Indonesia Fan Market Study and Policy Analysis

Final Report

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CLASP
PwC

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Contents

List of Tables

List of Figures

List of Abbreviations

APEC	Asia Pacific Economic Cooperation
B2B	Business-to-business
BAU	Business-as-usual
BOE	Barrel of Oil Equivalent
BPS	Badan Pusat Statistik Indonesia Central Bureau of Statistics
BSN	Badan Standardisasi Nasional Indonesia National Standardization Agency
CAGR	Compound Annual Growth Rate
CO_2	Carbon Dioxide
EBTKE	Direktorat Jenderal Energi Baru, Terbarukan, dan Konservasi Energi Directorate General of New Renewable Energy and Energy Conservation
EE	Energy Efficiency
EU	European Union
FGD	Focus Group Discussion
GABEL	Gabungan Perusahaan Industri Elektronik dan Alat-alat Listrik Rumah Tangga Indonesia Association of Indonesian Electronics and Electrical Equipment Industry Companies
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GWh	Gigawatt-hour
HS	Harmonized (Commodity Description and Coding) System
Hz	Hertz
IDR, Rp	Indonesian Rupiah
IEC	International Electrotechnical Commission
INSW	Indonesia National Single Window (Trade Statistics)
ISO	International Organization for Standardization
KAN	Komite Akreditasi Nasional Indonesian National Accreditation Committee
KESDM	Kementrian Energy dan Sumber Daya Mineral (also MEMR)
kWh	Kilowatt-hour
LSPro	Lembaga Sertifikasi Produk Product Certification Body
MBOE	Million Barrels of Oil Equivalent
MEMR	Ministry of Energy and Mineral Resources of the Republic of Indonesia (also KESDM)
MEPS	Minimum Energy Performance Standard (also SKEM)
Mt	Megatonne
NDC	Nationally Determined Contribution
OECD	Organization for Economic Co-operation and Development
PLN	Perusahaan Listrik Negara Indonesia State-owned Electric Company
SKEM	Standar Kinerja Energi Minimum (also MEPS)
SNI	Standar Nasional Indonesia Indonesian National Standard

TWh	Terawatt-hour
USD	United States Dollar

Executive Summary

Indonesia is the 4th largest country in the world, with over 265 million people in 2018.[1] Gross domestic product (GDP) has been growing by around 5% annually over the past decade,[2] while per-capita income has been concurrently growing by almost 4% annually.[3] The country's steady economic growth has contributed to a doubling in electricity consumption, from 129 TWh in 2008 to 256 TWh in 2018.

The residential sector is the primary electricity user, responsible for nearly 40% of consumption, followed by industrial (37%), commercial (23%), and transportation (0.11%).[4] Coal is the main fuel in electricity generation, responsible for 58% of primary energy consumed, followed by natural gas (27%), renewables (hydro, geothermal, solar, and wind; 8%) and oil (6%).[5]

Under the Paris Agreement, Indonesia committed to reducing greenhouse gas (GHG) emissions by 29% below a business-as-usual (BAU) baseline by 2030, or by 38% below BAU by 2030 with international support. Reaching these unconditional and conditional targets, will require reductions in energy consumption of 19% and 24% below BAU.[6]

The Ministry of Energy and Mineral Resources (MEMR or KESDM), through its Directorate General of New Renewable Energy and Energy Conservation (EBTKE), aims to reduce national energy consumption across all sectors by 17% in 2025 relative to BAU through various policies,[7] including energy efficiency standards and labeling for household electric appliances. Energy efficiency regulations for air conditioners and compact fluorescent lamps are already in place, and MEMR plans to issue additional Ministerial Regulations this year to further reduce household energy consumption.

As the leading international voice and resource for appliance efficiency policies and market acceleration initiatives, CLASP, together with local partner PwC, conducted a comprehensive study of electric fans in Indonesia. The goal of the study was to characterize the market; inform the development of appropriate and robust fans testing, standards, and labeling requirements; and assess the potential impacts of these energy efficiency policies.

The team contacted over 56 manufacturers and importers, received data and inputs from the trade association GABEL and six major manufacturers responsible for 59% of the market, and visited 51 retail stores in six cities. The team also collected government data, reviewed past studies, reviewed manufacturers' websites, and incorporated the findings of CLASP's forthcoming 5000-household, nationwide residential end-use survey. Finally, the team developed policy recommendations and analyzed them using CLASP's Policy Analysis Modeling System (PAMS).

The key findings, summarized below, will inform EBTKE of the opportunity for ambitious energy efficiency policies for fans that save money and reduce energy and CO_2 while taking into account the current range of products on the market.

Key Findings in the Market Study

The heat and humidity of Indonesia's tropical climate drives demand for cooling appliances. However, in contrast to air conditioners, which are found in only 6% of electrified Indonesian homes, fans are much more common, with 66% of homes owning an average of 1.3 fans. They are used for 6 hours per day on average.

Standing and desk fans are the most popular in homes,[8] as well as the most commonly available in retail stores. Nearly 80% of models in retail stores have blade sweep of 12 to 20 inches. Domestic manufacturing

[1] MEMR, Handbook of Energy & Economic Statistics of Indonesia, 2018, p. 3.
[2] GDP Growth (annual %) - Indonesia. (n.d.). World Bank Open Data | Data. https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?end=2018&locations=ID&start=1961&view=chart
[3] Indonesia Economic Snapshot. http://www.oecd.org/economy/indonesia-economic-snapshot/
[4] MEMR, Handbook of Energy & Economic Statistics of Indonesia, 2018, pp. 41-53.
[5] Statistics Report 2018. PLN. https://www.pln.co.id/stakeholder/laporan-statistik
[6] Government of Indonesia, First Nationally Determined Contribution Republic of Indonesia, November 2016, p.10.
[7] President of Indonesia, Presidential Regulation Number 22 of 2017 about National Energy General Plan (RUEN), p. 30.
[8] CLASP, 5000-Household Indonesian Residential End-Use Survey, Forthcoming.

and assembly dominate the Indonesian electric fan market, comprising 96% of annual sales.[9] The top three manufacturers hold a total of 35% market share, with many small enterprises present in the market.

Data on the market for fans in Indonesia is limited due to the large number of domestic producers, and neither the Ministry of Trade nor the trade association Gabel have official statistics on annual sales or present stock. Data from the major manufacturers, import statistics, and other market research were used to estimate the historical and projected annual sales as shown in Figure 1. Sales of desk, standing, wall, combination, and ceiling fans are projected to increase at a compound annual growth rate (CAGR) of 0.93%, and at 5.1% for professional fans from 2018 to 2030.

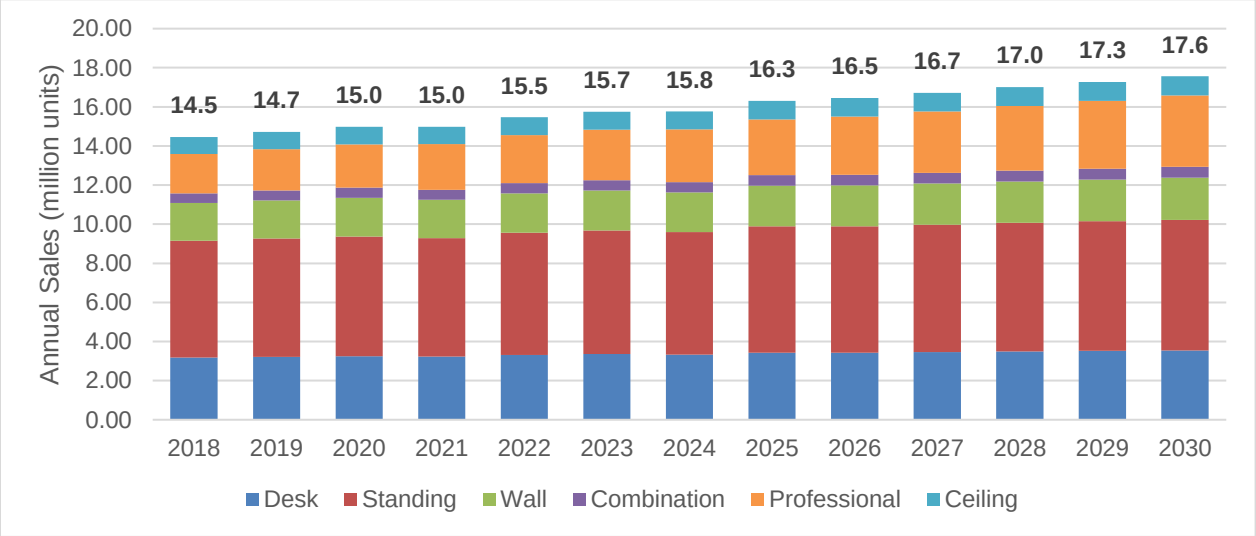

Figure 1: Historical and projected sales of six electric fans types from 2018 to 2030

Policy Options, Recommendations, and Impact Assessment

EBTKE had drafted an energy efficiency regulation in 2018, setting minimum energy performance standards (MEPS) and labeling criteria for electric fans. The regulation references the IEC 60879:1986 test standard, which has been adopted as Indonesian National Standard SNI IEC 60879:2013. A newer international test standard was adopted in 2019, IEC 60879:2019, with several improvements: the revised standard permits testing using a modern, digital anemometer and includes measurements of noise level and standby power. CLASP therefore recommends alignment with this latest version.

As performance testing of fans is not mandatory in Indonesia, manufacturers do not typically provide performance data for fans. PwC nonetheless found a total of 150 fan models with available performance data: 106 desk, standing, wall, combination, and professional fans, and 44 ceiling fans. Based on this sample, 87% of the models that exist in the market would meet the MEPS defined in the draft regulation, while 35% would be rated 4-star, the highest labeling tier drafted by EBTKE. Moreover, an international comparison shows that most countries in Southeast and South Asia have more stringent performance requirements than the current draft regulation.

To achieve greater impact and lead regional efficiency efforts, CLASP recommends the MEPS and labeling requirements for fan products with blade sweep ranging from 6 to 24 inches, as shown in Figure 2. In addition, CLASP recommends a minimum air flow requirement based on performance currently found in the market, to ensure that the energy efficiency policy does not inadvertently affect the usefulness of the fans.

[9] Considering 14.46 million-unit sales and UN Comtrade Import data (imports of 620,000 million units of fans)

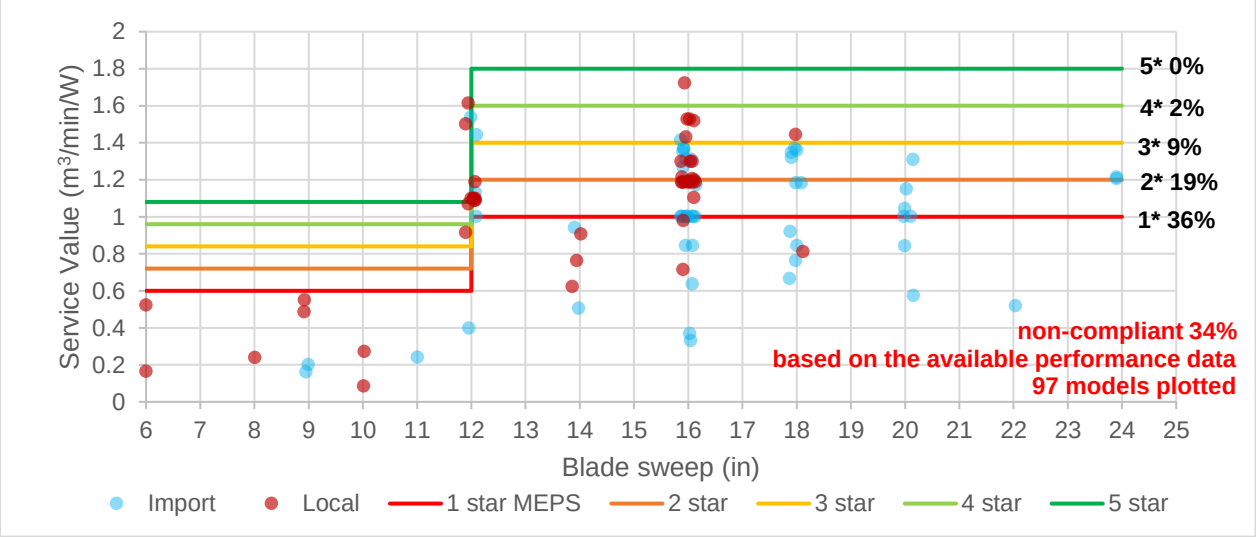

Figure 2: Electric comfort fan market performance distribution plotted against CLASP-recommended MEPS and comparative labeling levels for 6 to 24-inch fans

The performance requirements recommended by CLASP are expected to be met by 66% of the models in the market based on the available performance data, including 69% of domestically manufactured models. CLASP's analysis on the cost-efficiency relationship did not reveal any increase in prices due to this recommended standard. The life-cycle cost savings are therefore equal to the electricity bill savings and are estimated at 120,000 IDR per fan (average lifetime of 5 years for desk, standing, wall, and combination fans, and 7 years for professional fans).

CLASP also recommends policies for ceiling fans with blade sweep of 36 to 60 inches, as shown in Figure 3. While ceiling fans are estimated to account for only 6% of units sold, they are more efficient than smaller fans. Therefore, encouraging their use through labeling would be an added benefit to the savings that can be obtained from applying the proposed MEPS.

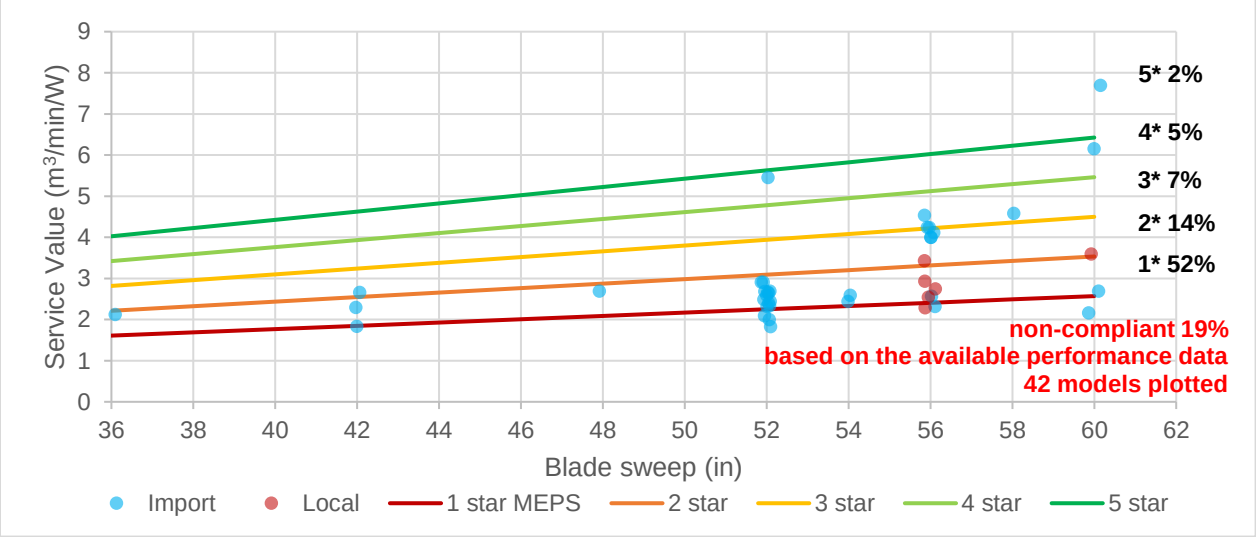

Figure 3: Ceiling fan market performance distribution plotted against CLASP-recommended MEPS and comparative labeling levels

From the available performance data, 81% of the existing ceiling fan models would be compliant, which includes 83% of locally manufactured models. Again, an analysis of the cost-efficiency relationship did not reveal any increase in prices due to this recommended standard. The life-cycle cost savings are therefore equal to the electricity bill savings and are estimated at 32,650 IDR (average lifetime of 7 years).

The impacts at the national level from both recommended standards (6–24 inches and 36–60 inches) are summarized below in Table 1. CLASP's recommended requirements would result in energy reductions of almost 1.6 TWh annually in 2030 and over 10.2 TWh between 2020 and 2030. Meanwhile, CO_2 mitigation would be nearly 1.4 $MtCO_2$ annually in 2030 and 9.0 $MtCO_2$ between 2020 and 2030, almost double the impact estimated for the requirements in the draft regulation.

Table 1. Summary of impacts of EBTKE draft regulation and CLASP-recommended policy requirements

Policy Option	Products	Final Energy Savings (TWh)		CO2 Mitigation (Mt)	
		2020-2030	2030	2020-2030	2030
CLASP Recommended Levels	• **Non-ceiling fans: 6 to 24-inch blade sweep** • **Ceiling fans: 36 to 60-inch blade sweep**	10.2	1.59	9.07	1.41
EBTKE Draft MEPS	• **Non-ceiling fans: 6 to 18-inch blade sweep**	5.18	0.66	4.62	0.59

CLASP presented the preliminary findings of this market study to a wide audience in a National Workshop in Jakarta held on November 20, 2019. On January 30, 2020, EBTKE held a Focus Group Discussion (FGD), in which CLASP was invited to present these recommendations to a smaller group of key stakeholders, namely major manufacturers, approved testing facilities, government research laboratories, and technical experts. The stakeholders could voice their opinions, provide inputs, and state possible concerns regarding CLASP's recommendations.

During the January FGD, EBTKE and stakeholders agreed on CLASP's recommended reference test standard, IEC 60879:2019, as well as CLAP's recommended minimum air flow rate, efficiency requirements, and comparative labeling levels for fan products with blade sweep ranging from 6 to 24 inches. EBTKE decided against CLASP's recommendations for ceiling fans, stating that this fan type would not be included in the upcoming regulation due to its low market share and the need to establish dedicated ceiling fan test chambers.

During subsequent discussions in February 2020, EBTKE decided to:

- Adopt CLASP's minimum performance requirements specified for fans with blade sweep ranging from 6 to 24 inches;
- Continue referencing the SNI IEC 60879:2013 because IEC 60879:2019 has not yet been adopted as an Indonesia National Standard (SNI);
- Drop the air flow rate requirement;
- Separate the 2- to 5-star labeling requirement lines for fans with blade sweep less than 12 inches; and
- Separate the 4- and 5-star lines for fans with blade sweep great than or equal to 12 inches.

The last two changes will slightly reduce the proportion of models at the higher star bands, as illustrated in Figure 4, giving further incentive to higher efficiency products.

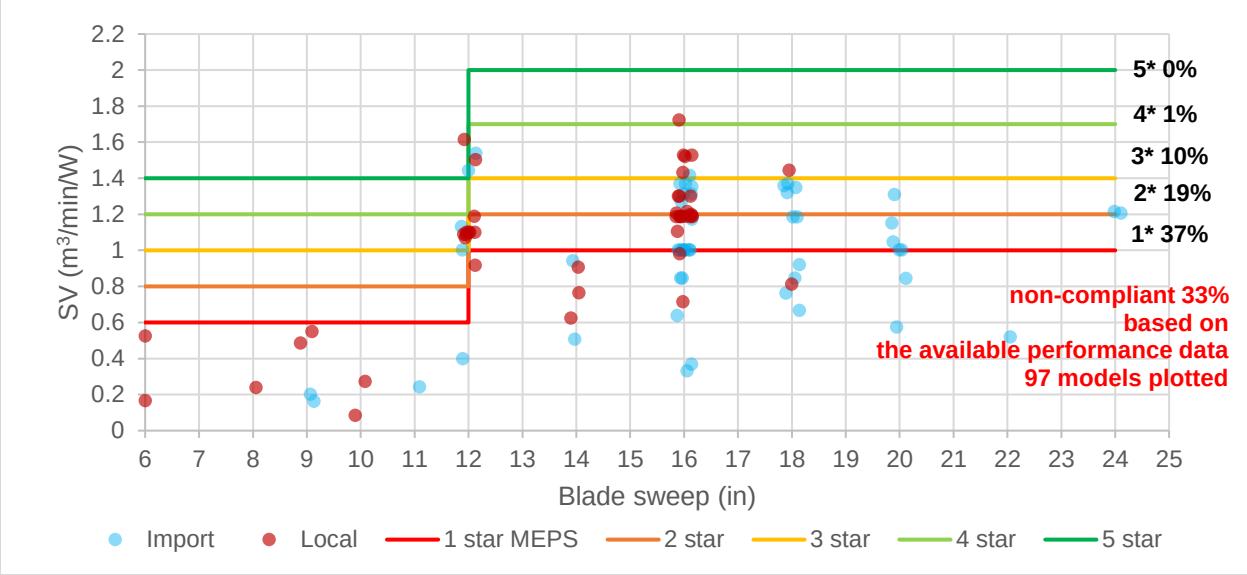

Figure 4: MEPS and comparative labeling requirements decided by EBTKE for the revised draft regulation

Despite these changes, the MEPS requirements for the most common, non-ceiling fan types are those recommended by CLASP, which should result in Indonesia achieving the majority of household and national energy reductions in Table 1 once MEMR adopts the policy.

Ringkasan Eksekutif

Indonesia adalah negara ke 4 terbesar di dunia, dengan lebih dari 265 juta jiwa pada tahun 2018.[10] Produk Domestik Bruto (PDB) telah tumbuh sekitar 5% per tahun selama dekade terakhir,[11] sementara pendapatan per kapita telah secara bersamaan tumbuh hampir 4% per tahun.[12] Pertumbuhan ekonomi yang stabil di Indonesia telah berkontribusi menaikkan konsumsi listrik dua kali lipat, dari 129 TWh pada tahun 2008 menjadi 256 TWh pada tahun 2018.

Sektor perumahan adalah pengguna listrik yang utama, menyumbang hampir 40% dari konsumsi, diikuti oleh industri (37%), komersial (23%), dan transportasi (0,11%).[13] Batubara adalah bahan bakar utama dalam pembangkit listrik, yang menyumbang 58% dari energi primer yang dikonsumsi, diikuti oleh gas alam (27%), energi terbarukan (air, panas bumi, tenaga surya, dan angin; 8%) dan minyak bumi (6%).[14]

Berdasarkan Perjanjian Paris, Indonesia berkomitmen untuk mengurangi emisi gas rumah kaca (GRK) sebesar 29% di bawah *baseline* Bisnis-Seperti-Biasa (BSB) di tahun 2030, atau 38% di bawah BSB pada tahun 2030 dengan dukungan internasional. Mencapai target tanpa syarat dan bersyarat ini, akan memerlukan pengurangan konsumsi energi 19% dan 24% di bawah BSB.[15]

Kementerian Energi dan Sumber Daya Mineral (KESDM), melalui Direktorat Jenderal Energi Baru Terbarukan dan Konservasi Energi (EBTKE), bertujuan untuk mengurangi konsumsi energi nasional di semua sektor sebesar 17% pada tahun 2025 dibandingkan dengan kondisi BSB melalui berbagai kebijakan,[16] termasuk kebijakan efisiensi energi untuk peralatan listrik umum rumah tangga. Peraturan efisiensi energi untuk AC dan lampu neon ringkas (*Compact Fluorescent Lamp*, CFL) sudah berjalan, dan KESDM berencana untuk mengeluarkan Peraturan Menteri tambahan tahun ini untuk mengurangi konsumsi energi rumah tangga lebih lanjut.

Sebagai perwakilan suara dan sumber daya internasional terkemuka untuk kebijakan efisiensi alat dan inisiatif percepatan pasar, CLASP, bersama-sama dengan mitra lokal PwC, melakukan studi komprehensif kipas angin di Indonesia. Tujuan dari penelitian ini adalah untuk mengkarakterisasi pasar, menginformasikan perkembangan uji, standar, dan persyaratan pelabelan kipas angin yang tepat dan kuat, dan menilai potensi dampak kebijakan efisiensi energi ini.

Tim menghubungi lebih dari 56 produsen dan importir, menerima data dan masukan dari asosiasi perdagangan GABEL dan enam produsen besar yang mengendalikan 59% pasar, dan mengunjungi 51 toko ritel di enam kota. Tim juga mengumpulkan data pemerintah, meninjau kembali studi sebelumnya, mengulas Informasi dari produsen, dan memasukkan temuan survei nasional yang dilakukan oleh CLASP tentang penggunaan akhir pada rumah tangga yang meliputi 5000-rumah tangga. Akhirnya, tim mengembangkan rekomendasi kebijakan dan melakukan analisis dengan menggunakan Sistem Pemodelan Analisis Kebijakan (PAMS) dari CLASP.

Temuan utama yanng dirangkum di bawah ini, akan memberikan informasi kepada EBTKE tentang kesempatan untuk kebijakan efisiensi energi yang kuat untuk kipas angin, yang dapat memberikan penghematan uang, mengurangi energi dan CO_2, serta memperhitungkan kisaran produk saat ini di pasar.

Temuan Utama dalam Studi Pasar

Suhu yang panas dan kelembaban udara yang tinggi dari iklim tropis Indonesia mendorong kebutuhan untuk peralatan pendingin. Namun, berbeda dengan AC, yang ditemukan hanya di 6% rumah tangga di Indonesia, kipas angin adalah alat pendingin jauh lebih lazim, dimana 66% rumah tangga memiliki rata-rata 1,3 kipas angin. Kipas angin digunakan selama rata-rata 6 jam per hari.

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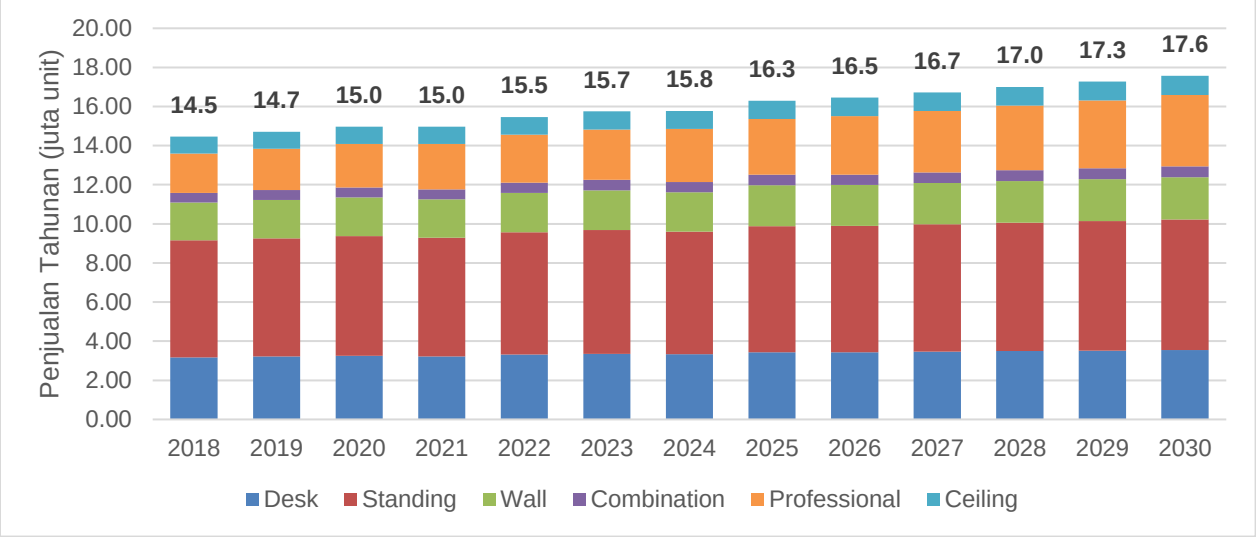
[10] KESDM, Buku Pegangan Statistik Energi & Ekonomi Indonesia, 2018, p. 3.
[11] Pertumbuhan PDB (tahunan %) - Indonesia. (n.d.). Data Terbuka Bank Dunia | Data. https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?end=2018&locations=ID&start=1961&view=chart
[12] Cuplikan Ekonomi Indonesia. http://www.oecd.org/economy/indonesia-economic-snapshot/
[13] KESDM, Buku Pegangan Statistik Energi & Ekonomi Indonesia, 2018, pp. 41-53.
[14] Laporan Statistik 2018. PLN. https://www.pln.co.id/stakeholder/laporan-statistik
[15] Pemerintah Indonesia, Kontribusi Republik Indonesia yang Pertama Ditentukan Secara Nasional , November 2016, p.10.
[16] Presiden Indonesia, Peraturan Presiden Nomor 22 tahun 2017 tentang Rencana Umum Energi Nasional (RUEN), p. 30.

Kipas angin berdiri dan kipas angin meja adalah tipe yang paling populer di rumah-rumah,[17] selain itu juga tipe yang paling umum tersedia di toko ritel. Hampir 80% dari model di toko ritel memiliki sudu kipas berdiameter 12 sampai 20 inci. Pabrik dan perakit domestik mendominasi pasar kipas angin listrik Indonesia, meliputi 96% dari penjualan tahunan.[18] Tiga produsen teratas memegang 35% total pangsa pasar, dengan banyak pengusaha kecil yang ditemukan di pasar.

Data di pasar untuk kipas angin di Indonesia terbatas karena sejumlah besar produsen dalam negeri, dan baik Kementerian Perdagangan maupun asosiasi perdagangan Gabel tidak memiliki statistik resmi tentang penjualan tahunan atau persediaan saat ini. Data dari produsen besar, statistik impor, dan riset pasar lainnya digunakan untuk memperkirakan data historis dan proyeksi penjualan tahunan seperti yang ditunjukkan pada Gambar 5. Penjualan kipas angin meja, berdiri, dinding, kombinasi, dan langit-langit diproyeksikan meningkat pada laju pertumbuhan tahunan majemuk (CAGR) sebesar 0,93%, dan 5,1% untuk kipas angin professional dari tahun 2018 sampai 2030.



