.5 hours). The programmes are indicated with "ECO" on the machine's panel. In parallel, the machine still offers regular cotton programmes which are the same as in the BAU scenario. As the standard cotton programmes, which are the basis for the Energy label test measurements, are regulated regarding minimum temperature and maximum time, and thus limited in possible energy efficiency gains, it was decided that in this policy scenario, additionally a highly energy saving programme should be offered, which is not regulated by EU Ecodesign or Energy label. This programme (45°C at 5 hours wash time) is saving 40% energy compared to the regular cotton 60°C programme.

| Programme | Duration | Washing temperature | Energy consumption | Water consumption |
|---|---|---|---|---|
| Cotton 30 °C | 1:30 h | 30 °C | 0,76 kWh | 72 L |
| Cotton 40 °C | 1:50 h | 40 °C | 0,96 kWh | 72 L |
| ECO 40 °C with arrow | 2:30 h | 35 °C | 0,80 kWh | 55 L |
| Cotton 60 °C | 2:00 h | 60 °C | 1,52 kWh | 72 L |
| ECO 60 °C with arrow | 2:30 h | 55 °C | 1,24 kWh | 55 L |
| Cotton 90 °C | 2:10 h | 90 °C | 2,30 kWh | 72 L |
| ECO+Leaf | 5:00 h | 45 °C | 0,90 kWh | 52 L |

**Policy scenario ECO + ECO light:**

In parallel to the regular cotton programmes for 40°C and 60°C, which are the same as in the BAU scenario, in this policy scenario two combination programmes for textiles labelled from 30°C to 60°C for lightly soiled laundry, and for textiles labelled from 40°C to 60°C for normally soiled laundry are offered, indicated ECO 30-60°C and ECO 40-60°C. The washing temperatures are 30°C and 40°C respectively; the programme duration is reduced to 3 hours. As these programmes are already rather energy saving, no additional "super ECO" programme has been offered.

| Programme | Duration | Washing temperature | Energy consumption | Water consumption |
|---|---|---|---|---|
| Cotton 30 °C | 1:30 h | 30 °C | 0,76 kWh | 72 L |
| Cotton ECO 30-60 °C with arrow | 3:00 h | 30 °C | 0,76 kWh | 55 L |
| Cotton 40 °C | 1:50 h | 40 °C | 0,96 kWh | 72 L |
| Cotton ECO 40-60 °C with arrow | 3:00 h | 40 °C | 0,91 kWh | 55 L |
| Cotton 60 °C | 2:00 h | 60 °C | 1,52 kWh | 72 L |
| Cotton 90 °C | 2:10 h | 90 °C | 2,30 kWh | 72 L |

# Analysis
# Consumer survey
# on washing machines

Berlin, 16.03.2017

Rainer Stamminger, Lara Belke (Uni Bonn)
Kathrin Graulich (Öko-Institut)

Commissioned by
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Federal Energy Efficiency Center (BfEE)

# Content of the survey

- Concept by University of Bonn, Oeko-Institute under participation of feedback from BMWi, BMUB, BAFA, UBA, BAM, ifeu, and adelphi
- Different categories of questions
  - Socio demographic questions
  - Questions with regard to understanding of the Energy label
  - Questions on purchase decisions
  - Questions regarding decisions on washing behaviour
  - à Single choice questions [SC]
  - à Multiple choice questions [MC]
  - à Ranking questions
- Interim analysis after 130 participants

# Procedure of the survey

- Collaboration with the market research agency Toluna
  - Programming
  - Translations
  - Hosting
  - Cleaning of data
  - Incentivising of participants
- Using the Toluna panels
  - Germany (DE): 352.000 registered users
  - France (FR): 371.000 registered users
  - Poland (PL): 41.000 registered users (complemented by partner agency)
  - Sweden (SW): 35.000 registered users

# Sample of the survey

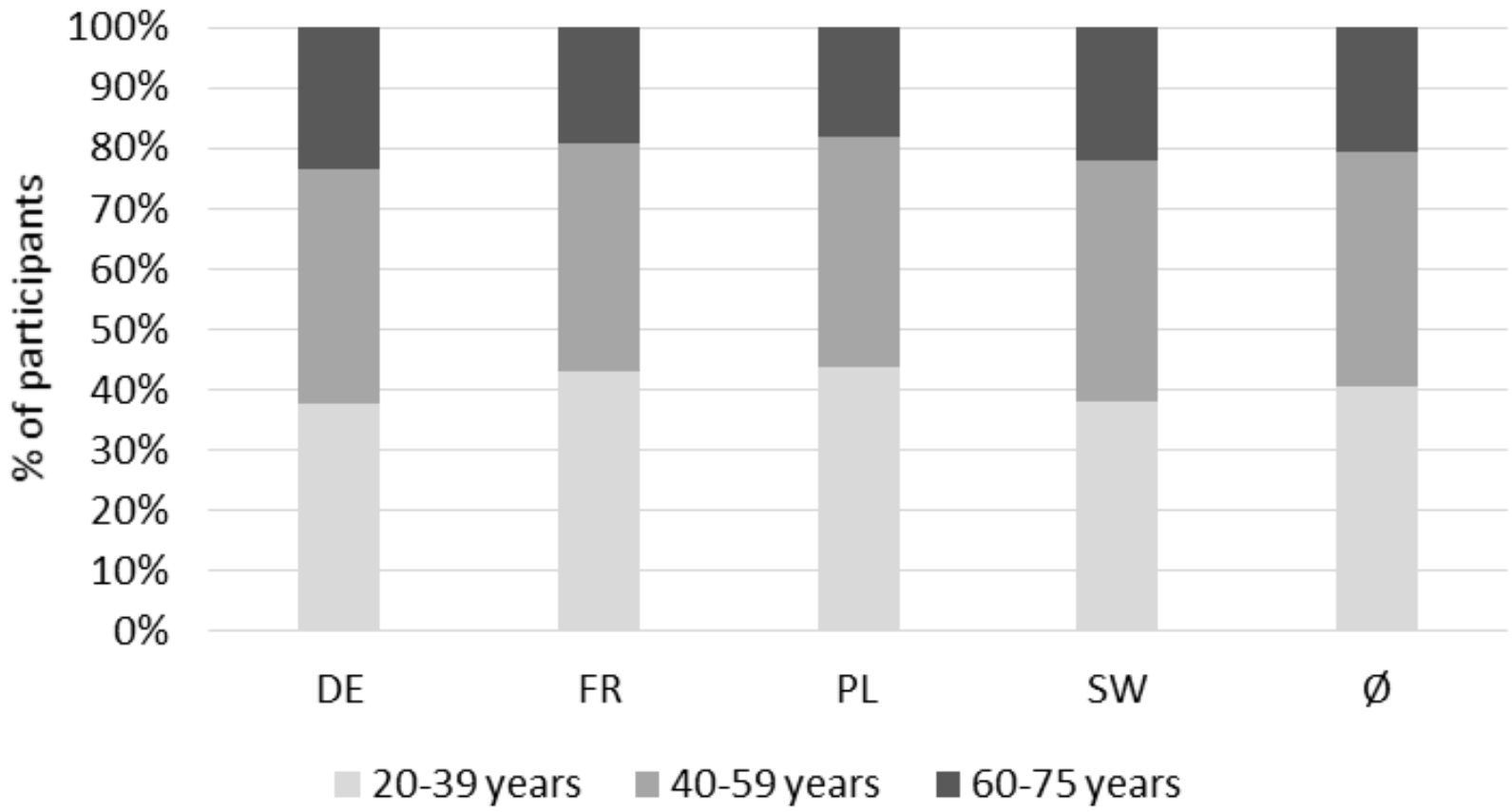
- 1,200 participants per country
- Gender distribution 50:50
- Representative to national statistics with regard to:
  - Age 20-75 in 3 categories(20-39, 40-59, 60-75)
  - Household size in 5 categories (1, 2, 3, 4, ≥5)
- Pre-condition: participants have to be actively involved in washing laundry
  - Evidence by the question: „Who is involved in the activity of washing laundry in your household?“

# DESCRIPTIVE ANALYSIS

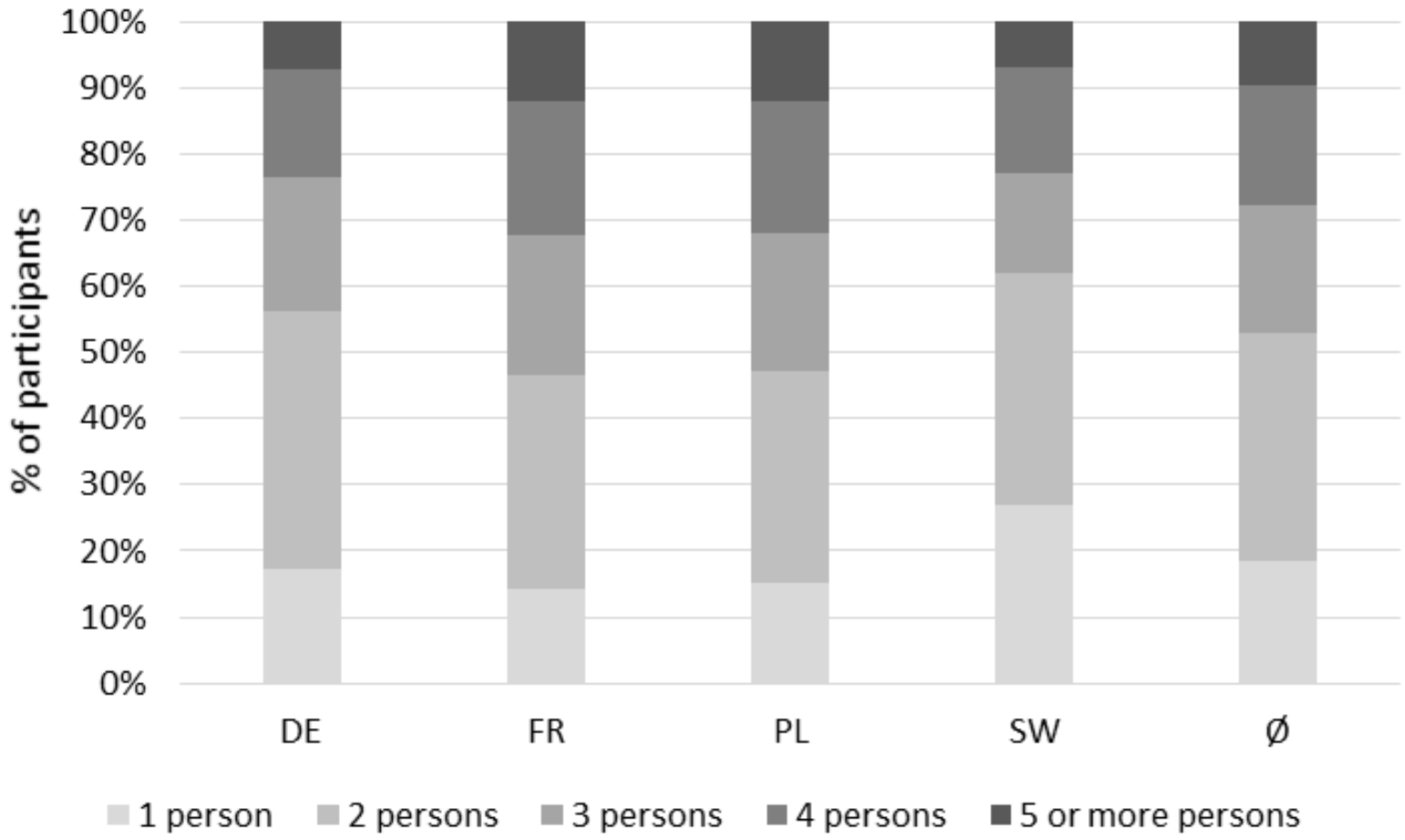
**Note**: In the following, all calculated averages summarizing countries do not take into account the different number of inhabitants of these countries, but are mere averages of the survey's sample of 1,200 participants per country (the country analysis revealed no significant differences between the countries)

# à SOCIO DEMOGRAPHIC DATA AND GENERAL INFORMATION

# Age (determined by quota)



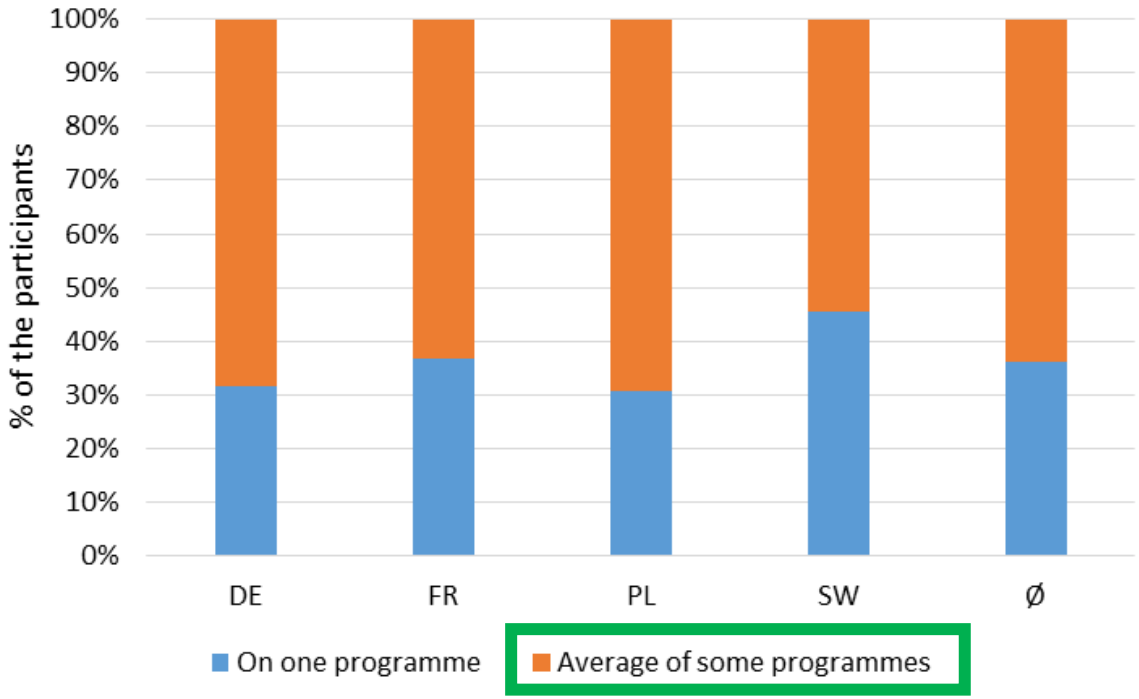
# Household size (determined by quota)



# à PART 1: ENERGY LABEL – UNDERSTANDING / PREFERENCES

# Preferred basis for the indication of water and energy consumption on the Energy label

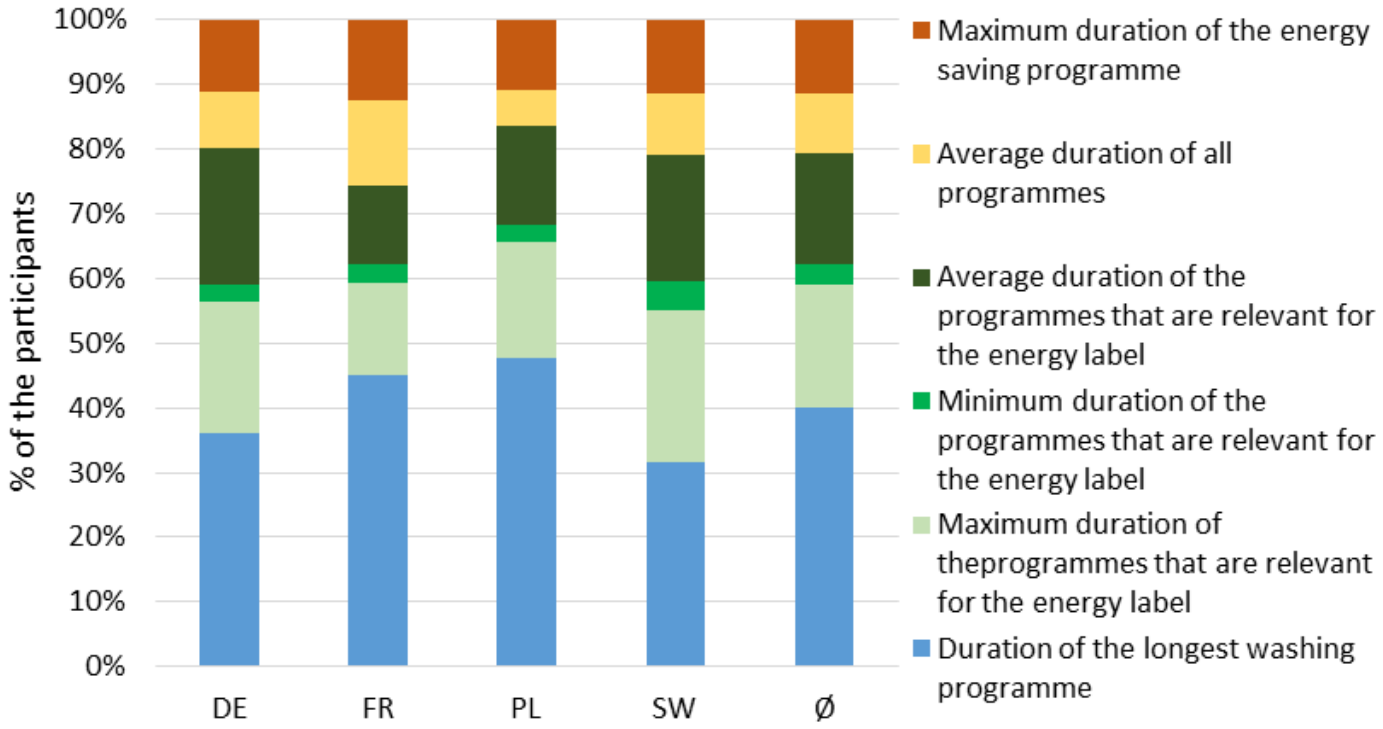
To your view, which basis should underlie the indication of the water and energy consumption on the Energy label? [SC]




**Result:** 64 % of the participants prefer the indication of the energy and water consumption on the Energy label being based on the average of some programmes.

# Understanding of the programme duration on the Energy label

To your view, which information would underlie an indicated programme duration on the Energy label? [SC]




**Result:** Most of the participants (40%) expect the longest programme duration of the machine beyond the time indication. Each 20% assume the average or maximum programme duration of the programmes underlying the Energy label.

# Summary: Energy Label – understanding and preferences

- More than 60 % of the participants prefer the indication of the energy and water consumption on the Energy label being based on the average of some programmes.
- 40 % of the participants interpret an indication of the programme duration as longest programme duration of the machine.

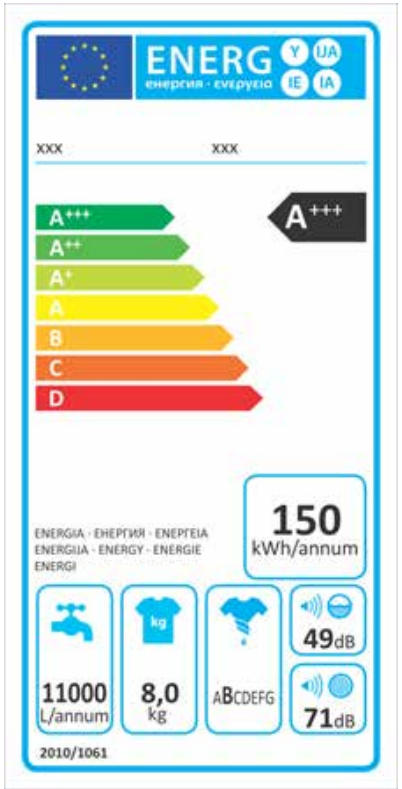
# à PART 2: PURCHASE DECISIONS

Kaufentscheidungen

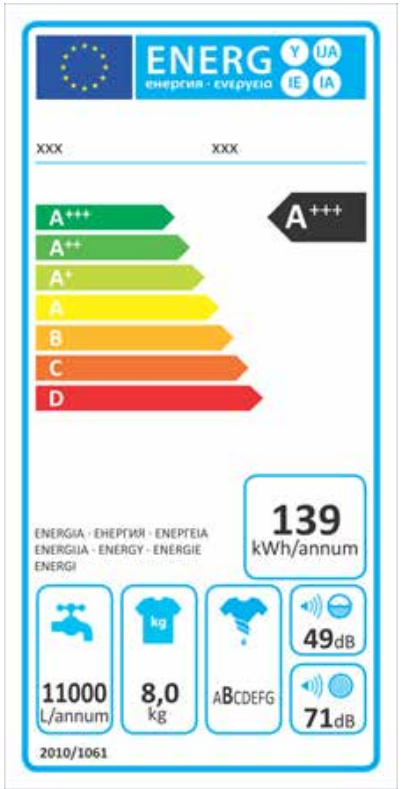
# Purchase decision – energy efficiency

Imagine, you plan purchasing a new washing machine. On the basis of the presented information, which of the offered appliances would you choose? [SC]

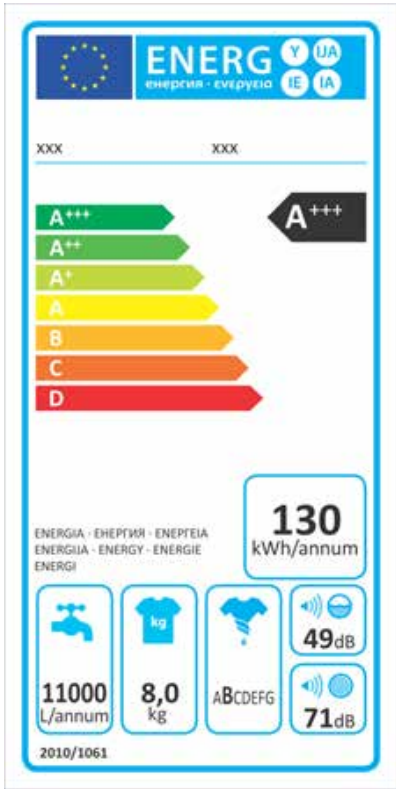
Label A



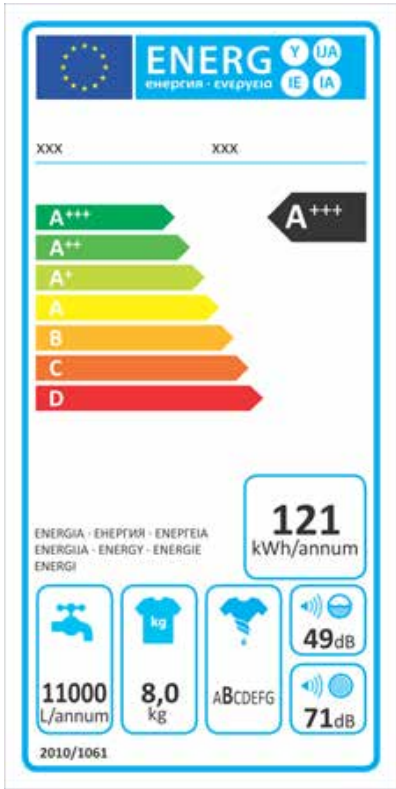

Label B



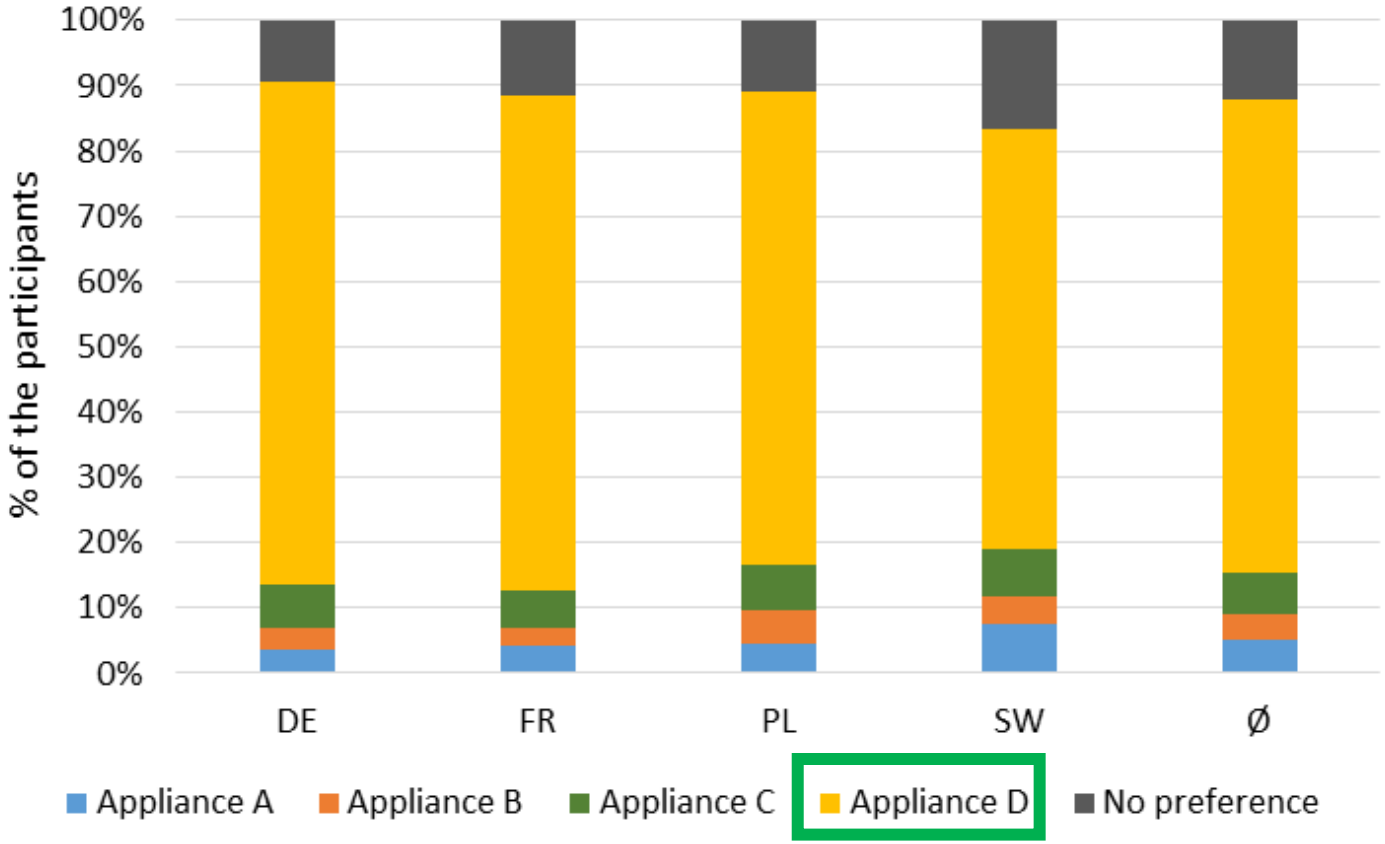

Label C




Label D



# Purchase decision – energy efficiency



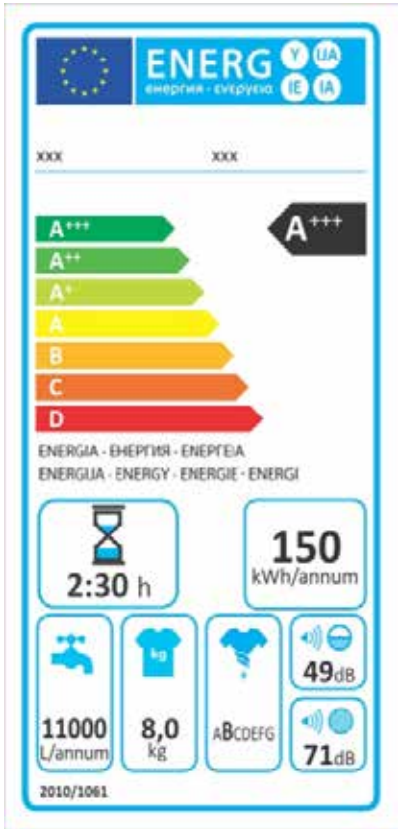

**Result:** The most energy efficient appliance is **recognized and clearly preferred** by 72 % of the participants**.**

Kaufentscheidungen

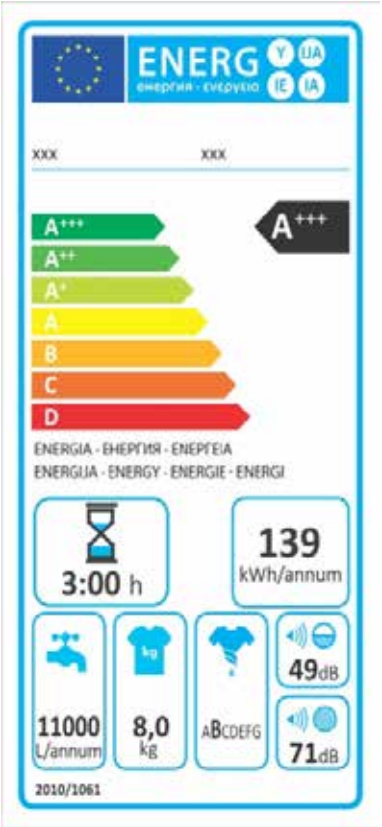
# Purchase decision – energy efficiency or time?

