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Unlocking the Energy Efficiency Potential of Washing Machines in China

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AUTHOR

Feiyan Zhao, CLASP

fzhao@clasp.ngo

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Introduction

Washing machines are common household appliances with high market penetration in China. By the end of 2023, the ownership of washing machines had exceeded 98.2 units per 100 households[1], with over 450 million units in use[2], leading to increased energy and water consumption.

In China, washing machines consume approximately 61 terawatt hours (TWh) of electricity and around 13 billion cubic meters (m^3) of water annually. As washing machines are widely used and resource-intensive appliances, improving their energy and water efficiency standards can play a significant role in achieving China's energy- and water-saving goals.

China's current energy efficiency standards for washing machines, last updated in 2013, have fallen behind technological advancements and market trends. In contrast, the European Union (EU) has implemented more comprehensive and stringent energy efficiency standards that cover washing machines, washer-dryers, and tumble dryers.

This report provides key findings and targeted policy recommendations for updating and strengthening China's washing machine energy efficiency standards. The findings and recommendations are informed by analyses conducted by CLASP. These analyses are summarized in the following sections, which compare energy efficiency standards for washing machines in China and the EU, analyze market trends, and quantify the potential energy and water savings from policy improvements.

[1] *China Statistical Yearbook 2024* 中国统计年鉴 2024.
[2] *Calculation of the Inventory and Replacement Volume of Household Washing Machines in Chinese Market*《中国家庭洗衣机市场保有量及换新量测算》-中国家电网.

Key findings and recommendations

1. Upgrade energy efficiency standards for washing machines

Key findings: Market data analyses show that China's energy efficiency requirements for washing machines have not kept up with market developments. Grade 1 drum washing machines, the most energy-efficient category, now account for 99% of the total market share. For impeller washing machines, the proportion of grades 1, 2, and 3 has also exceeded 99%.

To drive further energy and water efficiency improvements, it is recommended that China accelerate the upgrade of washing machine standards, based on market analyses and the guiding principles for the revision of national energy efficiency standards.

CLASP estimates that upgrading China's washing machine minimum energy performance standards (MEPS) to the BAT (Best Available Technology) in the Chinese market would result in an annual reduction of 21 megatons (Mt) of carbon dioxide (CO_2) emissions and water savings of 5.5 billion m^3. Even just a 20% upgrade to the MEPS would reduce up to CO_2 emissions by 6 Mt and save 2.7 billion m^3 of water annually.

Recommendations:

- Establish stricter MEPS based on market trends and the BAT to reduce the gap between current standards and energy efficiency levels found in the market.
- Implement regular reviews and updates for the energy efficiency standard of washing machines to align with technological advancements.

2. Introduce mandatory efficiency standards for clothes dryers

Key findings: In 2020 and 2021, the sales volume and sales value growth rates of clothes dryers in China grew by over 100%. While growth slowed in 2023, retail sales volume and sales value of dryers still increased significantly, by 30.3% and 26.6%, respectively. Heat pump dryers now account for 61% of China’s dryer market, and they consume less than half the energy that heat element dryers use.

Recommendations:

- Given the rapid growth of the dryer market, China should develop mandatory energy efficiency standards for clothes dryers.
- Set unified energy efficiency requirements for heat element dryers and heat pump dryers to make sure MEPS is an effective tool to promote the most efficient technology.

3. Expand the standard scope to cover the wash-drying cycle and set requirements for washing cycle time and detergent residue

Key findings: The EU's regulations are more comprehensive than China's standards. The EU's standards cover washing machines, washer-dryers, and dryers. Along with energy and water efficiency requirements, the EU sets limits on washing time to prevent manufacturers from artificially improving efficiency by extending wash duration cycles. The EU's standards also include requirements for detergent residue to ensure healthier washing.

In contrast, China's standards only regulate requirements for washing machines, and the washing cycle of washer-dryers, and they do not address washing time and detergent residue.

Recommendations:

- Introduce energy and water efficiency requirements for the wash-drying cycle of washer-dryers.
- Introduce a washing time limit to prevent manufacturers from artificially improving efficiency testing results.
- Introduce detergent residue limits to ensure cleaner, safer washing for consumers.

4. Conduct consumer usage studies

Key findings: Washing machine energy consumption and performance are influenced by user behavior, including program selection and factors like cycle duration, detergent type and dosage, as well as temperature settings. It is crucial to establish energy efficiency standards based on real-world usage scenarios.

The EU's review study[3] on ecodesign standards for washing machines and tumble dryers noted a gap between standard testing conditions and real-world consumer behavior. The study found that consumers seldom use the most energy-efficient washing programs, primarily due to long cycle durations. It also highlighted a difference between the test program load and typical consumer loads.

Recommendations:

- Analyze the washing behaviors of Chinese consumers to refine test procedures.
- Adapt standards to reflect real-world consumer behavior for greater effectiveness.

[3] European Commission. Joint Research Centre. *Follow-up of the Preparatory Study for Ecodesign and Energy Label for Household Washing Machines and Household Washer Dryers*.

5. Conduct comparative testing between Chinese and EU standards

Key findings: There are notable differences between China and the EU's energy efficiency standards for washing machines, particularly in their testing procedures, conditions, and the methods used to calculate energy efficiency parameters. Because of these differences, a simple textual comparison of energy efficiency parameters cannot adequately capture the disparities between China and the EU's energy efficiency requirements.

Recommendations:

- Conduct physical product testing to accurately assess the differences between China and the EU's energy efficiency standards.
- Improve data-driven policymaking by using cross-market test comparison results.

6. Assess the impact of smart and additional features on energy consumption

Key findings: The washing machine market is heavily saturated with smart products and models offering new features. In 2022, smart washing machines accounted for 27% of the retail sales volume in China and 33% of retail sales value in overseas markets.