Gambar 5: Historis dan proyeksi penjualan enam jenis kipas angin listrik tahun 2018 sampai 2030

Pilihan Kebijakan, Rekomendasi, dan Penilaian Dampak

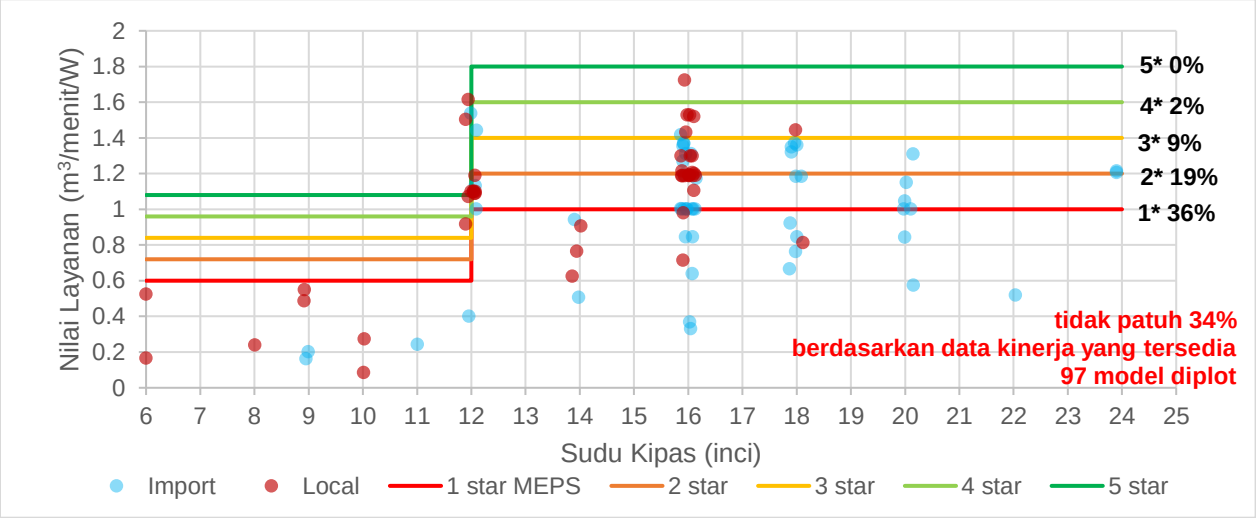
EBTKE telah menyusun regulasi efisiensi energi di tahun 2018, termasuk peraturan Standar Kinerja Energi Minimum (SKEM) dan kriteria pelabelan untuk kipas angin. Peraturan mengacu ke IEC 60879:1986 standar uji yang telah diadopsi sebagai Standar Nasional Indonesia SNI IEC 60879:2013. Sebuah standar uji internasional yang lebih baru diadiopsi di tahun 2019, IEC 60879:2019, dengan beberapa perbaikan yaitu revisi uji izin standar menggunakan anemometer digital modern dan termasuk pengukuran tingkat kebisingan dan daya siaga (*standby power*). Oleh karena itu, CLASP merekomendasikan keselarasan dengan versi terbaru ini.

Karena pengujian kinerja kipas angin tidak diwajibkan di Indonesia, produsen biasanya tidak menyediakan data kinerja untuk kipas angin. Meskipun begitu PwC menemukan total 150 model kipas angin dengan data kinerja yang tersedia, yaitu dari 106 kipas angin meja, berdiri, dinding, kombinasi, dan profesional, serta 44 kipas angin langit-langit. Berdasarkan sampel ini, 87% dari model yang ada di pasar akan memenuhi SKEM yang ditetapkan dalam rancangan peraturan, sementara 35% akan dinilai memiliki bintang 4, yang merupakan tingkat pelabelan tertinggi yang disusun oleh EBTKE. Selain itu, perbandingan regulasi kipas

[17] CLASP, Survei Nasional Penggunaan Akhir Perumahan Indonesia 5000-Rumah tangga, yang akan datang.
[18] Dengan mempertimbangkan penjualan 14,46 juta-unit dan Impor data Comtrade PBB (impor 620,000 juta unit kipas angin)

angin internasional menunjukkan bahwa sebagian besar negara di Asia Tenggara dan Asia Selatan memiliki persyaratan kinerja yang lebih ketat daripada rancangan peraturan saat ini.

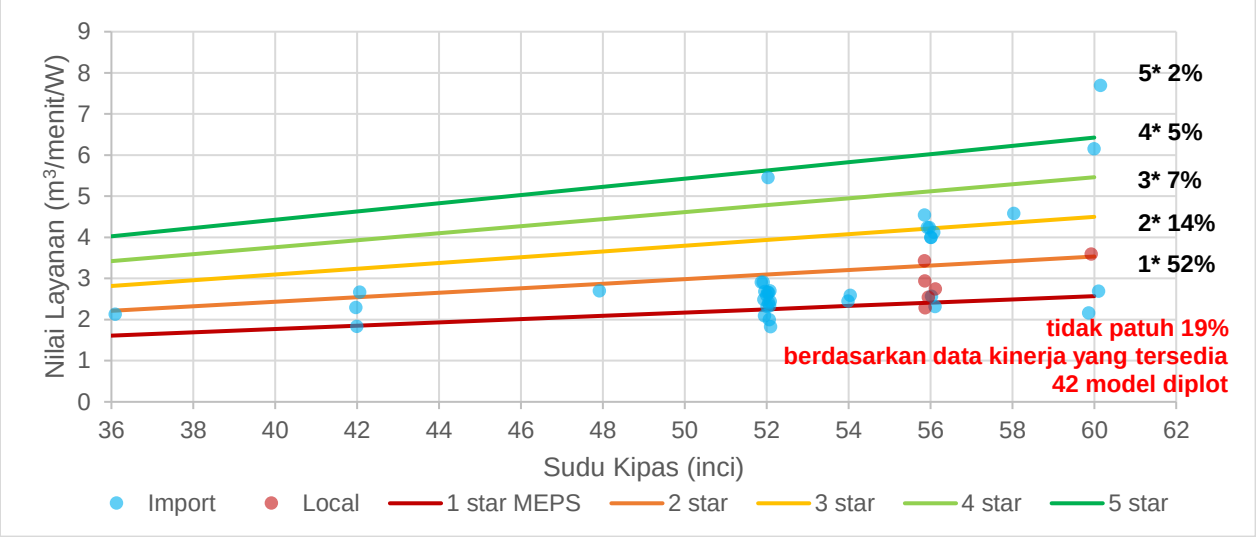
Untuk mencapai dampak yang lebih besar dan menggiring upaya efisiensi regional, CLASP merekomendasikan SKEM dan persyaratan pelabelan untuk produk kipas dengan sudu kipas berdiameter mulai dari 6 sampai 24 inci, seperti yang ditunjukkan pada Gambar 6. Selain itu, CLASP juga merekomendasikan persyaratan laju aliran udara minimum berdasarkan kinerja yang ditemukan di pasar saat ini, untuk memastikan bahwa kebijakan efisiensi energi tidak mempengaruhi kegunaan fungsional dari kipas angin secara tidak sengaja.



Gambar 6: Distribusi kinerja pasar Kipas Angin Listrik Komfort diplot terhadap SKEM yang direkomendasikan CLASP dan tingkat pelabelan komparatif untuk untuk kipas angin 6 sampai 24-inch

Persyaratan kinerja yang direkomendasikan oleh CLASP diharapkan akan dipenuhi oleh 66% dari model di pasar berdasarkan data kinerja yang tersedia, termasuk 69% dari model yang diproduksi dalam negeri. Analisis CLASP tentang hubungan efisiensi-biaya tidak menemukan adanya kenaikan harga karena standar yang direkomendasikan ini. Penghematan biaya siklus hidup karena itu sama dengan penghematan tagihan listrik dan diperkirakan sebesar Rp 120.000 per kipas angin (umur pakai rata-rata 5 tahun untuk kipas angin meja, berdiri, dinding, dan kombinasi, dan 7 tahun untuk kipas angin profesional).

CLASP juga merekomendasikan kebijakan untuk kipas angin langit-langit dengan sudu kipas berdiameter mulai dari 36 sampai 60 inci, seperti yang ditunjukkan pada Gambar 7. Walaupun kipas angin langit-langit diperkirakan hanya menyumbang 6% dari unit yang terjual, model ini lebih energi efisien daripada kipas angin yang lebih kecil. Oleh karena itu, mendorong penggunaan kipas angin langit-langit melalui pelabelan akan memberikan manfaat tambahan untuk penghematan yang dapat diperoleh dari penerapan SKEM yang diusulkan.



Gambar 7: Distribusi kinerja pasar kipas langit-langit diplot terhadap SKEM yang direkomendasikan CLASP dan tingkat pelabelan komparatif

Dari data kinerja yang tersedia, 81% dari model kipas angin langit-langit yang ada akan memenuhi aturan yang direkomendasikan, yang mencakup 83% model yang diproduksi secara lokal. Sekali lagi, analisis hubungan efisiensi-biaya tidak menemukan adanya kenaikan harga karena standar yang direkomendasikan ini. Karena ini, penghematan biaya siklus hidup akan sama dengan penghematan tagihan listrik, diperkirakan sebesar Rp 32.650 (umur pakai rata-rata 7 tahun).

Dampak di tingkat nasional dari kedua standar yang direkomendasikan (6-24 inci dan 36-60 inci) dirangkum sebagai berikut di Tabel 2. Persyaratan yang direkomendasikan CLASP ini akan menghasilkan pengurangan energi hampir sebesar 1,6 TWh per tahun pada tahun 2030 dan lebih dari 10,2 TWh antara tahun 2020 dan 2030. Sementara itu, mitigasi CO_2 akan hampir sebesar 1,4 $MtCO_2$ per tahun pada tahun 2030 dan 9,0 $MtCO_2$ antara tahun 2020 dan 2030, hampir dua kali lipat dampak yang diperkirakan untuk persyaratan dalam rancangan peraturan.

Tabel 2. Ringkasan dari dampak rancangan peraturan EBTKE dan persyaratan kebijakan yang direkomendasikan CLASP

Pilihan Kebijakan	Produk	Penghematan Energi Final (TWh)		Mitigasi CO2 (Mt)	
		2020-2030	2030	2020-2030	2030
Tingkat yang Direkomendasikan CLASP	• **Kipas non-langit-langit: sudu kipas berdiameter 6 sampai 24-inci** • **Kipas langit-langit: sudu kipas berdiameter 36 sampai 60-inci**	10,2	1,59	9,07	1,41
Rancangan peraturan EBTKE	• **Kipas non-langit-langit: sudu kipas berdiameter 6 sampai 18-inci**	5,18	0,66	4,62	0,59

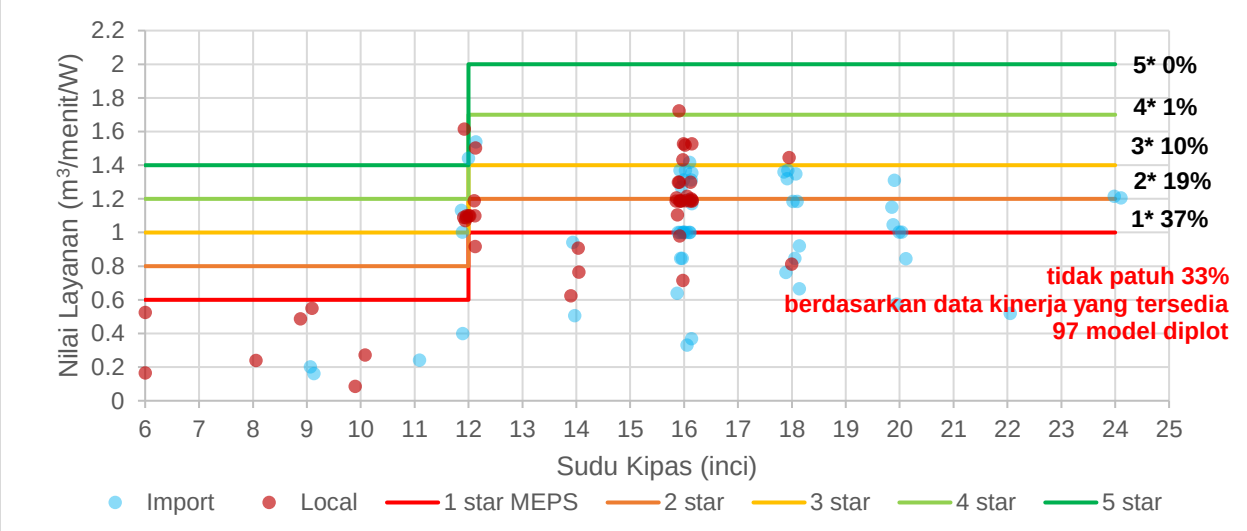
CLASP menyajikan temuan awal dari studi pasar ini ke khalayak luas dalam Lokakarya Nasional di Jakarta yang diadakan pada tanggal 20 November 2019. Pada tanggal 30 Januari, 2020, EBTKE menggelar *Focus Group Discussion* (FGD), di mana CLASP diundang untuk menyampaikan rekomendasi tersebut kepada kelompok pemangku kepentingan utama yang lebih kecil, yaitu produsen besar, fasilitas pengetesan yang diakui, laboratorium penelitian pemerintah, dan para ahli teknis. Pemangku kepentingan menyampaikan pendapat mereka, memberi masukan, dan menyatakan kemungkinan-kemungkinan yang harus diperhatikan terkait rekomendasi CLASP ini.

Selama FGD Januari, EBTKE dan pemangku kepentingan bersepakat atas standar uji acuan yang direkomendasikan CLASP, IEC 60879: 2019, serta tingkat minimum laju aliran udara, persyaratan efisiensi, dan tingkat pelabelan komparatif yang direkomendasikan CLASP untuk produk kipas angin dengan sudu kipas berdiameter mulai dari 6 sampai 24 inci. EBTKE memutuskan tidak mengikuti rekomendasi CLASP untuk kipas angin langit-langit, yang menyatakan bahwa jenis kipas ini tidak akan dimasukkan dalam regulasi yang akan datang karena pangsa pasar yang rendah dan kebutuhan untuk membangun ruang khusus untuk pengujian kipas angin langit-langit.

Selama diskusi berikutnya pada bulan Februari 2020, EBTKE memutuskan untuk:

- Memakai persyaratan kinerja minimum yang direkomendasikan oleh CLASP untuk kipas angin dengan sapuan pisau mulai dari 6 sampai 24 inci;
- Melanjutkan acuan SNI IEC 60879:2013 karena IEC 60879:2019 belum diadopsi sebagai Standar Nasional Indonesia (SNI);
- Meniadakan persyaratan laju aliran udara;
- Memisahkan baris persyaratan pelabelan bintang 2 sampai 5 untuk kipas angin dengan sudu kipas berdiameter kurang dari 12 inci; dan
- Memisahkan baris bintang 4 dan 5 untuk kipas angin dengan sudu pisau lebih besar atau sama dengan 12 inci.

Dua perubahan terakhir akan sedikit mengurangi proporsi model pada kelompok bintang yang lebih tinggi, seperti digambarkan pada Gambar 8, memberikan insentif lebih lanjut untuk produk dengan efisiensi yang lebih tinggi.



Gambar 8: SKEM dan persyaratan pelabelan komparatif yang diputuskan oleh EBTKE untuk revisi rancangan peraturan

Meskipun adanya perubahan ini, persyaratan SKEM telah disepakati untuk jenis kipas angin yang paling banyak digunakan di Indonesia adalah persyaratan yang direkomendasikan oleh CLASP. Dengan peraturan ini, Indonesia akan mencapai sebagian besar pengurangan energi rumah tangga dan nasional yang tersedia di Tabel 2 segera setelah KESDM memberlakukan kebijakan tersebut.

1 Background and Introduction

Indonesia is home to over 265 million people.[19] It is the fourth most populous country in the world and its rapidly expanding economy is the largest in Southeast Asia. GDP per capita has risen by 70% during the past two decades and while the end of the commodity price boom weighed on incomes and government revenues, GDP has continued growing at around 5% per year, while per capita income has grown at almost 4% per year.[20]

The manufacturing sector has played an important role in the country's development and it is positioned to continue as an engine of economic growth for the national economy.[21] The home appliances segment in particular has benefited from increasing investments in the country by multinationals such as LG, Sharp, and Panasonic. According to the Ministry of Trade, Indonesia was home to 235 companies in the electronics and home appliance manufacturing business (including component makers) in 2014.[22] The country has one of the strongest manufacturing sectors in the world, accounting for 20.5% of GDP in 2018.[23] The Asian Development Bank expects Indonesia's GDP growth rate to average around 6% between 2020 and 2024 due to its growing manufacturing sector.[24]

Growth in the manufacturing sector has also been attributed to the change in consumption patterns in the country. The middle-class consumer segment is anticipated to grow from 88 million people in 2014 to 140 million by 2020.[25] Retail sales grew by 3.7% in 2018 and household consumption grew 5.5% in 2018, up from 4.9% the year before.[26]

Economic growth has been accompanied by a rise in energy consumption and greenhouse gas (GHG) emissions. Electricity consumption has doubled over the past decade, from 129 TWh in 2008 to 256 TWh in 2018. The residential sector is the primary electricity user, responsible for nearly 40% of consumption, followed by industrial (37%), commercial (23%), and transportation (0.11%) sectors.[27] Coal is the main fuel in electricity generation, responsible for 58% of primary energy consumed, followed by natural gas (27%), renewables (hydro, geothermal, solar, and wind; 8%) and oil (6%).[28]

Indonesia is the world's 11th highest CO_2 emitter when considering only emissions due to energy.[29] Indonesia's success in achieving its national climate pledges will be critical to keeping the planet's temperature rise below the 2 °C (3.6 °F) threshold called for in the Paris Agreement. Per the Nationally Determined Contributions (NDCs) of Indonesia, energy efficiency is one of the key measures to reduce GHG (greenhouse gas) emissions from the energy sector. In its NDC, Indonesia committed to reducing greenhouse gas (GHG) emissions by 29% against a business-as-usual (BAU) baseline by 2030, or to reach 38% below BAU by 2030 with international support.[30]

To achieve these reductions and mitigate the effects of climate change on island countries such as Indonesia, EBTKE under MEMR is implementing policies targeted at both energy supply and demand, including the efficiency of household products. MEMR aims to reduce energy consumption across all

[19] Ministry of Energy and Mineral Resources, Republic of Indonesia, Handbook of Energy & Economic Statistics of Indonesia, 2018
[20] Indonesia Economic Snapshot. http://www.oecd.org/economy/indonesia-economic-snapshot/
[21] The Jakarta Post, Business; https://www.thejakartapost.com/news/2019/02/11/manufacturing-sector-to-drive-indonesias-economy-bappenas.html (accessed on 22 May 2019)
[22] Global Business Guide, Indonesia; http://www.gbgindonesia.com/en/manufacturing/article/2015/electronics_and_home_appliances_manufacturing_in_indonesia_finding_its_edge_11128.php (accessed on 22 May 2019)
[23] The Jakarta Post, Business; https://www.thejakartapost.com/news/2018/12/31/manufacturing-sectors-contribution-to-gdp-above-world-average-minister.html (accessed on 22 May 2019)
[24] The Jakarta Post, https://www.thejakartapost.com/news/2019/02/11/manufacturing-sector-to-drive-indonesias-economy-bappenas.html (accessed on 22 May 2019)
[25] Consumer Durables study by BCG, November 2015
[26] Oxford Business Group; https://oxfordbusinessgroup.com/analysis/loosening-belt-growing-middle-class-boosts-consumer-spending (accessed on 23 May 2019)
[27] Handbook of Energy & Economic Statistics of Indonesia, 2018, pp. 41-53.
[28] Statistics Report 2018. PLN. https://www.pln.co.id/stakeholder/laporan-statistik
[29] Energy Information Administration, 2017 International Emissions, https://www.eia.gov/international/data/world/other-statistics/emissions-by-fuel (accessed 27 February 2020).
[30] Government of Indonesia, First Nationally Determined Contribution Republic of Indonesia, November 2016, p.10.

sectors by 17% in 2025 relative to BAU through various policies, including minimum energy efficiency standards (MEPS) and comparative labeling for energy-using products.[31]

MEPS currently exist for compact fluorescent lamps and room air conditioners, and standards for other products are either in development or pending approval. However, limited or non-existent data on the appliance market makes it challenging for EBTKE to estimate the CO_2 reduction potential of other products, to be used as the basis for product selection for new MEPS levels and compliance efforts. Therefore, CLASP and its partners undertook market studies for four products—fans, lighting, refrigerators, and rice cookers—to inform EBTKE's analysis of the market and the characteristics of these products, and to calculate the energy and CO_2 reduction potential from setting ambitious efficiency policies.

As the leading international voice and resource for appliance efficiency policies and market acceleration initiatives, CLASP, together with local partner PwC, conducted a comprehensive market study in Indonesia. This study assesses the potential impact of energy efficiency policies for fan products based on product-level data and market characteristics. The market assessment is based on data from 8 manufacturers representing close to 59% market share.[32] The remaining market share of approximately 41% is distributed between more than 36 smaller players.

This report first describes the results of the market assessment, and then looks at the policy options and their impacts.

Market Assessment:

- **Section 1** provides an introduction, background and study objectives;
- **Section 2** describes the approach including scope and key activities;
- **Section 3** provides an overview of the market including key players and a discussion of the supply chain; and
- **Section 4** presents data on market characteristics.

Policy Options and Impacts Assessment:

- **Section 5** summarizes the current draft MEPS and labeling requirements and compares them to international test methods;
- **Section 6** summarizes the current test method referenced in the draft requirements and compares it to international test methods as well as calculates lab capacity;
- **Section 7** describes the approach to analyzing alternative policies;
- **Section 8** presents the policy options;
- **Section 9** reviews the impacts on consumers, manufacturers, and the nation; and finally
- **Section 10** contains the conclusions and recommendations.

[31] President of Indonesia, Republic of Indonesia Presidential Regulation Number 22 of 2017 about National Energy General Plan (RUEN), p. 30.
[32] Representing 8.54 million units of annual shipments in the year 2018. Annual shipments estimated are 14.46 million units for the year 2018 for electric fans as per stock model.

Market Assessment

2 Market Assessment Methodology

Market assessment is the first step in designing and implementing energy efficiency policies for any appliance. It helps policymakers and other stakeholders understand:

- Product characteristics, market segments, and core issues of the sector;
- Past, present, and future trends in the sector; and
- Impacts of energy efficiency policies.

The CLASP team therefore collected market and product level data, followed by validation and detailed data analysis. Each of these three steps is described in the sections below.

Step 1 – Market Data Collection Methodology

Data collection was performed by PwC and was conducted through survey questionnaires, interviews, and secondary research, as illustrated in Figure 9.

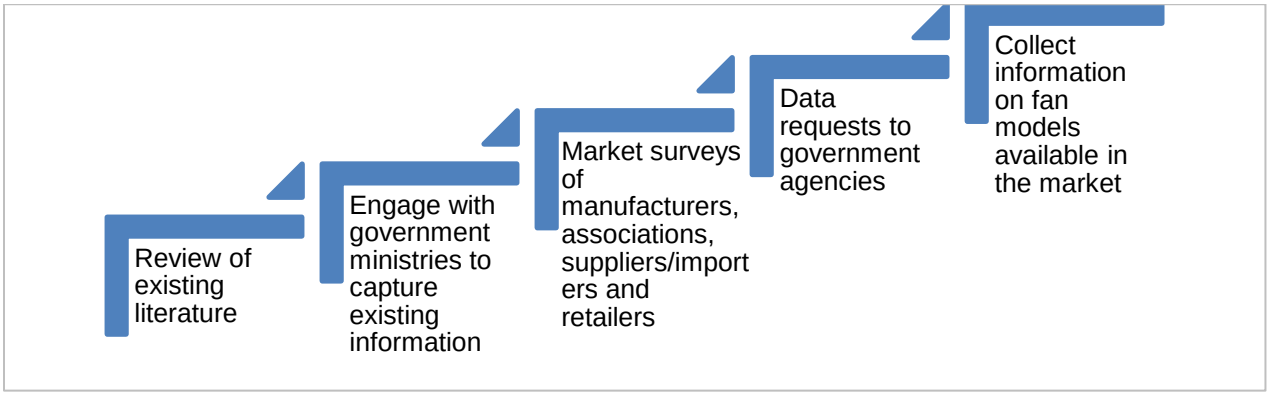


Figure 9: Data collection steps

First, the team **conducted a review of existing literature such as credible market reports and research papers** from organizations like Euromonitor International to build an initial view of the market. Outputs of this exercise included understanding the market profile for electric fans, profile of end users, technology available in the market, key manufacturers, import/export profile etc. This information helped to identify stakeholders to approach for data collection. **Appendix A** provides details on secondary data collected that the team used as reference.

The team then engaged with government ministries such as EBTKE, Ministry of Trade, BSN, members of the technical committee that develops test standards for electric fans, etc., to capture existing information. Contact with manufacturers was established from references, by sending requests by email, and web research. The full list of stakeholders contacted is in **Appendix B.**

- *Personal interviews with Ministry of Trade for import/export data:* **I**mport and export by many small market players. Therefore, the most appropriate way to capture data relating to import was relying on aggregate data from the Ministry of Trade and UN Comtrade. The type of products imported such as product type, price, technology etc. was a part of the information collected from retailers.

- *Data requests to government agencies.* To validate the primary data gathered from the manufacturers and importers, secondary data was requested from government agencies.

Market survey of electric fan manufacturers, suppliers/importers and retailers

- *Meetings with local manufacturers and importers.* Industry associations and individual manufacturers are the sole custodians of all sales, production and supply chain data for electric

fans. Therefore, they form the most credible sources of information. After the initial round of discussions, the project team shared a detailed questionnaire requesting market and product data.

- *Retailer survey.* The team visited a number of retail stores across 6 cities in Indonesia to understand the type of models and fan technologies available and sold in the country. Product data was collected including information on brand, model number, type, usage, performance values, country of manufacture, power rating, blade sweep, and price. The retailer survey methodology is explained in **Appendix C**.

Table 3: Survey of fans retailer outlets

City	Modern Stores Visited	Traditional Stores Visited
Jakarta	10	5
Bandung	5	3
Surabaya	6	3
Makassar	7	3
Denpasar	3	-
Medan	6	-
Total	**37**	**14**

- *Web survey***.** Additional data on fan models available in the market were collected from Web sources, such as manufacturer websites and online aggregators such as Alibaba.

Table 4, below, summarizes the collection strategy for each required piece of data.

Table 4. Data collection strategy

Data	Collection strategy
Products on the Market and their Characteristics	• Manufacturer and supplier websites and catalogs from retail stores to identify models and technologies sold • Interviews with/survey of retailers, manufacturers, dealers, distributors, and more to understand end-user purchasing preferences and other criteria • Physical examination of models available in-store during survey of retailers • Review of existing literature and market reports
Manufacturers and Brands, Supply Chain, Imports and% Local Content	• Secondary research to identify relevant stakeholders • Interview with industry association • Interviews with manufacturers/suppliers/importers • Interview with Ministry of Trade for import/export data
Test Standards and Performance Requirements	• Assessment of existing standards & performance requirements in Indonesia • Interviews with EBTKE, manufacturers, test laboratories, national standards body BSN, and individual experts to understand national standard development process, stakeholder participation, harmonization, number of independent test lab, lab accreditation, accreditation body in Indonesia, affiliation with ILAC or APLAC

Data	Collection strategy
Lab Capacity and Accreditation	• Interviews with EBTKE, test laboratories, and BSN
Product Lifetime and Secondary (second hand) Market	• Interviews with manufacturers/suppliers • Interviews with retail store owners • Consultations with consumers, consumer organizations, NGOs etc.

Stock, Historical Shipments, Forecasts, and Market Trends through 2030	• Information on stock is usually not available directly and was estimated from the following data from manufacturers, retailers, and suppliers:
	  ○ Sales for past 5-10 years, product lifetime, replacement rates
	• Forecasting through a top-down approach:
	  ○ Identify how market indicators such as sales/ imports have increased or decreased with macroeconomic indicators such as GDP, GDP per capita, etc. and other drivers of market through correlation analysis
	  ○ Estimate the market indicators for the forecast period through established correlations

Step 2 – Data Validation

PwC conducted a quality check of the collected data to ensure that there were no discrepancies in reporting. Key stakeholders from government, manufacturers, associations gave their feedback and comments on the findings during *The National Workshop: Preliminary findings & validation meeting* on November 20th, 2019 in Jakarta. Stakeholders mostly agreed with the findings of this market assessment during the workshop.

Step 3 – Impact Analysis and Policy Recommendations

Finally, CLASP used the Policy Analysis Modeling System (PAMS)—a spreadsheet impacts model developed by CLASP and Laurence Berkeley National Laboratory—to estimate energy, emissions, and consumer cost savings under different MEPS scenarios. This analysis informed policy recommendations for fans in Indonesia.

3 Fan Industry at a Glance

3.1. Supply Chain Analysis

This section reviews the supply chain, followed by the number of imports and exports and the Indonesia's main trading partners for fans. For residential users, distribution occurs through retail stores, which procure fans from distributors.

The distributors in turn procure either from domestic producers (the majority) or from importers. For professional users, the supply chain is similar except some manufacturers, importers, and distributors conduct business to business (B2B) sales, selling directly to end users. This supply chain is shown in Figure 10.