Imagine, you plan purchasing a new washing machine. On the basis of the presented information, which of the offered appliances would you choose? [SC]

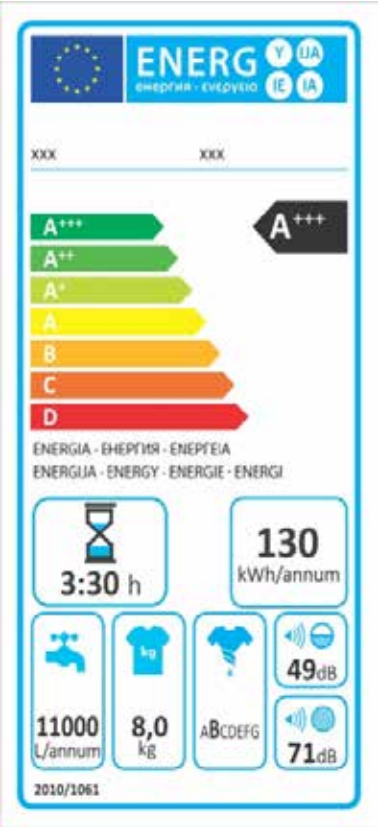
Label A



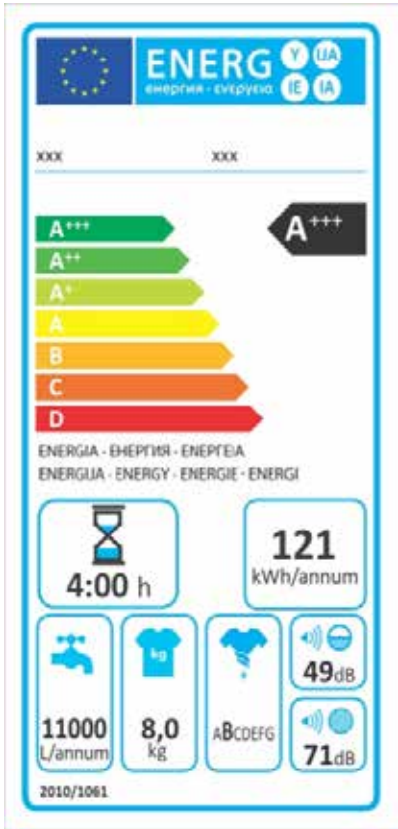

Label B



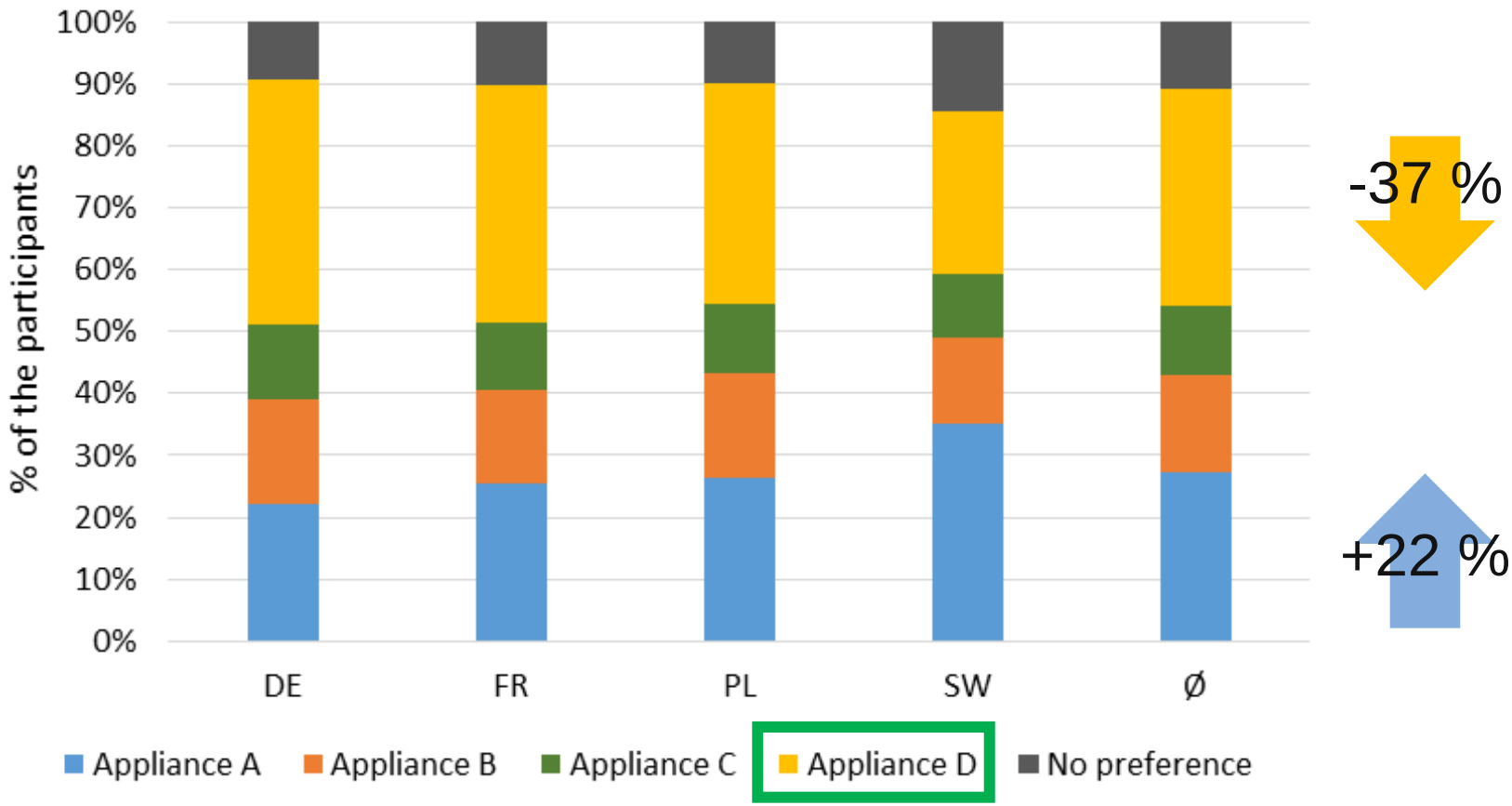

Label C




Label D



# Purchase decision – energy efficiency or time?




**Result:** The indication of the programme duration reduces the clear preference of energy efficient appliances – the most energy efficient appliance loses Ø 37 %, of which a major share shifts to the appliance with the highest energy consumption.

# Summary: Purchase decisions

- Participants of the survey recognize out of the current Energy labels the most energy efficient appliance and choose it for purchase.
- Together with the indication of the programme duration, energy efficiency is not the most relevant criterion any more, but rather a trade-off between programme duration and energy efficiency takes place. Appliances with shorter programme times are getting more attractive.

# à PART 3: SIMULATION OF THE WASHING BEHAVIOUR

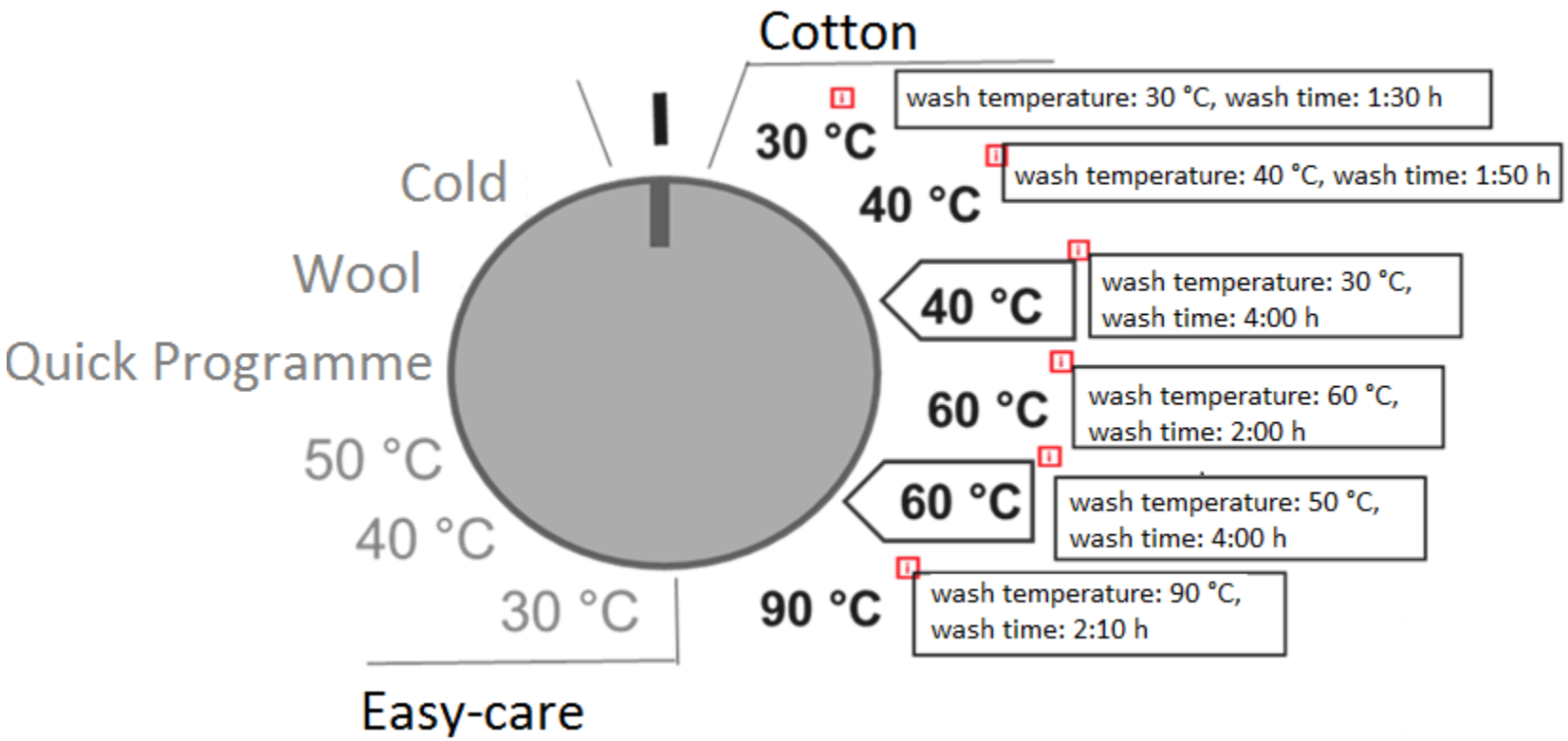
# Approach

- 6 different washing situations are presented
  - 3 different washing machine panels
    - **BAU:**
      - business-as-usual, referring to the current situation, i.e. 40 °C and 60 °C standard cotton programmes
    - **BAU+:**
      - ECO 40°C and ECO 60°C cotton programmes with limited programme duration and defined minimum temperatures;
      - Additionally: highly energy saving eco programme (Eco+Leaf)
    - **ECO+ECO light:**
      - Energy efficient combination programmes for normally soiled laundry (ECO: 40-60°C) and lightly soiled laundry (ECO light: 30-60 °C)
  - Combined with each 2 different laundry situations
    - **50:50** - 40° and 60° laundry **1/2 basket** 40 **1/2 basket** 60
    - **25:75** - 40° and 60° laundry **1/4 basket** 40 **3/4 basket** 60

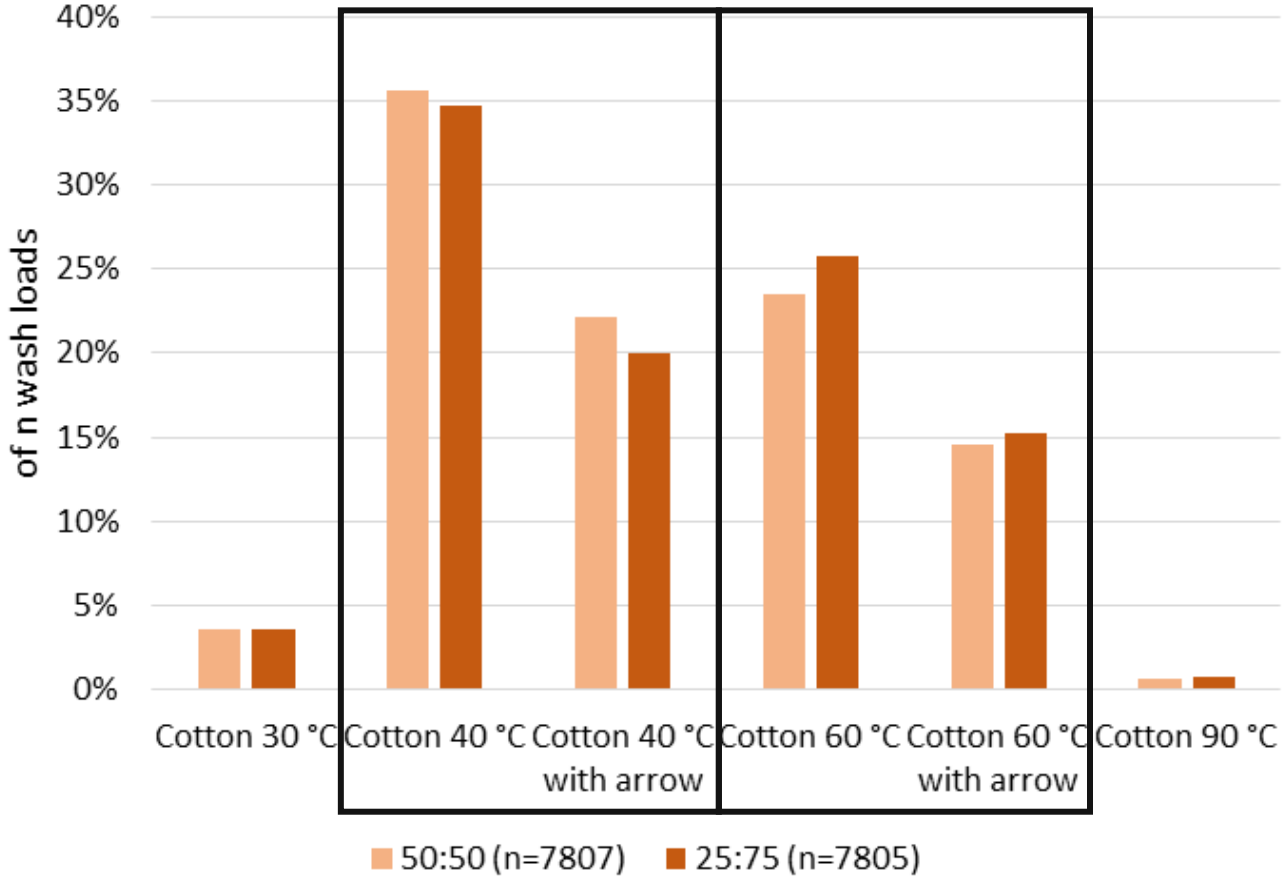
# Approach

- Additional information about the washing programmes available via info boxes.
- Question: „Imagine the indicated amount of laundry. How would you carry out the washing?“
- Options for selection:
  - „Immediately washing all together“
  - „Immediately washing separately“
  - „Later washing separately“
  - à Which laundry in which programme [SC]

# Washing machine panel BAU

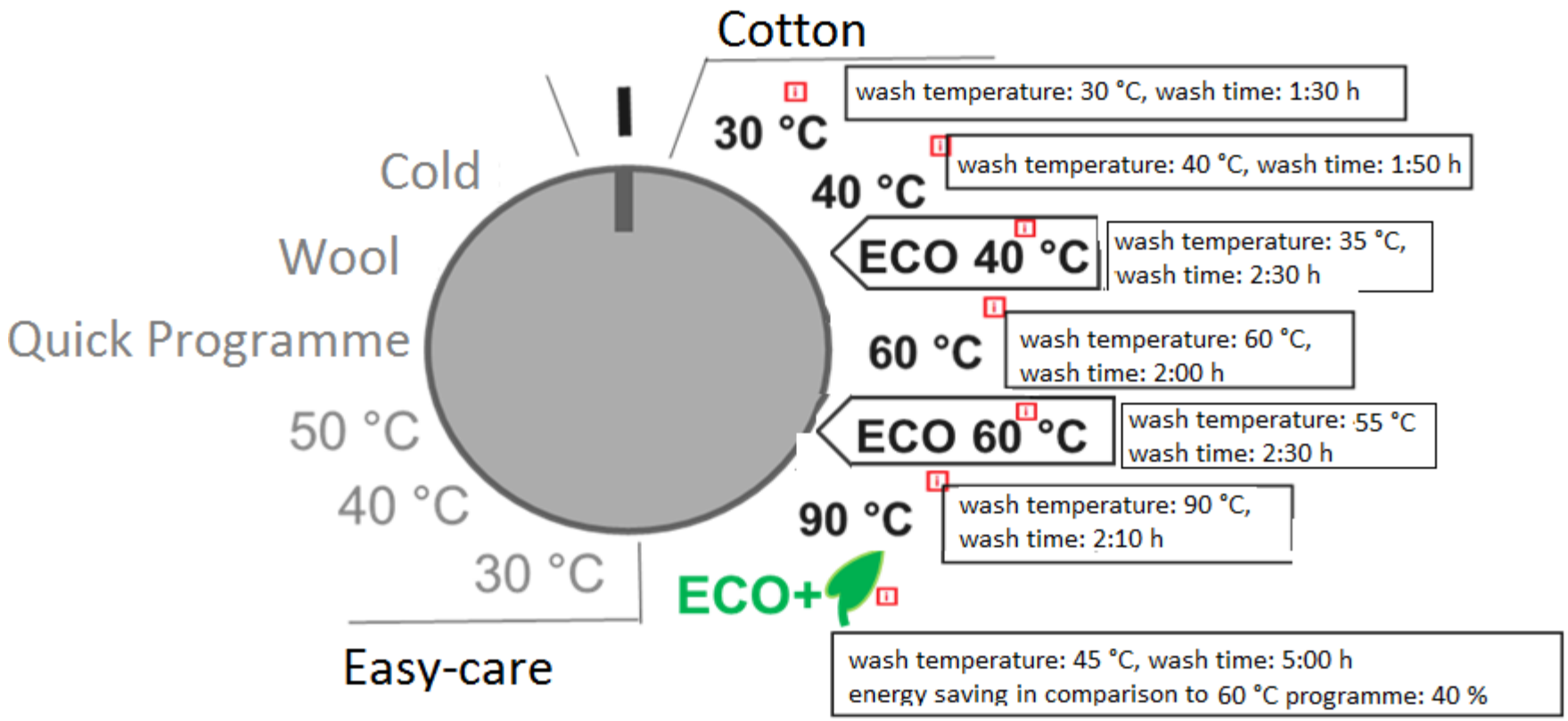


# Washing simulation BAU – use of programmes

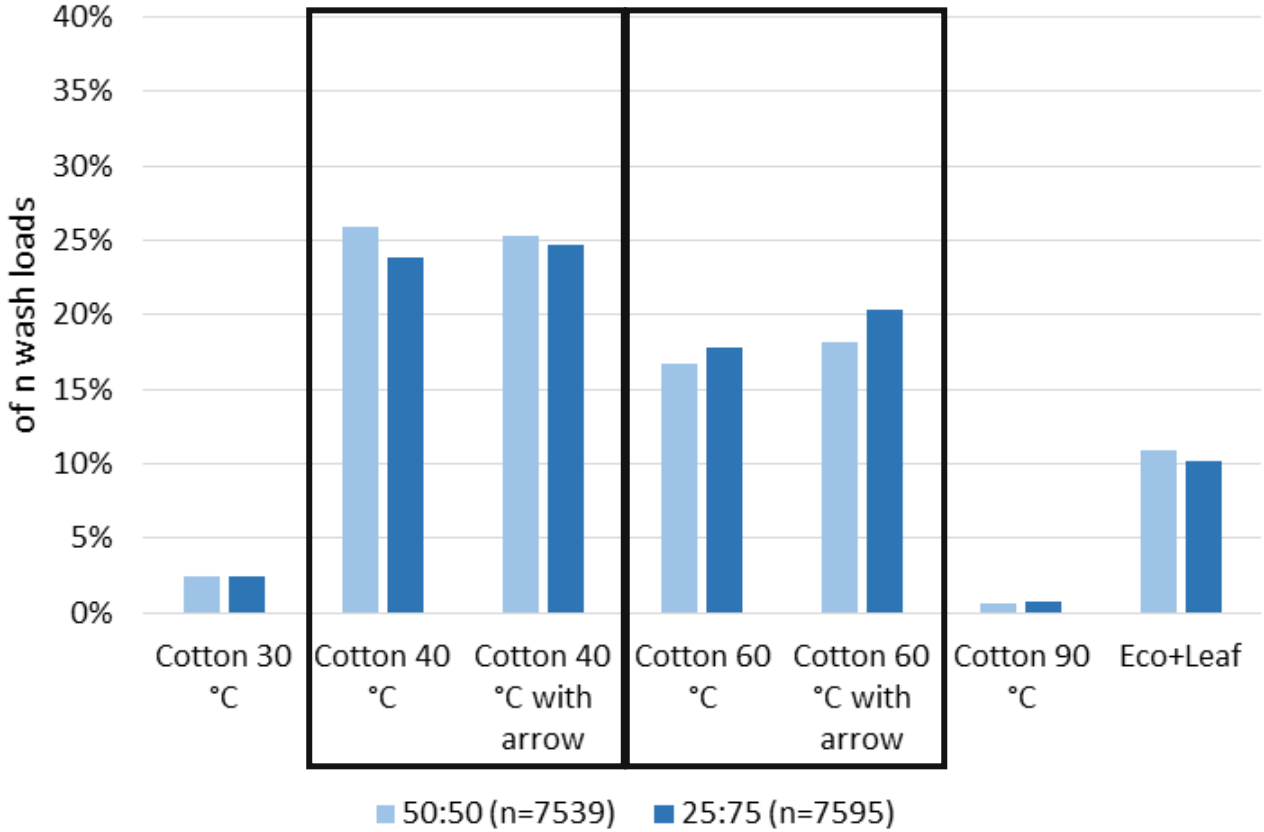



**Result:** The shorter regular cotton programmes are used more frequently compared to the longer lasting standard cotton programmes (35 % versus 21 % at 40 °C and 24 % versus 15 % at 60 °C).

# Washing machine panel BAU+

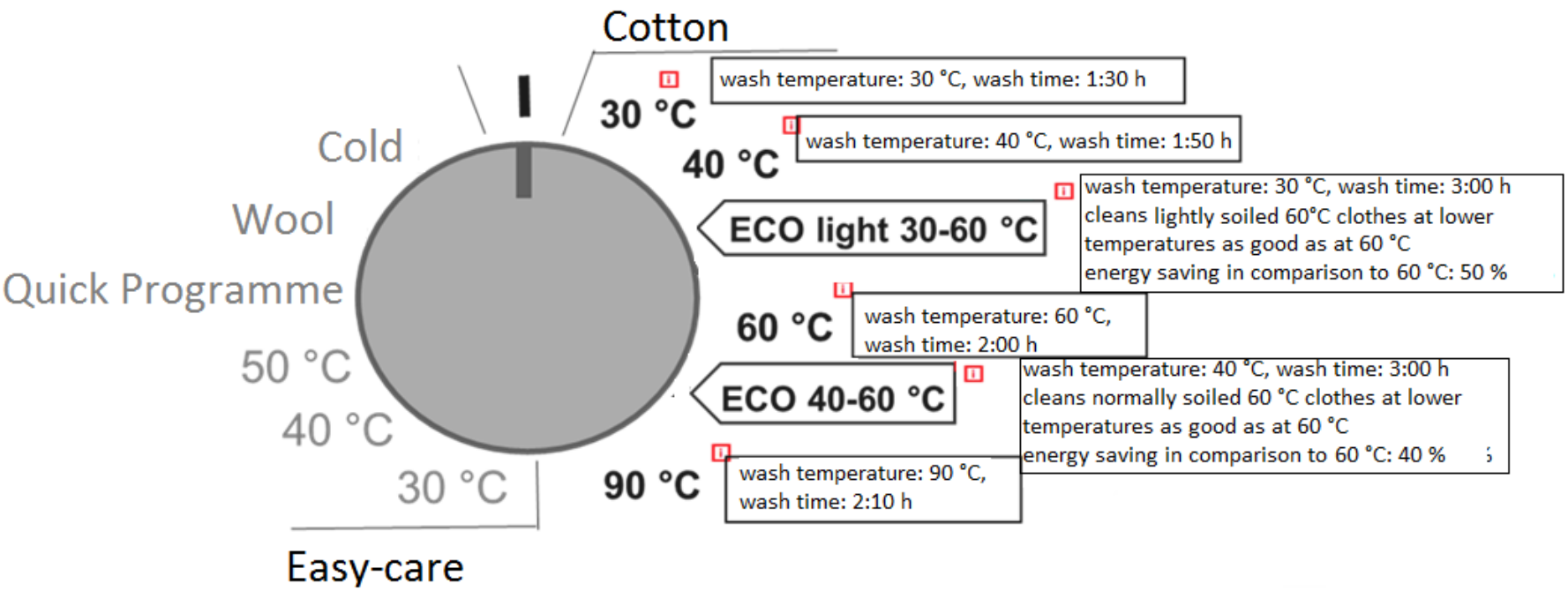


# Washing simulation BAU+ – use of programmes

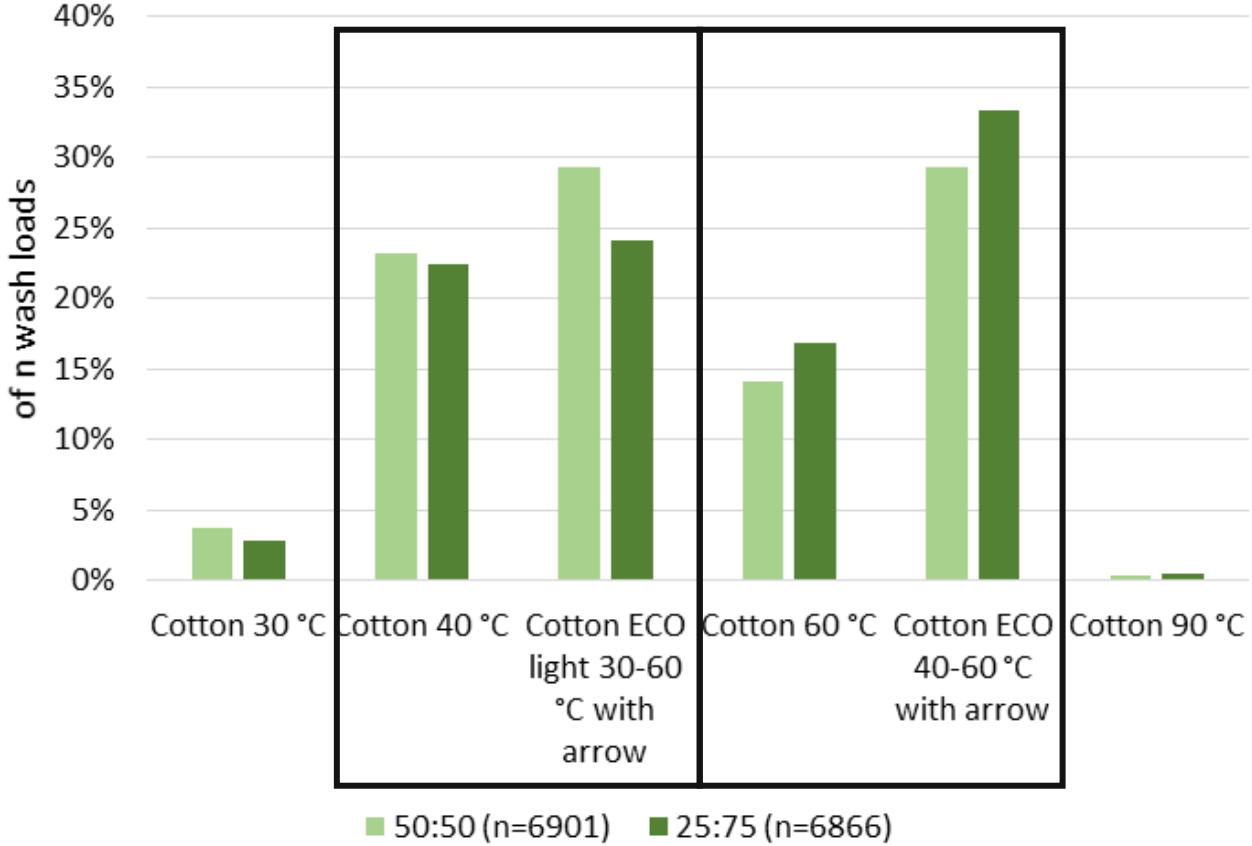



**Result:** By limiting the programme duration and prescribing a minimum temperature the adapted cotton programmes with arrow gain in attractiveness; they are used to the same extent at 40 °C and even slightly more frequently at 60 °C compared to the regular cotton programmes. The highly energy saving ECO+Leaf programme is used by around 10 %.

# Washing machine panel ECO+ECO light



# Washing simulation ECO+ECO light – use of programmes

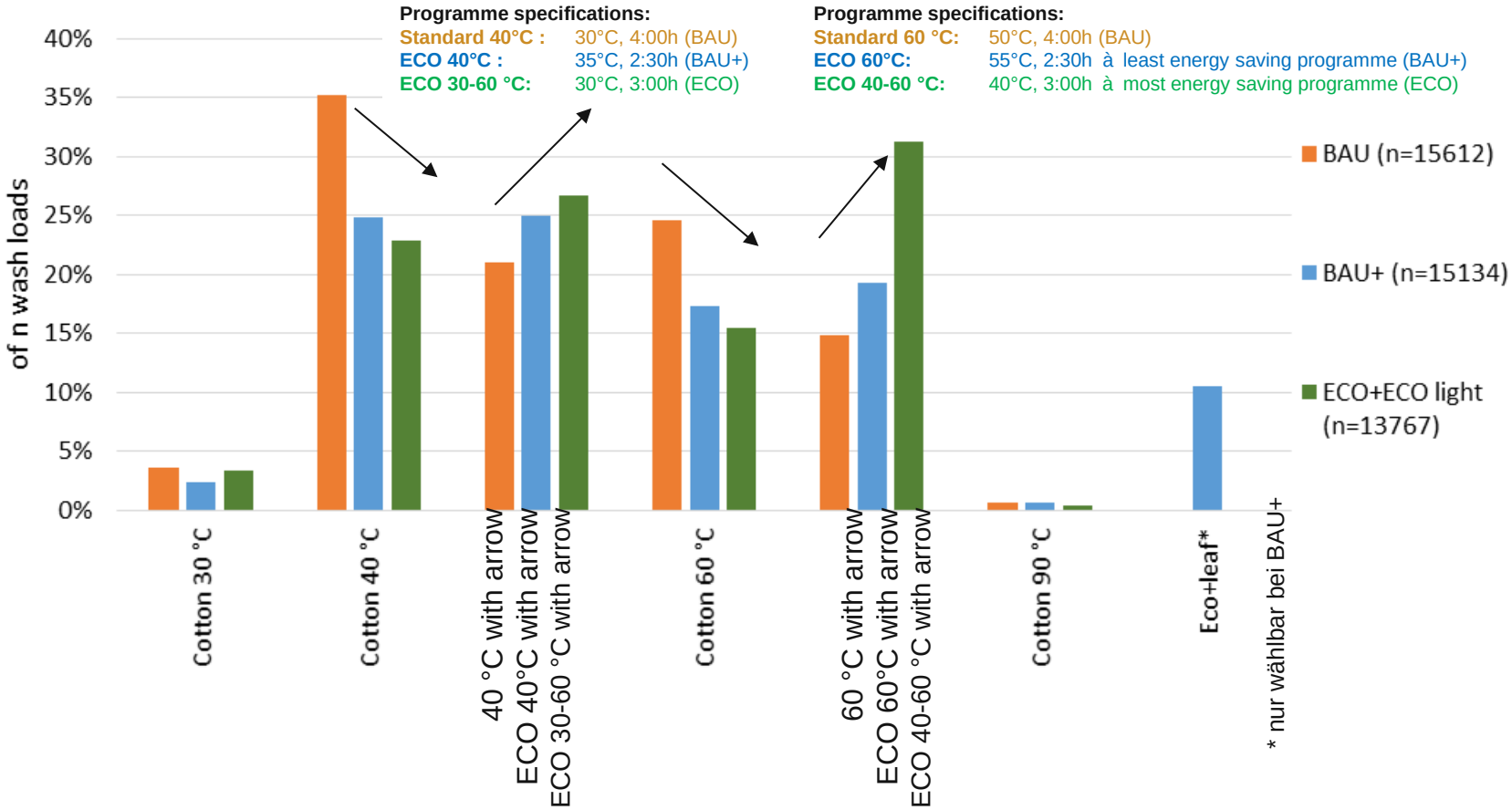



**Result:** The combination programmes ECO 30-60°C and ECO 40-60°C are used more frequently compared to the regular cotton programmes. In case of mainly 60 °C laundry, the ECO 40-60 °C programme is used most frequently.