Despite the growing presence of intelligent features and new functions, there is a lack of research on how they impact energy consumption. It is essential to evaluate the feasibility of incorporating energy consumption limits for these features and controls into energy efficiency standards for washing machines. CLASP recommends the following areas of research to assess the impact of smart features.

Recommendations:

- Research the impact of intelligent controls and additional features on energy consumption.
- Research the necessity and feasibility of incorporating energy consumption limits requirements for these additional features and intelligent controls into washing machine energy efficiency standards.

Research methodology

This report provides a qualitative comparison of the energy efficiency standards for washing machines in China and the EU, focusing on core content and key performance indicators, including product scope, MEPS, energy labeling, and other performance criteria.

It presents a quantitative analysis of energy efficiency levels, product categories, capacity distribution, and the development of smart features in the Chinese market, along with trends in the growing tumble dryer market, using data from the JD e-commerce platform.

To assess the potential impact of policy improvements, modeling scenarios are provided, in which MEPS are improved by 20% and aligned with the BAT. These scenarios account for typical user behavior and estimate the potential reductions of CO_2 emissions and water consumption from washing machines in China.

Overview and comparison of China and the EU's washing machine standards

1. Overview of EU standards for washing machines, washer-dryers and tumble dryers

The European Union has established ecodesign requirements and energy labeling regulations for washing machines, washer-dryers, and dryers. Washing machines and washer-dryers are regulated by one standard which sets different energy and water efficiency requirements for the washing cycle and wash-drying cycle. Dryers are regulated by a separate standard.

- Commission Regulation (EU) 2019/2023[4] sets ecodesign requirements for household washing machines and washer-dryers. These requirements cover energy efficiency, washing performance, washing time limits, water consumption, standby and off-mode energy consumption, and the washing effectiveness index for the washing cycle and the wash-drying cycle.
- Commission Delegated Regulation (EU) 2019/2014[5] defines the energy labeling requirements for household washing machines and washer-dryers.
- Commission Regulation (EU) No 932/2012[6] establishes ecodesign requirements for household tumble dryers. As of 30 June 2025, Regulation (EU) 2023/2533[7] will replace (EU) No 932/2012.
- Commission Delegated Regulation (EU) No 392/2012[8] defines energy labeling requirements for household tumble dryers. On 30 June 2025, Regulation (EU) 2023/2534[9] will replace (EU) No 392/2012.
- The EU Ecodesign Directive applies to washing machines and washer-dryers with a rated capacity of at least 2 kilograms (kg) and tumble dryers with a rated capacity of at least 3 kg, covering both gas and electric dryers.

Under the (EU) 2019/2023 Ecodesign Regulation, effective since March 2021, the energy efficiency index (EEI_W) for household washing machines and the washing cycle of household

[4] Commission Regulation (EU) 2019/2023 Ecodesign Requirements for Household Washing Machines and Household Washer-Dryers
[5] Commission Delegated Regulation (EU) 2019/2014 Energy Labelling of Household Washing Machines and Household Washer-Dryers
[6] Commission Regulation (EU) No 932/2012 Ecodesign Requirements for Household Tumble Dryers
[7] Commission Regulation (EU) 2023/2533 Ecodesign Requirements for Household Tumble Dryers, Repealing Commission Regulation (EU) No 932/2012
[8] Commission Delegated Regulation (EU) No 392/2012 Energy Labelling of Household Tumble Dryers
[9] Commission Delegated Regulation (EU) 2023/2534 Energy Labelling of Household Tumble Dryers and Repealing Commission Delegated Regulation (EU) No 392/2012

washer-dryers should be lower than 105. Similarly, the energy efficiency index (EEI_{WD}) for the wash-drying cycle of household washer-dryers should be lower than 105.

From 1 March 2024, household washing machines with a rated capacity higher than 3 kg and household washer-dryers with a rated washing capacity exceeding 3 kg, the EEI_W should be lower than 91, and the EEI_{WD} for the wash-drying cycle should be lower than 88. The energy label requirements for washing machines and washer-dryers is shown in TABLE 1.

TABLE 1 THE EU'S ENERGY EFFICIENCY CLASSES REQUIREMENTS FOR WASHING MACHINES AND WASHER-DRYERS

ENERGY EFFICIENCY CLASSES	ENERGY EFFICIENCY REQUIREMENTS FOR WASHING CYCLE (EEI_W)	ENERGY EFFICIENCY REQUIREMENTS FOR WASHING & DRYING CYCLE (EEI_{WD})
A	$EEI_W \leqslant 52$	$EEI_{WD} \leqslant 37$
B	$52 < EEI_W \leqslant 60$	$37 < EEI_{WD} \leqslant 45$
C	$60 < EEI_W \leqslant 69$	$45 < EEI_{WD} \leqslant 55$
D	$69 < EEI_W \leqslant 80$	$55 < EEI_{WD} \leqslant 67$
E	$80 < EEI_W \leqslant 91$	$67 < EEI_{WD} \leqslant 82$
F	$91 < EEI_W \leqslant 102$	$82 < EEI_{WD} \leqslant 100$
G	$EEI_W > 102$	$EEI_{WD} > 100$

Commission Regulation (EU) No 932/2012 specifies that tumble dryers are required to have an energy efficiency index (EEI) below 76. However, from 1 July 2025, Commission Regulation (EU) 2023/2533 will increase the maximum EEI for tumble dryers to 85. The EEI calculation method has undergone significant changes between the former and revised tumble dryer standards.

Starting 1 July 2025, the energy efficiency classes for dryers in the EU will change from the current A+++ to D scale to an A (most efficient) to G (least efficient) scale. The energy efficiency requirements for each class will also be adjusted accordingly, as shown in Table 2.