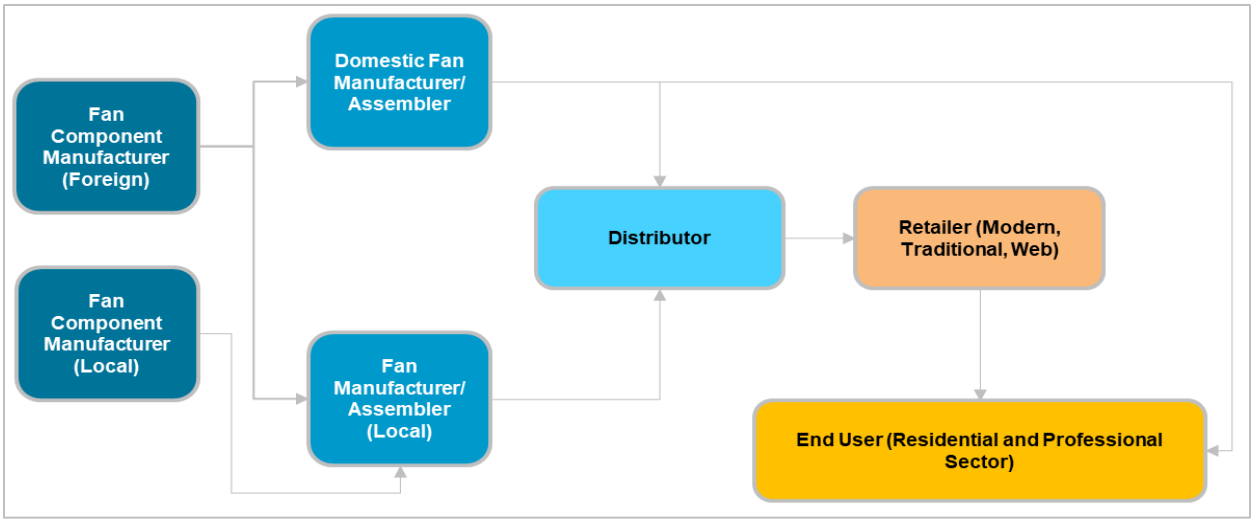


Figure 10: Supply chain distribution network

3.1.1. Imports

Imports represent less than 5% of the domestic market, amounting to 621 thousand units in 2018.[33] The imports over the past 5 years have been fluctuating, with an increase in 2015, followed by a plateau in 2016 and 2017, before a rise in 2018, as shown in Figure 11, below.

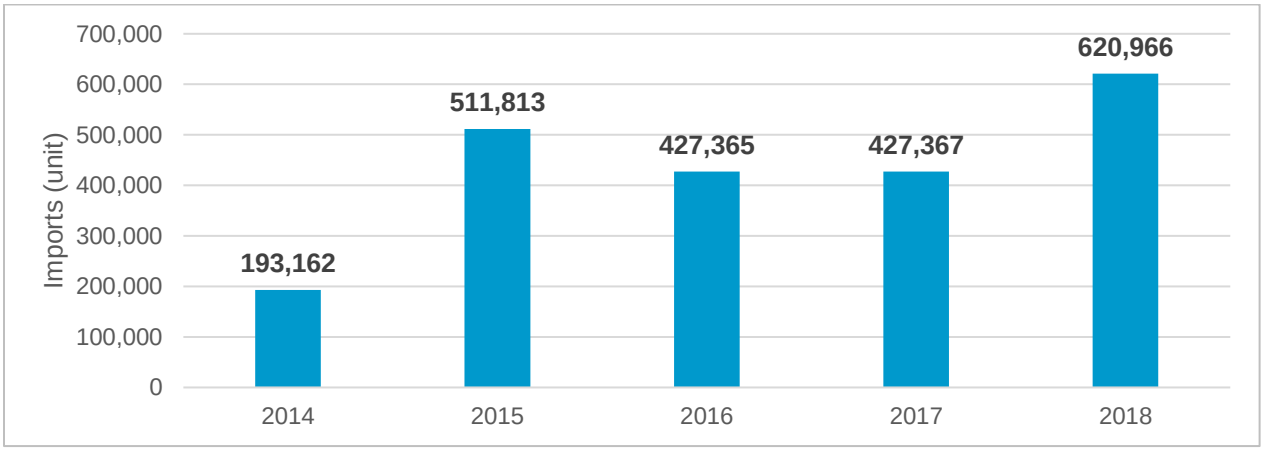


Figure 11: Fan imports in units (UN Comtrade)

List of countries with their share in imports is shown in below figure. Maximum volume of imports originated from China, followed by Thailand and Singapore.

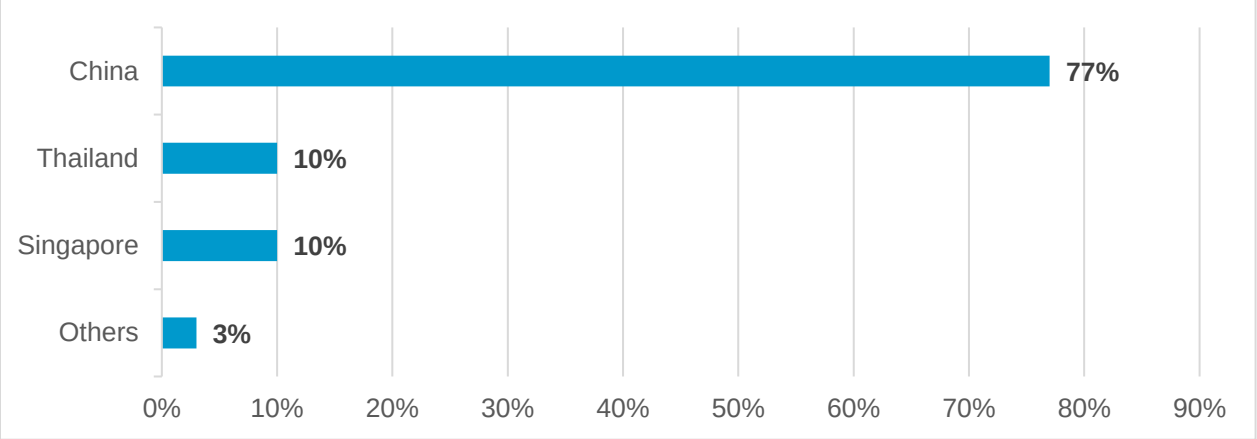


Figure 12: Shares of fan imports to Indonesia by country of origin in 2018

[33] United Nations, Commodity Trade Database (Comtrade). Results For HS Code 841451: Fans; table, floor, wall, window, ceiling or roof fans, with a self-contained electric motor of an output not exceeding 125 W. Import data calculated by UN Comtrade is based on monetary trade value in USD, as reported by Ministry of Trade.

3.1.2. Exports

Fan exports have been very low as compared to imports with main export destinations of East Timor, Singapore, Egypt, Vietnam, and Sri Lanka. Exports have been observed to significantly decline from 2013. In 2018, fan exports reached their lowest point in 5 years at 8,800 units.

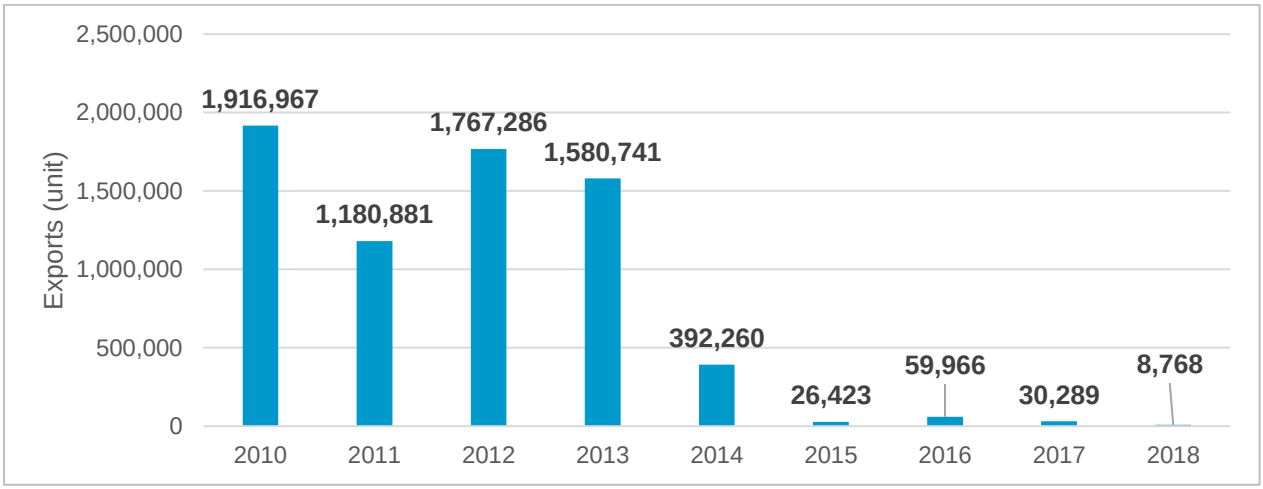


Figure 13: Fan exports in units (UN Comtrade)

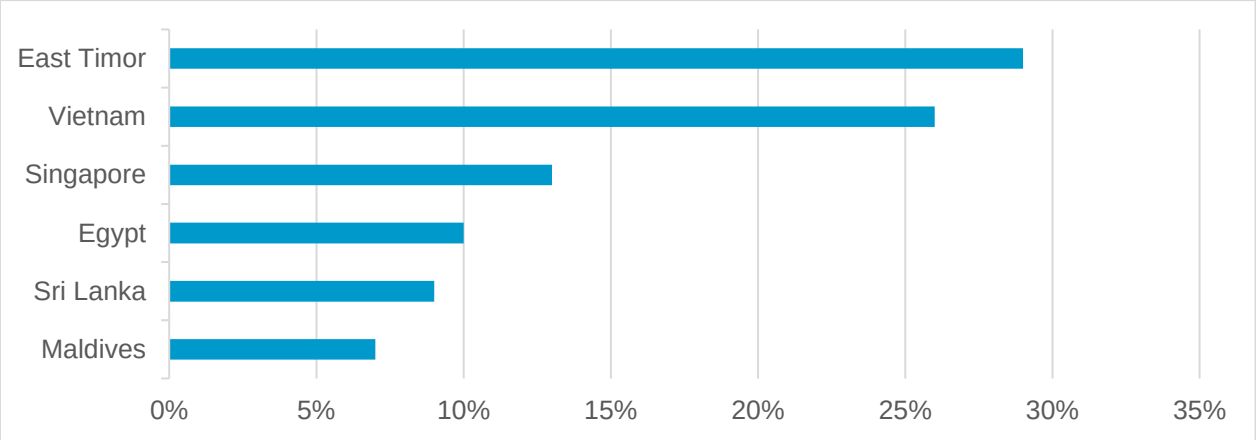


Figure 14: Major 10 destination countries for electric fan exports from Indonesia in 2018

3.1.3. Local Manufacturing

Local manufacturing dominates the Indonesian electric fan market, accounting for **95%** of annual sales, discussed in Section 4. The retail survey findings match this observation, as most brands identified were of local manufacturers. Nonetheless, the supply chain of many domestic manufacturers is dependent on import of high-value components: motors (five out of six manufacturers import) and switches (four out of five). Other components are either manufactured in-house or procured locally, as shown in Figure 15.

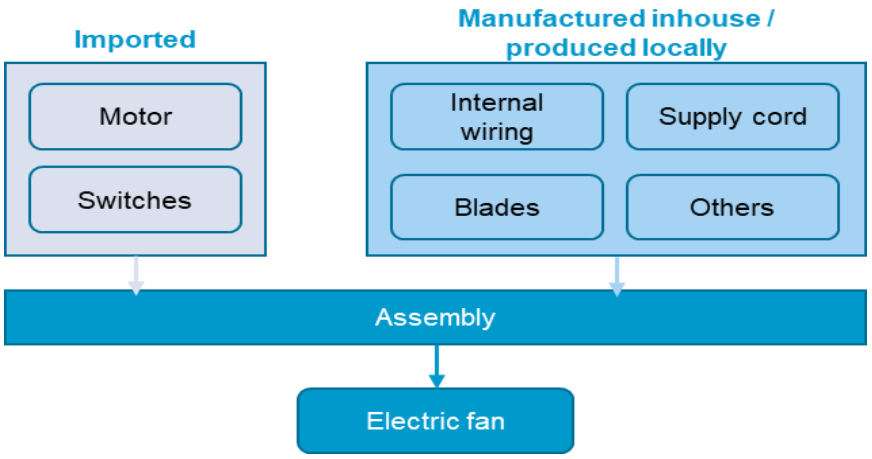


Figure 15: Supply Chain Structure of Electric Fans in Indonesia

3.1.4. Data Validation

The import and export findings presented in Section 3 are based on the UN Comtrade database and Ministry of Trade. The project team compared the traded monetary value of imports and exports with UN Comtrade data.[34] The two data sets were found to be comparable.

3.2. Key Players

The electric fans industry in Indonesia is mostly composed of notable local manufacturers. There is no regulation applied for the fan industry to-date. In addition to this, it is observed that there is limited coordination between key players in the fan industry. Hence, availability of market data on the industry at an aggregate level is limited. Neither the Ministry of Trade nor Gabel (the association of electrical and electronics equipment manufacturers in Indonesia) has official statistics on annual sales or present stock.

As such, the figures quoted below for total production and market share are a result of rigorous data collection efforts and extensive interactions with stakeholders from the fans industry in Indonesia. A total of more than 44 brands were identified during the fans market survey in Indonesia through the process illustrated in Figure 16. The project team contacted a large proportion of these manufacturers; a complete list of the interactions is provided in **Appendix B.**

[34] UN Comtrade specifies the data in terms of monetary value as well as number of units. This way the above accuracy check was achieved.

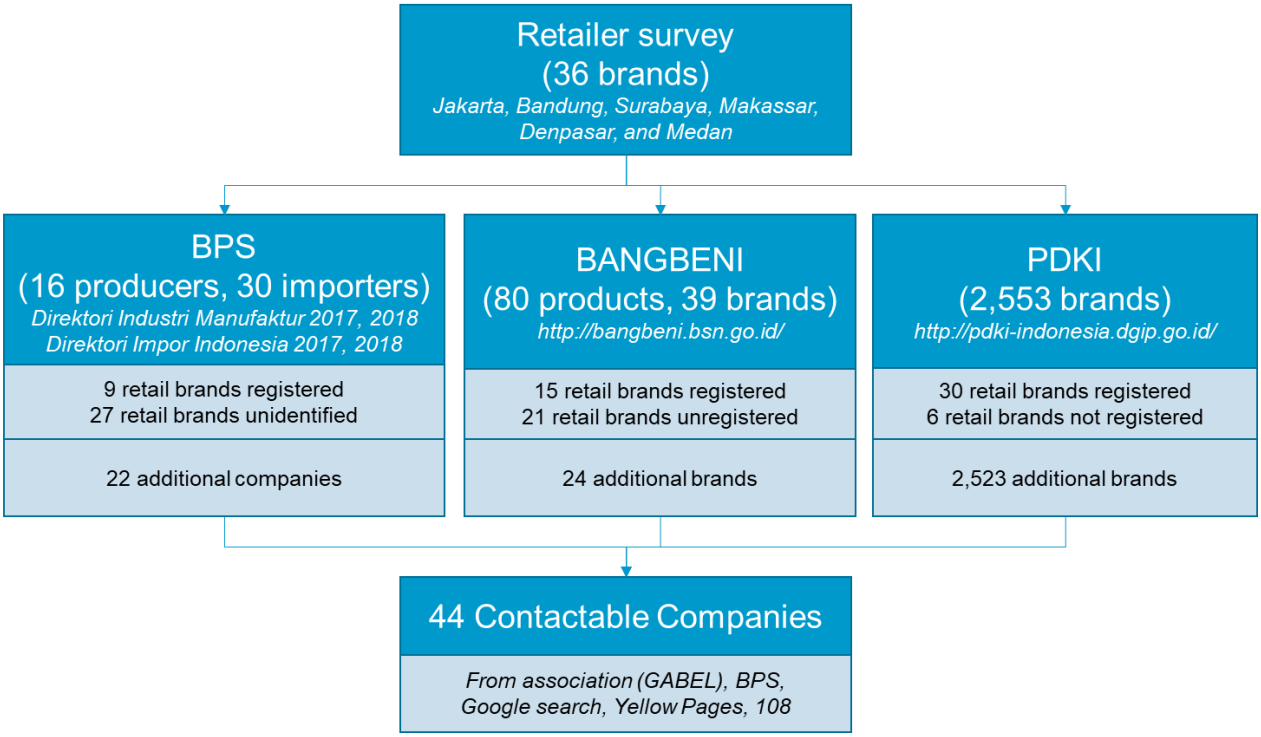


Figure 16: Identification of fan brands in Indonesia

Major manufacturers shared production data with the project team. These were estimated to represent **59%** of the total market. In addition to this, the imports accounted for **4.3%** (620 thousand units). The remaining 34.6**%** of the market is due to more than 35 smaller manufacturers. This is consistent with past market reports, including Euromonitor, which found that six major manufacturers and one importer accounted for 54% of the market by value, with Other, smaller players accounting for the remaining 46%.

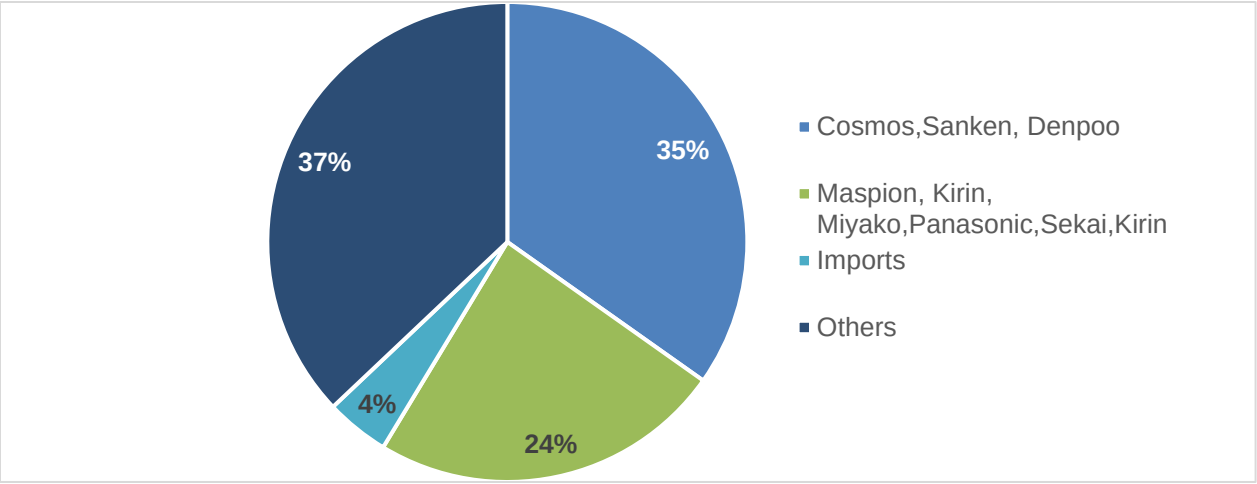


Figure 17: Key players and imports share in 2018 (total market size ~ 14.46 million units[35])

[35] Euromonitor International 2015, Sector Capsule: Air Treatment Products in Indonesia by 2014 revenue

4 Market Characteristics

4.1. Definitions

4.1.1. Technology

An electric fan is an electrically powered mechanical device which uses rotation of blades to create air flow. Fans cool people through evaporative cooling of sweat and increased heat convection into the surrounding air. Electric fans are extensively used in households and commercial establishments with wide open-air spaces. All electric fans, regardless of type, size and application comprise of at least three basic parts – electric motor, blades and wiring. Other components which depend on the type of fan include fan stand, enclosure, water tank,[36] etc. Table 5 summarizes the various components of an electric fan and their functions.

Table 5. Fan components with functions

Component	Function
Motor	Converts electrical energy to rotational energy. Responsible to create rotation in the motor shaft
Base	Supports the entire mechanism. It is usually where the speed regulator is placed, except in ceiling fans
Motor housing	Contains the electric motor, the rotor to which the blade assembly is attached
Blade assembly	Creates air flow - Cuts the air and pushes it forward.
Blade guard	Protects users from accidental contact
Power supply cord	Connects to electric power supply – may be grounded or polarized

How efficiently air flow is generated by the fan is ascertained by determining the fan's service value at various loads. The service value is calculated as follows:

$$Service\ Value\ (SV) = \frac{Air\ flow\ (m^3/min)}{Input\ power\ (W)}$$

The two factors that impact the service value are: efficiency of the motor and blade design. These determine how efficiently air displacement is achieved through the rotational movement.

[36] A mist fan is a high-powered stand fan with an attached water-storage unit and pumping system to produce mist. These were observed to be widely available in "specialty" retail stores (stores which only sell electric fans).

4.1.2. Fan Types

The types of fans available in Indonesia are shown in Figure 18. Key features of each of the types are listed below. Each type is available in several sizes and power ratings. Additional features such as oscillation, remote control, mist-generation, and luminaires may be available in a few models. Bladeless fans were not found during the retailer survey.

- **Desk/table fans**: Desk fans or table fans are the most basic types of electric fans sold in the market. As the name suggests, they are designed to be placed on a table and to provide low to medium airflow. A desk fan typically consists of a motor, blades, a base made of either metal or plastic and a wire guard for protection. A variant of the desk type fan is a box fan – the entire motor/blade apparatus is provided in a box-type enclosure.
- **Standing/pedestal fans**: A metal stand elevates the fan two to four feet from the ground. The standard stand fan has an oscillation feature that automatically varies the direction of the air flow while the fan is operating.
- **Wall-mounted fans: M**ounted on the wall and are typically placed at a height. The air flow they provide is angled downwards and they are equipped with an oscillation feature. However, these types of fans were not commonly seen in retail stores.
- **Combination fans**: Commonly available and often marketed as “two-in-one” or “three-in-one” fans, they are designed such that they may qualify as more than one of the above categories
- **Ceiling fans**: Ceiling fans are suspended from the ceiling of a room and move air and heat from top to the bottom parts of the room and vice versa.
- **Professional/commercial fans:** Commercial establishments such as open-space restaurants, use these fans to move large amounts of air. These have higher power and therefore higher prices. They also often include mist functionality.

Desk/table fans

Standing/pedestal fans

Wall fans

Combination fans

Ceiling fans

Professional

Figure 18: Six types of electric fans in the Indonesian market

Table 6, below, summarizes the characteristics of each of these fan types.

Table 6. Summary characteristics of the different fan types

	Desk /Table	Standing /Pedestal	Wall-mounted	Combination	Ceiling	Professional
Style	Placed on desk or on a low-level platform	fan head mounted on a stand	Hung from wall	Qualifies as more than one category	Hung from ceiling	Variety of formats
Diameter	6–18 inch	12–30 inch	12–20 inch	7–20 inch	16–56 inch	16–72 inch
Power rating	18–90 W	35–230 W	37–100 W	22–90 W	Up to 75 W	26–750 W
Price (Rp)	101,000–542,486	219,000–3,700,000	456,358 average	137,500–1,070,100	499,000–1,269,000	NA
Avg. Air Flow Rate	67 m^3/min	58 m^3/min	51m^3/min	43 m^3/min	181 m^3/min	171 m^3/min[37]

4.2. Market Size

4.2.1. Market Demographics at a Glance

Population, household size, electrification rates, household incomes contribute to demand for electrical fans in the residential sector. The industrial growth rate and the economic growth rate of the country contribute to demand for professional products. As the market for fans is divided between many small players and it was not possible to obtain sales data for all of them, the following key findings were used in modeling the demand for fans, from which the team estimated historical and future sales:

- Population growth rate (2013–2018): 1.24%,[38]
- Population growth rate (2019–2030): 0.9%,[39]
- Household size: 4 persons per household[40]
- Electrification rate: 98.14% in 2017, up from 97% in 2014,
- Industrial growth rate: 5.1%.[41]

[37] From web research, we obtained the following average flow rate values for: Combo Industrial (204.25 m3/min), Standing Industrial (177.84 m3/min), Ceiling Industrial (170.95 m3/min), Wall Industrial (146.96 m3/min), Desk Industrial (48 m3/min)
[38] World Bank, https://data.worldbank.org/indicator/SP.POP.TOTL?locations=ID
[39] World Bank, https://datacatalog.worldbank.org/dataset/population-estimates-and-projections
[40] BPS Statistics data for the year
[41] World bank industrial growth estimates in 2019 for last 14 quarters in Indonesia on an average

4.2.2. Sales Trend and Forecast

Annual shipments are estimated at 14.5 million units in Indonesia for the year 2018. This estimate was derived from estimates of stock (Section 0) and the number of new fans required to replace those retiring after a 5-year average lifetime. Residential fans were responsible for 85% of the total fan sales in 2018.

The major manufacturers interviewed provided a wide range of historical and predicted growth rates. From -5% to 30%. Due to fans' low cost and relatively high household penetration, the project team assumed that most households that need fans, already have them, and forecast a low growth of 1.63% from 2018 to 2030, on account of fan replacements and new installations based on industrial growth and increase in number of dwelling units.

Residential fans shipments, which include desk, standing, wall, combination, and ceiling fans, are estimated to increase at a CAGR of 0.93% as compared to 5.1% for professional fans.[42] The calculation method is provided in **Appendix D**. This is much lower than Euromonitor's projected sales of 9% from 2014 to 2019; however, manufactures and the trade association validated the team's estimates.

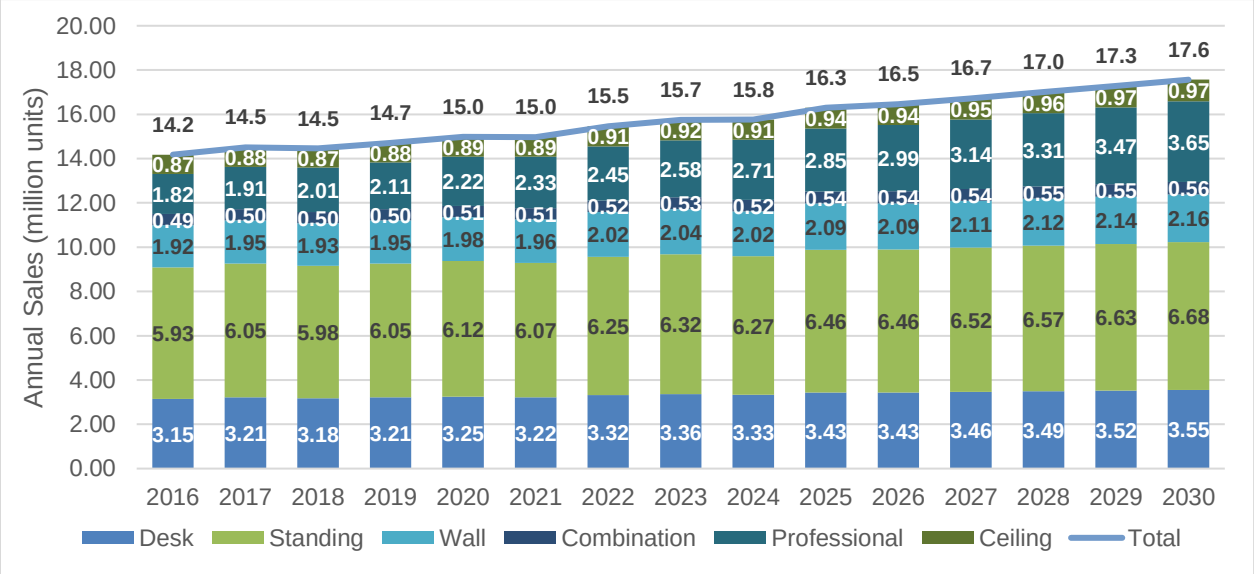


Figure 19: Electrical fan annual shipments (past, present and future trends)

[42] As per industrial growth rate estimated by World Bank for Indonesia

4.2.3. Stock

The total residential and professional fans stock in 2018 is estimated to be 68.9 million units: 58.5 million residential fans and 10.4 million professional. The residential stock was based on CLASP's Indonesia-wide residential end-use survey, which found that 66.5% of electrified, non-business households owned on average 1.3 fans. Table 7 shows the breakdown by type, with table and standing fans by far the most common.

Table 7. Fan types identified during CLASP residential end-use survey

Fan Types Identified	Distribution among households
Desk[43]	26%
Standing Fan	48%
Ceiling Fan	7%
Wall Fan	16%
Combination/Multi-function	4%

Professional fans stock was based on the number of professional electricity customers listed by PLN. It was assumed 100% of these customers owned fans, with the number per customer varying from 1.3 for small business (same as residential) to 5.2 for large industry.

Fans stock is expected to steadily increase, with residential fan stock growing at the population and household growth rate (0.9%) and professional fan stock growing at the industrial growth rate of 5.1%. Figure 20, shows the residential stock forecast.