Washing simulation

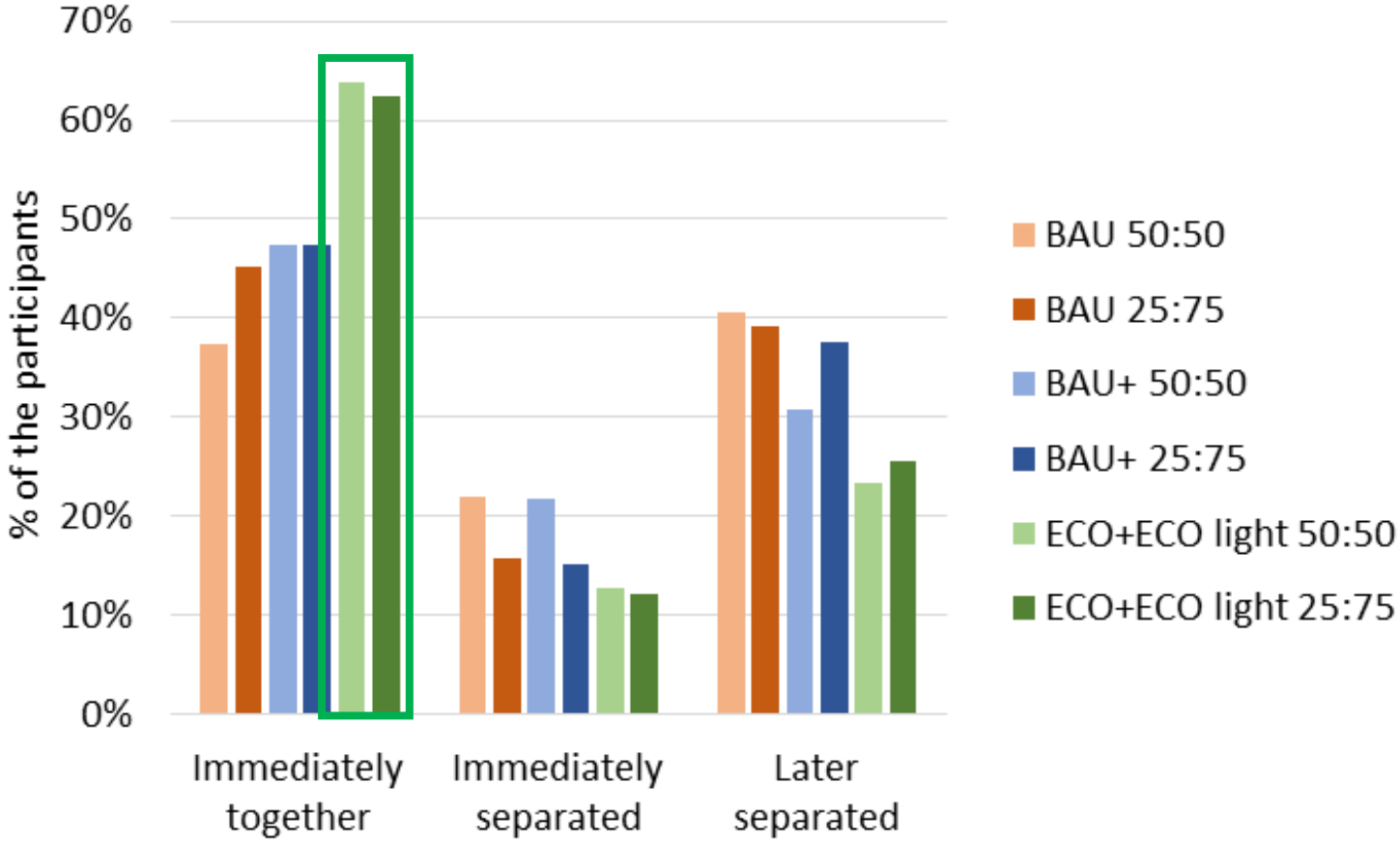
# Shift towards energy saving programmes?

(presentation based on the average of 50:50 and 25:75 wash loads)




**Result:** The energy saving programmes in the washing machine panels BAU+ and ECO+ECO light are used more frequently compared to the current standard programmes, and even compared to the shorter regular cotton programmes, especially at 60 °C.

# Washing combined together or not – is there a shift triggered by the different washing machine panels?




**Result:** The washing machine panel ECO+ECO light increases the number of participants who combine their wash loads (from around 43 % to 62 %).

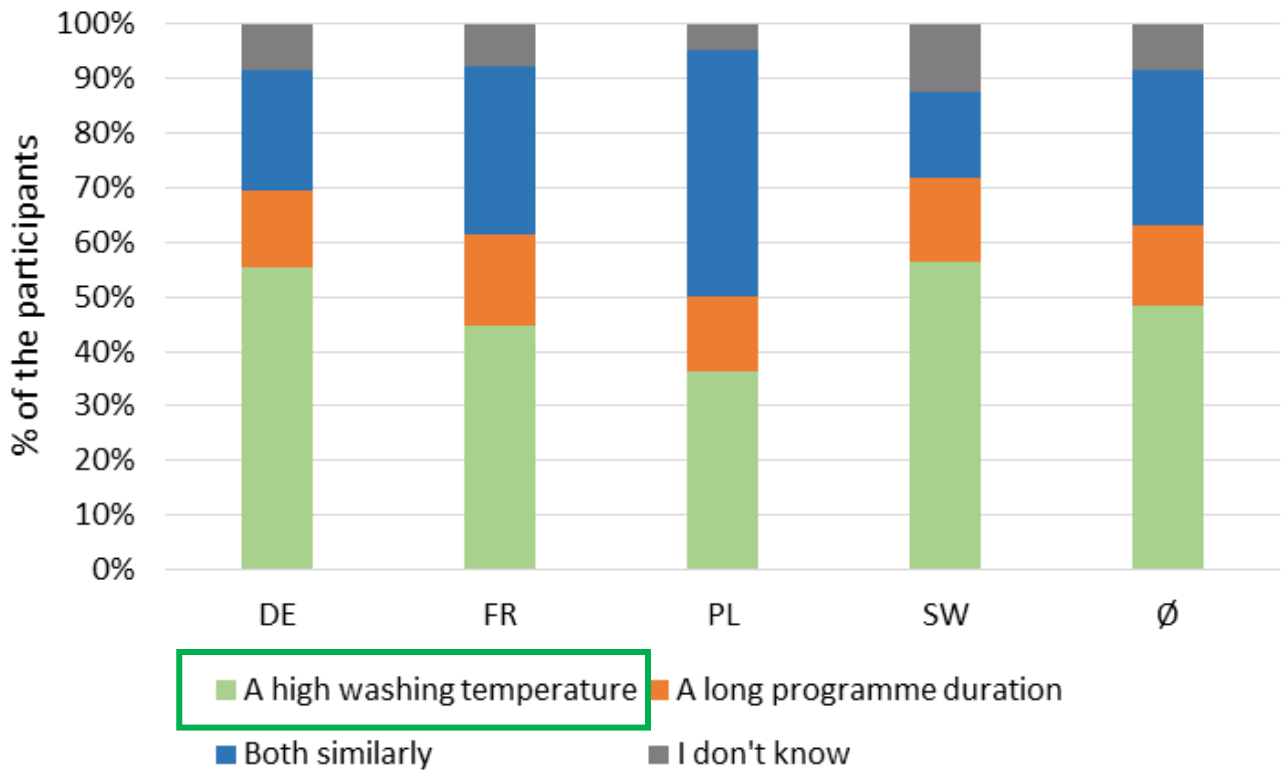
# Summary: Simulation of the washing behaviour

- In the business-as-usual (BAU) situation the shorter regular cotton programmes are preferred compared to the longer lasting standard cotton programmes (confirmed by data from EU consumer survey 2015).
- By introducing limits on programme duration and temperature, the acceptance of the (adapted) standard cotton programmes is increased.
- The combination programmes ECO light 30-60°C und ECO 40-60°C are accepted by the participants and support the combination of wash loads. In this scenario, the ECO programmes are significantly used more frequently compared to the regular cotton programmes, especially for 60 °C laundry.

# à PART 4: FINAL QUESTIONS

# Understanding of energy saving programmes

To your understanding, which factor leads to higher energy consumption? [SC]

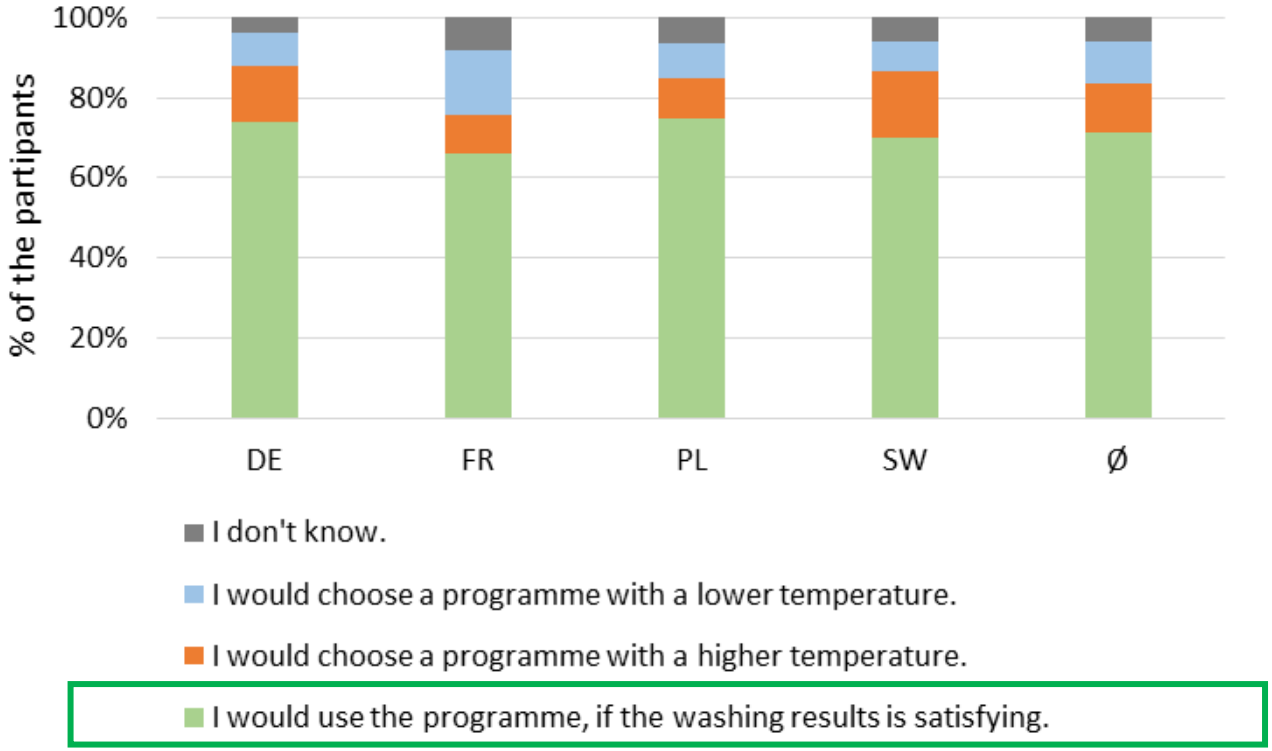



**Result: Half** of the participants is **not aware** that the energy consumption of washing laundry is mainly depending on the washing temperature.

Final Questions

# Acceptance of energy saving programmes with reduced temperature [without explanation]

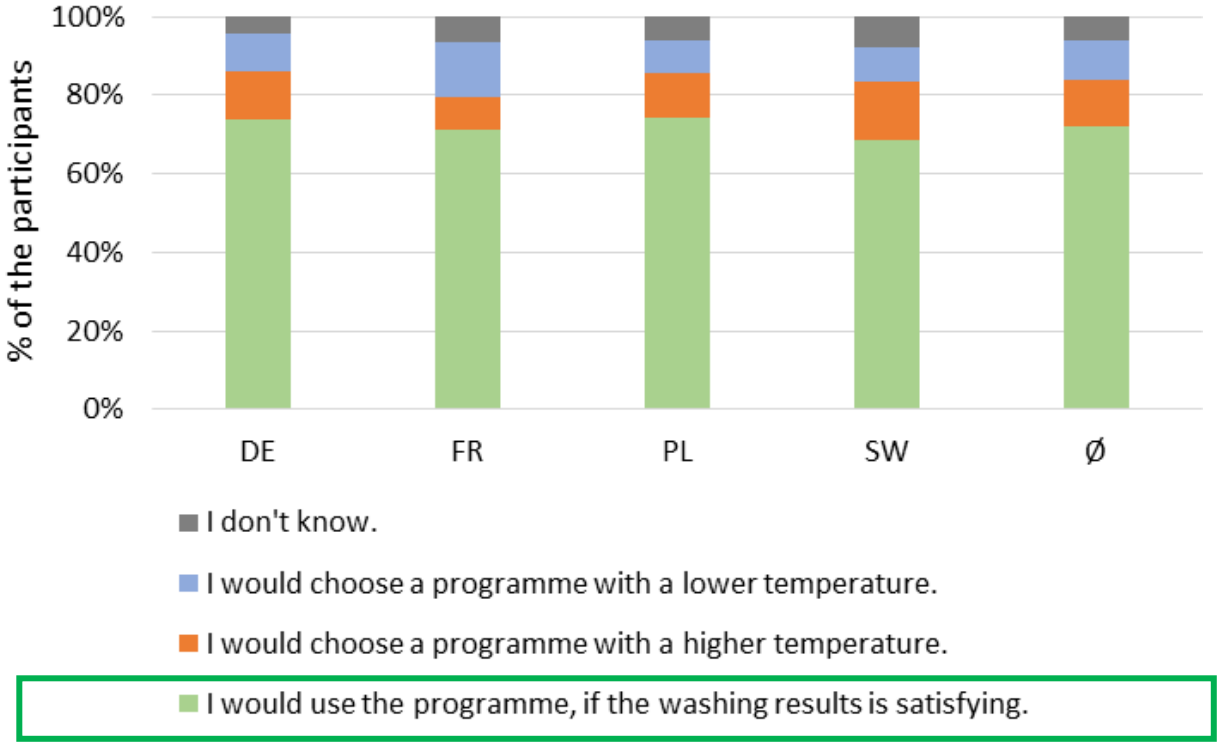
How would you react if you find out that the 60 °C energy saving programme is only washing at 50 °C? [SC]




**Result**: Despite the lower temperature, the energy saving programme would be **accepted** by a large number of participants (71 %)**.**

# Acceptance of energy saving programmes with reduced temperature [after explanation]

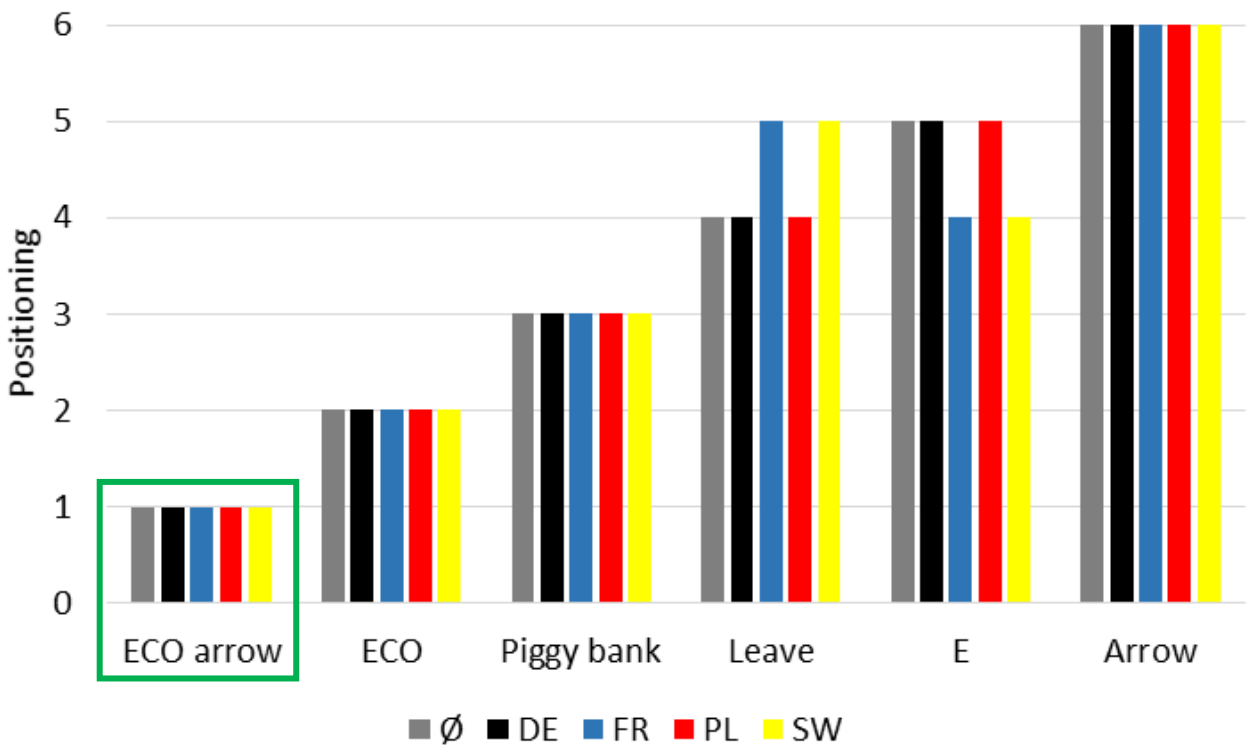
Washing machines consume most of the energy for heating up the water. In an energy saving programme the temperature is reduced, compensational the programme duration is longer, thus a similar cleaning performance is reached with a significantly lower energy consumption. What do you think about such a programme? [SC]




**Result**: The already high acceptance could not be further increased by additional explanation and is rather identical (+1 %).

# Preference regarding the indication / symbol

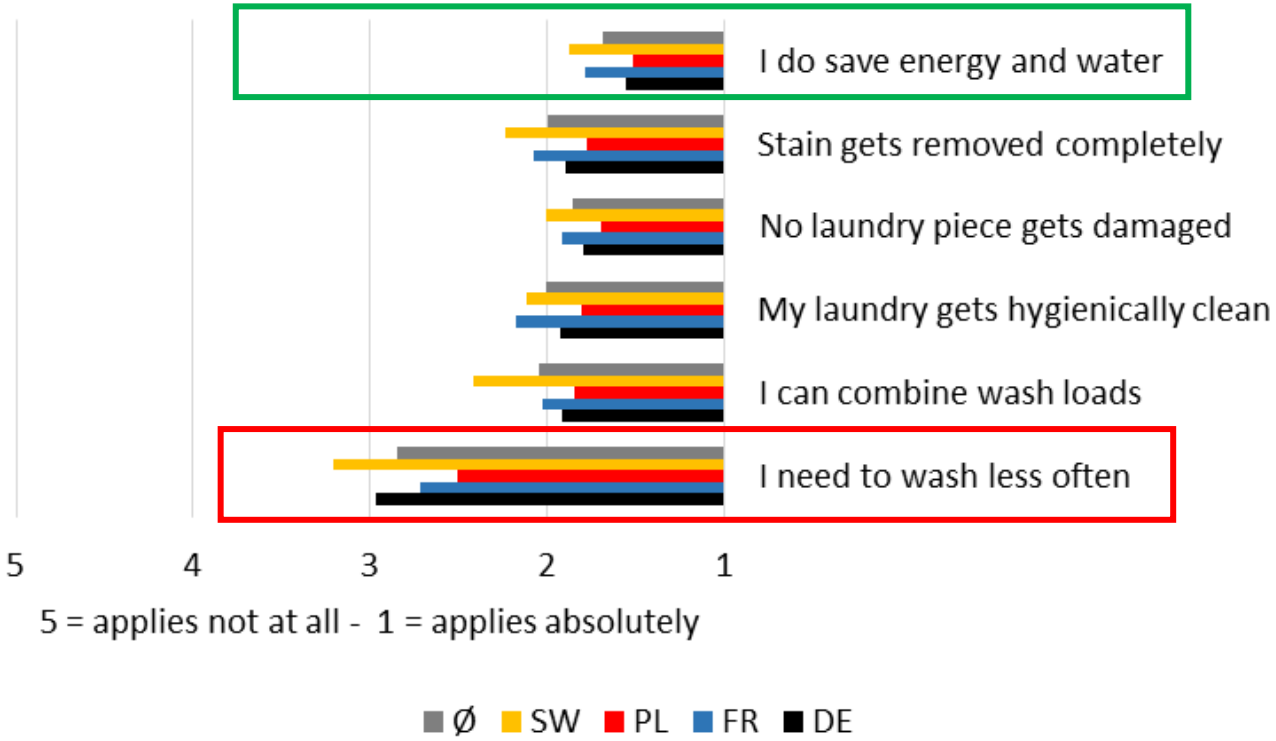
To your view, which indication or symbol would be most meaningful for an energy saving programme? [Ranking]




**Result:** The most popular symbol is **ECO in an arrow**, whereas the pure arrow (current symbol) is ranked last in all countries.

# Expectations on the Eco 40-60 programmes

What do you expect of a combined ECO 40-60 °C programme? [MC]




**Result**: The participants recognize the possibility to combine wash loads. Energy and water savings are expected. Participants do not expect a decrease of wash quality. Despite the possibility to combine wash loads, a total reduction of the number of wash cycles is not seen.

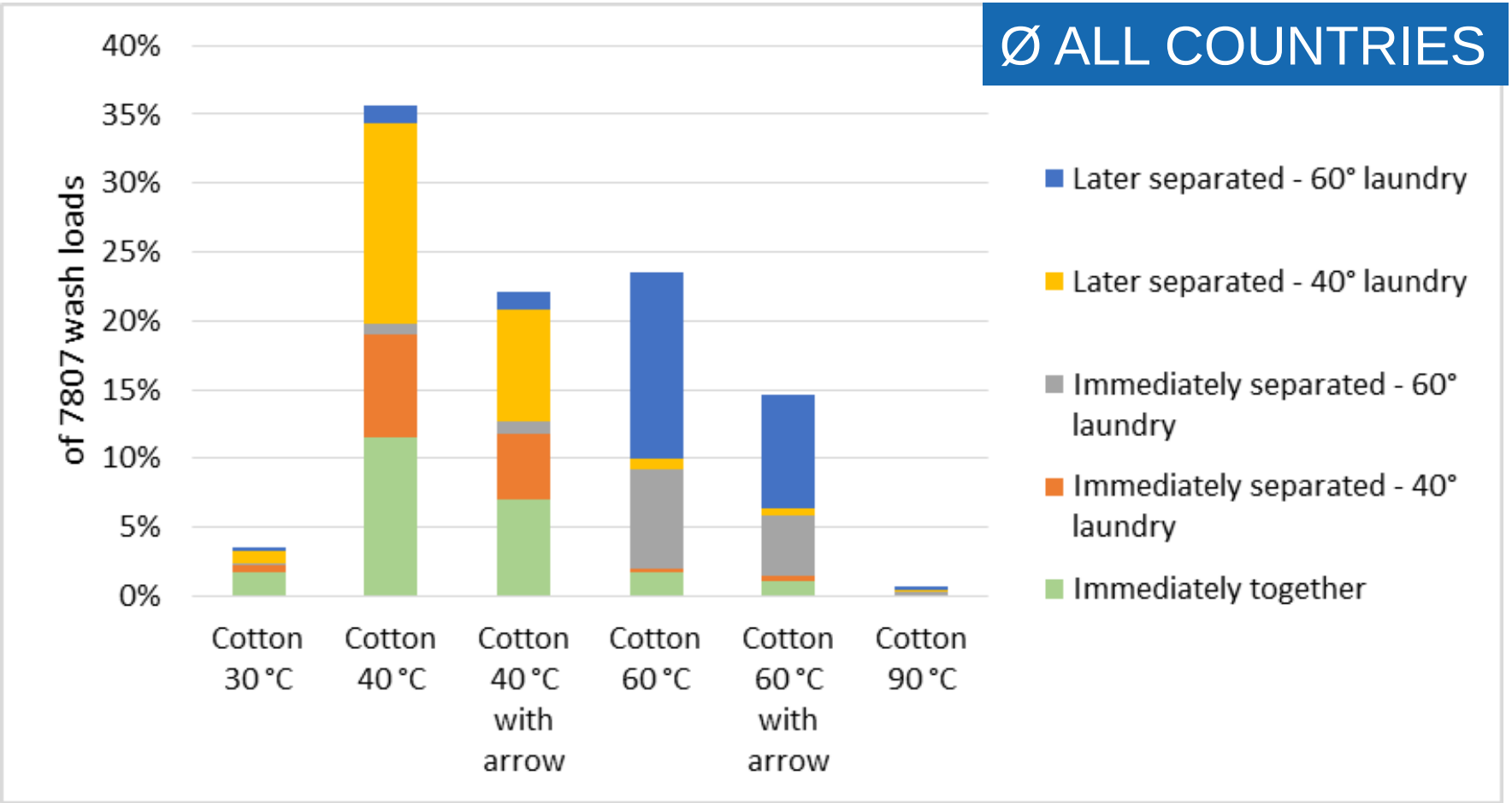
# Summary: Final Questions

- Approximately 50 % of the participants understand that the choice of the washing temperature influences the energy consumption of the wash cycle most.
- Energy saving programmes with lower temperatures than indicated on the washing machine‘s panel are accepted by the majority of the participants and used if the washing performance is still achieved.
- Combination programmes such as ECO 40-60°C are associated with the possibility of saving energy and water.
- The participants recognize the possibility to combine wash loads. Energy and water savings are expected. Participants do not expect a decrease of wash quality. Despite the possibility to combine wash loads, a total reduction of the number of wash cycles is not seen.