TABLE 2: CHANGES TO EU ENERGY EFFICIENCY CLASSES AND INDEXES FOR TUMBLE DRYERS

Old

ENERGY EFFICIENCY CLASS	ENERGY EFFICIENCY INDEX
A+++	EEI<24
A++	24≤EEI<32
A+	32≤EEI<42
A	42≤EEI<65
B	65≤EEI<76
C	76≤EEI<85
D	85≤EEI

New

ENERGY EFFICIENCY CLASS	ENERGY EFFICIENCY INDEX
A	EEI≤43
B	43≤EEI≤50
C	50≤EEI≤60
D	60≤EEI≤70
E	70≤EEI≤85
F	85≤EEI≤100
G	100≤EEI

2. Overview of China's washing machine MEPS

In 1989, China released its first MEPS and testing method for washing machines, GB 12021.4-1989[10], revised in 2004 and 2014. China is now enforcing the energy and water efficiency standard GB 12021.4-2013[11]. This standard specifies energy and water consumption limits for each washing cycle based on the washing capacity for drum, impeller, and twin-tub washing machines. It also sets energy labeling requirements for washing machines. GB12021.4-2013 covers washing machines with a rated washing capacity between 1-13 kg. For washer-dryers, this standard only considers the washing function. Table 3 shows the energy label requirements of GB12021.4-2013, with grade 5 as the MEPS.

[10] GB 12021.4-1989 The Limited Value and Testing Method of Energy Consumption for Household Electric Washing Machines
[11] GB 12021.4-2013 Maximum Allowable Values of the Energy, Water Consumption and Grades for Household Electric Washing Machines

TABLE 3 CHINA'S ENERGY AND WATER EFFICIENCY REQUIREMENTS FOR WASHING MACHINES

Energy Efficiency Grade	Energy Efficiency Requirements [kWh/(cycle. kg)]		Water Efficiency Requirements [L/(cycle. kg)]		Cleaning Ratio Requirements	
	Drum washing machines	Impeller washing machines & double-tub washing machines	Drum washing machines	Impeller washing machines & double-tub washing machines	Drum washing machines	Impeller washing machines & double-tub washing machines
1	⩽0.110	⩽0.011	⩽7	⩽14	⩾1.03	⩾0.90
2	⩽0.130	⩽0.012	⩽8	⩽16		⩾0.80
3	⩽0.150	⩽0.013	⩽9	⩽20		
4	⩽0.170	⩽0.017	⩽10	⩽24		
5	⩽0.190	⩽0.022	⩽12	⩽28		

The table above shows that, in China, energy efficiency requirements for impeller washing machines are more stringent than the requirements for drum washing machines. However, the water consumption and cleaning ratio requirements are stricter for drum washing machines.

3. Comparison of washing machine standards in China and the EU

The standards for washing machines in China and the EU differ significantly in terms of coverage, testing procedures, calculation methods for efficiency parameters, and indicator requirements. Both China and the EU's standards impose requirements on energy consumption, water consumption, and washing performance. However, the EU's standards cover a wider range of product categories and include additional requirements for washing time and detergent residue, making them more comprehensive than China's standards. Table 4 summarizes the comparison between GB12021.4-2013 and (EU)2019/2023.

TABLE 4 COMPARISON OF GB12021.4-2013 AND (EU)2019/2023

ITEMS	GB 12021.4-2013	(EU)2019/2023
Scope	Washing machines with a capacity between 1 kg to 13 kg. For washer-dryers, this only covers the washing cycle.	Washing machines and washer-dryers with a capacity no less than 2 kg
Functions covered	Washing	Washing, wash-drying
Technical neutral	Separate energy efficiency requirements for drum and impeller washing machines	Separate energy efficiency requirements for washing cycle and washing-drying cycle
Energy consumption test procedure	Standard washing cycle	Eco 40-60
Test load	Full load, half load	Full load, half load, and quarter load
Energy efficiency calculation method	$E=I_e*(E_{full}+E_{1/2})/(2m)$ E_{full} and $E_{1/2}$ are the energy consumption of a full load and ½ load. m is the rated capacity. I_e is the energy efficiency compensation factor. For drum washing machines, the value is 0.85, and for pulsator washing machines, the value is 0.75.	$EEI_W=E_W/SCE_W*100$ E_W is the weighted average value of energy consumption. SCE_W is the standard energy consumption, determined by the rated capacity.
Energy consumption calculation for each washing cycle	$E=(E_{full}+E_{1/2})/2$	$E_W=A*E_{W,full}+B*E_{W,1/2}+C*E_{W,1/4}$ A, B and C are the weighted coefficients for the energy consumption of full, half, and quarter loads.
Water consumption calculation for each washing cycle	$W=I_W*(W_{full}+W_{1/2})/(2m)$ I_W is the water efficiency compensation factor with the value of 0.7.	$W_t=(A*W_{W,full}+B*W_{W,1/2}+C*W_{W,1/4})$ A, B and C are the weighted coefficients for water consumption of a full load, half load and quarter load.
Washing performance requirements	Cleaning ratio C, tested with full load and half load. For drum washing machine, C should not be less than 1.03. For impeller and double-tub washing machines, C should not be less than 0.80.	Washing efficiency index: I_W Rated capacity>3 kg, I_W should be bigger than 1.03 for full load, half load and quarter load. Rated capacity≤3 kg, I_W should be bigger than 1.00 for a full load and half load.
Detergent residue	No	Limitation: 5 g/ kg
Washing time requirements	No	Yes

4. Best technical practices in China and the EU

The best available technical practices for washing machines in China and the EU are shown in Table 5, based on data from the European Product Registry for Energy Labelling[12] (EPREL) and the China energy label database[13].