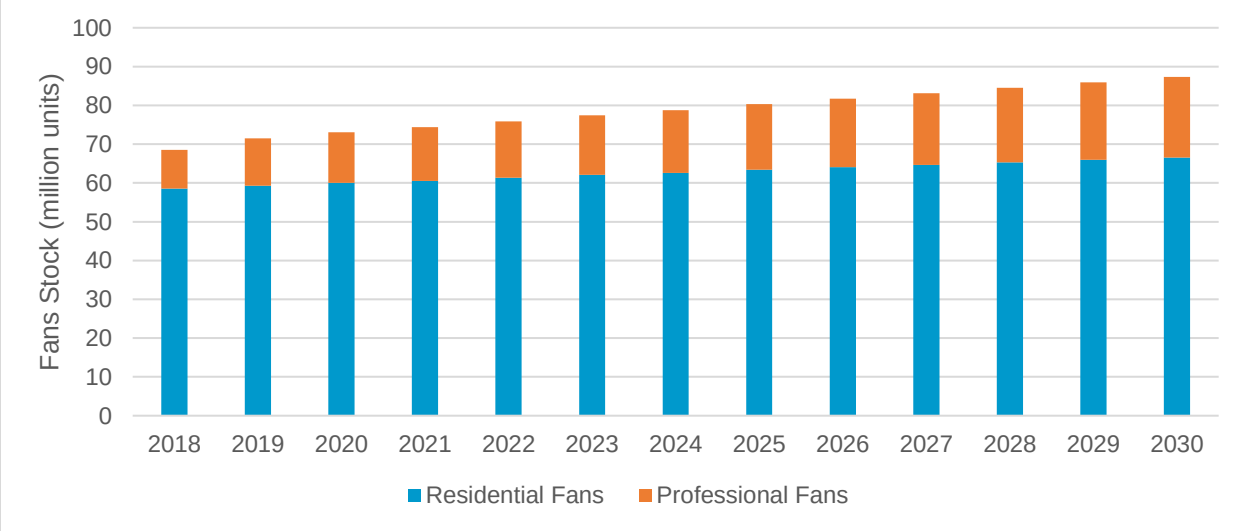


Figure 20: Indonesian fans stock from 2018 to 2030

[43] Identified in the survey as "Floor" or "Portable".

4.2.4. Detailed Model Characteristics

Fans market assessment was performed using collected product data from retailer survey (542 models) and website research (543 models) for a total of 932 models, not including duplicates.

Some models in the dataset lack values for one or several characteristics, such as blade sweep, air flow rate, power rating, and retail price. As a result, analysis of each product attribute excludes models without data on that particular attribute. For example, the average price of a fan was calculated based on models with price data, and models without price data were excluded from analysis. The CLASP team did not perform any product testing to verify the accuracy of manufacturer-claimed energy performance data.

- **Size**: Among non-ceiling fans (desk/table, standing, wall, combination, and professional), 16 inch blade sweeps are predominant, followed by 12 inch and 18 inch, as seen in Figure 21 and Figure 22.

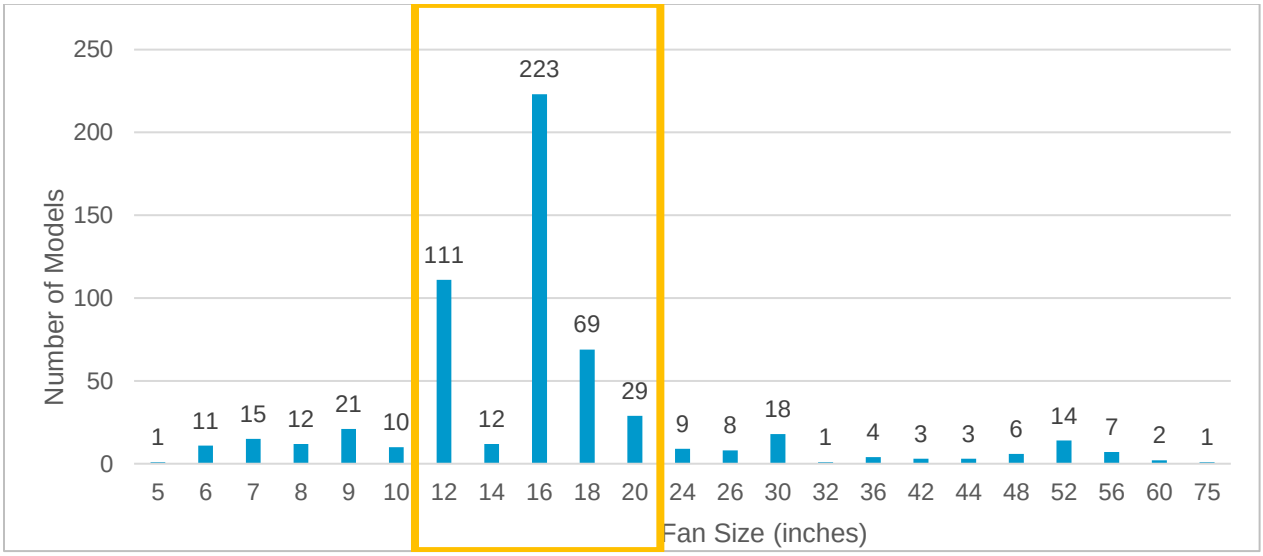


Figure 21: Fan sizes and count (retailer survey), most common types highlighted in yellow

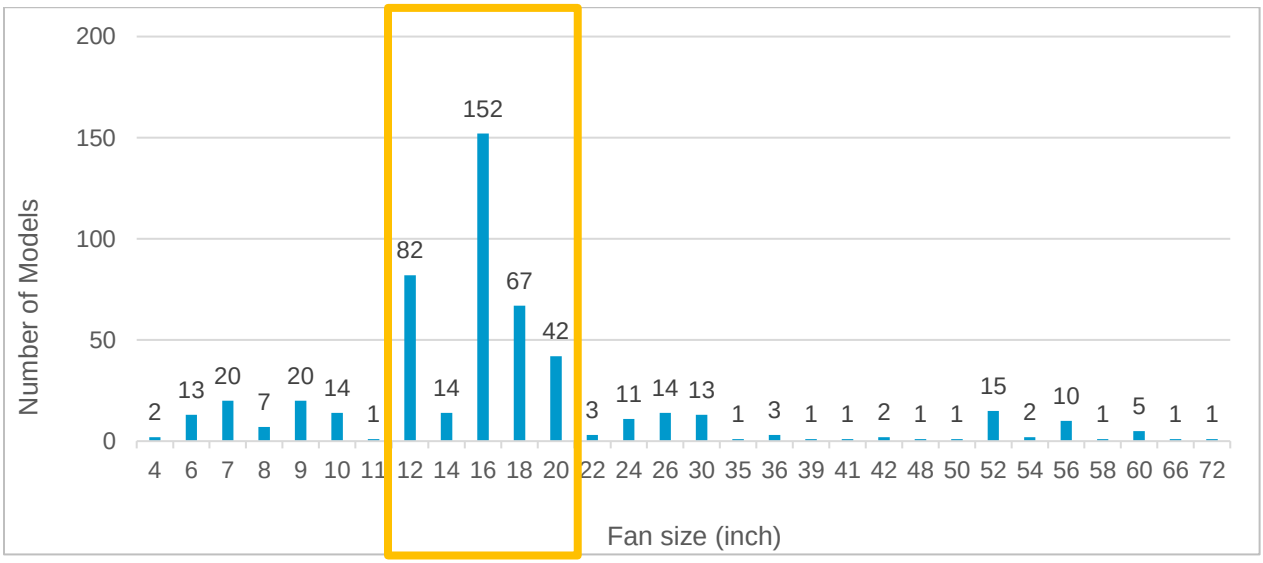


Figure 22: Fan sizes and count (web research), most common types highlighted in yellow

The model counts by blade sweep are further shown in Table 8. As previously mentioned, fans with blade sweep of 12 to 18 inches are the most common in the Indonesian market, while 96% of all models have blade sweep between 6 to 24. The blade sweep of ceiling fans ranges from 36 to 72 inches. More information on fan types provided by the manufacturer is provided in **Appendix F**.

Table 8. Count and percentages of fan models in the market, grouped by blade sweep

Blade sweep (in)	Count	%	Fan type
6 to 11	119	16%	Desk/table, standing, wall, combination, professional
12 to 18	539	71%	
20 to 24	69	9%	
26 to 32	34	4%	
Total	**761**	**100%**	
36 to 72	60		Ceiling fans

- **Price:** Prices were analyzed for the model data collected during retailer survey. Fan type and blade sweep have a considerable effect on price. Desk fans and combination fans are considerably cheaper than other types, while standing fans are generally more expensive, as illustrated in Figure 23 and Table 9.

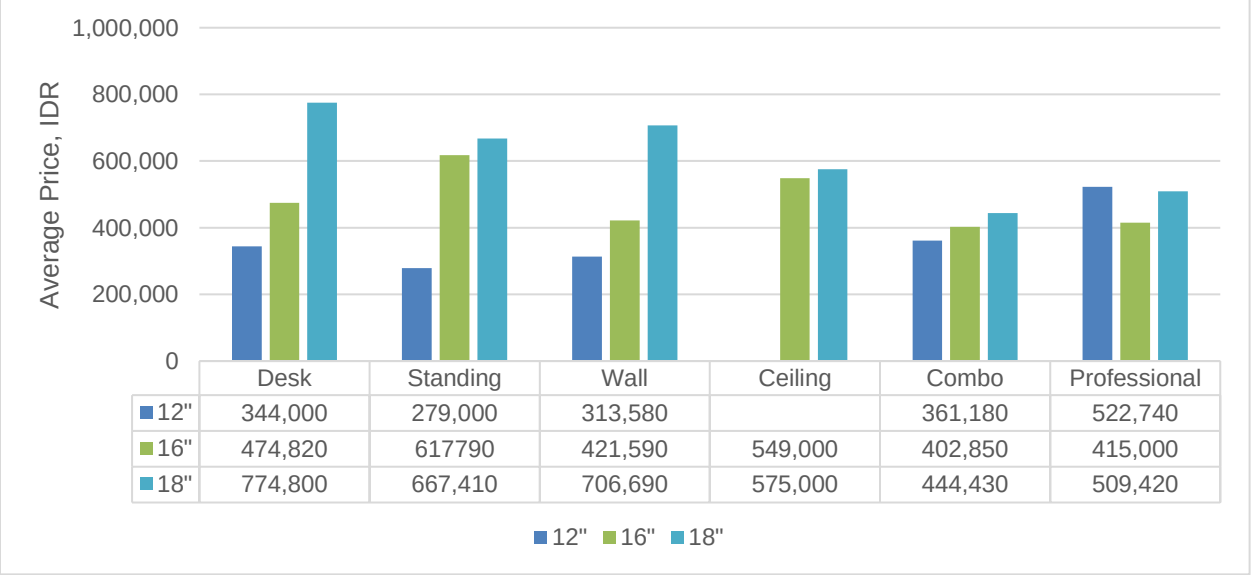


Figure 23: Fan prices by type

Table 9. Minimum, maximum and average price comparison by type across all sizes

Fan Size	Min. Price	Max. Price	Avg. Price
Desk	72,900	11,999,000	574,338
Standing	188,900	4,999,000	747,950
Wall	229,000	2,999,000	575,644
Ceiling	499,000	3,299,000	1,689,710
Combo	137,500	1,070,100	428,159
Professional	319,000	2,499,000	590,890

Fan prices increase linearly with blade sweep, as illustrated in Figure 24 and Table 10.

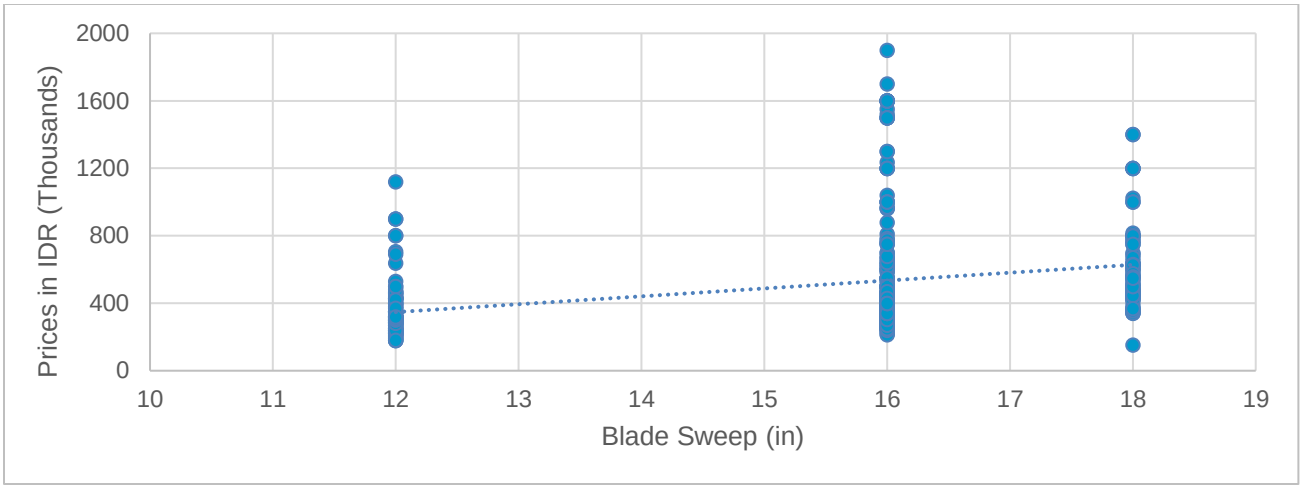


Figure 24: Fan prices across the most common blade sweeps of 12, 16, and 18 inch

Table 10. Minimum, maximum and average price comparison by blade sweep

Fan Size	Min. Price	Max. Price	Avg. Price
12 inch	179,000 IDR	1,119,000 IDR	348,591 IDR
16 inch	212,000 IDR	1,899,000 IDR	532,620 IDR
18 inch	151,000 IDR	1,399,000 IDR	631,680 IDR

4.3. Consumer Usage Behavior

Information on hourly usage of electric fans in Indonesia was collected through CLASP's residential end-use survey, illustrated in Figure 25. It can be observed that the hourly trends are very similar for weekdays and weekends, with slightly higher use on the weekends. The survey estimated average operating duration of 6.6 hour per weekday and 6.9 hours per weekend day. Respondents claimed to use fans for 27 days per month on average, resulting in an average daily usage of 6.0 hours per day.

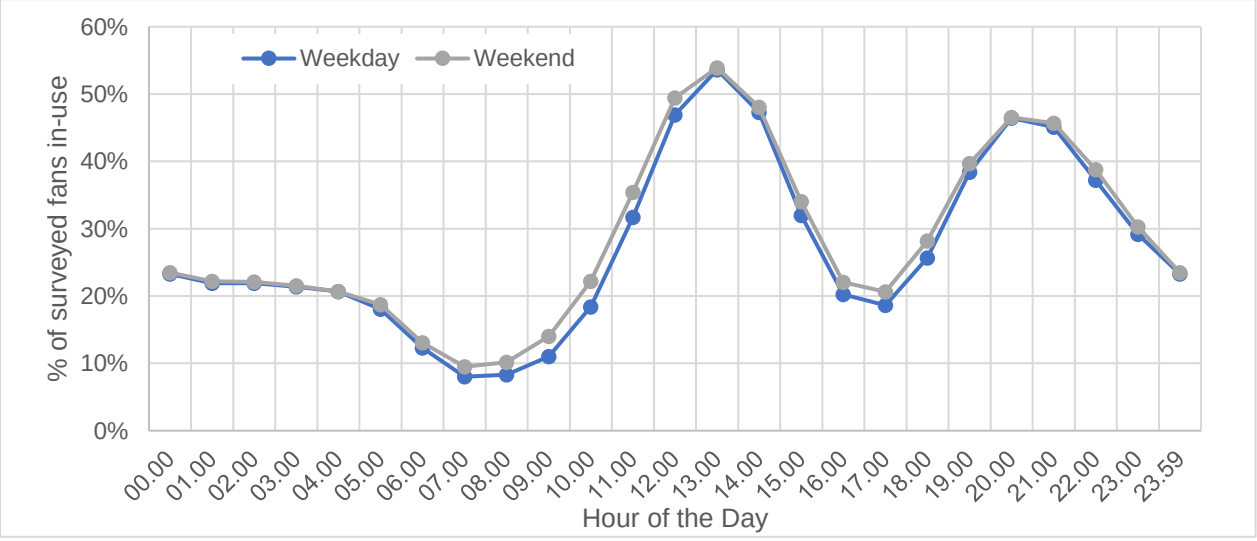


Figure 25. Electric fans daily use trends for weekdays and weekends

Policy Options and Impact Assessment

5 Review of Draft Regulation

5.1. Draft Regulation for Electric Fans

5.1.1. Overview of Draft MEPS & Comparative Labeling

EBTKE had drafted an energy efficiency regulation, setting minimum energy performance standards (MEPS) and labeling criteria for electric fans. The regulation references the IEC 60879:1986 test standard, which has been adopted as Indonesian National Standard SNI IEC 60879:2013.

Program scope & technical specifications	Draft MEPS for fans
Existing status	Draft
Reference with Government regulation	Draft Regulation of the Minister of Energy and Mineral Resources on the Implementation of Minimum Energy Performance Standards and Energy Efficient Labelling of Fans
Implementing body	EBTKE
Referenced test standard	SNI IEC 60879:2013
Parameters graded	Service value
Key definitions	Minimum Energy Performance Standard, Energy Efficient Label, Fan, Fan Energy Efficiency or Service Value, Energy Efficient Certificate, Indonesian National Standards, Product Certification Agency, Test Laboratory, Domestic Producer, Importer, Minister, Director General
Calculation for efficiency limits for MEPS	Air flow (in m^3/minute) divided by measured power (in watts)
Label band	Four bands (see Table 13 below)
Criteria for receiving the label	SNI 04-6958-2003
Key stakeholders that have been part of developing the draft MEPS	MEMR, industry players, industry association

The draft regulation proposes both a minimum energy performance standard (MEPS) based on service value as well as a comparative labelling for table/ desk fans, floor/ standing fans, wall fans and combination fans, 150 to 450 mm (6 to 18 inch). Ceiling fans are excluded from energy performance requirements. MEPS are set at the 1-star (lowest) efficiency band, corresponding to a service value of 0.4 m^3/min/W for fans with blade sweep less than 12 inch and 0.6 for those at least 12 inch. The requirements are described in Table 11.

Table 11. Proposed energy efficiency standards

Energy efficiency level	Service value for <12 inch	Service value for ≥12 inch
1 star	0.40 to 0.60	0.60 to 0.90
2 stars	0.60 to 0.80	0.90 to 1.05
3 stars	0.80 to 1.00	1.05 to 1.20
4 stars (highest)	Greater than 1.00	Greater than 1.20

5.1.2. Labeling Application Review

Competent authority	Director General, MEMR
Documents required to be submitted for seeking permission for labeling	Manufacturers or Importer, before affixing an Energy Efficient Label Signs on a fan, must obtain permission from the Director General Manufacturers of domestic fans or importers must apply to the Director General by enclosing the following documents: a) Energy Saving Certificates; b) Tax ID number; c) Deed of Incorporation; d) Copy of a certificate on using SNI 04-6292.2.80-2006 Household and Similar Electrical Appliances – Safety: Specific Requirements for fans or its amendments; e) Copy of the certificate of quality management system ISO 9001: 2008 or its amendments, or self-declaration letter on implementing quality management system SNI ISO 9001:2008 including the scope of fans; f) Photo or picture of the fan; g) Guidance on reading the production code of the fan; h) Planned amount of production or import for one year; i) Notification letter on the List of Shareowners (*Daftar Pemegang Saham,* DPS) of the business in accordance with the law; and Fiscal Notification Letter from the Directorate General of Tax
Additional documents required to be submitted by importers	In addition to the documents mentioned above, the importer must also submit the following: j) Copy of Importer Identification Number (API)-U; and Copy of ISO 9001: 2008 or its amendments, or equivalent quality management system standards by the producer in English or translated into English covering fans;
Process	The Director General's office is the verifying authority for the applications of energy efficient labeling submitted by manufacturers and/or importers of fans. Based on the results of verification of application, the Director General may approve or reject the license for application of Energy Efficient Labeling Signs. The process is generally to be done in 7 (seven) working days from the receipt of complete applications. In case the application is approved, the Director General give permission for Energy Efficient Labeling. In case of rejection, the Director General shall notify in writing to the applicant accompanied by reasons for refusal.
Labeling period validity	Three years and may be extended

Reporting requirements	Domestic manufacturers which have obtained permission for labeling, shall make a monthly report on the domestic market which is to be delivered in every 3 (three) months. An extension must be requested at least a month before the validity expires. Domestic producers who have obtained permission for labelling must develop monthly reports on the brands, types, models/types, and number of fans and submit the reports to the Director General every three months. Importers who have obtained permission for labeling and import through a port that has not been linked to the Indonesia National Single Window must report the brands, models/types, and number of imported fans for each import consignment.

5.2. International Comparison of Desk/Table Fan Policies

Table 12, below, highlights the key differences among the regulations for table fans in various countries. The draft regulation for Indonesia proposes a minimum energy performance standard (MEPS) and a mandatory comparative label for table/ desk fans, floor/standing fans, wall fans and combo fans. This approach is in line with the regulations present in other countries within the South East Asian region. Malaysia, China and Vietnam have a mandatory MEPS as well as comparative label in their regulation.

Vietnam and South Korea having the most relaxed and the most stringent minimum energy efficiency standards, respectively. The draft regulation for fans in Indonesian has the most relaxed MEPS for table fans among the compared countries, below the Vietnamese MEPS for smaller fans.

Table 12. Comparison of regulations for table fans in different countries in the region[44]

	Indonesia	Malaysia	China	Vietnam	South Korea
Regulation type	Comparative label, MEPS (under development)	Comparative label, MEPS	Comparative label, endorsement label, MEPS	Comparative label, endorsement label, MEPS	Comparative label, MEPS
Compliance	Mandatory	Mandatory	Mandatory	Mandatory	
MEPS	0.4–1.0 m^3/min/W	1.01–1.07 m^3/min/W (2 star)	0.54–1.30 m^3/min/W (blade sweep 200 – 500 mm)	0.64-1.13 m^3/min/W (230–599 mm)	0.75–1.95 m^3/min/W (blade sweep 200–600 mm)
Highest efficiency band	1 m^3/min/W (blade sweep <300 mm); 1.2 m^3/min/W (blade sweep ≥ 300 mm)	1.20 m^3/min/W	Service value 0.71–1.65 (blade seep 200–600mm)	Same formula as ceiling	NA
Range	1 – 4 stars	2 – 5 stars	1 – 3 tiers	1 – 5 stars	NA

[44] Indonesia—as shared by EBTKE; Malaysia—as described in MS 2574:2014 http://bseep.gov.my/App_ClientFile/df08bc24-99fb-47a3-937f-dc25df9d3997/Assets/EE%20FEATURES/TEEAMBSEEP.pdf; China—as described in GB/T 13380-2007 https://bigee.net/media/filer_public/2017/04/27/bigee_china_fans_1212.pdf ; Vietnam—as described in TCVN 7826 : 2015 https://vanbanphapluat.co/tcvn-7826-2015-quat-dien-hieu-suat-nang-luong; South Korea—as described in https://www.energy.or.kr/renew_eng/energy/appliances/labeling.aspx

5.3. International Comparison of Ceiling Fan Policies

A comparison of the various regulations on ceiling fans appears in Table 13. The comparison reveals that minimum energy efficiency threshold is the least stringent in Vietnam and most stringent in South Korea, which has requirement that increases with blade sweep.

China uses a 3-tier comparative label with tier 3 as the MEPS. China has a strict MEPS and comparative label for both ceiling and table fans. Their regulation offers a wide range of fan sweep size with minimum energy efficiency defined at regular intervals.

As the market for ceiling fans in Indonesia is limited, the draft regulation for fans in Indonesia does not cover ceiling fans under its scope.

Table 13. Comparison of regulations for ceiling fans in different countries in the region[45]

	Malaysia	China	Vietnam	South Korea
Regulation type	Label comparative, MEPS	Label comparative, Label Endorsement, MEPS	Label comparative, Label Endorsement, MEPS	Label Endorsement
Compliance	Mandatory	Mandatory	Mandatory	
MEPS	2.58-2.65 m^3/min/W (2 star)	2.75–3.47 m^3/min/W (Tier 3)	2.4 m^3/min/W (blade sweep < 1200 mm) 2.5 m^3/min/W (blade sweep > 1400 mm)	N/A
Highest efficiency band	3.00 m^3/min/W	2.95 m^3/min/W (blade sweep 900–1800 mm)	Ratio of Energy efficiency to MEPS is defined as Efficiency index R. R greater than equal to 1.4.	m^3/min/W ≥ 0.1518 + 0.0302 × blade sweep (cm) (2.87–5.55 m^3/min/W for 900–1800 mm sweep)
Range	2 – 5 stars	1 – 3 tiers	1 – 5 stars	NA

[45] Malaysia—as described in MS 2574:2014 http://bseep.gov.my/App_ClientFile/df08bc24-99fb-47a3-937f-dc25df9d3997/Assets/EE%20FEATURES/TEEAMBSEEP.pdf; China—as described in GB/T 13380-2007 https://bigee.net/media/filer_public/2017/04/27/bigee_china_fans_1212.pdf ; Vietnam—as described in TCVN 7826 : 2015 https://vanbanphapluat.co/tcvn-7826-2015-quat-dien-hieu-suat-nang-luong; South Korea—as described in https://www.energy.or.kr/renew_eng/energy/appliances/labeling.aspx

5.4. Comparison with Other Countries' Regulations

5.4.1. China

The regulation for testing and performance of electric fans in China is GB/T 13380-2007. The test procedure described in GB/T 13380-2007 is based on IEC 60879:1986 albeit with a few modifications. The term "energy efficiency value" is used instead of, but is equivalent to, service value.

GB 12021.9-2008 sets three energy efficiency tiers based on the energy efficiency value. Tier 1 represents the most efficient model, whereas tier 3 sets the threshold for market access. Consequently, fans with an energy performance value below tier 3 are not allowed for sale on the market.[46]

Table 14. China's test & performance standards adopted for electric fan

Fan types		Blade sweep (mm)	Energy efficiency value [m^3/min/W] Energy efficiency tiers		
			1 (highest)	2	3
Table fans, wall mounted fans and standing fans	**Capacitor-type fan**	200	0.71	0.6	0.54
	Shaded pole fan		0.63	0.51	0.45
	Capacitor-type fan	230	0.84	0.7	0.64
	Shaded pole fan		0.65	0.57	0.5
	Capacitor-type fan	250	0.91	0.79	0.74
	Shaded pole fan		0.72	0.61	0.54
	Capacitor-type fan	300	0.98	0.86	0.8
		350	1.08	0.95	0.9
		400	1.25	1.06	1
		450	1.42	1.19	1.1
		500	1.45	1.25	1.13
		600	1.65	1.43	1.3
Ceiling fans	**Capacitor-type fan**	900	2.95	2.87	2.75
		1050	3.1	2.93	2.79
		1200	3.22	3.08	2.93
		1400	3.45	3.32	3.15
		1500	3.68	3.52	3.33
		1800	3.81	3.67	3.47

[46] BigEE China Fans. https://bigee.net/media/filer_public/2017/04/27/bigee_china_fans_1212.pdf

5.4.2. Malaysia

The standard that regulates the testing and performance of electric fans in Malaysia is MS 1220-2010. The test procedure is very similar to IEC 60879:1986. “Coefficient of Performance (COP)” is used instead of, but is equivalent to, service value. The MEPS value is set at the 2-star level shown in Table 15.[47]

Table 15. Malaysia’s star rating for electric fan

Star rating	Ceiling fan	Pedestal, wall and desk fan
	Minimum COP	
5	≥ 3.00	≥ 1.20
4	2.74 – 2.99	1.12 – 1.19
3	2.66 – 2.73	1.08 – 1.11
2	2.58 – 2.65	1.01 – 1.07
1	2.50 – 2.57	0.93 – 1.00

5.4.3. Vietnam

The Government of Vietnam has introduced legislation to implement MEPS for appliances and equipment alongside a program of energy labelling. The current testing requirements for electric fans are given in TCVN 7827: 2007, which again is equivalent to IEC 60879.

Table 16. Vietnam’s minimum energy performance standards for electric fan[48]

Fan type	Blade sweep (mm)	MEPS (m^3/min/W)
Desk, stand, wall	Sweep <= 250	0.5
	250 < Sweep <=450	0.8
Ceiling	Sweep <=1200	2.4
	Sweep >=1400	2.5

For mandatory labelling there are five levels of energy efficiency (R) determined by the ratio (k) of the measured energy efficiency to the minimum energy performance standard (MEPS) prescribed above. The R value represents the ratio of the measured energy efficiency to the minimum energy performance standard (MEPS). The thresholds for the five efficiency levels are provided below.

Table 17. Vietnam’s energy star rating for electric fan

Energy efficiency level	Energy efficiency index
5 (highest efficiency)	1.4 <=R
4	1.3 <=R <1.4
3	1.2 <=R <1.3
2	1.1 <=R <1.2
1	1.0 <=R <1.1

[47] Malaysia—as described in MS 2574:2014 http://bseep.gov.my/App_ClientFile/df08bc24-99fb-47a3-937f-dc25df9d3997/Assets/EE%20FEATURES/TEEAMBSEEP.pdf
[48] Vietnam—as described in TCVN 7826 : 2015 https://vanbanphapluat.co/tcvn-7826-2015-quat-dien-hieu-suat-nang-luong

5.4.4. South Korea

South Korea has adopted Korean Standard KS C 9301 for testing and setting MEPS for conventional electric fan (table, desktop, and floor-standing type) with blade sweep of 20–41 cm and axial single-wing fan with induction motor for use in home or office, etc. (table or stand).