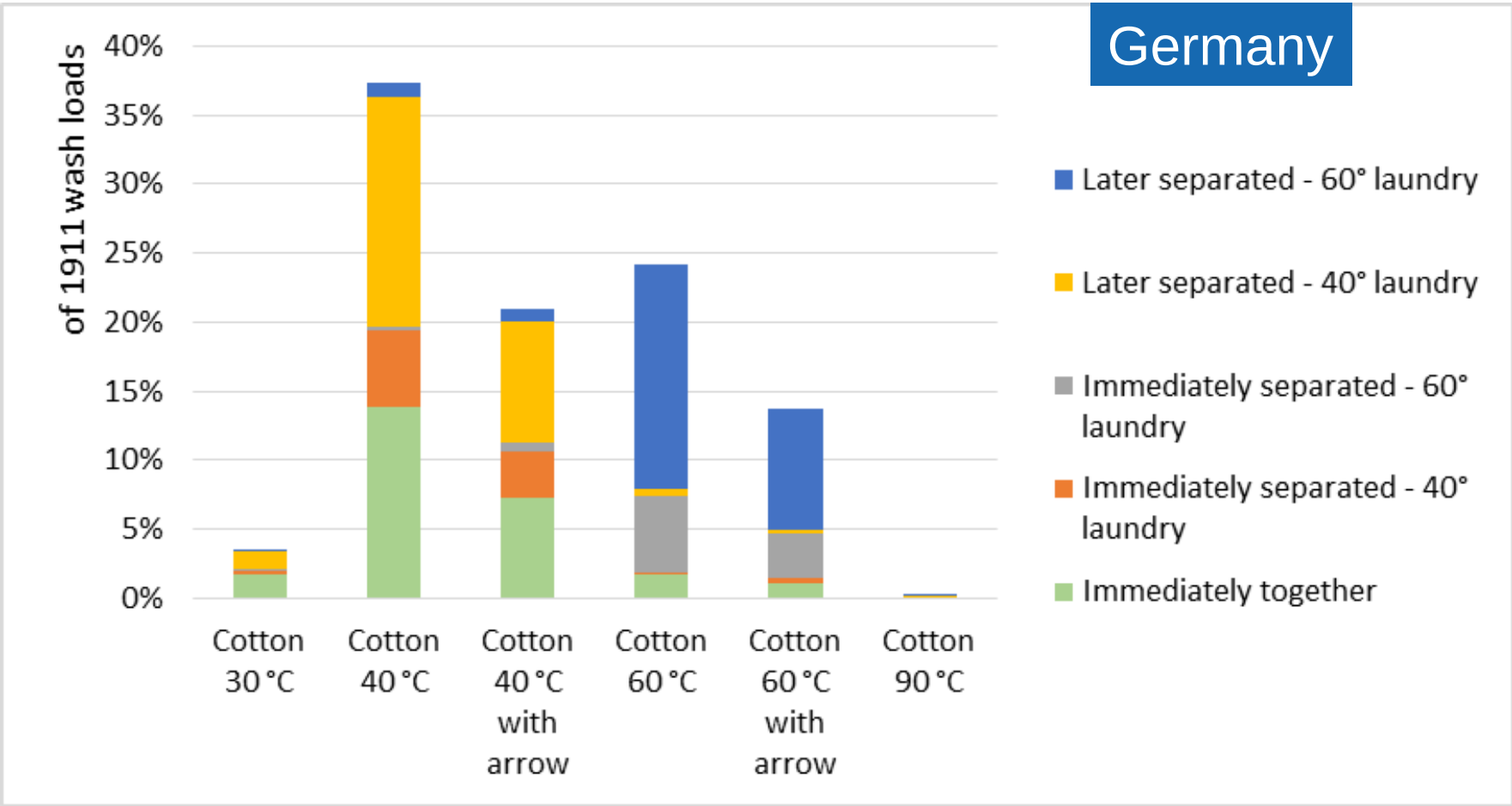
# ANNEX

# DETAILED ANALYSIS OF WASHING SITUATIONS

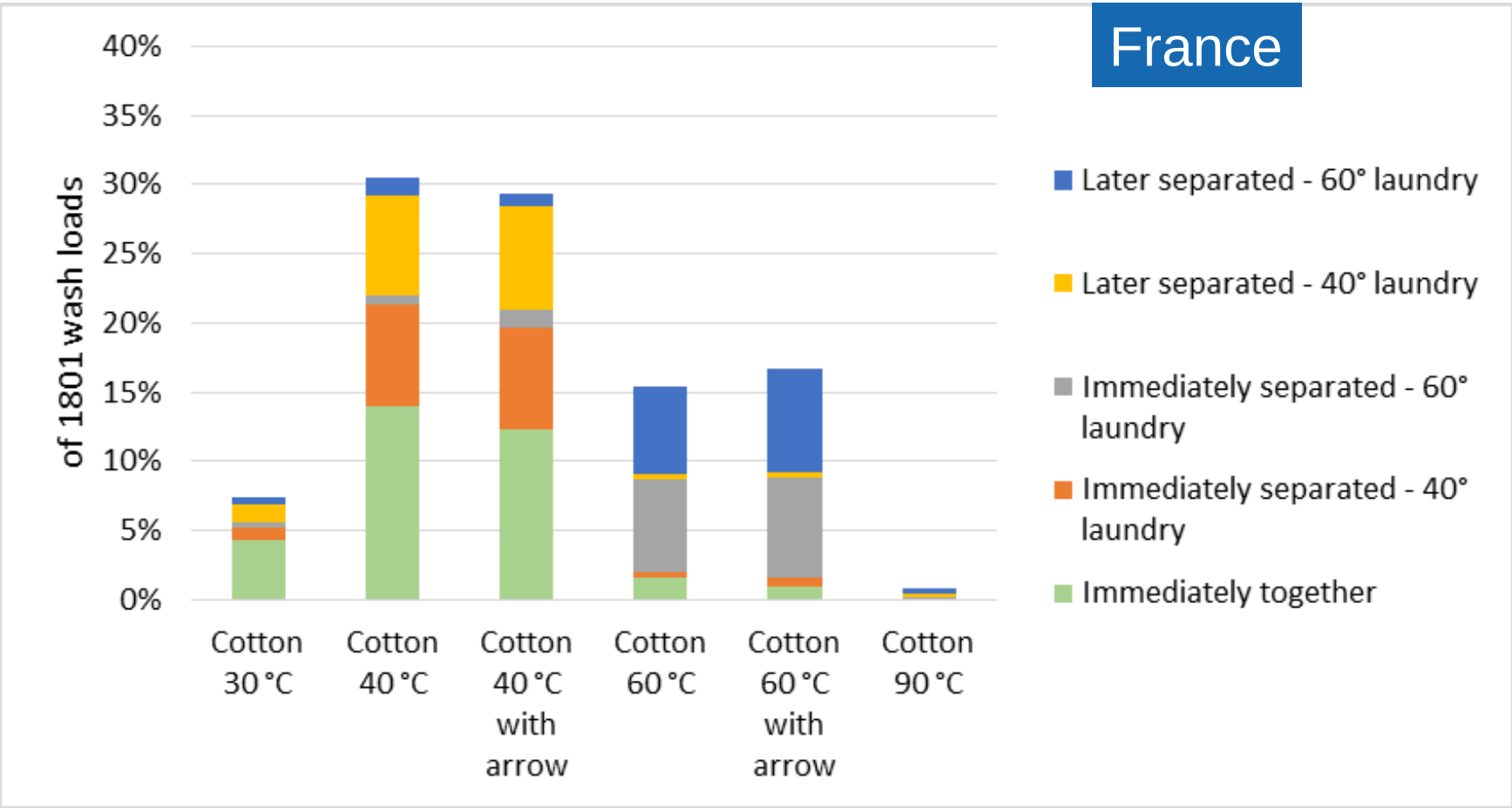
# Washing simulation BAU 50:50



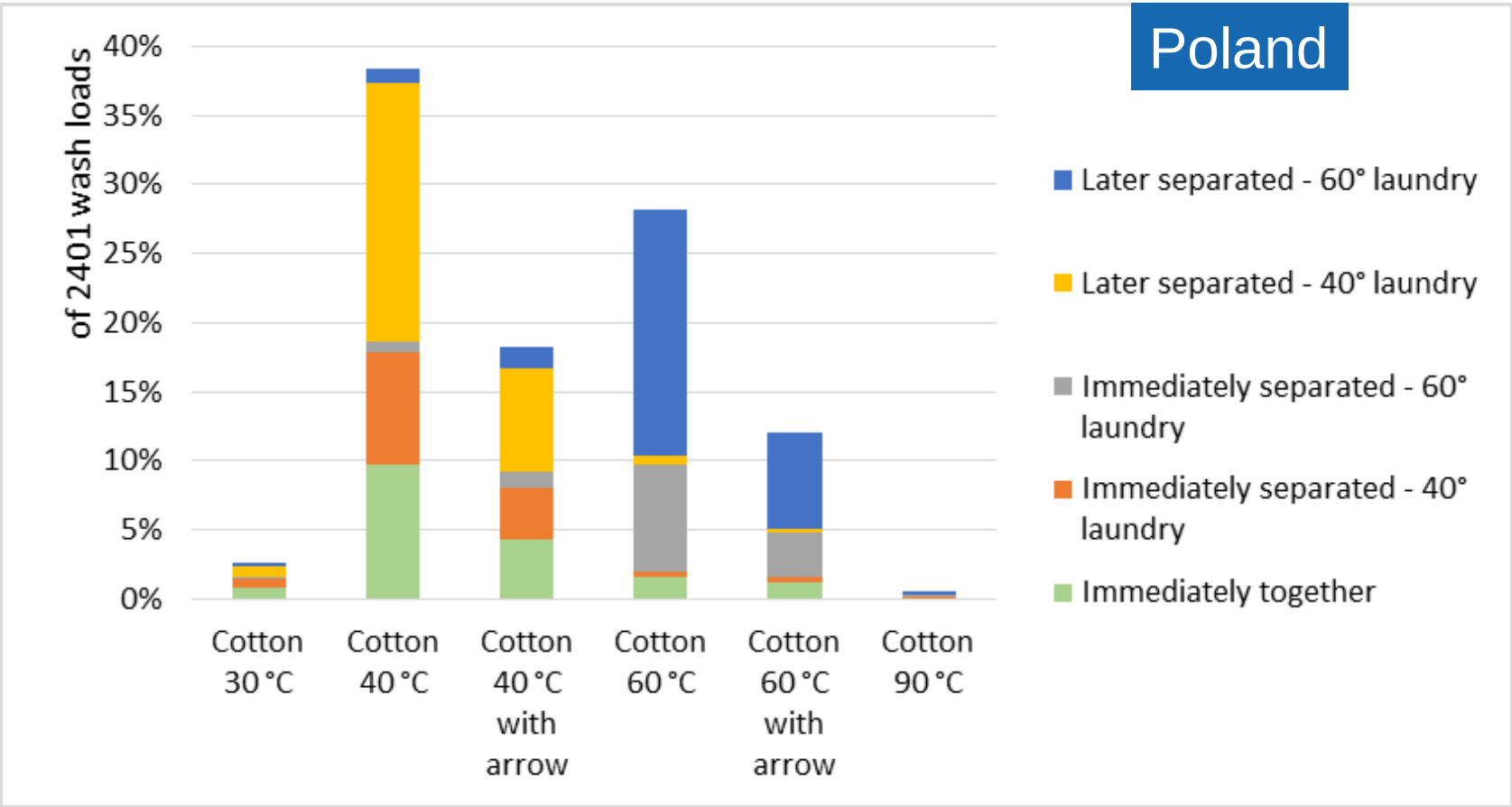
# Washing simulation BAU 50:50



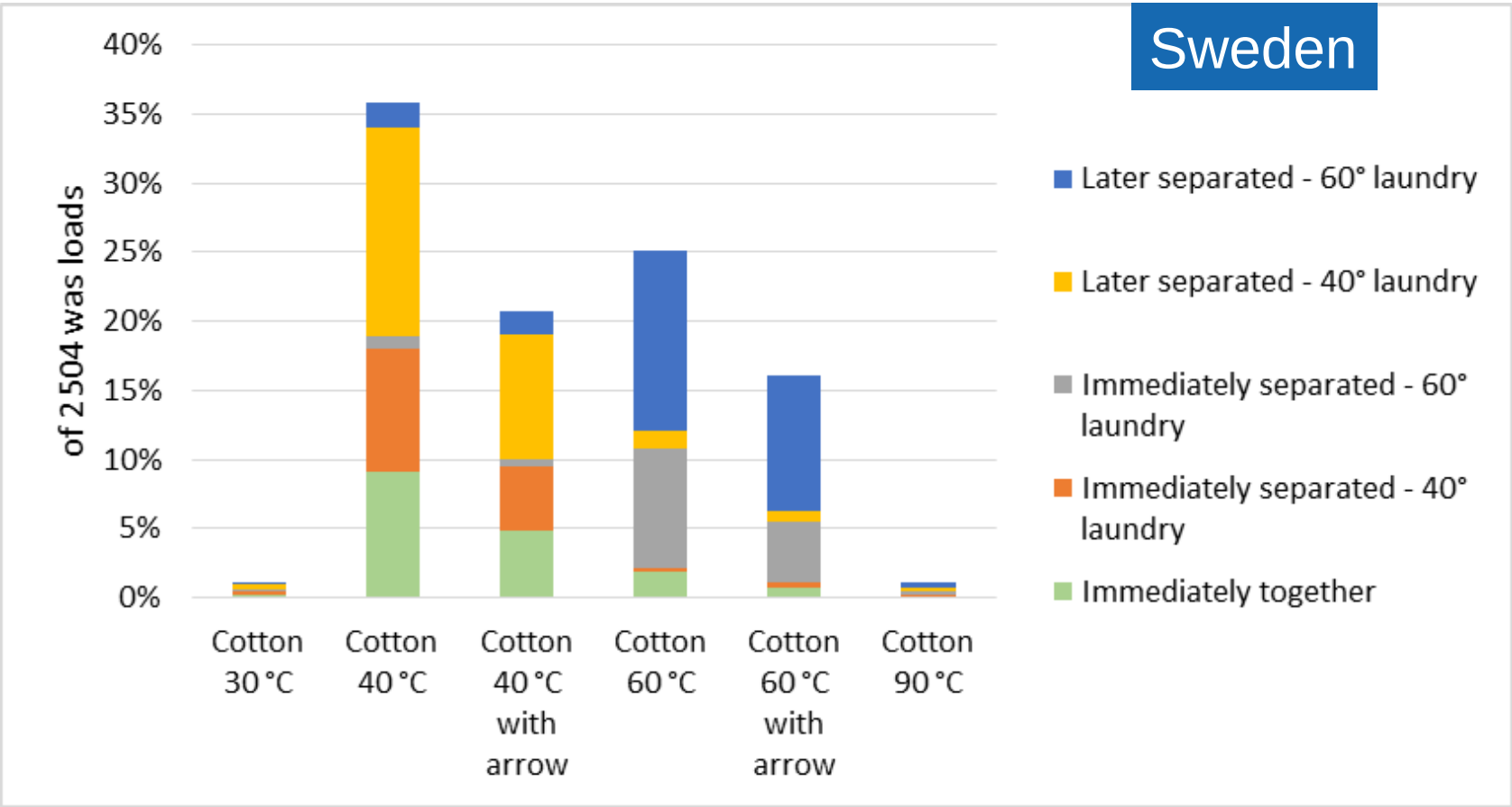
# Washing simulation BAU 50:50



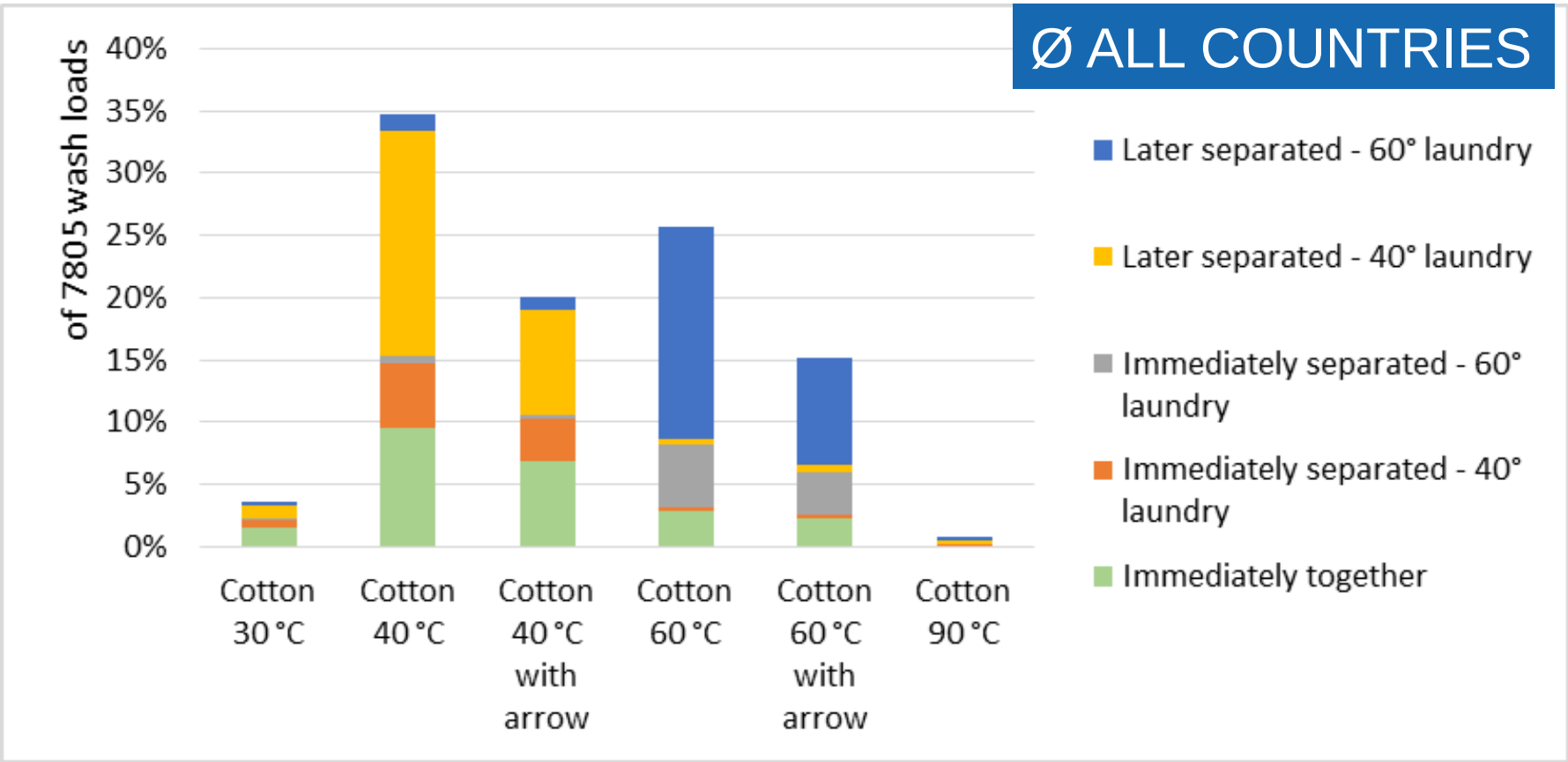
# Washing simulation BAU 50:50



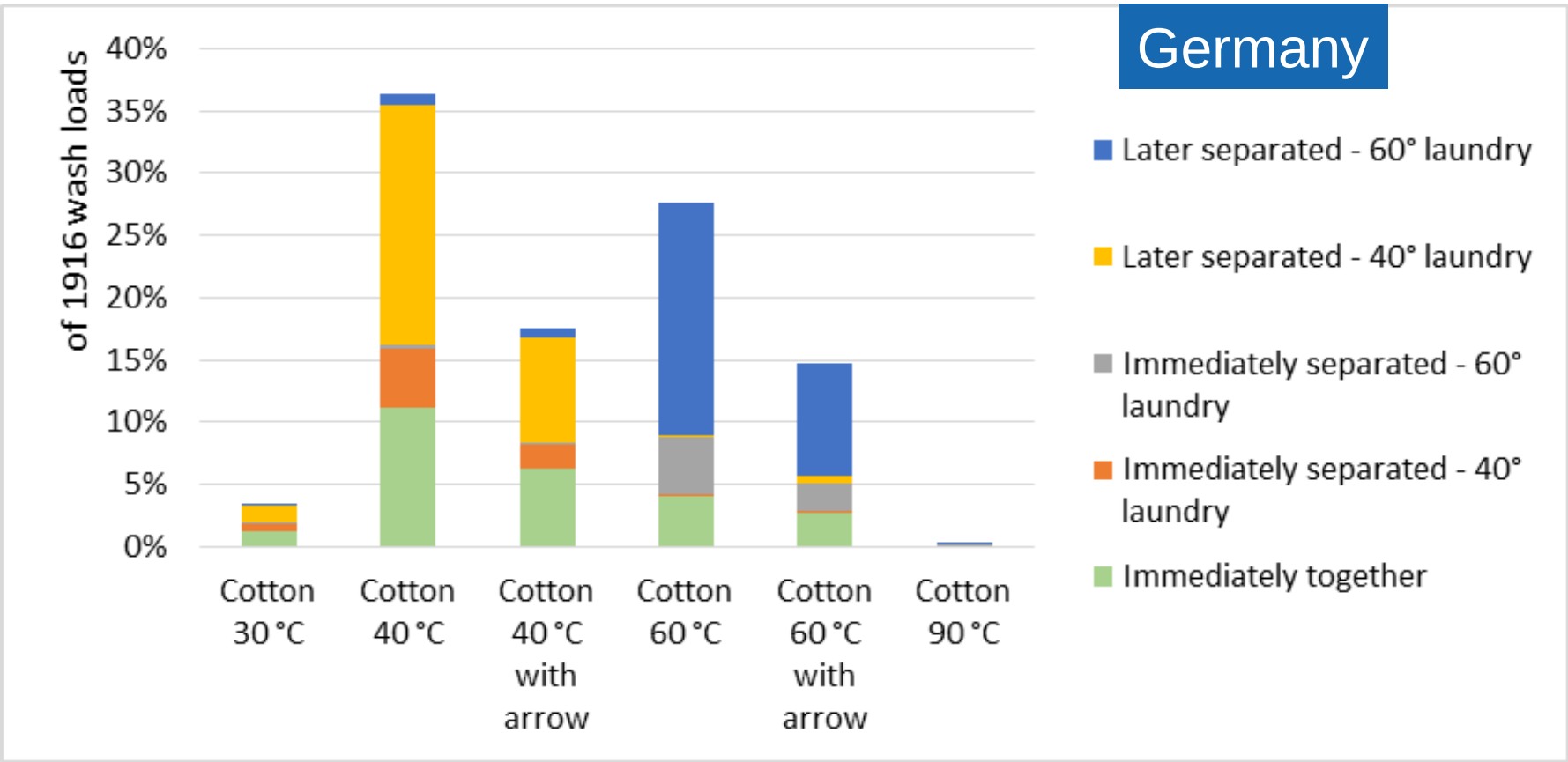
# Washing simulation BAU 50:50



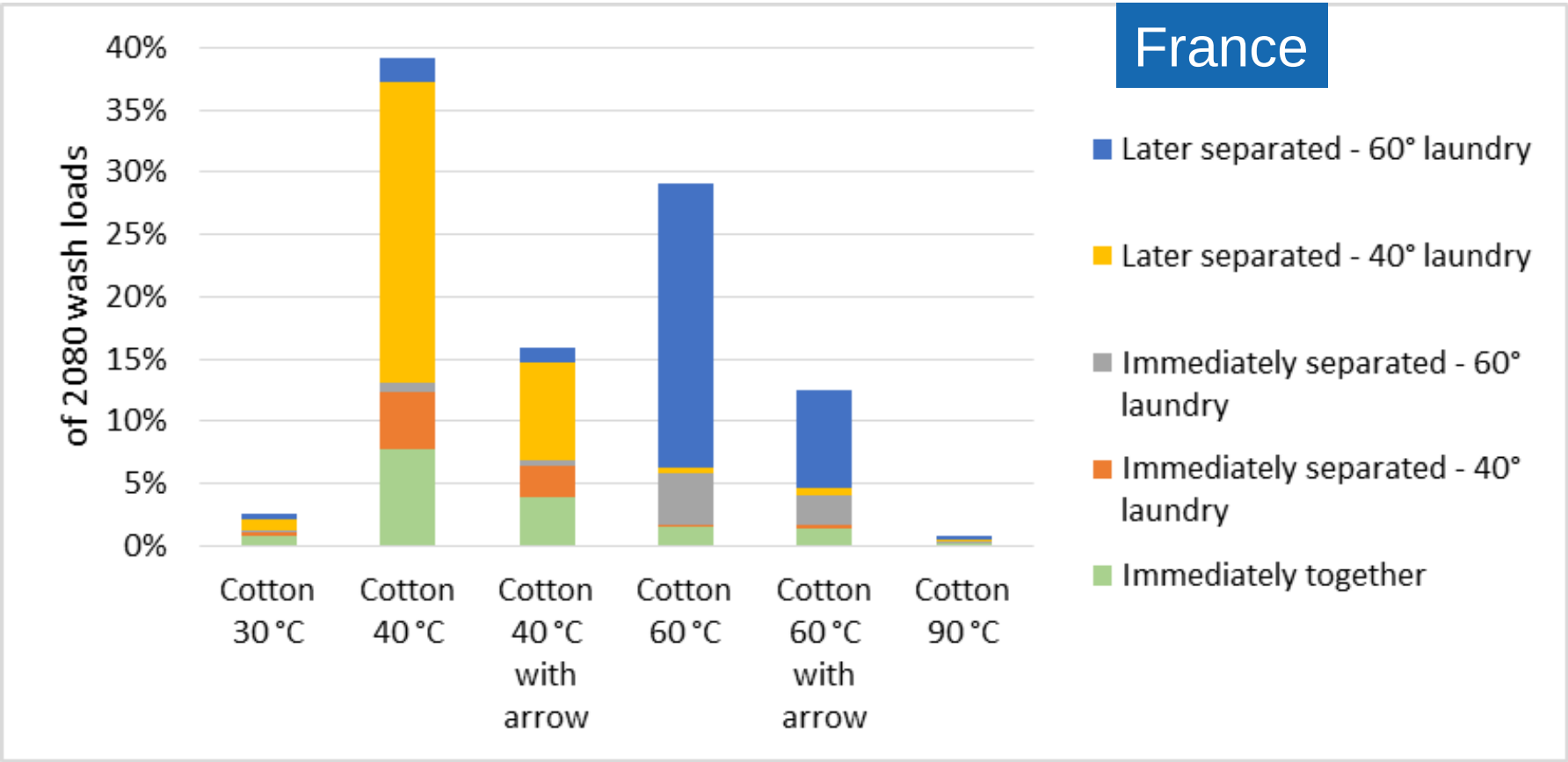
# Washing simulation BAU 25:75



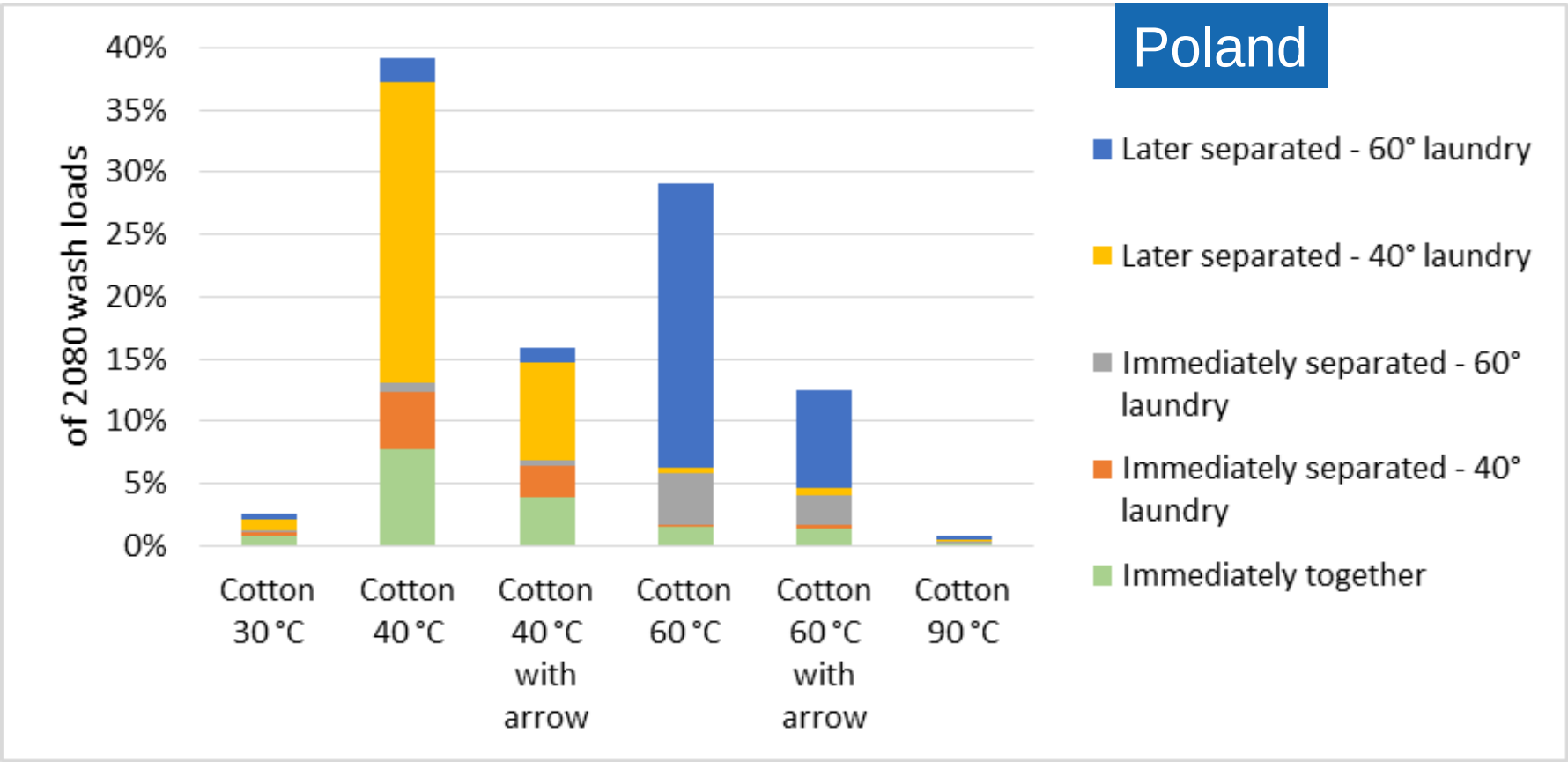
# Washing simulation BAU 25:75



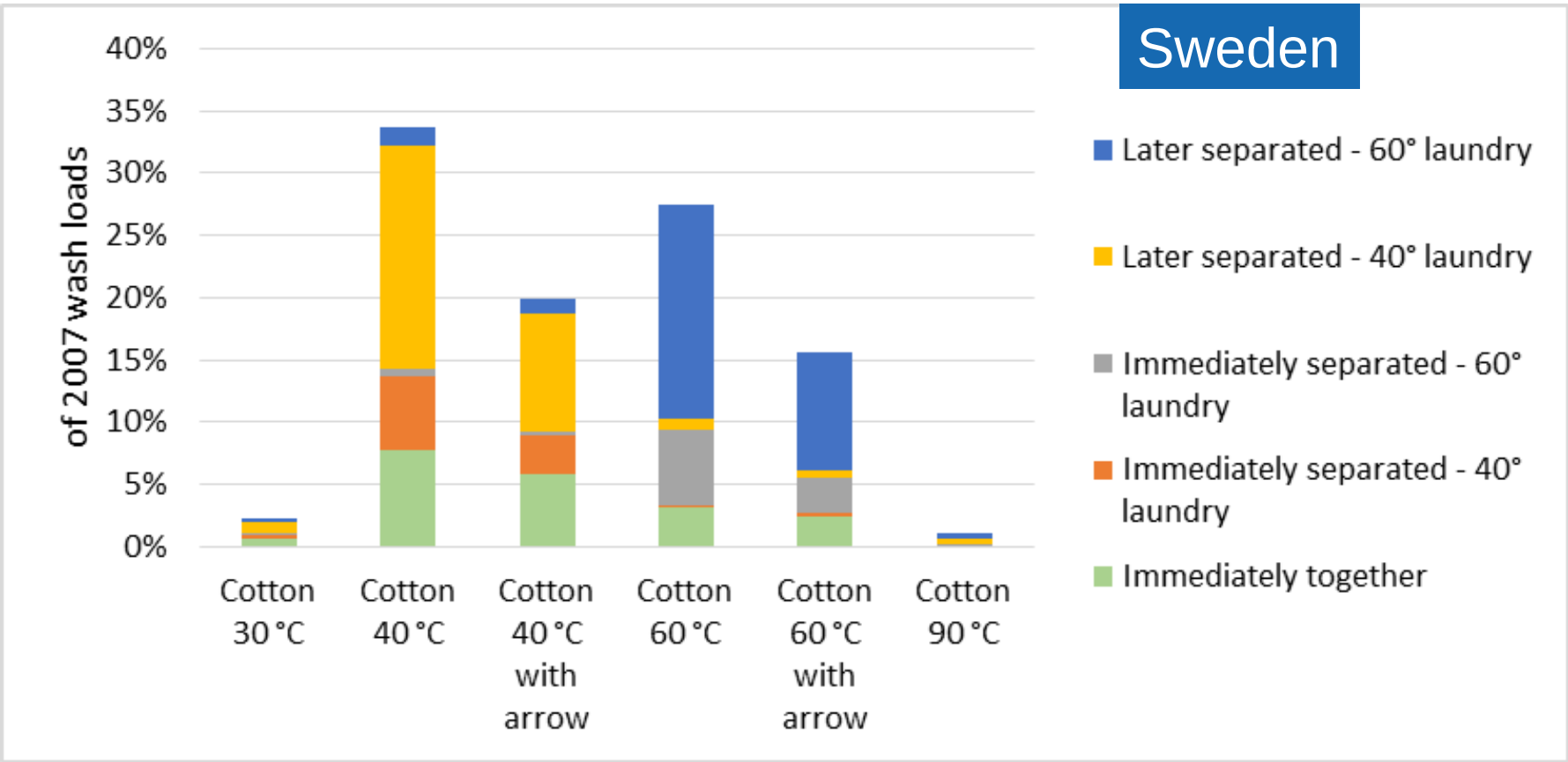