TABLE 5 BEST TECHNICAL PRACTICES FOR WASHING MACHINES IN CHINA AND THE EU

TYPES		CAPACITY (KG)	ENERGY CONSUMPTION KWH/(CYCLE.KG)	WATER CONSUMPTION L/(CYCLE.KG)	PROGRAM TIME (MIN)	ENERGY EFFICIENCY GRADES
Chinese drum washing machines		9	0.039	5.2	/	1
Chinese impeller washing machines		10	0.008	11.1	/	1
EU washing machines		8	0.046	4	218	A
EU washer-dryers	Washing cycle	9	0.033	/	239	A
EU washer-dryers	Washing and drying cycle	7	0.27	9.7	610	A
EU dryers		8	155 kWh/year	/	182	A+++

Assuming an annual operation of 220 washing cycles, the most energy-efficient drum washing machines in China consume 3.7 kWh less annually than the best available washing machines in the EU. However, the most efficient washing cycle of a washer-dryer in the EU uses even less energy, saving 12 kWh per year compared to China's most efficient drum washing machine.

[12] EPREL www.Eprel.Ec.Europa.Eu/Screen/Home
[13] China Energy Label www.energylabel.com.cn 中国能效标识网."

Market status of washing machines and dryers in China

1. Market status of washing machines

According to data from CNIS and ChinaIoL, China produced 104.38 million washing machines in 2023. Of these, 42.01 million units were sold domestically, representing a 3% increase from 2022 to 2023. Exports reached 38.45 million units, with an increase of 38.1%. Washing machine exports to Asia and Europe amounted to 27.28 million units, accounting for 71% of China's total exports in 2023[14]. Globally, the washing machine market was valued at $65.44 billion in 2023, with China accounting for approximately half of total production.

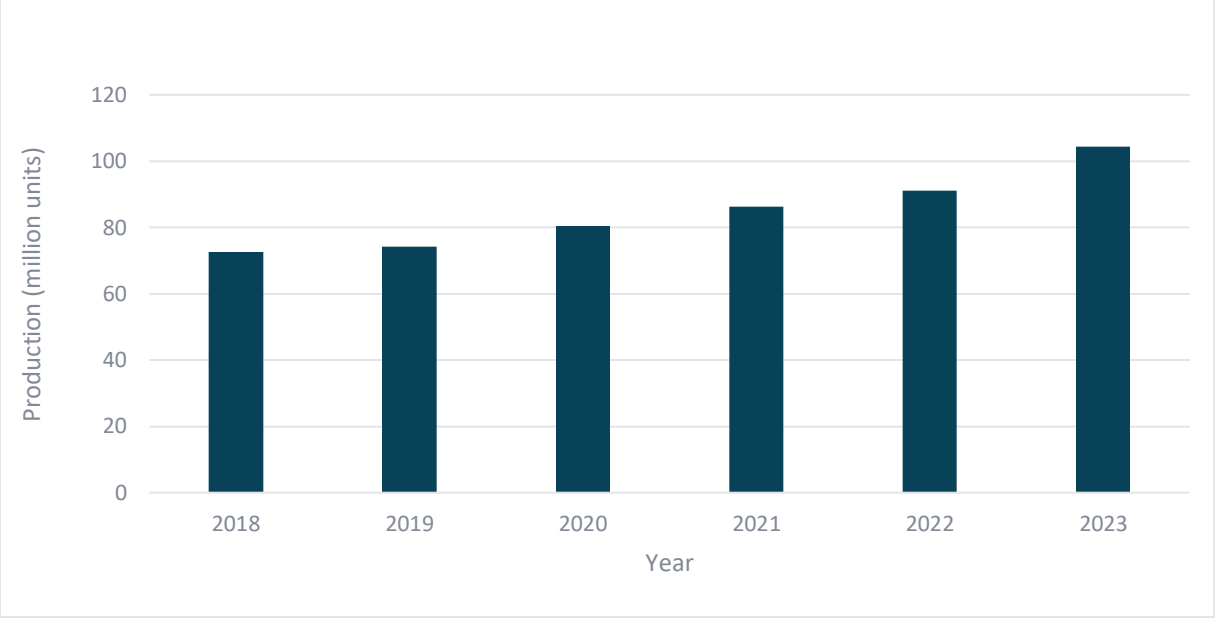

FIGURE 1 WASHING MACHINE PRODUCTION IN CHINA

[14] China Washing Machine Production and Sales Volume in 2023, www.Chinaiol.Com/News/Content/202402/68_49671.html