According to the test method of KS C 9301, energy efficiency shall be calculated as follows measuring the maximum (standard) rate of airflow, maximum air velocity and power consumption. The standard rate of airflow means the maximum rate of airflow at 25 °C of ambient temperature

$$\text{Airflow efficiency rate (P)} = \frac{\text{Standard airflow rate } (m^3/\text{min})}{\text{Measured electric power (W)}}$$

Where:

$$\text{Standard airflow rate} = \frac{\text{Maximum airflow rate } (m^3/\text{min})}{\sqrt{\frac{1.178}{\Gamma}}}$$

And

$$\text{Specific gravity of air } (\Gamma) = \frac{10{,}332}{29.44 \times (273 + \text{temperature at test in C})}$$

The MEPS is defined based on the airflow efficiency rate (P) and varies according to the blade sweep (A), as defined below;[49]

Item	MEPS
	From October 1, 2016
Electric fan	P ≥ 0.0304A + 0.1518

[49] Korea Energy Management Corporation. http://www.kemco.or.kr/nd_file/kemco_eng/MKE_Notice_2010-124.pdf; http://www.kemco.or.kr/nd_file/kemco_eng/KoreaEnergyStandards&Labeling.pdf

5.5. Energy Assessment

Testing to SNI IEC 60879 is not currently mandatory in Indonesia. As a result, performance data were not available for most fan models. Of 932 models found in retail and on the Internet, manufacturers provided complete performance data (blade sweep, power rating, and air flow rate) for only 150 models. 44 models are ceiling fans, and the remaining 106 models are desk/table, standing, wall, combination, and professional fans. Figure 26 plots performance for non-ceiling fan products with blade sweep ranging from 6 to 30 inches. MEPS levels defined by EBTKE in the draft regulation for 6 to 18 inches fans are plotted as well. Figure 27 plots the performance of ceiling fans, for which there is no draft regulation.

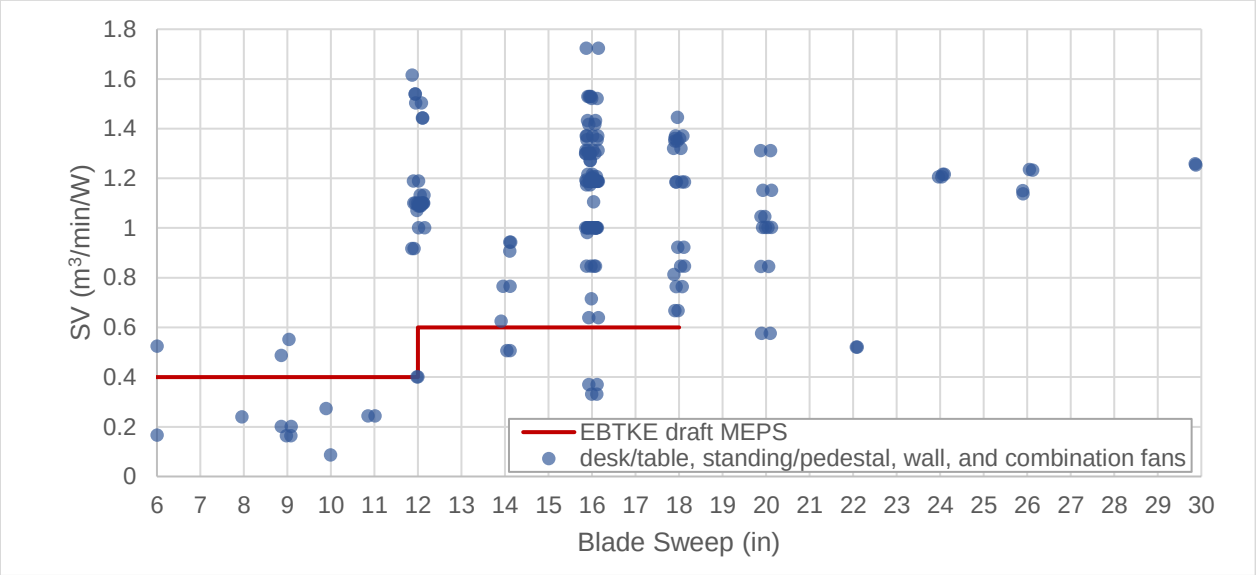


Figure 26: Service value distribution of desk/table, standing, wall, combination, and professional fans, plotted against EBTKE draft MEPS levels

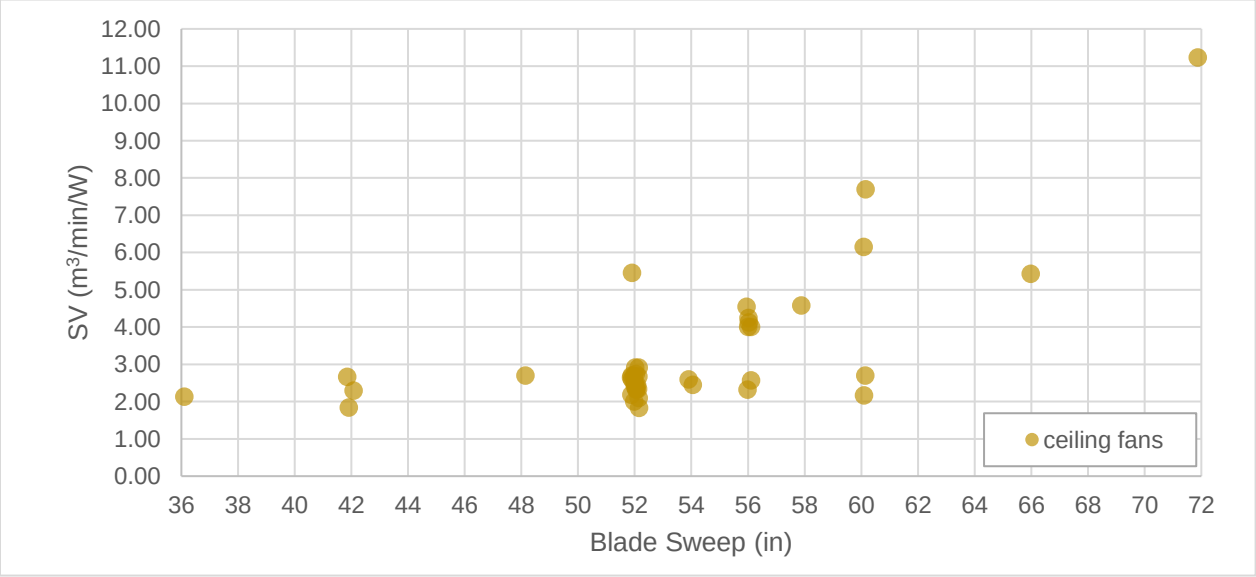


Figure 27: Service value distribution of ceiling fans

During interviews, manufacturers stated that service values of 0.8 to 1.7 were typical for non-ceiling fans, while service values of around 3.2 were typical for ceiling fans, confirming the data found in retail and on the Internet. Figure 28 shows the distribution of the reported air flow rate values for fan products with blade sweep ranging from 6 to 24 inches. While air flow rate generally increases at higher blade diameter and higher wattage, such dispersion implies that relatively wide range of efficiency exists in the fans market.

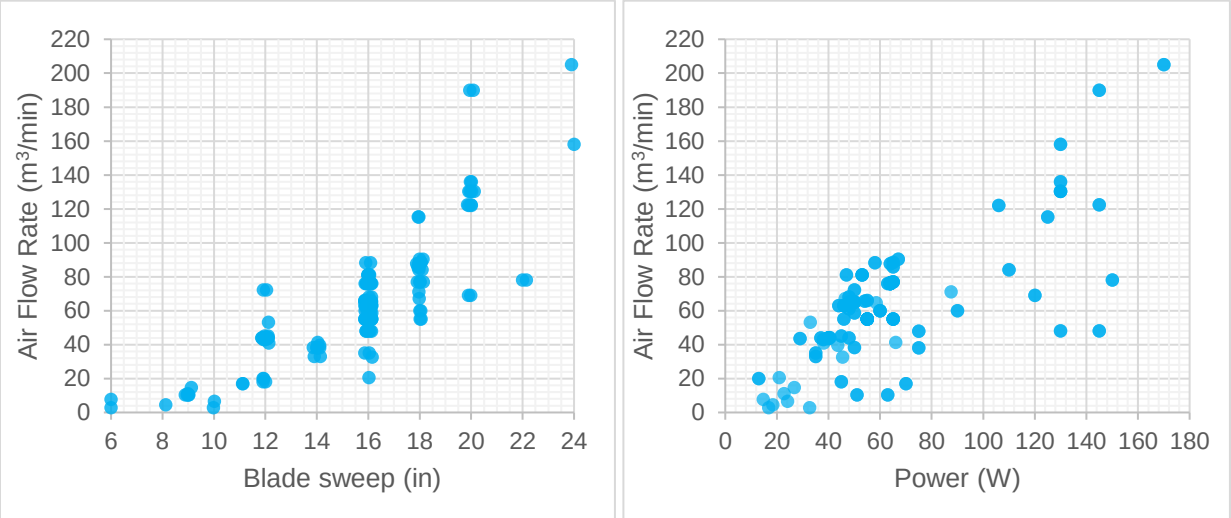


Figure 28: Distribution of reported flow rates across blade sweep and power rating for 9 to 18 inch non-ceiling fans

Initial assessment performed for a group of 6 to 18 inches fans covered in the draft regulation shows that **87% of the models are expected to meet the defined MEPS level**. **91% of the locally manufactured models would be compliant, while 17% of imported models would be non-compliant**. In addition to this, **35% of the compliant models would be rated at 4-star**. Considering these rates of compliance at the proposed MEPS and 4-star levels, a revision to more stringent MEPS and labeling levels would be necessary to achieve greater savings. Provided in Figure 29 is the distribution of the performance in the market against the draft levels.

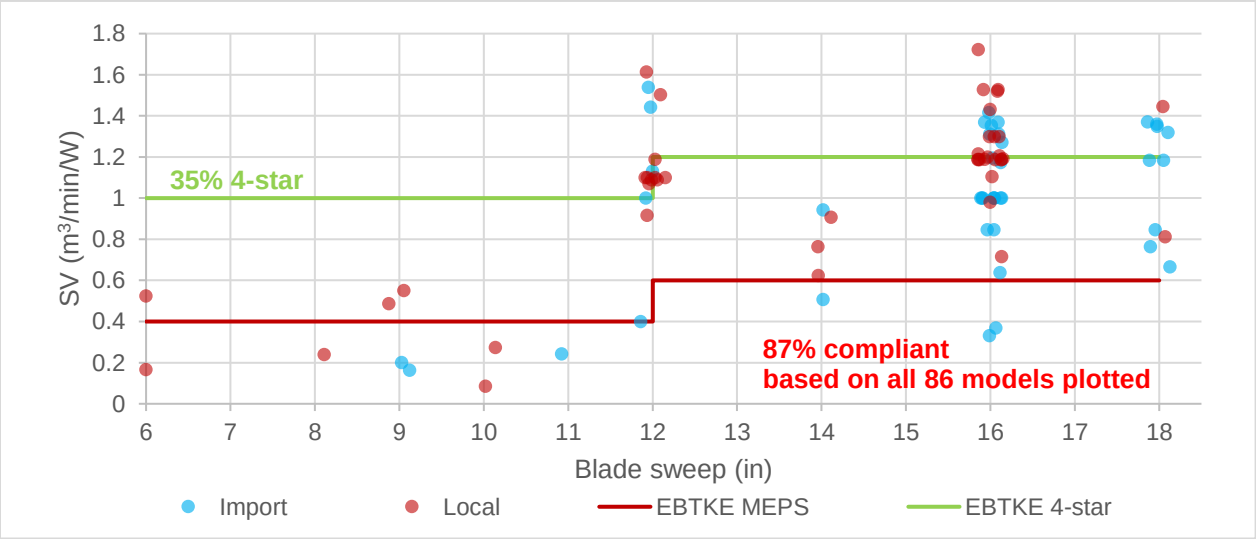


Figure 29: Distribution of local and imported fan models compared to draft EBTKE levels

6 Test Procedure and Testing Capability

6.1. Test Procedure in Draft Regulation

The draft regulation on fans specifies a common performance test procedure for table and floor fans and a separate procedure for ceiling fans which is in line with IEC 60879:1986. Energy saving testing for fans requires a laboratory setup and testing laboratory management in accordance with SNI ISO / IEC 17025: 2008 concerning general requirements for competence of testing laboratories and laboratories calibration. Tests are carried out based on each product type, with sample size of 2 units is based on the similarity of technical specifications covering - Electric motors, propellers, protective lattice forms and electrical circuits. Samples are tested at the location or space free of wind flow and carried out on ambient temperature 27.5˚C and relative humidity 45% - 75%.

The space must be free from outside air disturbances. The test chamber must be free of obstructions where the fan is placed except the pole / stand used in testing. Every table or shelf for Electric instruments must be on the side of the fan intake, with distance. Air movement must be measured using a propeller anemometer blades that have an inner diameter not exceeding 100 mm. Standard covers all the requirements for test set up, instrumentation, test method for air flow and power consumption.

6.2. Comparison with Other Countries' Testing

The following table illustrates the various performance standards adopted by several countries in the region.[50]

Table 18. Comparison of test standards adopted by different countries in the region

	Indonesia	IEC 60879	Malaysia	China	Vietnam	South Korea
Test standard	SNI IEC 60879:2013	IEC 60879: 2019	MS 2574:2014 MS 1220:2010	GB/T 13380-2018 GB 12021.9-2008	TCVN 7827: 2007	KS C 9301
Scope for testing	**Desk fan**, floor fan, wall fan, ceiling fan, **combo fans**	Ceiling fan, table fan, pedestal fan	Moving-louver fan, Ceiling fan, Pedestal fan, Table fan, Wall fan	Ceiling fan, table fan, pedestal fan	Ceiling fan, table fan, pedestal fan	NA
Parameters tested	Air flow performance Fan speed Power factor & power input	Air flow performance Fan speed Power factor & power input	Air delivery Input power & power factor Noise RPM	Air flow performance Fan speed Power factor & power input	Air flow performance Fan speed Power factor & power input	Air flow performance Fan speed Power factor & power input

[50] Standards pertaining to safety requirements for electric fans are not included. [50] Indonesia—as shared by EBTKE; Malaysia—as described in MS 2574:2014 http://bseep.gov.my/App_ClientFile/df08bc24-99fb-47a3-937f-dc25df9d3997/Assets/EE%20FEATURES/TEEAMBSEEP.pdf; China—as described in GB/T 13380-2007 https://bigee.net/media/filer_public/2017/04/27/bigee_china_fans_1212.pdf ; Vietnam—as described in TCVN 7826 : 2015 https://vanbanphapluat.co/tcvn-7826-2015-quat-dien-hieu-suat-nang-luong; South Korea—as described in https://www.energy.or.kr/renew_eng/energy/appliances/labeling.aspx

	Indonesia	IEC 60879	Malaysia	China	Vietnam	South Korea
Test conditions	Chamber for testing total air delivery Measured at rated power & max speed Ambient temperature 20 C	Chamber for testing total air delivery Measured at rated power & max speed Ambient temperature 20 C	Chamber for testing total air delivery Measured at rated power & max speed Ambient temperature 20 C	Chamber for testing total air delivery Measured at rated power & max speed Ambient temperature 20 C	Chamber for testing total air delivery Measured at rated power & max speed Ambient temperature not specified	Ambient temperature 25 C

The standards followed are very similar to the IEC 60879:1986 standard in terms of scope, parameters tested and test conditions. While it would seem that harmonizing with other ASEAN countries would be easy, a new IEC 60879 standard was adopted in 2019, introducing several significant improvements. CLASP recommends referencing or harmonizing with this latest International Standard.

The new IEC 60879:2019 includes several new types of fans in the scope:

a) Fans for household and similar purposes:
- ceiling type fans
- wall
- table type fans;
- pedestal/standing type fans.
- **louvre fans**
- **tower fans**
- **bladeless fans**

b) Fans for use in ships:
- deck-head type fans;
- cabin type fans

In addition, the new standard permits the use of either analog or digital vane anemometer for measuring air speed, and provides a different measurement method (measurement points spaced further apart and along the test-chamber's semi-diagonals, rather than perpendicular to the fan axis, as in the 1986 edition).

The standard specifies test protocols, testing conditions, instrumentation, and calculation methodology for measurement of three parameters relevant to performance of electric fans – 1) **total air delivery**, 2) **fan speed**, 3) **power factor**, 4) **acoustical testing for noise**, 5) **standby power** measurement. The standard further requires manufacturers to mark each fan with the size of fan in addition to the information specified in IEC 60335-2-80 as applicable. Separately mounted regulators should be marked with the model/size of fans for which they are suited.

In addition, the following information should be supplied on request:

- power factor;
- rated speed in revolutions per minute;
- number of blades;
- type of regulator and number of running positions;
- class of insulation;
- type of bearings;
- rated air flow rate;
- sound power level;
- service value

Information about service value, fan flow rate, sound level and standby power are required to be provided by the manufacturer in the instructions. Summarized details on test conditions, measurement of fan speed, power factor, and total air delivery are provided in **Appendix G**. The availability of test labs would ensure testing of the products and proper implementation of the proposed regulation.

6.3. Existing Test Facilities and Capabilities

At present, it is currently mandatory for electric fans sold in Indonesia to adhere to a safety standard, SNI 6292-2-80: 2006. This standard prescribes several requirements pertaining to electrical safety during operation. However, it does not relate to testing of performance of electric fans nor set any benchmark/ requirements thereof. However, we understand based on a brief discussion with EBTKE that a draft regulation has been proposed and is currently under circulation.

Two test labs, Baristand and Sucofindo confirmed that they could perform fan performance tests. Additionally, several manufacturers (Panasonic and Miyako) shared that they routinely conducted performance tests for their products in their own labs, in accordance with SNI IEC 60879.

The testing time for fan performance is around 3 hours, based on discussion with labs and industry players. Assuming each test lab or company owns one test chamber, this would translate to a total testing capacity of 10 to 20 fans per month. Estimated monthly capacity for testing labs is provided in Table 16. This capacity should be sufficient to test the 540 models currently in the market with a year.

A respondent from Sucofindo shared that the performance test did not require the construction of a permanent room. Testing labs that are currently able to test fans for safety might thus consider investing in a performance testing facility. The list of safety test labs is shown below.

Table 19. List of safety test labs in Indonesia

Laboratory	KAN Accreditation	Monthly Capacity
Baristand	Yes	20
Succofindo	Yes	75
Qualis	Yes	10
Polytron	Yes	20
Panasonic	Yes	20
Miyako	No (Not found in KAN website)	10
Total		**155**

7 Policy Analysis Methodology

To support EBTKE in formulating effective energy conservation regulations, CLASP used the findings from this market study to evaluate the currently drafted MEPS level and labeling policies as well as alternate policy scenarios. CLASP used the Policy Analysis Modeling System (PAMS), which was developed with Lawrence Berkeley National Laboratory, to assess the impacts of policies and inform key stakeholders in the policymaking process.

PAMS is a tool that helps policymakers assess the benefits of energy efficiency policies and identify the most attractive targets for MEPS levels. It is an Excel workbook designed to give first-order policy impact projections with a minimal preparatory research on the part of local policymakers. The model can be also used to perform robust technical analysis to support the development of MEPS, by customizing the tool with any country-specific data available.

PAMS can estimate savings potential from implementing policies that improve the energy efficiency of products in any economy. The impacts are examined from two perspectives – the consumer and national perspective:

- **At the consumer level**, savings are estimated using life-cycle cost (LCC) metric - the total costs of owning the appliance, including the purchase price and the electricity cost throughout its life between business as usual and the improved policy scenario.
- **At the national level**, energy savings are expressed in terms of the reduction in national energy consumption due to more efficient appliances as well as in terms of avoided CO_2 emissions resulting from reduced electricity consumption.

In this analysis, CLASP evaluated the impacts to consumers as well as impacts at the national level for selected policy scenarios. Additionally, CLASP estimated the impacts to the manufacturers by calculating the number of models that would be eliminated from the market under more stringent MEPS.

7.1. Baseline Analysis

The price of a fan depends on its brand, aesthetic finish, motor technology, blade sweep, blade material, structural build design, control functions, and more. Aside from these factors, improved efficiency generally results in increased up-front cost due to more complex fan blades, higher precision in ac motor manufacturing, or a redesign that uses a much more efficient brushless direct current (BLDC) motor. To determine the relationship between unit cost and efficiency, CLASP analyzed the price of units on the market against service value and other fan parameters.

A total of 245 models with available unit price data were analyzed, covering four fan types (desk, standing, wall, and combination) with blade sweep ranging from 5 to 20 in, and power rating from 12 to 90 W. As a general trend, it can be observed that within the wide range of variation, unit price increases with power rating; however, there is no clear relationship between price and service value. Given the high dispersion and variability within the main dataset, no reliable multiple regression equation could not be obtained between unit price and the three primary design variables: blade sweep, power rating, and air flow rate. In other words, other factors unrelated to performance (such as the above-mentioned brand and control functions) obscured any relationship between performance and price. Due to these uncertainties, difference in unit price will be excluded from the analysis.

Figure 30 illustrates these observations further. Within the subset of fan models with blade sweep of 16 inches, most data points fall within the range of 300,000 to 800,000 IDR for unit price and 1.0 to 1.4 for service values. A number of models that fall above this price range, around 1,600,000 IDR can also be identified, with service values ranging from 0.6 to 1.9.

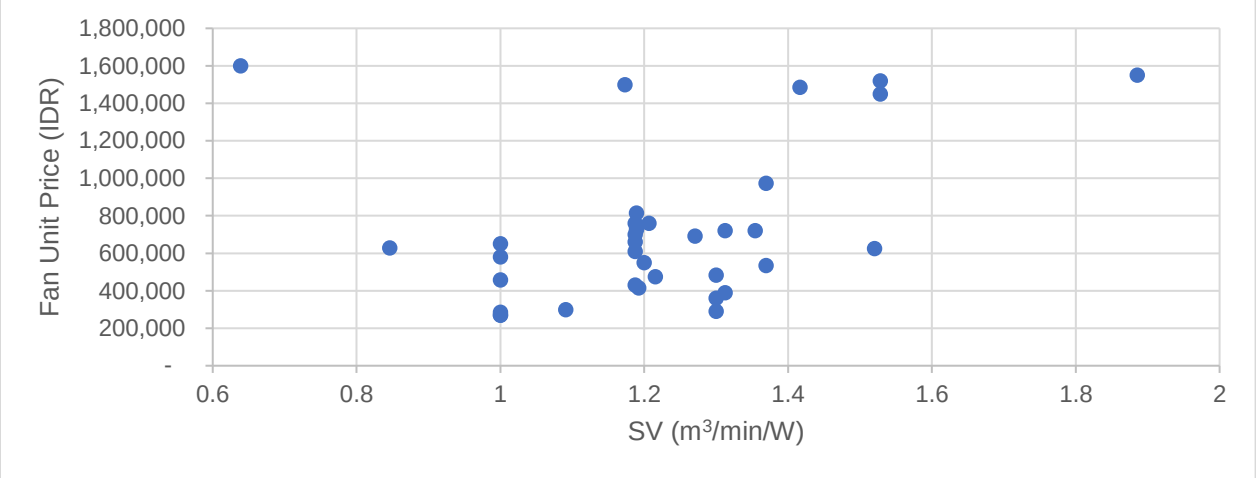


Figure 30. Distribution of price across service values for the 16 inches fan models

Desk/Table, Standing, Wall, and Combination Fans

The most common fan product type identified in the Indonesian market is a desk/table, standing, wall, combination, or professional fan with 16-inch blade sweep. This product group was designated as the representative model in the analysis.

The market study reveals that 96% of the total fan model count identified in the market are fan products with blade sweep ranging between 6 and 24 inches. In addition to this, it was also noted that electric comfort fan standards and regulations in a number of countries, such as Bangladesh, Taiwan, India, and China cover fan products with blade sweep up to 24 inches.

In this analysis, performance data from 86 models were available for fans with blade sweep ranging from 6 to 18 inches, and 97 for fans with blade sweep rang ing from 6 to 24 inches. A subset of performance data from 44 models of 16-inch fan was used in the analysis. The distribution of air flow rate for the representative model is shown in Figure 31.

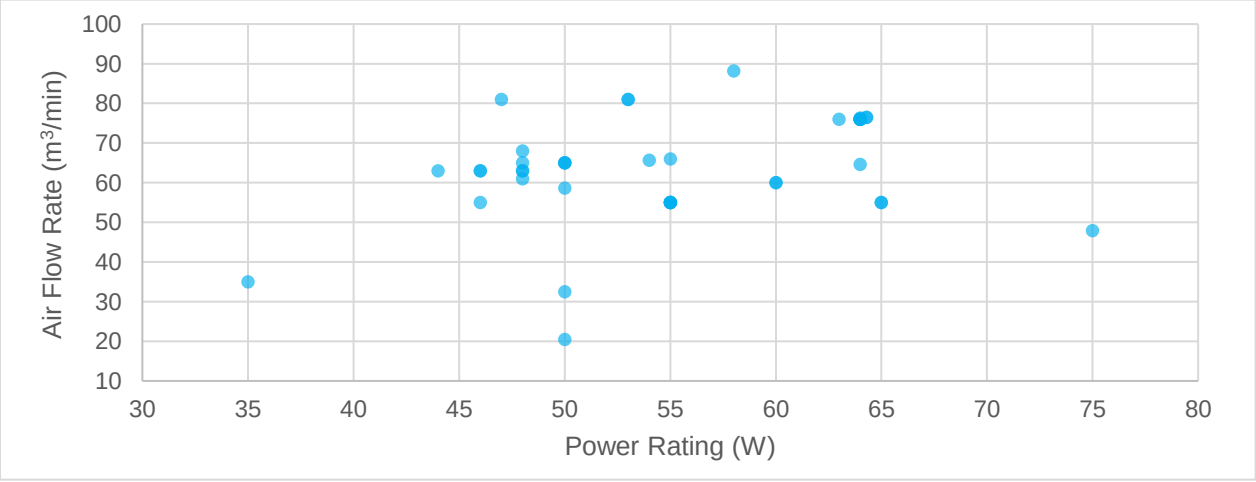


Figure 31: Distribution of airflow rate and power rating for the 16 inches fan models

Policy scenarios considered in the analysis were the baseline scenario, without regulation in place, and EBTKE-drafted and CLASP-recommended scenarios, with MEPS requirements in place. In this assessment, a conservative assumption was applied that considers non-compliant models to reach the minimum established requirements. Averages of power rating and air flow rate values were then obtained based on the subset of the representative model, 16-inch fans.

At the policy scenarios where MEPS levels proposed by EBTKE and CLASP are enforced, shift towards higher performance would be expected, reflected through decreased power rating and retained or improved air flow rate. Unit Energy Consumption (UEC) defined in kWh/year was then calculated based on the respective average power calculated for each policy scenario, and the daily operating time of 6.6 hour for 27 days per month.[51] Given CLASP's proposal of a more stringent MEPS level, the representative 16 inch fan model for the dataset used in the analysis of CLASP policy scenario operates at higher flow rate and higher power rating. Tabulated inputs generated through this assessment are provided in Table 20.

Table 20. Summary of the generated input variables for the representative 16-inch fan models

MEPS	Ref. Air flow rate for 16-inch Fans (m^3/min)	Power (W)	Service Value (m^3/min/W)	UEC (kWh/year)
Baseline	63	58	1.08	124
EBTKE	64	54	1.17	116
Baseline	63	63	1.00	135
CLASP	67	55	1.22	117

Ceiling Fans

Using the available performance data for ceiling fan models with blade sweep of 36 to 60 inches, an assessment was also performed to determine impact from the implementation of MEPS level in the market. Ceiling fan product with blade sweep of 52 inches was identified as the predominant type and assigned as the representative model for the analysis. Performance data from 44 ceiling fans models were available, and a subset of performance data from 16 models of 52 inch ceiling fan was used in the analysis The distribution of flow rate values for the representative model is shown in Figure 32.

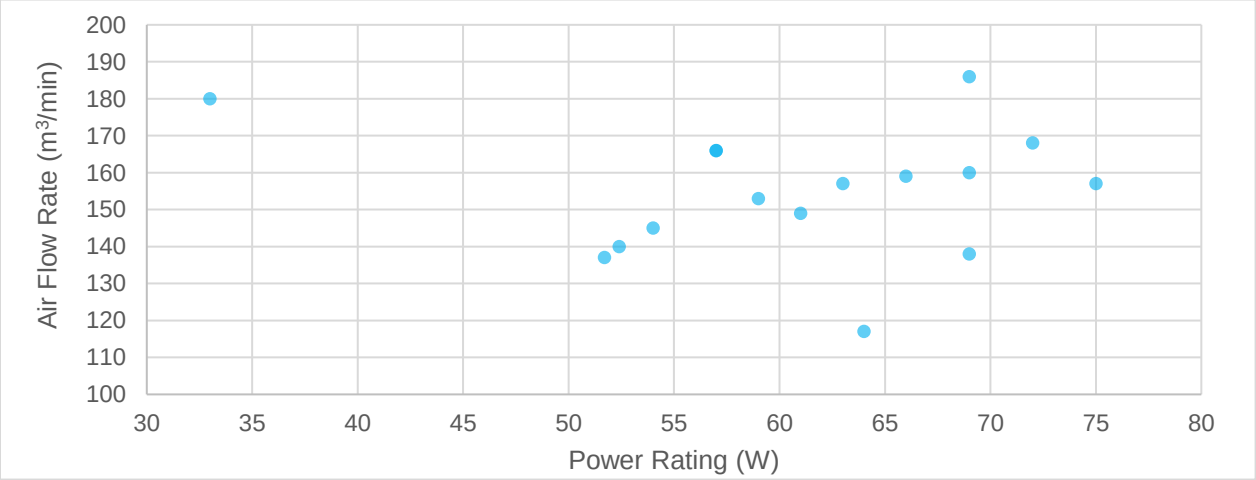


Figure 32: Distribution of airflow rate and power rating for the 52 inches ceiling fan models

[51] CLASP 5,000-Household Residential End Use Survey

Policy scenarios considered in the analysis were the baseline scenario, without regulation in place, and CLASP-recommended scenarios, with MEPS requirements in place. Averages of power rating and air flow rate were then obtained based on the subset of the 52-inch fan models. Values are summarized in Table 21.