# Washing simulation BAU 25:75



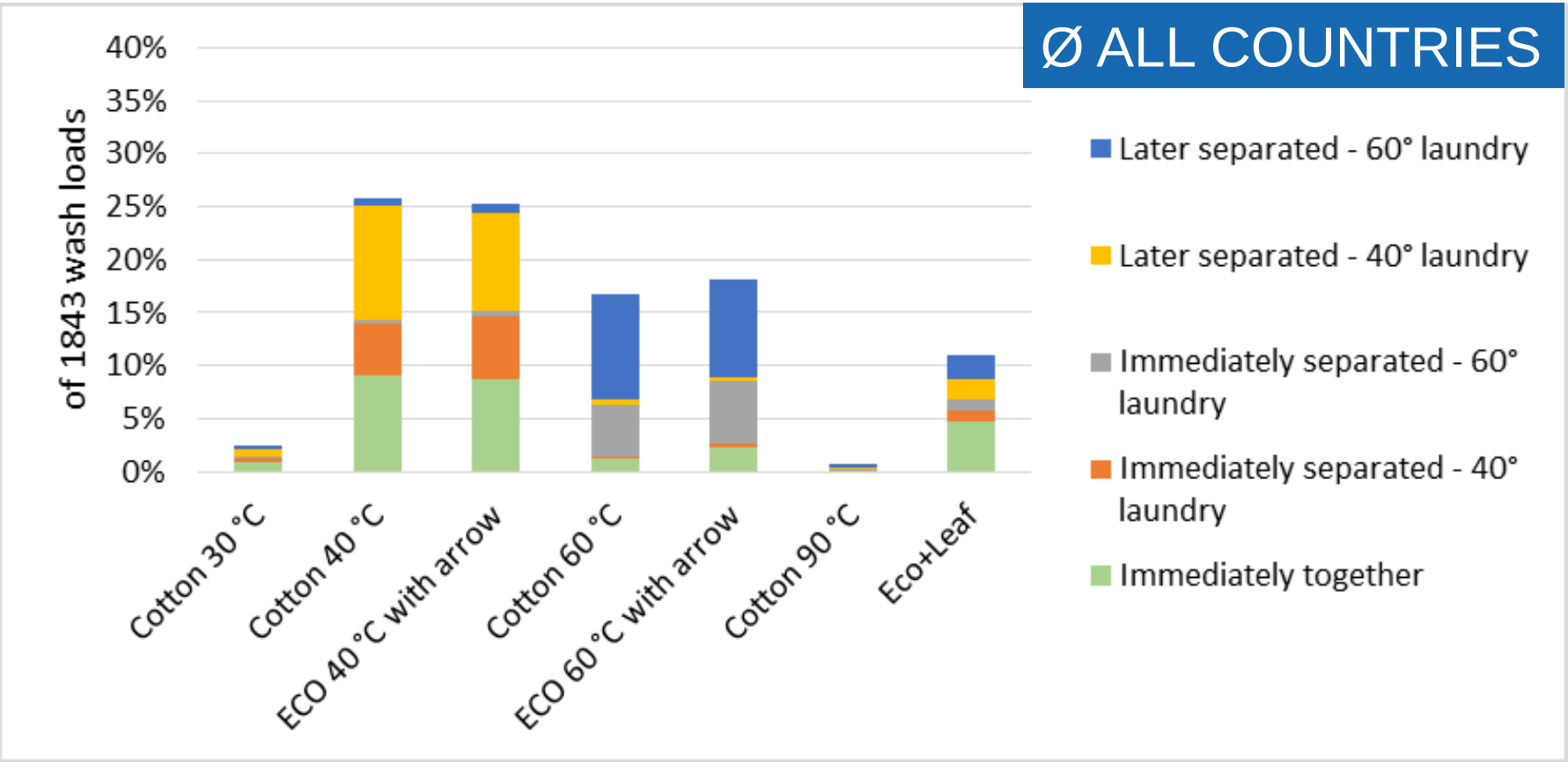
# Washing simulation BAU 25:75



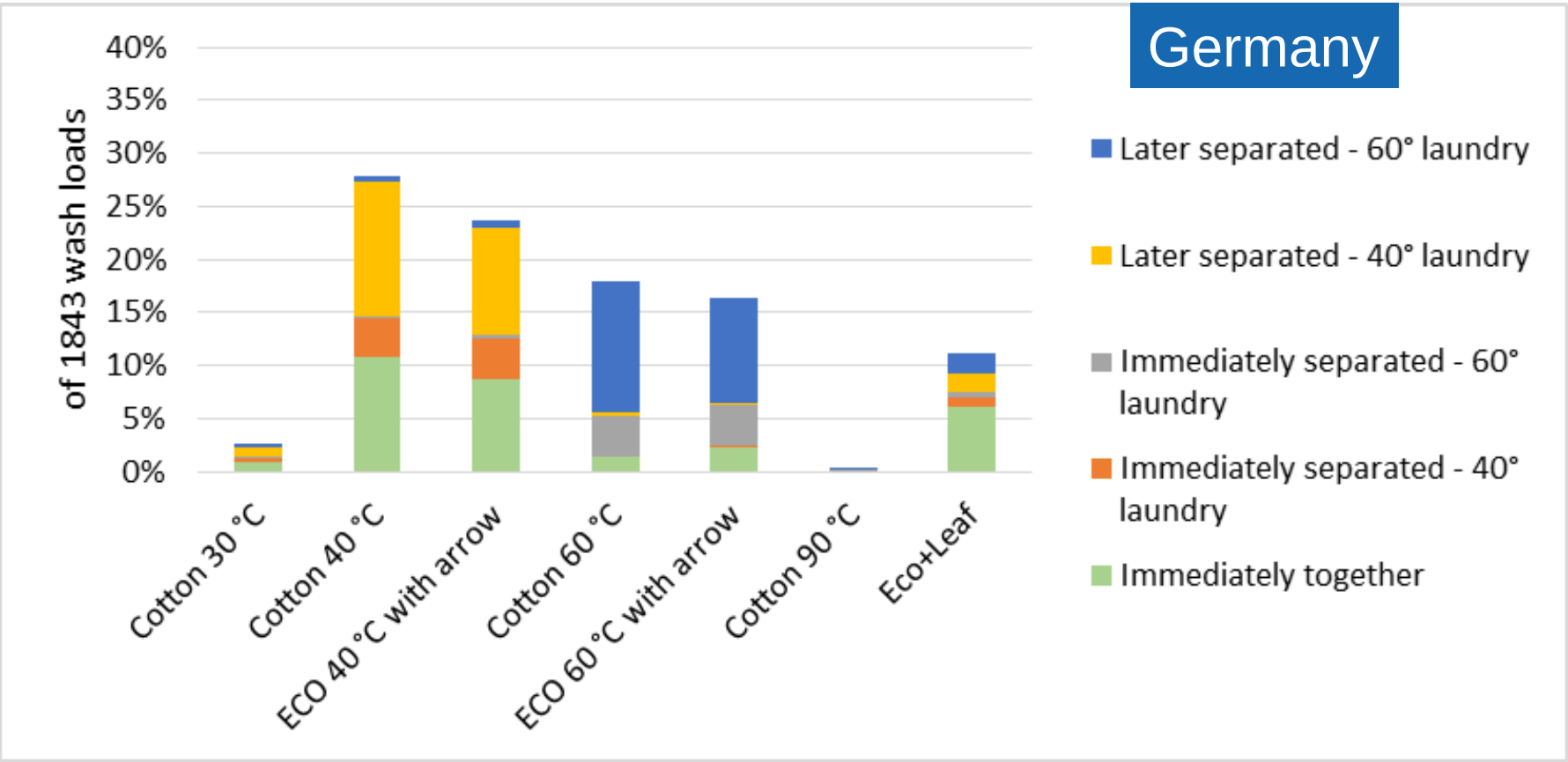
# Washing simulation BAU 25:75



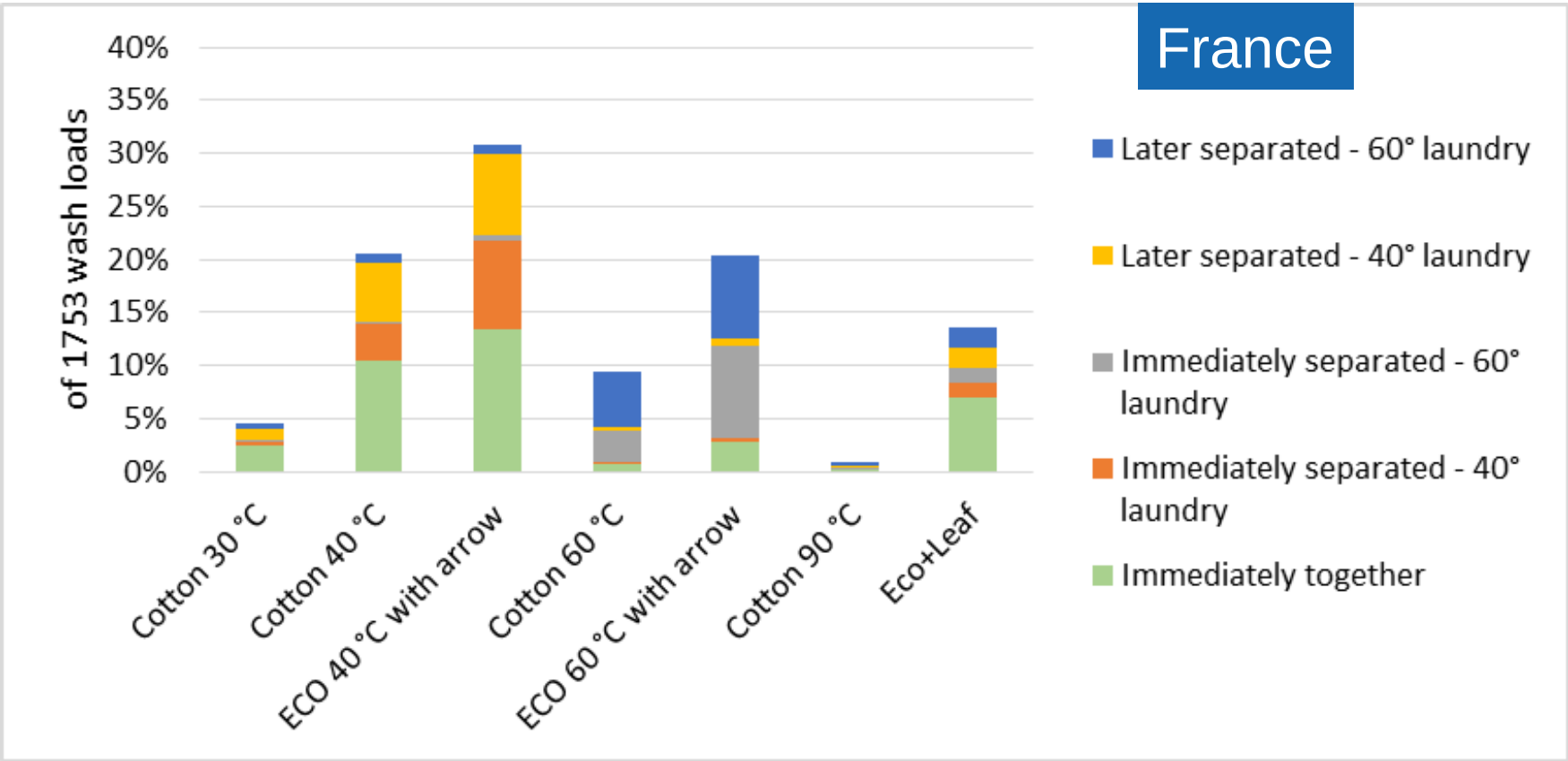
# Washing simulation BAU+ 50:50



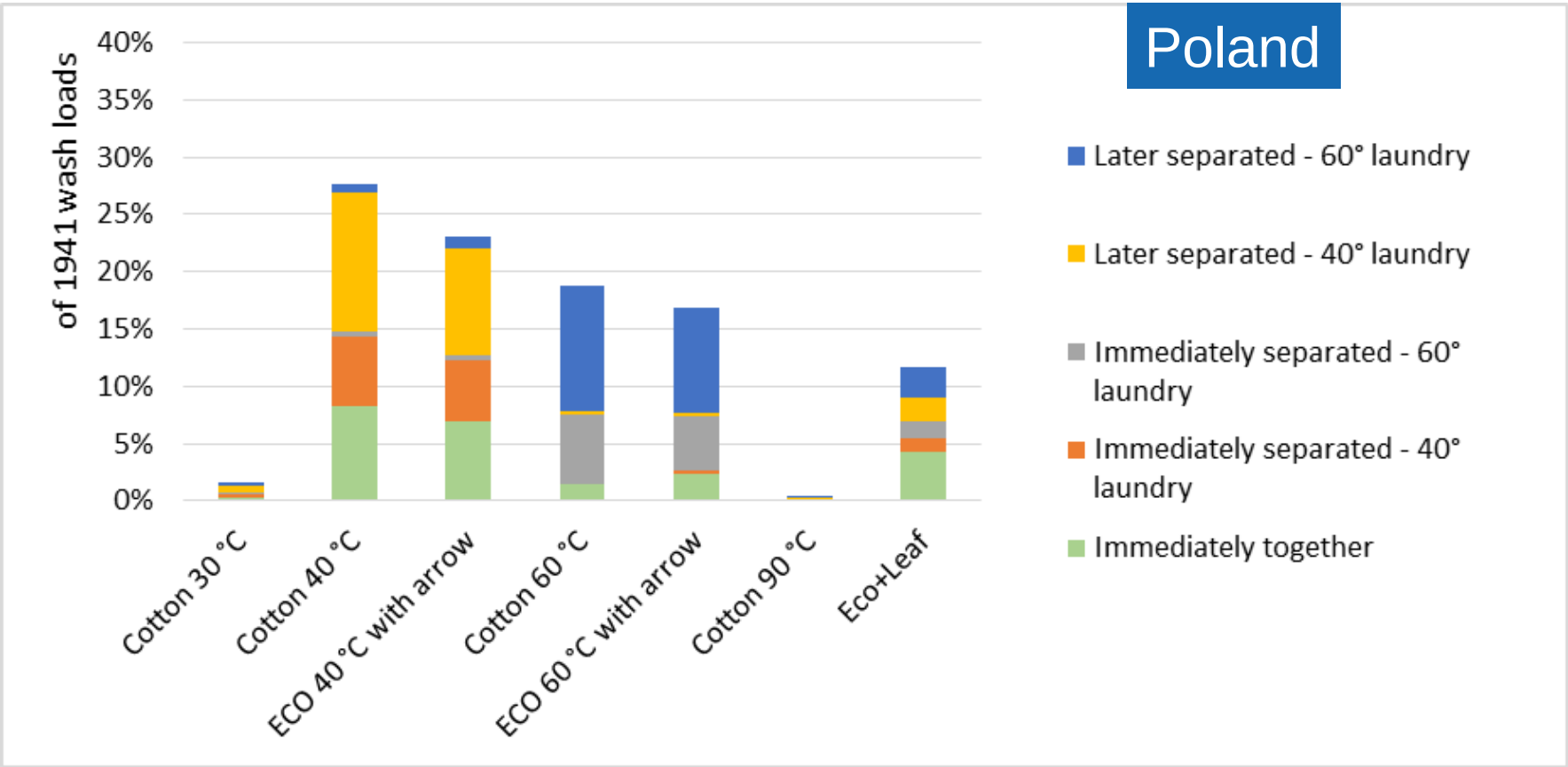
# Washing simulation BAU+ 50:50



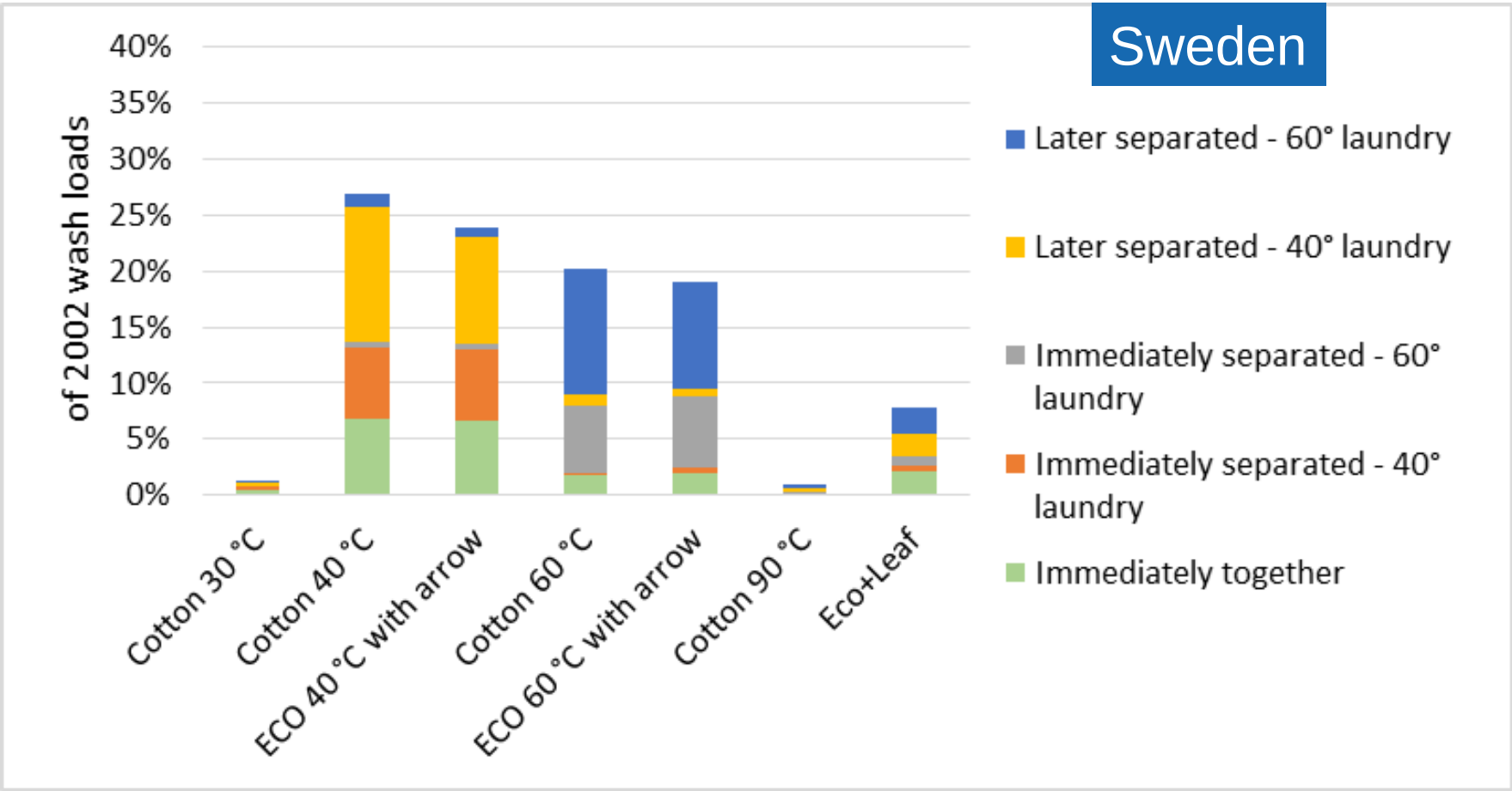
# Washing simulation BAU+ 50:50



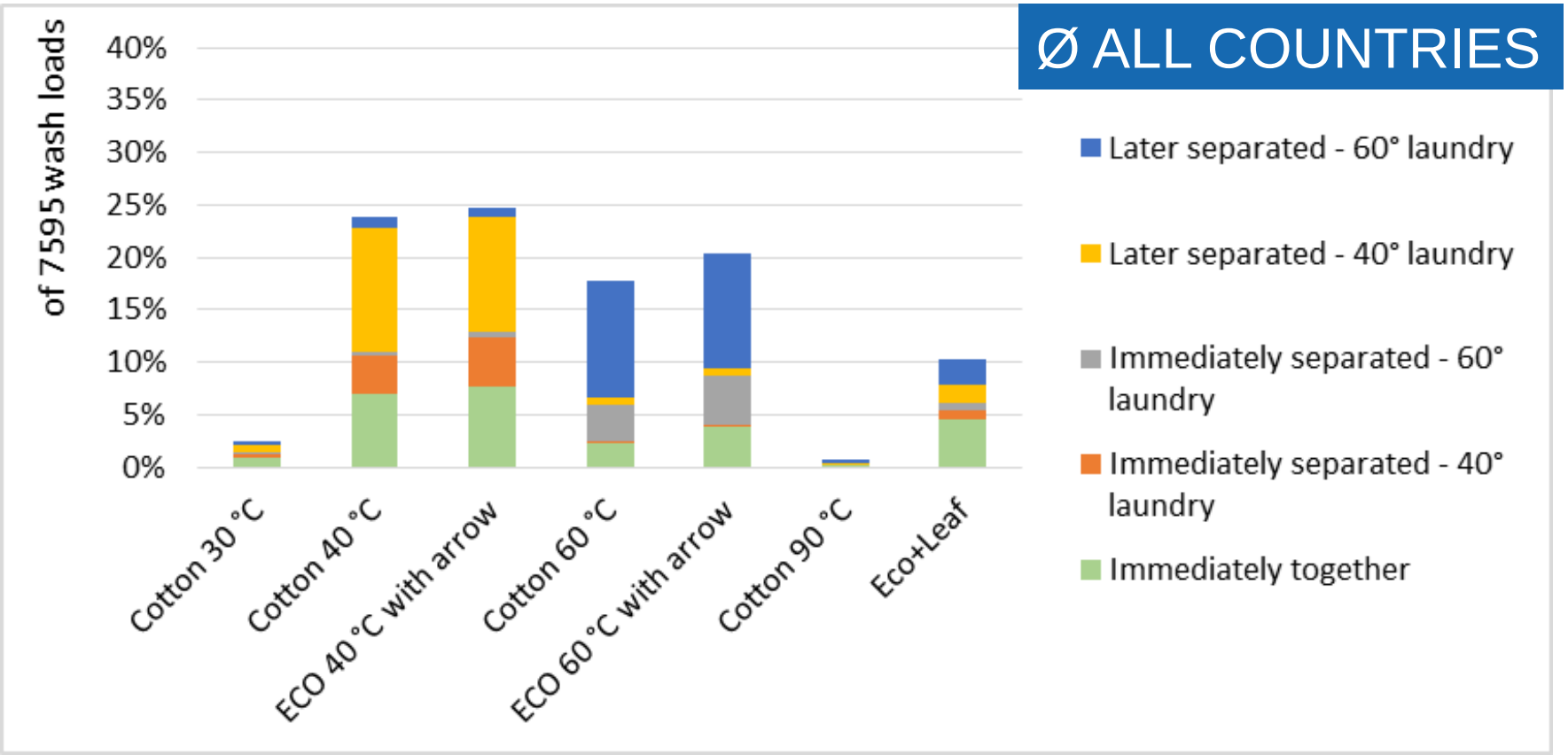
# Washing simulation BAU+ 50:50



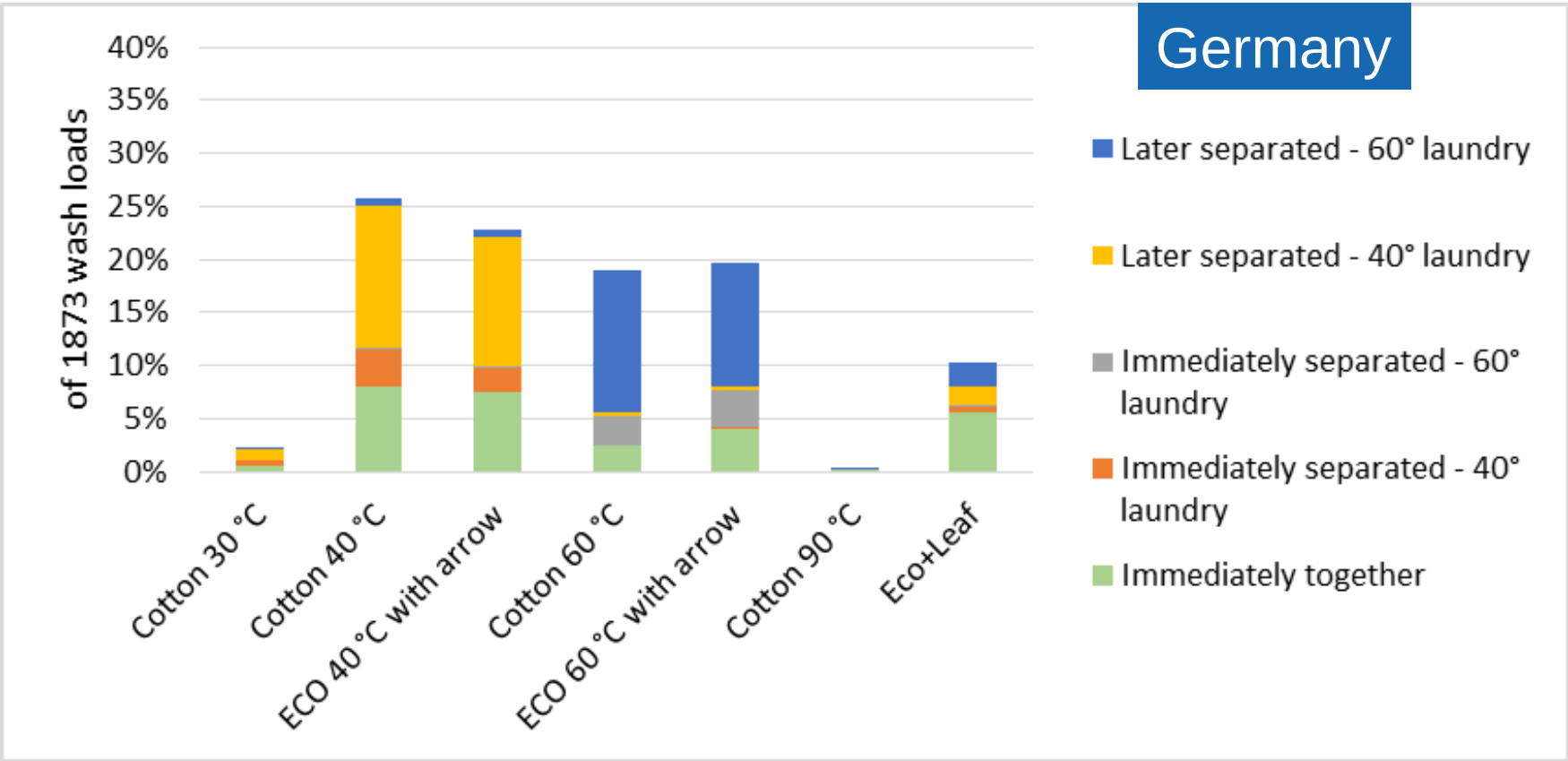
# Washing simulation BAU+ 50:50



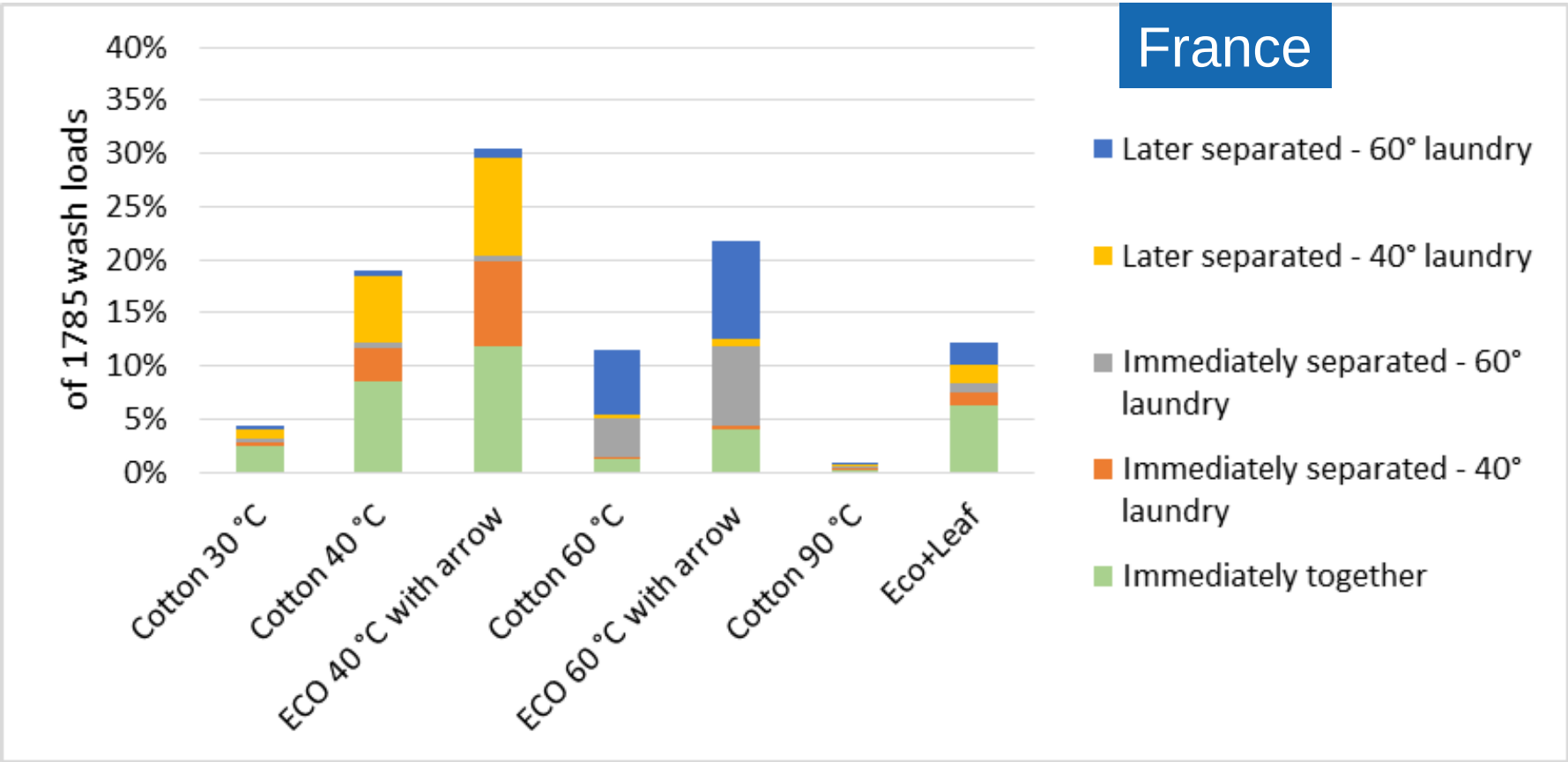
# Washing simulation BAU+ 25:75



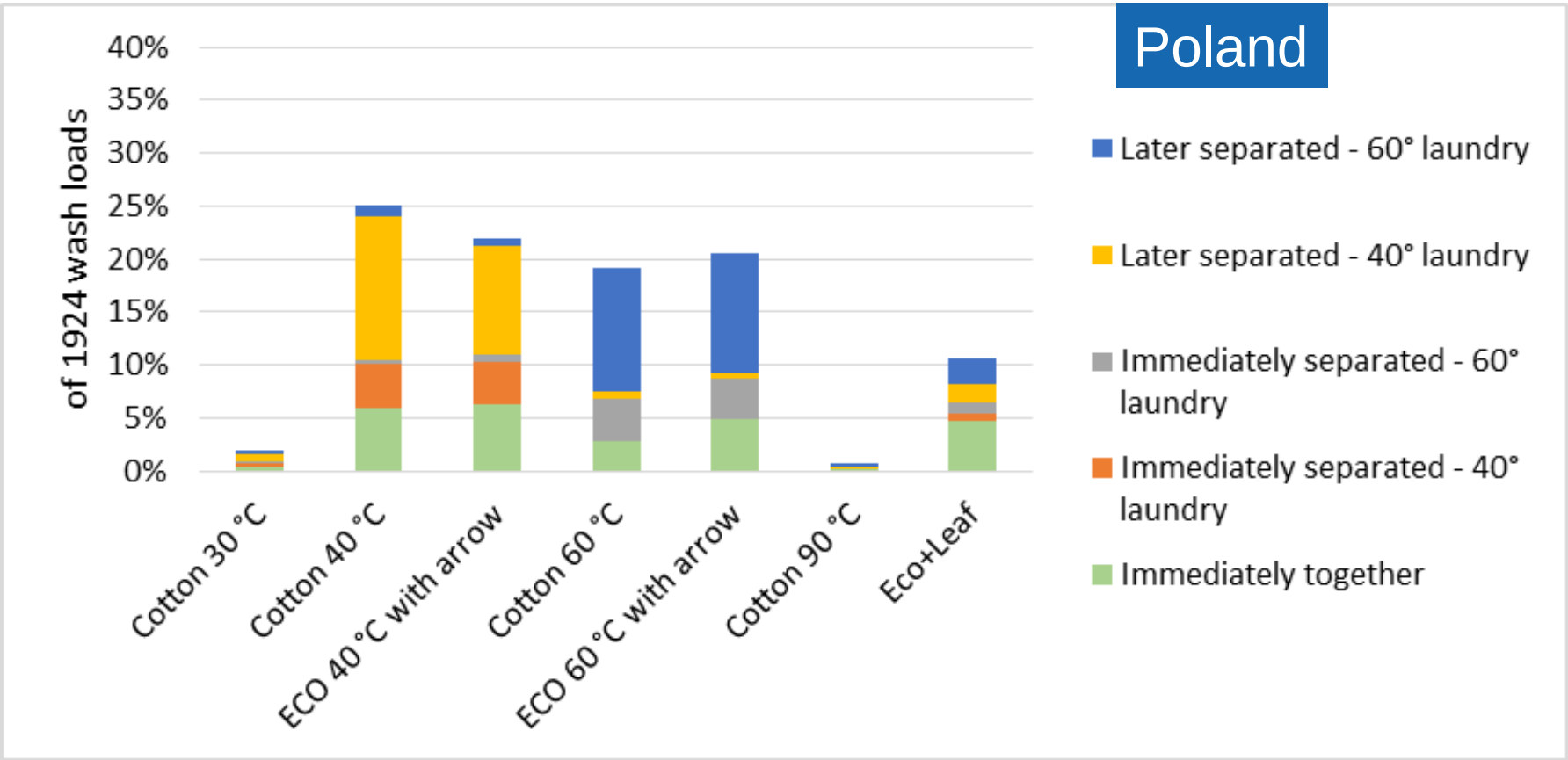
# Washing simulation BAU+ 25:75



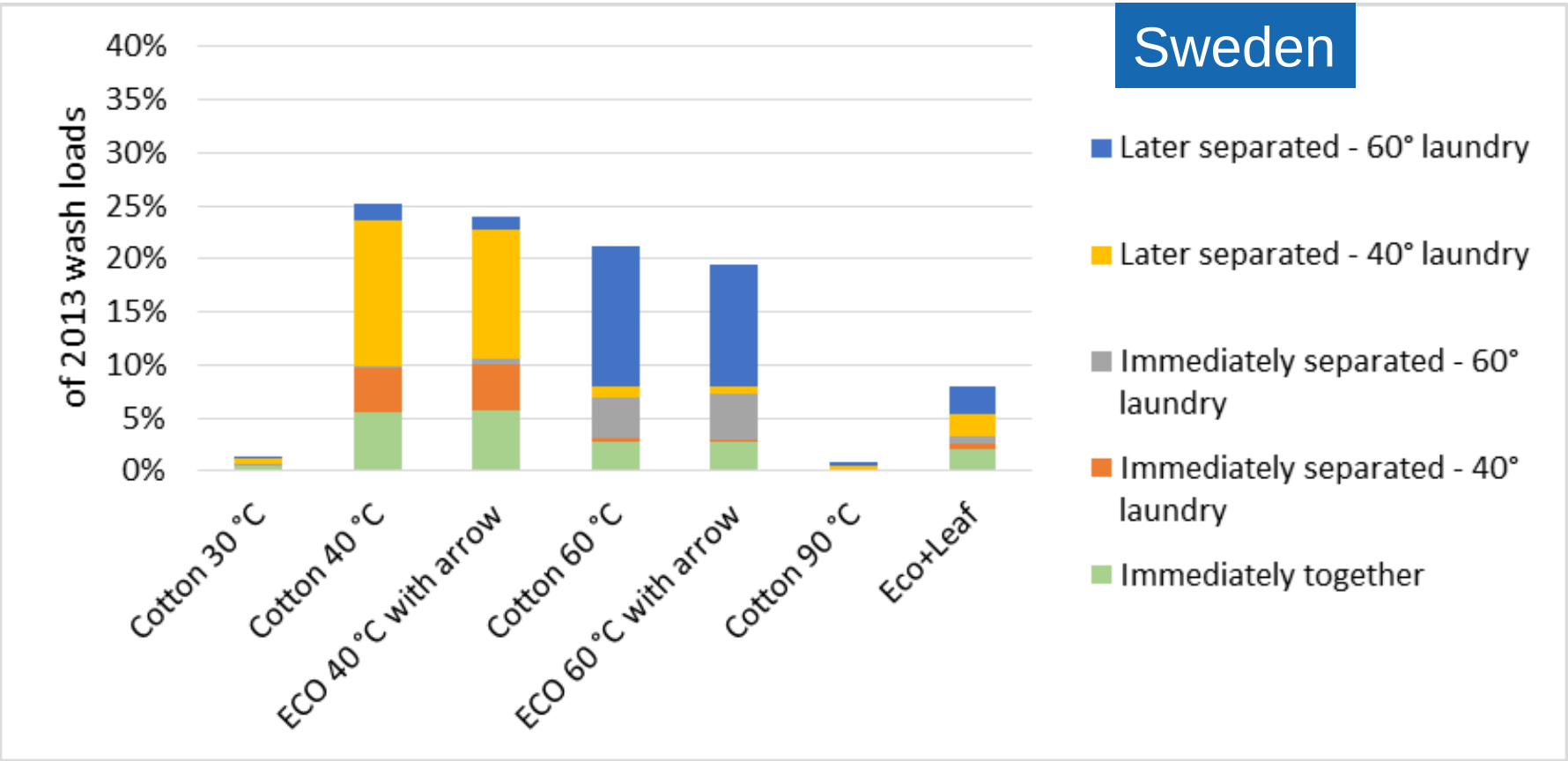