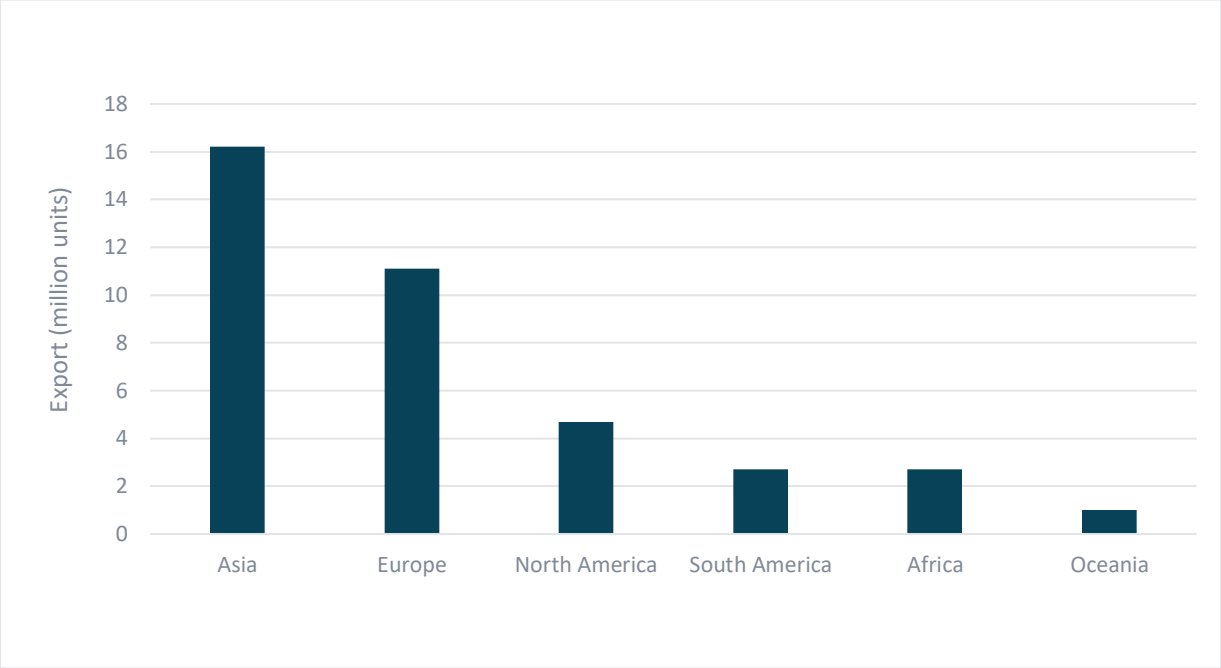

FIGURE 2 CHINA'S WASHING MACHINE EXPORTS IN 2023

According to data from the National Bureau of Statistics of China, by the end of 2023, the ownership of washing machines in China had reached 98.2 units per 100 households. This high level of ownership indicates that the market is nearing saturation, with consumer replacement demand becoming the main driver of growth.

Based on data from the 2022 *Annual Report on China's Home Appliance Industry*, the online market share of washing machines reached 59.4% in 2022. Among both online and offline home appliance retail platforms in China, JD holds the largest share, accounting for 36.5% in 2022[15].

To support this analysis, CLASP selected www.JD.com[16] as a representative e-commerce platform and collected data on washing machines sold online in July 2023. Data from 4,531 washing machines were gathered on www.JD.com, covering key product parameters such as brand, model, type, energy efficiency grade, power consumption, water consumption, and cleaning ratio.

The market share of drum washing machines in the Chinese market has reached 43%, while the market share of impeller washing machines represents 36%. Mini washing machines, double tub washing machines, and wash-dryers also have market shares of 7%, 6%, and 8%, respectively.

[15] China Household Electric Appliance Research Institute, 2022 "Annual Report on China's Home Appliance Industry" "中国家用电器研究院：2022 年中国家电行业年度报告."
[16] JD, www.JD.com

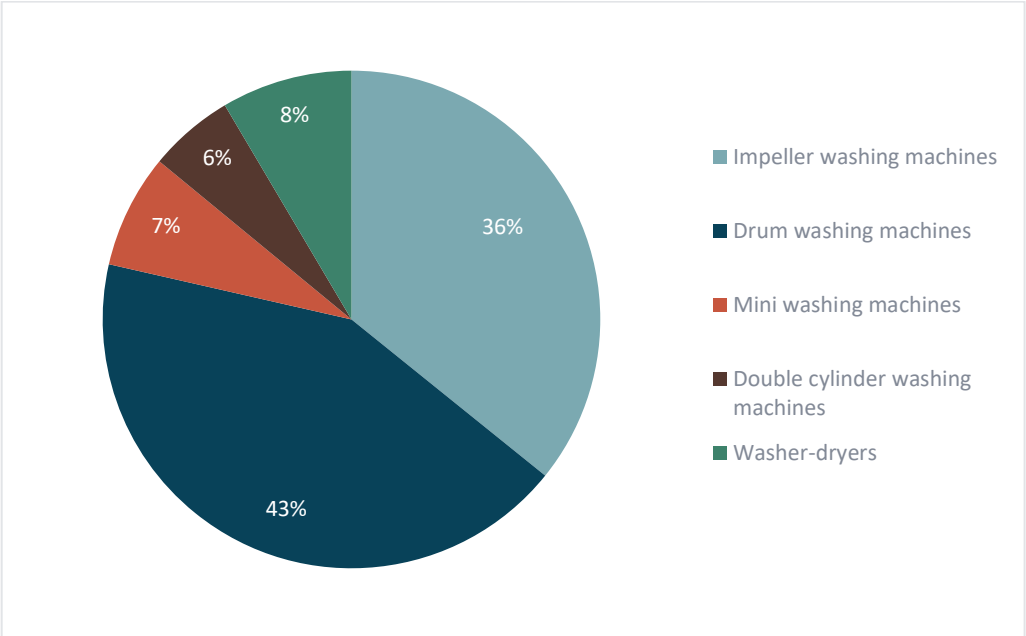

FIGURE 3 DISTRIBUTION OF WASHING MACHINE TYPES ON JD.COM

Washing machines with a rated washing capacity of 10 kg dominate the market, accounting for 58% of the market share. Models with a rated washing capacity of less than 10 kg make up approximately 31%, mostly concentrated in the 8-9 kg range. Larger models with a rated washing capacity exceeding 10 kg account for about 11%, with 12 kg models being most prevalent in this segment.