Table 21. Summary of the generated input variables for the representative 52-inch ceiling fan models

MEPS	Ref. Air flow rate for 52-inch Ceiling Fans (m^3/min)	Power (W)	Service Value (m^3/min/W)	UEC (kWh/year)
Baseline	155	61	2.55	130
CLASP	159	59	2.70	126

7.2. Model Inputs and Assumptions

PAMS estimates the impacts of implementing policies that improve energy efficiency of new equipment by calculating the difference between a business-as-usual scenario (i.e., no policies implemented) and a policy scenario (i.e., higher MEPS or Best Available Technology). The model uses a bottom-up approach, based on a stock model and sales forecasts considering first purchase (increase in number of households and ownership levels) and replacement of retired appliances.

In the model, total energy consumption is estimated per year for the stock in use under each policy scenario. Emissions are estimated using an electricity CO_2-intensity emissions factor, CO_2/kWh. Costs consider appliance prices (defined for each scenario using a cost-efficiency curve reflective of the market) and local electricity prices to estimate total life cycle cost (purchase price and cost of electricity bill over appliance lifetime).

CLASP used the following data inputs and assumptions to estimate the impacts under different scenarios:

- Annual electric fans sales data and forecasts from 2020 to 2030 were obtained in this market study by PwC and validated by the stakeholders involved throughout the study. The geometric mean compound annual growth rate (CAGR) of sales up to 2030 was estimated at 1.2%, primarily based on the proportional impact from the increase in the number of households in Indonesia.
- Fans are used on daily average for 6.6 hours per day for 27 days per month, and have a lifetime of 5 years for desk/table, standing, wall, and combination fans, 7 years for professional fans, and 7 years for ceiling fans, based on inputs from manufacturers and other stakeholders, and CLASP's Indonesia-wide 5000-household end-use survey.
- Electricity price of 1,467.28 IDR/kWh, equivalent to 0.10 USD/kWh was applied, based on the most recent price for non-subsidized tariff for the R-1 residential class, published by PLN for the year of 2019.
- Transmission and distribution (T&D) losses at 9.51%, as published in PLN's annual statistics report for the year of 2018.
- CO_2 emissions factor of 0.807 kg/kWh was applied, as listed in PLN's statement release.[52]
- The standard year or year when policy is implemented is set at 2020.

[52] PLN Bantah PLTU Jadi Penyebab Polusi Jakarta. (2019, August 3). Retrieved from https://nasional.republika.co.id/berita/pvnraa377/pln-bantah-pltu-jadi-penyebab-polusi-jakarta

- Consumer discount rate of 6.1%, national discount rate of 6.5% and real income growth rate of 4.0% from World Bank for 2018.
- Population and urbanization data from United Nations, namely from the 2017 revisions of the World Population Prospects dataset from the Department of Economic and Social Affairs, Population Division.
- UEC values were calculated based on the assessment discussed in the previous section.
- The exchange rate used for conversion to and from IDR and USD was 14,124.50 IDR/USD.

The specific inputs used for the modeling are shown in the table below.

Table 22: Summary of fans market study key findings[53]

	Desk	Standing	Wall	Combination	Ceiling	Professional
Product lifetime (year)	5	5	5	5	7	7
Stock in 2018 (million units)	14.92	28.09	9.07	2.34	4.10	10.04
Sales (million units)						
2016	3.15	5.93	1.92	0.49	0.87	1.82
2017	3.21	6.05	1.95	0.50	0.88	1.91
2018	3.18	5.98	1.93	0.50	0.87	2.01
2019	3.21	6.05	1.95	0.50	0.88	2.11
2020	3.25	6.12	1.98	0.51	0.89	2.22
2021	3.22	6.07	1.96	0.51	0.89	2.33
2022	3.32	6.25	2.02	0.52	0.91	2.45
2023	3.36	6.32	2.04	0.53	0.92	2.58
2024	3.33	6.27	2.02	0.52	0.91	2.71
2025	3.43	6.46	2.09	0.54	0.94	2.85
2026	3.43	6.46	2.09	0.54	0.94	2.99
2027	3.46	6.52	2.11	0.54	0.95	3.14
2028	3.49	6.57	2.12	0.55	0.96	3.31
2029	3.52	6.63	2.14	0.55	0.97	3.47
2030	3.55	6.68	2.16	0.56	0.97	3.65

[53] Sources for inputs and findings specified in stock model available in Appendix D

8 Policy Options and Results

EBTKE Draft Regulation for 6- to 18-inch Electric Fans

EBTKE has proposed a draft regulation for electric fans since 2017, under the Ministerial Regulation No. 57 / 2017 released by MEMR. The draft for electric fans includes units with blade sweep of 6 to 18 inch or 150 to 450 mm. Energy efficiency parameter defined in Service Value, is in units of m^3/min/W. MEPS and up to 4 star-rating levels are defined for two product groups; ranging from 0.4 to 1.0, and 0.6 to 1.2 for fans with blade sweep lower than 12 inch and fans with blade sweep at and above 12 inch respectively.

The market is dominated by desk, standing, and wall fans with blade sweep of 12, 16, and 18 inch, hence the draft regulation targets these fan groups and excluding the less prominent group, ceiling fans. Regulations for non-ceiling fan products are already in place in a number of countries in South and Southeast Asia, namely Bangladesh, Malaysia, Vietnam, Thailand, China, and Taiwan. However, the levels proposed in draft regulation will be considered least stringent in the region.

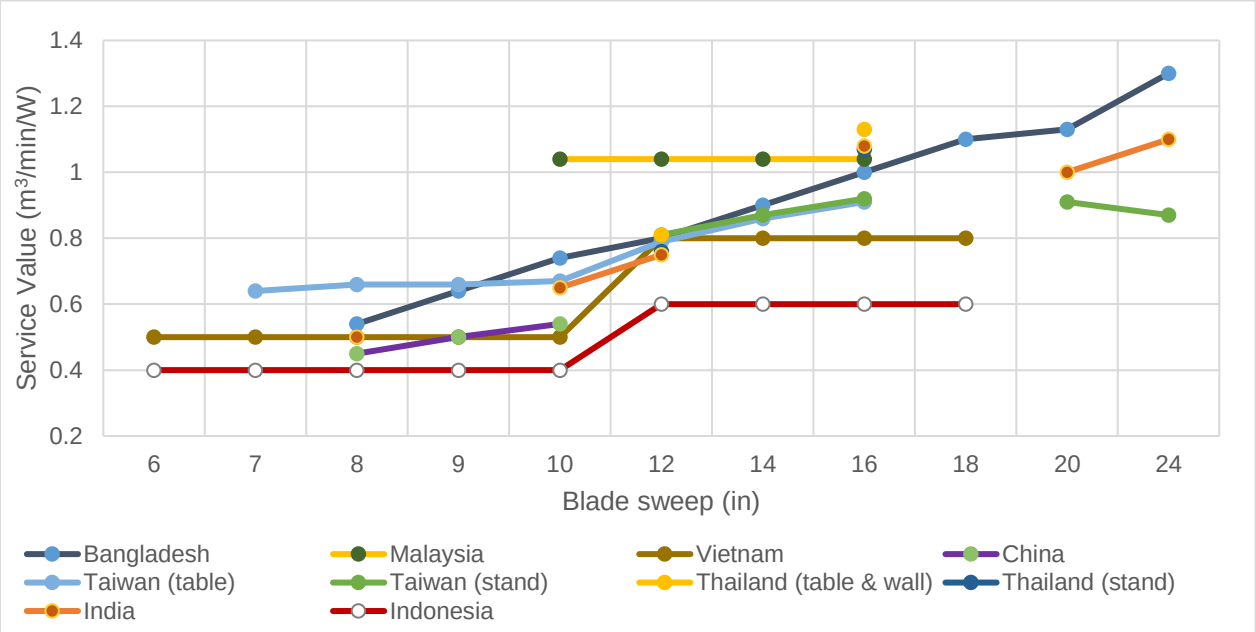


Figure 33: Electric fan MEPS regulations in South and Southeast Asia countries[54]

[54] Indonesia—as shared by EBTKE; Malaysia—as described in MS 2574:2014 http://bseep.gov.my/App_ClientFile/df08bc24-99fb-47a3-937f-dc25df9d3997/Assets/EE%20FEATURES/TEEAMBSEEP.pdf; China—as described in GB/T 13380-2007 https://bigee.net/media/filer_public/2017/04/27/bigee_china_fans_1212.pdf ; Vietnam—as described in TCVN 7826 : 2015 https://vanbanphapluat.co/tcvn-7826-2015-quat-dien-hieu-suat-nang-luong; South Korea—as described in https://www.energy.or.kr/renew_eng/energy/appliances/labeling.aspx. Review of Vietnamese Electric Fans Standards. Department of Industry – Australia. 2014. https://www.environment.gov.au/system/files/energy/files/review-of-vietnamese-electric-fans-standards-a-report-for-the-veesl-program.pdf for Bangladesh, Thailand. India—as specified in IS 555. Taiwan--https://www.moeaboe.gov.tw/ECW/english/content/Content.aspx?menu_id=1535

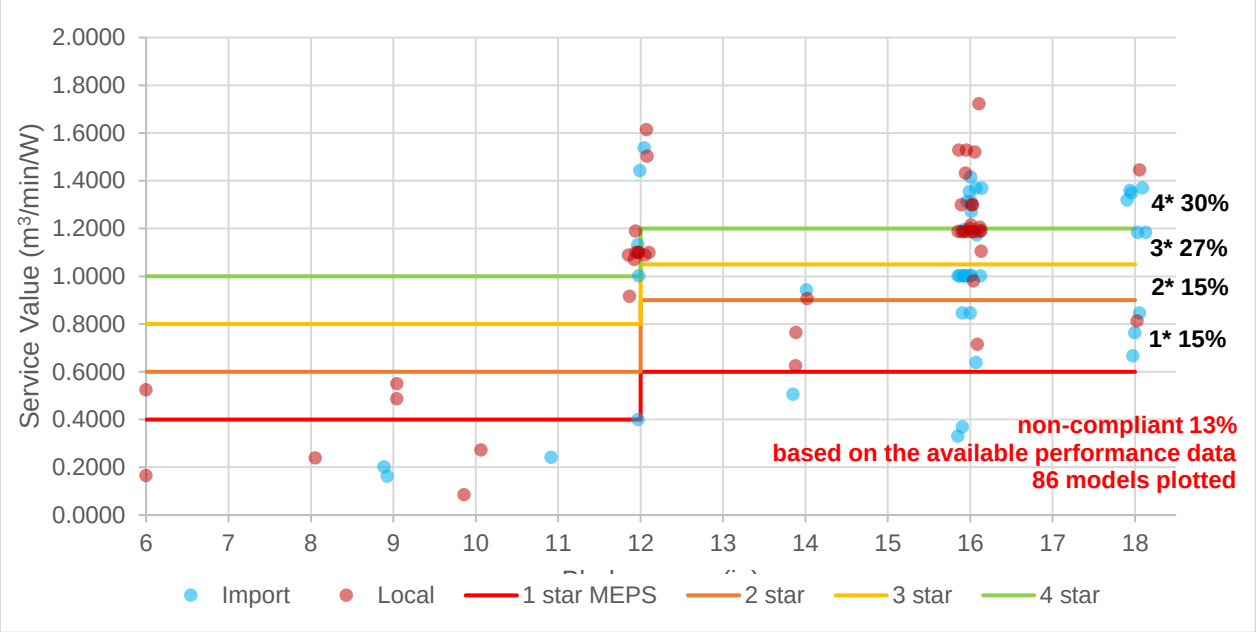


Figure 34. Draft regulation proposed by EBTKE for fans with blade sweep of 6 to 18 inches

CLASP Recommendation for 6 to 24-inch Fans

Upon closer evaluation of market performance distribution, along with other countries' active regulations for electric fans, CLASP proposed two MEPS levels at 0.6 m^3/min/W for fans with blade sweep from 6 inches to below 12 inches and 1.0 m^3/min/W for fans with blade sweep at and above 12 inches up to 24 inches. This requirement is slightly lower than Malaysia's level at 1.04 m^3/min/W.

While this regulation would be among one of the most ambitious in Asia, 66% of the currently existing models in the fans market would be expected to meet this standard, including more than two-third of locally manufactured models. Comparative labeling with 5-star rating scale is proposed at ratio proportions of 1.2 for 2-star, 1.4 for 3-star, 1.6 for 4-star, and 1.8 for 5-star respective to the service value specified for the 1-star MEPS level.

These requirements are illustrated in Figure 35. Minimum airflow requirement based on blade sweep was also proposed to further encourage advancements toward higher efficiency as compliance for maximum power rating would be implied. Tabulated values of the proposed minimum airflow requirement, MEPS, and comparative labeling levels are available in Table 25.

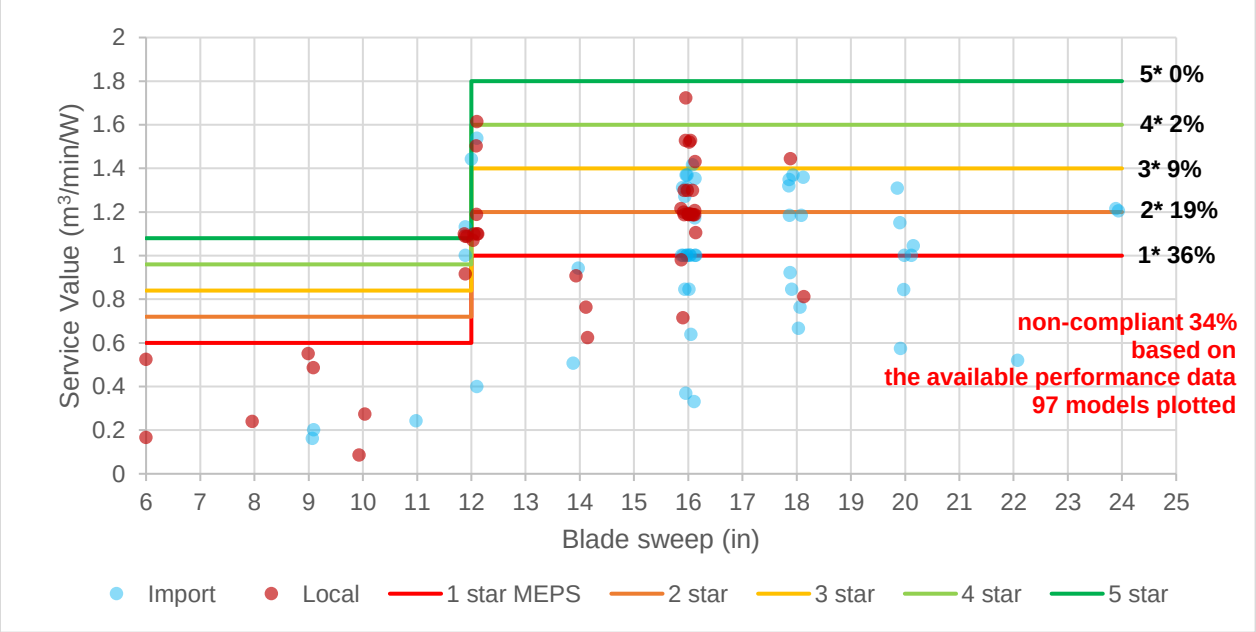


Figure 35: CLASP policy recommendation for Indonesia electric fan products with blade sweep of 6 to 24 inches

Table 23. Minimum air flow rate, MEPS, and star-rating levels recommended by CLASP for fan products with blade sweep of 6 to 24 inches

Blade sweep (in)	Minimum air flow rate (m^3/min)	1 star MEPS	2 star	3 star	4 star	5 star
6	4	0.60	0.72	0.84	0.96	1.08
7	4	0.60	0.72	0.84	0.96	1.08
8	4	0.60	0.72	0.84	0.96	1.08
9	4	0.60	0.72	0.84	0.96	1.08
10	5	0.60	0.72	0.84	0.96	1.08
11	8	0.60	0.72	0.84	0.96	1.08
12	12	1.00	1.20	1.40	1.60	1.80
13	17	1.00	1.20	1.40	1.60	1.80
14	23	1.00	1.20	1.40	1.60	1.80
15	30	1.00	1.20	1.40	1.60	1.80
16	39	1.00	1.20	1.40	1.60	1.80
17	48	1.00	1.20	1.40	1.60	1.80
18	58	1.00	1.20	1.40	1.60	1.80
19	70	1.00	1.20	1.40	1.60	1.80
20	82	1.00	1.20	1.40	1.60	1.80
21	95	1.00	1.20	1.40	1.60	1.80

Blade sweep (in)	Minimum air flow rate (m^3/min)	1 star MEPS	2 star	3 star	4 star	5 star
22	110	1.00	1.20	1.40	1.60	1.80
23	126	1.00	1.20	1.40	1.60	1.80
24	142	1.00	1.20	1.40	1.60	1.80
		1 star MEPS	2 star	3 star	4 star	5 star
Level ratio respective to 1 star		1.0	1.2	1.4	1.6	1.8
Min. air flow rate equation model		$0.53\ \text{Blade sweep (in)}^2 - 8.24\ \text{Blade sweep (in)} + 34.75$				

CLASP Recommendation for 36 to 60-inch Ceiling Fans

Despite ceiling fans being the less prominent fan product type in the Indonesian market, implementation of ceiling fan regulation would be highly beneficial in many aspects, considering its efficiency in delivering higher air flowrate at lower power consumption as compared to desk, standing, wall, and combination fans.

The presence of comparative labeling would inform consumers on ceiling fans service value, illustrating the extent of thermal comfort gain. In addition to this, a number of South Asian countries along with Indonesia's neighboring countries in ASEAN, namely Malaysia and Vietnam have implemented ceiling fan regulations. The country would reap additional savings through the inclusion of ceiling fans and enforce harmonization in electric fan standardization within the ASEAN region.

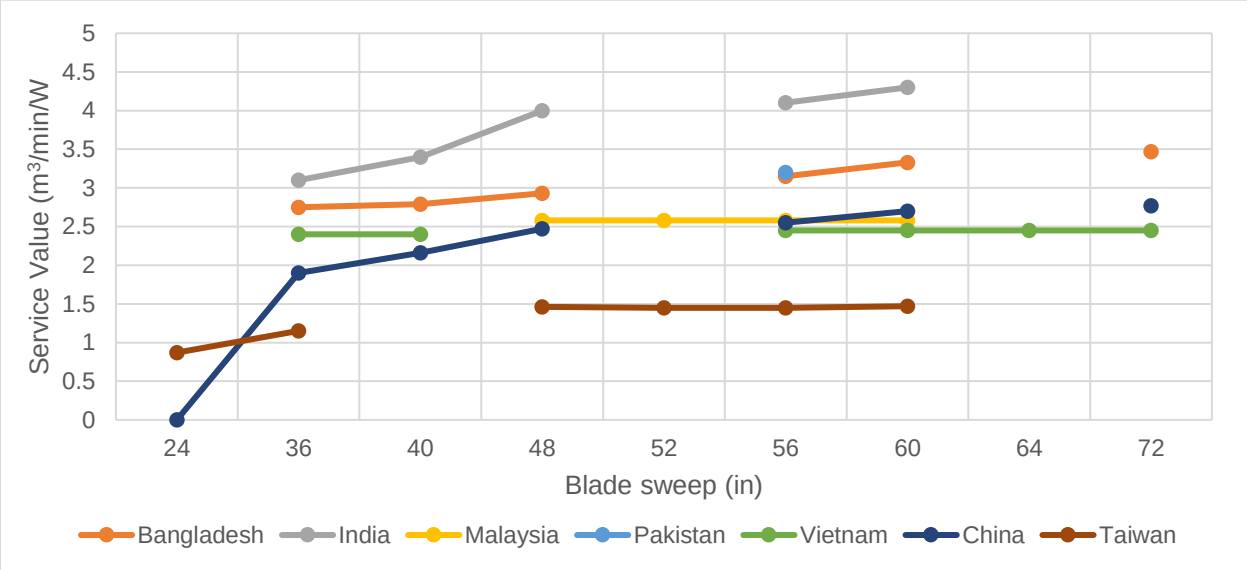


Figure 36: Electric ceiling fan MEPS regulations in South and Southeast Asian countries[55]

[55] Indonesia—as shared by EBTKE; Malaysia—as described in MS 2574:2014 http://bseep.gov.my/App_ClientFile/df08bc24-99fb-47a3-937f-dc25df9d3997/Assets/EE%20FEATURES/TEEAMBSEEP.pdf; China—as described in GB/T 13380-2007 https://bigee.net/media/filer_public/2017/04/27/bigee_china_fans_1212.pdf ; Vietnam—as described in TCVN 7826 : 2015

About 81% of the ceiling fans currently available in the market would be able to meet this standard, including 83% of the models produced by local manufacturers. Comparative labeling with 5-star rating scale is proposed at ratio proportions of 1.375 for 2-star, 1.75 for 3-star, 2.125 for 4-star, and 2.5 for 5-star respective to the Service Values specified for the 1-star MEPS level.

These requirements are illustrated in Figure 37. Minimum airflow requirement based on blade sweep was also proposed for ceiling fan products. Tabulated values of the proposed minimum air flow rate, MEPS, and comparative labeling levels are available in Table 24.

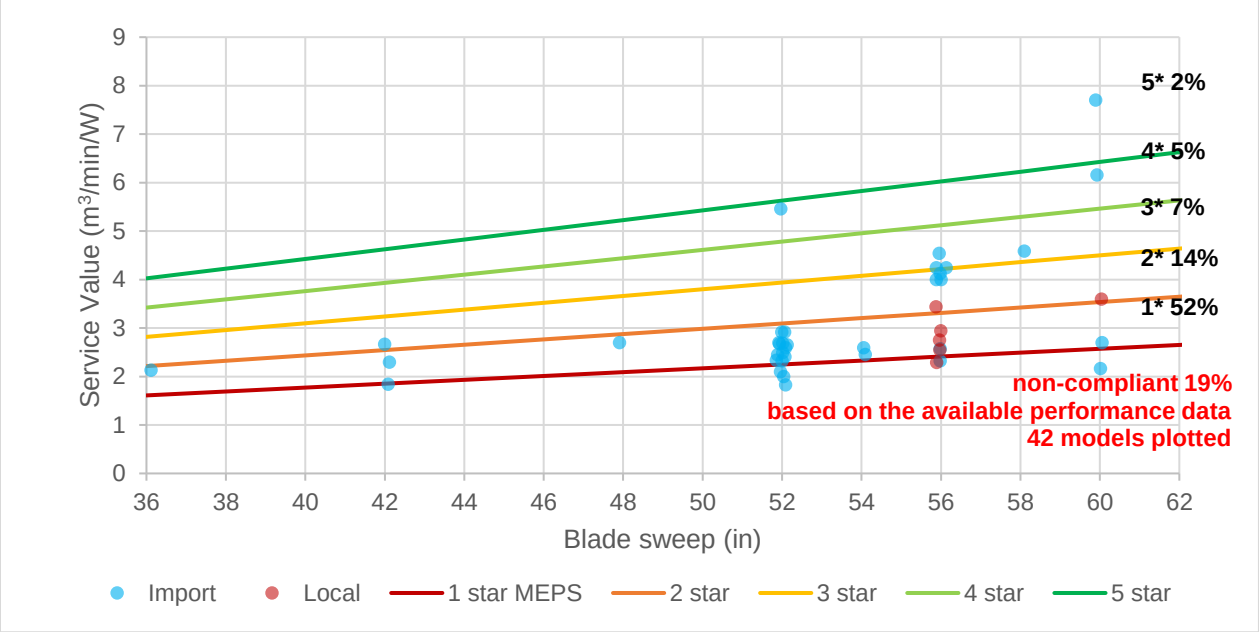


Figure 37: CLASP policy recommendation for Indonesia ceiling fan products

Table 24. Minimum air flow rate, MEPS, and star-rating levels recommended by CLASP for ceiling fan products with blade sweep of 36 to 60 inches

Blade sweep (in)	Minimum air flow rate (m^3/min)	1 star MEPS	2 star	3 star	4 star	5 star
36	45	1.61	2.21	2.82	3.42	4.03
42	75	1.85	2.54	3.24	3.93	4.63
48	105	2.09	2.87	3.66	4.44	5.23
52	125	2.25	3.09	3.94	4.78	5.63
54	135	2.33	3.20	4.08	4.95	5.83
56	145	2.41	3.31	4.22	5.12	6.03
58	155	2.49	3.42	4.36	5.29	6.23

https://vanbanphapluat.co/tcvn-7826-2015-quat-dien-hieu-suat-nang-luong; South Korea—as described in https://www.energy.or.kr/renew_eng/energy/appliances/labeling.aspx. Review of Vietnamese Electric Fans Standards. Department of Industry – Australia. 2014. https://www.environment.gov.au/system/files/energy/files/review-of-vietnamese-electric-fans-standards-a-report-for-the-veesl-program.pdf for Bangladesh, Thailand. India—as specified in IS 374:2018. Taiwan--https://www.moeaboe.gov.tw/ECW/english/content/Content.aspx?menu_id=1535

Blade sweep (in)	Minimum air flow rate (m^3/min)	1 star MEPS	2 star	3 star	4 star	5 star
60	165	2.57	3.53	4.50	5.46	6.43
MEPS equation model		$5\,\text{Blade sweep (in)} - 135$				
		1 star MEPS	2 star	3 star	4 star	5 star
Level ratio respective to 1 star MEPS		1.0	1.375	1.75	2.125	2.5
Min. air flow rate equation model		$5\,\text{Blade sweep (in)} - 135$				

9 Impacts Assessment

9.1. Impacts to Consumers

CLASP analyzed the prices of fans available on the Indonesian market in both modern and traditional retail but found no reliable correlation between price and service value, even after controlling for a variety of factors such as blade sweep, fan type, import versus local. Even after extending the dataset as described in the next section, CLASP found no correlation, leading us to conclude that for smaller non-ceiling fans available in Indonesia, there is no strong impact of efficiency on price, and that the CLASP recommended requirement would not result in any price increases to consumers. This observation extended to ceiling fan products as well, for which products are available in wide pricing range and performance levels.

In addition to savings obtained through reduced electricity consumption, the presence of enforced regulation that promotes higher performance in fan models would enhance air delivery performance, namely higher air flow rate output at lower wattage. The quantified increase in air flow rate can be assumed proportional to increased comfort levels for consumers. The findings are presented in Table 25.

Table 25. Summary of impacts at the consumer-level with CLASP recommended requirements

Policy Option	Price Increase (IDR)	Lifecycle Cost Savings (IDR)	Payback Period (years)	Product Life (years)	Comfort Level Increase
Desk/table, Standing, Wall, Combination, and Professional Fans, 6 to 18 inch Blade Sweep					
EBTKE	N/A	52,000	N/A	5	1%
Desk/table, Standing, Wall, Combination, and Professional Fans, 6 to 24 inch Blade Sweep					
CLASP	N/A	117,000	N/A	5	6%
Ceiling Fans, 36 to 60-inch Blade Sweep					
CLASP	N/A	32,650	N/A	7	3%

9.2. Impacts to Manufacturers

Desk/Table, Standing, Wall, and Combination Fans

Through enforcement of stringent regulation, there are electric fan models that would be eliminated for not being compliant with the defined energy efficiency and performance. Impacts on manufacturers were evaluated by calculating the number of models that would be eliminated under the two policy options. In addition to MEPS level requirement, CLASP proposes minimum flow rate requirements for different blade sweeps, represented by a polynomial equation provided in Figure 38.

The main benefit of having minimum air flow rate values specified for the covered fan products is the implied maximum power rating specifications. With this proposed formulation, development of efficient components and finished products with low energy consumption would be encouraged. Additionally, manufacturers would need to closely review their design decisions and improve the quality of the fan components to maintain compliancy and improve service values. Figures below show the performance distribution of local and imported models, plotted against the specified requirements of minimum flowrate and MEPS levels.