# Washing simulation BAU+ 25:75



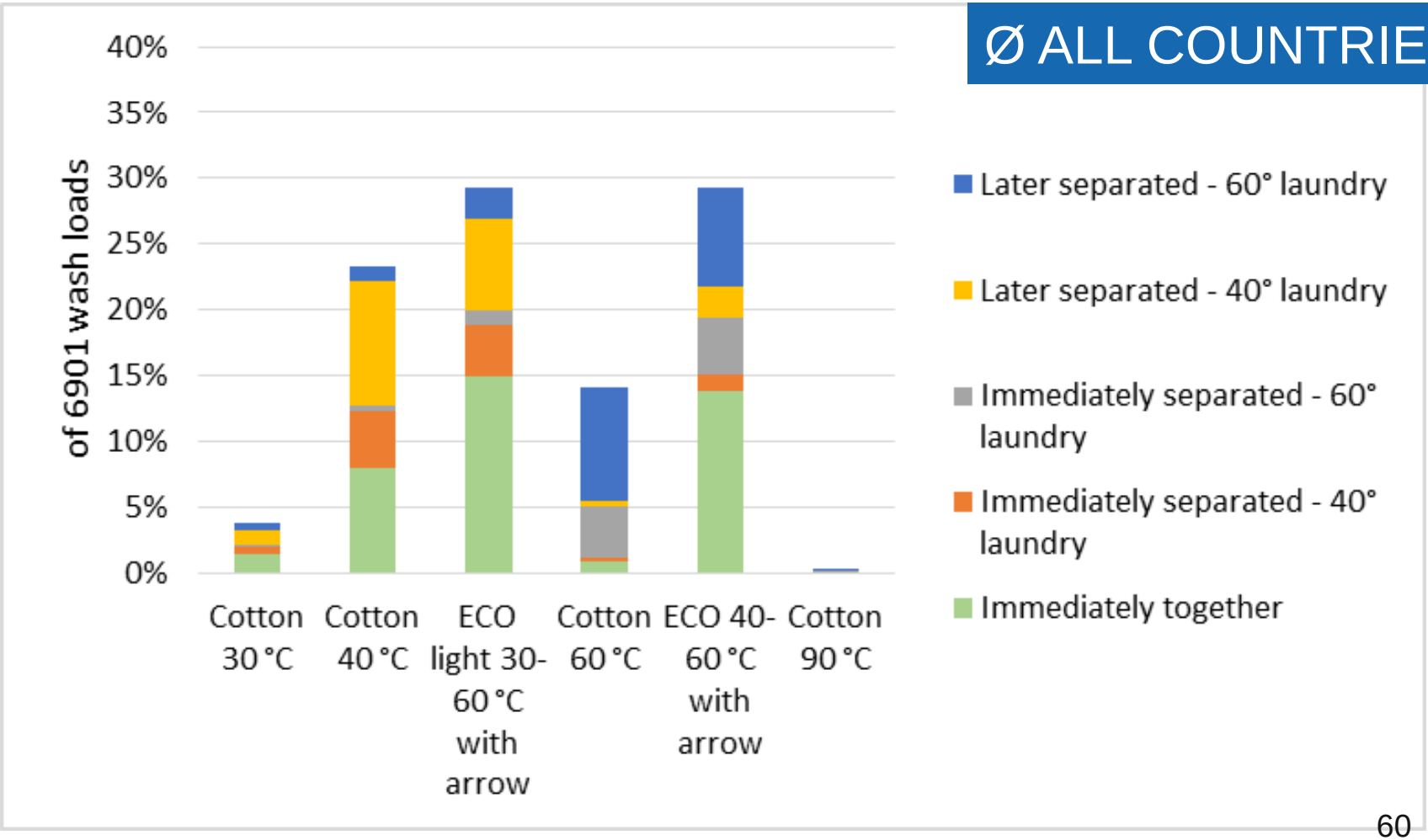
# Washing simulation BAU+ 25:75



# Washing simulation BAU+ 25:75



# Washing simulation ECO+ECO light 50:50



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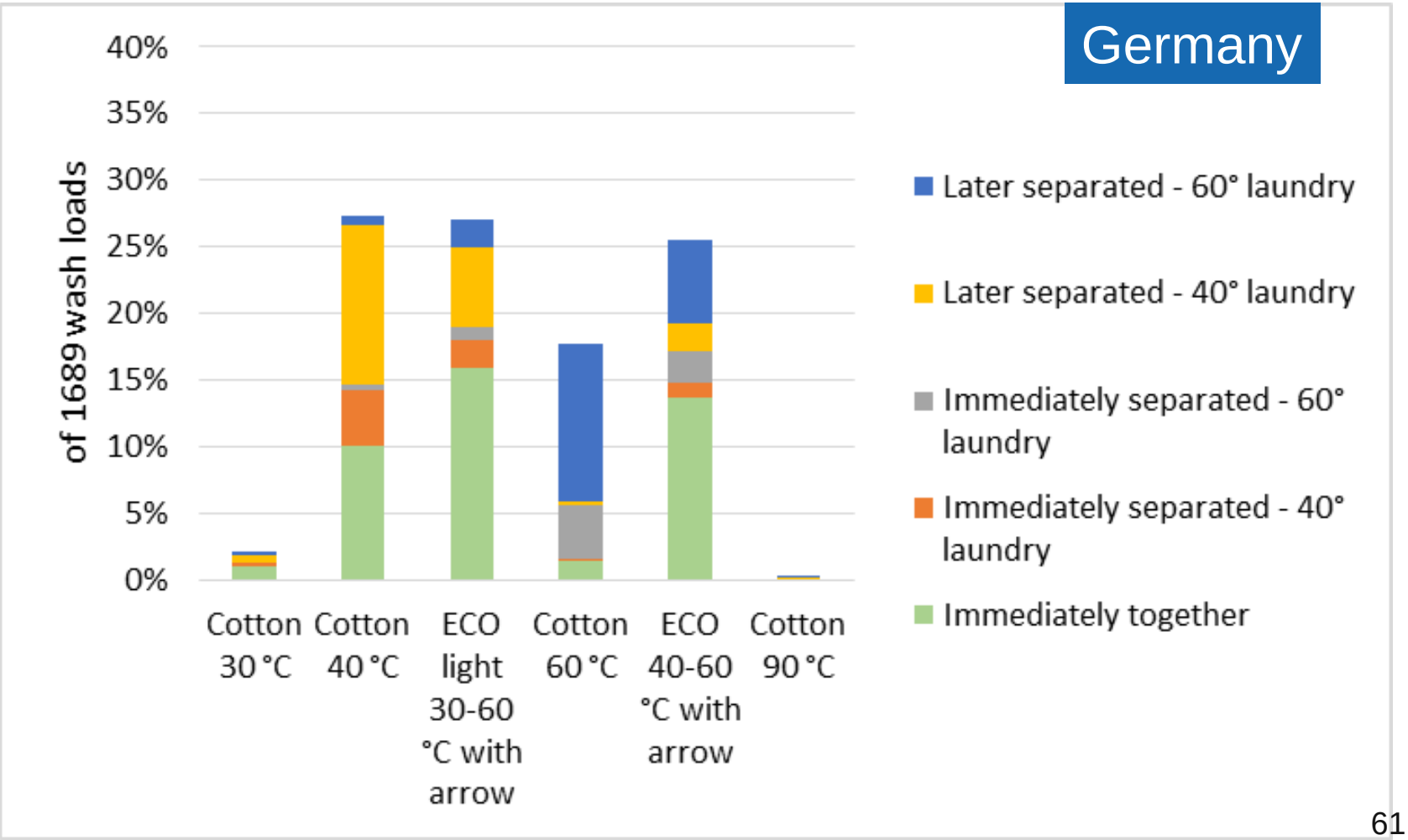

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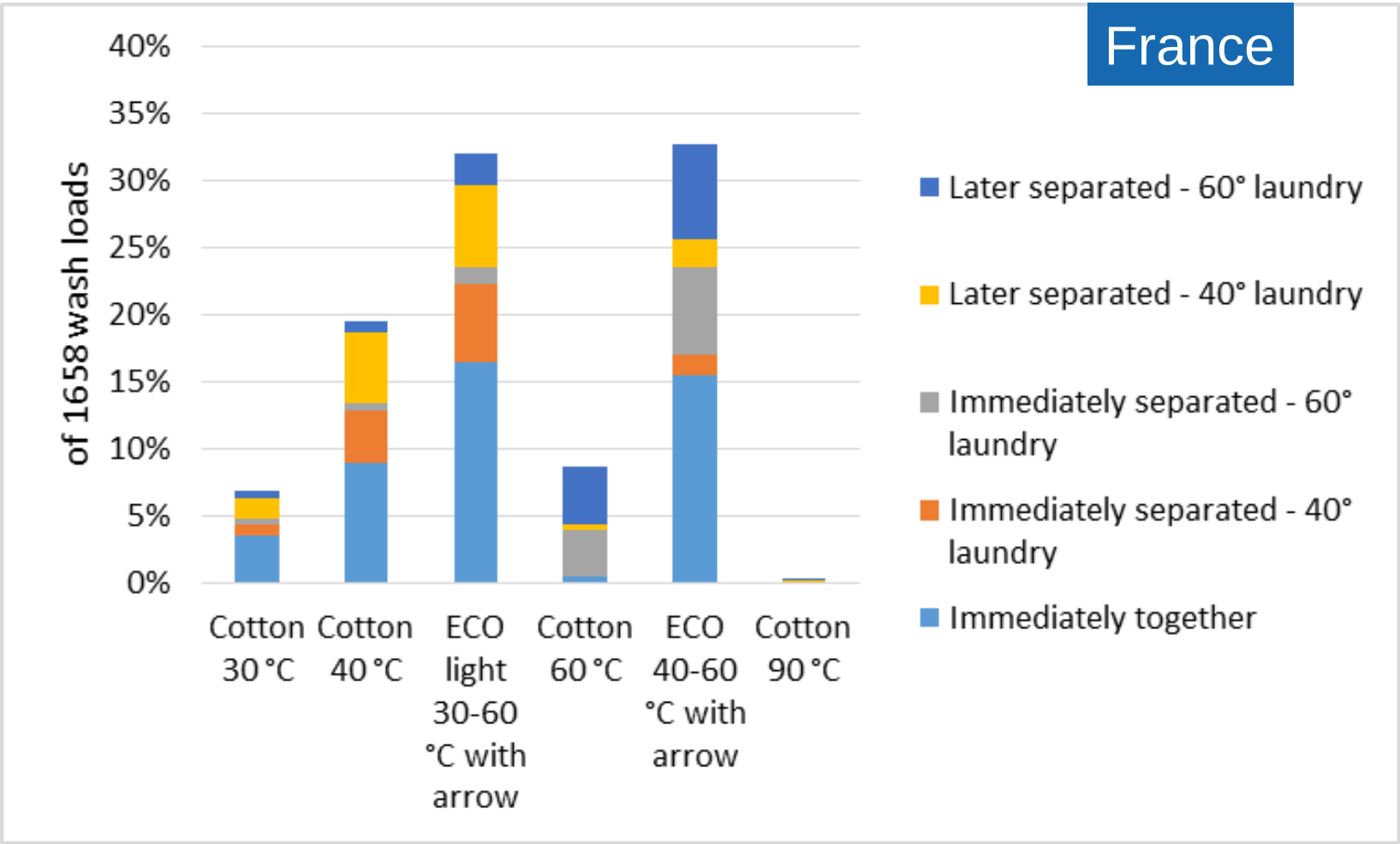

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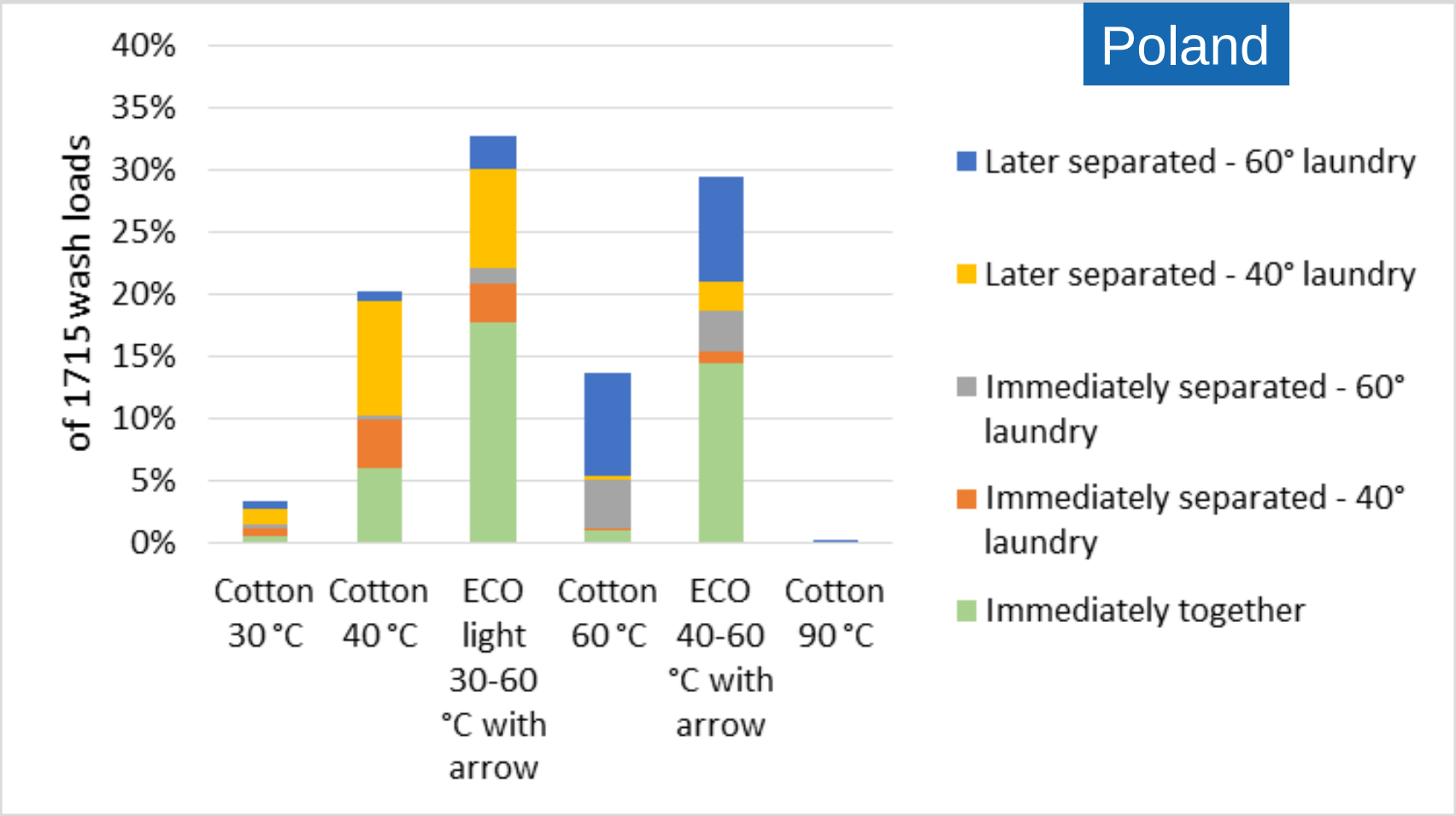

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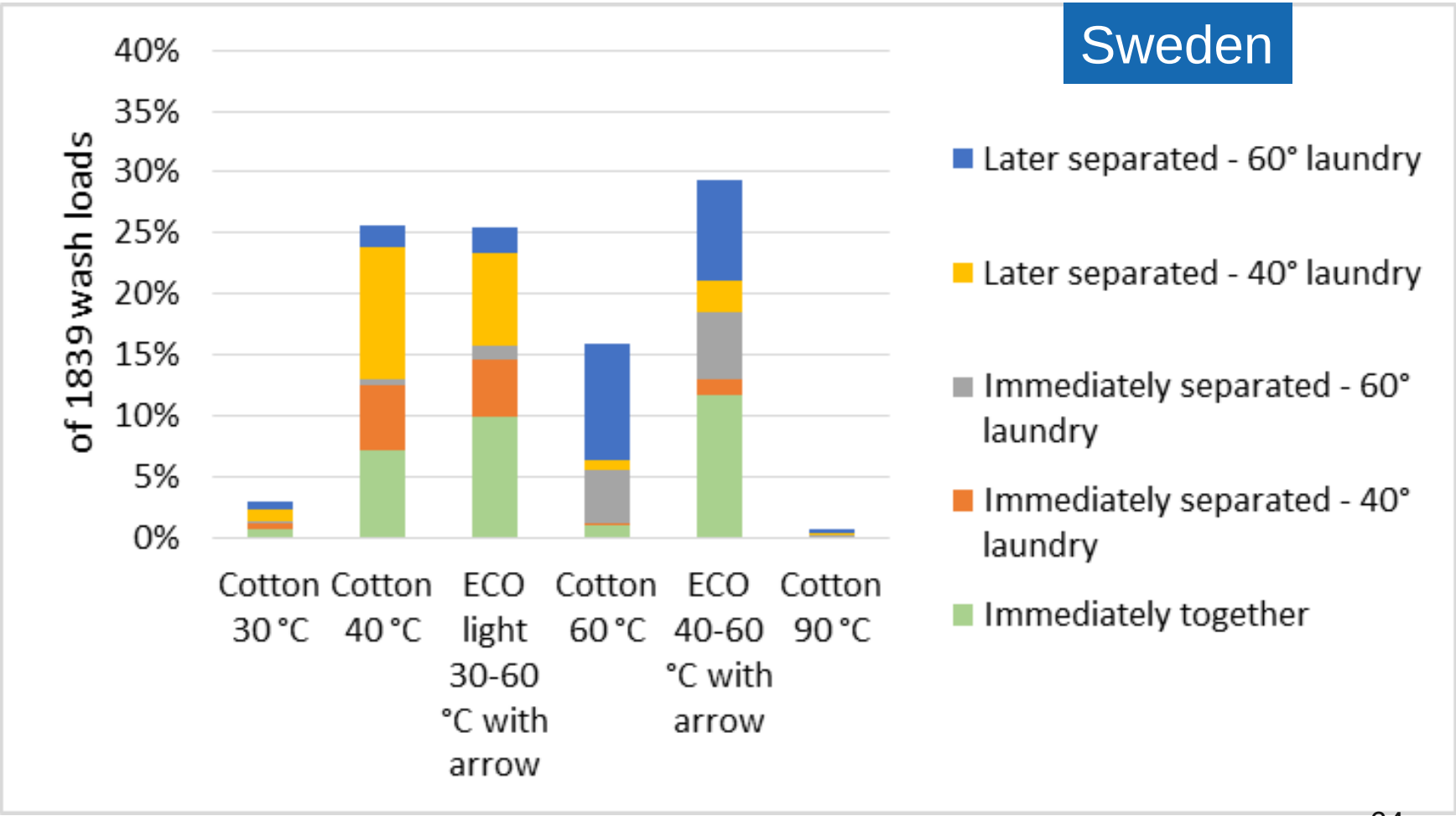
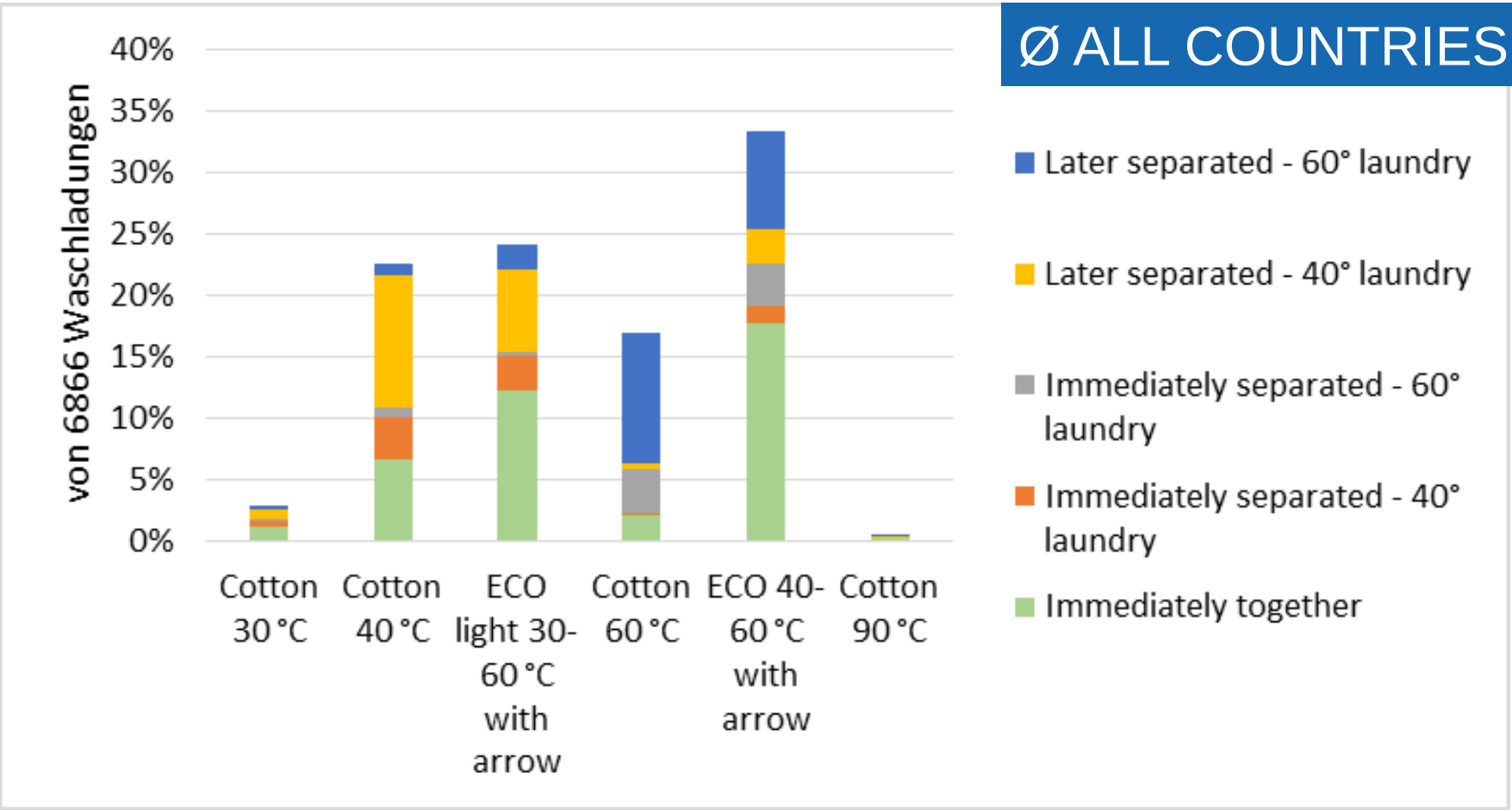
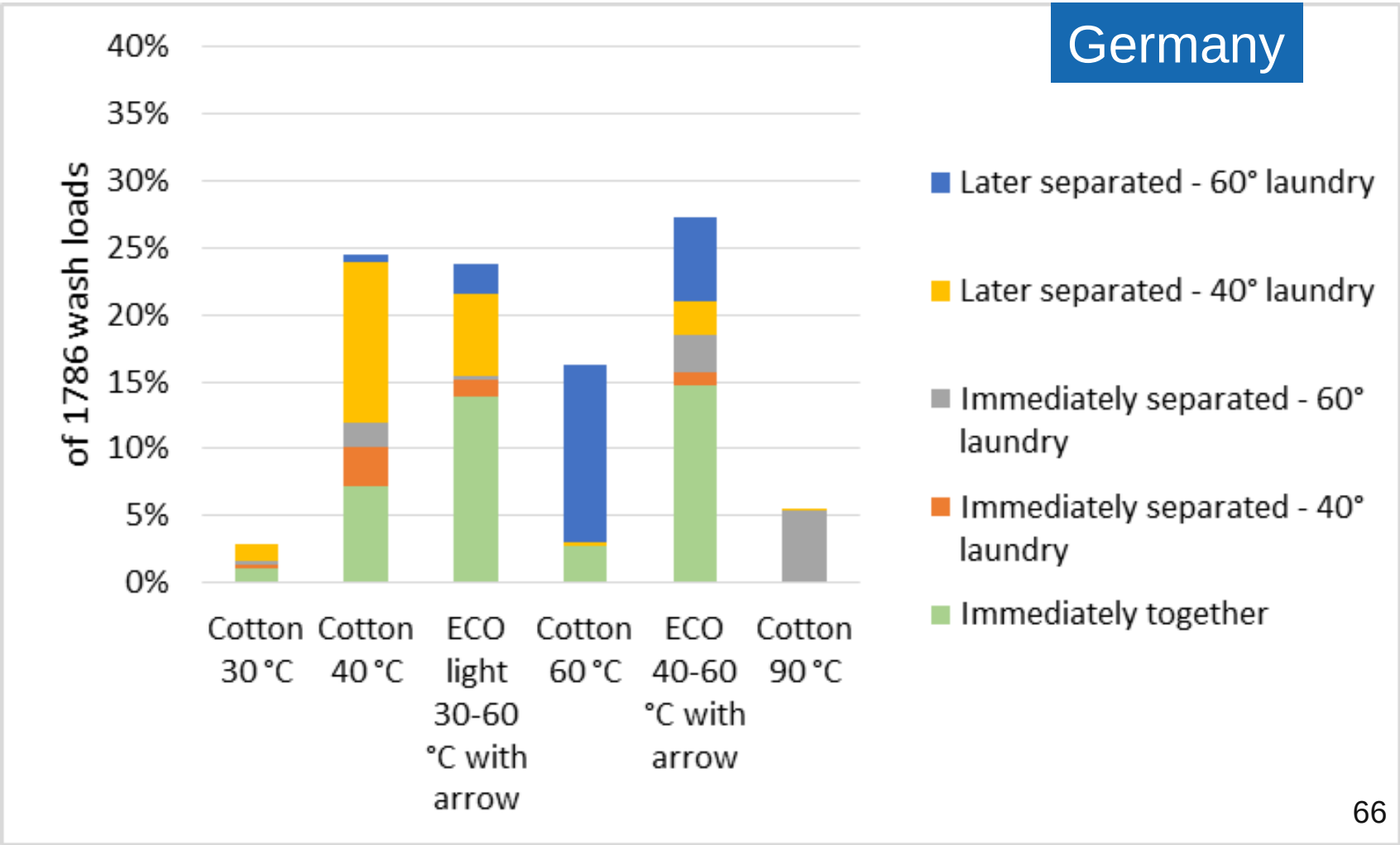