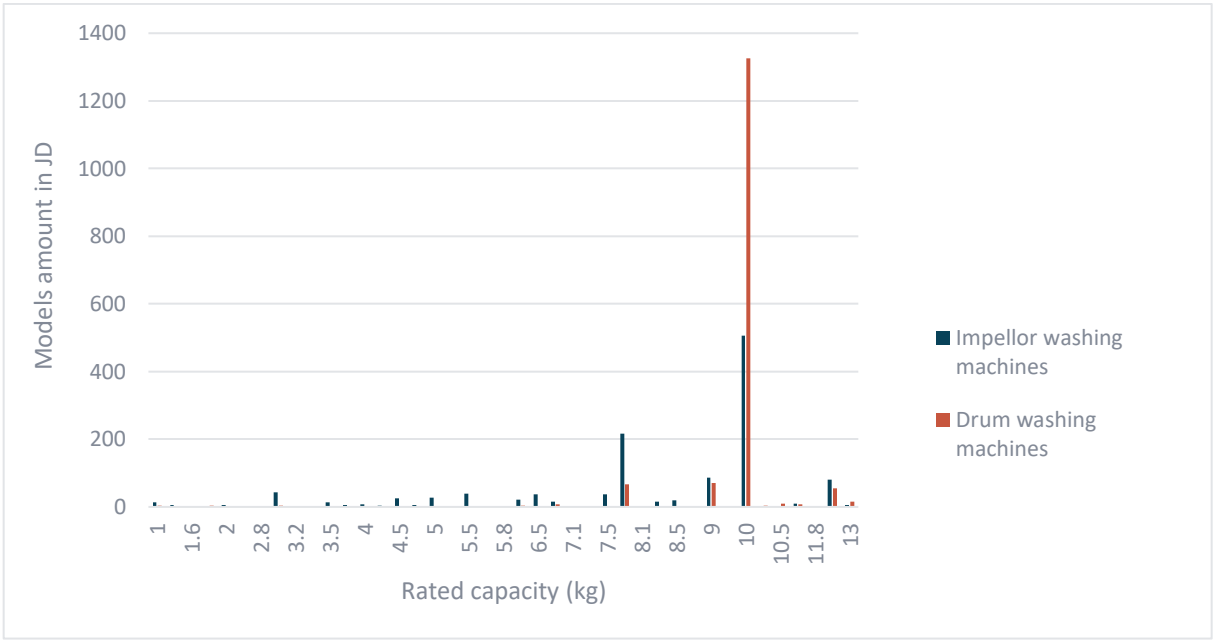

FIGURE 4 WASHING MACHINE CAPACITY DISTRIBUTION ON JD.COM

Currently, there are 5 energy grades for washing machines in China. On www.JD.com, the proportion of washing machines with energy grades of 4 and 5 is quite small. For drum washing machines, over 99% of products are rated grade 1%. In the case of impeller washing machines, 30% are grade 1, 42% are grade 2, and 27% are grade 3.

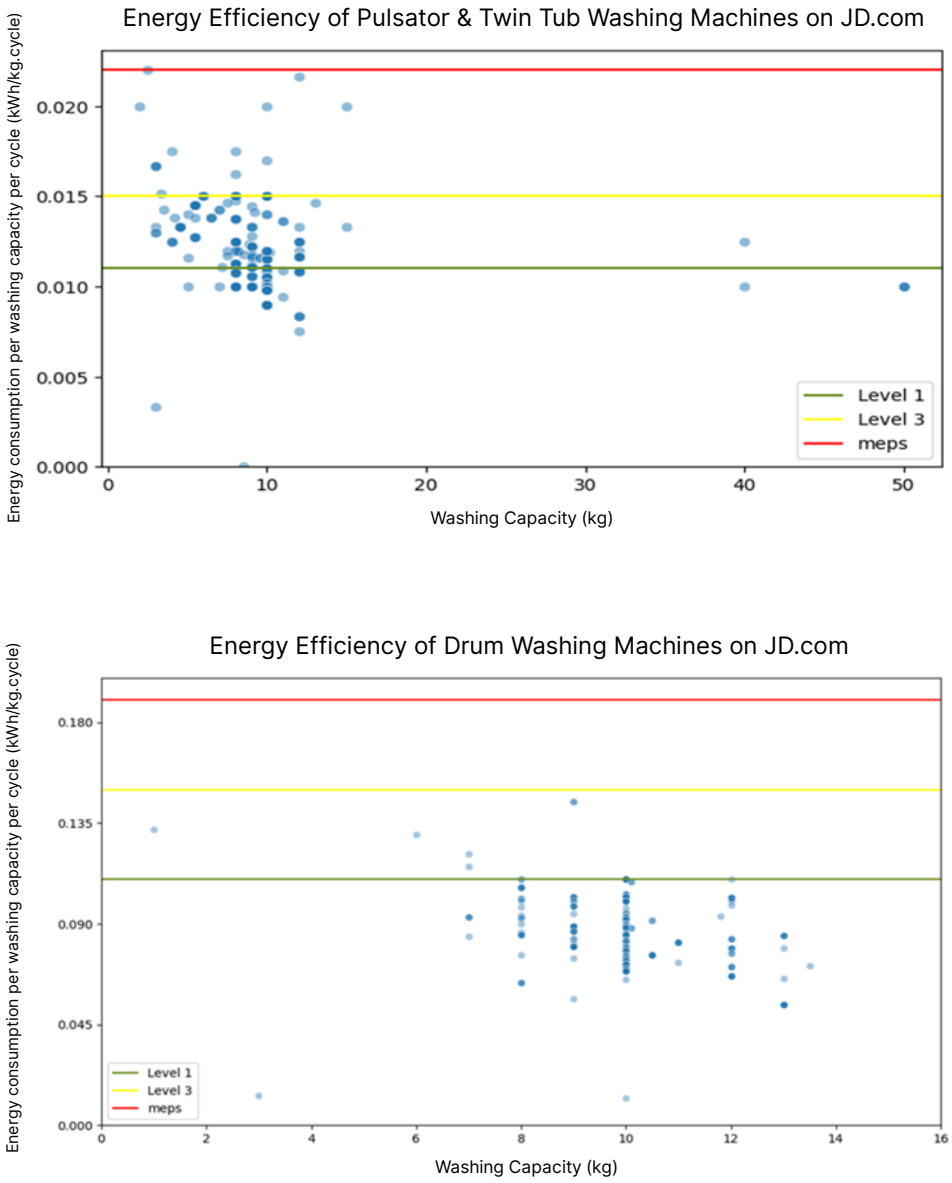

FIGURE 5 ENERGY GRADE DISTRIBUTION OF WASHING MACHINES ON JD.COM

Washing machines with additional features are increasingly popular in China, especially those with health-related functions such as sterilization, mite removal, and high-temperature washing. With the rapid development of artificial intelligence, the market share of smart washing machines has been growing steadily. These machines are equipped with intelligent recognition

and automatic adjustment functions, utilizing advanced technologies such as microprocessors, sensors, and network communication systems. They can detect the household environment and monitor their own operational status. Additionally, they can autonomously control operations and respond to control commands from users, both locally and remotely.