Analyzing **86 electric fan models with blade sweep of 6 to 18 inches**;

- 87% of the models will be compliant under EBTKE draft MEPS level
  - **91% of locally manufactured models would meet the proposed EBTKE MEPS.**

Analyzing **97 electric fan models with blade sweep of 6 to 24 inches**;

- 92% of the available models would be able to meet the minimum flowrate requirement
- 66% of the models will be compliant under both minimum flowrate requirement and MEPS recommendations
  - **69% of locally manufactured models would meet the proposed EBTKE MEPS**

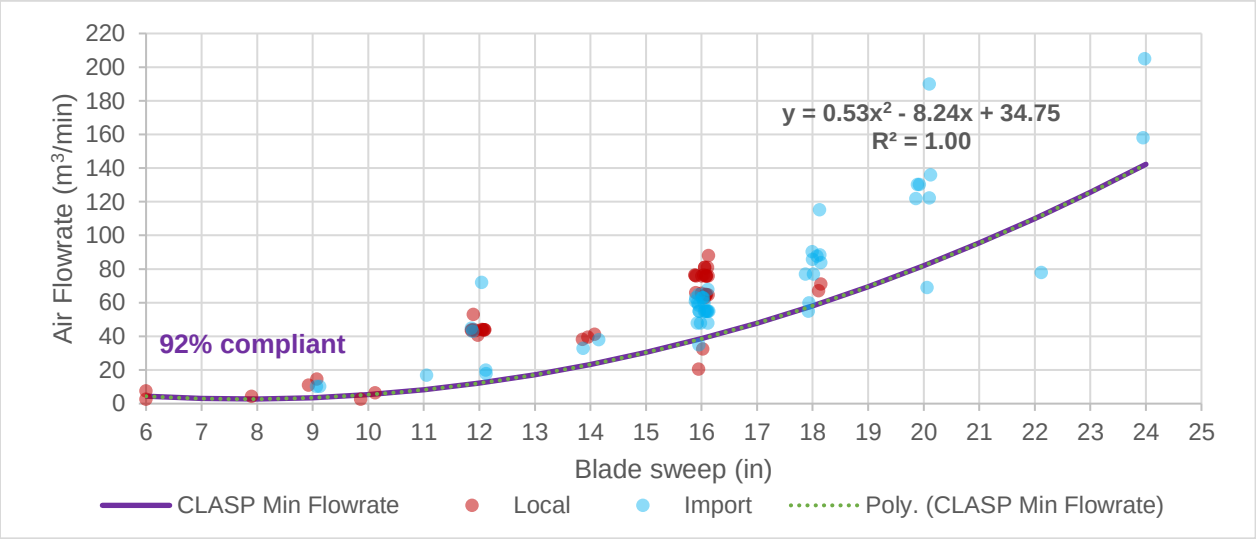


Figure 38: Minimum air flow rate recommendation for fan products with blade sweep of 6 to 24 inch

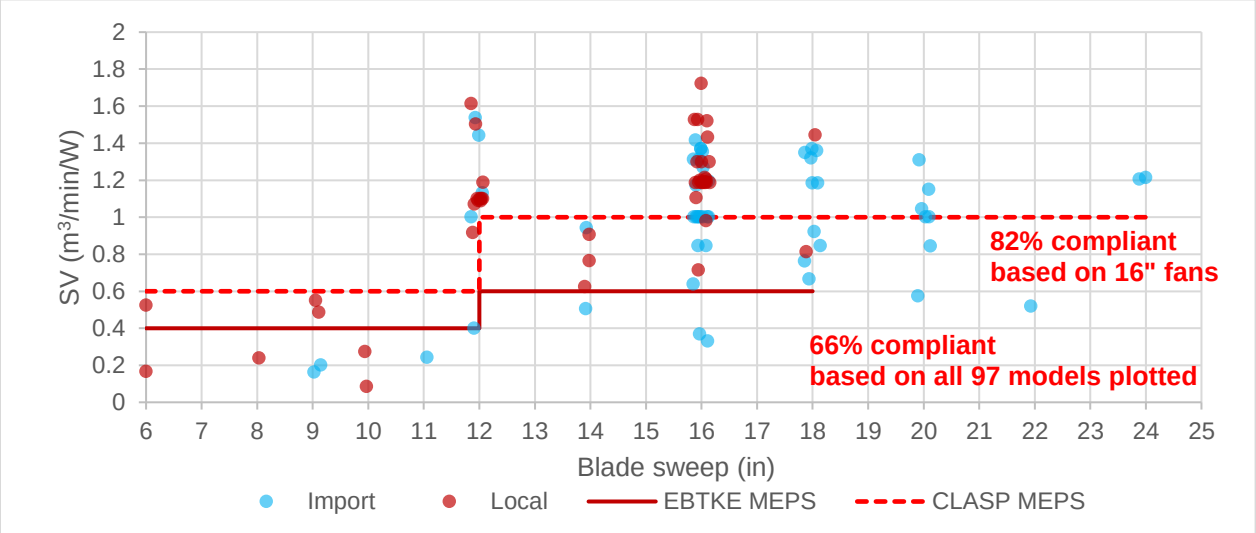


Figure 39: MEPS level recommendation for fan products with blade sweep of 6 to 24 inch

Table 26 shows a summary of the compliancy rates for both policy options defined by EBTKE and CLASP for fan products with blade sweep of 6 to 18 inch, and for the expanded policy option defined by CLASP for blade sweep 6 to 24 inches.

Table 26. Overview of the estimated compliancy rate for the defined EBTKE and CLASP MEPS levels for desk/table, standing, wall, and combination fans based on the available performance data

6 to 18 inch	# of data	Compliant	Non -compliant	(count)	Compliant	Non -compliant	(%)
EBTKE MEPS	86	75	11	Total	87%	13%	Total
	41	34	7	Import	83%	17%	Import
	45	**41**	**4**	**Local**	**91%**	**9%**	**Local**
6 to 24 inch	**# of data**	**Compliant**	**Non -compliant**	**(count)**	**Compliant**	**Non -compliant**	**(%)**
CLASP MEPS	97	64	33	Total	66%	34%	Total
	52	33	19	Import	63%	37%	Import
	45	**31**	**14**	**Local**	**69%**	**31%**	**Local**

Further assessment on estimated compliancy rate was performed based on the total model count found available in the market. Listed in Table 27 are the summarized results, listed for fans with different blade sweeps based on the estimated sales volume shares. Breakdown of compliancy rates for the locally manufactured and imported models at different blade sweeps is provided in the subsequent Table 28.

Despite the limitation in the available performance dataset for fans at certain blade sweeps, it should be noted that nearly 80% of the entire market share is represented by fans with blade sweeps of 16, 12, 18, and 20 inches. At the recommended requirements, **17% reduction in volume share** is estimated for this product group. Within this subgroup of fans with blade sweeps of 16, 12, 18, and 20 inches, **31 out of 35 models** of local models that have available performance data would be compliant.

Table 27. Summary of the estimated volume shares for fan models at baseline and at CLASP recommended requirements

Blade size (in)	Model count (price data available)	Est. volume share at baseline	Est. volume share with min. air flow rate and MEPS requirements
16	**277**	**38%**	**31%**
12	**143**	**20%**	**17%**
18	**99**	**14%**	**8%**
20	**55**	**8%**	**5%**
9	34	5%	0%
7	33	5%	0%
6, 8, 10, 11, 14, 22, 24	86	12%	2%
Total	**727**	**100%**	**63%**

Table 28. Summary of the estimated compliancy rates for local and imported fan models based on the available performance data

Blade size (in)	Model count (performance data available) (local & import)	Local model count with performance data	Import model count with performance data	Compliant rate per blade sweep (local & import)	Compliant rate per blade sweep of local models	Compliant rate per blade sweep of import models
6	2	2	-	0%	0%	-
8	1	1	0	0%	0%	-
9	4	2	2	0%	0%	-
10	2	2	-	0%	0%	-
11	1	-	1	0%	-	0%
12	**16**	**11**	**5**	**88%**	**91%**	**80%**
14	5	3	2	0%	0%	0%
16	**44**	**22**	**22**	**82%**	**91%**	**73%**
18	**12**	**2**	**10**	**58%**	**50%**	**60%**
20	**7**	**-**	**7**	**71%**	**-**	**71%**
22	1	-	1	0%	-	0%
24	2	-	2	100%	-	100%
Total	**97**	**45**	**52**			

Ceiling Fans

Implementation of minimum flowrate requirement and MEPS level for ceiling fan products in Indonesia would result in distribution shifts within the national market performance, eliminating less efficient products. Assessment conducted based on the available performance data collected from **44 ceiling fan models** shows that;

- 95% of the models are expected to meet the minimum airflow requirement.
- 83% of the models will be compliant under CLASP recommended MEPS level
    - **83% of locally manufactured products would be compliant;**

Within the analyzed dataset, it should be noted that most datapoints were collected from imported products. Out of the **44 data points**, **6 were from locally manufactured models and the remaining 38 were imports**. Despite the limited data availability, a glimpse into ceiling fan market performance has been established, which would continue to improve through the presence of regulation.

Inclusion of larger amounts of data points from local ceiling fan manufacturers may certainly change the estimated compliancy percentages; however, it is worth noting that compliant local and imported ceiling fan technologies are present in relatively large percentage. Shown in Figure 41 is the market performance distribution plotted against the proposed MEPS level, and in Table 29 the tabulated values of compliancy rates.

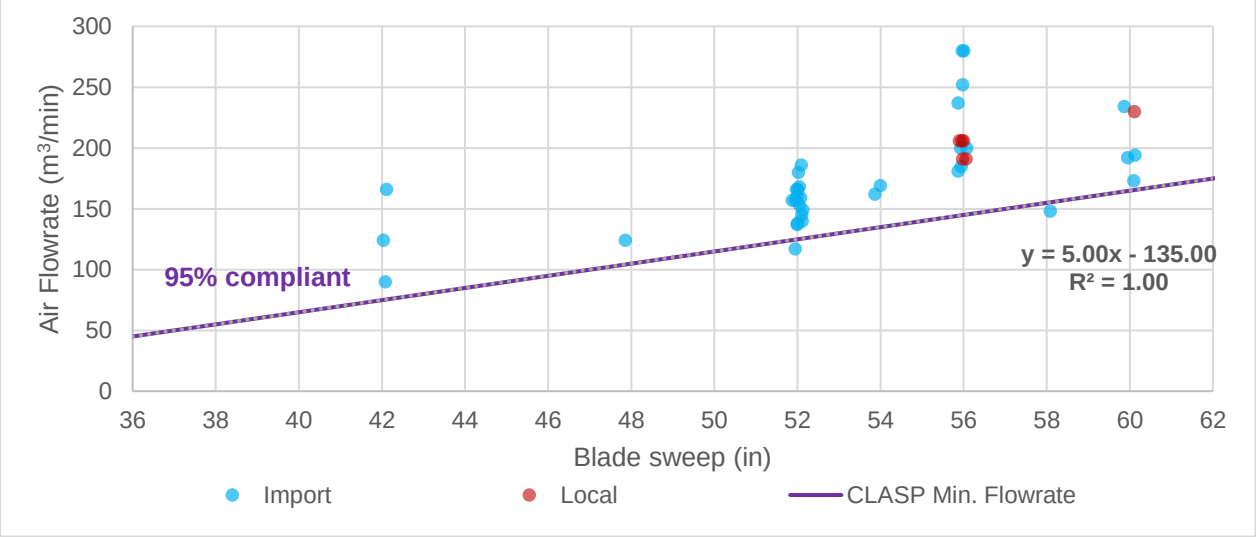


Figure 40: Minimum flowrate recommendation for ceiling fan products with blade sweep of 36 to 60 inch

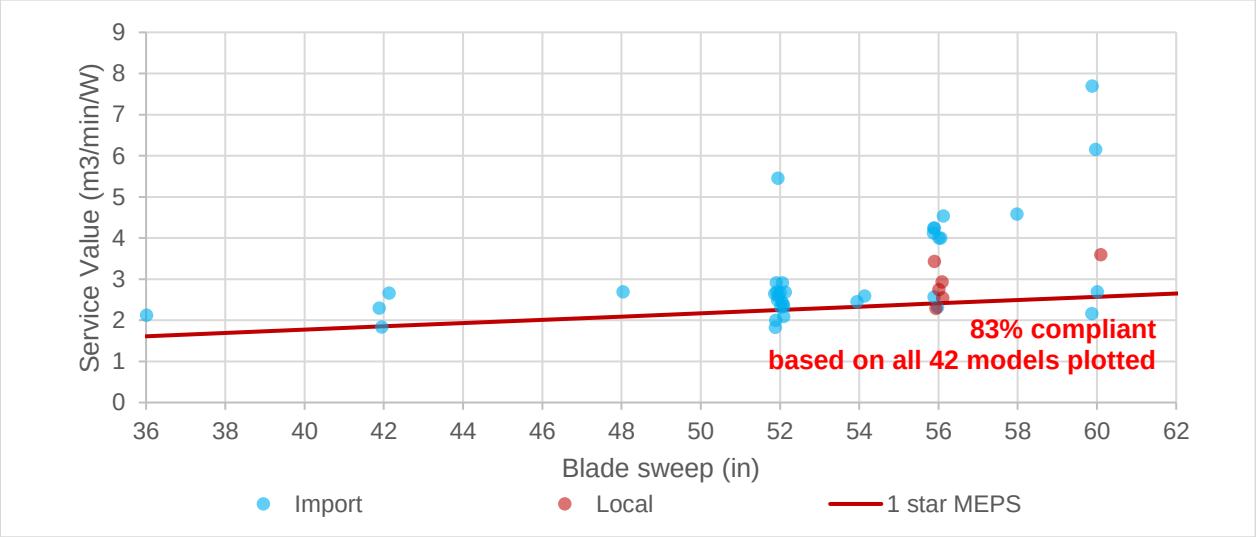


Figure 41. MEPS level recommendation for ceiling fan products with blade sweep of 36 to 60 inch

Table 29. Overview of the estimated compliancy rates for CLASP recommended ceiling fan MEPS level

	# of data	Compliant	Non -compliant	(count)	Compliant	Non -compliant	(%)
CLASP	42	34	8	Total	81%	19%	Total
	36	29	7	Import	81%	19%	Import
	6	**5**	**1**	**Local**	**83%**	**17%**	**Local**

9.3. Impacts at the National Level

The large number of fans in Indonesia results in significant energy and CO_2 benefits to the nation. Table 30 shows the savings, calculated from the cumulative stock within the period of 2020 to 2030 and annually in 2030.

Table 30. Indonesian national impacts of CLASP recommended MEPS

Policy Option	Products	Final Energy Savings (TWh)		CO2 Mitigation (Mt)	
		2020-2030	2030	2020-2030	2030
CLASP Recommended Levels	**Desk/table, standing, wall, combination, and professional fans of 6 to 24-inch blade sweep**	9.99	1.56	8.91	1.39
	Ceiling fans of 36 to 60-inch blade sweep	0.18	0.03	0.16	0.02
CLASP Subtotal		**10.17**	**1.59**	**9.07**	**1.41**
EBTKE Draft MEPS	**Desk/table, standing, wall, combination, and professional fans of 6 to 18-inch blade sweep**	5.18	0.66	4.62	0.59
	Ceiling fans of 36 to 60-inch blade sweep (no regulation)	0	0	0	0
EBTKE Subtotal		**5.18**	**0.66**	**4.62**	**0.59**

10 Conclusion and Recommendations

This *Indonesia Fan Market Study and Policy Analysis* provides the technical evidence to support a revision of the draft MEPS. Government agencies can use this information to define their efficiency baseline for fans, quantify potential energy and GHG emissions savings in support of national energy efficiency targets or NDC commitments, and estimate other potential benefits from revising the draft S&L program requirements.

The analysis presented in this report was based on the product data for almost a thousand models from retail stores in Jakarta, Bandung, Surabaya, Makassar, Denpasar, and Medan, as well as additional ones found through manufacturer websites. Manufacturers provided sales data, which was supplemented by modelling to arrive at a total market size. Findings were validated by manufacturers, government officials, and other organizations during a National Workshop on November 20th, 2020.

Fans are an important household appliance in Indonesia, contributing significantly to the nation's electricity use due to their high-power draw (tens of watts), high penetration (67% with 1.33 fans per household nationally), and frequent use (6.6 hours per day for 27 days per month).

There is currently an Indonesian National Standard harmonized with IEC 60879:1986. However, the 2019 version of IEC 60879 has recently been adopted, which would ease the testing burden by allowing the use of digital anemometer for air velocity measurement and specifying testing of noise and standby power. **CLASP recommends referencing this new standard for the electric comfort fans energy efficiency policy in Indonesia.**

Currently EBTKE is developing MEPS and labeling criteria for fans. **The service values for fans on the market are well above the recommended MEPS.** While the MEPS in the current draft regulations would result in some savings, there is an opportunity for a more stringent requirement similar to the neighboring country, Malaysia, which would establish Indonesia as a leader in energy efficiency in the ASEAN region and result in greater savings. Out of all models assessed in the policy analysis, 66% of the current models would meet this requirement, which should not result in an increase in price.

Based on this analysis, CLASP recommends adopting the recommended MEPS and minimum airflow requirements to eliminate the least efficient models from the market and encourage technological advancements towards energy efficiency in the fans market. The presence of 5-star labelling tier will serve as a reliable guide for consumers in making purchase decisions, and an authoritative source that rewards manufacturers for producing energy efficient models in Indonesia.

CLASP presented the preliminary findings of this market study to a wide audience in a National Workshop in Jakarta held on November 20, 2019, to validate the results. In preparation to the upcoming revision to the existing draft regulation, a Focus Group Discussion (FGD) was then held by EBTKE in Jakarta on January 30th, 2020. Key market study findings and CLASP's recommendations were presented to a smaller group of key stakeholders, namely major manufacturers, approved testing facilities, governmental research laboratories, and technical experts. Stakeholders could voice their opinions, provide inputs, and state possible concerns for the proposed requirements.

Through this meeting, EBTKE had successfully established a collective agreement for the recommended reference standard, the proposed minimum air flow rate and MEPS requirements, and the comparative labeling criteria. No concerns were raised over the recommended adoption of IEC 60879:2019, which would allow for improved accuracy and enable simpler procedures.

Same applies for the quadratic minimum air flow rate requirements, as well as the MEPS levels of 0.6 in service value for fans with blade sweep ranging from 6 inches to below 12 inches, and 1.0 in service value for fans with blade sweep ranging from 12 inches to 24 inches. Comparative labeling with 5-star rating scale proposed at ratio proportions of 1.2 for 2-star, 1.4 for 3-star, 1.6 for 4-star, and 1.8 for 5-star respective to the service value specified for the 1-star MEPS level, was likewise well-received.

As for the ceiling fans recommendation, EBTKE stated that this fan type would not be included in the upcoming regulation, being a considerably less popular fan type at the household level and the necessity to establish dedicated ceiling fan test chamber. Concluding the FGD, CLASP recommendations for fans with blade sweep of 6 to 24 inches were approved by the key stakeholders, confirming that the requirements can feasibly be met by the industry.

Subsequent discussions were held in February 2020. Several decisions were made by EBTKE for the fans policy, based on the inputs obtained during the January FGD, summarized as follows;

- To continue referencing SNI IEC 60879:2013, which is equivalent to IEC 60879:1986, because IEC 60879:2019 has not yet been adopted as an Indonesia National Standard (SNI);
- To not include the air flow rate requirement in the fan policy;
- To separate the 2- to 5-star labeling requirement lines for fans with blade sweep less than 12 inches; and
- To separate the 4- and 5-star lines for fans with blade sweep great than or equal to 12 inches.

Based on the distribution of the available performance data, the last two changes will slightly reduce the proportion of models in the higher star bands as illustrated in Figure 4.

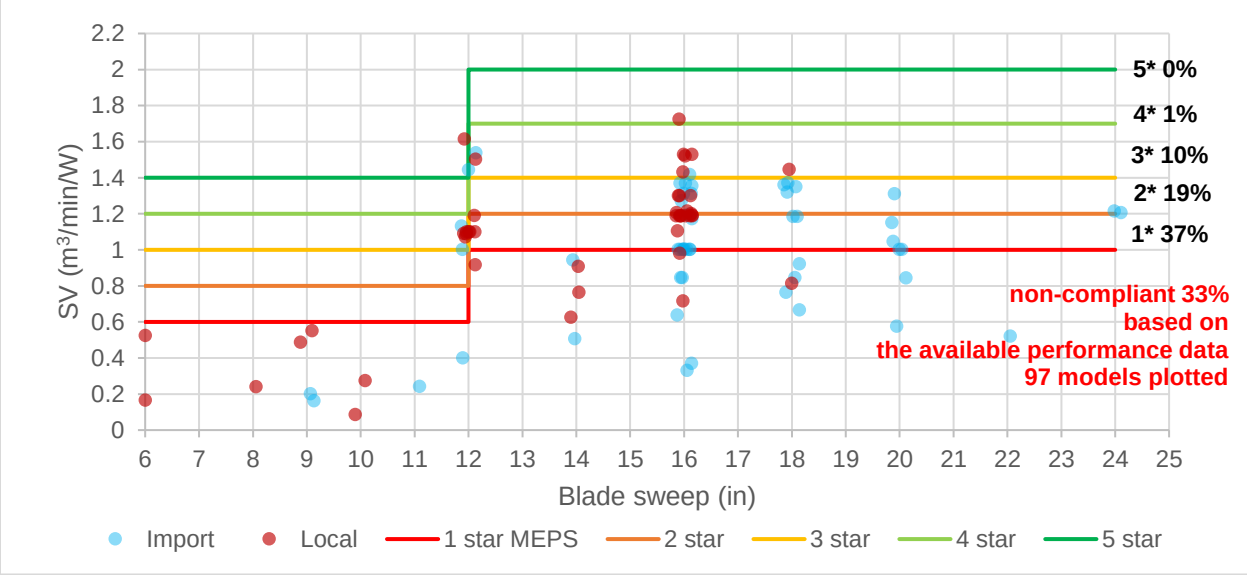


Figure 42: MEPS and comparative labeling requirements decided by EBTKE for the revised draft regulation

Under these levels, household consumers would save at least 120,000 IDR in electricity savings. At the national level, Indonesia would gain significant energy savings of at least 10 TWh from 2020 to 2030 and 1.6 TWh in 2030 and mitigate GHG emissions of at least 8.9 $MtCO_2$ from 2020 to 2030 and 1.4 $MtCO_2$ in 2030. This first fan policy in Indonesia would help the country achieve significant energy reductions. In parallel, the presence of this regulation would transform the national fans market by providing household consumers with an authoritative guide to select energy efficient products and awarding the leading brands for advancing market performance.

Import/export data

The import export data for electric fans was collected from the UN Comtrade website. The relevant HS code for electric fans was selected and data was retrieved for the last 3 years (2018, 2017 and 2016) for Indonesia.

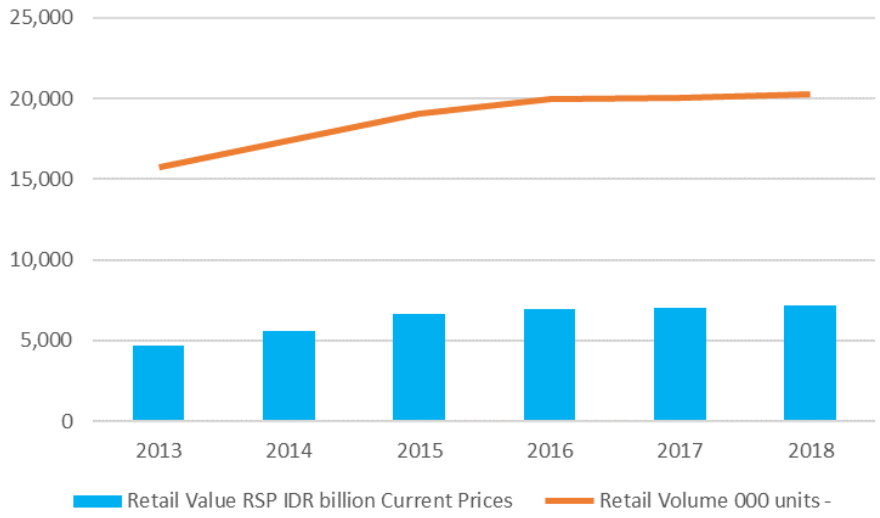
Year	2018	2017	2016
Qty. imported	620,955	427,359	427,365

China: 77% Thailand: 10% Singapore: 10% in 2018

In 2018, most imports of electric fans were from China (77%). Imports from Thailand and Singapore comprised of 10% of total imports of fans each.

Euromonitor International's report on Air Treatment sector in Indonesia

The hot and humid climate which exists across Indonesia throughout the year drives demand for cooling appliances. The air-cooling sector has exhibited strong growth over the last 5-10 years on the backdrop of rising incomes, population growth and rising number of households in the country.



Market size for cooling fans, Indonesia[56]

According to this report, "cooling" fans dominate retail sales of air treatment products. Interestingly, the top brands of cooling fans came from local companies: Tripacific Electrindo (Sekai), Star Cosmos (Cosmos) and Kencana Gemilang (Miyako). However, cooling fans became more competitive with entry of local brands as well as cheaper Chinese products. As a result, Tripacific Electrindo and Star Cosmos suffered a gradual decline in share.[57]

[56] Source: Euromonitor International 2015, Sector Capsule: Air Treatment Products in Indonesia
[57] Source: Euromonitor International 2019, Cooling Fans Indonesia Market Sizes

"A Comparative Analysis of Household Energy Consumption in Jakarta and Bandung", Tetsu Kubota, Usep Surahman, Osamu Higashi

This paper was presented at CEPT University, Ahmedabad India in 2014 at the Passive and Low Energy Architecture (PLEA) conference. It aims to reveal the detailed household operational energy consumption patterns in major cities of Indonesia. A total of 297 households were surveyed in Jakarta, while 247 households were investigated in Bandung, focusing especially on unplanned landed houses as a part of this study. During the study, **detailed information about household appliances and gas consumption were investigated through face-to-face interviews**. This information is very useful as standing (or pedestal) and ceiling fans were included in the scope of the survey.

Jakarta and Bandung survey

14 typical residential neighborhoods were selected in Jakarta, and six were selected in Bandung. A total of 297 and 247 houses were investigated respectively (see Table 1). The detailed information about household appliances and gas consumption were obtained through face-to-face interviews using a questionnaire form.

The content of the questionnaire covered: (a) socio-economic profile, (b) building information, (c) monthly energy bills (electricity, water, gas (LPG), and kerosene), and (d) number and usage time of household appliances. Meanwhile, on-site measurements using watt meters (MWC01, OSAKI) were carried out to investigate the electric capacity of respective household appliances.

Then, the monthly average household electricity consumption was estimated based on the data of (a) number of appliances, (b) usage time, and (c) measured electric capacities. These measured electricity consumptions were validated by the data obtained through the electricity bills. The monthly gas (LPG) and kerosene consumption was estimated from bills. The annual average household energy consumption was then calculated in the form of secondary energy by combining electricity consumption for all the household appliances as well as gas and kerosene consumption. The seasonal variation in climate conditions is small in both Jakarta and Bandung.

Table 1. Socio-economic profile of respondents

	Jakarta	Bandung
Sample size	297	247
House category (%)		
Simple	42.1	48.6
Medium	38.7	40.1
Luxurious	19.2	11.3
Gender (%)		
Male	50.5	39.3
Female	49.5	60.7
Age (%)		
< 40 (years old)	21.9	17.0
40-49	33.7	27.9
50-60	32.3	32.0
> 60	12.1	23.1
Household size (persons)	4.5	4.8
Monthly household income (%)		
< 90 (US$)	3.0	4.5
90-450	58.9	61.5
450-900	26.6	28.7
> 900	11.5	5.3
Total floor area (%)		
< 50 (m^2)	33.7	25.9
50-99	28.3	32.4
100-300	34.0	37.7
> 300	4.0	4.0

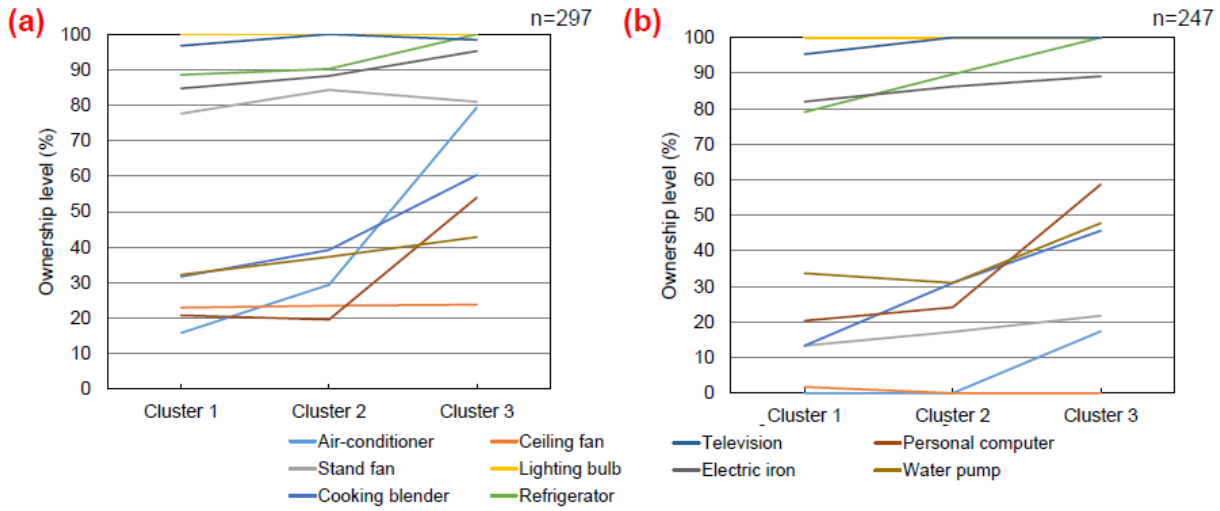


Figure 3 Ownership levels of major household appliances. (a) Jakarta; (b) Bandung.

As shown, light bulb (100%), television (95-100%) and refrigerator (79-100%) recorded high ownership levels similarly in the two cities among three clusters. In the case of Jakarta (Figure 3a), the stand fan also recorded high ownership levels of 78-84%, reflecting hot climatic conditions. Cluster 1 represents small, lower-income households, Cluster 2 represents larger lower-income household, while Cluster 3 represents high-income households. In general, the ownership levels of other appliances increase from Cluster 1 to 3 respectively, except for a few appliances such as water pump in Bandung.