# Washing simulation ECO+ECO light 25:75

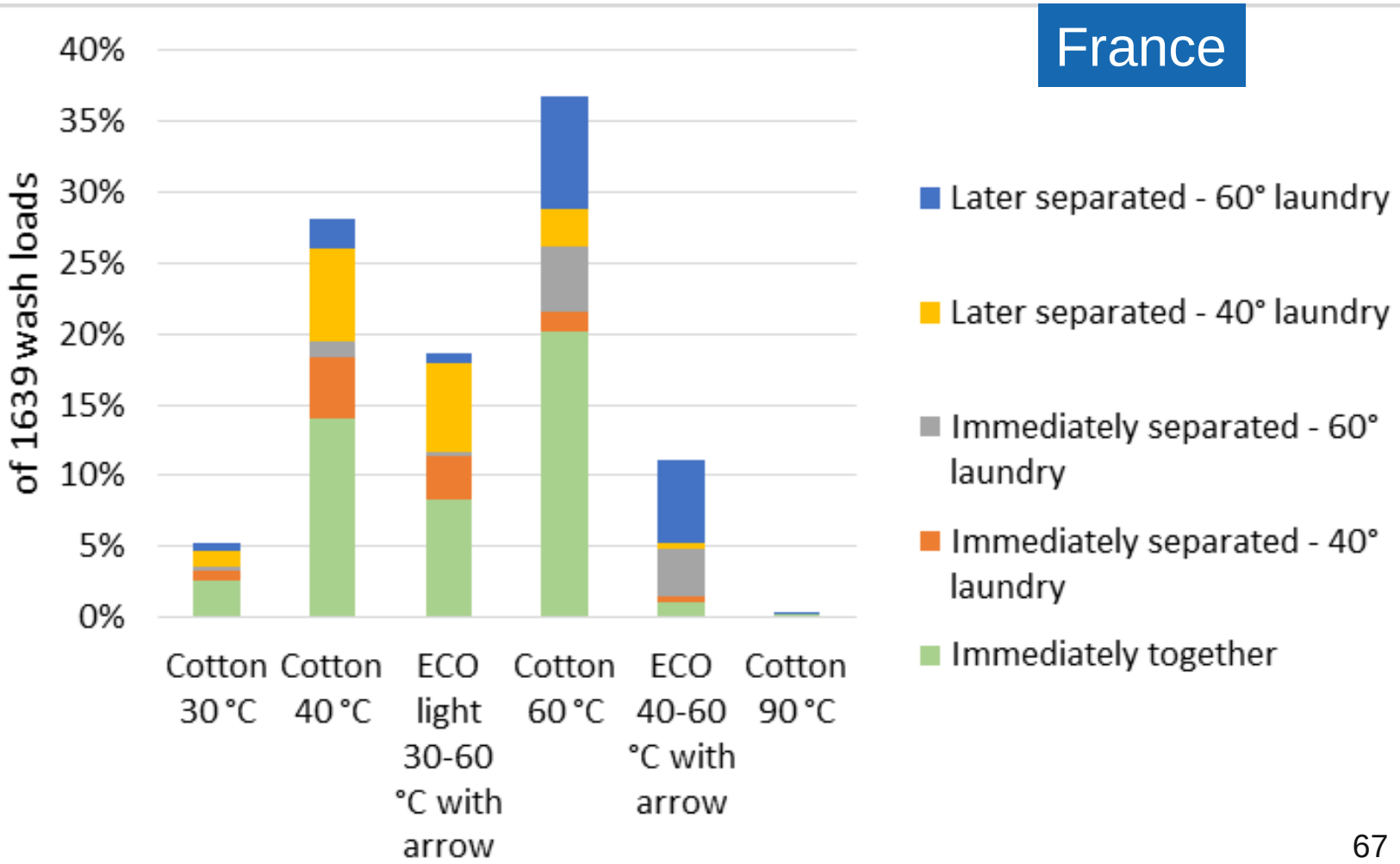


Washing simulations

# Washing simulation ECO+ECO light 25:75



# Washing simulation ECO+ECO light 25:75



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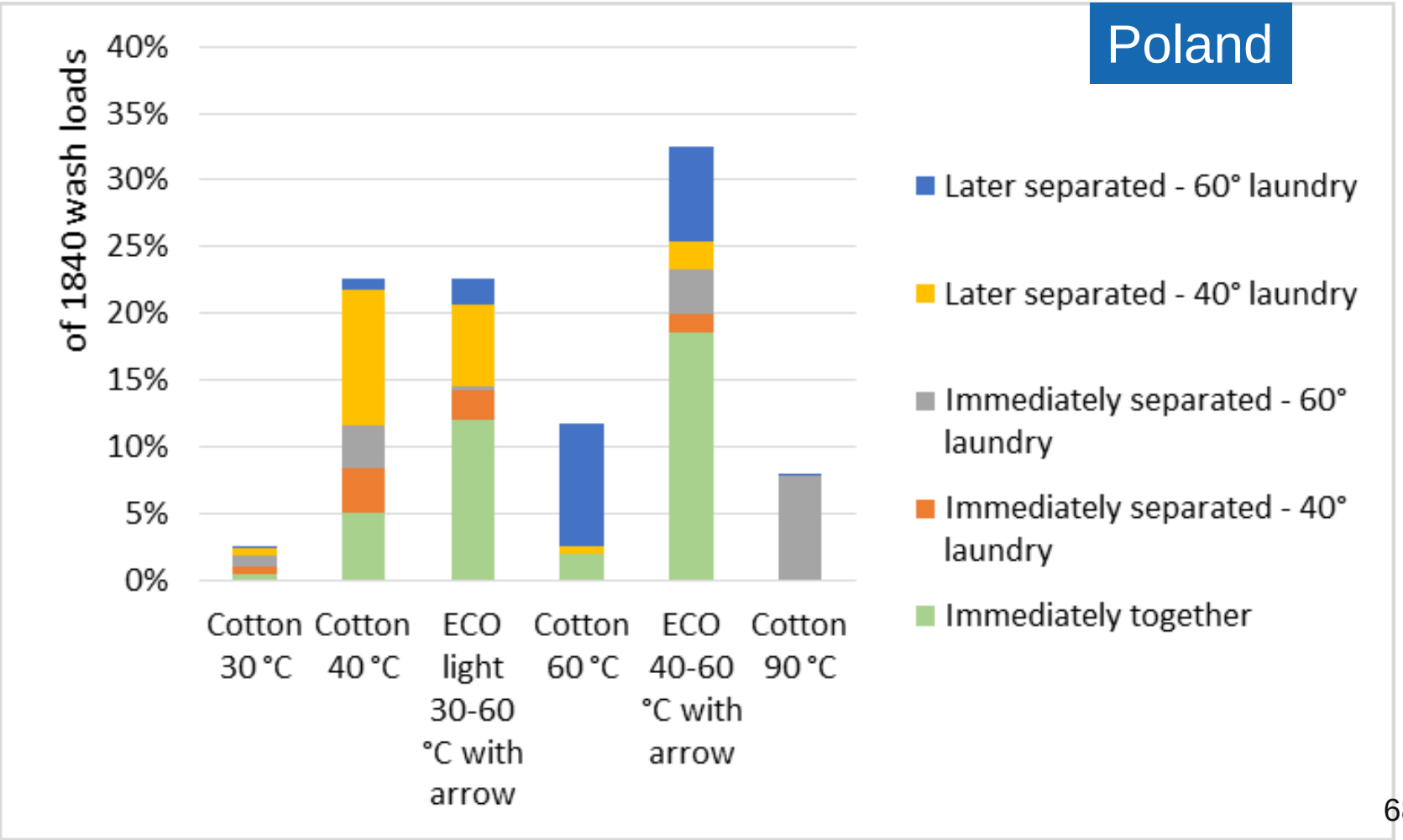

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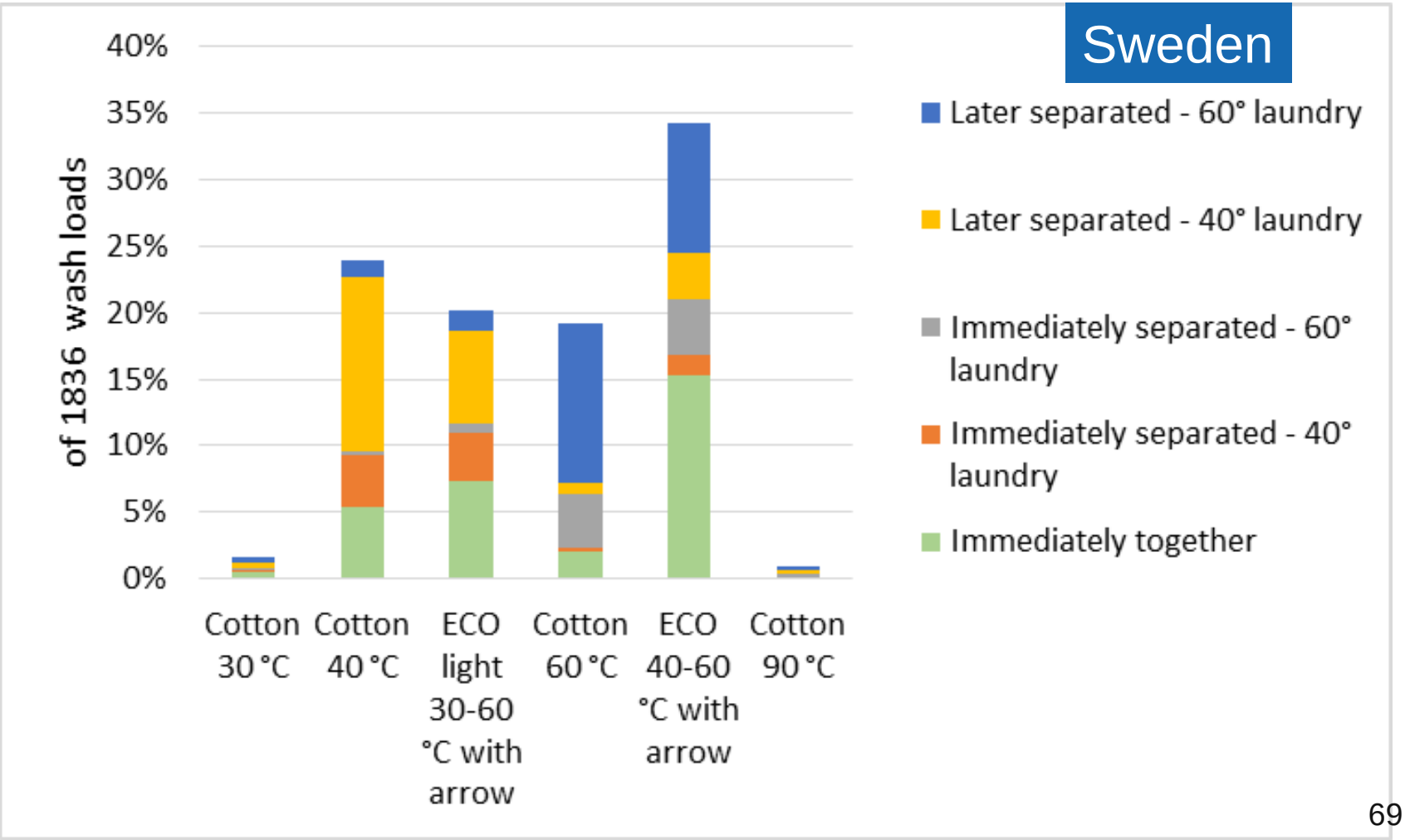

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# Consumer survey on the use of washing programmes in the context of new policy options proposed in the EU Ecodesign and Energy label revisions for washing machines

Scenario analysis – calculation of energy and water consumption of different policy scenarios (WP2)

Freiburg,
23 May 2017

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Federal Energy Efficiency Center (BfEE)


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# 1. Background of the BMWi consumer survey on washing machines

Regulation 1015/2010 on ecodesign of household washing machines, and Regulation 1061/2010 on energy labelling of household washing machines are currently under a review in light of technological progress. During 2014 and 2016, a preparatory study has been carried out for the European Commission's Directorate General for the Environment by the Directorate B - Growth and Innovation of the European Commission´s Joint Research Centre (JRC), with scientific support of Oeko Institut and University of Bonn.

Major conclusions of the preparatory study (final report to be published) are the following aspects:

- Broad programme range: Washing machines are characterised by offering a broad range of programmes, besides the standard cotton 40°/60°C programmes which are the basis for the Energy label. Usually, these other programmes are not optimised for energy efficiency to such extent as the standard programmes. However, a user survey in 2015 indicated that 90% of respondents expect or understand the label to represent the performance of the WM in all programmes, not only some of them.
- Minor use of standard programmes / other programmes for the same purpose: Especially for washing machines, the standard cotton 40°/60°C programmes that are used for testing the energy performance of the appliance are used in practice by consumers only to a minor extent (17% altogether, or 5% if considering only the programmes lasting more than 3 hours). Instead, there are other programmes for the same purpose (i.e. the 'normal' cotton 40°/60°C programmes) which are more often used (26% altogether) but which consume more energy and water than the standard programmes. In some appliances, consumers can also alter the standard cotton 40°/60°C programme by adding options such as ‘short’ or different temperatures. However, such alterations should have an influence on the energy and water efficiency of this programme.
- Long programme duration: The standard cotton 40°/60°C programmes, whose consumption values are displayed on the Energy label and thus influence the purchase decisions of consumers, are designed and configured to improve the energy efficiency, often at the expense of reducing the washing temperature and prolonging the programme duration (according to the Sinner’s Circle principle) – characteristics that are not fully convenient to consumers. The 2015 user survey indicates that the reluctance to use long programmes (beyond 3 hours) is large.
- Underloading combined with increase in rated capacity of machines: In general, consumer research shows that the average amount of load under real-life conditions is on average still only 3.3 kilogram per cycle for the cotton programmes, which is far away from full load conditions and also from the average 5 kg load used for measurement under standard conditions for a 7 kg capacity machine. In parallel, there is an apparent trend towards an increase of the rated load capacity of machines, for which it seems easier to reach good labels based on the current calculation formulas for the Energy label’s energy efficiency index make it easier for larger machines to reach good labels. However, the lower consumption per kilogram of laundry is only obtained if the machines are fully loaded, a condition difficulty met in households nowadays.
- According to the review study, important energy savings could be achieved by increasing the frequency of use of standard cotton programmes and the implementation of technical improvement options together with an increase of the loading.

Against this background, DG JRC proposed different policy scenarios which took the above listed challenges into account (OLD, BAU+, ECO, ECO+). These alternatives to the business-as-usual

(BAU) scenario answer in different ways the above mentioned constraints with regard to programme time, programme temperature, load, and the resulting washing performance.

Based on this information, the German Federal Ministry for Economic Affairs and Energy (BMWi) and the Federal Energy Efficiency Center (BfEE) launched the study "Consumer survey on the use of washing programmes in the context of new policy options proposed in the EU Ecodesign and Energy label revisions for washing machines." Main target of the consumer survey is to analyse, if energy and water saving washing behaviour of consumers based on their programme choices and loading attitudes can be triggered by the policy instruments EU Ecodesign and Energy label.

The consumer survey study is carried out by Oeko-Institut in cooperation with University of Bonn. The detailed concept of the consumer survey has been developed by University Bonn and Oeko-Institute, including feedback from an Advisory Group with representatives from the Federal Ministry of Economic Affairs and Energy (BMWi), the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), the Federal Environmental Agency (UBA), the Federal Energy Efficiency Center (BfEE), the Federal Institute for Materials Research and Testing (BAM), the Institute for Energy and Environmental Research (ifeu), and adelphi.

## 2. Explanatory notes regarding the consumer survey on washing machines

The consumer survey consists of different categories of questions: general socio demographic questions, questions with regard to the general understanding of the Energy label, questions on purchase decisions based on the Energy label, and finally questions regarding decisions on washing behaviour based on different washing machine panels reflecting the policy scenarios proposed in the EU revision study on household washing machines by DG JRC. Deviating from the policy scenarios proposed by DG JRC, the following variations have been made within the consumer survey based on the discussions within the Advisory Group.

Analysed policy scenarios: Business as Usual (BAU), Business as Usual adapted (BAU+), and ECO + ECO light. The policy scenario OLD proposed by DG JRC was not chosen for further analysis within this consumer survey. Reason: the policy scenario OLD does not foresee any regulation of the programme duration. However, it is expected, that this scenario would lead to the provision of parallel programmes with shorter programme duration after a certain time. Thus, OLD will probably induce another programme variety in future as simulated by the current consumer survey meaning that the results of the survey would not lead to reliable results for the regulation

**Policy scenario "BMWi BAU"**

Consisting of two standard cotton programmes for 40°C and 60°C which are optimised for energy efficiency by using reduced temperatures (30°C and 50°C) and prolonged programme durations (4 hours); in parallel, the machine offers regular cotton programmes for 40°C and 60°C at these indicated temperatures, but with shorter programme durations (1.5 hours and 2 hours).

**Table 1: Technical specifications of policy scenario "BMWi BAU"**

| Programme | Duration | Temperature | Energy consumption | Water consumption |
|---|---|---|---|---|
| Cotton 30°C | 1:30 h | 30°C | 0.37 kWh | 53.3 L |
| Normal cotton 40°C | 1:50 h | 40°C | 0.93 kWh | 64.0 L |
| Standard cotton 40°C (arrow) | 4:00 h | 30°C | 0.75 kWh | 51.2 L |

| Programme | Duration | Temperature | Energy consumption | Water consumption |
|---|---|---|---|---|
| Normal cotton 60°C | 2:00 h | 60°C | 1.18 kWh | 60.3 L |
| Standard cotton 60°C (arrow) | 4:00 h | 50°C | 0.97 kWh | 49.2 L |
| Cotton 90°C | 2:10 h | 90°C | 2.19 kWh | 66.8 L |

**Policy scenario "BMWi BAU+":**

For this scenario, the standard cotton programmes for 40°C and 60°C have been adapted by regulating the minimum temperatures not going below 35°C and 55°C, enabling slightly shorter programme durations compared to the BAU scenario (each 2.5 hours). The programmes are indicated with "ECO" on the machine's panel. In parallel, the machine still offers regular cotton programmes which are the same as in the BAU scenario. As the standard cotton programmes, which are the basis for the Energy label test measurements, are regulated regarding minimum temperature and maximum time, and thus limited in possible energy efficiency gains, it was decided that in this policy scenario, additionally a highly energy saving programme should be offered, which is not regulated by EU Ecodesign or Energy label. This programme (45°C at 5 hours wash time) is saving 40% energy compared to the regular cotton 60°C programme.

**Table 2: Technical specifications of policy scenario "BMWi BAU+"**

| Programme | Duration | Temperature | Energy consumption | Water consumption |
|---|---|---|---|---|
| Cotton 30 °C | 1:30 h | 30°C | 0.37 kWh | 53.3 L |
| Normal cotton 40 °C | 1:50 h | 40°C | 0.93 kWh | 64.0 L |
| Standard cotton 40 °C adapted (arrow) | 2:30 h | 35°C | 0.84 kWh | 51.2 L |
| Normal cotton 60 °C | 2:00 h | 60°C | 1.18 kWh | 60.3 L |
| Standard cotton 60 °C adapted (arrow) | 2:30 h | 55°C | 1.07 kWh | 49.2 L |
| Cotton 90 °C | 2:10 h | 90°C | 2.19 kWh | 66.8 L |
| ECO+Leaf | 5:00 h | 45°C | 0.82 kWh | 46.5 L |

**Policy scenario "BMWi ECO + ECO light":**

In parallel to the regular cotton programmes for 40°C and 60°C, which are the same as in the BAU scenario, in this policy scenario two combination programmes for textiles labelled from 30°C to 60°C for lightly soiled laundry, and for textiles labelled from 40°C to 60°C for normally soiled laundry are offered, indicated ECO 30-60°C and ECO 40-60°C. The washing temperatures are 30°C and 40°C respectively; the programme duration is reduced to 3 hours. As these programmes are already rather energy saving, no additional "super ECO" programme has been offered.

**Table 3: Technical specifications of policy scenario "BMWi ECO + ECO light"**

| Programme | Duration | Temperature | Energy consumption | Water consumption |
|---|---|---|---|---|
| Cotton 30°C | 1:30 h | 30°C | 0.37 kWh | 53.3 L |
| Cotton ECO light 30-60°C (arrow) | 3:00 h | 30°C | 0.78 kWh | 51.2 L |
| Cotton 40°C | 1:50 h | 40°C | 0.93 kWh | 64.0 L |

| Programme | Duration | Temperature | Energy consumption | Water consumption |
|---|---|---|---|---|
| Cotton ECO 40-60°C (arrow) | 3:00 h | 40°C | 0.84 kWh | 49.2 L |
| Cotton 60°C | 2:00 h | 60°C | 1.18 kWh | 60.3 L |
| Cotton 90°C | 2:10 h | 90°C | 2.19 kWh | 66.8 L |

## 3. Results of the EU consumer survey on washing machines[1] relevant for the EU Ecodesign and Energy label regulations

The following summarized results of the BMWi consumer survey 2017 are seen as most relevant for the overall revision of the EU Ecodesign and Energy label regulations:

### Purchase decision

- With the current EL, consumers choose within a certain (same) Energy Efficiency class the model with the lowest annual energy consumption.
- If the time is provided as additional information on the EL, the clear preference of low energy consumption is reduced; a relevant share of consumers shift to appliances with shorter programme durations indicated on the label.

### Washing behaviour

- BAU: The shorter regular cotton programmes are used more frequently compared to the longer lasting standard cotton programmes.
- BAU+: Compared to the BAU scenario, consumers are more willing to choose the Energy Label programmes for cotton 40° and 60° if their programme duration is limited. Additional, even 10% of consumers also choose the highly energy saving ECO+ programme which is not regulated (low temperatures, long programme duration).
- ECO/ECO light: These (new) combination programmes are even used more frequently compared to the regular cotton programmes. Further, people start combining their wash loads instead of washing separately which means that the overall number of wash cycles will decrease in the households leading to further energy savings.
- Consumers preferred ECO/arrow as indication of an energy saving programme. The current arrow symbol was ranked last in all countries.
- Although consumer organisations have strong doubts about consumers' understanding and acceptance of presenting 40° and 60° together in the naming of a wash programme, the survey revealed that such programmes showing the range of temperatures (ECO 40-60°C, i.e. not ECO 40/60°C) is accepted and chosen by consumers; it might reflect a behaviour consumers already do, i.e. washing certain (e.g. lightly soiled) 60°C-labelled textiles at 40°C.
- It is expected that the additional programme information provided via icon in the survey (equivalent to information in the manual) might be also provided via display in future machines.

[1] The BMWi consumer survey 2017 was conducted in 4 European countries Germany, France, Poland and Sweden which reflect a broad range of different washing behaviours and acceptance of longer programme duration throughout Europe. Further, these Member states represent Northern, Eastern, Western and Southern European countries. The consumer survey is representative with regard to the attributes age and household size for each of the analysed countries. The panel is based on 1200 valid participants per country which is seen as sufficient for the representativeness of the overall results. Detailed results in a separate document!

# 4. Scenario analysis – calculation of energy and water consumption of different policy scenarios

In April 2017, DG JRC verbally proposed the following idea for a policy scenario which will be included in the following calculation of policy scenarios (Work Package 2 of the overall BMWi study):

**Policy scenario "JRC new":**

"Cotton 40°C" with a fixed minimum temperature of 40°C as sole standard programme for the Energy Label, as this is the programme most used by consumers. The cotton 60°C programme will only be regulated under Ecodesign with a cap on the total energy consumption to restrict rather high consuming 60°C cotton programmes. On this basis, it is assumed that no parallel cotton 40°C and 60°C programmes with longer programme durations and/or lower temperatures than indicated are offered on the machines any more as there will be no need for this. Further, it is not regulated that machines shall offer any energy saving programme, so it is assumed that machines will not provide such programmes any more.

**Table 4: Technical specifications of policy scenario "JRC new"**

| Programme | Duration | Wash temperature | Energy consumption | Water consumption |
|---|---|---|---|---|
| Cotton 30 °C | 1:30 h | 30 °C | 0.37 kWh | 53.3 L |
| Cotton 40 °C | 1:50 h | 40 °C | 0.93 kWh | 64.0 L |
| Cotton 60 °C | 2:00 h | 60 °C | 1.18 kWh | 60.3 L |
| Cotton 90 °C | 2:10 h | 90 °C | 2.19 kWh | 66.8 L |

## 4.1. Input data and data sources

### 4.1.1. Use share of washing programmes in the different policy scenarios

**Table 5: Input data on use shares of washing programmes in the different policy scenarios**

| Programme | For comparison: Use share scenario JRC BAU (Source JRC) | Use share scenario BMWi BAU (Sources BMWi,JRC) | Use share scenario BMWi BAU+ (Sources BMWi,JRC) | Use share scenario ECO / ECO light (Sources BMWi,JRC) | Use share scenario JRC new (own assumption) |
|---|---|---|---|---|---|
| Cotton 30°C | 10,5% | 2,2% | 1,5% | 2,0% | 2,2% |
| Normal cotton 40°C | 15,8% | 21,5% | 15,2% | 14,0% | 34,3% |
| Standard cotton 40°C | 10,5% | 12,9% | 15,2% | --- | --- |
| ECO light 30-60°C | --- | --- | --- | 16,3% | --- |
| Normal cotton 60°C | 11,6% | 15,0% | 10,5% | 9,4% | 24,1% |
| Standard cotton 60°C | 7,4% | 9,1% | 11,8% | --- | --- |
| ECO 40-60°C | --- | --- | --- | 19,1% | --- |
| Cotton 90°C | 5,3% | 0,4% | 0,4% | 0,2% | 0,4% |
| Cotton 60°C, ECO+leaf | --- | --- | 6,5% | --- | --- |
| Cotton 20°C | 4,2% | 4,2% | 4,2% | 4,2% | 4,2% |
| Synthetic/easy care | 11,6% | 11,6% | 11,6% | 11,6% | 11,6% |
| Mix, rated capacity | 9,5% | 9,5% | 9,5% | 9,5% | 9,5% |
| Super quick (20-30 min) | 5,4% | 5,4% | 5,4% | 5,4% | 5,4% |
| Normal quick (45-70 min) | 8,3% | 8,3% | 8,3% | 8,3% | 8,3% |
| **Use share of programmes of the consumer survey** | **61,1%** | | | | |
| **Use share of all other programmes** | **38,9%** | | | | |

**Data sources**

For comparison, the second column shows the original use share of programmes indicated in the JRC Ecodesign revision study on washing machines and washer dryers for the scenario JRC BAU.

For all policy scenarios, the use share of programmes marked grey in the lower section of the table (Cotton 20°C to Normal quick programme, with a total use share of approximately 39%) are taken unmodified from the JRC Ecodesign revision study on washing machines and washer dryers.

For the BMWi scenarios BAU, BAU+ and ECO/ECO light, the remaining cotton programmes marked light blue in the upper section of the table (Cotton 30°C to Cotton 60°C ECO+leaf, with a total use share of approximately 61%), the actual use shares resulting out of the BMWi consumer survey 2017 were taken as basis, but scaled up to a total use share of 61% of these wash programmes.

For the scenario JRC new, the use shares of the BMWi scenario BAU have been assumed as basis, further assuming that all users of standard cotton 40°C and 60°C will use the respective normal cotton 40° and 60°C programmes instead.

### 4.1.2. Wash load of washing programmes in the different policy scenarios

**Table 6: Input data on full and partial loads in the different washing programmes**

| Programme | Wash load (kg) partial load (Source: JRC) | Wash load (kg) full load (Source: JRC) |
|---|---|---|
| Cotton 30°C | 3,4 | 7,0 |
| Normal cotton 40°C | 3,4 | 7,0 |
| Standard cotton 40°C | 3,4 | 7,0 |
| ECO light 30-60°C | 3,4 | 7,0 |
| Normal cotton 60°C | 3,4 | 7,0 |
| Standard cotton 60°C | 3,4 | 7,0 |
| ECO 40-60°C | 3,4 | 7,0 |
| Cotton 90°C | 3,4 | 7,0 |
| Cotton 60°C, ECO+leaf | 3,4 | 7,0 |
| Cotton 20°C | 3,4 | 7,0 |
| Synthetic/easy care | 2,8 | 4,0 |
| Mix, rated capacity | 3,7 | 5,0 |
| Super quick (20-30 min) | 1,8 | 2,8 |
| Normal quick (45-70 min) | 3,8 | 4,5 |
| **Average sum of wash load over all wash programmes** | 3,3 | 6,0 |

**Data sources**

For some programmes, according to the user manual the maximum capacity to be used is lower than the full rated capacity of the washing machine. Further, it is known from literature that consumers often do not use the full rated capacity for several programmes.

The table above shows the wash loads of the different programmes for full and partial load as indicated in the JRC Ecodesign revision study on washing machines and washer dryers for the scenario JRC BAU. For the cotton programmes ECO / ECO light and Cotton 60°C ECO+leaf, it has been assumed that they have the same wash loads as the other cotton programmes.

Based on the use share of the specific programmes, the average sum of wash load over all programmes is calculated to be 3.3 kg for partial load and 6.0 kg for full load condition. These values have been taken as basis for all scenario calculations.

For partial loads, DG JRC has taken specific correction factors for the energy and water consumption of each washing programme to calculate the consumption values based on the values for full load.

### 4.1.3. Energy consumption of washing programmes in the different policy scenarios

**Table 7: Input data on energy consumption of washing programmes in the different policy scenarios**

| Programme | energy consumption (kWh/cycle) JRC BAU (full load) | energy consumption (kWh/cycle) BMWi BAU (full load) | energy consumption (kWh/cycle) BMWi BAU+ (full load) | energy consumption (kWh/cycle) BMWi ECO/ECO light (full load) | energy consumption (kWh/cycle) JRC new (full load) |
|---|---|---|---|---|---|
| Cotton 30°C | 0,37 | 0,37 | 0,37 | 0,37 | 0,37 |
| Normal cotton 40°C | 0,93 | 0,93 | 0,93 | 0,93 | 0,93 |
| Standard cotton 40°C | 0,75 | 0,75 | 0,84 | --- | --- |
| ECO light 30-60°C | --- | --- | --- | 0,78 | --- |
| Normal cotton 60°C | 1,18 | 1,18 | 1,18 | 1,18 | 1,18 |
| Standard cotton 60°C | 0,97 | 0,97 | 1,07 | --- | --- |
| ECO 40-60°C | --- | --- | --- | 0,84 | --- |
| Cotton 90°C | 2,19 | 2,19 | 2,19 | 2,19 | 2,19 |
| Cotton 60°C, ECO+leaf | --- | --- | 0,82 | --- | --- |
| Cotton 20°C | 0,33 | 0,33 | 0,33 | 0,33 | 0,33 |
| Synthetic/easy care | 0,63 | 0,63 | 0,63 | 0,63 | 0,63 |
| Mix, rated capacity | 0,74 | 0,74 | 0,74 | 0,74 | 0,74 |
| Super quick (20-30 min) | 0,21 | 0,21 | 0,21 | 0,21 | 0,21 |
| Normal quick (45-70 min) | 0,51 | 0,51 | 0,51 | 0,51 | 0,51 |

#### Data sources

For comparison, the second column shows the original energy consumption of programmes indicated in the JRC Ecodesign revision study on washing machines and washer dryers for the scenario JRC BAU. The consumption values of policy scenario BMWi BAU correspond to JRC BAU.

For all policy scenarios, the energy consumption of programmes marked grey in the lower section of the table (Cotton 20°C to Normal quick programme, with a total use share of approximately 39%) is taken unmodified from the JRC Ecodesign revision study on washing machines and washer dryers. Also, the energy consumption of the following programmes in the upper section of the table has not been altered compared to scenario JRC BAU: cotton 30°C, normal cotton 40°C and 60°C, as well as cotton 90°C.

The notably lower energy consumption of the quick programmes (super quick, normal quick) have their limits due to the following reasons: a) these programmes are only suitable for very lightly soiled clothes, i.e. their washing performance is worse compared to the cotton programmes; and b) they are designed for lower total wash loads only (cf. Table 6).