In 2022, smart washing machines accounted for 27% of the retail sales volume and 33% of the retail sales value in overseas markets[17]. According to GfK retail monitoring data, smart product penetration for appliances like refrigerators, air conditioners, and washing machines in China has reached a share of 54%[18].

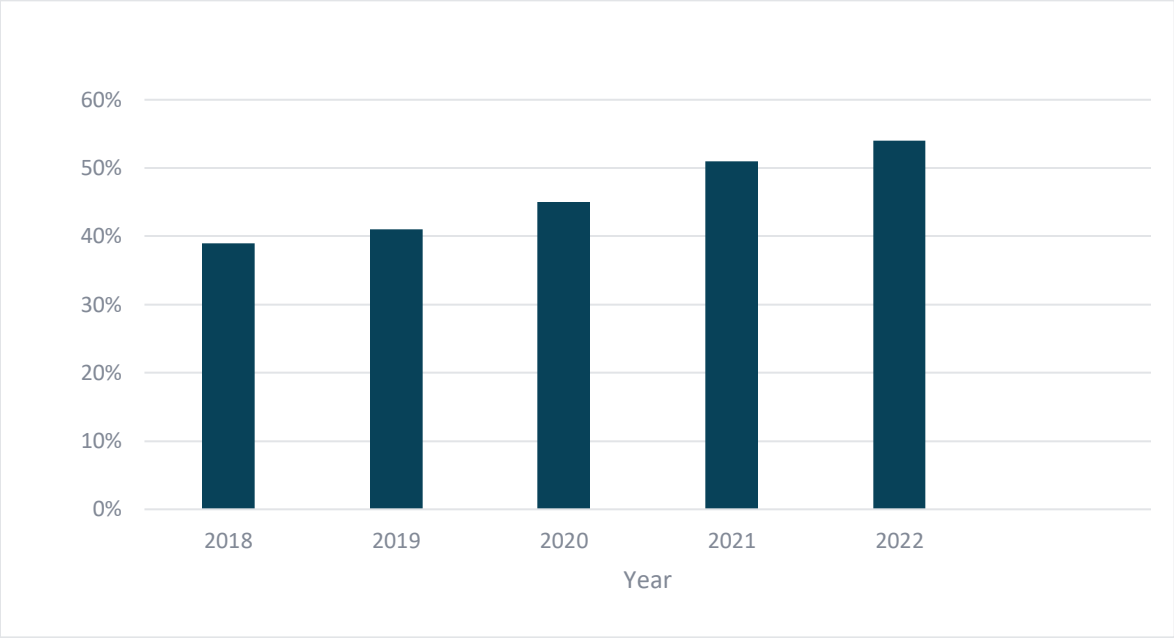

FIGURE 6 PROPORTION OF RETAIL SALES OF SMART APPLIANCES IN CHINA: REFRIGERATORS, ROOM AIR CONDITIONS, AND WASHING MACHINES

2. Rapid development of the dryer market in China

Following explosive growth in 2020 and 2021, when both sales volume and sales value growth rates increased by over 100%, China's dryer market began to slow down in 2022. By 2023, the retail sales volume and sales value of dryers had reached 2.3 million units and 13 billion RMB, respectively, with year-on-year growth rates of 30.3% and 26.6%[19].

[17] Gfk, "International Market Status of Washing Machines in 2022, 2022 年洗衣机国际市场."
[18] Gfk, "2023 China Home Appliance Retail and Innovation White Paper, 2023 中国家电零售与创新白皮书."
[19] Gfk, "Summary of the China Washing Machine Market in 2023 & Report on the Outlook for 2024."

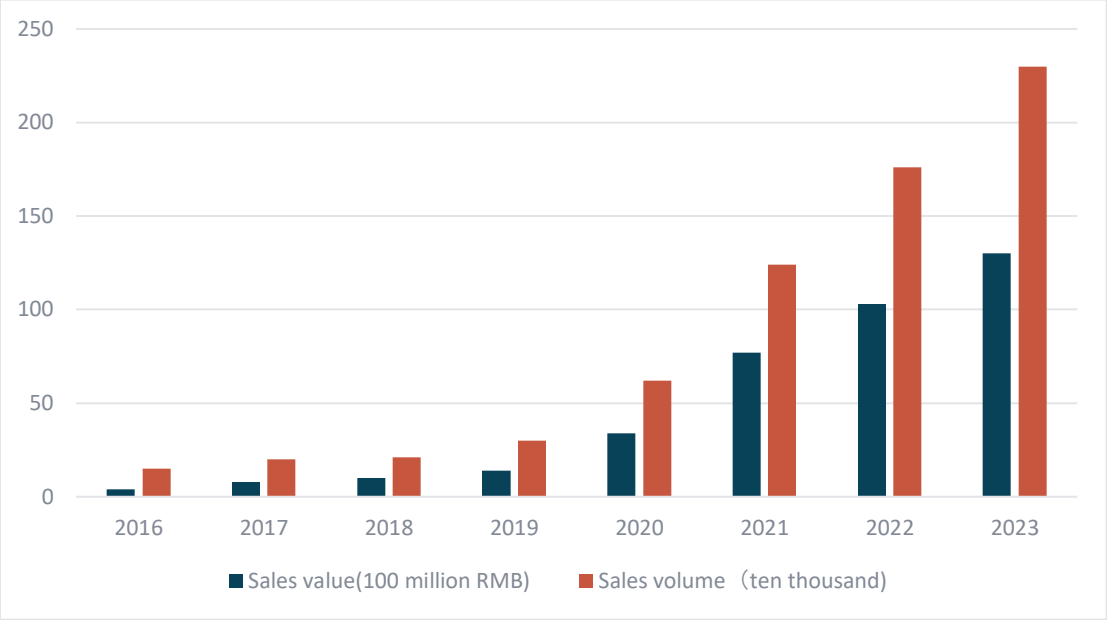

FIGURE 7 DRYER SALES IN CHINA

To analyze current market trends, CLASP collected data from over 2,300 dryer models listed on JD.com in 2023. Due to the lower efficiency of air-vented dryers, the market share of heat pump condenser dryers has grown rapidly, accounting for 61% of all dryers. Heat pump dryers represent a substantial share of the market and offer a significant advantage in energy efficiency over other dryer technologies.