Appendix B – List of Stakeholders Contacted & Engagement Status

Top players contacted

No	Manufacturer	Brands	Status	Next Actions
1	PT Star Cosmos	Cosmos	Completed	Done
2	PT Kencana Gemilang	Miyako	Completed	Done
3	PT Panasonic Manufacturing Indonesia	Panasonic	Completed	Done
4	PT Maspion Indonesia	Maspion	Completed	Done
5	PT Aditya Sarana Graha	Kirin	Completed	Done
6	PT Sanken Argadwija	Sanken	Completed	Done
7	PT Tripacific Electrindo	Sekai	Completed	Done
8	PT Denpoo Mandiri Indonesia	Denpoo	Completed	Done
9	PT KDK Indonesia	KDK	Completed	Done (domestic production is conducted by Panasonic; import is limited to exhaust fans)

Additional manufacturers contacted, listed by BPS (Direktori Industri Manufaktur, 2017 and 2018)

No	Manufacturer	Brands	Status	Remarks
1	CV Garuda Multi Makmur	?	Contacted	No responses despite follow ups
2	PT Lima Jaya Abadi	Matsunichi	Contacted	No responses despite follow ups
3	PT Aditya Manufaktur Indonesia	Kirin	Completed	Done
4	PT Gikoko Kogyo / PT Gikoko Utama	?	Contacted	No responses despite follow ups
5	CV Mekar Perkasa	?	Contacted	No responses despite follow ups
6	PT Panalux Multi Top	Panalux	Contacted	No responses despite follow ups
7	PT Sukses Maga Abadi	?	No contact details	Not listed in Yellow Pages, not registered in Telkom
8	PT Sinar Group Indocemerlang	Airlux	Partially completed	Follow up (calls and messages)

Importers contacted, listed by BPS (Direktori Importir Indonesia, 2017 and 2018)

No	Importer	Brands	Status	Remarks
1	PT KDK Indonesia	KDK	Completed	Done
2	PT Mega Mitra Indopratama	Mistral	Completed	Done
3	PT Midea Planet Indonesia	Midea	Contacted	No responses despite follow ups
4	PT Panasonic Gobel Indonesia	Panasonic	In progress, data will be provided.	Reminders
5	PT Mitsubishi Electric Indonesia	Mitsubishi	In progress, data will be provided.	Reminders
6	PT Ace Hardware Indonesia	Kris, Krisbow, Air Monster	Contacted	No responses despite follow ups
7	PT Dailindo Nusantara	Power Air	Contacted	No responses despite follow ups
8	PT Gunawan Elektrindo	?	Contacted	No responses despite follow ups
9	CV Indah Mentari Pratama	?	Not contactable	
10	PT Bersaudara Gemilang Karya	?	No contact details	Not listed in Yellow Pages, not registered in Telkom
11	PT Sinar Dagang Multi Tehnik	?	No contact details	Not listed in Yellow Pages, not registered in Telkom
12	PT Multitek Indopanca	Fantech	Contacted	No responses despite follow ups
13	PT Surya Lancar Makmur	Kangaroo	No contact details	Not listed in Yellow Pages, not registered in Telkom
14	PT Visalux Elektrindo / PT Prima Makmur Indonesia (from Google search)	Visalux	Contacted	No responses despite follow ups

Manufacturers/importers of additional retail brands identified during surveys contacted

No	Manufacturer/Importer	Brands	Status	Remarks
1	PT Arisamandiri Pratama	Arisa	Contacted	No responses despite follow ups
2	PT Nusantara Jayatama Sentosa	Vornado	Contacted	No responses despite follow ups
3	PT GMC Elektronik	GMC	Contacted	No responses despite follow ups
4	Katsu Corporation Indonesia	Katsu	Contacted	No responses despite follow ups
5	PT Industrial Multi Fan	CKE, Misty Cool	Contacted	No responses despite follow ups
6	PT Kamal Sejahtera Indonesia	Pisces	Contacted	No responses despite follow ups
7	PT Multi Mayaka	Mayaka	Contacted	No responses despite follow ups
8	PT Indo Prima Nusantara	Yundai	Contacted	No responses despite follow ups
9	PT Melindo Cipta Agung	RBF	Contacted	No responses despite follow ups
10	PT Citra Hannochs Niagantara	Arashi	Contacted	No responses despite follow ups
11	PT National Super	Natsuper	No contact details	Not listed in Yellow Pages, not registered in Telkom
12	PT Mahakarya Sukses Indonesia	Mitochiba	No contact details	Not listed in Yellow Pages, not registered in Telkom
13	Bun Ko Kuet (Indonesian individual)	Regency	No contact details	Individual instead of company
14	Qiu Yu Xia (Indonesian individual)	Aoyama	No contact details	Individual instead of company
15	Xunfu Jiang (Indonesian individual)	Kingston	No contact details	Individual instead of company
16	Shenchao He (Indonesian individual)	Sivicom	No contact details	Individual instead of company
17	No contact details	Welhome	No contact details	Can’t found the manufacturer/ importer’s name
18	No contact details	WorldStar	No contact details	Can’t found the manufacturer/ importer’s name

Manufacturers/importers of additional brands listed in BANG-BENI (products with SNI) contacted

No	Manufacturer/Importer	Brands	Status	Next Actions
1	PT. China International Raya	Odaiba	No contact details	Not listed in Yellow Pages, not registered in Telkom
2	PT. Luby Indonesia	Luby	Contacted	No responses despite follow ups
3	PT. Indomekar Yasia	Eka; Naterra	No contact details	Not listed in Yellow Pages, not registered in Telkom
4	PT. Kyzuku Indonesia	Kyzuku	No contact details	Not listed in Yellow Pages, not registered in Telkom
5	PT Mugan Indonesia	Mugan	No contact details	Not listed in Yellow Pages, not registered in Telkom
6	PT. Bumi Mitra Sejahtera	GMC	Contacted	No responses despite follow ups
7	PT. Berdikari Inti Gemilang	Welhome	No contact details	Not listed in Yellow Pages, not registered in Telkom

Appendix C – Retailer Survey Methodology

The table below lists the number of different types of stores in Indonesia. These counts were used to determine the minimum sample size for the retailer survey. The sampling method is explained below.

Statistics of Retailers[58]

Retailer Type	Units
Electrical Shops	72,000
Supermarkets	1000
Traditional Stores	2,000,000

Proposed Sampling Methodology

The following approach was proposed for conducting the survey of retail stores in Indonesia:

Determination of survey sample size

The survey samples were chosen to statistically represent the retail stores across the selected regions.

$$\text{Sample size} = \frac{\frac{z^2 \times p(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p(1-p)}{e^2 N}\right)}$$

Population Size = N, Margin of error = e, z-score = z, p is the sample proportion, e is percentage, put into decimal form.

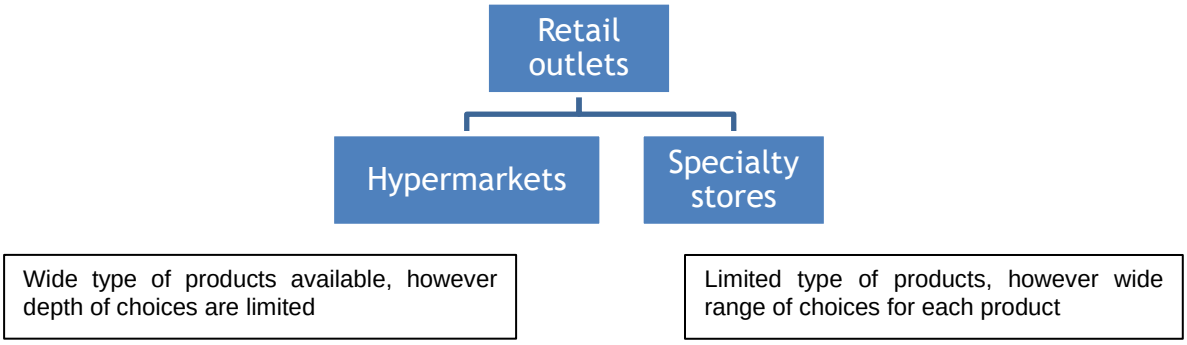
Confidence/Margin of error	9%	7%	5%	3%
80%	51	84	164	455
85%	64	106	207	576
90%	84	138	271	752
95%	119	196	384	1067
99%	205	339	664	1843

[58] The data is taken from the website of Indonesian Electrical Lighting Association and the source is *'PT PLN (Persero) / Electricity State Enterprise, ESDM, Litbang Sentra Elektrik'*

As shown above, the sample size depends on the required confidence interval and the appropriate margin of error. We proposed confidence interval of 80% and a margin of error of 9%, making it a total of 51 field visits to non-traditional retailers. Based on consultations with EBTKE and CLASP, the hypermarkets and specialty stores were selected for the retailer survey. Traditional retailers could not be adequately sampled due to their high number. Instead, between a total of 14 traditional stores were visited across four cities.

Approach Selected for Selection of Retail Stores

The approach was discussed with CLASP and EBTKE teams and the first-phase retailer survey was conducted in Jakarta. This was followed with retailer surveys at Bandung, Surabaya and Makassar. The survey was therefore extended to Medan (North Sumatra) and Bali.



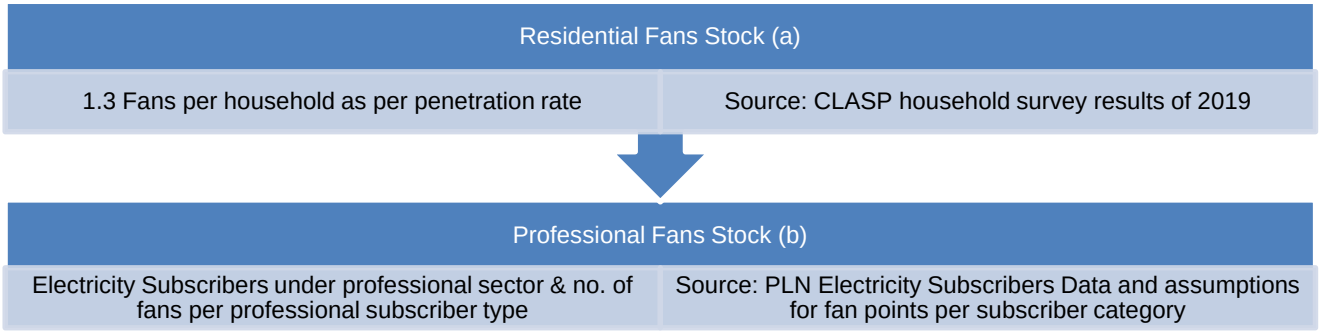
Retailer surveys focused on common fan types, models, wattages, flow rates, brands, and retail prices. Although the geographical coverage was limited, the findings were quite useful in understanding the fans retail market. The retailer survey questionnaire was designed to identify number of fan models available. We assumed that fan retailers would carry only models regularly sought by consumers and on-shelf availability would determine their popularity.

Appendix D – Stock, Annual Shipment Calculation & Forecasting

Stock Calculation for Indonesia Fans

Two different approaches were followed to estimate fans market stock in Indonesia across the residential and professional sectors. Residential fans stock was obtained from CLASP's 2019 Indonesia-wide residential end-use survey household, while for professional fan, stock was derived from the number of electricity subscribers provided by the national electrical company PLN.

Step by Step Approach to Stock Calculation



Annual shipments

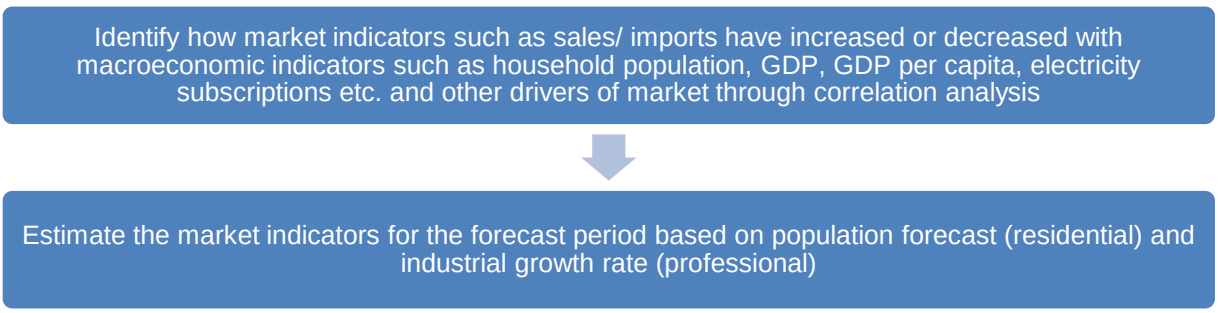
Annual shipments in the residential sector were derived from the stock as follows:

Annual Shipment in 2018 = (Stock 2018 – Stock 2017) + (Replacements in 2018), where replacements are a function of stock divided by the replacement factor (RF).

Replacement factor *is the estimated replacement period (in years) considered in proportion to technology stock existing in that year. Lifetime for a residential fan was considered as 5 years across types as per data and inputs received from manufacturers.*

Forecast

A top-down approach to sales forecasting was undertaken as presented in the figure below.



Approach to forecasting fans shipments to 2030

Detailed calculation for annual shipments, annual shipments and their forecast is provided below.

1) Population Data of Indonesia, Source : *World Bank population data and forecast*

Millions	2015	2016	2017	2018	2019	2020	2021	2022
Population Indonesia	258	262	265	268	271	274	276	279

2023	2024	2025	2026	2027	2028	2029	2030
282	284	287	290	292	295	297	299

2) Household numbers as per population, considering ~ 4people per household,[59]

- Electrification rate considered is 97.5% for 2015, 97.6% for 2016 and 98.14% from 2018 to 2030

Millions	2015	2016	2017	2018	2019	2020	2021
Households (electrified)	64.4	65.6	66.8	67.7	68.6	69.4	70.0

Millions	2022	2023	2024	2025	2026	2027	2028
Households (electrified)	70.9	71.8	72.4	73.3	74.1	74.8	75.6

Millions	2029	2030
Households (electrified)	76.3	77.0

3) Penetration and fans probability per household, *Source: Household survey of CLASP in 2019*

Fan types	Penetration, Percentage
Ceiling fans	4.66%
Table/ desk fans	16.96%
Stand/ pedestal fans	31.92%
Wall mounted fans	10.31%
Combination fans	2.66%
Total	**66.5%**

[59] Source: BPS population statistics of 2010 provides a typical household size as ~ 4 people per household

Number of Fans Per Household
1.3

4) Fans stock calculation from above inputs

Stock = Households with electricity in 2018 x No. of fans per household x Penetration Percentage

5) Estimated fans stock over the years as per above calculation equation in point 4)

	2016	2017	2018	2019	2020	2021
Total Fans Stock	56.7	57.8	58.5	59.3	60.0	60.6

	2022	2023	2024	2025	2026	2027	2028
Total Fans Stock	61.3	62.1	62.6	63.4	64.0	64.7	65.3

	2029	2030
Total Fans Stock	65.9	66.5

6) Annual Shipments Calculation

Annual shipments in the residential sector were derived from residential stock estimate.

The annual sales for the year 2018 were calculated as per the below:

Annual Shipment in 2018 = e.g. (Stock 2018 – Stock 2017) + (Replacements in 2018), where replacements are a function of stock divided by the replacement factor (RF).

Replacement factor *is the estimated replacement period (in years) considered in proportion to technology stock existing in that year. Lifetime for a residential fan was considered as 5 years across types as per data and inputs received from manufacturers, Source: Manufacturer Survey*

Sales, million units	2016	2017	2018	2019	2020	2021	2022
Desk	3.15	3.21	3.18	3.21	3.25	3.22	3.32
Standing	5.93	6.05	5.98	6.05	6.12	6.07	6.25
Wall	1.92	1.95	1.93	1.95	1.98	1.96	2.02
Combo	0.49	0.50	0.50	0.50	0.51	0.51	0.52

Ceiling	0.87	0.88	0.87	0.88	0.89	0.89	0.91
Total	12.36	12.60	12.45	12.60	12.76	12.65	13.02

Sales, million units	2023	2024	2025	2026	2027	2028	2029	2030
Desk	3.36	3.33	3.43	3.43	3.46	3.49	3.52	3.55
Standing	6.32	6.27	6.46	6.46	6.52	6.57	6.63	6.68
Wall	2.04	2.02	2.09	2.09	2.11	2.12	2.14	2.16
Combo	0.53	0.52	0.54	0.54	0.54	0.55	0.55	0.56
Ceiling	0.92	0.91	0.94	0.94	0.95	0.96	0.97	0.97
Total	13.17	13.06	13.45	13.47	13.58	13.70	13.81	13.91

7) Professional fans stock

- Electricity subscribers considered as part of professional sector involving business sector, industrial sector and other relevant subscribers as per below list:

PLN, Tariff Category	Type	Subscribers,2018
B-1	Small business, low voltage	3,071,766
B-2	Medium business, low voltage	601,607
B-3	Large business, medium voltage	7,896
I-1	Small/home industry, low voltage	35,007
I-2	Medium industry, low voltage	39,323
I-3	Medium industry, medium voltage	13,769
I-4	Large industry, high voltage	86
S-1	Small social	665
S-2	Medium social	1,558,092
S-3	Large social	1,905
P-1	Govt offices small users	196,431
P-2	Govt offices medium users	1,682

- Assumptions and inputs for Penetration, no. of fans per professional subscriber type

PLN, Tariff Category	Penetration Percentage	Assumed Fans Per Subscriber type	Stock 2018, million units[60]
B-1	100%	1.3	3.99
B-2		2.6	1.56

[60] Stock = No. of subscribers x Respective assumption for fans per subscriber type x penetration percentage

PLN, Tariff Category	Penetration Percentage	Assumed Fans Per Subscriber type	Stock 2018, million units[60]
B-3		3.9	0.03
I-1		1.3	0.05
I-2		2.6	0.10
I-3		3.9	0.05
I-4		5.2	0.00
S-1		1.3	0.00
S-2		2.6	4.05
S-3		3.9	0.01
P-1		1.3	0.20
P-2		2.6	0.00
Total Stock for professional fans			**10.04**

- Annual shipments for professional fans considered for 2018 as per below calculation,

  Annual shipments for 2018 ~ Stock 2018 / lifetime (5 years)

- Forecasting for annual shipments in professional fans is done by considering industrial growth rate of 5.1% till 2030[61]

8) Annual Shipments for Indonesia

Historical sales (million units)	Desk	Standing	Wall	Combination	Ceiling	Professional fans
2016	3.15	5.93	1.92	0.49	0.87	1.82
2017	3.21	6.05	1.95	0.50	0.88	1.91
2018	3.18	5.98	1.93	0.50	0.87	2.01
2019	3.21	6.05	1.95	0.50	0.88	2.11
2020	3.25	6.12	1.98	0.51	0.89	2.22
2021	3.22	6.07	1.96	0.51	0.89	2.33
2022	3.32	6.25	2.02	0.52	0.91	2.45
2023	3.36	6.32	2.04	0.53	0.92	2.58
2024	3.33	6.27	2.02	0.52	0.91	2.71
2025	3.43	6.46	2.09	0.54	0.94	2.85
2026	3.43	6.46	2.09	0.54	0.94	2.99
2027	3.46	6.52	2.11	0.54	0.95	3.14

[61] Industrial growth rate considered from world bank as per prev

2028	3.49	6.57	2.12	0.55	0.96	3.31
2029	3.52	6.63	2.14	0.55	0.97	3.47
2030	3.55	6.68	2.16	0.56	0.97	3.65

Appendix E – Brands in Modern and Traditional Retail

Brands in traditional retail only

	Traditional Retail Brands	Location
1	Kangaroo	Jakarta
2	Vornado	Jakarta
3	Katsu	Jakarta
4	Regency	Jakarta
5	Pisces	Jakarta
6	CKE	Jakarta
7	Misty cool	Jakarta
8	Mayaka	Jakarta
9	Yundai	Jakarta, Makassar, Medan
10	Aoyama	Jakarta
11	RBF	Jakarta
12	Kingston	Medan
13	Sivicom	Medan
14	TD	Medan
15	Mitochiba	Medan
16	Kelhome	Medan
17	WorldStar	Medan

Brands in modern retail only

	Modern Retail Brands
1	Air Monster
2	Ariston
3	Cosmos
4	Denpoo
5	Hannochs
6	Hunter
7	Kirin
8	Kris
9	Krisbow
10	Midea
11	Mitsubshi
12	Miyako
13	Oxone
14	Panasonic
15	Power Air
16	Sanex
17	Sanken
18	Sekai
19	Tecstar
20	Turbo
21	Westinghouse

Brands in both modern and traditional retail

	Modern and Traditional Retail Brands	Location
1	Arisa	Jakarta
2	KDK	Jakarta, Medan
3	Maspion	Jakarta
4	GMC	Jakarta, Makassar
5	Visalux	Jakarta, Medan
6	Arashi	Medan
7	Natsuper	Medan
8	Mistral	Medan

Appendix F – Data from Manufacturers by Type

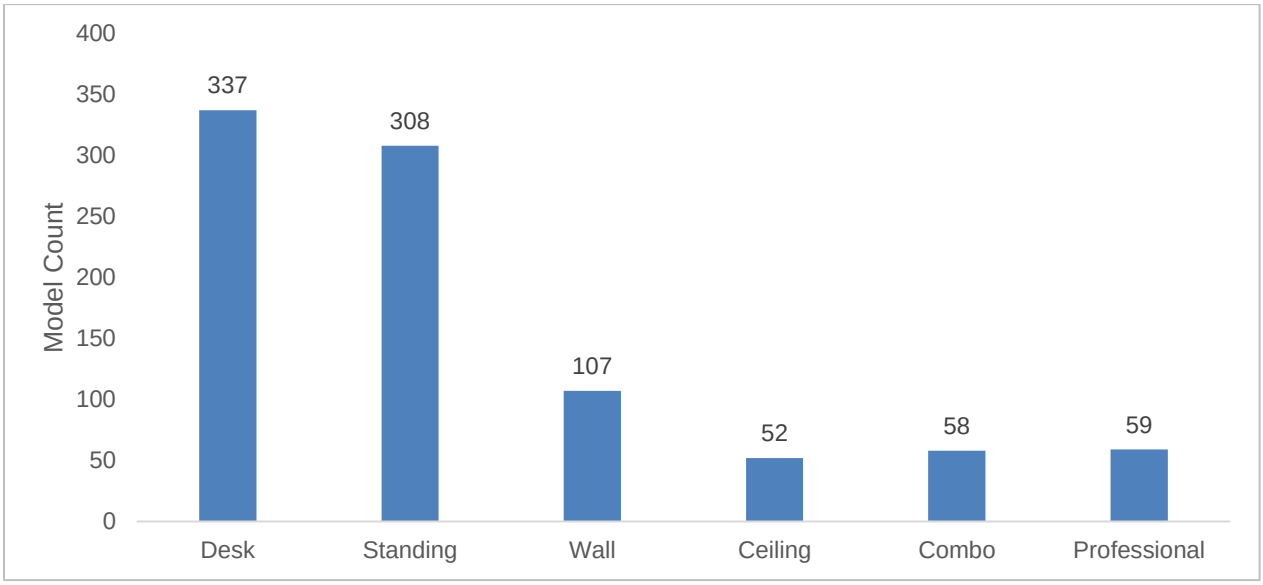
Since Gabel (Indonesian Electronics Industries Association) has limited data on the fans market, the team attempted to engage with local manufacturers to understand the size and structure of the fans market in Indonesia. Manufacturers and their market share based on production data was discussed in Section 3.2. Their total production is reported at 8.48 million units for the year 2018 representing **59%** market share.

The manufacturers together reported a cumulative production of 8 million units in 2018. Cumulatively, for these manufacturers, production of electric fans has been growing at a CAGR of 10% over the last 3 financial years. Table fans, standing fans and wall-mounted fans accounted for approximately 85% of the overall production. A detailed estimate of the production data is illustrated in the following table.

Production Data by type from 6 manufacturers

Production for 6 manufacturers	2016	2017	2018
Ceiling fans	4%	5%	5%
Table/desk fans	22%	21%	22%
Standing fans	29%	28%	31%
Wall-mounted fans	38%	38%	37%
Combo fans	3%	3%	2%
Professional fans	5%	5%	4%

During the retailer survey, desk and standing fans also had the highest model availability (37% and 33% respectively) followed by wall fans (12%). However, the availability of desk fans was found to be higher than of standing fans. Nonetheless, desk, standing, and wall fans account again account for the vast majority of fans available.



Fan models in the market by type

Test conditions

The testing is to be conducted under the following test conditions, as specified in the standard.

Test conditions followed of testing

Testing conditions	
Run-in condition	It is essential that before taking any steps towards testing a fan according to this standard, it should have been "run-in "to steady conditions at the test voltage. A period of 1 h is considered adequate for this purpose, covering conditioning period of 30 minutes.
Limits of error of electrical measuring instruments	Ammeter, voltmeter and wattmeter used for type tests shall have a class index 0.5 or better
Test voltage	When a rated voltage is indicated on the nameplate, the tests shall be conducted at the rated voltage. If the fan is specified for two or more distinct rated voltages, the tests shall be carried out at the most unfavorable voltage.
Test speed	The measurements shall be carried out with the fan running at full speed at the test voltage
Frequency	Fans shall be tested at rated frequency, if marked. For a fan with a range of frequencies, the tests shall be made at the frequency which gives the most unfavorable results. For a fan not marked with rated frequency the tests shall be made either at 50 Hz or 60 Hz whichever is more unfavorable.
Limits of voltage variation	shall not exceed ± 1% of the test voltage. Total Harmonic Distortion (THD) of ≤5%.
Atmospheric Conditions for testing	**Ambient temperature** of 20 ± 5 °C, in case of doubt it shall be 23 ± 2 °C, **Relative humidity** – 50% ± 30% **Air pressure** – 86 kPa to 106 kPa

Measurement of fan speed

The speed of rotation of the fan shall be determined by running the fan at the test voltage and at its rated frequency (if a.c.). The method of measurement shall be such that the speed of the fan is not affected. The regulator, if any, shall be at the highest speed position and the oscillating mechanism, if any, shall be disconnected.

Measurement of power factor

The fan shall be connected to the supply at the test voltage and frequency. Capacitors, if any, associated with the fan shall be retained in the circuit. The regulator, if provided, shall be set at the highest speed position and the oscillating mechanism, if any, shall be disconnected. Power input (W) shall be noted and power factor of the fan shall be either measured directly with the help of a power factor meter or calculated from the readings of ammeter, voltmeter and wattmeter.

Measurement of total air delivery

IEC 60879 prescribes very specific conditions for measurement of total air delivery of the test fan. At a glance, the fan is first placed in a chamber of appropriate size and physical structure in a way described in the standard. Then, it is brought to “run-in” steady state condition by letting it run for approximately 1-2 hours at full speed at the test voltage. Depending on the type of fan being tested, the measurement of air velocity is taken at specific positions over the blade sweep using an appropriate anemometer (at least 4 vane anemometers) at frequent intervals.

IEC Test Standards Requirements

	Ceiling/ deck-type fan	Other non-ceiling comfort fans
Dimensions of chamber	Length: 4.50 m, width: 4.50 m, height: 3 m, tolerance of ± 15 mm The central diaphragm in which the top opening is located shall be not more than 6 mm thick.	Length: 4.50 m for table and cabin type fans, 6 m for pedestal type fans, width: 4.50 m, height: 3 m
Other requirements	Top of the test chamber shall be covered except for a centrally situated circular opening (top opening) The diameter of which shall be between 1.1 and 1.2 times the blade sweep	The test chamber shall be free from obstructions other than the stand on which the fan is kept. Any table or shelf for electrical instruments shall be on the intake side of the fan, beyond a distance of 0.90 m from the plane of the fan blades. No heating or cooling apparatus shall be used in the test room while the test is in progress.
Height of fan	The fan shall be placed at such a height that the plane of the fan blades is 3 m (tolerance ± 10 mm) from the ground level and lies in the plane of the top edge of the diaphragm containing the top opening in the roof of the test chamber.	The table/cabin type fan shall be mounted with the blade centre 1.20 m from the floor and with the front of the blades at least 1.20 m from the back wall and at least 1.80 m from the side walls and the wall in front. The pedestal type fan shall be so situated that the blade centre is 1.50 m from the floor and the front of the blades is at least 1.20 m from the back wall, 1.80 m from the side walls and 4 m from the wall in front.
Air movement	The air movement shall be measured by means of a rotating vane anemometer having an internal diameter not exceeding 100 mm	The air movement shall be measured by means of a rotating vane anemometer having an internal diameter not exceeding 100 mm suitable for the range of velocities to be measured.

	Ceiling/ deck-type fan	Other non-ceiling comfort fans
Air velocity	Air velocity readings shall be taken along each of the four semi-diagonals of the test chamber commencing at a point 40 mm from the vertical axis of the fan motor by increments of 80 mm so that each reading represents an air velocity at the mean radius of an annulus 80 mm wide. The readings shall be continued until the velocity falls below 9.0 m per min. Each reading shall consist of the time taken by an air movement of 300 m measured by the anemometer, except when such air movement takes more than 2 min; the reading shall then consist of the time taken by a movement of some convenient and readable quantity of air requiring approximately 2 min	Air velocity readings shall be commenced at a point 20 mm from the axis of the fan blades and shall progress along the horizontal line in each direction, by increments of40 mm wide. Readings shall be continued in each direction until the true air velocity falls below 24 m/min. Each reading shall consist of the time taken by an air movement of 300 m measured by the anemometer, except when such air movement takes more than 2 min; the reading shall then consist of the time taken by a movement of some convenient and readable quantity of air requiring approximately 2 min. In no case should the duration of the reading be less than 1 min.

The average air velocity over any annulus shall be the mean of the readings on the four semi diagonals at each mean radius of annulus. The average velocity so obtained, multiplied by the area of the corresponding annulus shall be taken as the total air delivery through that annulus

The sum of the air deliveries through all such annuli up to the limit of readings shall be taken as the measured air delivery of the fan for the purposes of this standard.

Measurement of sound power level

To be measured and tested as per IEC 60704

Tolerance

The tolerances to be applied to the rated quantities, when assigned by the manufacturer, shall be as given below:

- Air delivery: —10%
- Power factor: — 1/6 (1 — cos P), minimum 0.02, maximum 0.07
- Fan speed: ± 10%