#### Assumptions

**Table 8: Input data on temperature, time and energy consumption of the Energy labelling washing programmes in the different policy scenarios**

| | Standard cotton 40°C (BAU) | ECO light 30-60 °C (ECO) | Standard cotton 40°C (BAU+) | ECO 40-60 °C (ECO) | Cotton 60°C ECO+leaf (BAU+) | Standard cotton 60°C (BAU) | Standard cotton 60°C (BAU+) |
|---|---|---|---|---|---|---|---|
| Temperature | 30 °C | 30 °C | 35 °C | 40 °C | 45 °C | 50 °C | 55 °C |
| Duration | 4 h | 3 h | 2,5 h | 3 h | 5 h | 4 h | 2,5 h |
| Energy consumption | 0,75 kWh | 0,78 kWh | 0,84 kWh | 0,84 kWh | 0,82 kWh | 0,97 kWh | 1,07 kWh |

- Scenario BMWi BAU+:
  - Compared to BMWi BAU, the energy consumption of the adapted standard cotton 40°C and 60°C programmes slightly increases due to the slightly higher washing temperatures combined with shorter programme durations. The mean value of the normal cotton 40°C and the standard cotton 40°C has been taken as basis for the adapted standard cotton 40°C in the BMWi scenario BAU+, and for the 60°C programmes accordingly.
  - The programme “Cotton 60°C ECO+leaf” (45°C, 5h) is assumed to have a lower energy consumption both compared to the standard cotton 60°C programme of BAU (50°C, 4h) and the standard cotton 60°C adapted of BAU+ (55°C, 2.5h). On the other hand, the energy consumption is higher compared to “ECO light 30-60°C” (for lightly soiled clothes) as the washing performance is required to be for *normally* soiled clothes, thus being rather comparable to the other 60°C cotton programmes.
- Scenario BMWi ECO / ECO light:
  - The programme ECO light 30-60°C is comparable to the standard cotton 40°C programme of BAU, only with slightly shorter programme duration, so that the energy consumption is assumed to be slightly higher. Compared to the normal cotton 30°C programme (0.37 kWh), the energy consumption of ECO light 30-60°C is rather higher (0.78 kWh), as for the latter on the one hand, the required washing performance is higher and on the other hand, the normal cotton 30°C programme is not regulated at all, so that the indicated value is based on self-declarations of manufacturers without standard measurements.
  - The programme ECO 40-60°C is assumed to be comparable to the adapted standard cotton 40°C programme of scenario BAU+, as slightly higher temperature combined with slightly longer programme duration.
- Scenario JRC new:
  - Due to a regulated fixed minimum temperature (40°C) of the future cotton 40°C programme taken as basis for the Energy labelling measurements, the energy consumption is assumed to correspond to that of the normal cotton 40°C programme as no more savings are expected.
  - For the 60°C programme, which will not be regulated under the Energy label any more in this policy scenario, the consumption value of normal cotton 60°C of BMWi BAU has been taken; even though this programme will be regulated under EU Ecodesign, the maximum cap on the energy consumption is expected to be beyond this value.

### 4.1.4. Water consumption of washing programmes in the different policy scenarios

**Table 9: Input data on water consumption of washing programmes in the different policy scenarios**

| Programme | water consumption (L/cycle) JRC BAU (full load) | water consumption (L/cycle) BMWi BAU (full load) | water consumption (L/cycle) BMWi BAU+ (full load) | water consumption (L/cycle) BMWi ECO / ECO light (full load) | water consumption (L/cycle) JRC new (full load) |
|---|---|---|---|---|---|
| Cotton 30°C | 53,3 | 53,3 | 53,3 | 53,3 | 53,3 |
| Normal cotton 40°C | 64,0 | 64,0 | 64,0 | 64,0 | 64,0 |
| Standard cotton 40°C | 51,2 | 51,2 | 51,2 | --- | --- |
| ECO light 30-60°C | --- | --- | --- | 51,2 | --- |
| Normal cotton 60°C | 60,3 | 60,3 | 60,3 | 60,3 | 60,3 |
| Standard cotton 60°C | 49,2 | 49,2 | 49,2 | --- | --- |
| ECO 40-60°C | --- | --- | --- | 49,2 | --- |
| Cotton 90°C | 66,8 | 66,8 | 66,8 | 66,8 | 66,8 |
| Cotton 60°C, ECO+leaf | --- | --- | 46,5 | --- | --- |
| Cotton 20°C | 82,9 | 82,9 | 82,9 | 82,9 | 82,9 |
| Synthetic/easy care | 62,0 | 62,0 | 62,0 | 62,0 | 62,0 |
| Mix, rated capacity | 68,6 | 68,6 | 68,6 | 68,6 | 68,6 |
| Super quick (20-30 min) | 34,8 | 34,8 | 34,8 | 34,8 | 34,8 |
| Normal quick (45-70 min) | 49,5 | 49,5 | 49,5 | 49,5 | 49,5 |

**Data sources**

For comparison, the second column shows the original water consumption of programmes indicated in the JRC Ecodesign revision study on washing machines and washer dryers for the scenario JRC BAU. The consumption values of policy scenario BMWi BAU correspond to JRC BAU.

For all policy scenarios, the water consumption of programmes marked grey in the lower section of the table (Cotton 20°C to Normal quick programme, with a total use share of approximately 39%) is taken unmodified from the JRC Ecodesign revision study on washing machines and washer dryers. Also, the water consumption of the following programmes in the upper section of the table has not been altered compared to scenario JRC BAU: cotton 30°C, normal cotton 40°C and 60°C, as well as cotton 90°C.

**Assumptions:**

It is expected that the adaptations of temperature and time do not have notable influence on the water consumption of the washing programmes being basis for the Energy label measurements.

**Table 10: Input data on water consumption of the Energy labelling washing programmes in the different policy scenarios**

| | Standard cotton 40°C (BAU) | ECO light 30-60 °C (ECO) | Standard cotton 40°C (BAU+) | ECO 40-60 °C (ECO) | Cotton 60°C ECO+leaf (BAU+) | Standard cotton 60°C (BAU) | Standard cotton 60°C (BAU+) |
|---|---|---|---|---|---|---|---|
| Temperature | 30 °C | 30 °C | 35 °C | 40 °C | 45 °C | 50 °C | 55 °C |
| Time | 4 h | 3 h | 2,5 h | 3 h | 5 h | 4 h | 2,5 h |
| Water consumption | 51.2 L | 51.2 L | 51.2 L | 49.2 L | 46.5 L | 49.2 L | 49.2 L |

## 4.2. Results of the scenario analysis – single scenarios

### 4.2.1. Policy scenario "BMWi BAU"

**Table 11: Energy and water consumption of the scenario BMWi BAU**

| Programmes, Scenario BMWi BAU | Use share of programmes (%) (Sources: BMWi,JRC) | Wash load (kg) partial load (Source: JRC) | Wash load (kg) full load (Source: JRC) | Energy consumption (kWh/cycle) partial load | Energy consumption (kWh/cycle) full load | Water consumption (L/cycle) partial load | Water consumption (L/cycle) full load |
|---|---|---|---|---|---|---|---|
| Cotton 30°C | 2,2% | 3,4 | 7,0 | 0,22 | 0,37 | 36,4 | 53,3 |
| Normal cotton 40°C | 21,5% | 3,4 | 7,0 | 0,71 | 0,93 | 43,6 | 64,0 |
| Standard cotton 40°C | 12,9% | 3,4 | 7,0 | 0,60 | 0,75 | 34,9 | 51,2 |
| ECO light 30-60°C | --- | --- | --- | --- | --- | --- | --- |
| Normal cotton 60°C | 15,0% | 3,4 | 7,0 | 0,98 | 1,18 | 41,1 | 60,3 |
| Standard cotton 60°C | 9,1% | 3,4 | 7,0 | 0,80 | 0,97 | 33,5 | 49,2 |
| ECO 40-60°C | --- | --- | --- | --- | --- | --- | --- |
| Cotton 90°C | 0,4% | 3,4 | 7,0 | 1,93 | 2,19 | 45,5 | 66,8 |
| Cotton 60°C, ECO+leaf | --- | --- | --- | --- | --- | --- | --- |
| Cotton 20°C | 4,21% | 3,4 | 7,0 | 0,18 | 0,33 | 56,5 | 82,9 |
| Synthetic/easy care | 11,58% | 2,8 | 4,0 | 0,52 | 0,63 | 53,1 | 62,0 |
| Mix, rated capacity | 9,47% | 3,7 | 5,0 | 0,63 | 0,74 | 59,0 | 68,6 |
| Super quick (20-30 min) | 5,35% | 1,8 | 2,8 | 0,12 | 0,21 | 29,5 | 34,8 |
| Normal quick (45-70 min) | 8,33% | 3,8 | 4,5 | 0,46 | 0,51 | 45,3 | 49,5 |
| **Scenario BMWi BAU** | **100%** | **3,3** | **6,0** | **0,633** | **0,789** | **43,55** | **58,45** |
| **For comparison: Scenario JRC BAU** | | **3,3** | **6,0** | **0,644** | **0,798** | **43,50** | **58,37** |

Comparing JRC BAU and BMWi BAU, the total energy and water consumption per cycle over all wash programmes hardly differ despite different use shares of the cotton programmes: the water consumption of BMWi BAU is with 0.1% deviation nearly identical to JRC BAU; the energy consumption of BMWi BAU is 1.1% (full load) and 1.6% (partial load) lower compared to JRC BAU. The reason is probably the lower use share of cotton 90°C in the scenario BMWi BAU compared to JRC BAU.

### 4.2.2. Policy scenario "BMWi BAU+"

**Table 12: Energy and water consumption of the scenario BMWi BAU+**

| Programmes, Scenario BMWi BAU+ | Use share of programmes (%) (Sources: BMWi,JRC) | Wash load (kg) partial load (Source: JRC) | Wash load (kg) full load (Source: JRC) | Energy consumption (kWh/cycle) partial load | Energy consumption (kWh/cycle) full load | Water consumption (L/cycle) partial load | Water consumption (L/cycle) full load |
|---|---|---|---|---|---|---|---|
| Cotton 30°C | 1,48% | 3,4 | 7,0 | 0,22 | 0,37 | 36,4 | 53,3 |
| Normal cotton 40°C | 15,17% | 3,4 | 7,0 | 0,71 | 0,93 | 43,6 | 64,0 |
| Standard cotton 40°C | 15,24% | 3,4 | 7,0 | 0,67 | 0,84 | 34,9 | 51,2 |
| ECO light 30-60°C | --- | --- | --- | --- | --- | --- | --- |
| Normal cotton 60°C | 10,55% | 3,4 | 7,0 | 0,98 | 1,18 | 41,1 | 60,3 |
| Standard cotton 60°C | 11,75% | 3,4 | 7,0 | 0,89 | 1,07 | 33,5 | 49,2 |
| ECO 40-60°C | --- | --- | --- | --- | --- | --- | --- |
| Cotton 90°C | 0,41% | 3,4 | 7,0 | 1,93 | 2,19 | 45,5 | 66,8 |
| Cotton 60°C, ECO+leaf | 6,45% | 3,4 | 7,0 | 0,68 | 0,82 | 31,7 | 46,5 |
| Cotton 20°C | 4,21% | 3,4 | 7,0 | 0,18 | 0,33 | 56,5 | 82,9 |
| Synthetic/easy care | 11,58% | 2,8 | 4,0 | 0,52 | 0,63 | 53,1 | 62,0 |
| Mix, rated capacity | 9,47% | 3,7 | 5,0 | 0,63 | 0,74 | 59,0 | 68,6 |
| Super quick (20-30 min) | 5,35% | 1,8 | 2,8 | 0,12 | 0,21 | 29,5 | 34,8 |
| Normal quick (45-70 min) | 8,33% | 3,8 | 4,5 | 0,46 | 0,51 | 45,3 | 49,5 |
| **Scenario BMWi BAU+** | | **3,3** | **6,0** | **0,644** | **0,798** | **42,5** | **56,9** |
| **For comparison: Scenario BMWi BAU** | | | | **0,633** | **0,789** | **43,5** | **58,4** |

With regard to the water consumption, scenario BMWi BAU+ is slightly lower (minus 2.5 - 2.7%) compared to BMWi BAU; the reason for this effect is the assumed lower water consumption for the Cotton 60°C ECO+leaf programme.

On the other hand, there is only small difference in the energy consumption; JRC BAU+ even consumes more energy (plus 1.1 - 1.7%) compared to the scenario BMWi BAU. Indeed, more consumers shift to the adapted standard programmes due to their shorter programme durations compared to the standard programmes of BMWi BAU. However, the slightly higher energy consumption of the adapted standard programmes due to increased temperatures to reach shorter programme durations outweighs the increased usage.

### 4.2.3. Policy scenario "BMWi ECO / ECO light"

**Table 13: Energy and water consumption of the scenario BMWi ECO / ECO light**

| Programmes, Scenario BMWi ECO/ECO-light | Use share of programmes (%) (Sources: BMWi,JRC) | Wash load (kg) partial load (Source: JRC) | Wash load (kg) full load (Source: JRC) | Energy consumption (kWh/cycle) partial load | Energy consumption (kWh/cycle) full load | Water consumption (L/cycle) partial load | Water consumption (L/cycle) full load |
|---|---|---|---|---|---|---|---|
| Cotton 30°C | 2,01% | 3,4 | 7,0 | 0,22 | 0,37 | 36,4 | 53,3 |
| Normal cotton 40°C | 13,96% | 3,4 | 7,0 | 0,71 | 0,93 | 43,6 | 64,0 |
| Standard cotton 40°C | --- | --- | --- | --- | --- | --- | --- |
| ECO light 30-60°C | 16,29% | 3,4 | 7,0 | 0,48 | 0,78 | 34,9 | 51,2 |
| Normal cotton 60°C | 9,44% | 3,4 | 7,0 | 0,98 | 1,18 | 41,1 | 60,3 |
| Standard cotton 60°C | --- | --- | --- | --- | --- | --- | --- |
| ECO 40-60°C | 19,11% | 3,4 | 7,0 | 0,67 | 0,84 | 33,5 | 49,2 |
| Cotton 90°C | 0,24% | 3,4 | 7,0 | 1,93 | 2,19 | 45,5 | 66,8 |
| Cotton 60°C, ECO+leaf | --- | --- | --- | --- | --- | --- | --- |
| Cotton 20°C | 4,21% | 3,4 | 7,0 | 0,18 | 0,33 | 56,5 | 82,9 |
| Synthetic/easy care | 11,58% | 2,8 | 4,0 | 0,52 | 0,63 | 53,1 | 62,0 |
| Mix, rated capacity | 9,47% | 3,7 | 5,0 | 0,63 | 0,74 | 59,0 | 68,6 |
| Super quick (20-30 min) | 5,35% | 1,8 | 2,8 | 0,12 | 0,21 | 29,5 | 34,8 |
| Normal quick (45-70 min) | 8,33% | 3,8 | 4,5 | 0,46 | 0,51 | 45,3 | 49,5 |
| **Scenario BMWi ECO / ECO light** | | **3,3** | **6,0** | **0,578** | **0,752** | **42,4** | **56,7** |
| **For comparison: Scenario BMWi BAU** | | | | **0,633** | **0,789** | **43,5** | **58,4** |

In the policy scenario BMWi ECO / ECO light, the energy consumption is 5% (full load) or 9% (partial load) lower compared to BMWi BAU; for the water consumption, the savings potential is 3% compared to BMWi BAU.

Note: So far, this calculation does not take into account that consumers combine a certain number of wash loads due to offering the combination programmes ECO light 30-60°C and ECO 40-60°C. More detailed results are provided in section 4.3.

### 4.2.4. Policy scenario "JRC new"

**Table 14: Energy and water consumption of the scenario JRC new**

| Programmes, Scenario JRC new | Use share of programmes (%) (Sources: BMWi,JRC) | Wash load (kg) partial load (Source: JRC) | Wash load (kg) full load (Source: JRC) | Energy consumption (kWh/cycle) partial load | Energy consumption (kWh/cycle) full load | Water consumption (L/cycle) partial load | Water consumption (L/cycle) full load |
|---|---|---|---|---|---|---|---|
| Cotton 30°C | 2,2% | 3,4 | 7,0 | 0,22 | 0,37 | 36,4 | 53,3 |
| Normal cotton 40°C | 34,3% | 3,4 | 7,0 | 0,7 | 0,93 | 43,6 | 64,0 |
| Standard cotton 40°C | --- | --- | --- | --- | --- | --- | --- |
| ECO light 30-60°C | --- | --- | --- | --- | --- | --- | --- |
| Normal cotton 60°C | 24,1% | 3,4 | 7,0 | 0,98 | 1,18 | 41,1 | 60,3 |
| Standard cotton 60°C | --- | --- | --- | --- | --- | --- | --- |
| ECO 40-60°C | --- | --- | --- | --- | --- | --- | --- |
| Cotton 90°C | 0,4% | 3,4 | 7,0 | 1,93 | 2,19 | 45,5 | 66,8 |
| Cotton 60°C, ECO+leaf | --- | --- | --- | --- | --- | --- | --- |
| Cotton 20°C | 4,21% | 3,4 | 7,0 | 0,18 | 0,33 | 56,5 | 82,9 |
| Synthetic/easy care | 11,58% | 2,8 | 4,0 | 0,52 | 0,63 | 53,1 | 62,0 |
| Mix, rated capacity | 9,47% | 3,7 | 5,0 | 0,63 | 0,74 | 59,0 | 68,6 |
| Super quick (20-30 min) | 5,35% | 1,8 | 2,8 | 0,12 | 0,21 | 29,5 | 34,8 |
| Normal quick (45-70 min) | 8,33% | 3,8 | 4,5 | 0,46 | 0,51 | 45,3 | 49,5 |
| **Scenario JRC new** | | **3,3** | **6,0** | **0,669** | **0,832** | **45,36** | **61,11** |
| **For comparison: Scenario BMWi BAU** | | | | **0,633** | **0,789** | **43,55** | **58,45** |

The overall energy consumption of the scenario JRC new is about 5 to 6% and the water consumption about 4 to 5% higher compared to the scenario BMWi BAU.

## 4.3. Results of the scenario analysis – overall comparison including the influence of full, partial and combined loads

### 4.3.1. Energy consumption of different policy scenarios

The following Table 15 summarizes and compares the total energy consumption of all policy scenarios. Per cycle, it can be seen that the overall consumption of partial load washes per cycle is lower than for full loads. However, it has to be noted that also less laundry will be washed. Therefore, if converting the consumption per cycle towards the consumption per kg load washed, it can be clearly seen that partial load washing consumes more energy compared to full load washing, e.g. in the BMWi scenario BAU, the energy consumption is 0.131 kWh per kg washed laundry under full load conditions, whereas 0.192 kWh per kg washed laundry under partial load conditions.

**Table 15: Energy consumption (per kg and per cycle) of different policy scenarios, including the influence of partial and full loads**

| | per kg load | | per cycle | |
|---|---|---|---|---|
| | Energy consumption per kg laundry (partial load, Ø 3.3 kg laundry) | Energy consumption per kg laundry (full load, Ø 6 kg laundry) | Energy consumption per cycle (partial load, Ø 3.3 kg laundry) | Energy consumption per cycle (full load, Ø 6 kg laundry) |
| For comparison: Scenario JRC BAU | 0,195 | 0,132 | 0,644 | 0,798 |
| Scenario BMWi BAU | 0,192 | 0,131 | 0,633 | 0,789 |
| Scenario BMWi BAU+ | 0,195 | 0,132 | 0,644 | 0,798 |
| Scenario BMWi ECO / ECO light | 0,175 | 0,125 | 0,578 | 0,752 |
| Scenario JRC new | 0,202 | 0,138 | 0,669 | 0,832 |

In Table 16, the consumption values are scaled up to the annual energy consumption by taking 220 cycles per year as basis. Again, it can be seen that the overall annual energy consumption of partial load washing per year is lower than for full loads. However, it has to be noted that also less laundry will be washed, i.e. 726 kg laundry at partial load washing compared to 1,320 kg laundry when washing with full loads.

**Table 16: Energy consumption per year of different policy scenarios, including the influence of partial, combined and full loads**

| | Energy consumption per year (full load, 1320 kg laundry) | Energy consumption per year (partial load, 726 kg laundry) | Energy consumption per year partial load + combined loads (726 kg laundry) | Energy consumption per year (full load, 726 kg laudry) |
|---|---|---|---|---|
| For comparison: Scenario JRC BAU | 176 | 142 | 142 | 96 |
| Scenario BMWi BAU | 174 | 139 | 139 | 95 |
| Scenario BMWi BAU+ | 175 | 142 | 139 | 96 |
| Scenario BMWi ECO / ECO light | 165 | 127 | 119 | 91 |
| Scenario JRC new | 183 | 147 | 147 | 100 |

The BMWi consumer survey 2017 revealed that in the scenario BMWi BAU+ 47% of the consumers combine their wash loads compared to 41% in the scenario BMWi BAU, i.e. an increase of 6%.

The scenario BMWi ECO / ECO light explicitly offers programmes encouraging consumers to combine their wash loads being labelled for different wash temperatures. In this scenario, the consumer survey revealed that even 63% took the chance to combine their laundry, i.e. an increase of 22% compared to BMWi BAU. In Table 16, the cells marked yellow reflect this effect, showing that due to offering programmes that facilitate consumers in combining their wash loads, the overall energy consumption can be further reduced compared to the scenario BMWi BAU.

Finally, the last column of Table 16 shows the hypothetical effect if the total amount of 726 kg laundry would be washed with full load cycles, i.e. the savings potential for energy would be even higher.

### 4.3.2. Water consumption of different policy scenarios

The following Table 17 summarizes and compares the total water consumption of all policy scenarios. Per cycle, it can be seen that the overall consumption of partial load washes per cycle is lower than for full loads. However, it has to be noted that also less laundry will be washed. Therefore, if converting the water consumption per cycle towards the consumption per kg load washed, it can be clearly seen that partial load washing consumes more water compared to full load washing, e.g. in the BMWi scenario BAU, the water consumption is 9.69 litres per kg washed laundry under full load conditions, whereas 13.17 litres per kg washed laundry under partial load conditions.

**Table 17: Water consumption (per kg and per cycle) of different policy scenarios, including the influence of partial and full loads**

| | per kg load | | per cycle | |
|---|---|---|---|---|
| | Water consumption per kg laundry (partial load, Ø 3.3 kg laundry) | Water consumption per kg laundry (full load, Ø 6 kg laundry) | Water consumption per cycle (partial load, Ø 3.3 kg laundry) | Water consumption per cycle (full load, Ø 6 kg laundry) |
| For comparison: JRC-Szenario BAU | 13,15 | 9,68 | 43,50 | 58,37 |
| Scenario BMWi BAU | 13,17 | 9,69 | 43,55 | 58,45 |
| Scenario BMWi BAU+ | 12,80 | 9,40 | 42,34 | 56,67 |
| Scenario BMWi ECO / ECO light | 12,82 | 9,41 | 42,39 | 56,74 |
| Scenario JRC new | 13,75 | 10,16 | 45,48 | 61,27 |

In Table 18, the consumption values are scaled up to the annual water consumption by taking 220 cycles per year as basis. Again, it can be seen that the overall annual water consumption of partial load washing per year is lower than for full loads. However, it has to be noted that also less laundry will be washed, i.e. 726 kg laundry at partial load washing compared to 1,320 kg laundry when washing with full loads.

**Table 18: Water consumption per year of different policy scenarios, including the influence of partial, combined and full loads**

| | per year | | | |
|---|---|---|---|---|
| | Water consumption per year (full load, 1320 kg laundry) | Water consumption per year (partial load, 726 kg laundry) | Water consumption per year partial load + combined loads (726 kg laundry) | Water consumption per year (full load, 726 kg laudry) |
| For comparison: JRC-Szenario BAU | 12842 | 9569 | 9569 | 7028 |
| Scenario BMWi BAU | 12858 | 9581 | 9581 | 7037 |
| Scenario BMWi BAU+ | 12467 | 9314 | 9165 | 6823 |
| Scenario BMWi ECO / ECO light | 12483 | 9325 | 8779 | 6832 |
| Scenario JRC new | 13480 | 10005 | 10005 | 7377 |

As for the energy consumption in section 4.3.1 above, an increase of 6% (BAU+) and 22% (ECO / ECO light) of consumers combining their wash loads compared to the BMWi BAU scenario has been taken into account. Due to offering programmes that facilitate consumers in combining their wash loads, also the overall water consumption can be further reduced compared to the scenario BMWi BAU.

Finally, the last column of shows the hypothetical effect if the total amount of 726 kg laundry would be washed with full load cycles, i.e. the savings potential for water would be even higher.

## 5. Summary and conclusion

Assuming that most of the consumers currently wash at partial loads, by combining a share of wash loads towards full loads, the overall annual energy consumption of partial load washing can be reduced.

Figure 1 summarizes the annual energy consumption and Figure 2 the annual water consumption of the different policy scenarios, taking into account the effect of combined washing.

- It shows that scenario BMWi ECO / ECO light saves up to 15% energy and 8% water compared to the scenario BMWi BAU, which is due to offering programmes that facilitate consumers combining their wash loads.
- On the other hand, under the assumptions of BMWi BAU+ no significant change will take place compared to the current situation as simulated in BMWi BAU (minus 0.3% for energy and minus 4% for water consumption). Although more consumers are willing to use the adapted standard programmes, the slightly increase of energy consumption of these programmes outweighs their increased usage.
- Finally introducing the policy scenario JRC new, assuming a standard programme with fixed minimum temperature and no further offer of any energy saving programme, would even lead to an increase of the energy and water consumption (plus 6% and plus 4%) compared to the current situation.

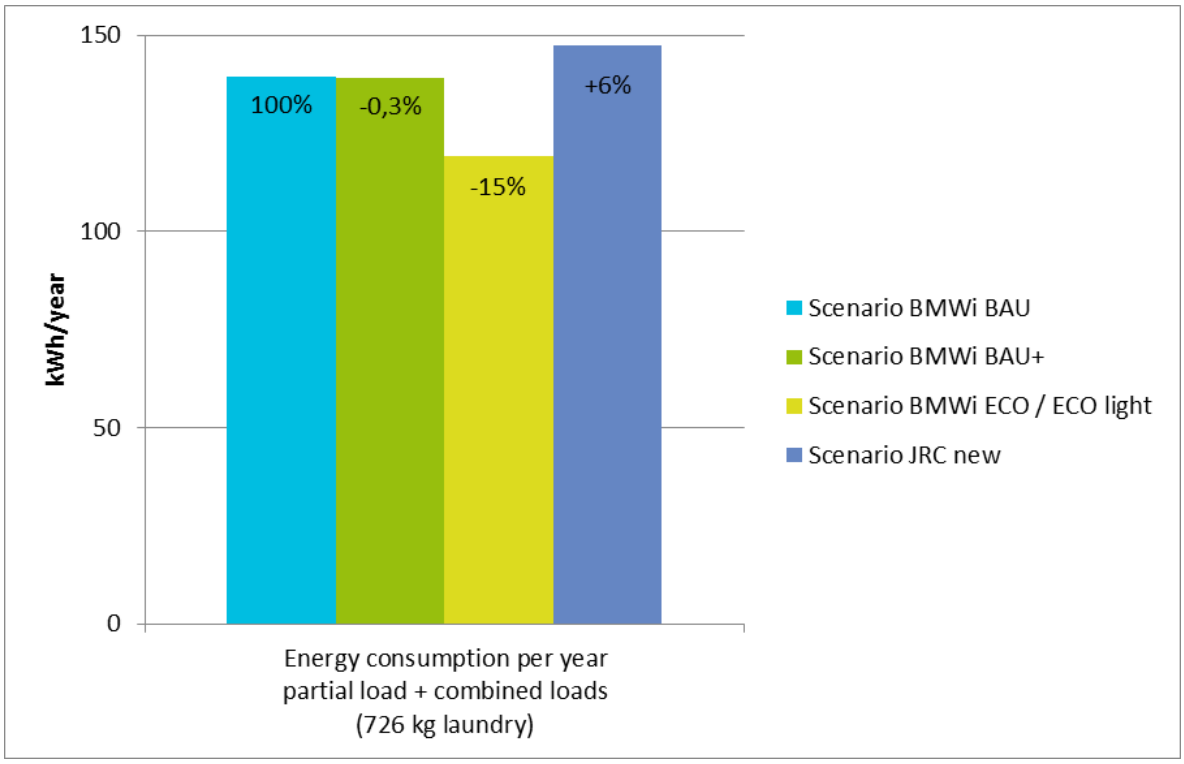


**Figure 1: Annual energy consumption of different policy scenarios, taking into account increased combined loading**

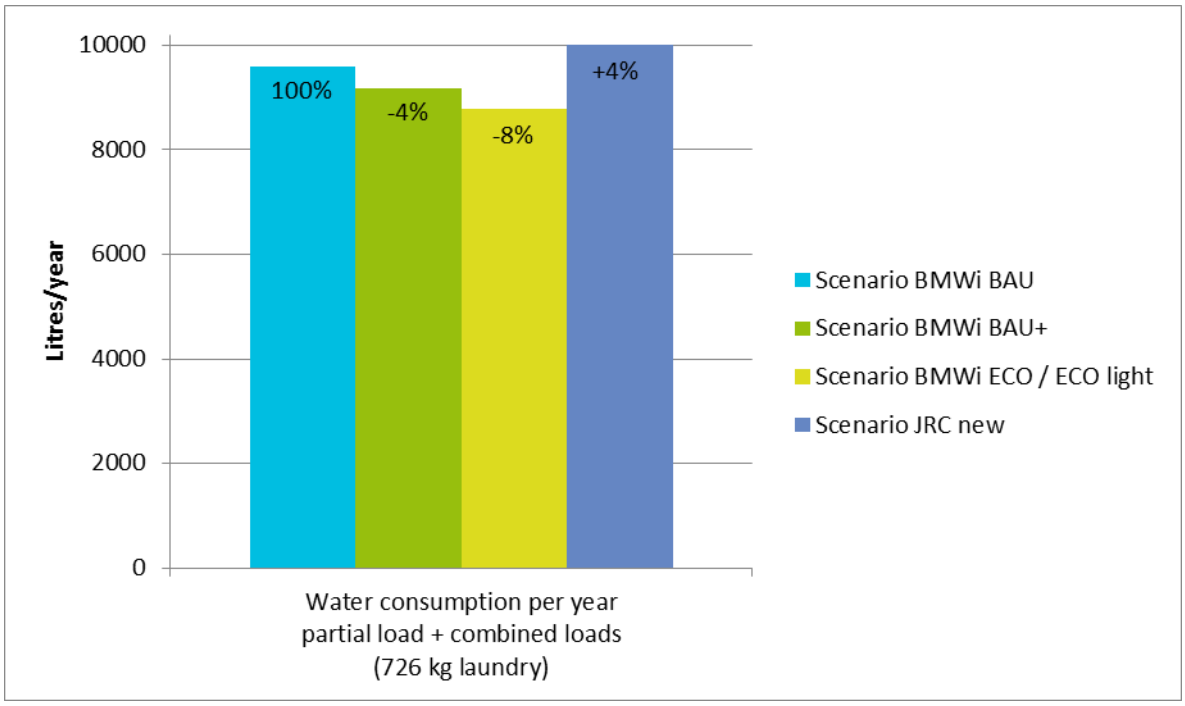


**Figure 2: Annual water consumption of different policy scenarios, taking into account increased combined loading**