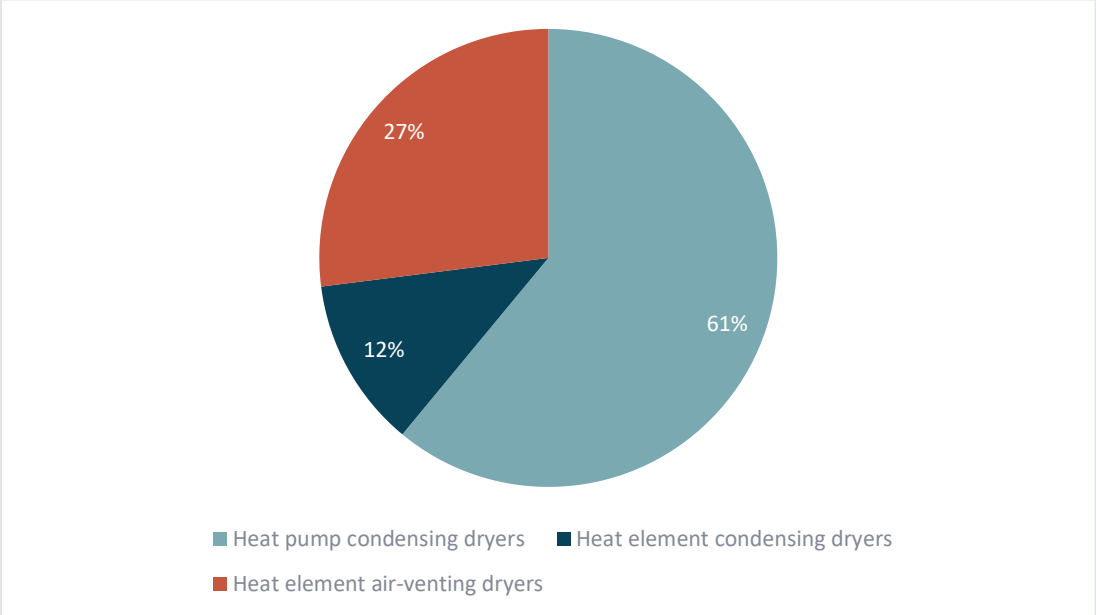

FIGURE 8 CLOTHES DRYER TECHNICAL DISTRIBUTION ON JD.COM

A 2018 EU energy consumption study, comparing different dryer technologies and rated capacities, revealed that heat pump condenser dryers consistently exhibited the lowest energy consumption across all rated capacities.

TABLE 6 EU ENERGY CONSUMPTION COMPARISON OF DRYER TECHNOLOGIES[20]

RATED CAPACITY (KG)	WEIGHTED ENERGY CONSUMPTION PER CYCLE (KWH/CYCLE)			
	HP-C[21]	HE-C[22]	HE-V[23]	Sales weighted average
6	1.07	2.46	2.47	1.70
7	1.20	2.77	2.74	1.90
8	1.23	3.07	3.20	2.08
9	1.40	3.38	3.54	2.32
Sales distribution	59%	31%	10%	

[20] *European Union, Review-Study-on-Household-Tumble-Driers,* 2019
[21] HP-C heat pump condensing dryer
[22] HE-C heat element condensing dryer
[23] HE-V heat element air-venting dryer

Emissions reductions and water savings assessment

1. Potential emissions reductions and water savings from a 20% MEPS improvement scenario

Currently, grade 1 drum washing machines account for 99% of the market in China. In contrast, the distribution of impeller washing machines is more varied: grade 1 impeller washing machines represent 30%, grade 2 machines account for 42%, and grade 3 machines make up 27%.

In line with the principles for revising China's energy efficiency standards, new MEPS could eliminate 20% of the less-efficient products. New MEPS requirements for energy and water consumption of impeller washing machines could phase out grades 3, 4, and 5 impeller washing machines and could phase out 20% of the less-efficient grade 1 drum washing machines.

Based on a scenario of 220 washing cycles per year, a 20% improvement in MEPS is estimated to reduce annual CO_2 emissions by 6 Mt and save 2.7 billion m^3 of water annually.

2. Emissions reductions and water savings under a BAT scenario

According to the China Energy Labeling Database, the current BAT of drum washing machines with a rated washing capacity of 9 kg has an energy consumption of 0.039 kWh/(cycle. kg) and a water consumption of 5.2 L/(cycle. kg).

For impeller washing machines with a rated washing capacity of 10 kg, the BAT has an energy consumption of 0.008 kWh/(cycle. kg), and a water consumption of 11.1 L/(cycle. kg).

Under this BAT scenario, assuming washing machines run 220 washing cycles per year, the BAT of drum and impeller washing machines can reduce CO_2 emissions by 21 Mt and save 5.5 billion m^3 of water annually.

Conclusion

This analysis of China's washing machine market and comparison of China and the EU's washing machine standards reveal the need to upgrade China's standards to meet current market demands, trends, and sustainability goals.

China should accelerate the revision of its washing machine energy efficiency standards and aim to set benchmarks that lead both domestically and internationally. Strengthening these standards will deliver substantial emissions reductions and water savings.

China should also introduce mandatory energy efficiency standards for clothes dryers and extend requirements to cover the wash-drying cycle of washer-dryers, aligning with more comprehensive standards adopted by the EU.

Further research is required, particularly on consumer usage behavior, to conduct comparative testing, and assess the impact of smart and additional features on energy consumption, to ensure that future standards are evidence-based and effective.

Endnotes

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